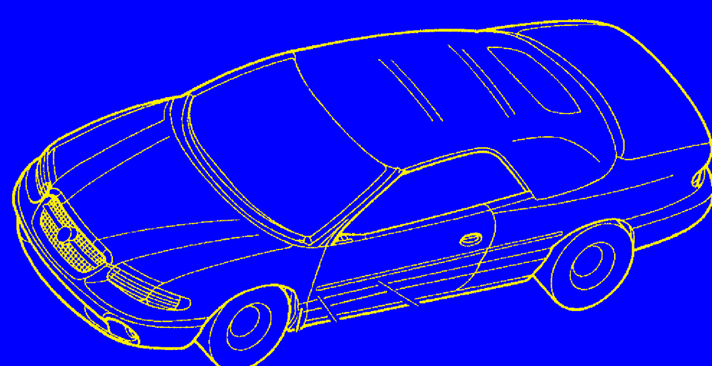
CHRYSLER CORPORATION

Welcome to the
1997 Stratus Convertible
(RHD & LHD)
Interactive Electronic Service Manual!

CLICK ON VEHICLE TO BEGIN



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GROUP TAB LOCATOR

INTRODUCTION

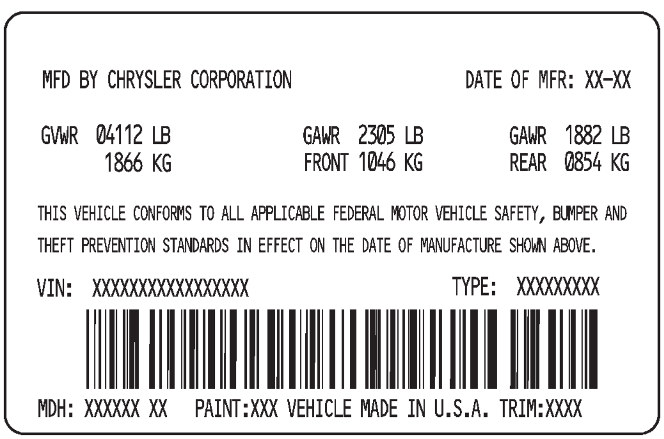
CONTENTS

GENERAL INFORMATION

VEHICLE SAFETY CERTIFICATION LABEL

A vehicle safety certification label (Fig. 1) is attached to the rear facing of the driver's door. This label indicates date of manufacture (month and year), Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating (GAWR) front, Gross Axle Weight Rating (GAWR) rear and the Vehicle Identification Number (VIN). The Month, Day and Hour of manufacture is also included.

All communications or inquiries regarding the vehicle should include the Month-Day-Hour and Vehicle Identification Number.



800dfad9

Fig. 1 Vehicle Safety Certification Label

VEHICLE IDENTIFICATION NUMBER

The Vehicle Identification Number (VIN) is located on the upper left corner of the instrument panel, near the left windshield pillar (Fig. 2). The VIN consists of 17 characters in a combination of letters and numbers that provide specific information about the vehicle. Refer to VIN Code Breakdown table for decoding information.

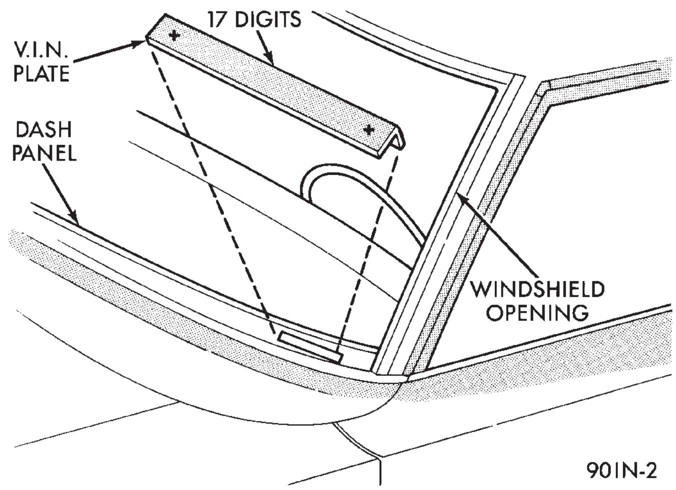


Fig. 2 Vehicle Identification Number (VIN Plate)

VIN CHECK DIGIT

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

BODY CODE PLATE

LOCATION AND DECODING

The Body Code Plate (Fig. 3) is located in the engine compartment on the driver side strut tower. There are seven lines of information on the body code plate. Lines 4, 5, 6, and 7 are not used to define service information. Information reads from left to right, starting with line 3 in the center of the plate to line 1 at the bottom of the plate.

GENERAL INFORMATION (Continued)

VIN CODE BREAKDOWN

POSITION	INTERPRETATION	CODE=DESCRIPTION
1	Country of Origin	3=Built in Mexico by Chrysler of Mexico
2	Make	C=Chrysler
3	Vehicle Type	3=Passenger Car
4	Other	E=Active Driver and Passenger Air Bag
5	Car LIne	L=Chrysler, Sebring
6	Series	4=High line
		5=Premium
7	Body Style	5=Convertible/Open Body
8	Engines	X=2.4L 4 Cyl 16 V Gasoline DOHC
		H=2.5 L 6 Cyl Gasoline SOHC S=2.4L 4 Cyl Gasoline DOHC Turbo(sold in Mexico)
9	Check Digit	See explanation in this section
10	Model Year	V =1997
11	Plant	T =Toluca
12 thru 17	Sequence Number	6 digit number assigned by assembly plant.

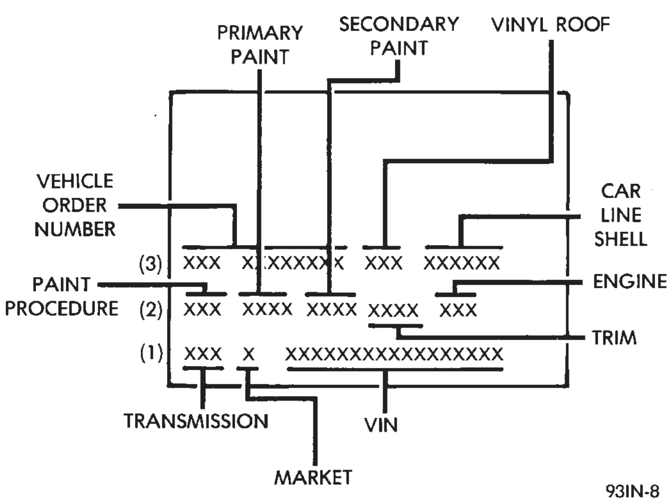


Fig. 3 Body Code Plate

BODY CODE PLATE—LINE 3

DIGITS 1 THROUGH 12

Vehicle Order Number

DIGITS 13, 14, AND 15

Open Space

DIGITS 16, 17, AND 18

Vehicle Shell Line
- JXCP= Chrysler, Sebring LXi
- JXCH=Chrysler, Sebring LX

DIGIT 19

Price Class
- E = Economy
- H = High Line
- L = Low Line
- M = Mid Line
- P = Premium
- S = Special/Sport
- X = Performance Image

DIGITS 20 AND 21

Body Type
- 27=2 Door Convertible

BODY CODE PLATE LINE 2

DIGITS 1, 2, AND 3—

Paint procedure

DIGIT 4—

Open Space

DIGITS 5 THROUGH 8—

Primary paint
See Group 23, Body for color codes.

DIGIT 9—

Open Space

DIGITS 10 THROUGH 13—

Secondary Paint

GENERAL INFORMATION (Continued)

DIGIT 14—

Open Space

DIGITS 15 THROUGH 18—

Interior Trim Code

DIGIT 19—

Open Space

DIGITS 20, 21, AND 22—

Engine Code
- EEB = 2.5L Six Cylinder SOHC Gasoline
- EDZ = 2.4L Four Cylinder DOHC Gasoline

BODY CODE PLATE LINE 1

DIGITS 1, 2, AND 3—

Transaxle Codes
- DGL = 41TE 4-speed Electronic Automatic Transaxle

DIGIT 4—

Open Space

DIGIT 5—

Market Code
- U = United States
- C = Canada
- B = International
- M = Mexico

DIGIT 6—

Open Space

DIGITS 7 THROUGH 23—

Vehicle Identification Number
- Refer to Vehicle Identification Number (VIN) paragraph for proper breakdown of VIN code.

IF TWO BODY CODE PLATES ARE REQUIRED

The last code shown on either plate will be followed by END. When two plates are reqired, the last code space on the first plate will indicate (CTD)

When a second plate is required, the first four spaces of each line will not be used due to overlap of the plates.

STANDARD VEHICLE DIMENSIONS

INTERIOR DIMENSIONS

BODY	HEADROOM		LEG ROOM		SHOULDER ROOM		HIP ROOM	
	FRONT	REAR	FRONT	REAR	FRONT	REAR	FRONT	REAR
CH-27	38.7 in. 983 mm	37.0 in. 940 mm	42.4 in. 1076 mm	35.2 in. 895 mm	55.0 in. 1396 mm	49.0 in. 1245 mm	52.4 in. 1332 mm	44.7 in. 1135mm

EXTERIOR DIMENSIONS

BODY STYLE	WHEELBASE	FRONT TRACK	REAR TRACK	OVERALL LENGTH	WIDTH	HEIGHT
CH-27	106.0 in. 2692 mm	60.2 in. 1530 mm	60.2 in. 1528 mm	193.0 in. 4902 mm	69.2 in. 1757 mm	54.8 in. 1392 mm

GENERAL INFORMATION (Continued)

INTERNATIONAL CONTROL AND DISPLAY SYMBOLS

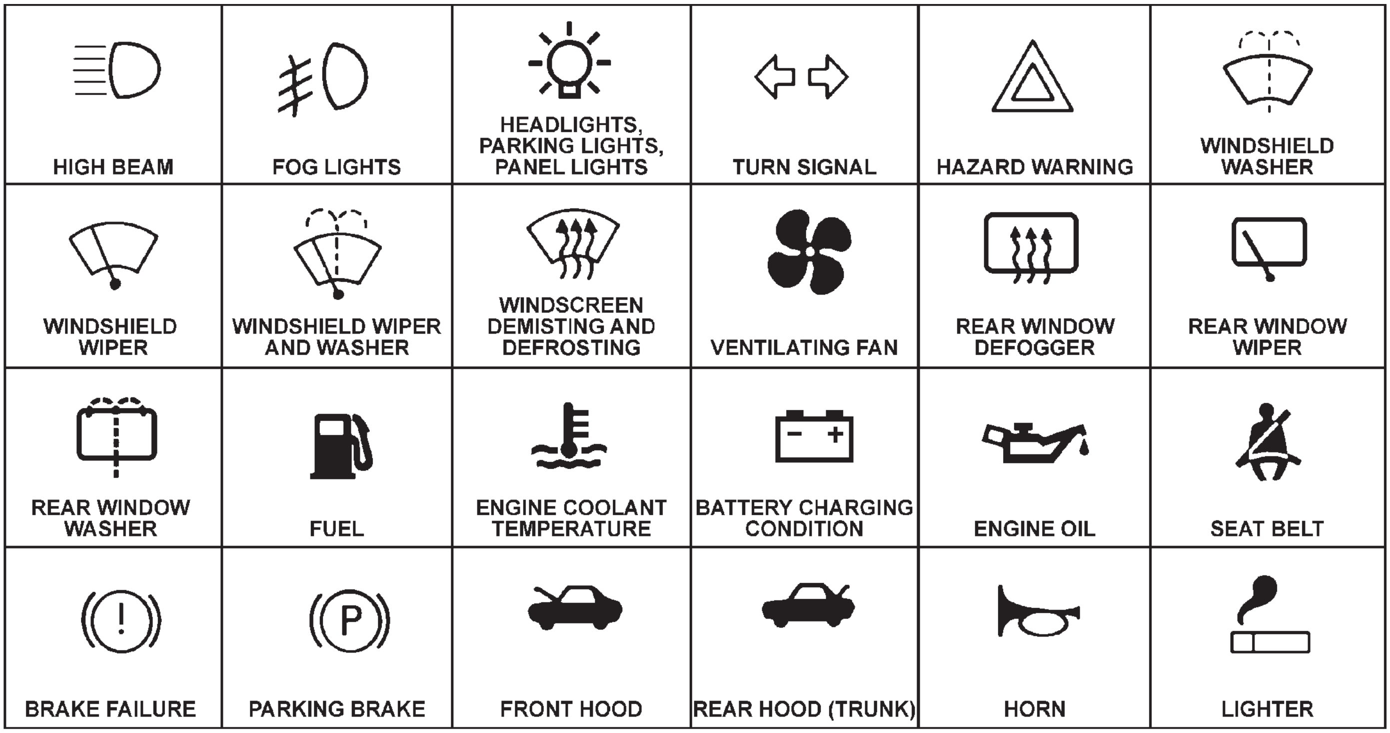


Fig. 4

INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS

INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS

The graphic symbols illustrated in the following chart (Fig. 4) are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

FASTENER IDENTIFICATION

FASTENER IDENTIFICATION

THREAD IDENTIFICATION

SAE and metric bolt/nut threads are not the same. The difference is described in the Thread Notation chart (Fig. 5).

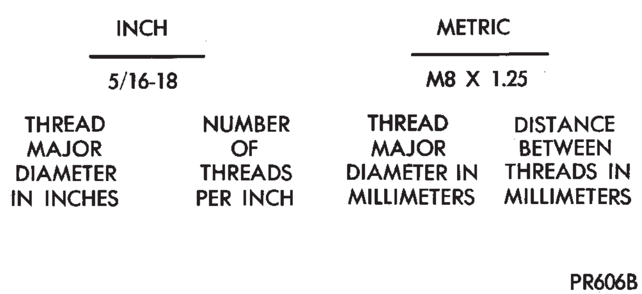


Fig. 5 Thread Notation—SAE and Metric

GRADE/CLASS IDENTIFICATION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 12.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts

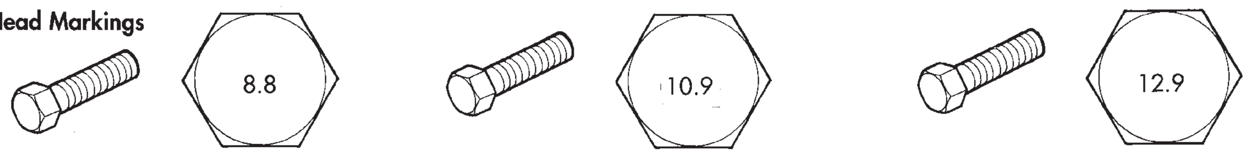
GENERAL INFORMATION (Continued)

FASTENER IDENTIFICATION

Bolt Markings and Torque - Metric

Commercial Steel Class: 8.8, 10.9, 12.9

Bolt Head Markings

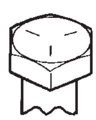


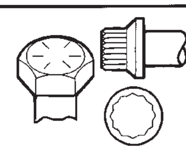
Body Size Diam. mm	8.8 Torque Cast Iron N•m	8.8 Torque Cast Iron ft-lb	8.8 Torque Aluminum N•m	8.8 Torque Aluminum ft-lb	10.9 Torque Cast Iron N•m	10.9 Torque Cast Iron ft-lb	10.9 Torque Aluminum N•m	10.9 Torque Aluminum ft-lb	12.9 Torque Cast Iron N•m	12.9 Torque Cast Iron ft-lb	12.9 Torque Aluminum N•m	12.9 Torque Aluminum ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7
7	14	9	11	7	18	14	14	11	23	18	18	14
8	25	18	18	14	32	23	25	18	36	27	28	21
10	40	30	30	25	60	45	45	35	70	50	55	40
12	70	55	55	40	105	75	80	60	125	95	100	75
14	115	85	90	65	160	120	125	95	195	145	150	110
16	180	130	140	100	240	175	190	135	290	210	220	165
18	230	170	180	135	320	240	250	185	400	290	310	230

Bolt Markings and Torque Values - U.S. Customary

SAE Grade Number: 5, 8

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





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

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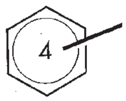
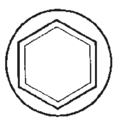
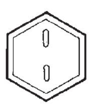
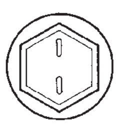
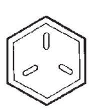
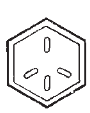
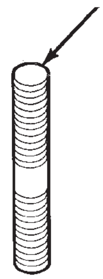
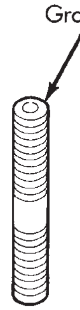
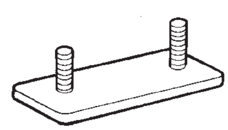
GENERAL INFORMATION (Continued)

FASTENER STRENGTH

HOW TO DETERMINE BOLT STRENGTH

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

	Mark	Class
Stud bolt	No mark 	4T
	Grooved 	6T
Welded bolt		4T

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GENERAL INFORMATION (Continued)

METRIC SYSTEM

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

Figure art, specifications and torque references in this Service Manual are identified in metric and SAE format.

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

The metric system is based on quantities of one, ten, one hundred, one thousand and one million (Fig. 6).

Mega - (M) Million	Deci - (D) Tenth
Kilo - (K) Thousand	Centi - (C) Hundredth
Milli - (m) Thousandth	

Fig. 6

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

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

CONVERSION FORMULAS AND EQUIVALENT VALUES

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

COMMON METRIC EQUIVALENTS

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

GENERAL INFORMATION (Continued)

METRIC CONVERSION2

in-lbs to N·m										N·m to in-lbs									
in-lb	N·m	in-lb	N·m	in-lb	N·m	in-lb	N·m	in-lb	N·m	N·m	in-lb	N·m	in-lb	N·m	in-lb	N·m	in-lb	N·m	in-lb
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032	.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292	.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552	.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811	.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071	1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331	1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590	1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850	1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110	1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369	2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629	2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889	2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148	2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408	2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668	3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927	3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187	3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447	3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706	3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966	4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N·m										N·m to ft-lbs									
ft-lb	N·m	ft-lb	N·m	ft-lb	N·m	ft-lb	N·m	ft-lb	N·m	N·m	ft-lb	N·m	ft-lb	N·m	ft-lb	N·m	ft-lb	N·m	ft-lb
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212	1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770	2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328	3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888	4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446	5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004	6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562	7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120	8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678	9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236	10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794	11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352	12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910	13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468	14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026	15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586	16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144	17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702	18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260	19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820	20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

GENERAL INFORMATION (Continued)

in. to mm										mm to in.									
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574	.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828	.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082	.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336	.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590	.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844	.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098	.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352	.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606	.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860	.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114	.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368	.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622	.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876	.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130	.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384	.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	3.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638	.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892	.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146	.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400	.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

GENERAL INFORMATION (Continued)

TORQUE REFERENCES

Individual Torque Charts appear at the end of many Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts.

TORQUE SPECIFICATIONS

SPECIFIED TORQUE FOR STANDARD BOLTS

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

LUBRICATION AND MAINTENANCE

CONTENTS

GENERAL INFORMATION

INDEX

GENERAL INFORMATION

INTRODUCTION

Service and maintenance procedures for components and systems listed in Schedule—A or B can be found by using the Group Tab Locator index at the front of this manual. If it is not clear which group contains the information needed, refer to the index at the back of this manual.

There are two maintenance schedules that show proper service based on the conditions that the vehicle is subjected to.

Schedule— **A** , lists scheduled maintenance to be performed when the vehicle is used for general transportation.

Schedule— **B** , lists maintenance intervals for vehicles that are operated under the conditions listed at the beginning of the Maintenance Schedule section.

Use the schedule that best describes your driving conditions.

Where time and mileage are listed, follow the interval that occurs first.

PARTS AND LUBRICANT RECOMMENDATIONS

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

INTERNATIONAL SYMBOLS

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

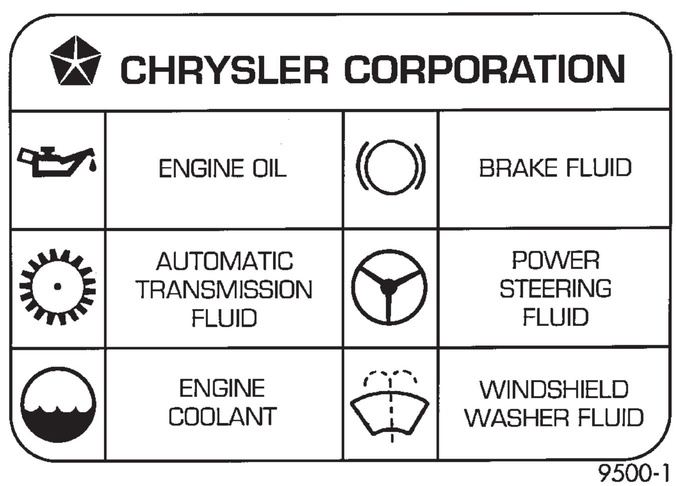


Fig. 1 International Symbols

CLASSIFICATION OF LUBRICANTS

Only lubricants that are endorsed by the following organization should be used to service a Chrysler Corporation vehicle.

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

GENERAL INFORMATION (Continued)

9400-9

Fig. 2 API Symbol

ENGINE OIL

SAE GRADE RATING INDICATES ENGINE OIL VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 30 specifies a single viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range.

- SAE 30 = single grade engine oil.
- SAE 10W-30 = multiple grade engine oil.

API QUALITY CLASSIFICATION

The API Service Grade specifies the type of performance the engine oil is intended to provide. The API Service Grade specifications also apply to energy conserving engine oils.

Use engine oils that are API Service Certified. 5W-30 and 10W-30 MOPAR engine oils conform to specifications.

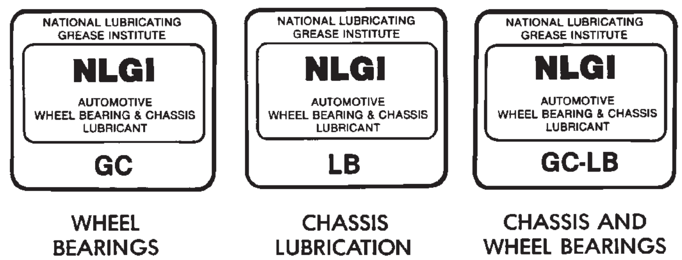
Refer to Group 9, Engine for engine oil specification.

GEAR LUBRICANTS

SAE ratings also apply to multiple grade gear lubricants. In addition, API classification defines the lubricants usage.

LUBRICANTS AND GREASES

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



9200-7

Fig. 3 NLGI Symbol

FLUID CAPACITIES

Fuel Tank . . . . 60.6 L (16 gal.)
Engine Oil—With Filter . . . . 4.25 L (4.5 qts.)
Engine Oil—Without Filter . . . . 3.8 L (4.0 qts.)
Cooling System—2.4 L Engine . . . . . 8.6 L (9.0 qts.)
Cooling System—2.5 L Engine . . . . 9.9 L (10.5 qts.)
Automatic Transaxle—Estimated
Service Fill . . . . 3.8 L (4.0 qts.)
Automatic Transaxle—Overhaul Fill
Capacity with Torque Converter
Empty . . . . 8.6 L (9.1 qts.)

MAINTENANCE SCHEDULES

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GENERAL INFORMATION

INTRODUCTION

There are two maintenance schedules that show the proper service for Chrysler vehicles. Use the schedule that best describes the conditions under which the vehicle is operated. Where time and mileage are listed, follow the interval that occurs first.

Schedule—A lists all the scheduled maintenance to be performed under “normal” operating conditions.

Schedule—B is a schedule for vehicles that are operated under one or more of the following conditions:

- Day and night temperatures are below freezing.
- Stop and go driving.
- Long periods of engine idling.
- Driving in dusty conditions.
- Short trips of less than 5 miles.
- Operation at sustained high speeds during hot weather, above 90°F (32°C).
- Taxi, police or delivery service.
- Trailer towing or heavy hauling.

EMISSION CONTROL SYSTEM MAINTENANCE

The scheduled emission maintenance listed in **bold type** in the Maintenance Schedules must be done at the specified mileage to assure the continued proper functioning of the emission control system. These, and all other maintenance services included in this manual, should be done to provide the best vehicle performance and reliability. More frequent maintenance may be needed for vehicles in severe operating conditions such as dusty areas and very short trip driving.

UNSCHEDULED INSPECTION

At Each Stop For Fuel

- Check engine oil level, add as required.
- Check windshield washer solvent and add if required.

Once A Month

- Check tire pressure and look for unusual wear or damage.
- Check fluid levels of coolant reservoir, power steering and automatic transmission and add as required.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Inspect exhaust system.
- Inspect brake hoses.
- Inspect the CV joints and front suspension components.
- Rotate the tires at each oil change interval shown on Schedule—A (7,500 miles – 12 000 km) or every other interval shown on schedule—B (6,000 miles – 10 000 km).
- Check coolant level, hoses and clamps.
- Check the manual transaxle fluid level.
- If the mileage is less than 7,500 miles (12 000 km) yearly, replace the engine oil filter at each oil change.

SCHEDULE—A

7,500 Miles (12 000 km) or at 6 months

- Change engine oil.
- Change engine oil filter on 2.4 liter engines.

15,000 Miles (24 000 km) or at 12 months

- Change engine oil.
- Replace engine oil filter on all engines.
- Adjust drive belt tension.

22,500 Miles (36 000 km) or at 18 months

- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Inspect the front brake pads and rear brake linings.

30,000 Miles (48 000 km) or at 24 months

- Change engine oil.
- Replace engine oil filter on all engines.
- Lubricate front and rear suspension ball joints.
- Adjust drive belt tension.
- **Replace air cleaner element.**
- **Replace spark plugs on 2.4L engines.**

GENERAL INFORMATION (Continued)

37,500 Miles (60 000 km) or at 30 months
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

45,000 Miles (72 000 km) or at 36 months
- Change engine oil.
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.
- Adjust drive belt tension.
- Flush and replace engine coolant at 36 months, regardless of mileage.

52,500 Miles (84 000 km) or at 42 months
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Flush and replace engine coolant if not done at 36 months.

60,000 Miles (96 000 km) or at 48 months
- Change engine oil.
- Replace engine oil filter on all engines.
- **Check and replace, if necessary***, the PCV valve.****
- Lubricate front and rear suspension ball joints.
- Replace drive belts.
- **Replace air cleaner element.**
- **Replace spark plugs and ignition cables on 2.4L engines.**

67,500 Miles (108 000 km) or at 54 months
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Inspect front brake pads and rear brake linings.

75,000 Miles (120 000 km) or at 60 months
- Change engine oil.
- Replace engine oil filter on all engines.
- Adjust drive belt tension.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

82,500 Miles (132 000 km) or at 66 months
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

90,000 Miles (144 000 km) or at 72 months
- Change engine oil.
- Replace engine oil filter on all engines.
- **Check and replace, if necessary***, the PCV valve.****
- Lubricate front and rear suspension ball joints.
- Inspect front brake pads and rear brake linings.
- Adjust drive belt tension.
- **Replace air cleaner air cleaner element.**
- **Replace spark plugs on 2.4L engines.**

97,500 Miles (156 000 km) or at 78 months
- Change engine oil.
- Replace engine oil filter on all 2.4 liter engines.

100,000 Miles (160 000 km)
- **Replace ignition cables.**
- **Replace spark plugs and ignition cables on 2.5L engines.**

105,000 Miles (168 000 km)
- Change engine oil.
- Replace engine oil filter on all engines
- **Replace engine timing belt on 2.4 liter engines**

SCHEDULE—B

3,000 Miles (5 000 km)
- Change engine oil
- Replace engine oil filter on 2.4 liter engines.

6,000 Miles (10 000 km)
- Change engine oil
- Replace engine oil filter on all engines.

9,000 Miles (14 000 km)
- Change engine oil
- Replace engine oil filter on 2.4 liter engines.

12,000 Miles (19 000 km)
- Change engine oil
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

15,000 Miles (24 000 km)
- Change engine oil
- Adjust drive belt tension.
- Replace engine oil filter on 2.4 liter engines.
- Change automatic transaxle fluid and filter.*

18,000 Miles (29 000 km)
- Change engine oil
- Replace engine oil filter on all engines.

21,000 Miles (34 000 km)
- Change engine oil
- Replace engine oil filter on 2.4 liter engines.

24,000 Miles (38 000 km)
- Change engine oil
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

GENERAL INFORMATION (Continued)

27,000 Miles (43 000 km)
- Change engine oil
- Replace engine oil filter on 2.4 liter engines.

30,000 Miles (48 000 km)
- Change engine oil
- Replace engine oil filter on all engines.
- **Check and replace, if necessary, the PCV valve.****
- Lubricate front and rear suspension ball joints.
- Adjust drive belt tension.
- **Replace air cleaner element.**
- **Replace spark plugs on 2.4 liter engines.**
- Change automatic transmission fluid and filter.*

33,000 Miles (53 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

36,000 Miles (58 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.
- Flush and replace engine coolant.
- Inspect front brake pads and rear brake linings.

39,000 Miles (62 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

42,000 Miles (67 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.

45,000 Miles (72 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Adjust drive belt tension.
- Change automatic transaxle fluid and filter.*

48,000 Miles (77 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

51,000 Miles (82 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Flush and replace engine coolant.

54,000 Miles (86 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.

57,000 Miles (91 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.

60,000 Miles (96 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.
- **Check and replace, if necessary***, the PCV valve.****
- Lubricate front and rear suspension ball joints.
- Replace drive belts.
- **Replace air cleaner element.**
- **Replace spark plugs and ignition cables on 2.4L engines.**
- Change automatic transaxle fluid and filter.*
- Inspect front brake pads and rear brake linings.

63,000 Miles (101 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

66,000 Miles (106 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.

69,000 Miles (110 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

72,000 Miles (115 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

75,000 Miles (120 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Adjust drive belt tension.
- Change automatic transaxle fluid and filter.*
- **Replace the spark plugs and ignition cables on 2.5L engines.**

78,000 Miles (125 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.

81,000 Miles (130 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- Flush and replace the engine coolant.

84,000 Miles (134 000 km)
- Change engine oil.
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

87,000 Miles (139 000 km)
- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

GENERAL INFORMATION (Continued)

90,000 Miles (144 000 km)

- Change engine oil.
- Replace engine oil filter on all engines.
- **Check and replace, if necessary***, the PCV valve.****
- Lubricate front and rear suspension ball joints.
- Adjust drive belt tension.
- **Replace air cleaner element.**
- **Replace spark plugs on 2.4L engines.**
- Change automatic transaxle fluid and filter.*

93,000 Miles (149 000 km)

- Change engine oil.
- Replace engine oil filter on 2.4 engines.

96,000 Miles (154 000 km)

- Change engine oil.
- Replace engine oil filter on all engines.
- Inspect front brake pads and rear brake linings.

99,000 Miles (158 000 km)

- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.

102,000 Miles (163 000 km)

- Change engine oil.
- Replace engine oil filter on all engines.

105,000 Miles (168 000 km)

- Change engine oil.
- Replace engine oil filter on 2.4 liter engines.
- **Replace the engine timing belt on 2.4 liter engines.**

*Police, taxi, or delivery service usage and trailer towing require the more frequent transaxle service indicated with a * in schedule—B. Perform these services if the vehicle is usually operated under these conditions.

NOTE: **This maintenance is recommended by Chrysler to the owner but is not required to maintain the warranty on the PCV valve.

NOTE: ***This maintenance is not required if the PCV valve was previously replaced.

JUMP STARTING, HOISTING AND TOWING

INDEX

SERVICE PROCEDURES

JUMP STARTING PROCEDURE

WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN GROUP 8A, BATTERY/STARTING/CHARGING SYSTEMS DIAGNOSTICS. DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT. DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR. DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES. DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE. DO NOT USE OPEN FLAME NEAR BATTERY. REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT. WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.

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

TO JUMP START A DISABLED VEHICLE:

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

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

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

(2) When using another vehicle as a booster source, park the booster vehicle within cable reach. Turn off all accessories, set the parking brake, place the automatic transmission in PARK or the manual transmission in NEUTRAL and turn the ignition OFF.

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

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

(5) On disabled vehicle, connect RED jumper cable clamp to positive (+) terminal. Connect BLACK jumper cable clamp to engine ground as close to the ground cable attaching point as possible (Fig. 1).

(6) Start the engine in the vehicle which has the booster battery, let the engine idle a few minutes, then start the engine in the vehicle with the discharged battery.

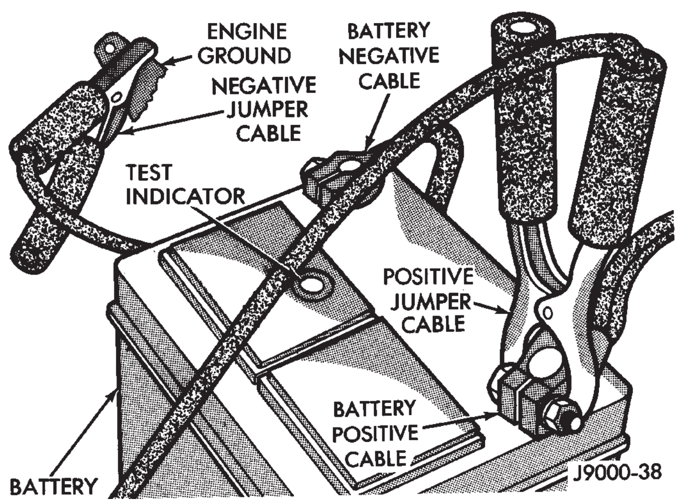


Fig. 1 Jumper Cable Clamp Connections

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

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

SERVICE PROCEDURES (Continued)

DISCONNECT CABLE CLAMPS AS FOLLOWS:

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

HOISTING RECOMMENDATIONS

Refer to Owner's Manual provided with vehicle for proper emergency jacking procedures.

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

CAUTION: Do not position hoisting device on suspension components, damage to vehicle can result.

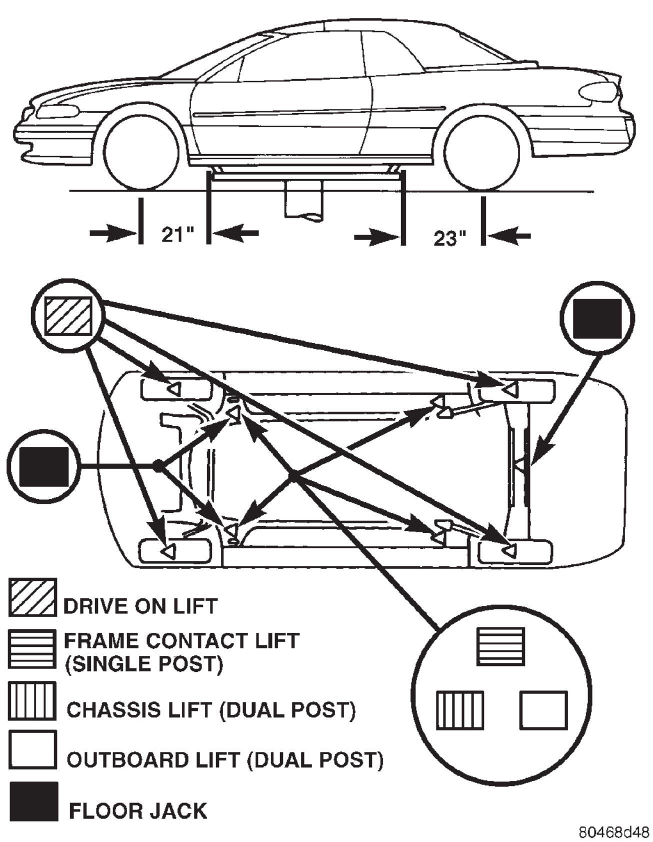


Fig. 2 Hoisting And Jacking Points

TOWING RECOMMENDATIONS

RECOMMENDED TOWING EQUIPMENT

To avoid damage to bumper fascia and air dams use of a flat bed towing device or wheel lift (Fig. 3) is recommended. When using a wheel lift towing device, be sure the unlifted end of disabled vehicle has at least 100 mm (4 in.) ground clearance. If minimum ground clearance cannot be reached, use a towing dolly. If a flat bed device is used, the approach angle should not exceed 15 degrees.

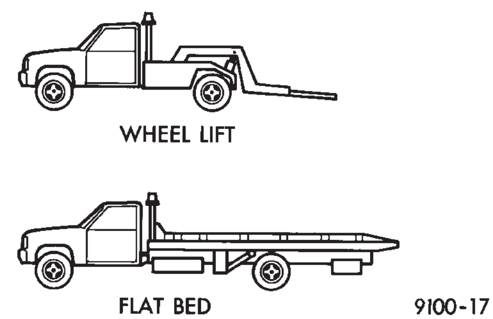


Fig. 3 Recommended Towing Equipment

GROUND CLEARANCE

CAUTION: If vehicle is towed with wheels removed, install lug nuts to retain brake drums or rotors.

A towed vehicle should be raised until the lifted wheels are a minimum 100 mm (4 in.) from the ground. Be sure there is at least 100 mm (4 in.) clearance between the tail pipe and the ground. If necessary, remove the wheels from the lifted end of the vehicle and lower the vehicle closer to the ground, to increase the ground clearance at the rear of the vehicle. Install lug nuts on wheel attaching studs to retain brake drums or rotors.

LOCKED VEHICLE TOWING

When a locked vehicle must be towed with the front wheels on the ground, use a towing dolly or flat bed hauler.

FLAT TOWING WITH TOW BAR

4–speed electronic transaxle vehicles can be flat towed at speeds not to exceed 72km/h (44 mph) for not more than 160 km (100 miles). The steering column must be unlocked and gear selector in neutral.

SERVICE PROCEDURES (Continued)

WARNINGS AND PRECAUTIONS

WARNING: DO NOT ALLOW TOWING ATTACHMENT DEVICES TO CONTACT THE FUEL TANK OR LINES, FUEL LEAK CAN RESULT. DO NOT LIFT OR TOW VEHICLE BY FRONT OR REAR BUMPER, OR BUMPER ENERGY ABSORBER UNITS. DO NOT VENTURE UNDER A LIFTED VEHICLE IF NOT SUPPORTED PROPERLY ON SAFETY STANDS. DO NOT ALLOW PASSENGERS TO RIDE IN A TOWED VEHICLE. USE A SAFETY CHAIN THAT IS INDEPENDENT FROM THE TOWING ATTACHMENT DEVICE.

CAUTION: Do not damage brake lines, exhaust system, shock absorbers, sway bars, or any other under vehicle components when attaching towing device to vehicle. Do not attach towing device to front or rear suspension components. Do not secure vehicle to towing device by the use of front or rear suspension or steering components. Remove or secure loose or protruding objects from a damaged vehicle before towing. Refer to state and local rules and regulations before towing a vehicle. Do not allow weight of towed vehicle to bear on lower fascia, air dams, or spoilers.

FLAT BED TOWING TIE DOWNS

CAUTION: Do not tie vehicle down by attaching chains or cables to suspension components or engine mounts, damage to vehicle can result.

JX vehicles can be tied to a flat bed device using the reinforced loops located under the front and rear bumpers on the drivers side of the vehicle. There are also four reinforced elongated holes for T or R-hooks located on the bottom of the front frame rail torque boxes behind the front wheels and forward of the rear wheels inboard of the rocker panel weld seam.

TOWING—FRONT WHEEL LIFT

Chrysler Corporation recommends that a vehicle be towed with the front end lifted, whenever possible. A 90 cm (36 in.) length of 4x4 wood beam can be placed between the wheel lift device and the bottom of the fascia to prevent damage to vehicle during the lifting operation. The beam can removed after lifting the front of the vehicle.

TOWING—REAR WHEEL LIFT

If a vehicle cannot be towed with the front wheels lifted, the rear wheels can be lifted provided the following guide lines are observed.

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

- Unlock steering column and secure steering wheel in straight ahead position with a clamp device designed for towing.
- Place front wheels on a towing dolly.

SUSPENSION

CONTENTS

WHEEL ALIGNMENT

INDEX

DESCRIPTION AND OPERATION

WHEEL ALIGNMENT INFORMATION

Proper vehicle wheel alignment is the proper adjustment of all interrelated front and rear suspension angles (Fig. 1). These angles are what affects the handling and steering of the vehicle when it is in motion.

The method of checking a vehicle's front and rear wheel alignment will vary depending on the type and manufacturer of the equipment being used. Instructions furnished by the manufacturer of the equipment being used should always be followed to ensure accuracy of the alignment, except alignment specifications recommended by Chrysler Corporation **MUST ALWAYS** be used.

CAUTION: Do not attempt to modify any suspension or steering components by heating or bending of the component.

Wheel alignment adjustments should always be made in the following sequence, to ensure that an accurate alignment is performed.

(1) Adjust rear camber to be at the prefered setting specification.

(2) Adjust rear wheel Toe to be at the prefered setting specification..

(3) Adjust front wheel Toe to be at the prefered setting specification for individual wheel Toe and for total Toe.

DESCRIPTION AND OPERATION (Continued)

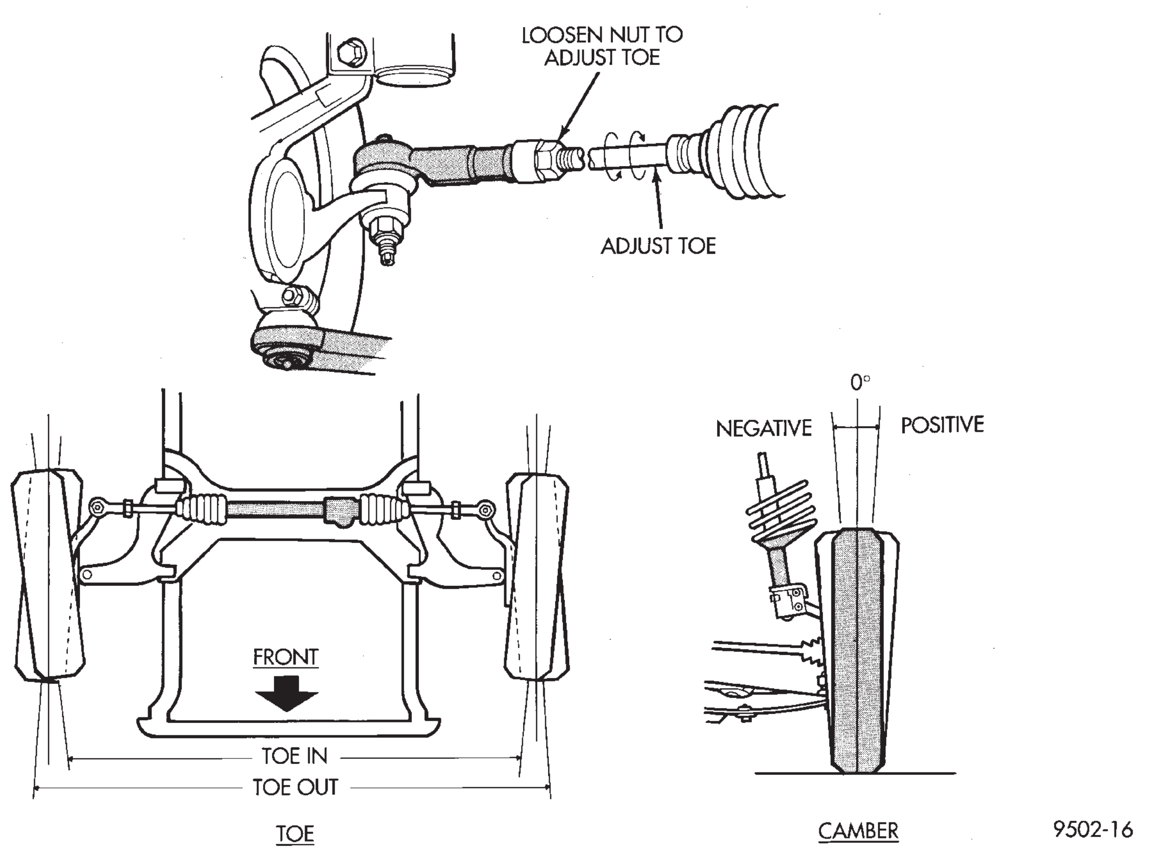


Fig. 1 Alignment Camber/Toe

(4) **Toe** is measured in degrees or inches and is the distance that the front edges of the tires are closer (or farther apart) than the rear edges (Fig. 1). See Front Wheel Drive Specifications for correct front and rear wheel Toe specifications.

(5) **Thrust Angle** is defined as the average of the Toe settings on each rear wheel. If this measurement is out of specification, re-adjust rear wheel Toe so that each wheel has 1/2 of the total Toe measurement. When re-adjusting, do not exceed the total Toe specification.

DIAGNOSIS AND TESTING

SUSPENSION AND STEERING DIAGNOSIS

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
Front End Whine On Turns	1. Defective Wheel Bearing 2. Incorrect Wheel Alignment 3. Worn Tires	1. Replace Wheel Bearing 2. Check And Reset Wheel Alignment 3. Replace Tires
Front End Growl Or Grinding On Turns	1. Defective Wheel Bearing 2. Engine Mount Grounding Against Frame Or Body Of Vehicle. 3. Worn Or Broken C/V Joint 4. Loose Wheel Lug Nuts 5. Incorrect Wheel Alignment 6. Worn Tires	1. Replace Wheel Bearing 2. Check For Motor Mount Hitting Frame Rail And Reposition Engine As Required 3. Replace C/V Joint 4. Verify Wheel Lug Nut Torque 5. Check And Reset Wheel Alignment 6. Replace Tires
Front End Clunk Or Snap On Turns	1. Loose Wheel Lug Nuts 2. Worn Or Broken C/V Joint 3. Worn Or Loose Tie Rod Or Ball Joint 4. Worn Control Arm Bushing 5. Loose Sway Bar Or Upper Strut Attachment	1. Verify Wheel Lug Nut Torque 2. Replace C/V Joint 3. Tighten Or Replace Tie Rod End Or Ball Joint 4. Replace Control Arm Bushing 5. Tighten Sway Bar Or Upper Strut Attachment To Specified Torque
Front End Whine With Vehicle Going Straight At A Constant Speed	1. Defective Wheel Bearing 2. Incorrect Wheel Alignment 3. Worn Tires	1. Replace Wheel Bearing 2. Check And Reset Wheel Alignment 3. Replace Tires
Front End Growl Or Grinding With Vehicle Going Straight At A Constant Speed	1. Engine Mount Grounding 2. Worn Or Broken C/V Joint	1. Reposition Engine As Required 2. Replace C/V Joint
Front End Whine When Accelerating Or Decelerating	1. Worn Or Defective Transaxle Gears Or Bearings	1. Replace Transaxle Gears Or Bearings
Front End Clunk When Accelerating Or Decelerating	1. Worn Or Broken Engine Mount 2. Worn Or Defective Transaxle Gears Or Bearings 3. Loose Wheel Lug Nuts 4. Worn Or Broken C/V Joint 5. Worn Or Loose Ball Joint 6. Worn Or Loose Control Arm Bushing 7. Loose Crossmember Bolts	1. Replace Engine Mount 2. Replace Transaxle Gears Or Bearings 3. Verify Wheel Lug Nut Torque 4. Replace C/V Joint 5. Tighten Or Replace Ball Joint 6. Tighten To Specified Torque Or Replace Control Arm Bushing 7. Tighten Crossmember Bolts To Specified Torque
Road Wander	1. Incorrect Tire Pressure 2. Incorrect Front Or Rear Wheel Toe 3. Worn Wheel Bearings 4. Worn Control Arm Bushings 5. Excessive Friction In Steering Gear 6. Excessive Friction In Steering Shaft Coupling 7. Excessive Friction In Strut Upper Bearing	1. Inflate Tires To Rcommended Pressure 2. Check And Reset Front Wheel Toe 3. Replace Wheel Bearing 4. Replace Control Arm Bushing 5. Replace Steering Gear 6. Replace Steering Coupler 7. Replace Strut Bearing
Lateral Pull	1. Unequal Tire Pressure 2. Radial Tire Lead 3. Incorrect Front Wheel Camber 4. Power Steering Gear Imbalance 5. Wheel Braking	1. Inflate All Tires To Recommended Pressure 2. Perform Lead Correction Procedure 3. Check And Reset Front Wheel Camber 4. Replace Power Steering Gear 5. Correct Braking Condition Causing Lateral Pull
Excessive Steering Free Play	1. Incorrect Steering Gear Adjustment 2. Worn Or Loose Tie Rod Ends 3. Loose Steering Gear Mounting Bolts 4. Loose Or Worn Steering Shaft Coupler	1. Adjust Or Replace Steering Gear 2. Replace Or Tighten Tie Rod Ends 3. Tighten Steering Gear Bolts To The Specified Torque 5. Replace Steering Shaft Coupler
Excessive Steering Effort	1. Low Tire Pressure 2. Lack Of Lubricant In Steering Gear 3. Low Power Steering Fluid Level 4. Loose Power Steering Pump Belt 5. Lack Of Lubricant In Steering Ball Joints 6. Steering Gear Malfunction 7. Lack Of Lubricant In Steering Coupler	1. Inflate All Tires To Recommended Pressure 2. Replace Steering Gear 3. Fill Power Steering Fluid Reservoir To Correct Level 4. Correctly Adjust Power Steering Pump Drive Belt 5. Lubricate Or Replace Steering Ball Joints 6. Replace Steering Gear 7. Replace Steering Coupler

DIAGNOSIS AND TESTING (Continued)

PRE-WHEEL ALIGNMENT INSPECTION

Before any attempt is made to change or correct the wheel alignment factors. The following part inspection and the necessary corrections should be made to those parts which influence the steering of the vehicle.

(1) Check and inflate all tires to recommended pressure. All tires should be the same size and in good condition and have approximately the same wear. Note the type of tread wear which will aid in diagnosing, see Wheels and Tires, Group 22.

(2) Check front wheel and tire assembly for radial runout.

(3) Inspect lower ball joints and all steering linkage for looseness.

(4) Check for broken or sagged front and rear springs.

(5) Check vehicle ride height to verify it is within specifications.

(6) Alignment **MUST** only be checked after the vehicle has the following areas inspected and or adjusted. Recommended tire pressures, full tank of fuel, no passenger or luggage compartment load and is on a level floor or a properly calibrated alignment rack.

SERVICE PROCEDURES

WHEEL ALIGNMENT CHECK AND ADJUSTMENT PROCEDURE

CASTER CAMBER DESCRIPTION

On this vehicle, the front suspension caster and camber settings and the rear suspension caster settings, are determined at the time the vehicle is designed. This is accomplished by very accurately locating the vehicle's suspension components when designing and assembling the vehicle. This is called a Net Build vehicle and results in no required or available adjustment of front and rear caster and front camber after the vehicle is built or when servicing the suspension components. Thus Caster and Camber are not normally considered an adjustable specification when performing an alignment on this vehicle. Though Caster and Camber are not adjustable they must be checked to ensure they meet vehicle specifications.

If a vehicle's front camber is found to be outside of the required specifications, the vehicles front suspension components should be inspected for any signs of damage or bending.

Rear Camber on this vehicle is adjustable. The rear camber on this vehicle is adjusted using the adjusting screw located in the forward and rear lateral links of the vehicles rear suspension (Fig. 2).

Rear Caster on this vehicle is not adjustable and is not shown as an alignment specification.

CAUTION: Do not attempt to adjust the vehicles Caster or Camber by heating, bending or any other modification of the suspension components.

CAUTION: When checking the rear alignment on this vehicle the alignment rack must be equipped with rear skid plates.

Correctly position vehicle on alignment rack and install all required equipment on vehicle, per the alignment equipment manufacturers specifications.

NOTE: Prior to reading each alignment specification, front and rear of vehicle should be jounced an equal number of times. Induce jounce (rear first then front) by grasping center of bumper and jouncing each end of vehicle an equal number of times. Bumper should always be released when vehicle is at the bottom of the jounce cycle.

Correctly jounce vehicle and read front and rear alignment settings and compare to vehicle specifications for camber, caster and Toe. See Alignment Specifications in this group of the service manual for required specifications.

FRONT WHEEL TOE AND REAR WHEEL TOE AND CAMBER SETTING PROCEDURE

(1) Prepare vehicle as described in the Pre-Alignment Vehicle Inspection procedure.

(2) Center steering wheel and lock in place using a steering wheel clamp.

NOTE: When performing the Front Toe and Rear Camber and Toe setting procedure, the rear wheel Camber and Toe MUST be set to the preferred specification first, then set front wheel Toe to the preferred specification.

CAUTION: Do not attempt to straighten or repair a lateral link. Do not apply heat to the lateral link adjusting screws or to the jam nuts, (Fig. 2) when loosening or adjusting the lateral links.

(3) Loosen the adjusting screw jam nuts (Fig. 2) on all 4 of the rear lateral arm adjusting screws.

CAUTION: Do not attempt to move the adjusting screws without properly loosening the jam nuts. Note that each adjusting screw has one right-handed nut and one left-handed nut.

SERVICE PROCEDURES (Continued)

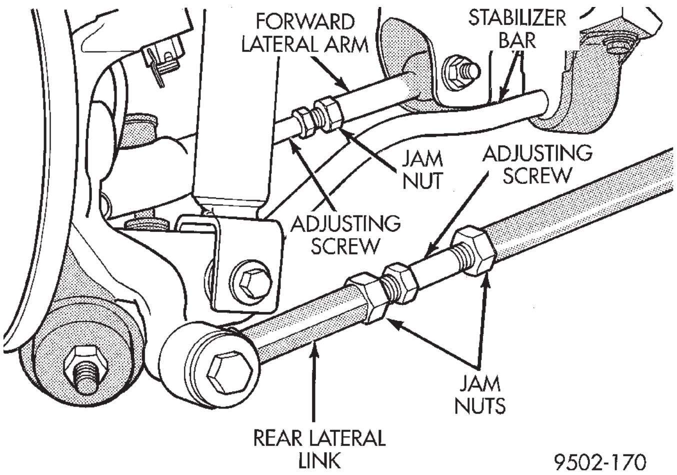


Fig. 2 Lateral Arm Adjusting Screw Jam Nuts

CAUTION: When setting rear Camber and Toe on the vehicle, the maximum lengths of the adjustable lateral link at the locations shown in (Fig. 3) must not be exceeded. If these maximum lengths are exceeded, inadequate retention of adjustment link to the inner and outer link may result.

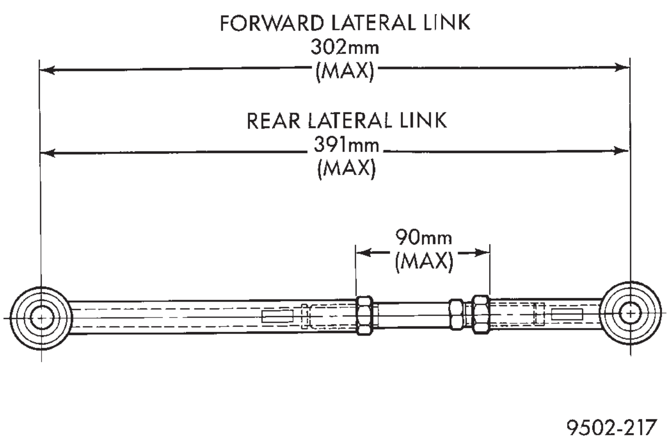


Fig. 3 Rear Lateral Link Maximum Length Dimensions

(4) Rough in Rear Camber setting as close as possible to the preferred specification first, by mainly adjusting the rear lateral link adjusting screw (Fig. 2). Some adjustment of the forward lateral link adjusting screw (Fig. 2) will also be required to get Rear Camber setting to preferred specification. See Alignment Specifications in this group of the service manual for preferred specification.

(5) Adjust the forward lateral link adjusting screw (Fig. 2) to set rear Toe to preferred specification. See Alignment Specifications in this group of the service manual for preferred specification.

- Adjusting Toe will cause a slight change in the Camber setting. If during setting of Toe, Camber no longer is at the preferred specification, continue to adjust Camber and Toe until both are at their preferred specifications.

(6) While holding adjustment screws from turning, use a crow foot and torque wrench, and tighten all lateral link adjusting screw jam nuts to a torque of 65 N·m (48 ft. lbs.). This will securely hold adjusting screws from turning.

CAUTION: Do not twist front inner tie rod to steering gear rubber boots during front wheel Toe adjustment.

(7) Loosen front inner to outer tie rod end jam nuts (Fig. 4). Grasp inner tie rods at serrations (Fig. 4) and rotate inner tie rods of steering gear to set front Toe to the preferred Toe specification. See Alignment Specifications in this group of the service manual for preferred specification.

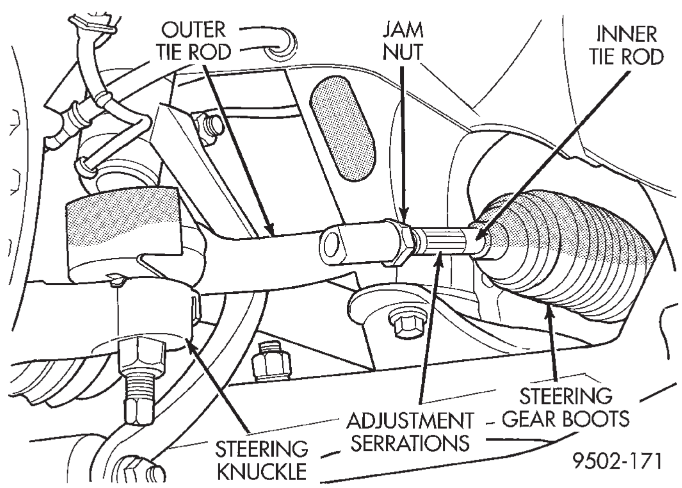


Fig. 4 Inner To Outer Tie Rod Jam Nut

(8) Tighten tie rod locknuts (Fig. 4) to 61 N·m (45 ft. lbs.) torque.

(9) Adjust steering gear to tie rod boots (Fig. 4) at inner tie rod.

(10) Remove steering wheel clamp.

SPECIFICATIONS

VEHICLE ALIGNMENT SPECIFICATIONS AT CURB HEIGHT

FRONT WHEEL ALIGNMENT	ACCEPTABLE ALIGNMENT RANGE AT CURB HEIGHT (FULL FLUIDS NO PASSENGERS)	PREFERRED SETTING (FULL FLUIDS NO PASSENGERS)	FENDER LIP TO GROUND HEIGHT
CAMBER.......................... **Side To Side Camber Difference Not To Exceed	-0.5° to +0.7° 0.7° or less	+0.1° 0.0°	28.0 in. + or - 3/4 in.
TOE RIGHT/LEFT	0.05°out to 0.15° in	0.05° in	
*TOTAL TOE Specified In Degrees (See Note)	0.1°out to 0.3°in	0.1° in	
CASTER........................... **Side To Side Caster Difference Not To Exceed	+2.1° to +4.1° 1.0° or less	+3.1° 0.0°	
REAR WHEEL ALIGNMENT	ACCEPTABLE ALIGNMENT RANGE AT CURB HEIGHT	PREFERRED SETTING	FENDER LIP TO GROUND HEIGHT
CAMBER.......................	-0.5° to +0.3°	-0.1°	28.0 in.
TOE RIGHT/LEFT	0.05° out to 0.15° in	0.05° in	+ or - 3/4 in.
*TOTAL TOE Specified In Degrees (See Note) TOE OUT: When Backed On Alignment Rack Is TOE In When Driving	0.1° out to 0.3° in	0.1° in	
THRUST ANGLE................	+ or - 0.15°	0.0°	
*Note: Total Toe is the arithmetic sum of the left and right wheel Toe settings. Positive is Toe-in, negative is Toe-out. Total Toe must be equally split between each front wheel to ensure the steering wheel is centered after setting Toe. Left and Right Toe must be equal to within 0.02 degrees. **Remove the front shock/spring/upper control arm assemblies per the instructions in the Front Suspension Section in this service manual. Remove the 2 upper control arm bracket to body locator pins. Install the front shock/spring/upper control arm assembly back in the vehicle. Using the available clearance between the attaching bolts and the shock tower bolts, adjust the side to side Camber and/or Caster to the preferred settings shown above.			

FRONT SUSPENSION

INDEX

GENERAL INFORMATION

GENERAL INFORMATION

CAUTION: ONLY FRAME CONTACT HOISTING EQUIPMENT CAN BE USED ON THIS VEHICLE. All vehicles have a fully independent rear suspension. The vehicles can not be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used, damage to rear suspension components will occur.

CAUTION: At no time when servicing a vehicle, can a sheet metal screw, bolt or other metal fastener be installed in the shock tower to take the place of an original plastic clip. Also, NO holes can be drilled into the front shock tower in the area shown in (Fig. 1), for the installation of any metal fasteners into the shock tower.

Because of the minimum clearance in this area (Fig. 1) installation of metal fasteners could damage the coil spring coating and lead to a corrosion failure of the spring. If a plastic clip is missing, or is lost or broken during servicing a vehicle, replace only with the equivalent part listed in the Mopar parts catalog.

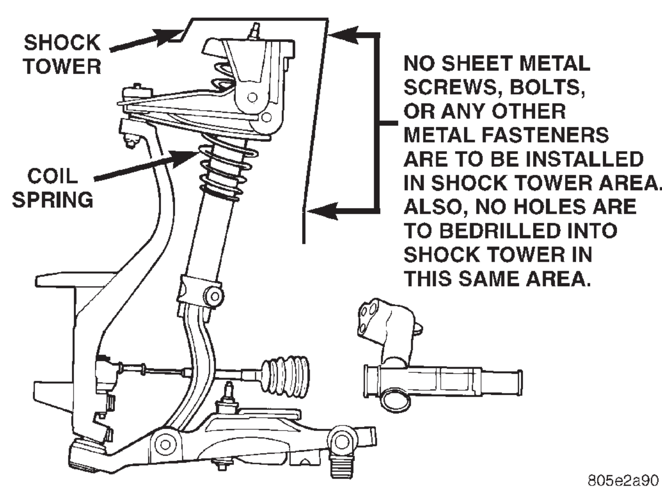


Fig. 1 Shock Tower To Spring Minimum Clearance Area

DESCRIPTION AND OPERATION

FRONT SUSPENSION SYSTEM DESCRIPTION

This vehicle's front suspension is a short long arm design used in conjunction with a gas pressurized shock absorber and coil spring assembly.

The upper control arm of the vehicle is mounted using rubber isolation bushings to an aluminum casting which is attached to the shock tower using 4 mounting bolts. This aluminum casting is also used as the upper mount for the front shock/coil spring assembly. The shock absorber assembly is also isolated from the aluminum bracket using a 2 piece rubber bushing design. The lower control arm is mounted to the vehicle's front suspension crossmember using 2 through bolts per control arm. The lower control arm is also isolated from the vehicle using 2 rubber bushings of unique design for the front and rear mounting location. The bottom of the shock absorber is mounted to the lower control arm by a clevis bracket which is part of the shock absorber assembly. The clevis bracket is mounted to and isolated from the lower control arm using a rubber isolation bushing and a through-bolt. The front steering knuckle is mounted to the vehicle by a ball joint located in the upper and lower control arms. Steering of the vehicle is provided by a rack and pinion steering gear which is connected directly to the steering knuckle by an outer tie rod.

The front shock absorber assembly includes the following components: A rubber isolated top mount, an upper spring seat, upper control arm/shock absorber bracket, jounce bumper, dust shield, coil spring, lower spring seat and the shock absorber clevis bracket.

A sealed for life front hub and bearing assembly is attached to the front steering knuckle. The outer C/V joint assembly is splined to the front hub and bearing assembly and is retained by a nut, nut retainer and cotter pin.

CAUTION: ONLY FRAME CONTACT HOISTING EQUIPMENT CAN BE USED ON THIS VEHICLE. All vehicles have a fully independent rear suspension. The vehicles can not be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used, damage to rear suspension components will occur.

SHOCK ABSORBER ASSEMBLY

The front shock absorber and suspension of the vehicle is supported by coil springs positioned around the shock absorbers. The springs are contained between an upper seat, located just below the top shock absorber mounting bracket and a lower spring seat located on the shock absorber.

The top of each shock absorber assembly is bolted to the cast aluminum upper control arm bracket which is then bolted to the shock tower of the vehicle using 4 mounting bolts.

The bottom of the shock absorber assembly attaches to the lower control arm of the vehicle using a thru-bolt and prevailing torque nut. Caster and camber is a fixed setting (net build) on all vehicles and is not required nor can be adjusted.

STEERING KNUCKLE

The steering knuckle is a single casting with legs machined for attachment to the vehicle's upper and lower control arm ball joints. The steering knuckle also has machined abutments on the casting to support and align the front brake caliper assembly. The knuckle also holds the front drive shaft outer C/V joint hub and bearing assembly. The hub is positioned through the bearing and knuckle, with the constant velocity stub shaft splined through the hub. The outer C/V joint is retained to the hub and bearing assembly using a nut, nut lock and cotter pin.

LOWER CONTROL ARM

The lower control arm is a ductile iron casting using 2 rubber bushings to isolate it from the front suspension crossmember and body of the vehicle. The isolator bushings consist of 2 metal encased rubber isolated pivot bushings. The front of the lower control arm is bolted to the front crossmember using a bolt through the center of the rubber pivot bushing. The rear of the lower control arm is mounted to the front suspension crossmember using a thru-bolt. The lower control arms are inter-connected through a linked rubber isolated sway bar.

UPPER CONTROL ARM

The upper control arm is a high strength steel stamping. The upper control arm uses the 2 rubber bushings of the upper control arm/shock absorber mounting bracket to isolate it from the mounting bracket and the body of the vehicle. The isolator bushings used in the upper control arm are a metal encased rubber isolated pivot bushing. The bushings isolate the upper control arm from the body of the vehicle yet allows for the up and down movement of the control arm during the jounce and rebound travel of the vehicle suspension. The upper control arm is bolted to the top of the steering knuckle using the upper ball joint.

STABILIZER BAR

The stabilizer bar interconnects both front lower control arms of the vehicle and is attached to the front suspension cradle and the underbody of the vehicle.

DESCRIPTION AND OPERATION (Continued)

Jounce and rebound movements affecting one wheel are partially transmitted to the opposite wheel of the vehicle to stabilize body roll.

Attachment of the stabilizer bar to the front suspension cradle is through 2 rubber-isolator bushings and bushing retainers. The stabilizer bar to lower control arm attachment is done utilizing a ball joint type, stabilizer bar attaching link. All parts of the stabilizer bar are replaceable as individual components, and the stabilizer bar to crossmember bushings are split for easy removal and installation.

HUB BEARING ASSEMBLY

The bearing used on the front hub of this vehicle is the combined hub and bearing unit type assembly. This unit assembly combines the front wheel mounting hub (flange) and the front wheel bearing into a one piece unit. The hub/bearing assembly is mounted to the steering knuckle and is retained by three mounting bolts accessible from the back of the steering knuckle. The hub/bearing unit is not serviceable and must be replaced as an assembly if the bearing or the hub is determined to be defective. The wheel mounting studs are the only replaceable component of the hub/bearing assembly.

COIL SPRING

Coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. During service procedures when both springs are removed, mark springs to ensure installation in original position. **If the coil springs require replacement, be sure that the springs needing replacement, are replaced with springs meeting the correct load rating and spring rate for the vehicle and its specific options.**

LOWER CONTROL ARM BALL JOINT

The ball joint used in the lower control arm of this vehicle is a sealed for life ball joint. The ball joint can not be replaced as a separate component of the lower control arm assembly. If the ball joint is determined to be defective it will require replacement of the complete lower control arm assembly.

. The lower ball joint connection to the steering knuckle is achieved by an interference fit created by the tapered stud of the ball joint and a tapered hole in the steering knuckle. The ball joint stud is retained in the steering knuckle using a castle nut and a cotter pin. The cotter pin is used for positive retention of the castle nut.

The lower ball joint is lubricated for life at the time it is assembled in the lower control arm. **The ball joint does not require any type of additional lubrication for the life of the vehicle. No attempt should be made to ever add any lubrication to the lower ball joint.**

UPPER CONTROL ARM BALL JOINT

The ball joint is pressed into the upper control arm and has a tapered stud for attachment to the steering knuckle. The ball joint stud is attached and locked into the steering knuckle using a castle nut and cotter pin. The ball joint is not serviceable as a separate component of the upper control arm. If the ball joint is defective it will require replacement of the entire upper control arm.

WHEEL MOUNTING STUDS

If wheel attaching studs need to be replaced in the hub and bearing assembly the studs **CAN NOT** be hammered out of the hub flange. If a stud is removed by hammering it out of the bearing flange, damage to the hub and bearing assembly will occur leading to premature bearing failure.

Use the procedure and special tools shown in the service procedures section for the wheel mounting studs when replacing the wheel attaching studs.

The hub and bearing assembly does not require removal from the steering knuckle or the rear knuckle to replace the wheel attaching studs in the hub and bearing assembly.

DIAGNOSIS AND TESTING

SHOCK ABSORBER ASSEMBLY

(1) Inspect for damaged or broken coil springs (Fig. 2).

(2) Inspect for torn or damaged shock absorber dust boots (Fig. 2).

(3) Lift the dust boot and inspect the shock absorber for evidence of fluid running from the upper end of fluid reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off lower end of unit). A slight amount of seepage between the shock absorber rod and the seal is not unusual and does not affect performance of the shock absorber. Also inspect jounce bumpers for signs of damage or deterioration (Fig. 2).

STEERING KNUCKLE

The front suspension steering knuckle is not a repairable component of the front suspension. **IT MUST BE REPLACED IF FOUND TO BE DAMAGED IN ANY WAY.** If it is determined that the steering knuckle is bent when servicing the vehicle, no attempt is to be made to straighten the steering knuckle.

On this vehicle the steering knuckle must be removed from the vehicle when servicing the front hub bearing.

DIAGNOSIS AND TESTING (Continued)

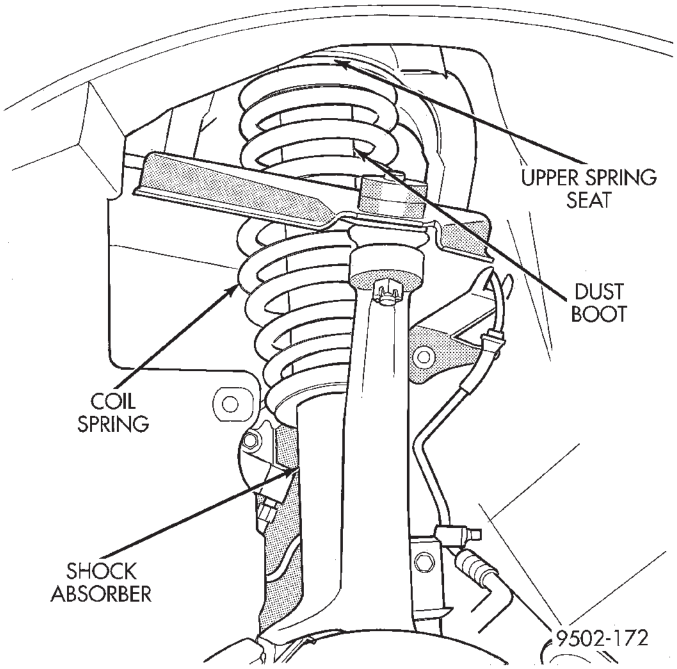


Fig. 2 On Vehicle Shock Absorber Assembly Inspection

LOWER CONTROL ARM

If damaged, the lower control arm casting is serviced only as a complete component. Inspect lower control arm for signs of damage from contact with the ground or road debris. If lower control arm shows any sign of damage, inspect lower control arm for distortion. **Do not attempt to repair or straighten a broken or bent lower control arm.**

The replaceable components of the lower control arm are: the ball joint grease seal and the control arm bushings. Inspect both control arm bushings for severe deterioration, and replace if required.

Inspect the lower ball joint for wear. Use the wear inspection procedure in the diagnosis and testing section in this group of service manual to determine if the wear is excessive and ball joint (lower control arm) replacement is required.

Service procedures to replace these components are detailed in the specific component removal and installation sections in this group of the service manual.

UPPER CONTROL ARM

If damaged, the upper control arm is serviced only as a complete component. Inspect the upper control arm for any signs of damage. If control arm shows any sign of damage the upper control arm must be replaced. **Do not attempt to repair or straighten a broken or bent upper control arm.**

The only serviceable component of the upper control arm is the ball joint grease seal. No other repair or replacement procedure should be attempted on any component of the upper control arm. Service procedures to replace the serviceable components are detailed in the specific component sections of this group.

LOWER BALL JOINT ASSEMBLY WEAR INSPECTION

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Install a dial indicator on the vehicle so it is contacting the top surface of the steering knuckle near the lower ball joint stud castle nut.

(3) Grab wheel and tire assembly and push it up and down firmly.

(4) Record the amount of up and down movement of the steering knuckle recorded on the dial indicator.

(5) Replace lower control arm if the movement in the lower control arm exceeds 1.5 mm (.059 in.).

UPPER BALL JOINT WEAR INSPECTION

With the weight of the vehicle resting on the road wheels. Grasp the grease fitting and with no mechanical assistance or added force attempt to move the grease fitting.

If the ball joint is worn the grease fitting will move easily. If movement is noted, replacement of the upper control arm is required.

STABILIZER BAR

Inspect for broken or distorted stabilizer bar bushings, bushing retainers, and worn or damaged stabilizer bar to control arm attaching links. If stabilizer bar to front suspension cradle bushing replacement is required, bushing can be removed from stabilizer bar by opening slit and peeling bushing off stabilizer bar.

HUB/BEARING

The hub bearing is designed for the life of the vehicle and requires no type of periodic maintenance. The following procedure may be used for diagnosing the condition of the hub bearing.

With the wheel, disc brake caliper, and brake rotor removed, rotate the wheel hub. Any roughness or resistance to rotation may indicate dirt intrusion or a failed hub bearing. If the hub bearing exhibits any of these conditions during diagnosis, the hub bearing will require replacement, the bearing is not serviceable.

Damaged bearing seals and the resulting excessive grease loss may also require bearing replacement. Moderate grease weapage from the hub bearing is considered normal and should not require replacement of the hub bearing.

REMOVAL AND INSTALLATION (Continued)

REMOVAL AND INSTALLATION

SHOCK ABSORBER ASSEMBLY

WARNING: DO NOT REMOVE SHOCK ROD NUT WHILE SHOCK ASSEMBLY IS INSTALLED IN VEHICLE, OR BEFORE SHOCK ASSEMBLY SPRING IS COMPRESSED.

REMOVE

(1) Loosen wheel nuts.

(2) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(3) Remove the wheel and tire from the location on front of vehicle requiring shock removal.

(4) If both shock absorbers are removed, mark the shock absorbers right and left according to which side of the vehicle they were removed from.

(5) Remove the wheel speed sensor cable routing bracket (Fig. 3) from the steering knuckle.

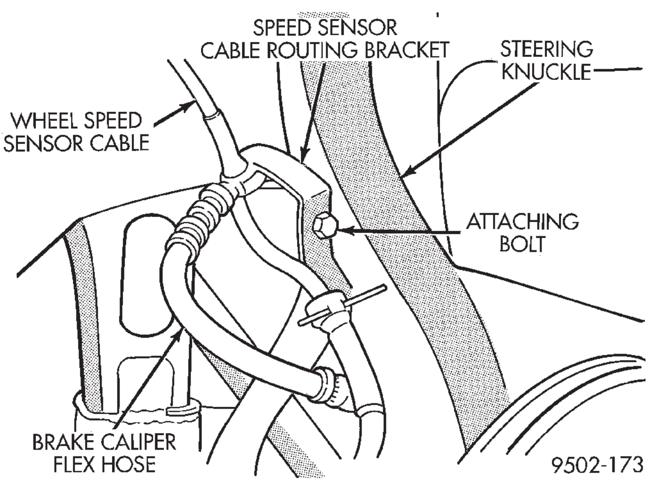


Fig. 3 Wheel Speed Sensor Cable Routing Bracket

(6) Remove the cotter pin and castle nut (Fig. 4) from the upper ball joint stud.

(7) Remove the upper ball joint stud from the steering knuckle using Puller, Special Tool, C-3894-A (Fig. 5). Pull steering knuckle outward and position toward the rear of the front wheel opening.

(8) Remove pinch bolt attaching shock absorber clevis to shock absorber (Fig. 6).

(9) Remove the nut and thru-bolt (Fig. 7) attaching the shock absorber clevis to the lower control arm.

(10) Remove the clevis from the shock absorber by carefully tapping the clevis off the shock absorber using a soft (brass) drift.

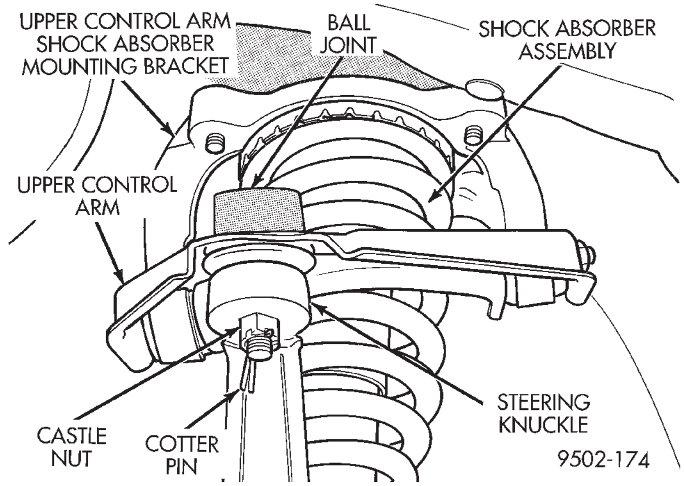


Fig. 4 Ball Joint Attachment To Steering Knuckle

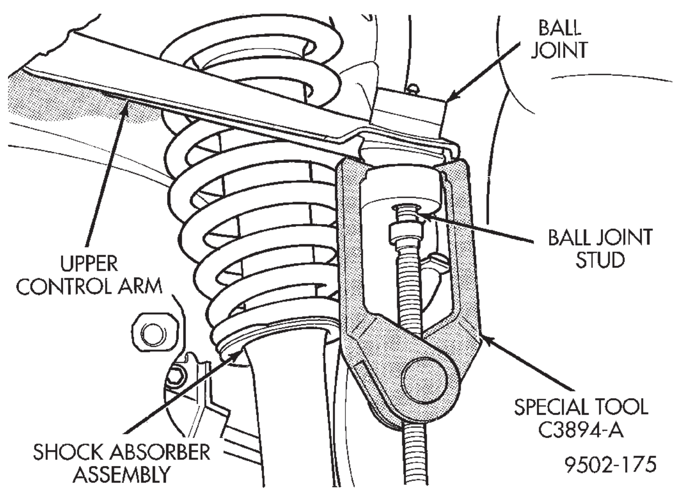


Fig. 5 Ball Joint Stud Removal From Steering Knuckle

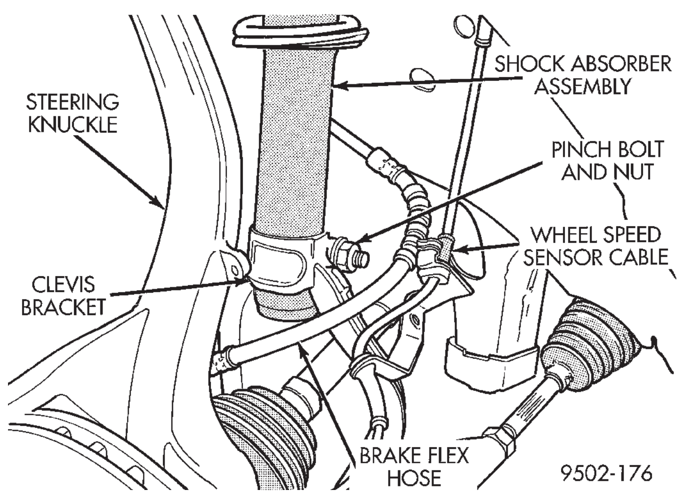


Fig. 6 Shock Absorber Clevis Bracket Pinch Bolt

(11) Remove the 4 bolts (Fig. 8) attaching the shock absorber/upper control arm mounting bracket to the shock tower of the vehicle.

REMOVAL AND INSTALLATION (Continued)

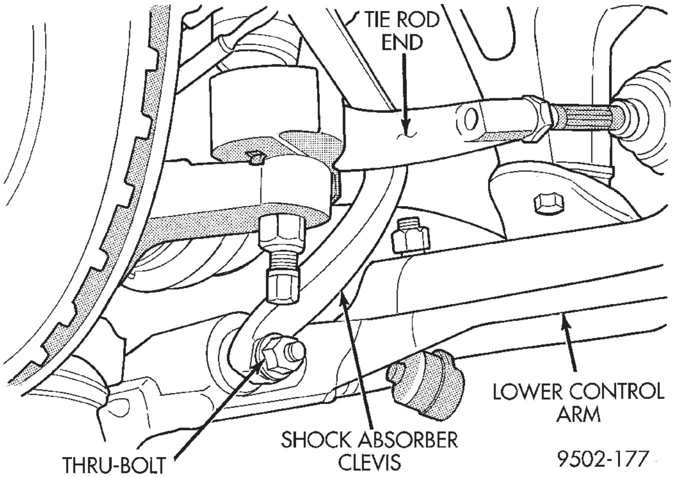


Fig. 7 Clevis To Lower Control Arm Attaching Bolt

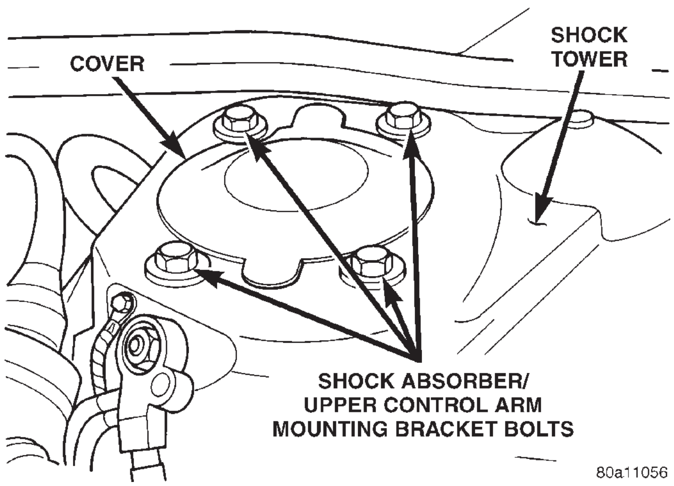


Fig. 8 Shock Absorber Attachment To Shock Tower

(12) Remove the shock absorber and upper control arm mounting bracket as an assembly from the vehicle. The shock absorber is removed out through the front area of the front wheel well.

INSTALL

(1) Install the shock absorber assembly, with the clevis removed, into shock tower. Aligning the 2 locating pins and the 4 mounting holes on the upper control arm shock absorber mount with the 4 holes in shock tower. Install the 4 upper control arm mount to shock tower mounting bolts (Fig. 8). Tighten the 4 bolts to a torque of 95 N·m (70 ft. lbs.).

(2) Install the clevis on the shock absorber. Clevis is installed by tapping it onto the fluid reservoir of the shock absorber using a soft (brass) drift until fully seated against locating tab on shock absorber (Fig. 9). Orientation tab on locating tab must be positioned in the split of the clevis (Fig. 9).

(3) Install the pinch bolt retaining the shock clevis to the shock absorber (Fig. 6). Tighten the pinch bolt to a torque of 88 N·m (65 ft. lbs.)

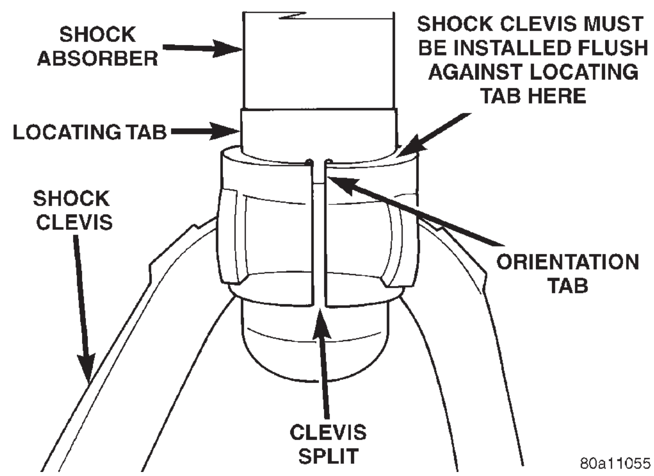


Fig. 9 Clevis Correctly Installed On Shock Absorber

(4) Install the clevis bracket to lower control arm thru-bolt (Fig. 7). Do not tighten or torque the thru-bolt at this time.

(5) Install upper ball joint into steering knuckle. Install castle nut on ball joint stud. Tighten castle nut to a torque of 54 N·m (40 ft. lbs.). Install cotter pin in stud of ball joint (Fig. 4).

(6) Install the routing bracket for the speed control cable (Fig. 3) on the steering knuckle. Install and securely tighten the routing bracket attaching bolt (Fig. 3).

CAUTION: When supporting lower control arm with jack stand, do not position jack stand under the ball joint cap on the lower control arm. Position in area of lower control arm shown in (Fig. 10).

(7) Lower vehicle to the ground with a jack stand positioned under the lower control arm (Fig. 10). Continue to lower vehicle so the total weight of the vehicle is supported by the jack stand and lower control arm.

(8) Tighten the shock absorber clevis to lower control arm bushing thru-bolt nut to a torque of 88 N·m (65 ft. lbs.).

(9) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

UPPER CONTROL ARM

REMOVE

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

REMOVAL AND INSTALLATION (Continued)

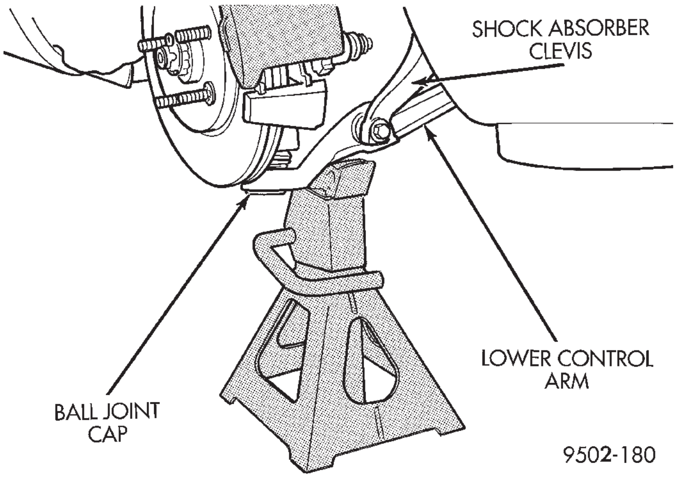


Fig. 10 Lower Control Arm Correctly Supported By Jack Stand

(2) Remove wheel and tire assembly from location on front of vehicle requiring upper control arm removal.

(3) Remove the wheel speed sensor cable routing bracket (Fig. 11) from the steering knuckle.

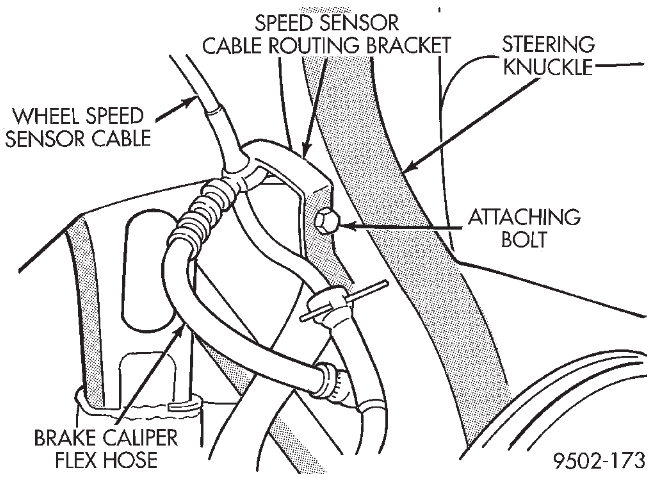


Fig. 11 Wheel Speed Sensor Cable Routing Bracket

(4) Remove the cotter pin and castle nut (Fig. 12) from the upper ball joint stud.

(5) Remove the upper ball joint stud from the steering knuckle using Puller, Special Tool, C-3894-A (Fig. 13). Pull steering knuckle outward and position toward the rear of the front wheel opening.

(6) Remove bolt (Fig. 14) attaching shock absorber clevis to the shock absorber.

CAUTION: When removing the shock absorber clevis to lower control arm thru-bolt (Fig. 15) do not turn the thru-bolt in the clevis. The serrations on the bolt and the clevis will be damaged.

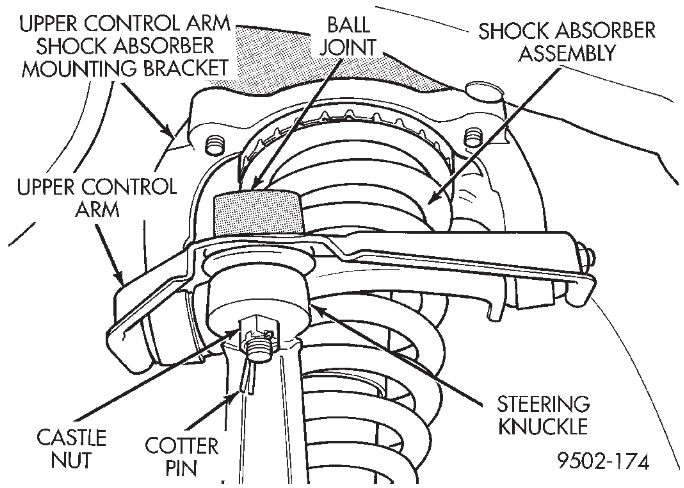


Fig. 12 Ball Joint Attachment To Steering Knuckle

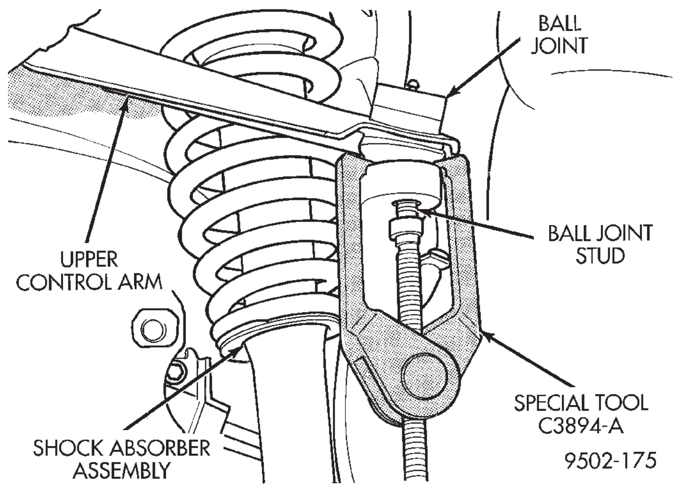


Fig. 13 Ball Joint Stud Removal From Steering Knuckle

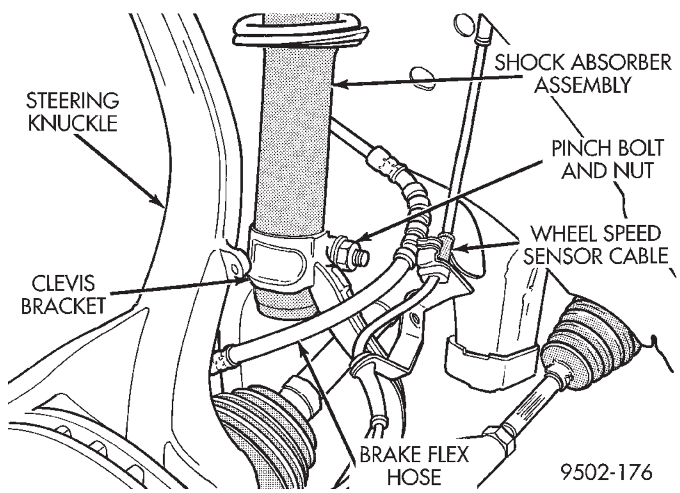


Fig. 14 Shock Absorber Clevis Pinch Bolt

(7) Remove the nut and thru-bolt (Fig. 15) attaching the shock absorber clevis to the lower control arm.

REMOVAL AND INSTALLATION (Continued)

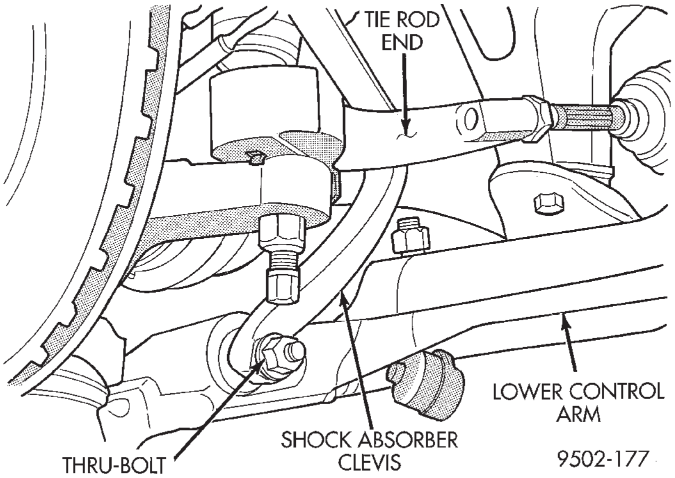


Fig. 15 Clevis To Lower Control Arm Attaching

(8) Remove the clevis from the shock absorber by carefully tapping it off the shock absorber using a soft (brass) drift.

(9) Remove the 4 bolts (Fig. 16) attaching the upper control arm/shock absorber mounting bracket to the shock tower of the vehicle.

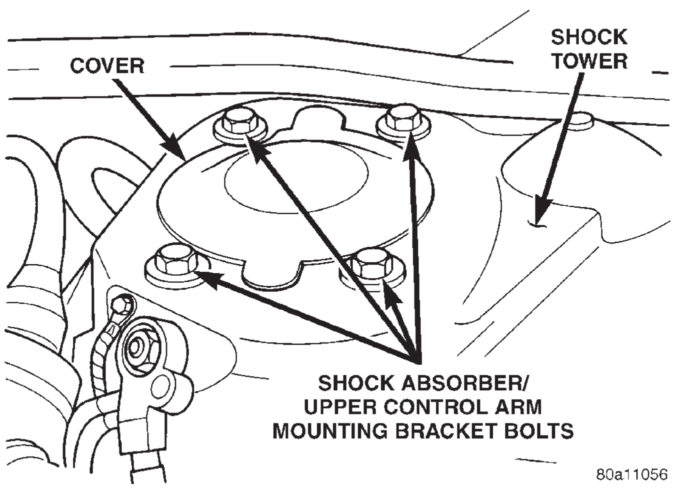


Fig. 16 Shock Absorber Attachment To Shock Tower

(10) Remove the shock absorber and upper control arm mounting bracket as an assembly from the vehicle.

CAUTION: Do not clamp the shock absorber in a vise by the body of the shock absorber. The clevis bracket must be reinstalled on the shock absorber clamped in the vise using the clevis bracket.

(11) Install clevis bracket back on shock absorber and tighten pinch bolt. Then using the clevis bracket, clamp the shock absorber assembly in vise, with shock absorber in a vertical position (Fig. 17).

WARNING: DO NOT REMOVE SHOCK ABSORBER ROD NUT, BEFORE SHOCK ABSORBER COIL SPRING IS COMPRESSED, REMOVING SPRING TENSION FROM UPPER CONTROL ARM/SHOCK ABSORBER MOUNTING BRACKET.

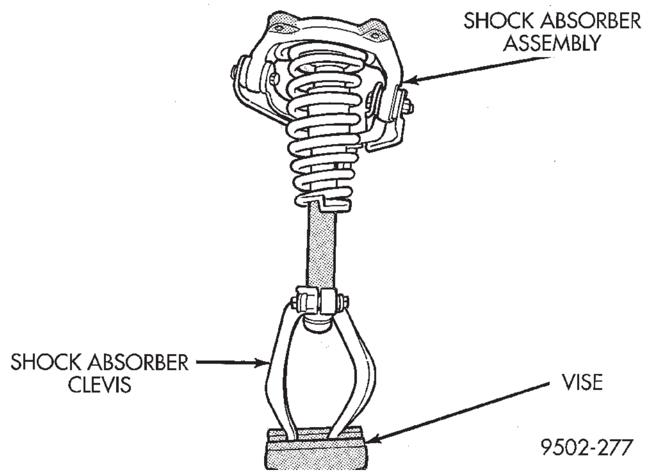


Fig. 17 Shock Absorber Correctly Mounted In Vise

WARNING: WHEN COMPRESSING COIL SPRING FOR REMOVAL FROM SHOCK ABSORBER, THE FIRST FULL TOP AND BOTTOM COIL OF THE COIL SPRING MUST BE CAPTURED BY THE JAWS OF THE COIL SPRING COMPRESSOR.

(12) Compress shock absorber coil spring, using Professional Services Equipment Spring Compressor, GP-2020-C3.5 fitted with the GP-C42 top spring shoe and the GP-A20 bottom spring shoe (Fig. 18).

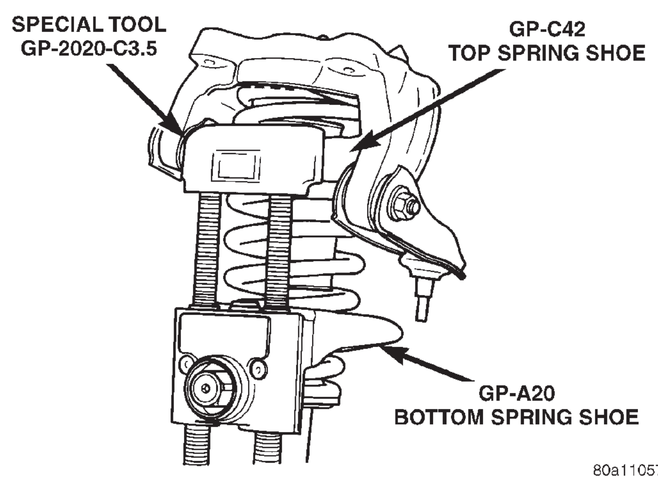


Fig. 18 Compressing Shock Absorber Coil Spring

(13) Hold the rod of the shock absorber from rotating using Shock Absorber Socket, Snap-On A136 or an equivalent (Fig. 19). Then remove the shock absorber shaft nut.

(14) Remove the washer (Fig. 20) from shock absorber rod.

REMOVAL AND INSTALLATION (Continued)

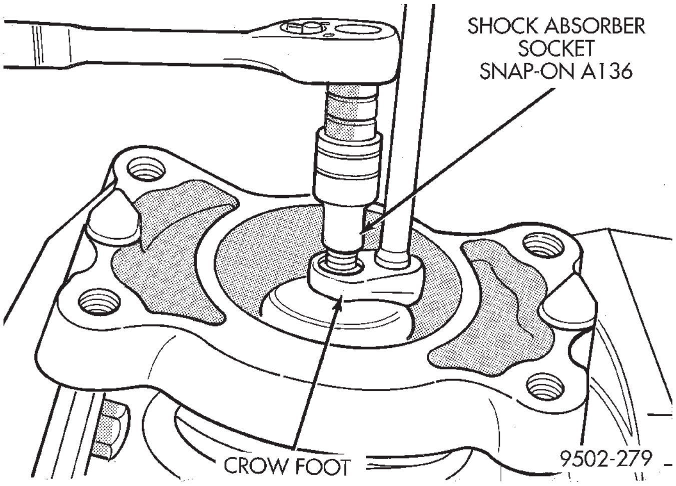


Fig. 19 Shock Absorber Shaft Nut Removal

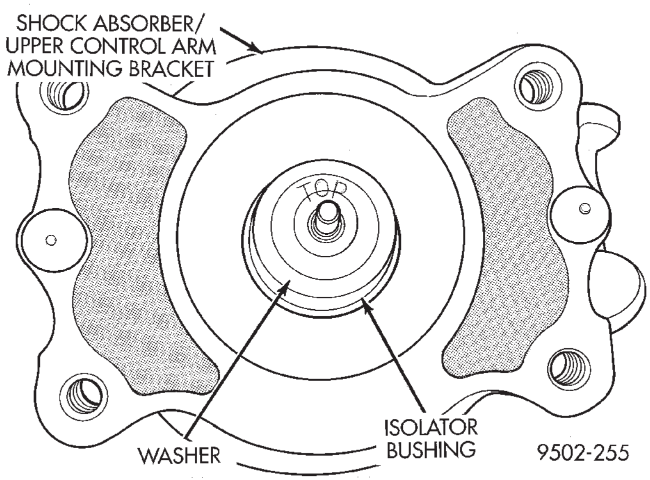


Fig. 20 Shock Absorber Rod Upper Washer

(15) Remove the shock absorber/upper control arm mounting bracket from the shock absorber assembly (Fig. 21).

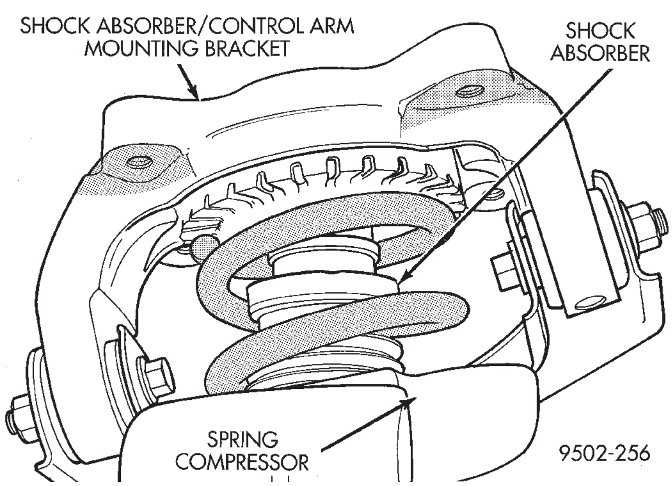


Fig. 21 Shock Absorber/Upper Control Arm Mounting Bracket

CAUTION: The top and bottom bushings for the shock absorber rod are unique to the position which they are installed on the rod. When removing the bushings from the rod, attention must be paid to their location so they will be installed correctly when shock absorber is assembled.

(16) Remove the shock absorber rod upper isolator bushing (Fig. 22) from the shock absorber/upper control arm mounting bracket.

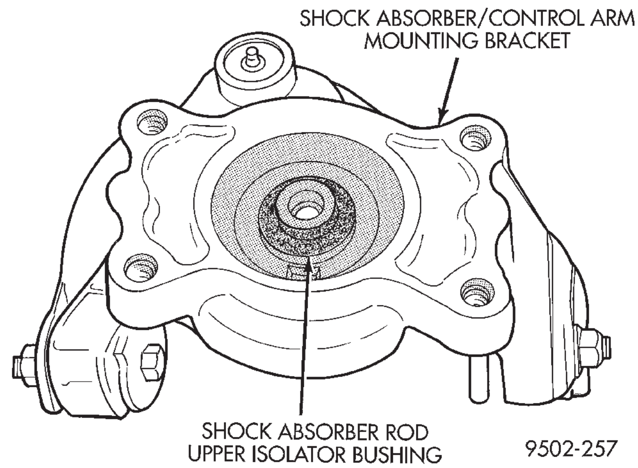


Fig. 22 Shock Absorber Rod Upper Isolator Bushing

(17) Remove the shock absorber rod lower isolator bushing and sleeve (Fig. 23) from the shock absorber/upper control arm mounting bracket. Then remove upper spring isolator (Fig. 23) from mounting bracket.

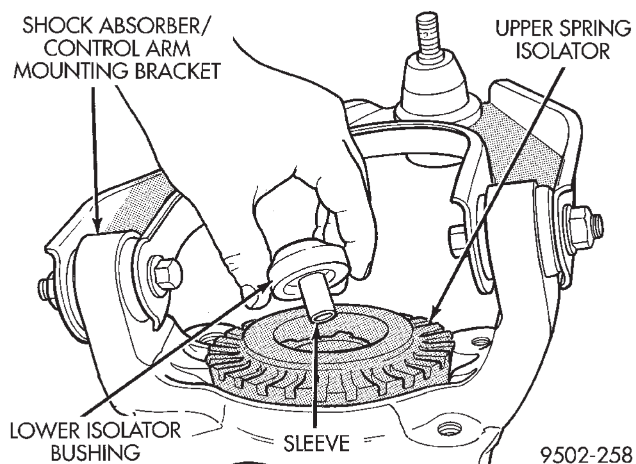


Fig. 23 Shock Absorber Rod Lower Isolator Bushing And Sleeve

(18) Remove the 2 bolts (Fig. 24) attaching the upper control arm to the bushings in the upper control arm mounting bracket.

(19) Remove the upper control arm from the mounting bracket.

REMOVAL AND INSTALLATION (Continued)

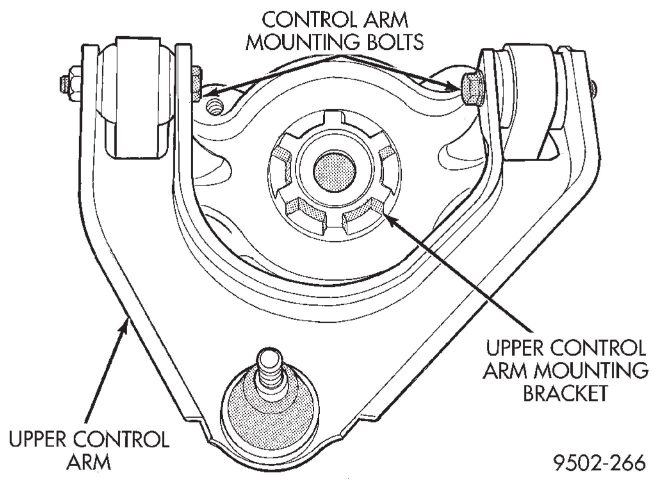


Fig. 24 Upper Control Arm To Mounting Bracket Attachment

INSTALL

(1) Install the upper control arm assembly on its mounting bracket.

NOTE: Bolts MUST be installed so the head of the bolt will be toward the coil spring when the mounting bracket is installed on the shock absorber mounting bracket (Fig. 24).

(2) Install and securely tighten the 2 bolts attaching the upper control arm to the bushings in the mounting bracket (Fig. 24). Tighten the attaching bolts to a torque of 95 N·m (70 ft. lbs.).

CAUTION: The top and bottom shock absorber rod bushings are unique to the position which they are installed on the rod. When installing the bushings on the rod, attention must be paid to their location so they are installed correctly (Fig. 25).

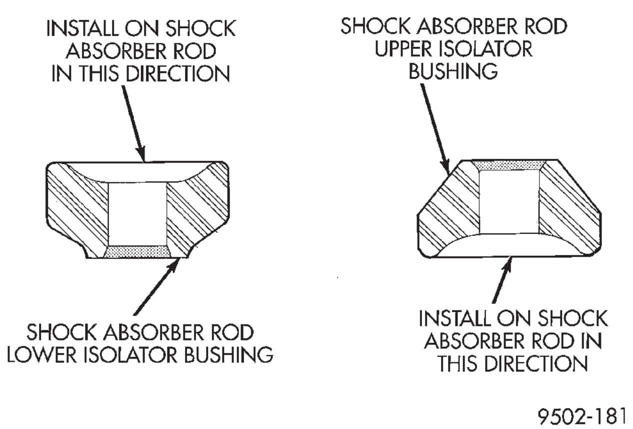


Fig. 25 Upper And Lower Shock Absorber Rod Bushing Identification

(3) Install the lower isolator bushing and sleeve (Fig. 23) in the shock absorber/lower control mounting bracket. Install the coil spring upper isolator on the mounting bracket (Fig. 23).

(4) Install the upper isolator bushing (Fig. 22) on the shock absorber/upper control arm mounting bracket.

(5) Install the shock absorber/upper control arm mounting bracket (Fig. 21) on the shock absorber assembly.

(6) Install the upper washer on the rod of shock absorber and positioned with the word TOP facing up (Fig. 20).

WARNING: THE FOLLOWING 2 STEPS MUST BE COMPLETELY DONE BEFORE SPRING COMPRESSOR, GP-2020-C3.5 OR AN EQUIVALENT IS RELEASED FROM THE COIL SPRING.

(7) Install nut on rod of shock absorber assembly. While holding rod of shock absorber from turning, tighten shock absorber rod retaining nut to a torque of 55 N·m (40 ft. lbs.) (Fig. 19).

(8) Relieve all tension from spring compressor. After all spring tension has been removed from the spring compressor, remove it from the shock absorber assembly.

(9) Remove the shock absorber assembly from the vise and remove the clevis from the shock absorber.

(10) Install shock absorber assembly with the clevis bracket removed, into the shock tower. Align the 2 locating pins and the 4 mounting holes on the upper control arm shock absorber mount with the holes in shock tower. Install the 4 upper control arm mount to shock tower mounting bolts. Tighten the 4 bolts to a torque of 95 N·m (70 ft. lbs.). Refer to Shock Absorber Installation in this section of the service manual for the proper procedure.

(11) Install the clevis on the shock absorber. Clevis is installed by tapping it onto shock absorber using a soft (brass) drift until fully seated against locating tab on shock absorber. Locating tab on collar must be positioned in the split of the clevis bracket (Fig. 26).

CAUTION: When tightening the clevis pinch bolt do not turn the pinch bolt in the clevis. The serrations on the pinch bolt and the clevis will be damaged.

(12) Tighten the **nut** on the shock absorber clevis pinch bolt (Fig. 14) to a torque of 88 N·m (65 ft. lbs.).

(13) Install the clevis to lower control arm isolator bushing thru- bolt (Fig. 15). Do not tighten or torque the thru-bolt at this time.

(14) Install upper ball joint stud into steering knuckle. Install castle nut on ball joint stud. Tighten nut to a torque of 55 N·m (40 ft. lbs.). Install cotter pin in ball joint (Fig. 12).

(15) Install the routing bracket for the wheel speed sensor cable on the steering knuckle (Fig. 11). Install

REMOVAL AND INSTALLATION (Continued)

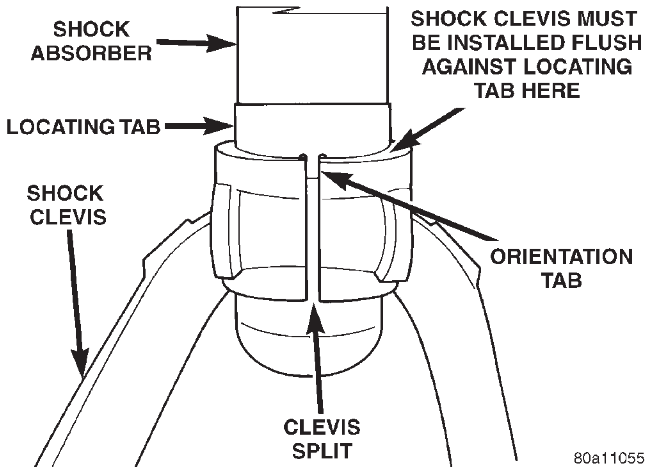


Fig. 26 Clevis Correctly Installed On Shock Absorber

and securely tighten the routing bracket attaching bolt.

CAUTION: When supporting the lower control arm with jack stand, do not position jack stand under the ball joint cap on the lower control arm. Position jack stand in area of lower control arm shown in (Fig. 27).

(16) Lower vehicle to the ground with a jack stand positioned under the lower control arm (Fig. 27). Continue to lower vehicle so the total weight of the vehicle is supported by the jack stand and lower control arm.

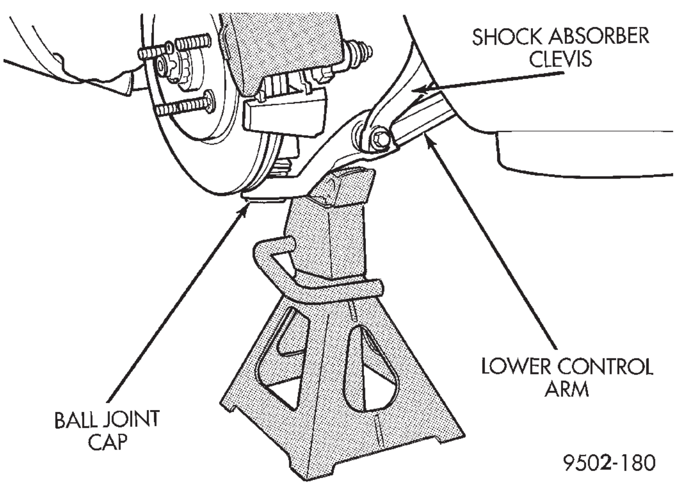


Fig. 27 Lower Control Arm Correctly Supported By Jack Stand

CAUTION: When tightening the shock absorber clevis to lower control arm thru-bolt (Fig. 15) do not turn the thru-bolt in the clevis. The serrations on the bolt and the clevis will be damaged.

(17) Tighten the shock absorber clevis to lower control arm bushing thru-bolt nut to a torque of 88 N·m (65 ft. lbs.).

(18) Properly lubricate the upper ball joint using Mopar Multi-Mileage Lube or an equivalent.

(19) Install the wheel and tire assembly back on the vehicle.

(20) Raise vehicle and remove jack stand from under lower control arm and lower vehicle to the ground.

(21) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

LOWER CONTROL ARM

REMOVE

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the tire and wheel from the vehicle.

NOTE: Removing the tie rod end from the steering knuckle allows the steering knuckle to be turned further. This allows better access to the steering knuckle when striking it to remove the ball joint stud from the steering knuckle.

(3) Remove nut attaching the outer tie rod end to the steering knuckle (Fig. 28). **Nut is to be removed from tie rod end using the following procedure, hold tie rod end stud with a 11/32 socket while loosening and removing nut with wrench (Fig. 28).**

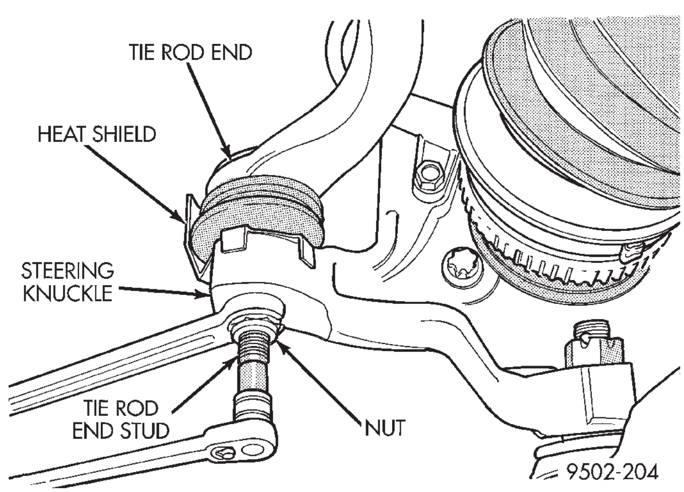


Fig. 28 Tie Rod End Attaching Nut

REMOVAL AND INSTALLATION (Continued)

(4) Remove the tie rod end from the steering knuckle using Remover, Special Tool MB-991113 (Fig. 29).

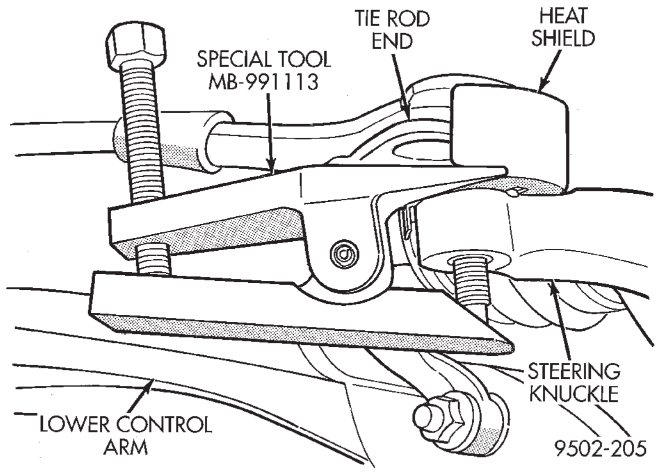


Fig. 29 Tie Rod End Removal From Steering Knuckle

(5) Remove cotter pin and castle nut (Fig. 30) from stud of lower ball joint.

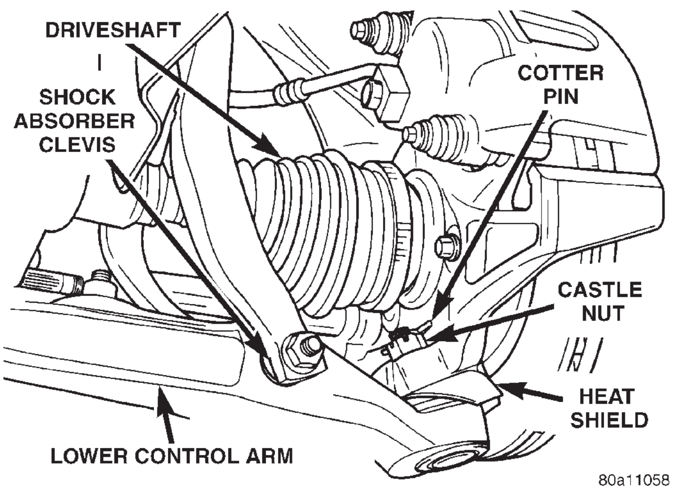


Fig. 30 Lower Ball Joint Attachment To Steering Knuckle

CAUTION: No tool is to be inserted between the steering knuckle and the lower ball joint to separate the lower ball joint from the steering knuckle. The steering knuckle is to be separated from the ball joint only using the procedure as described in step Step 6 below.

CAUTION: When striking the steering knuckle, do not hit the heat shield covering the ball joint grease seal. Bending the heat shield against the ball joint grease seal will cause the grease seal to fail.

(6) Turn steering knuckle so the front of the steering knuckle is facing as far outboard in the wheel opening as possible (Fig. 31). Using a hammer, strike steering knuckle boss (Fig. 31) until steering knuckle separates from the lower ball joint. **When striking steering knuckle care MUST be taken not to hit lower control arm or ball joint grease seal.**

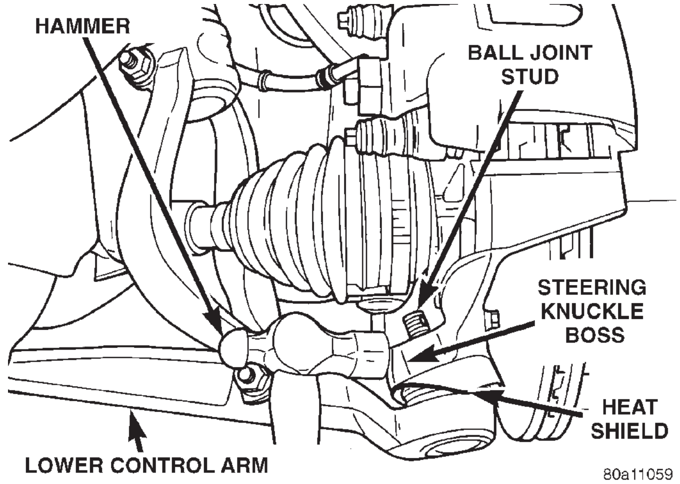


Fig. 31 Separating Lower Ball Joint Stud From Steering Knuckle

CAUTION: Pulling the steering knuckle outward from the vehicle after releasing it from the ball joint, can separate inner C/V joint. See Driveshafts.

(7) Remove the shock absorber clevis to lower control arm bushing, nut and thru-bolt. Separate the clevis from lower control arm (Fig. 32).

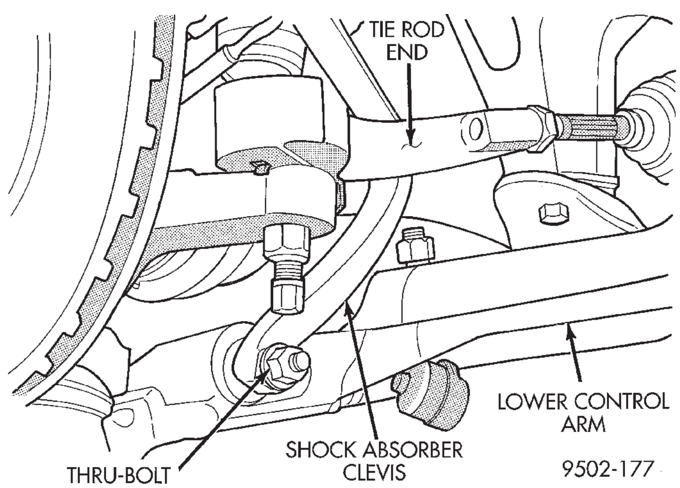


Fig. 32 Clevis To Lower Control Arm Attachment

(8) Remove nut attaching the stabilizer bar link to the lower control arm (Fig. 33). When removing nut, hold stud of stabilizer bar link from turning by inserting an allen wrench in the end of the stud (Fig. 33).

REMOVAL AND INSTALLATION (Continued)

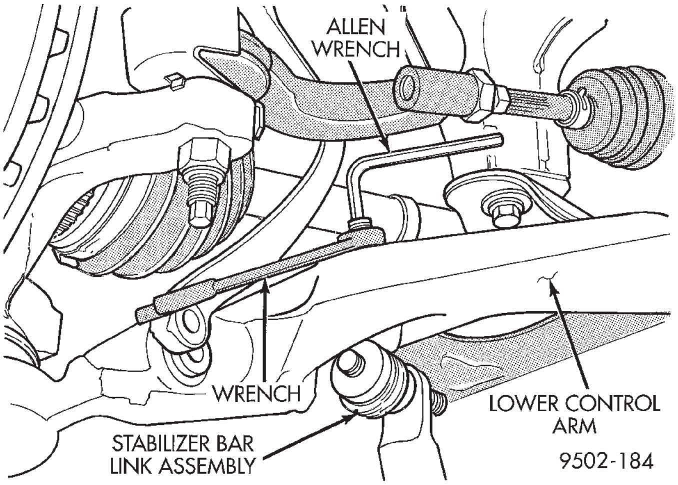


Fig. 33 Removing/ Installing Nut From Stud Of Stabilizer Link

(9) Remove the bolts (Fig. 34) attaching the one stabilizer bar bushing clamp to the front suspension crossmember and the body of the vehicle.

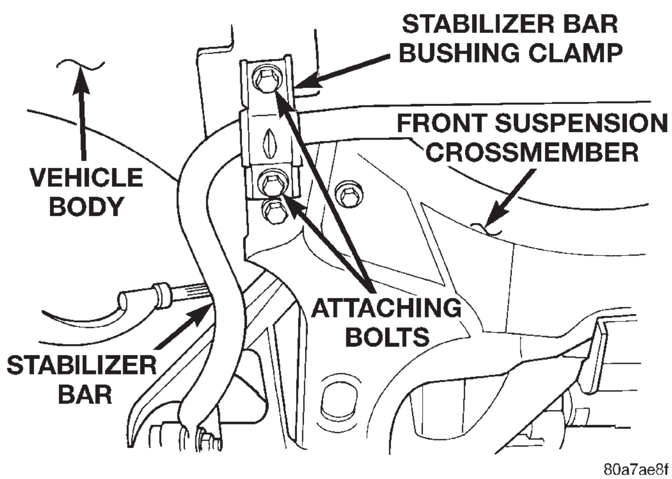


Fig. 34 Stabilizer Bar Bushing Clamp Attachment To Vehicle

(10) Lower the one side of the stabilizer bar away from the lower control arm and body of vehicle.

(11) Remove the nut and bolt (Fig. 35) attaching the rear of the lower control arm to the front suspension crossmember.

(12) Remove nut and bolt attaching the front of the lower control arm to the front suspension crossmember (Fig. 36).

CAUTION: When removing lower control arm from crossmember care must be taken to prevent hitting lower ball joint seal against steering knuckle, causing damage to the ball joint seal.

(13) Remove the front of the lower control arm from the front suspension crossmember first.

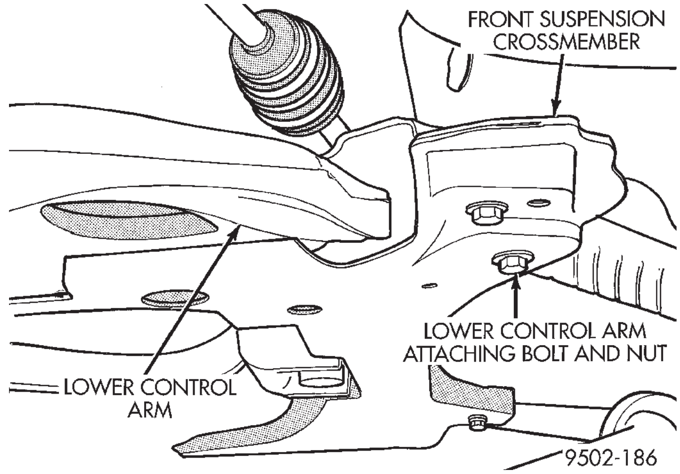


Fig. 35 Lower Control Arm Attachment To Front Suspension Crossmember

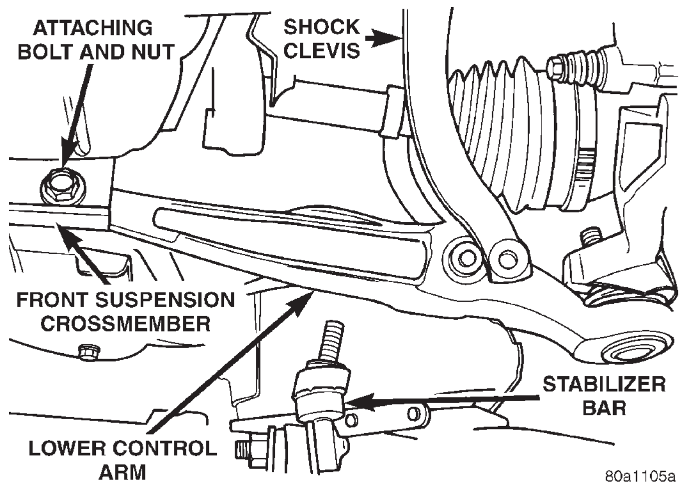


Fig. 36 Attaching Front Of Lower Control Arm To Suspension Crossmember

(14) Then, remove the rear of the lower control arm from the front suspension crossmember. When removing rear of lower control arm from crossmember, keep control arm as level as possible. This will keep rear bushing from binding on crossmember making it easier to remove control arm from crossmember.

INSTALL

(1) Position rear of lower control arm into front suspension crossmember first. Then install front of lower control arm in front suspension crossmember. Install bolts and nuts (Fig. 36) and (Fig. 35) attaching the front and rear of lower control arm to front suspension crossmember. **Do not tighten front attaching bolt at this time** .

(2) Tighten lower control arm rear attaching nut and bolt (Fig. 35) to a torque of 95 N·m (70 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

(3) Install the lower control arm ball joint stud into the steering knuckle. Install the steering knuckle to ball joint stud castle nut (Fig. 30).

(4) Install the tie rod end into the steering knuckle. Start the tie rod end to steering knuckle attaching nut onto stud of tie rod end. While holding stud of tie rod end stationary, tighten tie rod end to steering knuckle attaching nut (Fig. 28). Then using a crowfoot and 11/32 socket tighten the attaching nut to a torque of 61 N·m (45 ft. lbs.) (Fig. 37).

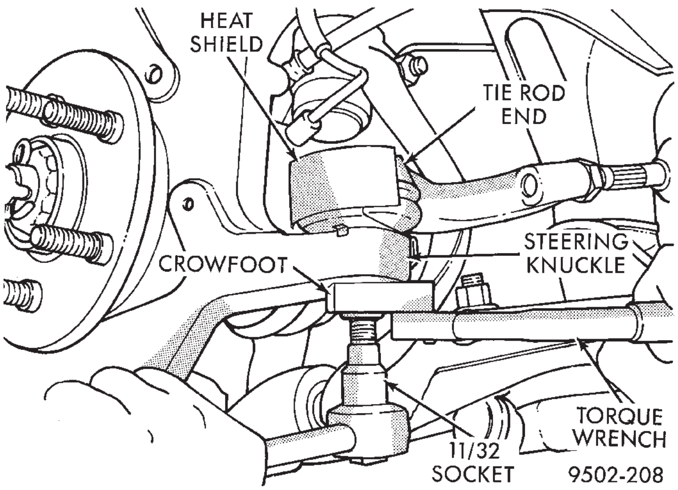


Fig. 37 Torquing Tie Rod End Attaching Nut

(5) Tighten the lower control arm ball joint stud castle nut (Fig. 30) to a torque of 74 N·m (55 ft. lbs.). Install the cotter pin (Fig. 30) in the ball joint stud.

(6) Position sway bar link into its lower control arm mounting hole.

(7) Align sway bar bushing clamp with mounting holes in front suspension crossmember and body of vehicle. Then install and securely tighten the bushing clamp mounting bolts (Fig. 34) to a torque of 61 N·m (45 ft. lbs.).

(8) Install and securely tighten the stabilizer bar link to lower control arm attaching nut to a torque of 102 N·m (75 ft. lbs.). When tightening and torquing attaching nut, hold stud of attaching link from turning with an allen wrench (Fig. 33).

(9) Install the clevis on the lower control arm. Loosely install the clevis to bushing thru-bolt (Fig. 32).

CAUTION: When supporting lower control arm with jack stand, do not position jack stand under the ball joint cap on the lower control arm. Position in area of lower control arm shown in (Fig. 38).

(10) Lower vehicle to the ground with a jack stand positioned under the lower control arm (Fig. 38). Continue to lower vehicle so the total weight of the vehicle is supported by the jack stand and lower control arm.

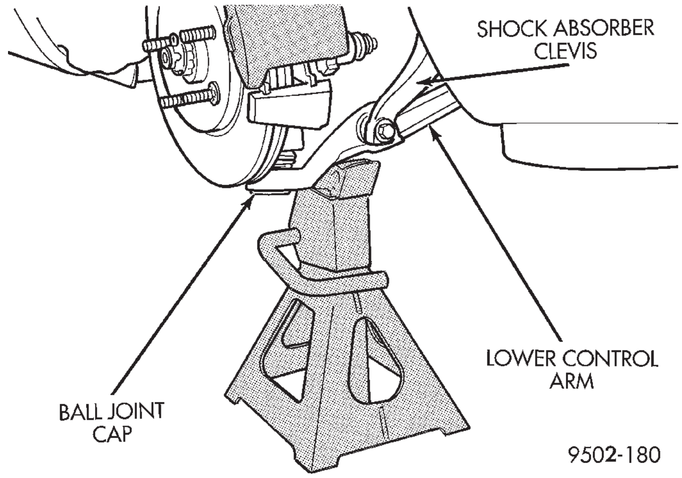


Fig. 38 Supporting Lower Control Arm With Jack Stand

CAUTION: When tightening the thru-bolt do not turn the bolt in the clevis. The serrations on the bolt and the hole in the clevis will be damaged.

(11) **With the vehicle's suspension at curb height,** tighten the clevis to lower control arm bushing thru-bolt nut (Fig. 32) to a torque of 88 N·m (65 ft. lbs.).

(12) Tighten front lower control arm nut and bolt (Fig. 36) to a torque of 182 N·m (135 ft. lbs.).

(13) Install wheel and tire assembly.

(14) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(15) Remove jack stand from under lower control arm and lower vehicle to the ground.

(16) Check the vehicles alignment specifications and set front Toe to preferred specifications.

STEERING KNUCKLE

REMOVE

(1) Remove cotter pin, nut lock, and spring washer (Fig. 39) from the front stub axle.

CAUTION: Wheel bearing damage will result if after loosening hub nut, vehicle is rolled on the ground or the weight of the vehicle is allowed to be supported by the tires.

(2) Loosen hub nut while vehicle is on the floor with the brakes applied (Fig. 40). **The hub and driveshaft are splined together through the knuckle (bearing) and retained by the hub nut.**

(3) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for

REMOVAL AND INSTALLATION (Continued)

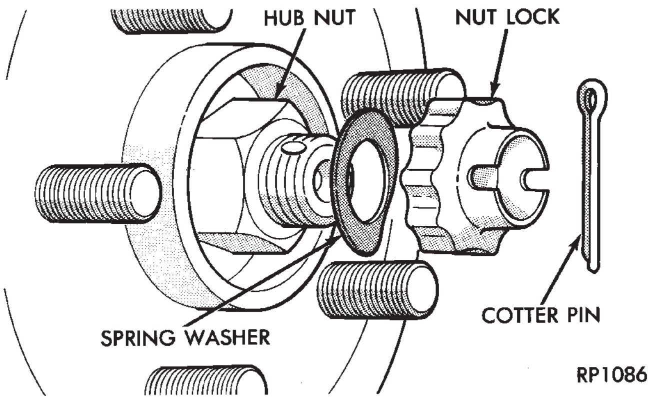


Fig. 39 Cotter Pin, Nut Lock

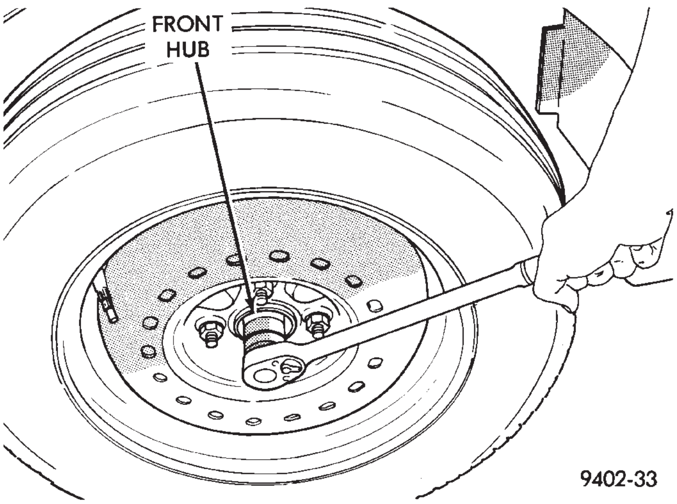


Fig. 40 Loosening Front Hub Nut

the required lifting procedure to be used for this vehicle.

(4) Remove front tire and wheel assembly from the hub.

(5) Remove front disc brake caliper to steering knuckle guide pin attaching bolts (Fig. 41).

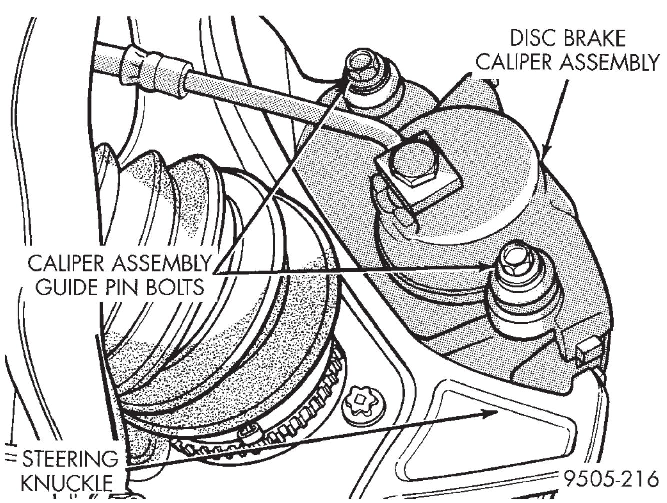


Fig. 41 Front Disc Brake Caliper Mounting

(6) Remove disc brake caliper assembly from steering knuckle. Caliper is removed by first lifting bottom of caliper away from steering knuckle, and then removing top of caliper out from under steering knuckle (Fig. 42).

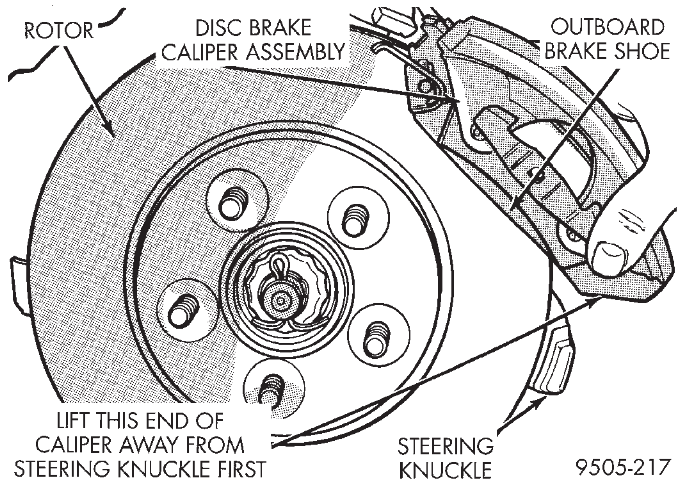


Fig. 42 Disc Brake Caliper Removal

(7) Support brake caliper/adapter assembly using a wire hook (Fig. 43) and not by hydraulic hose.

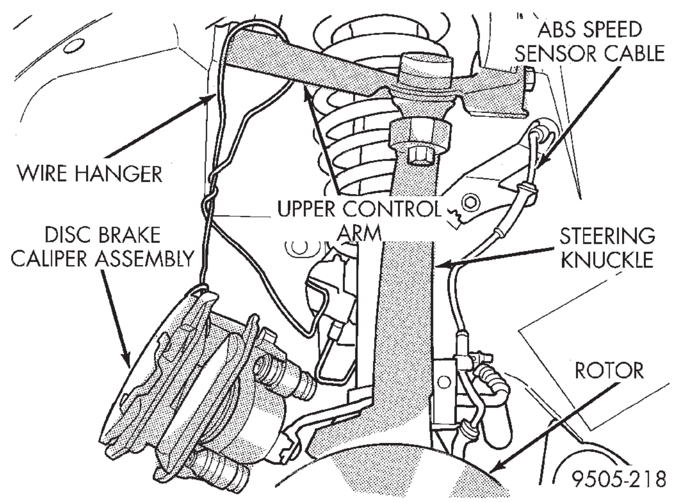


Fig. 43 Correctly Supported Front Disc Brake Caliper

(8) Remove the braking disc from the front hub/ bearing assembly.

(9) Remove nut attaching outer tie rod end to the steering knuckle (Fig. 44). **Nut is to be removed from tie rod end using the following procedure, hold tie rod end stud with a 11/32 socket while loosening and removing nut with wrench (Fig. 44).**

(10) Remove the tie rod end from the steering knuckle using Remover, Special Tool MB-991113 (Fig. 45).

(11) Remove the speed sensor cable routing bracket (Fig. 46) from the steering knuckle.

REMOVAL AND INSTALLATION (Continued)

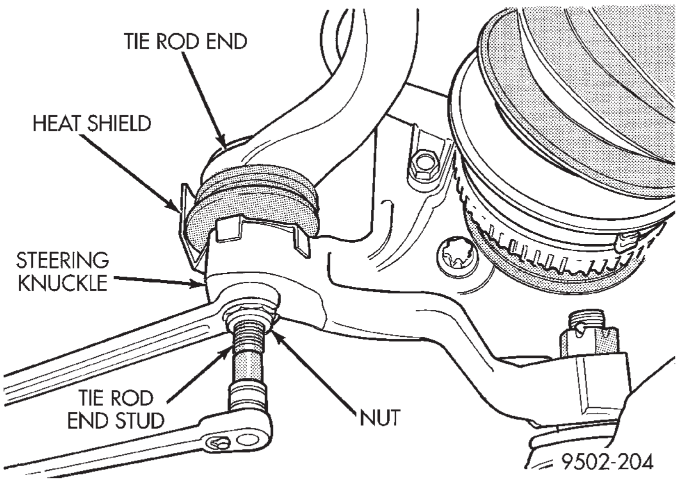


Fig. 44 Tie Rod End Attaching Nut

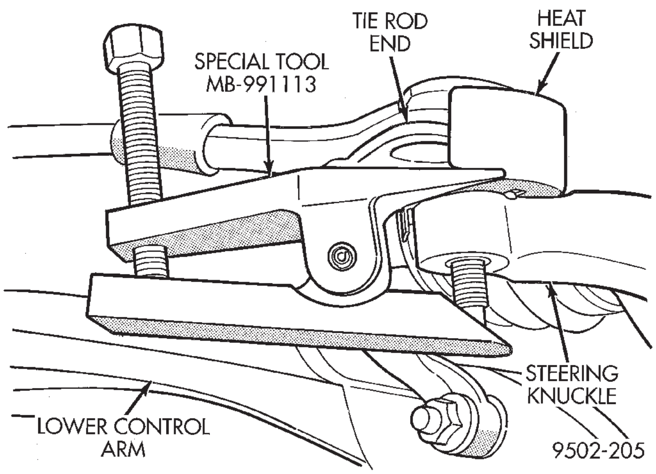


Fig. 45 Tie Rod End Removal From Steering Knuckle

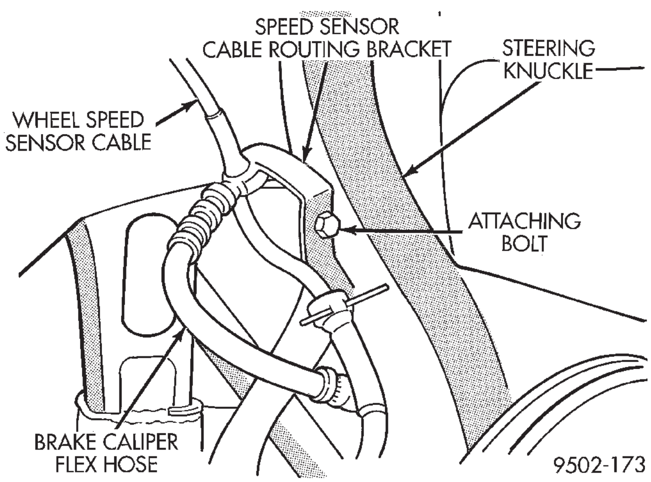


Fig. 46 Speed Sensor Cable Routing Bracket

(12) Remove cotter pin and castle nut (Fig. 47) from the stud of the lower ball joint .

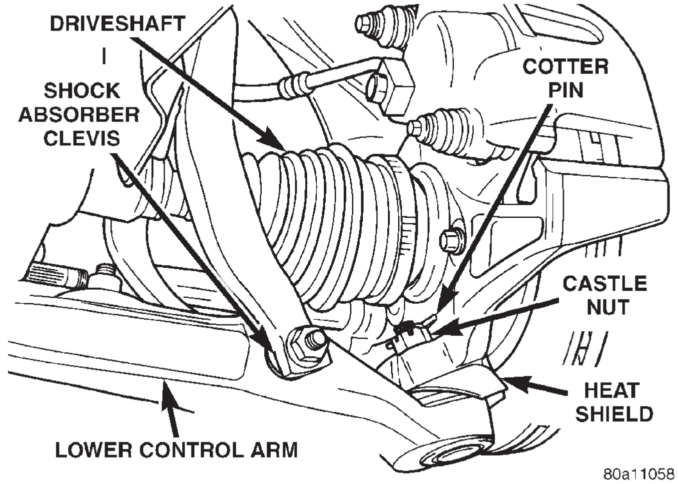


Fig. 47 Lower Ball Joint Attachment To Steering Knuckle

CAUTION: No tool is to be inserted between the steering knuckle and the lower ball joint to separate stud of lower ball joint from the steering knuckle. The steering knuckle is to be separated from the stud of the ball joint only using the procedure as described in step Step 13 below.

CAUTION: When striking the steering knuckle, do not hit the heat shield covering the ball joint grease seal. Bending the heat shield against the ball joint grease seal will cause the grease seal to fail.

(13) Turn steering knuckle so the front of the steering knuckle is facing as far outboard in the wheel well as possible. Using a hammer strike the boss on the steering knuckle, (Fig. 48) until the steering knuckle separates from the stud of lower ball joint.

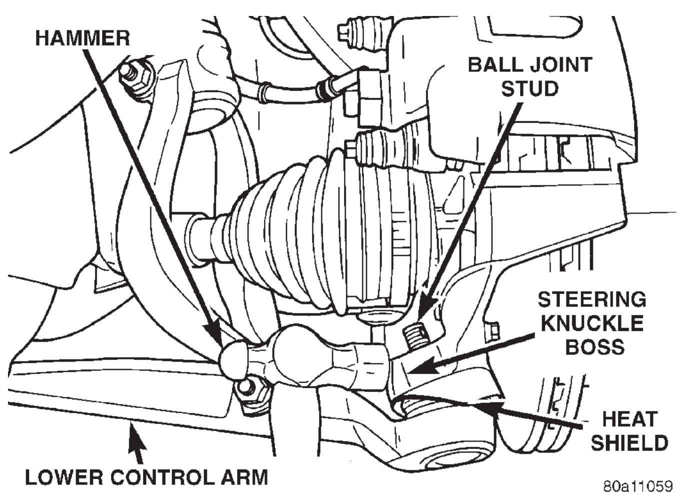


Fig. 48 Separating Ball Joint Stud From Steering Knuckle

REMOVAL AND INSTALLATION (Continued)

CAUTION: Pulling steering knuckle out from vehicle after releasing from ball joint can separate inner C/V joint. See Driveshafts.

(14) Lift up on steering knuckle separating it from the lower ball joint stud. **Use caution when separating ball joint stud from steering knuckle, so ball joint seal does not get cut.**

NOTE: Care must be taken not to separate the inner C/V joint during this operation. Do not allow driveshaft to hang by inner C/V joint, driveshaft must be supported.

(15) Separate the steering knuckle from the outer C/V joint. Separate steering knuckle from outer C/V joint, by supporting the driveshaft while pulling steering knuckle away from the outer C/V joint (Fig. 49).

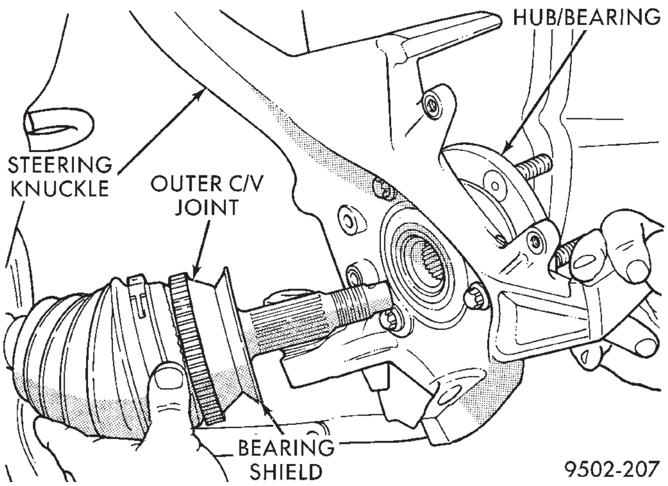


Fig. 49 Separating Steering Knuckle From Outer C/V Joint

(16) Remove the cotter pin and nut (Fig. 50) from the upper ball joint stud to steering knuckle attachment.

(17) Remove the upper ball joint stud from the steering knuckle using Puller, Special Tool, C-3894-A (Fig. 51).

(18) Remove steering knuckle from vehicle.

(19) **The bolt in type front wheel bearing used on the vehicle is transferable to the replacement steering knuckle if bearing is found to be in usable condition.** Refer to Hub And Bearing Service in this section of the service manual for proper wheel bearing removal and installation procedure.

INSTALL

(1) If required install a hub/bearing assembly into the steering knuckle before installing steering knuckle on vehicle. Refer to Hub And Bearing Service in this section of the service manual for proper wheel bearing removal and installation procedure.

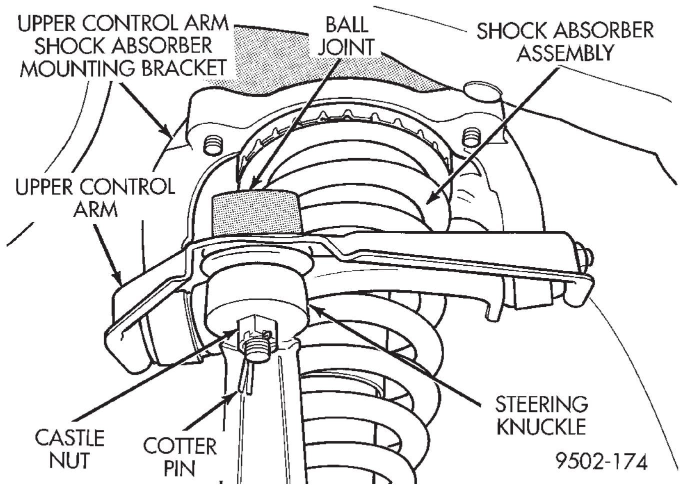


Fig. 50 Upper Ball Joint Attachment To Steering Knuckle

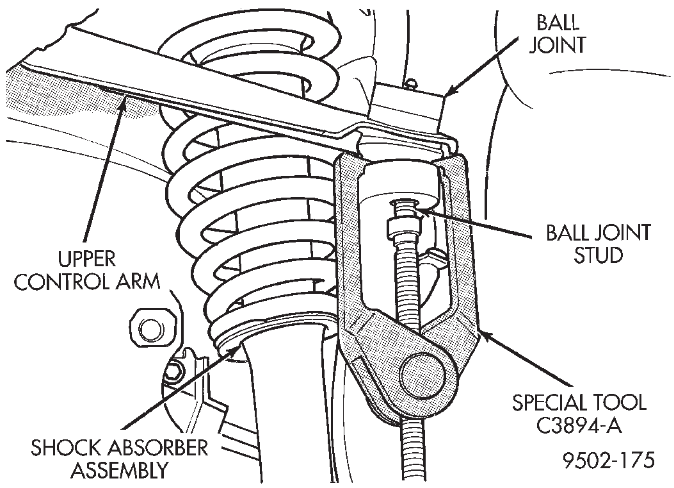


Fig. 51 Ball Joint Stud Removal From Steering Knuckle

(2) Install the heat shield for the lower control arm ball joint grease seal before beginning the installation of the steering knuckle on the vehicle.

(3) Slide drive shaft back into front hub/bearing assembly. Then install steering knuckle onto the ball joint stud in lower control arm.

(4) Install the steering knuckle to lower ball joint stud castle nut.

(5) Install upper ball joint in steering knuckle. Install the steering knuckle to upper ball joint nut. Tighten the upper ball joint castle nut (Fig. 50) to a torque of 54 N·m (40 ft. lbs.). Then, using a crowfoot and torque wrench, tighten the lower ball joint nut (Fig. 47) to a torque of 75 N·m (55 ft. lbs.). Install cotter pins in upper and lower ball joint studs.

(6) Install the speed sensor cable routing bracket on the steering knuckle (Fig. 46) and securely tighten the attaching bolt.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When installing tie rod on steering knuckle the heat shield (Fig. 52) must be installed. If heat shield is not installed, tie rod seal boot can fail due to excessive heat from brake rotor.

(7) Install tie rod end into the steering knuckle. Start tie rod end to steering knuckle attaching nut onto stud of tie rod end. While holding stud of tie rod end stationary, tighten tie rod end to steering knuckle attaching nut (Fig. 44). Then using a crow-foot and 11/32 socket tighten the attaching nut to a torque of 61 N·m (45 ft. lbs.) (Fig. 52).

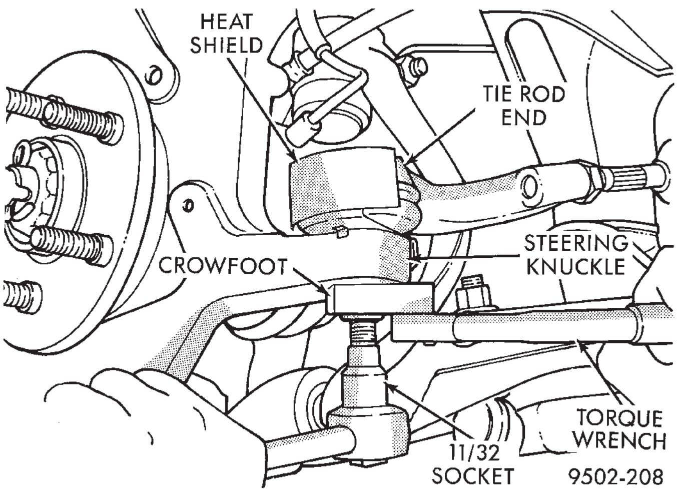


Fig. 52 Torquing Tie Rod End Attaching Nut

(8) Install braking disc back on hub and bearing assembly.

(9) Install disc brake caliper assembly on steering knuckle. Caliper is installed by first sliding top of caliper under top abutment on steering knuckle. Then installing bottom of caliper against bottom abutment of steering knuckle (Fig. 53).

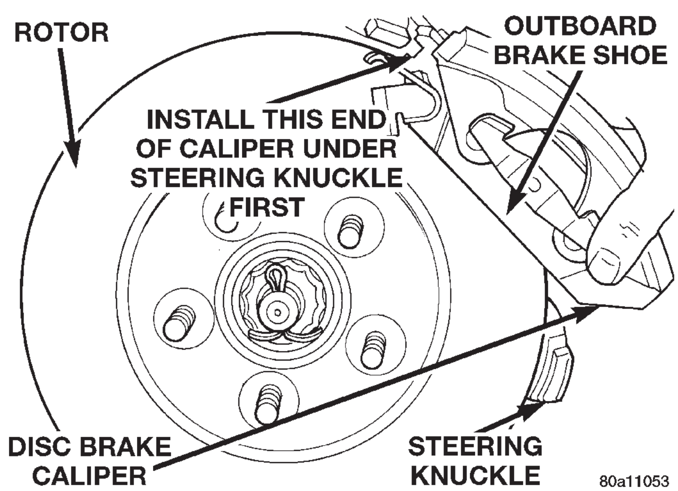


Fig. 53 Installing Brake Caliper

(10) Install the disc brake caliper guide pin bolts (Fig. 41). Tighten caliper assembly guide pin bolts to a torque of 31 N·m (23 ft. lbs.).

(11) Clean all foreign matter from the threads of the outer C/V joint stub axle. Install washer and hub nut (Fig. 54) onto stub axle and tighten nut.

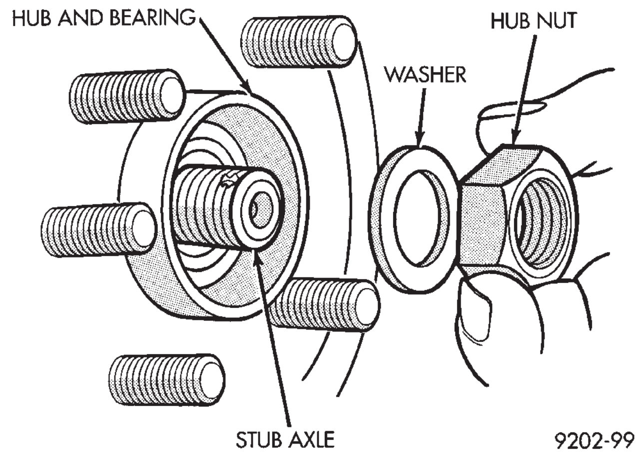


Fig. 54 Front Stub Axle Nut And Washer

(12) With vehicle brakes applied to keep braking disc from turning, tighten hub nut to 203 N·m (150 ft. lbs.) of torque.

(13) Install the spring washer, hub nut lock, and new cotter pin. Wrap cotter pin prongs tightly around the hub nut lock (Fig. 55).

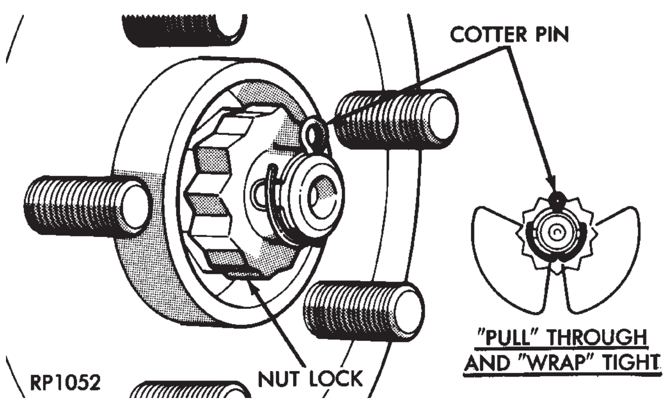


Fig. 55 Installing Spring Washer, Nut Lock And Cotter Pin

(14) Install front wheel and tire assembly. Install front wheel lug nuts and tighten in correct sequence. Then tighten to a torque of 135 N·m (100 ft.lbs.).

(15) Lower vehicle.

(16) Set front Toe on vehicle to required specification. Use procedure listed under Wheel Alignment, in the Front Suspension Service Procedures section of this service manual.

REMOVAL AND INSTALLATION (Continued)

STABILIZER BAR

REMOVE

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove nuts and stabilizer bar attaching link assemblies from the front lower control arms (Fig. 56). When removing attaching link nut, keep stud from turning by installing an allen wrench in the end of the stud (Fig. 56).

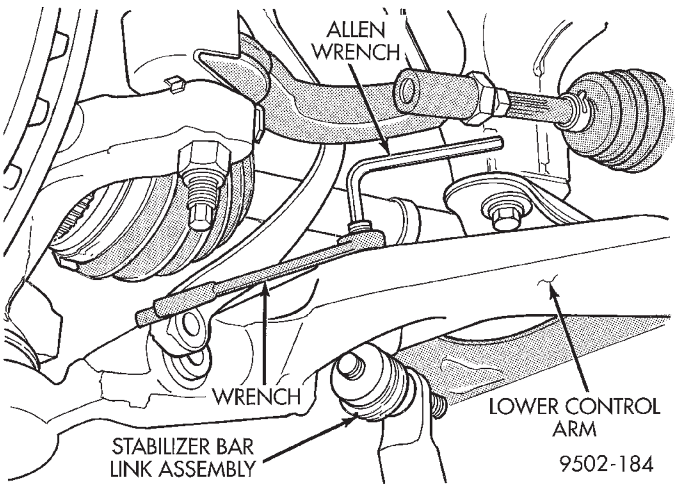


Fig. 56 Stabilizer Bar Attaching Link Nut Removal

(3) Remove the 4 bolts attaching the stabilizer bar bushing retainers to the front suspension crossmember and body (Fig. 57). Then remove the stabilizer bar assembly from the vehicle.

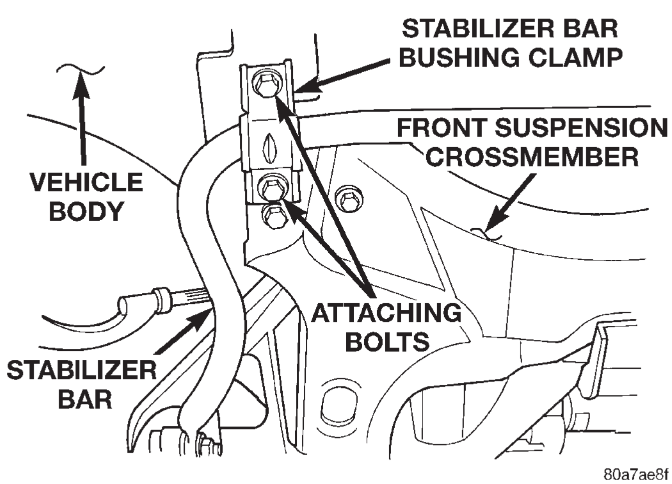


Fig. 57 Stabilizer Bar Bushing Retainer Attaching Bolts

STABILIZER BAR INSPECTION

Inspect for broken or distorted stabilizer bar bushings, clamps and attaching links. If stabilizer bar to front crossmember bushing replacement is required, bushing can be removed using the stabilizer bar bushing removal procedure in the Disassembly And Assembly section in this group of the service manual.

If inspection determines that replacement of a stabilizer bar to lower control arm attachment link is required, replace the link before installing stabilizer bar.

INSTALL

(1) Position stabilizer bar and bushings as an assembly into front crossmember. Install the stabilizer bar bushing retainer to crossmember and body attaching bolts (Fig. 57).

(2) Tighten the bushing retainer attaching bolts to a torque of 61 N·m (45 ft. lbs.).

(3) Align stabilizer bar attaching link assemblies with attaching link mounting holes in the lower control arms. Install stabilizer bar attaching links into both lower control arms. Install the attaching link to lower control arm retaining nuts. Torque the stabilizer bar attaching link nuts to 101 N·m (75 ft. lbs.).

FRONT HUB/BEARING ASSEMBLY

The front hub/bearing is serviced separately from the front steering knuckle. Retention of the front hub/bearing into the steering knuckle, is by means of 3 bolts installed from the rear of the steering knuckle. The bolts attach the hub/bearing to the outboard side of the steering knuckle. Removal and installation of the hub/bearing assembly from the steering knuckle must be done with the steering knuckle removed from the vehicle. **This is required due to the tool clearance to the ABS tone wheel when removing the retaining bolts. Removing the retaining bolts with the steering knuckle installed can result in damage to the tone wheel teeth requiring replacement of the driveshaft. If vehicle is not equipped with ABS, the hub/bearing may be removable without removing steering knuckle from vehicle.**

REMOVE

(1) Remove cotter pin, nut lock, and spring washer (Fig. 58) from the front stub axle.

CAUTION: Wheel bearing damage will result if after loosening hub nut, vehicle is rolled on the ground or the weight of the vehicle is allowed to be supported by the tires.

(2) Loosen hub nut while vehicle is on the floor with the brakes applied (Fig. 59). **The hub and driveshaft are splined together through the knuckle (bearing) and retained by the hub nut.**

(3) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubri-

REMOVAL AND INSTALLATION (Continued)

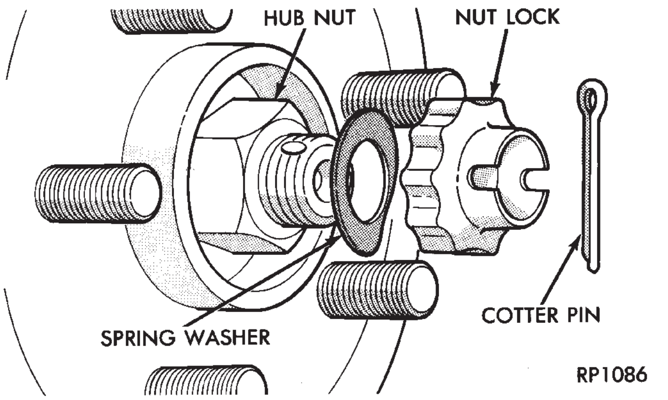


Fig. 58 Cotter Pin, Nut Lock

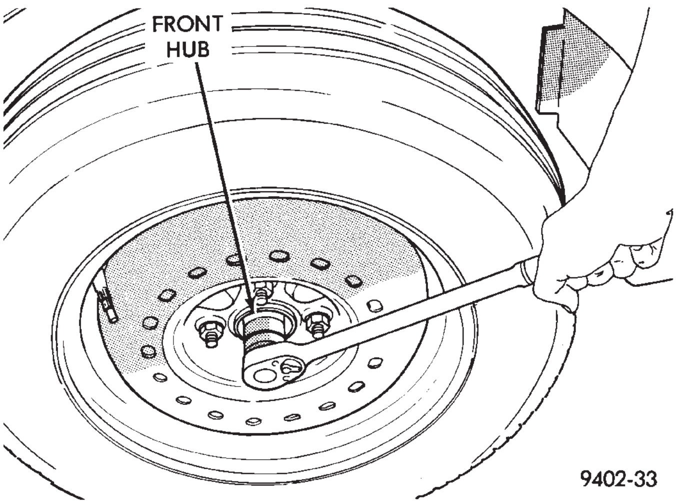


Fig. 59 Loosening Front Hub Nut

cation and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(4) Remove front tire and wheel assembly from the hub.

(5) Remove front disc brake caliper to steering knuckle guide pin attaching bolts (Fig. 60).

(6) Remove disc brake caliper assembly from steering knuckle. Caliper is removed by first lifting bottom of caliper away from steering knuckle, and then removing top of caliper out from under steering knuckle (Fig. 61).

(7) Support brake caliper/adapter assembly using a wire hook (Fig. 62) and not by hydraulic hose.

(8) Remove the braking disc from the front hub/bearing assembly (Fig. 63).

(9) Remove nut attaching the outer tie rod end to the steering knuckle (Fig. 64). **Nut is to be removed from tie rod end using the following procedure, hold tie rod end stud with a 11/32 socket while loosening and removing nut with wrench (Fig. 64).**

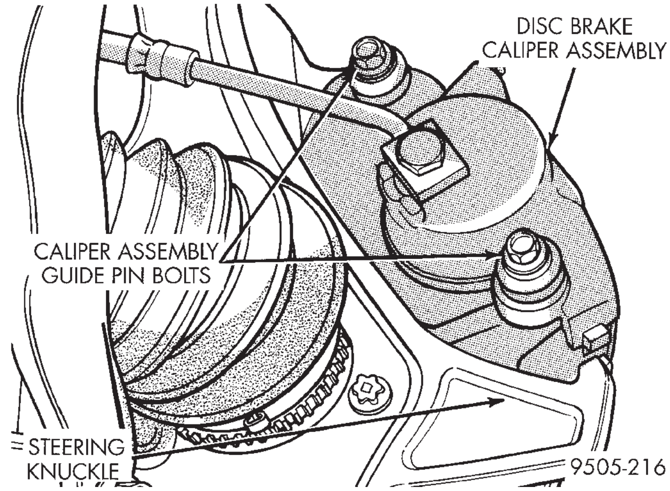


Fig. 60 Front Disc Brake Caliper Mounting

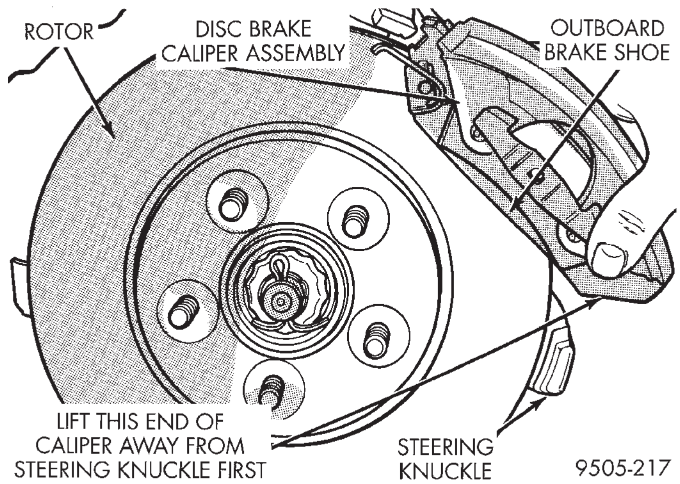


Fig. 61 Caliper Removal From Steering Knuckle

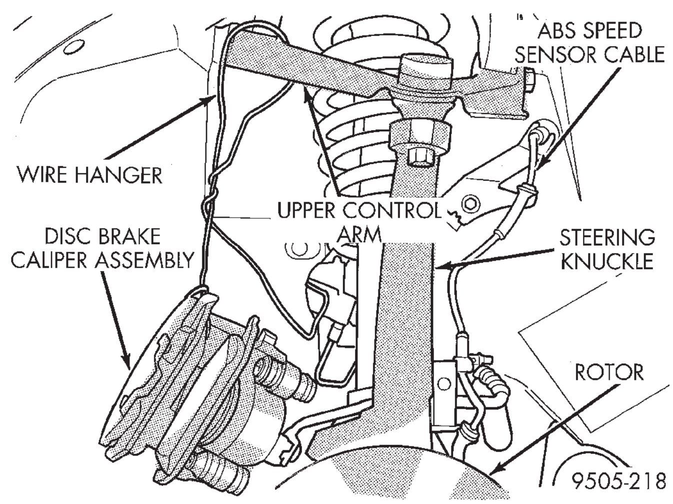


Fig. 62 Correctly Supported Front Disc Brake Caliper

(10) Remove the tie rod end from the steering knuckle arm, using Remover, Special Tool MB-991113 (Fig. 65).

REMOVAL AND INSTALLATION (Continued)

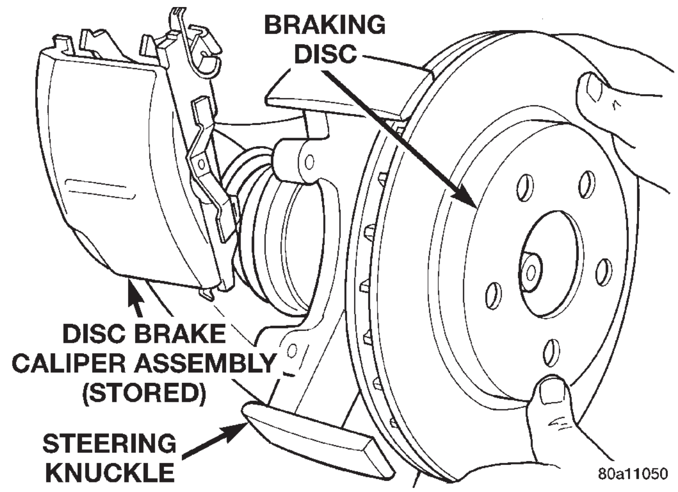


Fig. 63 Removing/Installing Front Braking Disc

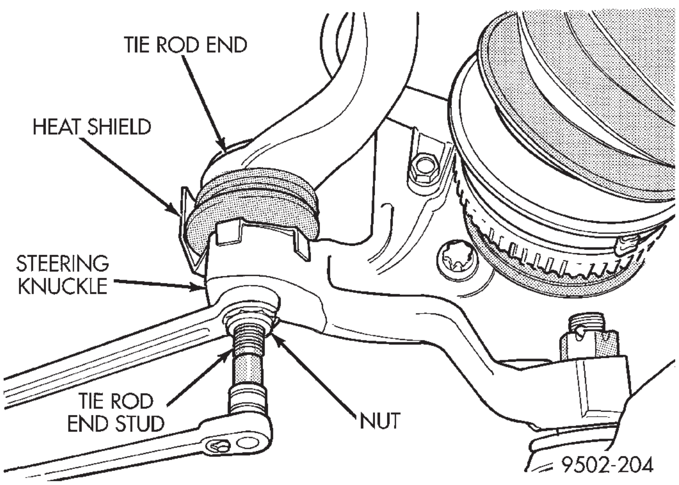


Fig. 64 Tie Rod End Attaching Nut Removal/ Installation

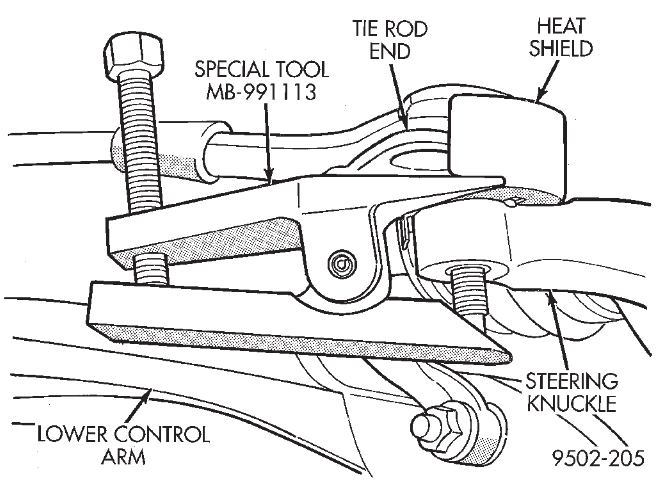


Fig. 65 Tie Rod End Removal From Steering Knuckle

(11) If equipped with antilock brakes remove the speed sensor cable routing bracket (Fig. 66) from the steering knuckle.

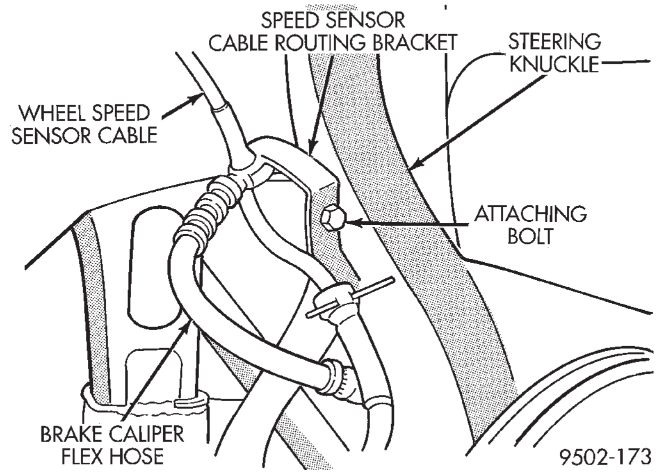


Fig. 66 Speed Sensor Cable Routing Bracket

(12) Remove cotter pin and castle nut (Fig. 67) from the stud of the lower ball joint.

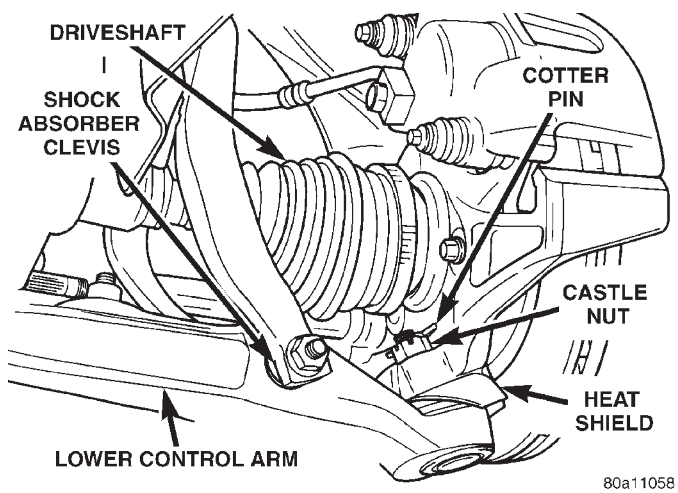


Fig. 67 Lower Ball Joint Attachment To Steering Knuckle

CAUTION: No tool is to be inserted between the steering knuckle and the lower ball joint to separate stud of lower ball joint from the steering knuckle. The steering knuckle is to be separated from the stud of the ball joint only using the procedure as described in step Step 13 below.

(13) Turn steering knuckle so the front of the steering knuckle is facing as far outboard in the wheel well as possible. Using a hammer strike the boss on the steering knuckle, (Fig. 68) until steering knuckle separates from stud of lower ball joint. **When striking steering knuckle, care MUST be taken not to hit lower control arm or ball joint grease seal.**

REMOVAL AND INSTALLATION (Continued)

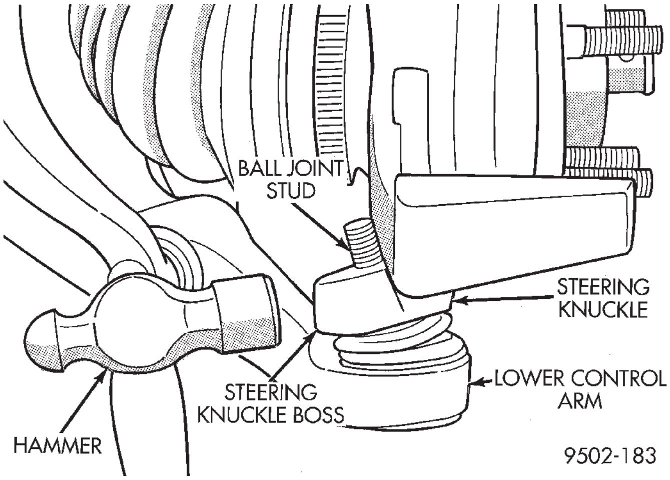


Fig. 68 Separating Ball Joint Stud From Steering Knuckle

CAUTION: Pulling steering knuckle out from vehicle after releasing from ball joint can separate inner C/V joint. See Driveshafts.

(14) Lift up on steering knuckle separating it from the lower ball joint stud. **Use caution when separating ball joint stud from steering knuckle, so ball joint seal does not get cut.**

NOTE: Care must be taken not to separate the inner C/V joint during this operation. Do not allow driveshaft to hang by inner C/V joint, driveshaft must be supported.

(15) Separate the steering knuckle from the outer C/V joint. Separate steering knuckle from outer C/V joint, by supporting the driveshaft while pulling steering knuckle away from the outer C/V joint (Fig. 69).

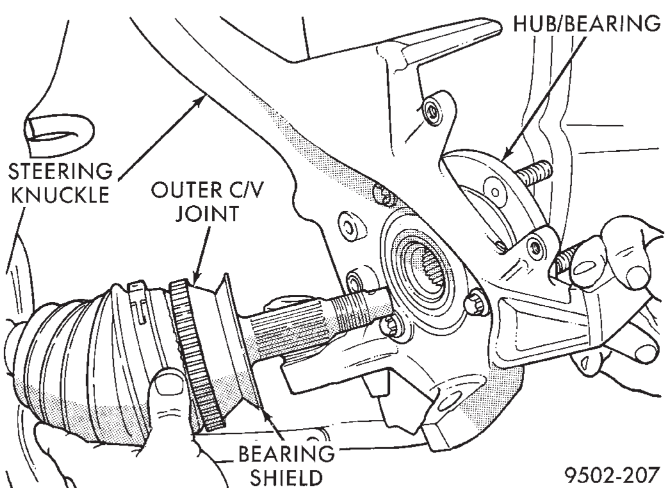


Fig. 69 Separating Steering Knuckle From Outer C/V Joint

(16) Remove the cotter pin and nut (Fig. 70) from the upper ball joint stud to steering knuckle attachment.

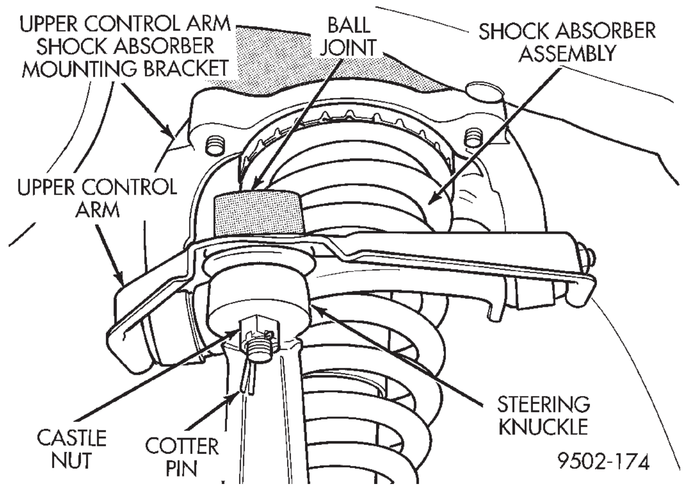


Fig. 70 Upper Ball Joint Attachment To Steering Knuckle

(17) Remove the upper ball joint stud from the steering knuckle using Puller, Special Tool, C3894-A (Fig. 71).

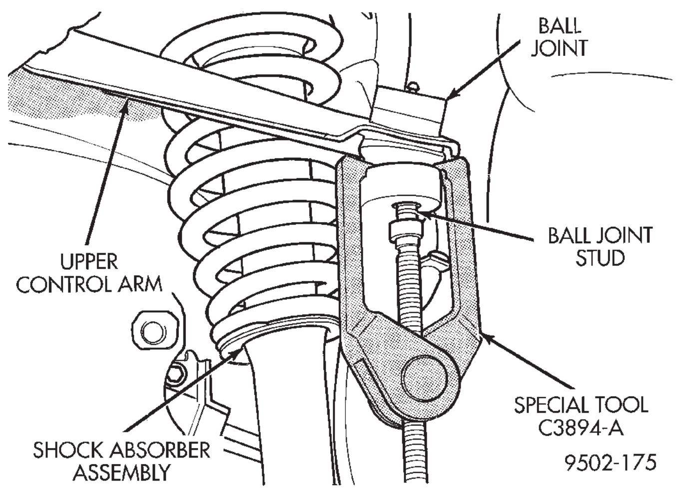


Fig. 71 Ball Joint Stud Removal From Steering Knuckle

(18) Remove steering knuckle from vehicle.

(19) Mount steering knuckle securely in a vise.

(20) Remove the 3 bolts (Fig. 72) attaching the hub/bearing assembly to the steering knuckle.

(21) Remove the hub/bearing assembly out from the front of the steering knuckle. **If bearing will not come out of steering knuckle, it can be tapped out using a soft faced hammer.**

(22) Thoroughly clean all hub/bearing assembly mounting surfaces on steering knuckle.

(23) Install the replacement hub/bearing assembly in steering knuckle aligning bolt boles in bearing flange with holes in steering knuckle.

REMOVAL AND INSTALLATION (Continued)

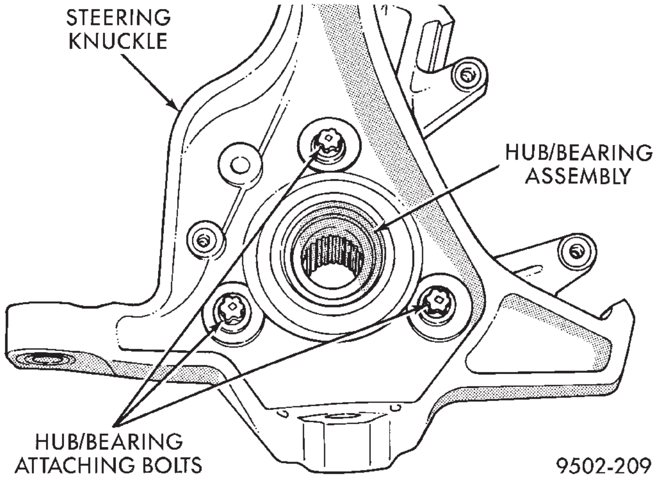


Fig. 72 Hub/Bearing Attaching Bolts

(24) Install the 3 mounting bolts (Fig. 72) and tighten evenly to ensure bearing is square to face of steering knuckle. The tighten the 3 mounting bolts (Fig. 72) to a torque of 110 N·m (80 ft. lbs.).

INSTALL

(1) Slide drive shaft back into front hub/bearing assembly.

(2) Install the steering knuckle on the lower control arm ball joint.

(3) Install the steering knuckle to lower ball joint castle nut.

(4) Install upper ball joint stud in steering knuckle.

(5) Install the steering knuckle to upper ball joint stud castle nut.

(6) Using a crow foot and torque wrench, tighten the upper and lower ball joint castle nuts to the following torque specifications.

- Lower ball joint castle nut 74 N·m (55 ft. lbs.).
- Upper ball joint castle nut 62 N·m (45 ft. lbs.).

(7) If equipped with antilock brakes install the speed sensor cable routing bracket on the steering knuckle (Fig. 66) and securely tighten attaching bolt.

CAUTION: When installing tie rod on steering knuckle the heat shield (Fig. 73) must be installed. If heat shield is not installed, tie rod seal boot can fail due to excessive heat from brake rotor.

(8) Install tie rod end into the steering knuckle. Start tie rod end to steering knuckle attaching nut onto stud of tie rod end. While holding the stud of the tie rod end stationary, tighten tie rod end to steering knuckle attaching nut (Fig. 64). Then using a crowfoot and 11/32 socket tighten the attaching nut to a torque of 61 N·m (45 ft. lbs.) (Fig. 73).

(9) Install rotor on hub and bearing.

(10) Install disc brake caliper assembly on steering knuckle. Caliper is installed by first sliding top of caliper under top abutment on steering knuckle. Then installing bottom of caliper against bottom abutment of steering knuckle (Fig. 74).

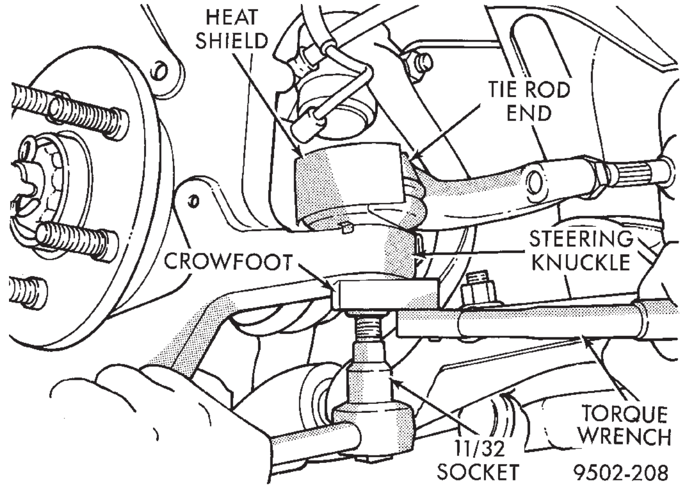


Fig. 73 Torquing Tie Rod End Attaching Nut

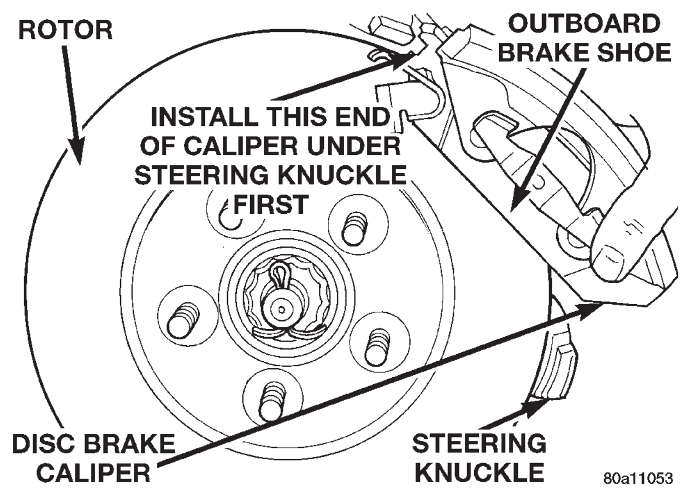


Fig. 74 Installing Brake Caliper

(11) Install disc brake caliper assembly to steering knuckle guide pin bolts (Fig. 60). Tighten caliper assembly guide pin bolts to a torque of 31 N·m (23 ft. lbs.).

(12) Clean all foreign matter from the threads of the outer C/V joint stub axle. Install the washer and hub nut (Fig. 75) onto the stub axle and tighten nut.

(13) With vehicle brakes applied to keep stub axle from turning, tighten hub nut to a torque of 203 N·m (150 ft. lbs.) of torque (Fig. 76).

(14) Install the spring washer, hub nut lock, and a **new** cotter pin. Wrap cotter pin prongs tightly around the hub nut lock (Fig. 77).

(15) Install front wheel and tire assembly. Install front wheel lug nuts and tighten in correct sequence. Then tighten to a torque of 129 N·m (95 ft.lbs.).

(16) Lower vehicle.

REMOVAL AND INSTALLATION (Continued)

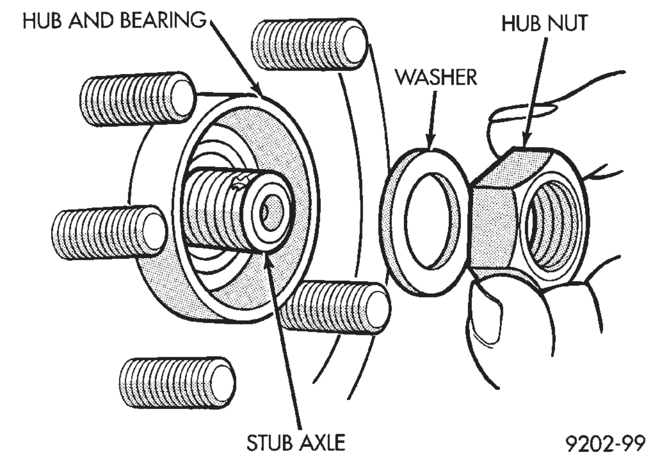


Fig. 75 Front Stub Axle Nut And Washer

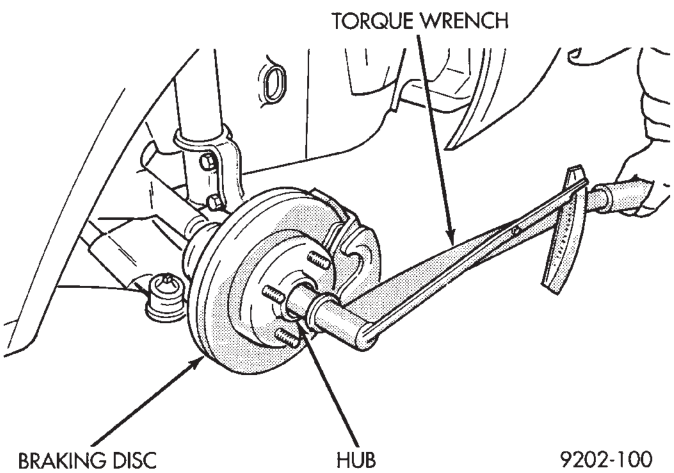


Fig. 76 Torquing Front Hub Nut

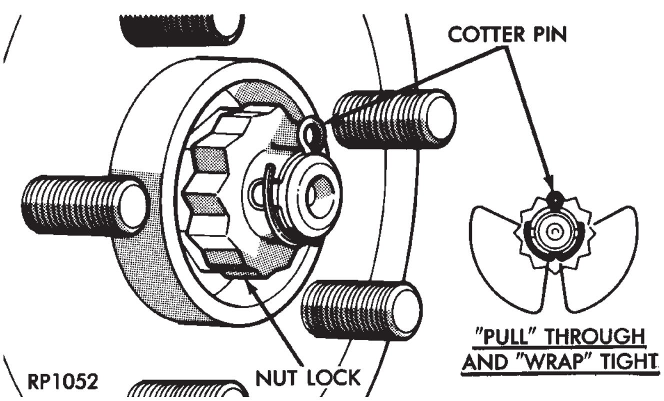


Fig. 77 Installing Spring Washer, Nut Lock And Cotter Pin

(17) Set front Toe on vehicle to required specification. Use procedure listed under Wheel Alignment, in the Front Suspension Service Procedures section of this service manual.

WHEEL MOUNTING STUDS

CAUTION: If a wheel mounting stud needs to be replaced in the hub and bearing assembly the studs CAN NOT be hammered out of the hub flange. If a stud is removed by hammering it out of the bearing flange, damage to the hub and bearing assembly will occur leading to premature bearing failure.

The following procedure and special tools shown **MUST** be used when replacing wheel attaching studs.

The hub and bearing assembly does not require removal from the steering knuckle to replace wheel attaching studs in the hub and bearing assembly.

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the front wheel and tire assembly from the vehicle.

(3) Remove front disc brake caliper to steering knuckle attaching bolts (Fig. 78).

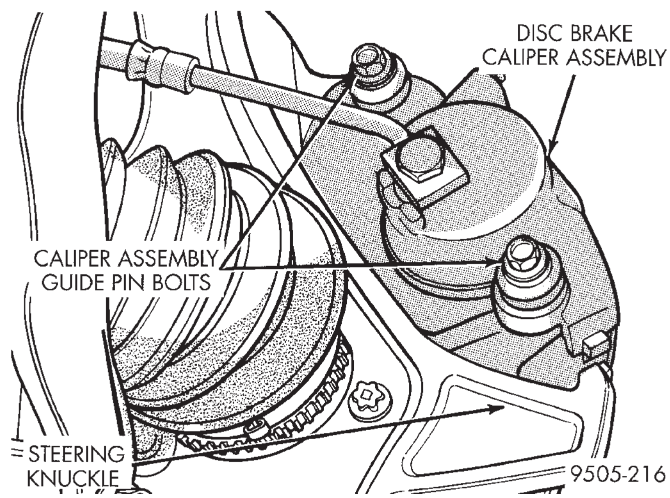


Fig. 78 Brake Caliper Attaching Bolts

(4) Remove disc brake caliper assembly from steering knuckle. Caliper is removed by first lifting bottom of caliper away from steering knuckle, and then removing top of caliper out from under steering knuckle (Fig. 79).

(5) Support brake caliper/adapter assembly using a wire hook and not by hydraulic hose (Fig. 80).

(6) Remove the rotor from the front hub (Fig. 81).

(7) Install a lug nut on the wheel stud to be removed from the hub/bearing assembly, (Fig. 82) so threads on stud are even with end of lug nut. Rotate hub so stud requiring removal is aligned with notch cast into front of steering knuckle. Install Remover,

REMOVAL AND INSTALLATION (Continued)

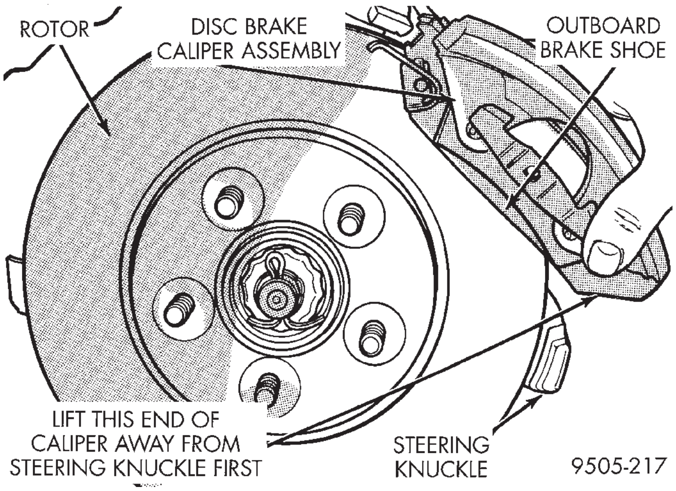


Fig. 79 Brake Caliper Removal

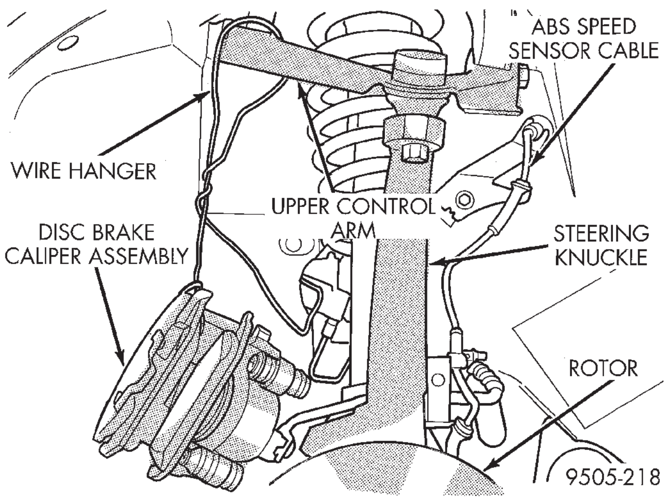


Fig. 80 Supporting Brake Caliper

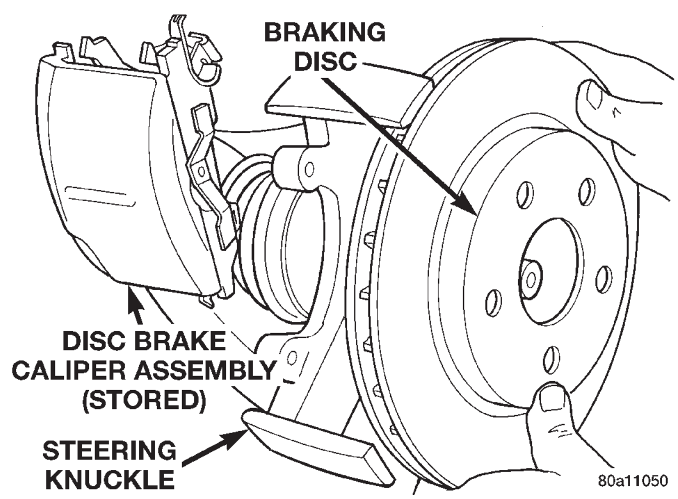


Fig. 81 Removing/Installing Front Braking Disc

Special Tool C-4150 on hub and bearing assembly flange and wheel stud (Fig. 82).

(8) Tighten down on special tool, this will push the wheel stud out of the hub and bearing flange.

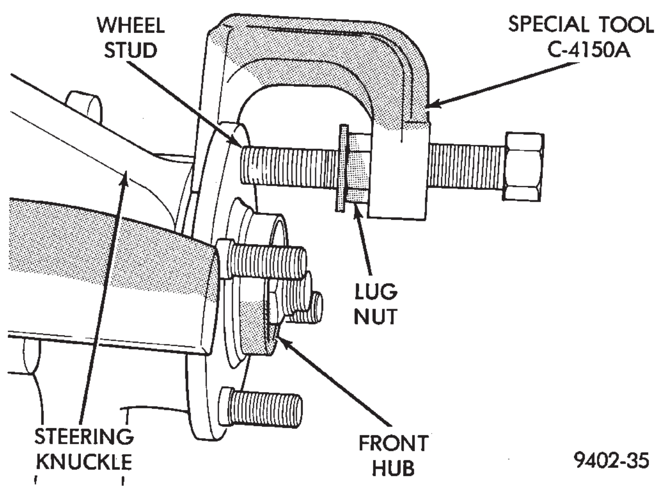


Fig. 82 Removing Wheel Stud From Hub And Bearing

INSTALL

(1) Install replacement wheel stud into flange of hub and bearing assembly. Install washers on wheel stud, then install a wheel lug nut on stud with flat side of lug nut against washers (Fig. 83).

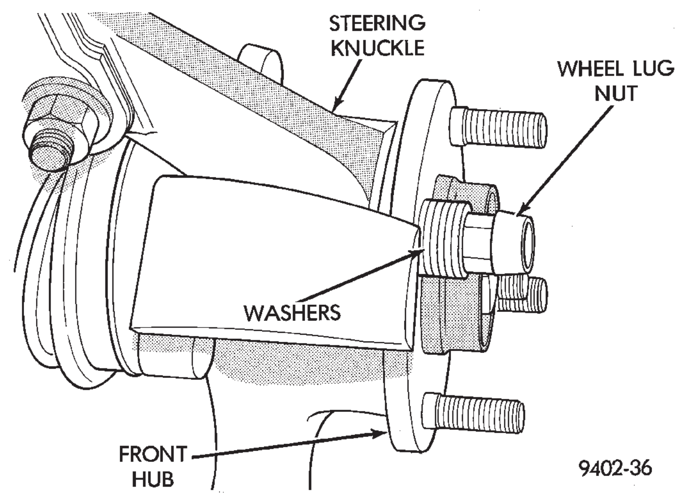


Fig. 83 Installing Wheel Stud Into Hub

(2) Tighten the wheel lug nut, pulling the wheel stud into the flange of the hub and bearing assembly. When the head of the stud is fully seated against the bearing flange, remove lug nut and washers from wheel stud.

(3) Install the rotor back on the front hub/bearing (Fig. 81).

(4) Install disc brake caliper assembly on steering knuckle. Caliper is installed by first sliding top of caliper under top abutment on steering knuckle. Then installing bottom of caliper against bottom abutment of steering knuckle (Fig. 84).

(5) Install disc brake caliper assembly attaching bolts (Fig. 78) and torque to 31 N·m (23 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

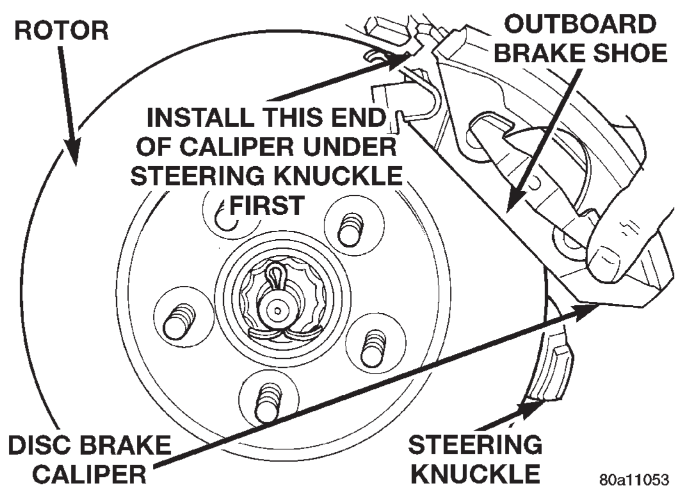


Fig. 84 Installing Brake Caliper

(6) Install front wheel and tire assembly. and torque to 135 N·m (100 ft. lbs.).

(7) Install wheel lug nuts. Tighten wheel mounting stud nuts in proper sequence until all nuts are torqued to half the specified torque. Then repeat the proper sequence, tightening the stud nuts to the specified torque of 135 N·m (100 ft. lbs.).

(8) Lower vehicle.

DISASSEMBLY AND ASSEMBLY

SHOCK ABSORBER

The front shock absorber can not be repaired and must be replaced as a unit if found to be defective in any way. The front shock absorber is available in 2 different suspension calibrations, be sure the shock absorber is replaced with a shock absorber of the same calibration. Refer to the sale codes for the vehicle be serviced to determine which type of suspension the vehicle is equipped with.

DISASSEMBLY

CAUTION: Do not clamp the shock absorber in a vise by the body of the shock absorber. The clevis bracket must be reinstalled on the shock absorber clamped in the vise using the clevis bracket.

(1) Install clevis bracket back on shock absorber and tighten pinch bolt. Then using the clevis bracket, clamp the shock absorber assembly in vise, with shock absorber in a vertical position (Fig. 85).

(2) Mark coil spring and shock absorber assembly right or left, according to which side of the vehicle the shock absorber was removed from, and which shock absorber the coil spring was removed from.

WARNING: DO NOT REMOVE THE SHOCK ABSORBER ROD NUT, BEFORE SHOCK

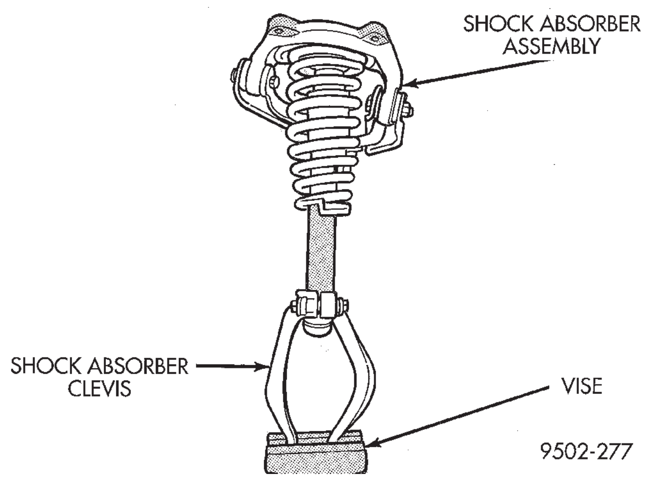


Fig. 85 Shock Absorber Correctly Mounted In Vise

ABSORBER COIL SPRING IS COMPRESSED, REMOVING SPRING TENSION FROM UPPER CONTROL ARM/SHOCK ABSORBER MOUNTING BRACKET.

WARNING: WHEN COMPRESSING COIL SPRING FOR REMOVAL FROM SHOCK ABSORBER, THE FIRST FULL TOP AND BOTTOM COIL OF THE COIL SPRING MUST BE CAPTURED BY THE JAWS OF THE COIL SPRING COMPRESSOR.

(3) Compress shock absorber coil spring, using Professional Services Equipment Spring Compressor, GP-2020-C3.5 fitted with the GP-C42 upper spring shoe and GP-A20 lower spring shoe (Fig. 86).

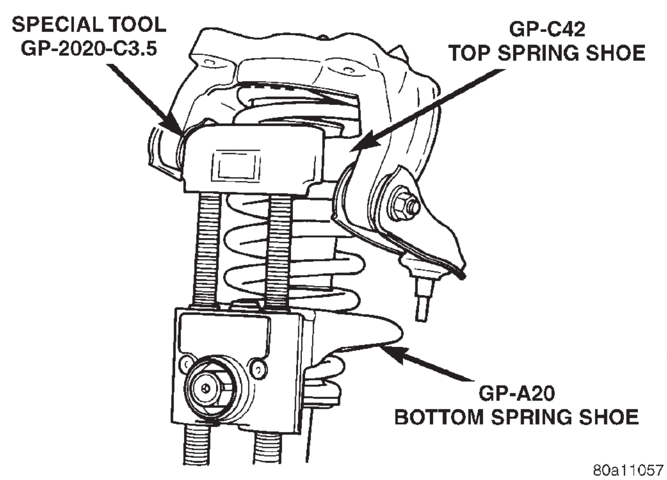


Fig. 86 Compressing Shock Absorber Spring

(4) Hold the rod of the shock absorber from rotating using Shock Absorber Socket, Snap-On A136 or an equivalent (Fig. 87). Then remove the shock absorber shaft nut.

(5) Remove the washer (Fig. 88) from the shock absorber rod.

DISASSEMBLY AND ASSEMBLY (Continued)

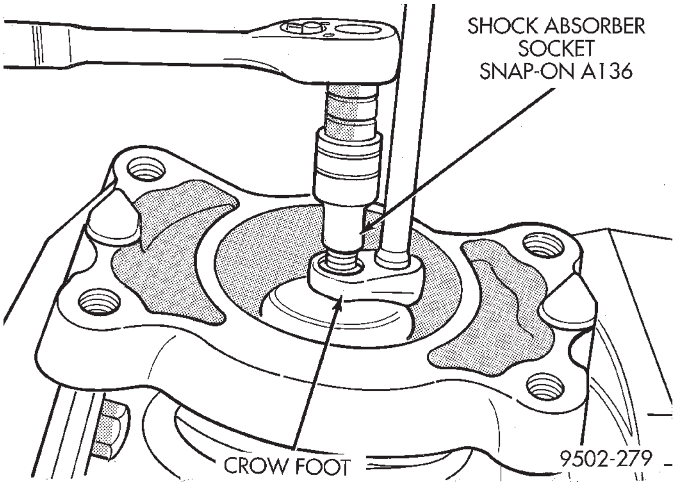


Fig. 87 Shock Absorber Shaft Nut Removal/ Installation

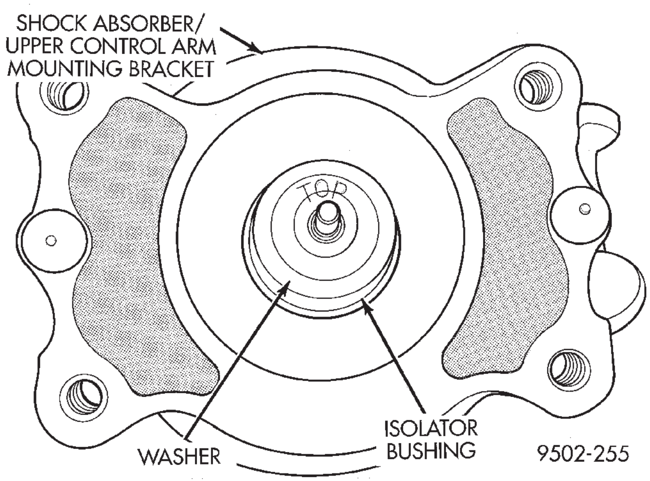


Fig. 88 Shock Absorber Rod Washer

(6) Remove the shock absorber/upper control arm mounting bracket from the shock absorber assembly (Fig. 89).

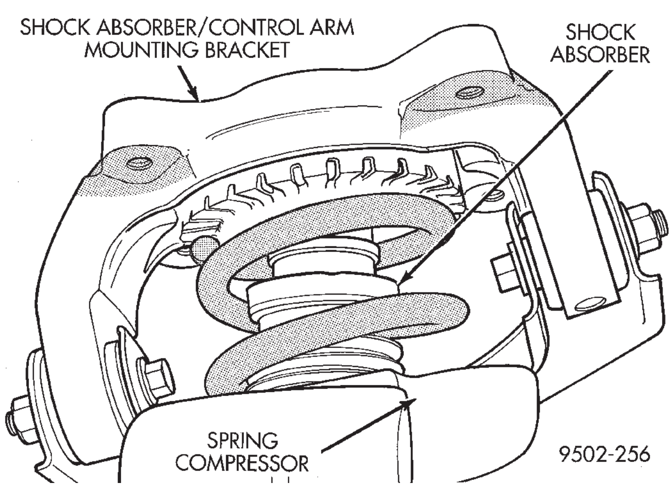


Fig. 89 Shock Absorber/Upper Control Arm Mounting Bracket

CAUTION: The top and bottom bushings for the shock absorber rod are unique to the position which they are installed on the rod. When removing the bushings from the rod, attention must be paid to their location so they will be installed correctly when shock absorber is assembled.

(7) Remove the shock absorber rod upper isolator bushing (Fig. 90) from the shock absorber/upper control arm mounting bracket.

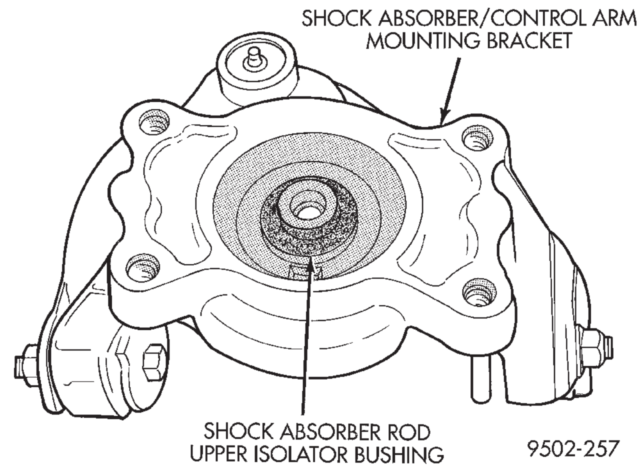


Fig. 90 Shock Absorber Rod Upper Isolator Bushing

(8) Remove the shock absorber rod lower isolator bushing and sleeve, (Fig. 91) from the shock absorber/upper control arm mounting bracket. Remove upper spring isolator from mounting bracket.

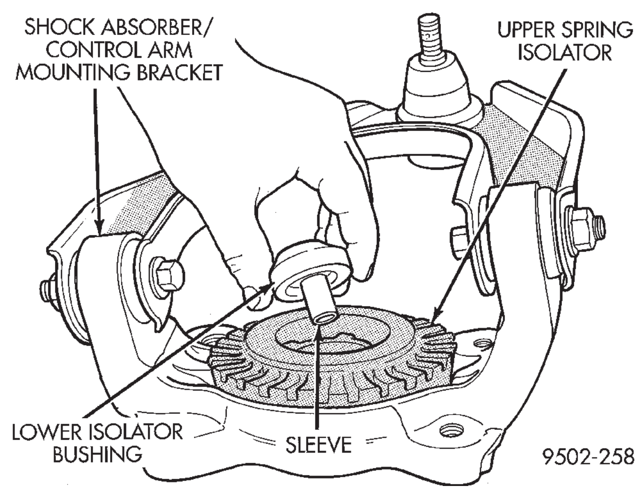


Fig. 91 Shock Absorber Rod Lower Isolator Bushing And Sleeve

(9) Remove the lower isolator bushing from the shock absorber rod sleeve.

(10) Remove washer from top of dust shield (Fig. 92).

(11) Remove the dust shield (Fig. 93) from the shock absorber assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

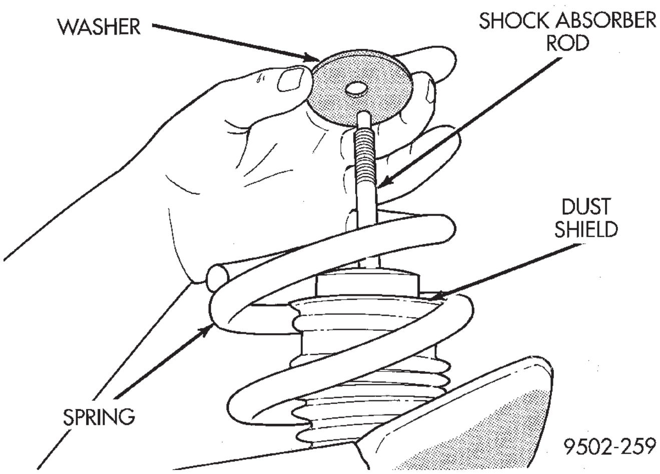


Fig. 92 Shock Absorber Rod Washer

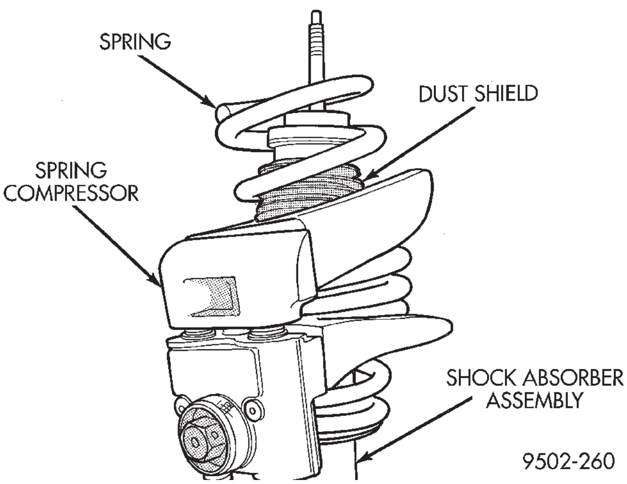


Fig. 93 Shock Absorber Dust Shield

(12) Remove the coil spring and spring compressor as an assembly (Fig. 94) from the shock absorber assembly. **Mark springs, left and right, for installation back on the correct side of the vehicle.**

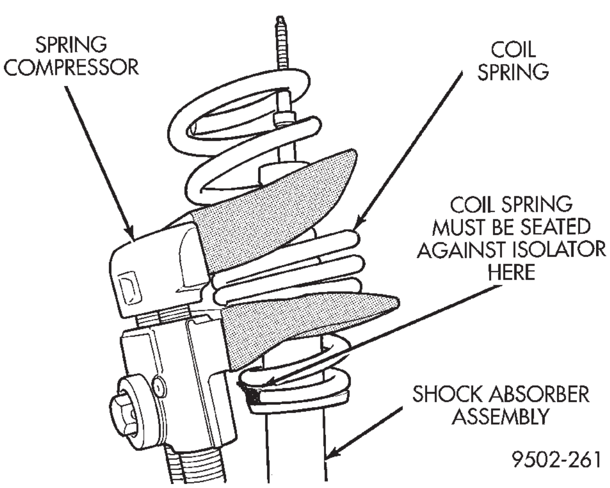


Fig. 94 Shock Absorber Coil Spring And Compressor

NOTE: The collar (Fig. 95) is a press fit on the rod of the shock absorber do not attempt to remove it from the shock absorber rod. The jounce bumper will have to be removed over the collar.

(13) Remove the jounce bumper (Fig. 95) from the rod of the shock absorber assembly.

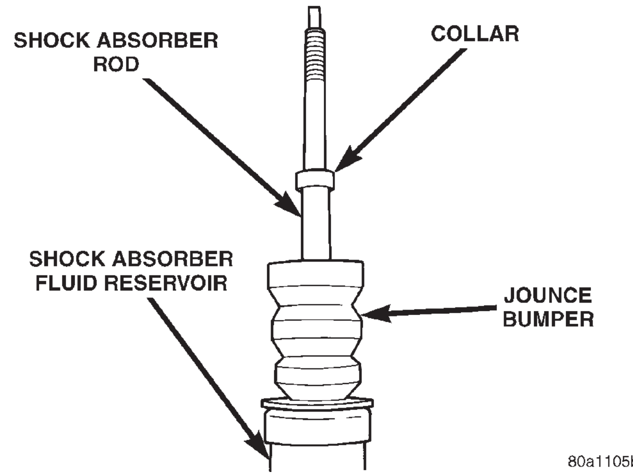


Fig. 95 Shock Absorber Jounce Bumper

(14) Remove the coil spring isolator (Fig. 96) from the lower spring seat on the shock absorber assembly.

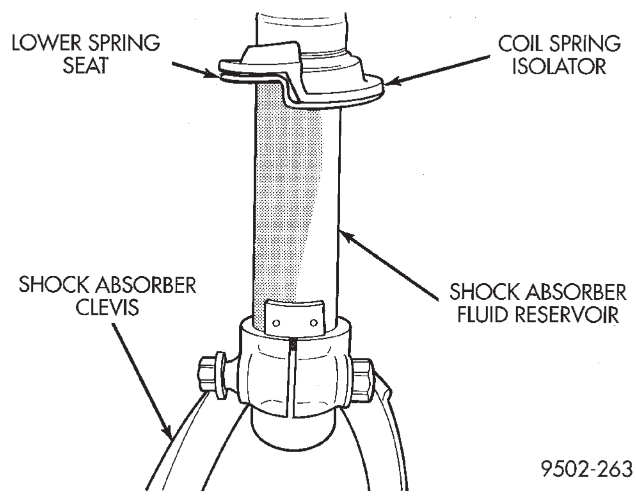


Fig. 96 Coil Spring Lower Isolator

(15) Inspect the shock absorber for any condition of rod binding over the full stroke of the shock rod.

(16) Inspect the shock mount and upper spring seat/isolator assembly for the following:

- Mount for cracks and distortion and locating pins for any sign of damage.
- Severe deterioration of the upper or lower coil spring isolators.
- Deterioration of the shock absorber rod to shock absorber mounting bracket bushings.
- Inspect dust shield for rips and/or deterioration.

DISASSEMBLY AND ASSEMBLY (Continued)

• Inspect jounce bumper for cracks and signs of deterioration.

(17) Replace any components of the shock absorber assembly found to be worn or defective during the inspection, before re-assembling the shock absorber.

ASSEMBLY

CAUTION: Do not clamp the shock absorber in a vise by the body of the shock absorber. The clevis bracket must be reinstalled on the shock absorber clamped in the vise using the clevis bracket.

(1) Install clevis bracket back on replacement shock absorber and snug the pinch bolt to keep shock from turning. Then using the clevis bracket, clamp the shock absorber assembly in a vise, with shock absorber in a vertical position (Fig. 85).

(2) Install the coil spring isolator (Fig. 96) on the lower spring seat of the shock absorber assembly. Isolator must be positioned on lower spring seat as shown in (Fig. 96).

(3) Install the jounce bumper on the shock absorber rod with the tapered end down (Fig. 97).

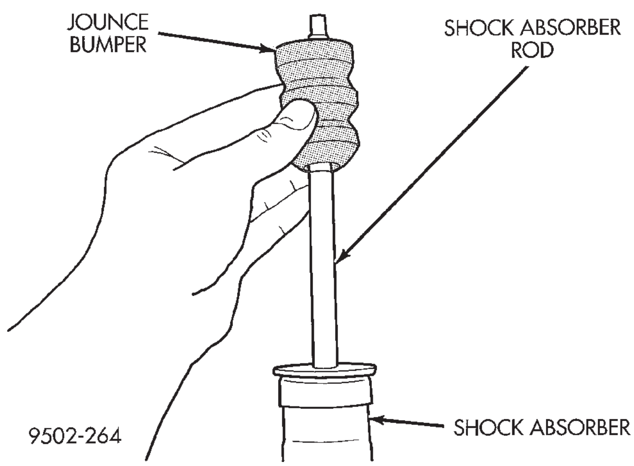


Fig. 97 Jounce Bumper Installation

WARNING: IF A REPLACEMENT COIL SPRING IS TO BE INSTALLED ON THE STRUT ASSEMBLY, THE FIRST FULL TOP AND BOTTOM COIL OF THE SPRING MUST BE CAPTURED BY THE JAWS OF THE COIL SPRING COMPRESSOR.

(4) Install the coil spring (with small diameter coils down) and spring compressor on the shock absorber assembly. Be sure bottom coil of spring is correctly positioned on the lower spring isolator (Fig. 94).

(5) Install dust shield (Fig. 93) on rod of shock absorber assembly.

(6) Install bottom washer (Fig. 92) on rod of shock absorber assembly and the top of the dust shield.

CAUTION: The top and bottom shock absorber rod bushings are unique to the position which they are installed on the rod. When installing the bushings on the rod, attention must be paid to their location so they are installed correctly (Fig. 98).

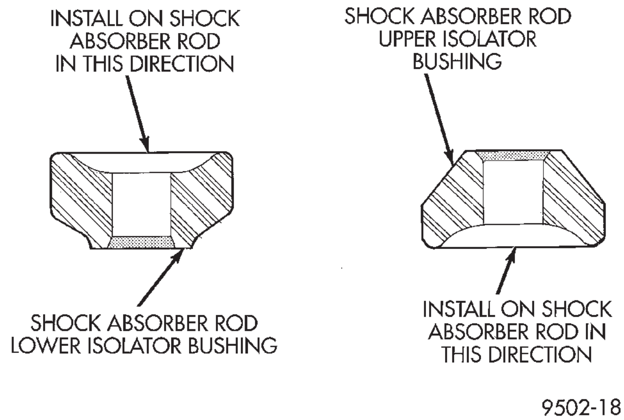


Fig. 98 Upper And Lower Shock Absorber Rod Bushing Identification

(7) Install the lower isolator bushing and sleeve (Fig. 91) in the shock absorber/upper control arm mounting bracket. Install coil spring upper isolator in mounting bracket (Fig. 91).

(8) Install the upper isolator bushing (Fig. 90) on the sleeve and the shock absorber/upper control arm mounting bracket.

(9) Install the shock absorber/upper control arm mounting bracket (Fig. 89) on the shock absorber assembly.

(10) Install the upper washer on rod of shock absorber and position it over top bushing with the word TOP facing up (Fig. 88).

WARNING: THE FOLLOWING 2 STEPS MUST BE COMPLETELY DONE BEFORE SPRING COMPRESSOR, GP-2020-C3.5 OR AN EQUIVALENT IS RELEASED FROM THE COIL SPRING.

(11) Install nut on rod of shock absorber assembly. Install Shock Absorber Socket, Snap-On A136 or an equivalent on end of shock rod to keep rod from turning (Fig. 87) Then tighten rod nut using a crowfoot (Fig. 87) to a torque of 55 N·m (40 ft. lbs.).

(12) Relieve all tension from spring compressor. After all spring tension has been remove from the spring compressor, remove it from the shock absorber assembly.

(13) Remove the clevis from the shock absorber. The clevis must be removed from the shock absorber for installation in vehicle.

(14) Install shock absorber assembly back in the vehicle. Refer to Shock Absorber Installation in this section of the service manual for the proper procedure

DISASSEMBLY AND ASSEMBLY (Continued)

LOWER CONTROL ARM FRONT ISOLATOR BUSHING

To perform removal and replacement of the lower control arm isolator bushings, the lower control arm must be removed from the vehicle.

DISASSEMBLY

(1) Remove lower control arm assembly from vehicle. See Lower Control Arm Removal in this section of the service manual for the required removal procedure.

(2) Install Bushing Remover, Special Tool 6602-5 and Bushing Receiver, Special Tool MB-990799 on Special Tool C-4212-F.

(3) Install lower control arm on Special Tools assembled for removal of the front isolator bushing. Be sure Special Tool MB-990799 is square on lower control arm and Special Tool 6602-5 is positioned correctly on isolator bushing (Fig. 99).

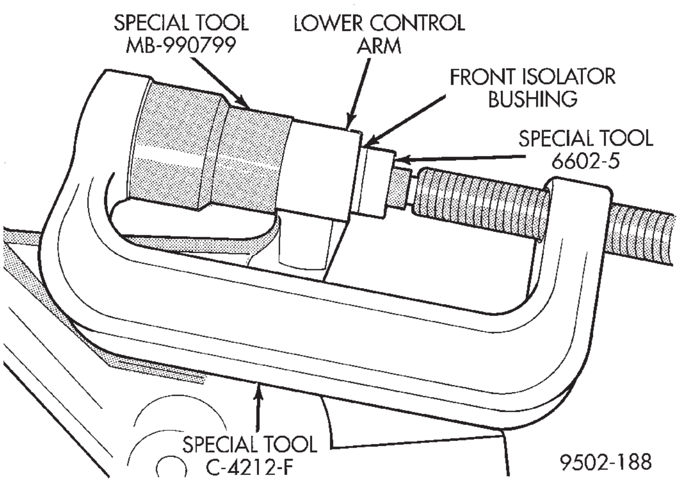


Fig. 99 Removing Front Bushing From Lower Control Arm

(4) Tighten screw on Remover/Installer Special Tool C-4212-F to press front bushing out of lower control arm.

ASSEMBLY

(1) Mount Bushing Installer, Special Tool 6876 on screw portion of Remover/Installer Special Tool C-4212-F (Fig. 100).

(2) Start front bushing into lower control arm **by hand, making sure it is square with its mounting hole in the lower control arm.** Bushing is to be installed in lower control arm from the machined surface side of lower control arm bushing hole.

(3) Install lower control arm on Special Tools assembled for installation of front isolator bushing into lower control arm (Fig. 100). Be sure Special Tool 6758 is square on lower control arm and Special Tool 6876 is positioned correctly on isolator bushing.

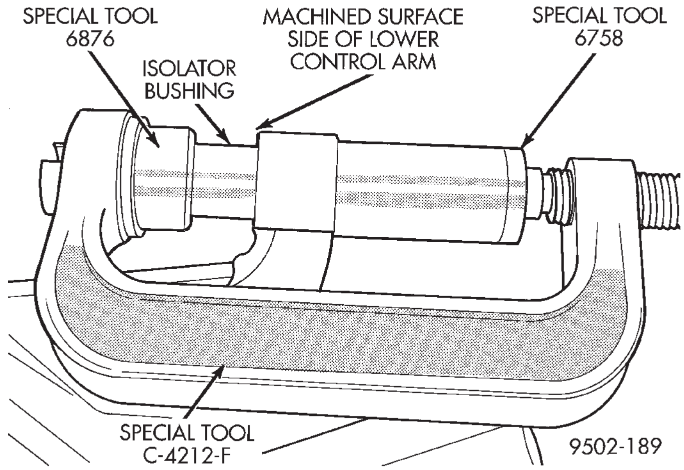


Fig. 100 Installing Front Bushing In Lower Control Arm

(4) Tighten screw on Remover/Installer Special Tool C-4212-F pressing front bushing into lower control arm. Continue pressing front bushing into lower control arm until bushing is sitting flush on the machined surface of the lower control arm. This will correctly position front bushing in lower control arm.

(5) Install lower control arm assembly back on vehicle. See Lower Control Arm Installation in this section of the service manual for the required installation procedure.

LOWER CONTROL ARM REAR ISOLATOR BUSHING

To perform removal and replacement of the lower control arm isolator bushings, the lower control arm must be removed from the vehicle.

DISASSEMBLY

(1) Remove lower control arm assembly from vehicle. See Lower Control Arm Removal in this section of the service manual for the required removal procedure.

(2) Install Bushing Remover, Special Tool 6756 and Bushing Receiver, Special Tool C-4366-2 on Special Tool C-4212-F (Fig. 101).

(3) Install Special Tools assembled for removal of the rear isolator bushing on the lower control arm. Be sure Special Tool C-4366-2 is square on lower control arm and Special Tool 6756 is positioned correctly on isolator bushing (Fig. 101).

(4) Tighten screw on Remover/Installer Special Tool C-4212-F to press rear bushing out of lower control arm.

ASSEMBLY

(1) Start rear bushing into lower control arm **by hand, making sure it is square with its mounting hole in the lower control arm.** Bushing is to be installed from the machined surface side of lower

DISASSEMBLY AND ASSEMBLY (Continued)

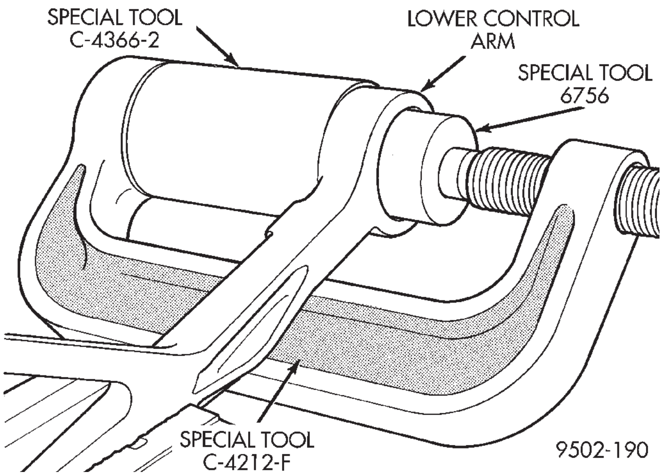


Fig. 101 Removing Lower Control Arm Rear Bushing

control arm bushing hole, with the void in rubber portion of bushing facing away from ball joint (Fig. 102).

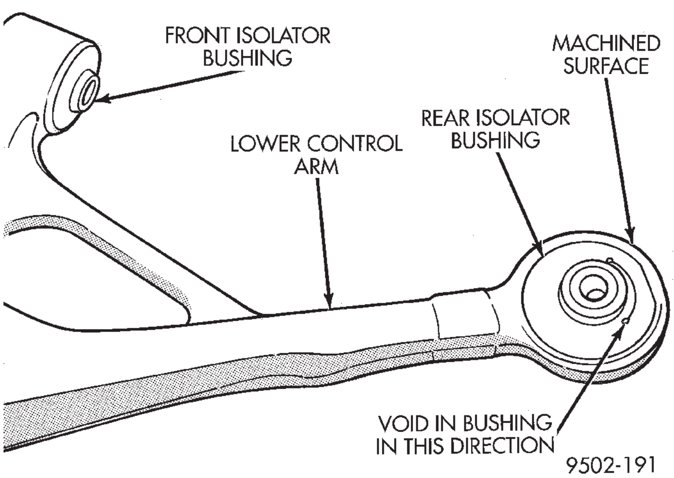


Fig. 102 Correctly Positioned Rear Isolator Bushing In Control Arm

(2) Mount Bushing Installer, Special Tool 6760 on screw portion of Remover/Installer Special Tool C-4212-F (Fig. 103).

(3) Install Special Tools assembled for installation of rear isolator bushing into lower control arm on the lower control arm. Be sure Special Tool 6756 is square on lower control arm and Special Tool 6760 is positioned correctly on isolator bushing (Fig. 103).

(4) Tighten screw on Remover/Installer Special Tool C-4212-F pressing rear bushing into lower control arm. Continue pressing rear bushing into lower control arm until bushing is sitting flush on the machined surface (Fig. 103) of the lower control arm. This will correctly position rear bushing in lower control arm.

(5) Install lower control arm assembly back on vehicle. See Lower Control Arm Installation in this

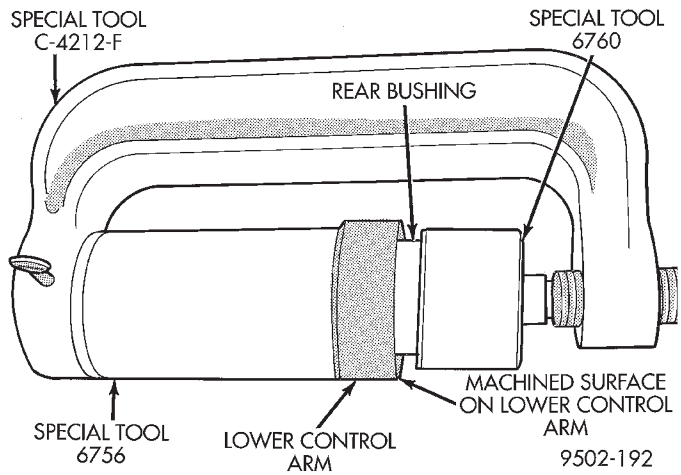


Fig. 103 Installing Rear Bushing In Lower Control Arm

section of the service manual for the required installation procedure.

CONTROL ARM CLEVIS BUSHING

To perform removal and replacement of the lower control arm clevis bushing, the lower control arm must be removed from the vehicle.

DISASSEMBLE

(1) Remove lower control arm assembly from vehicle. See Lower Control Arm Removal in this section of the service manual for the required removal procedure.

(2) Install Bushing Remover, Special Tool 6877 and Bushing Receiver, Special Tool 6876 on Special Tool C-4212-F.

(3) Install lower control arm on Special Tools assembled for removal of the clevis isolator bushing. Be sure Special Tool 6876 is square on lower control arm and Special Tool 6877 is positioned correctly on clevis bushing (Fig. 104).

(4) Tighten screw on Remover/Installer Special Tool C-4212-F to press clevis bushing out of lower control arm.

ASSEMBLE

(1) Start clevis bushing into lower control arm **by hand, making sure it is square with its mounting hole in the lower control arm.** Bushing is to be installed in lower control arm from the machined surface side of lower control arm bushing hole.

(2) Mount Bushing Installer, Special Tool 6877 on screw portion of Remover/Installer Special Tool C-4212-F as shown in (Fig. 105).

(3) Install the assembled special tools for installing the clevis bushing into the lower control arm, on the lower control arm and clevis bushing (Fig. 105). Be sure Special Tool 6876 is square on lower control arm

DISASSEMBLY AND ASSEMBLY (Continued)

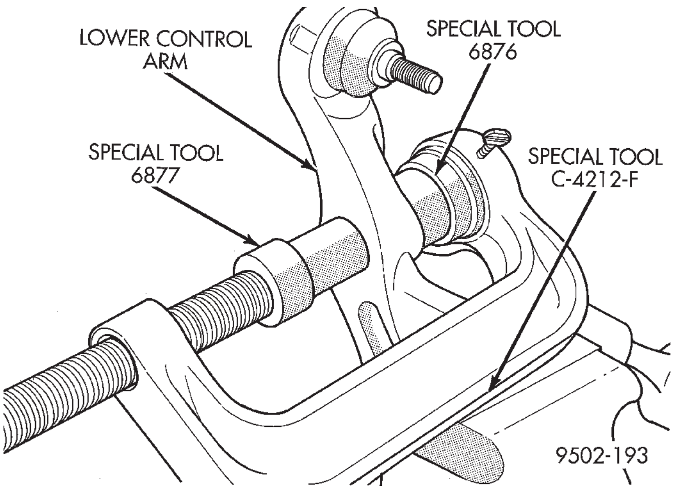


Fig. 104 Removing Clevis Bushing From Lower Control Arm

and Special Tool 6877 is positioned correctly on clevis bushing (Fig. 105).

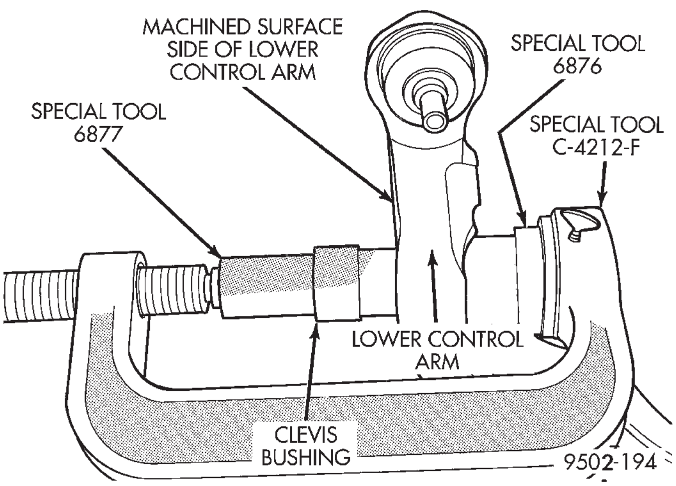


Fig. 105 Installing Clevis Bushing In Lower Control Arm

(4) Tighten screw on Remover/Installer Special Tool C-4212-F pressing clevis bushing into lower control arm. Continue pressing clevis bushing into lower control arm until bushing is sitting flush with the machined surface of the lower control arm. This will correctly position the clevis bushing in the lower control arm.

(5) Install lower control arm assembly back on vehicle. See Lower Control Arm Installation in this section of the service manual for the required installation procedure.

LOWER BALL JOINT SEAL BOOT

CAUTION: The replacement of the lower ball joint seal boot can only be done in the event that the seal boot is damaged while performing a service procedure on the vehicle.

CAUTION: Under no circumstances can a lower ball joint seal boot be replaced if it is determined that the vehicle had been driven with the seal boot damaged. If the vehicle has been driven with a damaged seal boot contamination of the ball joint has occurred. When contamination of the ball joint has occurred the lower control arm must be replaced. This is to ensure excessive wear of the ball joint does not occur from the contamination present in the ball joint.

CAUTION: Excessive wear in the ball joint can lead to a separation of the ball joint from the lower control arm.

CAUTION: The procedure below must be carefully followed when replacing the ball joint seal in the event it is damaged while servicing a vehicle.

CAUTION: The ball joint used in the lower control arm of this vehicle is a lubricated for life ball joint. This ball joint does not required any additional lubrication for the life of the vehicle. Do not alter the lower control arm or ball joint in an attempt to lubricate the lower control arm ball joint. If it is determined that the ball joint is lacking proper lubrication, the lower control arm will need to be replaced.

DISASSEMBLE

(1) Remove lower control arm assembly from vehicle. See Lower Control Arm Removal in this section of the service manual for the required removal procedure.

(2) Wrap a shop towel around the ball joint and seal boot. This is to prevent dirt and cleaning solvent to enter ball joint when cleaning area around ball joint.

(3) Using **ONLY** a solvent such as Mopar Foamy Engine Degreaser or an equivalent, thoroughly clean lower control arm in area around ball joint and seal. Then using a shop towel saturated with the engine degreaser, carefully wipe off the ball joint seal boot.

(4) Using 2 screwdrivers (Fig. 106) remove the ball joint seal retaining ring from the bottom of the ball joint seal.

(5) Remove ball joint seal from ball joint.

ASSEMBLE

CAUTION: When replacing ball joint seal, do not use any other type of grease to lubricate ball joint other than the lubricant provided in the Mopar Ball Joint Seal service kit.

DISASSEMBLY AND ASSEMBLY (Continued)

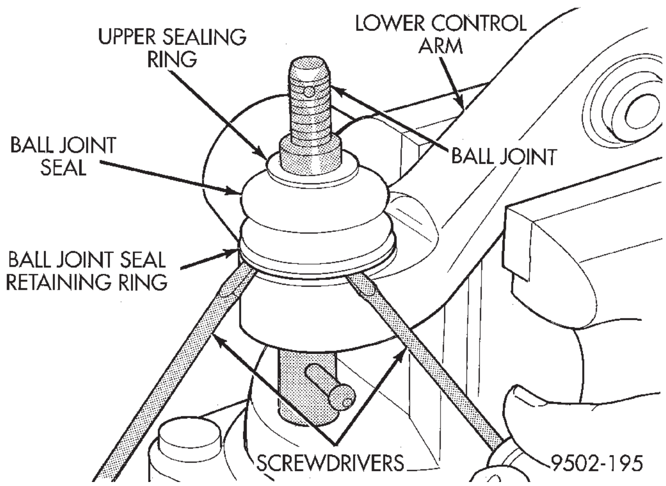


Fig. 106 Removing Ball Joint Seal Retaining Ring

(1) Apply grease from the ball joint seal kit, to the specified areas of the ball joint stud and seal (Fig. 107). Be sure no grease is present on the seal boot installation section of the seal boot or lower control arm (Fig. 107).

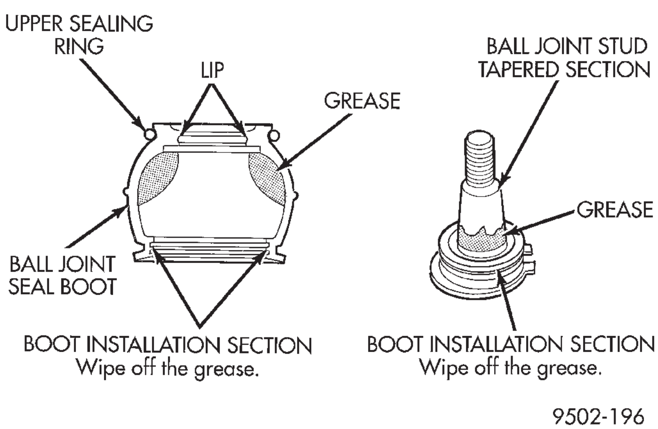


Fig. 107 Grease Correctly Applied To Ball Joint Stud And Seal Boot

(2) Slide ball joint seal boot with upper seal ring installed, (Fig. 107) down tapered section of ball joint stud (Fig. 107). Seal boot is to be installed on stud of ball joint until seal boot is sitting on seal groove in lower control arm.

(3) Carefully position ball joint seal boot in seal retaining groove on lower control arm. After installing seal boot in retaining groove, carefully bleed air out of sealing boot without getting grease pushed into seal boot retaining groove in lower control arm.

(4) Place Retaining Ring Installer, Special Tool, 6875-1 over ball joint seal boot (Fig. 108). Using adjusting knob, adjust tool so bottom edge of tool is even with top of retaining ring groove in seal boot (Fig. 108).

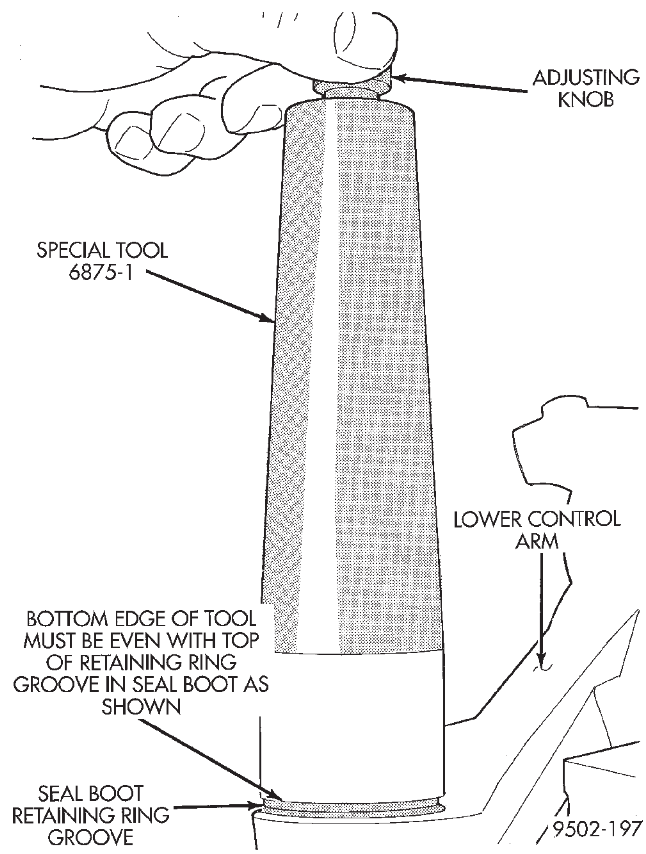


Fig. 108 Correctly Installed Ball Joint Seal Retaining Ring Tool

(5) Place seal boot retaining ring on Installer, Special Tool, 6875- 1 (Fig. 109). Then place expandable collar from Installer, Special Tool, 6875 over tapered cone of the special tool (Fig. 109).

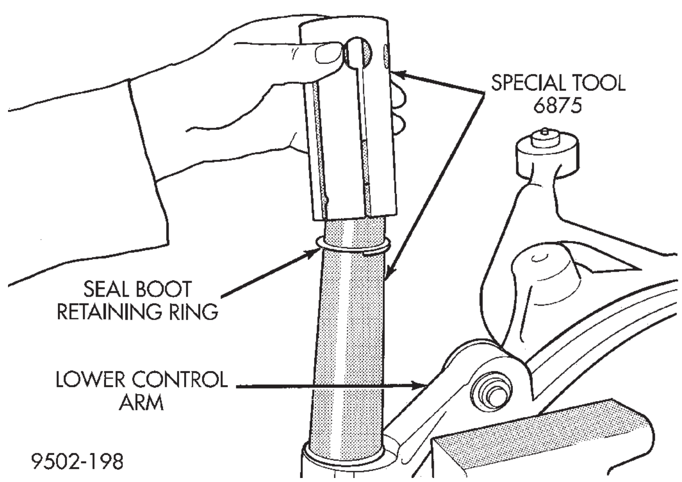


Fig. 109 Retaining Ring And Expandable Collar Installed On Tool

(6) Using the expandable collar of Installer, Special Tool, 6875 (Fig. 110) push the seal boot retaining ring down the cone of Installer, Special Tool, 6875.

DISASSEMBLY AND ASSEMBLY (Continued)

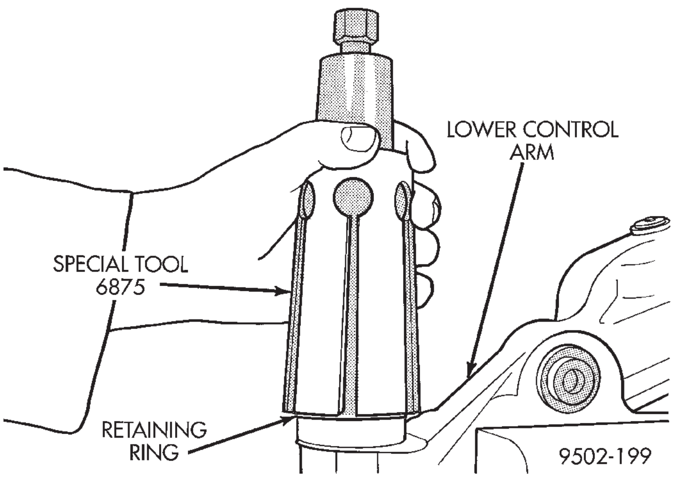


Fig. 110 Installing Seal Boot Retaining Ring

(7) Continue pushing retaining ring down Installer, Special Tool, 6875, until it is installed in the retaining ring groove of the seal boot (Fig. 111)

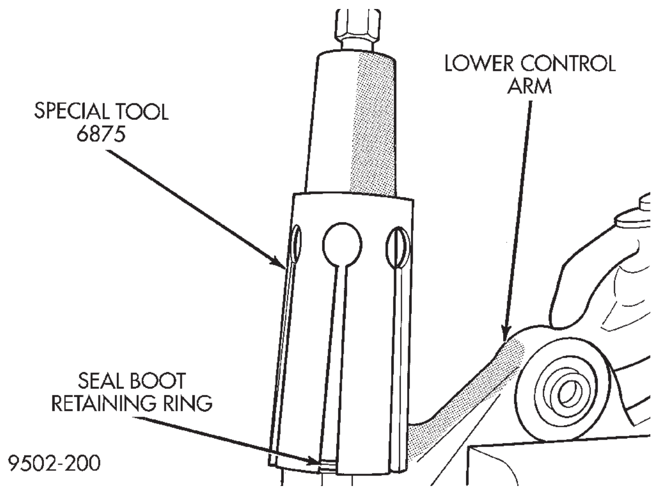


Fig. 111 Retaining Ring Installed In Ball Joint Seal Boot

(8) Remove Installer, Special Tool, 6875 from the ball joint seal boot. **When removing tool from seal boot be careful not to damage the seal boot with the tool.**

(9) Check retaining ring installation on seal boot to ensure it is fully seated in seal boot groove and the ends are not twisted (Fig. 112). Also, make sure upper sealing ring is on seal boot and correctly installed (Fig. 112). Check seal boot for damage before installing back on car.

(10) Install lower control arm assembly back on vehicle. See Lower Control Arm Installation in this section of the service manual for the required installation procedure.

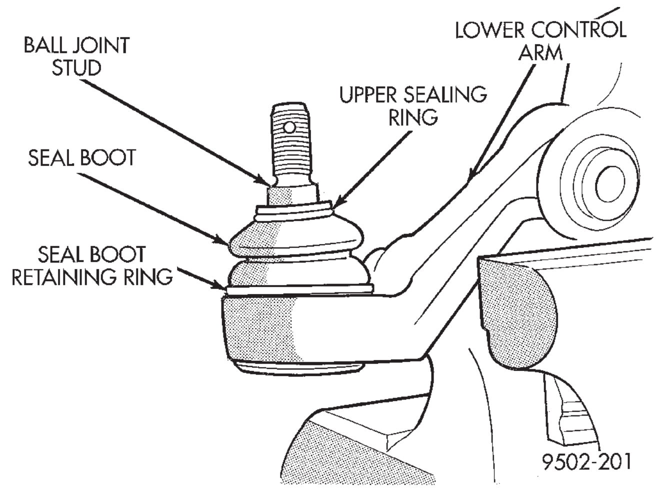


Fig. 112 Properly Installed Ball Joint Seal Boot

UPPER BALL JOINT SEAL BOOT

(1) Using a screw driver or other suitable tool, pry seal boot off of the ball joint assembly (Fig. 113).

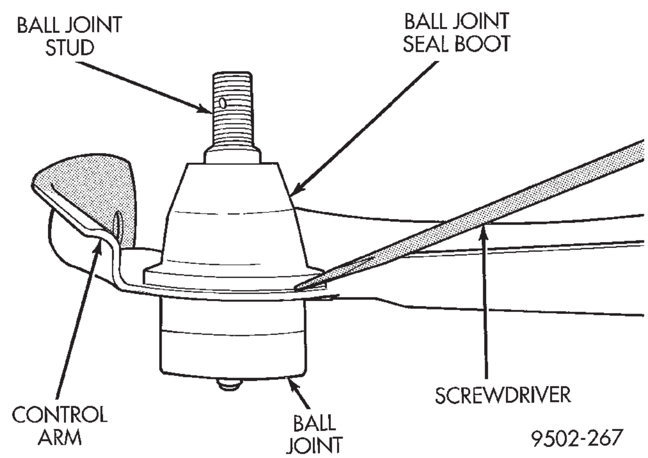


Fig. 113 Seal Boot Removal From Ball Joint

(2) Install a **NEW** ball joint assembly sealing boot on ball joint assembly. Install sealing boot as far as possible on ball joint assembly.

CAUTION: Do not use an arbor press to install the sealing boot on the upper control arm ball joint assembly. Damage to the sealing boot can occur do to excessive pressure applied to sealing boot when being installed.

(3) Position Receiving Cup, Special Tool 6758 over sealing boot so it is aligned properly with bottom edge of sealing boot (Fig. 114). Apply pressure **BY HAND** to special tool 6758, until sealing boot is pressed squarely against surface of upper control arm.

(4) Properly lubricate the upper ball joint assembly using only Mopar Multi-Mileage Lube or an equivalent.

DISASSEMBLY AND ASSEMBLY (Continued)

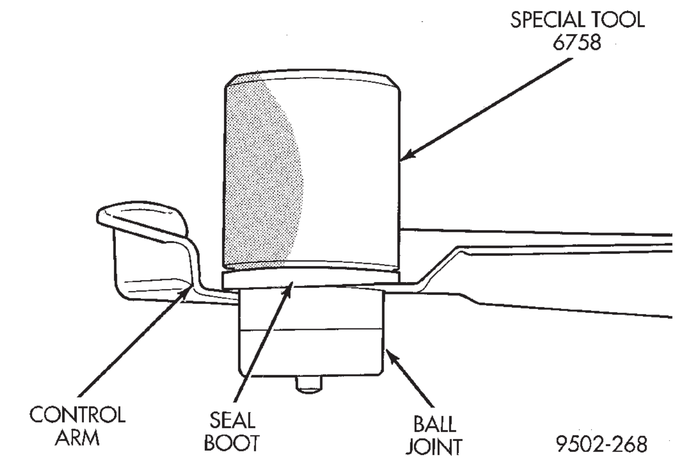


Fig. 114 Seal Boot Installation On Ball Joint

STABILIZER BAR BUSHING

(1) Bend back the 4 crimp locations on the stabilizer bar bushing retainer (Fig. 115).

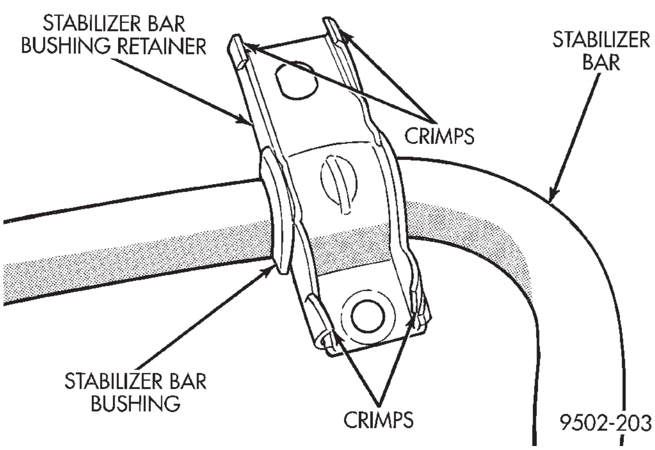


Fig. 115 Stabilizer Bar Bushing Retainer

(2) Separate the stabilizer bar bushing retainer.

(3) Stabilizer bar bushings are removed by opening slit and peeling bushing off stabilizer bar.

(4) Install new stabilizer bar bushings on the stabilizer bar. **Bushings must be installed on sway bar with slit in bushing facing front of vehicle when sway bar is installed.**

(5) Install bushing retainers back on stabilizer bar bushings.

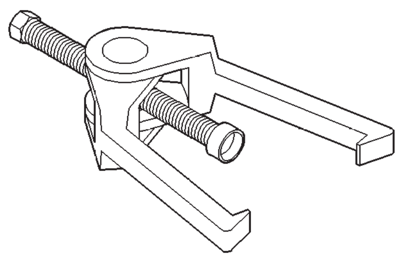
SPECIFICATIONS

FRONT SUSPENSION FASTENER TORQUE SPECIFICATIONS

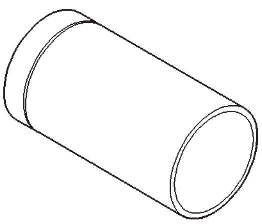
DESCRIPTION	TORQUE
Shock Absorber	
To Clevis Pinch Bolt	88 N·m (65 ft. lbs.)
To Shock Tower Bolts	101 N·m (75 ft. lbs.)
Clevis To Control Arm Bolt	88 N·m (65 ft. lbs.)
Rod To Upper Mount Nut	54 N·m (40 ft. lbs.)
Steering Gear Assembly	
Tie Rod To Steering Knuckle Nut	61 N·m (45 ft. lbs.)
To Suspension Crossmember Bolts	68 N·m (50 ft. lbs.)
Tie Rod End Adjustment Jam Nuts	61 N·m (45 ft. lbs.)
Lower Control Arm	
Ball Joint Stud Castle Nut	74 N·m (55 ft. lbs.)
To Crossmember Pivot Bolt (Front)	183 N·m (135 ft. lbs.)
To Crossmember Rear Bolt	95 N·m (70 ft. lbs.)
Ball Joint Heat Shield Attaching Bolts	13 N·m (10 ft. lbs.)
Upper Control Arm	
Ball Joint Stud Castle Nut	54 N·m (40 ft. lbs.)
To Shock Bracket	88 N·m (65 ft. lbs.)
Front Suspension Crossmember	
To Body Mounting Bolts	108 N·m (80 ft. lbs.)
Hub And Bearing Assembly	
To Stub Axle Retaining Nut	244 N·m (180 ft. lbs.)
Wheel Stud Lug Nut	109-150 N.m (80-110 ft. lbs.)
Stabilizer Bar	
Bushing Clamp Bolts	61 N·m (45 ft. lbs.)
Attaching Link Nuts (All)	101 N·m (75 ft. lbs.)
Steering Knuckle	
Disc Brake Caliper Bolts	22 N·m (16 ft. lbs.)

SPECIAL TOOLS

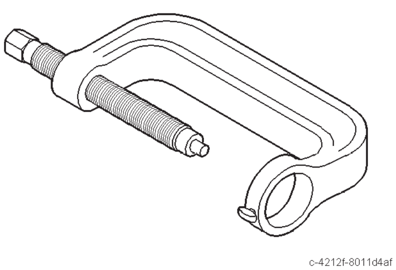
FRONT SUSPENSION



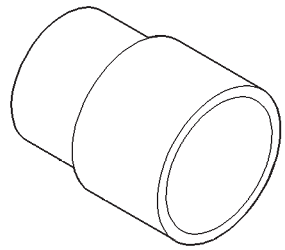
Puller C-3894-A



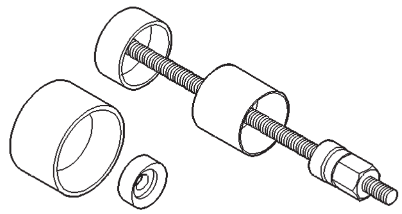
Installer, Ball Joint 6758



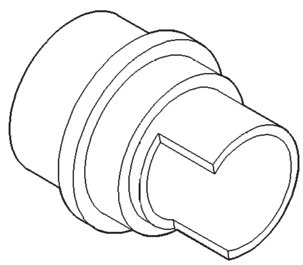
Press, Ball Joint Remover Installer C-4212F



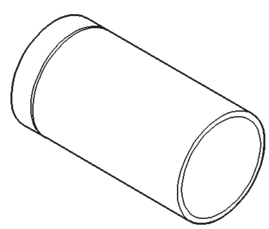
Remover, Ball Joint MB-990799



Remover/Installer Control Arm Bushing 6602–5 (In Tool Kit 6602)

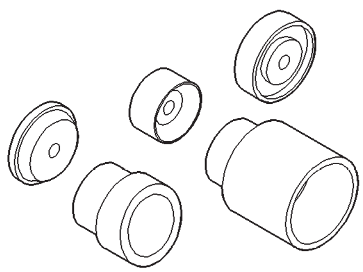


Installer/Receiver, Control Arm Bushing 6876

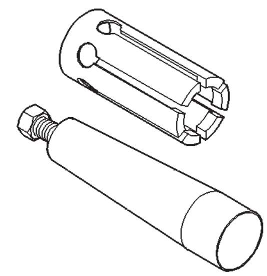


Installer, Ball Joint 6758

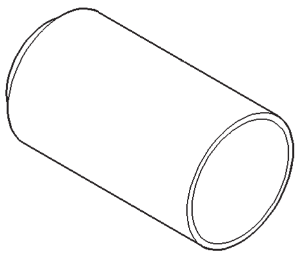
SPECIAL TOOLS (Continued)



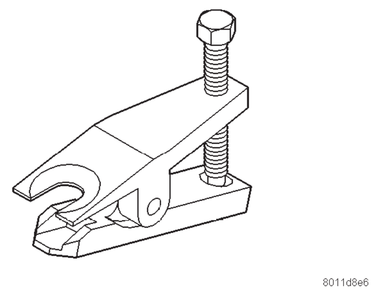
Remover / Installer C-4366-2 (In Tool Kit C-4366)



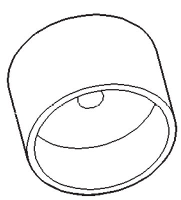
Installer, Ball Joint Seal Boot Retainer 6875



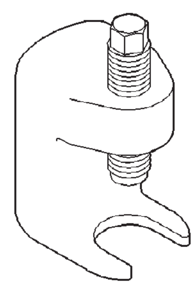
Receiver, Ball Joint 6756



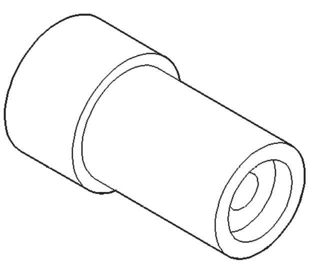
Remover, Tie Rod End MB-991113 or MB-990635



Installer, Bushing 6760



Remover, Lower Ball Joint C-4150A



Remover/Installer Control Arm Clevis Bushing 6877

REAR SUSPENSION

INDEX

GENERAL INFORMATION

GENERAL INFORMATION

CAUTION: Only frame contact or wheel lift hoisting equipment can be used on vehicles having a fully independent rear suspension. Vehicles with independent rear suspension can not be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used damage to rear suspension components will occur.

NOTE: If a rear suspension component becomes bent, damaged or fails, no attempt should be made to straighten or repair it. Always replace with a new component.

DESCRIPTION AND OPERATION

REAR SUSPENSION SYSTEM DESCRIPTION

The rear suspension used on this vehicle is a fully independent short and long arm style suspension (Fig. 1).

SHOCK ABSORBER ASSEMBLY

The rear shock absorber assemblies support the weight of the vehicle using coil springs positioned around the shock absorbers. The coil springs are contained between the upper mount of the shock absorber and a lower spring seat on the body of the shock absorber.

The top of each shock absorber assembly is bolted to the top of the inner fender through a rubber isolated mount. Access for the removal of the nuts attaching the shock absorber mount to the inner fender is from the interior of the vehicle, through the convertible top storage well.

The bottom of the shock absorber assembly attaches to the rear knuckle using a thru-bolt. The shock absorber is isolated from the rear knuckle by a rubber bushing which is pressed into the knuckle.

UPPER CONTROL ARM

An upper control arm is attached to the top of each rear knuckle, connecting the knuckle to the rear suspension crossmember. The attachment of the upper control arm to the knuckle is achieved through a ball joint in the upper control arm. The ball joint is pressed into the upper control arm and is attached to the knuckle using a tapered stud and a castle nut.

DESCRIPTION AND OPERATION (Continued)

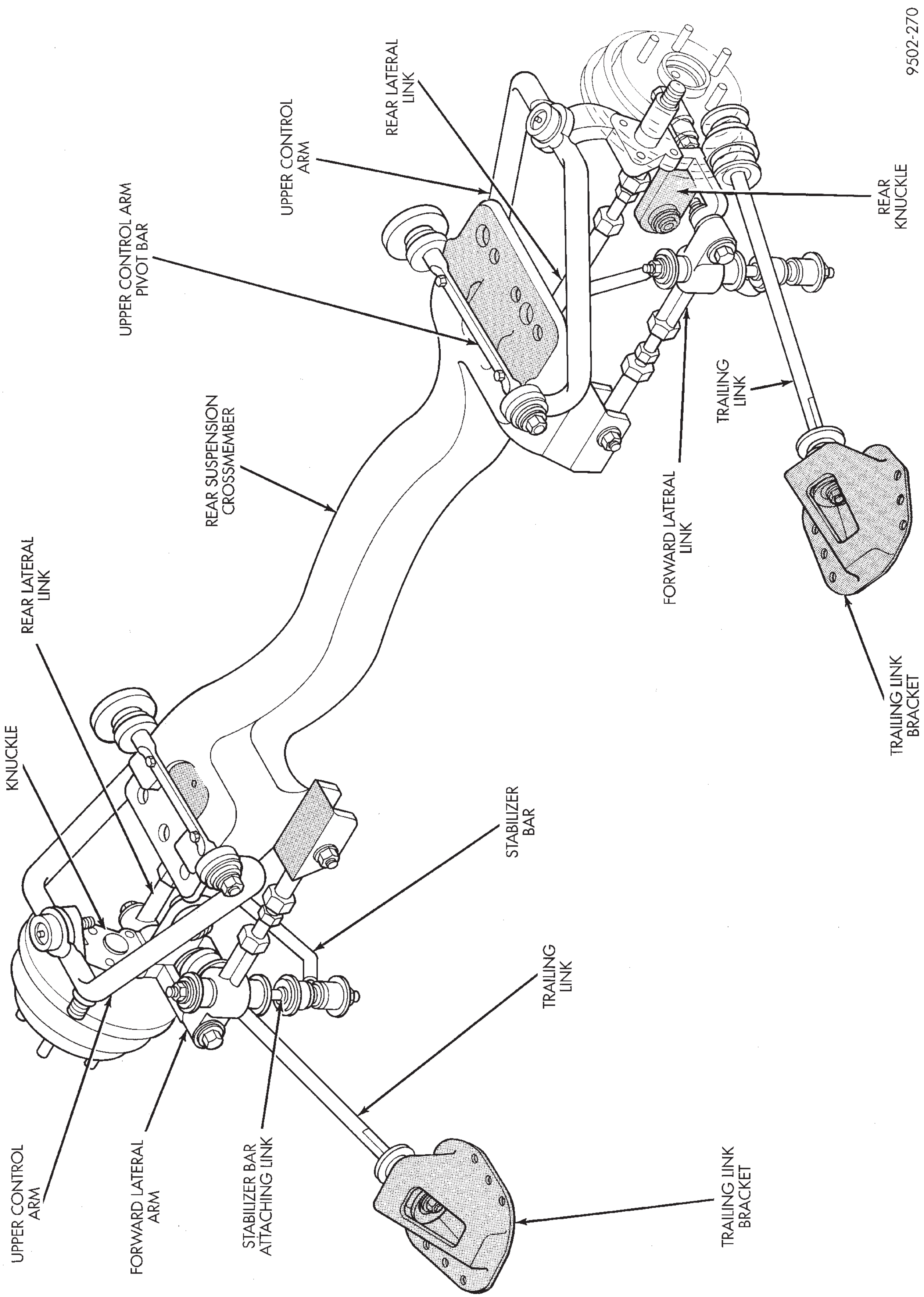


Fig. 1 Fully Independent Rear Suspension

DESCRIPTION AND OPERATION (Continued)

The upper control arm is bolted to the rear suspension crossmember using a pivot bar which is rubber isolated from the upper control arm.

The upper control arms have rubber bushings at the rear suspension crossmember end and a ball joint at the rear knuckle.

COIL SPRING

Rear coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. During service procedures when both rear coil springs are removed, mark the coil springs to ensure installation of the springs in their original position. **If coil springs require replacement, be sure the springs needing replacement, are replaced with springs meeting the correct load rating for the vehicle and its specific options.**

STABILIZER BAR

The stabilizer bar interconnects the forward lateral links of the vehicle's rear suspension and is attached to the rear suspension crossmember of the vehicle.

Jounce and rebound movements affecting one rear wheel of the vehicle are partially transmitted to the opposite wheel of the vehicle to stabilize body roll.

Attachment of the stabilizer bar to the rear crossmember of the vehicle is through 2 rubber-isolator bushings and bushing retainers. The stabilizer bar to lateral arm attachment is done utilizing a rubber isolated stabilizer bar attaching link. All parts of the stabilizer bar are serviceable, and the stabilizer bar to rear suspension isolator bushings are split for easy removal and installation. The split in the stabilizer bar to crossmember bushing must be positioned toward the front of the vehicle, when the stabilizer bar is installed on the vehicle.

KNUCKLE

A cast iron rear knuckle is attached to the upper control arm by the upper ball joint and to the rear shock absorber assembly. The lateral movement of the rear knuckle is controlled using two lateral arms attached to the bottom of the knuckle and by the upper control arm attached to the top of the knuckle. The outboard ends of the two lateral arms are mounted forward and rearward of the knuckle centerline, and the inboard ends are mounted to the rear suspension crossmember. Fore and aft movement of the knuckle is controlled by the trailing link.

LATERAL ARMS AND TRAILING LINKS

The lateral movement of the rear knuckle is controlled by the lateral arms going from the front and rear of the knuckle to the rear suspension crossmember. Fore and aft movement of the knuckle is controlled by a trailing link.

The lateral arms and trailing link have rubber isolator bushings at each end to isolate suspension noise from the body of the vehicle.

The trailing link bolts to the bottom of the knuckle and to a bracket attached to the floor pan of the vehicle.

Lateral links, trailing arms and knuckles are normally replaced only when the part has been damaged or when the vehicle has been involved in an accident. If a suspension part has been damaged, be sure to check the underbody dimensions of the car. If the underbody dimensions are not correct, the frame of the vehicle must be straightened, before replacement suspension components are installed.

REAR SUSPENSION CROSSMEMBER

This vehicle is equipped with a bolt in type rear suspension crossmember. The crossmember on this vehicle is the same for all of the optional suspensions that are available on the vehicle.

DIAGNOSIS AND TESTING

SHOCK ABSORBER

(1) Inspect for damaged or broken coil springs.

(2) Inspect for torn or damaged shock absorber dust boots.

(3) Inspect for damaged lower spring isolator.

(4) Lift dust boot and inspect shock absorber for evidence of fluid running from the upper end of fluid reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off lower end of unit). A slight amount of seepage between the shock absorber rod and shock absorber rod seal is not unusual and does not affect performance of the shock absorber. Also inspect jounce bumpers for signs of damage or deterioration.

SUSPENSION KNUCKLE

The rear suspension knuckle is not a repairable component of the rear suspension. If it is determined that the knuckle is broken or bent when servicing the vehicle, no attempt is to be made to repair or to straighten the knuckle. **THE KNUCKLE MUST BE REPLACED IF FOUND TO BE DAMAGED IN ANY WAY.**

UPPER CONTROL ARM

The rear suspension upper control arm is not a repairable component of the rear suspension. When diagnosing a condition with the rear suspension of the vehicle it is determined that the upper control arm is broken or bent, the upper control arm **MUST** be replaced. No attempt is to be made to repair or to

DIAGNOSIS AND TESTING (Continued)

straighten the upper control arm. **THE UPPER CONTROL ARM MUST BE REPLACED IF FOUND TO BE DAMAGED OR DEFECTIVE IN ANY WAY.**

UPPER BALL JOINT WEAR INSPECTION

With the weight of the vehicle resting on the road wheels, grasp grease fitting and with no mechanical assistance or added force attempt to move the grease fitting.

If the ball joint is worn the grease fitting will move easily. If movement is noted, replacement of the ball joint is required.

LATERAL LINKS

Inspect the lateral link isolator bushings and sleeves for signs of damage or deterioration. If the lateral link isolator bushings or sleeves are damaged or are deteriorated, replacement of the lateral link assembly will be required. The isolator bushings are not serviceable as a separate component of the lateral link assembly.

Inspect the lateral links for signs of contact with the ground or road debris which has bent or caused other damage to the lateral link. If the lateral link is bent or damaged, the lateral link will require replacement. **Do not attempt to repair or straighten a lateral link.**

CAUTION: Do not apply heat to the lateral link adjusting screws or to the jam nuts, when loosening or adjusting the lateral links.

TRAILING LINKS

Inspect the trailing link bushings and retainers for signs of deterioration or damage. If the trailing link bushings are deteriorated or the retainers are damaged, replacement of the trailing link bushings and or the retainers will be required. The bushings and retainers are serviceable as separate components of the trailing link.

Inspect the trailing link for signs of contact with the ground or road debris which has bent or caused other damage to the trailing link. If the trailing link is bent or damaged the trailing link will require replacement. **Do not ever attempt to repair or straighten a trailing link.**

STABILIZER BAR AND BUSHINGS

Inspect the stabilizer bar for damage or bending. Inspect for broken or distorted stabilizer bar bushings, bushing retainers, and worn or damaged stabilizer bar to lateral arm attaching links. If stabilizer bar to crossmember bushing replacement is required, bushings can be removed from sway bar by opening slit and peeling bushing off sway bar.

STABILIZER BAR ATTACHING LINKS

Inspect the bushings and sleeves in the stabilizer bar attaching links for damage or deterioration. Inspect the stabilizer bar attaching link to ensure it is not bent or broken. If any of these conditions are present when inspecting the attaching links, replacement of the attaching link is required.

SERVICE PROCEDURES

REAR WHEEL ALIGNMENT

Refer to Front And Rear Wheel Toe And Camber Setting Procedures in the Wheel Alignment Check And Adjustment section in this group of the service manual for the required rear wheel Toe and Camber setting procedure.

REMOVAL AND INSTALLATION

SHOCK ABSORBER

NOTE: Access for the nuts attaching the rear shock absorber upper mount is from the passenger compartment of the vehicle. The top of the vehicle must be up to access the attaching nuts.

REMOVE

(1) Remove the plastic access panel (Fig. 2) in the convertible top storage well. Refer to Group 23 Body in this service manual, for the required procedure to remove the access panel.

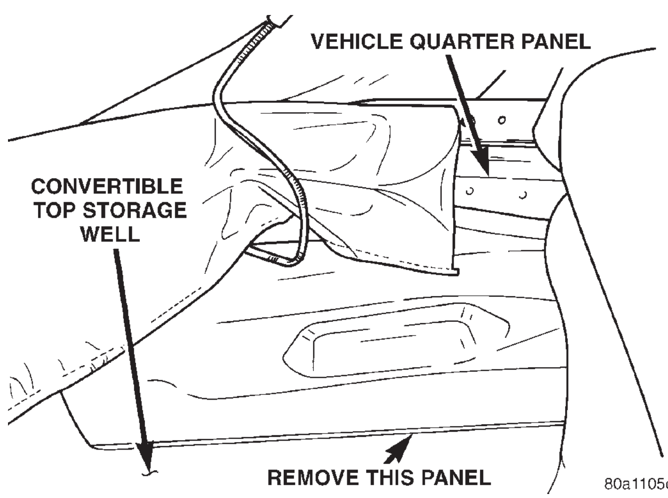


Fig. 2 Access Panel

(2) Roll back the sound matting in the corner of the convertible top storage well to access the shock absorber attaching nuts.

(3) Remove the 2 nuts (Fig. 3) attaching the shock absorber upper mount/spring seat to the body of the vehicle.

REMOVAL AND INSTALLATION (Continued)

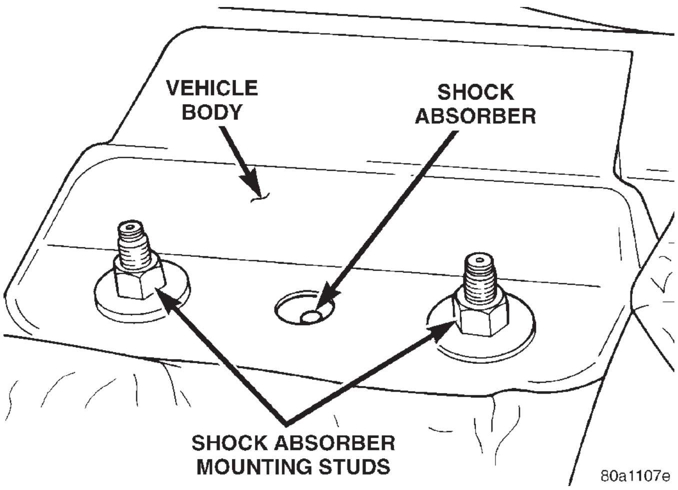


Fig. 3 Shock Absorber Upper Mount Attaching Nuts

(4) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(5) Remove the rear wheel and tire from the vehicle.

(6) Remove bolt attaching shock absorber to rear knuckle (Fig. 4).

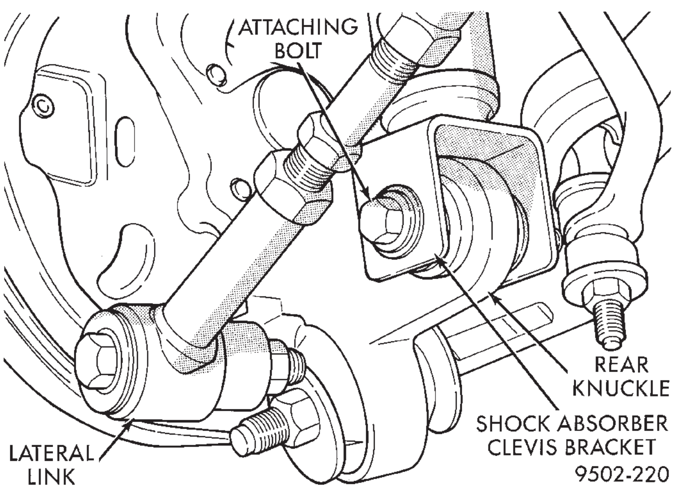


Fig. 4 Shock Absorber Attachment To Knuckle

(7) Remove the shock absorber from the vehicle using the following procedure: First remove the shock absorber from the rear knuckle. Then remove the shock absorber upper mount from the body of the vehicle. For the required clearance to remove upper mount from body it may be necessary to push down on the rear suspension.

(8) Move shock absorber downward and tilt top of shock outward. Then remove shock absorber from vehicle through top of wheel opening (Fig. 5).

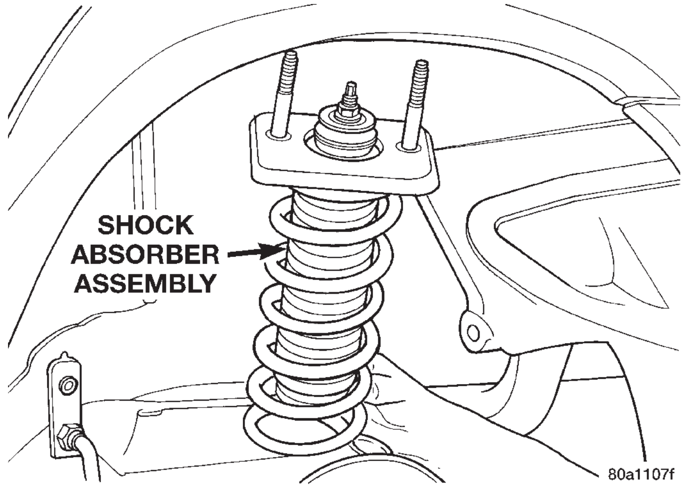


Fig. 5 Shock Absorber Removal

INSTALL

(1) Install shock absorber back in vehicle using the reverse sequence of removal (Fig. 5).

(2) Install upper shock absorber mount into the mounting holes in rear shock tower.

(3) Push down on rear knuckle to obtain clearance and then install shock absorber clevis bracket on rear knuckle.

(4) Align clevis bracket on shock absorber with bushing in knuckle. Install and tighten bolt (Fig. 4) to a torque of 95 N·m (70 ft. lbs.).

(5) Lower vehicle far enough to gain access to the passenger compartment of the vehicle.

(6) Install and tighten the 2 shock absorber mounting bracket attaching nuts (Fig. 3) to a torque of 54 N·m (40 ft. lbs.).

(7) Install the sound matting over the top of the shock absorber attaching nuts.

(8) Install the plastic access panel (Fig. 2) in the convertible top storage well. Refer to Group 23 Body in this service manual, for the required procedure to install the access panel.

(9) Install wheel and tire assembly on vehicle. Then torque all wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat tightening sequence to full specified torque of 135 N·m (100 ft. lbs.).

(10) Lower the vehicle to the ground.

COIL SPRINGS

Coil springs are rated separately for each side of vehicle depending on optional equipment and type of service. During service procedures where both springs are removed, mark springs (Chalk, Tape, etc.) to ensure installation in original position. **If the coils springs require replacement, be sure that the springs being replaced, are replaced with springs meeting the correct load and spring rate for the vehicle.**

REMOVAL AND INSTALLATION (Continued)

NOTE: During service procedures requiring removal or installation of a coil spring, be sure that the first full top and bottom coil of the spring is captured by the jaws of spring compressor.

Replacement of the coil spring requires removal of the shock absorber from the vehicle, and the disassembly of the shock absorber. Refer to shock absorber in the removal and installation section in this group of the service manual for the required removal and replacement procedure. Then refer to shock absorber in the disassembly and assembly section in this group of the service manual for the required procedure to disassemble and assemble the shock absorber.

STABILIZER BAR

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove both rear wheel and tire assemblies from the vehicle.

(3) From each side of the vehicle, remove the nut (Fig. 6) attaching the stabilizer bar attaching link/isolator bushings to the stabilizer bar.

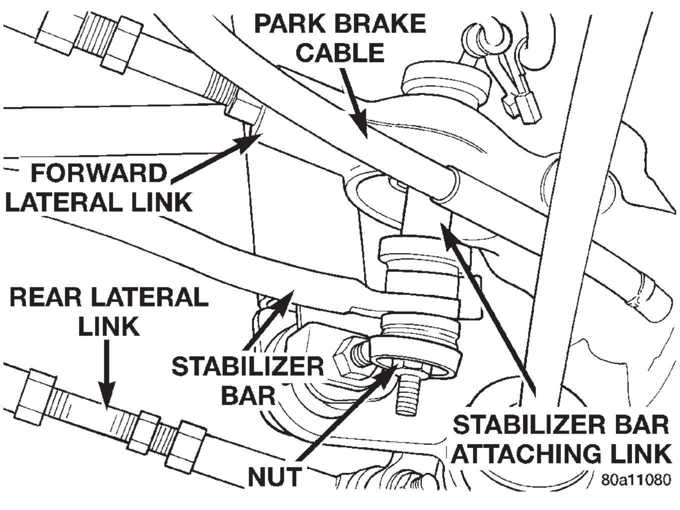


Fig. 6 Stabilizer Bar Attaching Link

(4) Remove the 4 bolts attaching the stabilizer bar bushing clamps to the rear suspension crossmember (Fig. 7).

(5) Remove the rear stabilizer bar to crossmember bushing clamps and bushings from the stabilizer bar.

(6) Remove stabilizer bar from vehicle. Stabilizer bar will come out of vehicle between the exhaust pipe and the rear suspension crossmember.

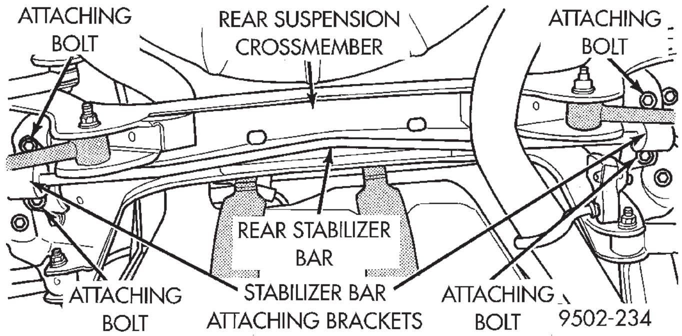


Fig. 7 Stabilizer Bar Attachment To Rear Suspension

STABILIZER BAR BUSHING INSPECTION

Inspect for broken or distorted retainers and bushings. If bushing replacement is required, bushings can be removed by opening slit in bushing and removing bushing from around stabilizer bar.

INSTALL

(1) Install stabilizer bar back in vehicle with the bushings removed using the reverse sequence of removal.

(2) When stabilizer bar is installed in vehicle, it must be installed with the bend in the end of the stabilizer bar positioned up in vehicle when viewed from the side (Fig. 8).

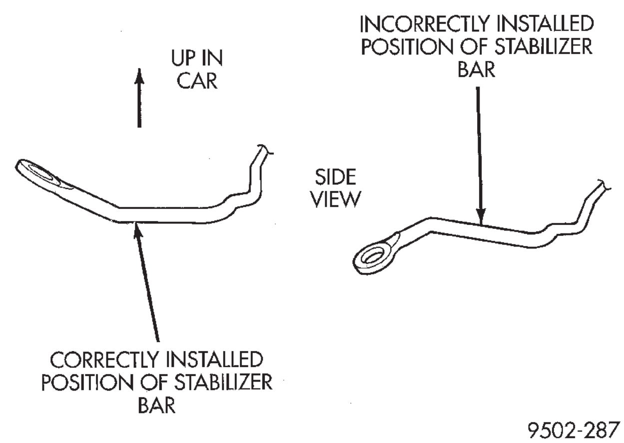


Fig. 8 Installed Position Of Stabilizer Bar In Vehicle

(3) Install the stabilizer bar onto the stabilizer bar to forward lateral link attaching links (Fig. 6). Install the stabilizer bar to attaching link bushings on attaching links. Tighten the bushing retaining nuts to a torque of 35 N·m (26 ft. lbs.).

(4) Loosely install the stabilizer bar bushing clamps on the rear suspension crossmember

(5) Position the stabilizer bar so it is centered in the vehicle and does not contact other suspension components or vehicle body.

REMOVAL AND INSTALLATION (Continued)

(6) Tighten the bolts attaching the stabilizer bar bushing clamps to the rear crossmember to a torque of 27 N·m (19 ft. lbs.) (Fig. 7).

(7) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(8) Lower vehicle to the ground.

KNUCKLE

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the rear wheel and tire assembly from the vehicle.

(3) Remove rear brake drum from rear hub and bearing assembly.

(4) If vehicle is equipped with antilock brakes remove the rear wheel speed sensor from the brake support plate and brake flex hose routing bracket (Fig. 9).

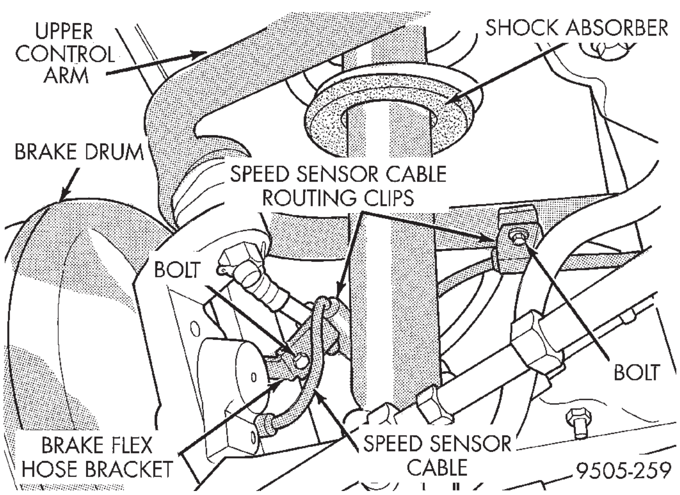


Fig. 9 Rear Wheel Speed Cable Routing And Attachment

(5) Remove the park brake cable from the park brake actuating lever (Fig. 10). Then remove the park brake cable from the rear brake support plate (Fig. 11). Park brake cable is removed from brake support plate using this procedure. Position a 1/2 inch box end wrench over cable retainer (Fig. 11) to collapse retaining tabs. Then pull bear brake cable from brake support plate.

(6) Remove the rear hub/bearing assembly retaining nut (Fig. 12). Then remove the washer and the hub/bearing assembly from the knuckle.

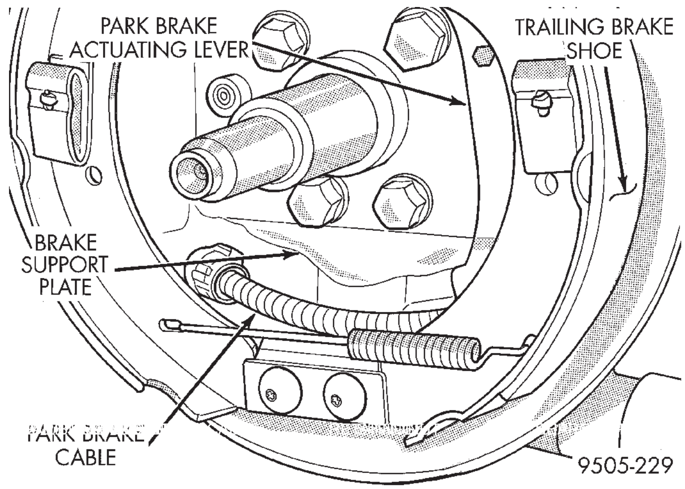


Fig. 10 Park Brake Cable Attachment To Actuating Lever

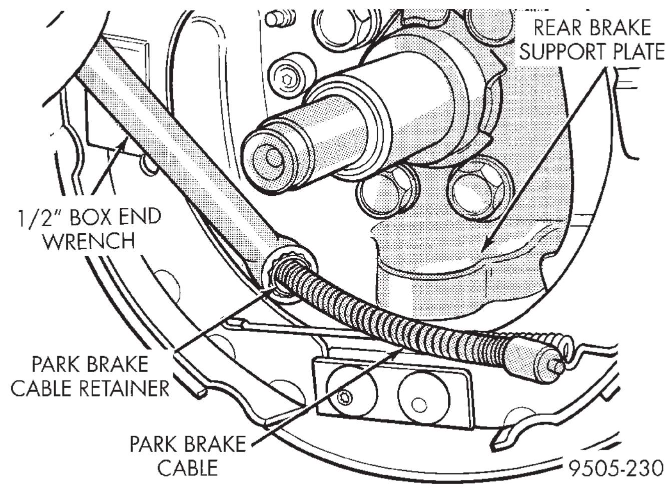


Fig. 11 Park Brake Cable Removal From Brake Support Plate

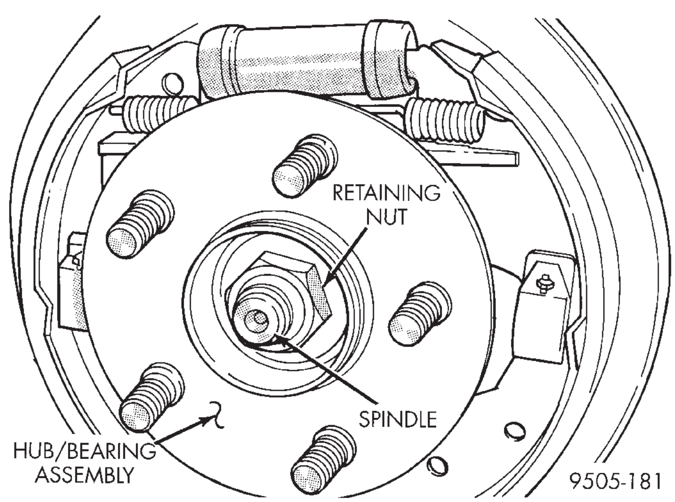


Fig. 12 Hub/Bearing Assembly Retaining Nut

(7) Remove the 4 bolts (Fig. 13) attaching rear brake support plate to knuckle. Then remove brake

REMOVAL AND INSTALLATION (Continued)

support plate, brake shoes and wheel cylinder as an assembly from rear knuckle. **It is not necessary to remove brake flex hose from wheel cylinder when removing support plate.** Brake support plate when removed, must be supported using mechanics wire as shown in (Fig. 14).

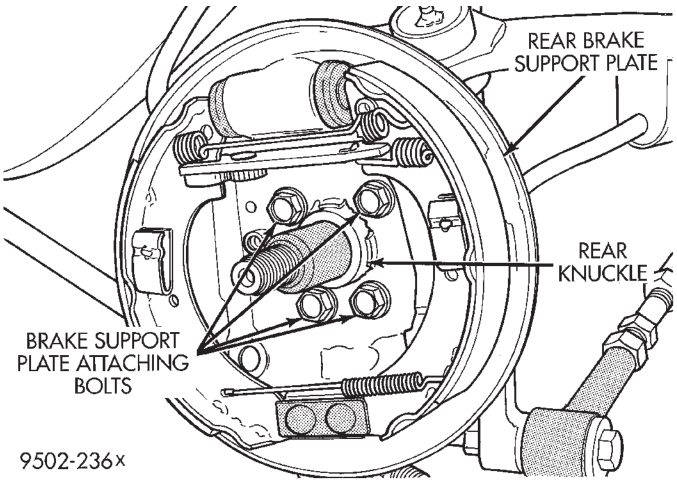


Fig. 13 Rear Brake Support Plate Mounting Bolts

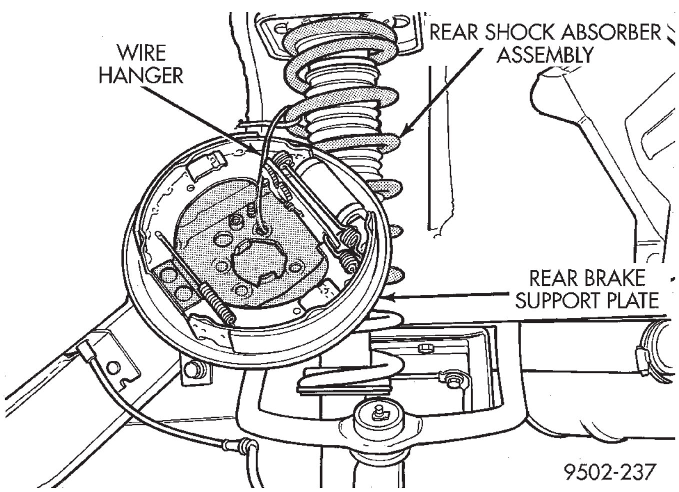


Fig. 14 Correctly Stored Rear Brake Support Plate

(8) Remove the nuts and bolts attaching the forward and rear lateral links (Fig. 15) to the rear knuckle.

(9) Remove cotter pin and castle nut attaching upper control arm ball joint to knuckle.

(10) Remove ball joint stud from knuckle using Puller, Special Tool, CT-1106 (Fig. 16). When using puller, install castle nut on ball joint stud (Fig. 16) to protect threads from damage.

(11) Remove the nut and washer attaching the trailing link to the rear knuckle. Use a wrench on the flat of the trailing link to keep it from turning when removing nut (Fig. 17).

(12) Remove the shock absorber clevis bracket to knuckle attaching nut and bolt (Fig. 18).

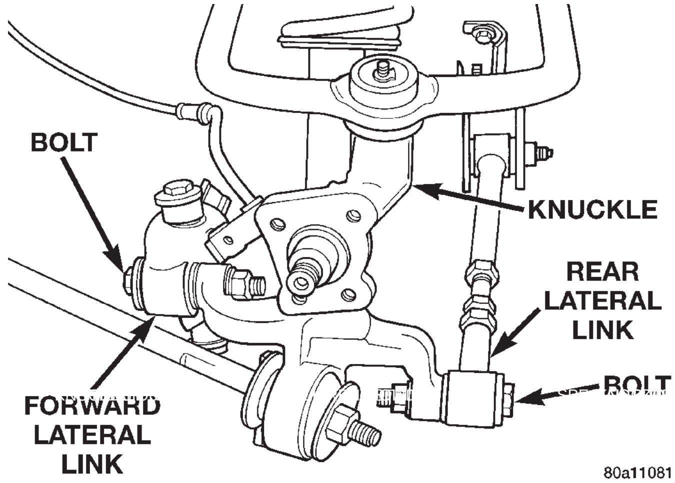


Fig. 15 Lateral Link Attachment To Rear Knuckle

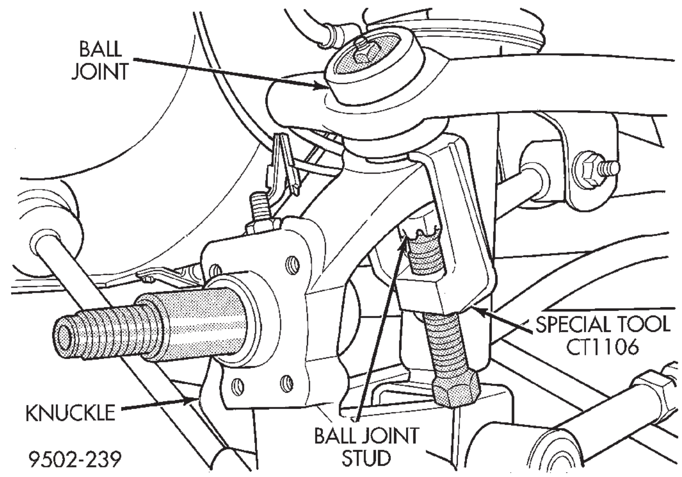


Fig. 16 Removing Ball Joint Stud From Knuckle

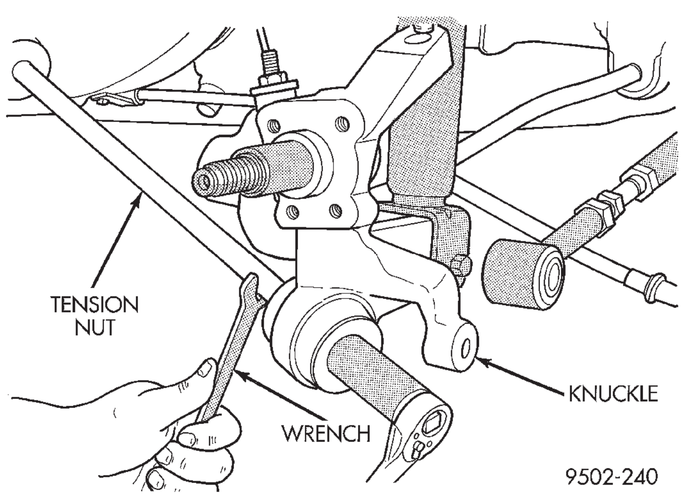


Fig. 17 Trailing Link Attachment To Rear Knuckle

(13) Remove the knuckle assembly from the vehicle.

REMOVAL AND INSTALLATION (Continued)

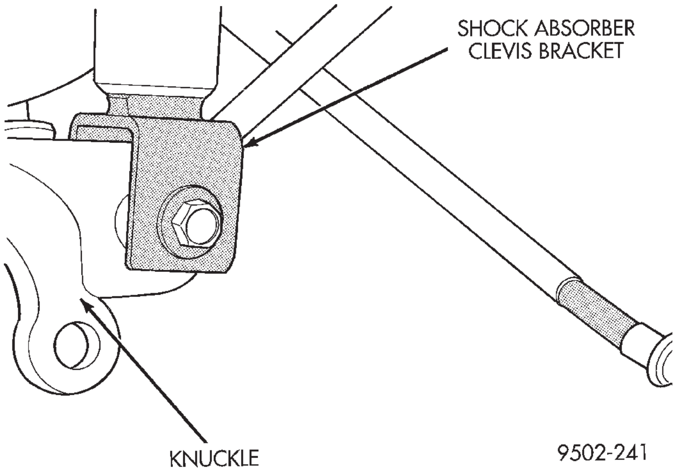


Fig. 18 Shock Absorber Attachment To Knuckle

INSTALL

(1) Install knuckle on clevis bracket of rear shock absorber. Then install clevis bracket to shock absorber attaching bolt with head of bolt facing rear of vehicle (Fig. 18).

CAUTION: When installing trailing link bushing retainers, retainers must be installed with cupped side of retainer facing away from bushing and knuckle (Fig. 19).

(2) Install knuckle on trailing link. Then install the outer trailing link bushing, bushing retainer and retaining nut on trailing link (Fig. 19). Using a large adjustable wrench, to keep trailing link from rotating securely tighten the trailing link retaining nut (Fig. 19) to a torque of 99 N·m (73 ft. lbs.).

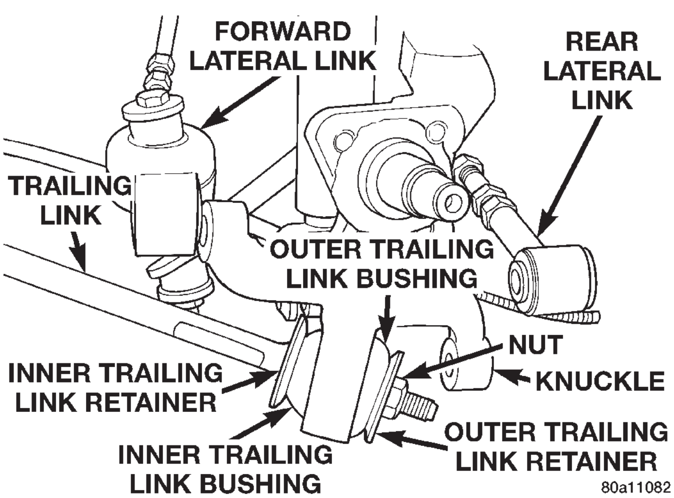


Fig. 19 Trailing Link Bushing And Retainer Installation

(3) Install the upper ball joint stud in the knuckle. Install and tighten the ball joint stud castle nut to a torque of 85 N·m (63 ft. lbs.). Install cotter pin in ball joint stud.

(4) Install the front and rear lateral links and attaching nuts and bolts on the knuckle (Fig. 15) Tighten the lateral links to knuckle attaching bolts and nuts to 108 N·m (80 ft. lbs.).

(5) Install rear brake support plate assembly onto the knuckle. Install the 4 bolts (Fig. 13) attaching rear brake support plate to rear knuckle. Tighten the attaching bolts to a torque of 61 N·m (45 ft. lbs.).

(6) If vehicle is equipped with ABS brakes, install speed sensor head into rear brake support plate (Fig. 20). Torque speed sensor head mounting bolt to 7 N·m (60 in. lbs.).

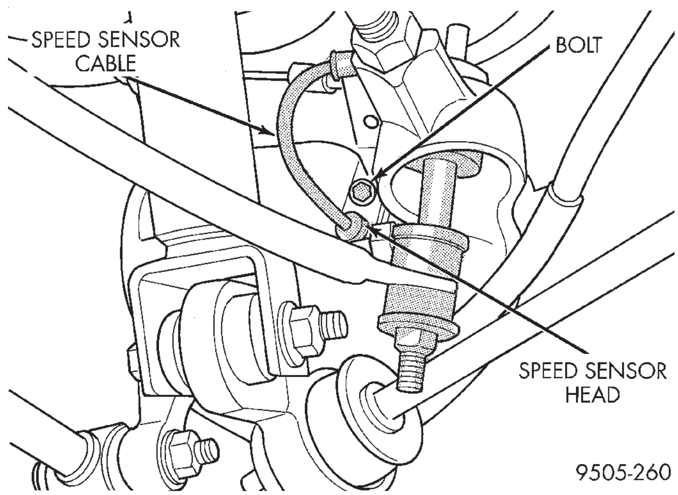


Fig. 20 Speed Sensor Head Attachment To Brake Support Plate

(7) Attach routing bracket for speed sensor cable to brake flex hose bracket and securely tighten attaching bolt (Fig. 9).

(8) Install park brake cable into brake support plate. Ensure cable retainer is securely holding cable to support plate. Then connect park brake cable to park brake lever on brake shoe.

(9) Install rear hub and bearing assembly on knuckle and install hub and bearing assembly retaining nut. Tighten retaining nut to a torque of 250 N·m (185 ft. lbs).

(10) Install the brake drum on the hub/bearing assembly.

(11) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(12) Lower vehicle.

(13) Check and reset rear wheel alignment to specifications if required. Refer to Front And Rear Alignment Setting Procedure in the Wheel Alignment Check And Adjustment section in this group of the service manual for the required alignment setting procedure.

REMOVAL AND INSTALLATION (Continued)

UPPER CONTROL ARM

The rear upper control arm, control arm bushings, and pivot bar are serviced as a complete assembly on this vehicle. Do not attempt to disassemble the control arm from the pivot bar to service the rear control arm bushings.

The rear ball joint and ball joint seal are replaceable components of the rear control arm assembly. The ball joint and ball joint seal are to be replaced with the control arm removed from the vehicle.

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove both rear wheel and tire assemblies from the vehicle.

(3) Remove the shock absorber clevis bracket to rear knuckle attaching bolt and nut (Fig. 21) on both sides of the vehicle.

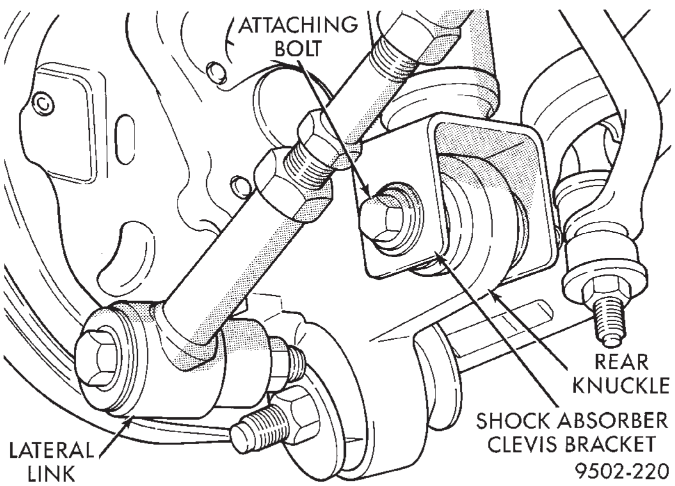


Fig. 21 Shock Absorber To Knuckle Attaching

(4) Remove muffler support bracket from rear frame rail (Fig. 22).

(5) Remove the rear exhaust pipe hanger bracket from the rear suspension crossmember (Fig. 23). Let exhaust system drop down as far as possible.

(6) On only the side of the vehicle requiring control arm removal, separate the control arm ball joint from the rear knuckle using following procedure.

• Remove cotter pin and castle nut attaching upper control arm ball joint to knuckle.

• Remove ball joint stud from knuckle using Puller, Special Tool, CT- 1106 (Fig. 24). When using puller, install castle nut on ball joint stud to protect threads from damage.

(7) Position a transmission jack and wooden block under the center of the rear suspension crossmember to support and lower crossmember during removal (Fig. 25).

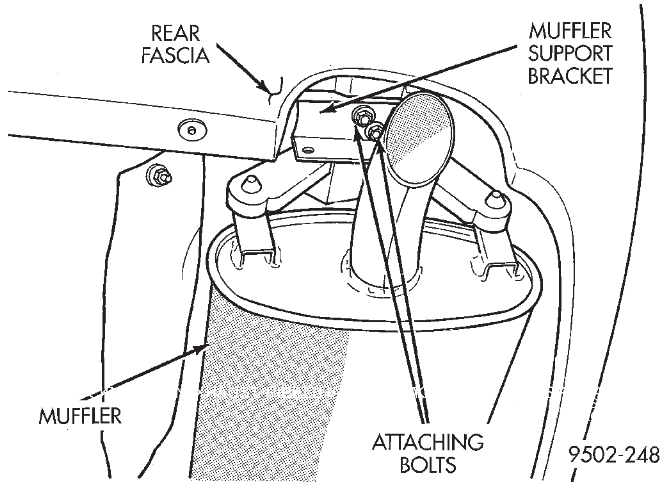


Fig. 22 Muffler Support Bracket

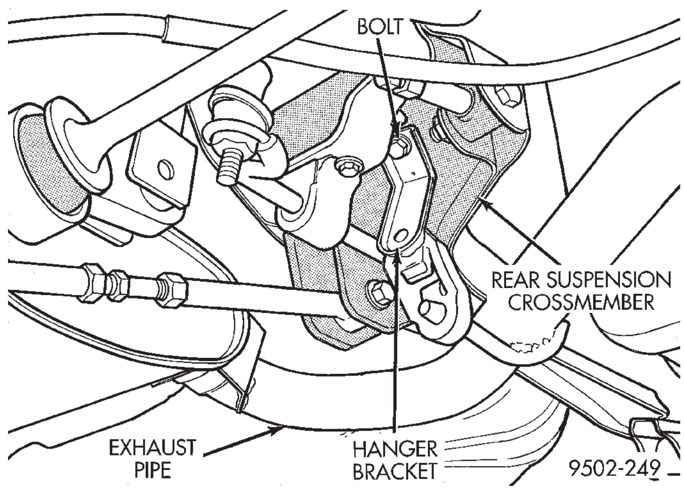


Fig. 23 Exhaust Pipe Hanger At Rear Suspension Crossmember

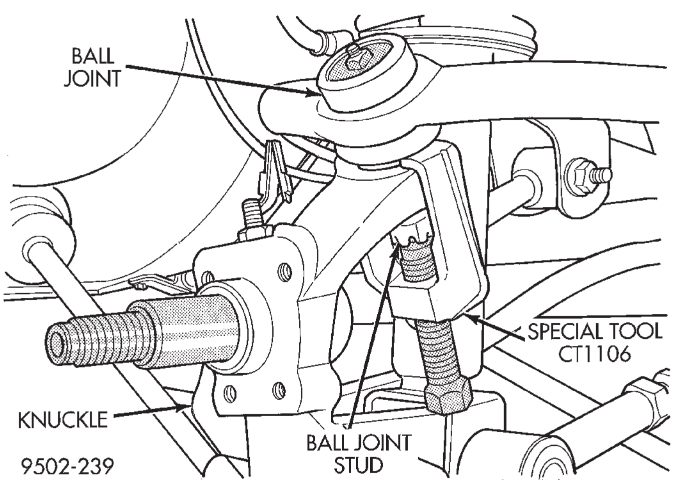


Fig. 24 Ball Joint Stud Removal From Knuckle

REMOVAL AND INSTALLATION (Continued)

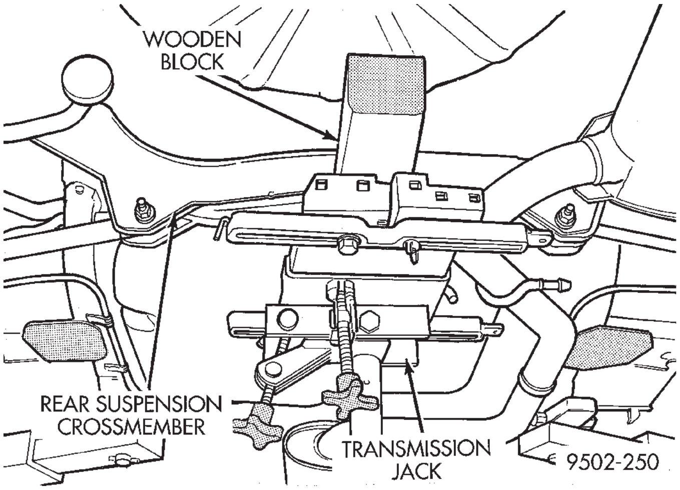


Fig. 25 Lowering And Supporting Rear Suspension Crossmember

(8) If vehicle is equipped with antilock brakes, remove routing clips for wheel speed sensor cable from brackets on both upper control arms (Fig. 26).

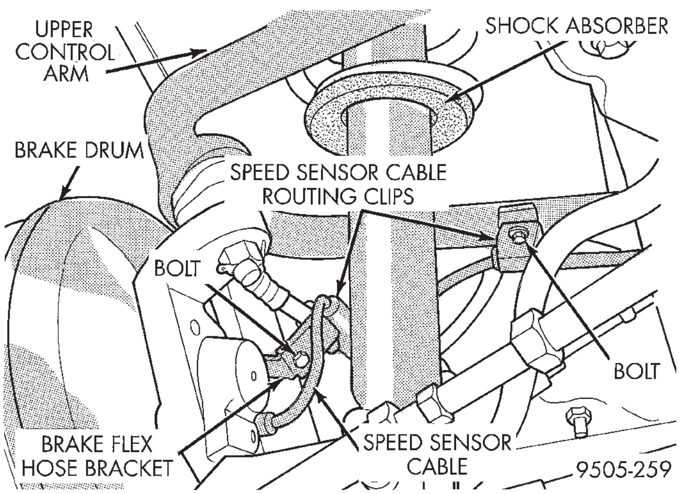


Fig. 26 Speed Sensor Cable Attachment To Control Arm

(9) Remove the 4 bolts (Fig. 27) attaching rear suspension crossmember to rear frame rails.

CAUTION: When lowering rear suspension crossmember do not put a strain on the rear brake flex hoses.

(10) Lower the rear suspension crossmember far enough to access the upper control arm pivot bar to crossmember attaching bolts.

NOTE: One flat washer is used at each upper control arm pivot bar attaching bolt. The flat washer is located between the pivot bar and the rear suspension crossmember. Be sure the washers are not lost when removing the pivot bar attaching bolts from the rear suspension crossmember.

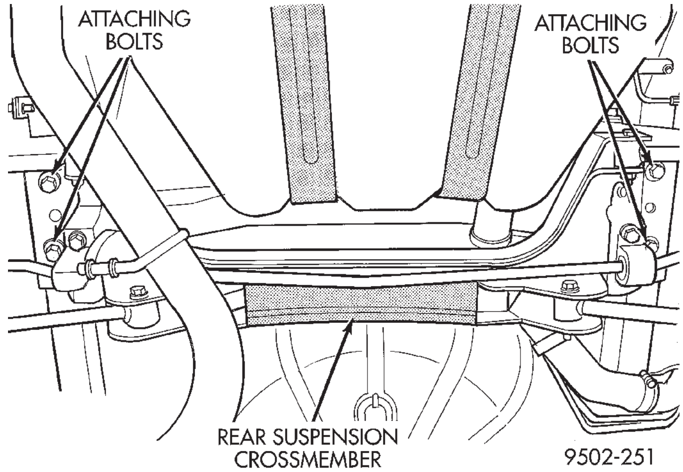


Fig. 27 Crossmember Attachment To Frame Rails

(11) Remove the 2 bolts (Fig. 28) attaching the upper control arm to the rear suspension crossmember.

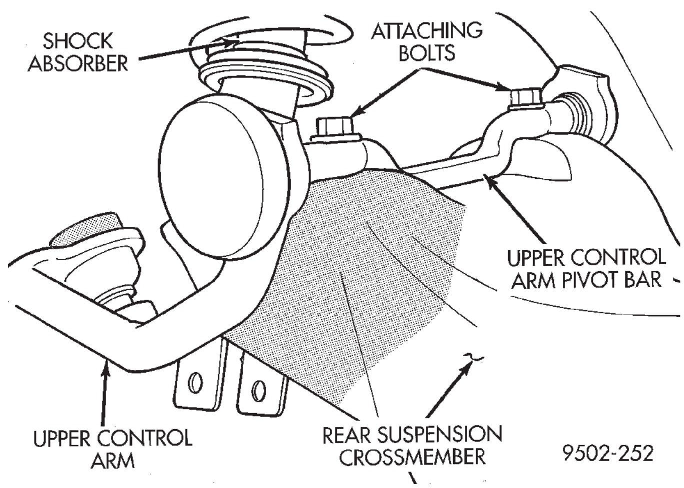


Fig. 28 Upper Control Arm Attachment To Crossmember

(12) Remove the flat washers and the upper control arm from the rear suspension crossmember.

(13) Transfer any required components to the replacement control arm.

INSTALL

NOTE: One flat washer is used at each upper control arm pivot bar attaching bolt. The flat washer is located between the pivot bar and the rear suspension crossmember. Be sure 1 flat washer is used at each bolt attaching the pivot bar to the rear suspension crossmember.

(1) Align the upper control arm pivot bar with the mounting holes in the rear suspension crossmember. Install the pivot bar attaching bolts and washers.

REMOVAL AND INSTALLATION (Continued)

Tighten the 2 pivot bar to crossmember attaching bolts (Fig. 28) to a torque of 108 N·m (80 ft. lbs.).

(2) Using transmission jack, raise rear suspension crossmember up to the rear frame rails and loosely install the 4 attaching bolts (Fig. 27).

(3) Position an appropriate size drift into the positioning hole in each side of rear suspension crossmember and crossmember locating holes in frame rails of the vehicle (Fig. 29). This is required to properly position rear suspension crossmember in the body of the vehicle. Then tighten the 4 crossmember to frame rail attaching bolts to 108 N·m (80 ft. lbs.). Remove drifts from rear suspension crossmember.

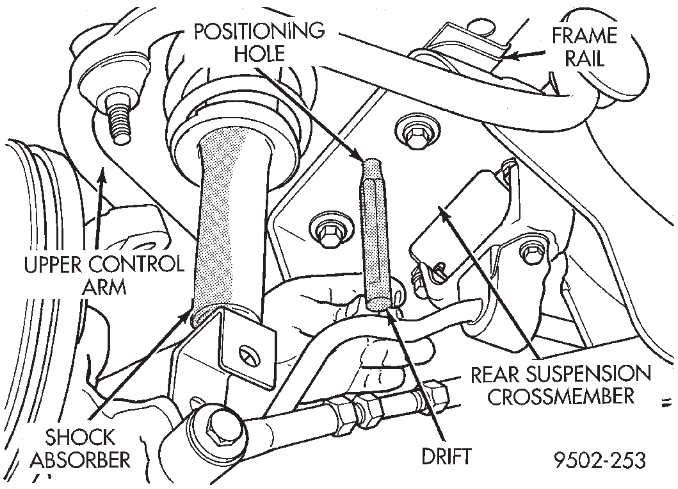


Fig. 29 Locating Rear Suspension Crossmember In Vehicle

(4) Install upper ball joint stud in knuckle. Install and tighten the ball joint stud castle nut to a torque of 85 N·m (63 ft. lbs.). Install cotter pin in ball joint stud.

(5) Remove transmission jack supporting rear suspension crossmember.

(6) Install muffler support bracket on rear frame rail (Fig. 22). Install rear exhaust pipe hanger on rear suspension crossmember (Fig. 23).

(7) Install the wheel speed sensor cable routing clip on upper control arm mounting bracket. Install and securely tighten attaching bolt (Fig. 26).

(8) Install the shock absorber clevis brackets (Fig. 21) on the rear knuckles. Tighten the shock absorber mounting bolts to a torque of 95 N·m (70 ft. lbs.).

(9) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(10) Lower vehicle to the ground.

(11) Check and reset if required, rear wheel Camber and Toe to preferred specifications.

UPPER BALL JOINT

The ball joints are replaceable **ONLY** as an assembly, do not attempt any type of repair on the ball joint assembly. The replacement procedure for the ball joint assembly is detailed in this section of the service manual.

The ball joint housing is a pressed fit into the control arm with the joint stud retained in the knuckle by a castle nut. The castle nut is retained on the ball joint stud by a cotter pin.

The procedure for the removal and replacement of the rear control arm ball joint must be done with the rear control arm removed from the vehicle. The ball joint will require the use of an arbor press to remove and install it on the control arm. For the required procedure to remove and install the rear control arm, refer to Rear Control Arm Service Procedures in this group of the service manual.

REMOVE

(1) Using a screw driver or other suitable tool, pry seal boot up and off of ball joint assembly (Fig. 30).

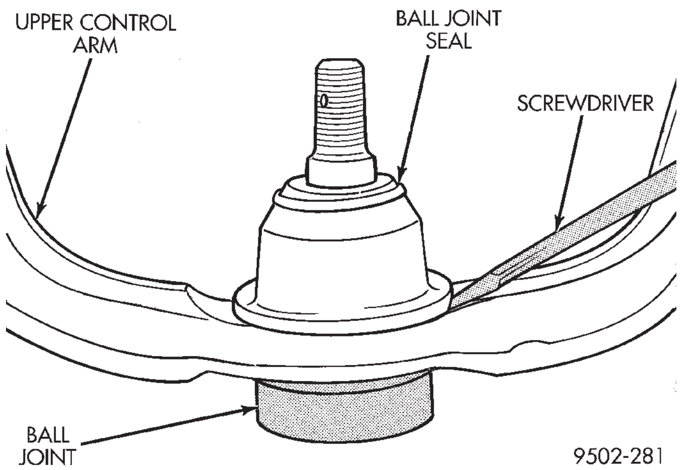


Fig. 30 Ball Joint Seal Boot Removal

(2) Position Receiving Cup, Special Tool 6758 to support control arm when removing ball joint assembly (Fig. 31). Install Remover/Installer, Special Tool 6804 on top of ball joint assembly (Fig. 31).

(3) Using an arbor press, press the ball joint assembly out of the control arm.

INSTALL

(1) By hand, position ball joint assembly into ball joint bore of control arm. Be sure ball joint assembly is not cocked in the bore of the control arm, this will cause binding of the ball joint assembly, when being pressed into lower control arm.

(2) Position assembly in an arbor press with Receiving Cup, Special Tool 6758 supporting lower control arm (Fig. 32). Then install Remover/Installer,

REMOVAL AND INSTALLATION (Continued)

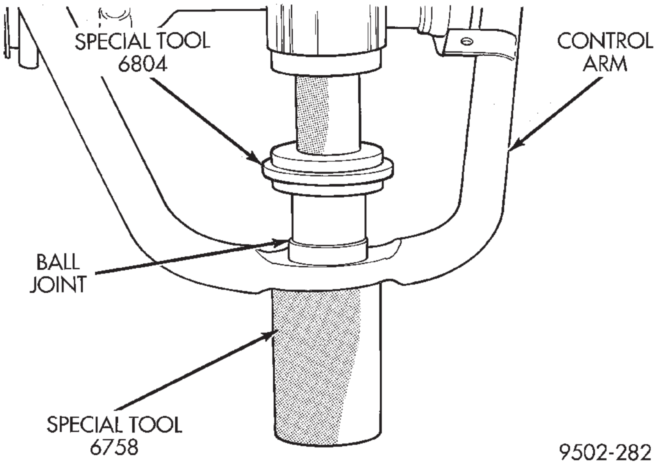


Fig. 31 Removing Ball Joint From Upper Control Arm

Special Tool 6804 on the top of the ball joint assembly (Fig. 32).

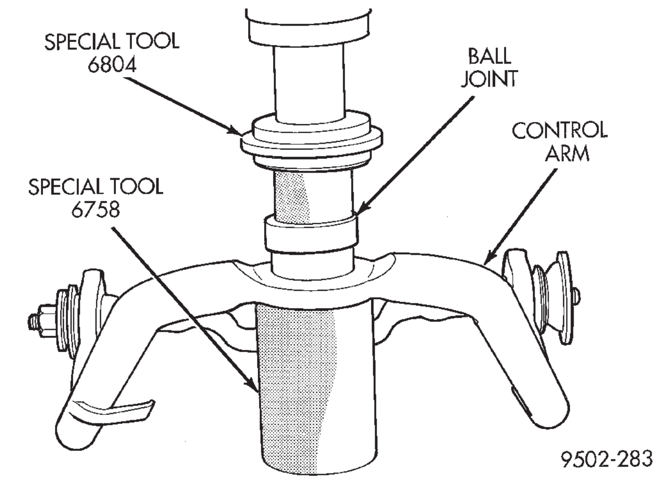


Fig. 32 Installing Ball Joint In Upper Control Arm

CAUTION: When installing the ball joint in the upper control arm, do not press the ball joint into the control arm all the way. The lip on the ball joint must not touch the surface of the control arm. Refer to Step 3 below when installing the ball joint.

(3) Carefully align all pieces. Using the arbor press, press the ball joint into the control arm until a gap of 3mm (1/8 inch) is between lip on ball joint and surface of lower control arm.

(4) Install a **NEW** ball joint assembly sealing boot on ball joint assembly.

CAUTION: Do not use an arbor press to install the sealing boot on the lower control arm ball joint assembly. Damage to the sealing boot can occur due to excessive pressure applied to sealing boot when being installed.

(5) Position Receiving Cup, Special Tool 6758 over sealing boot so it is aligned properly with bottom edge of sealing boot (Fig. 33). Apply pressure **BY HAND** to special tool 6758, until sealing boot is pressed squarely against surface of control arm.

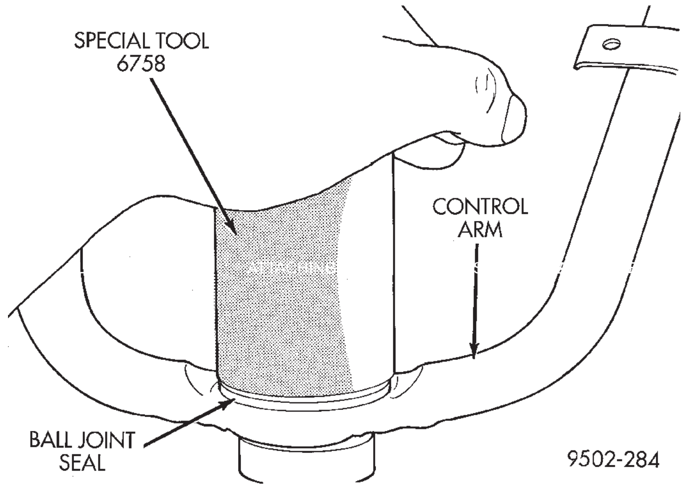


Fig. 33 Ball Joint Seal Boot Installation

REAR SUSPENSION CROSSMEMBER

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove both rear wheel and tire assemblies from the vehicle.

(3) Remove the shock absorber clevis bracket to rear knuckle attaching bolt and nut on both sides of the vehicle (Fig. 34).

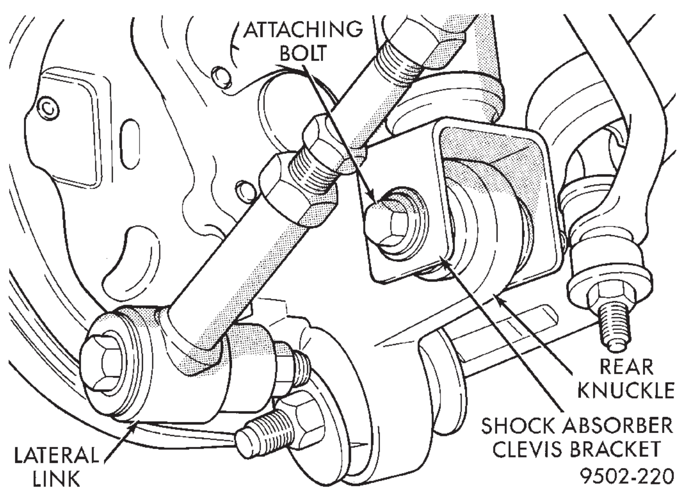


Fig. 34 Shock Absorber To Knuckle Attaching

(4) Remove muffler support bracket from rear frame rail (Fig. 35).

REMOVAL AND INSTALLATION (Continued)

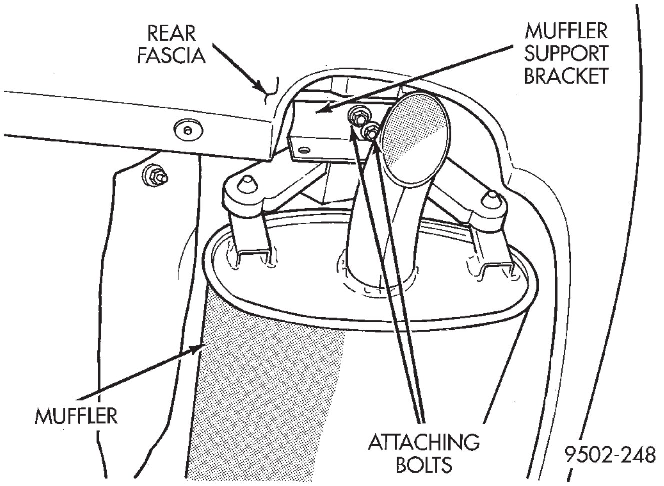


Fig. 35 Muffler Support Bracket

(5) Remove the rear exhaust pipe hanger from the rear suspension crossmember (Fig. 36). Let the exhaust system drop down as far as possible.

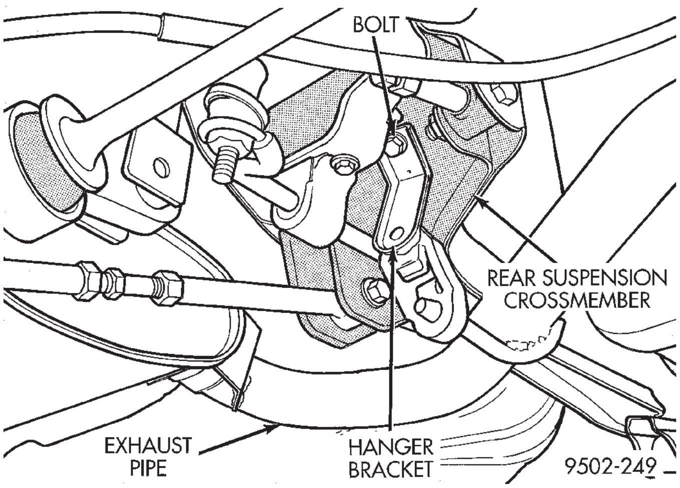


Fig. 36 Exhaust Pipe Hanger At Rear Suspension Crossmember

(6) Position a transmission jack and wooden block under the center of the rear suspension crossmember to support and lower crossmember during removal (Fig. 37).

(7) Remove the routing clips for the wheel speed sensor cable from the brackets on the upper control arm (Fig. 38).

(8) Remove the nuts and bolts on each side of the vehicle attaching the 4 lateral links to the knuckles.

(9) Remove the 4 bolts attaching the rear suspension crossmember to the rear frame rails (Fig. 39).

(10) Lower the rear suspension crossmember enough to access the upper control arm pivot bar to crossmember attaching bolts (Fig. 40).

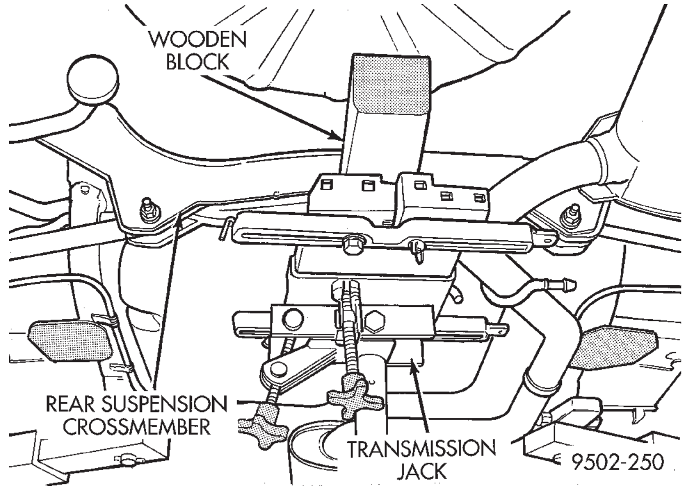


Fig. 37 Lowering And Supporting Rear Suspension Crossmember

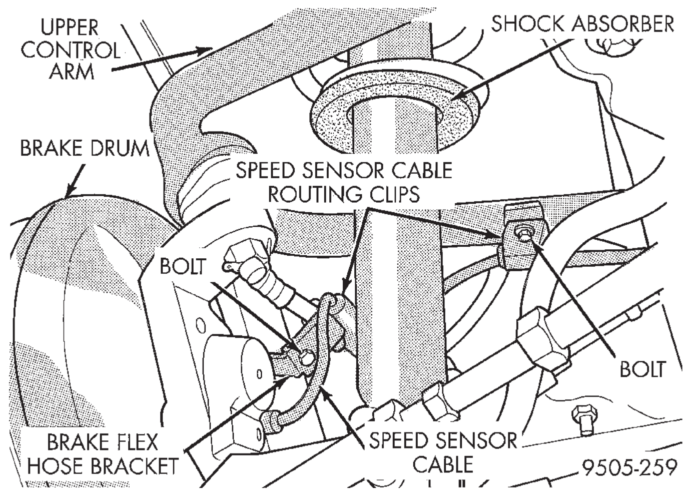


Fig. 38 Speed Sensor Cable Attachment To Control Arm

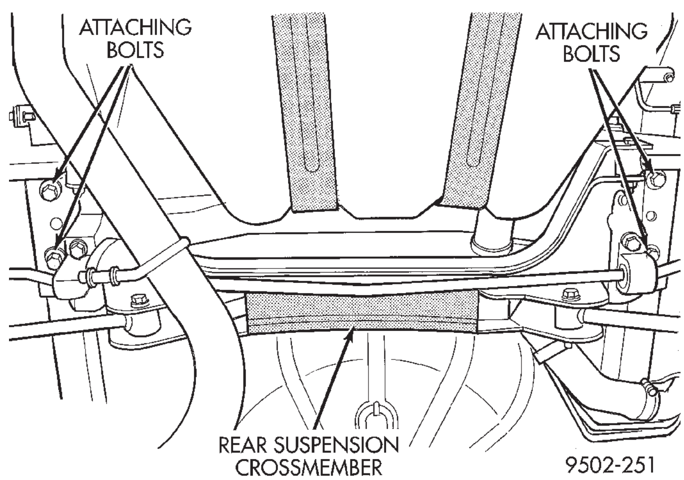


Fig. 39 Suspension Crossmember Attachment To Frame Rails

REMOVAL AND INSTALLATION (Continued)

NOTE: One flat washer is used at each upper control arm pivot bar attaching bolt. The flat washer is located between the pivot bar and the rear suspension crossmember. Be sure the washers are not lost when removing the pivot bar attaching bolts from the rear suspension crossmember.

(11) Remove the 4 bolts (Fig. 40) attaching the upper control arm pivot bars to the rear suspension crossmember. Remove the control arms from the crossmember.

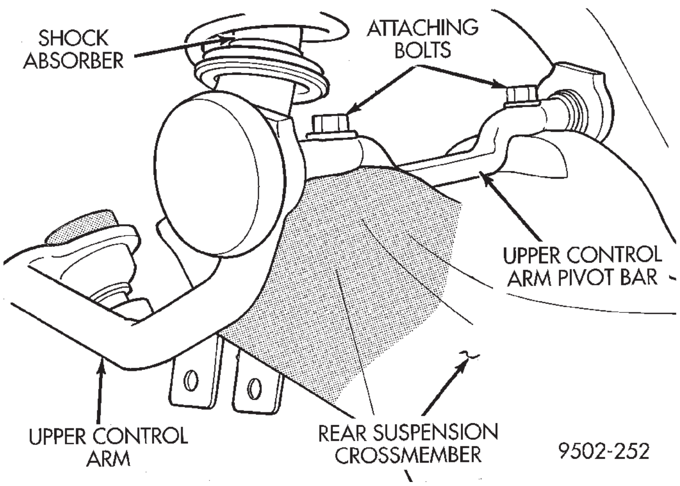


Fig. 40 Upper Control Arm Attachment To Crossmember

(12) Lower the rear suspension crossmember, lateral arms and stabilizer bar as far as possible using the transmission jack. Then with the aid of a helper remove rear suspension crossmember from the vehicle.

(13) Transfer the lateral arms, stabilizer bar mounting brackets and the stabilizer bar and bushings to the replacement crossmember before installing the replacement crossmember in the vehicle. Tighten the stabilizer bar mounting bracket to rear crossmember mounting bolts to a torque of 27 N·m (20 ft. lbs.). Tighten the 4 lateral arm to crossmember attaching bolts to a torque of 95 N·m (80 ft. lbs.). **Install the lateral arm to crossmember bolts so head of bolt will be toward the front of the vehicle when the crossmember is installed.**

INSTALL

(1) Install the rear suspension crossmember, lateral arms and rear stabilizer bar back into the vehicle as an assembly.

(2) With the aid of a helper position rear suspension crossmember back in vehicle and support it using the transmission jack.

NOTE: One flat washer is used at each upper control arm pivot bar attaching bolt. The flat washer is located between the pivot bar and the rear suspension crossmember. Be sure 1 flat washer is used at each bolt attaching the pivot bar to the rear suspension crossmember.

(3) Align the upper control arm pivot bars with the mounting holes in the rear suspension crossmember. Install the pivot bar attaching bolts and washers. Tighten the 4 pivot bar to crossmember attaching bolts (Fig. 40) to a torque of 107 N·m (80 ft. lbs.).

(4) Using transmission jack, raise rear suspension crossmember up to the rear frame rails and loosely install the 4 attaching bolts.

(5) Position a drift of the appropriate size into the positioning hole in each side of rear suspension crossmember and locating holes in the frame rail of the body. (Fig. 41). This is required to properly position the rear suspension crossmember side-to-side and front-to-rear on the body of the vehicle. Then tighten the 4 crossmember to frame rail attaching bolts to 107 N·m (80 ft. lbs.). Remove drifts from rear suspension crossmember.

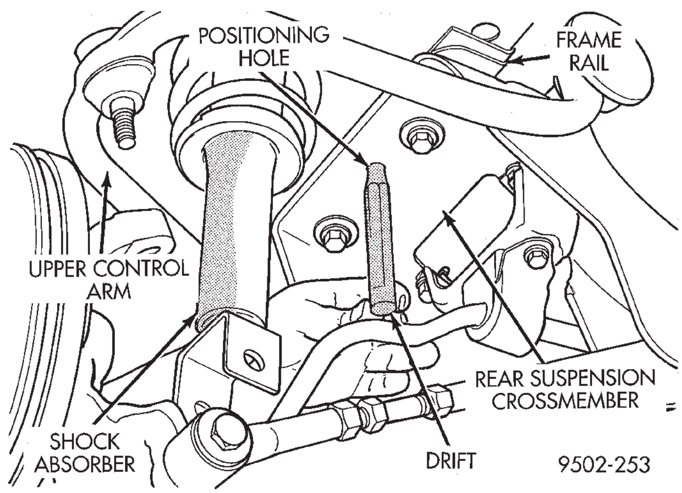


Fig. 41 Locating Rear Suspension Crossmember In Vehicle

(6) Align lateral links with knuckles and install the lateral arm to knuckle attaching bolts and washers. Tighten the 4 lateral arm to knuckle attaching bolts to a torque of 107 N·m (80 ft. lbs.).

(7) Remove transmission jack supporting rear suspension crossmember.

(8) Install muffler support bracket on rear frame rail (Fig. 35). Install rear exhaust pipe hanger on rear suspension crossmember (Fig. 36).

(9) Install the wheel speed sensor cable routing clip on the upper control arm mounting bracket (Fig. 38). Install and securely tighten attaching bolt.

(10) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specifica-

REMOVAL AND INSTALLATION (Continued)

tion. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(11) Lower vehicle to the ground.

(12) Check and reset if required, rear wheel alignment (camber and toe) to meet the preferred specifications.

LATERAL LINKS

The rear suspension lateral links (Fig. 42) are only serviced as complete assemblies. The isolator bushings used in the lateral links are not serviced as separate components.

CAUTION: Do not attempt to straighten or repair a lateral link. Do not apply heat to the lateral link adjusting screws or to the jam nuts, when loosening or adjusting the lateral links.

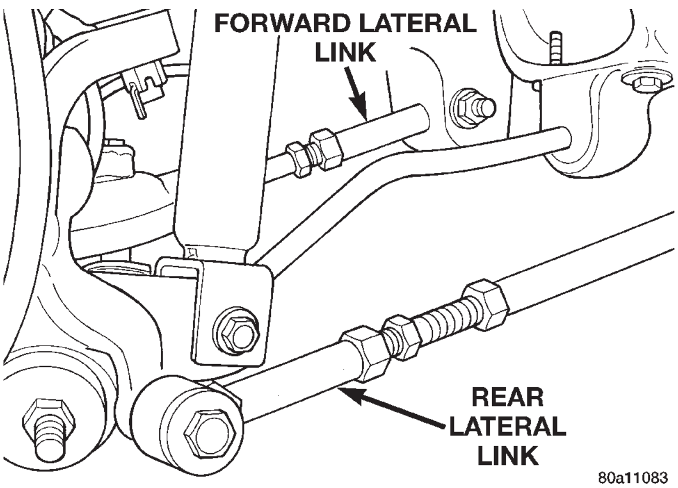


Fig. 42 Rear Suspension Lateral Links

FORWARD LATERAL LINK

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the rear wheel and tire assembly from the side of the vehicle requiring lateral link removal.

(3) Remove the rear stabilizer bar attaching link from the forward lateral link (Fig. 43).

(4) Remove the nut, bolt and washer (Fig. 43) attaching the forward lateral link to the knuckle.

(5) Remove the nut and bolt attaching the lateral link to the rear suspension crossmember (Fig. 44).

(6) Remove the forward lateral link from the vehicle.

INSTALL

(1) Install the lateral link and the attaching nut and bolt at rear suspension crossmember (Fig. 44).

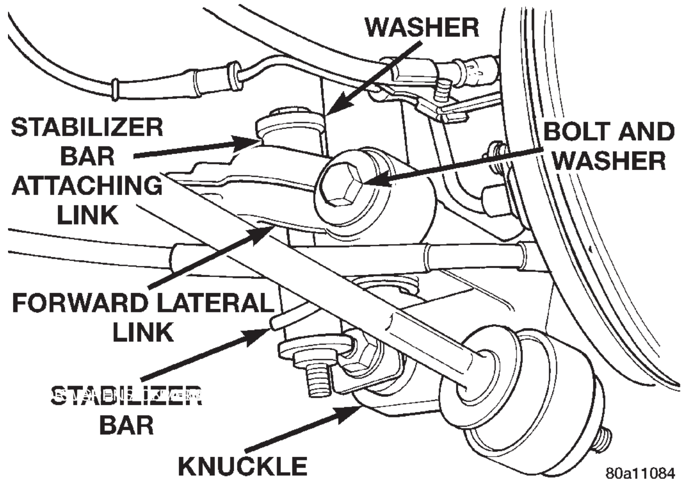


Fig. 43 Stabilizer Bar To Lateral Link Attachment

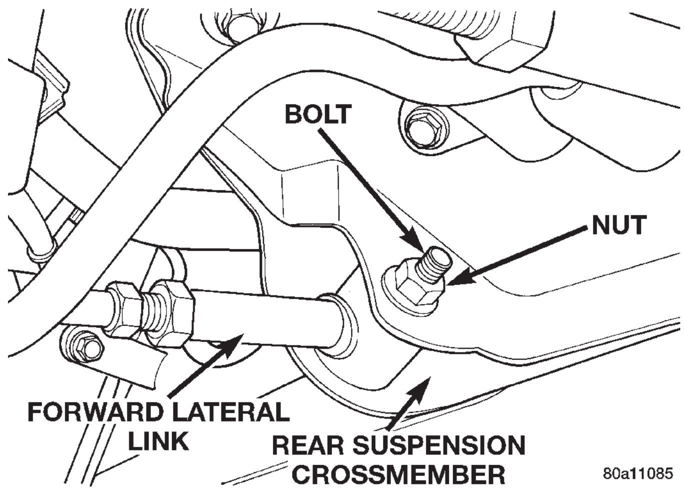


Fig. 44 Lateral Link Attachment To Rear Suspension Crossmember

The forward lateral link is to be installed with the cup in cast portion facing down and toward rear knuckle (Fig. 43).

(2) Install the lateral link and attaching nut, bolt and washer at rear knuckle (Fig. 43).

(3) Torque both lateral link attaching bolts to 108 N·m (80 ft. lbs.).

(4) Install the rear stabilizer bar attaching link, isolator bushings and attaching nut on the forward lateral link (Fig. 43). Tighten the attaching nut to a torque of 35 N·m (26 ft. lbs.).

(5) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(6) Lower vehicle to the ground.

(7) Check and reset rear wheel Camber and Toe to specifications if required. Refer to Front And Rear Alignment Setting Procedure in the Wheel Alignment Check And Adjustment section in this group of the

REMOVAL AND INSTALLATION (Continued)

service manual for the required alignment setting procedure.

REAR LATERAL LINK

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the rear wheel and tire assembly from the side of the vehicle requiring lateral link removal.

(3) Remove the nut, bolt and washer attaching the lateral link to the knuckle (Fig. 45).

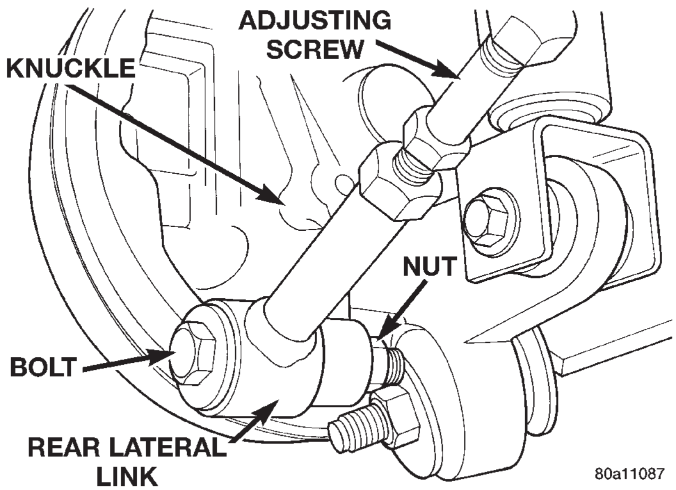


Fig. 45 Rear Lateral Link Attachment To Knuckle

(4) Remove the bolt (Fig. 46) and nut attaching the lateral link to the rear suspension crossmember.

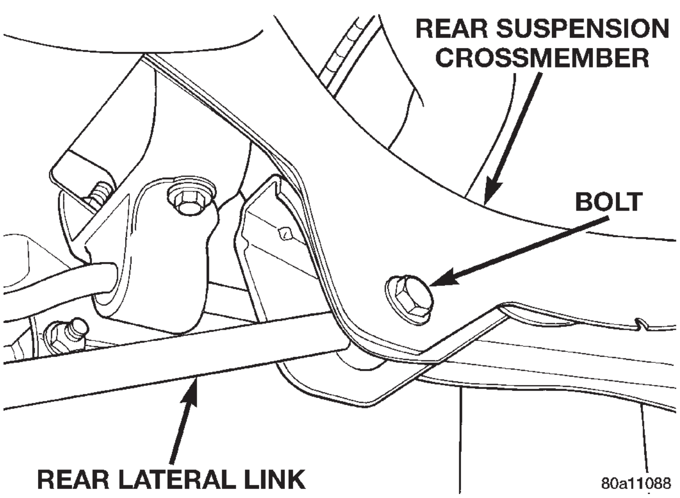


Fig. 46 Lateral Link Attachment To Rear Suspension Crossmember

(5) Remove rear lateral link from vehicle.

INSTALL

(1) Install the lateral link and the attaching nut and bolt at rear suspension crossmember (Fig. 46). **The rear lateral link is to be installed with the adjusting screw toward rear knuckle not rear suspension crossmember (Fig. 45).**

(2) Install the lateral link and the attaching nut, bolt and washer at rear knuckle (Fig. 45).

(3) Torque both lateral link attaching bolts to 108 N·m (80 ft. lbs.).

(4) Install wheel and tire assembly on vehicle. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(5) Lower vehicle to the ground.

(6) Check and reset rear wheel Camber and Toe to specifications if required. Refer to Front And Rear Alignment Setting Procedure in the Wheel Alignment Check And Adjustment section in this group of the service manual for the required alignment setting procedure.

TRAILING LINKS

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove rear wheel and tire assembly from the vehicle.

(3) At the knuckle, remove the nut, bushing retainer and outer trailing link bushing (Fig. 47) from the trailing link.

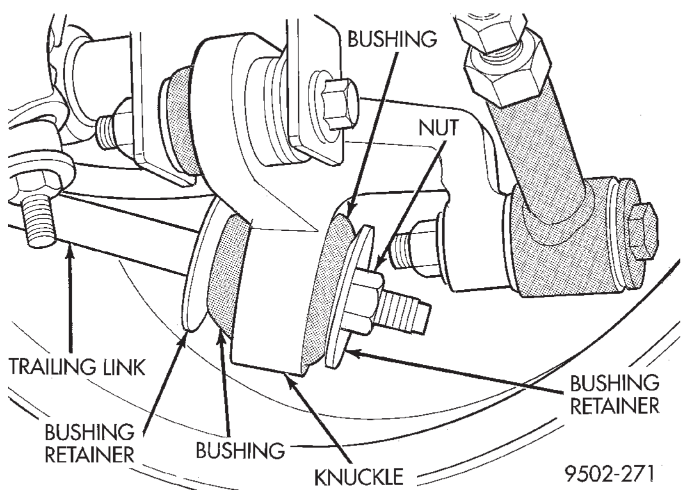


Fig. 47 Trailing Link To Knuckle Attachment

(4) Remove the 4 bolts (Fig. 48) attaching the trailing link hanger bracket to the floor pan and frame rail.

REMOVAL AND INSTALLATION (Continued)

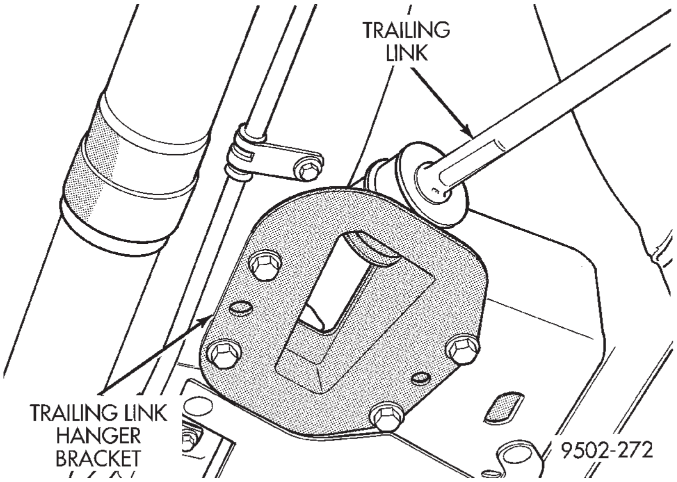


Fig. 48 Trailing Link Hanger Bracket Attachment To Vehicle

(5) Remove the trailing link and mounting bracket as an assembly from the vehicle.

CAUTION: The installation position of the bushings and retainers on the trailing link is important. When separating the trailing link from the hanger bracket, note the position and orientation on the bushings and retainers to ensure they are re-installed correctly.

(6) Separate the trailing link from the hanger bracket. To separate trailing link from hanger bracket, use a large adjustable wrench on flat of trailing link to turn link while holding nut stationary (Fig. 49).

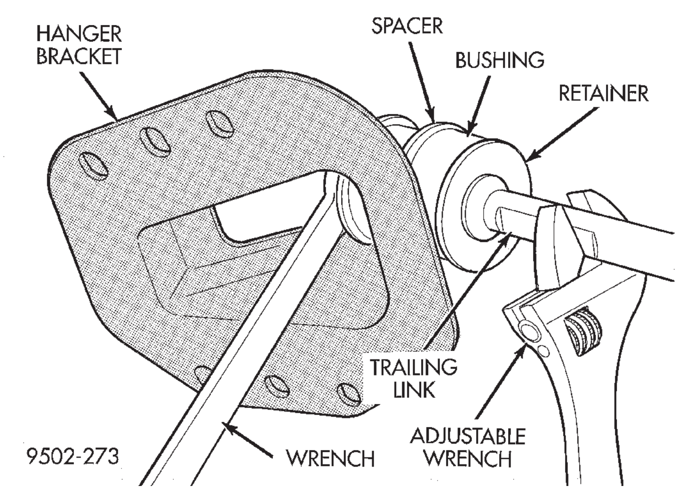


Fig. 49 Separating Trailing Link From Hanger Bracket

INSTALL

CAUTION: The inner and outer trailing link to hanger bracket bushings and retainers must be installed in their correct position on the trailing link. Do not reverse the position of the inner and outer trailing link bushing or retainers on the trailing link.

NOTE: When installing trailing link into hanger bracket, the flat on the trailing link (Fig. 49) must be positioned at the hanger bracket.

(1) Install the inner bushing retainer, and inner bushing (Fig. 50) on the trailing link. Install the trailing link, retainer and bushing on the hanger bracket (Fig. 50). Then install the outer bushing, outer bushing retainer and nut (Fig. 50) on the trailing link. Tighten the trailing link retaining nut to a torque of 99 N·m (73 ft. lbs.).

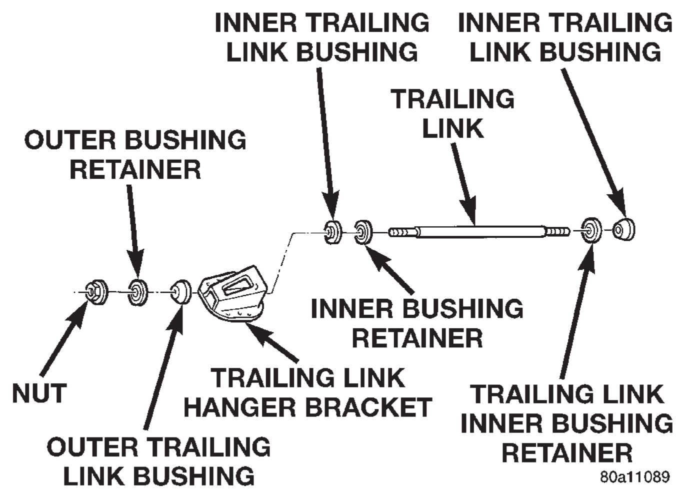


Fig. 50 Trailing Link Bushing Installation

(2) Install knuckle end of trailing link assembly in rear knuckle.

CAUTION: It is important that the following procedure be done when installing the trailing arm hanger bracket to the body of the vehicle. This procedure will ensure that the hanger bracket is installed in the correct position on the vehicle.

(3) Install trailing link hanger bracket on vehicle and loosely install the 4 attaching bolts (Fig. 51). Then install 2 drift pins of appropriate size in positioning holes on hanger bracket and into locating holes in body (Fig. 51). With hanger bracket correctly positioned on vehicle tighten the 4 hanger bracket mounting bolts to a torque of 34 N·m (25 ft. lbs.).

CAUTION: When installing trailing link bushing retainers, retainers must be installed with cupped side of retainer facing away from bushing and knuckle (Fig. 47).

(4) At the knuckle, install the outer trailing link bushing, outer bushing retainer and retaining nut on trailing link (Fig. 47). Using a large adjustable wrench on flat of trailing link to keep it from rotat-

REMOVAL AND INSTALLATION (Continued)

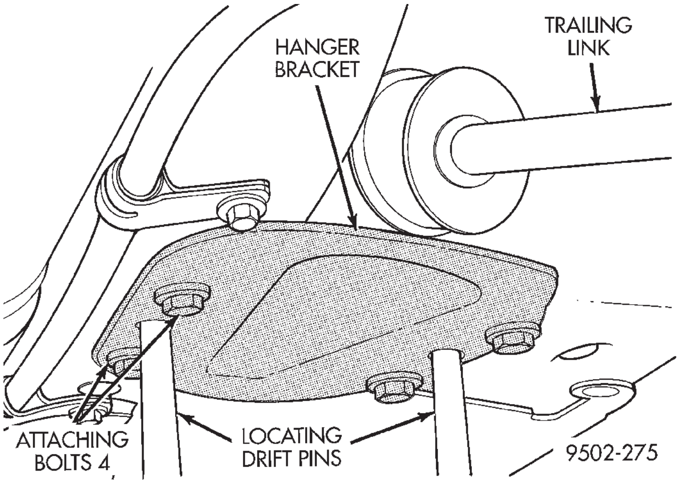


Fig. 51 Trailing Link Hanger Bracket Installation

ing tighten the trailing link retaining nut (Fig. 47) to a torque of 99 N·m (73 ft. lbs.).

DISASSEMBLY AND ASSEMBLY

SHOCK ABSORBER

The rear shock absorber can not be repaired and must be replaced as a unit if found to be defective in any way. The shock absorber is available in 2 different suspension calibrations, be sure the shock absorber is replaced with a shock absorber of the same calibration. Refer to the sales codes for the vehicle being serviced, to determine which type of suspension the vehicle is equipped with.

The components of the shock absorber assembly listed below are replaceable if found to be defective.

- Coil Spring (Coil springs come in a standard and high rate. Be sure spring is replaced with a spring of the correct rate.)
- Dust Shield Assembly
- Mount Bracket
- Jounce Bumper
- Lower Spring Isolator
- Shaft Nut
- Lower Retainer (Washer)
- Upper Retainer (Washer)
- Bushing Sleeve
- Upper Mount Bushing
- Lower Mount Bushing
- Upper Spring Isolator

DISASSEMBLE

(1) Remove shock absorber assembly requiring service from the vehicle. Refer to Shock Assembly Removal in Servicing Rear Shock Absorbers, in this section of the service manual.

(2) Position shock absorber assembly in a vise. Shock absorber is to be clamped only by the clevis bracket on the bottom of the shock absorber (Fig. 52).

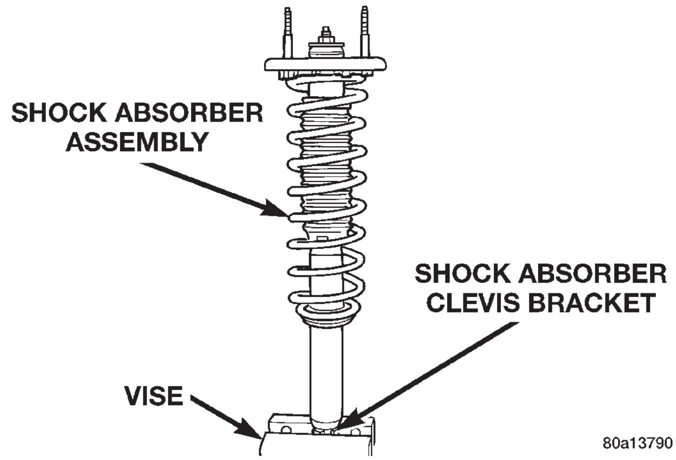


Fig. 52 Shock Absorber Correctly Mounted In Vise

(3) Mark the coil spring and the shock absorber right or left, according to which side of the vehicle it was removed from, and which shock absorber the spring was removed from.

WARNING: DO NOT REMOVE THE SHOCK ABSORBER ROD NUT, BEFORE THE SHOCK ABSORBER COIL SPRING IS COMPRESSED, REMOVING SPRING TENSION FROM THE SHOCK ABSORBER MOUNT.

WARNING: WHEN COMPRESSING COIL SPRING FOR REMOVAL FROM SHOCK ABSORBER ASSEMBLY, THE FIRST FULL TOP AND BOTTOM COIL OF THE SPRING MUST BE CAPTURED BY THE JAWS OF THE COIL SPRING COMPRESSOR.

(4) Compress shock assembly coil spring, using Professional Services Equipment Spring Compressor, GP-2020-C3.5 or an equivalent (Fig. 53).

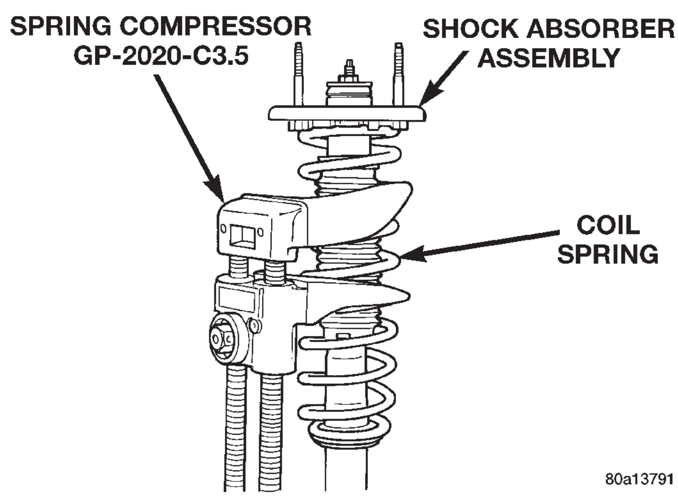


Fig. 53 Compressing Shock Absorber Spring

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Hold the rod of the shock absorber from rotating using Shock Absorber Socket, Snap-On A136 or an equivalent (Fig. 54). Then remove the shock absorber shaft nut.

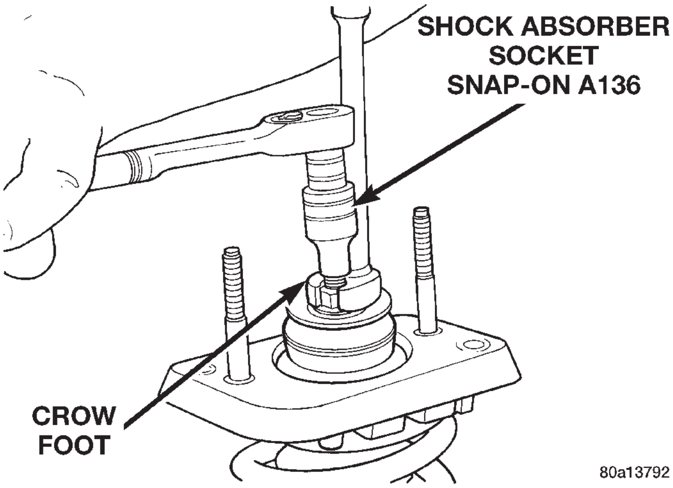


Fig. 54 Shock Absorber Shaft Nut

(6) Remove the washer from the shock absorber upper mounting bracket (Fig. 55).

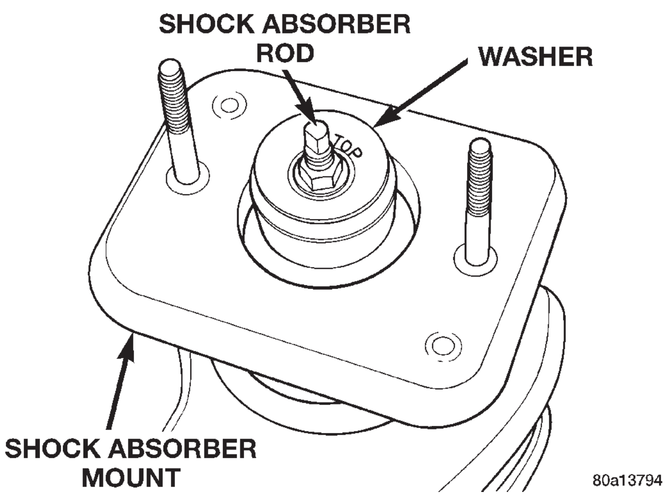


Fig. 55 Shock Absorber Upper Mount Washer

(7) Remove the shock absorber mounting bracket, bushings and sleeve (Fig. 56) as an assembly from the shock absorber.

(8) Remove the spring isolator (Fig. 57) from the coil spring.

(9) Remove the washer from the top of the dust shield and shock absorber rod (Fig. 58).

(10) Remove the dust shield (Fig. 59) from the shock absorber.

(11) Remove the coil spring and the spring compressor as an assembly (Fig. 60) from the shock absorber. **Mark left and right springs for installation back on correct side of vehicle.**

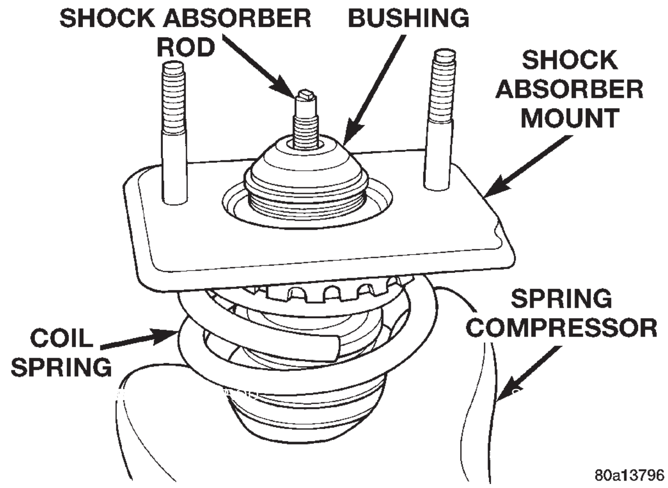


Fig. 56 Shock Absorber Mount And Bushings

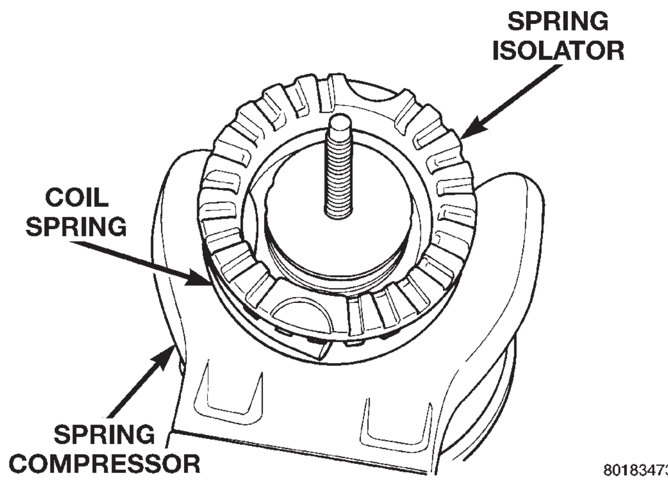


Fig. 57 Coil Spring Isolator

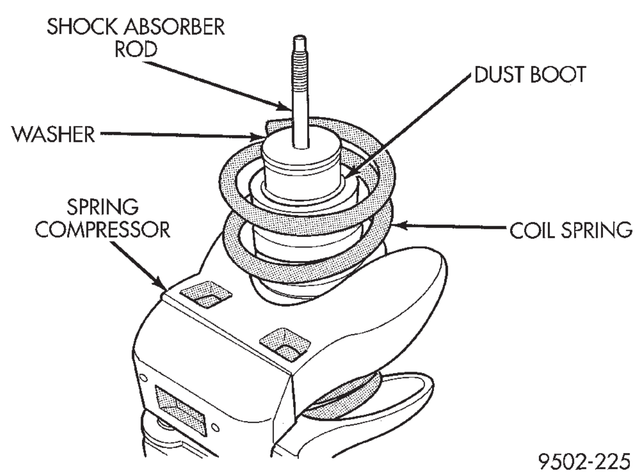


Fig. 58 Shock Absorber Rod Upper Washer

NOTE: The collar (Fig. 61) can not be removed from the shock absorber rod. When removing the jounce bumper it will have to be carefully pulled over the collar.

DISASSEMBLY AND ASSEMBLY (Continued)

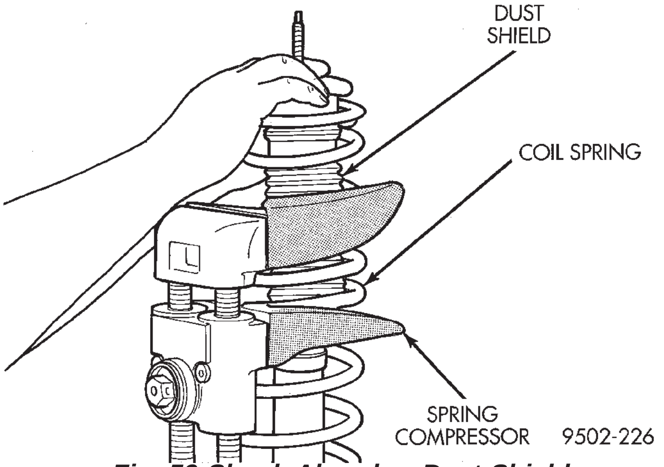


Fig. 59 Shock Absorber Dust Shield

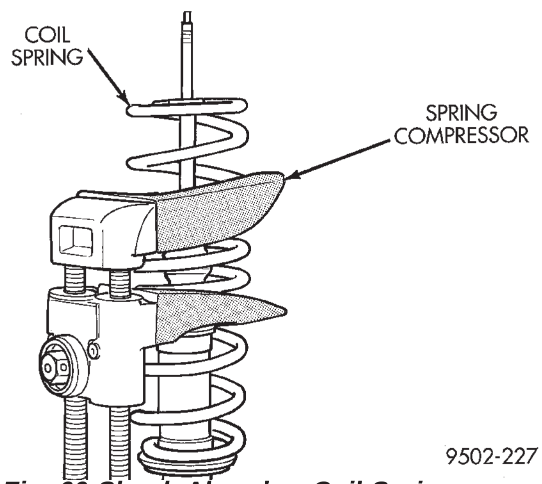


Fig. 60 Shock Absorber Coil Spring

(12) Remove the jounce bumper (Fig. 61) from the rod of the shock absorber assembly.

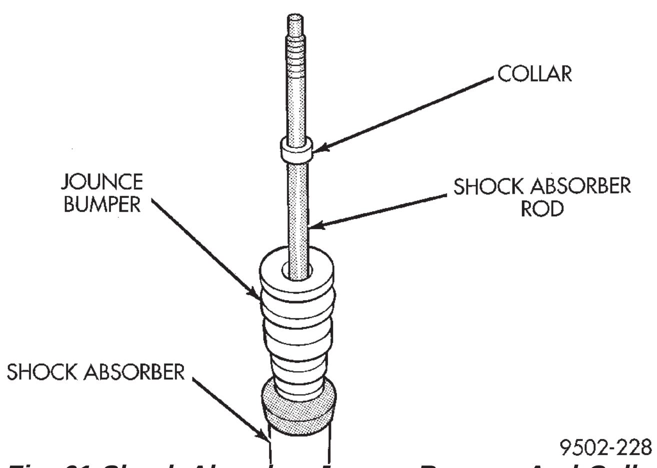


Fig. 61 Shock Absorber Jounce Bumper And Collar

(13) Remove the coil spring isolator (Fig. 62) from the lower spring seat on the shock absorber.

(14) Inspect the shock absorber for any condition of shaft binding over the full stroke of the rod.

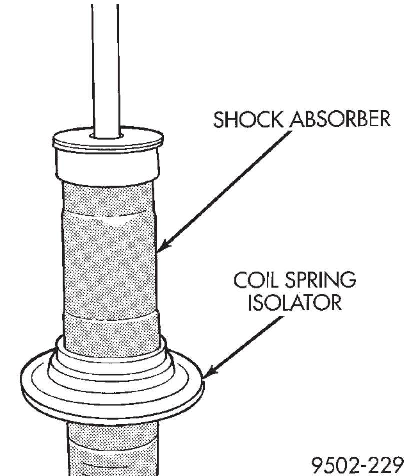


Fig. 62 Coil Spring Isolator

(15) Inspect all disassembled components for signs of abnormal wear or failure, replacing any components as required. Inspect shock absorber for signs of abnormal oil leakage and for loss of gas charge. To check for loss of gas charge in shock absorber, push the shaft of the shock absorber in and release, the shaft should return to its fully extended position. If shaft does not return to its fully extended position replace the shock absorber.

(16) Remove the upper bushing and sleeve from the shock absorber mount (Fig. 63).

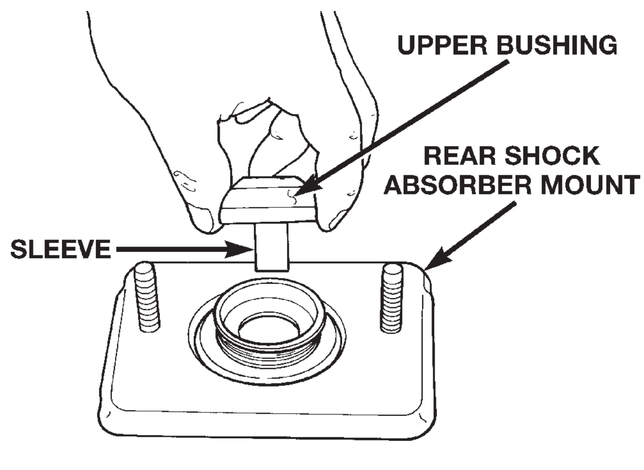


Fig. 63 Shock Absorber Mount Upper Bushing

(17) Remove the lower bushing from the rear shock absorber mount (Fig. 64).

(18) Inspect the rear shock absorber mount, upper and lower bushings, and upper and lower spring isolators for the following:

- Mount for cracks and distortion and locating studs for any sign of damage.
- Severe deterioration of the upper or lower coil spring isolators.
- Deterioration of the shock absorber rod to shock absorber mounting bracket bushings.
- Inspect dust shield for rips and/or deterioration.

DISASSEMBLY AND ASSEMBLY (Continued)

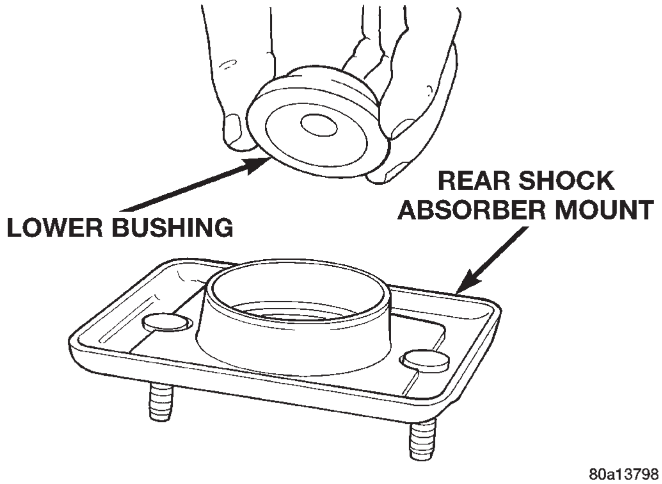


Fig. 64 Shock Absorber Mount Lower Bushing

• Inspect jounce bumper for cracks and signs of deterioration.

ASSEMBLE

CAUTION: Do not clamp shock absorber in a vise by the body of the shock absorber. The shock absorber must only be clamped in the vise using the clevis bracket on bottom of shock absorber (Fig. 52).

(1) Install the lower bushing in the shock absorber mount. Bushing is to be installed with the cupped side of the bushing toward the shock absorber mount (Fig. 64).

(2) Install the upper bushing and the sleeve in the shock absorber mount. Bushing and sleeve are to be installed with the tapered side of the Bushing facing up (Fig. 63).

(3) Install the coil spring isolator (Fig. 62) on the lower spring seat of the shock absorber assembly.

(4) Install the jounce bumper as shown on the rod of the shock absorber (Fig. 65).

WARNING: IF A REPLACEMENT COIL SPRING IS TO BE INSTALLED ON THE STRUT ASSEMBLY, THE FIRST FULL TOP AND BOTTOM COIL OF THE SPRING MUST BE CAPTURED BY THE JAWS OF THE COIL SPRING COMPRESSOR.

(5) Install the coil spring and spring compressor on the shock absorber (Fig. 60). Be sure bottom coil of spring is correctly positioned on the lower spring isolator.

(6) Install dust shield (Fig. 59) on rod of shock absorber.

(7) Install the washer on rod of shock absorber assembly and on top of dust shield (Fig. 58).

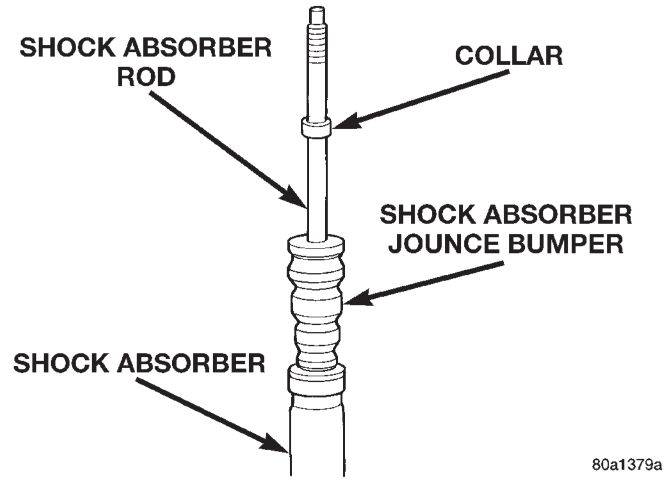


Fig. 65 Jounce Bumper Installed On Shock Rod

(8) Install the isolator on the top of the coil spring. Isolator must be installed with the two half circle formations in the isolator facing up (Fig. 57).

(9) Install the shock absorber mounting bracket and isolators as an assembly on the rod of the shock absorber assembly (Fig. 56).

(10) Install the top washer (Fig. 55) on rod of shock absorber and position it over shock absorber mount. **Washer must be installed with the word TOP stamped into washer facing up (Fig. 55).**

WARNING: THE FOLLOWING 2 STEPS MUST BE COMPLETELY DONE BEFORE SPRING COMPRESSOR IS RELEASED FROM THE COIL SPRING.

(11) Position shock absorber upper mount on shock absorber, so studs in upper mount are in line with the bolt hole in the shock absorber clevis bracket (Fig. 66).

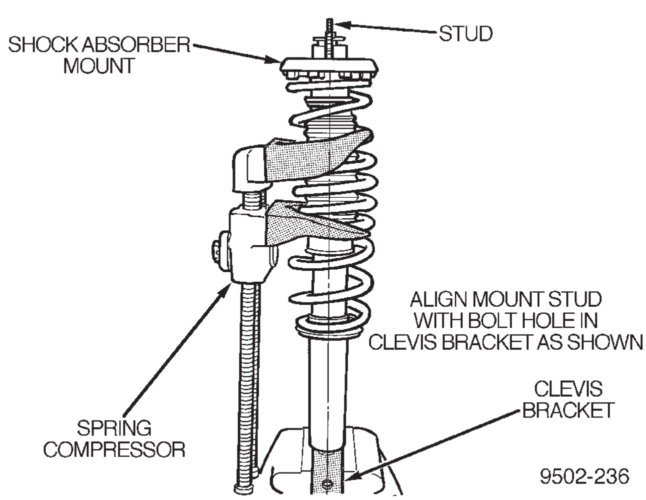


Fig. 66 Correctly Positioned Shock Absorber Upper Mount

(12) Install nut on rod of shock absorber assembly. Install Shock Absorber Socket, Snap-On A136 or an

DISASSEMBLY AND ASSEMBLY (Continued)

equivalent on end of shock rod to keep rod from turning (Fig. 54). Then tighten rod nut using a crowfoot (Fig. 54) to a torque of 55 N·m (40 ft. lbs.).

(13) Relieve all tension from spring compressor. After all spring tension has been remove from the spring compressor, remove it from the shock absorber assembly.

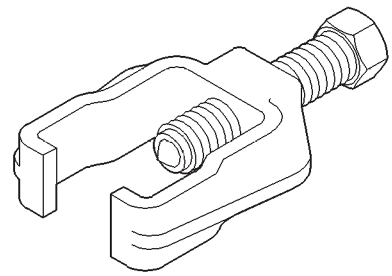
SPECIFICATIONS

REAR SUSPENSION FASTENER TORQUE SPECIFICATIONS

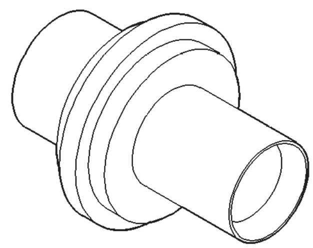
DESCRIPTION	TORQUE
Brakes	
Support Plate Mounting Bolts	61 N·m (45 ft. lbs.)
Brake Hose Mounting Bolt	45 N·m (45 ft. lbs.)
Brake Hose Bracket Bolt	23 N·m (17 ft. lbs.)
Shock Absorber	
Mounting Bracket To Body Nuts	54 N·m (40 ft. lbs.)
To Suspension Knuckle Bolt/Nut	95 N·m (70 ft. lbs.)
Rod To Upper Mount Nut	54 N·m (40 ft. lbs.)
Stabilizer Bar	
Isolator Bushing Retainer Bolt	28 N·m (20 ft. lbs.)
To Lateral Link Attaching Link Nut	35 N·m (26 ft. lbs.)
Bracket To Crossmember Bolts	28 N·m (20 ft. lbs.)
Trailing Link	
Shaft Nuts (Front And Rear)	99 N·m (73 ft. lbs.)
Bracket To Body Mounting Bolts	34 N·m (25 ft. lbs.)
Lateral Links	
To Knuckle Nuts	108 N·m (80 ft. lbs.)
Jam Nuts	65 N·m (48 ft. lbs.)
To Suspension Crossmember Nuts	108 N·m (80 ft. lbs.)
Hub And Bearing Assembly	
To Knuckle Retaining Nut	250 N·m (185 ft. lbs.)
Wheel Stud Lug Nuts	109-150 N·m (80-110 ft. lbs.)
Ball Joint	
To Knuckle Castle Nut	85 N·m (63 ft. lbs.)
Control Arm	
Pivot Bar To Crossmember	107 N·m (80 ft. lbs.)
Rear Suspension Crossmember	
To Body Attaching Bolts	108 N·m (80 ft. lbs.)

SPECIAL TOOLS

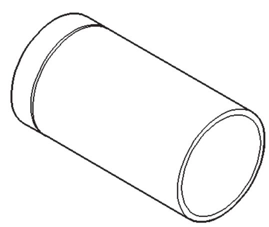
REAR SUSPENSION



Puller, Pitman Arm CT-1106



Remover, Suspension Arm Bushing And Ball Joint 6804



Installer, Ball Joint 6758

DIFFERENTIAL AND DRIVELINE

CONTENTS

GENERAL INFORMATION

FRONT DRIVESHAFTS

Vehicles equipped with either an automatic or manual transmission uses an unequal length driveshaft system.

Vehicles equipped with automatic transaxles use a solid short interconnecting shaft on the left side. The right side of the vehicle uses a longer solid interconnecting shaft.

Driveshafts used on both the right and left sides of the vehicle use a tuned rubber damper weight. The damper weight on the right side is a single clamp style damper. The damper weight on the left side is a double clamp style damper. When replacing a driveshaft, be sure the replacement driveshaft has the same damper weight as the original.

Both driveshaft assemblies use the same type of inner and outer joints. The inner joint of both driveshaft assemblies is a tripod joint, and the outer joint of both driveshaft assemblies is a Rzeppa joint. Both tripod joints and Rzeppa joints are true constant velocity (C/V) joint assemblies. The inner tripod joint allows for the changes in driveshaft length through the jounce and rebound travel of the front suspension.

On vehicles equipped with ABS brakes, the outer C/V joint is equipped with a tone wheel used to determine vehicle speed for ABS brake operation.

The inner tripod joint of both driveshafts is splined into the transaxle side gears. The inner tripod joints are retained in the side gears of the transaxle using a snap ring located in the stub shaft of the tripod joint. The outer C/V joint has a stub shaft that is splined into the wheel hub and retained by a hub nut using a nut lock and cotter pin, hub nut retention system.

NOTE: This vehicle does not use a rubber lip bearing seal as on past front wheel drive cars, to prevent contamination of the front wheel bearing. On these vehicles, the face of the outer C/V joint has a metal bearing shield which is pressed onto the end of the outer C/V joint housing. This design deters direct water splash on bearing seal while allowing any water that gets in, to run out the bottom of the bearing shield. It is important though to thoroughly clean the outer C/V joint and the wheel bearing area in the steering knuckle before it is assembled after servicing.

FRONT DRIVESHAFT IDENTIFICATION

Driveshafts and driveshaft inner and outer boots can be identified as shown in (Fig. 1). Driveshaft boot location on the driveshaft assemblies, is determined by the number of convolutes used on the driveshaft boot. Refer to (Fig. 1) for the correct location of the sealing boots.

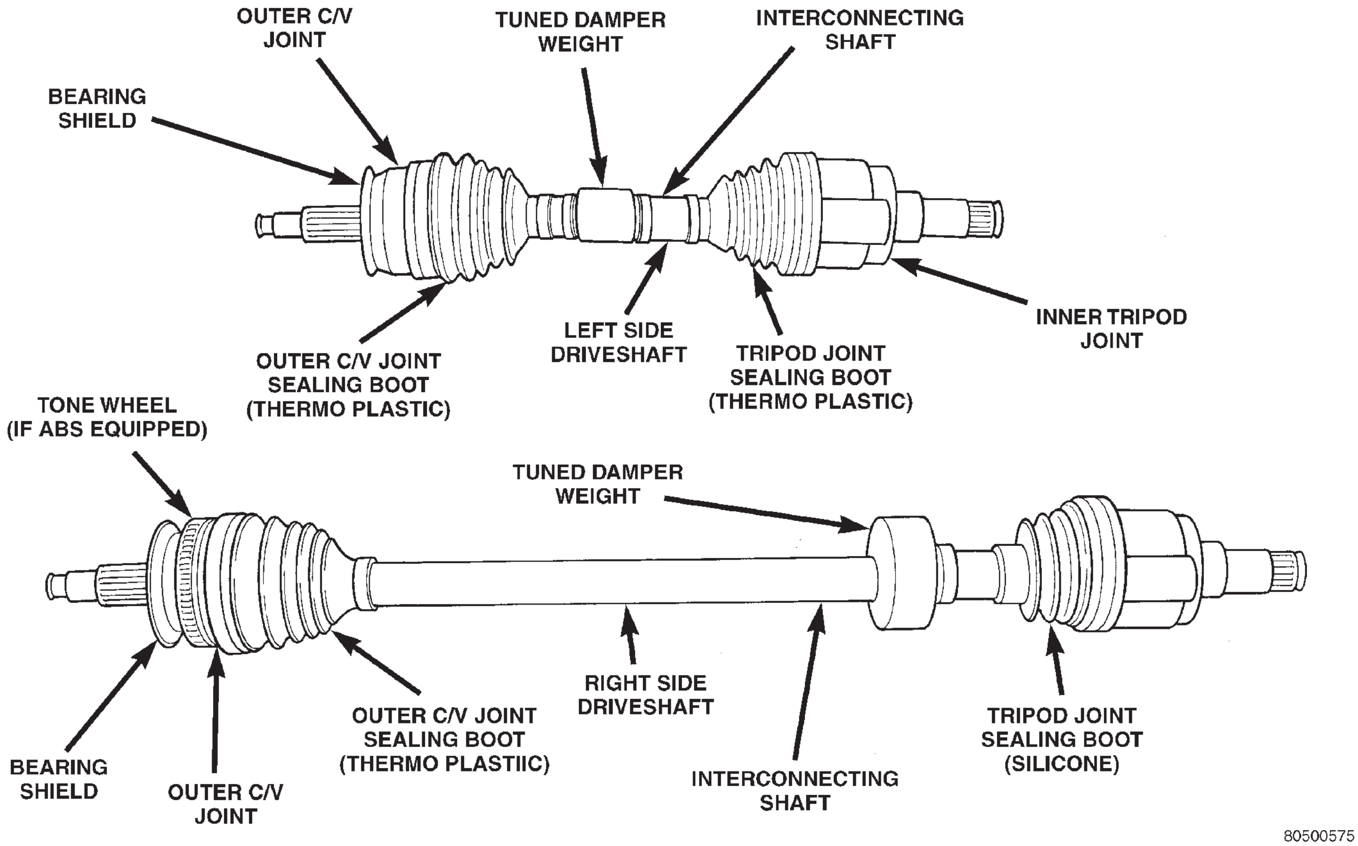


Fig. 1 Driveshaft Identification

DESCRIPTION AND OPERATION

DRIVESHAFT SERVICE

CAUTION: The outer C/V joint used on this vehicle uses a new design for retaining the cross to the interconnecting shaft. These driveshafts incorporate a slight twist (helical) in the spline on the interconnecting shaft where the cross is installed. This twist causes a interference fit between the interconnecting shaft and the cross when the outer C/V joint is installed on the interconnecting shaft. This design eliminates the clearance between the cross and the interconnecting shaft resulting in quieter operation of the driveshaft assembly. This design though, eliminated the capability of removing the outer C/V joint from the interconnecting shaft. For this reason the driveshafts will be serviced as a quarter shaft (outer C/V joint/sealing boot, interconnecting shaft and vibration damper) in the event of a outer C/V joint boot failure. The inner joint sealing boot will be serviced, as on past applications, as a separate component of the driveshaft assembly.

CAUTION: Boot sealing is vital to retain special lubricants and to prevent foreign contaminants from entering the C/V joint. Mishandling, such as allowing the assemblies to dangle unsupported, or pulling or pushing the ends, can cut boots or damage C/V joints. During removal and installation procedures, always support both ends of the driveshaft to prevent damage.

DIAGNOSIS AND TESTING

DRIVESHAFT DIAGNOSIS

VEHICLE INSPECTION

(1) Check for grease in the vicinity of the inboard tripod joint and outboard C/V joint; this is a sign of inner or outer joint seal boot or seal boot clamp damage.

(2) A light film of grease may appear on the right inner tripod joint seal boot; this is considered normal and should not require replacement of the seal boot.

NOISE AND/OR VIBRATION IN TURNS

A clicking noise and/or a vibration in turns could be caused by one of the following conditions:

DIAGNOSIS AND TESTING (Continued)

(1) Damaged outer C/V or inner tripod joint seal boot or seal boot clamps. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.

(2) Noise may also be caused by another component of the vehicle coming in contact with the driveshafts.

CLUNKING NOISE DURING ACCELERATION

This noise may be a result of one of the following conditions:

(1) A torn seal boot on the inner or outer joint of the driveshaft assembly.

(2) A loose or missing clamp on the inner or outer joint of the driveshaft assembly.

(3) A damaged or worn driveshaft C/V joint.

SHUDDER OR VIBRATION DURING ACCELERATION

This problem could be a result of:

(1) A worn or damaged driveshaft inner tripod joint.

(2) A sticking tripod joint spider assembly (inner tripod joint only).

(3) Improper wheel alignment. See Wheel Alignment in this group for alignment checking and setting procedures and specifications.

VIBRATION AT HIGHWAY SPEEDS

This problem could be a result of:

(1) Foreign material (mud, etc.) packed on the backside of the wheel(s).

(2) Out of balance front tires or wheels. See Group 22, Wheels And Tires for the required balancing procedure.

(3) Improper tire and/or wheel runout. See Group 22, Wheels And Tires for the required runout checking procedure.

REMOVAL AND INSTALLATION

FRONT DRIVESHAFTS

REMOVAL

CAUTION: The driveshaft, when installed, acts as a bolt and secures the front hub/bearing assembly. If vehicle is to be supported or moved on its wheels with a driveshaft removed, install a PROPER–SIZED BOLT AND NUT through front hub. Tighten bolt and nut to 244 N·m (180 ft. lbs.). This will ensure that the hub bearing cannot loosen.

(1) Remove cotter pin, nut lock, and spring washer from the end of the outer C/V joint stub axle (Fig. 2).

(2) Loosen (but do not remove) stub axle to hub/bearing retaining nut. Loosen hub nut while vehicle is on the floor with the brakes applied (Fig. 3). The front hub and driveshaft are splined together and retained by the hub nut.

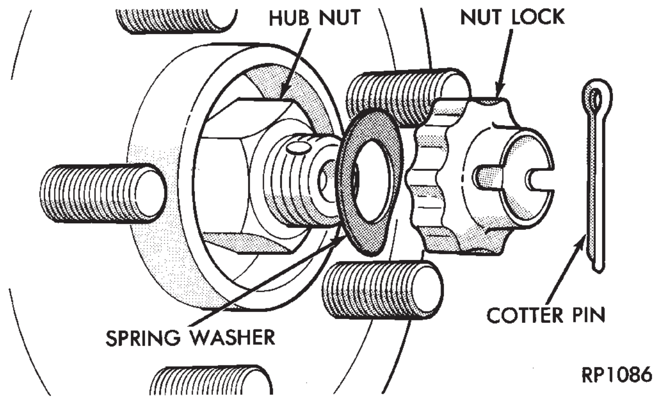


Fig. 2 Cotter Pin, Nut Lock and Spring Washer

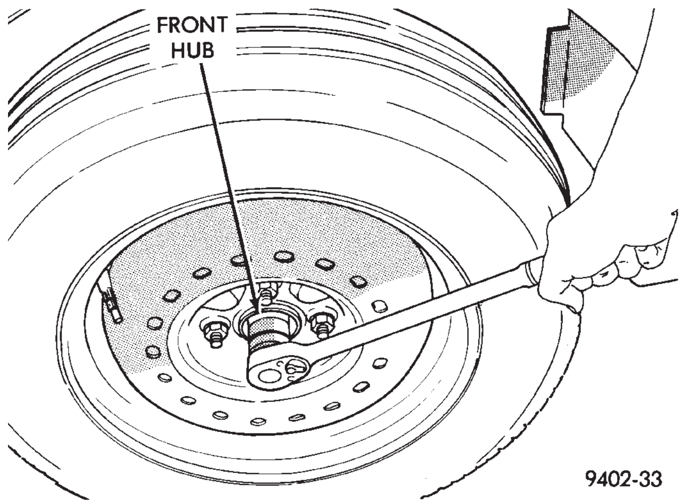


Fig. 3 Loosening Front Hub Retaining Nut

(3) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting, in the Lubrication and Maintenance section, for required lifting procedure to be used for this vehicle.

(4) Remove front tire and wheel assembly from the hub.

(5) Remove front disc brake caliper assembly to steering knuckle guide pin attaching bolts (Fig. 4).

(6) Remove disc brake caliper assembly from steering knuckle. Caliper is removed by first lifting bottom of caliper away from steering knuckle, and then removing top of caliper out from under steering knuckle (Fig. 5).

(7) Support brake caliper/adapter assembly using a wire hook (Fig. 6). **Do not support assembly by the brake flex hose.**

(8) Remove braking disc from front hub.

(9) Remove nut attaching outer tie rod end to steering knuckle. **Remove nut from tie rod end by holding tie rod end stud with a 11/32 socket and loosen and remove nut (Fig. 7).**

REMOVAL AND INSTALLATION (Continued)

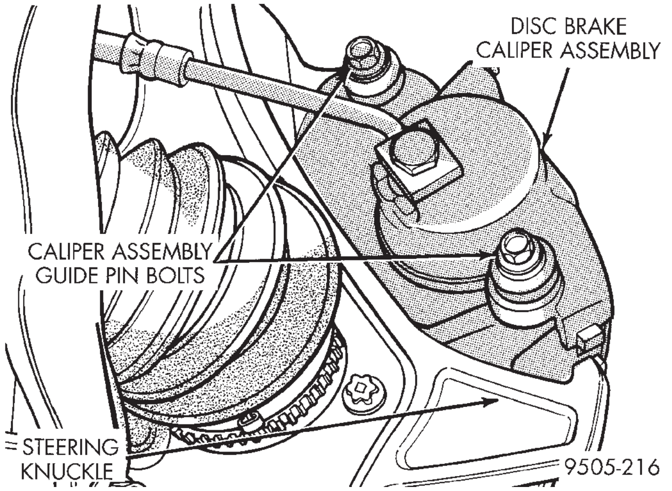


Fig. 4 Caliper Guide Pin Attaching Bolts

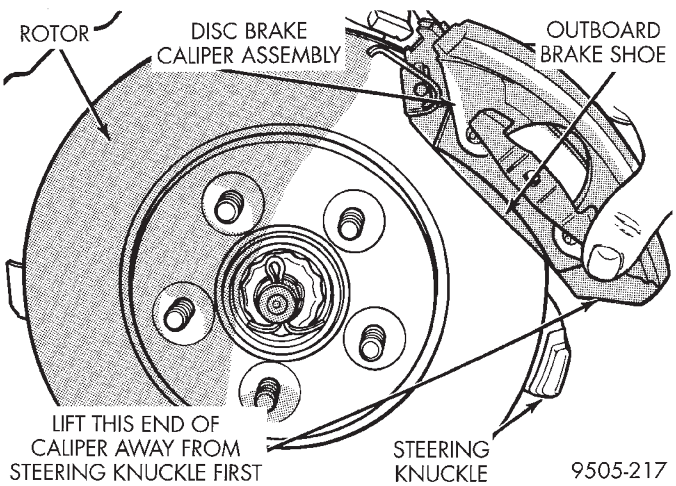


Fig. 5 Removing Disc Brake Caliper

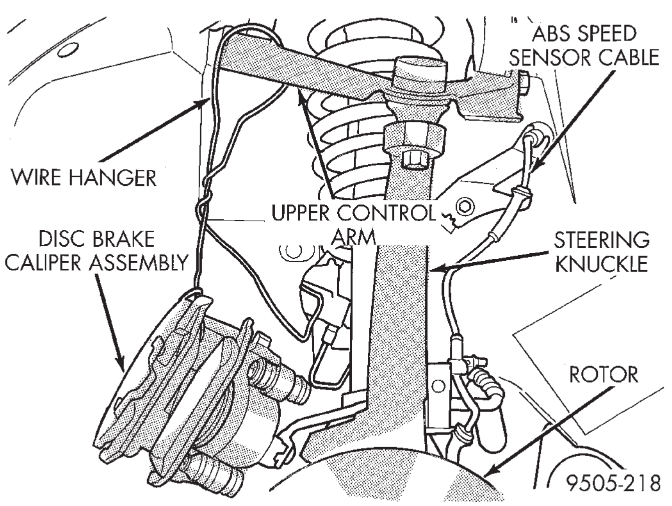


Fig. 6 Correctly Supported Brake Caliper

(10) Remove the tie rod end stud from steering knuckle arm, using remover, Special Tool MB-991113 (Fig. 8).

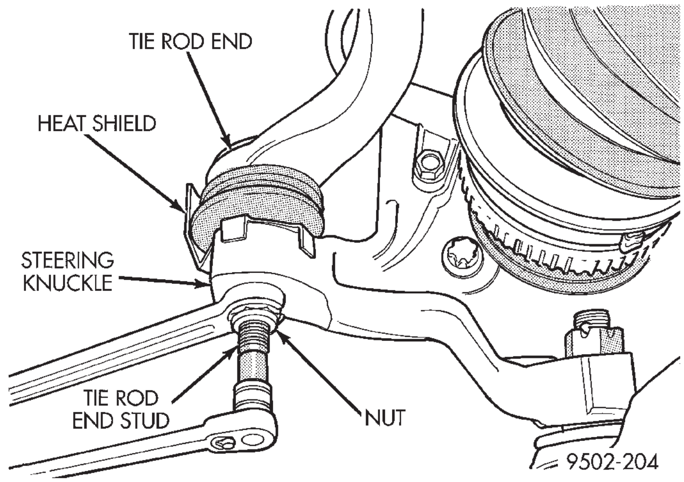


Fig. 7 Removing Tie Rod End Attaching Nut

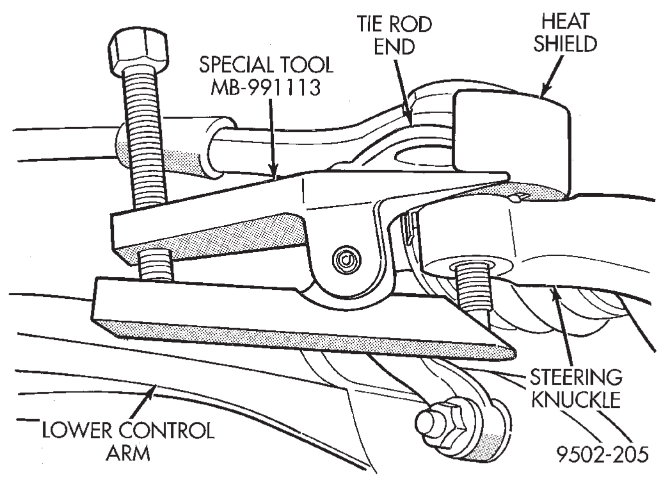


Fig. 8 Tie Rod End Removal from Steering Knuckle

(11) If equipped with antilock brakes, remove the speed sensor cable routing bracket from the steering knuckle (Fig. 9).

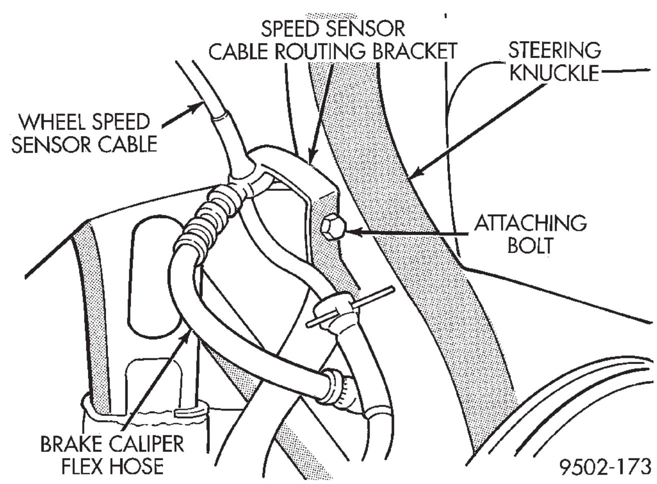


Fig. 9 Wheel Speed Sensor Cable Routing Bracket

REMOVAL AND INSTALLATION (Continued)

(12) Remove cotter pin and castle nut (Fig. 10) from stud of lower ball joint at the steering knuckle.

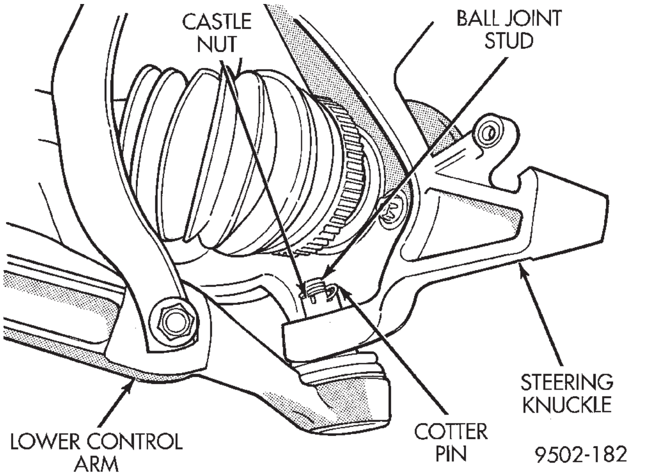


Fig. 10 Lower Ball Joint to Steering Knuckle Attachment

CAUTION: No tool is to be inserted between the steering knuckle and the lower ball joint to separate stud of lower ball joint from the steering knuckle. The steering knuckle is to be separated from the stud of the ball joint only using the procedure as described in Step 13.

(13) Turn steering knuckle so the front of the steering knuckle is facing as far outboard in the wheel well as possible. Using a hammer strike steering knuckle boss until steering knuckle separates from stud of lower ball joint (Fig. 11). **When striking steering knuckle, care MUST be taken not to hit lower control arm or ball joint grease seal.**

NOTE: Care must be taken not to separate the inner C/V joint during this operation. Do not allow driveshaft to hang by inner C/V joint. Driveshaft must be supported.

(14) Pull steering knuckle assembly out and away from outer C/V joint of the driveshaft assembly (Fig. 12).

CAUTION: When inserting pry bar between inner tripod joint and transaxle case, care must be used to ensure no damage occurs to oil seal in transaxle case.

(15) Support the outer end of the driveshaft assembly. Insert a pry bar between inner tripod joint and transaxle case (Fig. 13). Pry against inner tripod joint, until tripod joint retaining snap ring is disengaged from transaxle side gear.

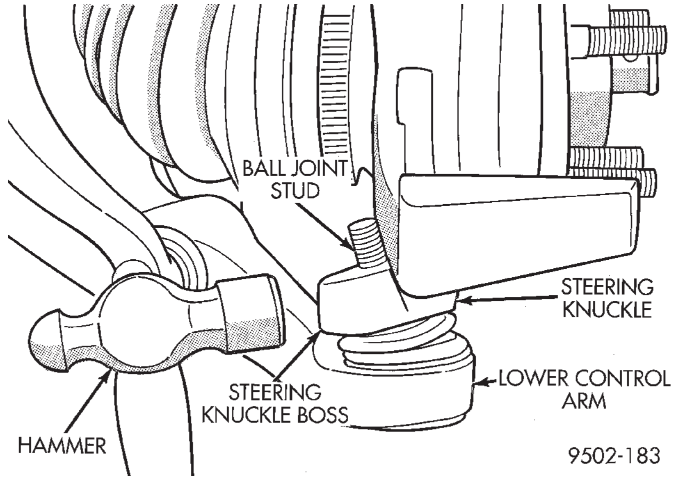


Fig. 11 Separating Ball Joint Stud from Steering Knuckle

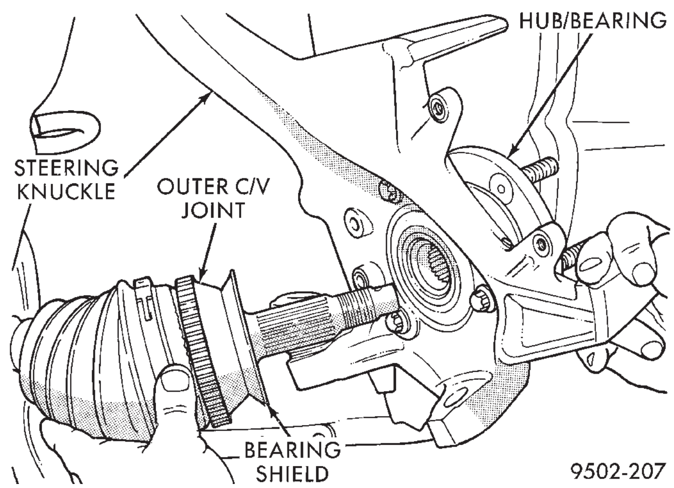


Fig. 12 Separating Steering Knuckle from Outer C/V Joint

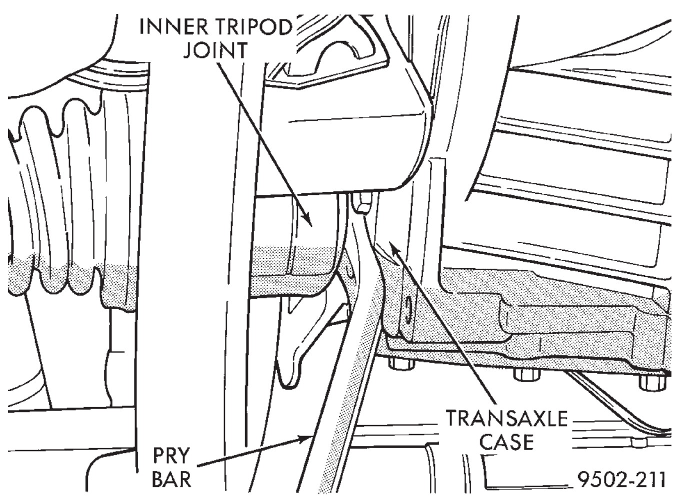


Fig. 13 Disengaging Inner Tripod Joint From Transaxle

REMOVAL AND INSTALLATION (Continued)

(16) Hold inner tripod joint and interconnecting shaft of driveshaft assembly. Remove inner tripod joint from transaxle, by pulling it straight out of transaxle side gear and transaxle oil seal (Fig. 14). **When removing tripod joint, do not let spline or snap ring drag across sealing lip of the transaxle to tripod joint oil seal.**

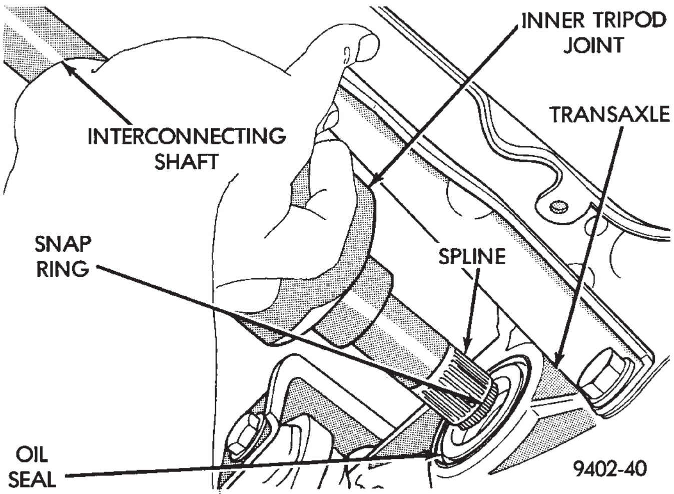


Fig. 14 Tripod Joint Removal from Transaxle

CAUTION: The driveshaft, when installed, acts as a bolt and secures the front hub/bearing assembly. If vehicle is to be supported or moved on its wheels with a driveshaft removed, install a PROPER–SIZED BOLT AND NUT through front hub. Tighten bolt and nut to 183 N·m (135 ft. lbs.). This will ensure that the hub bearing cannot loosen.

INSTALLATION

(1) Thoroughly clean spline and oil seal sealing surface, on tripod joint. Lightly lubricate oil seal sealing surface on tripod joint with fresh clean transmission lubricant.

(2) Holding driveshaft assembly by tripod joint and interconnecting shaft, install tripod joint into transaxle side gear as far as possible by hand (Fig. 14).

(3) Grasp inner tripod joint an interconnecting shaft. Forcefully push the tripod joint into side gear of transaxle, until snap ring is engaged with transaxle side gear. **Test that snap ring is fully engaged with side gear by attempting to remove tripod joint from transaxle by hand. If snap ring is fully engaged with side gear, tripod joint will not be removable by hand.**

(4) Clean all debris and moisture out of steering knuckle, in the area were outer C/V joint will be installed into steering knuckle.

(5) Ensure that front of outer C/V joint which fits against the face of the hub and bearing is free of debris and moisture before installing outer C/V joint into hub and bearing assembly (Fig. 15).

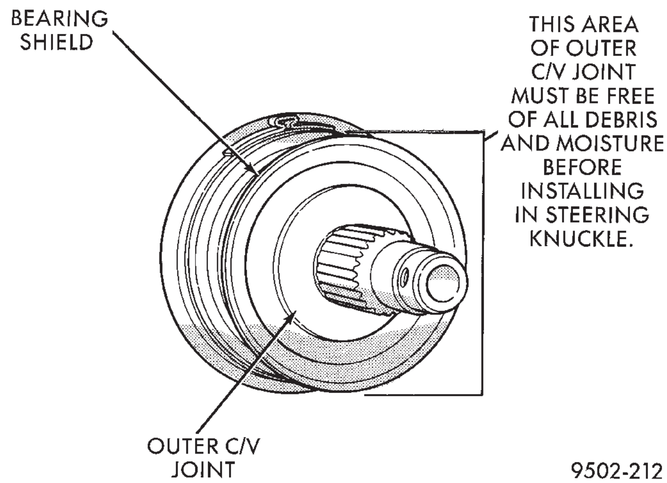


Fig. 15 Outer C/V Joint Inspection

(6) Slide driveshaft back into front hub (Fig. 16). Then install steering knuckle onto the lower control arm ball joint stud.

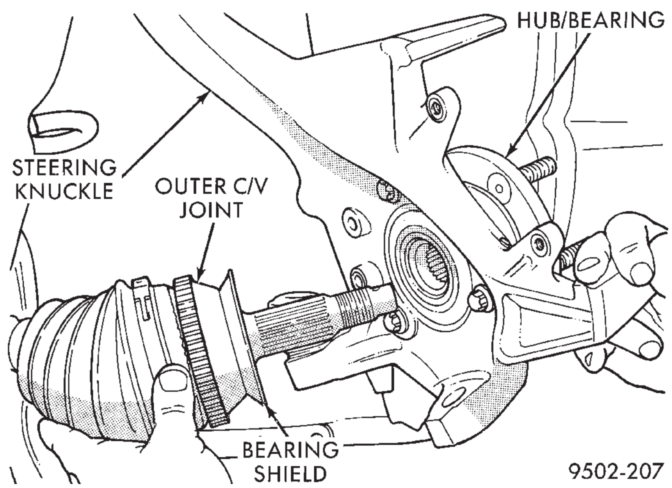


Fig. 16 Steering Knuckle Installation on Outer C/V Joint

(7) Install the steering knuckle to ball joint stud castle nut (Fig. 17). Tighten the castle nut to 95 N·m (70 ft. lbs.).

(8) If equipped with antilock brakes, install the speed sensor cable on the steering knuckle and securely tighten bolt (Fig. 18).

(9) Install tie rod end into the steering knuckle. Start tie rod end to steering knuckle nut onto stud of tie rod end. While holding stud of tie rod end stationary (Fig. 19), tighten tie rod end to steering knuckle nut. Using a crowfoot and 11/32 socket, tighten the nut to 61 N·m (45 ft. lbs.) (Fig. 20).

(10) Install braking disc back on hub and bearing assembly.

(11) Install disc brake caliper assembly on steering knuckle. Caliper is installed by first sliding top of caliper under top abutment on steering knuckle.

REMOVAL AND INSTALLATION (Continued)

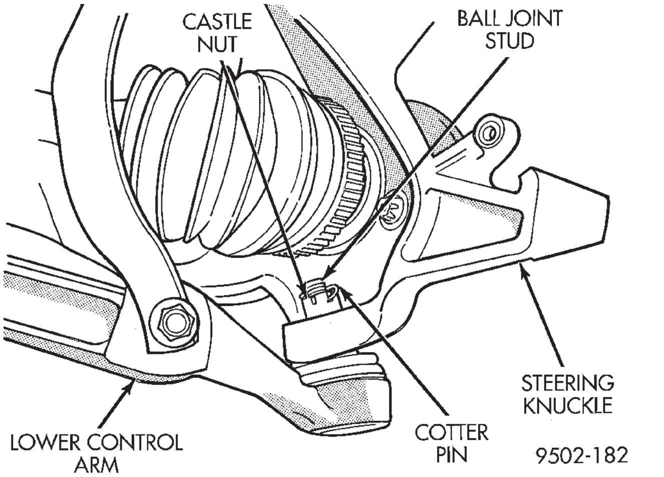


Fig. 17 Lower Ball Joint to Steering Knuckle Attachment

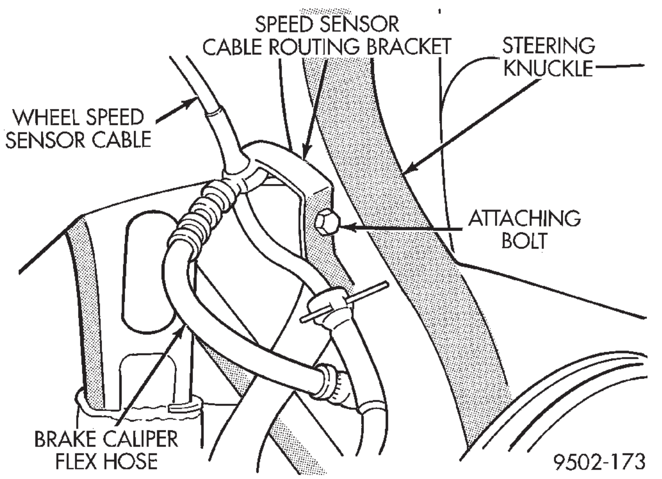


Fig. 18 Wheel Speed Sensor Cable Routing Bracket

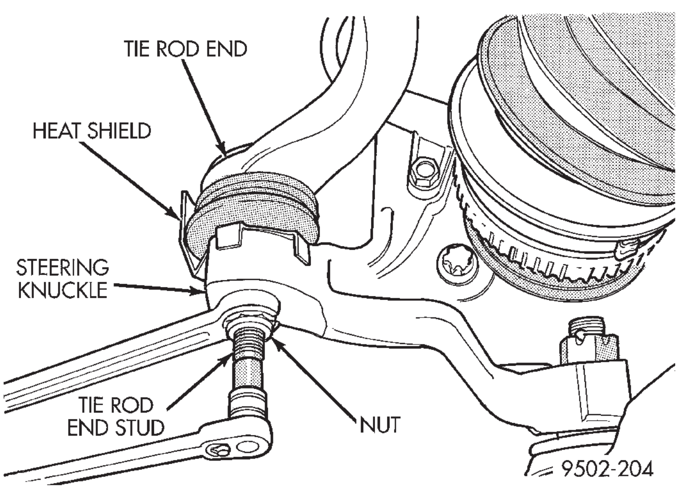


Fig. 19 Installing Tie Rod End Nut

Then installing bottom of caliper against bottom abutment of steering knuckle (Fig. 21).

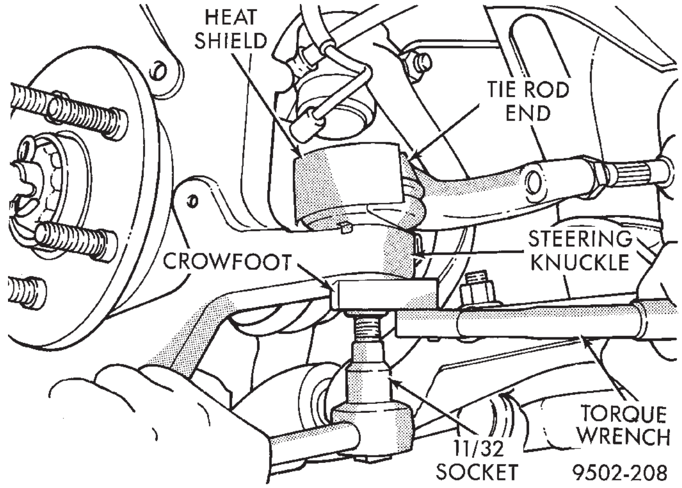


Fig. 20 Torquing Tie Rod End Nut

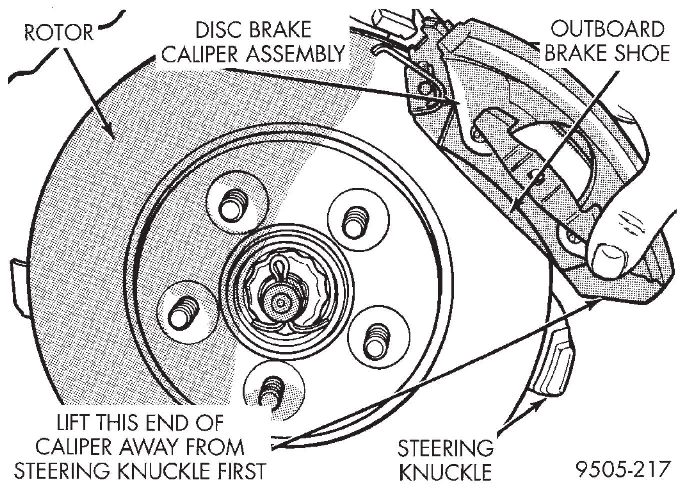


Fig. 21 Disc Brake Caliper Assembly Installation

(12) Install caliper assembly to steering knuckle guide pin bolts (Fig. 22). Tighten caliper assembly bolts to 31 N·m (23 ft. lbs.).

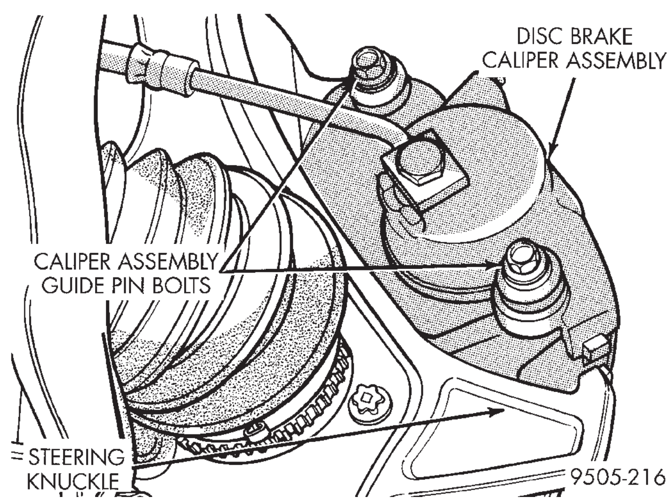


Fig. 22 Disc Brake Caliper Bolts

REMOVAL AND INSTALLATION (Continued)

(13) Clean all foreign matter from the threads of the outer C/V joint stub axle. Install hub nut onto threads of stub axle and tighten nut. (Fig. 23).

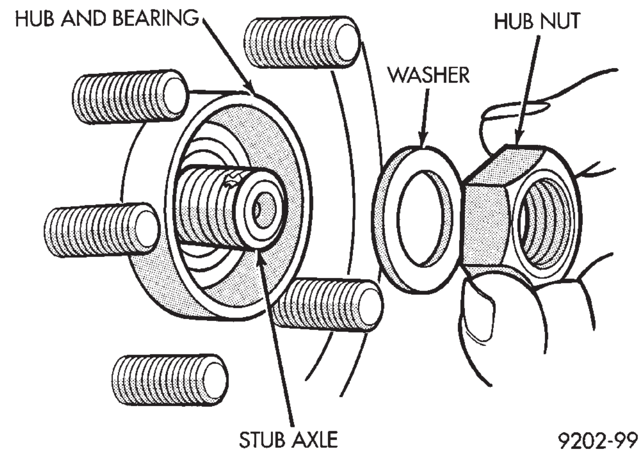


Fig. 23 Install Washer and Hub Nut

(14) With vehicle brakes applied to keep braking disc from turning, tighten hub nut to 244 N·m (180 ft. lbs.) (Fig. 24).

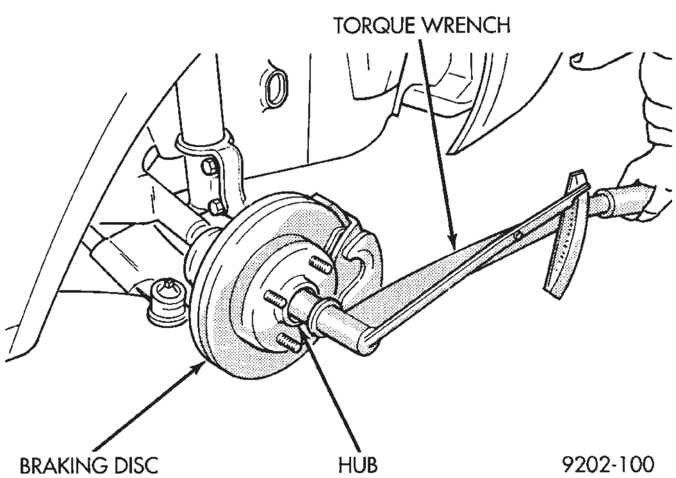


Fig. 24 Torquing Front Hub Nut

(15) Install the spring washer, hub nut lock, and new cotter pin on end of stub axle. Wrap cotter pin prongs tightly around the hub nut lock (Fig. 25).

(16) Install front wheel and tire assembly. Install front wheel lug nuts and tighten in the correct sequence (Fig. 26). Tighten lug nuts to 135 N·m (100 ft. lbs.).

(17) Lower vehicle.

(18) Check for correct fluid level in transaxle assembly. Refer to Group 21, Transaxle for the correct fluid level checking procedure for the type of transaxle being checked.

(19) Set front toe on vehicle to required specification.

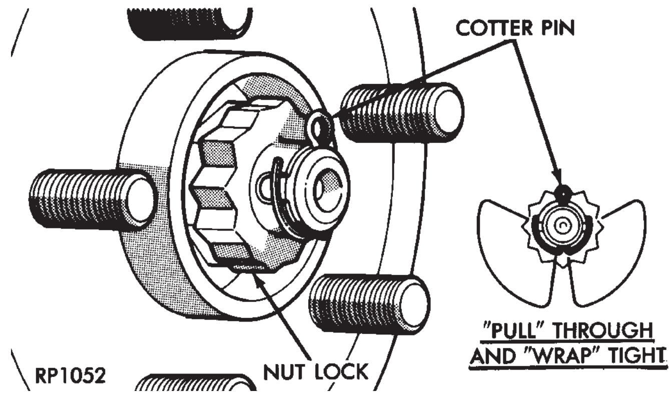


Fig. 25 Spring Washer, Nut Lock and Cotter Pin Installation

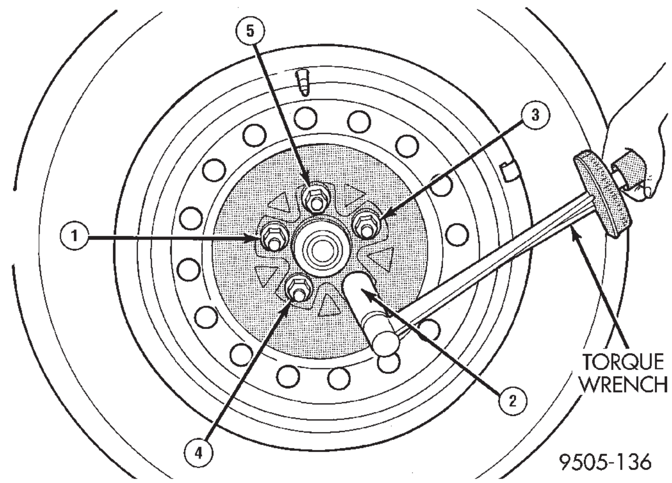


Fig. 26 Wheel Lug Torquing Sequence

DISASSEMBLY AND ASSEMBLY

DRIVESHAFT RECONDITIONING PROCEDURE

CAUTION: The outer C/V joint used on this vehicle uses a new design for retaining the cross to the interconnecting shaft. These driveshafts incorporate a slight twist (helical) in the spline on the interconnecting shaft where the cross is installed. This twist causes a interference fit between the interconnecting shaft and the cross when the outer C/V joint is installed on the interconnecting shaft. This design eliminates the clearance between the cross and the interconnecting shaft resulting in quieter operation of the driveshaft assembly. This design though eliminated the capability of removing the outer C/V joint from the interconnecting shaft. For this reason the driveshafts will be serviced as a quarter shaft (outer C/V joint/sealing boot, interconnecting shaft and vibration damper) in the event of a outer C/V joint boot failure.

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: The only service which is to be performed on the driveshaft assemblies is the replacement of the driveshaft seal boots on the inner tripod joints.

If any failure of internal driveshaft components is diagnosed during a vehicle road test or disassembly of the driveshaft, the driveshaft will need to be replaced as an assembly.

CAUTION: Lubricant requirements and quantities are different for inner joints than for outer joints. Use only the recommended lubricants in the required quantities when servicing driveshaft assemblies.

INNER TRIPOD JOINT SEAL BOOT

REMOVAL

To remove sealing boots from driveshafts, the driveshaft assemblies must be removed from the vehicle. See Servicing Driveshaft for the required driveshaft removal and replacement procedure.

The inner tripod joints use no internal retention in the tripod housing to keep the spider assembly in the housing. Therefore, do not pull on the interconnecting shaft to disengage tripod housing from transmission stub shaft. Removal in this manner will cause damage to the inboard joint sealing boots.

(1) Remove the driveshaft requiring boot replacement from the vehicle. See Servicing Driveshaft for the required driveshaft removal procedure.

(2) Remove large boot clamp which retains inner tripod joint sealing boot to tripod joint housing and discard. Remove small clamp which retains inner tripod joint sealing boot to interconnecting shaft and discard. Remove the sealing boot from the tripod housing and slide it down the interconnecting shaft.

CAUTION: When removing the tripod joint housing from the spider assembly, hold the bearings in place on the spider trunions to prevent the bearings from falling away.

(3) Slide the tripod joint housing off the spider assembly and the interconnecting shaft (Fig. 27).

(4) Remove snap ring which retains spider assembly to interconnecting shaft (Fig. 28). Remove the spider assembly from interconnecting shaft. If spider assembly will not come off interconnecting shaft by hand, it can be removed by tapping spider assembly with a brass drift (Fig. 29). **Do not hit the outer tripod bearings in an attempt to remove spider assembly from interconnecting shaft.**

(5) Slide sealing boot off interconnecting shaft.

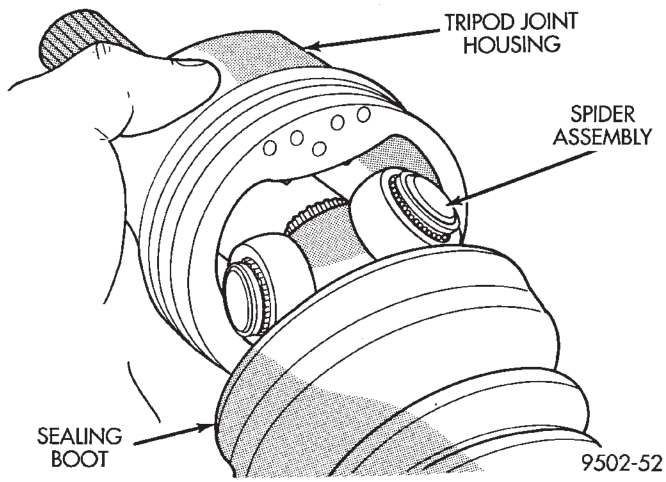


Fig. 27 Spider Assembly Removal from Tripod Joint Housing

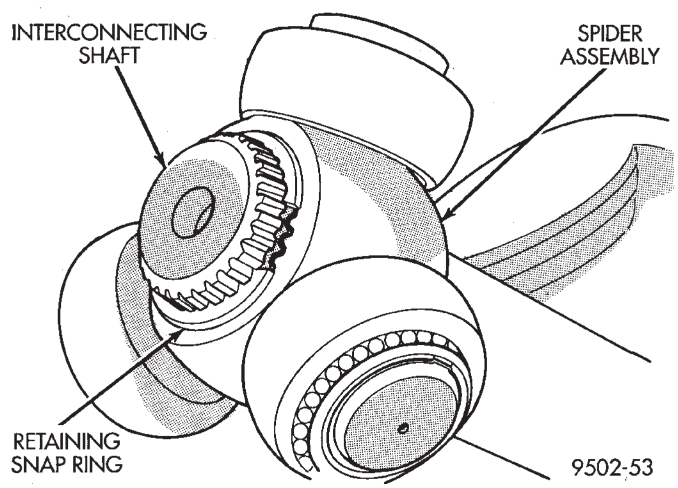


Fig. 28 Spider Assembly Retaining Snap Ring

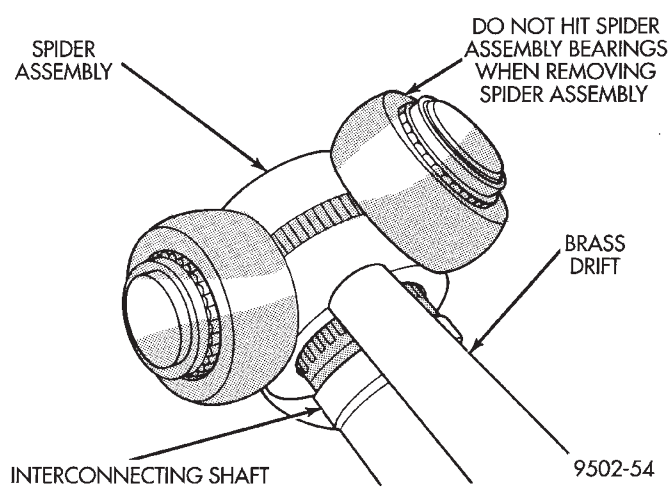


Fig. 29 Spider Assembly Removal from Interconnecting Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Thoroughly clean and inspect spider assembly, tripod joint housing, and interconnecting shaft for any signs of excessive wear. **If any parts show signs of excessive wear, the driveshaft assembly will require replacement. Component parts of these driveshaft assemblies are not serviceable.**

INSTALLATION

NOTE: The inner tripod joint sealing boots are made from two different types of material. High temperature applications use silicone rubber where as standard temperature applications use hytrel plastic. The silicone sealing boots are soft and pliable. The Hytrel sealing boots are stiff and rigid. The replacement sealing boot MUST BE the same type of material as the sealing boot which was removed.

(1) Slide inner tripod joint seal boot retaining clamp, onto interconnecting shaft. Then, slide the replacement inner tripod joint sealing boot onto the interconnecting shaft. **Inner tripod joint seal boot MUST be positioned on interconnecting shaft, so the raised bead on the inside of the seal boot is in groove on interconnecting shaft (Fig. 30).**

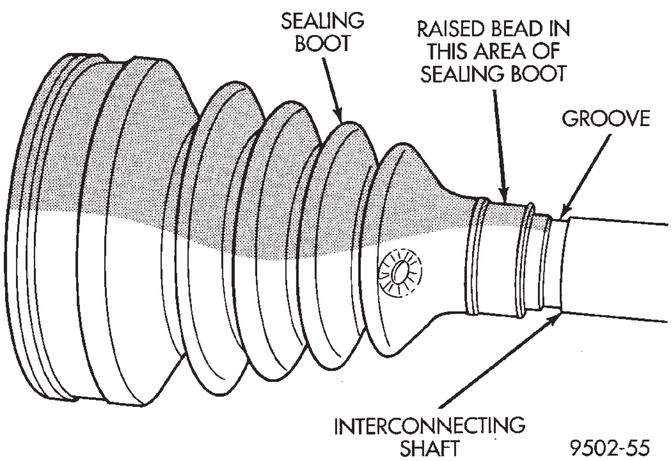


Fig. 30 Sealing Boot Installation on Interconnecting Shaft

(2) Install spider assembly onto interconnecting shaft (Fig. 31). Spider assembly must be installed on interconnecting shaft far enough to fully install spider retaining snap ring. If spider assembly will not fully install on interconnecting shaft by hand, it can be installed by tapping the spider body with a brass drift (Fig. 32). **Do not hit the outer tripod bearings in an attempt to install spider assembly on interconnecting shaft.**

(3) Install the spider assembly to interconnecting shaft retaining snap ring into groove on end of interconnecting shaft (Fig. 33). Be sure the snap ring is fully seated into groove on interconnecting shaft.

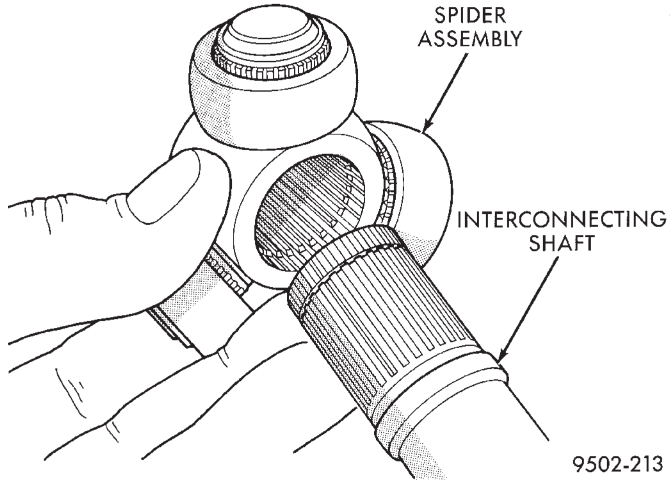


Fig. 31 Spider Assembly Installation on Interconnecting Shaft

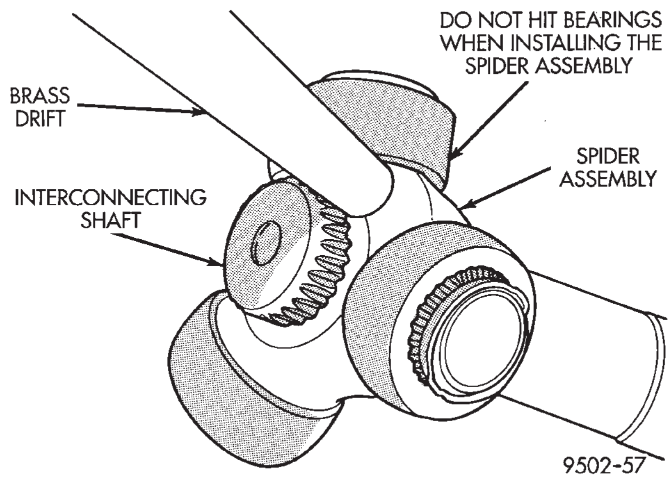


Fig. 32 Installing Spider Assembly on Interconnecting Shaft

(4) Distribute 1/2 the amount of grease provided in the seal boot service package (DO NOT USE ANY OTHER TYPE OF GREASE) into tripod housing. Put the remaining amount into the sealing boot.

(5) Align tripod housing with spider assembly and then slide tripod housing over spider assembly and interconnecting shaft (Fig. 34).

(6) Install inner tripod joint seal boot to interconnecting shaft clamp evenly on sealing boot.

(7) Clamp sealing boot onto interconnecting shaft using crimper, Special Tool C-4975-A and the following procedure. Place crimping tool C- 4975-A over bridge of clamp (Fig. 35). Tighten nut on crimping tool C- 4975-A until jaws on tool are closed completely together, face to face (Fig. 36).

DISASSEMBLY AND ASSEMBLY (Continued)

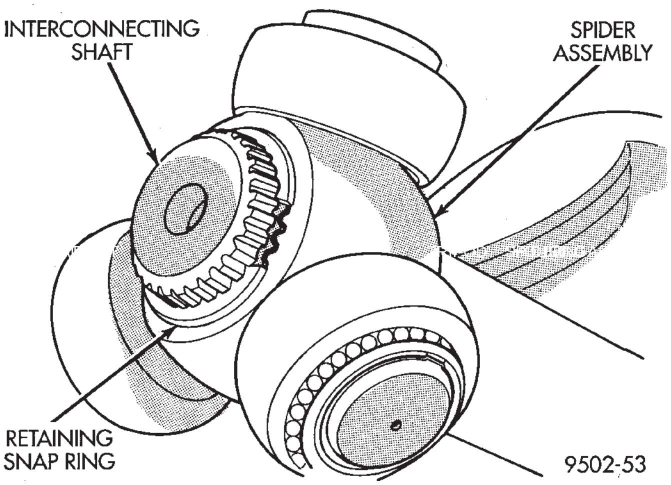


Fig. 33 Spider Assembly Retaining Snap Ring Installed

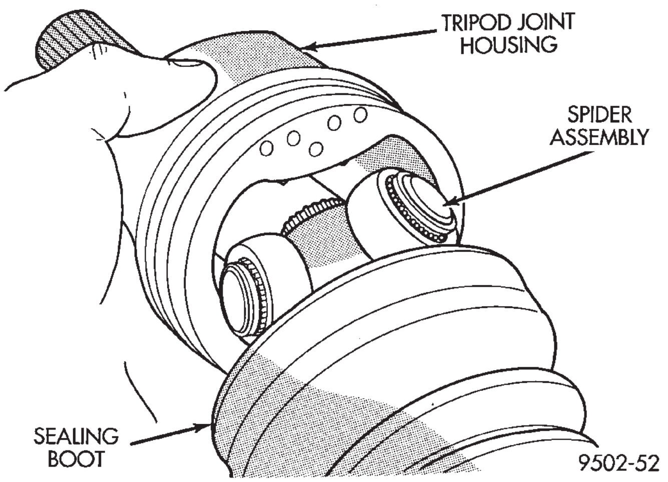


Fig. 34 Installing Tripod Housing on Spider Assembly

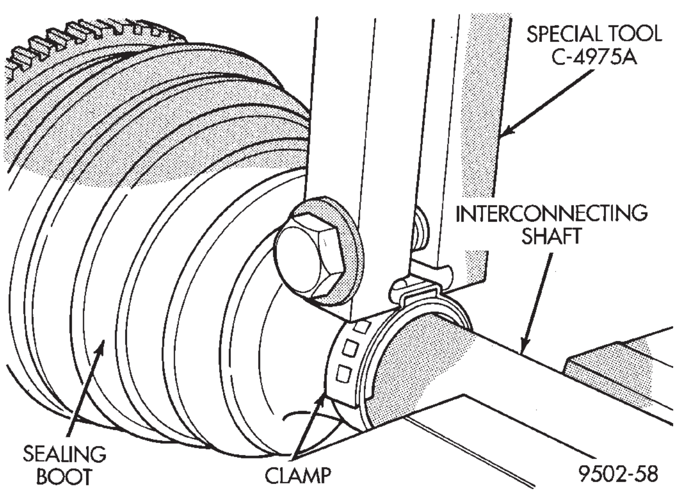


Fig. 35 Crimping Tool Installed on Sealing Boot Clamp

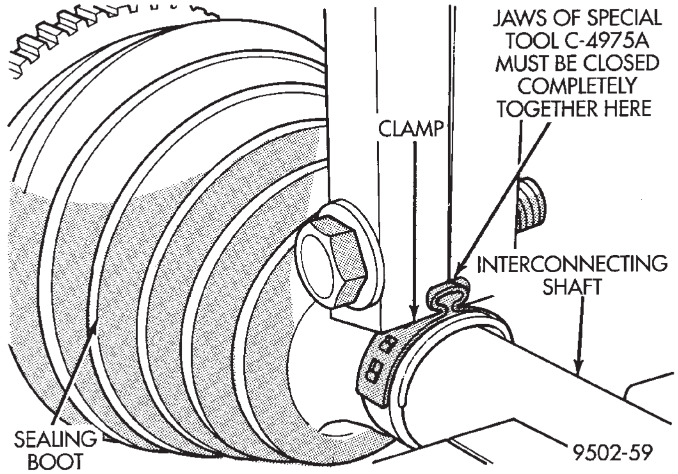


Fig. 36 Sealing Boot Retaining Clamp Installed

CAUTION: Seal must not be dimpled, stretched or out of shape in any way. If seal is NOT shaped correctly, equalize pressure in seal and shape it by hand.

(8) Position sealing boot into the tripod housing retaining groove. Install seal boot retaining clamp evenly on sealing boot.

CAUTION: The following positioning procedure determines the correct air pressure inside the inner tripod joint assembly prior to clamping the sealing boot to inner tripod joint housing. If this procedure is not done prior to clamping sealing boot to tripod joint housing sealing boot durability can be adversely affected.

CAUTION: When venting the inner tripod joint assembly, use care so inner tripod sealing boot does not get punctured, or in any other way damaged. If sealing boot is punctured, or damaged in any way while being vented, the sealing boot can not be used.

(9) Insert a trim stick between the tripod joint and the sealing boot to vent inner tripod joint assembly (Fig. 37). **When inserting trim stick between tripod housing and sealing boot ensure trim stick is held flat and firmly against the tripod housing. If this is not done damage to the sealing boot can occur.** If inner tripod joint has a Hytrel (hard plastic) sealing boot, be sure trim stick is inserted between soft rubber insert and tripod housing not the hard plastic sealing boot and soft rubber insert.

(10) With trim stick inserted between sealing boot and tripod joint housing, position the interconnecting shaft so it is at the center of its travel in the tripod joint housing. Remove the trim stick from between

DISASSEMBLY AND ASSEMBLY (Continued)

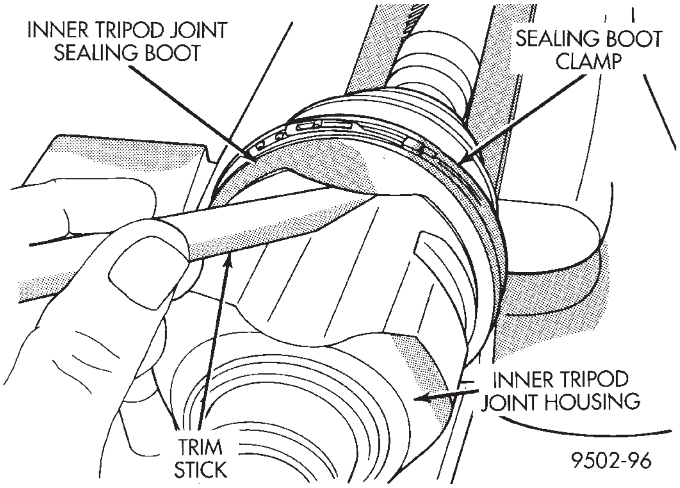


Fig. 37 Trim Stick Inserted for Venting Tripod Joint

the sealing boot and the tripod joint housing. **This procedure will equalize the air pressure in the tripod joint, preventing premature sealing boot failure.**

(11) Position trilobal boot to interface with the tripod housing. The lobes of the boot must be properly aligned with the recess's of the tripod housing.

(12) Clamp tripod joint sealing boot to tripod joint, using required procedure for type of boot clamp application.

CRIMP TYPE BOOT CLAMP

If seal boot uses crimp type boot clamp:

• Clamp sealing boot onto tripod housing using Crimper, Special Tool C-4975-A.

• Place crimping tool C- 4975-A over bridge of clamp (Fig. 38).

• Tighten nut on crimping tool C- 4975-A until jaws on tool are closed completely together, face to face (Fig. 39).

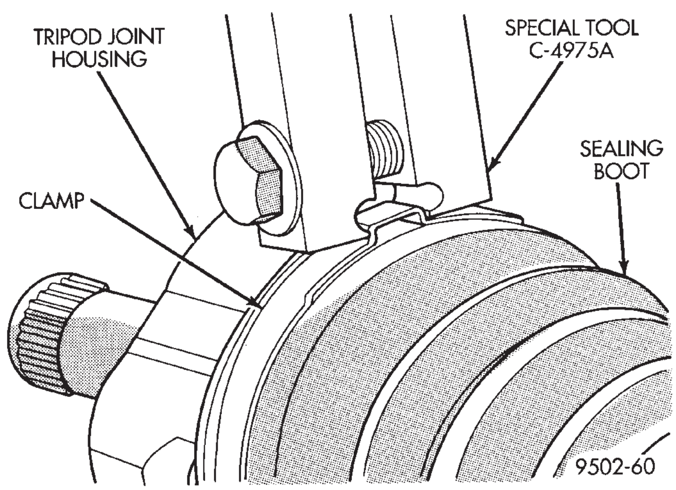


Fig. 38 Crimping Tool Installed on Sealing Boot Clamp

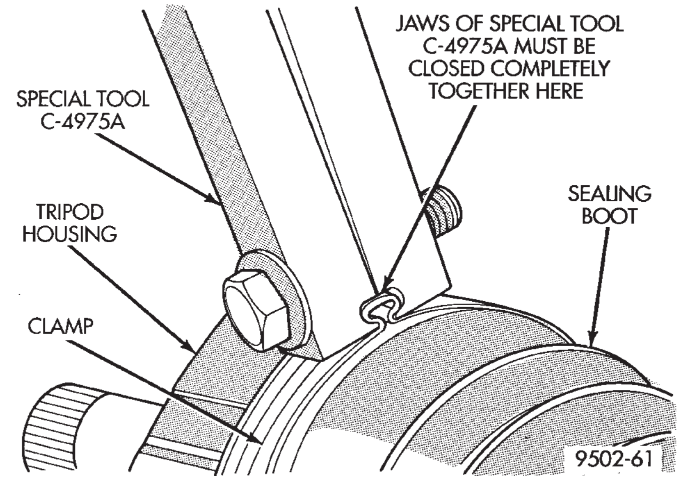


Fig. 39 Sealing Boot Retaining Clamp Installed

LATCHING TYPE BOOT CLAMP

If seal boot uses low profile latching type boot clamp:

• Clamp sealing boot onto tripod housing using clamp locking tool, Snap-On YA3050 or an equivalent.

• Place prongs of clamp locking tool in the holes of the clamp (Fig. 40).

• Squeeze tool together until top band of clamp is latched behind the two tabs on lower band of clamp (Fig. 41).

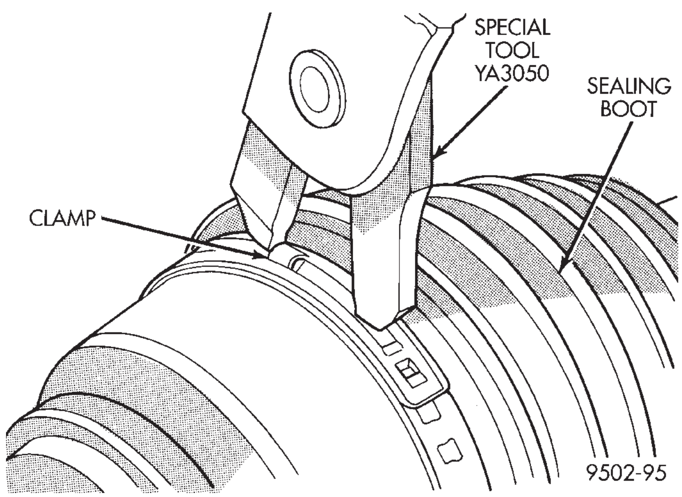


Fig. 40 Clamping Tool Installed on Sealing Boot Clamp

(1) Install the driveshaft back on the vehicle. See Servicing Driveshaft, for the required driveshaft installation procedure.

OUTER C/V JOINT SEALING BOOT SERVICE

CAUTION: The outer C/V joint used on this vehicle is not a serviceable joint.

DISASSEMBLY AND ASSEMBLY (Continued)

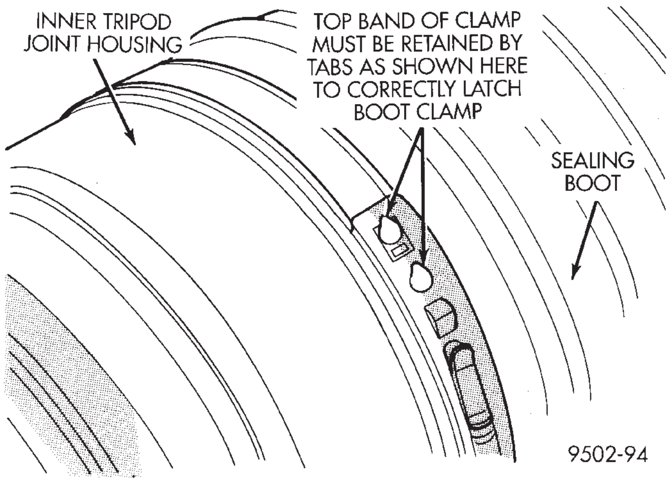


Fig. 41 Sealing Boot Clamp Correctly Installed

CAUTION: The outer C/V joint used on this vehicle uses a new design for retaining the cross to the interconnecting shaft. These driveshafts incorporate a slight twist (helical) in the spline on the interconnecting shaft where the cross is installed. This twist causes a interference fit between the interconnecting shaft and the cross when the outer C/V joint is installed on the interconnecting shaft. This design eliminates the clearance between the cross and the interconnecting shaft resulting in quieter operation of the driveshaft assembly. This design though eliminated the capability of removing the outer C/V joint from the interconnecting shaft. For this reason the driveshafts will be serviced as a quarter shaft (outer C/V joint/sealing boot, interconnecting shaft and vibration damper) in the event of a outer C/V joint boot failure.

OUTER C/V JOINT BEARING SHIELD SERVICE

The front hub/bearing shield on the outer C/V joint is a serviceable component of the outer C/V. If it is damaged in use on a vehicle or during servicing of a driveshaft it can be replaced using the following procedure.

To remove the bearing shield from the outer C/V joint, the driveshaft assemblies must be removed from the vehicle. See Servicing Driveshaft, for the required driveshaft removal and replacement procedure.

BEARING SHIELD REMOVAL FROM OUTER C/V JOINT

(1) Clamp driveshaft in a vise by the interconnecting shaft.

(2) Using a drift (Fig. 42) tap around the entire edge of the bearing shield until it is removed from the outer C/V Joint.

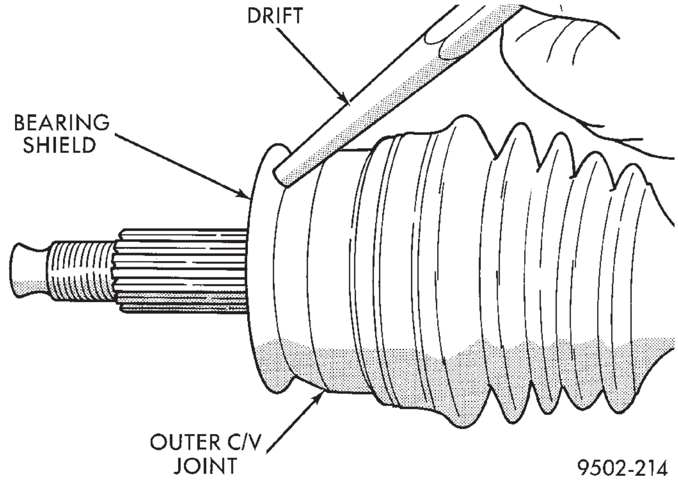


Fig. 42 Removing Bearing Shield from Outer C/V Joint

BEARING SHIELD INSTALLATION ON OUTER C/V JOINT

(1) Install bearing shield by hand on outer C/V Joint so that it is installed squarely on the C/V joint.

(2) Position installer, Special Tool, C-4698-2 and handle, Special Tool, C-4698-1 on face of bearing shield (Fig. 43).

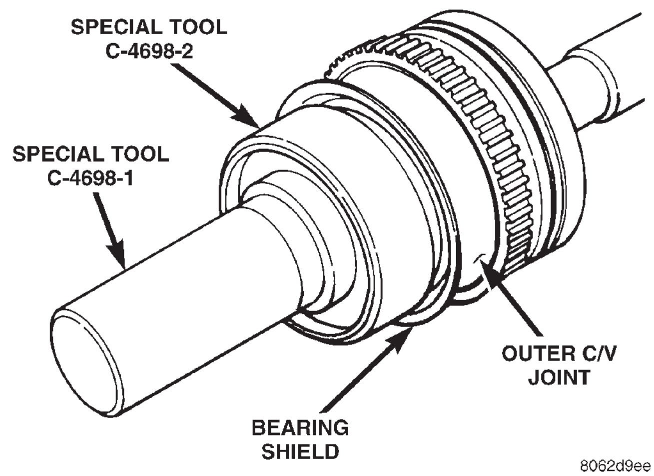


Fig. 43 Special Tools for Installing Bearing Shield

CAUTION: If bearing shield is not installed flush against the face of the outer C/V joint, interference with steering knuckle will occur when driveshaft is installed.

(3) Using a hammer, drive the bearing shield on the outer C/V joint until it is flush against the front of the outer C/V joint (Fig. 44).

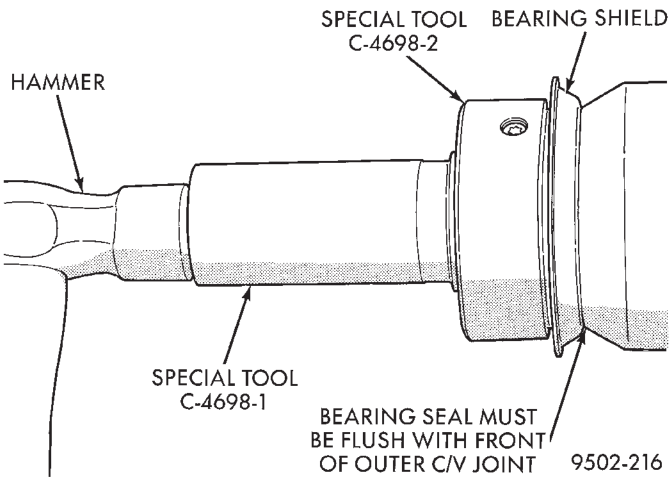


Fig. 44 Correctly Installed Bearing Shield

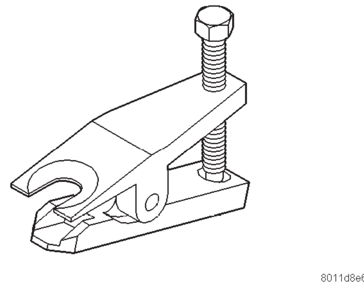
SPECIFICATIONS

TORQUE SPECIFICATIONS

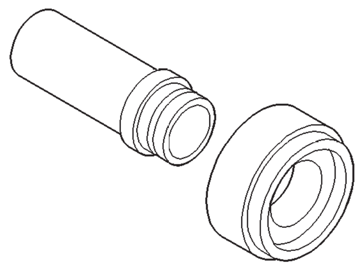
DESCRIPTION	TORQUE
Caliper To Knuckle Bolts	31 N·m (23 ft. lbs.)
Driveshaft Nut	244 N·m (180 ft. lbs.)
Front Wheel Lug Nuts	135 N·m (100 ft. lbs.)
Knuckle To Ball Stud Nut	95 N·m (70 ft. lbs.)
Tie Rod End To Knuckle	61 N·m (45 ft. lbs.)

SPECIAL TOOLS

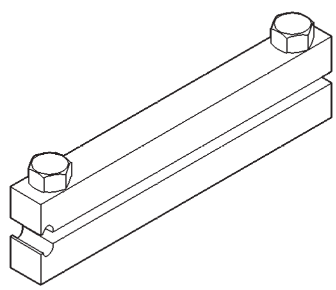
DRIVESHAFT–SPECIAL TOOLS



Tie Rod Remover MB-990635



Bearing Shield Installer C-4698



Boot Clamp Installer C-4975A

BRAKES

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GENERAL INFORMATION

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GENERAL INFORMATION

BASE BRAKE SYSTEM COMPONENT DESCRIPTION

Typical brake equipment consists of:

- Double pin floating caliper disc front brakes.
- Rear automatic adjusting drum brakes.
- Brake Fluid Level Switch.
- Master cylinder.
- Vacuum power booster.
- Double pin floating caliper rear disc brakes are available on some models.
- Hand operated park brake lever.
- Front disc brake pads are semi-metallic.

Vehicles equipped with an Antilock Brake System (ABS) use a system designated ABX-4 and is supplied by Bendix. This system shares the base brake hardware as vehicles not equipped with ABS. The ABS system does however use a different master cylinder and chassis brake tube assembly. Also included in the ABS system is a hydraulic control unit (HCU), four wheel speed sensors, and an electronic controller (CAB). These components will be described in detail in the Bendix ABX 4 brake section in this group of the service manual.

The hydraulic brake system is diagonally split on both the Non-ABS and ABS braking system. With the left front and right rear brakes on one hydraulic system and the right front and left rear on the other.

The master cylinder used on all vehicle equipped with or without Antilock Brakes is made from a lightweight, anodized, aluminum. On all vehicles the master cylinder has a piston bore diameter of 22.2 mm.

BASE BRAKE SYSTEM

INDEX

DESCRIPTION AND OPERATION

FRONT DISC BRAKES

The front disc brakes (Fig. 1) and (Fig. 2) consists of the following components:

- The driving hub
- Braking disc (rotor)
- Caliper assembly - single piston, floating type
- Brake pads and linings

The front disc brakes used on this vehicle are Allied Signal Inc. double pin floating caliper assemblies.

The front disc brake double pin calipers are mounted directly to the steering knuckles and use no adapter. The caliper is mounted to the steering knuckle using bushings, sleeves and 2 guide pin bolts which thread directly into bosses on the steering knuckle (Fig. 1), (Fig. 2) and (Fig. 3).

Two machined abutments on the steering knuckle position the caliper. The guide pin bolts, sleeves and bushings control the side to side movement of the caliper. The piston seal is designed to pull the piston back into the bore of the caliper when the brake pedal is released. This maintains the proper brake shoe to rotor clearance (Fig. 4).

DESCRIPTION AND OPERATION (Continued)

All the front brake forces generated during braking of the vehicle are taken up directly by the steering knuckles of the vehicle.

The caliper is a one piece casting with the inboard side containing a single piston cylinder bore.

The front disc brake caliper piston (Fig. 2), is manufactured from a phenolic compound. The outside diameter of the caliper piston is 54 mm.

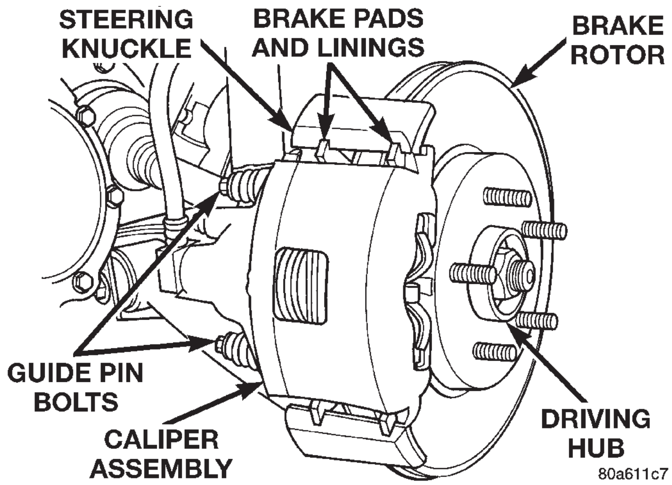


Fig. 1 Front Disc Brake Components

A square cut rubber piston seal is located in a machined groove in the caliper cylinder bore. This provides a hydraulic seal between the piston and the cylinder wall (Fig. 4).

A rubber dust boot is installed in the cylinder bore opening and in a groove in the piston (Fig. 4). This prevents contamination in the bore area.

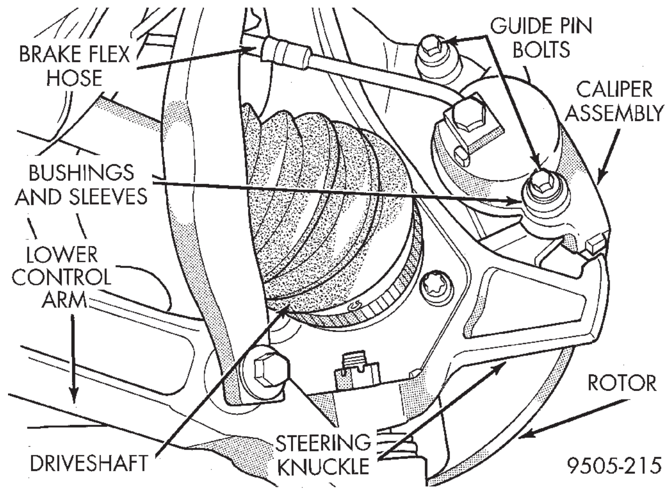


Fig. 3 Front Disc Brake Caliper Mounting

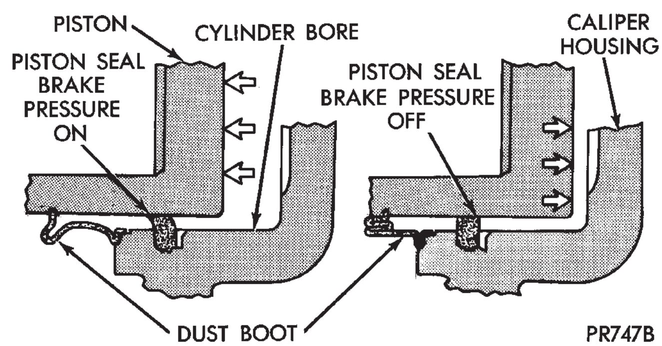


Fig. 4 Piston Seal Function for Automatic Adjustment

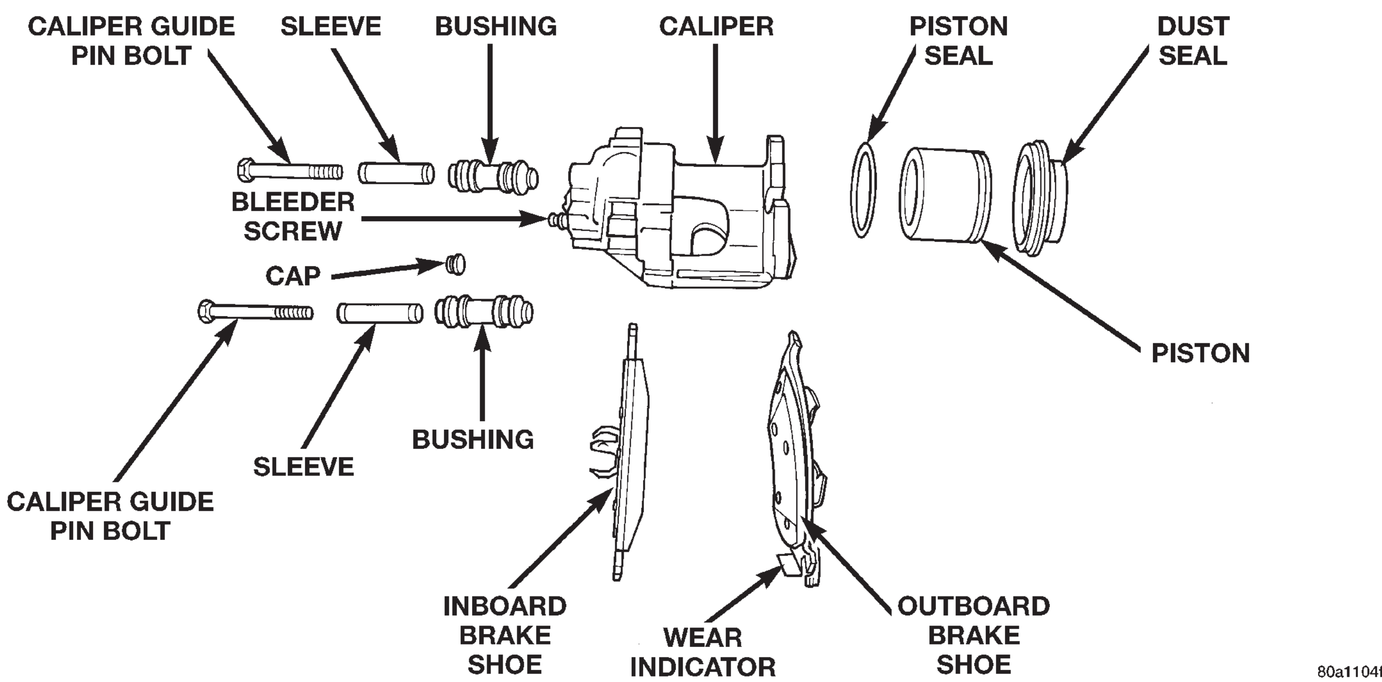


Fig. 2 Front Disc Brake Caliper (Exploded View)

DESCRIPTION AND OPERATION (Continued)

As front disc brake linings wear, master cylinder reservoir brake fluid level will drop. Fluid level should be checked after replacing linings.

Front disc brakes are equipped with an audible wear sensor (Fig. 2) on the outboard brake pad. This sensor emits a sound when the brake lining may need inspection and/or replacement.

REAR DRUM BRAKES

This vehicles rear wheel drum brakes, are a two shoe leading/trailing internal expanding type, with an automatic self adjuster mechanism. The automatic self adjuster mechanism used on this vehicle is a screw type adjuster. This type of self adjuster mechanism is actuated each time the vehicles service brakes are applied. The automatic adjuster mechanism is located directly below the rear wheel cylinder (Fig. 5).

The original equipment rear drum brakes used on this vehicle are supplied by Kelsey Hayes Inc. (Fig. 5).

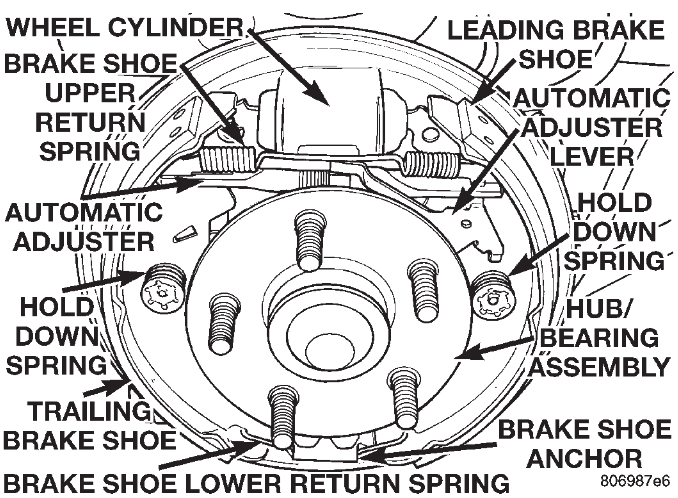


Fig. 5 Kelsey Hayes Rear Wheel Brake Assembly

PARKING BRAKES

All vehicles are equipped with a center mounted, hand operated park brake lever (Fig. 6). This lever is an auto-adjust type which continuously applies minimal tension to the parking brake cables to keep them in adjustment at all times. Due to this feature, the park brake cable system does not require adjustment. Proper parking brake system adjustment is obtained by proper rear drum brake shoe adjustment.

On this vehicle, the rear wheel service brakes also act as the vehicle's parking brakes. The rear drum brake shoes, when acting as parking brakes, are mechanically operated using an internal actuating lever and strut which is connected to a flexible steel cable. There is an individual park brake cable for each rear wheel, which are joined using a park cable equalizer before terminating at the floor mounted, hand operated park brake lever.

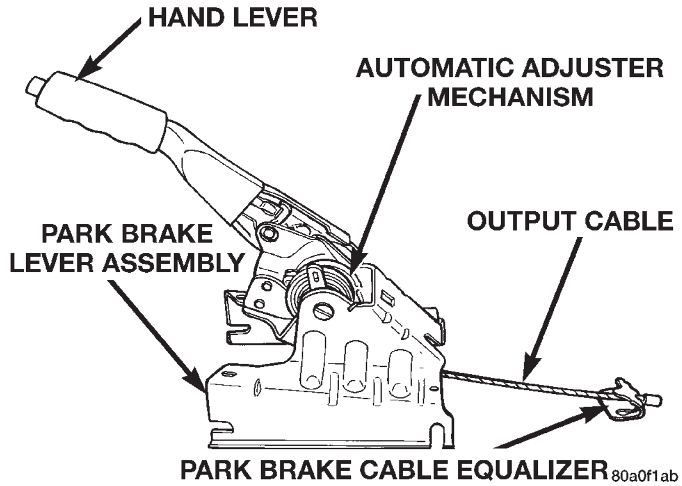


Fig. 6 Park Brake Lever Assembly

PROPORTIONING VALVES

This vehicle uses in-line proportioning valves. The proportioning valves are located in the rear brake tubes on vehicles not equipped with Antilock Brakes (Fig. 7) or at the rear brake outlet ports of the hydraulic control unit (HCU) on vehicles equipped with Antilock Brakes (Fig. 8). The in-line proportioning valves used on this vehicle, replace the combination valve used in prior brake hydraulic systems. With this design, the chassis brake tubes connect directly from the master cylinder or (HCU) to the brake flex hose at the wheel. The non ABS equipped proportioning valves are located in the same area of the vehicle as the hydraulic unit on ABS equipped vehicles (Fig. 7).

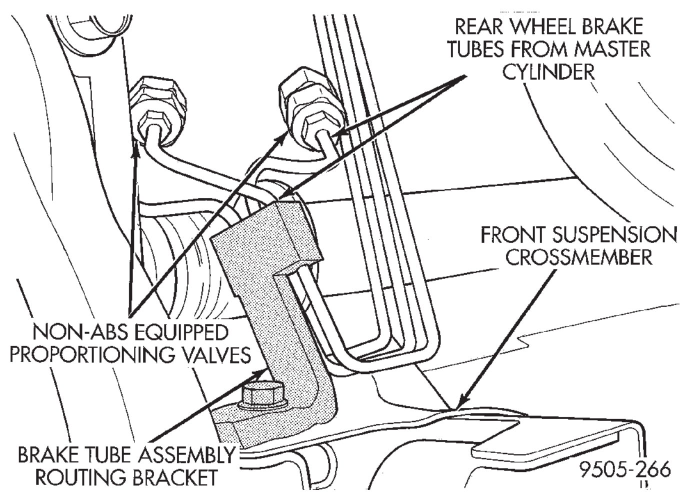


Fig. 7 Proportioning Valves For Non ABS Equipped Vehicles

Proportioning valves balance front to rear braking by controlling at a given ratio, the increase in rear

DESCRIPTION AND OPERATION (Continued)

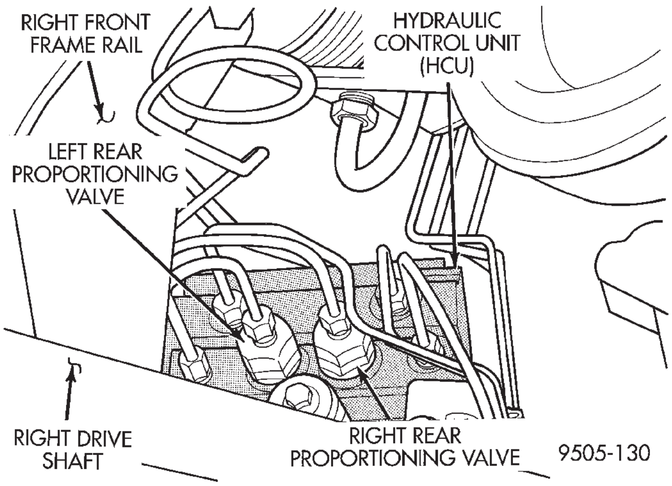


Fig. 8 Proportioning Valve Location For Antilock Brake Equipped Vehicles

brake system hydraulic pressure above a preset level (split point). Under light pedal application, the proportioning valve allows full hydraulic pressure to be applied to the rear brakes.

There are two different styles of proportioning valve assemblies used in each vehicle. Due to differences in thread sizes, each proportioning valve has a different part number. During any service procedures identify valve assemblies by supplier part number and or the bar code label and stamp identification band (Fig. 9) or (Fig. 10). All vehicle brake systems use a common calibration for the proportioning valve.

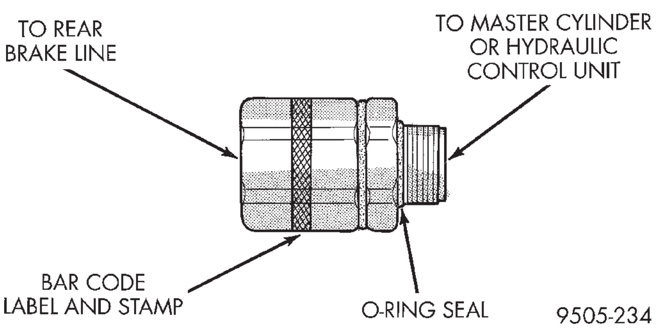


Fig. 9 Proportioning Valve With Antilock Brakes

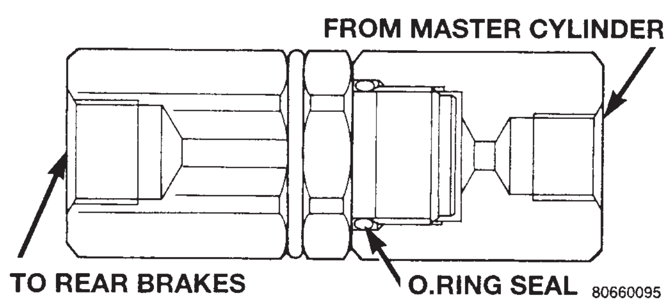


Fig. 10 Proportioning Valve Without Antilock Brakes

CHASSIS TUBES AND HOSES

The purpose of the chassis brake tubes and flex hoses is to transfer the pressurized brake fluid developed by the master cylinder to the wheel brakes of the vehicle. The chassis tubes are steel with a corrosion resistant coating applied to the external surfaces and the flex hoses are made of reinforced rubber. The rubber flex hoses allow for the movement of the vehicles suspension.

MASTER CYLINDER

This vehicle uses 2 differently designed master cylinder assemblies depending on whether the vehicle is or is not equipped with antilock brakes.

Vehicles not equipped with ABS use a standard compensating port master cylinder design, while vehicles equipped with ABS use a center valve design master cylinder.

On vehicles equipped with ABS brakes, the master cylinder is a two outlet design. On vehicles not equipped with ABS brakes, the master cylinder is a 4 outlet design. All vehicles are equipped with a master cylinder having a bore diameter of 22.2 mm.

The master cylinder assembly (Fig. 11) consists of the following components. The body of the master cylinder is an anodized aluminum casting. It has a machined bore to accept the master cylinder piston and threaded ports with seats for hydraulic brake line connections. The brake fluid reservoir of the master cylinder assembly is made of a see through polypropelene type plastic.

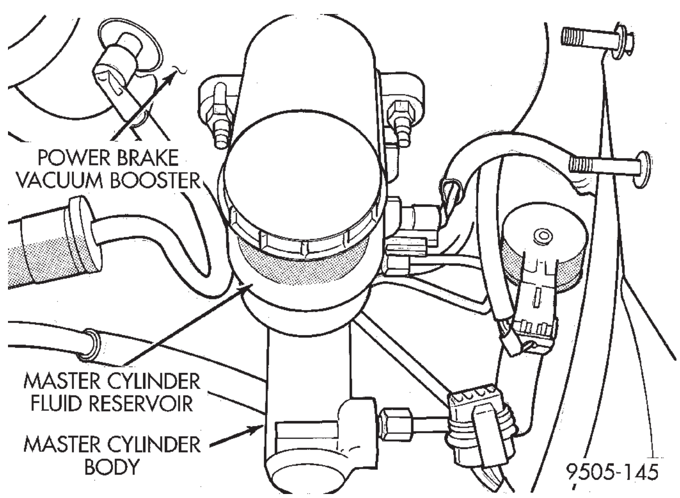


Fig. 11 Master Cylinder Assembly

On Non-ABS master cylinders, the primary outlet ports (Fig. 12) supply hydraulic pressure to the right front and left rear brakes. The secondary outlet ports (Fig. 12) supply hydraulic pressure to the left front and right rear brakes.

On ABS master cylinders, the primary outlet port (Fig. 13) supplies hydraulic pressure to the right

DESCRIPTION AND OPERATION (Continued)

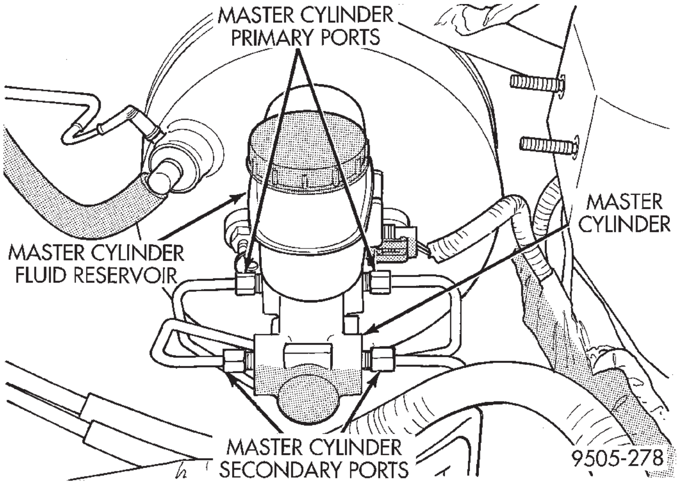


Fig. 12 Primary And Secondary Ports Without ABS

front and left rear brakes. The secondary outlet port (Fig. 13) supplies hydraulic pressure to the left front and right rear brakes.

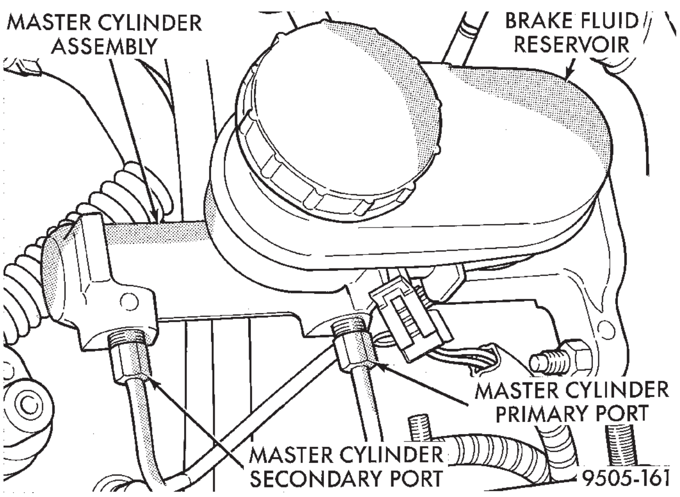


Fig. 13 Primary And Secondary Ports With ABS

VACUUM BOOSTER

All vehicles use a 205 mm tandem diaphragm vacuum booster. The vacuum booster though, may be unique for the type of brake system the vehicle is equipped with. For this reason, if the power brake vacuum booster requires replacement, be sure it is replaced with the correct part for the type of brake system that the vehicle is equipped with.

The vacuum booster can be identified if required, by the tag attached to the body of the vacuum booster (Fig. 14). This tag contains the following information: The production part number of the vacuum booster, the date it was built, and who manufactured it.

NOTE: The vacuum booster assembly is not a repairable part and must be replaced as a complete unit if it is found to be faulty in any way. The vacuum booster check valve is not repairable but can be replaced as a component of the vacuum booster.

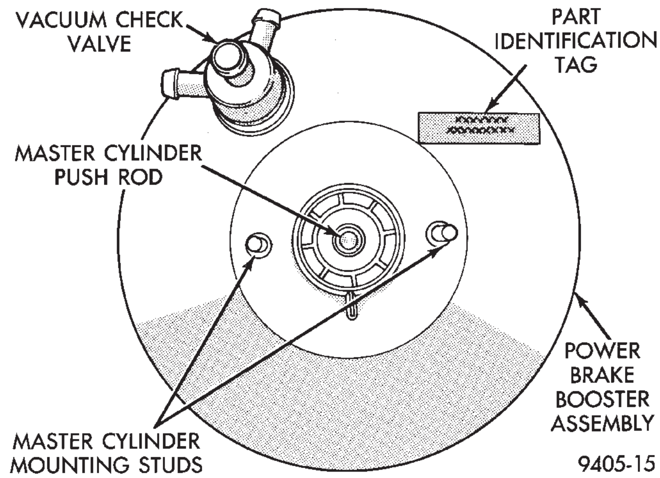


Fig. 14 Vacuum Booster Identification

The vacuum booster reduces the amount of force required by the driver to obtain the necessary hydraulic pressure to stop the vehicle.

The vacuum booster is vacuum operated. The vacuum is supplied from the intake manifold on the engine through the power brake booster check valve (Fig. 14).

As the brake pedal is depressed, the vacuum boosters input rod moves forward (Fig. 15). This opens and closes valves in the vacuum booster, allowing atmospheric pressure to enter on one side of a diaphragm. Engine vacuum is always present on the other side. This difference in pressure forces the output rod of the vacuum booster (Fig. 15) out against the primary piston of the master cylinder. As the pistons in the master cylinder move forward this creates the hydraulic pressure in the brake system.

Different systems and engine combinations require different vacuum hose routings.

The vacuum booster assembly mounts on the engine side of the dash panel. It is connected to the brake pedal by the input push rod (Fig. 15). A vacuum line connects the vacuum booster to the intake manifold. The master cylinder is bolted to the front of the vacuum booster assembly.

RED BRAKE WARNING LAMP

The red Brake warning lamp is located in the instrument panel cluster and is used to indicate a low brake fluid condition, the parking brake is applied or that the antilock brake system (ABS) has a fault but could not turn on the yellow ABS warning lamp. In addition, the brake warning lamp is turned on as a bulb check by the ignition switch when the ignition switch is placed in the crank position. Problems with this system will generally be of the type

DESCRIPTION AND OPERATION (Continued)

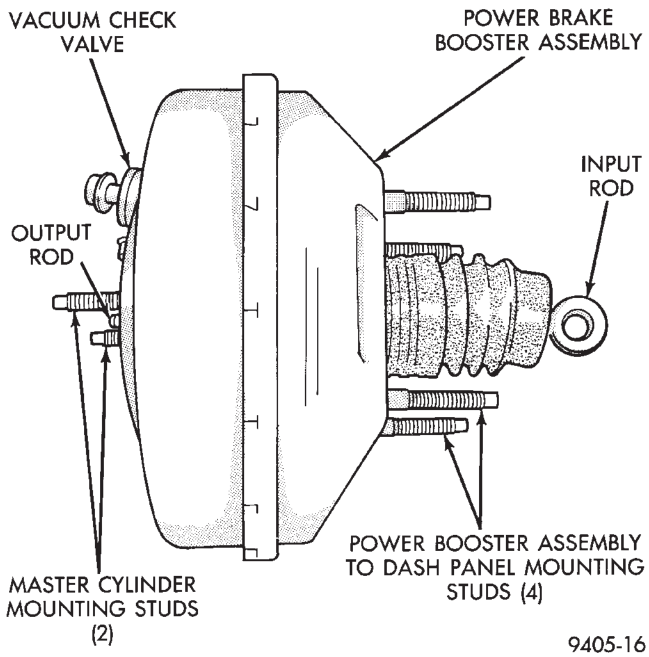


Fig. 15 Vacuum Booster Assembly

where the warning lamp fails to turn on when it should, or remains on when it should not.

The warning lamp bulb is supplied a 12 volt ignition feed anytime the ignition switch is on. The bulb is then illuminated by completing the ground circuit either through the park brake switch, the fluid level sensor in the master cylinder reservoir, the ignition switch in the crank position or the ABS CAB.

The Brake Fluid Level sensor is located in the brake fluid reservoir of the master cylinder assembly (Fig. 16). The purpose of the sensor is to provide the driver with an early warning that brake fluid level in master cylinder reservoir has dropped to below normal. This may indicate an abnormal loss of brake fluid in the master cylinder fluid reservoir resulting from a leak in the hydraulic system.

As the fluid drops below the minimum level, the fluid level sensor closes the brake warning light circuit. This will turn on the red brake warning light. At this time, master cylinder fluid reservoir should be checked and filled to the full mark with DOT 3 brake fluid. **If brake fluid level has dropped in master cylinder fluid reservoir, the entire brake hydraulic system should be checked for evidence of a leak.**

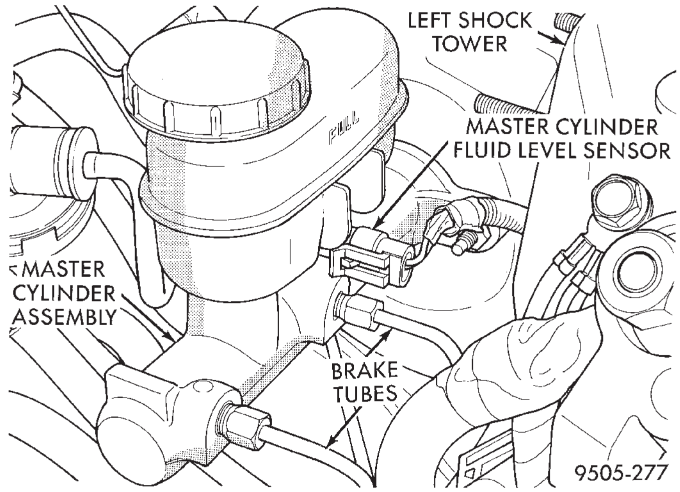


Fig. 16 Master Cylinder Fluid Level Sensor

STOP LAMP SWITCH

The stop lamp switch controls operation of the vehicles stop lamps. Also, if the vehicle is equipped with speed control, the stop lamp switch will deactivate speed control when the brake pedal is depressed.

The stop lamp switch controls operation of the right and left tail, stop and turn signal lamp and CHMSL lamp, by supplying battery current to these lamps.

The stop lamp switch controls the lamp operation by opening and closing the electrical circuit to the stop lamps.

REAR WHEEL HUB AND BEARING ASSEMBLY

All vehicles are equipped with permanently lubricated and sealed for life rear wheel bearings. There is no periodic lubrication or maintenance recommended for these units. However, if servicing of a rear wheel bearing is required, refer to procedures in the diagnosis and testing section and the removal and installation section in this group of the service manual for the inspection and replacement of the rear wheel bearing.

DIAGNOSIS AND TESTING

BRAKE SYSTEM BASIC DIAGNOSIS GUIDE

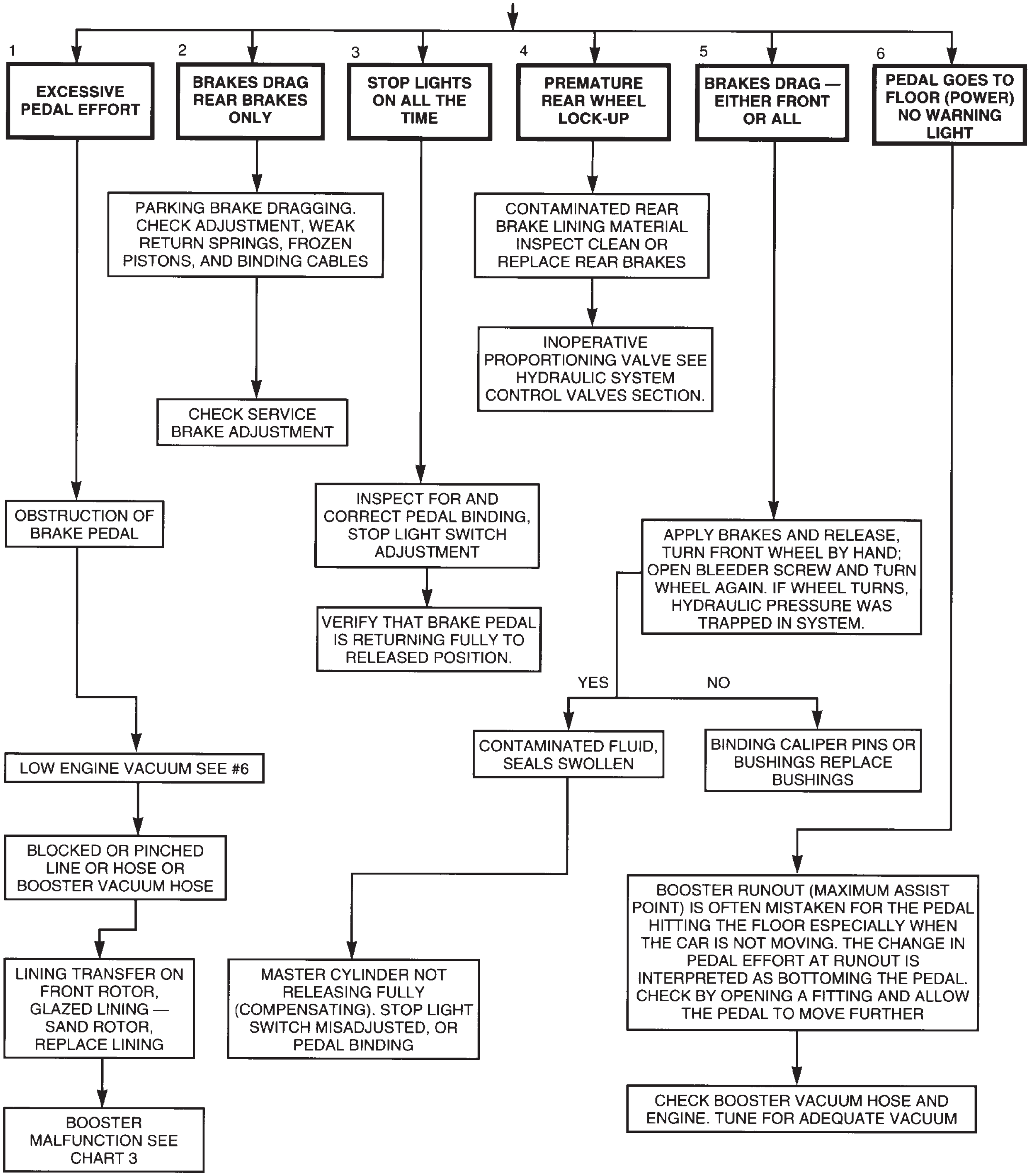
SYMPTOM	CHART 1 MISC. COND.	CHART 2 WARNING LIGHT	CHART 3 POWER BRAKES	CHART 4 BRAKE NOISE	CHART 5 WHEEL BRAKES
Brake Warning Light On		X	NO	NO	
Excessive Pedal Travel	6	X	NO		O
Pedal Goes To The Floor	6	X			
Stop Light On Without Brakes	3				
All Brakes Drag	5				
Rear Brakes Drag	2	NO	NO		
Grabby Brakes			O		X
Spongy Brake Pedal		X	NO		
Premature Rear Brake Lockup	4	NO	NO		O
Excessive Pedal Effort	1		O		
Rough Engine Idle		NO	O		
Brake Chatter (Rough)		NO	NO		X
Surge During Braking		NO	NO		X
Noise During Braking		NO	NO	X	
Rattle Or Clunking Noise		NO	NO	X	
Pedal Pulsates During Braking		NO	NO		X
Pull To Right Or Left		NO	NO		X
No: Not A Possible Cause		X: Most Likely Cause		O: Possible Cause	

DIAGNOSIS AND TESTING (Continued)

BRAKE SYSTEM DIAGNOSIS CHARTS

MISCELLANEOUS BRAKE SYSTEM CONDITIONS

CHART 1 MISCELLANEOUS CONDITIONS



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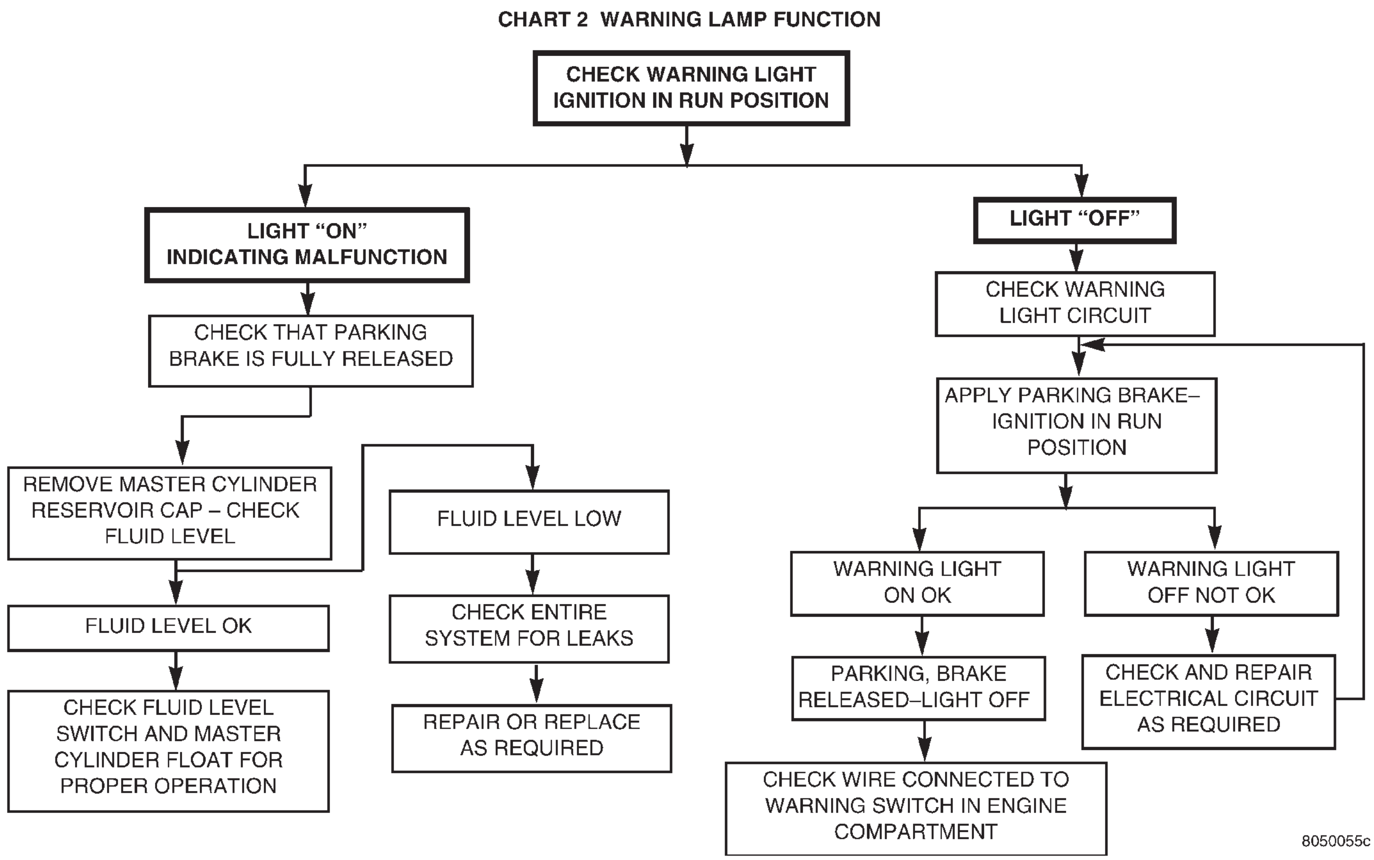
DIAGNOSIS AND TESTING (Continued)

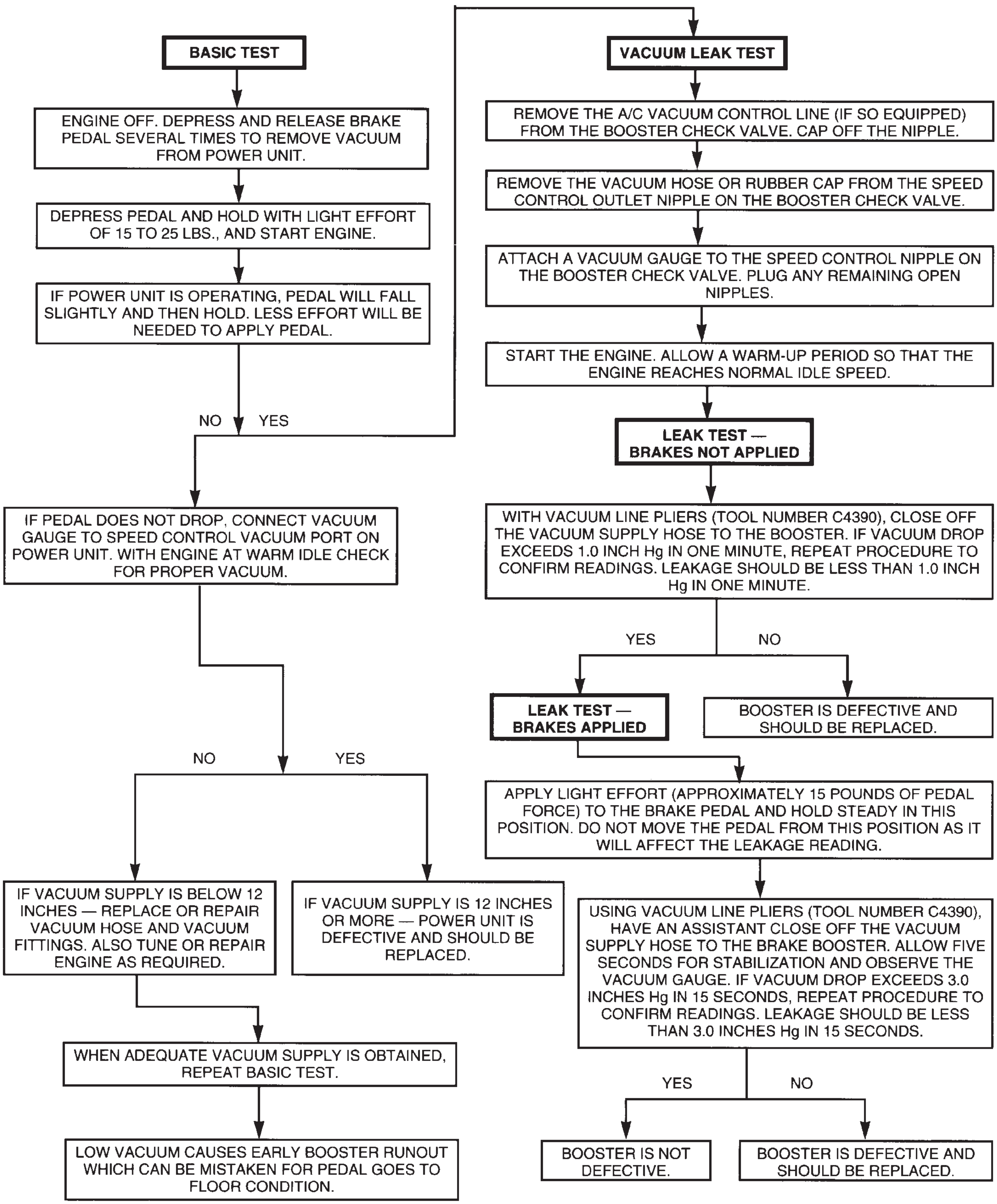
RED BRAKE WARNING LAMP FUNCTION



DIAGNOSIS AND TESTING (Continued)

POWER BRAKE SYSTEM DIAGNOSTICS

CHART 3 POWER BRAKES



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DIAGNOSIS AND TESTING (Continued)

BRAKE NOISE

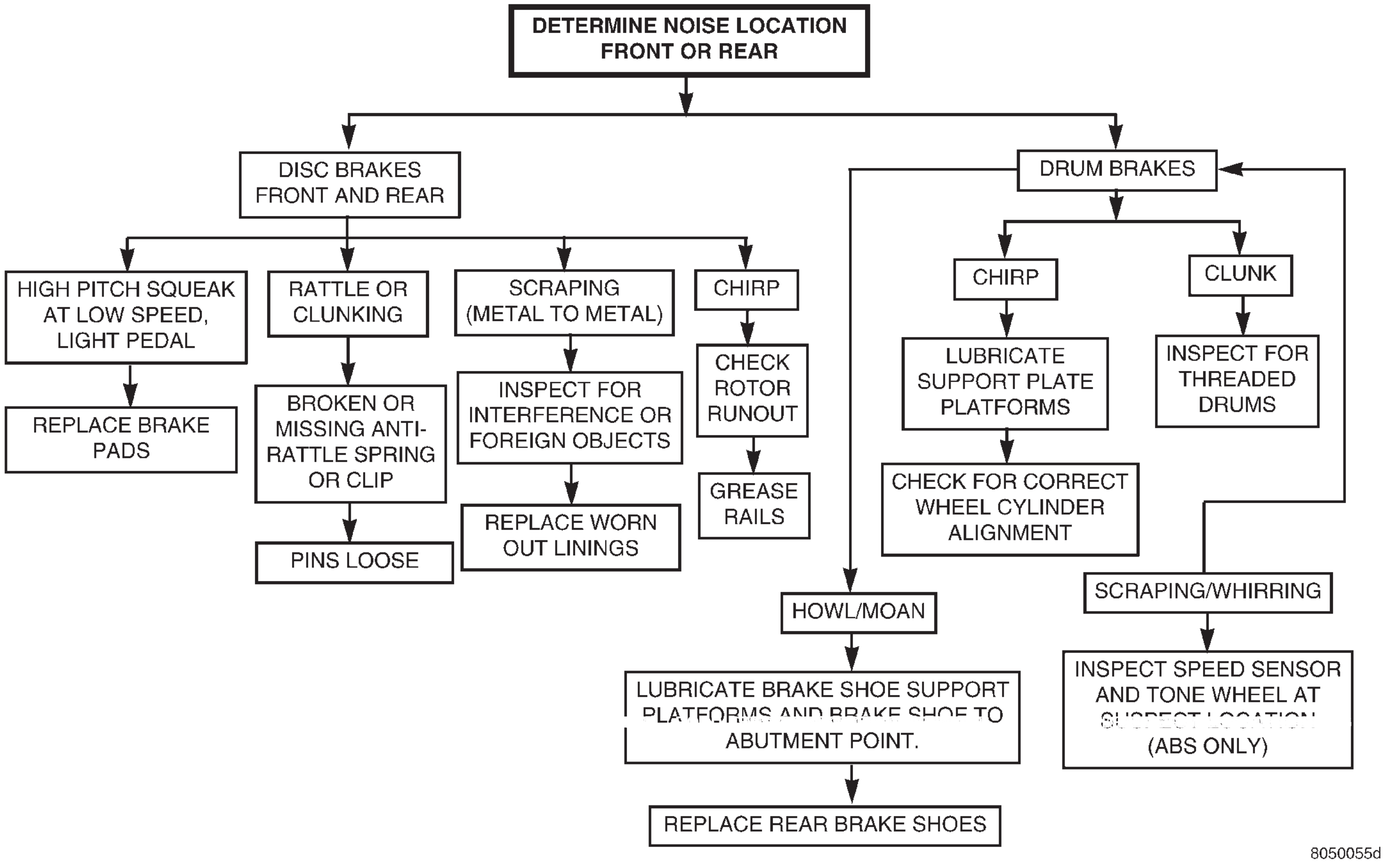
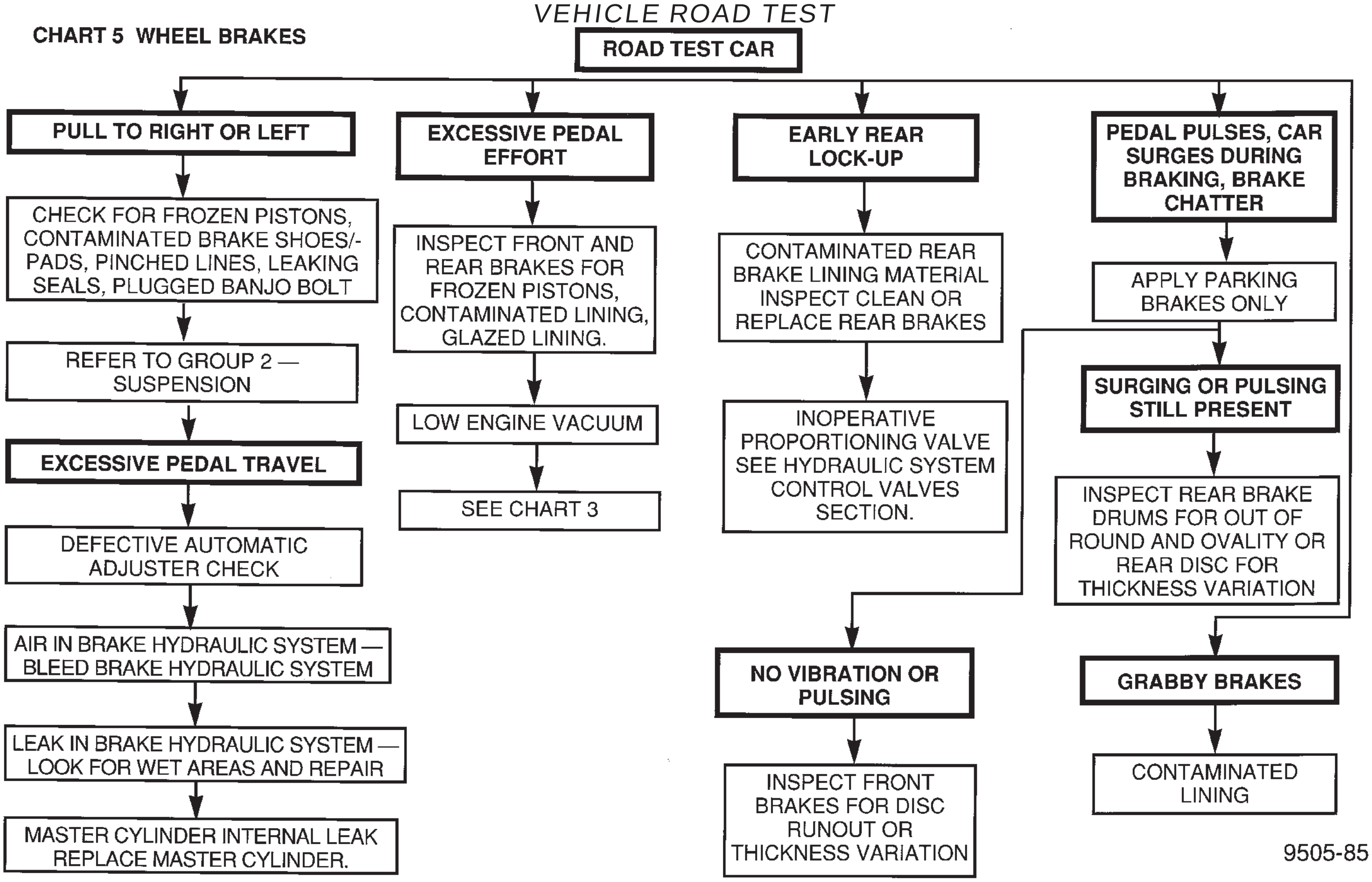


CHART 5 WHEEL BRAKES

VEHICLE ROAD TEST



DIAGNOSIS AND TESTING (Continued)

DRUM BRAKE AUTOMATIC ADJUSTER OPERATION

Place the vehicle on a frame contact hoist with a helper in the driver's seat to apply the brakes. Raise the vehicle. Remove the adjuster access hole plug, from the rear brake support plate (Fig. 17). This will allow access to the star wheel on the automatic adjuster mechanism. Then, to eliminate the possibility of maximum adjustment, insert a small screwdriver through the access hole in the support plate (Fig. 18) and back off the adjuster star wheel approximately 10 notches. **It will be necessary to hold the adjuster lever away from the star wheel to perform this adjustment procdure.**

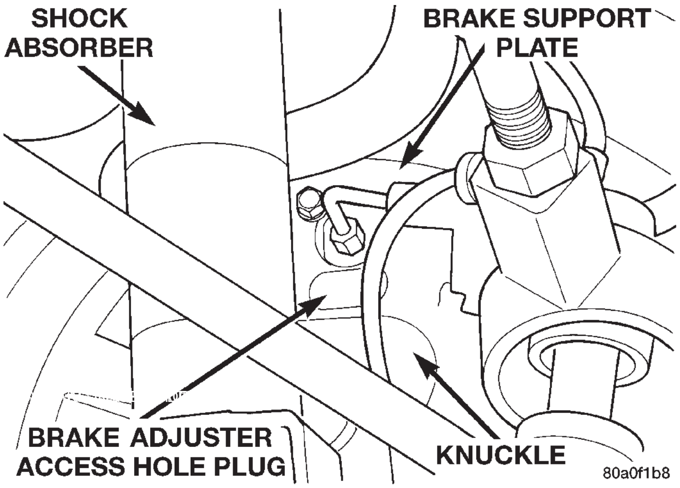


Fig. 17 Adjuster Access Hole Plug

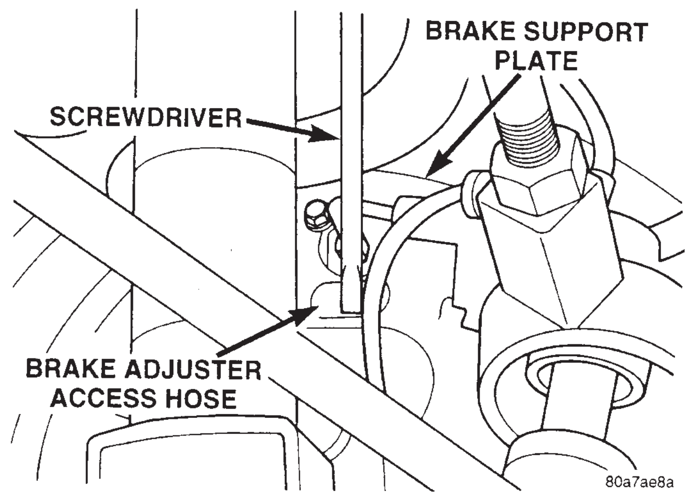


Fig. 18 Accessing The Automatic Adjuster

Fully apply the brake pedal which will cause the brake shoes to leave the anchor. Upon application of the brake pedal, the adjuster lever should move downward, turning the star wheel on the adjuster. Thus, a definite rotation of the adjuster star wheel can be observed if the automatic adjuster is working properly. If one or more adjusters do not function properly, the respective brake drum must be removed for servicing of the adjuster mechanism.

BRAKE ROTOR THICKNESS AND RUNOUT

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

Before refinishing or refacing a rotor, the disc should be checked and inspected for the following conditions:

Braking surface scoring, rust, impregnation of lining material and worn ridges.

Excessive lateral runout or wobble.

Thickness variation (Parallelism).

Dishing or distortion (Flatness).

If a vehicle has not been driven for a period of time, the rotor surface will rust in the area not covered by the brake lining and cause noise and chatter when the brakes are applied.

Excessive wear and scoring of the rotor can cause temporary improper lining contact if ridges are not removed before installation of new brake pad assemblies.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced.

Excessive runout or wobble in a rotor can increase pedal travel due to piston knock back. This will increase guide pin sleeve wear due to tendency of caliper to follow rotor wobble.

Thickness variation in a rotor can also result in pedal pulsation, chatter and surge due to variation in brake output. This can also be caused by excessive runout in rotor or hub.

Dishing or distortion can be caused by extreme heat and abuse of the brakes.

ROTOR RUNOUT AND THICKNESS VARIATION

On vehicle rotor runout is the combination of the individual runout of the hub face and the runout of the rotor. (The hub and rotor runouts are separable). To measure runout on the vehicle, remove the wheel and reinstall the lug nuts tightening the rotor to the hub. Mount Dial Indicator, Special Tool C-3339 with Mounting Adaptor, Special Tool SP- 1910 on steering arm. Dial indicator plunger should contact braking surface of rotor approximately one inch from edge of rotor (Fig. 19). Check lateral runout (both sides of rotor) runout should not exceed 0.13 mm (0.005 inch).

If runout is in excess of the specification, check the lateral runout of the hub face. Before removing rotor from hub, make a chalk mark across both the rotor and one wheel stud on the high side of runout so you'll know exactly how the rotor and hub was originally mounted (Fig. 20). Remove rotor from hub.

DIAGNOSIS AND TESTING (Continued)

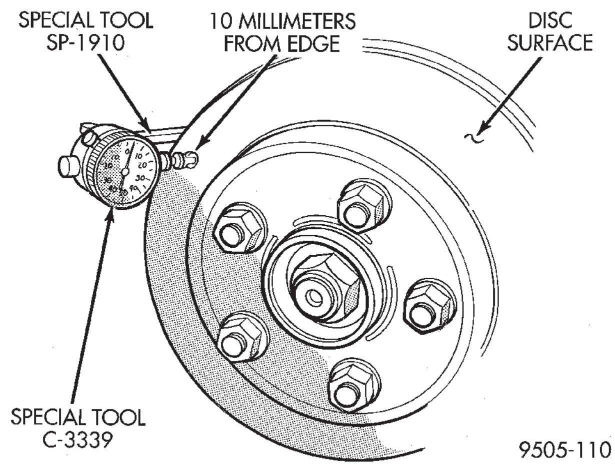


Fig. 19 Checking Rotor For Runout

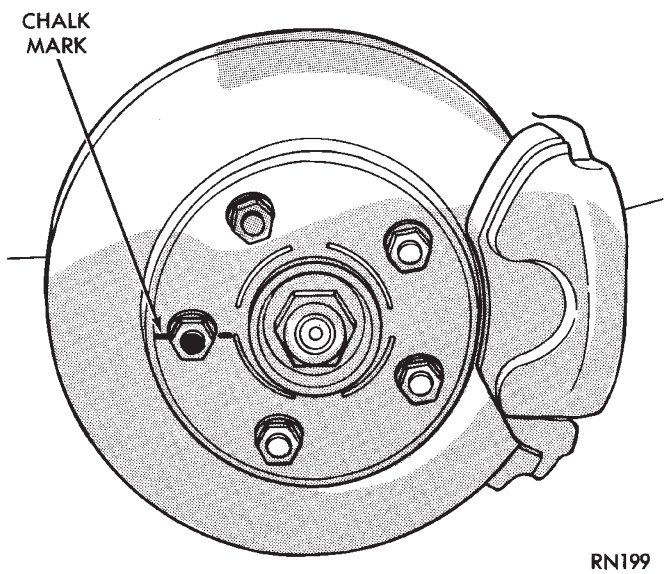


Fig. 20 Marking Rotor and Wheel Stud

Install Dial Indicator, Special Tool C-3339 and Mounting Adaptor, Special Tool SP-1910 on steering knuckle. Position stem so it contacts hub face near outer diameter. Care must be taken to position stem outside the stud circle but inside the chamfer on the hub rim (Fig. 21). **Clean hub surface before checking.**

Runout should not exceed 0.08 mm (0.003 inch). If runout exceeds this specification, hub must be replaced. See Suspension Group 2. If hub runout does not exceed this specification, install rotor on hub with chalk marks two wheel studs apart (Fig. 22). Tighten nuts in the proper sequence and torque to specifications. Finally, check runout of rotor to see if runout is now within specifications.

If runout is not within specifications. Install a new rotor or reface rotor, being careful to remove as little as possible from each side of rotor. Remove equal amounts from each side of rotor. Do not reduce thickness below minimum thickness cast into the un-machined surface of the rotor.

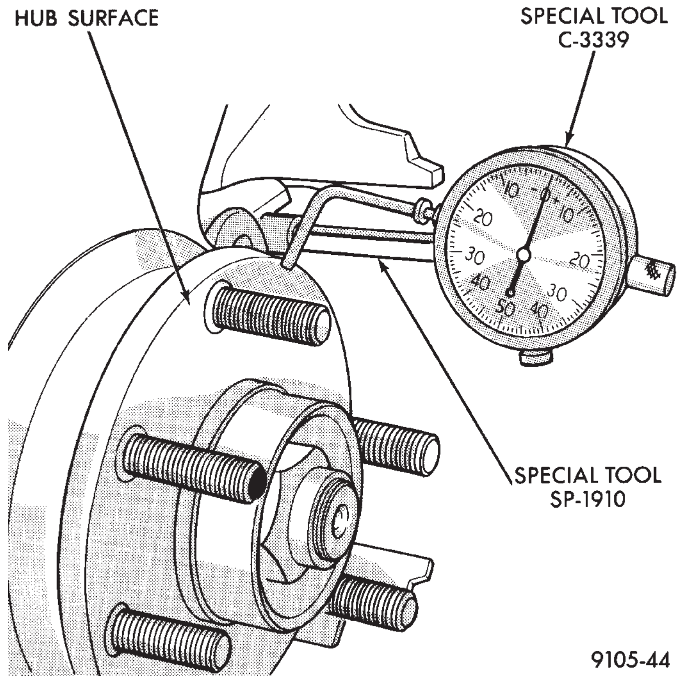


Fig. 21 Checking Hub for Runout

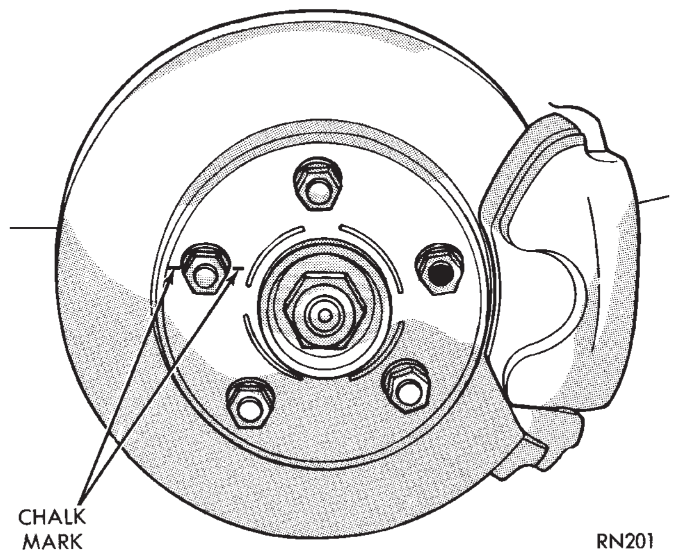


Fig. 22 Index Rotor And Wheel Stud

Thickness variation measurements of rotor should be made in conjunction with runout. Measure thickness of rotor at 12 equal points with a micrometer at a radius approximately 25 mm (1 inch) from edge of rotor (Fig. 23). If thickness measurements vary by more than 0.013 mm (0.0005 inch) rotor should be removed and resurfaced, or a new rotor installed. If cracks or burned spots are evident, rotor must be replaced.

Light scoring and/or wear is acceptable. If heavy scoring or warping is evident, the rotor must be

DIAGNOSIS AND TESTING (Continued)

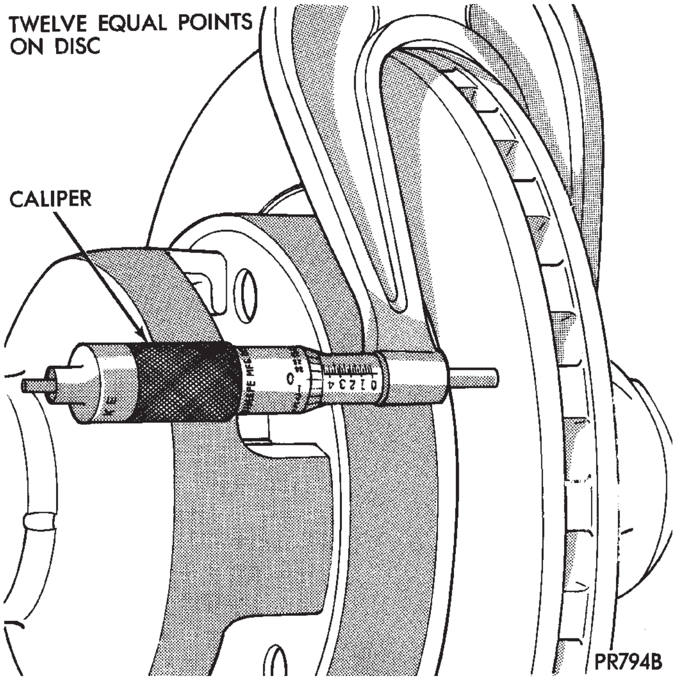


Fig. 23 Checking Rotor For Thickness

machined or replaced. See Brake Rotor Machining in the Service Procedures Section in this group of the service manual. Refer to front or rear brake rotor in the Removal And Installation section in this group of the service manual for the required brake rotor replacement procedure.

PROPORTIONING VALVES

PROPORTIONING VALVE TESTING SPECIAL TOOLS

The in-line proportioning valves used on this vehicle, require special pressure fittings to test for proper proportioning valve function. The pressure fittings are installed before and after the proportioning valve being tested. This is to verify the proportioning valve is maintaining the required hydraulic pressure to the rear wheel brake it controls.

If a condition of premature rear wheel skid occurs on a vehicle the proportioning valve should always be tested prior to it being replaced. This is due to the fact that there are conditions other then a faulty proportioning valve which can cause a premature rear wheel skid.

Testing proportioning valve pressures on a vehicle with or without ABS requires using the same special tools.

There are 4 new Pressure Fittings, Special Tool 6805 (Fig. 24) which are to be used for testing the proportioning valves. These same pressure fittings are used if the proportioning valves are either mounted in the HCU, on an antilock equipped vehicle, or in-line on the brake tube on non-antilock equipped vehicles.

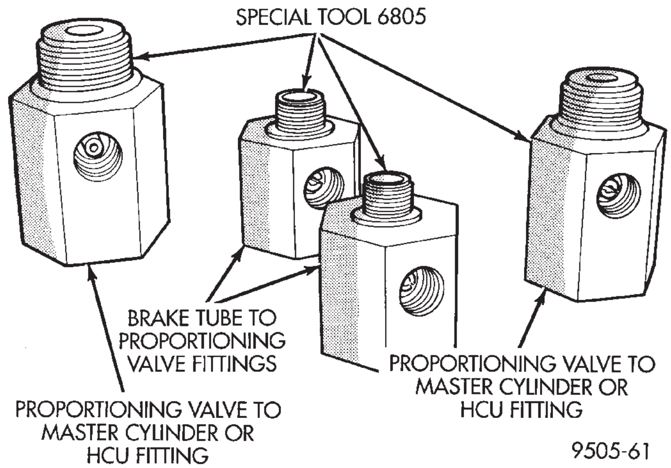


Fig. 24 Proportioning Valve Pressure Test Fittings

The pressure gauges used with the pressure test fittings for testing the in-line proportioning valves on both non-ABS and ABS brakes, is the Pressure Gauge Set, Special Tool C-4007-A, currently used for testing the combination valve (Fig. 25).

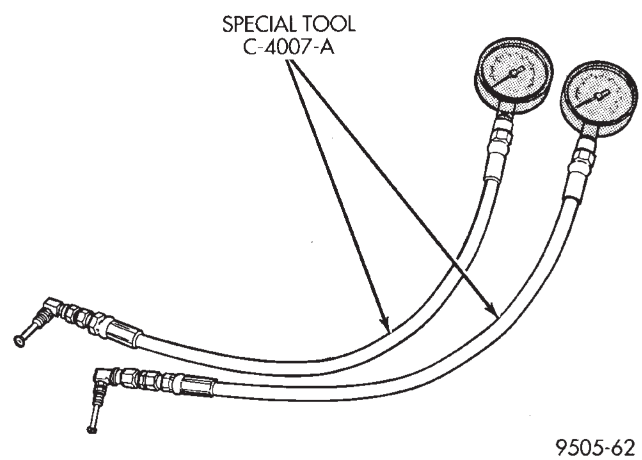


Fig. 25 Proportioning Valve Pressure Test Gauge Set

PROPORTIONING VALVE TESTING NON-ABS BRAKES

If premature rear wheel skid occurs on a hard brake application, it could be an indication that a malfunction has occurred with one of the rear brake proportioning valves.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake (Fig. 26). Therefore, a road test to determine which rear brake slides first is essential. Once the wheel which slides first is determined, use the following procedure to diagnose the proportioning valve.

DIAGNOSIS AND TESTING (Continued)

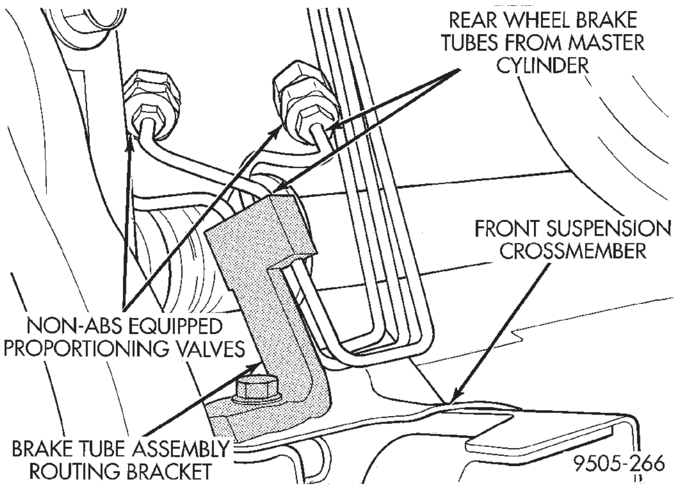


Fig. 26 Non-ABS Brake Proportioning Valve Location

The test procedure for a premature rear wheel skid is the same for both rear wheel proportioning valves. The pressure test fittings used for each proportioning valve though are different due to proportioning valve and brake tube nut thread sizes being unique for each rear wheel. After road testing vehicle to determine which wheel skids first, the proper test fittings required will have to be determined. Then follow the procedure below for testing the required proportioning valve.

(1) After road testing vehicle to determine which rear wheel exhibits premature rear wheel skid, refer to (Fig. 26) to determine which proportioning valve needs to be tested.

(2) Remove brake line (Fig. 26) from the proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

(3) Remove the proportioning valve from the rear brake line.

CAUTION: Be sure the pressure test fitting being installed into proportioing valve, has the correct thread sizes for installation into proportioing valve and installation of rear brake line tube nut.

(4) Install Pressure Test Fitting, Special Tool 6805-1 or 6805-2 on rear brake tube which the proportioning valve was removed from.

(5) Install proportioning valve into pressure test fitting installed on rear brake tube.

CAUTION: Be sure the pressure test fitting being installed into proportioning valve, has the correct thread sizes for installation into the proportioning valve and installation of brake tube fitting.

(6) Install Pressure Test Fitting, Special Tool 6805-3 or 6805-4 into outlet of the proportioning valve.

(7) Connect brake hydraulic line onto pressure test fitting installed in proportioning valve.

(8) Install a Pressure Gauge, Special Tool C-4007-A into each pressure test fitting. Bleed air out of hose from pressure test fitting to pressure gauge, at pressure gauge to remove all trapped air. hose.

(9) With the aid of a helper, apply pressure to the brake pedal until reading on proportioning valve inlet gauge, is at the pressure shown on the following chart. Then check the pressure reading on the proportioning valve outlet gauge. If proportioning valve outlet pressure does not agree with value shown on the following chart, when inlet pressure shown on chart is obtained, replace the proportioning valve.If proportioning valve is within pressure specifications do not replace proportioning valve.

(10) Check rear wheel brake shoe linings for contamination or for replacement brake shoes not meeting OEM brake lining material specifications. These conditions can also be a possible cause for a premature rear wheel skid.

(11) Install proportioning valve in rear brake line and hand tighten both tube nuts until they are fully seated in proportioning valve.

(12) Tighten both brake line tube nuts at the proportioing valve to a torque of 17 N·m (145 in-lbs.).

(13) Bleed the affected brake line. See Bleeding Brake System in the Service Adjustments section of the manual for proper bleeding procedure

PROPORTIONING VALVE TEST WITH ABS BRAKES

If premature rear wheel ABS cycling occurs on hard brake application, it could be an indication that a malfunction has occurred with one of the proportioning valves.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake (Fig. 27). Therefore, a road test to determine which rear brake slides first is essential. Once the wheel which is skidding first is determined, use the following procedure to diagnose the proportioning valve.

The test procedure for premature rear wheel ABS cycling is the same for both rear wheel proportioning valves. The pressure test fittings used for each proportioning valve though are different due to proportioning valve and brake tube nut thread sizes being unique for each rear wheel. After road testing the vehicle to determine which wheel exhibits premature ABS cycling, the proper test fittings required will have to be determined. Then follow the procedure below for testing the required proportioning valve.

(1) After road testing the vehicle to determine which rear wheel exhibits premature ABS cycling, refer to (Fig. 27) to determine which proportioning valve needs to be tested.

DIAGNOSIS AND TESTING (Continued)

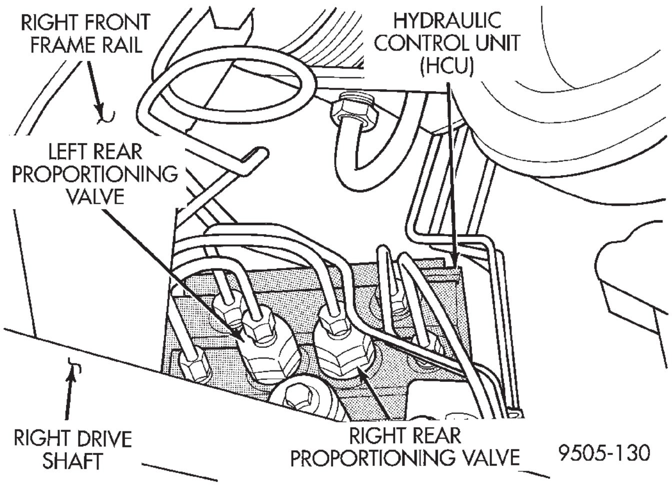


Fig. 27 Proportioning Valve Locations On HCU

(2) Remove hydraulic brake line (Fig. 27) from proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

(3) Then remove proportioning valve from that outlet port of the HCU.

CAUTION: Be sure the pressure test fitting being installed into the HCU, has the correct thread sizes for installation into the HCU and installation of the proportioning valve.

(4) Install Pressure Test Fitting, Special Tool 6805-1 or 6805-2 into the outlet port of the HCU.

(5) Install proportioning valve into pressure test fitting installed in the HCU outlet port.

CAUTION: Be sure the pressure test fitting being installed into proportioning valve, has the correct thread sizes for installation into the proportioning valve and installation of brake tube fitting into proportioning valve.

(6) Install Pressure Test Fitting, Special Tool 6805-3 or 6805-4 into the outlet of the proportioning valve.

(7) Connect brake hydraulic line onto pressure test fitting installed in proportioning valve.

(8) Install a Pressure Gauge, Special Tool C-4007-A into each pressure test fitting. Bleed air out of hose from pressure test fitting to pressure gauge, at pressure gauge to remove all trapped air.

(9) With the aid of a helper, apply pressure to the brake pedal until reading on proportioning valve inlet gauge, is at the pressure shown on the following chart. Then check the pressure reading on the proportioning valve outlet gauge. If proportioning valve outlet pressure does not agree with value shown on the following chart, when inlet pressure shown on chart is obtained, replace the proportioning valve. If proportioning valve is within pressure specifications do not replace proportioning valve.

(10) Check rear wheel brake shoe linings for contamination or for replacement brake shoes not meeting OEM brake lining material specifications. These conditions can also be a possible cause for a premature rear wheel skid.

(11) Install proportioning valve in HCU and hand tighten until proportioning is fully installed and O-ring seal is seated into HCU. Then torque proportioning valve to 40 N·m (30 ft. lbs.).

(12) Install brake tube on proportioning valve. Torque tube nut to 17 N·m (145 in-lbs.) torque.

(13) Bleed the affected brake line. See Bleeding Brake System in the Service Adjustments section of the manual for proper bleeding procedure.

PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS

Sales Code	Brake System Type	Split Point	Slope	Identification	Inlet Pressure	Outlet Pressure
BRA	14" Disc/Drum W/O ABS	600 psi	0.59	Black Or Gold Stripe	1000 psi	800-900 psi
BRJ	14" Disc/Drum W/ABS	600 psi	0.59	Bar Code Label	1000 psi	800-900 psi

DIAGNOSIS AND TESTING (Continued)

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

RED BRAKE WARNING LAMP TEST

For diagnosis of specific problems with the red brake warning lamp system, refer to Brake System Diagnostics Chart 2, located in the Diagnosis And Testing section in this group of the service manual.

STOP LAMP SWITCH TEST PROCEDURE

The required procedure for testing the stop lamp switch is covered in Group 8H, Vehicle Speed Control System in this service manual. The electrical circuit tests for stop lamps is covered in Group 8W Rear Lighting in this service manual.

SERVICE PROCEDURES

BRAKE FLUID LEVEL CHECK

Check master cylinder reservoir brake fluid level a minimum of twice a year.

Master cylinder reservoirs are marked with the words **FULL AND MIN** indicating proper range of the master cylinder fluid level (Fig. 28).

CAUTION: Use only Mopar® brake fluid or an equivalent from a tightly sealed container. Brake fluid must conform to DOT 3 specifications. Do not use petroleum-based fluid because seal damage in the brake system will result.

If necessary, add specified brake fluid bringing level to the **FULL** mark on the side of the master cylinder brake fluid reservoir (Fig. 28).

BRAKE BLEEDING

NOTE: For bleeding the ABS hydraulic system, see Bleeding ABX-4 Brake System in the Service Procedures Section of the ABS Brake Section in this group of the service manual.

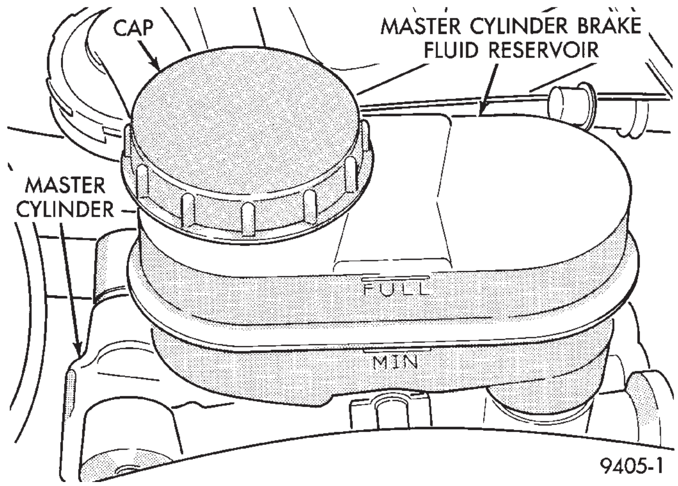


Fig. 28 Master Cylinder Fluid Level

CAUTION: Before removing the master cylinder cover, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder.

PRESSURE BLEEDING

CAUTION: Use bleeder tank Special Tool C-3496-B with required adapter for the master cylinder reservoir to pressurize the hydraulic system for bleeding.

NOTE: Follow pressure bleeder manufacturer's instructions for use of pressure bleeding equipment.

When bleeding the brake system, some air may be trapped in the brake lines or valves far upstream, as much as ten feet from the bleeder screw (Fig. 29). Therefore, it is essential to have a fast flow of a large volume of brake fluid when bleeding the brakes to ensure all the air gets out.

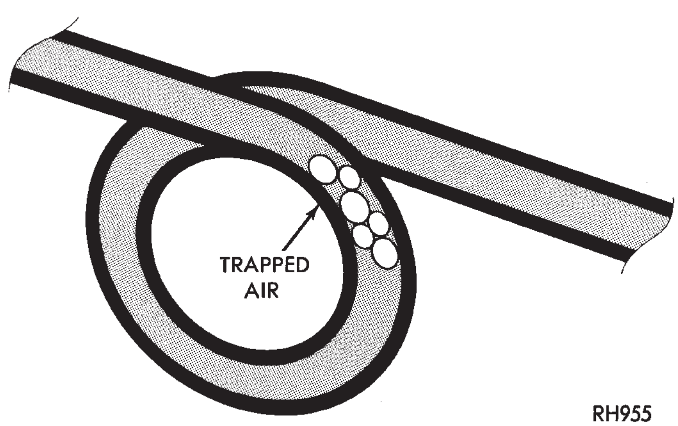


Fig. 29 Trapped Air in Brake Line

SERVICE PROCEDURES (Continued)

The following wheel sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

- Left rear wheel
- Right front wheel
- Right rear wheel
- Left front wheel

(1) Attach a clear plastic hose to the bleeder screw starting at the right rear wheel and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose (Fig. 30).

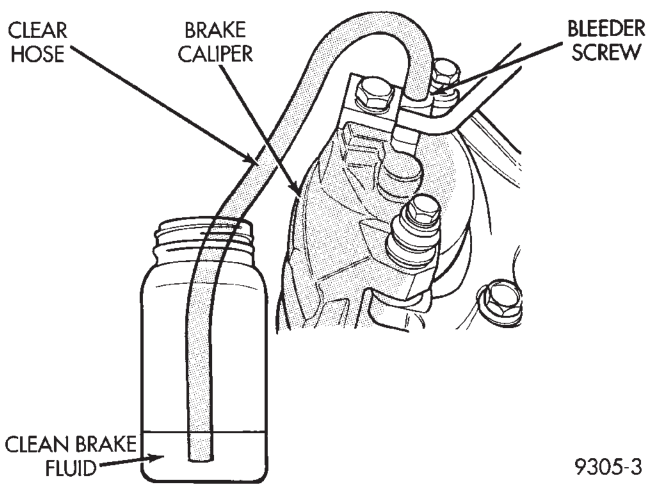


Fig. 30 Proper Method for Purging Air From Brake System (Typical)

(2) Open the bleeder screw at least **one full turn** or more to obtain an steady stream of brake fluid (Fig. 31).

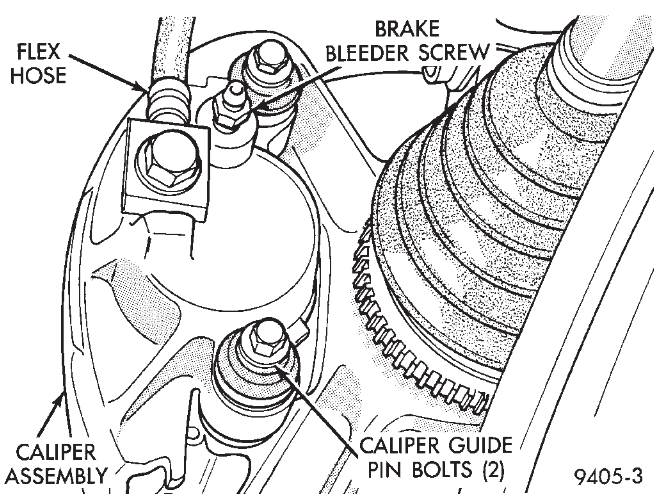


Fig. 31 Open Bleeder Screw at Least One Full Turn

(3) After 4 to 8 ounces of fluid has been bled through the brake and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.

(4) Repeat the procedure at all the other remaining bleeder screws. Then check the pedal for travel. If pedal travel is excessive or has not been improved, enough fluid has not passed through the system to expel all the trapped air. Be sure to monitor the fluid level in the pressure bleeder. It must stay at the proper level so air will not be allowed to reenter the brake system through the master cylinder reservoir.

BLEEDING WITHOUT A PRESSURE BLEEDER

NOTE: Correct bleeding of the brakes hydraulic system without the use of pressure bleeding equipment will require the aid of a helper.

The following wheel sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

- Left rear wheel
- Right front wheel
- Right rear wheel
- Left front wheel

(1) Attach a clear plastic hose to the bleeder screw starting at the right rear wheel and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose (Fig. 30).

(2) Pump the brake pedal three or four times and hold it down before the bleeder screw is opened.

(3) Open the bleeder screw at least 1 full turn. When the bleeder screw opens the brake pedal will drop.

(4) Close the bleeder screw. Release the brake pedal only **after** the bleeder screw is closed.

(5) Repeat steps 1 through 3, four or five times at each bleeder screw. Then check the pedal for travel. If pedal travel is excessive or has not been improved, enough fluid has not passed through the system to expel all the trapped air. Be sure to monitor the fluid level in the master cylinder reservoir. It must stay at the proper level so air will not be allowed to re-enter the brake system.

(6) Test drive vehicle to be sure brakes are operating correctly and that pedal is solid.

MASTER CYLINDER BLEEDING PROCEDURE

(1) Clamp the master cylinder in a vise. Attach Bleeding Tubes, Special Tool 6802 to the master cylinder outlet ports (Fig. 32) or (Fig. 33). Position bleeding tubes so the outlets of the bleeding tubes will be below the surface of the brake fluid when reservoir is filled to proper level.

(2) Fill brake fluid reservoir with brake fluid conforming to DOT 3 specifications such as Mopar or an Equivalent.

(3) Using a wooden dowel per (Fig. 34). Depress push rod slowly, and then allow pistons to return to

SERVICE PROCEDURES (Continued)

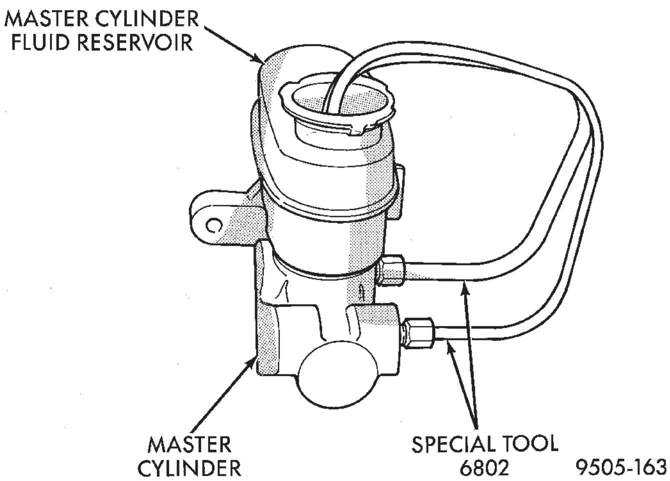


Fig. 32 Bleeding Tubes Attached To Master Cylinder With ABS

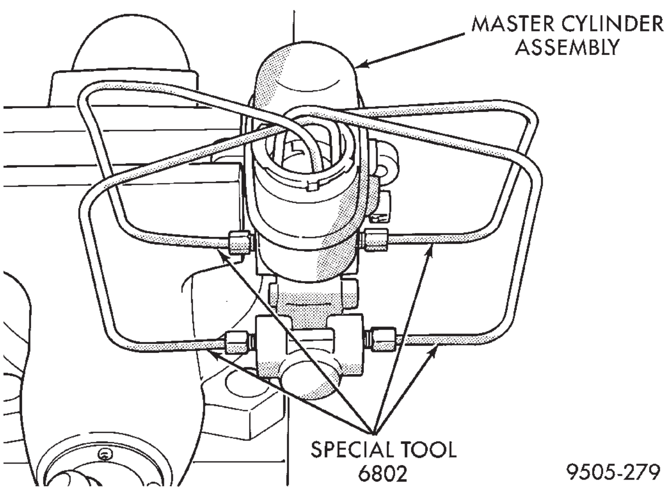


Fig. 33 Bleeding Tubes Attached to Master Cylinder With Out ABS

the released position. Continue to repeat this step several times after no more air bubbles are expelled from bleed tubes to ensure all air is bled from the master cylinder.

(4) Remove bleeding tubes from master cylinder outlet ports, plug outlet ports and install fill cap on reservoir.

(5) Remove master cylinder from vise.

NOTE: Note: It is not necessary to bleed the brakes entire hydraulic system after replacing the master cylinder. However, the master cylinder must have been thoroughly bled and filled to the proper level upon installation on the power brake vacuum booster.

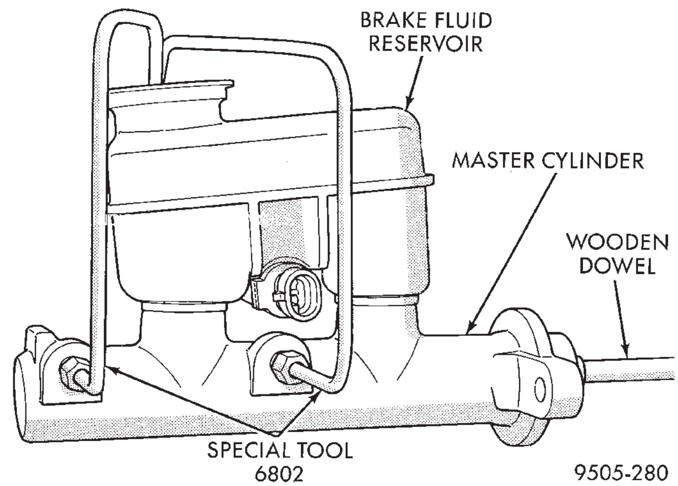


Fig. 34 Bleeding Master Cylinder

BRAKE ROTOR MACHINING

DISC BRAKE ROTOR TURNING PROCEDURES

Any servicing of the rotor requires extreme care to maintain the rotor to within service tolerances to ensure proper brake action.

BRAKE ROTOR REFINISHING INFORMATION

If the rotor surface is deeply scored or warped, or there is a complaint of brake roughness or pulsation, the rotor should be resurfaced or refaced (Fig. 35) or (Fig. 36).

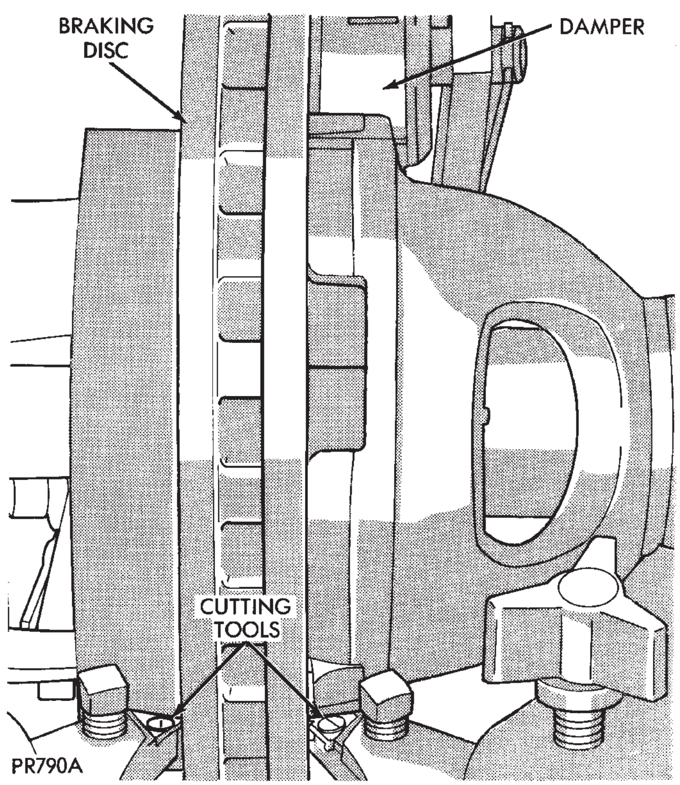


Fig. 35 Refacing Brake Rotor

SERVICE PROCEDURES (Continued)

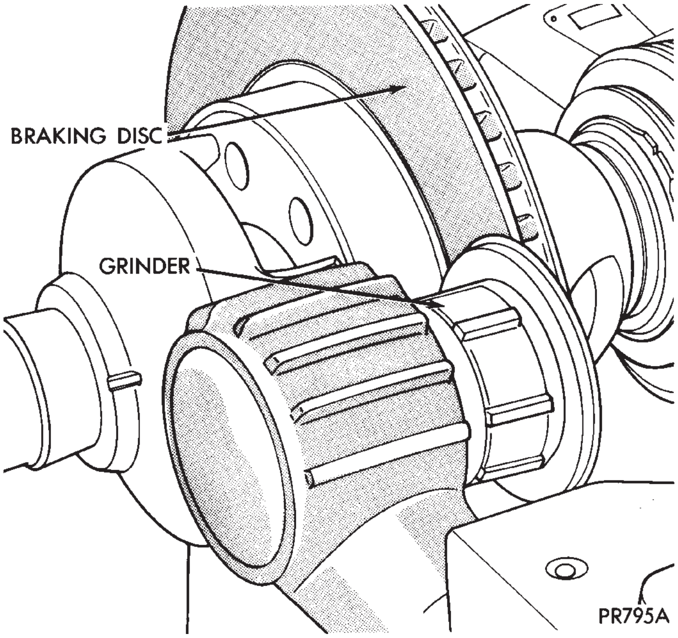


Fig. 36 Resurfacing Brake Rotor (Final Finish)

The following chart shows the location of measurements and specifications when servicing the rotor.

NOTE: All rotors have markings for minimum allowable thickness cast on an un-machined surface of the rotor (Fig. 37).

This marking includes 0.76 mm (0.030 inch) allowable rotor wear beyond the recommended 0.76 mm (0.030 inch) of rotor refacing.

The collets, shafts and adapters used on the brake lathe and the bearing cups in the rotor MUST be clean and free from any chips or contamination.

When mounting the rotor on the brake lathe, strict attention to the brake lathe manufacturer's operating instructions is required.

If the rotor is not mounted properly, the lateral runout will be worse after refacing or resurfacing than before.

REFACING BRAKE ROTOR

Refacing of the rotor is not required each time the brake pads are replaced.

When refacing a rotor the required 0.10 mm (0.004 inch) TIR (Total Indicator Reading) and 0.013 mm (0.0005 inch) thickness variation limits MUST BE MAINTAINED. **Extreme care** in the operation of rotor turning equipment is required.

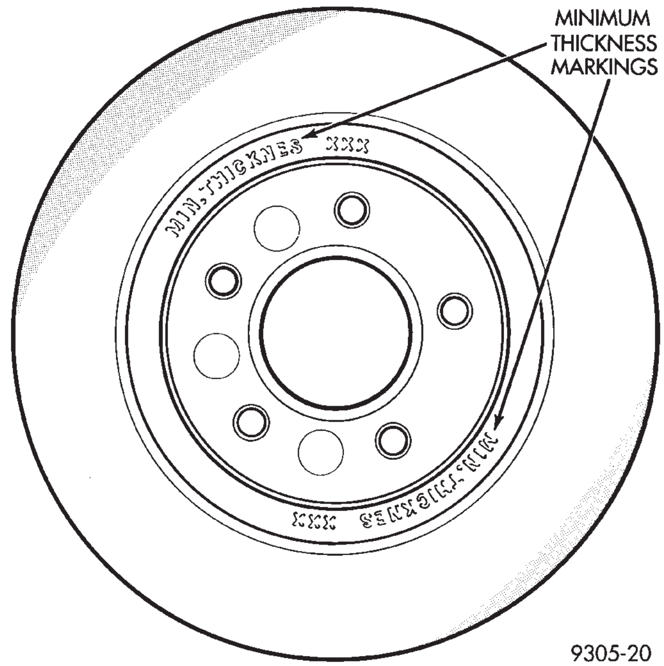


Fig. 37 Minimum Brake Rotor Thickness Markings (Example)

The use of a double straddle cutter (Fig. 35) that machines both sides of the rotor at the same time is highly recommended.

RESURFACNG BRAKE ROTOR

This operation can be used when rotor surface is rusty, has lining deposits or excessive lateral runout or thickness variation is evident.

A sanding rotor attachment will remove surface contamination without removing much rotor material.

It will generally follow variations in thickness that are in the rotor.

BRAKE DRUM MACHINING

Measure drum runout and diameter. If not to specification, reface drum. (Runout should not exceed 0.1524 mm or 0.006 inch). The diameter variation (oval shape) of the drum braking surface must not

BRAKE ROTOR REFINISHING LIMITS

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thicness Variation	Rotor Run Out *	Rotor Micro Finish
All Front Disc Brakes	23.13-22.87 mm .911 -.900 in.	21.4 mm .843 in	0.013 mm 0.0005 in.	0.13 mm 0.005 in.	15-80 RMS
* TIR Total Indicator Reading (Measured On Vehicle)					

SERVICE PROCEDURES (Continued)

exceed either 0.0635 mm (0.0025 inch) in 30° or 0.0889 mm (0.0035 inch) in 360°.

All brake drums are marked with the maximum allowable brake drum diameter (Fig. 38).

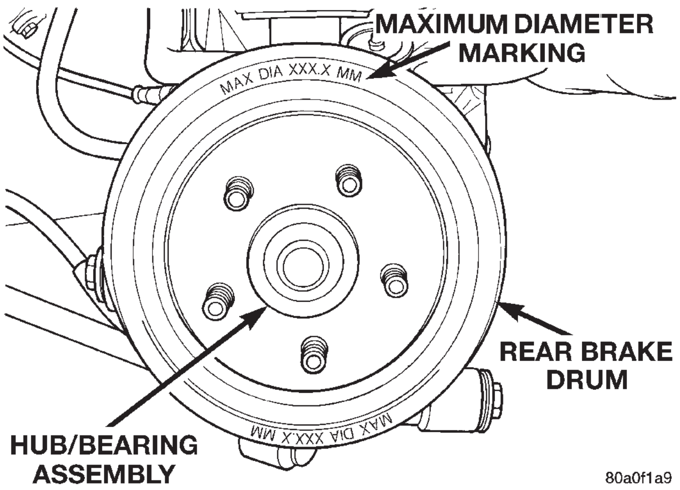


Fig. 38 Maximum Brake Drum Diameter Identification

BRAKE TUBE REPAIR

Only double wall 4.75mm (3/16 in.) steel tubing with Al-rich/ZN-AL alloy coating and the correct tube nuts are to be used for replacement of a hydraulic brake tube.

Care should be taken when repairing brake tubing, to be sure the proper bending and flaring tools and procedures are used, to avoid kinking. Do not route the tubes against sharp edges, moving components or into hot areas. All tubes should be properly attached with recommended retaining clips.

Using Tubing Cutter, Special Tool C-3478-A or equivalent, cut off damaged seat or tubing (Fig. 39). Ream out any burrs or rough edges showing on inside of tubing (Fig. 40). This will make the ends of tubing square (Fig. 40) and ensure better seating of flared end tubing. **PLACE TUBE NUT ON TUBING BEFORE FLARING THE TUBING.**

DOUBLE INVERTED TUBING FLARES

To make a double inverted tubing flare (Fig. 41) and (Fig. 42). Open handles of Flaring Tool, Special Tool C-4047 or equivalent. Then rotate jaws of tool until the mating jaws of tubing size are centered between vertical posts on tool. Slowly close handles with tubing inserted in jaws but do not apply heavy pressure to handle as this will lock tubing in place.

Place gauge (Form A) on edge over end of brake tubing. Push tubing through jaws until end of tubing contacts the recessed notch in gauge matching the tubing size. Squeeze handles of flaring tool and lock tubing in place. Place 3/16 inch plug of gauge (A) down in end of tubing. Swing compression disc over gauge and center tapered flaring screw in recess of

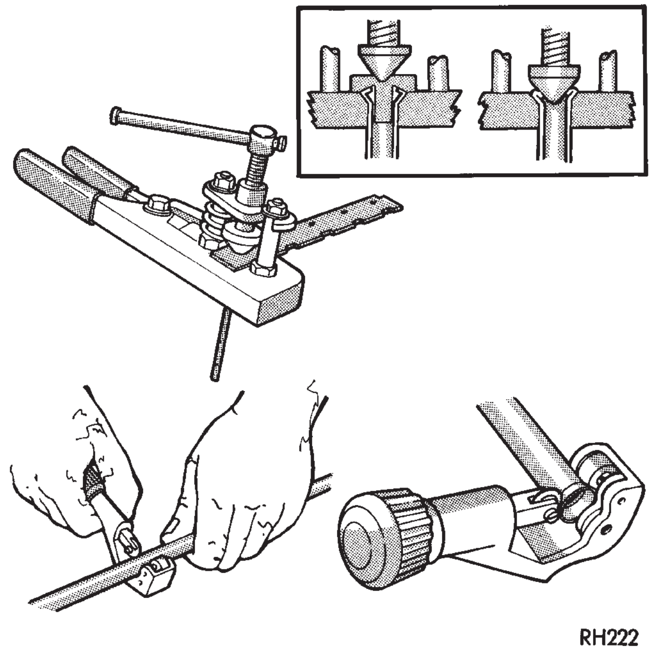


Fig. 39 Cutting And Flaring Of Brake Fluid Tubing

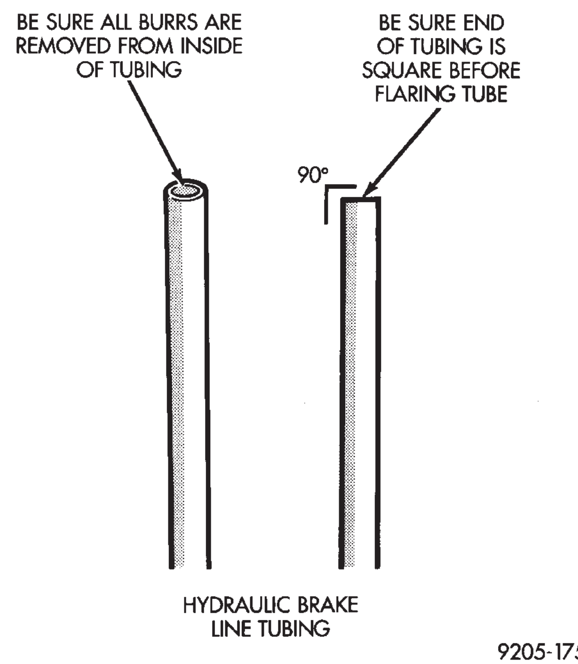


Fig. 40 Brake Fluid Tube Preparation For Flaring

disc. Screw in until plug gauge has seated on jaws of flaring tool. This action has started to invert the extended end of the tubing. Remove gauge and continue to screw down until tool is firmly seated in tubing. Remove tubing from flaring tool and inspect seat. Refer to tube routing diagrams for proper brake tube routing and clip locations. Replace any damaged tube routing clips.

REMOVAL AND INSTALLATION (Continued)

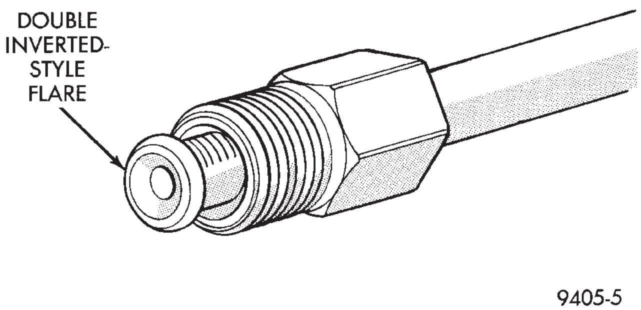


Fig. 41 Double Inverted Brake Line Tubing Flare

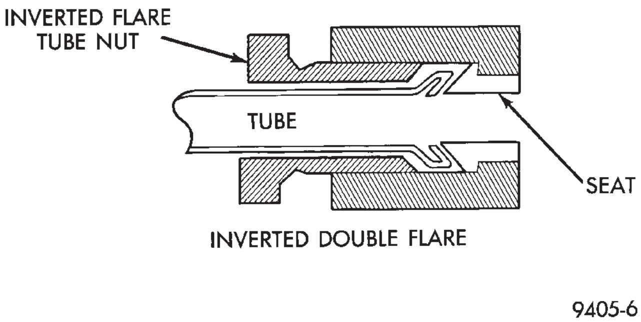


Fig. 42 Double Wall Inverted Flare Connection

REMOVAL AND INSTALLATION

WHEEL AND TIRE

To install the wheel and tire assembly, first position it properly on the mounting surface using the hub pilot as a guide. Then progressively tighten the lug nuts in the proper sequence to half of the required torque. Finally tighten the lug nuts in the proper sequence to 135 N·m (100 ft. lbs.) (Fig. 43). Never use oil or grease on studs or nuts.

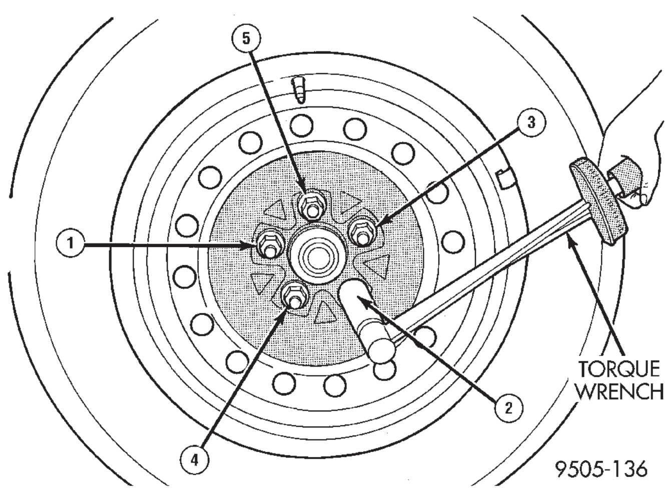


Fig. 43 Five Lug Wheel Nut Tightening Sequence

FRONT DISC BRAKE CALIPER

During service procedures, grease or any other foreign material must be kept off caliper assembly, surfaces of braking rotor and external surfaces of hub.

Handling of the braking rotor and caliper should be done in such a way as to avoid deformation of the rotor and scratching or nicking of the brake linings.

NOTE: Before vehicle is moved after any brake service work, pump the brake pedal several times to insure the vehicle has a firm brake pedal.

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove front wheel and tire assemblies from vehicle.

(3) Remove the 2 caliper to steering knuckle guide pin bolts (Fig. 44).

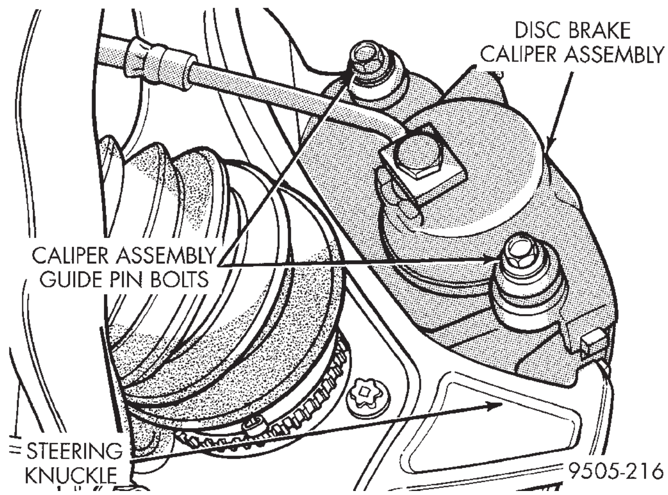


Fig. 44 Removing Caliper Guide Pin Bolts

(4) Remove brake caliper from steering knuckle, by first rotating bottom end of caliper away from steering knuckle. Then slide top of caliper down from the machined abutment on steering knuckle (Fig. 45).

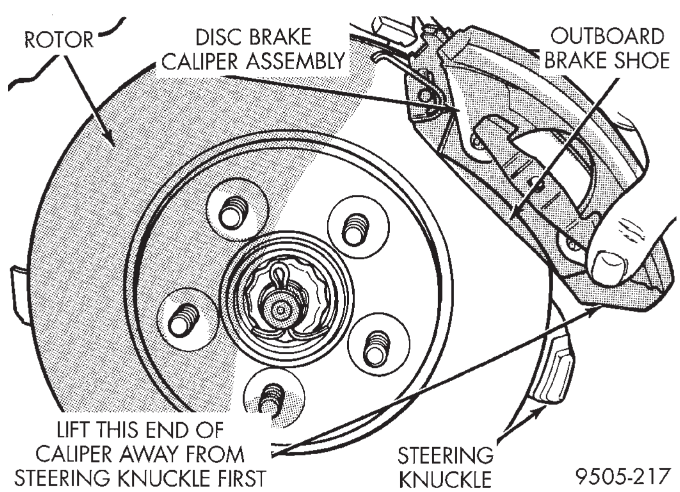


Fig. 45 Removing / Installing Brake Caliper

REMOVAL AND INSTALLATION (Continued)

(5) **Support caliper from upper control arm to prevent weight of caliper from being supported by brake flex hose. Supporting disc brake caliper from flex hose can damage the hose (Fig. 46).**

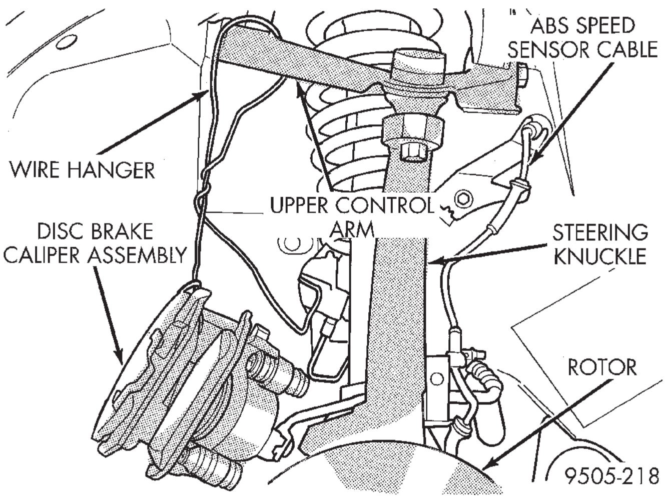


Fig. 46 Storing Caliper

INSTALL

(1) Lubricate both steering knuckle abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(2) If removed, install the front rotor on the hub, making sure it is squarely seated on face of hub.

CAUTION: Use care when installing the caliper assembly onto the steering knuckle so the seals on the caliper guide pin bushings do not get damaged by the steering knuckle bosses.

(3) Carefully position caliper and brake shoe assemblies over brake rotor by first hooking top of brake shoes on the machined abutment on upper steering knuckle (Fig. 45). Then rotate the bottom of the brake caliper into position on the steering knuckle. **Make sure that caliper guide pin bolts, bushings and sleeves are clear of the steering knuckle bosses.**

NOTE: When being installed, extreme caution must be taken not to cross thread the caliper guide pin bolts.

(4) Install the brake caliper guide pin bolts (Fig. 44). Then tighten the guide pin bolts to a torque of 22 N·m (16 ft. lbs.).

(5) Install the wheel and tire assembly.

(6) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(7) Remove jackstands or lower hoist. **Before moving vehicle, pump the brake pedal several times to insure the vehicle has a firm brake pedal.** .

(8) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.

FRONT BRAKE SHOES

WARNING: ALTHOUGH FACTORY INSTALLED BRAKELININGS ARE MADE FROM ASBESTOS FREE MATERIALS, SOME AFTER MARKET BRAKELINING MAY CONTAIN ASBESTOS. THIS SHOULD BE TAKEN INTO ACCOUNT WHEN SERVICING A VEHICLE'S BRAKE SYSTEM, WHEN AFTER MARKET BRAKELININGS MAY HAVE BEEN INSTALLED ON THE VEHICLE. ALWAYS WEAR A RESPIRATOR WHEN CLEANING BRAKE COMPONENTS AS ASBESTOS CAN CAUSE SERIOUS BODILY HARM SUCH AS ASBESTOSIS AND OR CANCER. NEVER CLEAN BRAKE COMPONENTS BY USING COMPRESSED AIR, USE ONLY A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF BRAKE DUST. IF A VACUUM CLEANER IS NOT AVAILABLE, CLEAN BRAKE PARTS USING ONLY WATER DAMPENED SHOP TOWELS. DO NOT CREATE BRAKELINING DUST BY SANDING BRAKE LININGS WHEN SERVICING A VEHICLE. DISPOSE OF ALL DUST AND DIRT SUSPECTED OF CONTAINING ASBESTOS FIBERS USING ONLY SEALED AIRTIGHT BAGS OR CONTAINERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA), FOR HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

If inspection reveals that the square sectioned caliper piston seal is worn or damaged, it should be replaced immediately.

During removal and installation of a wheel and tire assembly, use care not to strike the caliper.

NOTE: Before vehicle is moved after any brake service work, pump the brake pedal several times to insure the vehicle has a firm brake pedal.

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove front wheel and tire assemblies from vehicle.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When prying the piston back into the bore of the caliper do not use a hard pry bar. The use of a hard pry bar will damage the braking surface of the rotor.

(3) Slightly pry the piston back into the bore of the disc brake caliper. The piston is to be pryed back by inserting a soft tool (such as a trim stick) between the inboard brake shoe and the rotor and prying against the inboard brake shoe. This will force the piston back into the caliper.

(4) Remove the 2 brake caliper to steering knuckle guide pin bolts (Fig. 47).

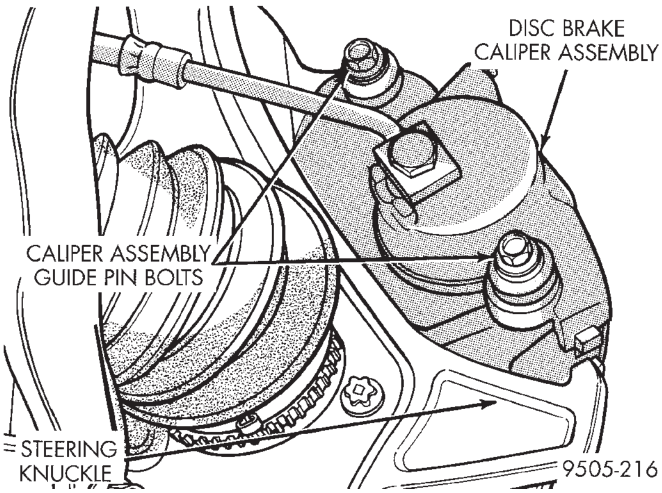


Fig. 47 Removing Caliper Guide Pin Bolts

(5) Remove brake caliper from steering knuckle, by first rotating bottom of brake caliper away from the steering knuckle. Then slide top of brake shoes down and out from the top machined abutment on steering knuckle (Fig. 48).

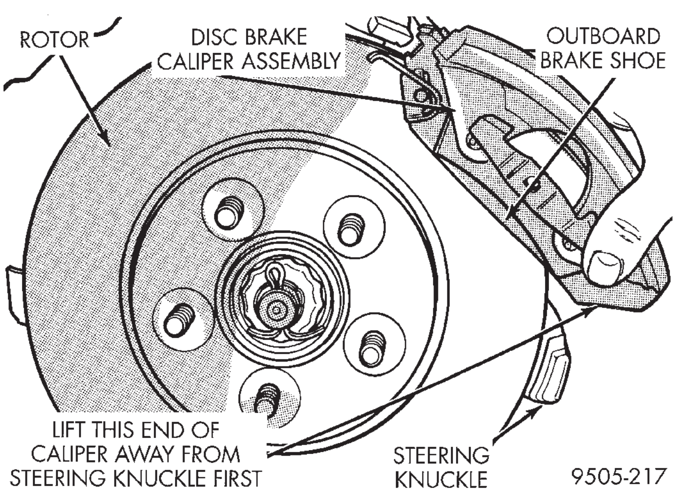


Fig. 48 Removing Brake Caliper

(6) **Support brake caliper from upper control arm to prevent weight of caliper from being supported by brake flex hose. Supporting disc brake caliper from flex hose can damage the hose (Fig. 49).**

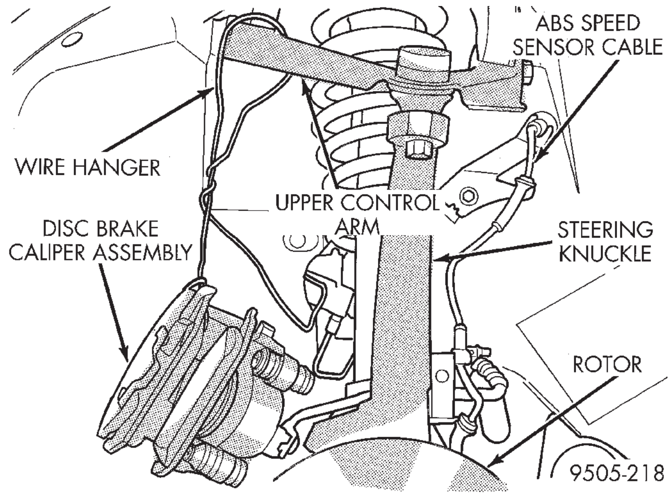


Fig. 49 Storing Caliper

(7) Remove the brake rotor from the front hub (Fig. 50).

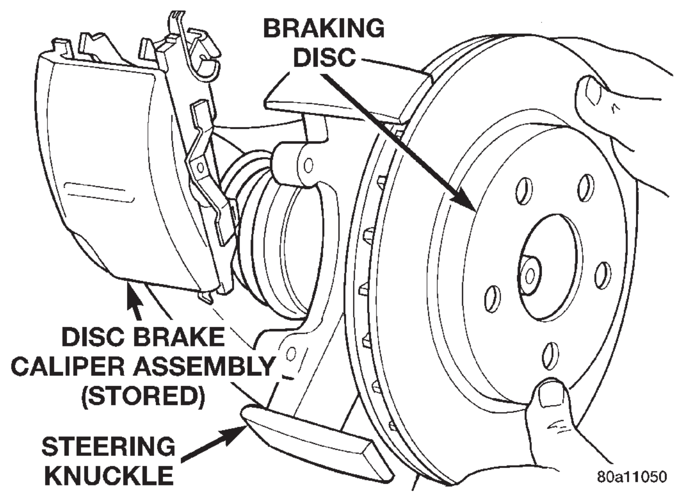


Fig. 50 Removing / Installing Brake Rotor

(8) Remove outboard brake shoe by pushing the brake shoe inward until retaining pins on brake shoe can be removed from holes in caliper (Fig. 51). Then slide the brake shoe off the caliper.

(9) Pull inboard brake shoe away from piston until retaining clip is free from cavity in piston (Fig. 52).

CALIPER INSPECTION

Check caliper for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper and install a new seal and boot, (and piston if scored). Refer to Caliper Disassembly And Re-Assembly Procedures in Disc Brake Caliper Service in this section of the service manual.

REMOVAL AND INSTALLATION (Continued)

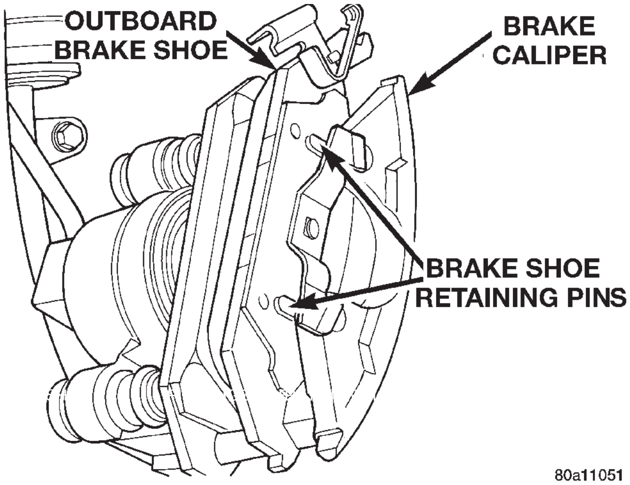


Fig. 51 Removing / Installing Outboard Brake Shoe

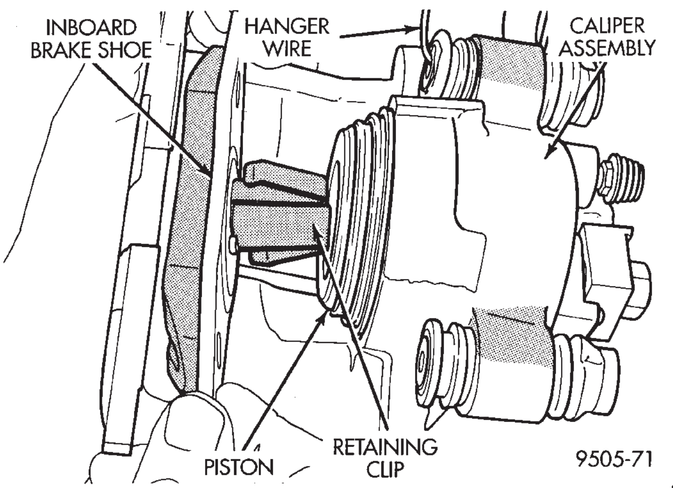


Fig. 52 Removing Inboard Brake Shoe

Check the caliper dust boot and caliper pin bushings to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

INSTALL

(1) Completely retract caliper piston back into piston bore of caliper assembly. This is required for caliper installation with new brake shoe assemblies.

(2) Lubricate both steering knuckle abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(3) Install the front rotor on the hub, making sure it is squarely seated on face of hub (Fig. 50).

(4) Remove the protective paper from the noise suppression gasket on both the inner and outer brake shoe assemblies (if equipped).

NOTE: Note: The inboard and outboard brake shoes are not common (Fig. 53). Be sure the correct outer brake shoe is installed in the correct caliper. The left and right outer brake shoes are different and must be installed correctly. The wear sensor (Fig. 53) and the hold down clip must be on the upper end of the caliper when the caliper and brake shoes are installed on the steering knuckle.

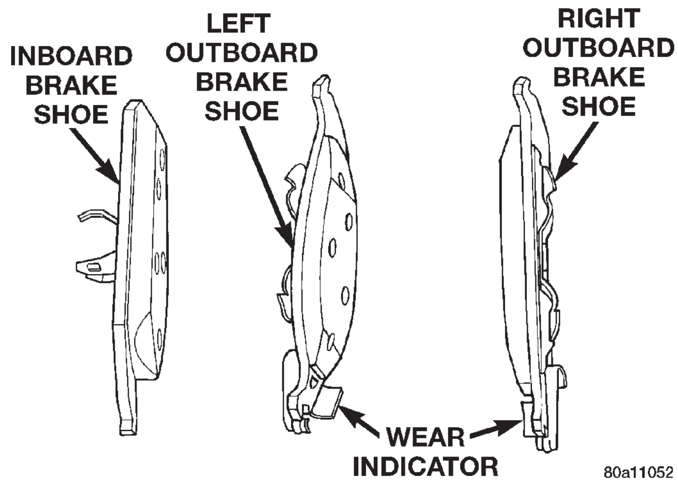


Fig. 53 Front Brake Shoe Assembly Identification

(5) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing into piston bore (Fig. 54). Be sure inboard brake shoe assembly is positioned squarely against face of caliper piston.

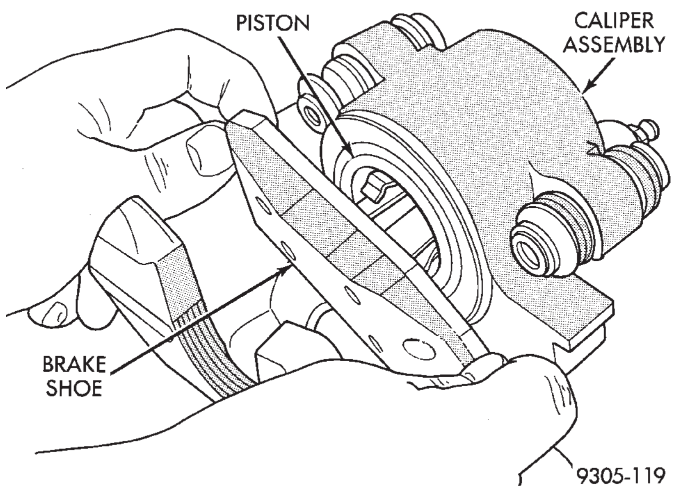


Fig. 54 Installing Inboard Brake Shoe Assembly

(6) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 51).

CAUTION: Use care when installing the caliper assembly onto the steering knuckle so the seals on the caliper guide pin bushings do not get damaged by the steering knuckle bosses. Also, make sure that caliper guide pin bushings and sleeves are clear of the steering knuckle bosses

REMOVAL AND INSTALLATION (Continued)

(7) Carefully position brake caliper and brake shoes over brake rotor by first hooking top of brake shoes onto upper abutment on steering knuckle (Fig. 55). Then rotate caliper into position at bottom of steering knuckle.

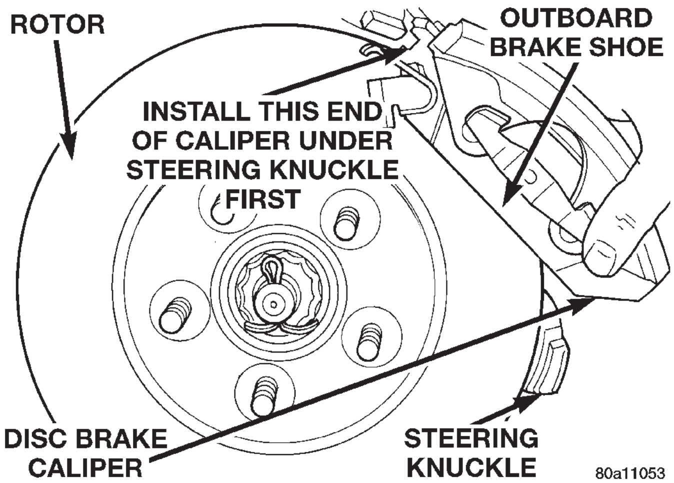


Fig. 55 Installing Brake Caliper

NOTE: When installing guide pin bolts, extreme caution should be taken not to cross thread the caliper guide pin bolts.

(8) Install the caliper guide pin bolts (Fig. 47) and tighten to a torque of 22 N·m (16 ft. lbs.).

(9) Install the wheel and tire assembly.

(10) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(11) Remove jackstands or lower hoist. **Before moving vehicle, pump the brake pedal several times to insure the vehicle has a firm brake pedal.** .

(12) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

REAR BRAKE DRUM

REMOVE

If the vehicle has high mileage, the brake drums may have a ridge worn in them by the brake shoes. This ridge causes the brake drum to interfere with the brake shoes thus, not allowing the brake drum to be removed. Further clearance can be obtained by backing off the brakes automatic self adjuster mechanism, using the following procedure.

(1) Remove the rubber plug (Fig. 56) from the brake support plate.

(2) Insert a screwdriver, through the automatic adjuster access hole, in the rear brake support plate (Fig. 57). Engage screwdriver with the teeth on the adjuster mechanism quadrant. Then rotate quadrant so that the teeth on the quadrant are moved toward the front of the vehicle (Fig. 57). This will back off the adjustment of the rear brake shoes.

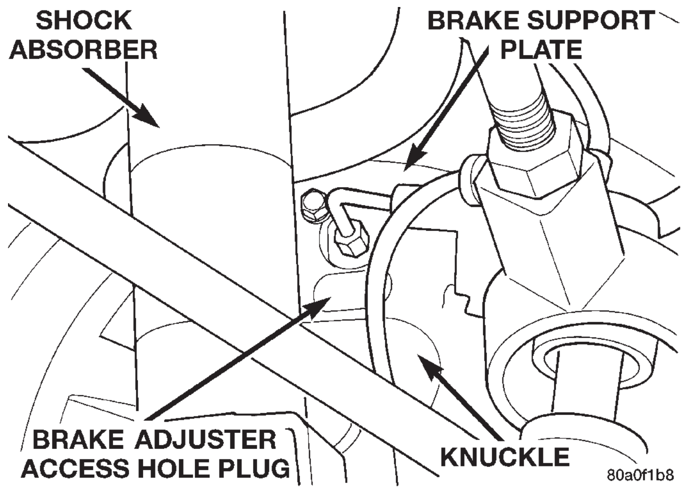


Fig. 56 Automatic Adjuster Access Hole Plug

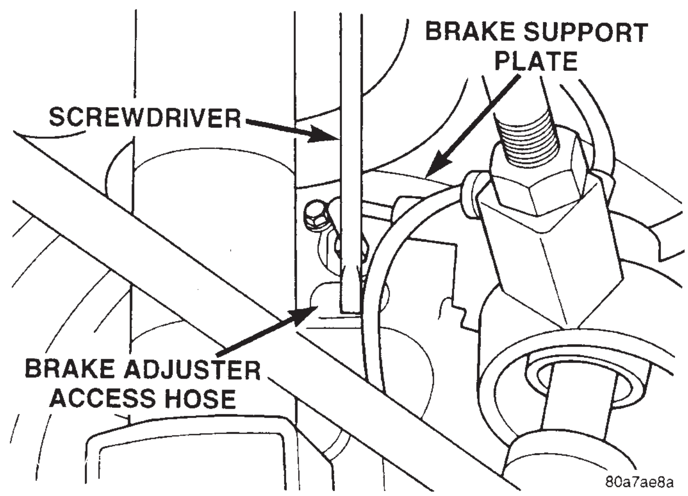


Fig. 57 Backing Off Rear Brake Shoe Adjustment

(3) Remove the rear brake drum from the rear hub and bearing assembly (Fig. 58).

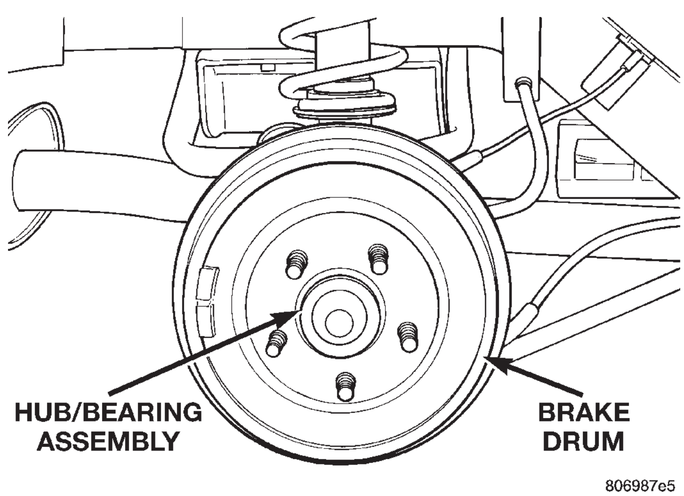


Fig. 58 Brake Drum And Hub And Bearing Assembly

REMOVAL AND INSTALLATION (Continued)

INSTALL

(1) Install rear brake drum on rear hub and bearing assembly.

(2) Install the wheel and tire assembly.

(3) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(4) Adjust rear brakes.

REAR BRAKE SHOES

NOTE: When replacing the rear brake shoes on this vehicle, remove the brake shoes from only one side of the vehicle at a time. This is due to the automatic adjustment feature of the park brake system. If the brake shoe assemblies are removed from both rear wheels at the same time the adjuster will remove all the slack from the park brake cables, making installation of the brake shoes extremely difficult.

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove the rear wheel and tire assemblies from the vehicle.

(3) Remove rear brake drum to hub retaining clips (if equipped). Then remove rear brake drum from hub and bearing assembly (Fig. 59).

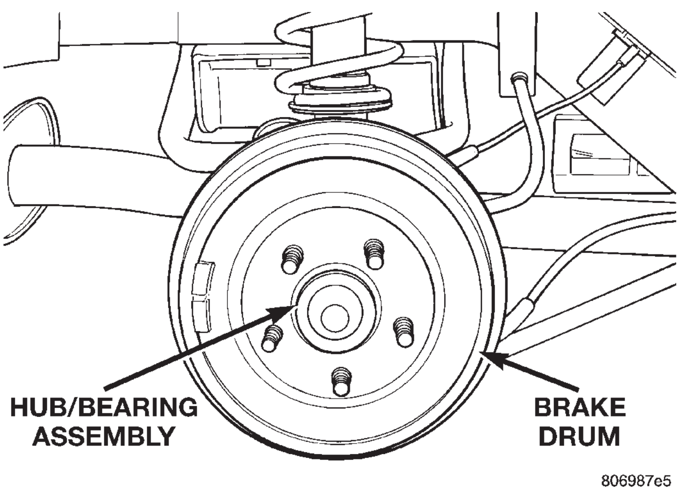


Fig. 59 Rear Brake Drum Assembly

(4) Remove the automatic adjuster lever actuating spring from the leading brake shoe (Fig. 60). Then remove the automatic adjuster actuating lever from the leading brake shoe (Fig. 60).

(5) Thread the automatic adjuster star wheel (Fig. 61) all the way into the adjuster, removing all tension from the adjuster. Then remove the upper return spring (Fig. 61) from the brake shoes.

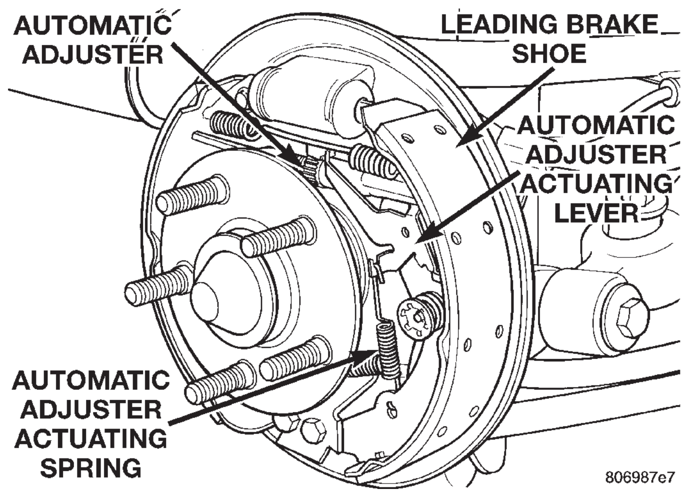


Fig. 60 Automatic Adjuster Actuating Spring And Lever

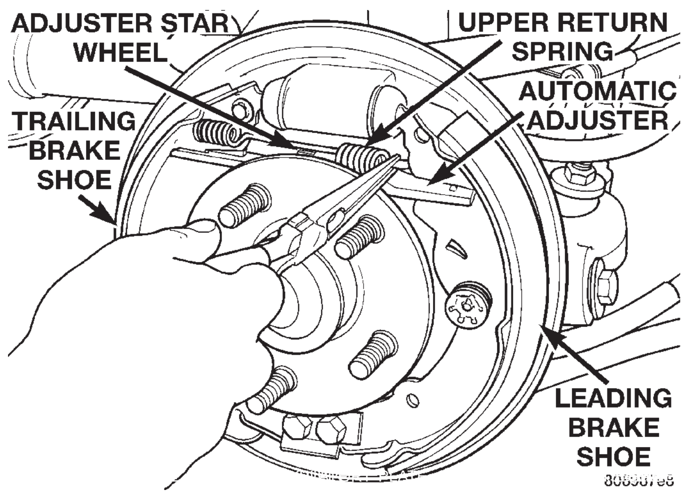


Fig. 61 Brake Shoe Upper Return spring

(6) Remove the brake shoe lower return spring (Fig. 62).

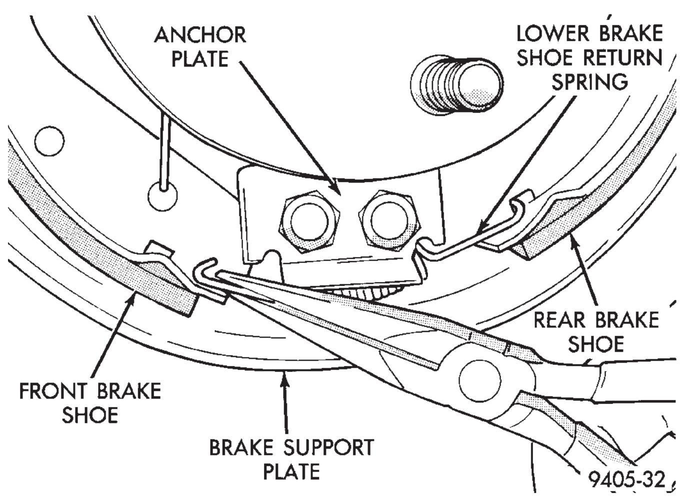


Fig. 62 Brake Shoe Lower Return Spring

REMOVAL AND INSTALLATION (Continued)

(7) Remove the hold down spring and attaching pin (Fig. 63) from the leading brake shoe.

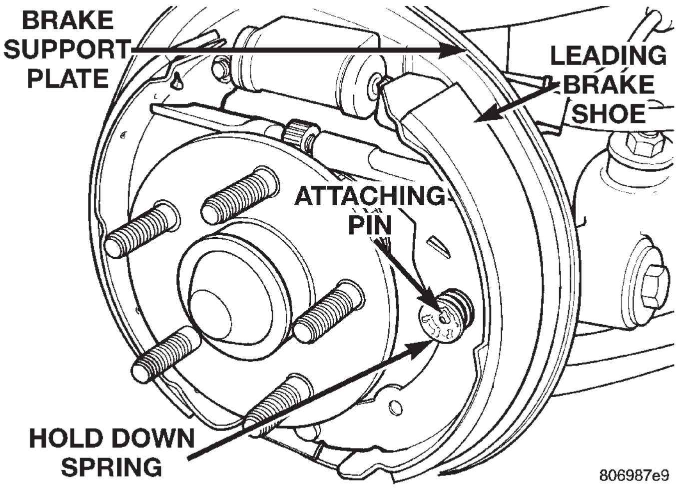


Fig. 63 Hold Down Spring And Pin

(8) Remove the leading brake shoe from the brake support plate.

(9) Remove the automatic adjuster (Fig. 64) from the trailing brake shoe and park brake actuating lever.

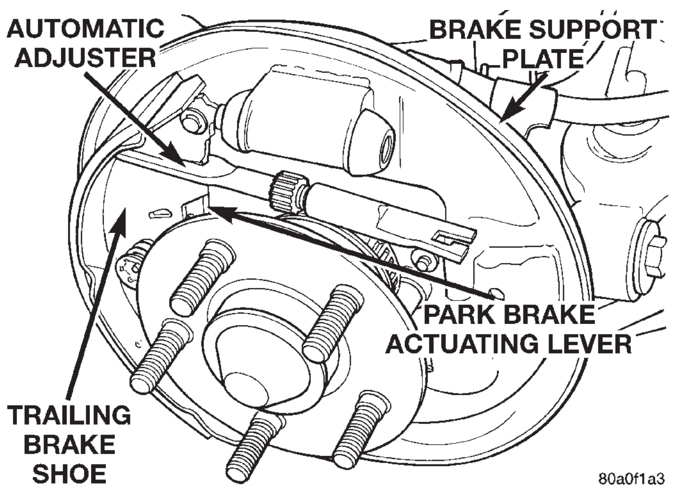


Fig. 64 Automatic Adjuster

(10) Remove the retaining clip (Fig. 65) holding the park brake actuating lever to the trailing brake shoe .

(11) Remove the hold down spring and attaching pin (Fig. 66) from the trailing brake shoe.

(12) Remove the trailing brake shoe from the brake support plate and the park brake actuating lever (Fig. 67).

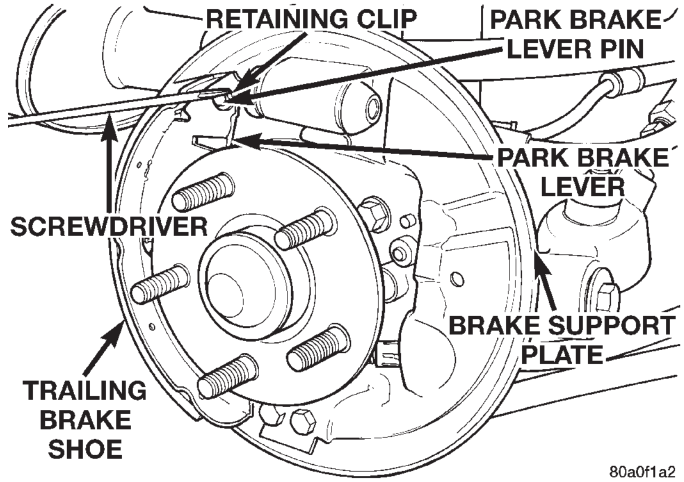


Fig. 65 Park Brake Lever Retaining Clip

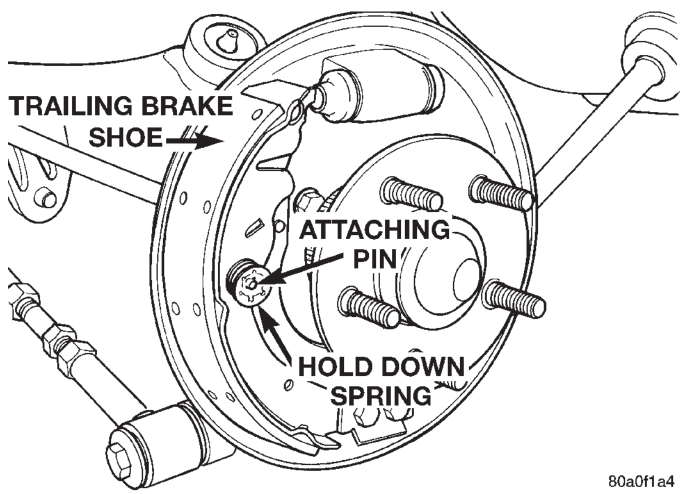


Fig. 66 Hold Down Spring And Pin

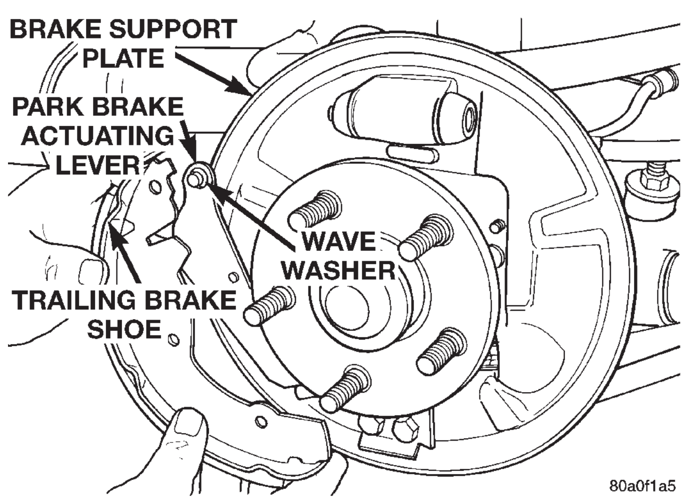


Fig. 67 Remove /Install Trailing Brake Shoe

CLEANING AND INSPECTION

Clean metal portion of brake shoes. Check to see if shoes are bent.

Brake shoe lining should show contact across its entire width and from the heel to the toe of the lining, otherwise replace.

REMOVAL AND INSTALLATION (Continued)

Shoes with lack of contact at toe or heel may be improperly ground.

Clean and inspect support and adjusting screws. Apply a thin coat of Mopar Multi-Purpose Lubricant or equivalent to the threads of the self adjuster (Fig. 68). Replace adjusting screw if corroded.

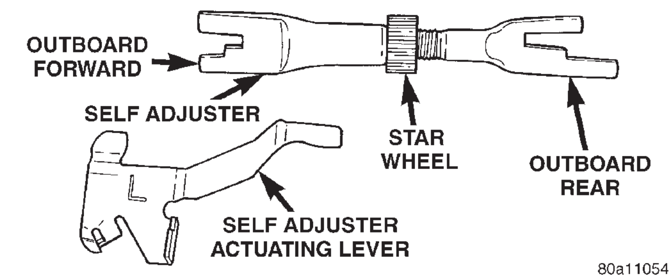


Fig. 68 Adjuster Screw and Lever (Typical)

If old springs have overheated or are damaged, replace. Overheating indications are paint discoloration or distorted end coils.

INSTALL

(1) Lubricate the six brake shoe contact areas on the brake support plate and the brake shoe contact points on the brake shoe anchor (Fig. 69) using Mopar Multi-Purpose Lubricant or equivalent .

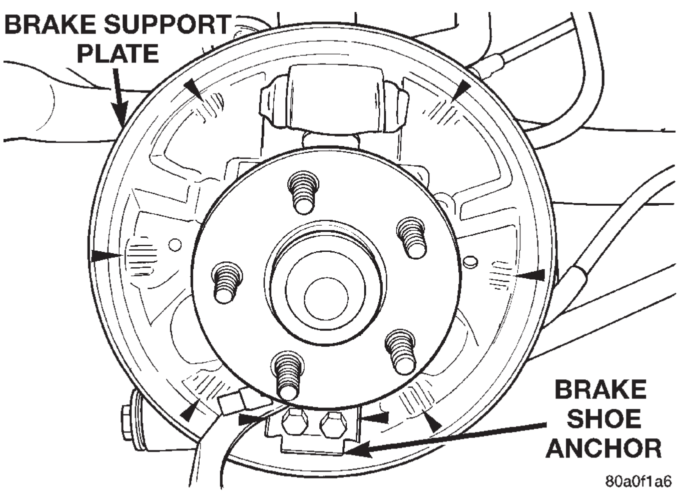


Fig. 69 Brake Shoe Contact Areas on Support Plate

(2) Install the wave washer on the pin of the park brake actuating lever (Fig. 70).

(3) Install the trailing brake shoe on the park brake actuating lever (Fig. 67)

(4) Install the trailing brake shoe on the brake support plate. Install the attaching pin and hold down spring for the trailing brake shoe (Fig. 66).

(5) Install the retaining clip attaching the park brake actuating lever to the trailing brake shoe (Fig. 71).

(6) Install the automatic adjuster on the trailing brake shoe and park brake actuating lever (Fig. 64).

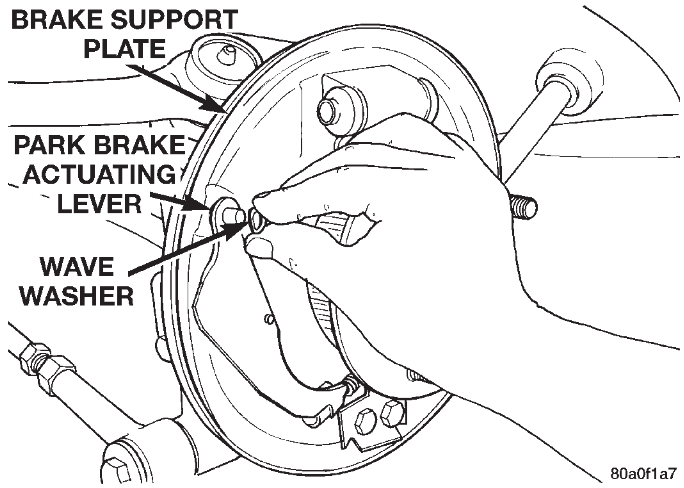


Fig. 70 Wave Washer Installation

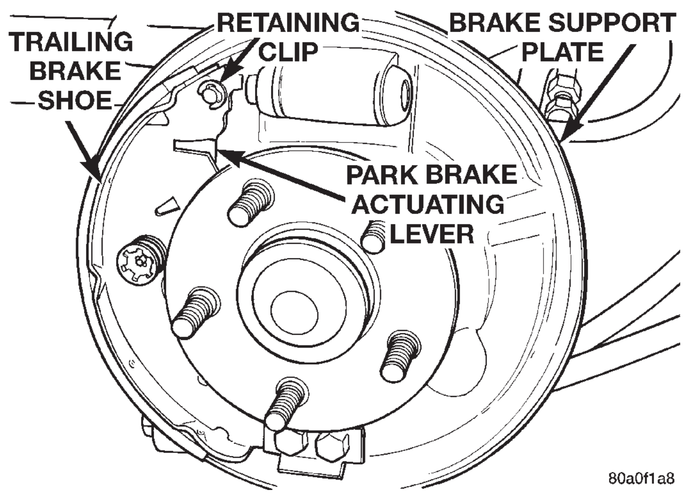


Fig. 71 Park Brake Actuating Lever Retaining Clip Installed

(7) Install the leading brake shoe on the brake support plate. Then install the attaching pin and hold down spring for the leading brake shoe (Fig. 63).

(8) Install the brake shoe lower return spring (Fig. 62).

(9) Install the upper return spring on the brake shoes (Fig. 61)

(10) Install the automatic adjuster actuating lever and the actuating spring on the leading brake shoe (Fig. 60).

(11) Manually adjust the brake shoes assemblies out as far as possible but not so as to interfere with brake drum installation.

(12) Install the rear brake drums on the hubs.

(13) Adjust rear brake shoes per Adjusting Rear Brakes procedure in the service adjustments section of the service manual.

(14) Install the wheel and tire assembly.

(15) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half

REMOVAL AND INSTALLATION (Continued)

specification. Then repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(16) Road test vehicle. The automatic adjuster will continue the brake adjustment during the road test of the vehicle.

REAR BRAKE SUPPORT PLATE

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove rear tire and wheel assembly from vehicle.

(3) Remove the dust cap from the rear hub and bearing assembly (Fig. 72).

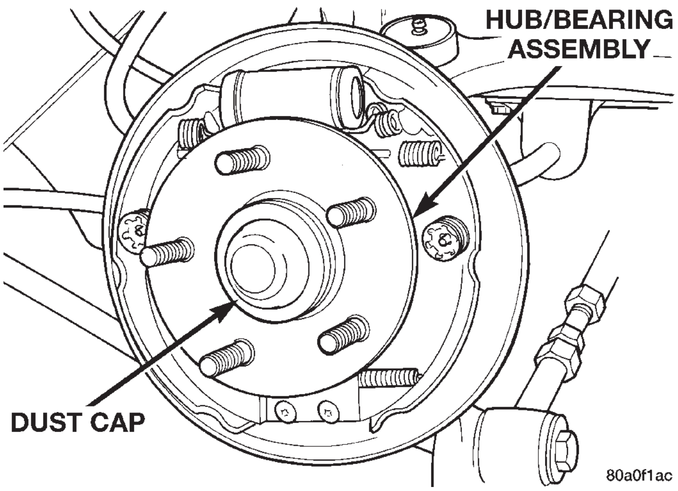


Fig. 72 Hub And Bearing Dust Cap

(4) Remove the rear hub and bearing assembly retaining nut (Fig. 73). Then remove the hub and bearing assembly from the rear knuckle.

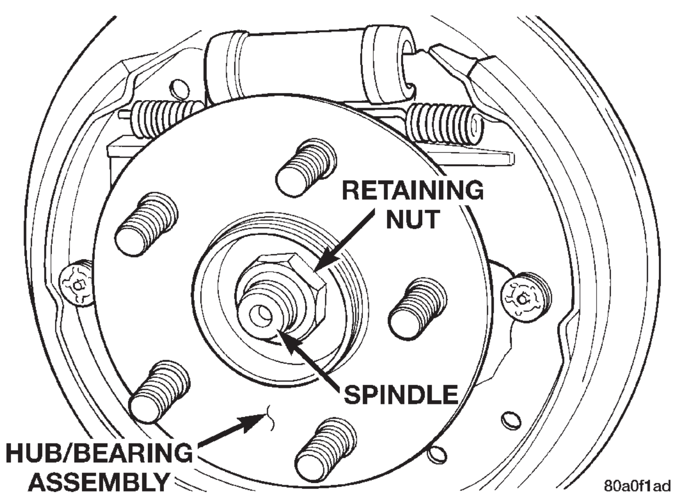


Fig. 73 Hub And Bearing Retaining Nut

(5) Remove the rear brake shoes from the brake support plate. Refer to Rear Brake Shoes in the Removal And Installation Section in this group of the service manual for the proper brake shoe assembly removal procedure.

(6) Disconnect rear brake flex hose tube from wheel cylinder and remove the brake flex hose bracket from the brake support plate (Fig. 74).

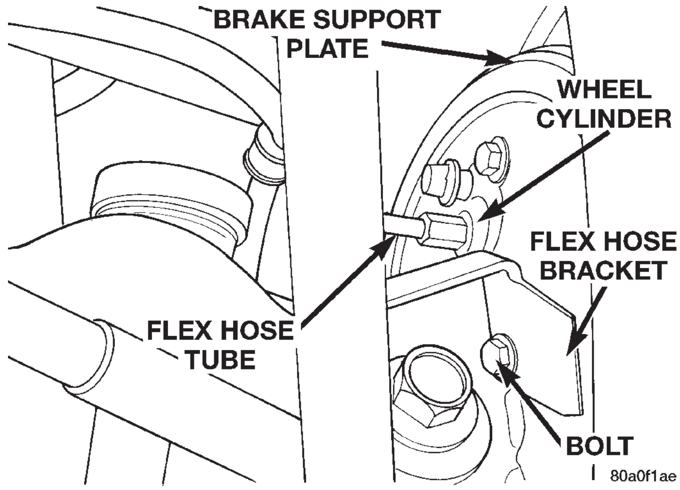


Fig. 74 Brake Flex Hose Tube At Wheel Cylinder

(7) Position a 1/2 wrench over the retainer fingers on the end of the parking brake cable (Fig. 75). Compress cable housing retaining fingers and start cable housing out of support plate (Fig. 75). Remove wrench when retainer is free from the park brake cable mounting hole in the rear brake support plate. Alternate method is to use a aircraft type hose clamp over cable housing end fitting compressing the three fingers.

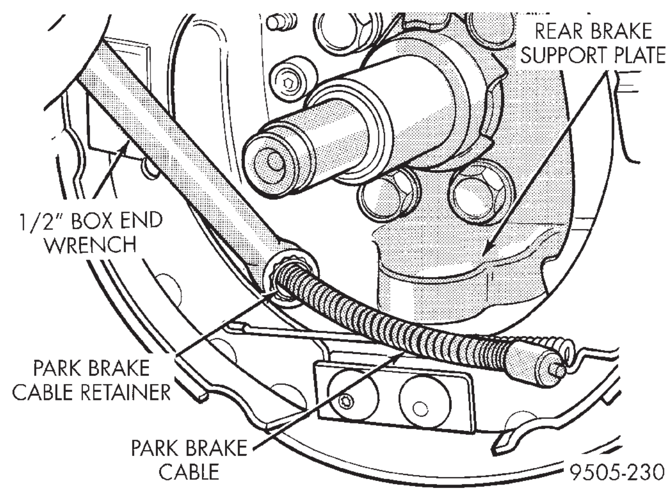


Fig. 75 Removing Park Brake Cable From Support Plate

(8) Remove the 4 bolts attaching the brake support plate to the knuckle. Separate brake support plate from rear suspension knuckle.

REMOVAL AND INSTALLATION (Continued)

INSTALL

(1) Install the gasket and brake support plate on rear suspension knuckle. Torque the brake support plate to knuckle attaching bolts to 75 N·m (55 ft. lbs.).

(2) Insert parking brake cable end fitting into brake support plate.

(3) Hand start hydraulic brake hose tube fitting to wheel cylinder. Tighten tube nut to a torque of 17 N·m (145 in. lbs.).

(4) Install rear brake shoe assemblies on the brake support plate. Refer to Rear Brake Shoes in the Removal And Installation Section in this group of the service manual for the proper brake shoe assembly installation procedure.

(5) Install rear hub and bearing assembly on rear knuckle. Install a **NEW** hub and bearing assembly retaining nut (Fig. 73). Tighten the hub and bearing assembly retaining nut to a torque of 250 N·m (185 ft. lbs.). Install dust cap.

(6) Adjust brake shoes assemblies so as not to interfere with brake drum installation.

(7) Install brake drum on rear hub/bearing assembly.

(8) Bleed the vehicle's base brakes hydraulic system.

(9) After brake drums are installed, pump brake pedal several times to do final adjustment of the brake shoe assemblies.

(10) Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

REAR BRAKE WHEEL CYLINDER

REMOVE

With brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks. If any of these conditions exist, the wheel cylinders should be completely cleaned, inspected and new parts installed.

(1) In case of a leak, remove brake shoes (replace if soaked with grease or brake fluid.)

(2) Disconnect rear brake flex hose tube from wheel cylinder and remove the flex hose routing bracket from the brake support plate (Fig. 76).

(3) Remove rear wheel cylinder attaching bolts (Fig. 77). Then pull wheel cylinder assembly off brake support plate.

INSTALL

(1) Apply a small bead of silicone sealer around the mating surface of the wheel cylinder to brake support plate.

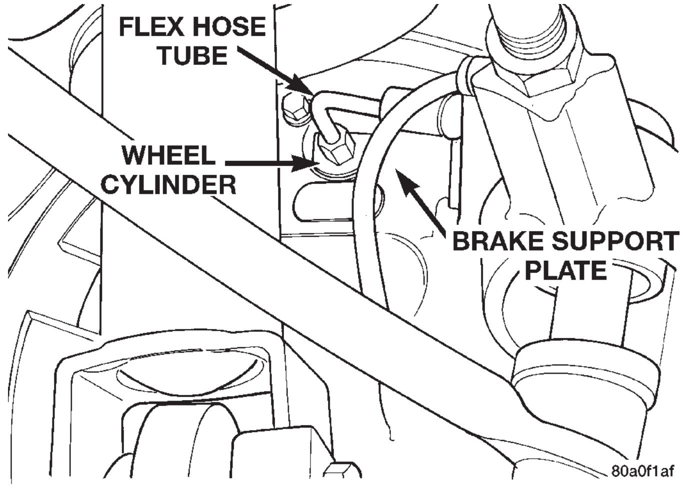


Fig. 76 Brake Flex Hose At Wheel Cylinder

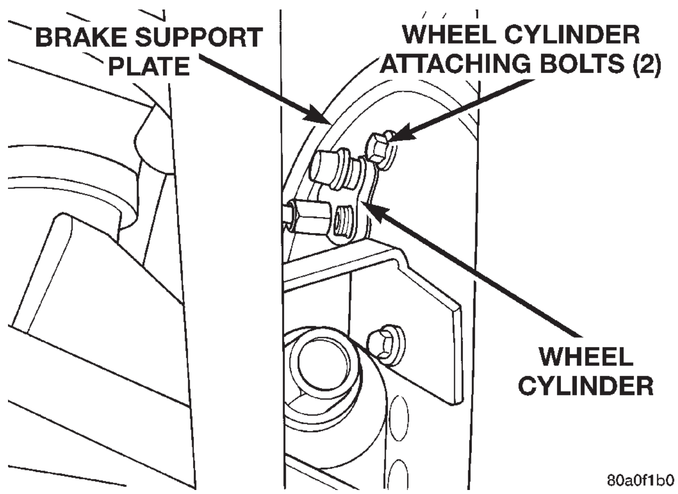


Fig. 77 Wheel Cylinder Attaching Bolts

(2) Install wheel cylinder onto brake support plate. Tighten the attaching bolts (Fig. 77) to a torque of 13 N·m (115 in. lbs.).

(3) Hand start the hydraulic brake hose tube fitting into the wheel cylinder (Fig. 76). Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(4) Install brake shoes on support plate. Follow procedure for Installing Brake Shoe Assemblies in this section of the service manual.

(5) Install rear brake drum onto rear hub.

(6) Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

(7) Adjust the rear brakes. See Adjusting Service Brakes in Service Adjustments section in this group of the service manual.

(8) Bleed the entire brake system. See Bleeding Brake System in Service Adjustments section in this group of the service manual.

REMOVAL AND INSTALLATION (Continued)

REAR HUB AND BEARING

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual for the required lifting procedure to be used for this vehicle.

(2) Remove rear wheel and tire assembly.

(3) If installed, remove brake drum retaining clips from wheel studs and discard.

(4) Remove the brake drum (Fig. 78) from the rear hub/bearing assembly.

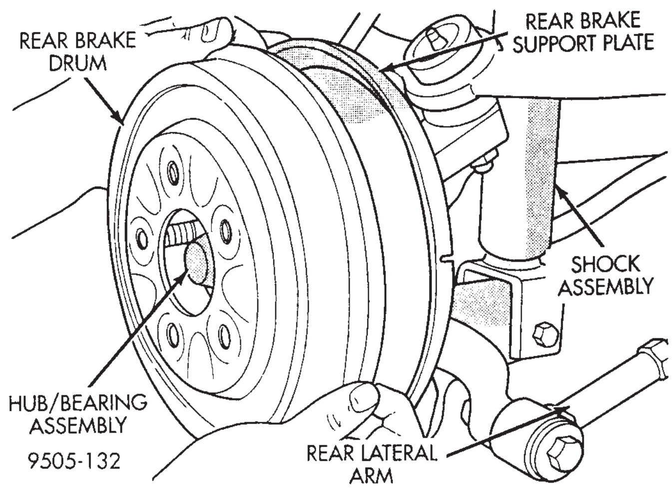


Fig. 78 Rear Brake Drum

(5) Remove dust cap (Fig. 79) from rear hub/bearing assembly.

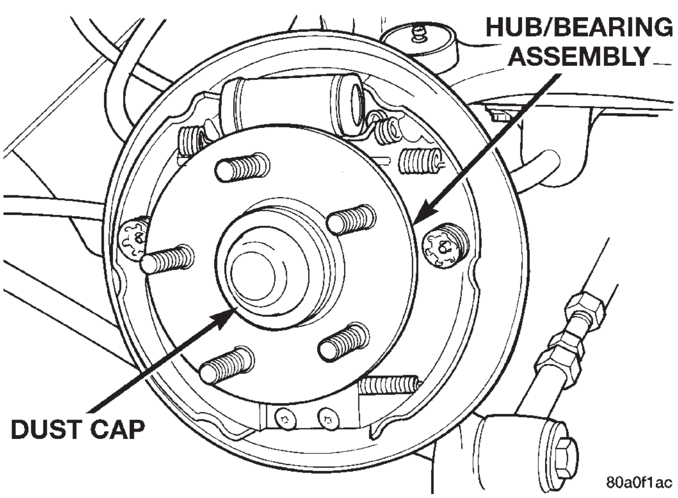


Fig. 79 Rear Hub/Bearing Dust Cap

(6) Remove hub/bearing assembly to rear spindle retaining nut (Fig. 80).

(7) Remove rear hub/bearing assembly from knuckle, by pulling it straight off the knuckle by hand.

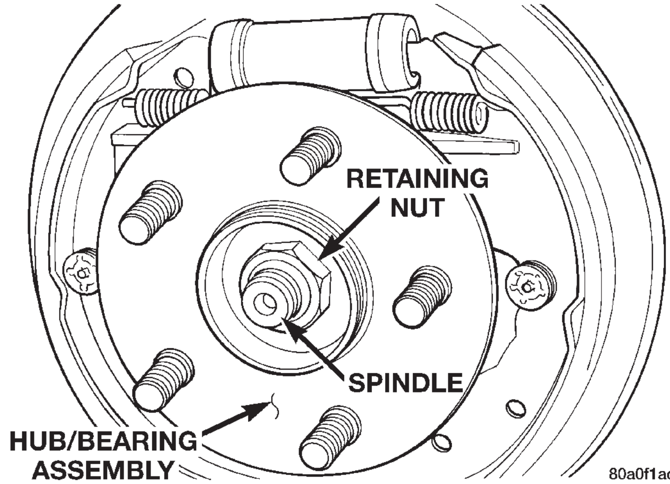


Fig. 80 Hub/Bearing Assembly Retaining Nut

INSTALL

(1) Install the hub/bearing assembly on the knuckle. Then install a **NEW** rear hub/bearing assembly retaining nut (Fig. 80). Tighten the hub/bearing assembly retaining nut to a torque of 250 N·m (185 ft. lbs.).

(2) Install hub/bearing assembly dust cap, (Fig. 79) using a soft faced hammer.

(3) Install the rear brake drum (Fig. 78) on the hub/bearing assembly.

(4) Install rear wheel and tire assembly on vehicle. Tighten all wheel stud nuts in criss cross pattern to one-half the specified torque. Then repeat pattern, fully tightening the stud nuts to a torque of 129 N·m (95 ft. lbs.).

(5) Lower vehicle.

MASTER CYLINDER

REMOVE

(1) Remove wiring harness connector from brake fluid level sensor in master cylinder brake fluid reservoir (Fig. 81).

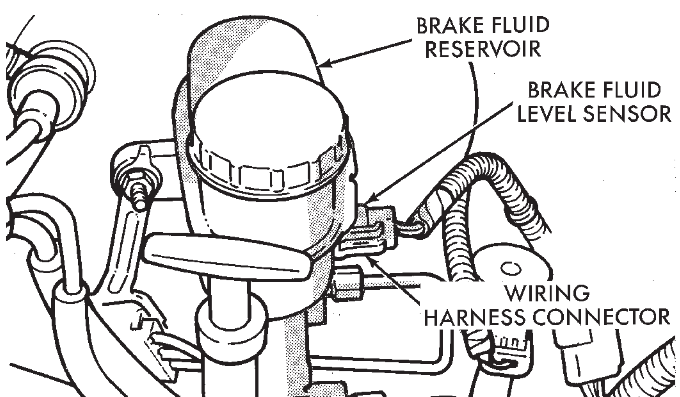


Fig. 81 Master Cylinder Fluid Level Sensor

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect the primary and secondary brake tubes from the master cylinder outlet ports (Fig. 82) (Fig. 83). Install plugs at all open brake tube outlets on master cylinder assembly.

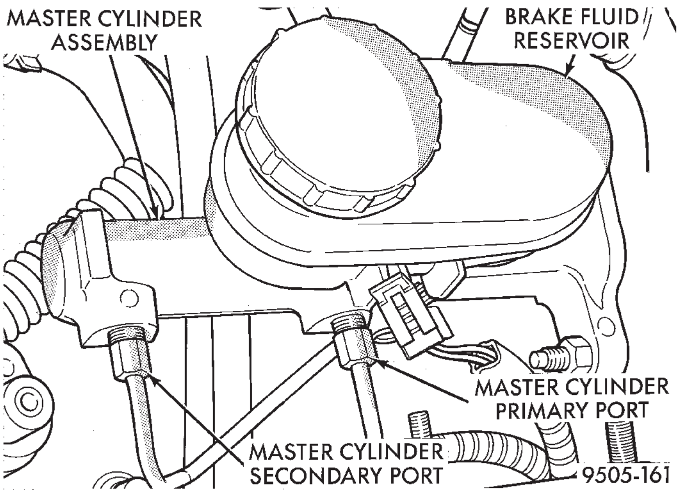


Fig. 82 Master Cylinder Primary And Secondary Ports With ABS

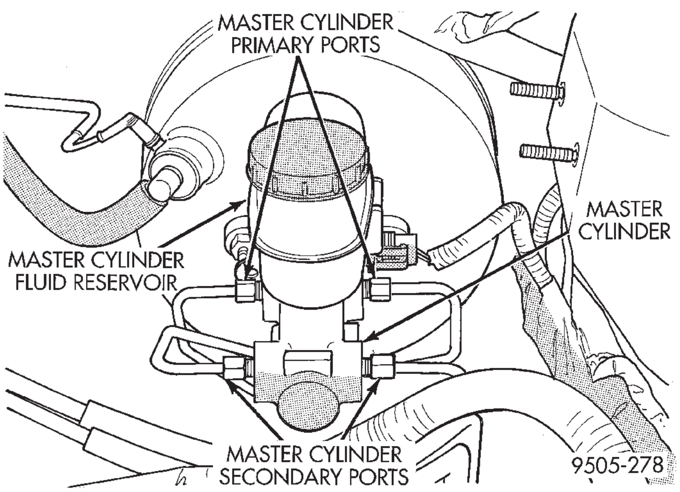


Fig. 83 Master Cylinder Primary And Secondary Ports Without ABS

(3) Using Mopar, Brake Parts Cleaner or an equivalent, clean the area where the master cylinder attaches to the vacuum booster.

(4) Remove the 2 nuts (Fig. 84) attaching the master cylinder to the vacuum booster.

CAUTION: When removing the routing clip and brake tubes from the mounting stud, do not bend or kink the chassis brake line tubes.

(5) Remove the routing clip and chassis brake tubes (Fig. 84) (as an assembly) from the mounting stud for the master cylinder.

(6) Slide the master cylinder straight off its mounting studs on the vacuum booster.

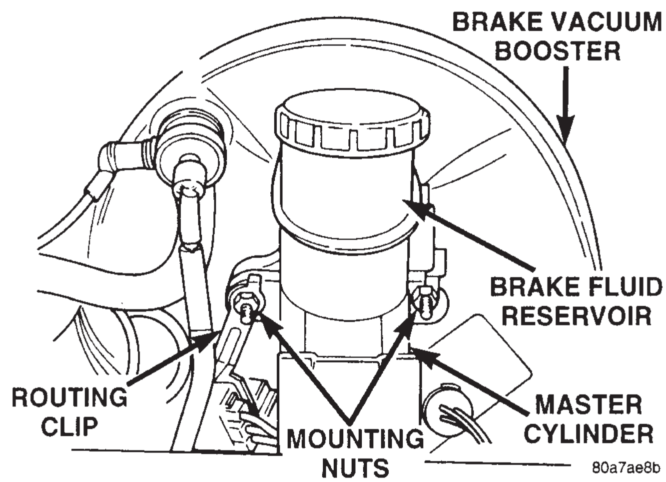


Fig. 84 Master Cylinder Mounting To Vacuum Booster

BLEEDING MASTER CYLINDER

(1) Clamp the master cylinder in a vise. Attach Bleeding Tubes, Special Tool 6802 to the master cylinder outlet ports (Fig. 85) (Fig. 86). **Position the bleeding tubes so outlets of the tubes will be below the surface of the brake fluid when reservoir is filled to the proper level.**

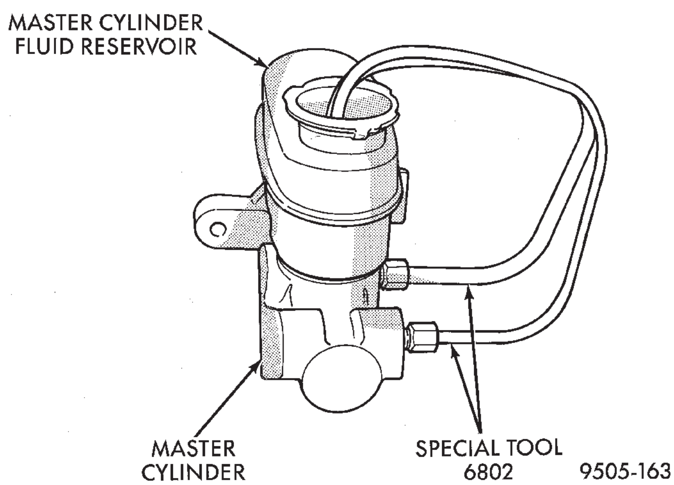


Fig. 85 Bleeding Tubes Attached to ABS Master Cylinder

(2) Fill brake fluid reservoir with brake fluid conforming to DOT 3 specifications such as Mopar or an Equivalent.

(3) Insert an appropriate size wooden dowel in the end of the master cylinder piston (Fig. 87). Using the dowel, slowly depress the piston to the full extent of its travel and then allow the piston to return to its released position. Continue to repeat this step until bubbles no longer appear in the brake fluid. After no more air bubbles are expelled from the bleed tubes repeat the above procedure several more times to ensure all air is bled from master cylinder.

REMOVAL AND INSTALLATION (Continued)

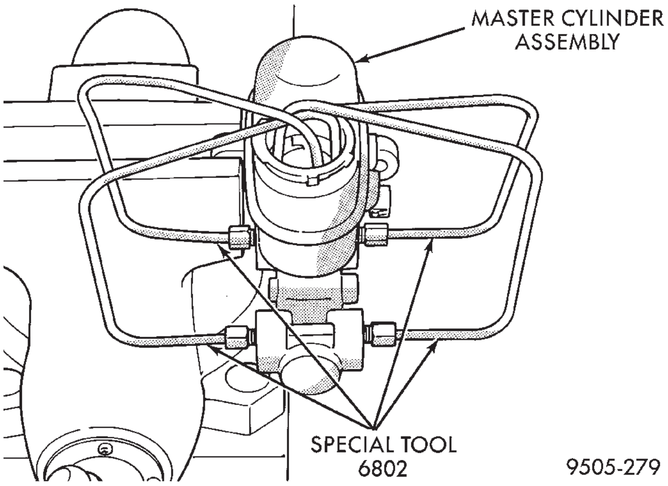


Fig. 86 Bleeding Tubes Attached to Non-ABS Master Cylinder

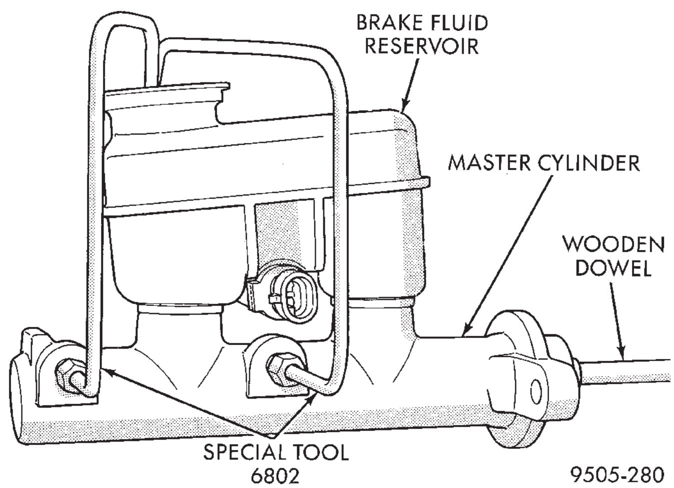


Fig. 87 Bleeding Master Cylinder

(4) Remove the bleeding tubes from the outlet ports of the master cylinder.

(5) Plug outlet ports of master cylinder and install the cap on the reservoir.

(6) Remove the master cylinder from the vise.

NOTE: Note: It is not necessary to bleed the entire hydraulic system after replacing the master cylinder. However, the master cylinder must have been bled and filled upon installation.

INSTALL

(1) Position master cylinder assembly on studs of power brake unit, aligning push rod on power brake vacuum booster with piston of master cylinder.

CAUTION: When installing the routing clip and brake tubes on the mounting stud, do not bend or kink the chassis brake line tubes. Be sure the chassis brake tubes are routed correctly. The chassis brake tubes can not touch each other or other components or the body of the vehicle.

(2) Install the routing clip and chassis brake tubes (Fig. 84) on the inboard mounting stud for the master cylinder.

(3) Install the 2 master cylinder to power brake vacuum booster mounting nuts (Fig. 84). Tighten both nuts to a torque of 28 N·m (250 in. lbs.).

(4) Connect brake tubes to master cylinder primary and secondary ports (Fig. 82). Then tighten the tube nuts to a torque of 17 N·m (145 in. lbs.).

(5) Install the connector from the vehicle wiring harness on the fluid level sensor in the master cylinder fluid reservoir (Fig. 81)

VACUUM BOOSTER 2.4 LTR. Engine

REMOVE

(1) Remove the remote ground cable from the ground stud located on the left strut tower (Fig. 88).

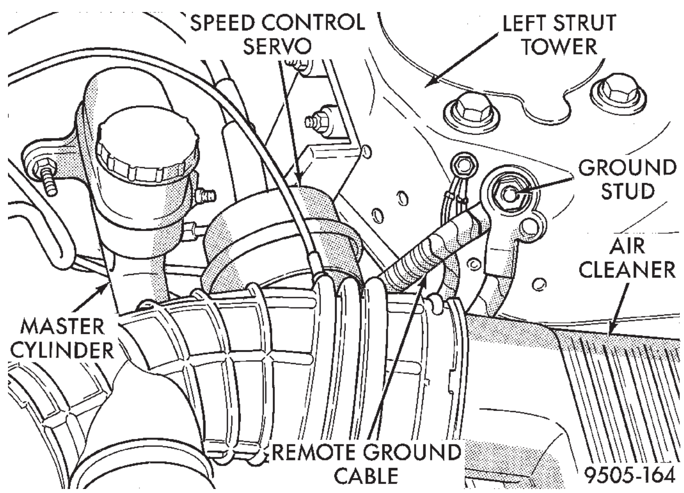


Fig. 88 Ground Cable Attachment At Strut Tower

(2) Correctly isolate remote ground cable when servicing vehicle by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 89). **This will prevent accidental grounding of the remote ground cable.**

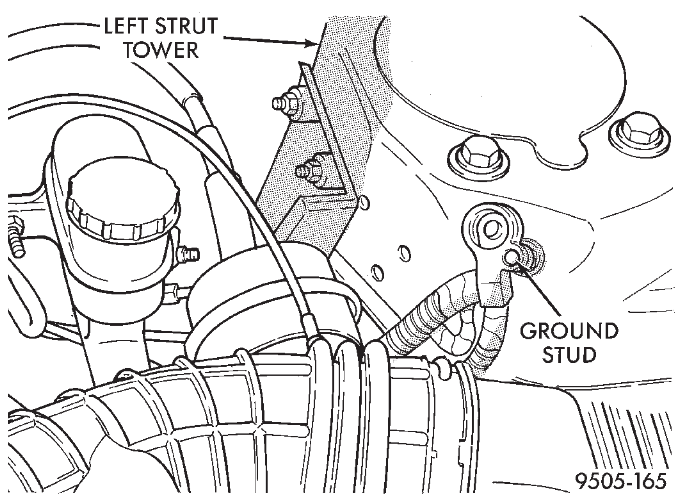


Fig. 89 Correctly Isolated Remote Ground Cable

REMOVAL AND INSTALLATION (Continued)

(3) If equipped, remove the vehicle's wiring harness connector from the speed control servo. Remove the 2 speed control servo mounting bracket to strut tower attaching nuts (Fig. 90). Without removing speed control cable from servo, move speed control servo out of the way.

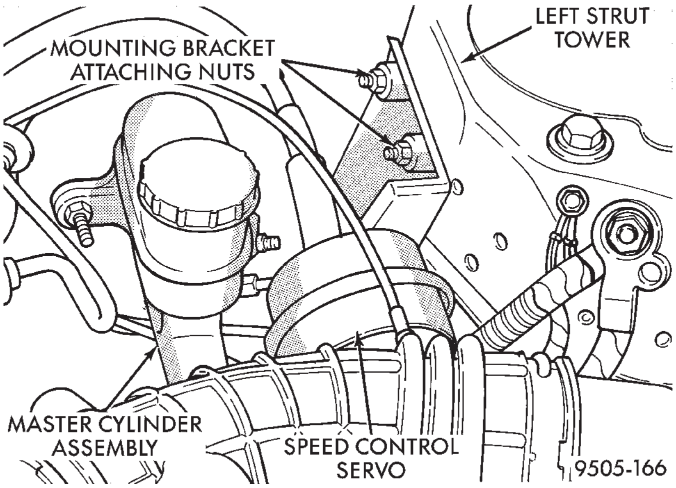


Fig. 90 Speed Control Servo Attachment

(4) Remove the vacuum harness connector and electrical connector from the purge solenoid (Fig. 91). Remove purge solenoid from vehicle.

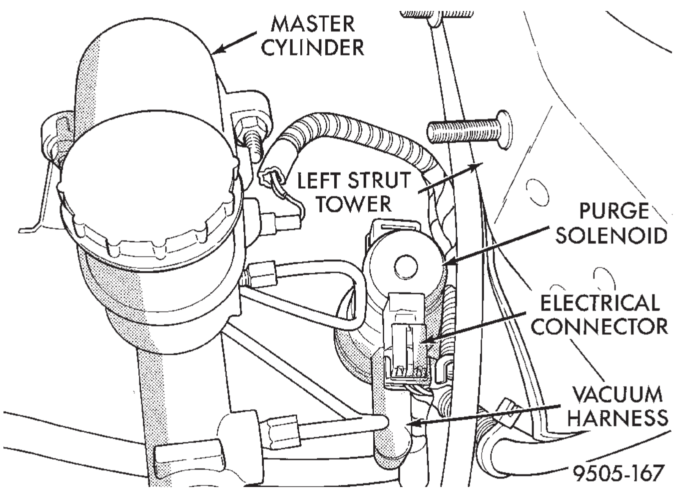


Fig. 91 Purge Control Solenoid

(5) Remove the air inlet resonator and air inlet hose (Fig. 92) as an assembly, from the engine mounted air inlet resonator and air cleaner housing (Fig. 92).

(6) Remove the vacuum hoses (Fig. 93) from the check valve located on the power brake vacuum booster.

(7) Remove EGR valve transducer assembly and vacuum hoses (Fig. 94) from the EGR valve. **Valve removal is necessary for required clearance to remove power brake vacuum booster from vehicle and not damage transducer during removal.**

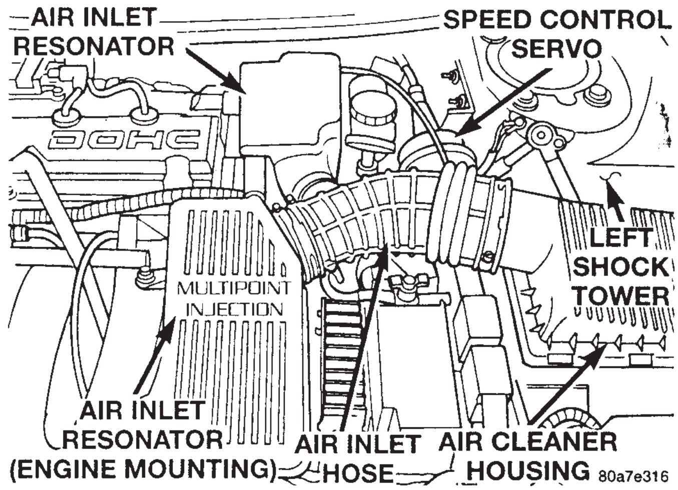


Fig. 92 Air Inlet Resonator And Tube

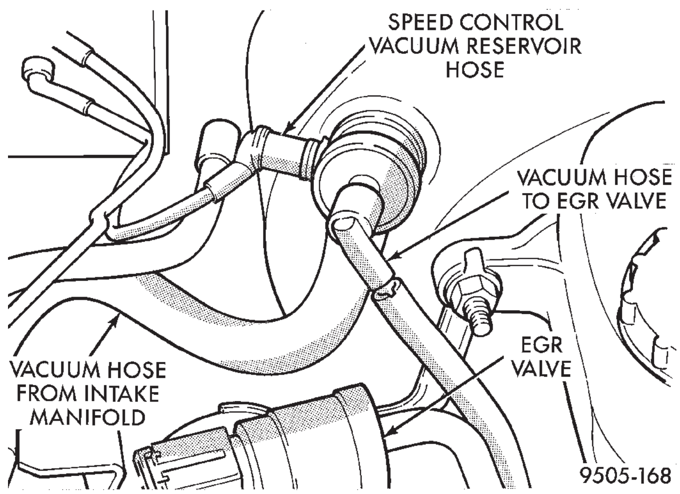


Fig. 93 Vacuum Hose Attachment To Check Valve

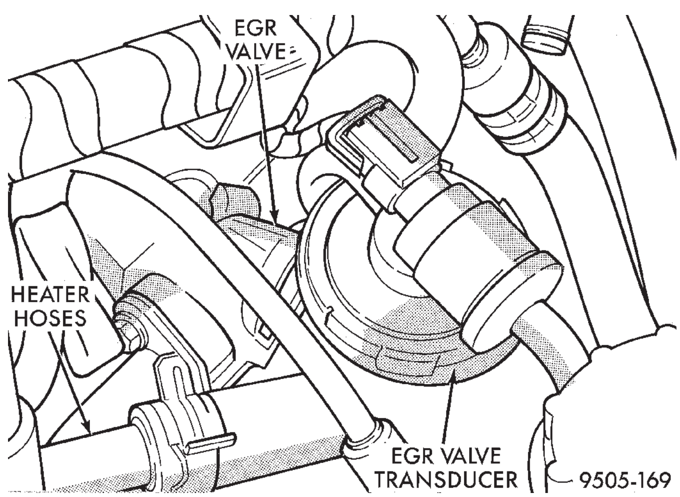


Fig. 94 EGR Valve Transducer Assembly

REMOVAL AND INSTALLATION (Continued)

(8) Remove the vehicle's wiring harness connector from the master cylinder brake fluid level sensor (Fig. 95).

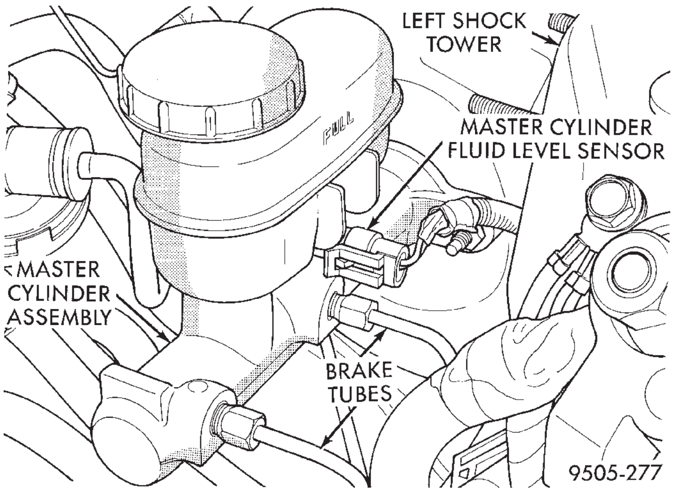


Fig. 95 Master Cylinder Brake Fluid Level Sensor

(9) Remove the 2 nuts (Fig. 96) attaching the master cylinder assembly to the power brake vacuum booster.

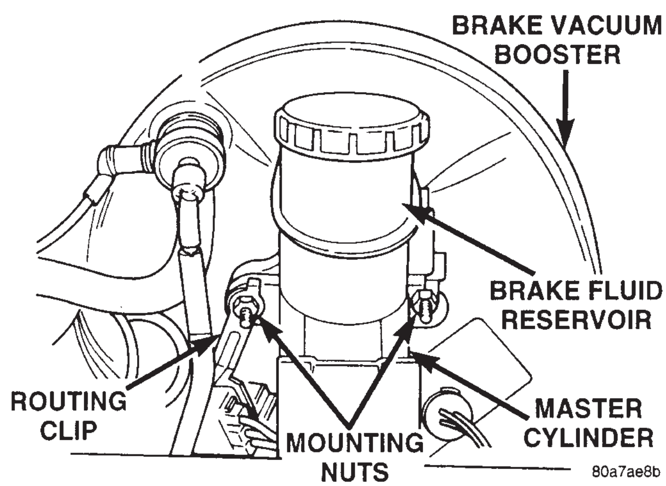


Fig. 96 Master Cylinder Mounting

CAUTION: When removing the routing clip and brake tubes from the mounting stud do not bend or kink the chassis brake line tubes.

(10) Remove the routing clip and chassis brake tubes (Fig. 96) (as an assembly) from the mounting stud for the master cylinder.

(11) Without removing the brake tubes from master cylinder, remove it from the power brake vacuum booster. Then carefully lower master cylinder and brake tubes as an assembly until it is positioned on top of the transaxle (Fig. 97).

(12) Locate the vacuum booster input rod to brake pedal attachment under instrument panel. Position a small screwdriver between the retaining clip center tang and the retaining clip (Fig. 98). Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin. Then pull retaining clip off brake pedal pin. **Discard retaining clip. Replace only with a new retaining clip when assembled.**

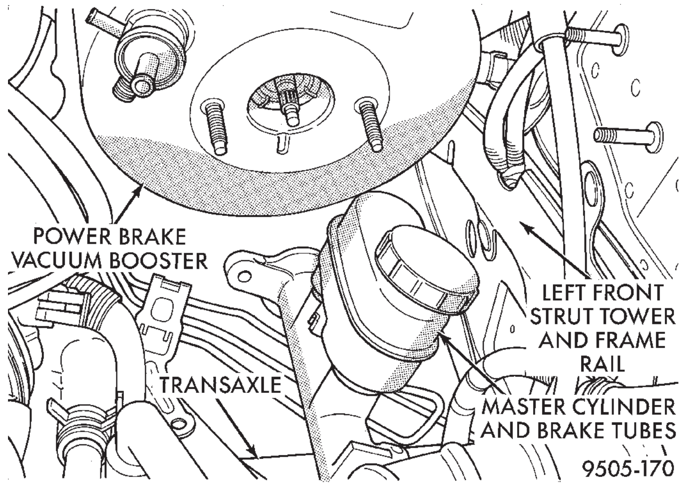


Fig. 97 Master Cylinder Assembly Positioned For Booster Removal

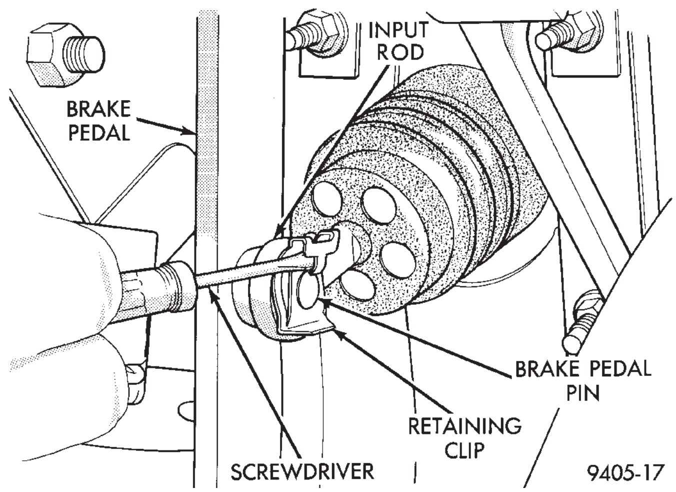


Fig. 98 Input Rod Retaining Pin

(13) Remove the 4 nuts attaching the vacuum booster to the dash panel. Nuts are accessible from under dash panel in area of the steering column and pedal bracket assembly (Fig. 99).

(14) Slide vacuum booster forward until mounting studs clear dash panel and then tilt up and rotate toward center of vehicle to remove (Fig. 100).

CAUTION: Do not attempt to disassemble the power brake vacuum booster it is to be serviced ONLY as a complete assembly.

REMOVAL AND INSTALLATION (Continued)

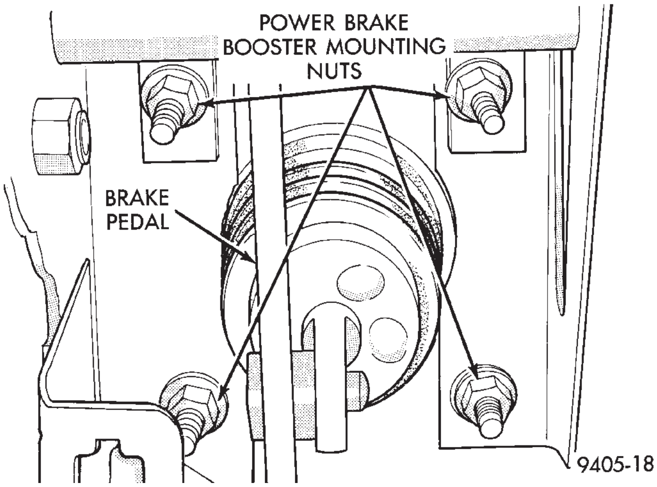


Fig. 99 Vacuum Booster Mounting

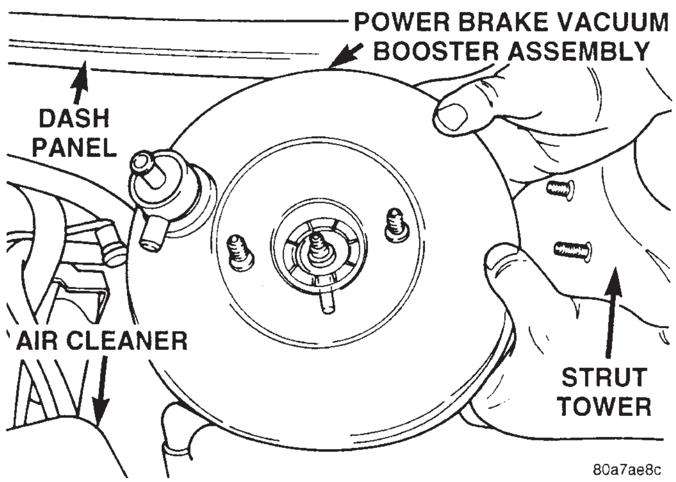


Fig. 100 Vacuum Booster Removal

INSTALL

(1) Install vacuum booster onto dash panel using the reverse procedure of removal.

(2) Install and tighten the 4 vacuum booster mounting nuts (Fig. 99) to a torque of 37 N·m (27 ft. lbs.) torque.

(3) Using lubriplate, or an equivalent, coat the surfaces of the brake pedal pin that contact the power vacuum booster input rod.

(4) Connect vacuum booster input rod to brake pedal pin and install a NEW retaining clip. **Use only a new retainer clip DO NOT USE the old clip.**

(5) Position master cylinder on studs of vacuum booster, aligning push rod on vacuum booster with piston of master cylinder.

CAUTION: When installing the routing clip and brake tubes on the mounting stud, do not bend or kink the chassis brake line tubes. Be sure the chassis brake tubes are routed correctly. The chassis brake tubes can not touch each other or other components or the body of the vehicle.

(6) Install the routing clip and chassis brake tubes (Fig. 96) on the inboard mounting stud for the master cylinder.

(7) Install the 2 master cylinder to power brake unit mounting nuts (Fig. 96). Tighten the 2 mounting nuts to a torque of 28 N·m (250 in. lbs.).

(8) Install the vehicle's wiring harness connector on the master cylinder brake fluid level sensor (Fig. 95).

(9) Install the purge control solenoid (Fig. 91) on the left front frame rail. Tighten the purge control solenoid mounting bolt.

(10) Install the EGR transducer assembly on the EGR valve (Fig. 94). Install the vehicle wiring harness connector (Fig. 94) on the EGR transducer, ensuring the retaining clip is fully engaged with transducer.

(11) Connect all previously removed vacuum hoses onto the power brake vacuum booster check valve (Fig. 93).

(12) If equipped, install speed control servo on the mounting studs in the left strut tower (Fig. 90). Install the 2 speed control servo bracket mounting nuts (Fig. 90). Tighten the 2 mounting nuts to a torque of 6 N·m (55 in. lbs.).

(13) Install the air inlet resonator and air inlet tube (Fig. 92) on the air cleaner housing and the throttle body.

(14) Check brake light switch for correct adjustment. If required, adjust stop lamp switch as necessary. See required procedure in the Service Adjustments Section in this group of the service manual.

(15) Road test vehicle to ensure proper operation of the vehicles brake system.

VACUUM BOOSTER 2.5 LTR. ENGINE

REMOVE

(1) Remove the remote ground cable from the ground stud located on the left shock tower (Fig. 101).

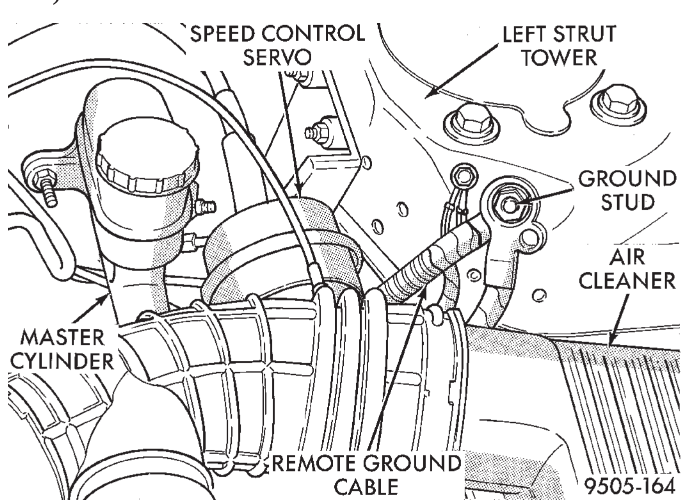


Fig. 101 Ground Cable Attachment To Strut Tower

REMOVAL AND INSTALLATION (Continued)

(2) Correctly isolate remote ground cable when servicing vehicle by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 102). **This will prevent accidental grounding of the remote ground cable.**

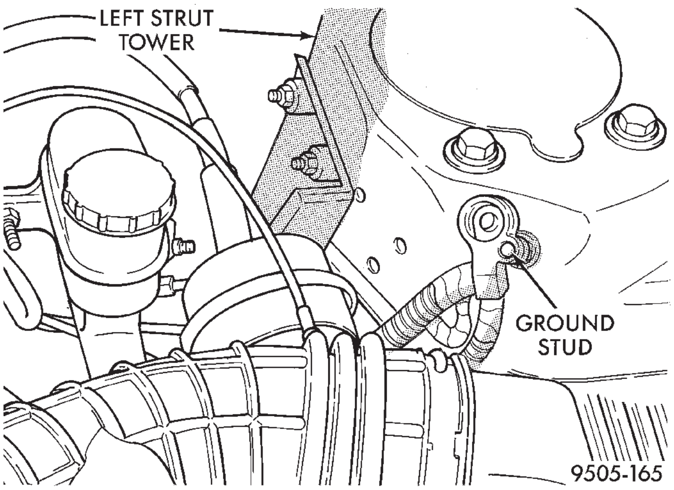


Fig. 102 Correctly Isolated Remote Ground Cable

(3) Remove the PCV hose (Fig. 103) from the air chamber located on the front of the intake manifold. Remove bolt (Fig. 103) attaching the air chamber to the intake manifold. Then unlatch lid of air cleaner from air cleaner housing and loosen clamp attaching air inlet hose to throttle body (Fig. 103). Remove the air cleaner lid, air inlet hose and air chamber (Fig. 103) as an assembly from the engine.

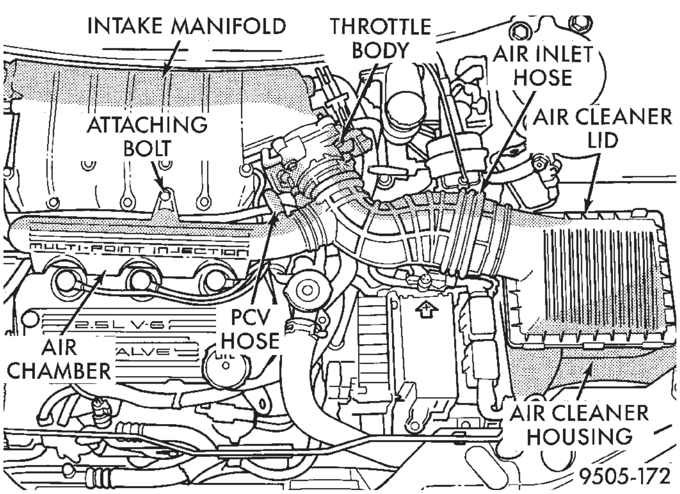


Fig. 103 Engine Air Intake System Components

(4) Remove the throttle cable and if equipped the speed control cable from the throttle body (Fig. 104). Remove the vacuum hose (Fig. 104) from the throttle body. Remove the wiring harness connectors from AIS motor and the Throttle Position Sensor (Fig. 104) on the throttle body. Then, remove the 4 bolts (Fig. 104) attaching the throttle body to the intake manifold and remove it from intake manifold.

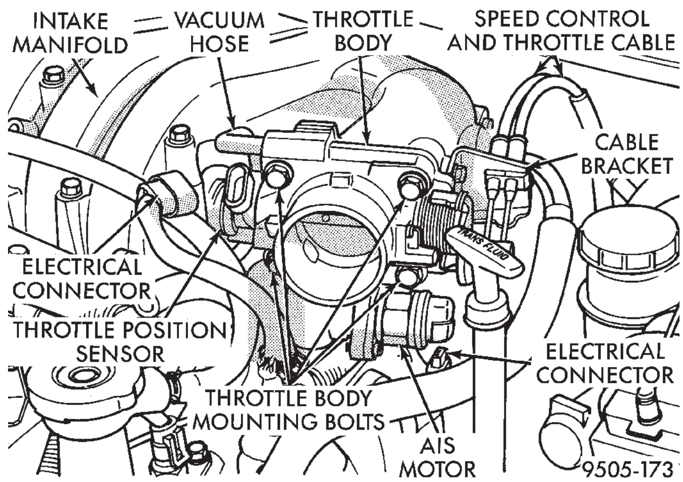


Fig. 104 Throttle Body Attachment To Intake Manifold

(5) Without removing cables from bracket, remove the throttle and speed control cable mounting bracket (Fig. 104) from the intake manifold.

(6) Remove the EGR tube (Fig. 105) from the intake manifold and EGR valve.

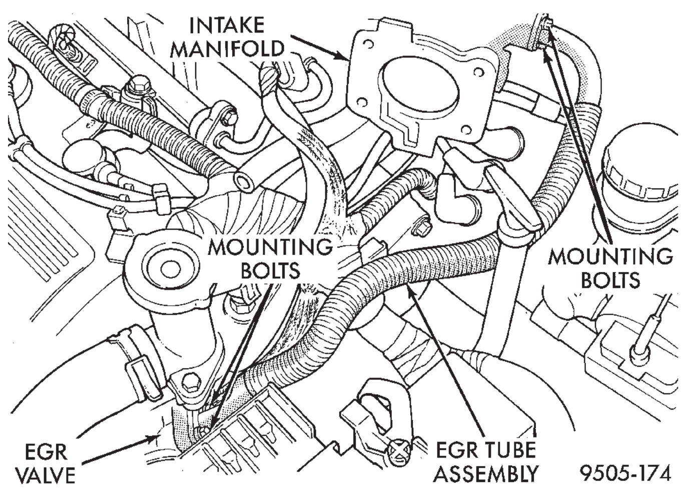


Fig. 105 EGR Tube Attachment To Intake Manifold And EGR Valve

REMOVAL AND INSTALLATION (Continued)

(7) If equipped, remove the vehicle's wiring harness connector from the speed control servo. Remove the 2 speed control servo mounting bracket to strut tower attaching nuts (Fig. 106). Without removing speed control cable from servo, move speed control servo out of the way.

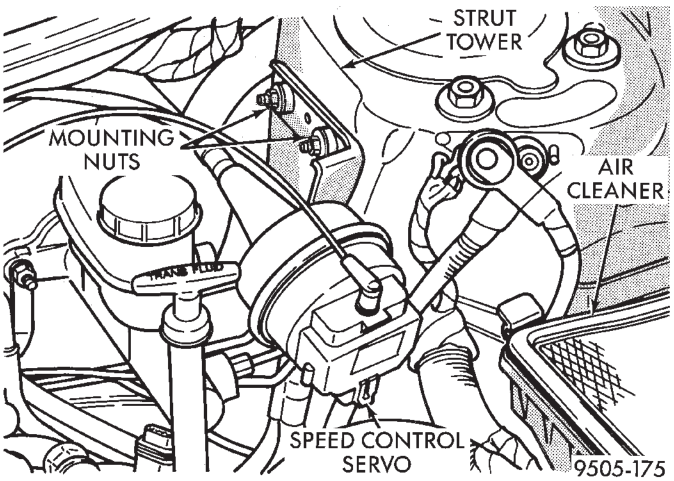


Fig. 106 Speed Control Servo Attachment To Strut Tower

(8) Remove the wiring harness connector from the brake fluid level sensor in the master cylinder fluid reservoir (Fig. 107).

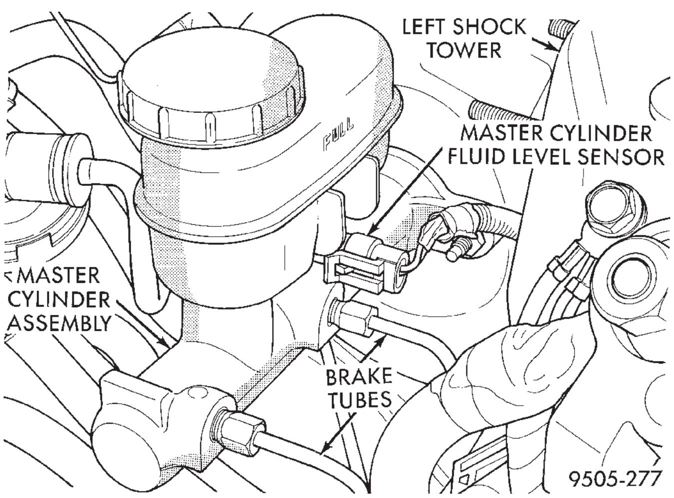


Fig. 107 Master Cylinder Brake Fluid Level Sensor

(9) Remove the primary and secondary brake tubes (Fig. 108) or (Fig. 109) from the master cylinder.

(10) Remove the 2 nuts (Fig. 110) attaching the master cylinder assembly to the power brake vacuum booster.

CAUTION: When removing the routing clip and brake tubes from the mounting stud do not bend or kink the chassis brake line tubes.

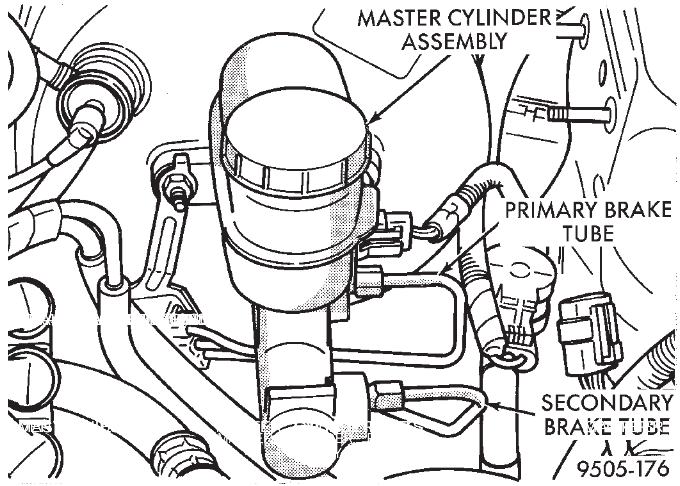


Fig. 108 Primary And Secondary Brake Tubes With Antilock Brakes

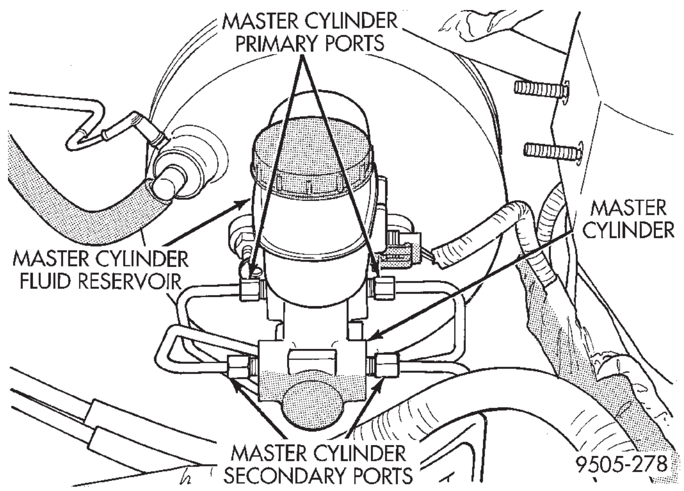


Fig. 109 Primary And Secondary Brake Tubes Without Antilock Brakes

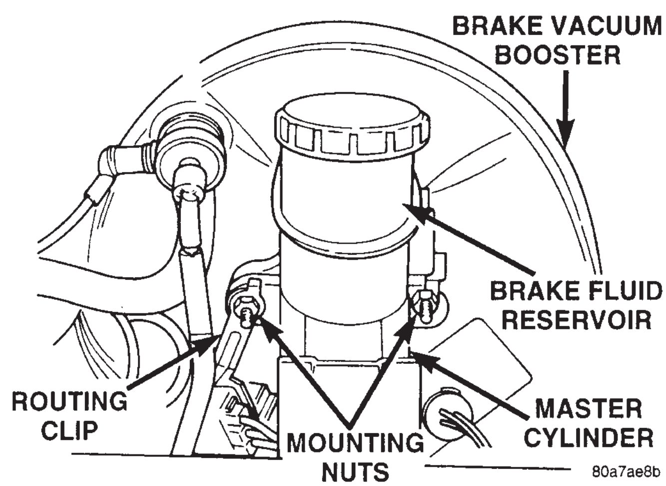


Fig. 110 Master Cylinder Mounting To Vacuum Booster

REMOVAL AND INSTALLATION (Continued)

(11) Remove the routing clip and chassis brake tubes (Fig. 110) (as an assembly) from the

(12) mounting stud for the master cylinder.

(13) Remove the master cylinder from the vacuum booster.

(14) Remove the vacuum harness connector and electrical connector from the purge solenoid (Fig. 111). Remove bracket and purge solenoid as an assembly from the vehicle.

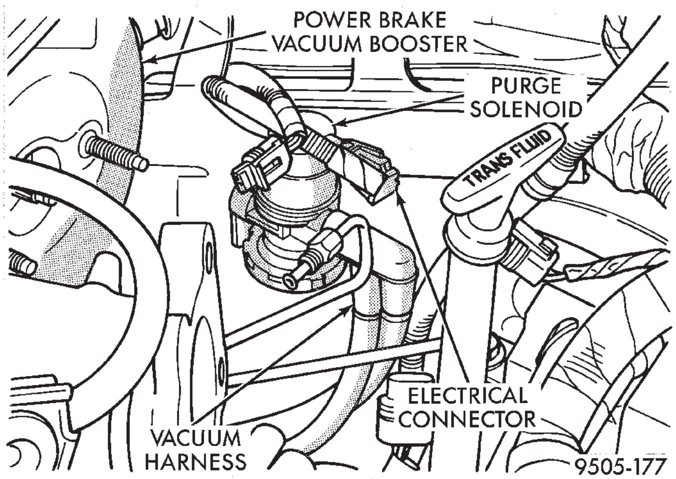


Fig. 111 Purge Control Solenoid

(15) Remove dipstick tube attaching bolt (Fig. 112). Then remove the dipstick tube and dipstick (Fig. 112) as an assembly from the transaxle.

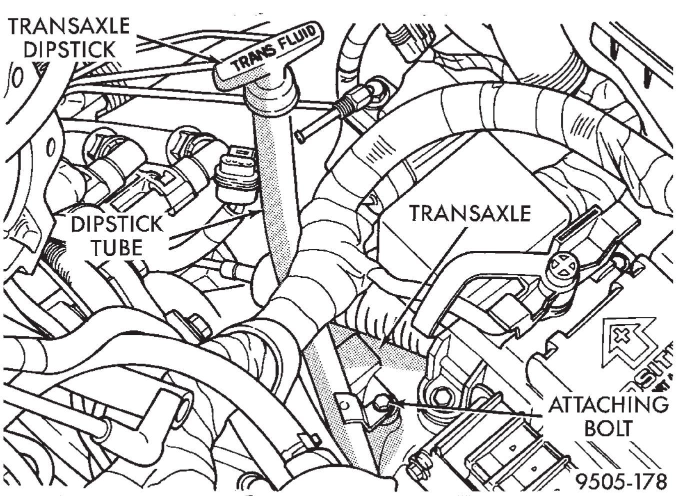


Fig. 112 Transaxle Dipstick Tube

(16) Remove the vacuum hoses from the check valve located on the power brake vacuum booster.

(17) Locate the power brake vacuum booster input rod to brake pedal attachment under instrument panel. Position a small screwdriver between the center tang on the power brake booster input rod to brake pedal pin retaining clip (Fig. 113). Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin. Then pull retaining clip off brake pedal pin. **Discard retaining clip. Replace only with a new retaining clip when assembled.**

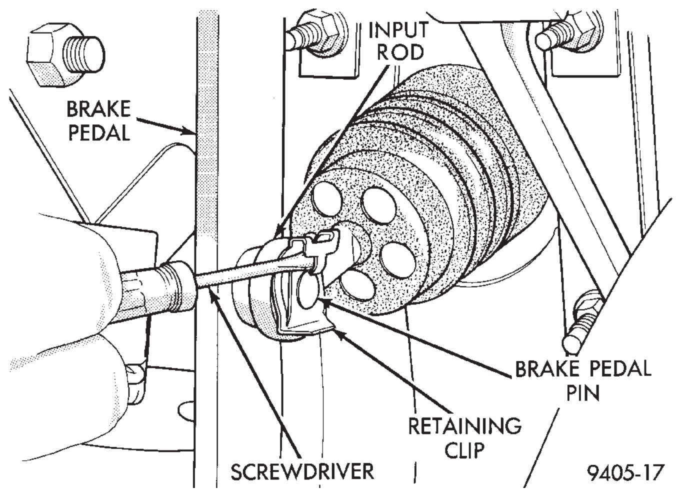


Fig. 113 Input Rod Retaining Pin

(18) Remove the 4 nuts attaching the vacuum booster to the dash panel. Nuts are accessible from under dash panel in area of the steering column and pedal bracket assembly (Fig. 114).

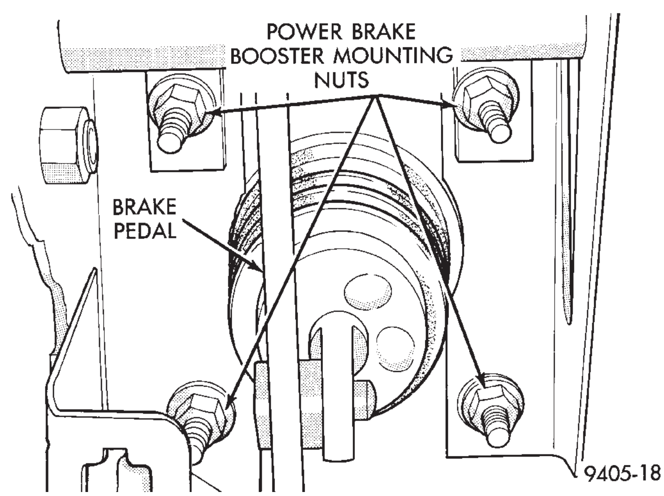


Fig. 114 Vacuum Booster Mounting

REMOVAL AND INSTALLATION (Continued)

(19) Slide the vacuum booster straight forward until mounting studs clear dash panel. Then lift the vacuum booster strait up to remove it from the vehicle (Fig. 115).

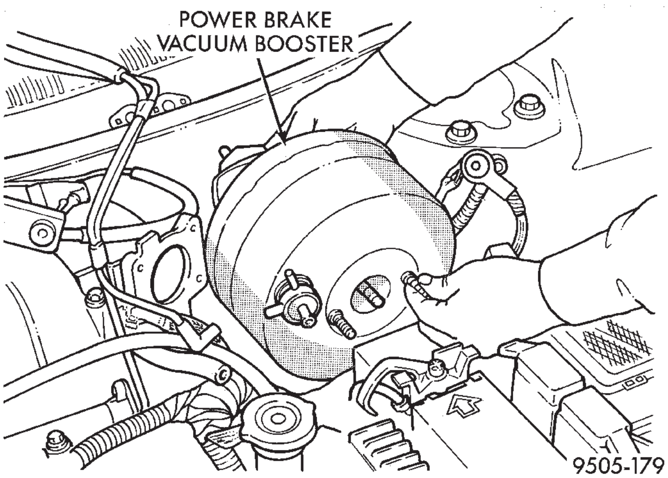


Fig. 115 Power Brake Vacuum Booster Removal

CAUTION: Do not attempt to disassemble the power brake vacuum booster it is to be serviced ONLY as a complete assembly.

INSTALL

(1) Position power brake booster onto dash panel.

(2) Install and torque the 4 power brake vacuum booster mounting nuts (Fig. 114) to 37 N·m (27 ft. lbs.) torque.

(3) Using lubriplate, or an equivalent, coat the surfaces of the brake pedal pin that contact the power brake vacuum booster input rod.

(4) Connect power brake vacuum booster input rod to brake pedal pin and install a NEW retaining clip. **Use only a new retainer clip DO NOT USE the old clip.**

(5) Install the dipstick tube in transaxle (Fig. 112). Install dipstick tube attaching bolt and securely tighten (Fig. 112).

(6) Install the vacuum hoses on the check valve in the power brake vacuum booster.

(7) Position purge control solenoid (Fig. 111) on left front strut tower and install and securely tighten attaching bolt. Then correctly route and install the vacuum harness connector and electrical connector (Fig. 111) on the purge control solenoid.

(8) Position master cylinder on vacuum booster, aligning push rod on vacuum booster with the piston of the master cylinder.

CAUTION: When installing the routing clip and brake tubes on the mounting stud, do not bend or kink the chassis brake line tubes. Be sure the chassis brake tubes are routed correctly. The chassis brake tubes can not touch each other or other components or the body of the vehicle.

(9) Install the routing clip and chassis brake tubes on the inboard mounting stud for the master cylinder.

(10) Install the 2 master cylinder to power brake unit mounting nuts (Fig. 110). Tighten the 2 mounting nuts to a torque of 28 N·m (250 in. lbs.).

(11) Install the primary and secondary brake tubes (Fig. 108) in the outlet ports of the master cylinder. Tighten the tube nuts to a torque of 17 N·m (145 in. lbs.).

(12) Install the vehicle's wiring harness connector on the master cylinder brake fluid level sensor (Fig. 107).

(13) If equipped, install speed control servo on the mounting studs in the left strut tower (Fig. 106). Install the 2 speed control servo bracket mounting nuts (Fig. 106). Tighten the 2 mounting nuts to a torque of 6 N·m (55 in. lbs.). Install electrical connector on speed control servo.

(14) Install the EGR tube with **NEW** gaskets on the intake manifold and EGR valve (Fig. 105). Install the 4 mounting bolts and tighten to a torque of 11 N·m (95 in. lbs.).

(15) Install the throttle body and a **NEW** gasket on the intake manifold. Install the 4 throttle body attaching bolts (Fig. 104) and tighten to a torque of 22 N·m (200 in. lbs.).

(16) Install the vacuum hose (Fig. 104) on the throttle body. Install the wiring harness connectors on the AIS motor and the Throttle Position Sensor (Fig. 104) located on the throttle body.

(17) Install the mounting bracket for the throttle cable and speed control cable onto the intake manifold and securely tighten the mounting bolts.

(18) Install the throttle cable, and if equipped, the speed control cable on the cam of the throttle body assembly.

(19) Install the air cleaner lid, air inlet hose and air chamber (Fig. 103) as an assembly on the engine. Latch lid of air cleaner to air cleaner housing. Securely tighten the clamp attaching the air inlet hose to the throttle body (Fig. 103). Install and securely tighten the bolt attaching the air chamber to the intake manifold (Fig. 103).

(20) Install the remote ground cable (Fig. 101) on the ground stud located on the left strut tower (Fig. 101). Install and securely tighten the ground cable attaching nut.

(21) Check brake light switch for correct adjustment. If required, adjust stop lamp switch as necessary. See required procedure in the Service Adjustments Section in this group of the service manual.

(22) Road test vehicle to ensure proper operation of the vehicles brake system.

REMOVAL AND INSTALLATION (Continued)

BRAKE PEDAL

REMOVE

(1) Remove the remote ground cable from the ground stud located on the left strut tower (Fig. 116).

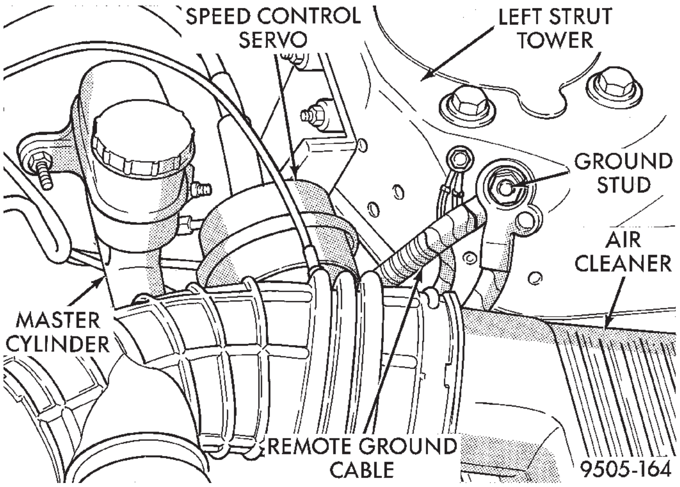


Fig. 116 Ground Cable Attachment At Strut Tower

NOTE: Step 2 2 below is to be done to prevent the accidental grounding of the remote ground cable.

(2) Correctly isolate remote ground by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 117)

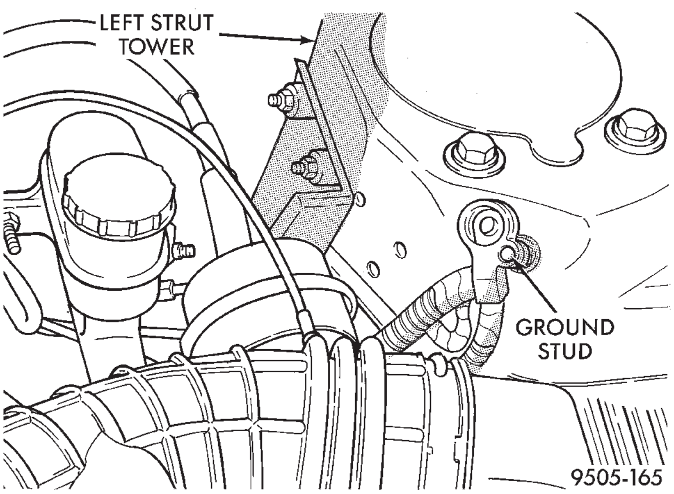


Fig. 117 Correctly Isolated Remote Ground Cable

(3) Remove the stop lamp switch from the brake pedal bracket. Stop lamp switch is removed using the following procedure. Depress and hold the brake pedal while rotating stop lamp switch (Fig. 118) in a counter-clockwise direction approximately 30 degrees.

(4) Remove the retaining clip (Fig. 119) from the brake pedal pin using following procedure. Position a small screwdriver (Fig. 119) between the center tang on the retaining clip and the brake pedal pin. Rotate blade of screwdriver enough so center tang on retain-

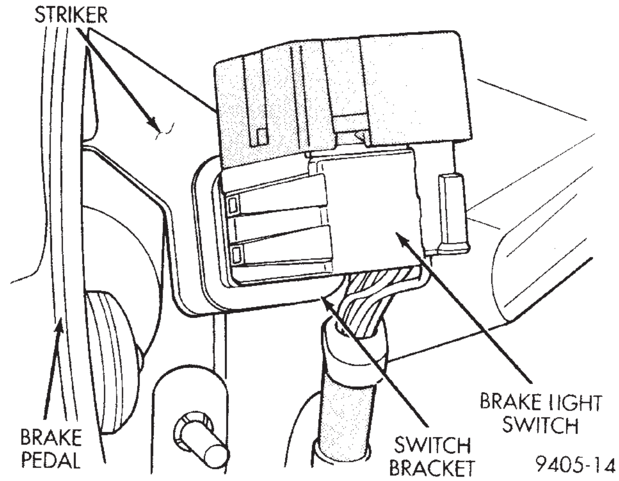


Fig. 118 Stop Lamp Switch

ing clip can pass over end of brake pedal pin (Fig. 119). Then pull retaining clip off brake pedal pin.

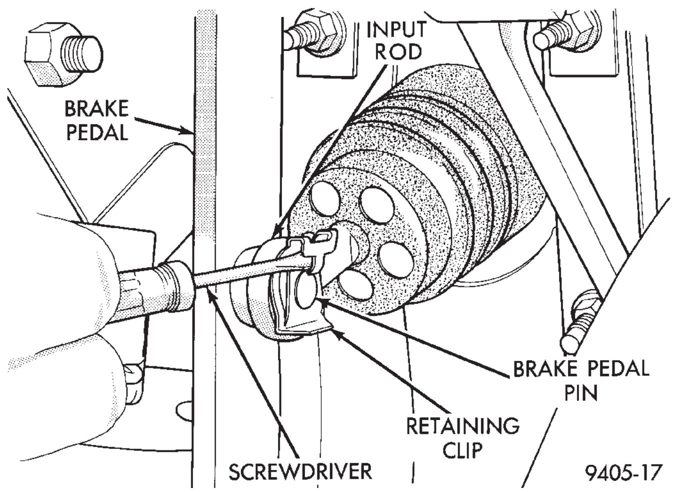


Fig. 119 Brake Pedal Retaining Clip

(5) Remove the nut from the brake pedal pivot pin.

(6) Remove bake pedal pivot pin from the brake pedal and pedal mounting bracket.

(7) Remove brake pedal from mounting bracket.

INSTALL

(1) Lubricate the brake pedal pivot pin and brake pedal bushings using Mopar Lubriplate or an equivalent.

(2) Install the brake pedal in the pedal bracket. Align the pivot pin hole in brake pedal with pivot pin holes in pedal bracket.

(3) Install nut on brake pedal pivot pin. Tighten pivot pin attaching nut to a torque of 34 N·m (25 ft. lbs.).

(4) Install the vacuum booster push rod on the brake pedal pin.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When installing the retaining clip on the brake pedal pin a NEW retaining clip must be used to ensure the retention of the vacuum booster push rod.

(5) Install a **NEW** retaining clip (Fig. 119) on the brake pedal pin.

(6) Using Mopar Lubriplate or an equivalent, lightly lubricate the surface of the brake pedal striker (Fig. 118) which the plunger of the stop lamp switch contacts.

NOTE: Prior to installing stop lamp switch into bracket, the plunger must be moved to its fully extended position using the procedure in Step 7.

(7) Hold stop lamp switch firmly in one hand. Using other hand, pull outward on the plunger of the stop lamp switch until it has ratcheted out to its fully extended position.

(8) Connect the wiring harness connector to the stop lamp switch.

(9) Install the stop lamp switch in the brake pedal bracket. Stop lamp switch is installed using the following procedure. Depress the brake pedal as far down as possible. Then while holding brake pedal down, align index key on switch with slot in square hole of mounting bracket. When switch is fully installed in bracket, rotate stop lamp switch (Fig. 118) in a clockwise direction approximately 30 degrees.

CAUTION: Do not use excessive force when pulling back on brake pedal to adjust the stop lamp switch. If to much force is used, damage to the stop lamp switch or striker (Fig. 118) can result.

(10) Gently pull back on the brake pedal until it stops moving. This will cause the switch plunger to ratchet back to its correct position.

(11) Install the silencer panel/air duct.

(12) Connect the remote ground cable for the battery on the ground post located on left shock tower (Fig. 116).

CHASSIS BRAKE TUBES AND HOSES

Always use Mopar replacement brake hose assemblies to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that the tube and hose mating surfaces are clean and free from nicks and burrs. **Hose assemblies for each brake are unique and not interchangeable.**

Use new copper seal washers on all connections using Banjo Bolts and tighten all fittings to their specified torques.

The flexible front hydraulic brake hose should always be installed on the vehicle by first attaching the Banjo connector to the disc brake caliper. After routing the flex hose around the strut, hand start the chassis brake tube nut into the end of the flex hose. Following this procedure will prevent twisting of the flex hose when the flex hose bracket is attached to the front frame rail. Then tighten all brake line fitting to the specified torques.

On vehicles equipped with rear drum brakes, loosely connect the flex hose tube nut to the wheel cylinder, and then secure the flex hose bracket to the brake support plate. After the flex hose bracket is secured to the brake support plate, tighten the flex hose to wheel cylinder tube nut to the specified torque. Then hand start the chassis tube nut to the opposite end of the flex hose. After chassis tube nut is hand started into flex hose attach the flex hose bracket to the rear frame rail. Then tighten the nut on the chassis brake tube to the specified torque. Following this procedure will reduce the potential for twisting the flex hose during the installation procedure.

Only double wall 4.75 mm (3/16 in.) steel brake line tubing, with Al- Rich/ZN-AL alloy coating should be used for replacement. Care must be taken when replacing brake tubing, to be sure the proper bending and flaring tools and procedures are used to avoid kinking. Do not route the tubes against sharp edges, moving components or into hot areas. All tubes should be properly attached with recommended retaining clips.

PARK BRAKE LEVER

REMOVE

(1) Remove the shift knob from the shifter. **The shift knob is attached to the shifter using a set screw (Fig. 120). Access to the set screw is from the front of the shift knob and is removed using a 2 mm allen wrench.**

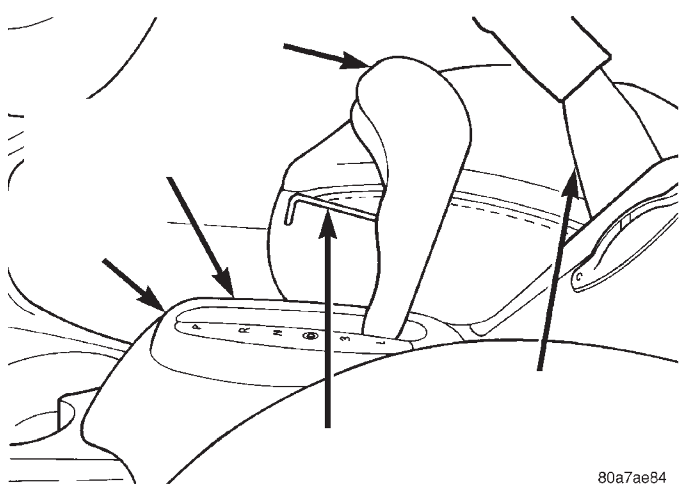


Fig. 120 Shift Knob Retaining Screw

(2) Remove the 3 screws (Fig. 121) attaching the rear of the center console to the console bracket.

(3) Remove the shift range indicator from the center console. The shift range indicator is attached to

REMOVAL AND INSTALLATION (Continued)

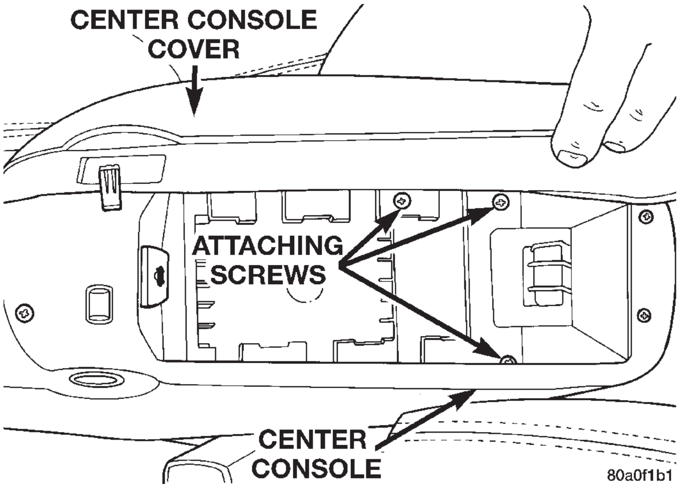


Fig. 121 Center Console Rear Attaching Screws

the center console using retaining clips. It is removed by carefully prying it off the center console. The shift range indicator covers the 2 screws attaching the center console to the shifter mechanism. (Fig. 122).

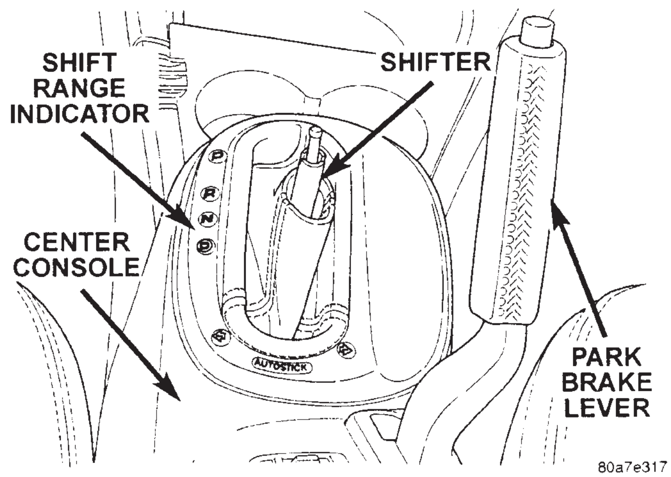


Fig. 122 Shift Range Indicator

(4) Remove the 2 screws (Fig. 123) attaching the center console to the shifter.

(5) Raise the park brake hand lever to approximately a 45° angle. This is for the required clearance to remove the center console.

(6) Raise the rear of the center console high enough to access the center console wiring harness connector (Fig. 124). Disconnect the center console wiring harness connector from the vehicle wiring harness 10 way connector (Fig. 124).

(7) Remove the center console from the vehicle.

(8) Lower park brake lever handle.

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT RELEASE THE PARK BRAKE CABLES FROM THE EQUALIZER UNTIL THE AUTO ADJUSTER IS RELOADED. FAILURE TO RELOAD THE ADJUSTER MECHANISM BEFORE REMOVING PARK BRAKE CABLES FROM EQUALIZER COULD RESULT IN SERIOUS INJURY.

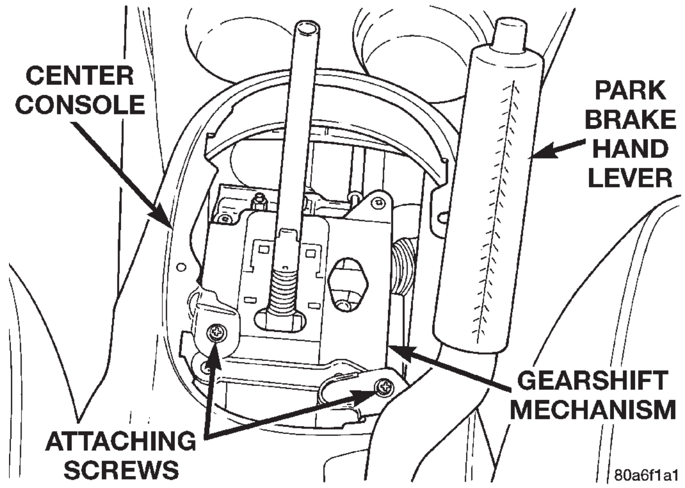


Fig. 123 Center Console Front Attaching Screw

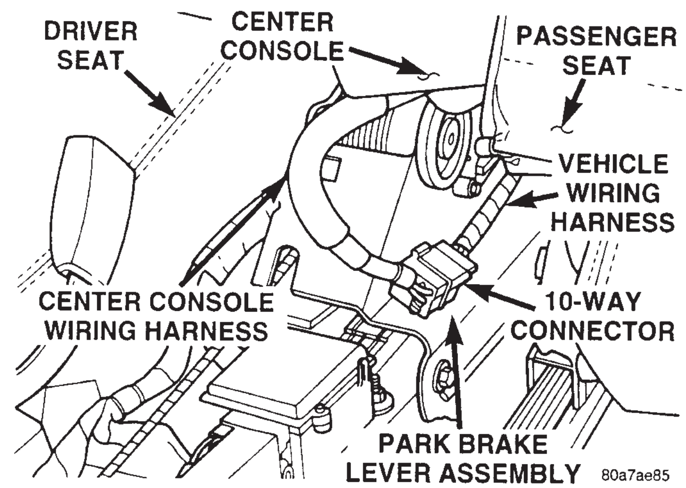


Fig. 124 Console Wiring Harness Connector

(9) Reload the adjuster mechanism on the park brake lever using the following procedure.

• Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 125).

• Grasp the park brake lever output cable (Fig. 125) by hand and pull upward.

• Continue to pull upward on cable until a 15/64 drill bit can be inserted in the adjuster mechanism as shown in (Fig. 125). This will lock-out the auto adjuster mechanism removing the tension from the park brake lever output cable. This will then allow the rear park brake cables to be easily removed from the equalizer.

REMOVAL AND INSTALLATION (Continued)

NOTE: If the output cable of the park brake mechanism will not move when pulled on, first, be sure the park brake lever is in the full down position. If park brake lever is in the full down position and the output cable will not move, use the following procedure to reload the adjuster mechanism.

Using a screw driver (Fig. 126) push down on the end of the clutch spring where shown (Fig. 126). While end of clutch spring is held down, pull outward on park brake mechanism output cable.

If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 126) to assist in pulling on cable.

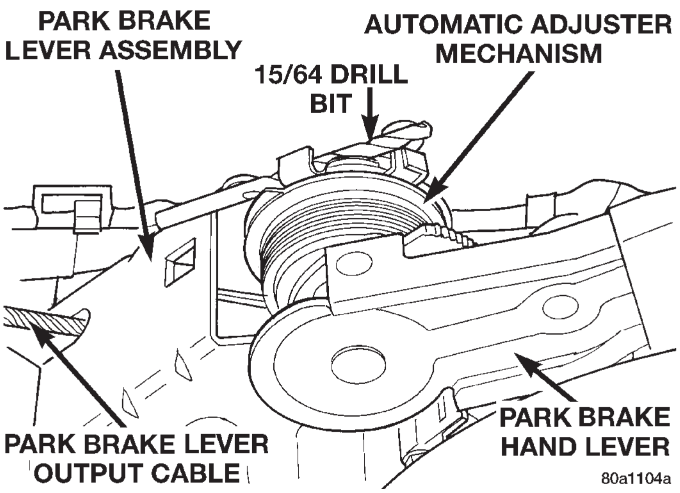


Fig. 125 Park Brake Lever Correctly Reloaded

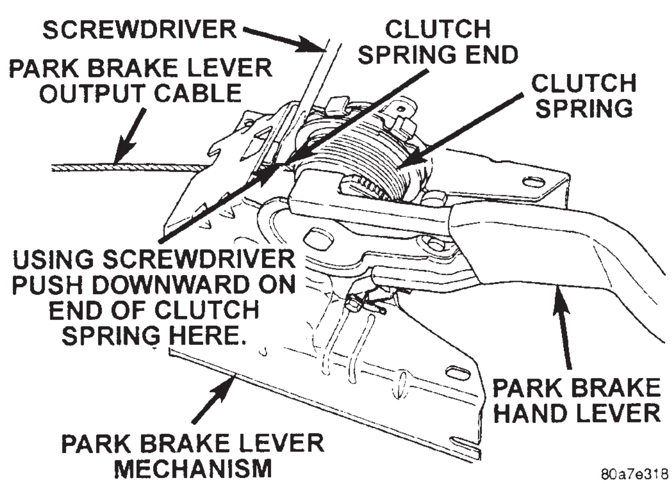


Fig. 126 Releasing Clutch Spring

(10) Remove the rear wheel park brake cables from the park brake cable tension equalizer (Fig. 127).

NOTE: If auto adjuster was not reloaded before removing the tension equalizer from both rear park brake cables, (Fig. 126) the park brake lever output

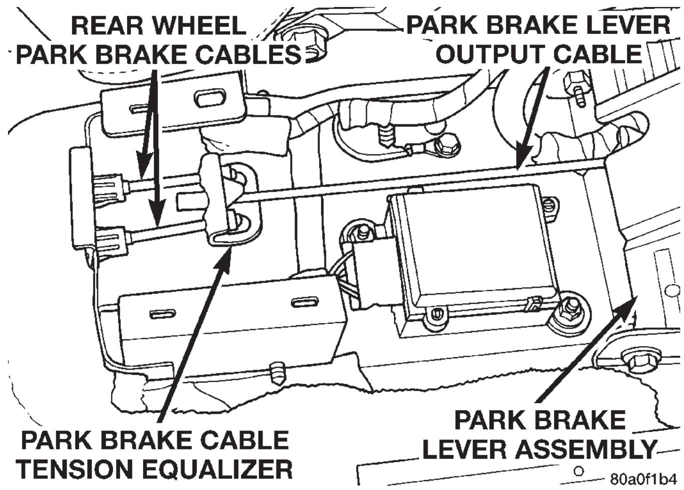


Fig. 127 Park Brake Cables At Tension Equalizer

cable (Fig. 126) will be pulled into the park brake mechanism.

If this happens the auto adjuster can be reloaded using the following procedure.

Using a screw driver (Fig. 126) push down on the end of the clutch spring where shown (Fig. 126). While the end of the clutch spring is held down, pull outward on park brake mechanism output cable. If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 126) to assist in pulling on cable.

(11) Disconnect the wiring harness from the ground switch on the park brake lever (Fig. 128).

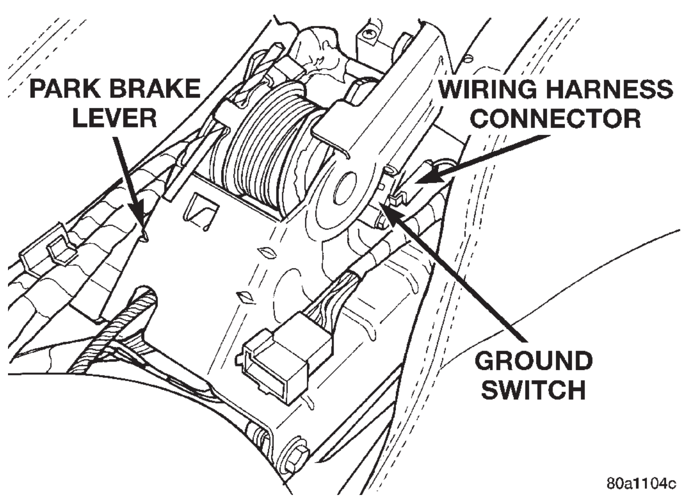


Fig. 128 Wiring Harness Connection To Ground Switch

(12) Remove the wiring harness routing clips from both sides of the park brake mechanism bracket. Move the wiring harnesses out of the way.

REMOVAL AND INSTALLATION (Continued)

NOTE: The mounting holes in the park brake lever bracket are slotted, which requires the mounting bolts to only be loosened but not removed.

(13) Loosen **but do not remove** the 4 bolts attaching the park brake lever to the console bracket (Fig. 129).

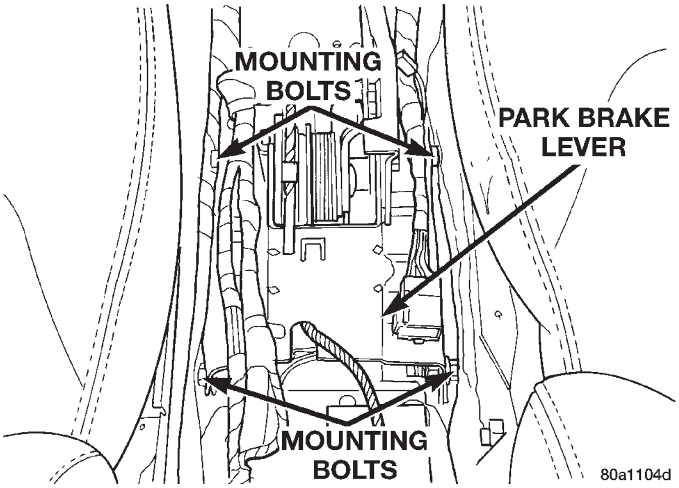


Fig. 129 Park Brake Lever Attaching Bolts

(14) Remove the park brake lever assembly from console bracket using the following procedure. First rotate the back of the lever bracket upward off the 2 rear mounting bolts, then slide the lever bracket rearward off the front mounting bolts.

INSTALL

NOTE: If the park brake lever mounting bolts are not installed in the console bracket install them before installing the park brake lever on the console bracket.

(1) Install the park brake lever on the console bracket using the following procedure. First slide the front of the park brake lever bracket on the 2 forward mounting bolts, then rotate the rear of the bracket downward onto the 2 rear mounting bolts. Tighten the 4 attaching bolts (Fig. 129) to a torque of 24 N·m (20 ft. lbs.).

(2) Install the rear park brake cables on the park brake cable tension equalizer (Fig. 127).

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT UNLOAD THE ADJUSTER MECHANISM USING A PROCEDURE OTHER THEN THE PROCEDURE IN Step 3 FAILURE TO UNLOAD THE ADJUSTER MECHANISM USING AN ALTERNATE PROCEDURE COULD RESULT IN SERIOUS INJURY.

(3) Unload the adjuster mechanism on the park brake lever using the following procedure.

- Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 125).
- Grasp the park brake lever output cable by hand and pull upward until all tension is removed from the drill bit used to reload the adjuster mechanism (Fig. 125).
- Remove the drill bit from the adjuster mechanism of the park brake lever (Fig. 125).
- Slowly release the park brake lever output cable until all slack is removed from the cable.

(4) Clip the wiring harness to the park brake lever bracket.

(5) Install the wiring harness connector on the ground switch of the park brake lever (Fig. 128).

(6) Cycle the park brake lever once from the released position to the fully applied position and then back to the released position. This will position the park brake cables and fully adjust them to their proper tension.

(7) Check the rear wheels of the vehicle with the park brake lever fully released, they should rotate freely without dragging.

(8) Raise the park brake hand lever to approximately a 45° angle. This is necessary for the required clearance to install the center console.

(9) Install the center console back in the vehicle.

(10) Install the wiring harness connector for the center console into the vehicle wiring harness (Fig. 124).

(11) Install the 2 screws attaching the front of the center console to the shifter. (Fig. 123).

(12) Install the 3 screws attaching the rear of the console to the console bracket (Fig. 121).

(13) Install the transmission range indicator (Fig. 122) in the center console.

(14) Install the shift knob on the shifter. Install and securely tighten the shift knob retaining screw (Fig. 130).

PARK BRAKE LEVER OUTPUT CABLE

On this vehicle, the park brake lever output cable is not replaceable as a separate component of the park brake lever. Never attempt to repair the park brake output cable in any manner.

PARK BRAKE CABLES

NOTE: Remove only one rear park brake cable from the vehicle at a time. Failure to do so will result in high efforts required to connect the park brake cables to the tension equalizer and the park brake lever at the rear wheel brakes.

REMOVAL AND INSTALLATION (Continued)

For servicing of either the left or right rear park brake cable, follow the procedure as listed below.

REMOVE

(1) Remove the shift knob from the shifter. **The gear shift knob is attached to the shifter using a set screw (Fig. 130). Access to the set screw is from the front of the shift knob and is removed using a 2 mm allen wrench.**

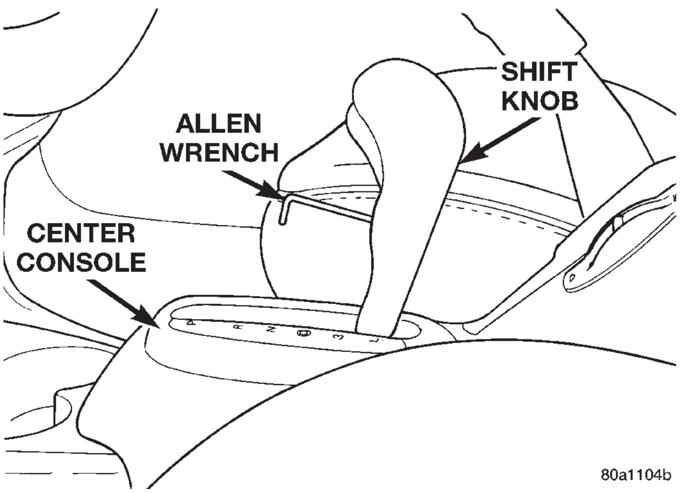


Fig. 130 Shift Knob Retaining Screw

(2) Remove the shift range indicator (Fig. 131) from the center console. The shift range indicator is attached to the center console using retaining clips. It is removed by carefully prying it off the center console. The shift range indicator covers the 2 attaching screws for the center console.

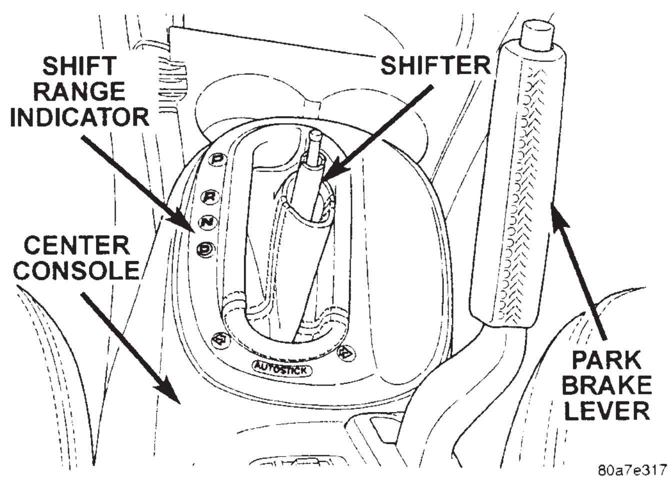


Fig. 131 Shift Range Indicator

(3) Remove the 2 screws (Fig. 132) attaching the center console to the shifter.

(4) Remove the 3 screws attaching the rear of the center console to the console bracket (Fig. 133).

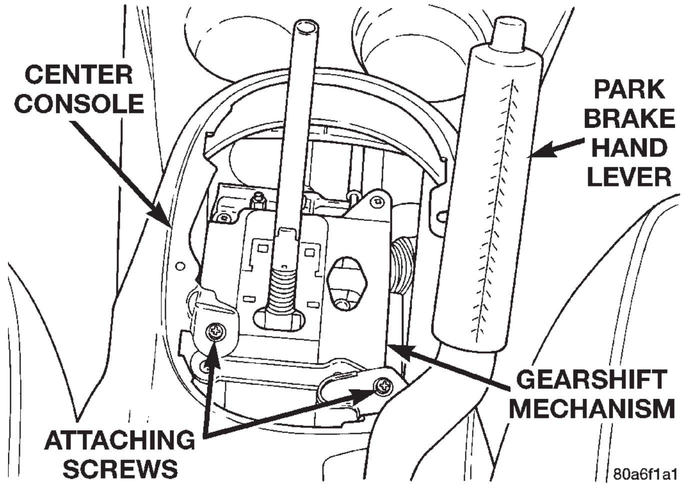


Fig. 132 Center Console Front Attaching Screw

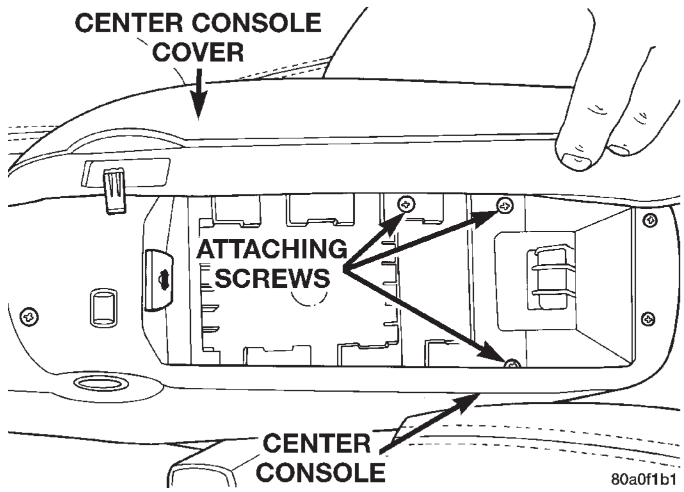


Fig. 133 Center Console Rear Attaching Screws

(5) Raise the park brake lever to a 45° angle. This is required for clearance to remove the center console.

(6) Raise the rear of the center console high enough to access the center console wiring harness connector (Fig. 134). Disconnect the center console wiring harness connector from the vehicle wiring harness 10–way connector (Fig. 134).

(7) Remove the center console from the vehicle.

(8) Lower the park brake lever to its fully released position.

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT RELEASE THE PARK BRAKE CABLES FROM THE EQUALIZER UNTIL THE AUTO ADJUSTER IS RELOADED. FAILURE TO RELOAD THE ADJUSTER MECHANISM BEFORE REMOVING PARK BRAKE CABLES FROM EQUALIZER COULD RESULT IN SERIOUS INJURY.

REMOVAL AND INSTALLATION (Continued)

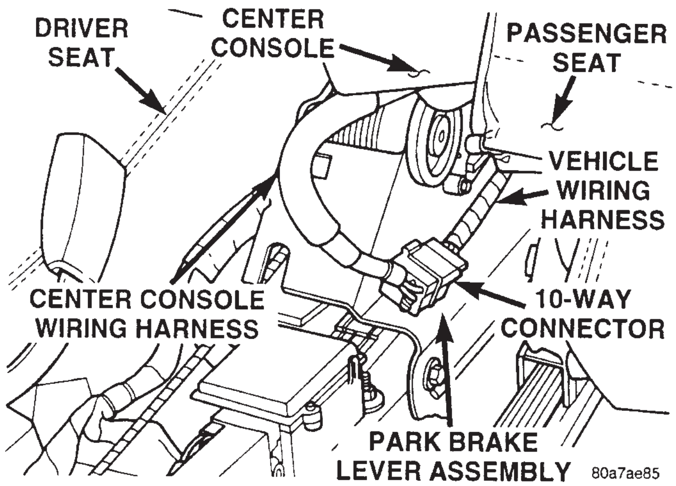


Fig. 134 Console Wiring Harness Connector

(9) Reload the adjuster mechanism on the park brake lever using the following procedure.

- Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 135).
- Grasp the park brake lever output cable (Fig. 135) by hand and pull upward.
- Continue to pull upward on cable until a 15/64 drill bit can be inserted in the adjuster mechanism as shown in (Fig. 135). This will lock-out the auto adjuster mechanism removing the tension from the park brake lever output cable. This will then allow the rear park brake cables to be easily removed from the equalizer.

NOTE: If the output cable of the park brake mechanism will not move when pulled on, first, be sure the park brake lever is in the full down position. If park brake lever is in the full down position and the output cable will not move, use the following procedure to reload the adjuster mechanism.

Using a screw driver (Fig. 136) push down on the end of the clutch spring where shown (Fig. 136). While end of clutch spring is held down, pull outward on park brake mechanism output cable.

If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 136) to assist in pulling on cable.

(10) Remove both rear wheel park brake cables from the park brake cable tension equalizer (Fig. 137).

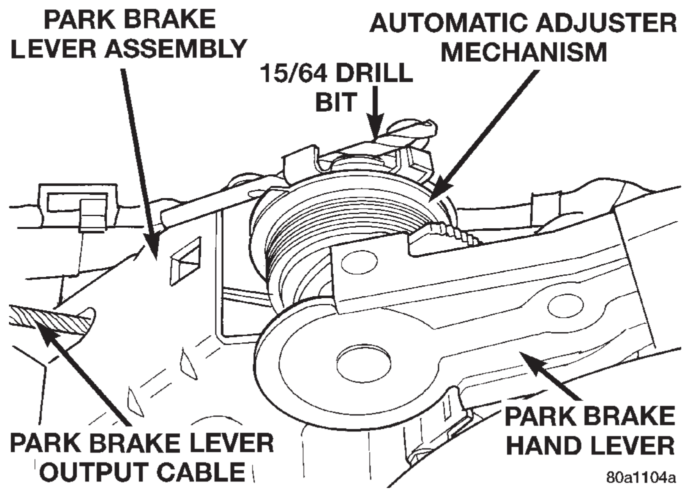


Fig. 135 Park Brake Lever Correctly Reloaded

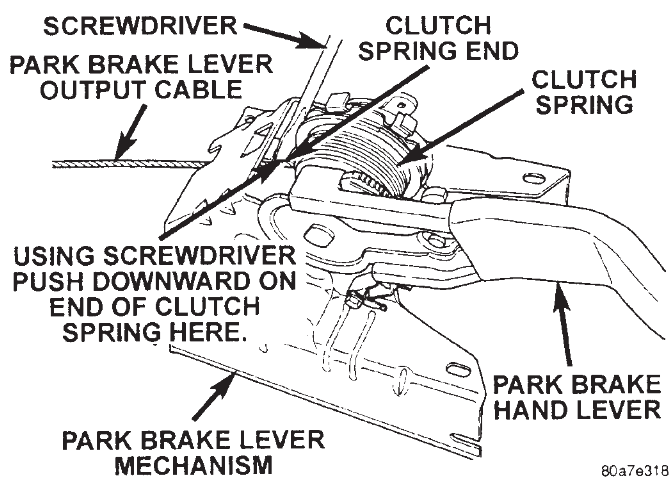


Fig. 136 Releasing Clutch Spring

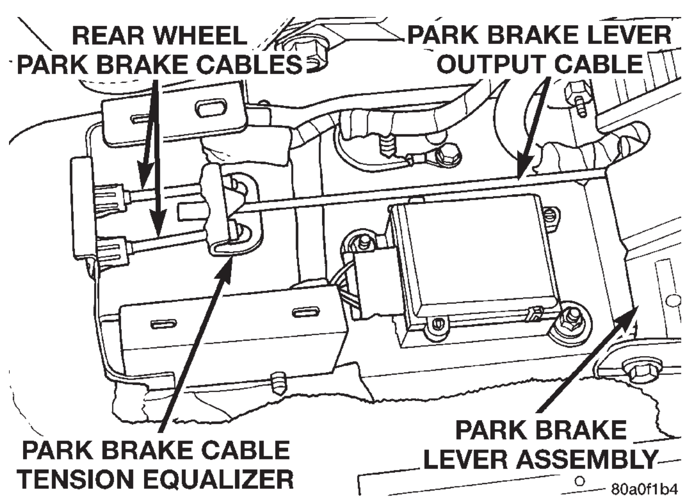


Fig. 137 Park Brake Cables At Tension Equalizer

REMOVAL AND INSTALLATION (Continued)

NOTE: If auto adjuster was not reloaded before removing the tension equalizer from both rear park brake cables, (Fig. 137) the park brake lever output cable (Fig. 137) will be pulled into the park brake mechanism.

If this happens the auto adjuster can be reloaded using the following procedure.

Using a screw driver (Fig. 136) push down on the end of the clutch spring where shown (Fig. 136). While end of clutch spring is held down, pull outward on park brake mechanism output cable. If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 136) to assist in pulling on cable.

(11) Remove the rear seat lower cushion from the vehicle.

(12) Remove scuff plates from right and left door sills. Scuff plates are attached to door sills using clips on bottom of scuff plates. Remove by carefully prying scuff plate retaining clips out of door sills.

(13) Remove the quarter trim panel from both sides of the vehicle. Refer to Group 23 Body in this group of the service manual for the required removal procedure.

(14) Remove the 2 wiring harness routing clips from the cross car beam.

(15) Remove the 2 clips attaching the carpeting to the cross car beam.

(16) Fold rear carpeting forward to expose park brake cables.

(17) Remove the routing clip (Fig. 138) attaching the rear park brake cables to the floor pan.

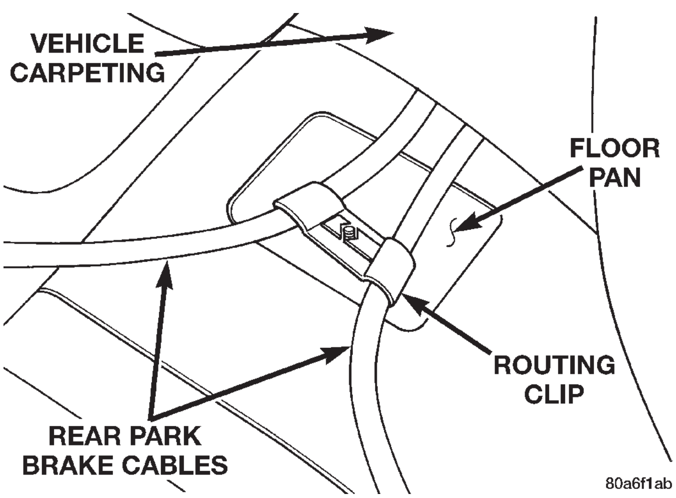


Fig. 138 Park Brake Cable Attachment To Floor Pan

(18) Install the box end of a 1/2 in. wrench over the park brake cable retainer as indicated in (Fig. 139). This will compress tabs on park brake cable retainer, allowing cable to be removed from console bracket. From under carpet, grasp park brake cable housing and pull cable straight out of console bracket.

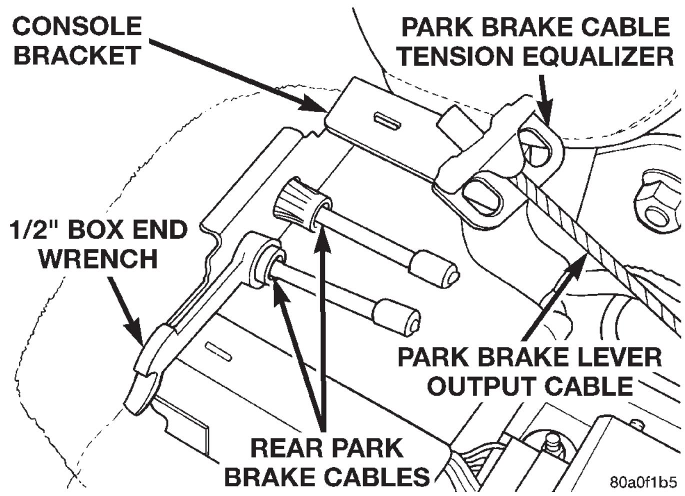


Fig. 139 Compressing Park Brake Cable Retaining Tabs

(19) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual for the required lifting procedure to be used for this vehicle.

(20) Remove rear wheel and tire assembly from the side of the vehicle requiring park brake cable service.

(21) Remove the rear brake drum (Fig. 140) from the rear hub/bearing assembly.

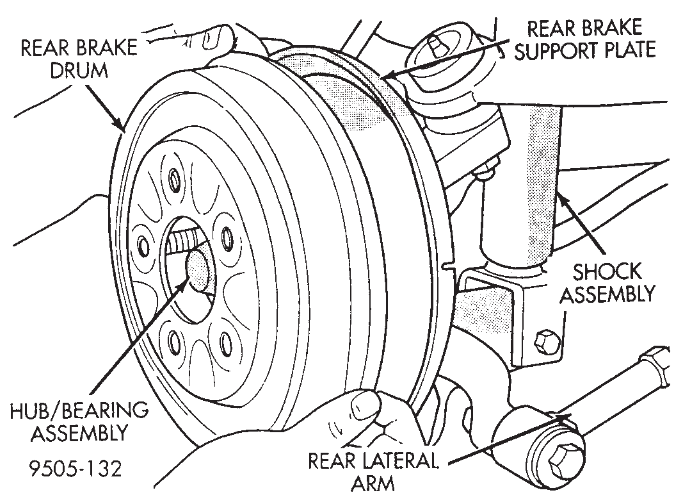


Fig. 140 Rear Brake Drum

REMOVAL AND INSTALLATION (Continued)

(22) Remove the dust cap (Fig. 141) from the rear hub/bearing assembly.

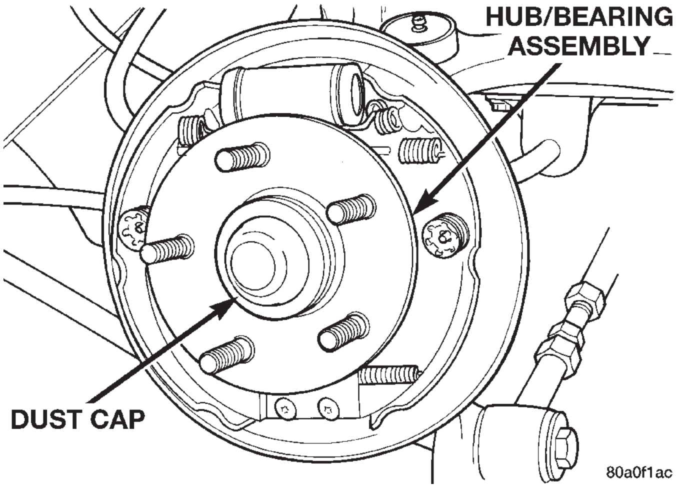


Fig. 141 Rear Hub/Bearing Dust Cap

(23) Remove the rear hub/bearing retaining nut (Fig. 142).

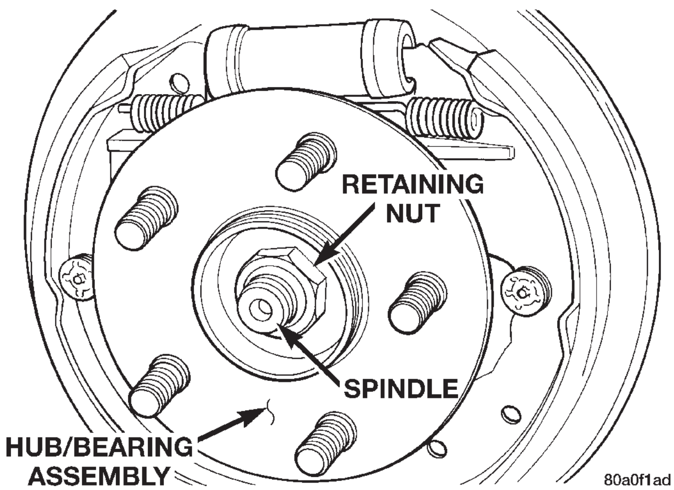


Fig. 142 Hub/Bearing Retaining Nut

(24) Remove the hub/bearing from the spindle.

(25) Remove the park brake cable from the park brake actuating lever on the trailing brake shoe (Fig. 143).

(26) Remove park brake cable (Fig. 144) from rear brake support plate. Park brake cable is removed from brake support plate using a 1/2 in. wrench as shown in (Fig. 144) to compress locking tabs on park brake cable retainer.

(27) Raise vehicle.

(28) Remove the 2 routing brackets (Fig. 145) attaching the park brake cable to the vehicle frame rail.

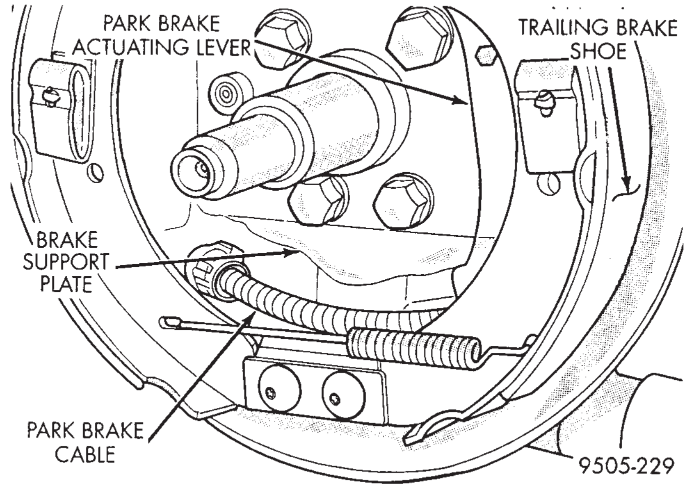


Fig. 143 Rear Park Brake Cable At Actuating Lever

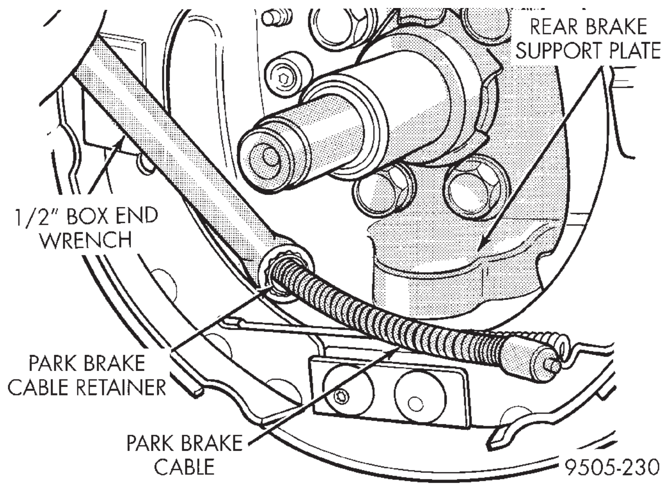


Fig. 144 Park Brake Cable Removal From Brake Support Plate

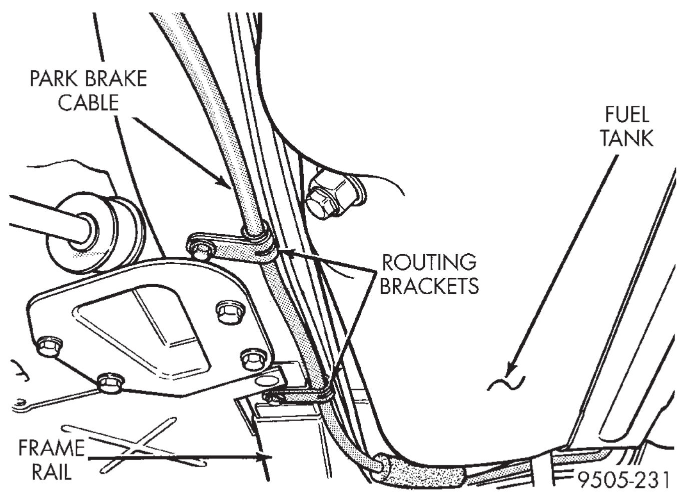


Fig. 145 Park Brake Cable Routing Brackets

REMOVAL AND INSTALLATION (Continued)

(29) Remove the park brake cable and sealing grommet (Fig. 146) from the floor pan of the vehicle.

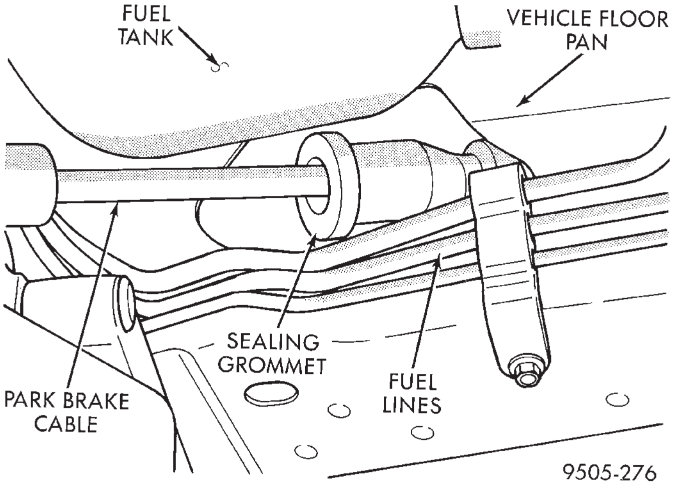


Fig. 146 Park Brake Cable Removal / Installation At Floor Pan

INSTALL

(1) Install the park brake cable into the floor pan. Make sure sealing grommet on park brake cable (Fig. 146) is installed in floor pan as far as possible to insure a proper seal.

(2) Install the 2 park brake cable routing brackets (Fig. 145) on the frame rail. Install and securely tighten the routing bracket attaching bolts.

(3) Install the park brake cable into the rear brake support plate **but do not** lock the locking tabs on the cable attachment retainer into the brake support plate.

(4) Install the park brake cable on the park brake actuating lever of the trailing brake shoe (Fig. 143). **Be sure the end of the spring is under the lip on the park brake actuating lever.**

(5) Push the park brake cable fully into the rear brake support plate. Be sure locking tabs on cable retainer are expanded to ensure park brake cable is securely held in the support plate.

(6) Install hub/bearing assembly on rear spindle. Then install **a new** rear hub/bearing assembly retaining nut (Fig. 142). Torque hub/bearing assembly to spindle retaining nut to 250 N·m (185 ft. lbs.).

(7) Install hub/bearing assembly dust cap, (Fig. 141) using a soft faced hammer.

(8) Install the rear brake drum on the hub/bearing assembly (Fig. 140).

(9) Install rear wheel and tire assembly on vehicle. Tighten all wheel stud nuts in criss cross pattern to one-half specified torque. Then repeat pattern, fully tightening stud nuts to 135 N·m (100 ft. lbs.).

(10) Lower vehicle.

(11) Grasp park brake cable to floor pan seal grommet by hand and pull it into the floor pan to ensure seal grommet is fully seated into the floor pan.

(12) Route park brake cable under carpeting and up to park brake cable hole in console bracket on floor pan. Then install park brake cable into console bracket (Fig. 147). Be sure tabs (Fig. 147) on park brake cable retainer, have expanded out to hold park brake cable in console bracket.

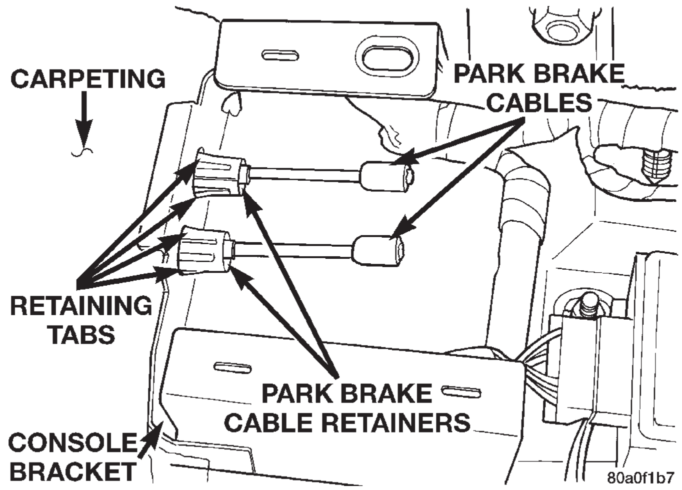


Fig. 147 Park Brake Cables Installed In Console Bracket

(13) Install the routing bracket holding park brake cables to the floor pan of the vehicle (Fig. 138).

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT UNLOAD THE ADJUSTER MECHANISM USING A PROCEDURE OTHER THEN THE PROCEDURE IN Step 14 FAILURE TO UNLOAD THE ADJUSTER MECHANISM USING AN ALTERNATE PROCEDURE COULD RESULT IN SERIOUS INJURY.

(14) Unload the adjuster mechanism on the park brake lever using the following procedure. Grasp the park brake lever output cable by hand and pull upward until all tension is removed from the drill bit (Fig. 135). used to reload the adjuster mechanism. Remove the drill bit from the clock spring of the park brake lever adjuster mechanism. Then, slowly release the park brake lever output cable until all slack is removed from the cable.

(15) Clip the wiring harness to the park brake lever bracket.

(16) Install the wiring harness connector on the ground switch of the park brake lever.

(17) Cycle the park brake lever once from the released position to the fully applied position and then back to the released position. This will position the park brake cables and fully adjust them to thier proper tension.

REMOVAL AND INSTALLATION (Continued)

(18) Check the rear wheels of the vehicle with the park brake lever fully released, they should rotate freely without dragging.

(19) Raise the park brake hand lever to approximately a 45° angle. This is necessary for the required clearance to install the center console.

(20) Install the center console back in the vehicle.

(21) Install the wiring harness connector for the center console into the vehicle wiring harness (Fig. 134).

(22) Install the 2 screws attaching the front of the center console to the shifter (Fig. 132). Install the screw hole garnish cap and the PRNDL strip on the center console.

(23) Install the 3 screws attaching the rear of the center console to the console bracket (Fig. 133).

(24) Install the transmission range indicator (Fig. 131) in the center console.

(25) Install the shift knob on the shifter. Install and securely tighten the shift knob retaining screw.

(26) Fold the carpeting back into position on the rear floor of the vehicle.

(27) Install the 2 clips attaching the carpeting to the cross car beam.

(28) Install the 2 wiring harness routing clips on the cross car beam.

(29) Install the quarter trim panels. Refer to Group 23 Body in this service manual for the required installation procedure.

(30) Install both door sill plate scuff moldings, by snapping them onto the door sills.

(31) Install lower rear seat cushion. Be sure lower seat cushion is fully installed in retainers on floor pan of vehicle.

STOP LAMP SWITCH

REMOVE

(1) Depress and hold the brake pedal while rotating stop lamp switch (Fig. 148) in a counter-clockwise direction approximately 30 degrees.

(2) Pull the switch rearward and remove from its mounting bracket.

(3) Disconnect wiring harness connector from stop lamp switch.

INSTALL

NOTE: Prior to installing stop lamp switch into bracket, the plunger must be moved to its fully extended position using procedure in Step 1.

(1) Hold stop lamp switch firmly in one hand. Then using other hand, pull outward on the plunger of the stop lamp switch until it has ratcheted out to its fully extended position.

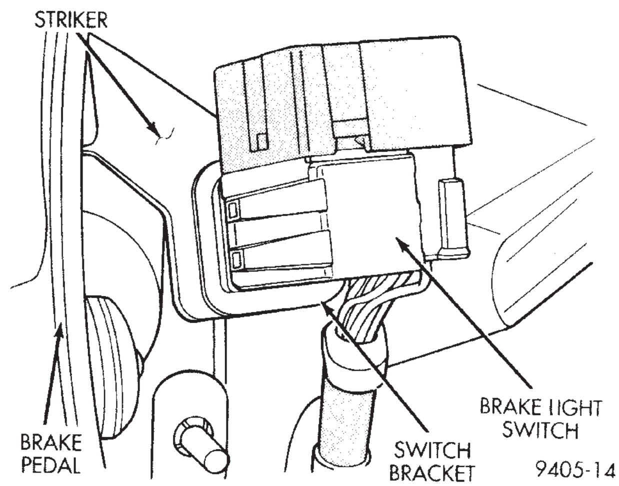


Fig. 148 Stop Lamp Switch

(2) Connect the wiring harness connector to the stop lamp switch.

(3) Mount the stop lamp switch into the bracket using the following procedure. Depress the brake pedal as far down as possible. Then install switch in bracket by aligning index key on switch with slot at top of square hole in mounting bracket. When switch is fully installed in bracket, rotate switch clockwise approximately 30° to lock switch into bracket.

CAUTION: Do not use excessive force when pulling back on brake pedal to adjust the stop lamp switch. If to much force is used, damage to the stop lamp switch or striker (Fig. 148) can result.

(4) Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger to ratchet backward to the correct position.

DISASSEMBLY AND ASSEMBLY

BRAKE FLUID RESERVOIR

NOTE: To replace the master cylinder brake fluid reservoir on this vehicle, it is not necessary to remove the master cylinder from the power brake vacuum booster.

(1) Using Mopar, Brake Parts Cleaner or an equivalent, thoroughly clean the master cylinder and brake fluid reservoir.

(2) Remove the brake fluid reservoir filler cap.

(3) Using a syringe or equivalent type tool, empty as much brake fluid as possible from the reservoir.

CAUTION: Do not pry fluid reservoir off master cylinder using a tool, damage to the reservoir or master cylinder can result.

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Remove brake fluid reservoir from master cylinder by rocking the reservoir from side to side while pulling upward on the fluid reservoir.

(5) Remove master cylinder housing to brake fluid reservoir sealing grommets (Fig. 149).

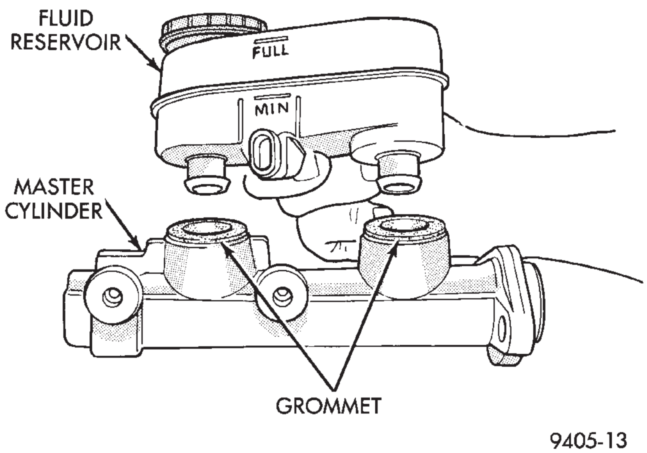


Fig. 149 Removing Fluid Reservoir From Master Cylinder

CAUTION: To ensure a leak proof seal when installing a fluid reservoir, never reuse the original fluid reservoir to master cylinder sealing grommets.

(6) Install new master cylinder housing to brake fluid reservoir sealing grommets (Fig. 149) in master cylinder housing.

(7) Lubricate reservoir mounting area with fresh clean brake fluid. Place reservoir in position over grommets. Seat reservoir into grommets using a rocking motion while firmly pressing down on fluid reservoir.

(8) Be sure reservoir is positioned properly.

(9) Make sure bottom of fluid reservoir touches top of both sealing grommets.

BRAKE FLUID LEVEL SWITCH

The master cylinder or brake fluid reservoir does not have to be removed from the vehicle for replacement of the brake fluid level sensor.

(1) Remove wiring harness connector from brake fluid reservoir level sensor (Fig. 150).

(2) Compress the retaining tabs (Fig. 151) on the end of the brake fluid level sensor.

(3) While compressing retaining tabs, grasp opposite end of brake fluid level sensor and pull it out of master cylinder fluid reservoir (Fig. 152).

FRONT AND REAR DISC BRAKE CALIPER

CLEANING AND INSPECTION

Check for brake fluid leaks in and around dust boot area and inboard brake pad, and for any ruptures, brittleness or damage to the piston dust boot.

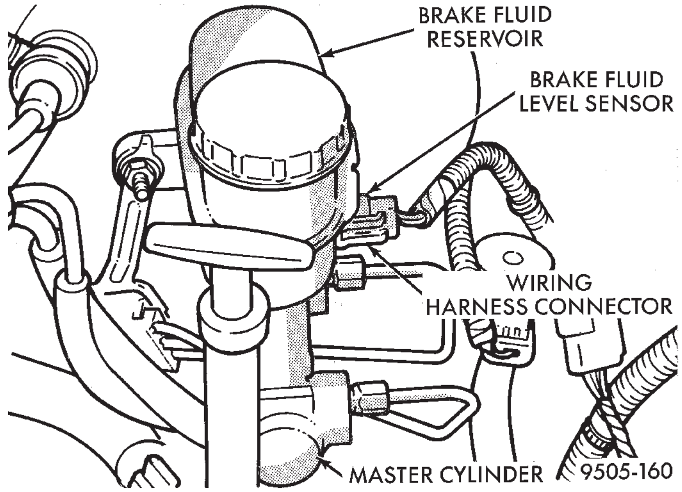


Fig. 150 Master Cylinder Fluid Level Sensor

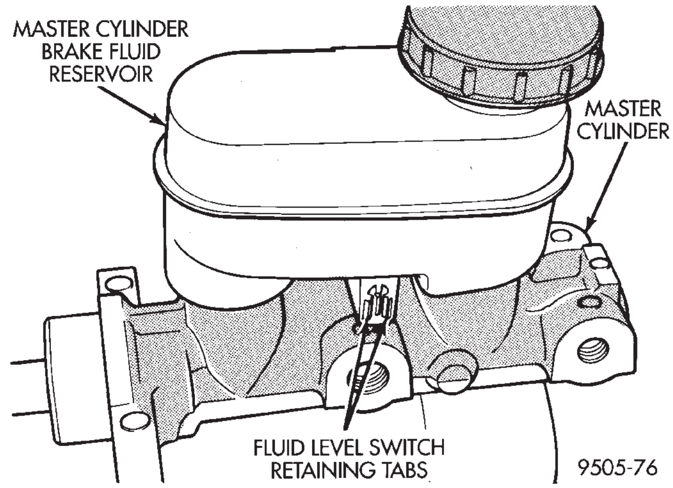


Fig. 151 Brake Fluid Level Switch Retaining Tabs

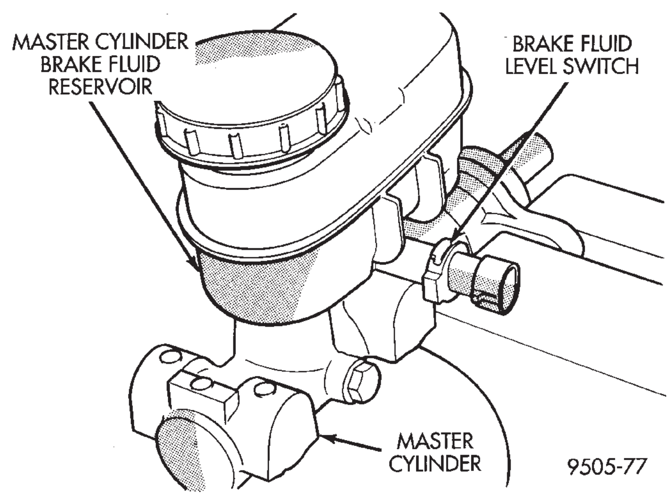


Fig. 152 Removing Fluid Level Switch From Reservoir

If the dust boot is damaged, or a fluid leak is visible, disassemble caliper assembly and install a new piston seal and dust boot, and piston if scored. Refer to

DISASSEMBLY AND ASSEMBLY (Continued)

Caliper Disassembly And Re-Assembly Procedures in Disc Brake Caliper Service in this section of the service manual.

Check the guide pin dust boots to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

CALIPER GUIDE PIN BUSHING SERVICE

The double pin caliper uses a sealed for life bushing and sleeve assembly. If required this assembly can be serviced using the following procedure.

REMOVING CALIPER GUIDE PIN BUSHINGS

(1) Remove caliper from brake rotor (See Brake Shoe Removal). Hang caliper assembly on a wire hook away from the brake rotor.

(2) Push out and then pull the steel sleeve from the inside of the bushing using your fingers as shown in (Fig. 153).

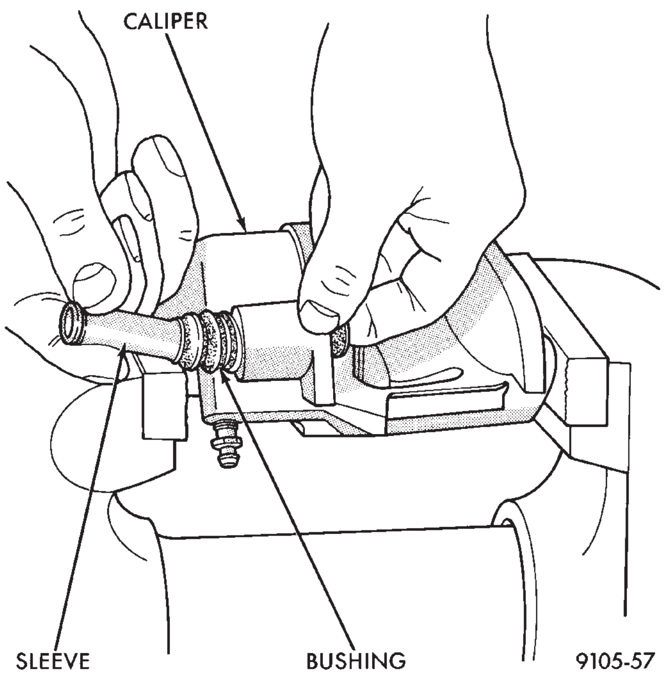


Fig. 153 Removing Inner Sleeve From Bushing

(3) Using your fingers, collapse one side of the bushing. Then pull on the opposite side to remove the bushing from the brake caliper housing (Fig. 154).

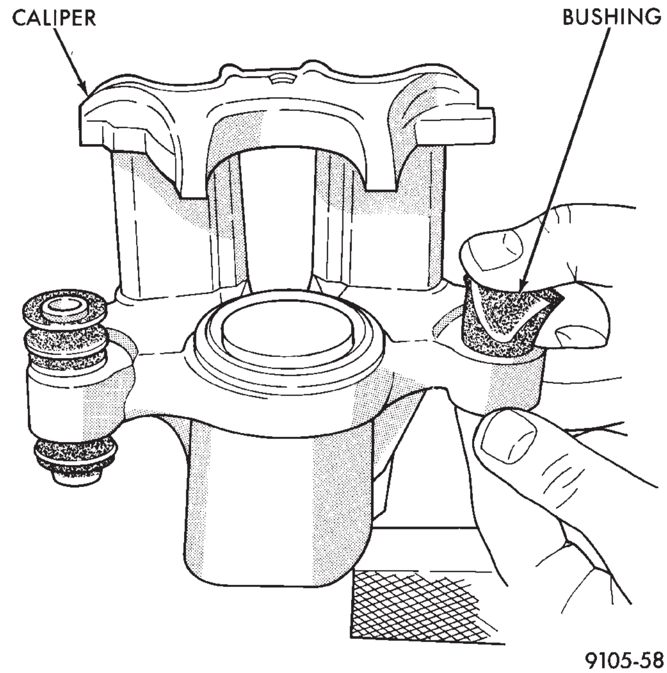


Fig. 154 Removing Bushing From Caliper

INSTALLING CALIPER GUIDE PIN BUSHINGS

(1) Fold the bushing in half lengthwise at the solid middle section of the bushing (Fig. 155).

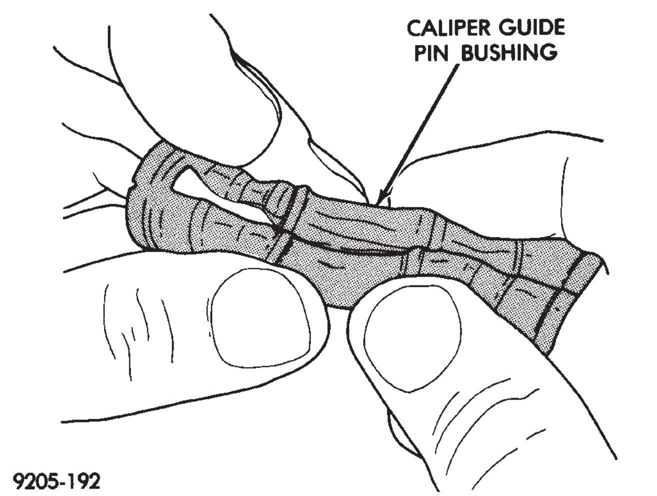


Fig. 155 Folded Caliper Guide Pin Bushing

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Insert the folded bushing into the caliper housing (Fig. 156). **Do not use a sharp object to perform this step due to possible damage to the bushing.**

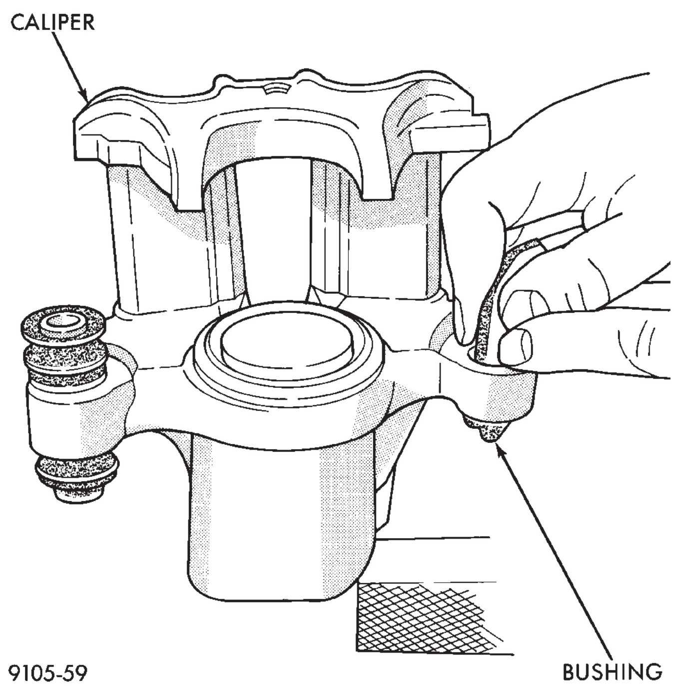


Fig. 156 Installing Caliper Guide Pin Bushing

(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper housing. Flanges should be seated evenly on both sides of the bushing hole (Fig. 157).

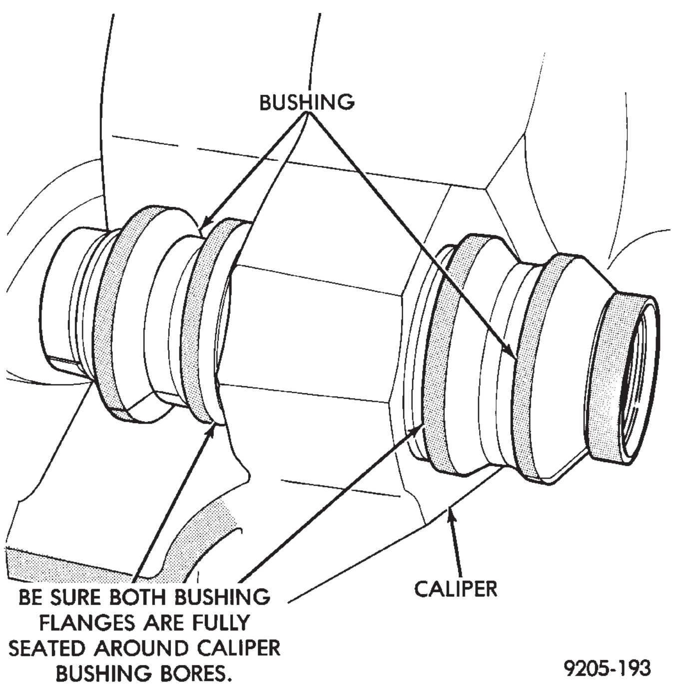


Fig. 157 Bushing Correctly Installed In Caliper

(4) Lubricate the inside surfaces of the bushing using Mopar, Silicone Dielectric Compound or an equivalent.

(5) Install guide pin sleeve into one end of bushing until seal area of bushing is past seal groove in sleeve (Fig. 158).

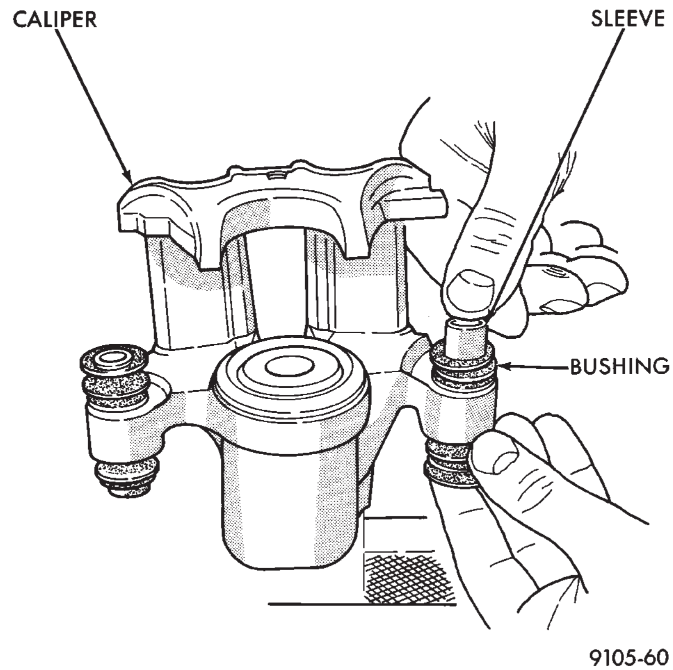


Fig. 158 Installing Sleeve In Bushing

(6) Holding convoluted boot end of bushing with one hand, push steel sleeve bushing through boot until one end of bushing is fully seated into seal groove on one end of sleeve (Fig. 158).

(7) Holding sleeve in place, work other end of bushing over end of sleeve and into the seal grove on sleeve (Fig. 159). Be sure other end of bushing did not come out of seal grove in sleeve.

(8) When the sleeve is seated properly into the bushing, the sealed for life sleeve/bushing can be held between your fingers and easily slid back and forth without the bushing unseating from the sleeve groove.

CALIPER DISASSEMBLY

WARNING: UNDER NO CONDITION SHOULD AIR PRESSURE EVER BE USED TO REMOVE A PISTON FROM A CALIPER BORE. PERSONAL INJURY COULD RESULT FROM SUCH A PRACTICE.

(1) Remove caliper from brake rotor (See Brake Shoe Removal). Hang assembly on a wire hook away from rotor, so hydraulic fluid cannot get on rotor. Place a small piece of wood between the piston and caliper fingers.

DISASSEMBLY AND ASSEMBLY (Continued)

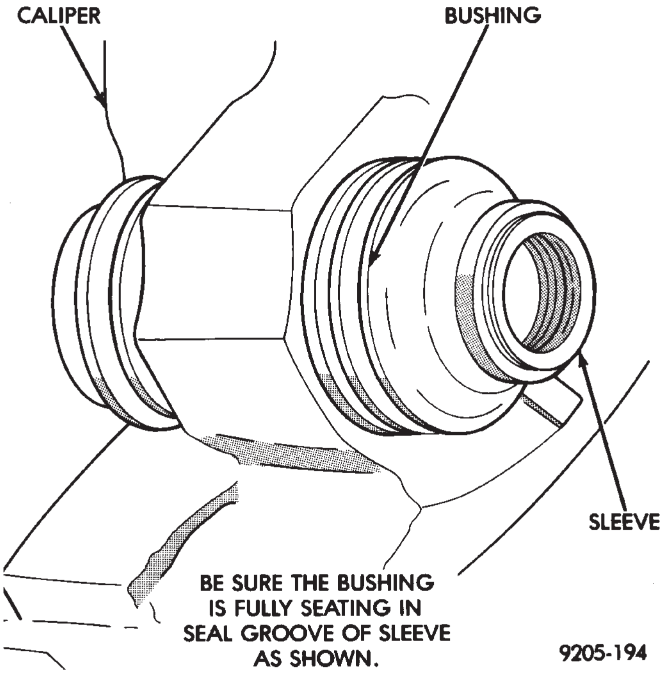


Fig. 159 Correctly Installed Caliper Sleeve And Bushing

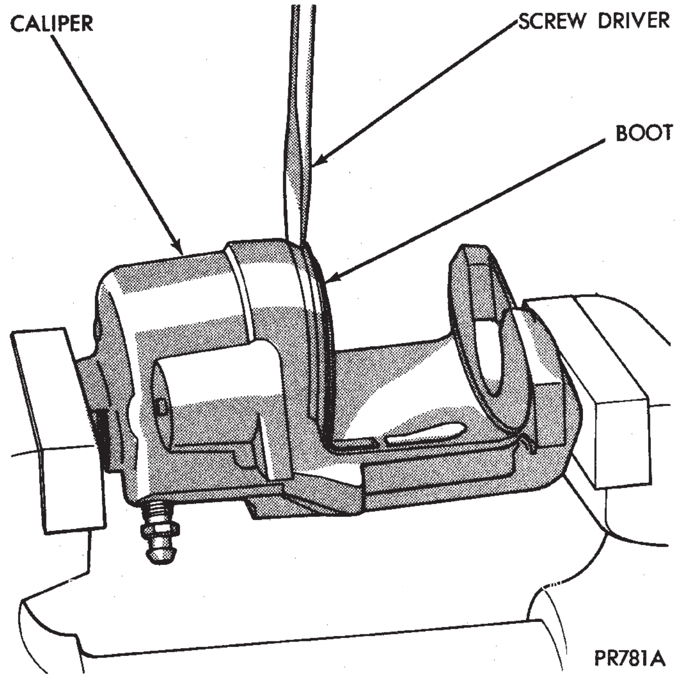


Fig. 160 Removing Caliper/Piston Dust Boot

(2) **Carefully** depress brake pedal to hydraulically push piston out of bore. Then apply and hold down the brake pedal to any position beyond the first inch of pedal travel. This will prevent loss of brake fluid from the master cylinder.

(3) If both front caliper pistons are to be removed, disconnect brake tube at flexible brake hose at frame rail. Plug brake tube and remove piston from opposite caliper using the same process as above for the first piston removal.

(4) Disconnect the brake fluid flex hose from the caliper assembly.

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion and binding of piston.

(5) To disassemble caliper, mount in a vise equipped with protective jaws.

(6) Remove guide pin sleeves and guide pin bushings. See Removing Guide Pin Bushings in the caliper disassembly section of this manual.

(7) Remove the piston dust boot from the caliper and discard (Fig. 160).

(8) Using a soft tool, such as a plastic trim stick, work piston seal out of its groove in caliper piston bore (Fig. 161). Discard old seal. **Do not use a screw driver or other metal tool for this operation, because of the possibility of scratching piston bore or burring edges of seal groove.**

(9) Clean all parts using alcohol or a suitable solvent and wipe dry **using only a lint free cloth.** No lint residue can remain in caliper bore. Clean out all drilled passages and bores. **Whenever a caliper has been disassembled, a new boot and seal must be installed at assembly.**

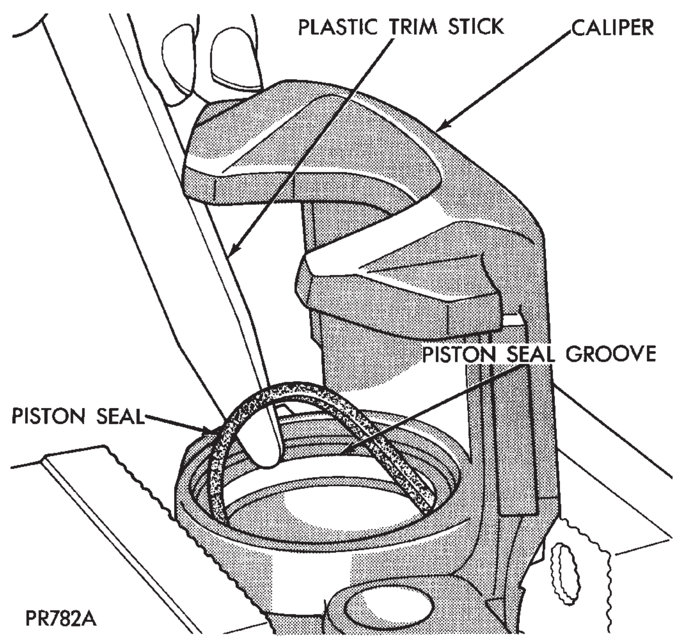


Fig. 161 Removing Piston Seal From Caliper

(10) Inspect the piston bore for scoring or pitting. Bores that show light scratches or corrosion can usually be cleared of the light scratches or corrosion using crocus cloth. Bores that have deep scratches or scoring should be honed. Use Caliper Hone, Special Tool C-4095, or equivalent providing the diameter of

DISASSEMBLY AND ASSEMBLY (Continued)

the bore is not increased more than 0.0254 mm (0.001 inch) (Fig. 162).

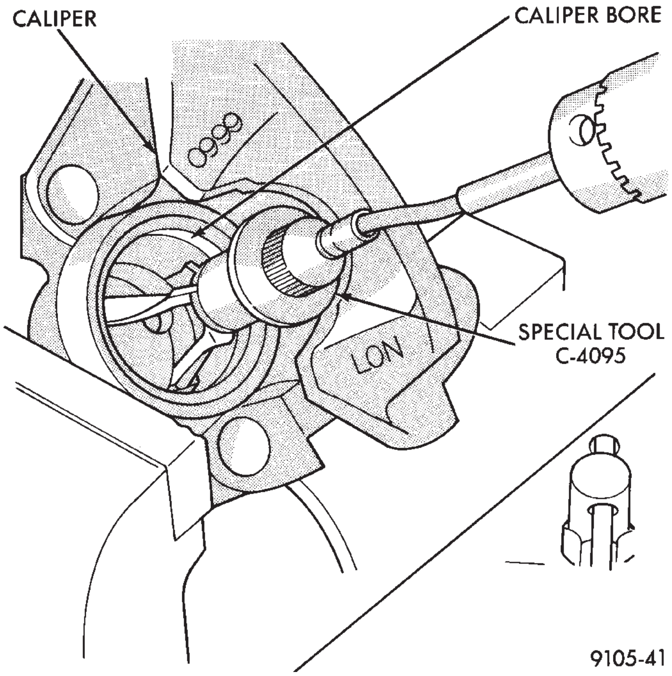


Fig. 162 Honing Brake Caliper Piston Bore

(11) If the bore does not clean up within this specification, a new caliper housing should be installed. Install a new piston if the old one is pitted or scored.

NOTE: When using Caliper Honing Tool, Special Tool C-4095, coat the stones and bore with brake fluid. After honing the bore, carefully clean the seal and boot grooves with a stiff non-metallic rotary brush.

NOTE: Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the caliper with brake fluid; wipe dry with a clean, lint free cloth and then clean a second time.

CAUTION: When inspecting caliper piston, do not use anything but solvents to clean piston surface. If surface of piston cannot be cleaned using only solvents, piston must be replaced.

(12) Inspect caliper piston for pitting, scratches, or any physical damage. Replace piston if there is evidence of scratches, pitting or physical damage.

CALIPER ASSEMBLY

CAUTION: Excessive vise pressure will cause bore distortion and binding of piston.

(1) Clamp caliper in a vise (with protective caps installed on jaws of vise).

(2) Dip new piston seal in clean brake fluid and install in the groove of the caliper bore. Seal should be positioned at one area in groove and gently worked around the groove (Fig. 163), using only your fingers until properly seated. **NEVER USE AN OLD PISTON SEAL.** Be sure that fingers are clean and seal is not twisted or rolled (Fig. 163).

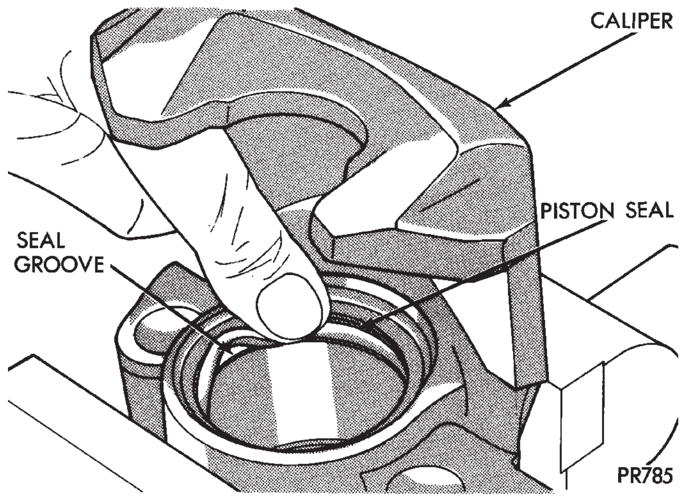


Fig. 163 Installing New Piston Seal In Caliper

(3) Coat new piston boot with clean brake fluid leaving a generous amount inside boot.

(4) Position dust boot over piston after coating with brake fluid.

CAUTION: Force must be applied to the piston uniformly to avoid cocking and binding of the piston in the bore of the caliper.

(5) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 164).

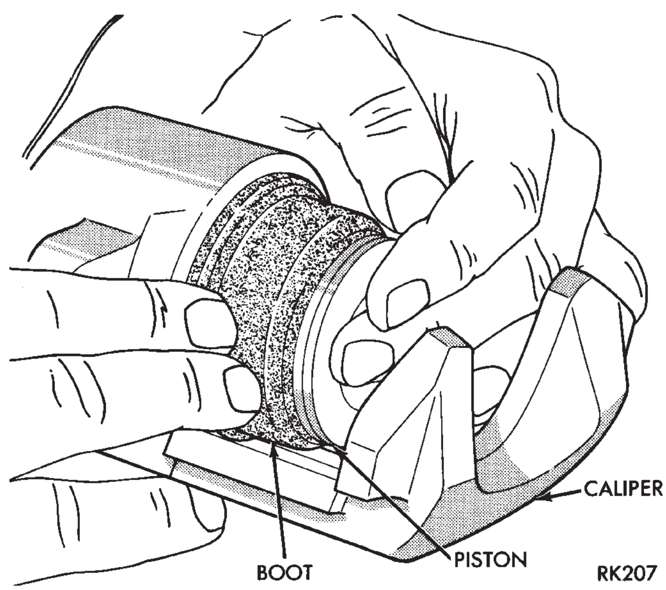


Fig. 164 Installing Piston Into Caliper Bore

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Position dust boot into the counterbore of the caliper assembly piston bore.

(7) Using a hammer and Installer Piston Caliper Boot, Special Tool C-4689 and Handle, Special Tool C-4171, drive boot into counterbore of the caliper (Fig. 165).

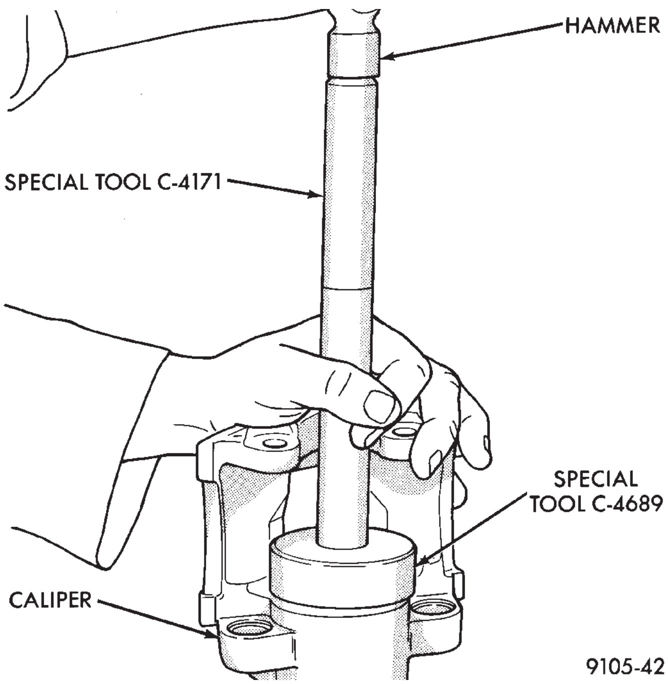


Fig. 165 Installing Dust Boot In Caliper Counterbore

(8) Install guide pin sleeves and bushings. See Install Guide Pin Bushings section in the caliper disassembly section of this manual.

(9) Install brake pads. See Installing Brake Pads in the Brake Pad Service Procedures section of this manual.

(10) Before installing caliper assembly on vehicle, inspect brake rotor. If any conditions as described in Checking Brake Rotor for Runout and Thickness are present the rotor, must be replaced or refaced. If the rotor does not require any servicing, install caliper assembly.

(11) Install brake hose onto caliper using banjo bolt. Torque the brake hose to caliper assembly banjo bolt to 33 N·m (24 ft. lbs.). **New seal washers MUST always be used when installing brake hose to caliper.**

(12) Bleed the brake system (see Bleeding Brake System).

WHEEL CYLINDER REAR DRUM BRAKE

DISASSEMBLE

To disassemble the wheel cylinders, proceed as follows:

(1) Pry boots away from cylinders and remove (Fig. 166).

(2) Press **IN** on one piston to force out opposite piston, cup and spring (Fig. 166). Then using a soft tool such as a dowel rod, press out the cup and piston that remain in the wheel cylinder.

(3) Wash wheel cylinder, pistons, and spring (Fig. 166) in clean brake fluid or alcohol; **(DO NOT USE ANY PETROLEUM BASE SOLVENTS)** clean thoroughly and blow dry with compressed air. Inspect cylinder bore and piston for scoring and pitting. (Do not use a rag as lint from the rag will stick to bore surfaces.)

(4) Wheel cylinder bores and pistons that are badly scored or pitted should be replaced. Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned with crocus cloth, using a circular motion. Black stains on the cylinder walls are caused by piston cups and will not impair operation of cylinder.

ASSEMBLE

Before assembling the pistons and new cups in the wheel cylinders, dip them in clean brake fluid. If the boots are deteriorated, cracked or do not fit tightly on the pistons or the cylinder casting, install new boots.

(1) Coat cylinder bore with clean brake fluid.

(2) Lightly coat the sealing lip and outer surfaces of the wheel cylinder cups with Mopar Protect-A-Cup Lubricant.

(3) Install expansion spring with cup expanders in cylinder. Install cups in each end of cylinder with open end of cups facing each other (Fig. 166).

(4) Install piston in each end of cylinder having the flat face of each piston contacting the flat face of each cup, already installed (Fig. 166).

(5) Install a boot over each end of cylinder (Fig. 166). **Be careful not to damage boot during installation.**

CLEANING AND INSPECTION

FRONT DISC BRAKE COMPONENT INSPECTION

BRAKE PAD LINING WEAR

If a visual inspection does not adequately determine the condition of the front disc brake shoe lining, a physical check will be necessary. To check the amount of brake shoe lining wear, remove the wheel and tire assemblies, and the calipers.

Remove the front brake shoes. (See Brake Shoe Removal paragraph).

Combined front brake shoe thickness should be measured at the thinnest part of the assembly.

CLEANING AND INSPECTION (Continued)

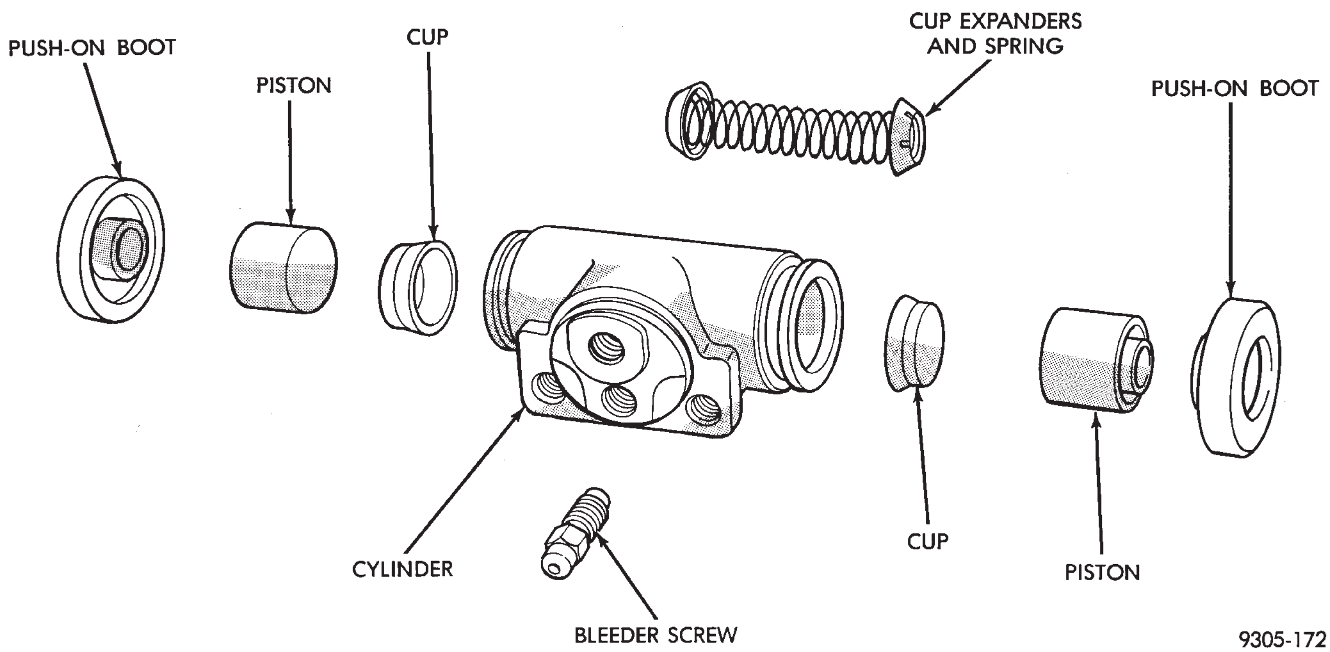


Fig. 166 Rear Wheel Cylinder (Exploded View)

When a set of brake shoes are worn to a total thickness of approximately 9.0 mm (3/8 inch) they should be replaced.

Replace both brake shoes (inboard and outboard) on both front sides of the vehicle.

If the front disc brake shoes do not require replacement, reinstall, the brake shoes making sure each brake shoe is returned to the original position on the vehicle it was removed from. (See Brake Pad Installation).

CALIPER INSPECTION

Check caliper for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper and install a new seal and boot, (and piston if scored). Refer to Caliper Disassembly And Re-Assembly Procedures in Disc Brake Caliper Service in this section of the service manual.

Check the caliper dust boot and caliper pin bushings to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

REAR DRUM BRAKES

Clean metal portion of brake shoes. Check to see if shoes are bent.

Lining should show contact across entire width and from heel to toe, otherwise replace.

Shoes with lack of contact at toe or heel may be improperly ground.

Clean and inspect the brake support plate and the automatic self adjusting mechanism.

Visually examine the adjuster assembly to ensure it is functioning correctly by checking for the following operation.

- Be sure the star wheel on the adjuster (Fig. 167) is free to rotate throughout its entire adjustment range.
- Ensure that the adjuster actuating lever is free to move on the brake shoe.
- Inspect the adjuster actuating spring (Fig. 167) for any signs of excessive wear or damage.
- Ensure that the teeth on the star wheel are not damaged (Fig. 167).
- Overall, examine the adjuster mechanism for excessive wear or damage and replace if necessary.

If the adjuster mechanism is re-useable, apply a light coat of Mopar Multi-Purpose Lubricant or equivalent, on the threads of the adjuster mechanism (Fig. 167).

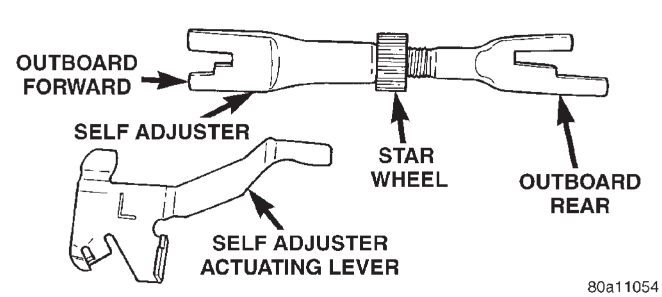


Fig. 167 Automatic Self Adjuster Mechanism And Actuating Lever

CLEANING AND INSPECTION (Continued)

If any return, hold down, or actuating springs have overheated or are damaged, replace them. Overheating indications are paint discoloration or distorted end coils.

REAR DRUM BRAKE WHEEL CYLINDER

With brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks. If any of these conditions exist, the wheel cylinders should be completely cleaned, inspected and new parts installed.

If a wheel cylinder is leaking and the brake lining material is saturated with brake fluid, the brake shoes must be replaced.

CHASSIS TUBES AND HOSES

Flexible rubber hose is used at both front and rear brakes. Inspection of brake hoses should be performed whenever the brake system is serviced and every 7,500 miles or 12 months, whichever comes first (every engine oil change). Inspect hydraulic brake hoses for severe surface cracking, scuffing, worn spots or physical damage. If the fabric casing of the rubber hose becomes exposed due to cracks or abrasions in the rubber hose cover, the hose should be replaced immediately. Eventual deterioration of the hose can take place with possible burst failure. Faulty installation can cause twisting, resulting in wheel, tire, or chassis interference.

The steel brake tubing should be inspected periodically for evidence of corrosion, physical damage or contact with moving or hot components of the vehicle.

REAR WHEEL HUB AND BEARING ASSEMBLY

The rear hub and bearing assembly is designed for the life of the vehicle and should require no maintenance. The following procedure may be used for evaluation of bearing condition.

With wheel and brake drum removed, rotate flanged outer ring of hub. Excessive roughness, lateral play or resistance to rotation may indicate dirt intrusion or bearing failure. If the rear wheel bearings exhibit these conditions during inspection, the hub and bearing assembly should be replaced.

Damaged bearing seals and resulting excessive grease loss may also require bearing replacement. Moderate grease loss from bearing is considered normal and should not require replacement of the hub and bearing assembly.

ADJUSTMENTS

STOP LAMP SWITCH

(1) Remove stop lamp switch from its bracket by rotating it approximately 30° in a counter-clockwise direction.

(2) Disconnect wiring harness connector from stop lamp switch.

(3) Hold stop lamp switch firmly in one hand. Then using other hand, pull outward on the plunger of the stop lamp switch until it has ratcheted out to its fully extended position.

(4) Install the stop lamp switch into the bracket using the following procedure. Depress the brake pedal as far down as possible. Then while keeping the brake pedal depressed, install the stop lamp switch into the bracket by aligning index key on switch with slot at top of square hole in mounting bracket. When switch is fully installed in the square hole of the bracket, rotate switch clockwise approximately 30° to lock the switch into the bracket.

CAUTION: Do not use excessive force when pulling back on brake pedal to adjust the stop lamp switch. If too much force is used, damage to the vacuum booster, stop lamp switch or striker (Fig. 168) can result.

(5) Connect the wiring harness connector to the stop lamp switch.

(6) Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger (Fig. 168) to ratchet backward to the correct position.

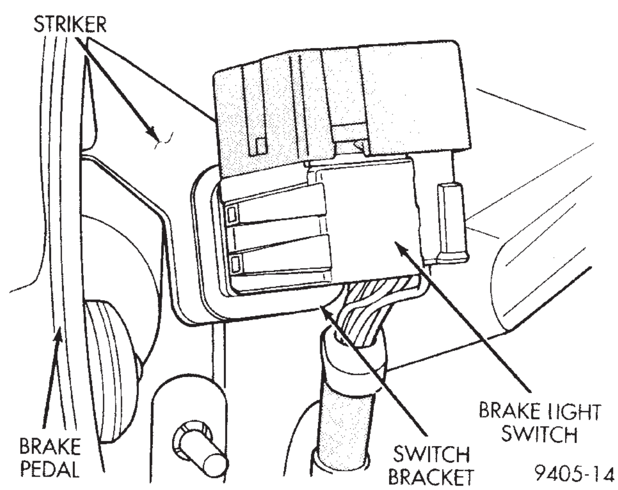


Fig. 168 Stop Light Switch Location In Vehicle

REAR DRUM BRAKE SHOE ADJUSTMENT

NOTE: Normally, self adjusting drum brakes will not require manual brae shoe adjustment. Although in the event that the rear brake shoes are replaced it is advisable to make the initial adjustment manually to speed up the initial adjustment time.

ADJUSTMENTS (Continued)

(1) Raise vehicle using a frame contact type hoist or supported as required using jack stands. See moisting in the Lubrication And Maintenance group of this service manual for the required hoisting or jacking procedure to be used for this vehicle.

(2) Remove the rubber plug (Fig. 169) from the brake adjuster access hole in the brake support plate.

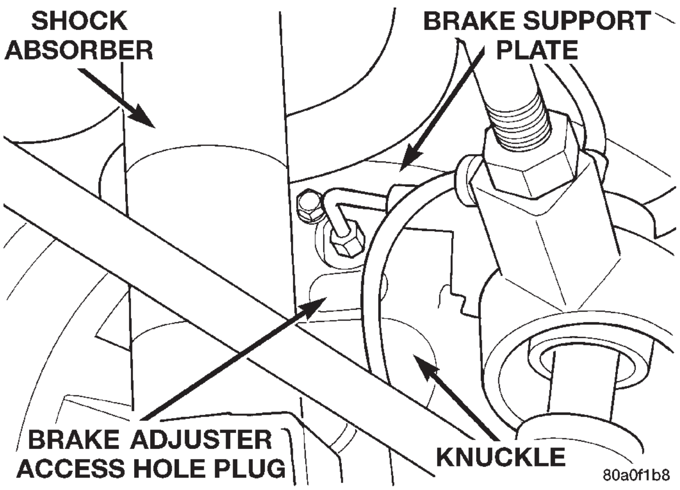


Fig. 169 Brake Adjuster Access Hole Plug

(3) **Be sure parking brake lever is fully released.**

(4) Insert a thin screwdriver through the adjuster access hole in the brake support plate (Fig. 170). Engage the tip of the screwdriver with the star wheel on the automatic adjuster. Move the handle of the screwdriver downward (toward the ground). Repeat the above procedure until drag is felt when rear wheel is rotated.

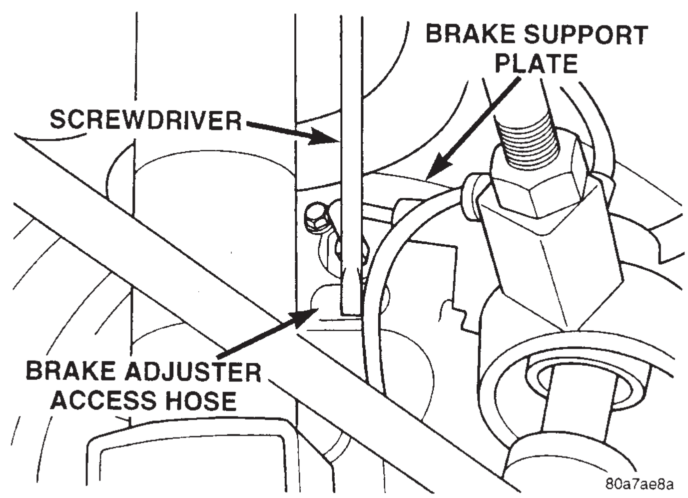


Fig. 170 Rear Brake Shoe Adjustment

CAUTION: When performing the procedure in Step 5, care must be taken not to bend the adjuster actuating lever or distort the lever actuating spring.

(5) Insert a thin screwdriver or a piece of welding rod through the adjuster access hole. Carefully push the adjuster actuating lever out of engagement with the adjuster star wheel. While holding the adjuster actuating lever away from the star wheel insert a second screwdriver in access hole and engage it with the star wheel on the adjuster. Back off the adjuster star wheel until no drag is present when rotating the wheel.

(6) Repeat the above adjustment procedure at the other rear wheel.

(7) Apply and release the park brake lever one time after the rear brake shoes are adjusted. This will correctly adjust the tension of the park brake cables.

(8) Install the rubber plugs into the adjuster access holes in the brake support plates (Fig. 169).

PARKING BRAKES

Due to the automatic adjustment feature of the parking brake system used on this vehicle, manual adjustment of the parking brakes is not required. Proper adjustment of the parking brakes on this vehicle relies on the proper adjustment of the rear drum brake shoes. See Rear Brake Adjustment in the Service Adjustments Section in this group of the service manual for the required rear brake shoe adjustment procedure.

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid ect.

SPECIFICATIONS (Continued)

BRAKE ACTUATING SYSTEM

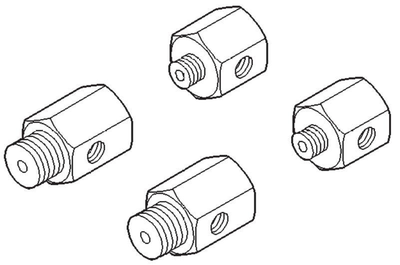
ACTUATION:
Vacuum Operated Power Brakes . . . . Standard
Hydraulic System . . . . Dual-Diagonally Split
MASTER CYLINDER ASSEMBLY:
Supplier . . . . Allied Signal
Type . . . . Center Valve Design
Body Material . . . . Anodized Aluminum
Reservoir Material . . . . Polypropelene
MASTER CYLINDER BORE / STROKE AND SPLIT:
ABS . . . . 22.2 mm x 33.4 mm (.874 in. x 1.32 in.)
Displacement Split . . . . 50 / 50
MASTER CYLINDER FLUID OUTLET PORTS:
ABS . . . . Primary 3/8–24 Secondary 7/16–24
Non ABS . . Primary Inboard And Outboard 7/16–24
Non ABS . Secondary Inboard And Outboard 3/8–23
Outlet Fitting Type . . . . Double Wall Inverted Flare
ABS HYDRAULIC CONTROL UNIT:
Hydraulic Tube Fitting Type . . Double Wall Inverted Flare
BOOSTER:
Make/Type . . . . Allied Signal Vacuum Assist
Mounting Studs . . . . M8 x 1.25
Type . . . . 205 mm Tandem
Boost At 20 inches Of Manifold Vacuum . . . 4690 All
SCREW IN PROPORTIONING VALVE:
Material . . . . Aluminum
Function . . . . Hydraulic Pressure Proportioning
BRAKE PEDAL
Pedal Ratio 3.32

BRAKE FASTENER TORQUE SPECIFICATIONS

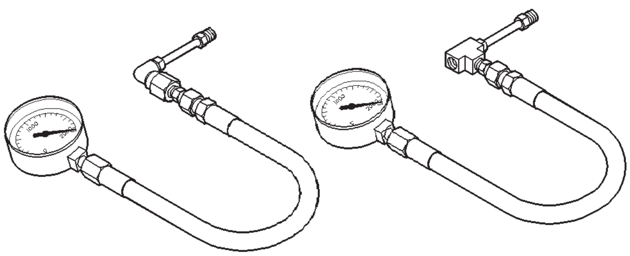
DESCRIPTION **TORQUE**
BRAKE TUBES:
Tube Nuts To Fittings And Components . . . . 20 N·m (180 in. lbs.)
BRAKE HOSE:
Front Caliper Banjo Bolt . . . . . 48 N·m (35 ft. lbs.)
Rear Intermediate Bracket . . 11 N·m (100 in. lbs.)
Front And Rear Brackets To Frame Rails . . . . 10 N·m (95 in. lbs.)
MASTER CYLINDER:
To Vacuum Booster Mounting Nut . . . . 28 N·m (250 in. lbs.)
BRAKE BOOSTER:
To Dash Panel Mounting Nuts . 37 N·m (27 ft. lbs.)
BRAKE PEDAL
To Dash Panel Plenum Mounting Nut . . . . 37 N·m (27 ft. lbs.)
Shaft To Brake Pedal Bracket Nut . . . . 34 N·m (25 ft. lbs.)
REAR WHEEL CYLINDER:
To Support Plate Mounting Bolts . . . . 13 N·m (115 in. lbs.)
Bleeder Screw . . . . 10 N·m (90 in. lbs.)
BRAKE SUPPORT PLATE:
To Axle Mounting Bolts . . . . . . 75 N·m (55 ft. lbs.)
DISC BRAKE CALIPER:
Guide Pin Bolts . . . . 22 N·m (16 ft. lbs.)
Bleeder Screw . . . . 20 N·m (15 ft. lbs.)
ABS HYDRAULIC CONTROL UNIT:
To Mounting Bracket Bolts . . 28 N·m (250 in. lbs.)
Bracket To Crossmember Mounting Bolts . . . . 28 N·m (250 in. lbs.)
PARKING BRAKE:
Lever Mounting Nuts . . . . 24 N·m (18 ft. lbs.)
REAR HUB AND BEARING:
To Knuckle Retaining Nut . . 250 N·m (185 ft. lbs.)
WHEEL:
Stud Lug Nut . . . . . 115–155 N·m (85–115 ft. lbs.)

SPECIAL TOOLS

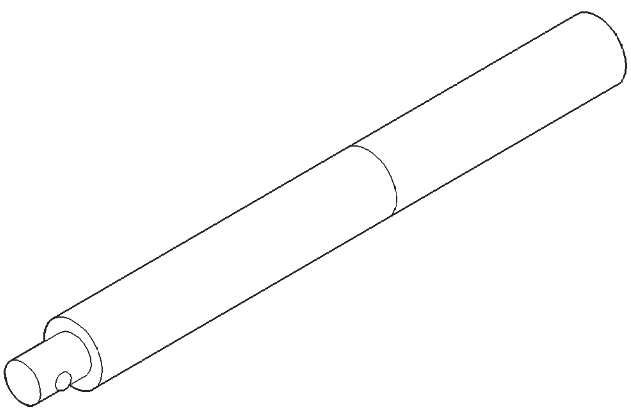
BASE BRAKE SYSTEM



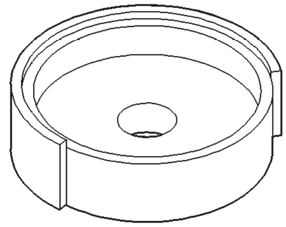
Adapters, Brake Pressure Test 6805



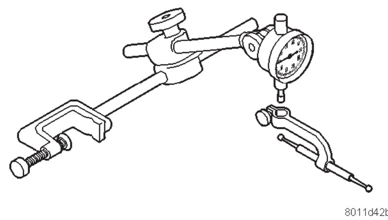
Gauge Set C-4007-A



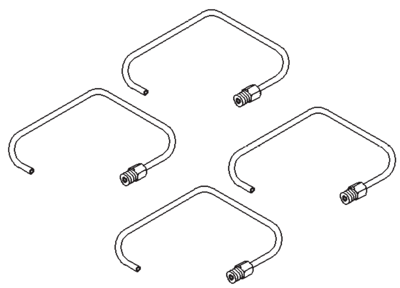
Handle, Universal C-4171



Installer, Dust Boot C-4689



Dial Indicator C-3339



Tubes, Master Cylinder Bleeding 6802

ANTILOCK BRAKE SYSTEM–ALLIED SIGNAL ABX-4

INDEX

DESCRIPTION AND OPERATION

ANTILOCK BRAKES OPERATION DESCRIPTION

The purpose of the Antilock Brake System (ABS) is to prevent wheel lock-up under heavy braking conditions on virtually any type of road surface. Antilock Braking is desirable because a vehicle which is stopped without locking the wheels will retain directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during heavy braking.

This section of the service manual covers the description and on car service for the Allied Signal ABX-4 Brake System. If other service is required on the non ABS related components of the brake system, refer to the appropriate section in this group of the manual for the specific service procedure required.

ABS COMPONENT ABBREVIATION LIST

In this section of the service manual several abbreviations are used for the components that are in the Allied Signal ABX-4 Brake System. These components are listed below for your reference.

- CAB—Controller Antilock Brake (Electronic)
- HCU—Hydraulic Control Unit
- ABS—Antilock Brake System
- PSI—Pounds per Square Inch (pressure)
- WSS—Wheel Speed Sensor
- FWD—Front Wheel Drive
- DTC—Diagnostic Trouble Code

DESCRIPTION AND OPERATION (Continued)

ABS OPERATION AND VEHICLE PERFORMANCE

This ABS System represents the current state-of-the-art in vehicle braking systems and offers the driver increased safety and control during braking. This is accomplished by a sophisticated system of electrical and hydraulic components. As a result, there are a few performance characteristics that may at first seem different but should be considered normal. These characteristics are discussed below.

NORMAL BRAKING SYSTEM FUNCTION

Under normal braking conditions, the ABS System functions the same as a standard brake system with a diagonally split master cylinder and conventional vacuum assist.

ABS SYSTEM OPERATION

If a wheel locking tendency is detected during a brake application, the brake system will enter the ABS mode. During ABS braking, hydraulic pressure in the four wheel circuits is modulated to prevent any wheel from locking. Each wheel circuit is designed with a set of electric solenoids to allow modulation, although for vehicle stability, both rear wheel solenoids receive the same electrical signal.

During an ABS stop, the brakes hydraulic system is still a diagonally split. However, the brake system pressure is further split into three control channels. During antilock operation of the vehicle brake system, the front wheels are controlled independently and are on two separate control channels. The rear wheels of the vehicle however, are controlled together through one control channel.

The system can build and release pressure at each wheel, depending on signals generated by the wheel speed sensors (WSS) at each wheel and received at the Controller Antilock Brake (CAB).

ABS operation is available at all vehicle speeds above 3 to 5 mph. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

VEHICLE HANDLING PERFORMANCE DURING ABS BRAKING

It is important to remember that an antilock brake system does not shorten a vehicle's stopping distance under all driving conditions, but does provide improved control of the vehicle while stopping. Vehicle stopping distance is still dependent on vehicle speed, weight, tires, road surfaces and other factors.

Though ABS provides the driver with some steering control during hard braking, there are conditions however, where the system does not provide any benefit. In particular, hydroplaning is still possible when the tires ride on a film of water. This results in the vehicles tires leaving the road surface rendering the vehicle virtually uncontrollable. In addition, extreme steering maneuvers at high speed or high speed cornering beyond the limits of tire adhesion to the road surface may cause vehicle skidding, independent of vehicle braking. For this reason, the ABS system is termed Antilock instead of Anti-Skid.

NOISE AND BRAKE PEDAL FEEL

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping and/or groaning noises heard by the driver. This is normal due to pressurized fluid being transferred between the master cylinder and the brakes. If ABS operation occurs during hard braking, some pulsation may be felt in the vehicle body due to fore and aft movement of the suspension as brake pressures are modulated.

At the end of an ABS stop, ABS will be turned off when the vehicle is slowed to a speed of 3–4 mph. There may be a slight brake pedal drop anytime that the ABS is deactivated, such as at the end of the stop when the vehicle speed is less then 3 mph or during an ABS stop where ABS is no longer required. These conditions will exist when a vehicle is being stopped on a road surface with patches of ice, loose gravel or sand on it. Also stopping a vehicle on a bumpy road surface may activate the ABS because of the wheel hop caused by the bumps.

TIRE NOISE AND MARKS

Although the ABS system prevents complete wheel lock-up, some wheel slip is desired in order to achieve optimum braking performance. Wheel slip is defined as follows, 0 percent slip means the wheel is rolling freely and 100 percent slip means the wheel is fully locked. During brake pressure modulation, wheel slip is allowed to reach up to 25 to30%. This means that the wheel rolling velocity is 25 to 30% less than that of a free rolling wheel at a given vehicle speed. This slip may result in some tire chirping, depending on the road surface. This sound should not be interpreted as total wheel lock-up.

Complete wheel lock up normally leaves black tire marks on dry pavement. The ABS System will not leave dark black tire marks since the wheel never reaches a fully locked condition. Tire marks may however be noticeable as light patched marks.

ABS COMPONENTS

The following is a detailed description of the Allied Signal ABX-4 ABS brake system components. For information on servicing the base brake system components, see the Base Brake section of this Service Manual.

DESCRIPTION AND OPERATION (Continued)

ABS BRAKES HYDRAULIC CONTROL UNIT (HCU)

WARNING: THE ONLY PARTS OF THE HYDRAULIC CONTROL UNIT HCU THAT ARE SERVICEABLE ARE THE RELAY BOX, THE PROPORTIONING VALVES, AND THE HCU MOUNTING BRACKET. THE REMAINING COMPONENTS OF THE HYDRAULIC CONTROL UNIT HCU ARE NOT SERVICEABLE ITEMS. NO ATTEMPT SHOULD EVER BE MADE TO REMOVE OR SERVICE ANY OTHER PARTS OF THE HYDRAULIC CONTROL UNIT HCU.

The hydraulic control unit HCU is located on the right side of the vehicle, mounted to the front suspension (Fig. 1). The HCU is mounted to the front suspension crossmember using a mounting bracket attached to the crossmember, which the HCU is mounted to using 3 isolation bushings. The HCU contains the following components for controlling brakes during ABS braking: 4 Decay Valves, 4 Shuttle Valves, 2 Fluid Sumps, a Pump/Motor and a relay box. Also attached to the hydraulic control unit are the rear brake proportioning valves and the vehicles 6 hydraulic brake tubes (Fig. 1).

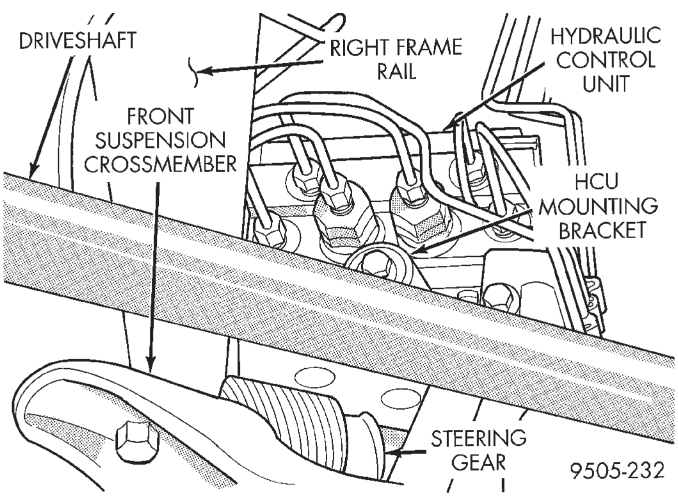


Fig. 1 Hydraulic Control Unit Mounting Location

HYDRAULIC CONTROL UNIT DECAY SOLENOIDS

There are 4 decay solenoids, one for each wheel. In the released position they provide a fluid path from the master cylinder to the wheel brakes of the vehicle. In the actuated (decay) position, they provide a fluid path from wheel brakes of the vehicle to the sumps. The Decay solenoids are spring loaded in the released (build) position during normal braking.

HYDRAULIC CONTROL UNIT SHUTTLE VALVES

There are 4 Shuttle Valves, one for each wheel. The Shuttle Valve is a hydraulically actuated valve which shuttles when the decay solenoid and pump are energized. This places an orifice (restriction) in the line between the pump and the decay solenoid. This restriction provides a controlled build rate to each wheel brake during an ABS stop. The Shuttle Valve will remain in the orificed position until the ABS cycle is complete. When the ABS cycle has been completed the decay solenoids will return to their released position which will equalize the pressure across the Shuttle Valves. When the pressure equalizes, the spring loaded Shuttle Orifice valves will return to the unrestricted position.

HYDRAULIC CONTROL UNIT FLUID SUMPS

There are two fluid sumps in the hydraulic control unit (HCU), one each for the primary and secondary hydraulic circuits. The fluid sumps temporarily store brake fluid that is decayed from the wheel brakes during an ABS cycle. This fluid is then delivered to the pump to provide build pressure. The typical pressure in the sumps is 50 psi, during ABS operation only.

HYDRAULIC CONTROL UNIT PUMP MOTOR ASSEMBLY

The HCU contains 2 Pump Assemblies, one each for the primary and secondary hydraulic circuits. Both pumps are driven by a common electric motor which is part of the HCU. The pumps pick up fluid from the sumps to supply build pressure to the brakes during an ABS stop. The motor only runs during an ABS stop and is controlled by the CAB via the Pump/Motor Relay. The Pump/Motor Assembly is not a serviceable item. If it requires service the HCU must be replaced.

RELAY BOX

ABX-4 utilizes two relays contained in a relay box mounted to the HCU. The relay box contains a system relay and a pump/motor relay. A single 10-way connector provides the electrical interface. The relay box is serviceable as an assembly.

PUMP/MOTOR RELAY OPERATION

Pump/Motor power is supplied by the Pump/Motor Relay. The pump motor relay is also part of the relay box (Fig. 2) mounted to the HCU. If pump/motor relay replacement is required, it is also only serviced by the replacement of the relay box assembly (Fig. 2).

Voltage for the 12 volt side of the relay coil is provided by the system relay. The ground path through the relay coil is completed by the CAB during ABS braking. The relay contacts are closed when the relay is energized. This provides 12 volts to the pump/motor as needed during ABS braking.

SYSTEM RELAY OPERATION

The main purpose of the system relay is to put the ABS system into a stand-by mode for ABS operation.

DESCRIPTION AND OPERATION (Continued)

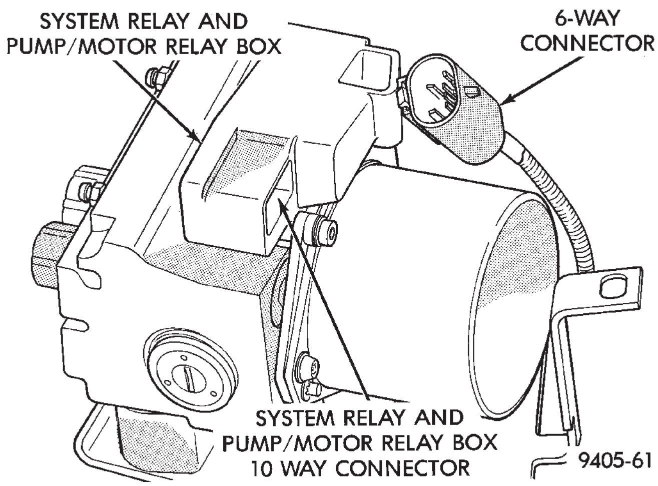


Fig. 2 System Relay And Pump/Motor Relay Box

The system relay is energized by the CAB shortly after the ignition switch is turned on.

When energized by the CAB, the system relay turns off the ABS warning lamp and provides 12 volts to the CAB. This voltage can then be used by the CAB to energize the decay solenoids during ABS braking. When energized, the system relay also provides the pump/motor relay coil with 12 volts. The ground path to the pump/motor relay is completed by the CAB during ABS braking.

Conversely, when the system relay is de-energized, the ABS warning lamp is illuminated, voltage to the decay solenoids is cut off, and the pump/motor relay is prevented from energizing. Typically, the system relay is de-energized by the controller when a fault is detected that requires turning ABS off.

PROPORTIONING VALVE

Two Proportioning Valves are used in the Allied Signal ABX-4 ABS system, one for each rear wheel brake hydraulic circuit. The proportioning valves function the same as in a standard brake system. The proportioning valves (Fig. 3) are located on the front of the HCU. The proportioning valve can be identified by the bar code label and stamp on the proportioning valve (Fig. 3). Be sure replacement proportioning valve has the same stamp as the proportioning valve being replaced.

WHEEL SPEED SENSORS

One Wheel Speed Sensor (WSS) is located at each wheel (Fig. 4) and (Fig. 5), and sends a small AC signal to the control module CAB. This signal is generated by magnetic induction created when a toothed sensor ring (tone wheel) (Fig. 4) and (Fig. 5) passes the stationary magnetic wheel speed sensor. The CAB converts the AC signal generated at each wheel into a digital signal. If a wheel locking tendency is detected by the CAB, it will then modulate hydraulic

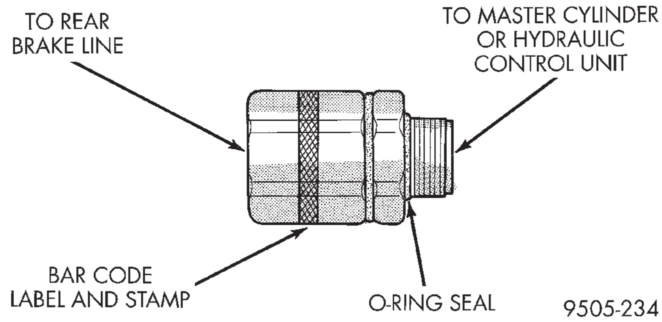


Fig. 3 Proportioning Valve Identification

pressure via the HCU to prevent the wheel(s) from locking.

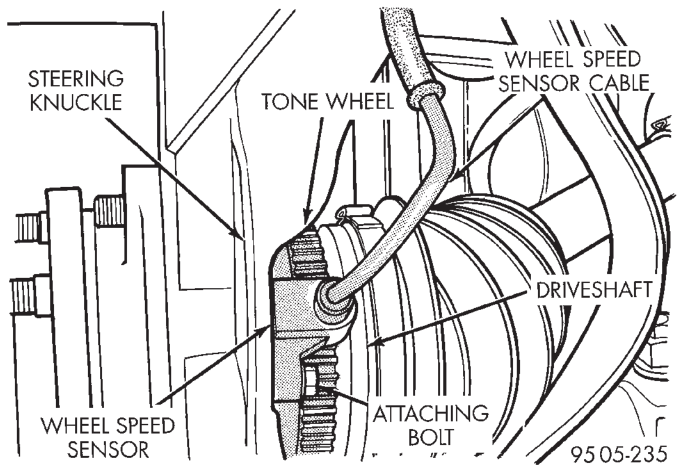


Fig. 4 Front Wheel Speed Sensor And Tone Wheel

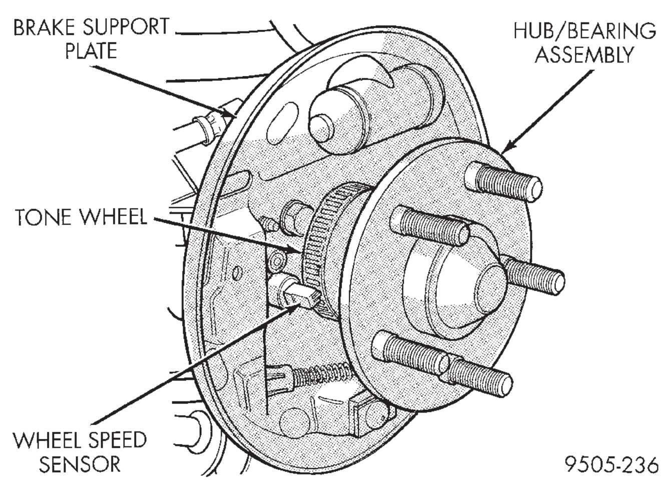


Fig. 5 Rear Wheel Speed Sensor And Tone Wheel With Drum Brakes

The front Wheel Speed Sensor is attached to a boss in the steering knuckle (Fig. 4). The tone wheel is part of the outboard constant velocity joint (Fig. 4). The rear Wheel Speed Sensor on rear drum brake applications is mounted to the rear brake support

DESCRIPTION AND OPERATION (Continued)

plate (Fig. 5) and the rear tone wheel is an integral part of the rear wheel hub and bearing assembly.

The four Wheel Speed Sensors are serviced individually. The front Tone Wheels are serviced as an assembly with the outboard constant velocity joint. The rear Tone Wheels are serviced as an assembly with the rear hub and bearing assembly.

Correct ABS system operation is dependent on accurate wheel speed signals. The vehicle's wheels and tires must all be the same size and type to generate accurate signals. Variations in wheel and tire size can produce inaccurate wheel speed signals.

CONTROLLER ANTILOCK BRAKES (CAB)

The Antilock Brake Controller (CAB) is a microprocessor based device which monitors the ABS system during normal braking and controls it when in an ABS stop. The CAB is mounted in the right front corner of the engine compartment using an integral mounting bracket to attach it to the inner fender (Fig. 6). The CAB uses a 60 way electrical connector on the vehicle wiring harness. The power source for the CAB is through the ignition switch in the Run or On position. **THE CONTROLLER ANTILOCK BRAKE (CAB) IS NOT ON THE CCD BUS**

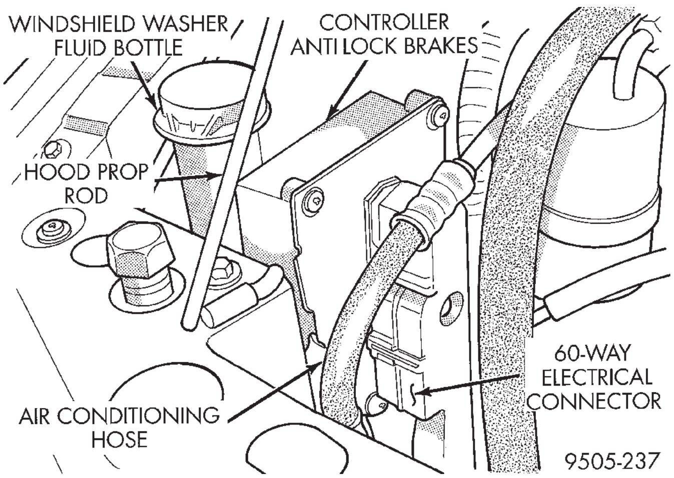


Fig. 6 Location Of Controller Antilock Brake

The primary functions of the (CAB) are:

(1) Detect wheel locking tendencies.

(2) Control fluid modulation to the brakes while in ABS mode.

(3) Monitor the system for proper operation.

(4) Provide communication to the DRB scan tool while in diagnostic mode.

The CAB continuously monitors the speed of each wheel through the signals generated at the Wheel Speed Sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the CAB commands the HCU to modulate brake fluid pressure in some or all of the hydraulic circuits. The CAB continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

The ABS system is constantly monitored by the CAB for proper operation. If the CAB detects a fault, it will turn on the Amber ABS Warning Lamp and disable the ABS braking system. The normal Non ABS braking system will remain operational.

The CAB contains a self-diagnostic program which will turn on the Amber ABS Warning Lamp when a ABS system fault is detected. Faults are then stored in a diagnostic program memory. There are multiple fault messages which may be stored in the CAB and displayed through the DRB scan tool. These fault messages will remain in the CAB memory even after the ignition has been turned off. The fault messages can be cleared by using the DRB scan tool, or they will be automatically cleared from the memory after a minimum of 3500 vehicle miles are accumulated.

CONTROLLER ANTILOCK BRAKE INPUTS

- Four wheel speed sensors.
- Stop lamp switch.
- Ignition switch.
- System relay voltage.
- Ground.
- Pump/Motor Relay Monitor
- Diagnostics Communications

CONTROLLER ANTILOCK BRAKE OUTPUTS

- 4 Decay Solenoids
- ABS warning lamp.
- System relay actuation.
- Diagnostic communication. (Single line ISOK)
- Pump motor relay actuation
- Brake Lamp (Low Fluid/Pressure).

ABS AMBER WARNING LAMP FUNCTION AND LOCATION

The ABS system uses an Amber ABS Warning Lamp, located in the instrument cluster. The purpose of the warning lamp is discussed in detail below.

The ABS warning lamp will turn on when the CAB detects a condition which results in a shutdown of ABS function. The ABS Warning Lamp is normally on until the CAB completes its self tests and turns the lamp off (approximately 4-5 seconds after the ignition switch is turned on). When the ABS warning lamp is on, only the ABS function of the brake system if affected. The standard brake system and the ability to stop the car will not be affected when only the ABS warning lamp is on.

NOTE: When the CAB detects a problem with the Amber Warning Lamp Circuit and a ABS fault is also detected at the same time, and results in shutting down the ABS Brakes, then the CAB will turn on the Red Brake Warning Lamp.

DESCRIPTION AND OPERATION (Continued)

ABS BRAKING MODE HYDRAULIC CIRCUIT SOLENOID AND VALVE FUNCTION

Through the following operation descriptions the function of the various hydraulic control valves in the ABS system will be described. The fluid control valves mentioned below, control the flow of pressurized brake fluid to the wheel brakes during the different modes of ABS braking.

For explanation purposes we will assume all speed sensors are sending the same wheel speed information, requiring the same hydraulic fluid modulation at the same rate.

NORMAL BRAKING BUILD/DECAY VALVE FUNCTION

BUILD/DECAY VALVES OPEN

The brake pedal is applied. The travel of the brake pedal closes primary and secondary circuits from the master cylinder fluid supply. Brake fluid from the primary and secondary circuits flows through the build/decay valves to the wheel brakes.

ABS BRAKING-DECAY MODE-DECAY SOLENOID FUNCTION

DECAY SOLENOID ENERGIZED

This will allow brake hydraulic pressure to be dumped to the HCU sump. At the HCU sump, the brake hydraulic fluid is picked up by the pump and restored to high pressure for the next build cycle.

ABS BRAKING-BUILD MODE-DECAY SOLENOID FUNCTION

DECAY SOLENOID DE-ENERGIZED

Decayed brake fluid, is picked up by the pump in the HCU and restored to high pressure. This high pressure brake fluid causes the shuttle valve in the HCU to actuate, routing high pressure brake fluid through the build orifice. Routing the high pressure brake fluid through the build orifice allows for a controlled build pressure in the brakes hydraulic system. High pressure brake fluid from the build orifice then passes through the de-energized decay solenoid and to the wheel brakes to restore braking pressure.

DIAGNOSIS AND TESTING

ABS GENERAL DIAGNOSTICS INFORMATION

This section contains information necessary to diagnose and test the Allied Signal ABX-4 Brake System. Specifically, this section should be used to help diagnose conditions which result in any of the following conditions:

- ABS Warning Lamp turned on.
- Brakes Lock on Hard Application

Diagnosis of base brake conditions which are obviously mechanical in nature should be directed to Group 5 Brakes in this service manual. This includes brake noise, brake pulsation, lack of power assist, parking brake, Red Brake Warning Lamp lighting, or vehicle vibration during normal braking.

Many conditions that generate customer complaints may be normal operating conditions, but are judged to be a problem due to not being familiar with the ABS system. These conditions can be recognized without performing extensive diagnostic work, given adequate understanding of the operating principles and performance characteristics of the ABS system. See the ABS System Operation section in this group of the service manual to familiarize yourself with the operating principles of the ABS system.

DIAGNOSTICS MANUAL INFORMATION

Detailed procedures for diagnosing specific ABS conditions are covered in the Allied Signal ABX-4 diagnostics manual. The following information is presented to give the technician a general background on the diagnostic capabilities of the ABX-4 ABS system. Please refer to the above mentioned manual for any further electronic diagnostics and service procedures that are required on the Allied Signal ABX-4 Brake System.

DIAGNOSTIC TESTER (DRB)

The Allied Signal ABX-4 Antilock Brake System diagnostics are performed using the DRB scan tool. Refer to the Allied Signal ABX-4 diagnostic manual for the proper testing procedures and the DRB operators manual for its proper operational information when diagnosing this brake system.

ABS (DRB) DIAGNOSTIC CONNECTOR

On this vehicle, the ABX-4 diagnostic connector is located under the lower instrument panel directly next to the left kick panel (Fig. 7). The ABX-4 system uses the ISO 9141-K connector which is shared by other vehicle diagnostic systems such as the powertrain control module and air bag.

SELF DIAGNOSTICS INFORMATION

The ABX-4 system is equipped with a self diagnostic capability which may be used to assist in isolation of ABS faults. The features of the self diagnostics system are described below.

START-UP CYCLE

The self diagnostic ABS start up cycle begins when the ignition switch is turned to the on position. Electrical checks are completed on ABS components, such as the Controller, decay solenoid continuity, and the system relay operation. During this check the Amber ABS Warning Light is turned on for approximately 5 seconds.

DIAGNOSIS AND TESTING (Continued)

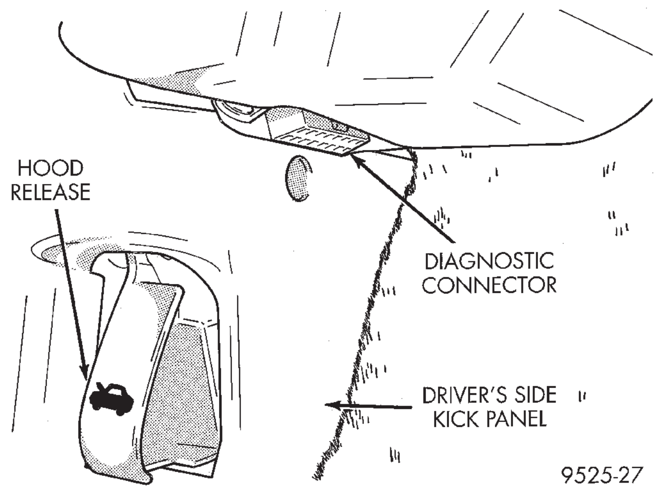


Fig. 7 ABS System Diagnostic Connector Location

DRIVE-OFF CYCLE

Further Functional testing is accomplished once the vehicle is set in motion and reaches a speed of about 7 mph. This cycle is performed only once after each ignition on/off cycle.

• The solenoid valves and the pump/motor are activated briefly to verify function. If the brake pedal is applied at this time, the test is bypassed.

• The wheel speed sensor output is verified to be within the correct operating range.

ONGOING TESTS

Other tests are performed on a continuous basis. These include checks for decay solenoid continuity, wheel speed sensor continuity and wheel speed sensor output.

DIAGNOSTIC TROUBLE CODE INFORMATION

Fault codes are kept in the controller's memory until either erased by the technician using the DRB or erased automatically after the vehicle has been driven 3500 miles. Fault codes are retained by the controller even if the ignition is turned off or the battery is disconnected. The only fault that will not be erased automatically is the (CAB) fault. More than one fault can be stored at a time. The number of miles the vehicle has been driven since the most recent fault was stored is also displayed. Most functions of the (CAB) and ABS system can be accessed by the technician for testing and diagnostic purposes by using the DRB.

LATCHING VERSUS NON-LATCHING ABS FAULTS

Some faults detected by the CAB are latching; the fault is latched and ABS braking is disabled until the ignition switch is reset. Thus ABS braking is non operational even if the original fault has disappeared. Other faults are non-latching, although a fault code will be set in most cases.

INTERMITTENT DIAGNOSTIC TROUBLE CODES

As with virtually any electronic system, intermittent faults in the ABS system may be difficult to accurately diagnose.

Most intermittent faults are caused by faulty electrical connections or wiring. When an intermittent fault is encountered, check suspect circuits for:

(1) Poor mating of connector halves or terminals not fully seated in the connector body.

(2) Improperly formed or damaged terminals. All connector terminals in a suspect circuit should be carefully reformed to increase contact tension.

(3) Poor terminal to wire connection. This requires removing the terminal from the connector body to inspect.

(4) Pin presence in the connector assembly

(5) Proper ground connections. Check all ground connections for signs of corrosion, tight fasteners, or other potential defects. Refer to wiring diagram manual for ground locations.

(6) If a visual check does not find the cause of the problem, operate the car in an attempt to duplicate the condition and record the Fault code.

(7) Most failures of the ABS system will disable ABS function for the entire ignition cycle even if the fault clears before key-off. There are some failure conditions, however, which will allow ABS operation to resume during the ignition cycle in which a failure occurred if the failure conditions are no longer present. The following conditions may result in intermittent illumination of the ABS Warning Lamp. All other failures will cause the lamp to remain on until the ignition switch is turned off. Circuits involving these inputs to the (CAB) should be investigated if a complaint of intermittent warning system operation is encountered.

(8) Low system voltage. If Low System Voltage is detected by the CAB, the CAB will turn on the ABS Warning Lamp until normal system voltage is achieved. Once normal voltage is seen at the CAB, normal operation resumes.

(9) Additionally, any condition which results in interruption of electrical current to the CAB or modulator assembly may cause the ABS Warning Lamp to turn on intermittently.

TONEWHEEL INSPECTION

Carefully inspect tonewheel at the suspected faulty wheel speed sensor for missing, chipped or broken teeth, this can cause erratic speed sensor signals.

Tonewheels should show no evidence of contact with the wheel speed sensors. If contact was made,

DIAGNOSIS AND TESTING (Continued)

determine cause and correct before replacing the wheel speed sensor.

Excessive runout of the tonewheel can cause erratic wheel speed sensor signals. Refer to Tonewheel Runout in the Specification Section in this section of the service manual for the tonewheel runout specification. Replace drive shaft assembly or rear hub/bearing assembly if tonewheel runout exceeds the specification.

Inspect tonewheels for looseness on their mounting surfaces. Tonewheels are pressed onto their mounting surfaces and should not rotate independently from the mounting surface.

Check the wheel speed sensor head alignment to the tone wheel. Also check the gap between the speed sensor head and the tone wheel to ensure it is at specification. Refer to Wheel Speed Sensor Clearance in the Specification Section in this section of the service manual.

HYDRAULIC SYSTEM PROPORTIONING VALVE

CAUTION: Proportioning valves (Fig. 8) should never be disassembled.

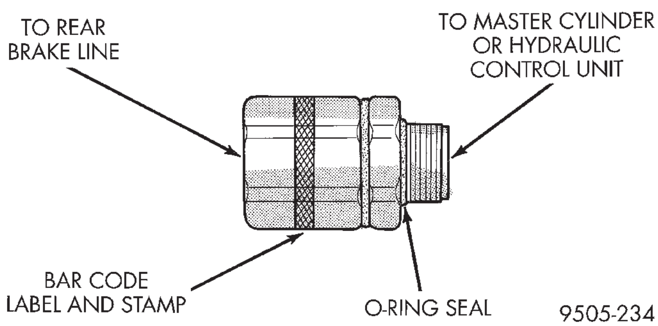


Fig. 8 Proportioning Valve Identification

If premature rear wheel skid occurs on hard brake application, it could be an indication that a malfunction has occurred with one of the proportioning valves.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake. Therefore, a road test to determine which rear brake slides first is essential.

If a malfunctioning proportioning valve is suspected on a vehicle equipped with ABS brakes. Refer to Proportioning Valve Test With ABS Brakes in the Proportioning Valves Section in this group of the service manual.

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

VEHICLE TEST DRIVE INFORMATION AND PROCEDURE

Most ABS complaints will require a test drive as a part of the diagnostic procedure. The purpose of the test drive is to duplicate the condition.

NOTE: Remember conditions that result in the turning on of the Red BRAKE Warning Lamp may indicate reduced braking ability. The following procedure should be used to test drive an ABS complaint vehicle.

Before test driving a brake complaint vehicle, note whether the Red Brake Warning Lamp or Amber ABS Warning Lamp is turned on. If it is the Red Brake Warning Lamp, refer to the hydraulic system section in the brake group of this manual. If the ABS Warning lamp was/is on, test drive the vehicle as described below, to verify the complaint. While the ABS Warning Lamp is on, the ABS system is not functional. The standard brake system and the ability to stop the car is not be affected if only the ABS Warning Lamp is on.

(1) Turn the key to the off position and then back to the on position. Note whether the ABS Warning Lamp continues to stay on. If it does, refer to the ABX-4 Diagnostic Manual for the required test procedures.

(2) If the ABS Warning Lamp goes out, shift into gear and drive the car to a speed of 5 mph to complete the ABS start up cycle. If at this time the ABS Warning Lamp goes on refer to the ABX-4 Diagnostic Manual.

(3) If the ABS Warning Lamp remains OUT, drive the vehicle a short distance. During this test drive be sure that the vehicle achieves at least 25 mph. Brake to at least one complete stop and again accelerate to 25 mph.

(4) If a functional problem with the ABS system is determined while test driving a vehicle, refer to the ABX-4 Diagnostics Manual for required test procedures and proper use of the DRB tester.

ABS SERVICE PRECAUTIONS

The ABS uses an electronic control module, the CAB. This module is designed to withstand normal current draws associated with vehicle operation.

DIAGNOSIS AND TESTING (Continued)

Care must be taken to avoid overloading the CAB circuits. **In testing for open or short circuits, do not ground or apply voltage to any of the circuits unless instructed to do so for a diagnostic procedure.** These circuits should only be tested using a high impedance multi-meter or the DRB tester as described in this section. Power should never be removed or applied to any control module with the ignition in the ON position. Before removing or connecting battery cables, fuses, or connectors, always turn the ignition to the OFF position.

CAUTION: Use only factory wiring harnesses. Do not cut or splice wiring to the brake circuits. The addition of after-market electrical equipment (car phone, radar detector, citizen band radio, trailer lighting, trailer brakes, ect.) on a vehicle equipped with antilock brakes may affect the function of the antilock brake system.

SERVICE PROCEDURES

BRAKE FLUID LEVEL INSPECTION

CAUTION: Use only Mopar brake fluid or an equivalent from a tightly sealed container. Brake fluid must conform to DOT 3 specifications. Do not use petroleum-based fluid because seal damage in the brake system will result.

For the specific procedure covering the inspection of the brake fluid level and adding brake fluid to the reservoir, refer to the Service Adjustments Section in this group of the service manual.

ABS HYDRAULIC SYSTEM BLEEDING PROCEDURE INFORMATION

The base brake system must be bled anytime air is permitted to enter the hydraulic system, due to disconnection of brake lines, hoses or components. The ABS system, particularly the HCU, should only be bled when the HCU is replaced or removed from the vehicle, or if there is reason to believe the HCU has ingested air. Under most circumstances that would require brake bleeding, only the base brake system needs to be bled.

It is important to note that excessive air in the brake system will cause a soft or spongy feeling brake pedal.

During bleeding operations, be sure that the brake fluid level remains close to the FULL level in the reservoir. Check the fluid level periodically during the bleeding procedure and add DOT 3 brake fluid as required.

The Allied Signal ABX-4 Brake System must be bled as two independent braking systems. The non ABS portion of the brake system is to be bled the same as any non ABS system. Refer to the Service Adjustments section in this manual for the proper bleeding procedure to be used. This brake system can be either pressure bled or manually bled.

The ABS portion of brake system MUST be bled separately. This bleeding procedure requires the use of the DRB scan tool and the bleeding sequence procedure outlined below.

ABS BLEEDING PROCEDURE

When bleeding the ABS system, the following bleeding sequence **MUST** be followed to insure complete and adequate bleeding. The ABS system can be bled using a Manual bleeding procedure or standard Pressure Bleeding Equipment.

If the brake system is to be bled using pressure bleeding equipment, refer to Bleeding Brake System in the Service Adjustments section at the beginning of this group for proper equipment usage and procedures.

(1) Assemble and install all brake system components on vehicle making sure all hydraulic fluid lines are installed and properly torqued.

(2) Connect the DRB scan tool to the diagnostics connector. The diagnostics connector is located under the lower instrument panel next to the left kick panel (Fig. 9).

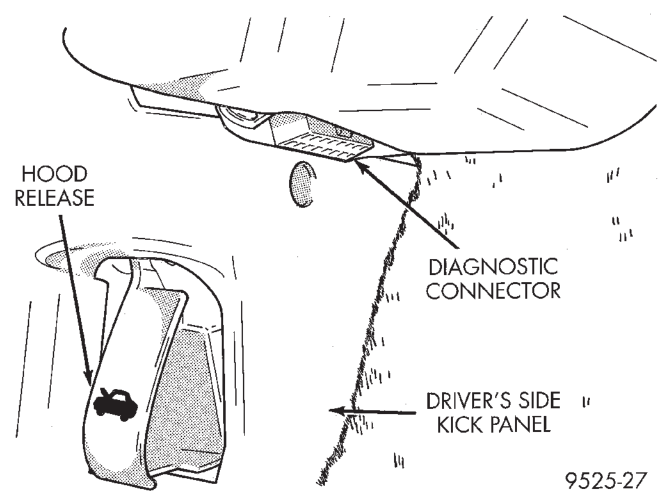


Fig. 9 ABS System Diagnostic Connector Location

(3) Using the DRB scan tool, check to make sure the CAB does not have any fault codes stored. If it does, remove them using the DRB scan tool.

SERVICE PROCEDURES (Continued)

WARNING: WHEN BLEEDING THE BRAKE SYSTEM WEAR SAFETY GLASSES. A CLEAR BLEED TUBE MUST BE ATTACHED TO THE BLEEDER SCREWS AND SUBMERGED IN A CLEAR CONTAINER FILLED PART WAY WITH CLEAN BRAKE FLUID. DIRECT THE FLOW OF BRAKE FLUID AWAY FROM THE PAINTED SURFACES OF THE VEHICLE. BRAKE FLUID AT HIGH PRESSURE MAY COME OUT OF THE BLEEDER SCREWS WHEN OPENED.

(4) Bleed the base brake system using the standard pressure or manual bleeding procedure as outlined in the Service Adjustments section of this service manual.

(5) Using the DRB scan tool, go to the “Bleed ABS” routine. Apply the brake pedal firmly and initiate the “Bleed ABS” cycle one time. Release the brake pedal.

(6) Bleed the base brake system again, as in step Step 4 above.

(7) Repeat steps Step 5 and Step 6 above until brake fluid flows clear and free of bubbles. Check brake fluid level in reservoir periodically to prevent reservoir from running low on brake fluid.

(8) Test drive the vehicle to be sure brake are operating correctly and that pedal is solid.

REMOVAL AND INSTALLATION

GENERAL SERVICE CAUTIONS

CAUTION: Review this entire section prior to performing any mechanical work on a vehicle equipped with the Allied Signal ABX- 4 Antilock Brake System. This section contains information on precautions pertaining to potential component damage, vehicle damage and personal injury which could result when servicing an ABS equipped vehicle.

CAUTION: Certain components of the ABS System are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in improper system operation. Only those components with approved removal and installation procedures in this manual should be serviced.

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash off with water immediately.

The following are general cautions which should be observed when servicing the ABS system and/or other vehicle systems. Failure to observe these precautions may result in ABS System component damage.

If welding work is to be performed on the vehicle, using an electric arc welder, the CAB connector should be disconnected during the welding operation.

The CAB 60 way connector or the HCU 10 and 6 way connectors should never be connected or disconnected with the ignition switch in the ON position.

ABS HYDRAULIC CONTROL UNIT

REMOVE

(1) Remove the remote ground cable from the ground stud located on the left strut tower (Fig. 10).

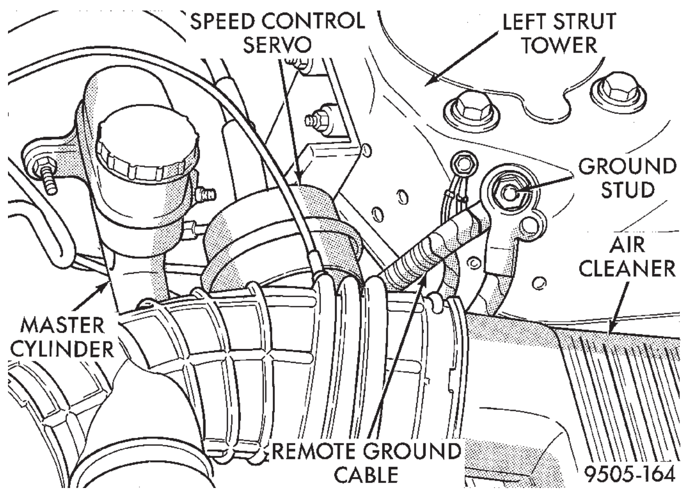


Fig. 10 Remote Ground Cable Attachment To Strut Tower

(2) Correctly isolate remote ground cable when servicing vehicle by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 11). **This will prevent accidental grounding of the remote ground cable.**

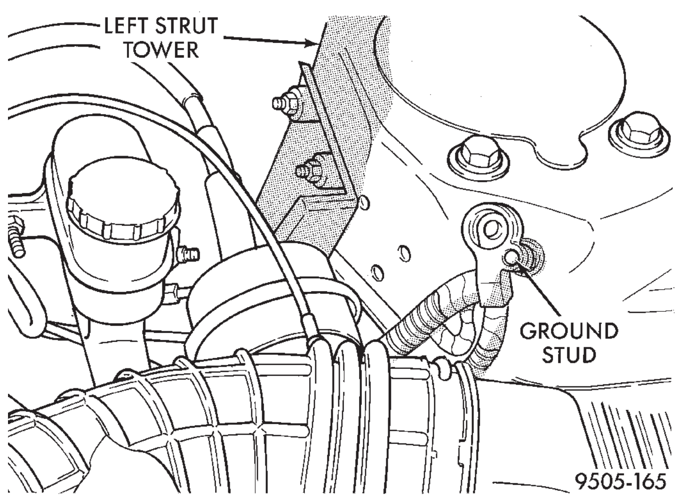


Fig. 11 Correctly Isolated Remote Ground Cable

(3) Using a brake pedal positioning tool such as shown in (Fig. 12) depress brake pedal past its first 1 inch of travel and hold in this position. This will iso-

REMOVAL AND INSTALLATION (Continued)

late the master cylinder reservoir from the brake hydraulic system, not allowing the brake fluid to drain out of the reservoir.

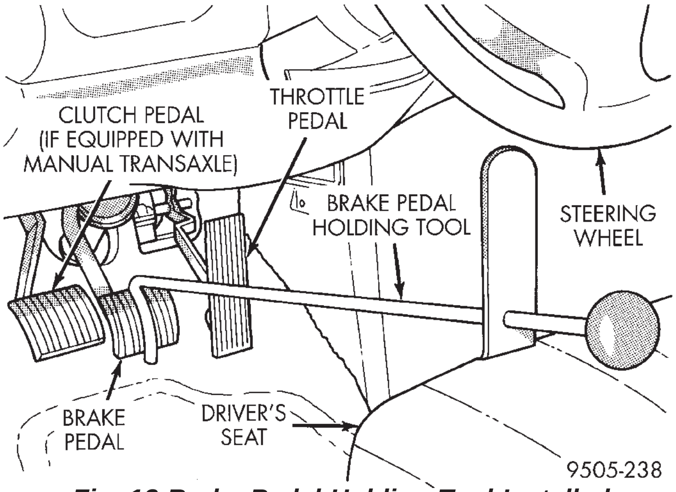


Fig. 12 Brake Pedal Holding Tool Installed

(4) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(5) Using Mopar, Brake Parts Cleaner or an equivalent, thoroughly clean all surfaces of the HCU. Also, thoroughly clean all brake line tube nut to HCU and proportioning valve connections.

(6) Remove the entire exhaust system from the vehicle as a complete assembly using following steps.

• Remove attaching bolts from exhaust pipe at exhaust manifold on engine (Fig. 13).

• Remove all exhaust system support/isolators from the vehicle's exhaust system (Fig. 14). Remove

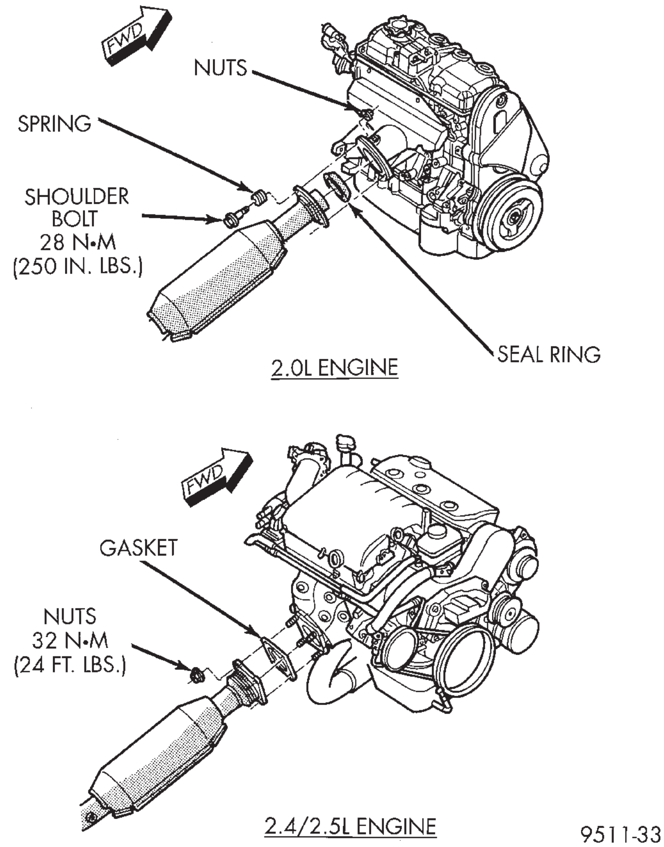


Fig. 13 Exhaust Pipe Mounting To Exhaust Manifold

support/isolators from brackets on exhaust system components and leave attached to body of vehicle.

• Lower exhaust system as a complete assembly away from the underbody of the vehicle.

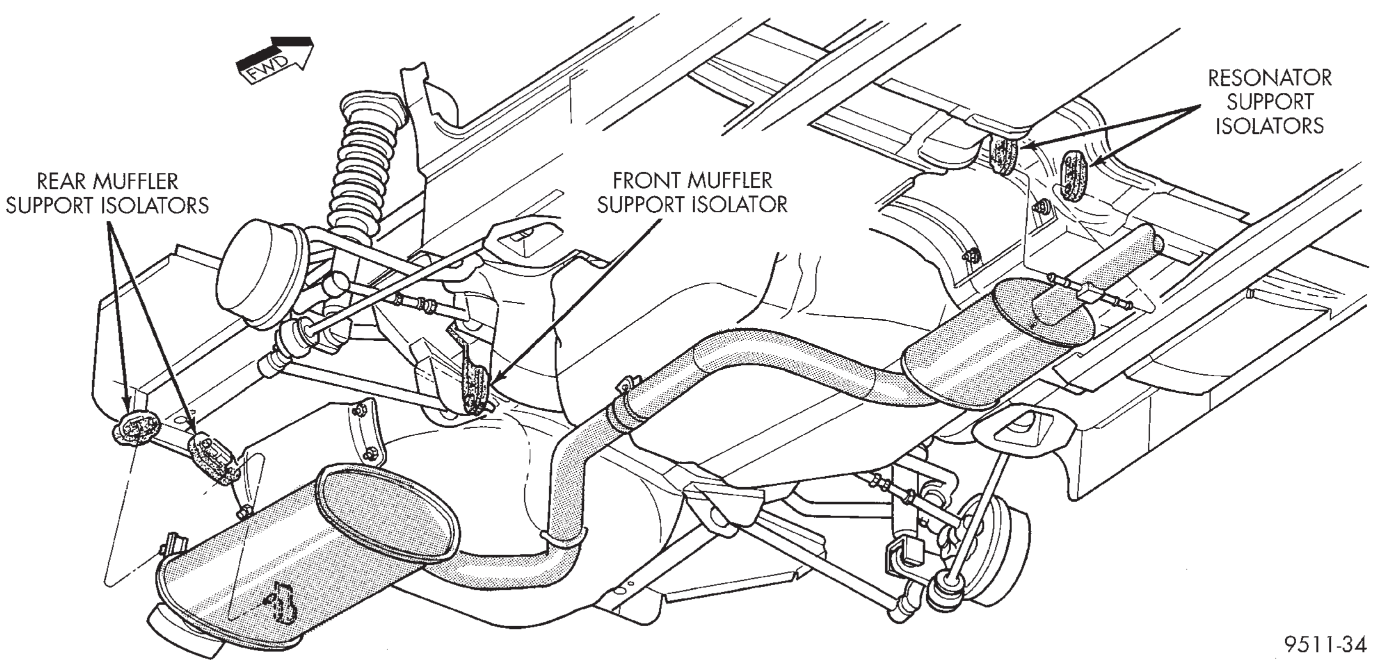


Fig. 14 Exhaust System Support/Isolator Locations

REMOVAL AND INSTALLATION (Continued)

(7) Remove right side engine compartment splash shield (Fig. 15) from the vehicle.

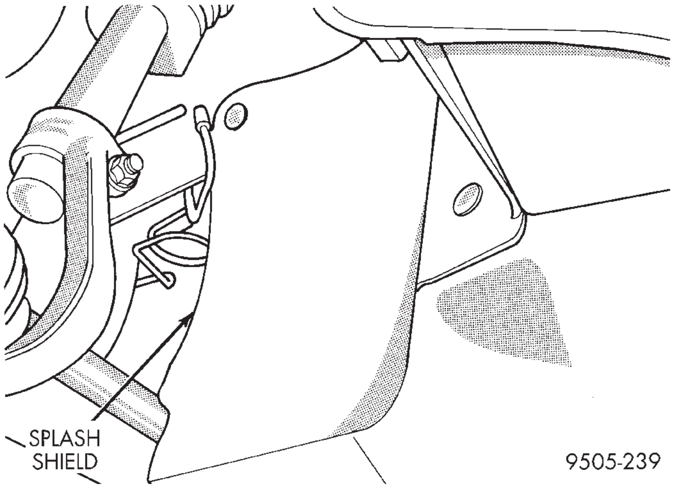


Fig. 15 Right Side Splash Shield

(8) Remove the HCU heat shield (Fig. 16) from the HCU mounting bracket.

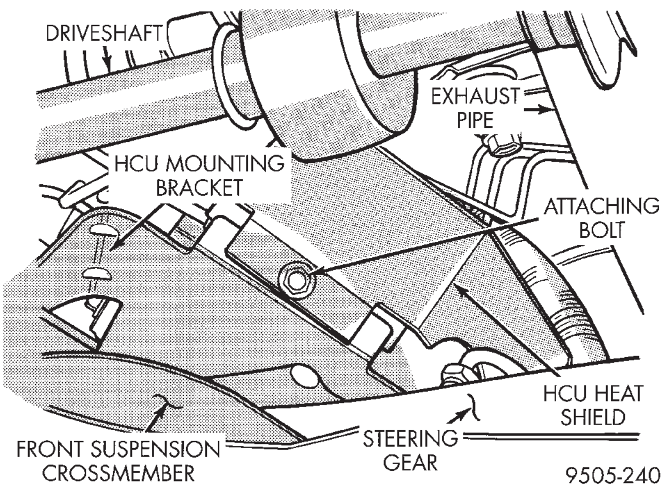


Fig. 16 HCU Heat Shield

(9) Disconnect the 6 way connector from the HCU wiring harness and the 10 way connector from the relay box located on the HCU (Fig. 17).

(10) Remove the brake tube routing clip (Fig. 18) from the HCU mounting bracket. Then remove the 2 brake tubes coming from master cylinder and the brake tube going to the left front wheel (Fig. 18) from the HCU ports.

(11) Remove the 2 rear brake tubes from the proportioning valves and the right front brake tube from the outlet port of the HCU (Fig. 19).

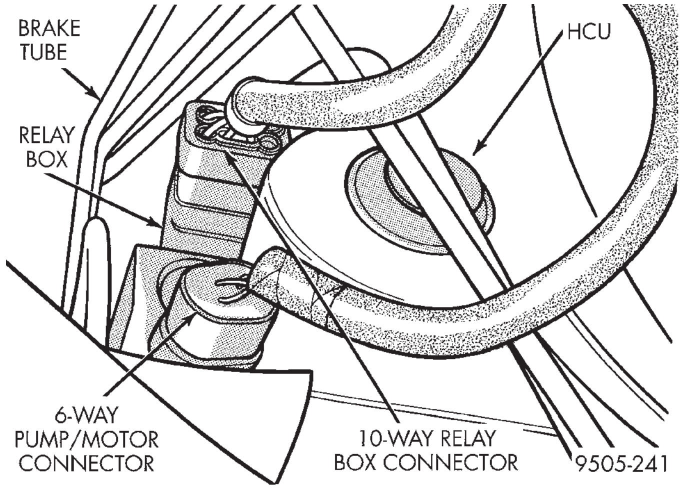


Fig. 17 Electrical Connections At HCU And Relay Box

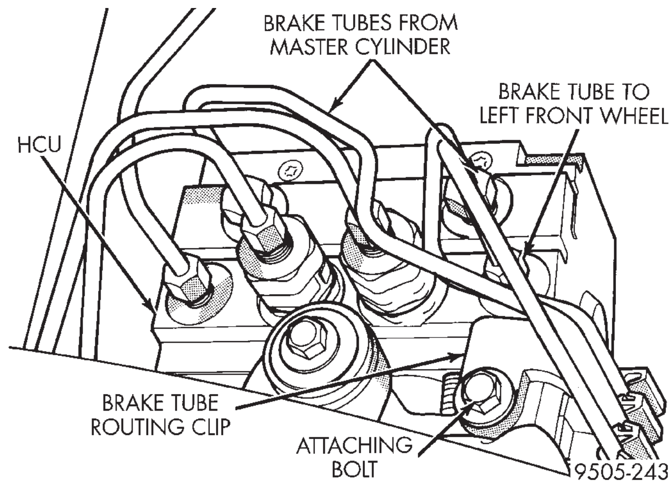


Fig. 18 Brake Tubes At HCU

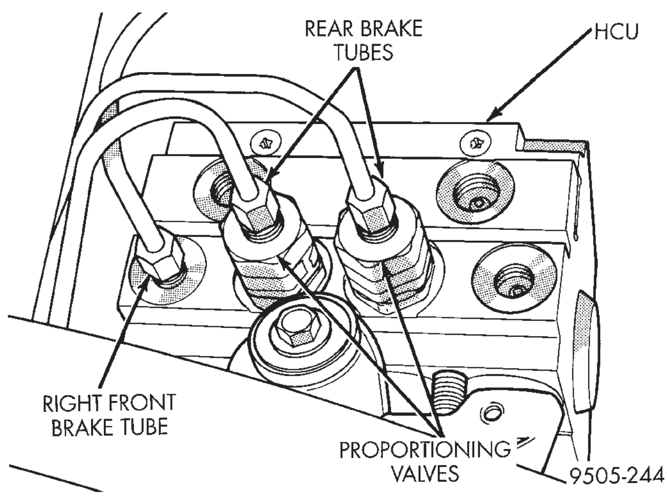


Fig. 19 Rear Brake Tubes And Right Front Brake Tube At HCU

REMOVAL AND INSTALLATION (Continued)

(12) Remove bolt (Fig. 20) attaching the front of the HCU to its mounting bracket.

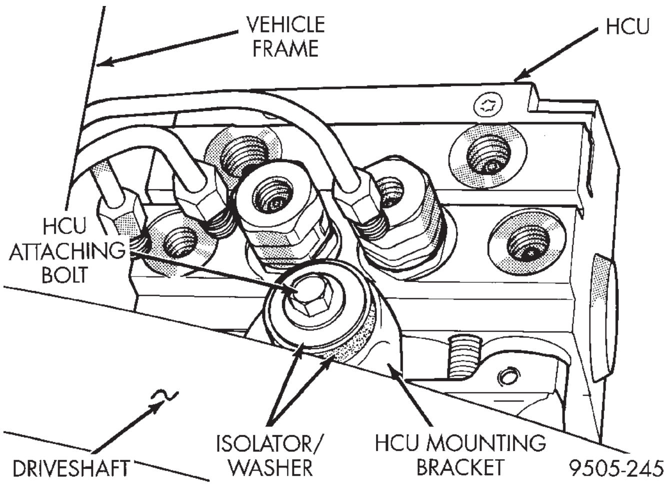


Fig. 20 Front Attachment Of HCU To Mounting Bracket

(13) Remove the 2 bolts (Fig. 21) attaching the rear of the HCU to its mounting bracket. **If vehicle being service is equipped with a 2.5 ltr. engine, remove the tube as indicated in (Fig. 21) and (Fig. 22). Removing this tube will make it easier to remove the HCU assembly from the vehicle.**

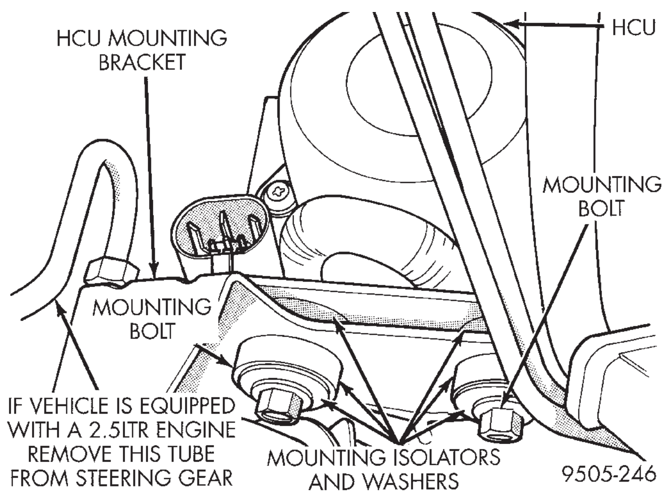


Fig. 21 Rear Attachment Of HCU To Mounting Bracket

(14) Remove HCU from its mounting bracket. Then remove HCU from vehicle out through the exhaust tunnel in the floor pan of the vehicle (Fig. 22).

INSTALL

(1) Install the HCU back in the vehicle and on its mounting bracket using the reverse order of its removal.

(2) Install mounting isolators, washers and attaching bolts, (Fig. 21) mounting the rear of the HCU to

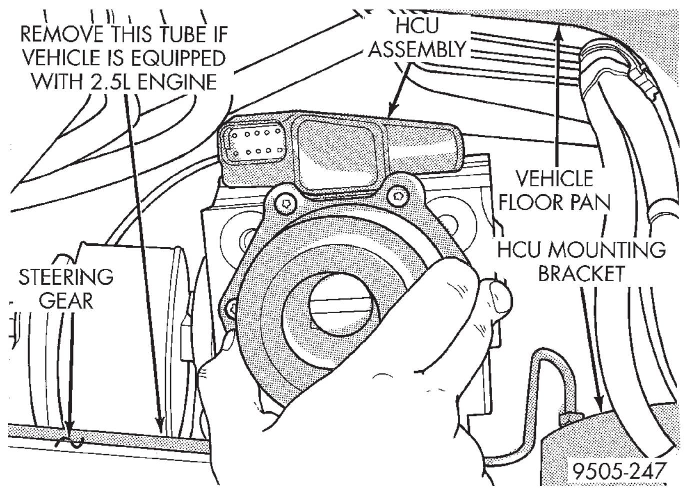


Fig. 22 Removal Of HCU Assembly From Vehicle

the mounting bracket. **Do not tighten bolts at this time.**

(3) Install mounting isolator, washer and attaching bolt, (Fig. 20) mounting the front of the HCU to the mounting bracket. **Do not tighten bolt at this time.**

(4) Then tighten the 3 HCU mounting bolts to a torque of 28 N·m (248 in. lbs.).

(5) Install the 2 rear brake tubes on the proportioning valves and the right front brake tube in the outlet port of the HCU (Fig. 19). Tighten the 3 brake tube nuts to a torque of 20 N·m (180 in. lbs.).

(6) Install the 2 brake tubes coming from master cylinder and the brake tube to the left front wheel (Fig. 18) in the HCU ports. Tighten the 3 brake tube nuts to a torque of 20 N·m (180 in. lbs.). Install the brake tube routing clip (Fig. 18) on the HCU mounting bracket and securely tighten attaching bolt.

(7) Install the 6 way connector on the HCU wiring harness and the 10 way connector on the relay box of the HCU (Fig. 17).

(8) Install the HCU heat shield (Fig. 16) on the HCU mounting bracket. Install and securely tighten attaching bolt.

(9) Install exhaust system in vehicle using the reverse steps of its removal.

(10) Install right side engine compartment splash shield (Fig. 15) back on the vehicle.

(11) Install the remote ground cable onto the ground stud located on left shock tower (Fig. 10). Install the remote ground cable attaching nut and tighten to a torque of 28 N·m (250 in. lbs.).

(12) Bleed the base brakes and the ABS brakes hydraulic system. Refer to the Bleeding ABS System in this section of the manual for the proper bleeding procedure.

(13) Road test vehicle to ensure proper operation of the base and ABS systems.

REMOVAL AND INSTALLATION (Continued)

HYDRAULIC SYSTEM PROPORTIONING VALVES

CAUTION: Proportioning valves (Fig. 23) should never be disassembled.

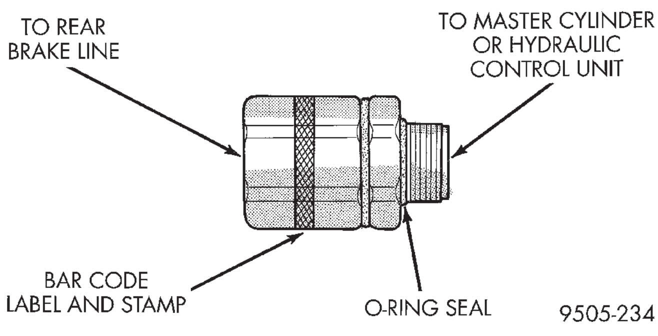


Fig. 23 Proportioning Valve Identification

The HCU does not require removal from the vehicle for the replacement of the proportioning valves.

REMOVE

(1) Disconnect brake tube fitting from proportioning valve requiring removal from HCU (Fig. 24).

(2) Remove proportioning valve requiring replacement (Fig. 24) from the HCU.

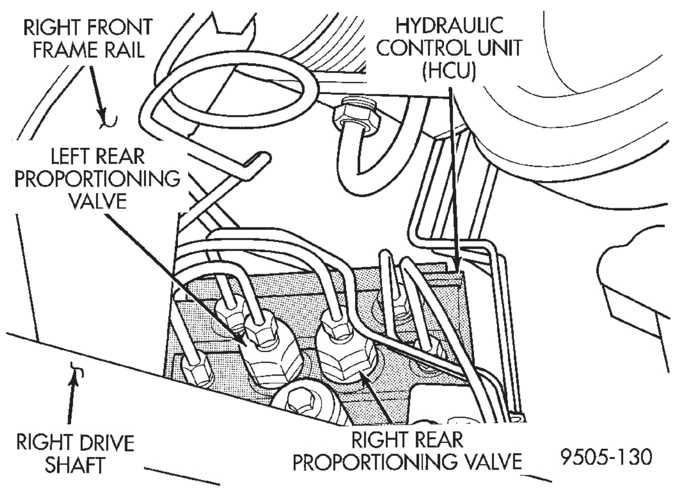


Fig. 24 Rear Wheel Proportioning Valve Location On HCU

INSTALL

(1) Wet O-ring seal on new proportioning valve using clean fresh brake fluid.

(2) Install proportioning valve in HCU and hand tighten until proportioning is fully installed and O-ring seal is seated into HCU. Then torque proportioning valve to 40 N·m (30 ft. lbs.).

(3) Install brake tube on proportioning valve. Tighten tube nut to 17 N·m (145 in. lbs.) torque.

(4) Bleed the affected brake line. See Bleeding Brake System in the Service Procedures section of the manual for proper bleeding procedure.

MASTER CYLINDER AND POWER BRAKE BOOSTER

If the Master Cylinder or the Power Booster need to be serviced or replaced, refer to Master Cylinder or Power Brake Booster in the Removal And Installation Section in the Base Brake Section of this service manual.

HYDRAULIC CONTROL UNIT RELAY BOX

The system relay and pump/motor relay are both serviced together as an assembly with the relay box. The relay box is mounted directly to the HCU.

To remove the relay box from the HCU, the HCU requires removal from the vehicle. This is to allow visual access of the relay box to HCU electrical connection. Visual access to this connection is necessary to be sure connection is correctly made when installing the relay box on the HCU.

REMOVE

(1) Disconnect negative (ground) cable from the battery and isolate the cable.

(2) Remove the HCU from the vehicle. See Hydraulic Control Unit in the Removal And Installation Section in this group of the service manual, for the required removal procedure for the HCU.

(3) Remove the 2 screws (Fig. 25) attaching the relay box assembly to the HCU. **Remove only the 2 screws mounting the relay box to the HCU do not remove the pump motor mounting screws (Fig. 25).**

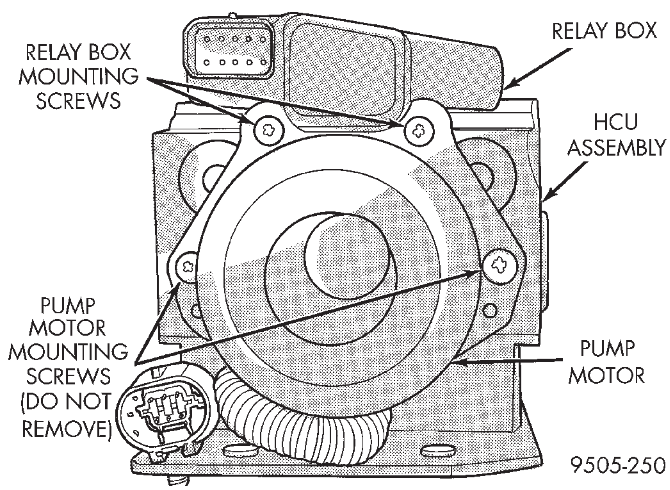


Fig. 25 Relay Box To HCU Mounting Screws

(4) Grasp relay box with both hands. Without twisting or rocking, pull relay box away from pump motor housing until connector on relay box unplugs from the pump motor terminal (Fig. 26). **This is a tight connection, relay box will require a good amount of force to unplug it from the pump motor.**

(5) Remove relay box from HCU.

REMOVAL AND INSTALLATION (Continued)

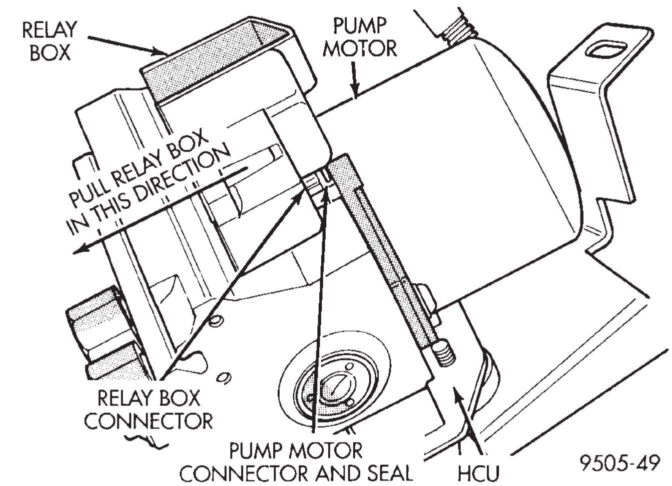


Fig. 26 Relay Box To HCU Electrical Connection

INSTALL

(1) Be sure electrical connector seal (Fig. 27) is installed in pump motor housing before installing relay box. If electrical connector seal is cracked, brittle or in any way damaged it must be replaced before installing relay box.

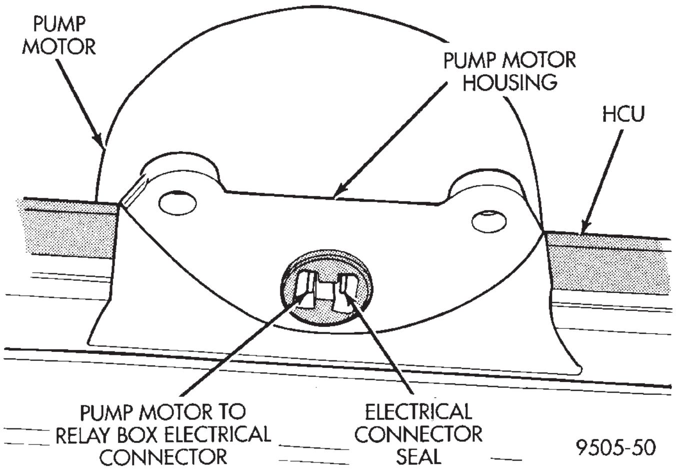


Fig. 27 Pump Motor To Relay Box Electrical Connection Seal

(2) Position relay box on HCU and carefully align the terminals on the relay box with the terminals on the pump motor.

(3) Grasp relay box with both hands. Then without twisting or rocking, push relay box onto the pump motor electrical connector as far as possible by hand.

(4) Install and securely tighten the 2 screws (Fig. 25) attaching the relay box assembly to the HCU.

(5) Install the HCU back in the vehicle. See Hydraulic Control Unit in the Removal And Installation Section in this group of the service manual, for the required installation procedure for the HCU.

(6) Connect the negative (-) ground cable back on the negative post of the battery.

(7) Bleed the base brakes and the ABS brakes hydraulic system. Refer to the Bleeding ABS System in this section of the manual for the proper bleeding procedure.

(8) Road test vehicle to ensure proper operation of the base and ABS systems.

CONTROLLER ANTILOCK BRAKES (CAB)

The CAB is located in the right front corner of the engine compartment (Fig. 28). It is mounted to the vehicle using an integral mounting bracket, which is attached by 2 bolts, to the inner fender and the front crossmember.

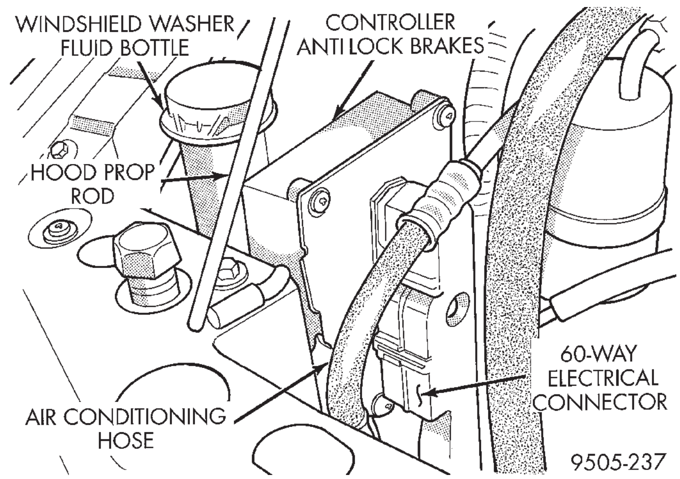


Fig. 28 Controller Antilock Brake (CAB) Location

REMOVE

(1) Turn vehicle ignition off.

(2) Disconnect the wiring harness 60 way connector (Fig. 29) from the Controller Antilock Brake Module (CAB). **VERIFY THAT THE VEHICLE IGNITION IS OFF BEFORE REMOVING THE 60 WAY CONNECTOR.**

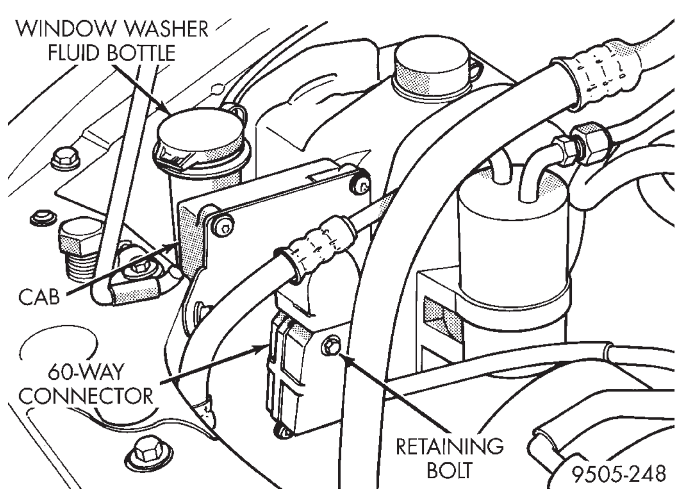


Fig. 29 CAB 60-Way Wiring Harness Connector

REMOVAL AND INSTALLATION (Continued)

(3) Remove the 2 bolts (Fig. 30) attaching the CAB mounting bracket to inner fender and front upper crossmember.

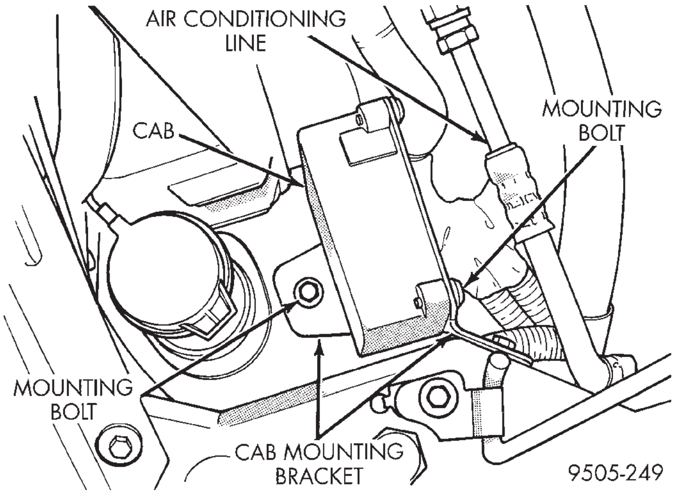


Fig. 30 CAB Bracket To Engine Compartment Mounting

(4) Remove the CAB from the vehicle.

INSTALL

(1) Install the CAB and the mounting bracket assembled, on the right inner fender of the vehicle. (Fig. 30).

(2) Install the 2 bolts mounting the CAB bracket to the vehicle. Tighten both mounting bolts to a torque of 9 N·m (75 in. lbs.).

(3) Install 60-way wiring harness connector (Fig. 29) into the CAB 60-way connector by hand until seated as far as possible. Then use CAB connector retaining bolt (Fig. 29) to fully seat wiring harness connector into the CAB.

(4) Tighten the 60-way connector retaining bolt (Fig. 29) to a torque of 4 N·m (35 in. lbs.).

FRONT WHEEL SPEED SENSOR

REMOVE

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the tire and wheel assembly from the vehicle.

(3) Remove the speed sensor cable routing bracket (Fig. 31) from the steering knuckle. Remove the wiring harness sealing grommet retainer and speed sensor routing bracket from the inner fender.

(4) Remove speed sensor sealing grommet from the inner fender (Fig. 32). Then unplug the speed sensor cable from the vehicle wiring harness (Fig. 32).

(5) Remove bolt (Fig. 33) attaching the speed sensor head to the steering knuckle. Then remove speed sensor head from steering knuckle

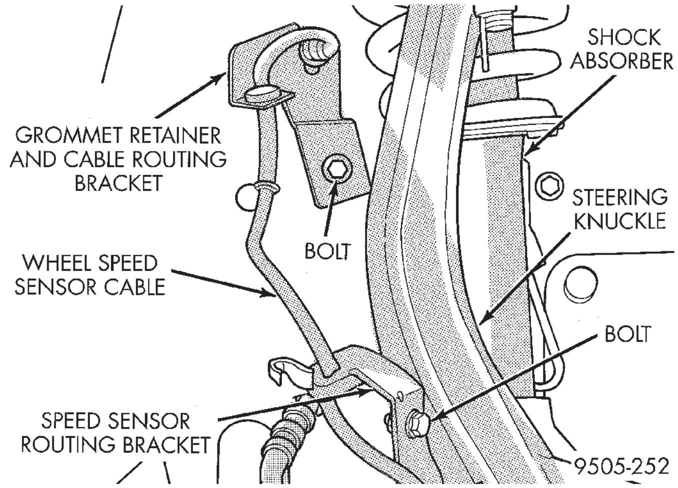


Fig. 31 Speed Sensor Cable Routing Brackets

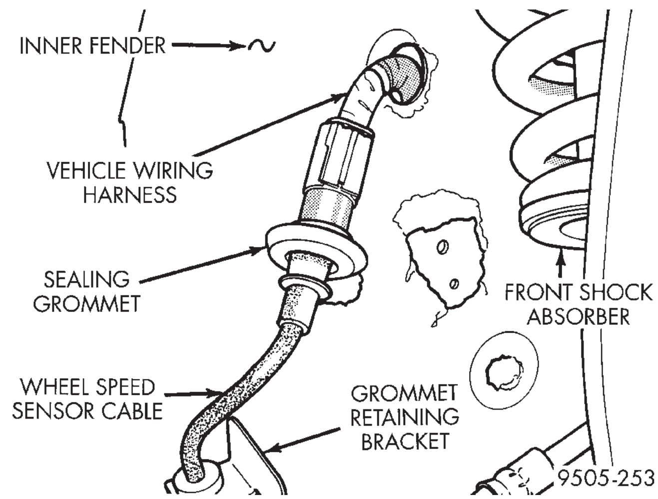


Fig. 32 Wheel Speed Sensor Connection To Vehicle Wiring Harness

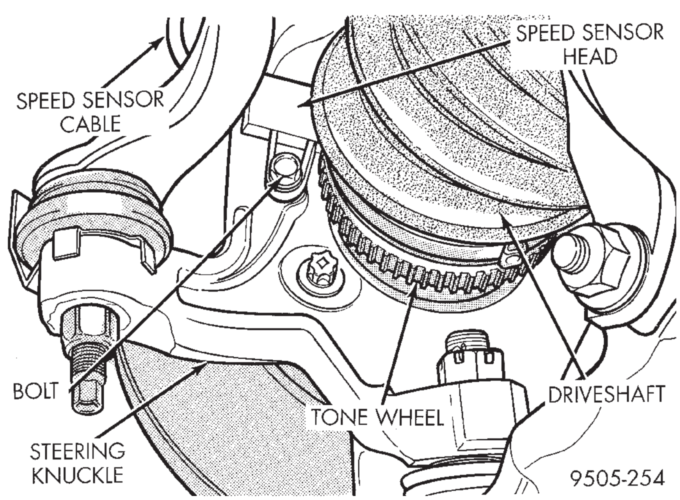


Fig. 33 Speed Sensor Head Attachment To Steering Knuckle

REMOVAL AND INSTALLATION (Continued)

CAUTION: If speed sensor head locating pin has seized to the steering knuckle, do not attempt to remove speed sensor head by grasping with pliers and turning. This will damage the speed sensor head. Use only the following procedure.

(6) If speed sensor head can not be removed from steering knuckle by hand, the locating pin on the speed sensor head has seized to the steering knuckle do to corrosion. Remove speed sensor head from steering knuckle using the following procedure. Remove disc brake caliper from steering knuckle, and remove brake rotor from hub/bearing assembly. Then insert a pin punch through hole in front steering knuckle (Fig. 34) and tap speed sensor head locating pin out of steering knuckle.

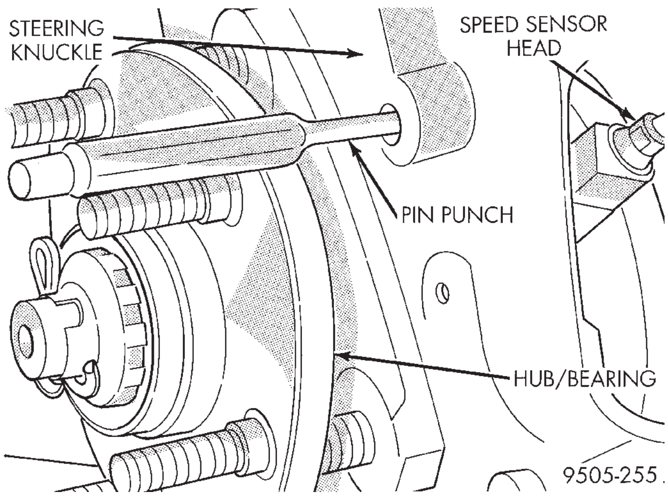


Fig. 34 Speed Sensor Head Removal From Steering Knuckle

INSTALL

CAUTION: Proper installation of wheel speed sensor cables is critical to continued system operation. Be sure that cables are installed in retainers. Failure to install cables in retainers as shown in this section may result in contact with moving parts and/or over extension of cables, resulting in an open circuit.

(1) Connect the wheel speed sensor cable connector to the vehicle wiring harness (Fig. 32).

(2) Install the speed sensor cable assembly grommet into the front inner fender (Fig. 31). Install speed sensor cable grommet retainer/routing bracket on the inner fender of the vehicle and install and securely tighten attaching bolt (Fig. 31).

CAUTION: When installing the wheel speed sensor cable routing bracket on the steering knuckle, (Fig. 31) the speed sensor cable must be looped toward the shock absorber as shown in (Fig. 35). If speed sensor cable is not routed in this direction it will rub against the tire or wheel, damaging the speed sensor cable.

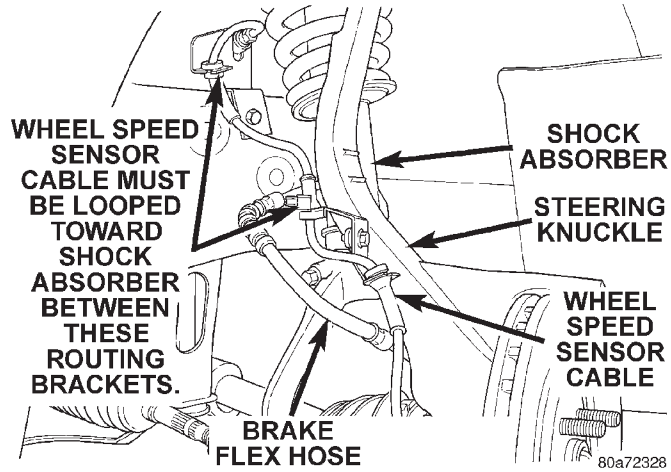


Fig. 35 Correct Front Wheel Speed Sensor Cable Routing

(3) Install the speed sensor cable routing bracket on the steering knuckle. Install and tighten routing bracket mounting bolt to a torque of 12 N·m (105 in. lbs.)

(4) Install speed sensor head on steering knuckle (Fig. 36). When installing speed sensor head on steering knuckle, apply a small amount of grease on speed sensor locating pin (Fig. 36). Use Mopar, Multi-Purpose Grease or an equivalent on speed sensor head locating pin. Install the speed sensor head attaching screw and tighten to a torque of 6 N·m (55 in. lbs.).

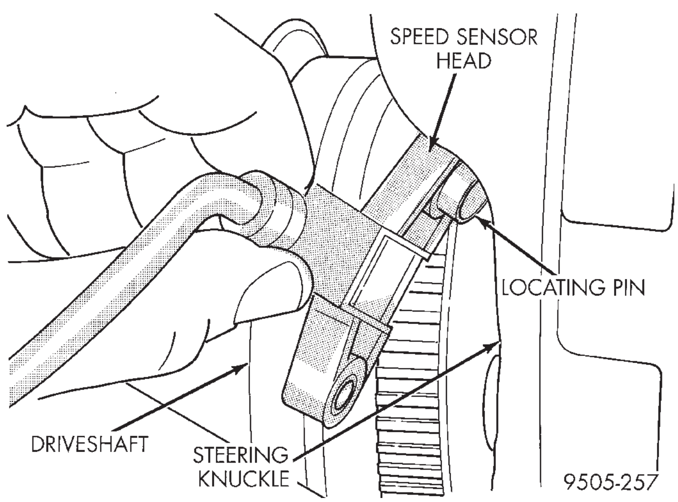


Fig. 36 Installing Speed Sensor Head In Steering Knuckle

(5) Install the wheel and tire assembly on vehicle.

(6) Road test vehicle to ensure proper operation of the base and ABS systems.

REMOVAL AND INSTALLATION (Continued)

REAR WHEEL SPEED SENSORS

REMOVE

(1) Unplug the speed sensor cable connector from the vehicle wiring harness (Fig. 37). **Access for speed sensor cable to vehicle wiring harness connection is in the trunk of the vehicle.**

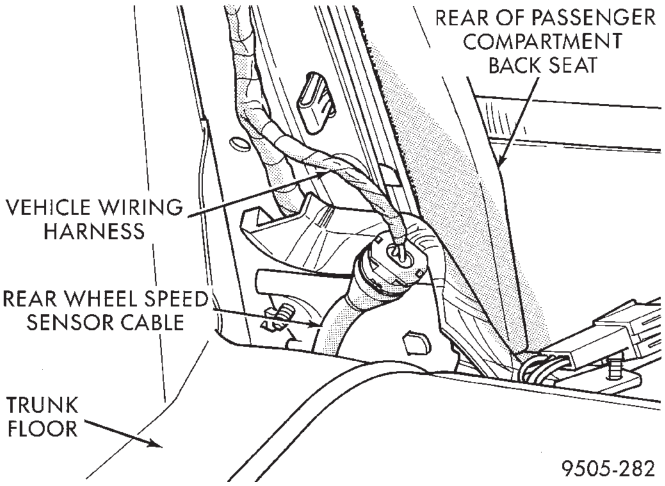


Fig. 37 Rear Speed Sensor Cable Connection To Vehicle Wiring Harness

(2) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(3) Remove the rear tire and wheel assembly from the vehicle.

(4) Remove speed sensor cable sealing grommet retainer (Fig. 38) from the rear frame rail of the vehicle. Then remove speed sensor cable sealing grommet and cable from hole in body of vehicle.

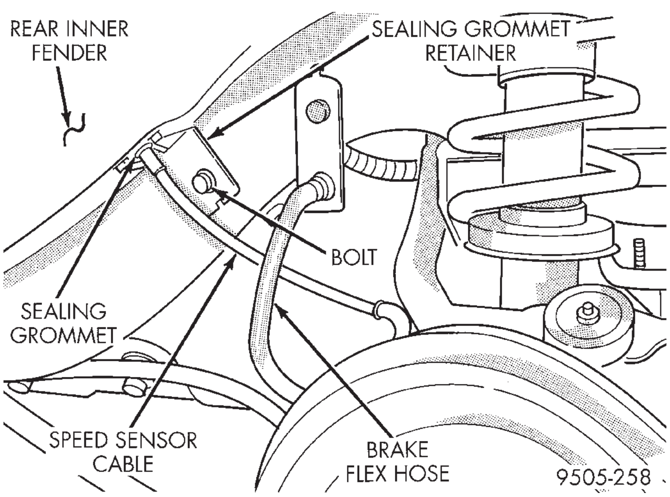


Fig. 38 Rear Speed Senor Cable Attachment To Body

(5) Remove speed sensor routing clips from the rear upper control arm and brake flex hose routing bracket (Fig. 39).

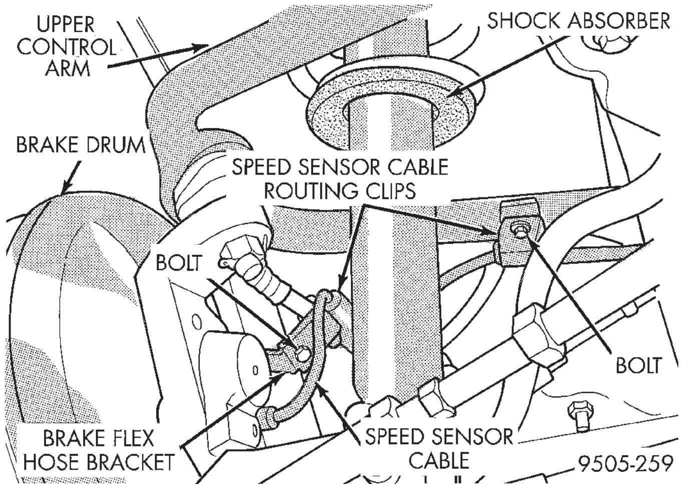


Fig. 39 Speed Sensor Cable Attachment To Rear Suspension

(6) Remove the rear speed sensor head from the rear brake support plate (Fig. 40).

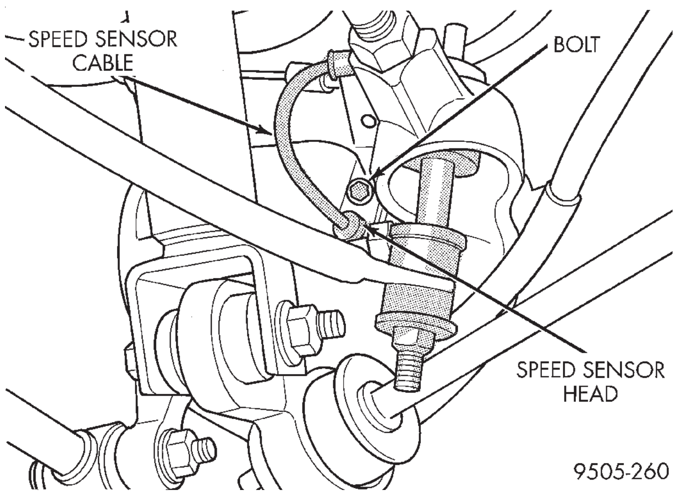


Fig. 40 Rear Speed Sensor Head Attachment To Brake Support Plate

INSTALL

CAUTION: Proper installation of wheel speed sensor cables is critical to continued system operation. Be sure that cables are installed in retainers. Failure to install cables in retainers as shown in this section may result in contact with moving parts and/or over extension of cables, resulting in an open circuit.

(1) Install speed sensor head into brake support plate (Fig. 40).

REMOVAL AND INSTALLATION (Continued)

(2) Install wheel speed sensor attaching bolt (Fig. 40). Tighten the speed sensor head attaching bolt to 8 N·m (75 in. lbs.)

(3) Install speed sensor cable routing clips (Fig. 39) on the brake flex hose bracket and the bracket on the upper control arm. Install and securely tighten the routing clip attaching bolts.

(4) Install connector end of speed sensor cable through hole in inner fender and into trunk of vehicle.

(5) Install speed control sealing grommet into hole in inner fender. Install the sealing grommet retainer and attaching bolt (Fig. 38) on rear frame rail. Securely tighten retainer attaching bolt.

(6) Install the tire and wheel assembly on vehicle.

(7) Lower vehicle.

(8) Plug speed sensor cable connector into vehicle wiring harness (Fig. 37). **Install foam sleeve back over the speed sensor cable to vehicle wiring harness connection to prevent connector from rattling against body of vehicle.**

(9) Road test vehicle to ensure proper operation of the base and ABS systems.

SPECIFICATIONS

SPEED SENSOR TONE WHEEL RUNOUT

The total indicator runout allowed for both the front and rear tone wheel measured using a dial indicator is 0.15 mm (.006 in.).

WHEEL SPEED SENSOR TO TONE WHEEL CLEARANCE

FRONT WHEEL

Minimum Clearance .35mm (.014 in.)
Maxamum Clearance 1.2 mm (.047 in.)

REAR WHEEL

Minimum Clearance .40mm (.016 in.)
Maxamum Clearance 1.2 mm (.047 in.)

BRAKE FASTENER TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
BRAKE TUBES:	
Tube Nuts To Fittings And Components	20 N·m (180 in. lbs.)
BRAKE HOSE:	
Front Caliper Banjo Bolt	48 N·m (35 ft. lbs.)
Rear Intermediate Bracket	11 N·m (100 in. lbs.)
Front And Rear Brackets To Frame Rails	10 N·m (95 in. lbs.)
MASTER CYLINDER:	
To Vacuum Booster Mounting Nut	28 N·m (250 in. lbs.)
BRAKE BOOSTER:	
To Dash Panel Mounting Nuts	37 N·m (27 ft. lbs.)
BRAKE PEDAL	
To Dash Panel Plenum Mounting Nut	37 N·m (27 ft. lbs.)
Shaft To Brake Pedal Bracket Nut	34 N·m (25 ft. lbs.)
REAR WHEEL CYLINDER:	
To Support Plate Mounting Bolts	13 N·m (115 in. lbs.)
Bleeder Screw	10 N·m (90 in. lbs.)
BRAKE SUPPORT PLATE:	
To Axle Mounting Bolts	75 N·m (55 ft. lbs.)
DISC BRAKE CALIPER:	
Guide Pin Bolts	22 N·m (16 ft. lbs.)
Bleeder Screw	20 N·m (15 ft. lbs.)
ABS HYDRAULIC CONTROL UNIT:	
To Mounting Bracket Bolts	28 N·m (250 in. lbs.)
Bracket To Crossmember Mounting Bolts	28 N·m (250 in. lbs.)
PARKING BRAKE:	
Lever Mounting Nuts	24 N·m (18 ft. lbs.)
REAR HUB AND BEARING:	
To Knuckle Retaining Nut	250 N·m (185 ft. lbs.)
WHEEL:	
Stud Lug Nut	115–155 N·m (85–115 ft. lbs.)

COOLING SYSTEM

CONTENTS

GENERAL INFORMATION

COOLING SYSTEM

Throughout this group, references may be made to a particular vehicle by letter or number designation. A chart showing the breakdown of these designations is included in the Introduction Section at the front of this service manual.

The cooling system consists of an engine cooling module, thermostat, coolant, a water pump to circulate the coolant. The engine cooling module may consist of a radiator, electric fan motor, shroud, radiator pressure cap, coolant reserve system, transmission oil cooler, hoses, clamps, air condition condenser, transmission oil lines and charge air cooler.

- When Engine is cold: Thermostat is closed, cooling system has no flow through the radiator. The coolant bypass flows through the engine and heater core.
- When Engine is warm: Thermostat is open, cooling system has bypass flow and coolant flow through radiator and heater core.

Its primary purpose is to maintain engine temperature in a range that will provide satisfactory engine performance and emission levels under all expected driving conditions. It also provides hot water (coolant) for heater performance and cooling for automatic transmission oil. It does this by transferring heat from engine metal to coolant, moving this heated coolant to the radiator, and then transferring this heat to the ambient air.

Coolant flow circuits for 2.4L engine equipped vehicles are shown in (Fig. 1). The 2.5L engine coolant routing is shown in (Fig. 2).

WATER PIPES—2.5L

The 2.5L engine use metal piping beyond the lower radiator hose to route coolant to the suction side of water pump, located in the V of the cylinder banks.

The pipes are also provided with inlet nipples for thermostat bypass and heater return coolant hoses, and brackets for rigid engine attachment. The pipes employ O-rings for sealing at their interconnection and to the water pump (Fig. 3).

ACCESSORY DRIVE BELTS

The engine is equipped with 2 drive belts. One belt drives the power steering pump, the other drives the generator and air conditioning. (Fig. 4)

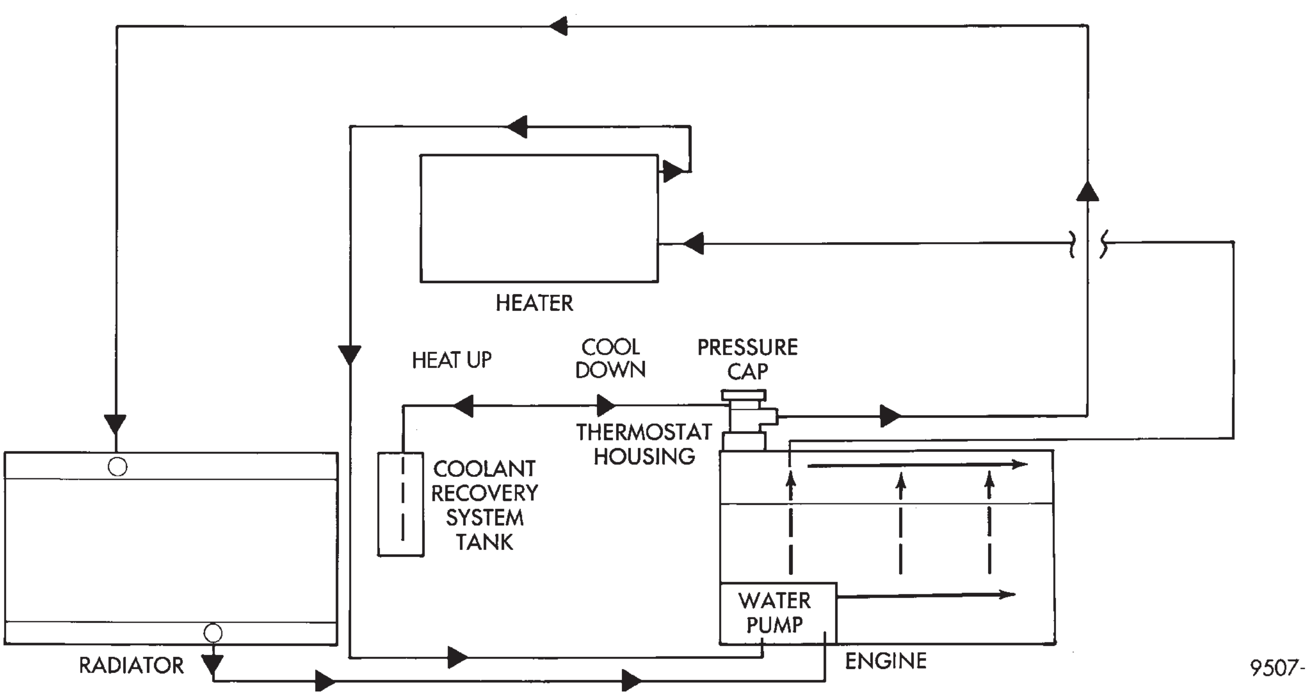


Fig. 1 Cooling System Operation—2.4L Engine

GENERAL INFORMATION (Continued)

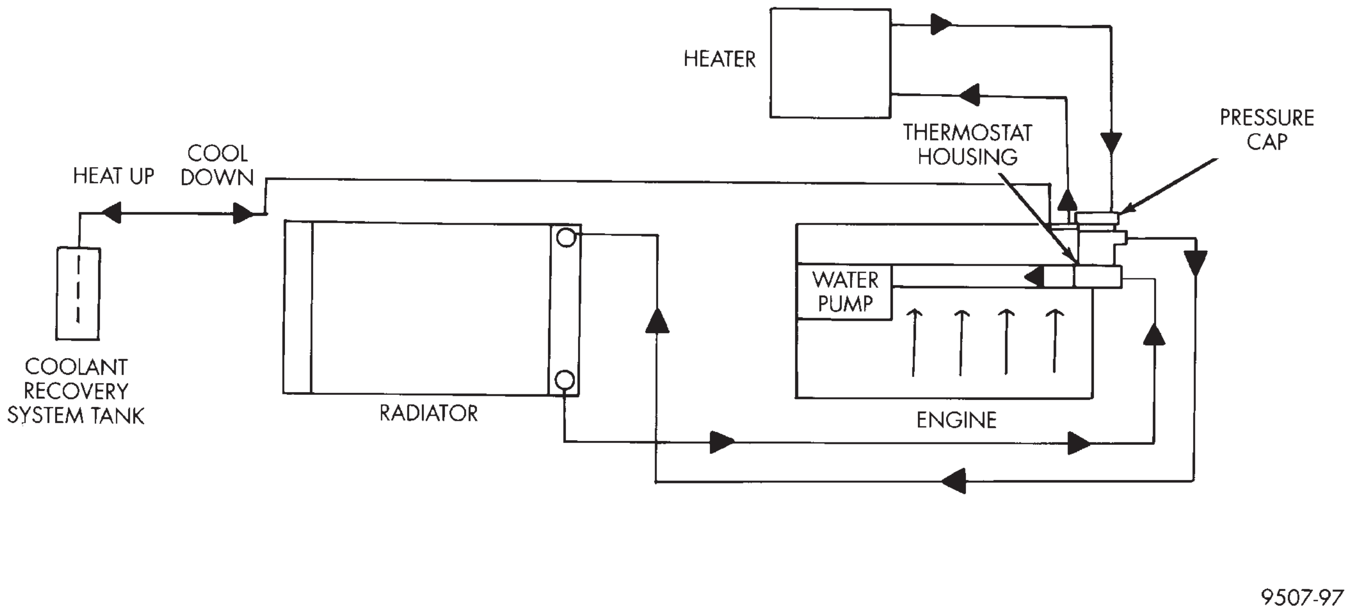


Fig. 2 Cooling System Operation—2.5L Engine

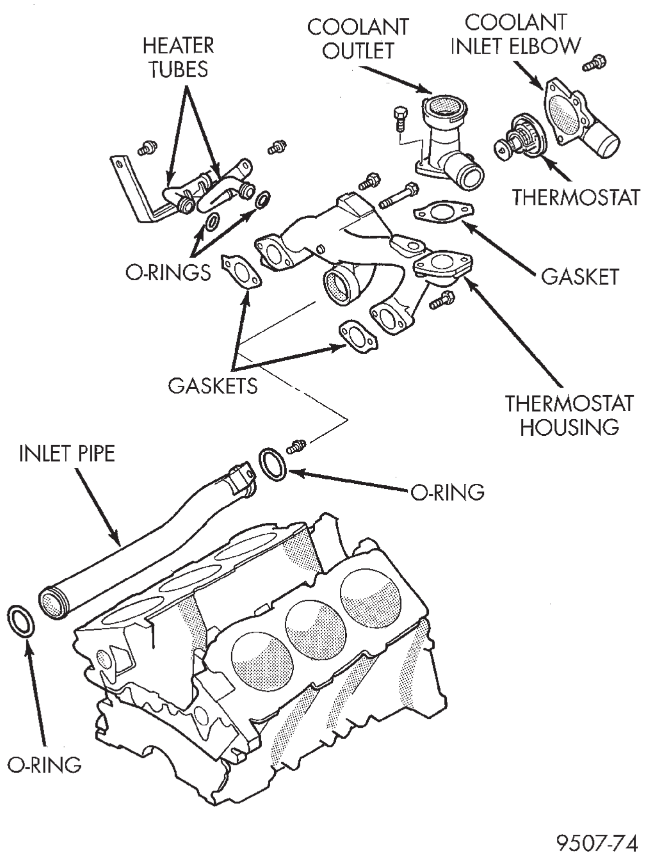


Fig. 3 Engine Inlet Coolant Pipes—2.5L Engine

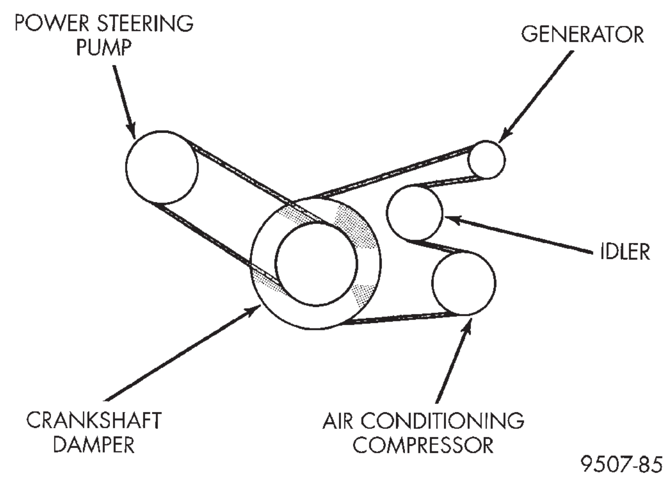


Fig. 4 Drive Belts—All Engines

GENERAL INFORMATION (Continued)

COOLANT RECOVERY SYSTEM (CRS)

This system works in conjunction with the pressure cap to utilize thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides a volume for expansion and contraction, provides a convenient and safe method for checking coolant level and adjusting level at atmospheric pressure without removing the pressure cap. It also provides some reserve coolant to cover minor leaks and evaporation or boiling losses. All vehicles are equipped with this system (Fig. 5).

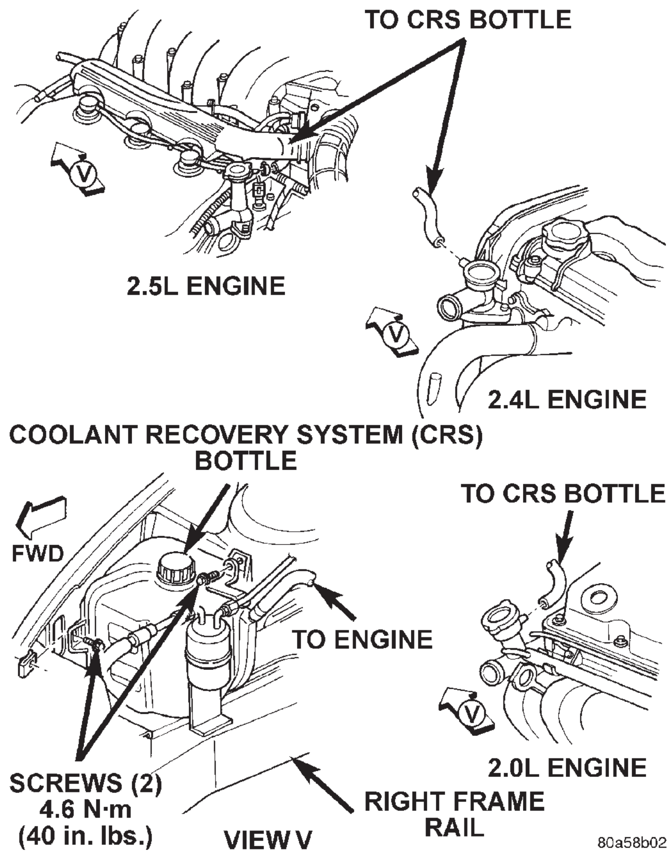


Fig. 5 Coolant Recovery System

See Coolant Level Check Service, Deaeration and Pressure Cap sections for operation and service. Vehicles equipped with the electric monitor system use a level sensor in the CRS tank, see Group 8E Electrical for service.

ENGINE THERMOSTATS

The 2.4L engine thermostat is located on the front of the engine (radiator side) in the thermostat housing/engine outlet connector (Fig. 6). The thermostat has a air bleed located in the flange and a O-ring with a locating dimple incorporate on it. There is a relief in the cylinder head for locating the air bleed.

The 2.5L engine thermostat is located in a thermostat housing, located below the throttle body. This

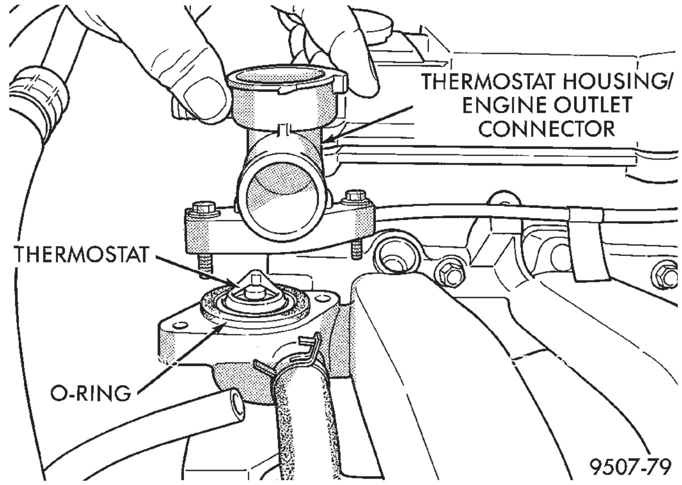


Fig. 6 Thermostat and Engine Outlet Connector—2.4L Engine

thermostat has an air bleed valve, located in the thermostat flange (Fig. 7).

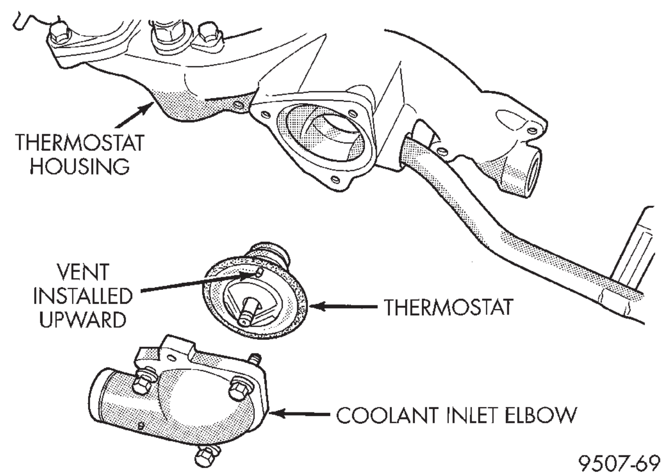


Fig. 7 Thermostat, Housing and Inlet Elbow—2.5L Engine

WATER PUMP

The water pump body is made of aluminum with a steel impeller. The water pump is bolted to the front of the block, and driven by the timing belt. The water pump is the heart of the cooling system, pumping the coolant through the engine block, cylinder head, heater core, and radiator.

NOTE: The water pump on all models can be replaced without discharging the air conditioning system.

WATER PUMP—2.5L ENGINE

The 2.5L pump bolts directly to the engine block, using a gasket for pump to block sealing (Fig. 8). The pump is serviced as a unit.

GENERAL INFORMATION (Continued)

The water pump is driven by the timing belt. See Timing System in Group 9, Engine for component removal providing access to water pump.

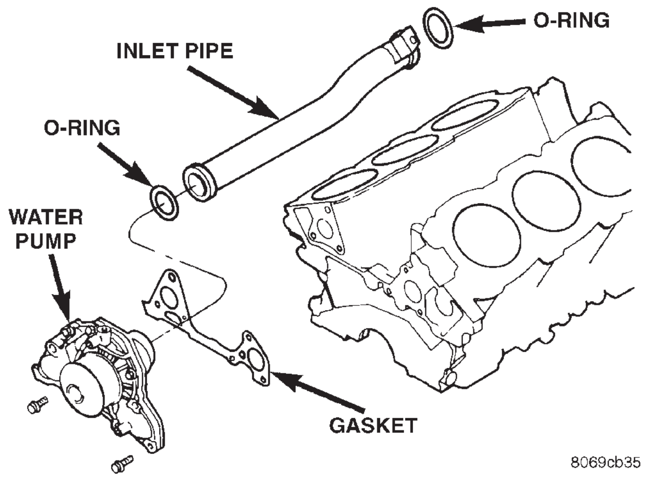


Fig. 8 Water Pump—2.5L Engine

WATER PUMP INLET TUBE—2.4L ENGINE

The inlet tube connects the water pump to the radiator and heater core. This tube is sealed by a O-ring and held in place by fasteners to the block.

COOLANT

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves. Then carry this heat to the radiator where the tube/fin assemblies of these components can give off the heat to the air.

COOLANT REPLACEMENT

Refer to Group 0, Lubrication and Maintenance for schedule.

COOLING SYSTEM PRESSURE CAP

The cooling system is equipped with a pressure cap that releases pressure at some point within a range of 97-124 kPa (14-18 psi) (Fig. 9).

The system will operate at higher than atmospheric pressure, which raises the coolant boiling point, allowing increased radiator cooling capacity.

There is a vent valve in the center of the cap that allows a small coolant flow to the CRS tank. **If the valve is stuck shut, the radiator hoses will collapse on cool-down. Clean the vent valve (Fig. 9) to ensure proper sealing when boiling point is reached.**

There is a gasket in the cap that seals to the top of the filler neck so that vacuum is maintained to draw coolant back into the system from the coolant reserve system tank.

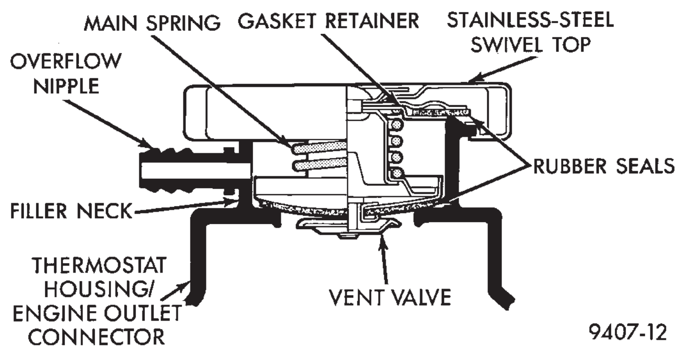


Fig. 9 Cooling System Pressure Cap to Filler Neck

RADIATOR

The radiators are cross flow types (horizontal tubes) with design features that provide greater strength as well as sufficient heat transfer capabilities to keep the engine satisfactorily cooled (Fig. 10).

CAUTION: Plastic tanks, while stronger then brass are subject to damage by impact, such as wrenches.

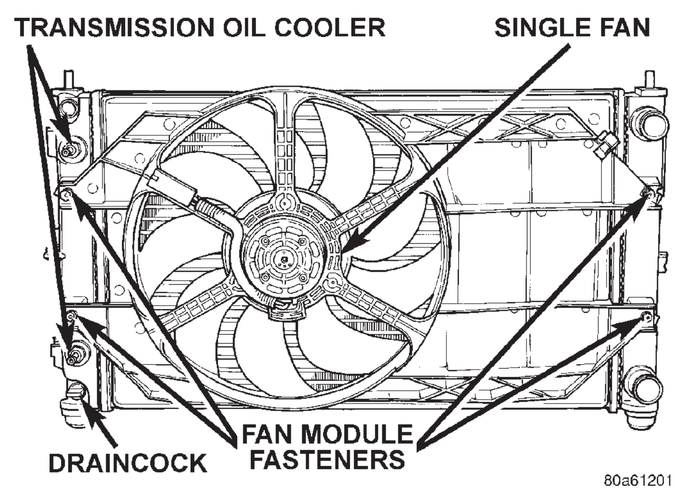


Fig. 10 Radiator Module—JX

COOLING SYSTEM FAN

The radiator has a single cooling fan, with a two speed motor (Fig. 10). The fan is controlled by the Powertrain Control Module (PCM) which energizes the fan relay.

AUTOMATIC TRANSMISSION OIL COOLER—2.4L

Oil coolers are internal oil to coolant type, mounted in the radiator left tank (Fig. 10). Rubber oil lines feed the oil cooler and the automatic transmission. Use only approved transmission oil cooler hose. Since these are molded to fit space available, molded hoses are recommended. Tighten Oil Cooler Hose Clamps to 2 N·m (18 in. lbs.).

GENERAL INFORMATION (Continued)

AUXILIARY TRANSMISSION OIL COOLER—2.5L

Models equipped with 2.5L engine, have an auxiliary transmission oil cooler added in series with the internal oil cooler in the radiator. The auxiliary cooler is a external oil to air type mounted in front of the cooling module (Fig. 11).

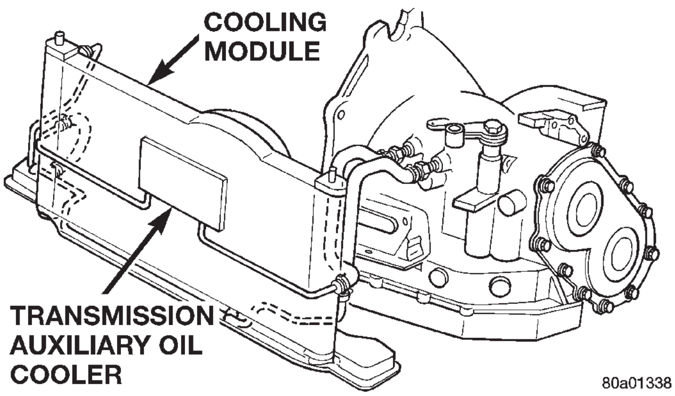


Fig. 11 Auxiliary Transmission Oil Cooler—2.5L Engine

ENGINE BLOCK HEATER

On all models an engine block heater is available as an optional accessory. The heater, operated by ordinary house current (110 Volt A.C.) through a power cord and connector behind the radiator grille. Refer to Description and Operation in this section for more information.

DESCRIPTION AND OPERATION

THERMOSTAT

The engine cooling thermostats are wax pellet driven, reverse poppet choke type. They are designed to provide the fastest warm up possible by preventing leakage through them and to guarantee a minimum engine operating temperature of 88 to 93°C (192 to 199°F). They also automatically reach wide open so they do not restrict flow to the radiator as temperature of the coolant rises in hot weather to around 104°C (220°F). Above this temperature the coolant temperature is controlled by the radiator, fan, and ambient temperature, not the thermostat.

The thermostat is operated by a wax filled container (pellet) which is sealed so that when heated to a predetermined temperature. The wax expands enough to overcome the closing spring and water pump pressure, which forces the valve to open. Coolant leakage into the pellet will cause a thermostat to fail open. Do not attempt to free up a thermostat with a screwdriver.

COOLANT PERFORMANCE

Performance is measurable. For heat transfer pure water absorbs 1 btu for each degree of temperature rise for each pound of water. This formula is altered when necessary additives to control boiling, freezing, and corrosion are added as follows:

- Pure Water (1 btu) boils at 100°C (212°F) and freezes at 0°C (32°F).
- 100 Percent ethylene glycol (.7 btu) can cause an engine to run hot, cause detonation, and will freeze at -22°C (-8°F).
- 50/50 Ethylene Glycol and Distilled Water (.82 btu) is the recommended combination that provides a freeze point of -37°C (-35°F). The radiator, water pump, engine water jacket, radiator pressure cap, thermostat, temperature gauge, coolant sensor and heater are all designed for 50/50 ethylene glycol.

Where required, a 56 percent glycol and 44 percent water mixture will provide a freeze point of -46°C (-50°F).

NOTE: Richer mixtures cannot be measured with field equipment and can lead to problems associated with 100 percent glycol. If there is doubt that the coolant mixture is to rich for field equipment to measure, put a sample in a clean container. Add exactly the same amount of water and retest. If the coolant in the vehicle is 100% antifreeze, the diluted sample will read 50%. If the coolant in the vehicle was 70% antifreeze and 30% water, the diluted sample will read as 35%, etc.

SELECTION AND ADDITIVES

The use of aluminum cylinder heads, intake manifolds, and water pumps requires special corrosion protection. Mopar Antifreeze or their equivalent are recommended for best engine cooling without corrosion. When mixed only to a freeze point of -37°C (-35°F) to -59°C (-50°F). If it looses color or becomes contaminated, drain, flush, and replace with fresh properly mixed solution.

CAUTION: Do not use well water, or suspected water supply in cooling system. A 50/50 ethylene glycol and distilled water mix is recommended.

COOLING SYSTEM PRESSURE CAP

The cooling system is equipped with a pressure cap that releases built up pressure, maintaining a range of 97-124 kPa (14-18 psi).

The cooling system will operate at higher than atmospheric pressure. The higher pressure raises the coolant boiling point thus, allowing increased radiator cooling capacity.

There is also a vent valve in the center of the cap. This valve also opens when coolant is cooling and contracting allowing coolant to return to radiator from coolant reserve system tank by vacuum through

DESCRIPTION AND OPERATION (Continued)

connecting hose. **If valve is stuck shut, the radiator hoses will be collapsed on cool down. Clean the vent valve (Fig. 12) to ensure proper sealing when boiling point is reached.**

The gasket in the cap seals the filler neck, so that vacuum can be maintained, allowing coolant to be drawn back into the radiator from the reserve tank.

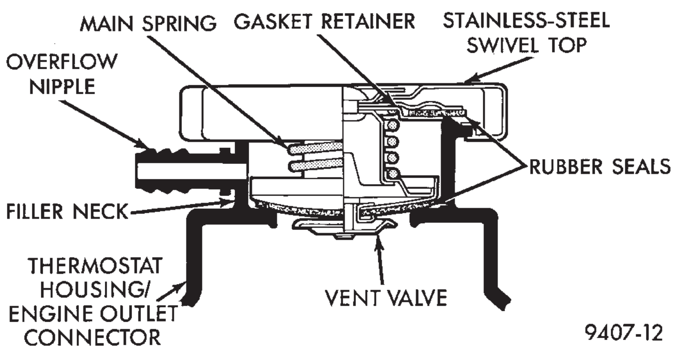


Fig. 12 Cooling System Pressure Cap

RADIATOR HOSES AND CLAMPS

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT 15 MINUTES BEFORE WORKING ON VEHICLE. RELIEVE PRESSURE BY PLACING A SHOP TOWEL OVER THE CAP AND WITHOUT PUSHING DOWN ROTATE IT COUNTERCLOCKWISE TO THE FIRST STOP. ALLOW FLUIDS TO ESCAPE THROUGH THE OVERFLOW TUBE AND WHEN THE SYSTEM STOPS PUSHING OUT COOLANT AND STEAM AND THE PRESSURE DROPS CONTINUE SERVICE.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAM. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only a original equipment clamp with matching number or letter.

The hose clamps are removed by using Special Tool 6094 or equivalent constant tension clamp pliers (Fig. 13) to compress hose clamp.

A hardened, cracked, swollen or restricted hose should be replaced. Do not damage radiator inlet and outlet when loosening hoses.

Radiator hoses should be routed without any kinks and indexed as designed. The use of molded hoses is recommended.

Spring type hose clamps are used in all applications. If replacement is necessary replace with the original Mopar equipment spring type clamp.

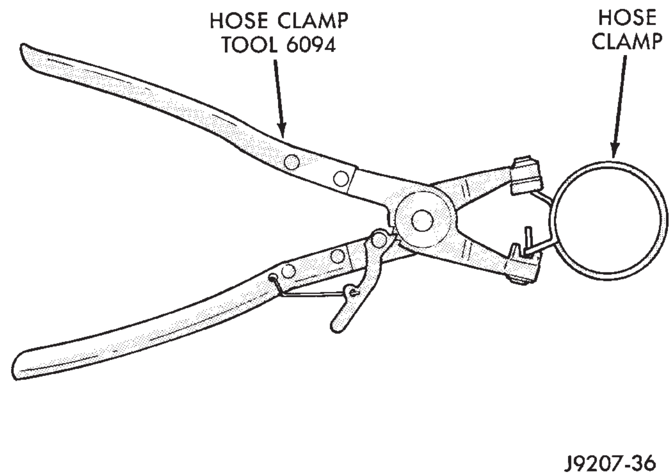


Fig. 13 Hose Clamp Tool

ENGINE BLOCK HEATER

The heater, operated by ordinary house current (110 Volt A.C.) through a power cord and connector behind the radiator grille, provides easier engine starting and faster warm-up when vehicle is operated in areas having extremely low temperatures. The heater is mounted in a core hole (in place of a core hole plug) in the engine block, with the heating element immersed in coolant (Fig. 14). **The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged. For removal procedures, refer to Removal and Installation in this section.**

WATER PUMP—2.4L ENGINE

The water has a diecast aluminum body and housing with a stamped steel impeller. The water pump bolts directly to the block (Fig. 15). Cylinder block to water pump sealing is provided by a rubber O-ring. The water pump is driven by the timing belt. Refer to Group 9, Engine section for component removal to access the water pump.

NOTE: The water pump on all models can be replaced without discharging the air conditioning system.

WATER PUMP—2.5L ENGINE

The water pump has a aluminum body with a steel impeller. A gasket is used to seal the pump to the cylinder block. The water pump inlet is located at the rear of the pump, a inlet tube located between the cylinder heads connects the water pump with the thermostat housing (Fig. 16). The water pump is

DESCRIPTION AND OPERATION (Continued)

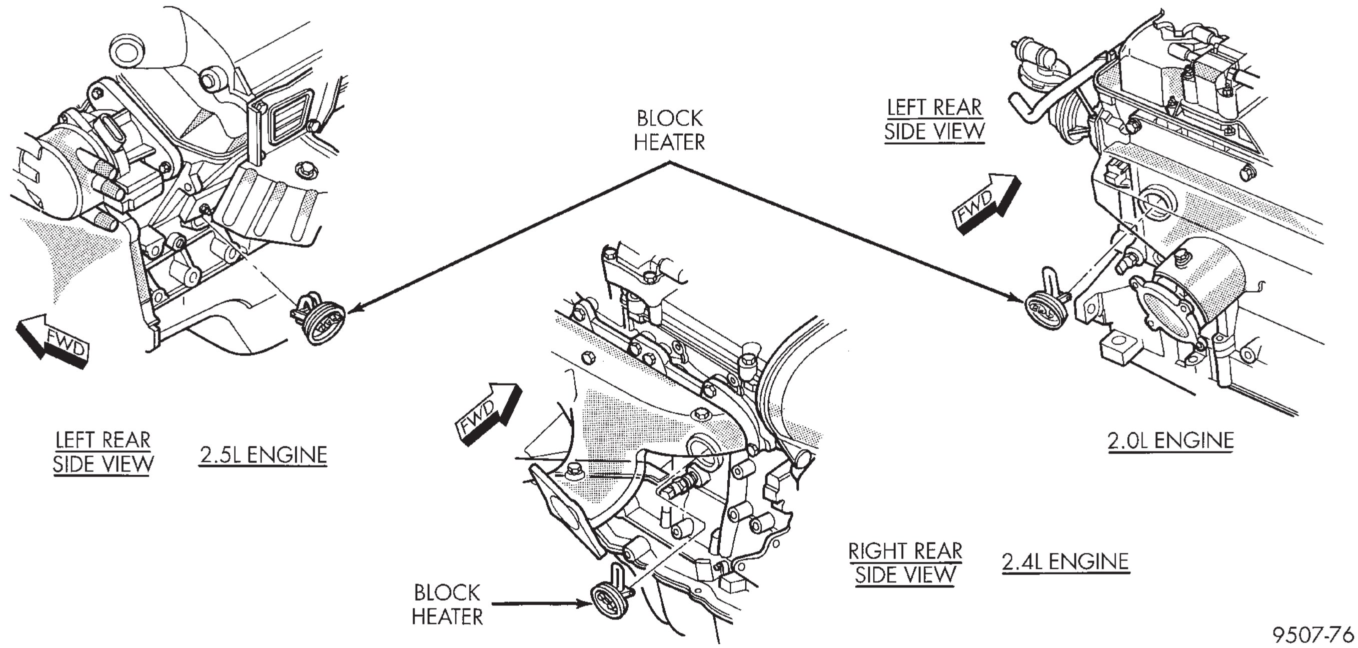


Fig. 14 Engine Block Heater

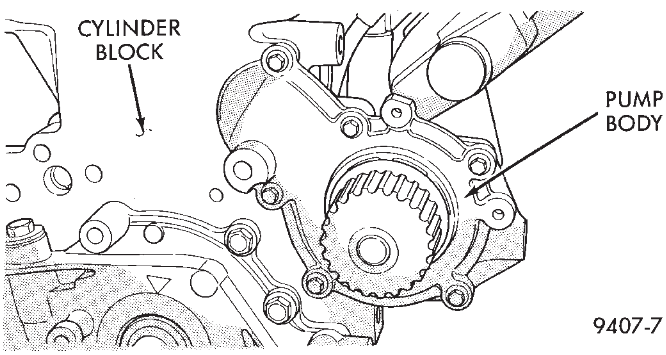


Fig. 15 Water Pump

driven by the timing belt. Refer to group 9, Engines for timing belt removal.

NOTE: The water pump can be replaced with out discharging the air conditioning system.

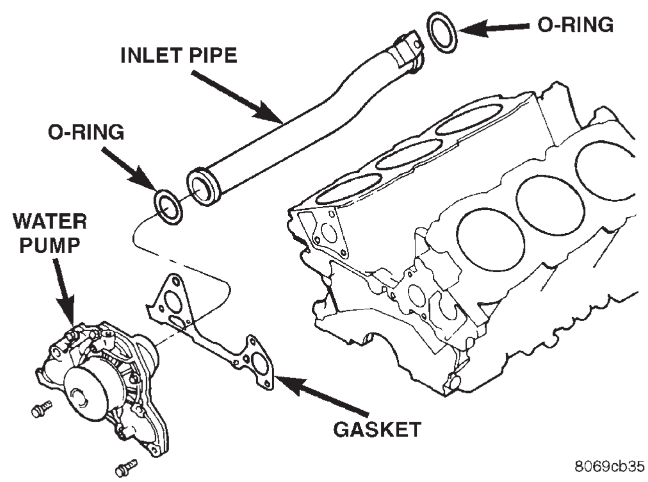


Fig. 16 Water Pump and Inlet Tube

DIAGNOSIS AND TESTING

COOLING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) number 17 been set indicating a stuck open engine thermostat? 2. Is the temperature gauge (if equipped) connected to the temperature gauge coolant sensor on the engine? 3. Is the temperature gauge (if equipped) operating OK? 4. Coolant level low during cold ambient temperature, accompanied by poor heater performance.	1. Refer to On Board Diagnostic in Group 25. Replace thermostat if necessary. if the (DTC) number 17 has not been set, the problem may be with the temperature gauge. 2. Check the connector at the engine coolant sensor. Refer to Group 8E. Repair as necessary. 3. Check Gauge operation. Refer to Group 8E. Repair as necessary. 4. Check coolant level in the coolant overflow/reserve tank and the radiator. Inspect the system for leaks. Repair as necessary. Refer to WARNINGS outlined in this section before removing pressure cap.
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST FROM SYSTEM.	1. Trailer being towed, a steep hill being climbed, vehicle being operated in slow moving traffic, or engine idling during high ambient (outside) temperatures with air conditioning on. High altitudes Could aggravate these conditions. 2. Is temperature gauge (if equipped) reading correctly? 3. Is temperature warning lamp (if equipped) illuminating unnecessarily? 4. Coolant low in overflow/reserve tank and radiator? 5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following step 6. 6. Poor seals at radiator cap.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and drive the vehicle without any of the previous conditions. Observe the temperature gauge the gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause of the overheating and repair. Refer to POSSIBLE CAUSES in this section. 2. Check gauge. Refer to Group 8E. Repair as necessary. 3. Check warning lamp operation. Refer to Group 8E. Repair as necessary. 4. Check for coolant leaks and repair as necessary. Refer to checking cooling system for leaks in this group. 5. Tighten cap. 6. (a) Check condition of cap and cap seals. Refer to Radiator cap Inspection. Replace cap if necessary. 6. (b) Check condition of filler neck. If neck is bent or damaged, replace neck.

DIAGNOSIS AND TESTING (Continued)

ENGINE THERMOSTAT TESTING

COOLING SYSTEM DIAGNOSIS CONT.

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST FROM SYSTEM.	7. Coolant level low in radiator but not in coolant overflow/reserve tank. This means the radiator is not drawing coolant from the coolant overflow/reserve tank as the engine cools. As the engine cools, a vacuum is formed inside the cooling system. If the radiator cap seals are defective, or the cooling system has a leak, a vacuum can not be formed.	7. (a) Check condition of radiator cap and cap seals. Replace cap if necessary. (b) Check condition of filler neck. If neck is damaged, replace filler neck. (c) Check condition of hoses from filler neck to coolant tank. It should be tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant overflow/reserve tank and tank hoses for blockage. Repair as necessary.
	8. Freeze point of coolant not correct. Mixture may be to rich.	8. Check coolant. Refer to coolant section in this group. Adjust glycol to water ratio as required.
	9. Coolant not flowing through system.	9. Check for coolant flow at filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through filler neck. If flow is not observed determine reason for lack of flow and repair as necessary.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Clean insects or debris.
	11. Radiator core is plugged or corroded.	11. Replace or re-core radiator.
	12. Fuel or ignition system problems.	12. Refer to Fuel and Ignition System group for diagnosis. Also refer to the appropriate Powertrain Diagnosis Procedures manual for operation of the DRB scan tool.
	13. Dragging brakes.	13. Inspect brake system and repair as necessary. Refer to Group 5, Brakes for diagnosis.
	14. Bug screen is being used causing reduced air flow.	14. Remove bug screen.
	15. Thermostat partially or completely shut. This is more prevalent on high mileage vehicles.	15. Check thermostat operation and replace as necessary. Refer to thermostats in this group.
	16. Electric cooling fan not operating properly.	16. Check electric fan operation and repair as necessary.
	17. Cylinder head gasket leaking.	17. Check cylinder head gasket for leaks. Refer to testing cooling system for leaks. For repairs, refer to group 9, Engines.
	18. Heater core leaking.	18. Check heater core for leaks. Refer to Group 24, Heating and Air Conditioning. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS CONT.

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. The gauge may cycle up and down. This is due to the cycling of the electric radiator fan.	1. A normal condition. No correction is necessary. If gauge cycling is going into the hot zone, check electric fan operation and repair as necessary. Refer to procedure outlined in this section.
	2. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.	2. A normal condition. No correction is necessary.
	3. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	3. Check operation of gauge and repair if necessary. Refer to Group 8E, Instrument Panel And Gauges.
	4. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running).	4. A normal condition. No correction is necessary. Gauge reading should return to normal range after a few minutes of engine operation.
	5. Gauge reading high after restarting a warmed-up (hot) engine.	5. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.
	6. Coolant level low in radiator (air will build up in the cooling system causing the thremostat to open late).	6. Check and correct coolant leaks. Refer to Testing Cooling System For Leaks in this group.
	7. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing thermostat to open late.	7. (a) Check for cylinder head gasket leaks with a commercially available Block Leak Tester. Repair as necessary. (b) Check for coolant in the engine oil. Inspect for white steam emitting from exhaust system. Repair as necessary.
	8. Water pump impeller loose on shaft.	8. Check water pump and replace as necessary. Refer to Water Pumps in this group.
	9. Loose accessory drive belt (water pump slipping).	9. Refer to Engine Accessory Drive Belts in this group. Check and correct as necessary.
	10. Air leak on the suction side of water pump allows air to build up in cooling system causing thermostat to open late.	10. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	1. Pressure relief valve in radiator cap is defective.	1. Check condition of radiator cap and cap seals. Refer to Radiator Caps in this group. Replace cap as necessary.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS CONT.

CONDITION	POSSIBLE CAUSES	CORRECTION
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF, GAUGE IS READING HIGH OR HOT	1. Coolant leads in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. Refer to Testing Cooling System For Leaks in this group.
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating.	1. Check reason for overheating and repair as necessary.
	2. Freeze point of coolant not correct. Mixture is too high or too lean.	2. Check the freeze point of the coolant. Refer to Coolant in the group for test procedure. Adjust the glycol to water ratio as required.
HOSE OR HOSES COLLAPSE WHEN ENGINE IS COOLING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. Refer to Radiator Cap in this group. Replace if necessary.
		(b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.
ELECTRIC RADIATOR FAN RUNS ALL THE TIME	1. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective. 2. Check for low coolant level.	1. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB scan tool. Repair as necessary. 2. Repair as necessary.
ELECTRIC RADIATOR FAN WILL NOT RUN. GAUGE READING HIGH OR NOT	1. Fan motor defective. 2. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective 3. Blown fuse in power distribution center (PDC).	1. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB scan tool. Repair as necessary. 2. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB scan tool. Repair as necessary. 3. Determine reason for blown fuse and repair as necessary.
NOISY FAN	1. Fan blades loose. 2. Fan blades striking a surrounding object. 3. Air obstructions at radiator or air conditioning condenser. 4. Electric fan motor defective.	1. Replace fan blade assembly. Refer to Cooling System Fans in this group. 2. Locate point of fan blade contact and repair as necessary. 3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser. 4. Refer to procedure outlined in this section.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS CONT.

CONDITION	POSSIBLE CAUSES	CORRECTION
INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)	1. Radiator and/or air conditioning condenser is restricted, obstructed or dirty.	1. Remove restriction and/or clean as necessary.
	2. Electric radiator fan not operating when a/c is on.	2. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB scan tool. repair as necessary.
	3. Engine is overheating (heat may be transferred from radiator to A/C condenser. High underhood temperature due to engine overheating may also transfer heat to A/C components).	3. Correct overheating condition. Refer to Group 7, Cooling.
INADEQUATE HEATER PERFORMANCE.	1. Has a diagnostic trouble code (DTC) number 17 been set?	1. Refer to On-Board Diagnostic in Group 25, and replace thermostat if necessary.
	2. Coolant level low.	2. Refer to testing cooling system for leaks in this section. Repair as necessary.
	3. Obstructions in heater hose fittings at engine.	3. Remove heater hoses at both ends and check for obstructions. Repair as necessary.
	4. Heater hose kinked.	4. Locate kinked area and repair as necessary.
	5. Water pump is not pumping coolant to heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. The accessory drive belt may be slipping causing poor water pump operation.	5. Refer to water pump in this group. Repair as necessary. If slipping belt is detected, refer to accessory drive belts in this group. Repair as necessary.
HEAT ODOR	6. Various heat shields are used at certain drive line components. One or more of these shields may be missing.	6. Locate missing shields and replace or repair as necessary.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS CONT.

CONDITION	POSSIBLE CAUSES	CORRECTION
HEAT ODOR - CONT.	2. Is temperature gauge reading above the normal range?	2. Refer to the previous Temperature Gauge Reads High in these Diagnosis Charts. Repair as necessary.
	3. Is cooling fan operating correctly?	3. Refer to Cooling System Fan in this group for diagnosis. Repair as necessary.
	4. Has undercoating been applied to any unnecessary component?	4. Clean undercoating as necessary.
	5. Engine may be running rich causing the catalytic convertor to overheat.	5. Refer to On-Board Diagnostics in Group 25. DTC's may also be checked using the DRB scan tool. Refer to the proper Powertrain Diagnostics Procedures manual for checking the thermostat using the DRB scan tool. Replace thermostat if necessary.
POOR DRIVEABILITY (THERMOSTAT POSSIBLY STUCK OPEN). GAUGE MAY BE READING LOW	1. For proper driveability, good vehicle emissions and for preventing build-up of engine oil sludge, the thermostat must be operating properly. Has a diagnostic trouble code (DTC) number 17 been set?	1. Refer to On-Board Diagnostics in Group 25. DTC's may also be checked using the DRB scan tool. Refer to the proper Powertrain Diagnostics Procedures manual for checking the thermostat using the DRB scan tool. Replace thermostat if necessary.
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. Check the freeze point of the coolant. Refer to Coolant in the group for test procedure. Adjust the glycol to water ratio as required.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal engine operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.

DIAGNOSIS AND TESTING (Continued)

The thermostat is operated by a wax filled container (pellet) which is sealed so that when heated to a predetermined temperature. The wax expands enough to overcome the closing spring and water pump pressure, which forces the valve to open. Coolant leakage into the pellet will cause a thermostat to fail open. Do not attempt to free up a thermostat with a screwdriver.

The thermostat that opens too soon type failure mode is included in the on-board diagnosis. The check engine light will not be lit by an open too soon condition. If it has failed open, code 17 will be set. Do not change a thermostat for lack of heater performance or temperature gage position, unless code 17 is present. See diagnosis for other probable causes. Thermostat failing shut is the normal long term mode of failure, and normally, only on high mileage vehicles. The temperature gauge will indicate this, Refer to diagnosis in this section.

WATER PUMP DIAGNOSIS

A quick flow test to tell whether or not the pump is working is to see if the heater warms properly. A defective pump will not be able to circulate heated coolant through the long heater hose.

Another flow test to help determine pump operation, remove radiator cap.

WARNING: DO NOT remove radiator cap if the cooling system is hot or under pressure.

COOLING SYSTEM FLOW CHECK

To determine whether coolant is flowing through the cooling system, use the following procedures:

(1) If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If it is hot, coolant is circulating.

WARNING: DO NOT REMOVE THE COOLING SYSTEM PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

(2) Remove pressure cap when engine is cold, remove small amount of coolant Idle engine until thermostat opens, you should observe coolant flow while looking down the filler neck. Once flow is detected install the pressure cap.

RADIATOR FAN CONTROL

The radiator has a single cooling fan, with a two speed motor (Fig. 17). The fan is controlled by the Powertrain Control Module (PCM) which energizes the fan relay. Fan operation is accomplished three ways:

- When air conditioning system pressure reaches 210 psi, fan will operate.
- Coolant temperature reaches 215° F, fan will operate.
- Models equipped with automatic transmission, a fluid thermister may have some influences on fan operation.
- Refer to tables below for fan operation.

RADIATOR FAN OPERATION—2.4L ENGINE

Radiator Fan Control			**A/C Pressure**	
A/C Off	Low	High		
Fan On:	102°C (215°F)	107°C (225°F)		
Fan Off:	96°C (205°F)	96°C (205°F)		
A/C On	Low	High	Low	High
Fan On:	102°C (215°F)	107°C (225°F)	1,448 Kpa (210 psi)	1,718 Kpa (249 psi)
Fan Off:	96°C (205°F)	96°C (205°F)	1,207 Kpa (175 Psi)	1,585 Kpa (229 Psi)
EATX Fluid Temperature			**Low Speed**	**High Speed**
Fan On:			118°C (244°F)	122°C (252°F)
Fan Off:			116°C (240°F)	118°C (244°F)

RADIATOR FAN OPERATION—2.5L ENGINE

Radiator Fan Control			**A/C Pressure**	
A/C Off	Low	High		
Fan On:	102°C (215°F)	107°C (224°F)		
Fan Off:	96°C (205°F)	103°C (217°F)		
A/C On	Low	High	Low	High
Fan On:	102°C (215°F)	107°C (224°F)	1,448 Kpa (210 psi)	1,718 Kpa (249 psi)
Fan Off:	96°C (205°F)	101°C (213°F)	1,207 Kpa (175 psi)	1,585 Kpa (229 psi)
EATX Fluid Temperature			**Low Speed**	**High Speed**
Fan On:			118°C (244°F)	122°C (252°F)
Fan Off:			116°C (240°F)	118°C (244°F)

DIAGNOSIS AND TESTING (Continued)

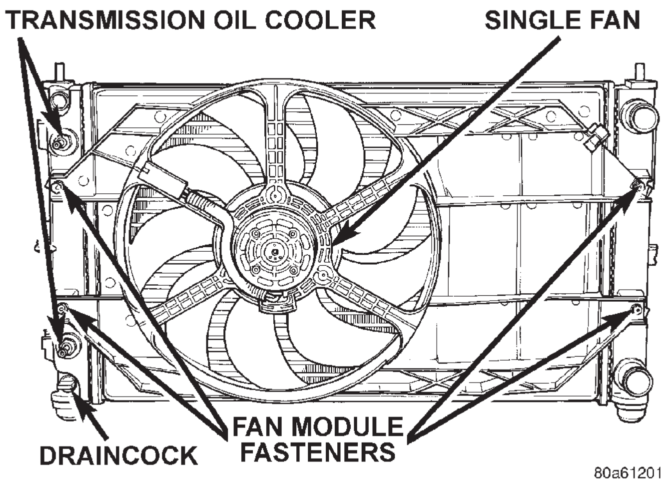


Fig. 17 Cooling Fan—JX

ELECTRIC FAN MOTOR TEST

Refer to Powertrain Diagnostic Manual for procedure.

For wiring diagrams of the fan motor systems refer to 8W Wiring Diagrams.

TESTING SYSTEM FOR LEAKS

With engine not running, wipe the coolant filler neck sealing seat clean. The radiator should be full.

Attach a radiator pressure tester to the coolant filler neck, as shown in (Fig. 18) and apply 104 kPa (15 psi) pressure. If the pressure drops more than 2 psi in 2 minutes inspect all points for external leaks.

All hoses, radiator and heater, should be moved while at 104 kPa (15 psi) since some leaks occur while driving due to engine rock, etc.

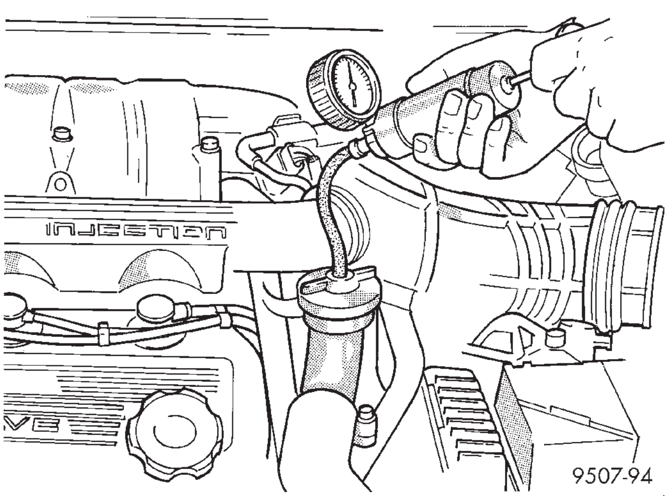


Fig. 18 Pressure Testing Cooling System—Typical

If there are no external leaks after the gauge dial shows a drop in pressure, detach the tester. Start engine and run the engine to normal operating temperature in order to open the thermostat and allow the coolant to expand. Re-attach the tester. If the needle on the dial fluctuates it indicates a combustion leak, usually a head gasket leak.

WARNING: WITH TOOL IN PLACE PRESSURE BUILDS UP FAST. ANY EXCESSIVE AMOUNT OF PRESSURE BUILT UP BY CONTINUOUS ENGINE OPERATION MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

If the needle on the dial does not fluctuate, race the engine a few times. If an abnormal amount of coolant or steam is emitted from the tail pipe, it may indicate a faulty head gasket, cracked engine block or cylinder head.

There may be internal leaks which can be determined by removing the oil dip-stick. If water globules appear intermixed with the oil it will indicate a internal leak in the engine. If there is an internal leak, the engine must be disassembled for repair.

PRESSURE CAP TO FILLER NECK SEAL PRESSURE RELIEF CHECK

The pressure cap upper gasket (seal) pressure relief can be checked by removing the overflow hose at the radiator filler neck nipple (Fig. 19). Attach the radiator pressure tester to the **filler neck nipple,** and pump air into the system. The pressure cap upper gasket should relieve pressure at 69-124 kPa (10-18 psi), and hold pressure at 55 kPa (8 psi) minimum.

WARNING: THE WARNING WORDS DO NOT OPEN HOT ON THE PRESSURE CAP IS A SAFETY PRECAUTION. WHEN HOT, THE COOLING SYSTEM BUILDS UP PRESSURE. TO PREVENT SCALDING OR OTHER INJURY, THE PRESSURE CAP SHOULD NOT BE REMOVED WHILE THE SYSTEM IS HOT AND/OR UNDER PRESSURE.

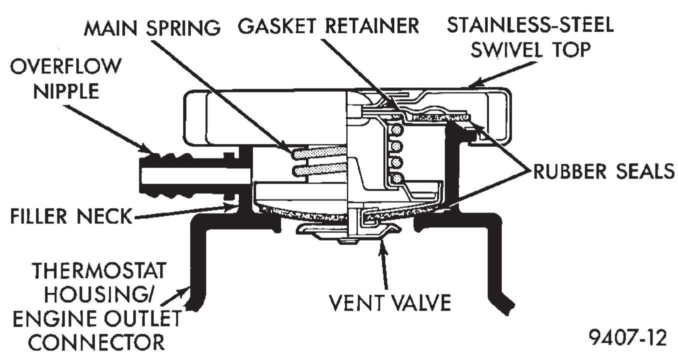


Fig. 19 Cooling System Pressure Cap to Filler Neck

There is no need to remove the pressure cap at any time **except** for the following purposes:

- Check and adjust coolant freeze point
- Refill system with new coolant

DIAGNOSIS AND TESTING (Continued)

- Conducting service procedures
- Checking for leaks

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT 15 MINUTES BEFORE REMOVING CAP. PLACE A SHOP TOWEL OVER THE CAP, AND WITHOUT PUSHING DOWN, ROTATE IT COUNTER-CLOCKWISE TO THE FIRST STOP. ALLOW FLUIDS TO ESCAPE THROUGH THE OVERFLOW TUBE. WHEN THE SYSTEM STOPS PUSHING COOLANT AND STEAM INTO THE CRS TANK AND PRESSURE DROPS, PUSH DOWN ON THE CAP AND REMOVE IT COMPLETELY. SQUEEZING THE RADIATOR INLET HOSE WITH A SHOP TOWEL (TO CHECK PRESSURE) BEFORE AND AFTER TURNING TO THE FIRST STOP IS RECOMMENDED.

PRESSURE TESTING COOLING SYSTEM PRESSURE CAP

Dip the pressure cap in water; clean off any deposits on the vent valve or its seat, and apply the cap to end of radiator pressure tester (Fig. 20). Working the plunger, increase the pressure to 104 kPa (15 psi) on the gauge. If the pressure cap fails to hold pressure of at least 97 kPa (14 psi), replace the cap.

CAUTION: The radiator pressure tester is very sensitive to small air leaks that will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to the tool. Turn the tool upside down, and recheck the pressure cap to confirm that the cap is faulty.

If the pressure cap tests properly while positioned the on radiator pressure tester, but will not hold pressure or vacuum when positioned on the filler neck, inspect the filler neck and cap top gasket for irregularities that may prevent the cap from sealing properly.

LOW COOLANT LEVEL AERATION

Low coolant level in a cross flow radiator will equalize in both tanks with engine off. With engine at running operating temperature the high pressure inlet tank runs full and the low pressure outlet tank drops. If this level drops below the top of the transmission oil cooler, air will be sucked into the water pump:

- Transmission oil will become hotter.
- High reading shown on the temperature gauge.
- Air in the coolant will also cause loss of flow through the heater.
- Exhaust gas leaks into the coolant can also cause the same problems.

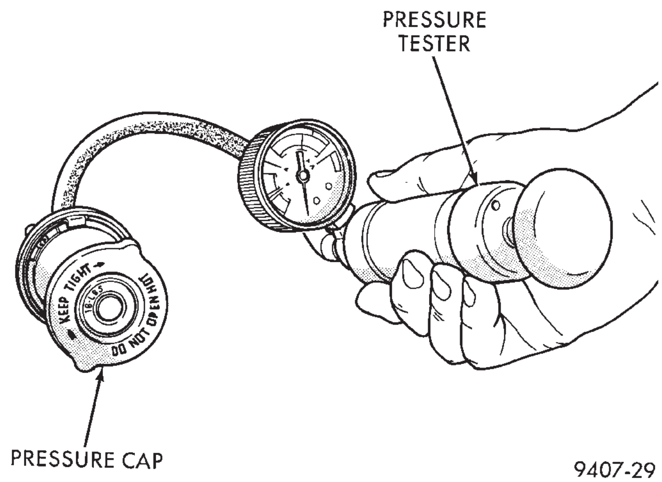


Fig. 20 Pressure Testing Radiator Cap

DEAERATION

Air can only be removed from the system by gathering under the pressure cap. On the next heat up it will be pushed past the pressure cap into the CRS tank by thermal expansion of the coolant. It then escapes to the atmosphere in the CRS tank and is replaced with solid coolant on cool down.

TEMPERATURE GAUGE INDICATION

At idle the temperature gauge could rise slowly to about 1/2 gauge travel. The fan will come on and the gauge could drop to about 1/3 gauge travel, this is normal.

DIAGNOSIS AND TESTING (Continued)

ACCESSORY DRIVE BELTS

Satisfactory performance of the belt driven accessories depends on belt condition and proper belt tension.

Condition	Possible Cause	Correction
INSUFFICIENT ACCESSORY OUTPUT DUE TO BELT SLIPPAGE	(a) Belt too loose. (b) Belt excessibely glazed or worn	(a) Adjust belt tension. (b) Replace and tighten as specified.
BELT SQUEAL WHEN ACCELERATING ENGINE	(a) Belts too loose. (b) Belts glazed.	(a) Adjust belt tension (b) Replace belts.
BELT CHIRP AT IDLE	(a) Belts too loose. (b) Dirt and paint imbedded in belt. (c) Non-uniform belt. (d) Misaligned pulleys. (e) Non-uniform groove or eccentric pulley.	(a) Adjust belt tension. (b) Replace belt. (c) Replace belt. (d) Align accessories (e) Replace pulley.
BELT ROLLED OVER IN GROOVE OR BELT JUMPS OFF	(a) Broken cord in belt. (b) Belt too loose, or too tight. (c) Misaligned pulleys. (d) Non-uniform grooves or eccentric pulley.	(a) Replace belt. (b) Adjust belt tension. (c) Align accessories. (d) Replace pulley.

ENGINE BLOCK HEATER

If unit does not operate, trouble can be in either the power cord or the heater element. Test power cord for continuity with a 110-volt voltmeter or 110-volt test light; test heater element continuity with an ohmmeter or 12-volt test light.

SERVICE PROCEDURES

ROUTINE COOLANT LEVEL CHECK

Do not remove radiator cap for routine coolant level inspections.

The coolant reserve system provides a quick visual method for determining the coolant level without removing the radiator cap. Simply observe, with the engine idling and warmed up to normal operating temperature, that the level of the coolant in the reserve tank is between the minimum and maximum marks.

ADDING ADDITIONAL COOLANT

NOTE: The radiator cap should not be removed.

When additional coolant is needed, it should be added to the coolant reserve tank. Use only 50/50 concentration of ethylene glycol type antifreeze and water

SERVICING COOLANT LEVEL

NOTE: The cooling system is closed and designed to maintain coolant level to the top of the radiator.

When servicing requires a coolant level check in the radiator, the engine must be **off** and **not** under pressure. Drain several ounces of coolant from the radiator drain cock while observing the Coolant Recovery System (CRS) Tank. Coolant level in the CRS tank should drop slightly. Then remove the radiator cap. The radiator should be full to the top. If not, and the coolant level in the CRS tank is at the ADD mark there is a air leak in the CRS system. Check hose or hose connections to the CRS tank, radiator filler neck or the pressure cap seal to the radiator filler neck for leaks.

DRAINING COOLING SYSTEM

NOTE: Drain, flush, and fill the cooling system at the mileage or time intervals specified in the Maintenance Schedule in this Group. If the solution is dirty or rusty or contains a considerable amount of sediment, clean and flush with a reliable cooling system cleaner. Care should be taken in disposing of the used engine coolant from your vehicle. Check governmental regulations for disposal of used engine coolant.

SERVICE PROCEDURES (Continued)

WARNING: DO NOT REMOVE THE COOLING SYSTEM PRESSURE CAP OR OPEN THE RADIATOR DRAINCOCK, WHEN SYSTEM IS HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

To drain cooling system move temperature selector for heater to full heat with engine running (to provide vacuum for actuation). **Without removing radiator pressure cap and with system not under pressure,** Shut engine off and open draincock (Fig. 21). The coolant reserve tank should empty first, then remove radiator pressure cap. (if not, see Testing Cooling System for leaks).

NOTE: To open draincock on vehicle equipped with 2.5L engine, use a 3/8 inch drive extension 3" long, a 19mm socket with universal.

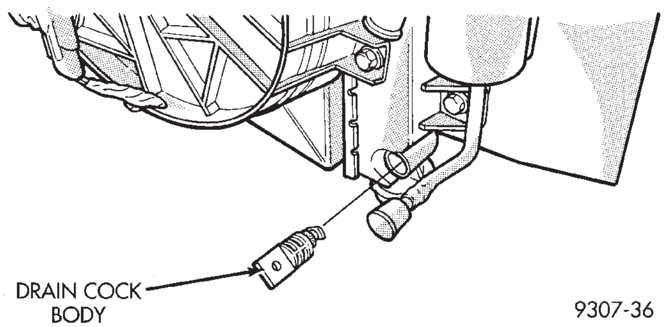


Fig. 21 Draincock—Typical

REFILLING COOLING SYSTEM

First clean system to remove old glycol, see Cooling System Cleaning.

Fill system using antifreeze described in Coolant section. Fill 50 percent of capacity with 100 percent glycol. Then complete filling system with water. The thermostats in the these engines allow air flow to through them.

Continue filling system until full, this provides better heater performance. **Be careful not to spill coolant on drive belts or the generator.**

Fill coolant reserve system to at least the FULL HOT mark with 50/50 solution. It may be necessary to add coolant to the reserve tank to maintain coolant level between the FULL HOT and ADD mark after three or four warm-up, cool down cycles and trapped air has been removed.

REMOVAL AND INSTALLATION

WATER PUMP—2.4L ENGINE

REMOVAL

(1) Raise vehicle on a hoist. Remove right inner splash shield.

(2) Remove accessory drive belts and power steering pump. Refer to Accessory Drive Belt service of this section.

(3) Drain cooling system. Refer to Draining Cooling System in this group.

(4) Support engine from the bottom and remove right engine mount.

(5) Remove power steering pump bracket bolts and set pump and bracket assembly aside. Power steering lines do not need to be disconnected.

(6) Remove right engine mount bracket.

(7) Remove timing belt. Refer to Timing Belt Removal in Group 9 for procedure.

(8) Remove inner timing belt cover.

(9) Remove water pump attaching screws to engine (Fig. 22).

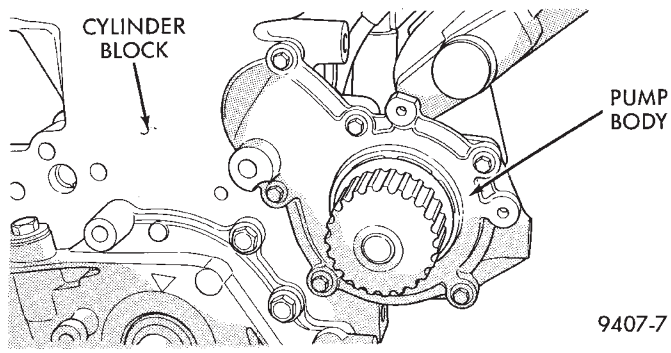


Fig. 22 Water Pump

INSTALLATION

(1) Install new O-ring gasket in water pump body O-ring groove (Fig. 23).

CAUTION: Make sure O-ring is properly seated in water pump groove before tightening screws. An improperly located O-ring may cause damage to the O-ring and cause a coolant leak.

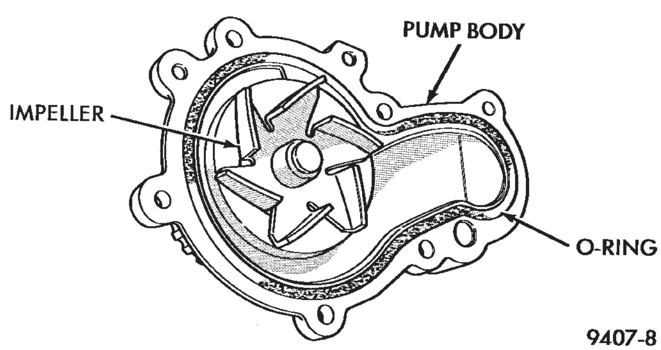


Fig. 23 Water Pump Body

(2) Assemble pump body to block and tighten screws to 12 N·m (105 in. lbs.) (Fig. 22). Pressurize cooling system to 15 psi with pressure tester and check water pump shaft seal and O-ring for leaks.

REMOVAL AND INSTALLATION (Continued)

(3) Rotate pump by hand to check for freedom of movement.

(4) Install inner timing belt cover.

(5) Install timing belt. Refer to Timing Belt Installation in Group 9 and Reassemble engine.

(6) Install right engine mount bracket and engine mount. Refer to Group 9 for procedure.

(7) Fill cooling system. Refer to Filling Cooling System for procedure outlined in this group.

(8) Install power steering pump and accessory drive belts, Refer to Accessory Drive Belts, in this Group.

WATER PUMP—2.5L ENGINE

REMOVAL

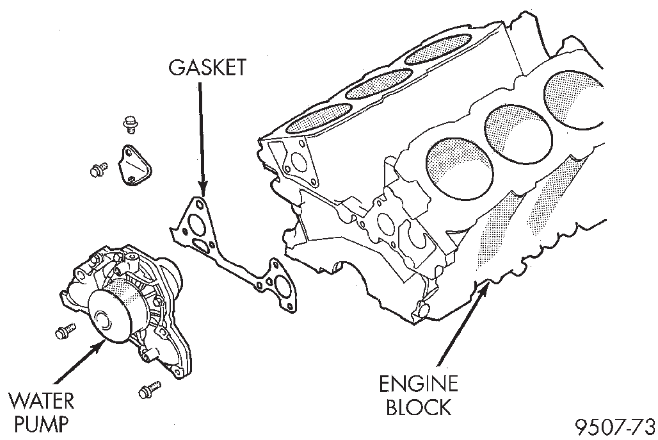


Fig. 24 Water Pump—2.5L Engine

(1) Drain cooling system. Refer to Draining Cooling System in this group.

(2) Remove mounting bolts.

(3) Separate pump from water inlet pipe (Fig. 25) and remove pump (Fig. 24).

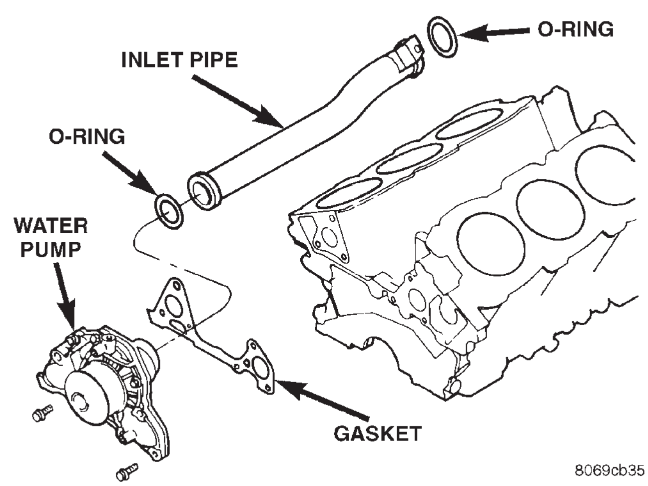


Fig. 25 Water Pump Inlet Tube

INSTALLATION

(1) Clean all gasket and O-ring surfaces on pump and water pipe inlet tube.

(2) Install new O-ring on water inlet pipe (Fig. 26). Wet the O-ring with water to facilitate assembly.

CAUTION: Keep the O-ring free of oil or grease.

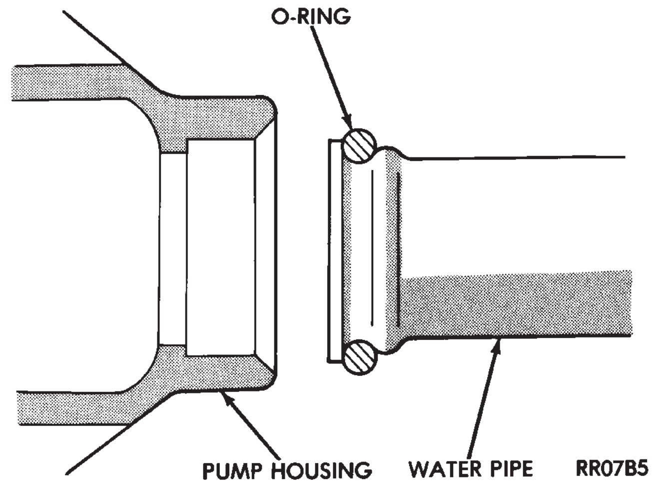


Fig. 26 Water Pipe O-Ring

(3) Install new gasket on water pump and install pump inlet opening over water pipe, press assembly to cause water pipe insertion into pump housing.

(4) Install pump to block mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(5) See Group 9, Engine and install timing belt. Reassemble engine.

(6) Fill cooling system. See Refilling Cooling System.

(7) Install accessory drive belts. Refer to Accessory Drive Belts, in this Group for procedure.

WATER PUMP INLET TUBE—2.4L

REMOVAL

(1) Drain cooling system. Refer to procedure outlined in this section.

(2) Remove upper radiator hose to access the hose connections at the inlet tube.

(3) Remove lower radiator hose and heater hose from the inlet tube (Fig. 27).

(4) Remove the 2 fasteners from that hold the inlet tube to the block.

(5) Rotate tube while removing the tube from the engine block (Fig. 28).

INSTALLATION

(1) Inspect the O-ring for damage before installing the tube into the cylinder block (Fig. 28).

(2) Lube O-ring with coolant and install into the cylinder block opening.

REMOVAL AND INSTALLATION (Continued)

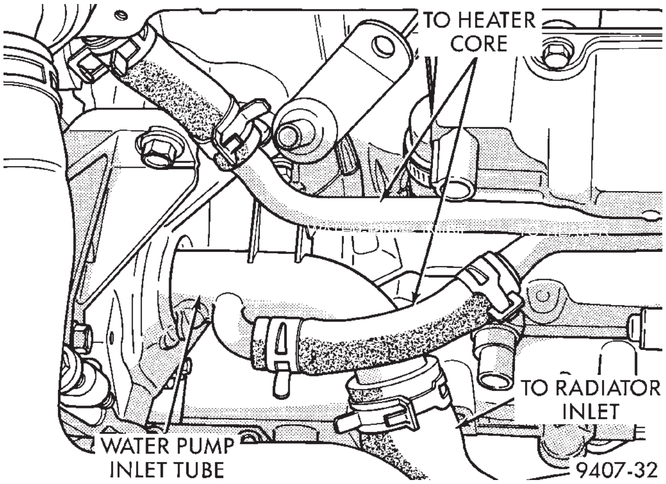


Fig. 27 Water Pump Inlet Tube Hose Connections

(3) Install 2 fasteners and tighten to 12 N·m (105 in. lbs.).

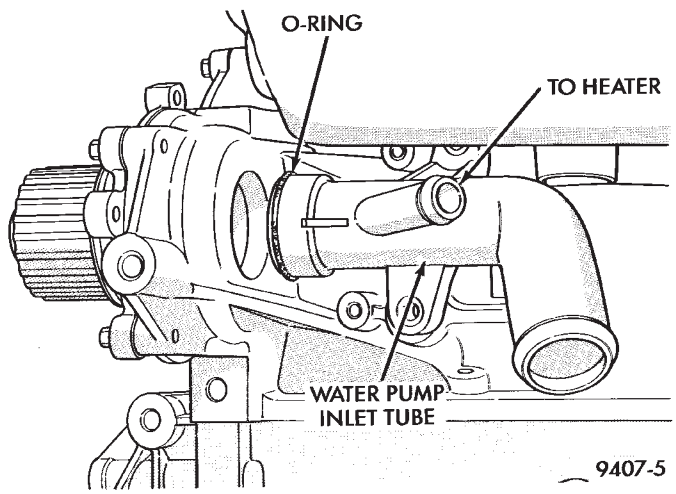


Fig. 28 Water Pump Inlet Tube—Service

(4) Connect lower radiator hose and heater hose to inlet tube (Fig. 27).

(5) Install upper radiator hose.

(6) Fill cooling system. Refer to procedure outlined in this section.

THERMOSTAT — 2.4L ENGINE

REMOVAL

(1) Drain cooling system down below the thermostat level. Refer to Draining Cooling System in this group.

(2) Remove thermostat housing bolts and housing (Fig. 29).

(3) Remove thermostat, discard gasket and clean both gasket sealing surfaces.

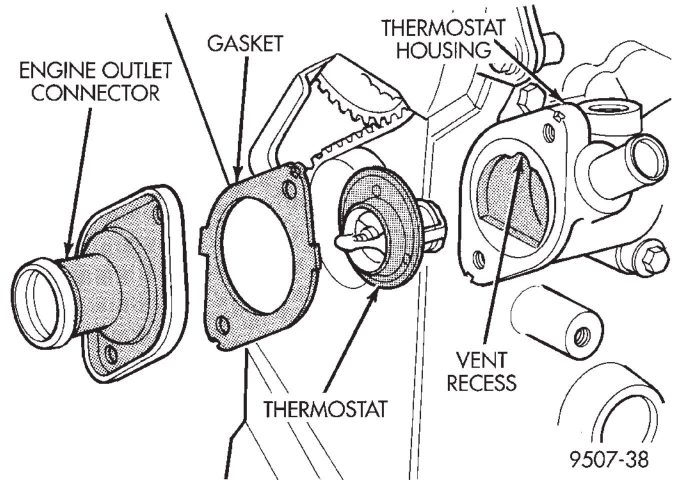


Fig. 29 Thermostat, Housing, and Outlet Connector —2.4L Engine

INSTALLATION— 2.4L ENGINE

(1) Place a new gasket (dipped in clean water) on the engine outlet connector surface. Center the thermostat in thermostat housing (Fig. 29).

(2) Place the engine outlet connector and gasket over the thermostat, making sure thermostat is seated in the thermostat housing.

(3) Bolt outlet connector to thermostat housing (Fig. 29). Tighten bolts to 28 N·m (250 in. lbs.).

(4) Refill the cooling system to the proper level. Refer to Refilling Cooling System outlined in this section for procedure

THERMOSTAT—2.5L

REMOVAL

(1) Drain cooling system to the thermostat level or below.

(2) Remove inlet hose and bolts from coolant elbow. Remove elbow. (Fig. 30).

(3) Remove thermostat assembly, and clean sealing surfaces.

INSTALLATION

(1) Install thermostat into the recess in the thermostat housing. Install inlet elbow and tighten the bolts to 12 N·m (133 in. lbs.) (Fig. 30).

(2) Fill cooling system. Refer to Refilling System outlined in this section.

RADIATOR

REMOVAL

(1) Disconnect negative cable from auxiliary jumper terminal. Remove air inlet resonator. Refer to Group 14, Fuel System for procedure.

REMOVAL AND INSTALLATION (Continued)

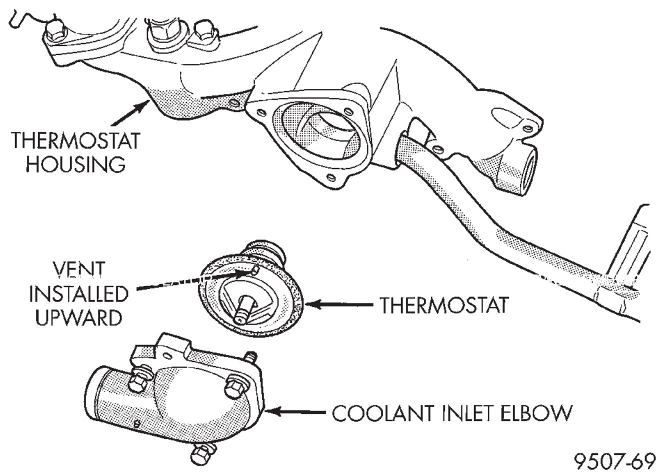


Fig. 30 Thermostat, Housing and Inlet Elbow

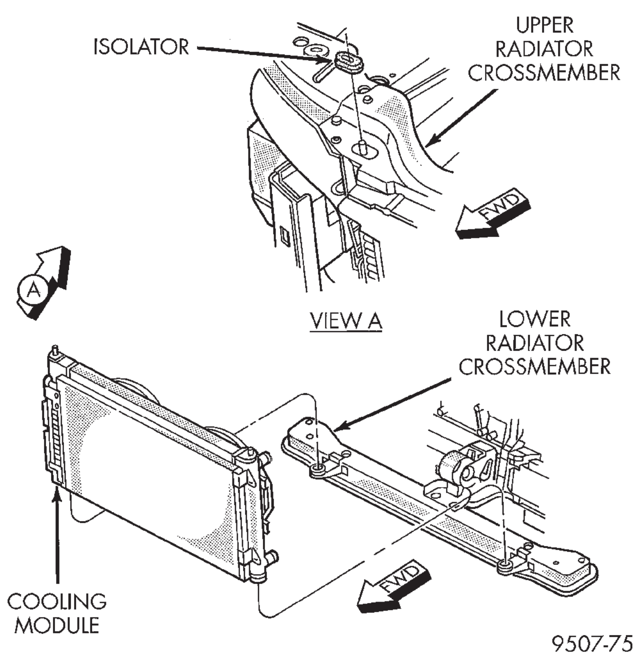


Fig. 31 Cooling Module Mounting

WARNING: DO NOT REMOVE THE CYLINDER BLOCK PLUG OR THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

(2) Drain cooling system. Refer to Draining Cooling System of this section.

(3) Remove upper radiator crossmember (Fig. 31). Refer to Group 23, Body for procedure.

CAUTION: Plastic tanks, while stronger then brass are subject to damage by impact, such as wrenches.

(4) Remove hose clamps and hoses from the radiator.

(5) Disconnect automatic transmission hoses from cooler and plug off.

(6) Disconnect the fan wiring connector.

(7) Disconnect the engine block heater wire, if equipped.

CAUTION: Avoid bending the condenser inlet tube. Care should be taken not to damage radiator or condenser cooling fins or water tubes during removal.

(8) Remove the air conditioning condenser attaching screws located at the front of the radiator (Fig. 32), if equipped. It is not necessary to discharge the air conditioning system to remove radiator.

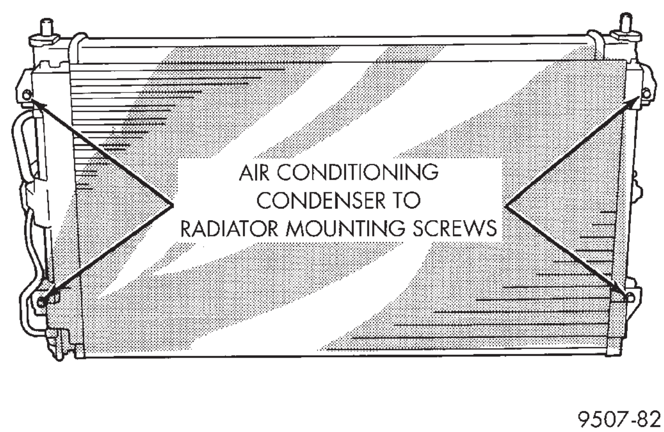


Fig. 32 A/C Condenser to Radiator Mounting Screws

(9) Radiator can now be lifted free from engine compartment. **Care should be taken not to damage radiator cooling fins or water tubes during removal.**

INSTALLATION

(1) Slide radiator and fan module down into position, seat the radiator assembly lower rubber isolators in the mount holes provided.

(2) Attach air conditioning condenser to radiator, if equipped. Tighten mounting screws to 5 N·m (45 in. lbs.).

(3) Connect engine block heater wire, if equipped.

(4) Connect lower radiator hose and clamp. Connect automatic transmission hoses; tighten hose clamps to 2.5 N·m (22 in. lbs.).

(5) Connect fan motor electrical connection.

(6) Install upper radiator hose. Align hose so it does not interfere with the accessory drive belt or engine. Position hose clamp so it will not interfere with the hood liner.

(7) Install upper radiator crossmember. Refer to Group 23, Body for procedure.

REMOVAL AND INSTALLATION (Continued)

(8) Connect negative cable from auxiliary jumper terminal.

(9) Fill cooling system with coolant. Refer to Refilling Cooling System in this group.

(10) Operate engine until it reaches normal operating temperature. Check cooling system and automatic transmission for correct fluid levels.

RADIATOR DRAINCOCK

REMOVAL

CAUTION: Plastic tanks, while stronger then brass are subject to damage by impact, such as wrenches.

(1) Turn the drain cock stem counterclockwise to unscrew the stem. When the stem is unscrewed to the end of the threads, pull the stem (Fig. 33) from the radiator tank.

NOTE: To open draincock on vehicle equipped with 2.5L engine, use a 3/8 inch drive extension 3” long, a 19mm socket with universal.

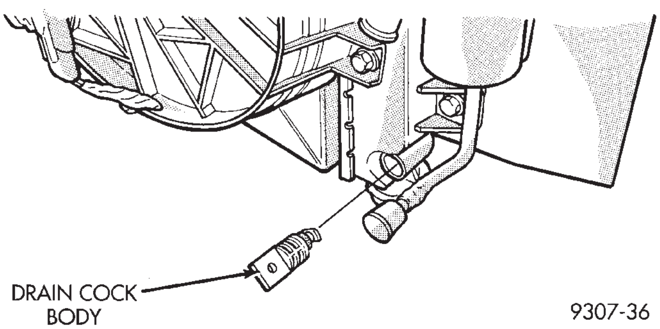


Fig. 33 Draincock—Typical

INSTALLATION

(1) Push the draincock assembly body into the tank opening until it snaps into place.

(2) Tighten the draincock stem by turning clockwise to 2.0-2.7 N·m (18-25 in. lbs.) torque.

RADIATOR FAN, MOTOR AND SHROUD

FAN SERVICE

There are no repairs to be made to the fan. If the fan is warped, cracked, or otherwise damaged, it must be replaced with **only** the recommended part for adequate strength, performance and safety.

(1) To remove fan from motor shaft, bench support the motor and motor shaft, while removing the fan retaining clip, so that the shaft and motor will not be damaged by excessive force. **Surface burr removal may be required to remove fan from motor shaft (Fig. 34).** Do not permit the fan blades to touch the bench.

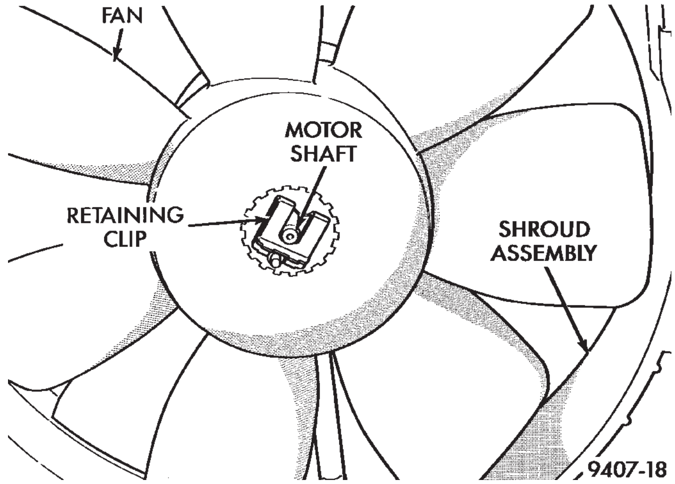
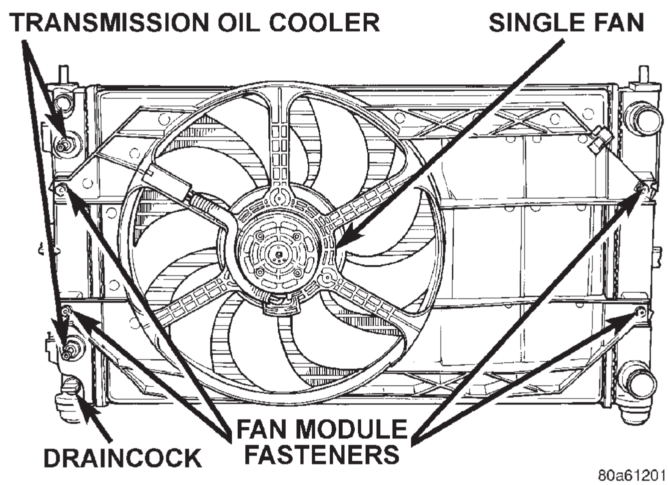


Fig. 34 Radiator Fan—Removal

(2) To install fan on motor shaft, slide the fan over shaft. Support motor and shaft as above while installing fan retaining clip.



Fan Module

FAN SHROUD

All vehicles have fan shrouds to improve fan air flow efficiency.

The shroud supports the electric fan motor and fan. For removal and installation procedures, refer to Radiator Section.

FAN MOTOR SERVICE

(1) Remove the motor fasteners from support. Remove motor from support.

(2) Reverse the above procedure for Installation. Tighten fan motor fasteners to 5 N·m (45 in. lbs.).

INSTALLATION

(1) Install assembly to radiator. Torque shroud to radiator fasteners to 7.5 N·m (65 in. lbs.).

(2) Connect fan motor lead. **For wiring diagrams of fan motor systems Refer to 8W Wiring Diagrams** .

REMOVAL AND INSTALLATION (Continued)

ENGINE BLOCK HEATER

REMOVAL

(1) Drain coolant from radiator and cylinder block. Refer to Cooling System Drain, Clean, Flush and Refill of this section for procedure.

(2) Detach power cord plug from heater.

(3) Loosen screw in center of heater. Remove heater assembly.

INSTALLATION

(1) Thoroughly clean core hole and heater seat (Fig. 35).

(2) Insert heater assembly with electrical connector position at the top of the core hole.

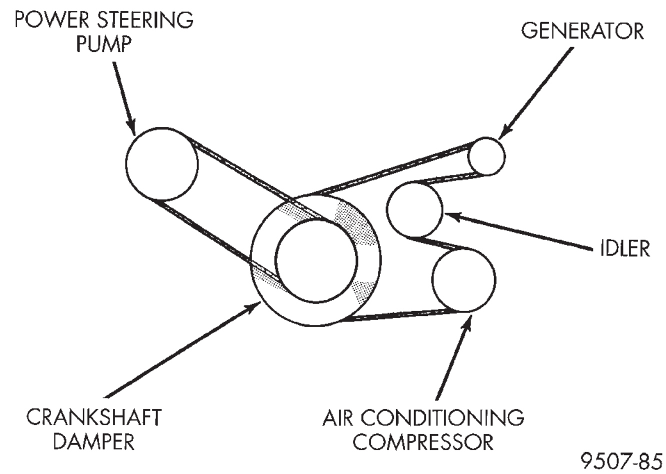
(3) With heater seated, tighten center screw securely to assure a positive seal.

(4) Fill cooling system with coolant to the proper level, vent air, and inspect for leaks. Pressurize system with Radiator Pressure Tool before looking for leaks.

The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged.

GENERATOR, POWER STEERING PUMP AND AIR CONDITIONING COMPRESSOR DRIVE BELT—2.4L ENGINE

AIR CONDITIONING COMPRESSOR AND GENERATOR BELT



Accessory Drive Belt System—All Engines

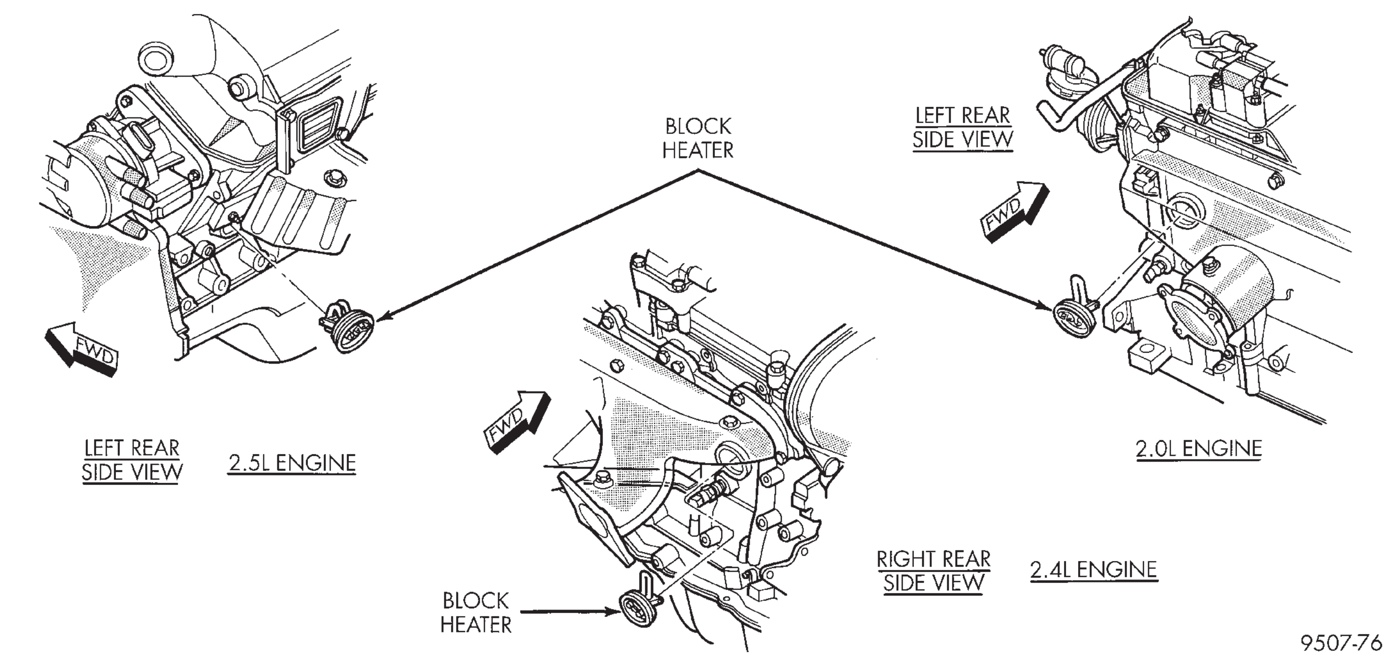


Fig. 35 Engine Block Heaters

REMOVAL AND INSTALLATION (Continued)

(1) Loosen T-Bolt locking nut A and pivot bolt B to remove and install Poly V belt and/or adjust belt tension (Fig. 36).

(2) Tighten adjusting bolt to adjust belt tension to specification shown in belt tension chart (Fig. 40).

(3) Tighten T-Bolt locking nut A and pivot bolt B to 54 N·m (40 ft. lbs.) (Fig. 36).

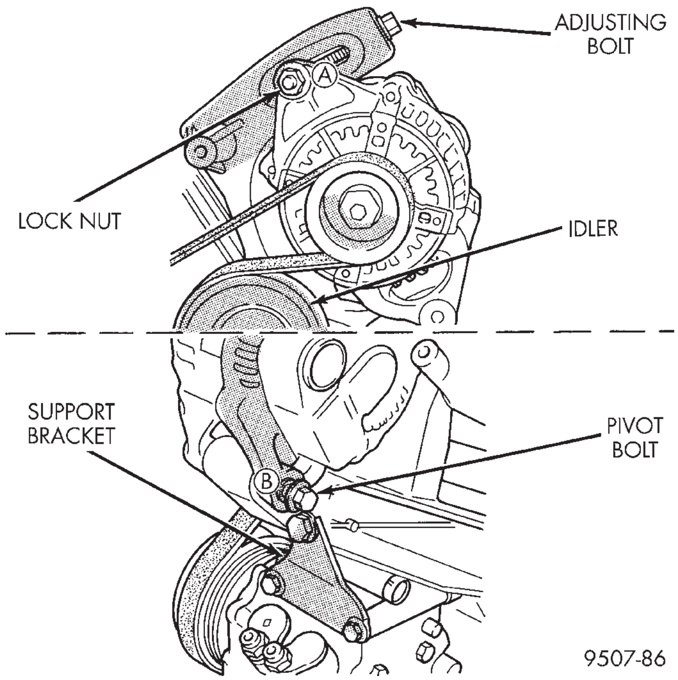


Fig. 36 Air Conditioning Compressor and Generator Belt Adjustment

POWER STEERING PUMP BELT

(1) From the top of the vehicle loosen pivot bolt C.

(2) From under the vehicle loosen locking bolts D and E (Fig. 37).

(3) Install the belt. Adjust belt tension with 1/2 in. breaker bar installed in adjusting bracket. See tension specification in chart (Fig. 40).

(4) Tighten locking bolt D to 54 N·m (40 ft. lbs.) (Fig. 37).

(5) Tighten locking bolt E and the pivot bolt C to 54 N·m (40 ft. lbs.)

ACCESSORY DRIVE BELT—2.5L ENGINE

AIR CONDITIONING BELT AND GENERATOR BELT

To remove and install the air conditioning compressor and generator drive belt, first loosen the idler pulley lock bolt, then turn the adjusting screw to increase or decrease the idler pulley tension (Fig. 38).

To adjust the air conditioning and generator drive belt, loosen the idler pulley bolt (Fig. 38) and adjust belt tension by turning adjusting screw (Fig. 38). Tighten pulley bolt to 54 N·m (40 ft. lbs.) after adjustment.

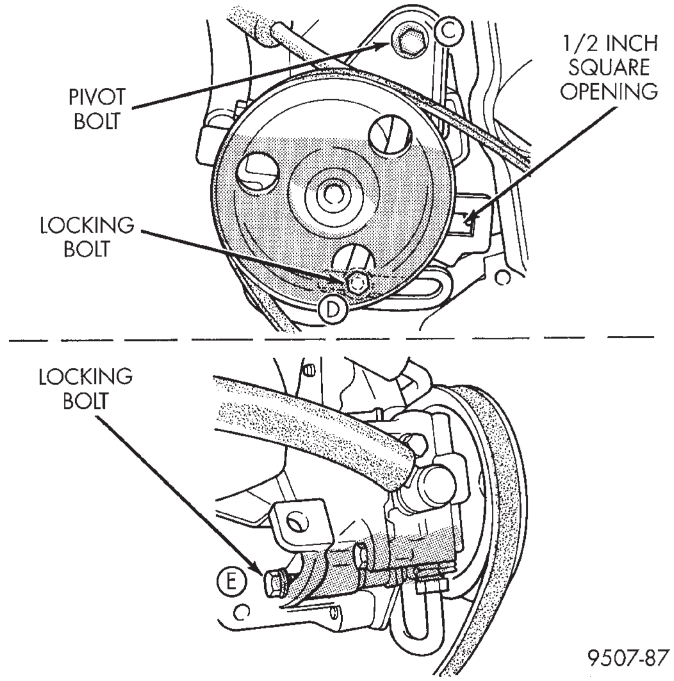


Fig. 37 Power Steering Belt Adjustment

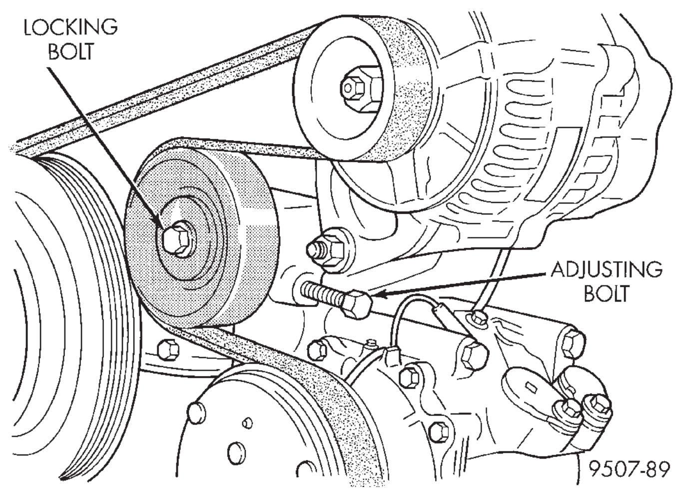


Fig. 38 Air Conditioning Compressor and Generator Belt Idler

REMOVAL AND INSTALLATION (Continued)

POWER STEERING PUMP BELT

(1) From the top of the vehicle loosen pivot bolt (Fig. 39).

(2) From under the vehicle loosen the locking bolts F and G (Fig. 39).

(3) Install the belt. Adjust belt tension with 1/2 in. breaker bar installed in adjusting bracket (Fig. 39). See tension specification in chart (Fig. 40).

(4) Tighten locking bolt G to 28 N·m (250 in. lbs.) (Fig. 39).

(5) Tighten locking bolt F and the pivot bolt to 54 N·m (40 ft. lbs.).

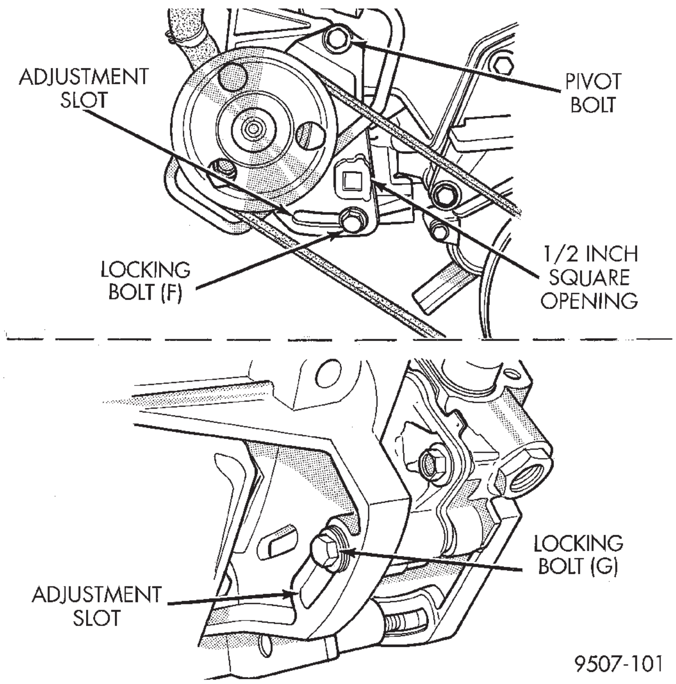


Fig. 39 Power Steering Belt Adjustment

ACCESSORY DRIVE BELT		GAUGE
2.0/2.4L ENGINE		
AIR CONDITIONING COMPRESSOR/ GENERATOR	NEW	150 LB.
	USED	80 LB.
POWER STEERING PUMP	NEW	130 LB.
	USED	80 LB.
2/5L ENGINE		
AIR CONDITIONING COMPRESSOR/ GENERATOR	NEW	150 LB.
	USED	80 LB.
POWER STEERING PUMP	NEW	130 LB.
	USED	80 LB.

Fig. 40 Belt Tension Chart

CLEANING AND INSPECTION

WATER PUMP—2.4L ENGINE

Replace water pump body assembly if it has any of these defects:

- Cracks or damage on the body.
- Coolant leaks from the shaft seal, evident by coolant traces on the pump body.
- Loose or rough turning bearing.
- Impeller rubs either the pump body or the engine block.
- Impeller loose or damaged.
- Sprocket or sprocket flange loose or damaged.

WATER PUMP—2.5L ENGINE

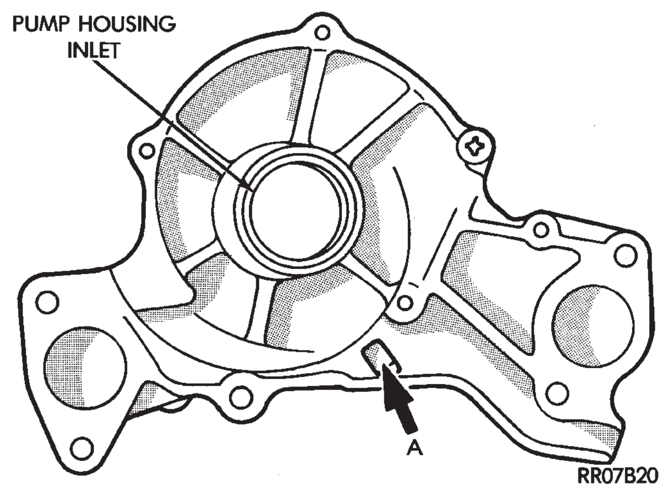


Fig. 41 Water Pump Inspection

Replace the water pump if it has any of the following defects:

- Damage or cracks on the pump body.
- Coolant leaks, if the shaft seal is leaking, evident by traces of coolant leaks from vent hole A in (Fig. 41).
- Impeller rubs inside of pump.
- Excessively loose or rough turning bearing.

ACCESSORY DRIVE BELT INSPECTION

Belt replacement under any or all of the following conditions is required, excessive wear, frayed cords or severe glazing.

Poly-V-Belt system with back drive pulley may develop minor cracks across the ribbed side (due to reverse bending). These minor cracks are considered normal and acceptable. Cracks parallel are not (Fig. 42).

NOTE: Do not use any type of belt dressing or restorer on Poly-V-Belt and V-Belt

CLEANING AND INSPECTION (Continued)

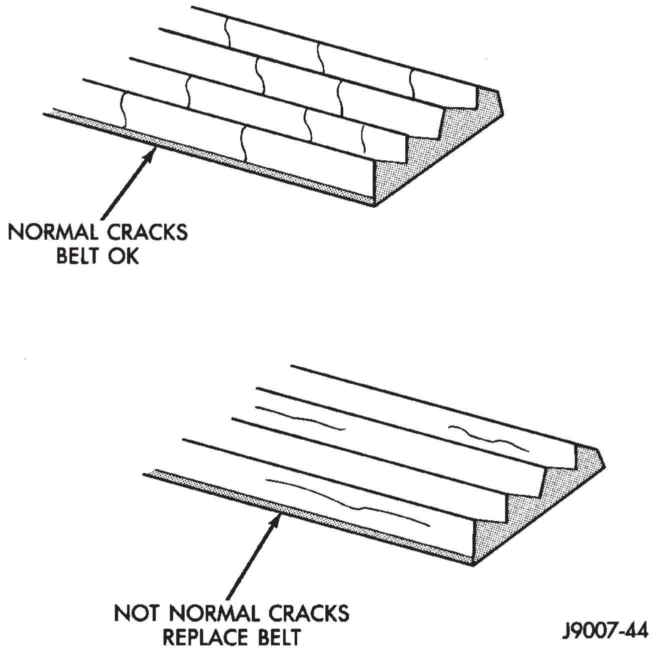


Fig. 42 Drive Belt Wear Pattern

COOLING SYSTEM CAP

Hold the cap in your hand, **right side up** (Fig. 43). The vent valve at the bottom of the cap should open. If the rubber gasket has swollen, preventing the valve from opening, replace the cap.

Hold the cleaned cap in your hand, **upside down.** If any light can be seen between vent valve and the rubber gasket, replace the cap. **Do not use a replacement cap that has a spring to hold the vent shut.**

A replacement cap must be of the type designed for coolant reserve systems. This design ensures coolant return to the radiator.

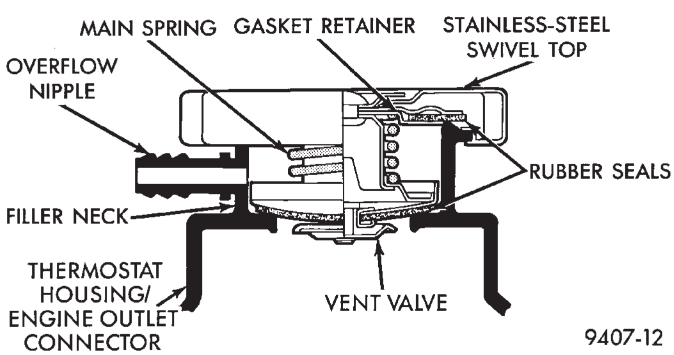


Fig. 43 Cooling System Pressure Cap

CLEANING COOLING SYSTEM

Drain cooling system (see: **Draining Cooling System**) and refill with clean water (see: **Refilling Cooling System**). Run engine with radiator cap installed until upper radiator hose is hot. Stop engine and drain water from system. If water is dirty, fill, run and drain system again until water runs clear.

RADIATOR FLUSHING

Drain cooling system and remove radiator hoses from engine. Install suitable flushing gun in radiator lower hose. Fill radiator with clean water and turn on air in short blasts.

CAUTION: Internal radiator pressure must not exceed 138 kPa (20 psi) as damage to radiator may result. Continue this procedure until water runs clear.

ENGINE FLUSHING

Drain radiator (see: **Draining Cooling System**) and remove hoses from radiator. Remove engine thermostat and reinstall thermostat housing. A gasket may be needed to seal the housing to cylinder head because the seal is part of thermostat. Install suitable flushing gun to thermostat housing hose. Turn on water, and when engine is filled, turn on air, but no higher than 138 kPa (20 psi) in short blasts. Allow engine to fill between blasts of air. Continue this procedure until water runs clean. Install thermostat and fill cooling system. Refer to **Refilling Cooling System**) for procedure.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system, using air pressure in a direction opposite to that of the normal flow of water. This is only necessary with dirty systems and evidence of partial plugging.

CHEMICAL CLEANING

One type of corrosion encountered with aluminum cylinder heads is aluminum hydroxide deposits. Corrosion products are carried to the radiator and deposited when cooled off. They appear as dark grey when wet and white when dry. This corrosion can be removed with a two part cleaner (oxalic acid and neutralizer) available in auto parts outlets. Follow manufacturers directions for use.

ADJUSTMENTS

BELT TENSION GAUGE METHOD

For conventional belts and Poly-V belts, use belt tensioning Special Tool Kit C-4162 to obtain proper belt tension.

Adjust the belt tension for a **New** or **Used** belt as prescribed in the Belt Tension Chart (Fig. 44).

ACCESSORY DRIVE BELT		GAUGE
2.0/2.4L ENGINE		
AIR CONDITIONING COMPRESSOR/ GENERATOR	NEW	150 LB.
	USED	80 LB.
POWER STEERING PUMP	NEW	130 LB.
	USED	80 LB.
2.5L ENGINE		
AIR CONDITIONING COMPRESSOR/ GENERATOR	NEW	150 LB.
	USED	80 LB.
POWER STEERING PUMP	NEW	130 LB.
	USED	80 LB.

Fig. 44 Belt Tension Chart

SPECIFICATIONS

COOLING SYSTEM CAPACITY

ENGINE	2.4L	2.5L
LITERS	8.5*	10.0*
U.S. QUARTS	9.0*	10.5*
* CAPACITY, Includes Heater and Coolant Recovery System		

TORQUE

DESCRIPTION . . . . TORQUE

A/C Condenser to Radiator
Fasteners . . . . 5 N·m (45 in. lbs.)

Thermostat Housing 2.0/2.4L
Bolts . . . . 12.5 N·m (110 in. lbs.)

Thermostat Housing 2.5L
Bolts . . . . 19 N·m (168 in. lbs.)

Water Pump Mounting 2.0/2.4L
Bolts . . . . 12 N·m (105 in. lbs.)

Water Pump Mounting 2.5L
Bolts . . . . 24 N·m (205 in. lbs.)

Water Pump Inlet Tube to Block
Bolts . . . . 12 N·m (105 in. lbs.)

Water Pump Inlet Pipe to Cylinder Head 2.5L
Fasteners . . . . 14 N·m (123 in. lbs.)

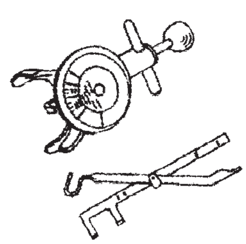
Fan Module to Radiator
Fasteners . . . . 7 N·m (65 in. lbs.)

Fan Motor to Shroud
Fasteners . . . . 5 N·m (45 in. lbs.)

Transmission Oil Cooler Hose
Clamps . . . . 2 N·m (18 in. lbs.)

SPECIAL TOOLS

COOLING



Accessory Drive Belt Tension Gauge C-4162

BATTERY

CONTENTS

GENERAL INFORMATION

INTRODUCTION

The battery stores, stabilizes, and delivers electrical current to operate various electrical systems in the vehicle. The determination of whether a battery is good or bad is made by its ability to accept a charge. It also must supply high-amperage current for a long enough period to be able to start the vehicle. The capability of the battery to store electrical current comes from a chemical reaction. This reaction takes place between the sulfuric acid solution (electrolyte) and the lead +/- plates in each cell of the battery. As the battery discharges, the plates react with the acid from the electrolyte. When the charging system charges the battery, the water is converted to sulfuric acid in the battery. The concentration of acid in the electrolyte is measured as specific gravity using a hydrometer. The specific gravity indicates the battery's state-of-charge. The OE battery is sealed and water cannot be added.

The battery is vented to release gases that are created when the battery is being charged and discharged. The battery top, posts, and terminals should be cleaned when other under hood maintenance is performed.

When the electrolyte level is below the top of the plates, the battery must be replaced. The battery must be completely charged, and the battery side, posts, and cable terminals must be cleaned before diagnostic procedures are performed.

SAFETY PRECAUTIONS AND WARNINGS

WARNING:

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

DO NOT USE OPEN FLAME NEAR BATTERY.

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

WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW THE DISABLED VEHICLE'S BATTERY TO EXCEED 16 VOLTS. PERSONAL INJURY OR DAMAGE TO ELECTRICAL SYSTEM CAN RESULT.

TO PROTECT THE HANDS FROM BATTERY ACID, A SUITABLE PAIR OF HEAVY DUTY RUBBER GLOVES, NOT THE HOUSEHOLD TYPE, SHOULD BE WORN WHEN REMOVING OR SERVICING A BATTERY. SAFETY GLASSES ALSO SHOULD BE WORN.

DESCRIPTION AND OPERATION

BATTERY BLANKET HEATER

The blanket heater is used with Alaska and Canada cold weather packages. The 110 volt A.C. blanket heater is used to improve the battery cold start ability. This vehicle has an electronic voltage regulator which controls battery charging. ONLY CHRYSLER approved battery blanket/block heater combination should be used. It is designed to provide optimum charging system performance in very cold ambient temperatures below -17.8°C (0°F). The addition of an aftermarket battery heater or engine block heater

DESCRIPTION AND OPERATION (Continued)

will adversely affect battery charging and will result in battery discharge or damage.

BATTERY IGNITION OFF DRAW (IOD)

A completely normal vehicle will have a small amount of current drain on the battery with the key out of the ignition. It can range from 15 to 30 milliamperes after all the modules time out. If a vehicle will not be operated for approximately a 20 days, the IOD fuse should be disconnected to eliminate the vehicle electrical drain on the battery. The IOD fuse is located in the Junction Block number 5. Removing this fuse will help prevent the battery from discharging during storage.

CHARGING TIME REQUIRED

WARNING: NEVER EXCEED 20 AMPS WHEN CHARGING A COLD -1°C (30°F) BATTERY. PERSONAL INJURY MAY RESULT.

The time required to charge a battery will vary depending upon the following factors.

SIZE OF BATTERY

A completely discharged large heavy-duty battery may require more recharging time than a completely discharged small capacity battery, refer to (Fig. 1) for charging times.

CHARGING AMPERAGE	5 AMPS	10 AMPS	15 AMPS	20 AMPS
OPEN CIRCUIT VOLTAGE	HOUR CHARGING AT 21°C (77°F)			
12.34 TO 12.52	4.6 HRS.	2.3 HRS.	1.5 HRS.	1.1 HRS.
12.16 TO 12.33	6.9 HRS.	3.4 HRS.	2.3 HRS.	1.8 HRS.
11.97 TO 12.15	9.2 HRS.	4.6 HRS.	3.0 HRS.	2.3 HRS.
10.00 TO 11.96	11.5 HRS.	5.8 HRS.	3.8 HRS.	2.9 HRS.
10.00 TO 0	SEE CHARGING COMPLETELY DISCHARGE BATTERY			

Fig. 1 Battery Charging Time

TEMPERATURE

A longer time will be needed to charge a battery at -18°C (0°F) than at 27°C (80°F). When a fast charger is connected to a cold battery, current accepted by battery will be very low at first. In time, the battery will accept a higher rate as battery temperature warms.

CHARGER CAPACITY

A charger which can supply only five amperes will require a much longer period of charging than a charger that can supply 20 amperes or more.

STATE OF CHARGE

A completely discharged battery requires more charging time than a partially charged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current amperage will be low. As water is converted back to sulfuric acid inside the battery, the current amp rate will rise. Also, the specific gravity of the electrolyte will rise. Refer to Battery Charging procedures.

DIAGNOSIS AND TESTING

BATTERY BLANKET HEATER INSPECTION

(1) Remove battery. Refer to battery removal.

(2) Remove blanket heater from battery (Fig. 2).

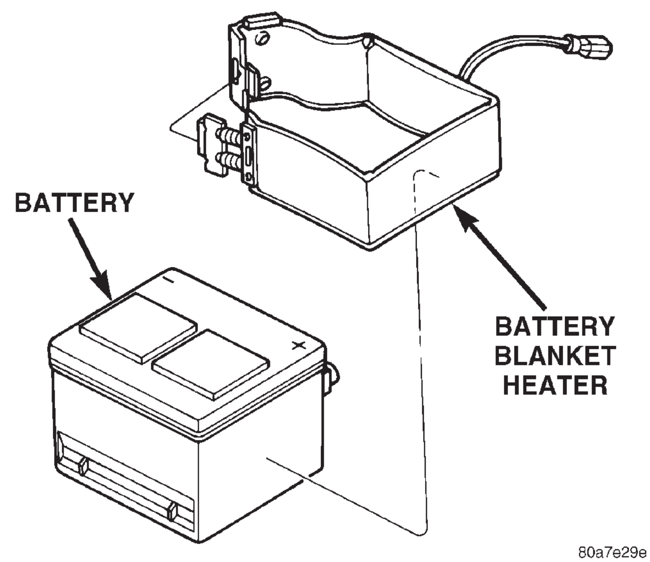


Fig. 2 Battery Blanket Heater

WARNING: SERIOUS PERSONAL INJURY AND/OR ELECTRICAL BURNS COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

(3) Clean battery blanket heater vinyl cover with a baking soda solution and wipe dry.

(4) Inspect blanket heater for cuts, abrasion or other damage. If heater is damaged replace. If OK, go to Step 5.

(5) Lay heater flat and connect heater to vehicle's connector.

(6) Connect the power cord to a 110 volt AC source for 3 minutes MAXIMUM.

(7) Disconnect voltage source from the power cord.

(8) Immediately feel the heater cover on the inside it should be warm to the touch. If warm, heater is OK. If not OK, go to Step 9.

(9) Using an Ohmmeter, connect a lead across the two terminals.

DIAGNOSIS AND TESTING (Continued)

(10) Check for a resistance value of 220 to 280 Ohms. If within the resistance value range the blanket is OK. If not OK, replace blanket.

(11) Check extension cord to vehicle for voltage. If extension cord is OK, go to Step 12. If not OK, repair as necessary.

(12) Ensure heater receives voltage from extension cord and power cord. If OK, replace heater. If not OK, repair as necessary.

BATTERY DISCHARGING

CAUSES OF BATTERY DISCHARGING

It is normal to have up to a 30 milliamperes continuous electrical draw ON the battery. This draw will take place with the ignition in the OFF position, and the courtesy, dome, storage compartments, and engine compartment lights OFF. The continuous draw is due to various electronic features or accessories that require electrical current with the ignition OFF to function properly. When a vehicle is not used over an extended period of approximately 20 days the IOD fuse should be disconnected. The IOD fuse is located in the Power Distribution Center and disconnection of this fuse will help prevent the battery from discharge during storage. Refer to Battery Diagnosis and Testing Chart and to the proper procedures.

ABNORMAL BATTERY DISCHARGING

- Corroded battery posts, cables or terminals.
- Loose or worn generator drive belt.
- Electrical loads that exceed the output of the charging system due to equipment or accessories installed after delivery.
- Slow driving speeds in heavy traffic conditions or prolonged idling with high-amperage electrical systems in use.
- Defective electrical circuit or component causing excess Ignition Off Draw (IOD). Refer to Ignition Off Draw (IOD).
- Defective charging system.
- Defective battery.

BATTERY IGNITION OFF DRAW TESTS

High battery current draw with the ignition switch in the OFF position will discharge a battery. After a dead battery is serviced the vehicle Ignition Off Draw (IOD) should be checked. To determine if a high current draw condition exists then check the vehicle with a multi-meter on the Milliampere Scale.

(1) Verify all electrical accessories are OFF:

- Remove key from ignition switch
- Turn off all lamps
- Trunk compartment, ensure that the trunk compartment lamp is off when the trunk lid is closed
- Engine compartment, ensure that the hood lamp is off when hood is closed

BATTERY DIAGNOSIS AND TESTING

STEPS	POSSIBLE CAUSE	CORRECTION
VISUAL INSPECTION Check for possible damage to battery and clean battery.	(1) Loose battery post, Cracked battery cover or case, Leaks or Any other physical (2) Battery OK.	(1) Replace Battery (2) Check state of charge. Perform Battery Open Circuit Voltage Test.
BATTERY OPEN CIRCUIT VOLTAGE TEST	(1) Battery is above 12.40 Volts (2) Battery is below 12.40 Volts.	(1) Perform the Battery Load Test. (2) Perform Battery Charging procedure
BATTERY CHARGED	(1) Battery accepted Charge. (2) Battery will not accept charge	(1) Perform Battery Open Circuit Voltage Test. (2) Perform Charging a Completely Discharged Battery procedure.
BATTERY LOAD TEST	(1) Acceptable minimum voltage. (2) Unacceptable minimum voltage	(1) Battery is OK to put in use, perform Battery Ignition Off Draw Test. (2) Replace Battery and perform Battery Ignition Off Draw Test.
CHARGING A COMPLETELY DISCHARGED BATTERY	(1) Battery accepted charge. (2) Battery will not accept charge.	(1)Perform Battery Open Circuit Voltage Test. (2) Replace Battery.
IGNITION OFF DRAW TEST	(1) IOD is 15-30 Milliamperes. (2) IOD Exceeds 30 Milliamperes.	(1) Vehicle is normal. (2) Eliminate excess IOD draw.

DIAGNOSIS AND TESTING (Continued)

• Glove box, ensure that the glove box compartment lamp is off when the door is closed
• All doors are closed
• Sun visor vanity lamps are OFF
• Allow the Illuminated Entry System to time out in approximately 30 seconds, if equipped.

(2) Disconnect battery negative remote cable (Fig. 3).

CAUTION: Always disconnect the milliampere meter before opening a door.

(3) Using an multi-meter, that has least a milliampere range of 200 mA. Set meter to the highest mA range.
(a) Connect it between the battery negative remote terminal and the battery negative remote stud (Fig. 4).
(b) If the reading is less than 30 milliamperes, system is OK.
(c) If the reading is more than 30 milliamperes, go to High Milliampere Reading.

(4) Each time the milliampere meter is disconnected and connected, all electronic timer functions will be activated for approximately one minute.

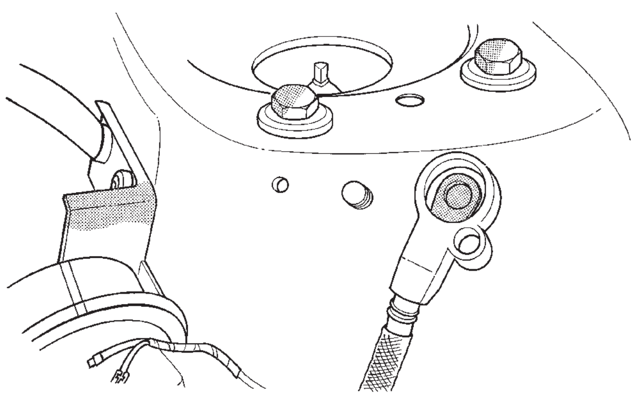


Fig. 3 Disconnect Battery Cable at Shock Tower

HIGH MILLIAMPERE READING

There is either a short circuit or a fault in an electronic module. There are seven fuses in the Power Distribution Center and Junction Block that feed the modules with ignition off draw.

Ensure that all electronic timer functions are timed out, before testing any of the components.

IN THE POWER DISTRIBUTION CENTER

• Automatic Transmission Control Module (20 Amp)
• Power Control Module (20 Amp)
• Hazard Flasher (20 Amp)

IN THE JUNCTION BLOCK:

• Canadian Daytime Running Lamps (DRL) (20 Amp)

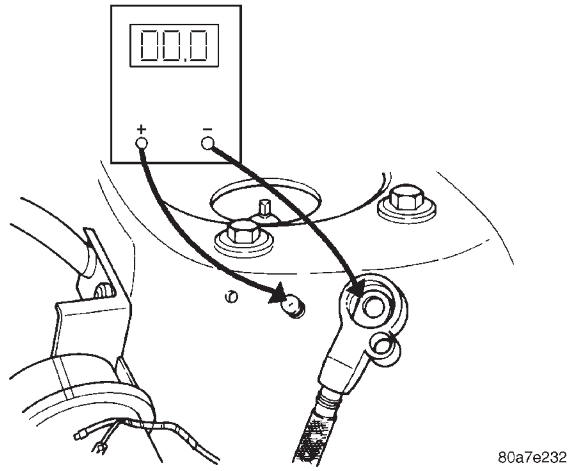


Fig. 4 Ignition Off Draw Test

• Optional Audio Power Amplifier (20 Amp)
• Interior lamps (10 Amp)
• Instrument Cluster (20 Amp)

CAUTION: Always disconnect the milliampere meter before opening a door.

(1) Remove all seven fuses. By removing these fuses all ignition off draw from the vehicle electronics will be disconnected. There should be no reading on the milliampere meter. If no reading go to Step 2. If a reading there is a short circuit. Refer to Group 8W, Wiring Diagrams.

(2) Install the Daytime Running Lamp (DRL) fuse, if equipped. If meter has no reading go to Step 4. If there is a reading go to Step 3.

(3) Disconnect the DRL module.
(a) If meter has no reading, replace the DRL module.
(b) If meter has a reading, there is a short circuit in the L25 circuit. Refer to Group 8W, Wiring Diagrams.

(4) Install the Power Amplifier fuse. If meter has no reading go to Step 6. If there is a reading go to Step 5.

(5) Disconnect the Power Amplifier.
(a) If meter has no reading, replace the Power Amplifier.
(b) If meter has a reading, there is a short circuit in the F30 circuit. Refer to Group 8W, Wiring Diagrams.

(6) Install the Interior Lamp fuse. If meter has no reading go to Step 7. If there is a reading go to Step 1.
(a) Disconnect the Radio.
(I) If meter has no reading, replace the Radio.
(II) If meter has a reading, go to Step 2.
(b) Disconnect the Power Sun Roof Module by disconnecting the headliner connector. The connec-

DIAGNOSIS AND TESTING (Continued)

tor is located on the back of Junction Block below the fuses.

(I) If meter has no reading, replace the Sun Roof Module.

(II) If meter has a reading, go to Step 3.

(c) Disconnect Body Control Module.

(I) If meter has no reading, replace the Body Control Module.

(II) If test lamp does not go out, there is a short circuit in the M1 circuit. Refer to Group 8W, Wiring Diagrams.

(7) Install the Automatic Transmission Control Module fuse. If meter has no reading go to Step 9. If there is a reading go to Step 8.

(8) Disconnect the Automatic Transmission Control Module.

(a) If meter has no reading, replace the Automatic Transmission Control Module.

(b) If meter has a reading, there is a short circuit in the A14 circuit. Refer to Group 8W, Wiring Diagrams.

(9) Install the Powertrain Control Module fuse. If meter has no reading go to Step 11. If there is a reading go to Step 10.

(10) Disconnect the Powertrain Control Module.

(a) If meter has no reading, replace the Powertrain Control Module

(b) If meter has a reading, there is a short circuit in the A14 circuit. Refer to Group 8W, Wiring Diagrams.

(11) Install the Instrument Cluster fuse. If meter has no reading go to Step 13. If there is a reading go to Step 12.

(12) Disconnect the Instrument Cluster.

(a) If meter has no reading, replace the Instrument Cluster.

(b) If meter has a reading, there is a short circuit in the F33 circuit. Refer to Group 8W, Wiring Diagrams.

(13) Install the Hazard Flasher fuse. If meter has no reading there is no Ignition Off Draw. If there is a reading go to Step 14.

(14) Disconnect the Hazard Flasher.

(a) If meter has no reading, replace the Hazard Flasher.

(b) If meter has a reading, there is a short circuit in the A15 circuit. Refer to Group 8W, Wiring Diagrams.

BATTERY LOAD TEST

A fully charged battery must have cranking capacity. To provide the starter motor and ignition system enough power to start the engine over a broad range of ambient temperatures. A battery load test will verify the actual cranking capability of the battery.

WARNING: IF BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR EXCESSIVELY LOW ELECTROLYTE LEVEL, DO NOT TEST. ACID BURNS OR AN EXPLOSIVE CONDITION MAY RESULT.

(1) Disconnect and isolate the battery negative remote cable first. Then disconnect and isolate the positive Jump Start cable.

(2) Use a suitable Volt/Ammeter/Load tester connected between remote battery terminals (Fig. 5) and (Fig. 6). Check the open circuit voltage of the battery. Voltage should be equal to or greater than 12.4 volts. If below 12.4 volts charge battery, perform the same test at the battery. Remove both battery cables the negative cable first. If the voltage is still below 12.4 perform Battery Charging procedures.

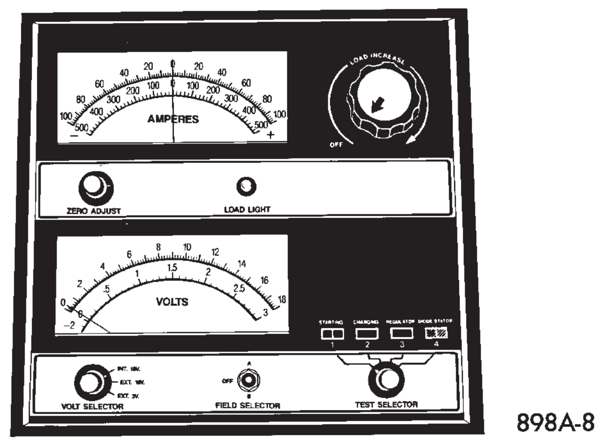


Fig. 5 Volt-Ammeter-Load Tester

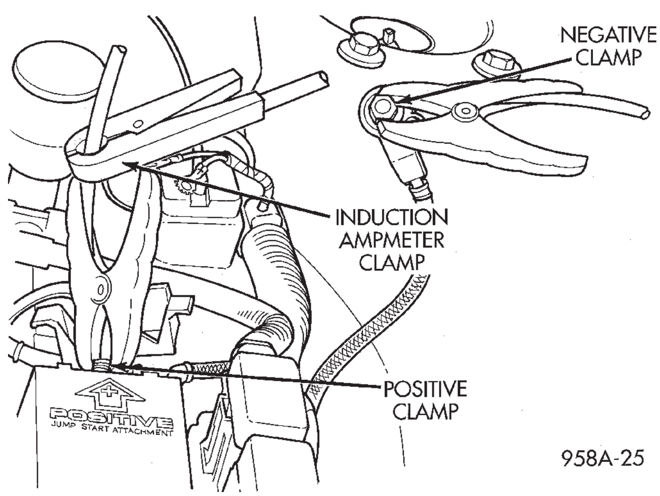


Fig. 6 Volt-Ammeter-Load Tester Connections

(3) Rotate the load control knob of the carbon pile rheostat to apply a 260 amp load. Apply this load for 15 seconds to remove the surface charge from the battery, and return the control knob to off (Fig. 7).

(4) Allow the battery to stabilize for two minutes, and then verify open circuit voltage.

DIAGNOSIS AND TESTING (Continued)

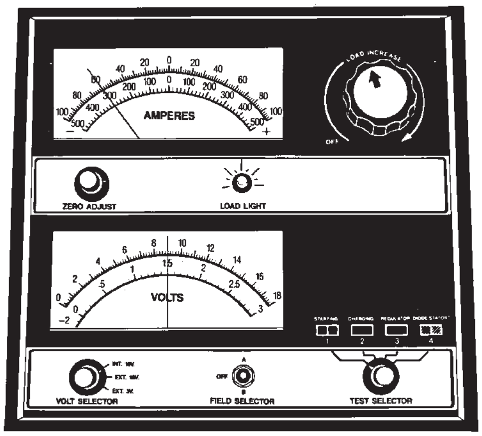


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Fig. 7 Remove Surface Charge from Battery

(5) Rotate the load control knob on the tester to maintain 50% (260) of the battery cold crank rating for a minimum 15 seconds (Fig. 8).

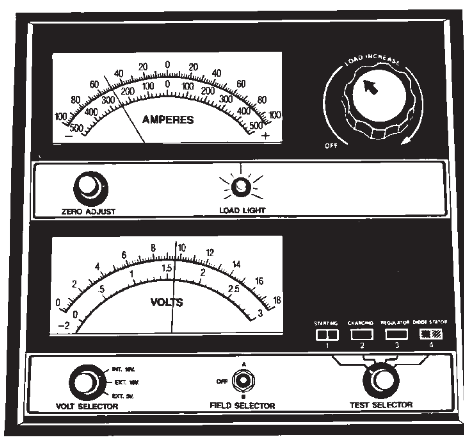

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Fig. 8 Load 50% Cold Crank Rating

(6) After 15 seconds, record the loaded voltage reading and return the load control to off.

(7) Voltage drop will vary according to battery temperature at the time of the load test. Battery temperature can be estimated by the temperature of exposure over the preceding several hours. If the battery has been charged, boosted, or loaded a few minutes prior to the test, the battery would be slightly warmer. Refer to Battery Load Test Temperatures Chart for proper loaded voltage reading.

(8) If battery passes load test, it is in good condition and further tests are not necessary. If it fails load test, it should be replaced.

BATTERY OPEN CIRCUIT VOLTAGE TEST

An open circuit voltage no load test shows the state of charge of a battery and whether it is ready for a load test at 50 percent of the battery's cold crank rating. Refer to Battery Load Test. If a battery has open circuit voltage reading of 12.4 volts or greater, and will not pass the load test, replace the battery because it is defective. To test open circuit voltage, perform the following operation.

Battery Load Test Temperatures

Minimum Voltage	Temperature	
	°F	°C
9.6 volts	70° and above	21° and above
9.5 volts	60°	16°
9.4 volts	50°	10°
9.3 volts	40°	4°
9.1 volts	30°	-1°
8.9 volts	20°	-7°
8.7 volts	10°	-12°
8.5 volts	0°	-18°

(1) Remove both battery cables, negative cable first. Connect a Volt/Ammeter/Load tester (Fig. 9) to the battery posts (Fig. 10).

(2) Allow the battery to stabilize for 2 minutes, and then verify the open circuit voltage (Fig. 11).

(3) This voltage reading will approximate the state of charge of the battery. It will not reveal battery cranking capacity.

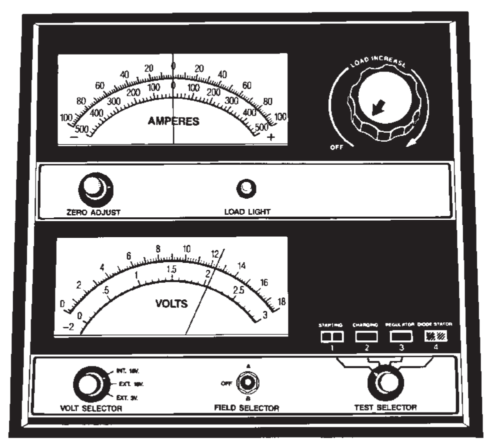

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Fig. 9 Testing Open Circuit Voltage

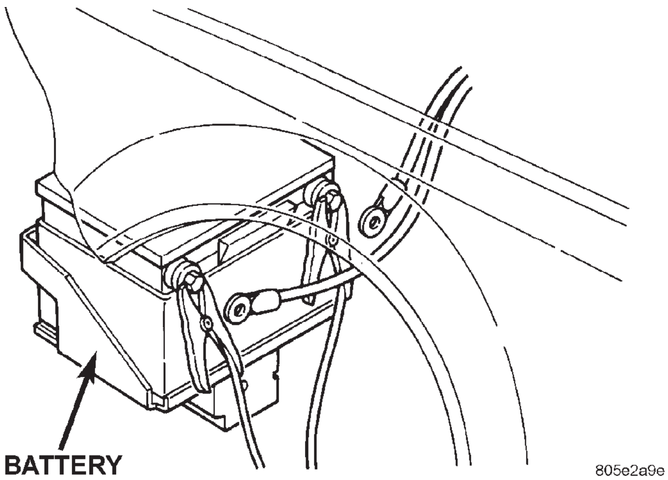


Fig. 10 Volt-Ammeter Load Tester Connections

Open Circuit Volts	Percent Charge
11.7 volts or less	0%
12.0	25%
12.2	50%
12.4	75%
12.6 or more	100%

Fig. 11 Battery Open Circuit Voltage

SERVICE PROCEDURES

BATTERY CHARGING

A battery is considered fully charged when it will meet all the following requirements.

- It has an open circuit voltage charge of at least 12.4 volts (Fig. 11).
- It passes the 15 second load test, refer to Battery Load Test Temperatures Chart above.

WARNING: DO NOT ASSIST BOOST OR CHARGE A FROZEN BATTERY.

EXPLOSIVE GASES FORM OVER THE BATTERY, DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR BATTERY.

CAUTION: Disconnect the battery NEGATIVE cable first (Fig. 3) before charging battery to avoid damage to electrical systems. Do not exceed 16.0 volts while charging battery. Refer to the instructions supplied with charging equipment

Battery electrolyte will bubble inside of battery case while being charged properly. If the electrolyte boils violently, or is discharged from the vent holes while charging, immediately reduce charging rate or turn off charger. Evaluate battery condition. Battery damage may occur if charging is excessive.

Some battery chargers are equipped with polarity sensing devices to protect the charger or battery from being damaged if improperly connected. If the battery state of charge is too low for the polarity sensor to detect, the sensor must be bypassed for charger to operate. Refer to operating instructions provided with battery charger being used.

CAUTION: Do not overcharge Battery refer to Charging Rate Chart.

After the battery has been charged to 12.4 volts or greater, perform a load test to determine cranking capacity. Refer to Battery Load Test in this Group. If the battery will endure a load test, return the battery to use. If battery will not endure a load test, it must be replaced. Properly clean and inspect battery hold downs, tray, terminals, cables, posts, and top before completing service.

CHARGING COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless procedure is properly followed, a good battery may be needlessly replaced (Fig. 12).

Voltage	Hours
16.0 volts or more	up to 4 hrs.
14.0 to 15.9 volts	up to 8 hrs.
13.9 volts or less	up to 16 hrs.

Fig. 12 Charging Rate

(1) Measure the voltage at remote cable terminals with a voltmeter accurate to 1/10 volt (Fig. 13). If below 10 volts, charge current will be low, and it could take some time before it accepts a current in excess of a few milliamperes. Such low current may not be detectable on amp meters built into many chargers.

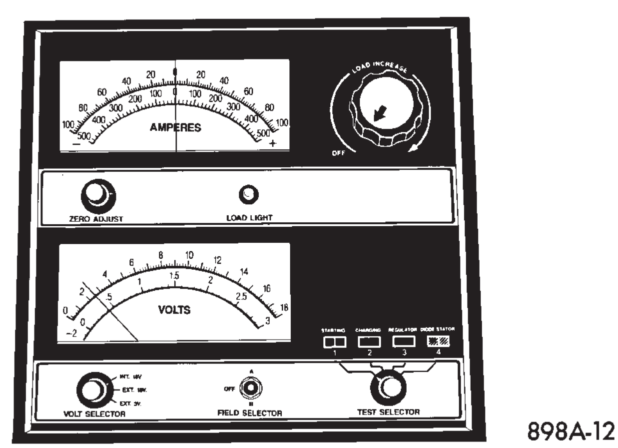


Fig. 13 Voltmeter Accurate to 1/10 Volt (Connected)

SERVICE PROCEDURES (Continued)

(2) Connect charger leads to the remote cables. Some chargers feature polarity protection circuitry that prevents operation unless charger is connected to battery posts correctly. A completely discharged battery may not have enough voltage to activate this circuitry. This may happen even though the leads are connected properly.

(3) Battery chargers vary in the amount of voltage and current they provide. For the time required for the battery to accept measurable charger current at various voltages, refer to (Fig. 12). If charge current is still not measurable after charging times, the battery should be replaced. If charge current is measurable during charging time, the battery may be good, and charging should be completed in the normal manner.

VISUAL INSPECTION AND SERVICE

CAUTION: Do not allow baking soda solution to enter vent holes, as damage to battery can result.

(1) Clean battery with a solution of warm water and baking soda. Apply solution with a bristle brush and allow to soak until acid deposits loosen (Fig. 14). Rinse with clear water and blot dry with paper toweling. Dispose of toweling in a safe manner. Refer to the WARNINGS on top of battery.

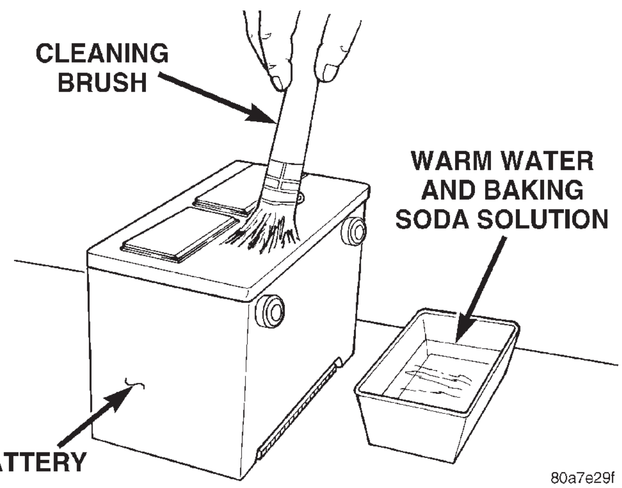


Fig. 14 Cleaning Battery

(2) Inspect battery case and cover for cracks or leakage. If leakage is present battery must be replaced.

(3) Inspect battery tray for damage caused by acid from battery. If acid damage is present, it will be necessary to clean area with:

- Baking soda solution
- Wire brush
- Scraper

(4) Clean battery terminals with baking soda and suitable cleaning tool.

(5) Inspect cables for damage and broken terminals. Replace damaged, frayed cables and broken terminal.

(6) Inspect battery for proper or damaged hold down ledge.

REMOVAL AND INSTALLATION

BATTERY

REMOVAL

Battery is accessible without removing the tire and wheel.

(1) Make sure ignition switch is in OFF UNLOCKED position and all accessories are OFF.

WARNING: NEVER GET UNDER A LIFTED VEHICLE IF NOT SUPPORTED PROPERLY ON SAFETY STANDS.

(2) Disconnect battery negative cable from remote negative terminal on shock tower (Fig. 3).

(3) Turn steering wheel to the full left position.

(4) Twist the four plastic screws one quarter turn to release shield.

(5) Remove shield.

(6) Disconnect battery blanket heater cord, if equipped (Fig. 15).

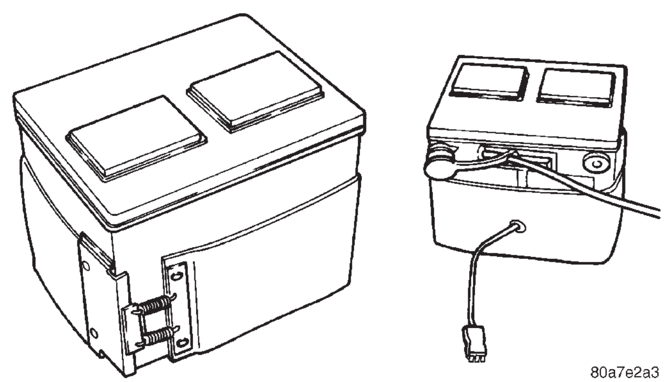


Fig. 15 Battery with Blanket Heater

(7) Remove battery negative cable followed by the battery positive cable.

(8) Remove bolt attaching the battery strap to the battery hold down bracket. Remove hold down bracket bolt.

(9) Slide battery to rear of tray and lift over lip. Use care not to tip battery so that the acid will not spill out.

(10) Remove battery.

(11) Remove battery blanket heater if equipped (Fig. 15).

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

For installation, reverse the above procedures. Tighten battery cables to 17 N·m (150 in. lbs.) torque.

BATTERY TRAY

REMOVAL

(1) Remove battery, refer to Battery Removal procedures above.
(2) Remove the battery tray attaching bolts (Fig. 16).
(3) Remove battery tray.
(4) Remove battery strap.

INSTALLATION

For installation, reverse the above procedures.

SPECIFICATIONS

BATTERY SPECIFICATIONS

Load Test (Amps)	Cold Cranking Rating @ -18°C (0°F)	Reserve Capacity
260 Amp	510 Amp	110 Minutes

COLD CRANK RATING

The current battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 volts or greater at –18° C (0° F).

RESERVE CAPACITY RATING

The length of time a battery can deliver 25 amps and maintain a minimum terminal voltage of 10.5 volts at 27°C (80°F).

TORQUE

DESCRIPTION **TORQUE**
Battery Hold Down Bolt
Clamp Bolt . . . . 14 N·m (160 in. lbs.)

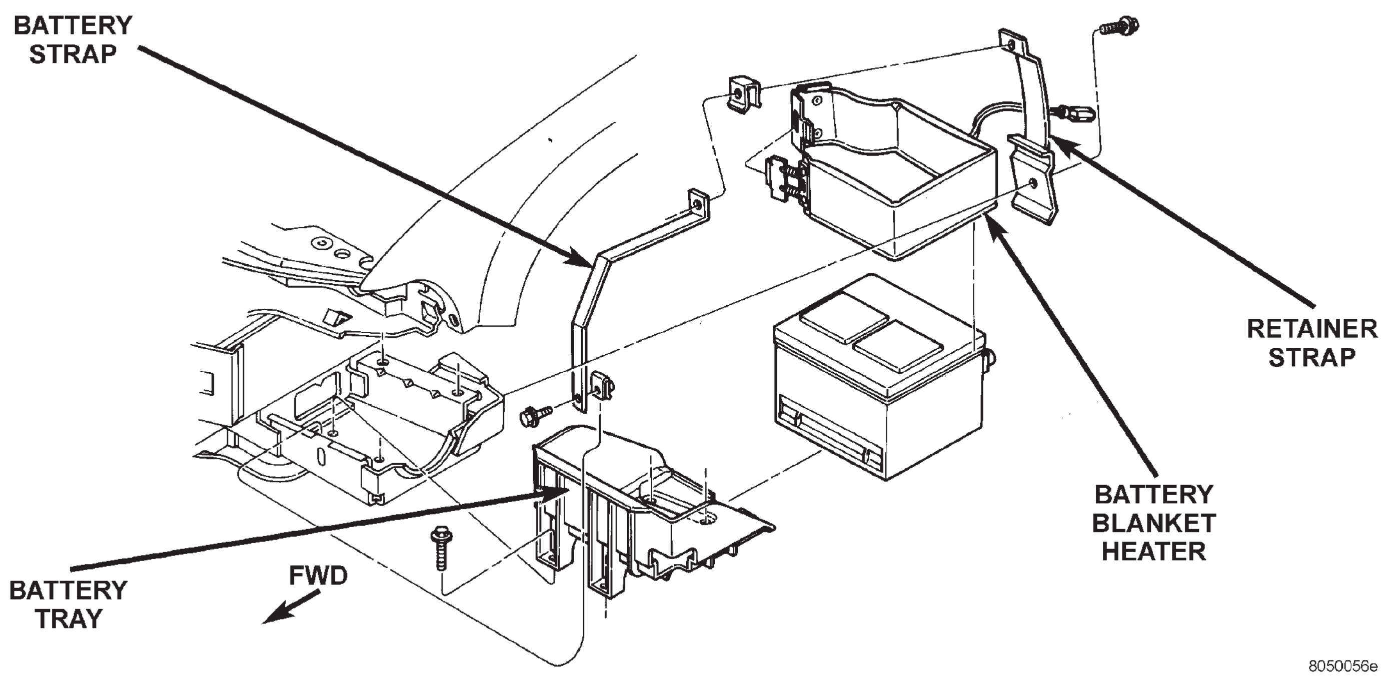


Fig. 16 Battery Tray Removal

STARTING

CONTENTS

GENERAL INFORMATION

GENERAL INFORMATION

The starting system (Fig. 1) has:

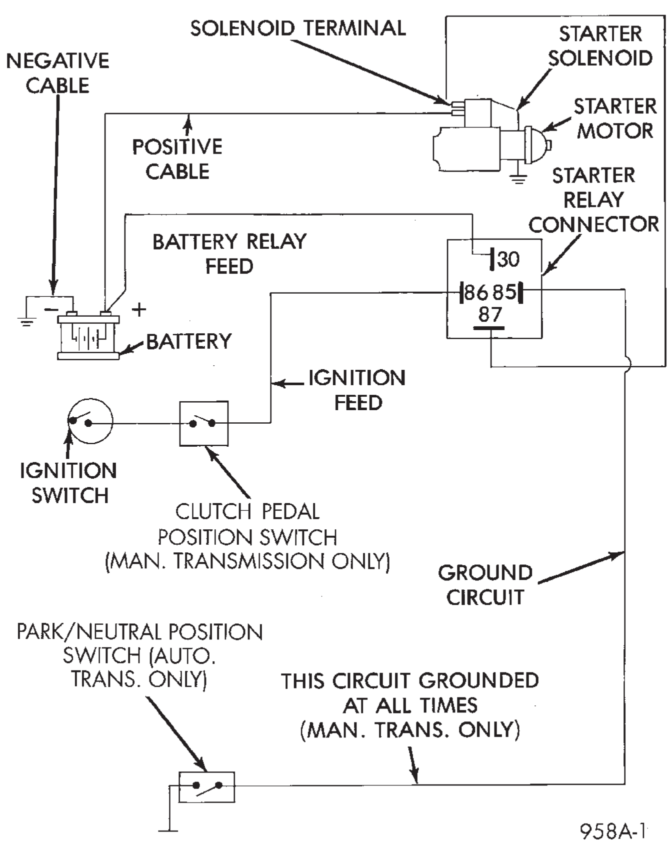


Fig. 1 Starting System Components

- Ignition switch
- Starter relay
- Transmission range sensor, or Park/Neutral Position switch with automatic transmissions
- Clutch Pedal Position Switch with manual transmissions
- Wiring harness
- Battery
- Starter motor with an integral solenoid

These components form two separate circuits. A high amperage circuit that feeds the starter motor up to 300+ amps, and a control circuit that operates on less than 20 amps.

DESCRIPTION AND OPERATION

BOSCH AND MELCO STARTERS

The Bosch and Melco are permanent magnet starter motors. A planetary gear train transmits power between starter motor and pinion shaft. The fields have six permanent magnets. The Bosch is used on 2.0L engines and Melco is used on 2.5L engines.

NIPPONDENSO STARTER

The Nippondenso is a reduction gear-field coil starter motor and is available on 2.4L engine.

SUPPLY CIRCUIT AND CONTROL CIRCUIT

The starter system consists of two separate circuits:

- A high amperage supply to feed the starter motor.
- A low amperage circuit to control the starter solenoid.

DIAGNOSIS AND TESTING

CONTROL CIRCUIT TEST

The starter control circuit has:

- Starter solenoid
- Starter relay
- Transmission range sensor, or Park/Neutral Position switch with automatic transmissions
- Clutch Pedal Position Switch with manual transmissions
- Ignition switch
- Battery
- All related wiring and connections

CAUTION: Before performing any starter tests, the ignition and fuel systems must be disabled.

- To disable ignition and fuel systems, disconnect the Automatic Shutdown Relay (ASD). The ASD relay is located in the in the Power Distribution Center (PDC). Refer to the PDC cover for the proper relay location.

STARTER SOLENOID

WARNING: CHECK TO ENSURE THAT THE TRANSMISSION IS IN THE PARK POSITION WITH THE PARKING BRAKE APPLIED

(1) Verify battery condition. Battery must be in good condition with a full charge before performing any starter tests. Refer to Battery Tests.

(2) Perform Starter Solenoid test BEFORE performing the starter relay test.

(3) Raise the vehicle.

(4) Perform a visual inspection of the starter/starter solenoid for corrosion, loose connections or faulty wiring.

(5) Lower the vehicle.

(6) Locate and remove the starter relay from the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location.

(7) Connect a remote starter switch or a jumper wire between the remote battery positive post and terminal 87 of the starter relay connector.

(a) If engine cranks, starter/starter solenoid is good. Go to the Starter Relay Test.

(b) If engine does not or solenoid chatters, check wiring and connectors from starter relay to starter solenoid for loose or corroded connections. Particularly at starter terminals.

(c) Repeat test. If engine still fails to crank properly, trouble is within starter or starter mounted solenoid, and replace starter.

STARTER RELAY

WARNING: CHECK TO ENSURE THAT THE TRANSMISSION IS IN THE PARK POSITION/NEUTRAL WITH THE PARKING BRAKE APPLIED

RELAY TEST

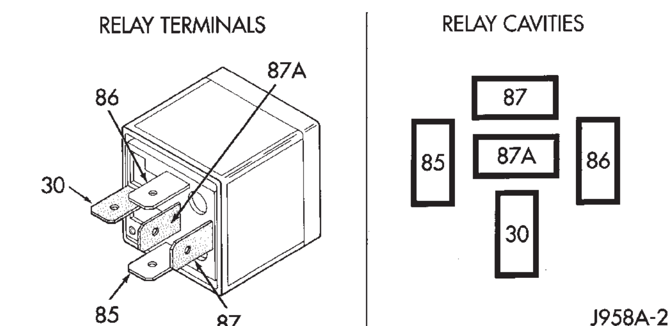
The starter relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

Remove the starter relay from the PDC as described in this group to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery B+ lead to terminals 86 and a ground lead to terminal 85 to energize the relay. The relay should click. Also test for continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, refer to Relay Circuit Test procedure. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Starter Relay

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the PDC fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the starter solenoid field coils. There should be

DIAGNOSIS AND TESTING (Continued)

continuity between the cavity for relay terminal 87 and the starter solenoid terminal at all times. If OK, go to Step 4. If not OK, repair the open circuit to the starter solenoid as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is energized when the ignition switch is held in the Start position. On vehicles with a manual transmission, the clutch pedal must be fully depressed for this test. Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the Start position, and no voltage when the ignition switch is released to the On position. If OK, go to Step 5. If not OK with an automatic transmission, check for an open or short circuit to the ignition switch and repair, if required. If the circuit to the ignition switch is OK, see the Ignition Switch Test procedure in this group. If not OK with a manual transmission, check the circuit between the relay and the clutch pedal position switch for an open or a short. If the circuit is OK, see the Clutch Pedal Position Switch Test procedure in this group.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. On vehicles with an automatic transmission, it is grounded through the park/neutral position switch only when the gearshift selector lever is in the Park or Neutral positions. On vehicles with a manual transmission, it is grounded at all times. Check for continuity to ground at the cavity for relay terminal 85. If not OK with an automatic transmission, check for an open or short circuit to the park/neutral position switch and repair, if required. If the circuit is OK, see the Park/Neutral Position Switch Test procedure in this group. If not OK with a manual transmission, repair the circuit to ground as required.

SAFETY SWITCHES

For diagnostics,

• Clutch Pedal Position Switch, refer to Group 6, Clutch.

• Park/Neutral Position Switch, refer to Group 21, Transaxle

IGNITION SWITCH

After testing starter solenoid and relay, test ignition switch and wiring. Refer to Group 8D, Ignition Systems or Group 8W, Wiring Diagrams. Check all wiring for opens or shorts, and all connectors for being loose or corroded.

BATTERY

Refer to Group 8A, Battery for proper procedures.

ALL RELATED WIRING AND CONNECTORS

Refer to Group 8W, Wiring Diagrams,

FEED CIRCUIT RESISTANCE TEST

Before proceeding with this operation, review Starting System Test. The following operation will require a voltmeter, accurate to one tenth of a volt.

CAUTION: Before Performing any starter test, the Ignition and fuel systems must be disabled.

(1) To disable ignition and fuel systems disconnect the Automatic Shutdown Relay (ASD) in the Power Distribution Center (PDC).

(2) Check that all wiring harnesses and components properly connected. Connect negative lead of voltmeter to battery negative terminal, and positive lead to engine block near the battery cable attaching point (Fig. 2). Rotate and hold the ignition switch in the START position. If voltage reads above 0.2 volt, clean or repair the poor contact at ground cable attaching points. If voltage reading is still above 0.2 volt after correcting poor contacts, replace ground cable.

(3) Connect the positive voltmeter lead to the battery positive terminal, and negative lead to battery positive cable terminal on starter solenoid (Fig. 3). Rotate and hold the ignition switch in the START position. If voltage reads above 0.2 volt, clean or repair the poor contact at:

• Battery cable to solenoid connection
• Battery cable to remote terminal
• Battery cable to battery

If reading is still above 0.2 volt after correcting poor contacts, replace battery positive cable as necessary.

(4) If resistance tests do not detect feed circuit failures, replace starter motor.

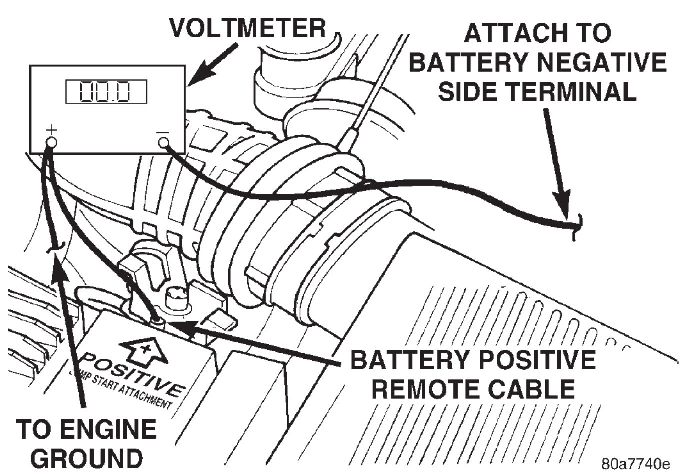


Fig. 2 Test Ground Circuit Resistance

FEED CIRCUIT TEST

The following procedure will require a suitable volt-ampere tester (Fig. 4).

DIAGNOSIS AND TESTING (Continued)

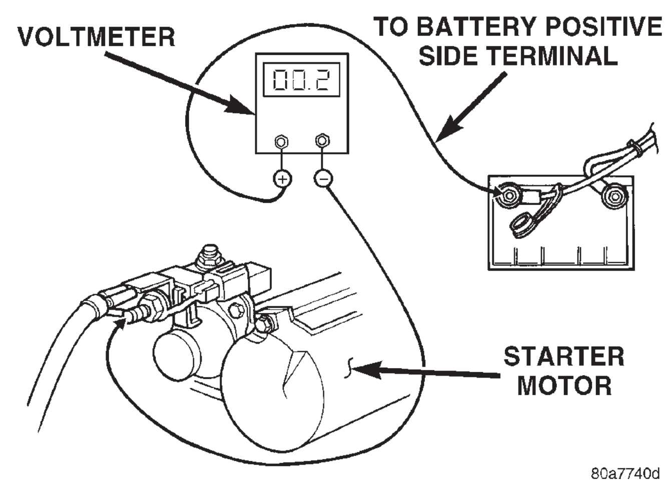


Fig. 3 Test Battery Positive Cable Resistance

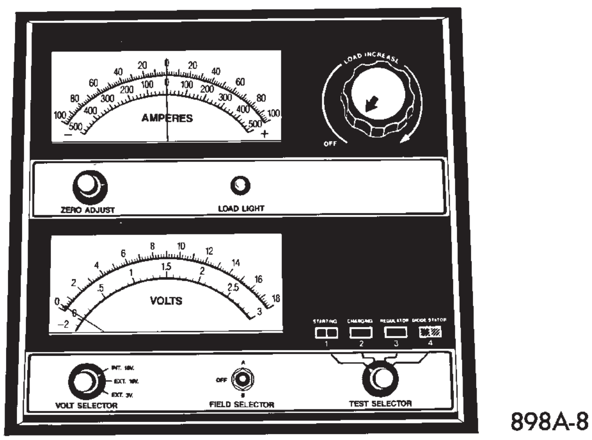


Fig. 4 Volt Ampere Tester

CAUTION: Before Performing any starter test, the Ignition and fuel systems must be disabled.

(1) Connect a volt-ampere tester (Fig. 4) to the remote battery terminals (Fig. 5). Refer to the operating instructions provided with the tester being used.

(2) To disable the ignition and fuel systems, disconnect the Automatic Shutdown Relay (ASD) in the Power Distribution Center (PDC). Refer to the PDC cover for the proper relay location.

(3) Verify that:

- All lamps and accessories are OFF
- Automatic transmission shift selector is in PARK
- Manual transmission clutch pedal depressed
- Set parking brake

(4) Rotate and hold the ignition switch in the START position. Observe the volt-ampere tester (Fig. 4).

- Voltage above 9.6 volts, and amperage draw above 280 amps, check for engine seizing or faulty starter.

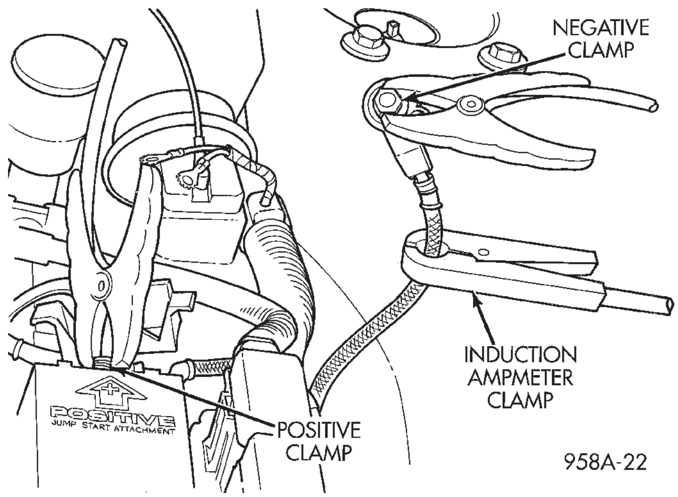


Fig. 5 Volt-Ampere Tester Connections

- Voltage above 12.4 volts and amperage reads 0 to 10 amps, check for corroded cables and/or bad connections.
- Voltage below 9.6 volts and amperage draw above 300 amps, the problem is the starter. Replace the starter refer to starter removal.

CAUTION: Do not overheat the starter motor or draw the battery voltage below 9.6 volts during cranking operations.

(5) After the starting system problems have been corrected, verify the battery state-of-charge and charge battery if necessary. Disconnect all testing equipment and connect ASD relay. Start the vehicle several times to assure the problem has been corrected.

STARTING SYSTEM TEST

For circuit descriptions and diagrams, refer to 8W-21, Starting System in Group 8W, Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

INSPECTION

Before removing any unit from the starting system for repair or diagnosis, perform the following inspections:

- **Battery** - Visually inspect the battery for indications of physical damage and loose or corroded

DIAGNOSIS AND TESTING (Continued)

cable connections. Determine the state-of-charge and cranking capacity of the battery. Charge or replace the battery, if required. Refer to Group 8A, Battery for more information.

- **Ignition Switch -** Visually inspect the ignition switch for indications of physical damage and loose or corroded wire harness connections.
- **Clutch Pedal Position Switch -** Visually inspect the clutch pedal position switch for indications of physical damage and loose or corroded wire harness connections.
- **Park/Neutral Position Switch -** Visually inspect the park/neutral position switch for indications of physical damage and loose or corroded wire harness connections.
- **Starter Relay -** Visually inspect the starter relay for indications of physical damage and loose or corroded wire harness connections.
- **Starter -** Visually inspect the starter for indications of physical damage and loose or corroded wire harness connections.
- **Starter Solenoid -** Visually inspect the starter solenoid for indications of physical damage and loose or corroded wire harness connections.
- **Wiring -** Visually inspect the wire harness for damage. Repair or replace any faulty wiring, as required.

STARTING SYSTEM DIAGNOSIS		
CONDITION	**POSSIBLE CAUSE**	**CORRECTION**
STARTER FAILS TO ENGAGE.	1. Battery discharged or faulty. 2. Starting circuit wiring faulty. 3. Starter relay faulty. 4. Ignition switch faulty. 5. Park/Neutral position switch (auto trans) faulty or mis-adjusted. 6. Clutch pedal position switch (man trans) faulty. 7. Starter solenoid faulty. 8. Starter assembly faulty.	1. Refer to Group 8A, Battery. Charge or replace battery, if required. 2. Refer to Feed Circuit Resistance Test and Feed Circuit Test in this section. 3. Refer to Relay Test, in this section. Replace relay, if necessary. 4. Refer to Ignition Switch Test, in Group 8D Ignition System or Group 8W, Wiring Diagrams. Replace switch, if necessary. 5. Refer Park/Neutral Position Switch Test, in Group 21, Transaxle. Replace switch, if necessary. 6. Refer to Clutch Pedal Position Switch Test, in Group 6, Clutch. Replace switch, if necessary. 7. Refer to Solenoid Test, in this section. Replace starter assembly, if necessary. 8. If all other starting system components and circuits check OK, replace starter assembly.
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. Battery discharged or faulty. 2. Starting circuit wiring faulty. 3. Starter assembly faulty. 4. Engine seized.	1. Refer to Group 8A, Battery. Charge or replace battery as necessary. 2. Refer to the Feed Circuit Resistance Test and the Feed Circuit Test in this section. Repair as necessary. 3. If all other starting system components and circuits check OK, replace starter assembly. 4. Refer to Group 9 Engine, for diagnostic and service procedures.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. Broken teeth on starter ring gear. 2. Starter assembly faulty.	1. Remove starter. Inspect ring gear and replace if necessary. 2. If all other starting system components and circuits check OK, replace starter assembly.
STARTER DOES NOT DISENGAGE.	1. Starter improperly installed. 2. Starter relay faulty. 3. Ignition switch faulty. 4. Starter assembly faulty.	1. Install starter. Tighten starter mounting hardware to correct torque specifications. 2. Refer to Relay Test, in this section. Replace relay, if necessary. 3. Refer to Ignition Switch Test, in Group 8D, Ignition System. Replace switch, if necessary. 4. If all other starting system components and circuits check OK, replace starter assembly.

REMOVAL AND INSTALLATION

SAFETY SWITCHES

For Removal and Installation of the:

• Clutch Position Switch, refer to Group 6, Clutch.

• Park/Neutral Switch, refer to Group 21, Transaxle.

STARTER

CAUTION: The generator output terminal must be connected to the battery positive terminal of the starter solenoid. For the charging and cranking systems to operate properly.

2.0 ENGINE – WITH MANUAL TRANSAXLE

REMOVAL

(1) Disconnect the remote battery negative cable from the terminal on shock tower (Fig. 6).

(2) Remove air cleaner resonator, refer to Group 14, Fuel.

(3) Remove the battery positive cable nut from starter. Remove battery positive cable and generator output wire from starter (Fig. 7).

(4) Disconnect push on solenoid connector.

(5) Remove two bolts attaching starter to transmission housing and remove starter from vehicle.

INSTALLATION

For installation, reverse the above procedures. Clean corrosion/dirt from wire terminals before installing wiring to the solenoid.

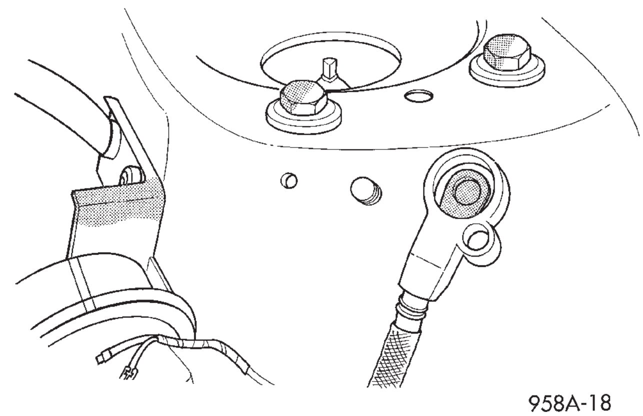


Fig. 6 Remove Remote Battery Cable at Shock Tower

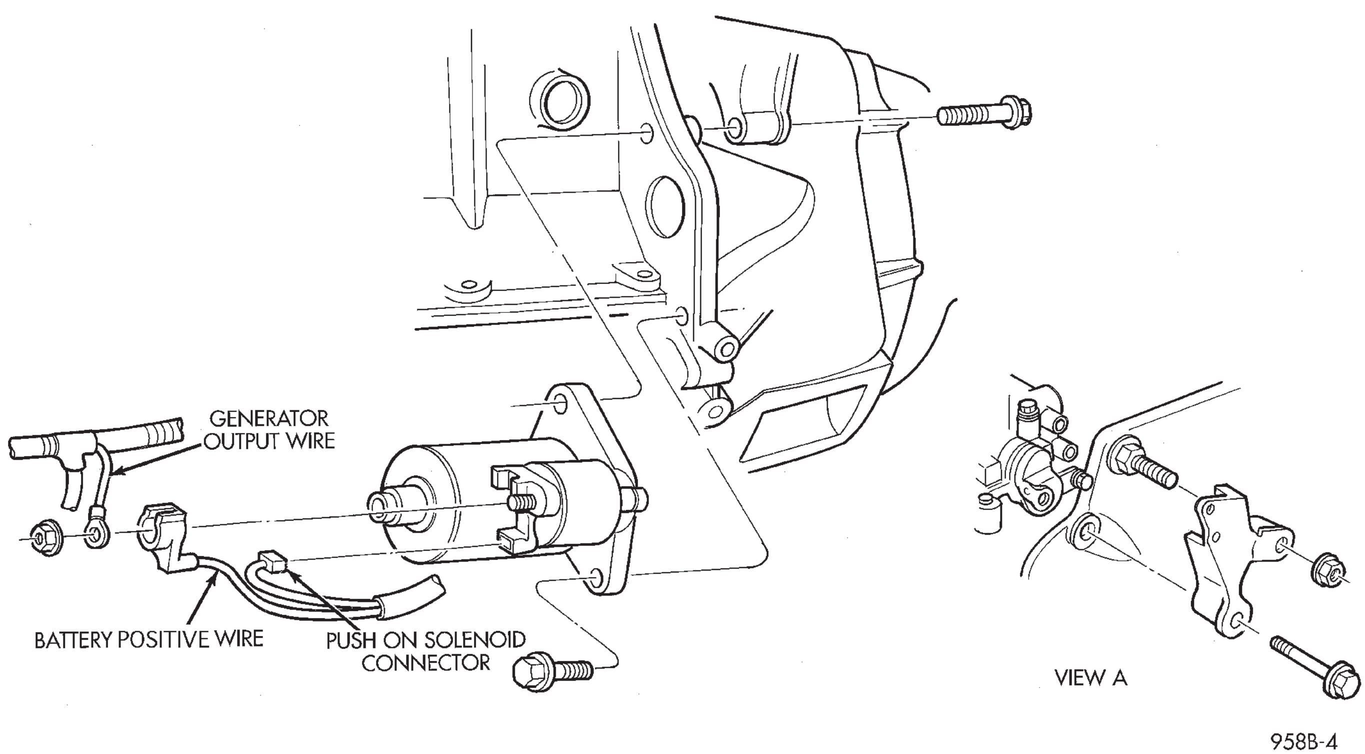


Fig. 7 Wire Terminal Connection – 2.0L Engine

REMOVAL AND INSTALLATION (Continued)

2.0L ENGINE WITH AUTOMATIC TRANSAXLE – 2.4L ENGINE

REMOVAL

(1) Disconnect battery negative cable from remote negative terminal on shock tower (Fig. 6).

(2) Remove air cleaner resonator, refer to Group 14, Fuel.

(3) Remove three Transmission Control Module (TCM) mounting screws. Move TCM to provide access to top starter mounting bolt. DO NOT disconnect TCM wiring.

(4) Remove top bolt attaching starter to transmission housing (Fig. 8).

(5) Raise vehicle.

(6) Remove battery positive cable nut from starter and remove cable.

(7) Disconnect push on solenoid connector.

(8) Remove the bottom bolt attaching starter to transmission housing (Fig. 8).

(9) Remove starter from vehicle.

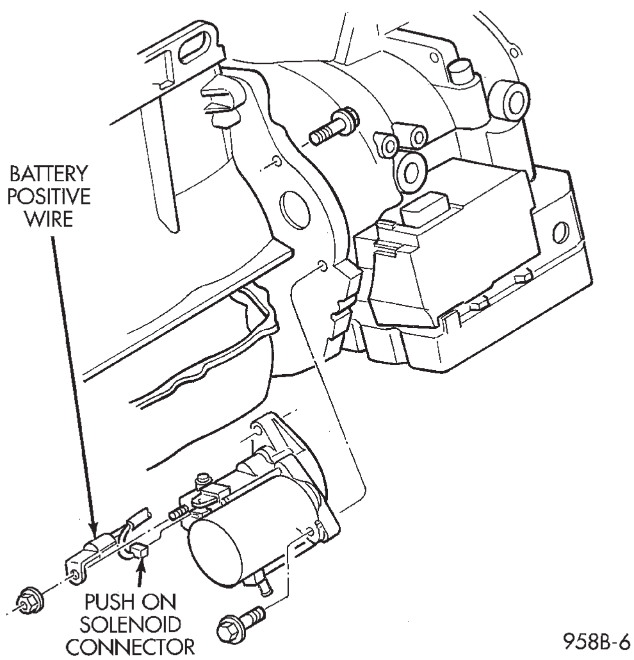


Fig. 8 Wire Terminal Connection

INSTALLATION

(1) With vehicle is raised, set starter face into transmission housing.

(2) Lower vehicle.

(3) Install top starter mounting bolt but do not tighten.

(4) Raise vehicle.

(5) Install bottom starter mounting bolt and tighten to 54 N·m (40 ft. lbs.) torque.

(6) Clean corrosion/dirt from wire terminals before installing wiring to the solenoid.

(7) Connect battery positive cable to solenoid post (Fig. 8).

(8) Connect the push-on solenoid connector.

(9) Lower vehicle.

(10) Tighten top starter bolt to 54 N·m (40 ft. lbs.) torque.

(11) Install TCM and the mounting screws.

(12) Install air cleaner resonator, refer to Group 14, Fuel.

(13) Connect battery remote cable to the remote terminal.

2.5L ENGINE

REMOVAL

(1) Disconnect battery negative cable from remote negative terminal on shock tower (Fig. 6).

(2) Raise vehicle.

(3) Remove oil filter.

(4) Remove battery positive cable nut from starter and remove cable (Fig. 9).

(5) Disconnect push on solenoid connector.

(6) Remove three bolts attaching starter to transmission housing and remove starter from vehicle.

INSTALLATION

For installation, reverse the above procedures. Clean corrosion/dirt from wire terminals before installing wiring to the solenoid.

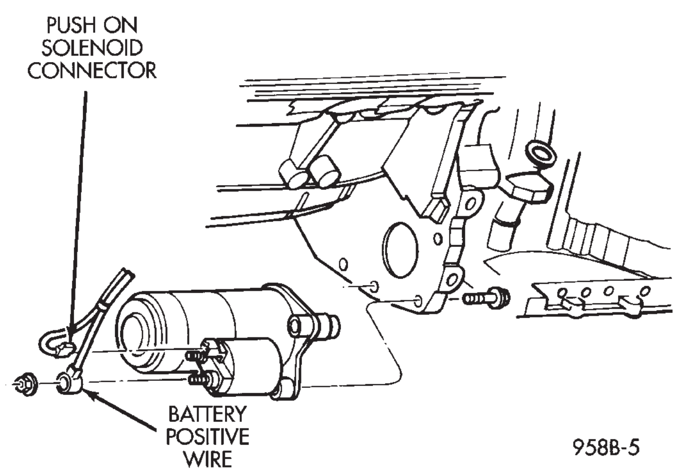


Fig. 9 Wire Terminal Connection – 2.5L Engine

STARTER RELAY

The relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for relay location.

SPECIFICATIONS

STARTER

Engine Amperage Draw Test ......150-280 Amps*

SPECIFICATIONS (Continued)

Manufacturer	BOSCH	MELCO	NIPPONDENSO
Engine Application	2.0L	2.5L	2.4L
Power rating	0 .95 Kw	1.2 Kw	1.4 Kw
Voltage	12 VOLTS	12 VOLTS	12 VOLTS
Brushes	4	4	4
Drive	Planetary Gear Train	Planetary Gear Train	Offset Gear Reduced

Engine should be up to operating temperature. Extremely heavy oil or tight engine will increase starter amperage draw.

TORQUE

DESCRIPTION	TORQUE
Starter Mounting Bolts	54 N·m (40 ft. lbs.)
Starter Solenoid Battery Nut	10 N·m (90 in. lbs.)

CHARGING SYSTEM

CONTENTS

GENERAL INFORMATION

OVERVIEW

The battery, starting, and charging systems operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components involved in these systems must perform within specifications.

Group 8A covers the battery, Group 8B covers the starting system, and Group 8C covers the charging system. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in these groups include the most basic conventional diagnostic methods to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See the On-Board Diagnostics Test in Group 8C - Charging System for more information.

DESCRIPTION AND OPERATION

CHARGING SYSTEM OPERATION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to Group 8D, Ignition System for information)
- Battery (refer to Group 8A, Battery for information)
- Battery temperature sensor
- Voltmeter (refer to Group 8E, Instrument Panel and Gauges for information)
- Wiring harness and connections (refer to Group 8W, Wiring for information)

The charging system is turned on and off with the ignition switch. When the ignition switch is turned to the ON position, battery voltage is applied to the generator rotor through one of the two field terminals to produce a magnetic field. The generator is driven by the engine through a serpentine belt and pulley arrangement.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry, contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including the EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See On-Board Diagnostic System Test in this group for more information.

DESCRIPTION AND OPERATION (Continued)

GENERATOR

The generator is belt-driven by the engine. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The Y type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicle electrical system through the generator, battery, and ground terminals.

Noise emitting from the generator may be caused by:
- Worn, loose or defective bearings
- Loose or defective drive pulley
- Incorrect, worn, damaged or misadjusted drive belt
- Loose mounting bolts
- Misaligned drive pulley
- Defective stator or diode

BATTERY TEMPERATURE SENSOR

The battery temperature sensor is used to determine the battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

The sensor is located on the rear side of the front bumper beam. (Fig. 1).

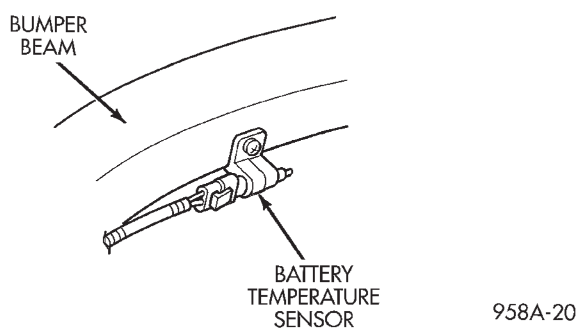


Fig. 1 Battery Temperature Sensor

ELECTRONIC VOLTAGE REGULATOR

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

Operation: The amount of DC current produced by the generator is controlled by EVR circuitry contained within the PCM. This circuitry is connected in series with the generators second rotor field terminal and its ground.

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage and battery temperature (refer to Battery Temperature Sensor for more information). It then compensates and regulates generator current output accordingly. Also see Charging System Operation for additional information.

DIAGNOSIS AND TESTING

CHARGING SYSTEM

When the ignition switch is turned to the ON position, battery potential will register on the voltmeter. During engine cranking a lower voltage will appear on the meter. With the engine running, a voltage reading higher than the first reading (ignition in ON) should register.

The following are possible symptoms of a charging system fault:
- The voltmeter does not operate properly
- An undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:
- Accessories being left on with the engine not running
- A faulty or improperly adjusted switch that allows a lamp to stay on. See Ignition-Off Draw Test in Group 8A, Battery for more information.

The following procedures may be used to correct a problem diagnosed as a charging system fault.

INSPECTION

(1) Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.

(2) Inspect all fuses in the fuseblock module and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.

(3) Inspect the electrolyte level in the battery. Replace battery if electrolyte level is low.

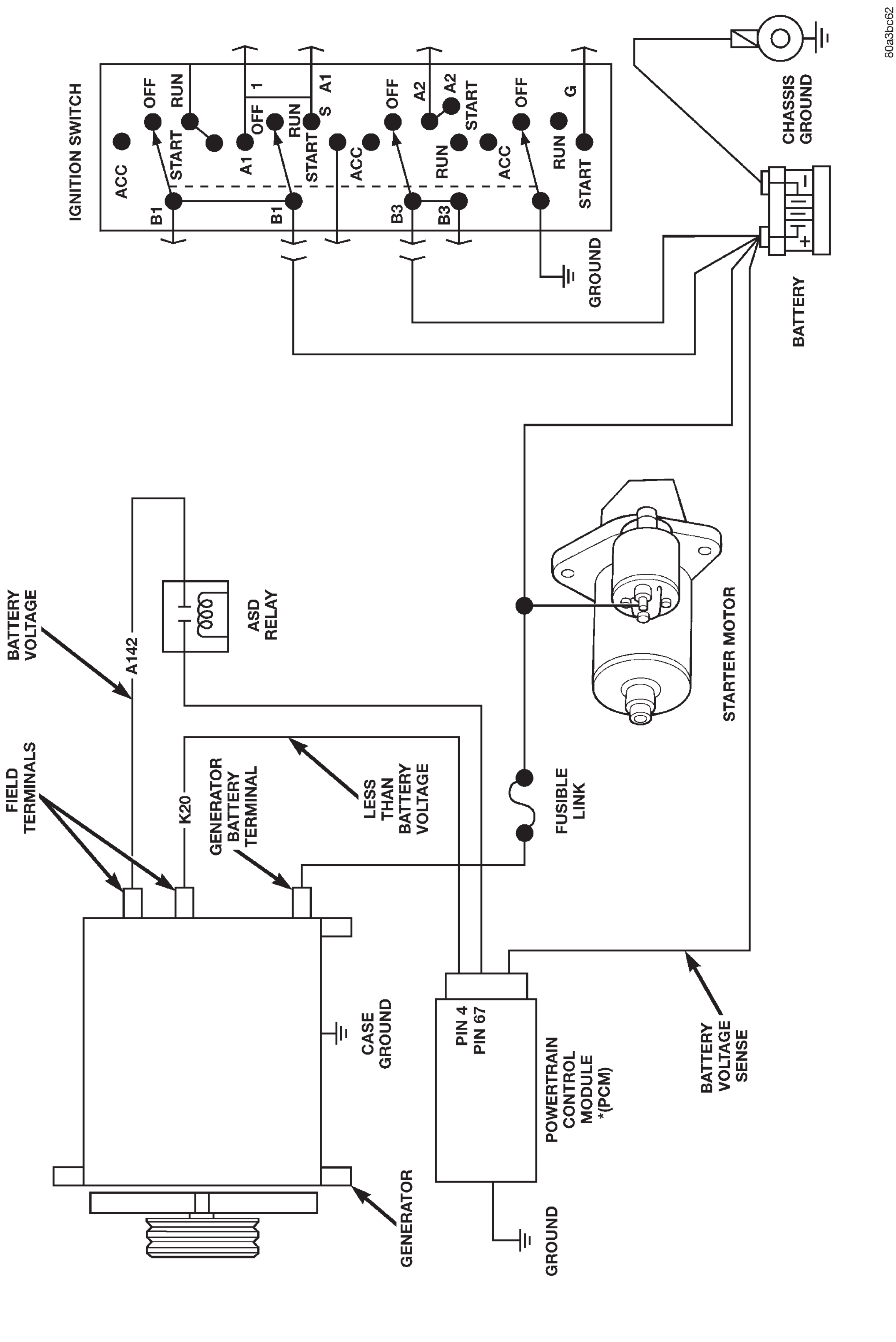
(4) Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in Group 7, Cooling System.

(6) Inspect automatic belt tensioner (if equipped). Refer to Group 7, Cooling System for information.

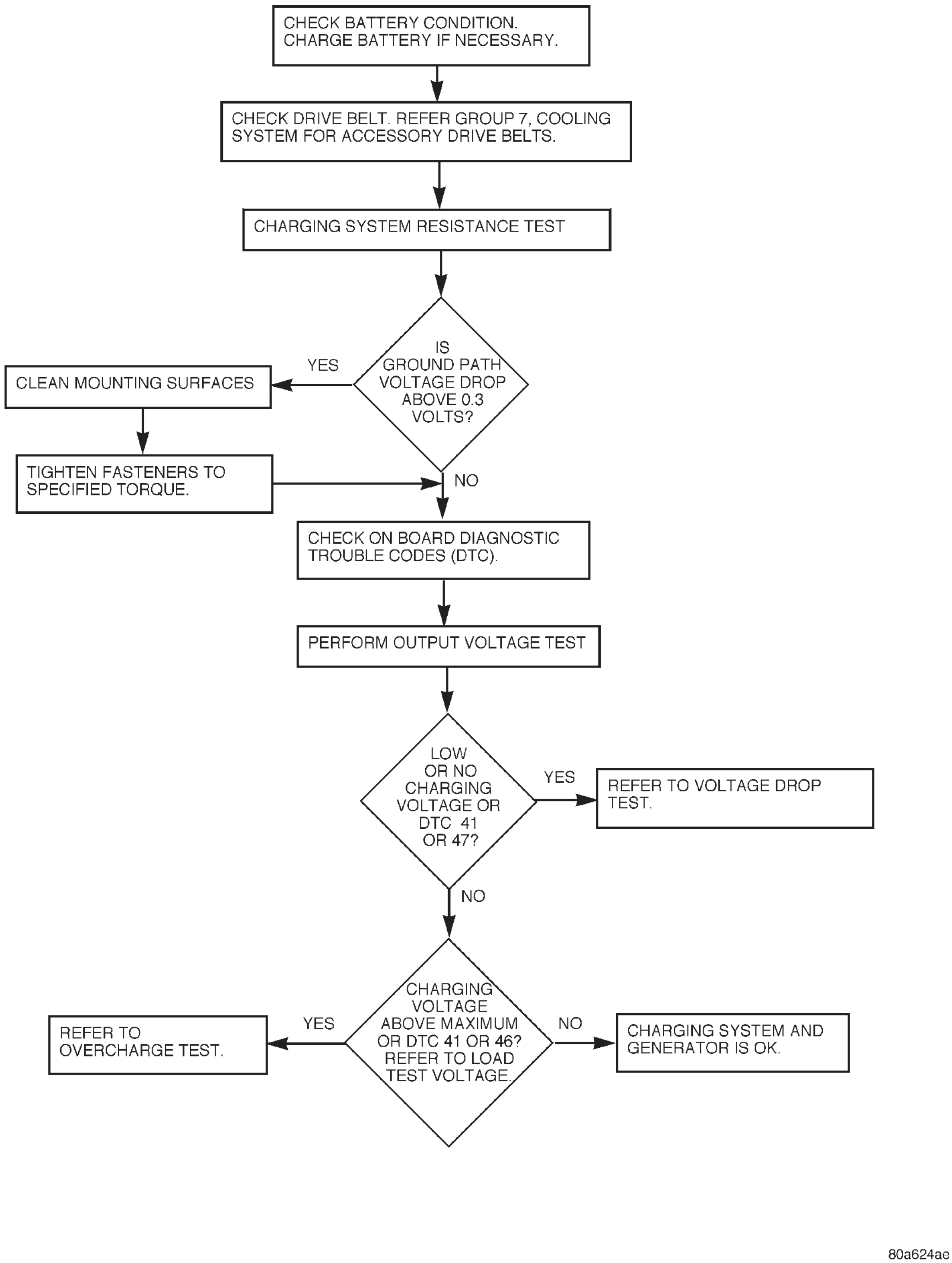
(7) Inspect connections at generator field, battery output, and ground terminals. Also check ground connection at engine. They should all be clean and tight. Repair as required.

DIAGNOSIS AND TESTING (Continued)



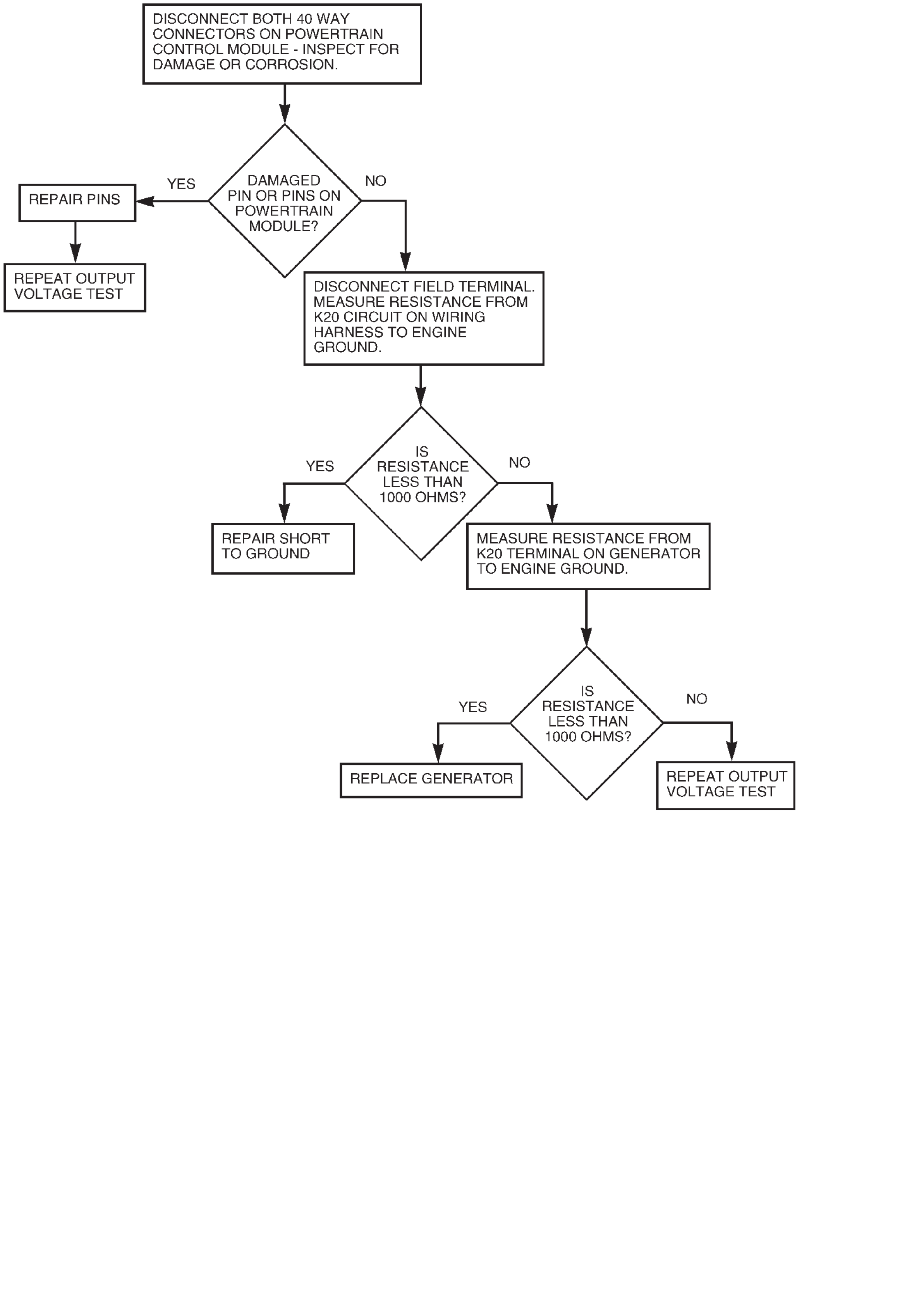
Charging System Schematic—Typical

DIAGNOSIS AND TESTING (Continued)



Charging System Test

DIAGNOSIS AND TESTING (Continued)



Overcharge Test

DIAGNOSIS AND TESTING (Continued)

CHARGING SYSTEM RESISTANCE TESTS

These tests will show the amount of voltage drop across the generator output wire from the generator output (B+) terminal to the battery positive post. They will also show the amount of voltage drop from the ground (-) terminal on the generator (Fig. 3) or (Fig. 2) to the battery negative post.

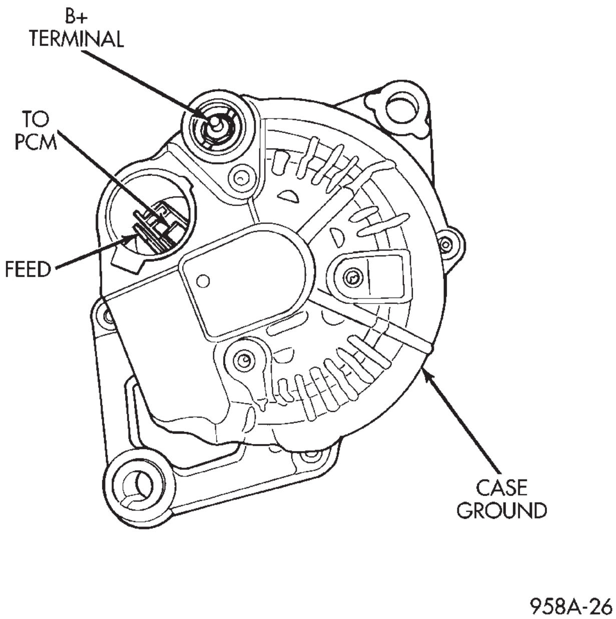


Fig. 2 Generator Terminals—2.4L

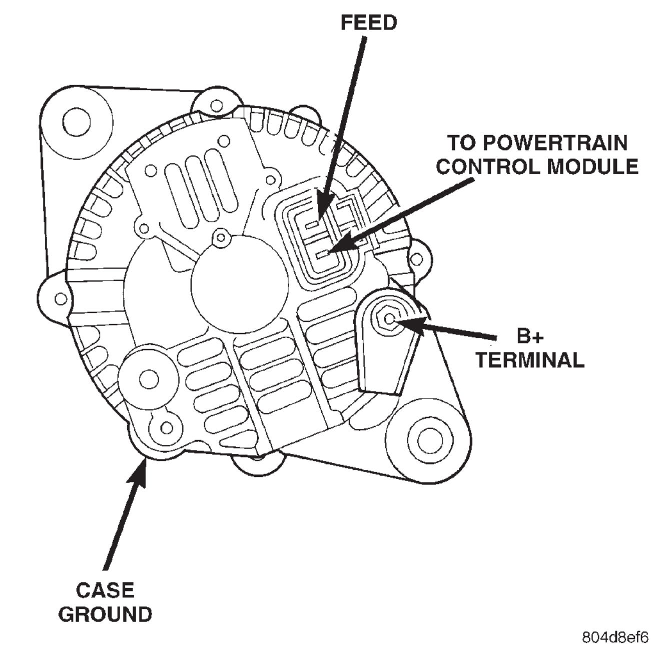


Fig. 3 Generator Terminals—2.5L

A voltmeter with a 0–18 volt DC scale should be used for these tests. By repositioning the voltmeter test leads, the point of high resistance (voltage drop) can easily be found.

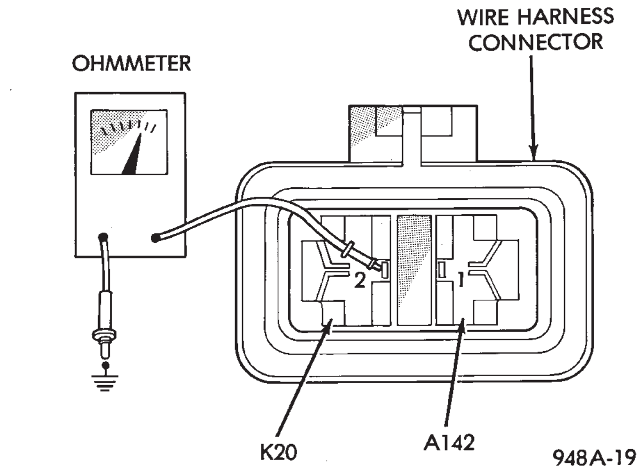


Fig. 4 Electrical Resistance Test

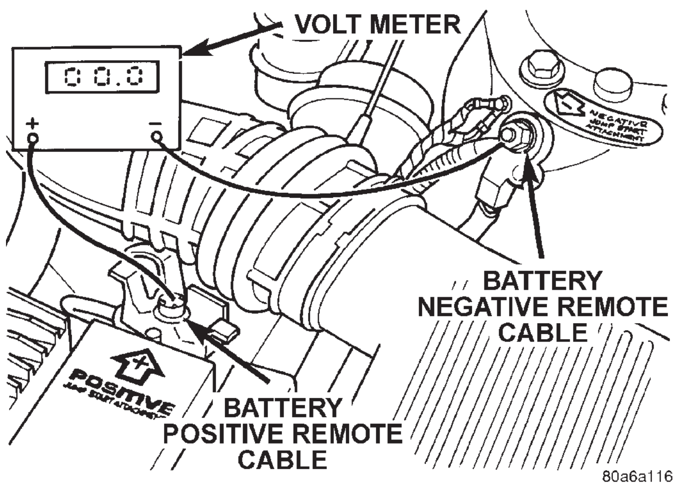


Fig. 5 Battery Voltage Test

PREPARATION

(1) Before starting test, make sure battery is in good condition and is fully-charged. See Group 8A, Battery for more information.

(2) Check condition of battery cables at battery. Clean if necessary.

(3) Start the engine and allow it to reach normal operating temperature.

(4) Shut engine off.

(5) Connect an engine tachometer.

(6) Fully engage the parking brake.

TEST

(1) Start engine.

(2) Place heater blower in high position.

(3) Turn on headlamps and place in high-beam position.

(4) Turn vehicle interior lamps on.

(5) Bring engine speed up to 2400 rpm and hold.

(6) Testing (+ positive) circuitry:

DIAGNOSIS AND TESTING (Continued)

(a) Touch the negative lead of voltmeter directly to positive battery remote cable **POST** (Fig. 5).

(b) Touch the positive lead of voltmeter to the B+ output terminal stud on the generator (not the terminal mounting nut). Voltage should be no higher than 0.6 volts. If voltage is higher than 0.6 volts, touch test lead to terminal mounting stud nut and then to the wiring connector. If voltage is now below 0.6 volts, look for dirty, loose or poor connection at this point. Also check condition of the generator output wire-to-PDC positive connector. Refer to Group 8, Wiring for connector location. A voltage drop test may be performed at each (- ground) connection in this circuit to locate the excessive resistance.

(7) Testing (- ground) circuitry:

(a) Touch the positive lead of voltmeter directly to negative battery remote cable **POST** .

(b) Touch the negative lead of voltmeter to the generator case. Voltage should be no higher than 0.3 volts. If voltage is higher than 0.3 volts, touch test lead to generator case and then to the engine block. If voltage is now below 0.3 volts, look for dirty, loose or poor connection at this point. A voltage drop test may be performed at each connection in this circuit to locate the excessive resistance. This test can also be performed between the generator case and the engine. If test voltage is higher than 0.3 volts, check for corrosion at generator mounting points or loose generator mounting.

CURRENT OUTPUT TEST

The current output test will determine if the charging system can deliver its minimum test current (amperage) output. Refer to the Specifications section at the end of this group for minimum test current (amperage) requirements.

The first part of this test will determine the combined amperage output of both the generator and the Electronic Voltage Regulator (EVR) circuitry.

PREPARATION

(1) Determine if any Diagnostic Trouble Codes (DTC) exist. To determine a DTC, refer to On-Board Diagnostics in this group. For repair, refer to the appropriate Powertrain Diagnostic Procedures manual.

(2) Before starting test, make sure battery is in good condition and is fully-charged. See Group 8A, Battery for more information.

(3) Check condition of battery cables at battery. Clean if necessary.

(4) Perform the previous Output Wire Resistance Test (voltage drop test) (Fig. 6). This will ensure clean and tight generator/battery electrical connections.

(5) Be sure the generator drive belt is properly tensioned. Refer to Group 7, Cooling System for information.

(6) A volt/amp tester equipped with both a battery load control (carbon pile rheostat) and an inductive-type pickup clamp (ammeter probe) will be used for this test. Refer to operating instructions supplied with tester. When using a tester equipped with an inductive-type clamp, removal of wiring at the generator will not be necessary.

(7) Start the engine and allow it to reach operating temperature.

(8) Shut engine off.

(9) Turn off all electrical accessories and all vehicle lighting.

(10) Connect the volt/amp tester leads to the battery. Be sure the carbon pile rheostat control is in the OPEN or OFF position before connecting leads. See Load Test in Group 8A, Battery for more information. Also refer to the operating instructions supplied with test equipment.

(11) Connect the inductive clamp (ammeter probe). Refer to the operating instructions supplied with test equipment.

(12) If volt/amp tester is not equipped with an engine tachometer, connect a separate tachometer to the engine.

TEST

(1) Perform the previous test Preparation.

(2) Fully engage the parking brake.

(3) Start engine.

(4) Bring engine speed to 2500 rpm.

(5) With engine speed held at 2500 rpm, slowly adjust the rheostat control (load) on the tester to obtain the highest amperage reading. Do not allow voltage to drop below 12 volts. Record the reading. **This load test must be performed within 15 seconds to prevent damage to test equipment.** On certain brands of test equipment, this load will be applied automatically. Refer to the operating manual supplied with test equipment.

(6) The ammeter reading must meet the Minimum Test Amps specifications as displayed in the Generator Ratings chart. This can be found in the Specifications section at the end of this group. A label stating a part reference number is attached to the generator case. On some engines this label may be located on the bottom of the case. Compare this reference number to the Generator Ratings chart.

(7) Rotate the load control to the OFF position.

(8) Continue holding engine speed at 2500. If EVR circuitry is OK, amperage should drop below 15–20 amps. With all electrical accessories and vehicle lighting off, this could take several minutes of engine operation. If amperage did not drop, refer to the appropriate Powertrain Diagnostic Procedures manual for testing.

(9) Remove volt/amp tester.

DIAGNOSIS AND TESTING (Continued)

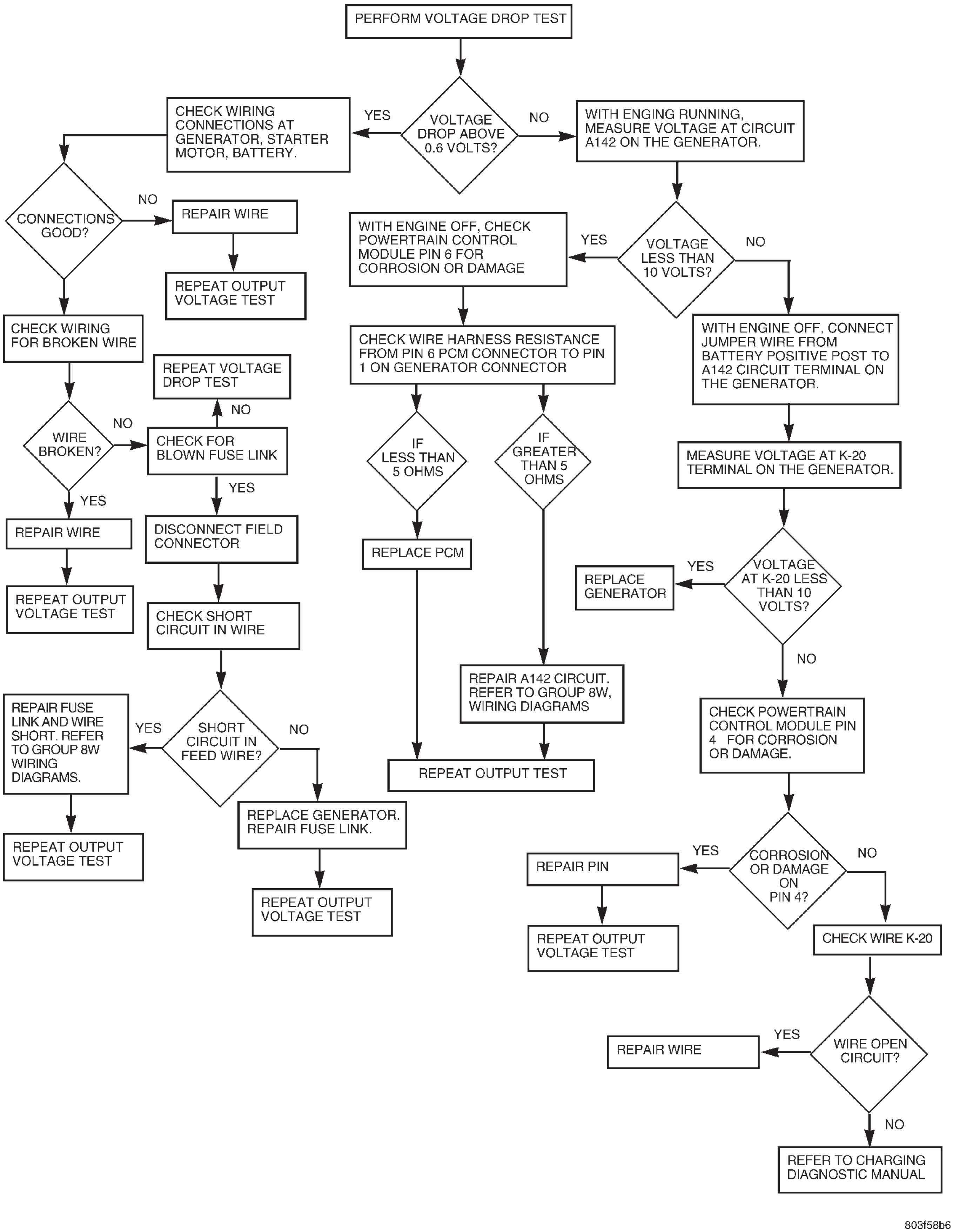


Fig. 6 Voltage Drop Test

DIAGNOSIS AND TESTING (Continued)

If minimum amperage could not be met, refer to the appropriate Powertrain Diagnostic Procedures manual for testing.

BATTERY TEMPERATURE SENSOR

To perform a complete test of this sensor and its circuitry, refer to the appropriate Powertrain Diagnostic Procedures manual. To test the sensor only, refer to the following:

(1) Disconnect the sensor from the engine harness.

(2) Attach ohmmeter leads to the wire terminals of the sensor.

(3) At room temperature of 25° C (75–80° F), an ohmmeter reading of 9K to 11K ohms should be observed.

(4) If reading is above or below the specification, replace the sensor.

(5) Refer to the Removal and Installation section for procedures.

ON-BOARD DIAGNOSTIC SYSTEM TEST

GENERAL INFORMATION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the OBD system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 50 engine starts if the problem does not occur again.

DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes (DTC) are two-digit numbers flashed on the malfunction indicator (Check Engine) lamp that identify which circuit is bad. Refer to Group 25, On Board Diagnostic for more information. A DTC description can also be read using the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

See the Generator Diagnostic Trouble Code chart (Fig. 7) for DTC's which apply to the charging system. Refer to the Powertrain Diagnostic Procedures manual to diagnose an on-board diagnostic system trouble code.

RETRIEVING DIAGNOSTIC TROUBLE CODES

To start this function, cycle the ignition switch ON-OFF-ON-OFF-ON within 5 seconds. This will cause any DTC stored in the PCM memory to be displayed. The malfunction indicator (Check Engine) lamp will display a DTC by flashing on and off. There is a short pause between flashes and a longer pause between digits. All DTC's displayed are two-digit numbers, with a four-second pause between codes.

Diagnostic Trouble Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
12*	Battery Disconnect	Direct battery input to PCM was disconnected within the last 50 key-on cycles.
41**	Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
46**	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
47**	Charging System Voltage Too Low	Battery voltage sense input below target charging during engine operation. Also, no significant change detected in battery voltage during active test of generator output.
55*	N/A	Completion of fault code display on Check Engine lamp.

*Check Engine lamp will not illuminate at all times if this Diagnostic Trouble Code was recorded. Cycle ignition key as described in manual and observe code flashed by Check Engine lamp.

**Check Engine lamp will illuminate during engine operation if this Diagnostic Trouble Code was recorded.

Fig. 7 Generator Diagnostic Trouble Code

DIAGNOSIS AND TESTING (Continued)

An example of a DTC is as follows:

(1) Lamp on for 2 seconds, then turns off.

(2) Lamp flashes 4 times pauses and then flashes 1 time.

(3) Lamp pauses for 4 seconds, flashes 4 times, pauses, then flashes 7 times.

(4) The two DTC's are 41 and 47. Any number of DTC's can be displayed, as long as they are in memory. The lamp will flash until all stored DTC's are displayed, then it will flash a DTC 55 to indicate the test is complete.

ERASING DIAGNOSTIC TROUBLE CODES

The DRB Scan Tool must be used to erase a DTC.

REMOVAL AND INSTALLATION

GENERATOR—2.4L (NIPPONDENSO)

REMOVAL

(1) Disconnect battery negative cable from remote negative terminal on shock tower (Fig. 8).

(2) Unplug field circuit from generator.

(3) Remove B+ terminal cover by spreading the cover with a small flat blade tool.

(4) Remove the B+ terminal nut and wire (Fig. 9).

(5) Loosen adjusting T-bolt, but do not remove (Fig. 9).

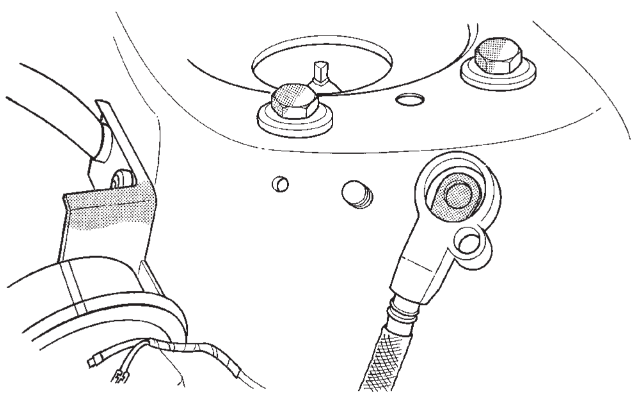


Fig. 8 Battery Cable at Shock Tower

(6) Loosen pivot bolt, but do not remove.

(7) Loosen adjusting bolt to allow removal of the generator drive belt. Refer to Group 7, Cooling System.

(8) Remove adjusting T-bolt.

(9) Remove pivot bolt.

(10) Remove ABS braking unit by removing the two lower plate mounting bolts. Refer to Group 5, Brakes.

(11) Remove Coolant Overflow bottle. Refer to Group 7, Cooling System.

(12) Remove by sliding alternator under the air conditioning lines towards passenger side of vehicle.

(13) Remove generator from vehicle.

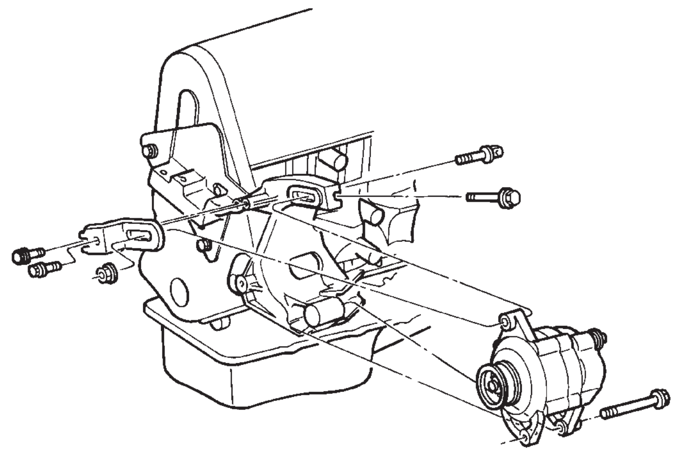


Fig. 9 Generator—2.4L Engine

INSTALLATION

(1) For installation, reverse above procedures. Tighten all fasteners to the proper torque. Refer to the Torque Specifications chart at the rear Group 8C, Charging.

GENERATOR—2.5L (MELCO)

REMOVAL

(1) Disconnect battery negative cable from remote negative terminal on shock tower.

(2) Unplug field circuit from generator.

(3) Remove the B+ terminal nut and wire (Fig. 10).

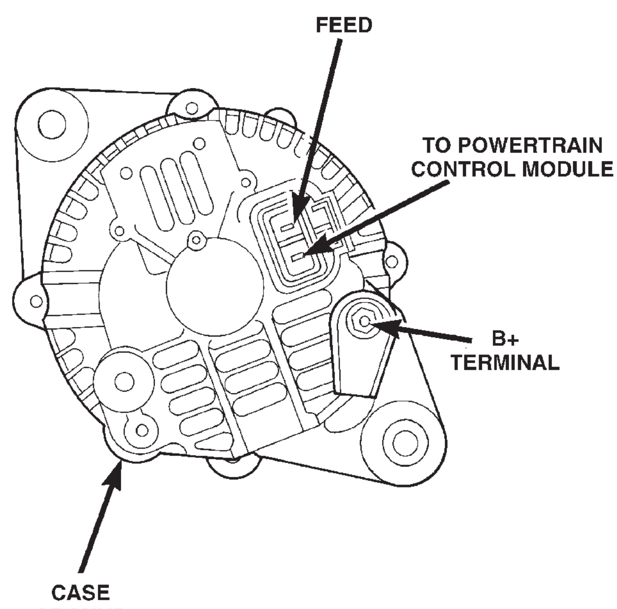


Fig. 10 Wiring Connections—2.5L

(4) Loosen top mounting ear bolt.

(5) Loosen pivot bolt, but do not remove. Be careful not to lose nut (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

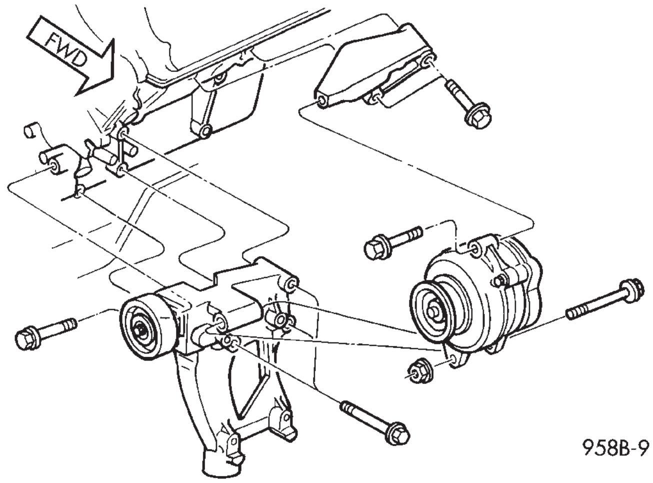


Fig. 11 Generator—2.5L Engine

(6) Loosen adjusting bolt on idler to allow removal of the generator drive belt. Refer to Group 7, Cooling System.

(7) Remove pivot bolt, do not drop spacer.

(8) Remove top mounting ear bolt.

(9) Remove upper generator bracket.

(10) Remove generator.

INSTALLATION

(1) For installation, reverse above procedures. Tighten all fasteners to the proper torque. Refer to the Torque Specifications chart at the rear Group 8C, Charging.

BATTERY TEMPERATURE SENSOR

REMOVAL

(1) Raise vehicle on host.

(2) Remove screw from sensor.

(3) Disconnect electrical connector from sensor.

INSTALLATION

(1) Connect electrical connector to sensor.

(2) Install screw and tighten.

(3) Lower vehicle.

SPECIFICATIONS

GENERATOR RATINGS

TYPE	ENGINES	MINIMUM TEST AMPS
DENSO	2.4L	74 amps
MELCO	2.5L	74 amps
The Test Specifications are: 1. 2500 ±20 RPMS 2. Voltage Output 15V ±.3V 3. Field Current 5amps ±.1amp		

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Battery Terminal Nut	10 N·m (90 in. lbs.)
Battery Hold Down Clamp Bolt	10 N·m (90 in. lbs.)
Battery Negative Cable Nut at Shock Tower	10 N·m (90 in. lbs.)
Generator B+ Terminal	9 N·m (75 in. lbs.)
Generator Mounting Bolt	54 N·m (40 ft. lbs.)
Generator Pivot Bolt	54 N·m (40 ft. lbs.)

IGNITION SYSTEM

CONTENTS

GENERAL INFORMATION

INTRODUCTION

This group describes the ignition systems for the 2.4 and 2.5L engines.

On Board Diagnostics is described in Group 25 - Emission Control Systems.

Group 0 - Lubrication and Maintenance, contains general maintenance information for ignition related items. The Owner's Manual also contains maintenance information.

DESCRIPTION AND OPERATION

IGNITION SYSTEM

NOTE: The 2.4 and 2.5L engines use a fixed ignition timing system. Basic ignition timing is not adjustable. All spark advance is determined by the Powertrain Control Module (PCM).

The distributorless ignition system used on 2.4L engines is refered to as the Direct Ignition System (DIS). **Basic ignition timing is not adjustable.** The system's three main components are the coil pack, crankshaft position sensor, and camshaft position sensor.

The crankshaft position sensor and camshaft position sensor are hall effect devices. The camshaft position sensor and crankshaft position sensor generate pulses that are inputs to the PCM. The PCM determines crankshaft position from these sensors. The PCM calculates injector sequence and ignition timing from crankshaft position. For a description of both sensors, refer to Camshaft Position Sensor and Crankshaft Position Sensor in this section.

The 2.5L engine uses a distributor, crankshaft sensor and ignition coil. **Basic ignition timing is not adjustable.** The system's main components are the distributor, distributor pickup, camshaft signal, crankshaft signal and ignition coil.

The crankshaft position sensor and camshaft position sensor are hall effect devices. The camshaft position sensor and crankshaft position sensor generate pulses that are inputs to the PCM. The PCM determines crankshaft position from these sensors. The PCM calculates injector sequence and ignition timing from crankshaft position. For a description of both sensors, refer to Camshaft Position Sensor and Crankshaft Position Sensor in this section.

POWERTRAIN CONTROL MODULE (PCM)

The PCM regulates the ignition system (Fig. 1). The PCM supplies battery voltage to the ignition coil through the Auto Shutdown (ASD) Relay. The PCM also controls the ground circuit for the ignition coil (2.4L). By switching the ground path for the coil on and off, the PCM adjusts ignition timing to meet changing engine operating conditions.

On a 2.5L The PCM controls ignition timing by turning on and off a tranisistor in the distributor. Refer to 2.5L Ignition Coil in this Group for more information.

During the crank-start period the PCM maintains spark advance at 9° BTDC. During engine operation the following inputs determine the amount of spark advance provided by the PCM.

- Intake air temperature
- Coolant temperature
- Engine RPM
- Intake manifold vacuum
- Knock sensor (2.4L Engines)

The PCM also regulates the fuel injection system. Refer to the Fuel Injection sections of Group 14.

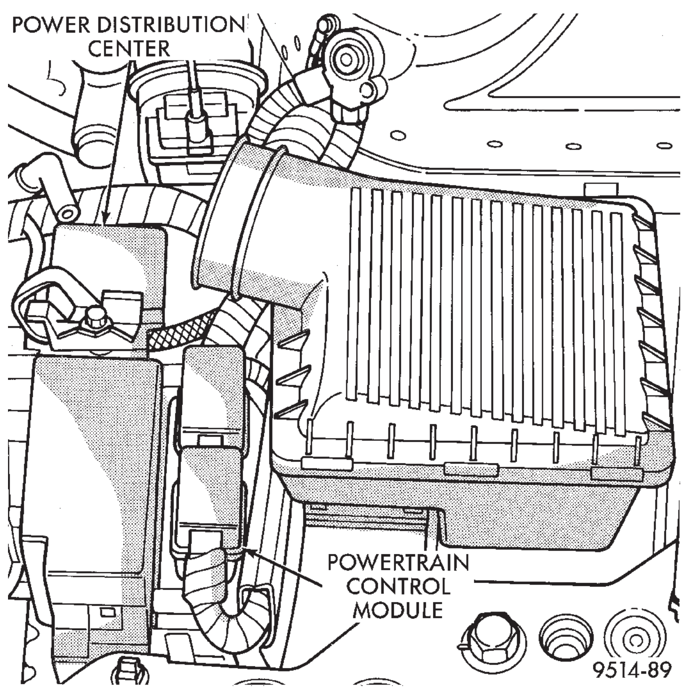


Fig. 1 Powertrain Control Module

SPARK PLUGS—2.4L

All engines use resistor spark plugs. They have resistance values ranging from 6,000 to 20,000 ohms when checked with at least a 1000 volt spark plug tester.

Do not use an ohm meter to check the resistance of the spark plugs. This will give an inaccurate reading.

Remove the spark plugs and examine them for burned electrodes and fouled, cracked or broken porcelain insulators. Keep plugs arranged in the order in which they were removed from the engine. An isolated plug displaying an abnormal condition indicates that a problem exists in the corresponding cylinder.

DESCRIPTION AND OPERATION (Continued)

Replace spark plugs at the intervals recommended in Group O - Lubrication and Maintenance.

Spark plugs that have low mileage may be cleaned and reused if not otherwise defective, carbon or oil fouled. Refer to the Spark Plug Condition section of this group. After cleaning, file the center electrode flat with a small flat point file or jewelers file. Adjust the gap between the electrodes (Fig. 3) to the dimensions specified in the chart at the end of this section.

Special care should be used when installing spark plugs in the 2.4L cylinder head spark plug wells. Be sure the plugs do not drop into the wells, damage to the electrodes can occur.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap. Overtightening can also damage the cylinder head. Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

SPARK PLUGS—2.5L

The 2.5L engines utilize platinum spark plugs. Refer to the maintenance schedule in Group 0 of this service manual.

All engines use resistor spark plugs. They have resistance values ranging from 6,000 to 20,000 ohms when checked with at least a 1000 volt spark plug tester.

Do not use an ohm meter to check the resistance of the spark plugs. This will give an inaccurate reading.

Remove the spark plugs and examine them for burned electrodes and fouled, cracked or broken porcelain insulators. Keep plugs arranged in the order in which they were removed from the engine. An isolated plug displaying an abnormal condition indicates that a problem exists in the corresponding cylinder. Replace spark plugs at the intervals recommended in Group O - Lubrication and Maintenance.

Spark plugs that have low mileage may be cleaned and reused if not otherwise defective, carbon or oil fouled. Refer to the Spark Plug Condition section of this group.

The spark plugs are double platinum and have a recommended service life of 100,000 miles for normal driving conditions per schedule A in this manual. The spark plugs have a recommended service life of 75,000 miles for serve driving conditions per schedule B in this manual. A thin platinum pad is welded to both electrode ends as show in (Fig. 2). Extreme care must be used to prevent spark plug cross threading, mis-gaping and ceramic insulator damage during plug removal and installation.

CAUTION: Never attempt to file the electrodes or use a wire brush for cleaning platinum plugs. This would damage the platinum pads which would shorten spark plug life.

Apply a very small amount of anti-seize compound to the threads when reinstalling the vehicle's original spark plugs that have been determined good. **Do not apply anti-seize compound to new spark plugs.**

NOTE: Anti-seize compound is electrically conductive and can cause engine misfires if not applied correctly. It is extremely important that the anti-seize compound doesn't make contact with the spark plug electrodes or ceramic insulator.

Never force a gap gauge between the platinum electrodes or adjust the gap on platinum spark plugs without reading the 2.5L Spark Plug Gap Measurement procedures in this section.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap. Overtightening can also damage the cylinder head. Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

Due to the engine packaging environment for the 2.5L engines, extreme care should be used when installing the spark plugs to avoid cross threading problems.

2.5L SPARK PLUG GAP MEASUREMENT

CAUTION: The Platinum pads can be damaged during the measurement of checking the gap if extreme care is not used.

- **Use only a taper gap gauge** (Fig. 3)
- Never force the gap gauge through the platinum pads. Only apply enough force until resistance is felt.
- Never use a wire brush or spark plug cleaner machine to clean platinum spark plugs
- Use an OSHA approved air nozzle when drying gas fouled spark plugs.

If gap adjustment is required of platinum plug, bend only the ground electrode. DO NOT TOUCH the platinum pads. Use only a proper gapping tool and check with a taper gap gauge.

CAUTION: Cleaning of the platinum plug may damage the platinum tip.

SPARK PLUG CABLES

Spark Plug cables are sometimes referred to as secondary ignition wires. They transfer electrical current from the distributor (2.5L), coil pack (2.0/2.4L), to individual spark plugs at each cylinder. The resistor type, nonmetallic spark plug cables provide suppression of radio frequency emissions from the ignition system.

Check the spark plug cable connections for good contact at the coil and distributor cap towers and at the spark plugs. Terminals should be fully seated.

DESCRIPTION AND OPERATION (Continued)

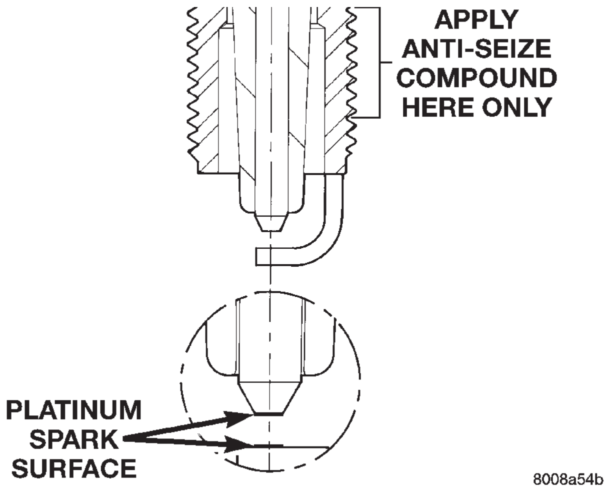


Fig. 2 Platinum Pads

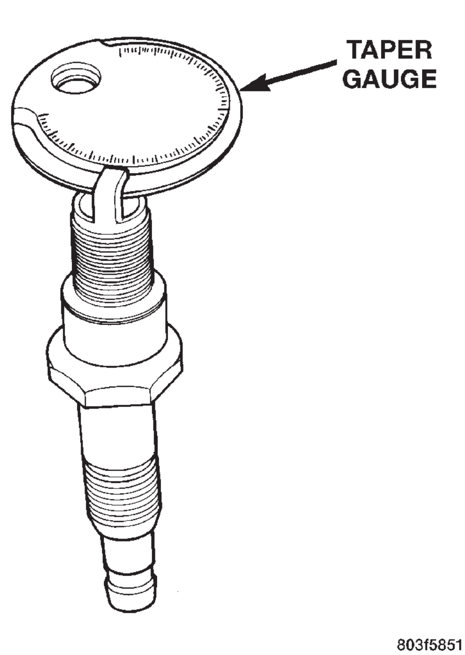


Fig. 3 Setting Spark Plug Electrode Gap

The nipples and spark plug covers should be in good condition. Nipples should fit tightly on the coil and distributor cap towers and spark plug cover should fit tight around spark plug insulators. Loose cable connections can cause ignition malfunctions by permitting water to enter the towers, corroding, and increasing resistance. **To maintain proper sealing at the terminal connections, the connections should not be broken unless testing indicates high resistance, an open circuit or other damage.**

Clean high tension cables with a cloth moistened with a non-flammable solvent and wipe dry. Check for brittle or cracked insulation.

ELECTRONIC IGNITION COIL

WARNING: THE DIRECT IGNITION SYSTEM GENERATES APPROXIMATELY 40,000 VOLTS. PERSONAL INJURY COULD RESULT FROM CONTACT WITH THIS SYSTEM.

The coil pack consists of 2 coils molded together. The coil pack is mounted on the valve cover (Fig. 4). High tension leads route to each cylinder from the coil. The coil fires two spark plugs every power stroke. One plug is the cylinder under compression, the other cylinder fires on the exhaust stroke. Coil number one fires cylinders 1 and 4. Coil number two fires cylinders 2 and 3. The PCM determines which of the coils to charge and fire at the correct time.

The Auto Shutdown (ASD) relay provides battery voltage to the ignition coil. The PCM provides a ground contact (circuit) for energizing the coil. When the PCM breaks the contact, the energy in the coil primary transfers to the secondary causing the spark. The PCM will de-energize the ASD relay if it does not receive the crankshaft position sensor and camshaft position sensor inputs. Refer to Auto Shutdown (ASD) Relay—PCM Output, in this section for relay operation.

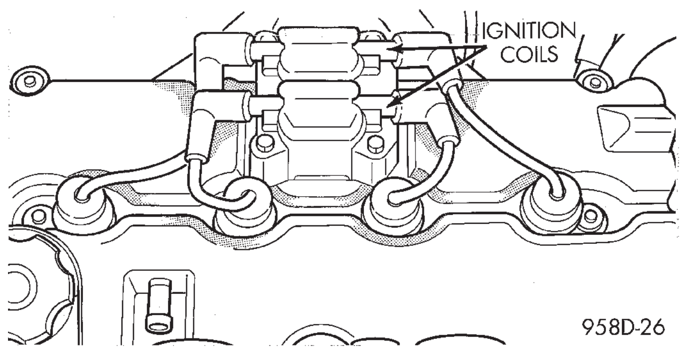


Fig. 4 Ignition Coil Pack—2.4L Engine

IGNITION COIL—2.5L

The 2.5L engine uses an epoxy type coil. The coils are not oil filled. The windings are embedded in a heat and vibration resistant epoxy compound.

On a 2.5L the ignition transistor is located in the distributor (pin 11). On a 2.5L The PCM controls ignition timing by turning on and off the tranisistor in the distributor. By switching the ground path for the coil on and off, the PCM adjusts ignition timing to meet changing engine operating conditions.

The PCM operates the ignition coil through the Auto Shutdown (ASD) relay. When the relay is energized by the PCM, battery voltage is connected to the ignition coil positive terminal. The PCM will de-energize the ASD relay if it does not receive an input from the distributor pick-up. Refer to Auto Shutdown (ASD) Relay and Fuel Pump Relay in this section.

DESCRIPTION AND OPERATION (Continued)

The ignition coil is located inside the distibutor. The distributor is mounted to the right end of the engine block behind the thermostat housing (Fig. 5).

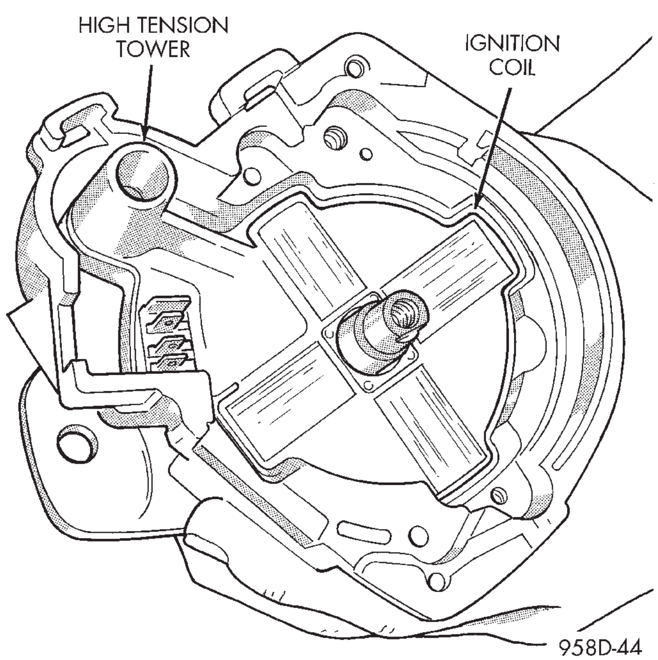


Fig. 5 Ignition Coil—2.5L Engine

AUTOMATIC SHUTDOWN RELAY

The Automatic Shutdown (ASD) relay supplies battery voltage to the fuel injectors, generator field, electronic ignition coil and the heating elements in the oxygen sensors.

Refer to Group 8W, Wiring Diagrams for circuit information.

The PCM controls the ASD relay by switching the ground path for the solenoid side of the relay on and off. The PCM turns the ground path off when the ignition switch is in the Off position unless the O2 Heater Monitor test is being run. Refer to Group 25, On-Board Diagnostics. When the ignition switch is in On or Start, the PCM momentarily turns on the ASD relay. While the relay is on the PCM monitors the crankshaft and camshaft position sensor signals to determine engine speed and ignition timing (coil dwell). If the PCM does not receive crankshaft and camshaft position sensor signals when the ignition switch is in the Run position, it will de-energize the ASD relay.

The ASD relay is located in the PDC (Fig. 6). The inside top of the PDC cover has a label showing relay and fuse identification.

CRANKSHAFT POSITION SENSOR

The PCM determines what cylinder to fire from the crankshaft position sensor input and the camshaft position sensor input. The second crankshaft counter-

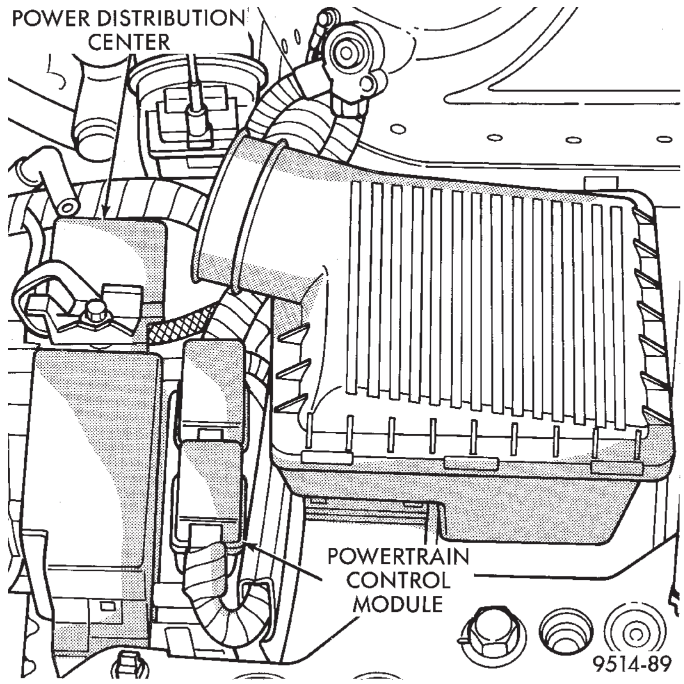


Fig. 6 Power Distribution Center (PDC)

weight has machined into it two sets of four timing reference notches including a 60 degree signature notch (Fig. 7). From the crankshaft position sensor input the PCM determines engine speed and crankshaft angle (position).

The notches generate pulses from high to low in the crankshaft position sensor output voltage. When a metal portion of the counterweight aligns with the crankshaft position sensor, the sensor output voltage goes low (less than 0.5 volts). When a notch aligns with the sensor, voltage goes high (5.0 volts). As a group of notches pass under the sensor, the output voltage switches from low (metal) to high (notch) then back to low.

If available, an oscilloscope can display the square wave patterns of each voltage pulse. From the frequency of the output voltage pulses, the PCM calculates engine speed. The width of the pulses represent the amount of time the output voltage stays high before switching back to low. The period of time the sensor output voltage stays high before switching back to low is referred to as pulse-width. The faster the engine is operating, the smaller the pulse-width on the oscilloscope.

By counting the pulses and referencing the pulse from the 60 degree signature notch, the PCM calculates crankshaft angle (position). In each group of timing reference notches, the first notch represents 69 degrees before top dead center (BTDC). The second notch represents 49 degrees BTDC. The third notch represents 29 degrees. The last notch in each set represents 9 degrees before top dead center BTDC.

DESCRIPTION AND OPERATION (Continued)

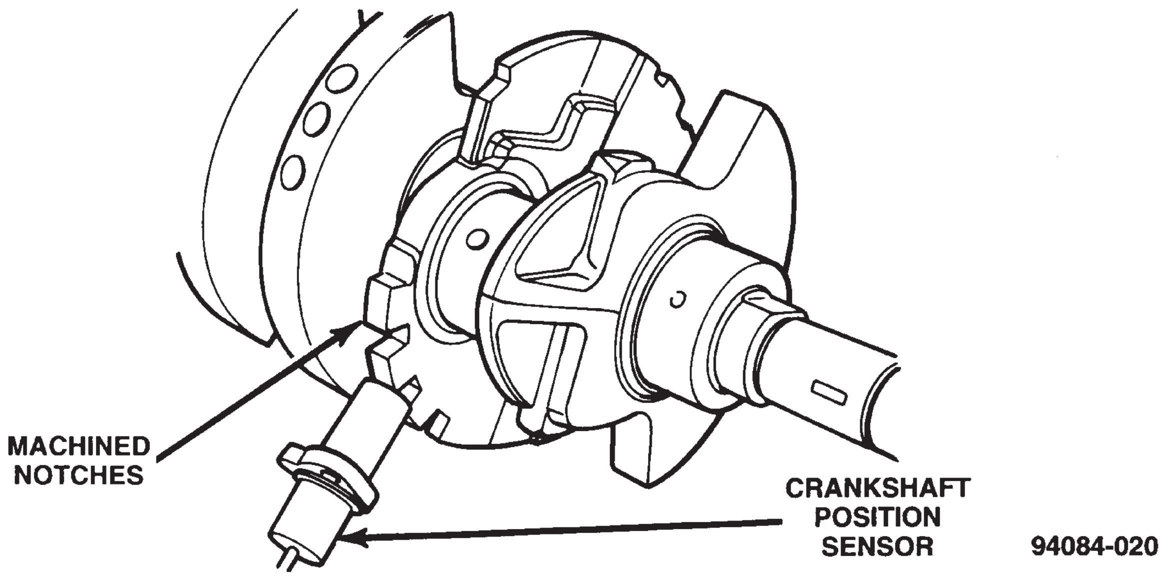


Fig. 7 Timing Reference Notches

The timing reference notches are machined at 20° increments. From the voltage pulse-width the PCM tells the difference between the timing reference notches and the 60 degree signature notch. The 60 degree signature notch produces a longer pulse-width than the smaller timing reference notches. If the camshaft position sensor input switches from high to low when the 60 degree signature notch passes under the crankshaft position sensor, the PCM knows cylinder number one is the next cylinder at TDC.

The crankshaft position sensor mounts to the engine block behind the generator, just above the oil filter (Fig. 8).

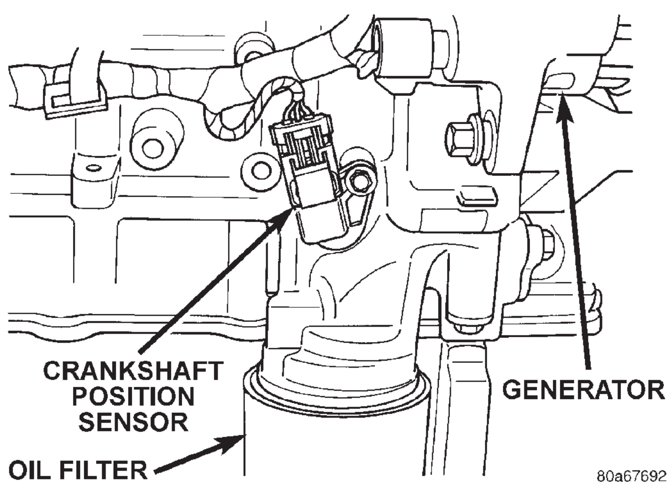


Fig. 8 Crankshaft Position Sensor

CRANKSHAFT POSITION SENSOR—2.5L

The crankshaft position sensor (Fig. 9) detects slots cut into the transmission driveplate extension. There are 3 sets of slots. Each set contains 4 slots, for a total of 12 slots (Fig. 10). Basic timing is set by the position of the last slot in each group. Once the Powertrain Control Module (PCM) senses the last slot, it determines crankshaft position (which piston will next be at TDC) from the camshaft position sensor input. The 4 pulses generated by the crankshaft position sensor represent the 69°, 49°, 29°, and 9° BTDC marks. It may take the PCM one engine revolution to determine crankshaft position.

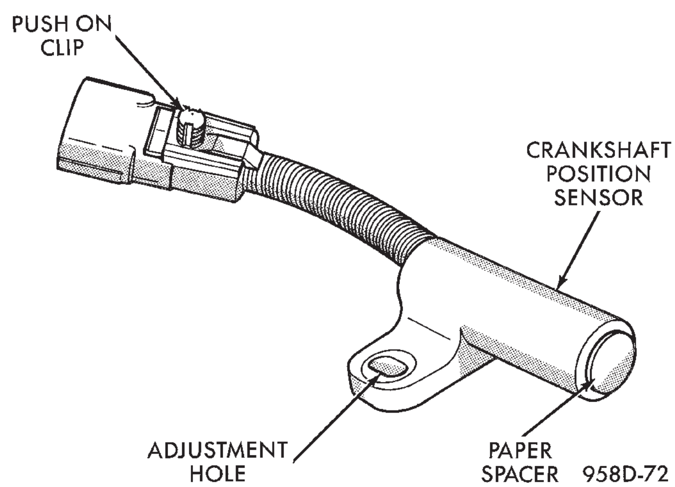


Fig. 9 Crankshaft Position Sensor—Adjustable

The PCM uses crankshaft position reference to determine injector sequence, ignition timing and the presence of misfire. Once the PCM determines crankshaft position, it begins energizing the injectors in sequence.

DESCRIPTION AND OPERATION (Continued)

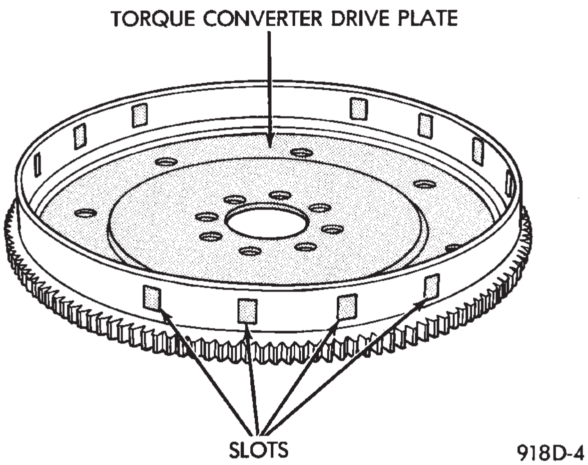


Fig. 10 Timing Slots

The crankshaft sensor is located on the rear of the transmission housing, above the differential housing (Fig. 11). The sensor connector has a christmas tree attached to the heater tube bracket. The bottom of the sensor is positioned next to the drive plate.

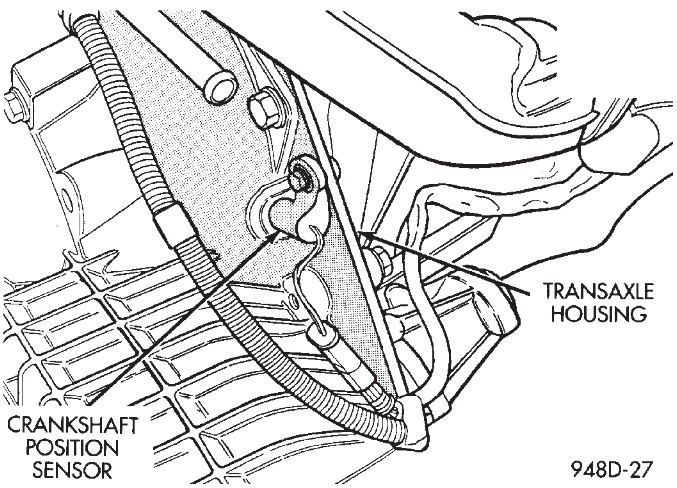


Fig. 11 Crankshaft Position Sensor Location—Typical

CAMSHAFT POSITION SENSOR—2.4L

The PCM determines fuel injection synchronization and cylinder identification from inputs provided by the camshaft position sensor (Fig. 12) and crankshaft position sensor. From the two inputs, the PCM determines crankshaft position.

The camshaft position sensor attaches to the rear of the cylinder head (Fig. 13). A target magnet attaches to the rear of the camshaft and indexes to the correct position. The target magnet has four different poles arranged in an asymmetrical pattern. As the target magnet rotates, the camshaft position sensor senses the change in polarity (Fig. 14). The sensor input switches from high (5 volts) to low (0.30 volts) as the target magnet rotates. When the north pole of the target magnet passes under the sensor, the output switches high. The sensor output switches low when the south pole of the target magnet passes underneath.

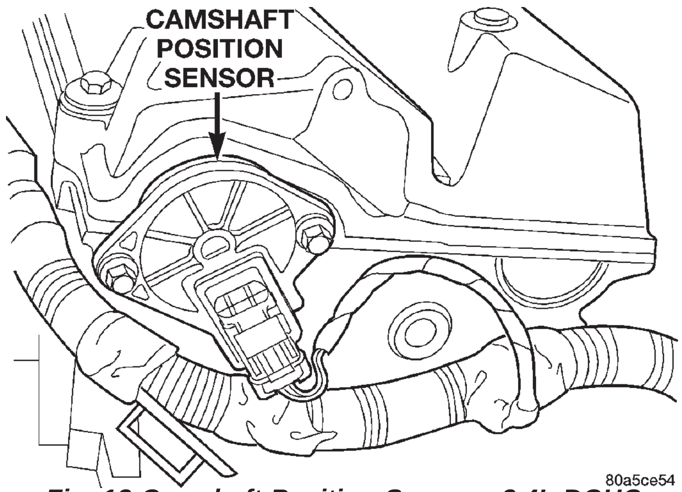


Fig. 12 Camshaft Position Sensor—2.4L DOHC

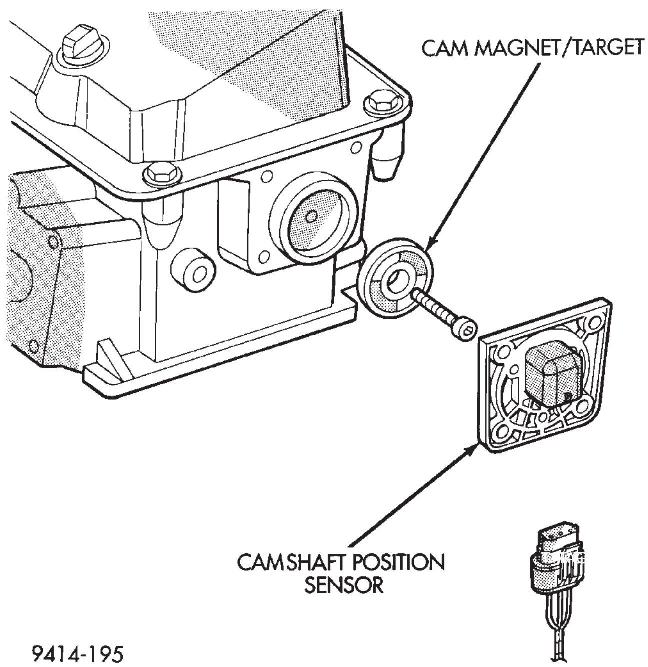


Fig. 13 Target Magnet—Typical

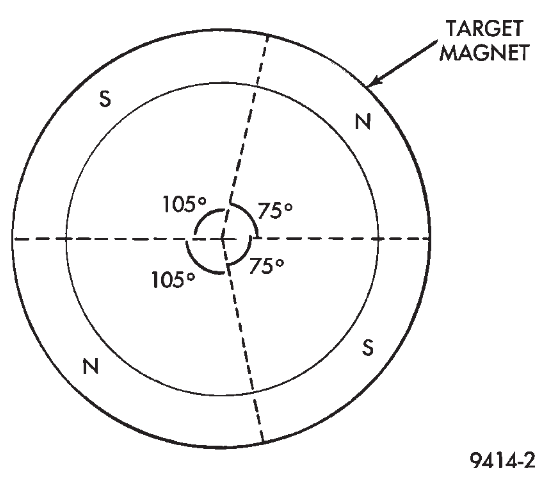


Fig. 14 Target Magnet Polarity

DESCRIPTION AND OPERATION (Continued)

The camshaft position sensor is mounted to the rear of the cylinder head. The sensor also acts as a thrust plate to control camshaft endplay.

CAMSHAFT POSITION SENSOR—2.5L

The PCM determines fuel injection synchronization and cylinder identification from inputs provided by the camshaft position sensor and crankshaft position sensor. From the two inputs, the PCM determines crankshaft position.

The 2.5L engine is equipped with a camshaft driven mechanical distributor, containing a shaft driven distributor rotor. The distributor is also equipped with an internal camshaft position (fuel sync) sensor (Fig. 15). This sensor provides fuel injection synchronization and cylinder identification to the PCM.

The camshaft position sensor contains a hall effect device called a sync signal generator. This sync signal generator detects a rotating pulse ring (shutter) on the distributor shaft. The pulse ring rotates 180 through the sync signal generator. Its signal is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

When the leading edge of the shutter enters the sync signal generator, the interruption of magnetic field causes the voltage to switch high. This causes a sync signal of approximately 5 volts.

When the trailing edge of the shutter leaves the sync signal generator, the change of magnetic field causes the sync signal voltage to switch low to 0 volts.

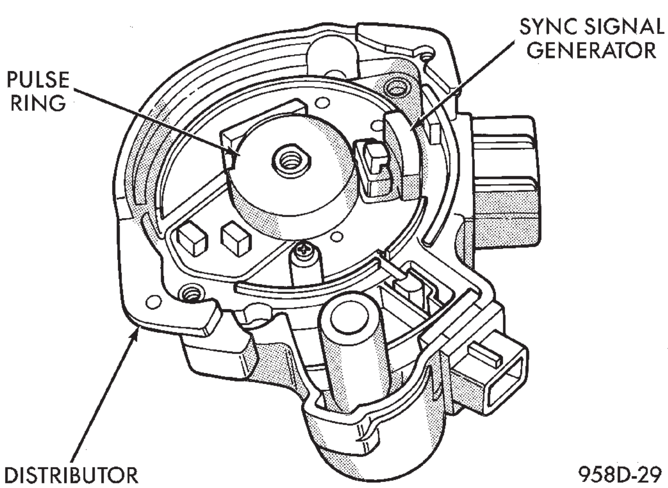


Fig. 15 Camshaft Position Sensor—2.5L Engine

Since the shutter rotates at half crankshaft speed, it may take 1 engine revolution during cranking for the PCM to determine the position of piston number 6.

ENGINE COOLANT TEMPERATURE SENSOR

The Engine Coolant Temperature (ECT) sensor has one element. The sensor provides an input voltage to the PCM. The sensor is a variable resistance (thermistor) with a range of -40°F to 265°F. As coolant temperature varies, the sensors resistance changes, resulting in a different input voltage to the PCM.

The PCM contains different spark advance schedules for cold and warm engine operation. The schedules reduce engine emissions and improve driveability. Because spark advance changes at different engine operating temperatures during warm-up, all spark advance testing should be done with the engine fully warmed.

The PCM demands slightly richer air-fuel mixtures and higher idle speeds until the engine reaches normal operating temperature.

The engine coolant sensor input is also used for radiator fan control.

INTAKE AIR TEMPERATURE SENSOR—2.4/2.5L

The Intake Air Temperature (IAT) sensor measures the temperature of the air as it enters the engine. The sensor supplies one of the inputs the PCM uses to determine injector pulse-width.

The IAT sensor threads into the intake manifold (Fig. 16) or (Fig. 17).

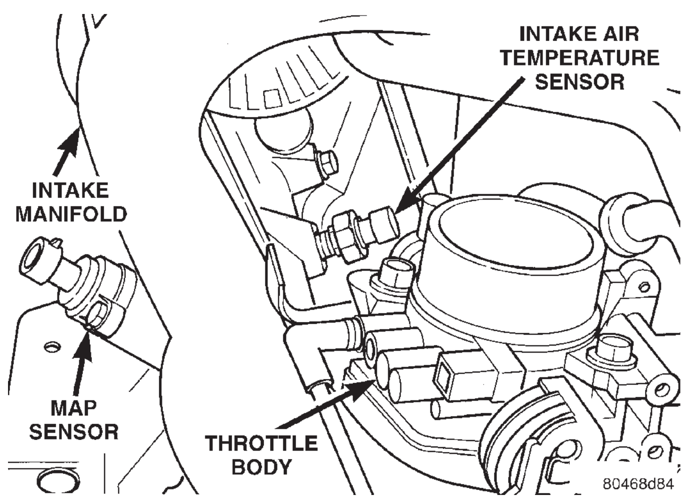


Fig. 16 Intake Air Temperature Sensor and MAP Sensor—2.4L

KNOCK SENSOR

The knock sensor threads into the side of the cylinder block in front of the starter motor. When the knock sensor detects a knock in one of the cylinders, it sends an input signal to the PCM. In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the PCM while the engine operates. As the

DESCRIPTION AND OPERATION (Continued)

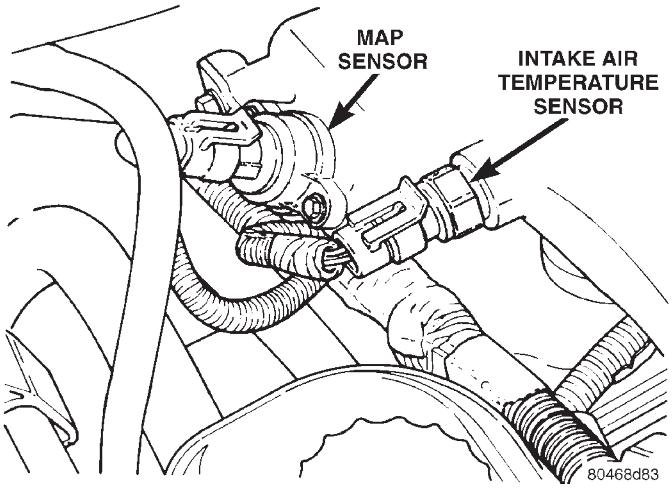


Fig. 17 Intake Air Temperature Sensor and MAP Sensor—2.5L

intensity of the crystal's vibration increase, the knock sensor output voltage also increases.

NOTE: Over or under tightening effects knock sensor performance, possibly causing improper spark control.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the Manifold Absolute Pressure (MAP) sensor. The MAP sensor converts intake manifold pressure into voltage. The PCM monitors the MAP sensor output voltage. As vacuum increases, MAP sensor voltage decreases proportionately. Also, as vacuum decreases, MAP sensor voltage increases proportionately.

During cranking, before the engine starts running, the PCM determines atmospheric air pressure from the MAP sensor voltage. While the engine operates, the PCM determines intake manifold pressure from the MAP sensor voltage. Based on MAP sensor voltage and inputs from other sensors, the PCM adjusts spark advance and the air/fuel mixture.

The MAP sensor mounts to the intake manifold.

THROTTLE POSITION SENSOR (TPS)

The TPS mounts to the side of the throttle body. The TPS connects to the throttle blade shaft. The TPS is a variable resistor that provides the Powertrain Control Module (PCM) with an input signal (voltage). The signal represents throttle blade position. As the position of the throttle blade changes, the resistance of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the powertrain control module) represents throttle blade position. The TPS output voltage to the PCM varies from approximately 0.38 volts to 1.2 volts at minimum throttle opening (idle) to a maximum of 3.1 volts to 4.4 volts at wide open throttle.

Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. The PCM also adjusts fuel injector pulse width and ignition timing based on these inputs.

LOCK KEY CYLINDER

The lock cylinder is inserted in the end of the housing opposite the ignition switch. The ignition key rotates the cylinder to 5 different detents (Fig. 18):

- Accessory
- Off (lock)
- Unlock
- On/Run
- Start

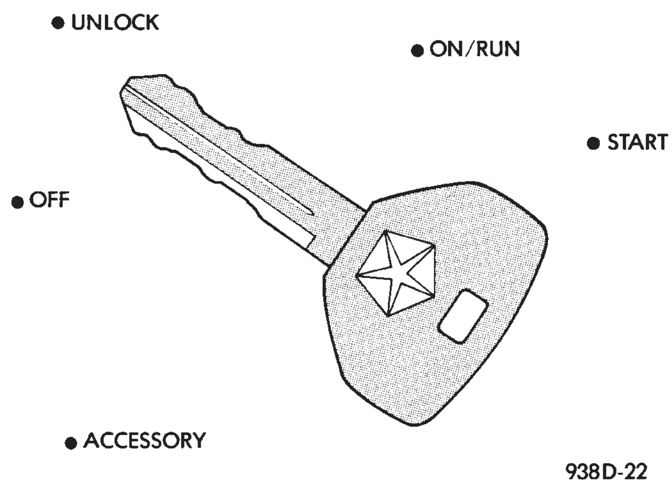


Fig. 18 Ignition Lock Cylinder Detents

IGNITION INTERLOCK

All vehicles equipped with automatic transaxles have an interlock system. The system prevents shifting the vehicle out of Park unless the ignition lock cylinder is in the Off, Run or Start position. In addition, the operator cannot rotate the key to the lock position unless the shifter is in the park position. On vehicles equipped with floor shift refer to Group 21 - Transaxle for Automatic Transmission Shifter/Ignition Interlock.

DIAGNOSIS AND TESTING

TESTING FOR SPARK AT COIL—2.4L

WARNING: THE DIRECT IGNITION SYSTEMS GENERATES APPROXIMATELY 40,000 VOLTS. PERSONAL INJURY COULD RESULT FROM CONTACT WITH THIS SYSTEM.

DIAGNOSIS AND TESTING (Continued)

The coil pack contains independent coils. Each coil must be checked individually.

CAUTION: Spark plug wire damage may occur if the spark plug is moved more than 1/4 inch away from the engine ground.

CAUTION: Do not leave any one spark plug cable disconnected any longer than 30 seconds or possible heat damage to catalytic converter will occur.

CAUTION: Test must be performed at idle and in park only with the parking brake on.

NOTE: New isolated engine valve cover may not provide adequate ground. Use engine block as engine ground.

Use a new spark plug and spark plug cable for the following test.

(1) Insert a new spark plug into the new spark plug boot. Ground the plug to the engine (Fig. 19). Do not hold with your hand.

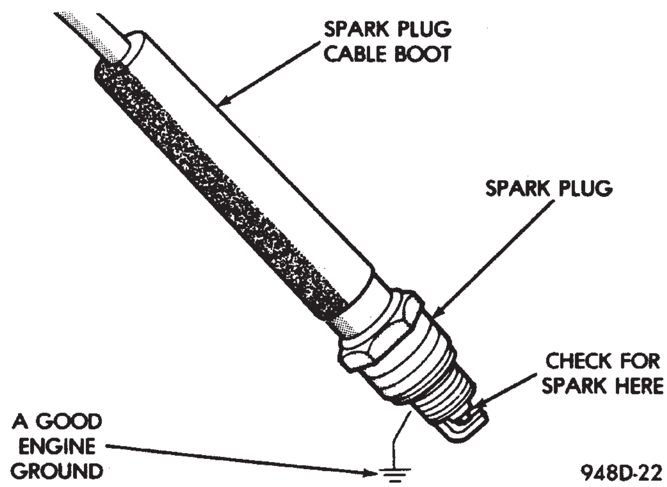


Fig. 19 Testing For Spark

(2) Starting with coil insulator #1, remove it from the DIS coil.

(3) Plug the test spark plug cable onto #1 coil tower. Make sure a good connection is made; there should be a click sound.

(4) Crank the engine and look for spark across the electrodes of the spark plug.

CAUTION: Always install the cable back on the coil tower after testing to avoid damage to the coil and catalytic converter.

(5) Repeat the above test for the remaining coils. If there is no spark during all cylinder tests, proceed to the Failure To Start Test.

(6) If one or more tests indicate irregular, weak, or no spark, proceed to Check Coil Test.

TESTING FOR SPARK AT COIL—2.5L

WARNING: THE IGNITION SYSTEM GENERATES APPROXIMATELY 32,000 VOLTS. PERSONAL INJURY COULD RESULT FROM CONTACT WITH THIS SYSTEM.

CAUTION: Spark plug wire damage may occur if the spark plug is moved more than 1/4 inch away from the engine ground.

CAUTION: Do not leave any one spark plug cable disconnected any longer than necessary during test or possible heat damage to catalytic converter will occur. Total test time must not exceed 1 minute. Use a new spark plug and spark plug cable for the following test.

(1) Insert a new spark plug into the new spark plug boot. Ground the plug to the engine (Fig. 19).

(2) Remove distributor cap. Refer to Distributor Service in this section.

(3) Plug test spark plug cable onto coil tower.

(4) Crank engine and look for spark across the electrodes of the spark plug. If there is no spark, check for: (Fig. 20)

- Continuity from PCM pin 11 to 6-way connector terminal 1
- Continuity between ground and 6-way connector terminal 2
- Continuity from PCM pin 6 to 2-way connector terminal 2
- Correct resistance in distributor cap, refer to Distributor Cap Resistance Test.

(5) If all circuits show continuity, replace distributor assembly.

CHECK COIL TEST—2.4L

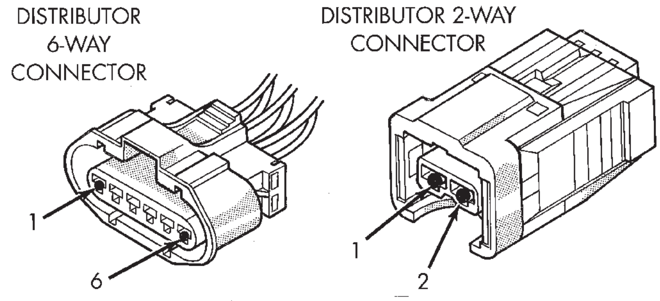
Coil one fires cylinders 1 and 4, coil two fires cylinders 2 and 3. Each coil tower is labeled with the number of the corresponding cylinder.

(1) Remove ignition cables and measure the resistance of the cables. Resistance must be within the range shown in the Cable Resistance Chart in Specifications. Replace any cable not within tolerance.

(2) Disconnect the electrical connector from the coil pack.

(3) Measure the primary resistance of each coil. At the coil, connect an ohmmeter between the B+ pin

DIAGNOSIS AND TESTING (Continued)



CAV	COLOR	FUNCTION
1	BK/GY	IGNITION COIL DRIVER
2	BK	GROUND
4	TN/YL	CMP SENSOR SIGNAL
5	DB/WT	FUSED IGN SWITCH OUTPUT
6	BK/LB	SENSOR GROUND

CAV	COLOR	FUNCTION
2	BK/RD	ASD RELAY OUTPUT

Fig. 20 Distributor Connectors

and the pin corresponding to the cylinders in question (Fig. 21). Resistance on the primary side of each coil should be 0.45 - 0.65 ohm at (70° to 80° F). Replace the coil if resistance is not within tolerance.

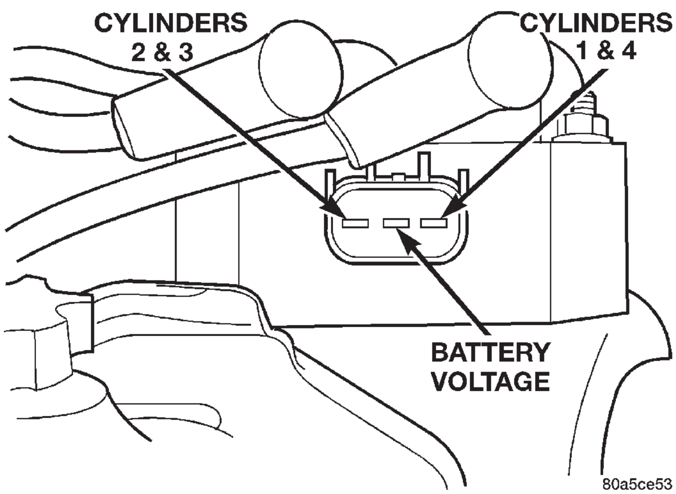


Fig. 21 Terminal Identification

(4) Remove ignition cables from the secondary towers of the coil. Measure the secondary resistance of the coil between the towers of each individual coil (Fig. 22). Secondary resistance should be 7,000 to 15,800 ohms. Replace the coil if resistance is not within tolerance.

CHECK COIL TEST—2.5L

Measure primary coil resistance at the 2 pin distributor connector. Resistance should be between 0.6 and 0.8 ohms.

Measure secondary coil resistance between the coil tower and each terminal of the 2 pin distributor connector. Resistance should be 12k to 18k ohms.

FAILURE TO START TEST—2.0/2.4L

This no-start test checks the camshaft position sensor and crankshaft position sensor.

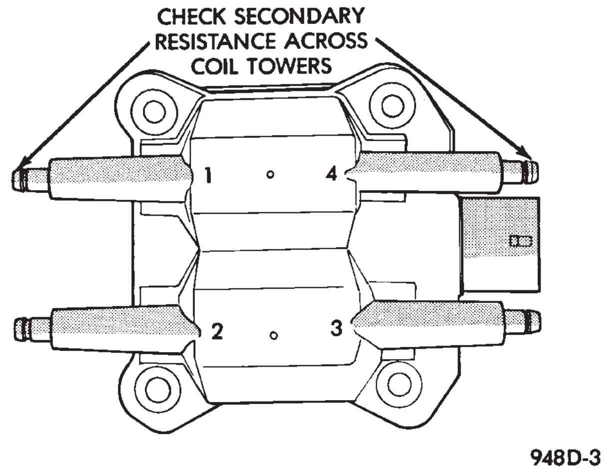


Fig. 22 Checking Ignition Coil Secondary Resistance

Use the DRB scan tool to test the camshaft position sensor and the sensor circuits. Refer to the appropriate Powertrain Diagnostics Procedure Manual. Refer to the wiring diagrams section for circuit information.

The Powertrain Control Module (PCM) supplies 8 volts to the camshaft position sensor and crankshaft position sensor through one circuit. If the 8 volt supply circuit shorts to ground, neither sensor will produce a signal (output voltage to the PCM).

When the ignition key is turned and left in the On position, the PCM automatically energizes the Auto Shutdown (ASD) relay. However, the controller de-energizes the relay within one second because it has not received a camshaft position sensor signal indicating engine rotation.

During cranking, the ASD relay will not energize until the PCM receives a camshaft position sensor signal. Secondly, the ASD relay remains energized only if the controller senses a crankshaft position sensor signal immediately after detecting the camshaft position sensor signal.

(1) Check battery voltage. Voltage should approximately 12.66 volts or higher to perform failure to start test.

(2) Disconnect the harness connector from the coil pack (Fig. 23).

(3) Connect a test light to the B+ (battery voltage) terminal of the coil electrical connector and ground. The B+ wire for the DIS coil is the center terminal. **Do not spread the terminal with the test light probe.**

(4) Turn the ignition key to the **ON position.** The test light should flash On and then Off. **Do not turn the Key to off position, leave it in the On position** .

(a) If the test light flashes momentarily, the PCM grounded the ASD relay. Proceed to step 5.

DIAGNOSIS AND TESTING (Continued)

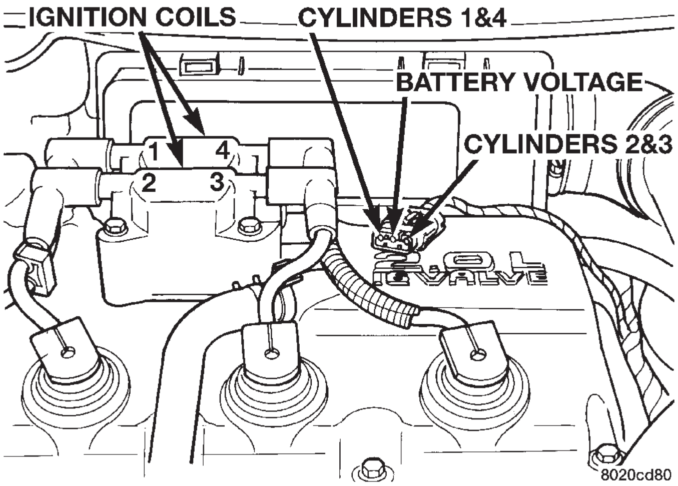


Fig. 23 Ignition Coil Engine Harness Connector

(b) If the test light did not flash, the ASD relay did not energize. The cause is either the relay or one of the relay circuits. Use the DRB scan tool to test the ASD relay and circuits. Refer to the appropriate Powertrain Diagnostics Procedure Manual. Refer to the wiring diagrams section for circuit information.

(5) Crank the engine. (If the key was placed in the off position after step 4, place the key in the On position before cranking. Wait for the test light to flash once, then crank the engine.)

(6) If the test light momentarily flashes during cranking, the PCM is not receiving a crankshaft position sensor signal.

(7) If the test light did not flash during cranking, unplug the crankshaft position sensor connector. Turn the ignition key to the off position. Turn the key to the On position, wait for the test light to momentarily flash once, then crank the engine. If the test light momentarily flashes, the crankshaft position sensor is shorted and must be replaced. If the light did not flash, the cause of the no-start is in either the crankshaft position sensor/camshaft position sensor 8 volt supply circuit, or the camshaft position sensor output or ground circuits.

FAILURE TO START TEST—2.5L

NOTE: Before proceeding with this test make sure Testing For Spark At Coil has been performed. Failure to do this may lead to unnecessary diagnostic time and wrong test results.

Refer to Group 25 for On-Board Diagnostic checks. Also, refer to the DRB scan tool and the appropriate Powertrain Diagnostic Procedures manual. These checks will help diagnose problems with the PCM and ASD relay.

IGNITION TIMING PROCEDURE

The engines for this vehicle, use a fixed ignition system. The PCM regulates ignition timing. Basic ignition timing is not adjustable.

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

The output voltage of a properly operating camshaft position sensor or crankshaft position sensor switches from high (5.0 volts) to low (0.3 volts). By connecting an Moper Diagonostic System (MDS) and engine analyzer to the vehicle, technicians can view the square wave pattern.

DISTRIBUTOR CAP RESISTANCE TEST—2.5L

There is a resistor built into the distributor cap. Connect an ohmmeter between the center button and igntion coil terminal. Ohmmeter should read 5000 ohms.

ENGINE COOLANT TEMPERATURE SENSOR

Refer to Group 14, Fuel System for Diagnosis and Testing.

INTAKE AIR TEMPERATURE SENSOR

Refer to Group 14, Fuel System, for Diagnosis and Testing.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR TEST

Refer to Group 14, Fuel System for Diagnosis and Testing.

THROTTLE POSITION SENSOR

To perform a complete test of the this sensor and its circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the throttle position sensor only, refer to the following:

The Throttle Position Sensor (TPS) can be tested with a digital voltmeter (DVM). The center terminal of the sensor is the output terminal. One of the other terminals is a 5 volt supply and the remaining terminal is ground.

Connect the DVM between the center and sensor ground terminal. Refer to Group 8W - Wiring Diagrams for correct pinout.

With the ignition switch in the ON position, check the output voltage at the center terminal wire of the connector. Check the output voltage at idle and at Wide-Open-Throttle (WOT). At idle, TPS output voltage should be approximately 0.38 volts to 1.2 volts. At wide open throttle, TPS output voltage should be approximately 3.1 volts to 4.4 volts. The output voltage should gradually increase as the throttle plate moves slowly from idle to WOT.

DIAGNOSIS AND TESTING (Continued)

Check for spread terminals at the sensor and PCM connections before replacing the TPS.

SPARK PLUG CONDITION

NORMAL OPERATING CONDITIONS

The few deposits present will be probably light tan or slightly gray in color with most grades of commercial gasoline (Fig. 24). There will not be evidence of electrode burning. Gap growth will not average more than approximately 0.025 mm (.001 in) per 1600 km (1000 miles) of operation for non platinum spark plugs. Non-platnium spark plugs that have normal wear can usually be cleaned, have the electrodes filed and regapped, and then reinstalled.

CAUTION: Never attempt to file the electrodes or use a wire brush for cleaning platinum spark plugs. This would damage the platinum pads which would shorten spark plug life.

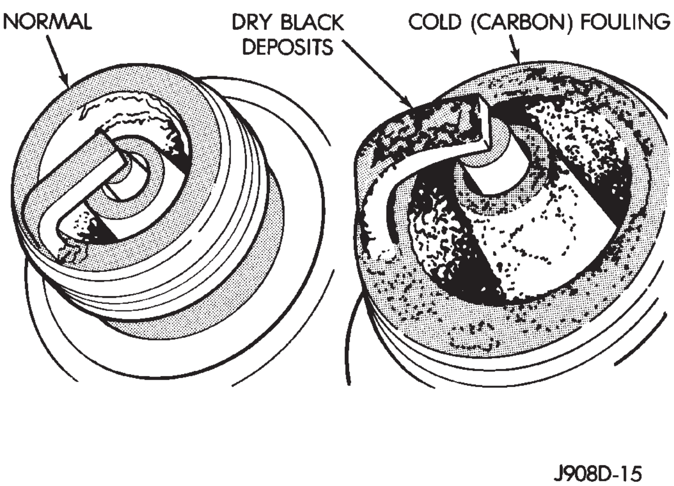


Fig. 24 Normal Operation and Cold (Carbon) Fouling

Some fuel refiners in several areas of the United States have introduced a manganese additive (MMT) for unleaded fuel. During combustion, fuel with MMT may coat the entire tip of the spark plug with a rust colored deposit. The rust color deposits can be misdiagnosed as being caused by coolant in the combustion chamber. Spark plug performance is not affected by MMT deposits.

COLD FOULING (CARBON FOULING)

Cold fouling is sometimes referred to as carbon fouling because the deposits that cause cold fouling are basically carbon (Fig. 24). A dry, black deposit on one or two plugs in a set may be caused by sticking valves or misfire conditions. Cold (carbon) fouling of the entire set may be caused by a clogged air cleaner.

Cold fouling is normal after short operating periods. The spark plugs do not reach a high enough operating temperature during short operating periods. **Replace carbon fouled plugs with new spark plugs.**

FUEL FOULING

A spark plug that is coated with excessive wet fuel is called fuel fouled. This condition is normally observed during hard start periods. **Clean fuel fouled spark plugs with compressed air and reinstall them in the engine.**

OIL FOULING

A spark plug that is coated with excessive wet oil is oil fouled. In older engines, wet fouling can be caused by worn rings or excessive cylinder wear. Break-in fouling of new engines may occur before normal oil control is achieved. **Replace oil fouled spark plugs with new ones.**

OIL OR ASH ENCRUSTED

If one or more plugs are oil or ash encrusted, evaluate the engine for the cause of oil entering the combustion chambers (Fig. 25). Sometimes fuel additives can cause ash encrustation on an entire set of spark plugs. **Ash encrusted spark plugs can be cleaned and reused.**

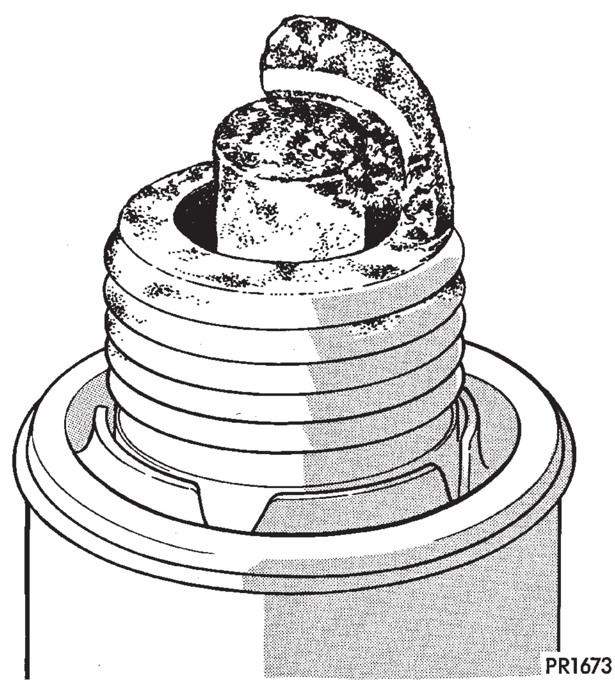


Fig. 25 Oil or Ash Encrusted

HIGH SPEED MISS

When replacing spark plugs because of a high speed miss condition; **wide open throttle operation should be avoided for approximately 80 km (50 miles) after installation of new plugs.** This will allow deposit shifting in the combustion chamber

DIAGNOSIS AND TESTING (Continued)

to take place gradually and avoid plug destroying splash fouling shortly after the plug change.

ELECTRODE GAP BRIDGING

Loose deposits in the combustion chamber can cause electrode gap bridging. The deposits accumulate on the spark plugs during continuous stop-and-go driving. When the engine is suddenly subjected to a high torque load, the deposits partially liquefy and bridge the gap between the electrodes (Fig. 26). This short circuits the electrodes. **Spark plugs with electrode gap bridging can be cleaned and reused.**

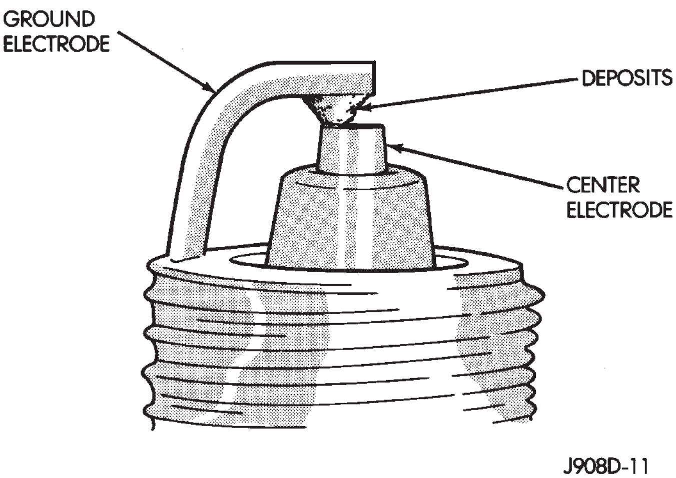


Fig. 26 Electrode Gap Bridging

SCAVENGER DEPOSITS

Fuel scavenger deposits may be either white or yellow (Fig. 27). They may appear to be harmful, but are a normal condition caused by chemical additives in certain fuels. These additives are designed to change the chemical nature of deposits and decrease spark plug misfire tendencies. Notice that accumulation on the ground electrode and shell area may be heavy but the deposits are easily removed. **Spark plugs with scavenger deposits can be considered normal in condition, cleaned and reused.**

CHIPPED ELECTRODE INSULATOR

A chipped electrode insulator usually results from bending the center electrode while adjusting the spark plug electrode gap. Under certain conditions, severe detonation also can separate the insulator from the center electrode (Fig. 28). **Spark plugs with chipped electrode insulators must be replaced.**

PREIGNITION DAMAGE

Excessive combustion chamber temperature can cause preignition damage. First, the center electrode dissolves and the ground electrode dissolves somewhat later (Fig. 29). Insulators appear relatively

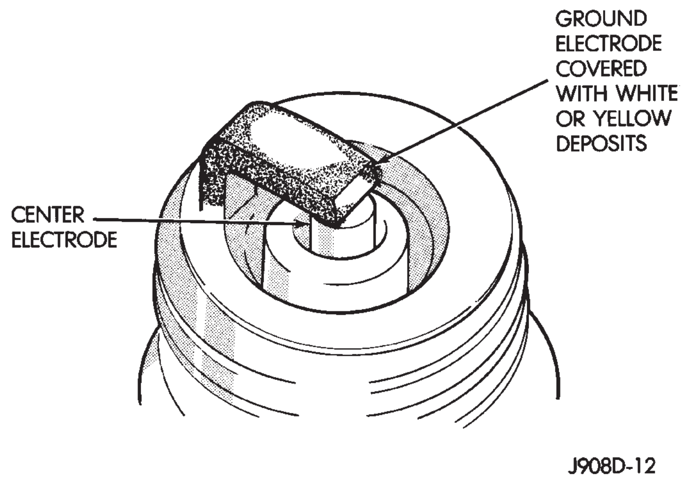


Fig. 27 Scavenger Deposits

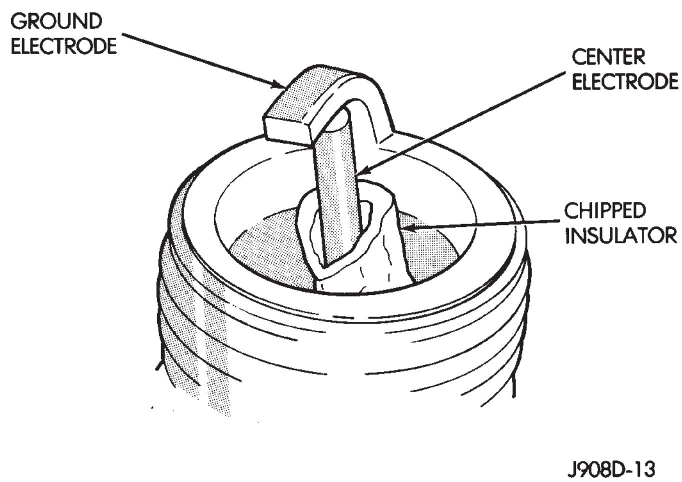


Fig. 28 Chipped Electrode Insulator

deposit free. Determine if the spark plugs are the correct type, as specified on the VECI label, or if other operating conditions are causing engine overheating.

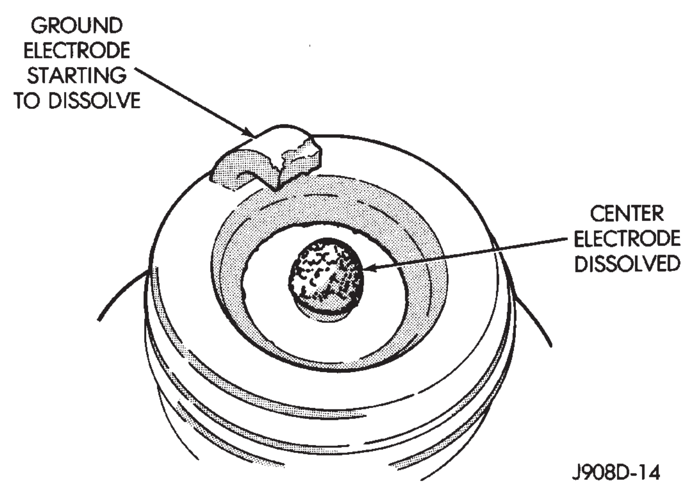


Fig. 29 Preignition Damage

DIAGNOSIS AND TESTING (Continued)

SPARK PLUG OVERHEATING

Overheating is indicated by a white or gray center electrode insulator that also appears blistered (Fig. 30). The increase in electrode gap will be considerably in excess of 0.001 in per 1000 miles of operation. This suggests that a plug with a cooler heat range rating should be used. Over advanced ignition timing, detonation and cooling system malfunctions also can cause spark plug overheating.

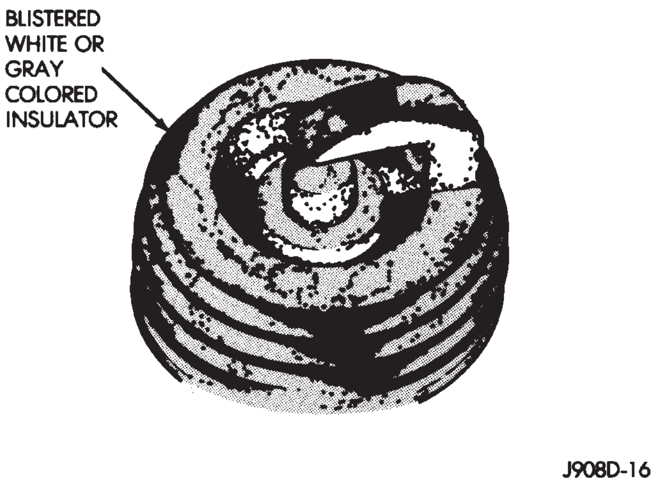


Fig. 30 Spark Plug Overheating

REMOVAL AND INSTALLATION

POWERTRAIN CONTROL MODULE

The PCM attaches to a bracket between the air cleaner housing and Power Distribution Center (PDC).

REMOVAL

(1) Disconnect negative cable from auxillary jumper terminal (Fig. 31).

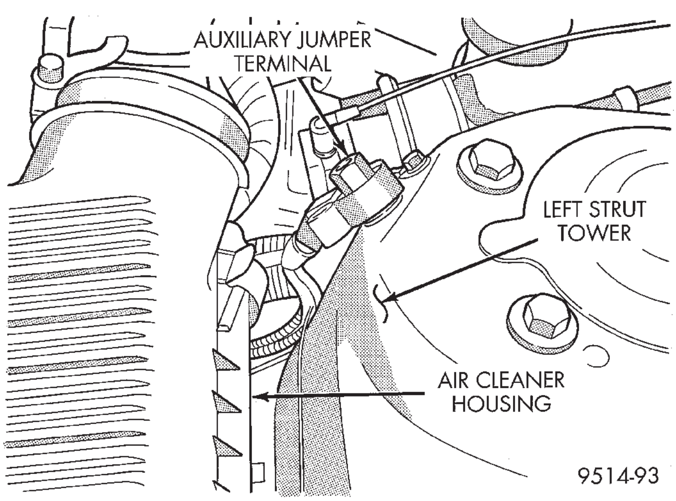


Fig. 31 Auxillary Jumper Terminal

(2) Disconnect both 40-way connectors from PCM.

(3) Remove screws attaching PCM to bracket (Fig. 32).

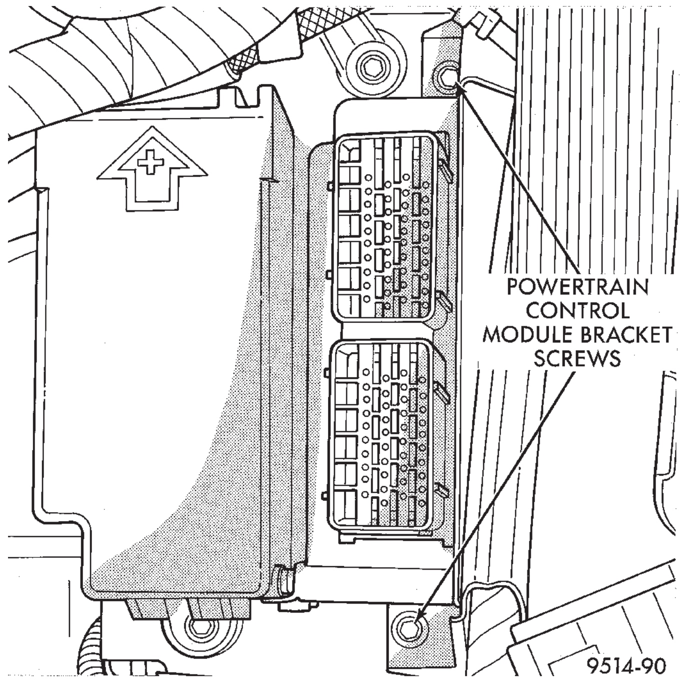


Fig. 32 PCM Bracket Screws

(4) Lift PCM up to remove it from vehicle.

INSTALLATION

(1) Install PCM. Tighten mounting screws.

(2) Attach both 40-way connectors to PCM.

(3) Connect negative cable to auxillary jumper terminal.

SPARK PLUG CABLES—2.4L

Clean high tension cables with a cloth moistened with a non- flammable solvent. Wipe the cables dry. Check for brittle or cracked insulation.

Resistance cables are identified by the words **Electronic Suppression** .

REMOVAL

Disconnect the cable from the ignition coil first.

The cables insulate the spark plugs and cover the top of the spark plug tubes (Fig. 3). To remove the cables, lightly grasp the top of the cable. Rotate the insulator 90° and pull straight up. **Ensure the #1 and #4 cables run under the #2 and #3 ignition coil towers. Keep #4 cable away from the oil fill cap.**

INSTALLATION

Ensure the #1 and #4 cables run under the #2 and #3 ignition coil towers. Keep #4 cable away from the oil fill cap.

Rotate the insulator 90° and push straight down. Connect the cable to the ignition coil.

REMOVAL AND INSTALLATION (Continued)

SPARK PLUG—2.4L

Failure to route the cables properly could cause the radio to reproduce ignition noise, cross ignition of the spark plugs or short circuit the cables to ground.

NOTE: REMOVE cables from coil first before removing spark plug insulator.

REMOVAL

Always remove the spark plug cable by grasping the top of the spark plug insulator, turning the boot 1/2 turn and pulling straight up in a steady motion.

(1) Remove the spark plug using a quality socket with a rubber or foam insert.

(2) Inspect the spark plug condition. Refer to Spark Plug Condition in this section.

INSTALLATION

(1) To avoid cross threading, start the spark plug into the cylinder head by hand.

(2) Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

(3) Install spark plug insulators over spark plugs. Ensure the top of the spark plug insulator covers the upper end of the spark plug tube.

(4) Install spark plug cable to coil.

SPARK PLUGS AND CABLES—2.5L

When replacing the spark plug and coil cables, route the cables correctly and secure them in the appropriate retainers. Failure to route the cables properly can cause the radio to reproduce ignition noise, cross ignition of the spark plugs or short circuit the cables to ground.

CAUTION: Never attempt to file the electrodes or use a wire brush for cleaning platinum plugs. This would damage the platinum pads which would shorten spark plug life.

Apply a very small amount of anti-seize compound to the threads when reinstalling the vehicle's original spark plugs that have been determined good. **Do not apply anti-seize compound to new spark plugs.**

NOTE: Anti-seize compound is electrically conductive and can cause engine misfires if not applied correctly. It is extremely important that the anti-seize compound doesn't make contact with the spark plug electrodes or ceramic insulator.

SPARK PLUG REMOVAL—#2, #4 or #6

Always remove the ignition cable by grasping at the spark plug boot turning, the boot 1/2 turn and pulling straight back in a steady motion.

(1) Prior to removing the spark plug spray compressed air around the spark plug hole and the area around the spark plug.

(2) Remove the spark plug using a quality socket with a rubber or foam insert.

(3) Inspect the spark plug condition. Refer to Spark Plug Condition in this section.

INSTALLATION

(1) To avoid cross threading, start the spark plug into the cylinder head by hand.

(2) Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

(3) Install ignition cables over spark plugs.

SPARK PLUG REMOVAL—#1, #3 or #5

(1) Disconnect negative cable from auxillary jumper terminal.

(2) Unplug connectors from MAP and intake air temperature sensors (Fig. 33).

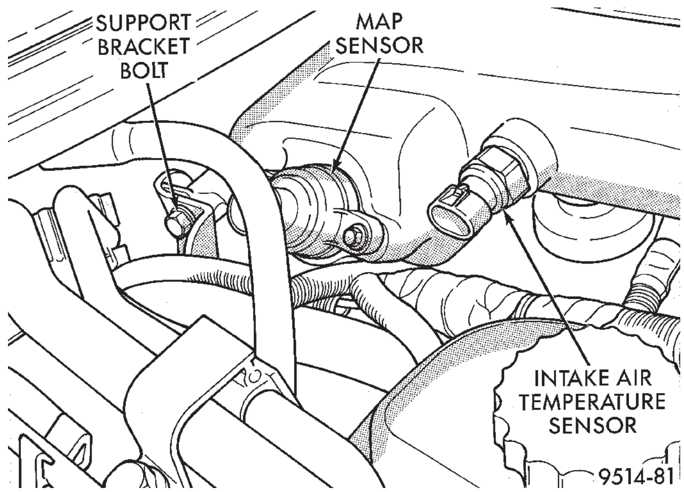


Fig. 33 Intake Manifold Sensors and Left Plenum Support Bolt

(3) Remove plenum support bracket bolt located rearward of MAP sensor (Fig. 33).

(4) Remove bolt holding air inlet resonator to intake plenum (Fig. 34).

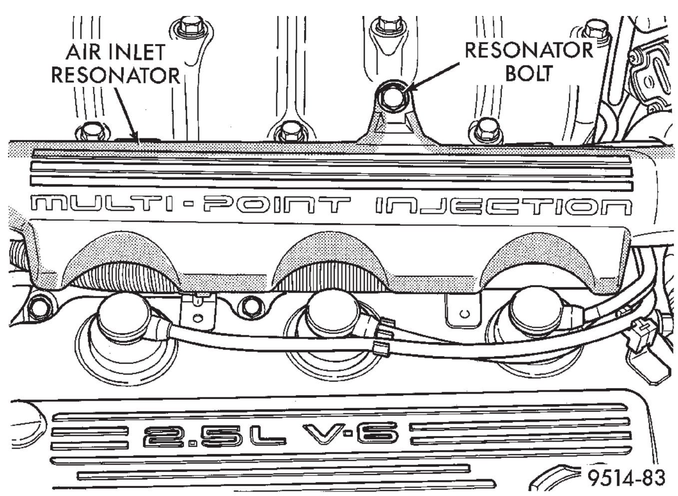


Fig. 34 Air Inlet Resonator

(5) Loosen throttle body air inlet hose clamp.

REMOVAL AND INSTALLATION (Continued)

(6) Release snaps holding air cleaner housing cover to housing.

(7) Remove air cleaner cover and inlet hoses from engine.

(8) Unplug TPS and idle air control motor connectors (Fig. 35) and (Fig. 36).

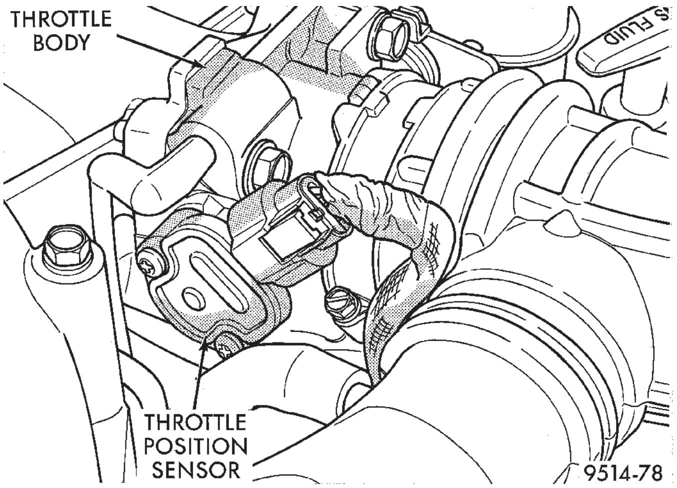


Fig. 35 Throttle Position Sensor

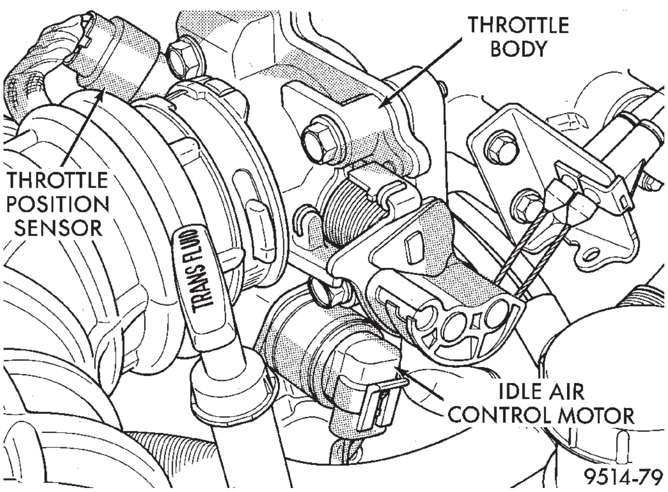


Fig. 36 Idle Air Control Motor

(9) Pry retainer tab back on throttle cable and slide cable out of bracket (Fig. 37). Remove cable from throttle lever.

(10) Slide Speed control cable out of bracket, if equipped (Fig. 37). Remove cable from throttle lever.

(11) Remove EGR tube from intake plenum (Fig. 38).

(12) Remove plenum support bracket bolt located rearward of EGR tube (Fig. 38).

(13) Remove bolts holding upper intake plenum and remove plenum.

(14) Always remove the ignition cable by grasping at the spark plug boot turning, the boot 1/2 turn and pulling straight back in a steady motion.

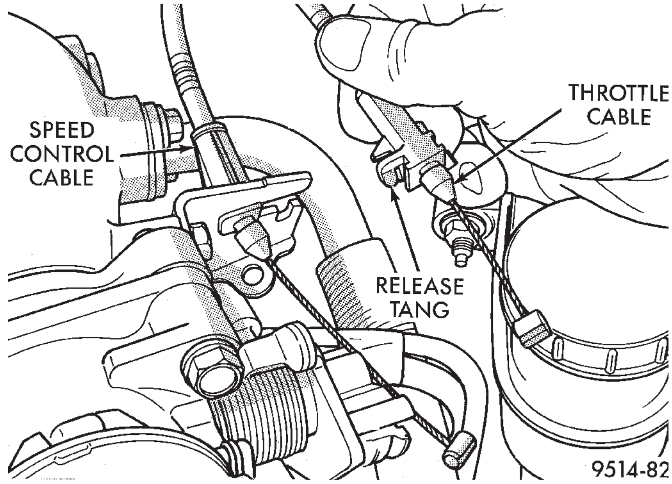


Fig. 37 Throttle Cable Attachment

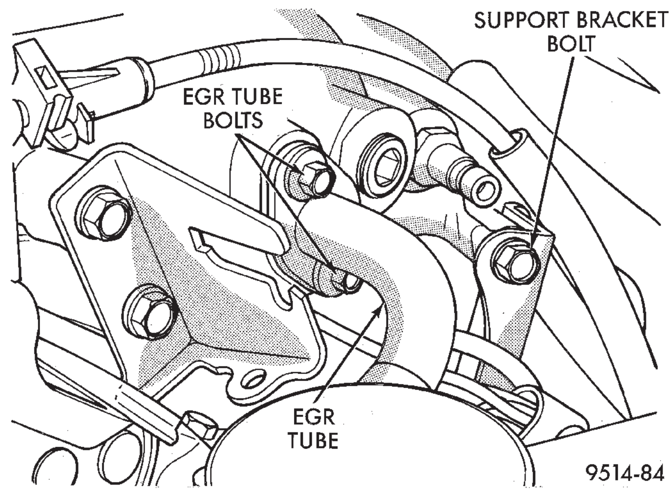


Fig. 38 EGR Tube and Right Manifold Support Bolt

(15) Prior to removing the spark plug spray compressed air around the spark plug hole and the area around the spark plug.

(16) Remove the spark plug using a quality socket with a rubber or foam insert.

(17) Inspect the spark plug condition. Refer to Spark Plug Condition in this section.

SPARK PLUG INSTALLATION

(1) To avoid cross threading, start the spark plug into the cylinder head by hand.

(2) Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

(3) Install ignition cables over spark plugs.

(4) Install new gasket and position upper intake plenum. Tighten plenum bolts to 18 N·m (13 ft. lbs.) torque.

(5) Install bolts at plenum support brackets. Tighten bolts to 18 N·m (13 ft. lbs.).

(6) Install EGR tube to plenum. Tighten EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

(7) Install throttle and speed control (if equipped) cables.

(8) Attach electrical connectors to sensors.

(9) Tighten air inlet tube clamps to 3 N·m ±1 (25 ±5 in. lbs.) torque.

(10) Connect negative terminal to auxiliary jumper terminal.

SPARK PLUG TUBES

The spark plugs tubes are pressed into the cylinder head. Sealant is applied to the end of the tube before installation. For engine information, refer to Group 9, Engines.

IGNITION COIL—2.4L

The electronic ignition coil pack attaches directly to the valve cover (Fig. 39).

REMOVAL

(1) Disconnect electrical connector from coil pack.

(2) Remove coil pack mounting nuts.

(3) Remove coil pack.

INSTALLATION

(1) Install coil pack on valve cover.

(2) Transfer spark plug cables to new coil pack. The coil pack towers are numbered with the cylinder identification. Be sure the ignition cables snap onto the towers.

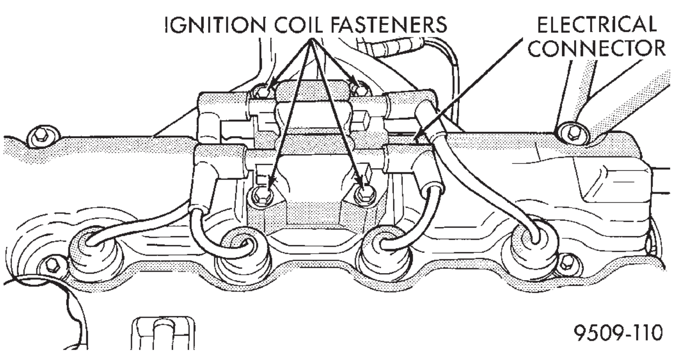


Fig. 39 Electronic Ignition Coil Pack—2.4L

IGNITION COIL—2.5L

The ignition coil is located in the distributor housing (Fig. 40).

If ignition coil is defective, replace distributor assembly. Refer to Distributor Service.

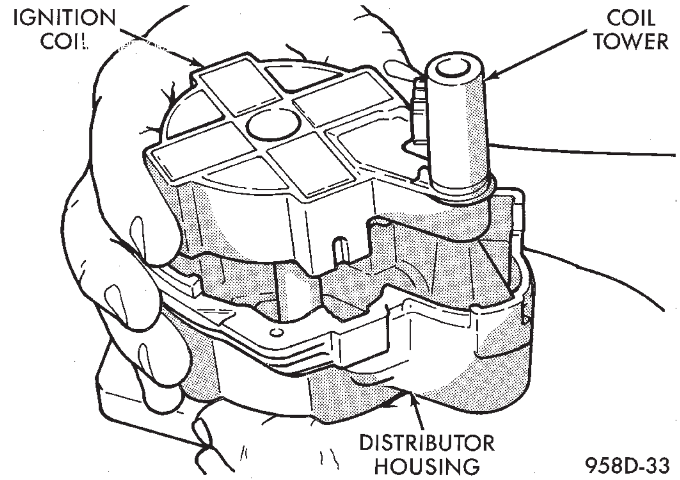


Fig. 40 Ignition Coil

AUTOMATIC SHUTDOWN RELAY

The relay is located in the Power Distribution Center (PDC) (Fig. 41). The PDC is located in the engine compartment. For the location of the relay within the PDC, refer to the PDC cover for location. Check electrical terminals for corrosion and repair as necessary.

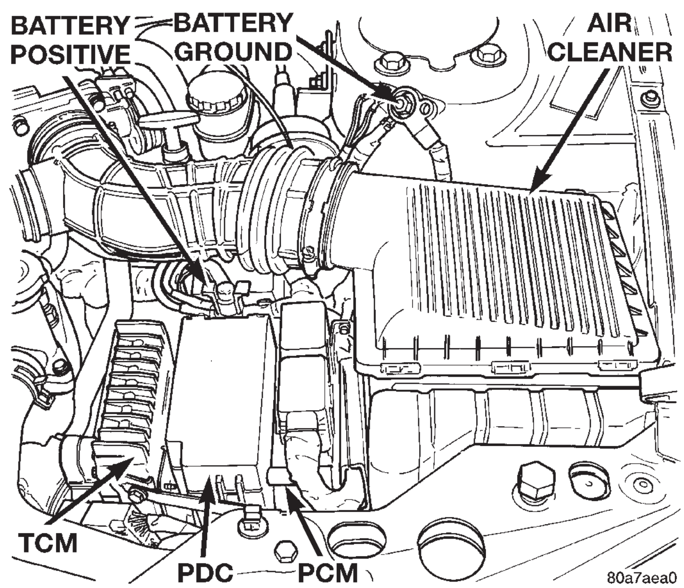


Fig. 41 Power Distribution Center (PDC)

REMOVAL AND INSTALLATION (Continued)

CAMSHAFT POSITION SENSOR—DOHC

The camshaft position sensor is mounted to the rear of the cylinder head (Fig. 42).

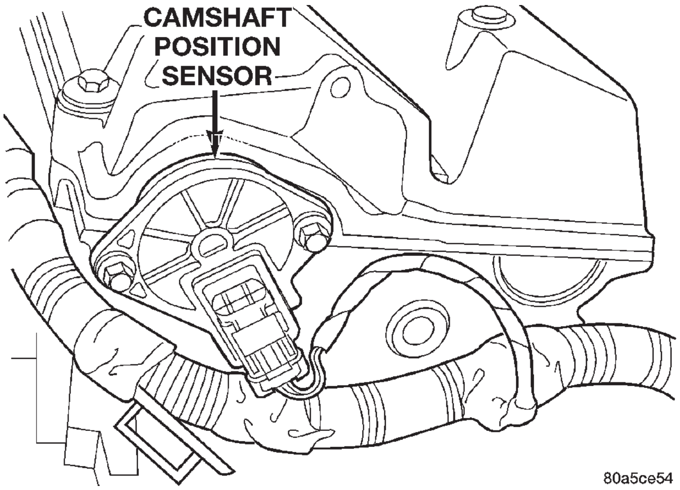


Fig. 42 Camshaft Position Sensor Location—DOHC

REMOVAL

(1) Remove filtered air tube from the throttle body and air cleaner housing.

(2) Disconnect electrical connector from camshaft position sensor.

(3) Remove camshaft position sensor mounting screws. Remove sensor.

(4) Loosen screw attaching target magnet to rear of camshaft (Fig. 43).

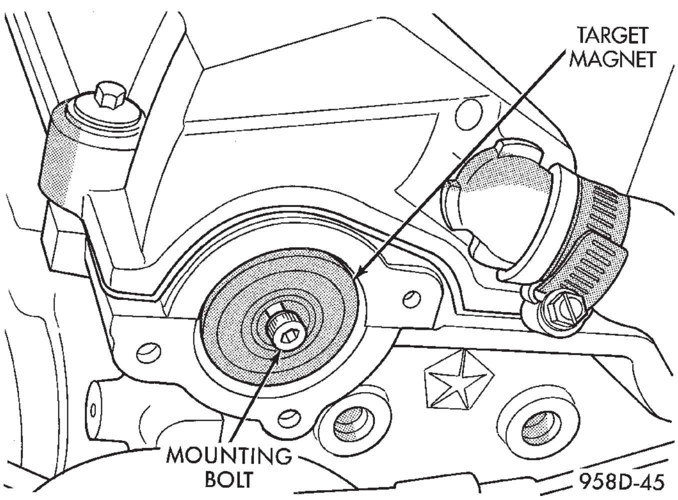


Fig. 43 Target Magnet Removal/Installation

INSTALLATION

The target magnet has locating dowels that fit into machined locating holes in the end of the camshaft (Fig. 44).

(1) Install target magnet in end of camshaft. Tighten mounting screw to 3 N·m (30 in. lbs.) torque.

(2) Install camshaft position sensor. Tighten sensor mounting screws to 9 N·m (80 in. lbs.) torque.

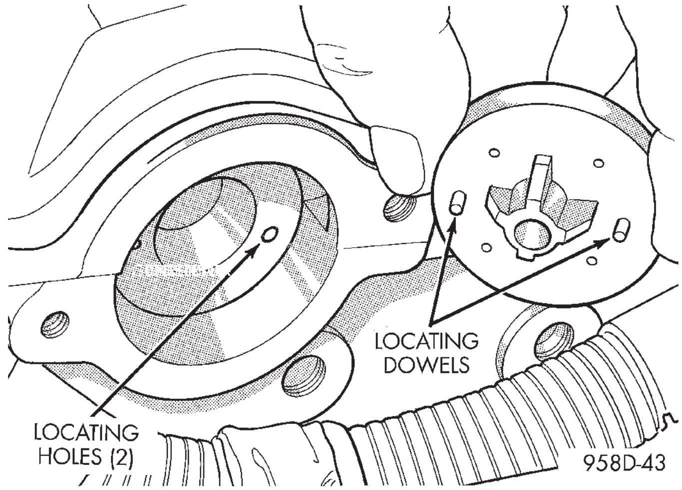


Fig. 44 Target Magnet Installation

(3) Carefully attach electrical connector to camshaft position sensor. Installation at an angle may damage the sensor pins.

(4) Install filtered air tube. Tighten clamps to 3 N·m ±1 (25 in. lbs. ±5) torque.

CRANKSHAFT POSITION SENSOR—2.4 L

The crankshaft position sensor mounts to the engine block behind the generator, just above the oil filter (Fig. 45).

REMOVAL

(1) Disconnect electrical connector from crankshaft position sensor.

(2) Remove sensor mounting screw. Remove sensor.

INSTALLATION

(1) Reverse procedure for installation.

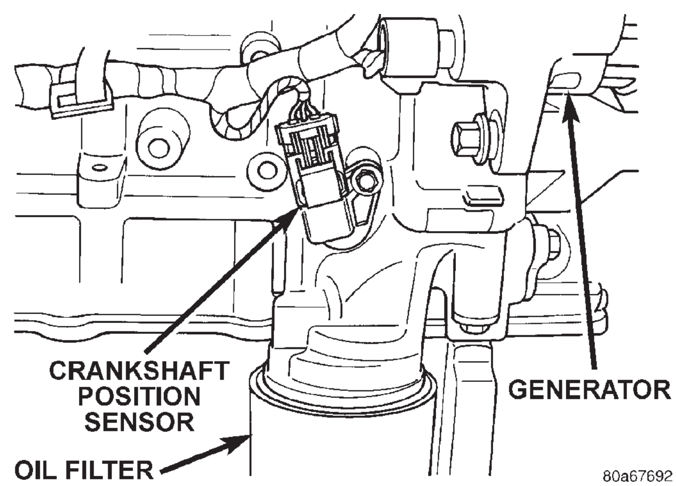


Fig. 45 Crankshaft Position Sensor—2.4L

REMOVAL AND INSTALLATION (Continued)

CRANKSHAFT POSITION SENSOR—2.5L

REMOVAL

(1) Remove speed control servo from driver's side strut tower.

(2) Remove crankshaft position sensor retaining bolt (Fig. 46).

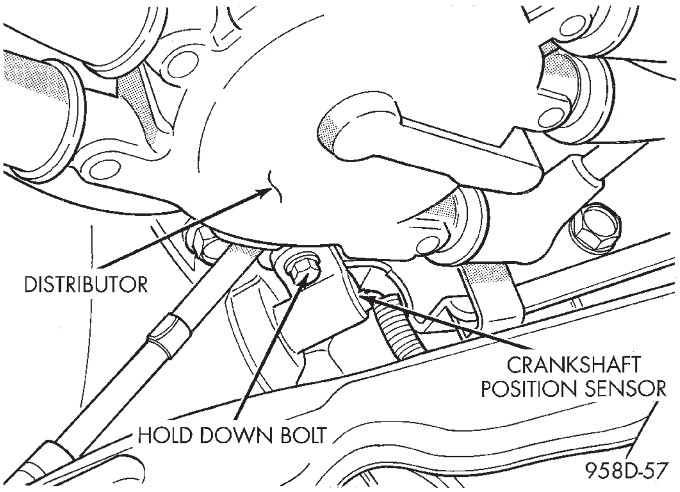


Fig. 46 Crankshaft Position Sensor

(3) Pull crankshaft position sensor straight up out of the transaxle housing.

(4) (Disconnect crankshaft position sensor electrical connector from the wiring harness connector.

INSTALLATION—ADJUSTABLE

All vehicles will be equipped with an adjustable crankshaft position sensor. This can be identified by an elongated mounting hole in the sensor.

NOTE: If the removed sensor is to be reinstalled, clean off the old spacer on the sensor face. A NEW SPACER must be attached to the sensor face before installation. If the sensor is being replaced, confirm that the paper spacer is attached to the face of the new sensor (Fig. 47).

(1) Install sensor in transaxle and push sensor down until contact is made with the drive plate. While holding the sensor in this position, install and tighten the retaining bolt to 12 N·m (105 in. lbs.) torque.

(2) Connect crankshaft position sensor electrical connector to the wiring harness connector.

(3) Attach connector to heater tube bracket.

(4) Install speed control servo. Tighten nuts to 9 N·m (80 in. lbs.) torque.

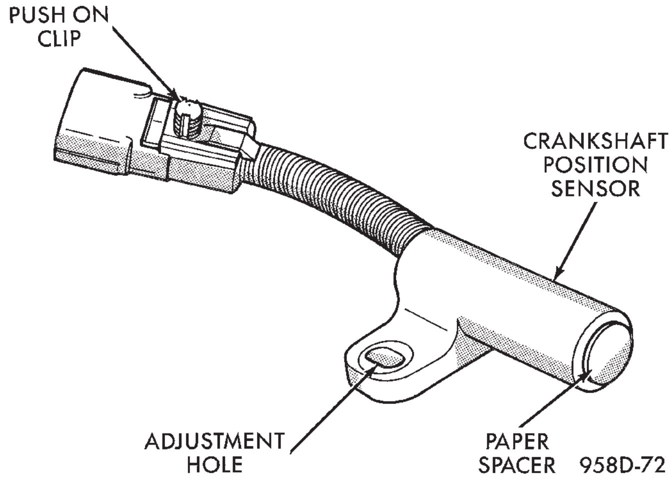


Fig. 47 Crankshaft Position Sensor and Spacer

DISTRIBUTOR—2.5L

REMOVAL

(1) Remove bolt holding air inlet resonator to intake manifold.

(2) Loosen clamps holding air cleaner cover to air cleaner housing.

(3) Remove PCV make-up air hose from air inlet tube.

(4) Loosen hose clamp at throttle body.

(5) Remove air inlet tube, resonator and air cleaner cover.

(6) Remove EGR tube.

(7) Remove spark plug cables from distributor cap.

(8) Loosen distributor cap holddown screws and remove cap (Fig. 48).

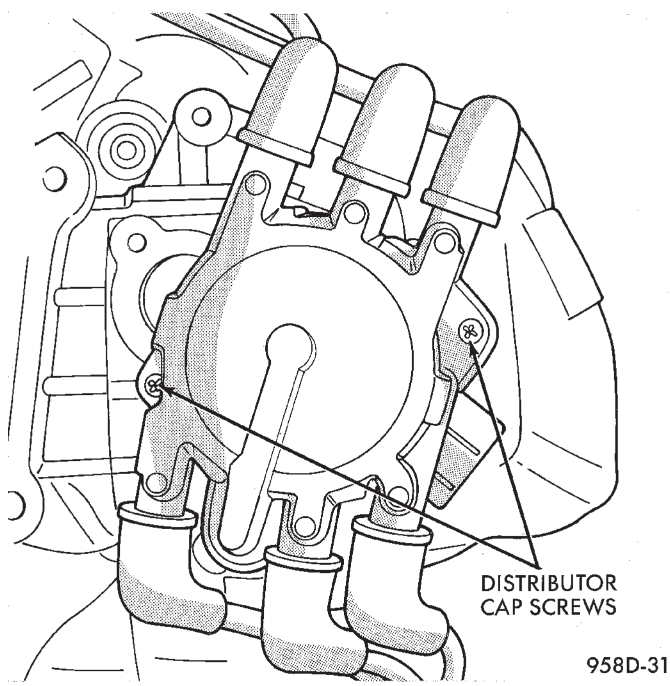


Fig. 48 Distributor Cap Screws

REMOVAL AND INSTALLATION (Continued)

(9) Mark the rotor position and remove rotor. The mark indicates where to position the rotor when reinstalling the distributor.

(10) Remove 2 harness connectors from distributor (Fig. 49).

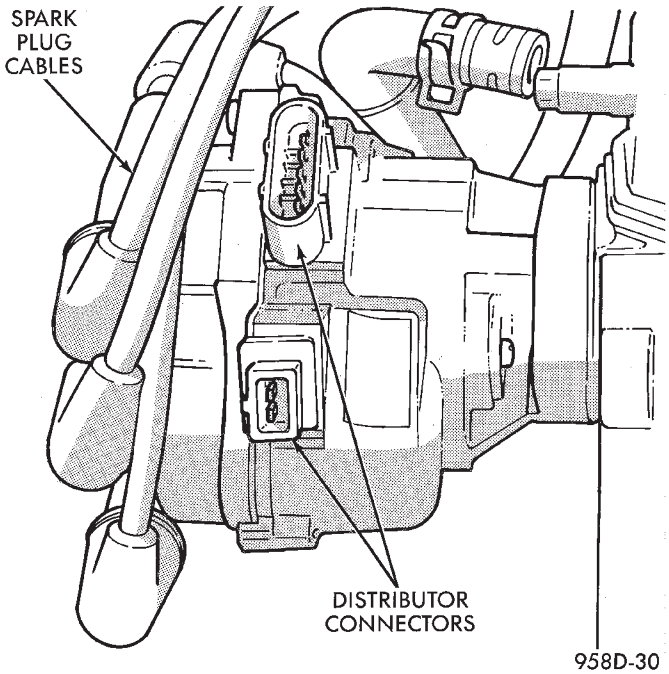


Fig. 49 Distributor Electrical Connectors—Viewed From Rear of Distributor

(11) Remove 2 sets of distributor holddown nuts and washers from studs.

(12) Remove bolt and spark plug cable mounting bracket from top of distributor housing.

(13) Remove bolt and transmission dipstick tube.

(14) Carefully remove distributor from engine.

INSTALLATION

(1) Install rotor on shaft.

(2) Position distributor in engine. Make certain that O-ring is properly seated on distributor. If O-ring is cracked or nicked replace with a new one.

(3) Carefully engage distributor drive with slotted end of camshaft. When the distributor is installed properly, the rotor will be in line with previously scribe line on air intake plenum. **If engine was cranked while distributor was removed, establish proper relationship between the distributor shaft and Number 1 piston position as follows:**

(a) Rotate the crankshaft until number one piston is at top of compression stroke.

(b) Rotate rotor to number one rotor terminal.

(c) Lower distributor into opening, engaging distributor drive with drive on camshaft. With distributor fully seated on engine, rotor should be under the number 1 terminal.

(4) Install distributor holddown washers and nuts. Tighten nuts to 13 N·m (9 ft. lbs.).

(5) Install spark plug cable bracket.

(6) Install 2 harness connectors to distributor.

(7) Install distributor cap.

(8) Install spark plug cables onto distributor cap. The cap is numbered as well as the cables. Ensure sure all high tension wires are firmly in the cap towers.

(9) Install transmission dispstick tube.

(10) Install EGR tube to intake manifold. Tighten bolts to 11 N·m (95 in. lbs.) torque.

DISTRIBUTOR CAP—2.5L

REMOVAL

(1) Remove bolt holding air inlet resonator to intake manifold.

(2) Loosen clamps holding air cleaner cover to air cleaner housing.

(3) Remove PCV make-up air hose from air inlet tube.

(4) Loosen hose clamp at throttle body.

(5) Remove air inlet tube, resonator and air cleaner cover.

(6) Remove EGR tube.

(7) Remove spark plug cables from distributor cap.

(8) Loosen distributor cap holddown screws and remove cap (Fig. 48).

(9) Transfer cables from old cap to new cap. The cap is numbered and so are the cables.

INSTALLATION

(1) Install distributor cap.

(2) Install distributor holddown washers and nuts. Tighten nuts to 13 N·m (9 ft. lbs.).

(3) Install EGR tube.

(4) Install air inlet tube, resonator and air cleaner cover.

(5) Tighten hose clamp at throttle body.

(6) Install PCV make-up air hose from air inlet tube.

(7) Tighten clamps holding air cleaner cover to air cleaner housing.

(8) Install bolt holding air inlet resonator to intake manifold.

DISTRIBUTOR ROTOR—2.5L

REMOVAL

(1) Remove bolt holding air inlet resonator to intake manifold.

(2) Loosen clamps holding air cleaner cover to air cleaner housing.

(3) Remove PCV make-up air hose from air inlet tube.

(4) Loosen hose clamp at throttle body.

REMOVAL AND INSTALLATION (Continued)

(5) Remove air inlet tube, resonator and air cleaner cover.
(6) Remove EGR tube.
(7) Remove spark plug cables from distributor cap.
(8) Loosen distributor cap holddown screws and remove cap (Fig. 48).
(9) Mark the rotor position and remove rotor. The mark indicates where to position the rotor when reinstalling the distributor.

INSTALLATION

(1) Install rotor on shaft.
(2) Install distributor cap.
(3) Install spark plug cables onto distributor cap. The cap is numbered as well as the cables. Ensure sure all high tension wires are firmly in the cap towers.
(4) Install EGR tube to intake manifold. Tighten bolts to 11 N·m (95 in. lbs.) torque.
(5) Install air inlet tube, resonator and air cleaner cover.
(6) Tighten hose clamp at throttle body.
(7) Install PCV make-up air hose to air inlet tube.
(8) Tighten clamps holding air cleaner cover to air cleaner housing.
(9) Tighten bolt holding air inlet resonator to intake manifold.

ENGINE COOLANT TEMPERATURE SENSOR—2.5L

The Engine Coolant Temperature (ECT) sensor is located next to the thermostat housing (Fig. 50).

REMOVAL

(1) With the engine cold, drain the cooling system until coolant level drops below sensor. Refer to Group 7, Cooling System.
(2) Disconnect ECT sensor electrical connector.
(3) Remove ECT sensor.

INSTALLATION

2.5L

(1) Install ECT sensor. Tighten sensor to 7 N·m (60 in. lbs.) torque.
(2) Attach electrical connector to sensor.
(3) Fill cooling system. Refer to Group 7, Cooling System.

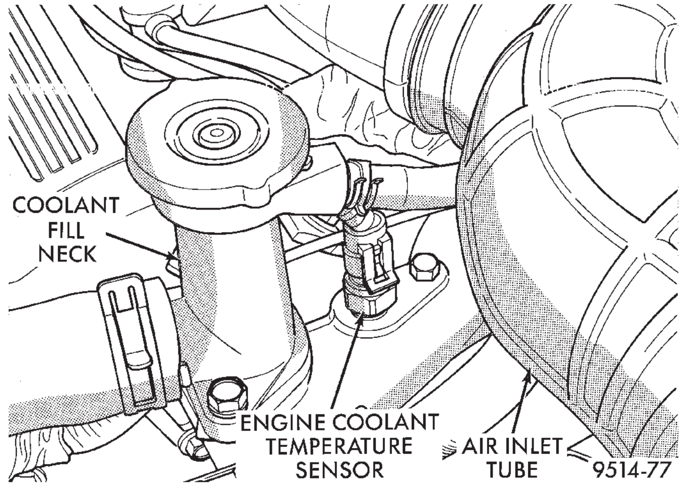


Fig. 50 Engine Coolant Temperature Sensor—2.5L Engine

INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor threads into the intake manifold plenum (Fig. 51) or (Fig. 52).

REMOVAL

(1) Remove electrical connector from sensor.
(2) Remove sensor.

INSTALLATION

(1) Install sensor. Tighten sensor to 28 N·m (20 ft. lbs.) torque.
(2) Attach electrical connector to sensor.

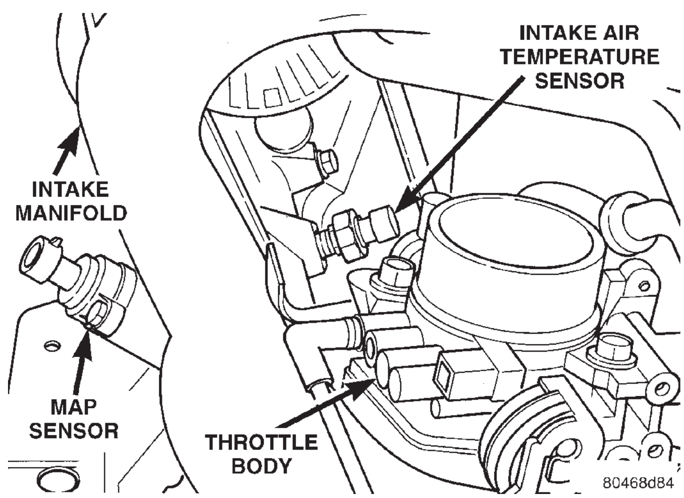


Fig. 51 Intake Air Temperature Sensor and MAP Sensor—2.4L

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—2.4L

The MAP sensor attaches to the intake manifold plenum (Fig. 51)

REMOVAL AND INSTALLATION (Continued)

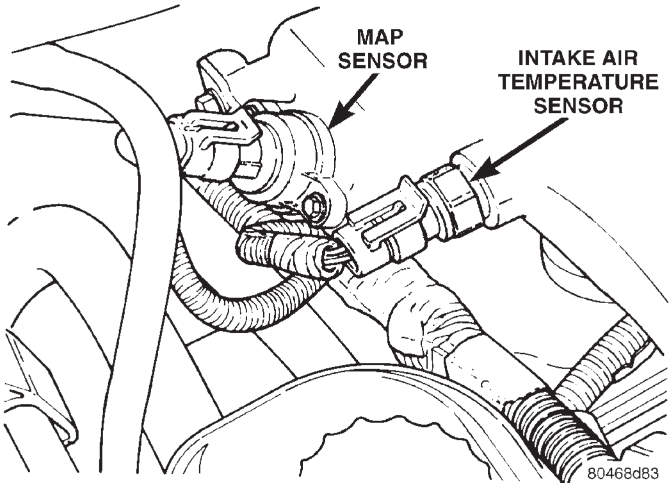


Fig. 52 Intake Air Temperature Sensor and MAP Sensor—2.5L

REMOVAL

(1) Disconnect the electrical connector from the MAP sensor.

(2) Remove sensor mounting screws.

(3) Remove sensor.

INSTALLATION

(1) Insert sensor into intake manifold while making sure not to damage O-ring seal.

(2) Tighten mounting screws to 2 N·m (20 in. lbs) torque.

(3) Attach electrical connector to sensor.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—2.5L

REMOVAL

(1) Remove mounting screws from sensor (Fig. 52).

(2) Unplug harness connector and remove sensor.

INSTALLATION

(1) Reverse the above procedure for installation.

THROTTLE POSITION SENSOR

Refer to Group 14, Fuel Injection Section, for Removal/Installation.

IGNITION SWITCH

The ignition switch attaches to the lock cylinder housing on the end opposite the lock cylinder (Fig. 53). For ignition switch terminal and circuit identification, refer to Group 8W, Wiring Diagrams.

REMOVAL

(1) Disconnect negative cable from auxillary jumper terminal on driver's side strut tower.

(2) Remove fuse panel cover from left end of instrument panel. Remove screw holding end of instrument panel top cover (Fig. 54).

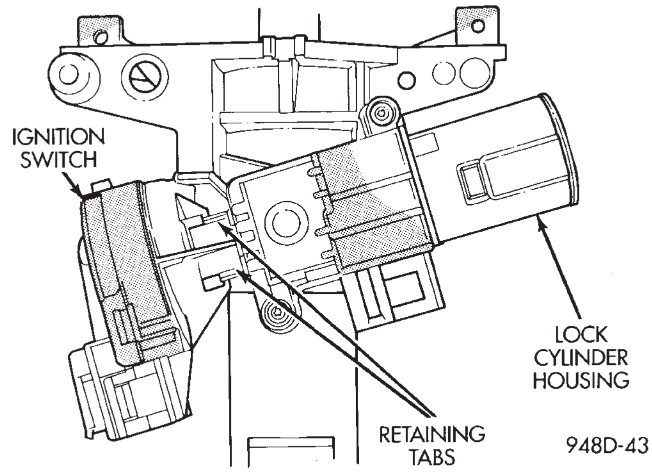


Fig. 53 Ignition Switch—Viewed From Below Column

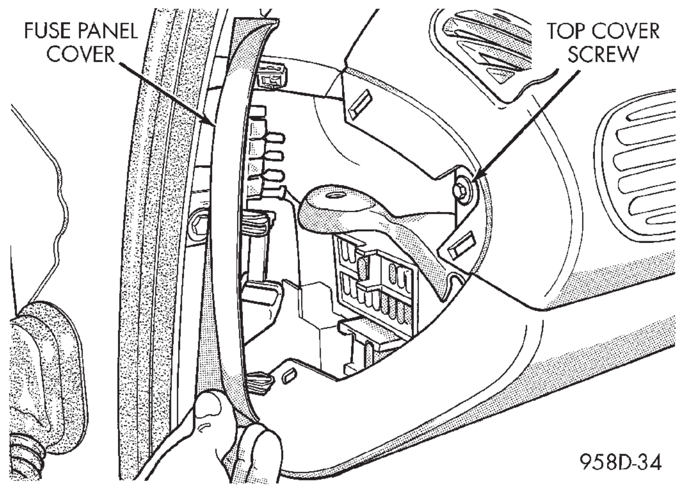


Fig. 54 Instrument Panel Top Cover—Left End

(3) Pull center bezel off (Fig. 55).

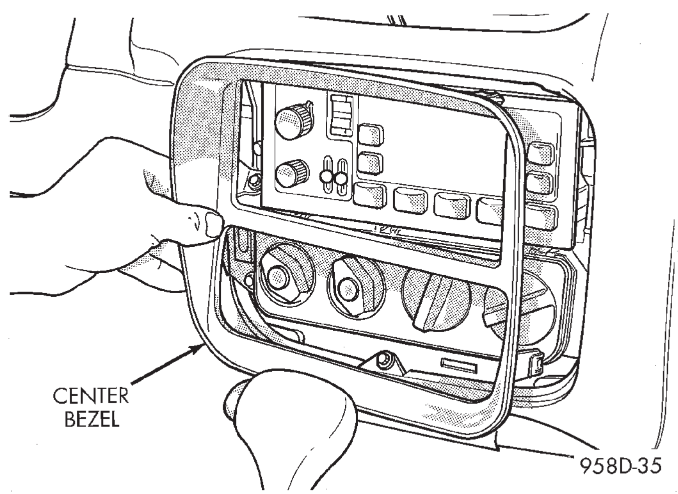


Fig. 55 Center Bezel

REMOVAL AND INSTALLATION (Continued)

(4) Remove screws holding instrument panel top cover to center of instrument panel (Fig. 56).

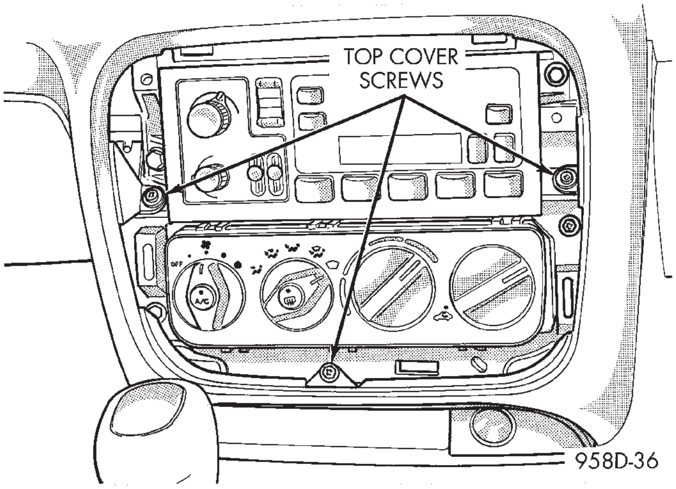


Fig. 56 Instrument Panel Top Cover—Center

(5) Pull instrument panel top cover up enough to gain access to knee bolster screws (Fig. 57).

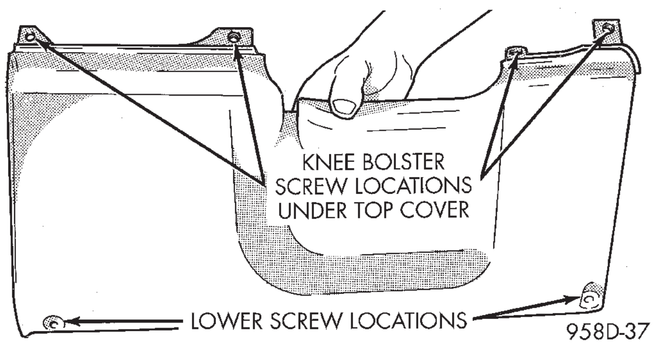


Fig. 57 Knee Bolster Attaching Points

(6) Remove lower knee bolster screws and knee bolster.

(7) Remove screws from lower steering column shroud (Fig. 58).

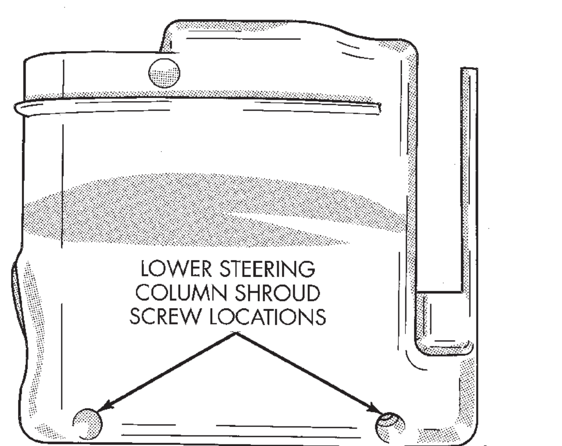


Fig. 58 Lower Steering Column Shroud Screw Locations

(8) Pull lower shroud to clear ignition cylinder and key release, if equipped (Fig. 59).

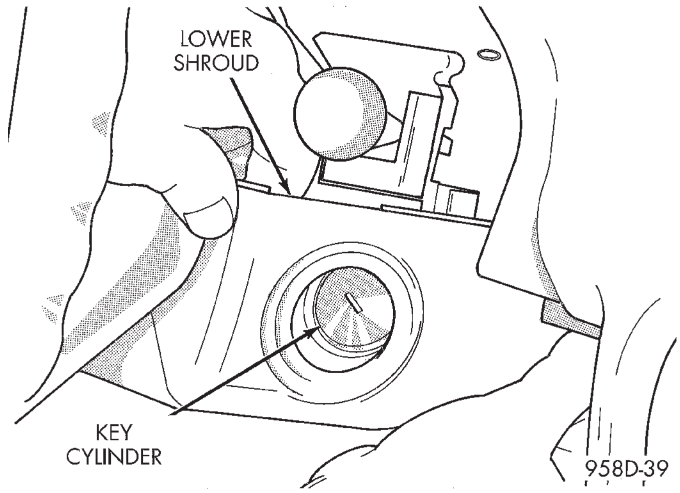


Fig. 59 Remove Lower Shroud From Ignition Cylinder

(9) Hold tilt wheel lever down and slide lower shroud forward to remove it from column (Fig. 60).

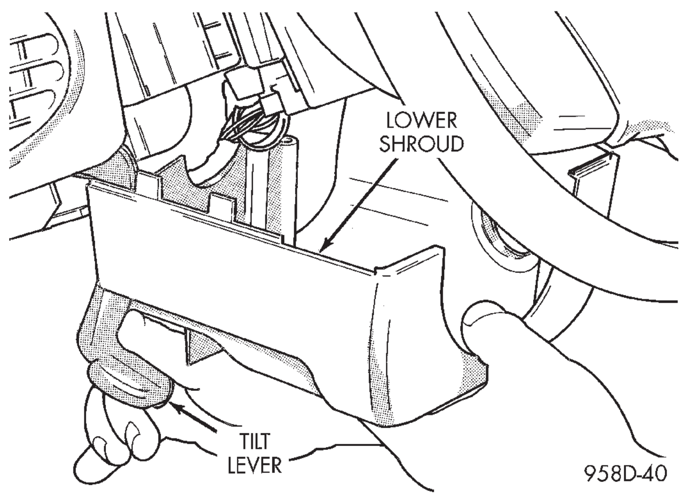


Fig. 60 Lower Shroud Removal

(10) Tilt wheel to full down position and remove upper steering column shroud.

REMOVAL AND INSTALLATION (Continued)

(11) Remove screws holding multi-function switch to lock housing (Fig. 61).

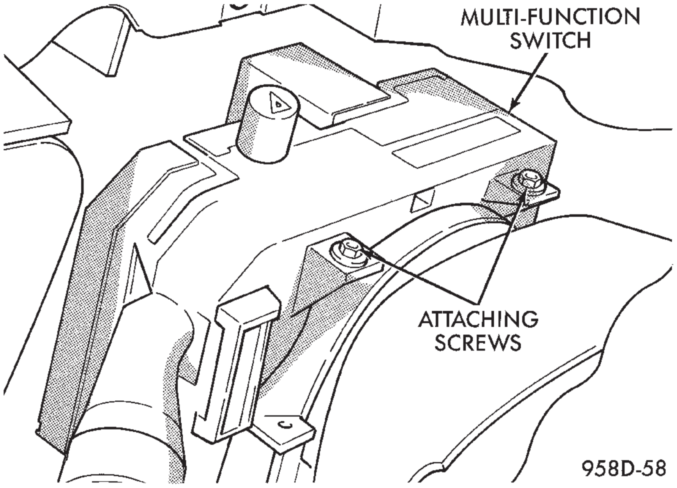


Fig. 61 Multi-Function Switch Removal/Installation

(12) Place key cylinder in RUN position. Depress lock cylinder retaining tab and remove key cylinder (Fig. 62).

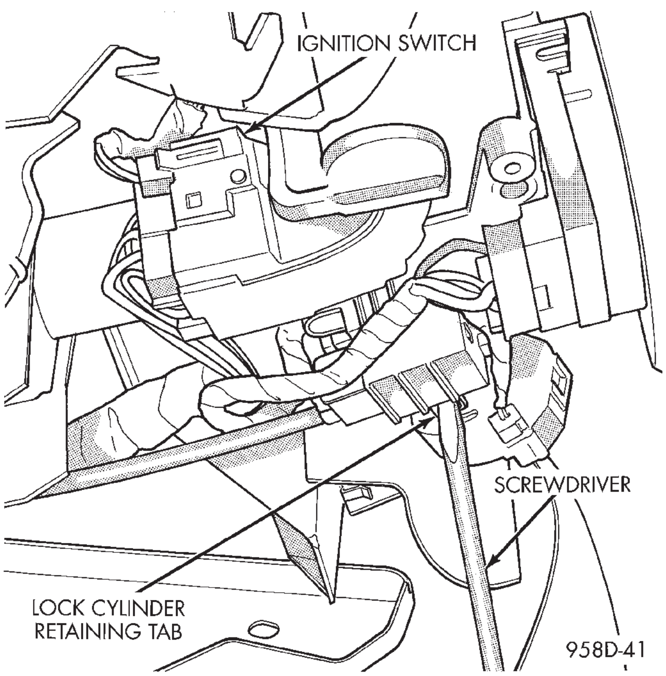


Fig. 62 Lock Cylinder Removal

(13) Disconnect electrical connectors from ignition switch (Fig. 63) and (Fig. 64).

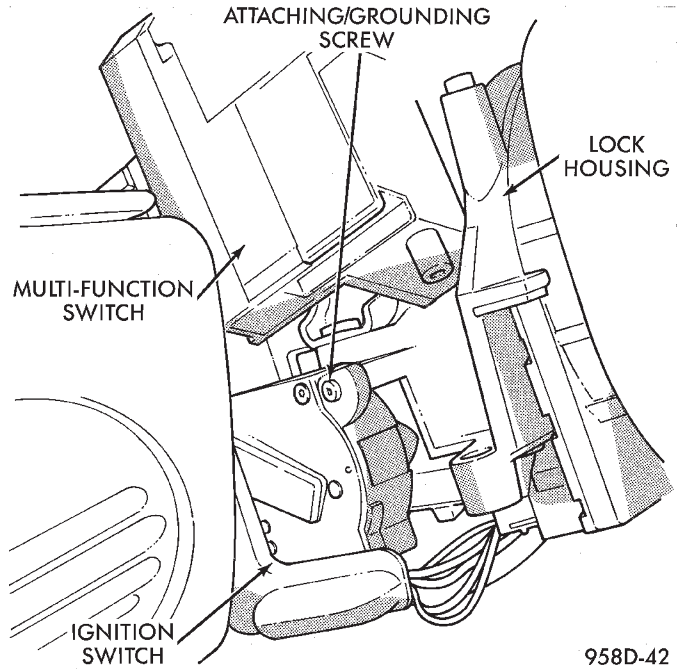


Fig. 63 Ignition Switch

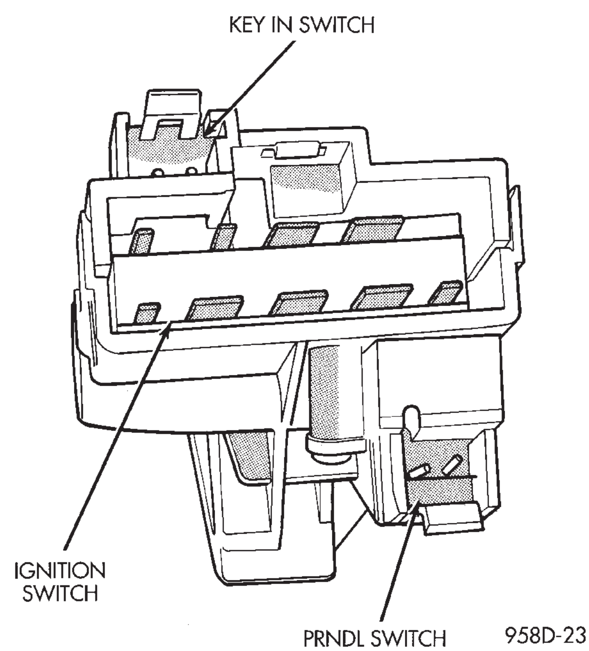


Fig. 64 Ignition Switch Connectors

(14) Remove ignition switch mounting screw (Fig. 63) with a #10 Torx® tamper proof bit.

(15) Depress retaining tabs (Fig. 53) and pull ignition switch from steering column.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Ensure the ignition switch is in the RUN position and the actuator shaft in the lock housing is in the RUN position.

(2) Carefully install the ignition switch. The switch will snap over the retaining tabs (Fig. 65). Install mounting screw (Fig. 63).

(3) Install electrical connectors to ignition switch.

(4) Install upper and lower shrouds.

(5) Install key cylinder (cylinder retaining tab will depress only in the RUN position).

(6) Connect negative cable to battery.

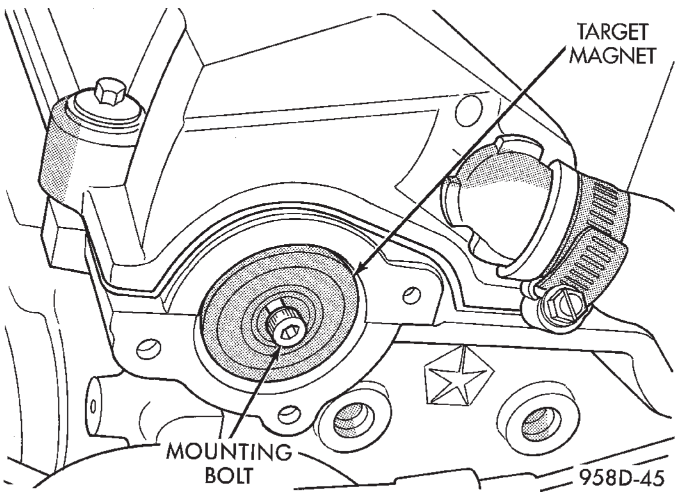


Fig. 65 Ignition Switch Installation

(7) Check for proper operation of ignition switch and key-in warning switch.

LOCK KEY CYLINDER

REMOVAL

(1) Disconnect negative cable from auxillary jumper terminal.

(2) Remove upper steering column shroud.

(3) Pull lower shroud down far enough to access lock cylinder retaining tab.

(4) Place key cylinder in RUN position. Depress retaining tab and remove key cylinder (Fig. 66).

INSTALLATION

(1) Install key in lock cylinder. Turn key to run position (retaining tab on lock cylinder can be depressed).

(2) The shaft at the end of the lock cylinder aligns with the socket in the end of the housing. To align the socket with the lock cylinder, ensure the socket is in the Run position (Fig. 67).

(3) Align the lock cylinder with the grooves in the housing. Slide the lock cylinder into the housing until the tab sticks through the opening in the housing.

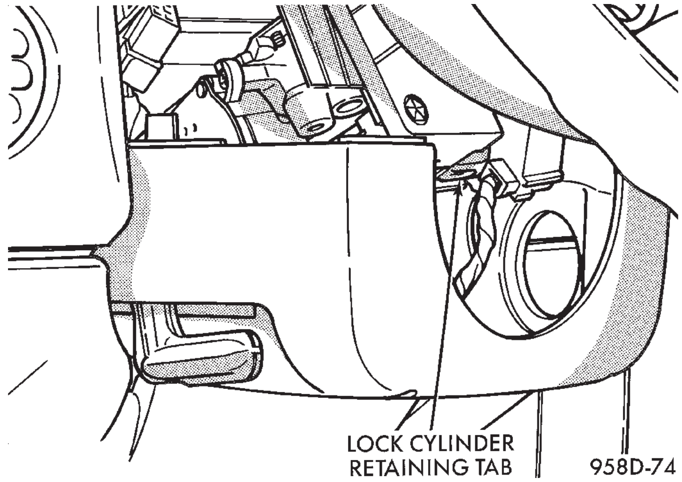


Fig. 66 Lock Cylinder Retaining Tab

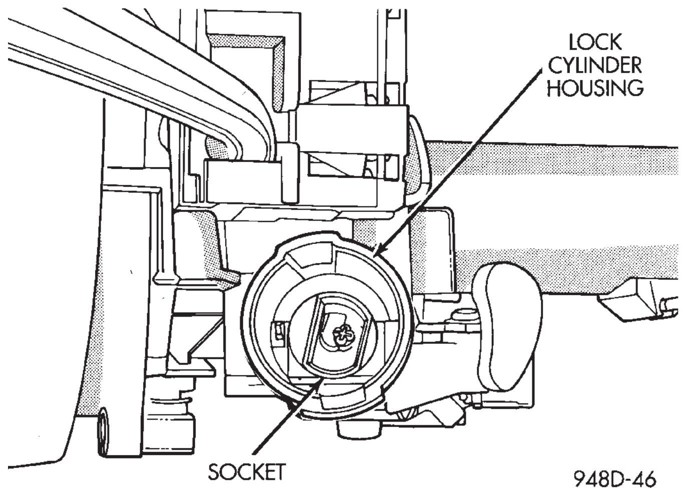


Fig. 67 Socket in Lock Cylinder Housing

(4) Turn the key to the Off position. Remove the key.

(5) Install steering column shrouds.

(6) Connect negative cable to auxillary battery terminal on shock tower.

IGNITION INTERLOCK

Refer to Group 21, Transaxle for Shifter/Ignition Interlock Service.

LOCK CYLINDER HOUSING

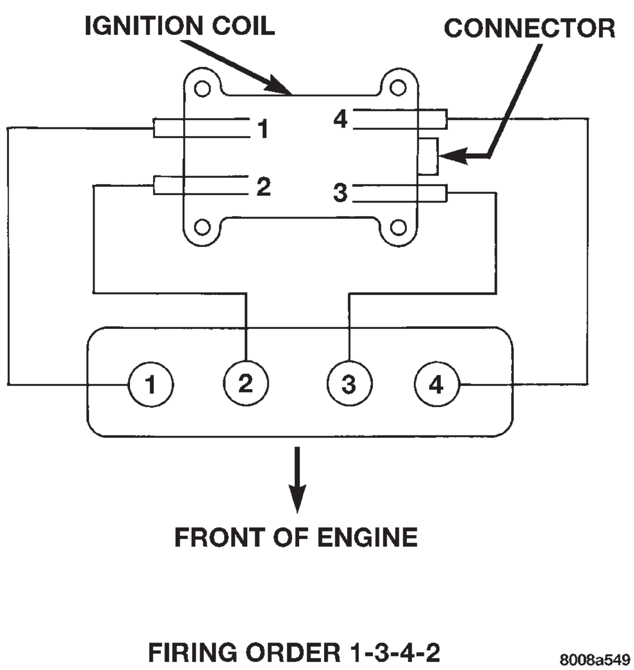
Refer to Steering Column in Group 19, Steering, for Lock Cylinder Housing Service.

SPECIFICATIONS

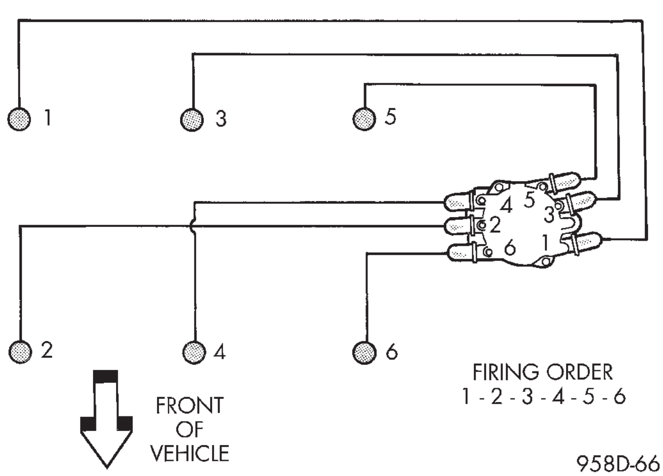
VECI LABEL

If anything differs between the specifications found on the Vehicle Emission Control Information (VECI) label and the following specifications, use specifications on VECI label. The VECI label is located in the engine compartment.

FIRING ORDER



FIRING ORDER—2.4L



FIRING ORDER—2.5L

TORQUE SPECIFICATION

DESCRIPTION	TORQUE
Air Inlet tube Clamp	3 N·m (25 in. lbs.)
Camshaft Position Sensor Screw	12 N·m (105 in. lbs.)
Coolant Sensor—2.4L	27 N·m (20 ft. lbs.)
Coolant Sensor—2.5L	27 N·m (20 ft. lbs.)
Crankshaft Position Sensor Screw	12 N·m (105 in. lbs.)
Coolant Temp. Sensor	18.6 N·m (165 in. lbs.)
Distributor Holddown Nut—2.5L	13 N·m (9 ft. lbs.)
EGR Tube to Intake	11 N·m (95 in. lbs.)
Ignition Coil to Cyl. Head—2.4L	12 N·m (105 in. lbs.)
IAT Sensor—2.4/2.5L	11.5 N·m (100 in. lbs.)
Knock Sensor	10 N·m (90 in. lbs.)
MAP/IAT Sensor Plastic Manifold	2 N·m (20 in. lbs.)
MAP/IAT Sensor Aluminum Manifold	3 N·m (30 in. lbs.)
MAP Sensor—2.5L	3.4 N·m (30 in. lbs.)
Spark Plugs	28 N·m (20 ft. lbs.)

SPECIFICATIONS (Continued)

SPARK PLUG CABLE RESISTANCE—2.4L

CABLE	RESISTANCE
#1,#4	3500 ohms—4900 ohms
#2,#3	2950 ohms—4100 ohms

SPARK PLUG CABLE RESISTANCE—2.5L

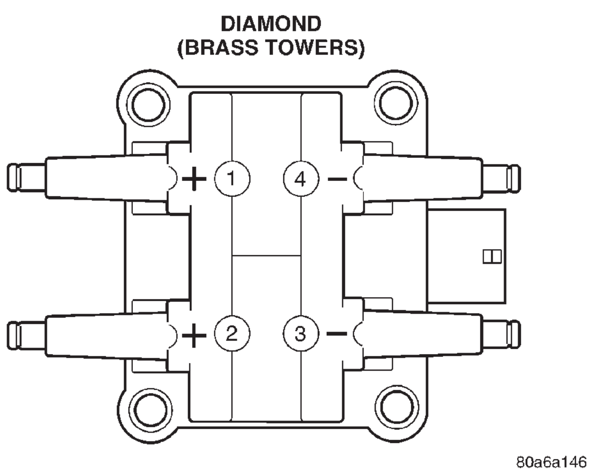
MINIMUM	MAXIMUM
250 Ohms Per Inch	560 Ohms Per Inch
3000 Ohms Per Foot	6700 Ohms Per Foot

SPARK PLUGS

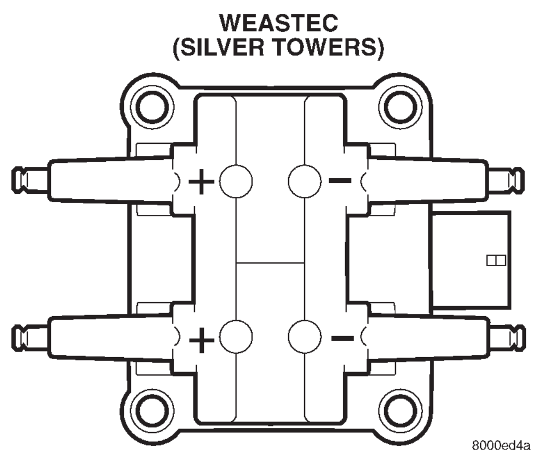
Engine	Spark Plug	Gap	Thread Size
2.4L	RC12YC5	0.048 TO 0.053	14mm (3/4 in.) reach
2.5L	RC10PYP4	0.038 TO 0.043	14mm (3/4 in.) reach

IGNITION COILS

Engines	Coil Manufacture	Primary Resistance at 21°C-27°C (70°F-80°F)	Secondary Resistance at 21°C-27°C (70°F-80°F)
2.0/2.4L	Toyodenso/Diamond	0.51 TO 0.61 Ohms	11,500 to 13,500 Ohms
2.5L	Melco	0.6 TO 0.8 Ohms	12,500 to 18,000 Ohms



Coil Polarity



Coil Polarity

INSTRUMENT PANEL AND SYSTEMS

CONTENTS

GENERAL INFORMATION

ELECTRO/MECHANICAL INSTRUMENT CLUSTER

The mechanical instrument cluster is an electro/mechanical module which receives most of its information from the Body Control Module (BCM) via the CCD bus.

The cluster (Fig. 1) includes:

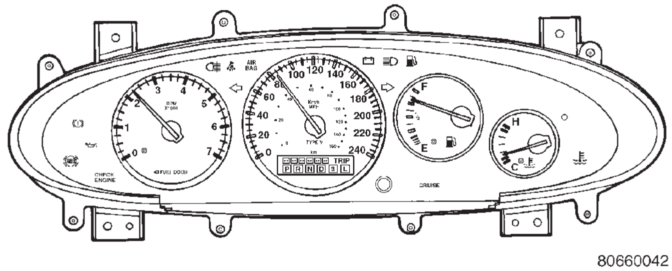


Fig. 1 Cluster

- 200 km/h (120 mph) speedometer
- Tachometer
- Odometer/trip odometer and transmission range indicator with automatic transmission
- Door ajar
- Deck ajar
- Lo washer fluid
- Fuel gauge
- Temperature gauge
- Security alarm indicator (optional)

The warning and information indicators include the following:

- Service Engine Soon (Checek Engine)
- Airbag
- Charging system
- Low oil pressure
- High temperature
- Low fuel
- Seat belt

GENERAL INFORMATION (Continued)

- Cruise
- Brake/park brake
- Anti-lock brake system
- High beam
- Fog lamps
- Security alarm LED indicator (optional)
- Turn signals

The gauges are the magnetic air-core type. When the ignition switch is OFF, the gauge pointers should rest at or below the low graduation.

DESCRIPTION AND OPERATION

AUTOSTICK

Vehicles with Autostick will have a unique Transmission Range Indicator display (Fig. 2). When in the Autostick mode, the Transmission Range Indicator will display 1, 2, 3 or 4 to inform the driver which transmission gear is currently engaged.

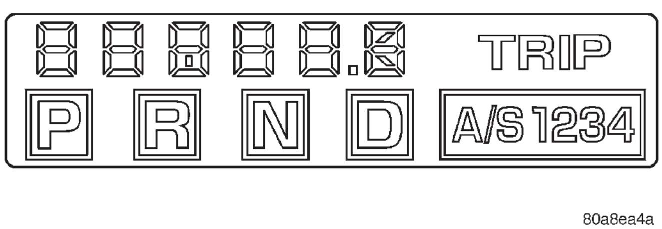


Fig. 2 Autostick Odometer/Transmission Range Indicator

COMPASS/TEMPERATURE MINI-TRIP COMPUTER

The Compass/Temperature Mini-Trip Computer (CMTC) system is located on the right hand side of the instrument panel cluster (Fig. 3). The CMTC is an electronic control module with a vacuum fluorescent display and two function buttons. The CMTC is capable of displaying compass, temperature, and trip computer information (Fig. 4). Actuation of the STEP button will cause the CMTC to change mode of operation and actuation of the US/M button will toggle between English and Metric unit of measurement. A reset of the trip computer information is accomplished by actuating the Step and US/M buttons simultaneously.

The CMTC is active only when the ignition switch is in the ON position. When the ignition switch is turned ON, the CMTC will turn on all of the segments in the display for one second then return to the last function screen that was displayed prior to the ignition being turned OFF. The functions that are available via activation of the STEP switch are as follow:

- Compass and Ambient Temperature
- Average Trip Fuel Economy (AVG ECO)
- Estimated Range (RANGE)
- Present Fuel Economy (ECO)
- Trip Odometer (ODO)
- Elapsed Ignition On Time (ET)
- Blank Screen (OFF)

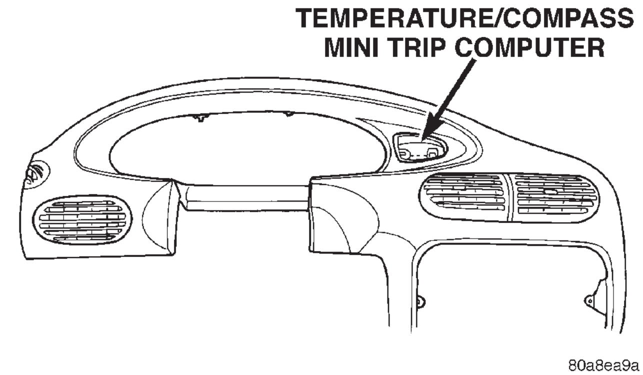


Fig. 3 Compass/Temperature Mini Trip Computer

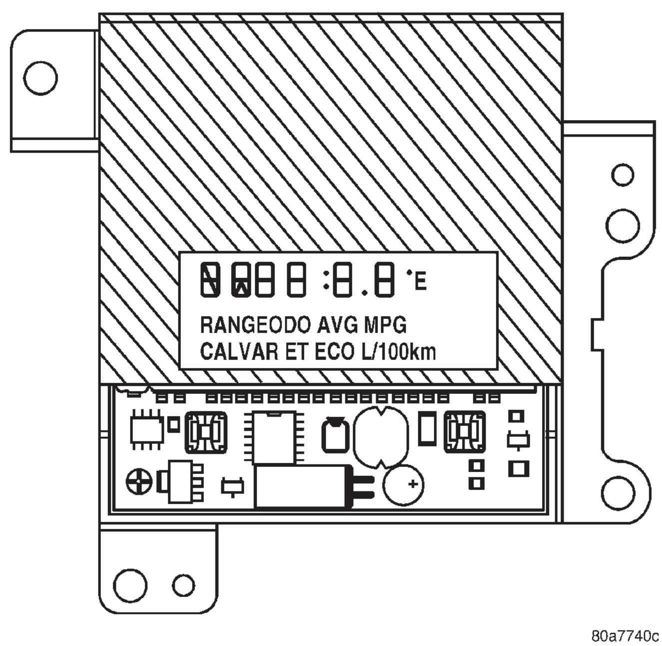


Fig. 4 CTMC Module

COMPASS

The CMTC is an auto-calibrating compass and requires no activation of any switches to trigger a forced calibration. The compass is initially setup to be calibrated for earth fields of approximately 180 milligauss. However, due to the variation in the magnetic earth field across the country and the variation of the magnetic structure from vehicle to vehicle the compass may need to be calibrated. Refer to Compass Calibration Service Procedures.

DESCRIPTION AND OPERATION (Continued)

AMBIENT TEMPERATURE

The temperature is displayed in whole degrees Celsius or Fahrenheit. Temperatures greater than or equal to zero are displayed unsigned and temperatures below zero are displayed signed (-). If the temperature is more than 55°C (131°F) or the temperature sending line is shorted to ground, the compass and ambient temperature screen will display SC. If the temperature is less than -40°C (-40°F) or the temperature sending line is an open circuit, the compass and ambient temperature screen will OC. If the message CCD bus to display the ambient temperature. Refer to the proper Body Diagnostic Procedures manual.

MINI TRIP COMPUTER MESSAGES

The Mini Trip Computer data is obtained from information put on the CCD bus from thee Powertrain Control Module and the Body Control Module. The CMTC will not display information for any of the screens for which it did not receive the proper data over the CCD bus for that particular screen. In which case the message CCd will be displayed. If the CCd message is displayed on all the screens of the CCD bus with a scan tool (DRB). If some of the screens appear to be functioning properly but some of the screens display CCd then check either the Powertrain Control Module or the Body Control Module for proper CCD bus communications. If the CCd message still persist refer to the Mini Trip Computer Self Diagnostic Test.

DATA LINK CONNECTOR

Data link connector is located on the left side kick panel just above hood release.

DIAGNOSIS AND TESTING

DIAGNOSTIC PROCEDURE

In order to diagnose the instrument cluster function, a DRB scan tool and the proper Body Diagnostic Procedures Manual are required.

As a quick diagnosis, the cluster will perform a function check immediately after the ignition is switched to the RUN/START position. The electronic display, odometer and transmission range indicator and all warning lamps except:

- Cruise
- Fog lamps
- High beam
- Low fuel
- Turn signal

will illuminate for a brief period.

If the cluster is not receiving CCD bus messages, the cluster will appear nonfunctional except for the continuously illuminated airbag indicator and NO BUS message displayed.

If the cluster is not receiving CCD bus messages, refer to the pre-diagnostic test described in proper Body Diagnostic Procedures Manual or refer to the Instrument Cluster Self-Diagnostic Test below.

INSTRUMENT CLUSTER SELF- DIAGNOSTICS

Initiate instrument cluster self-diagnostic by depressing the odometer/trip reset button while turning the ignition key to the OFF/RUN/START position. This will cycle an electronic display segment check and illumination in sequence of all CCD bus activated cluster warning indicators. There are four Check (CHEC) functions:

(1) CHEC 1, checks the gauges.

(2) CHEC 2, checks the warning lamps.

(3) CHEC 3, checks the odometer/trip meter.

(4) CHEC 4, Transmission Range Indicator for the automatic transmission or the autostick transmission.

If the diagnostic procedure determines that a replacement of an instrument cluster component is required, refer to the proper component removal procedure.

CHEC 1 - GAUGE DISPLAY
TACHOMETER …6000 rpm SPEEDOMETER …100mph (220 kmh) FUEL GAUGE pointer ON …F TEMPERATURE GAUGE pointer ON …H
TACHOMETER …3000 rpm SPEEDOMETER …75mph (120 kmh) FUEL GAUGE pointer ON …1/2 TEMPERATURE GAUGE pointer ON …midscale
TACHOMETER …3000 rpm SPEEDOMETER …55mph (100 kmh) FUEL GAUGE pointer ON …1/2 TEMPERATURE GAUGE pointer ON …midscale
TACHOMETER …1000 rpm SPEEDOMETER …20mph (40 kmh) FUEL GAUGE pointer ON …E TEMPERATURE GAUGE pointer ON …C

CHEC 1

(1) If all gauges fail to move, replace Cluster Printed Circuit (PC) Board.

(2) If any gauge fails to move, replace the gauge assembly.

(3) If any gauge(s) is not in the proper position, replace Cluster Printed Circuit Board.

DIAGNOSIS AND TESTING (Continued)

CHEC 2 - WARNING LAMP DISPLAY
SERVICE ENGINE SOON
SEAT BELT
AIRBAG
CHARGING SYSTEM
LOW FUEL
HIGH BEAM INDICATOR
ENGINE TEMPERATURE
CRUISE

CHEC 2

(1) If any lamp does not light, check lamp.

(2) If lamp is not OK, replace lamp.

(3) If lamp is OK, replace Cluster Printed Circuit Board.

CHEC 3 - VACUUM FLORSECENT (VF) DISPLAY
TRIP
ODOMETER CENTER
ODOMETER LOWER RIGHT
ODOMETER BOTTOM
ODOMETER LOWER LEFT
ODOMETER UPPER LEFT
ODOMETER TOP
ODOMETER UPPER RIGHT
ALL ODOMETER V/F DISPLAY DIGIT SEGMENTS ON

CHEC 3

If any V/F segment does not light, replace Odometer/Transmission Range Indication.

CHEC 4 - TRANSMISSION RANGE RANGE V/F DISPLAY
AUTOMATIC TRANSMISSION
PRND3L
PRND3L AND BOX AROUND P
PRND3L AND BOX AROUND R
PRND3L AND BOX AROUND N
PRND3L AND BOX AROUND D
PRND3L AND BOX AROUND 3
PRND3L AND BOX AROUND L
PRND3L AND ALL BOXES
END

CHEC 4 - AUTOMATIC TRANSMISSION

If any V/F segment does not light, replace Odometer/Transmission Range Indication.

CHEC 4 - TRANSMISSION RANGE INDICATOR V/F DISPLAY
AUTOSTICK
PRND A/S 1 AND A/S BOX
PRND A/S 2 AND A/S BOX
PRND A/S 3 AND A/S BOX
PRND A/S 4 AND A/S BOX
PRND A/S AND BOX AROUND P
PRND A/S AND BOX AROUND R
PRND A/S AND BOX AROUND N
PRND A/S AND BOX AROUND D
PRND A/S 1234 AND ALL BOXES
END

CHEC 4 - AUTOMATIC TRANSMISSION

If any V/F segment does not light, replace Odometer/Transmission Range Indication.

COMPASS/TEMPERATURE MINI TRIP COMPUTER SELF-DIAGNOSTIC TEST

The CMTC is capable of performing a diagnostic self check on many of its internal functions. CMTC diagnostics may be performed using a scan tool (DRB) and the proper Body Diagnostic Procedures manual or by the following procedure.

(1) With the ignition switch in the OFF position, press both the US/M and STEP button.

(2) Turn ignition switch to the ON position.

The CMTC will perform internal checks while lighting all segments of the vacuum florescent display. Upon completion of the internal check, the CMTC will display.

- PASS
- FAIL
- CCd

If any segment of the CMTC fails to light replace the module.

If FAIL is displayed, replace the module.

If CCd is displayed, check the CCD and Body Control Module (BCM) for proper operation, refer to the appropriate diagnostic test procedures manual If the CCD and the BCM are OK, replace the CMTC module.

For additional diagnostic information on the CMTC and for identifying CMTC problems, refer to the proper Body Diagnostic Procedures manual.

SERVICE PROCEDURES

COMPASS CALIBRATION PROCEDURE

VARIANCE SETTING PROCEDURE

Variance is the difference between magnetic North and geographic North (Fig. 5). To adjust the compass variance set the CMTC to Compass/Temperature mode and press both US/M and STEP buttons for up to one second than the symbol VAR and the current variance zone number will be displayed. Press the STEP button to select the proper variance zone as shown in (Fig. 5). After five seconds of inactivity, the displayed zone will be automatically set and normal operation in the Compass/Temperature mode resumed.

Calibrate the compass by driving the vehicle in a circle with a constant speed between 5 and 11 MPH (8 and 18 Km/h), the diameter should be between 6 and 27.5 meters (30 and 90 feet). The speed of the vehicle should not vary no more than 3 MPH (5 Km/h) otherwise the calibration is aborted.

To ensure that the compass has been properly calibrated, point the vehicle in each of the following four directions: (N), (S), (E), and (W).

DIRECT METHOD

Turn the vehicle to head in either a North or South direction. The vehicle must be within 45 degrees of the North or South position or the SETTING the VARIANCE will be ignored. The vehicle may be stationary or driving at any speed for this operation. Depress the STEP button until the Compass/Temperature screen is displayed. Simultaneously press both the US/M and STEP buttons up to one second, than the symbol VAR and the current variance zone number will be displayed. Within the next five seconds momentarily press the US/M button. The variance will be set and normal operation in the Compass/Temperature mode resumed. If the US/M button is not pressed within the five seconds interval, the compass variance shall not be changed and normal operation in the Compass/Temperature mode resumed. If the VAR symbol flashes twice before resuming operation, the new zone was not accepted. Realign the vehicle to within ± 45 degrees of North or South and try again.

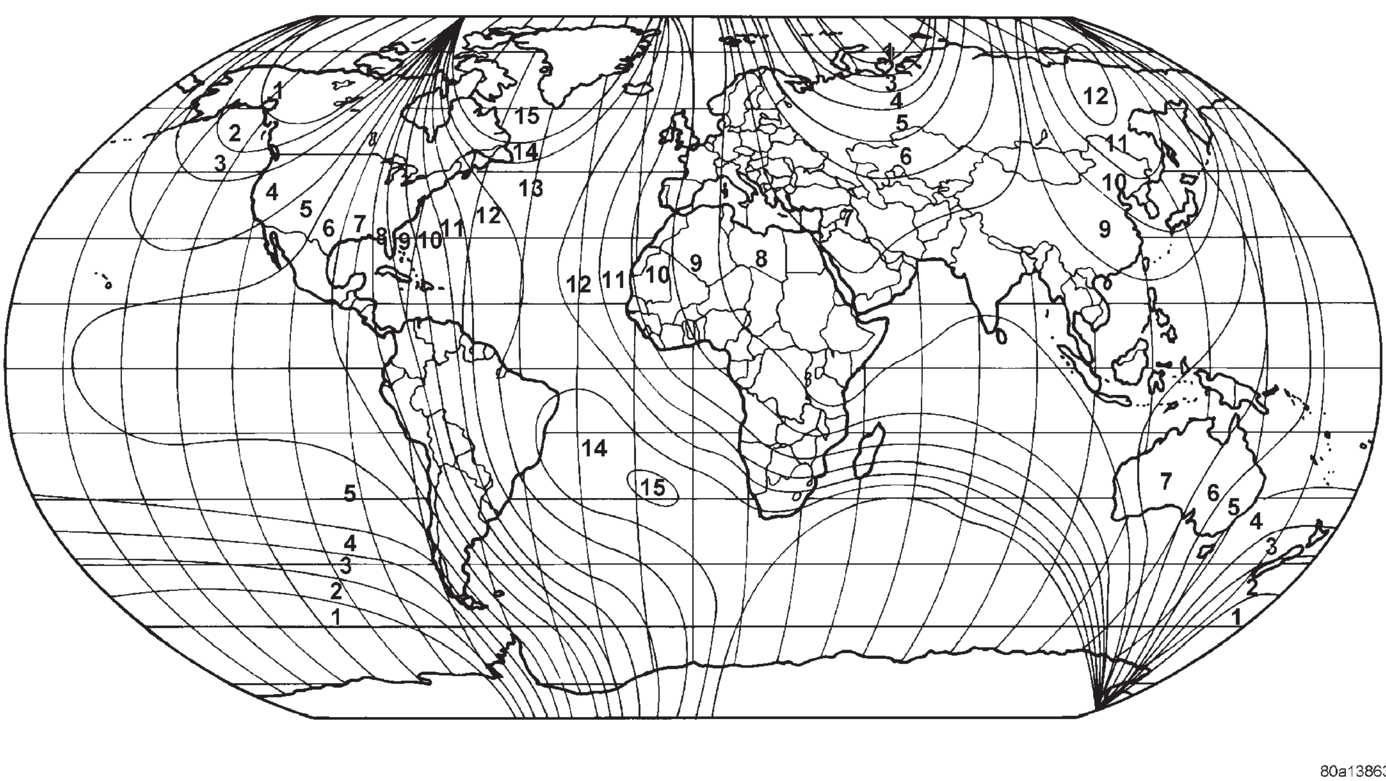


Fig. 5 Variance Settings

REMOVAL AND INSTALLATION

CENTER BEZEL

REMOVAL

Pull center bezel straight rearward along the sides of the radio and A/C control openings to disengage four clips (Fig. 6).

INSTALLATION

For installation, reverse the above procedures.

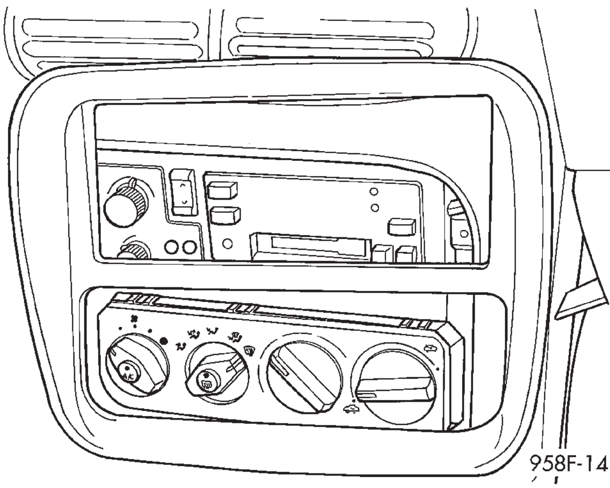


Fig. 6 Center Bezel

CLUSTER HOOD

REMOVAL

(1) Remove instrument panel left end cap.
(2) Tilt steering column down to its lowest position.
(3) Remove instrument panel center bezel by disengaging the four clips (Fig. 6).
(4) Remove instrument cluster hood (Fig. 7).
(a) Remove three attaching screws under the center bezel.
(b) Remove screw at left end of panel.
(c) Pull hood straight back to disengage the eight clips. If equipped with a Compass/Temperature Mini Trip Computer pull rearward about 3 inches and stop. Reach through the radio opening in the cluster hood and disconnect the CMTC wire connector.
(d) Remove the cluster hood.

INSTALLATION

For installation, reverse the above procedures. Keep the forward edge of the hood down on the instrument panel while sliding the hood forward to engage the retaining clips.

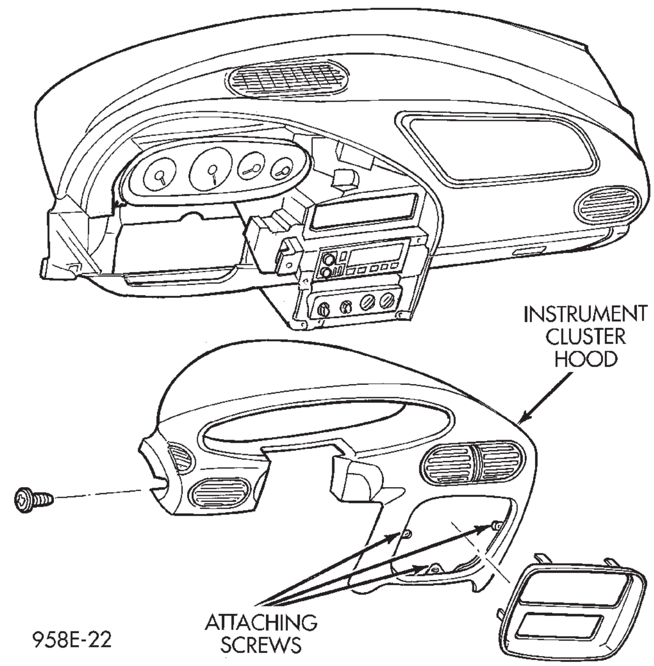


Fig. 7 Instrument Cluster Hood

CLUSTER LAMP

Refer to (Fig. 8) for appropriate lamp locations. Replace fog lamp indicator lamp and security LED socket assembly only if equipped.

CLUSTER PRINTED CIRCUIT BOARD

REMOVAL

(1) Remove six cluster back cover retaining screws and remove the cover.
(2) Disconnect odometer/transmission range indicator connector from the printed circuit board.
(3) Remove nine printed circuit board attaching screws and remove. There are two screws located at the base of each connector (Fig. 9).

INSTALLATION

For installation, reverse the above procedures.

COMPASS/TEMPERATURE MINI-TRIP COMPUTER MODULE

REMOVAL

(1) Disconnect the battery negative cable.
(2) Remove the Cluster Hood. Refer to Cluster Hood removal procedure.
(3) With the cluster hood removed remove the four screws attaching the mini computer (Fig. 10).
(4) Remove CMTC from console.

INSTALLATION

For installation, reverse the above procedures.

REMOVAL AND INSTALLATION (Continued)

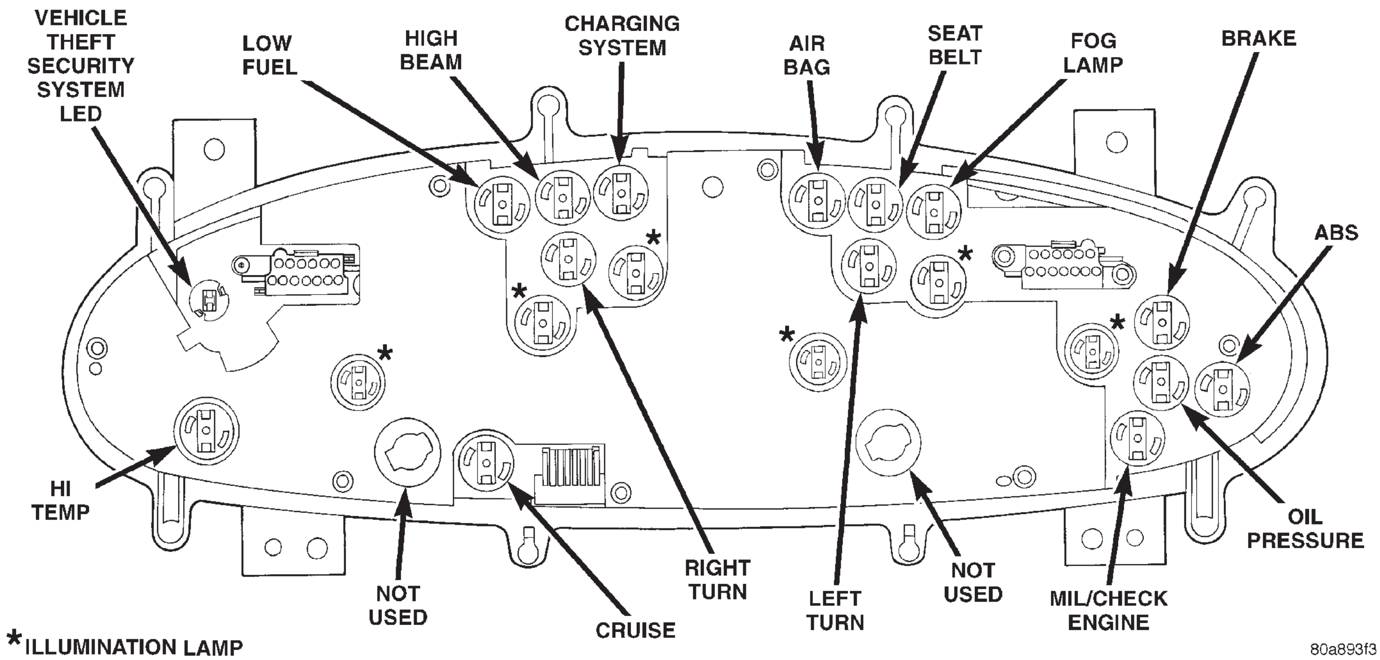


Fig. 8 Lamp Location

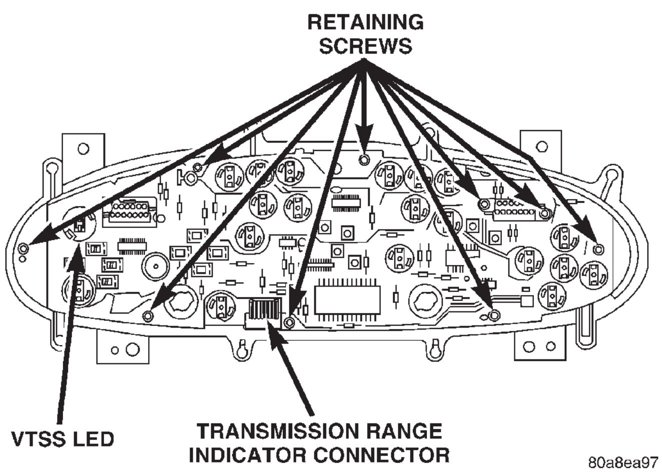


Fig. 9 Printed Circuit Board

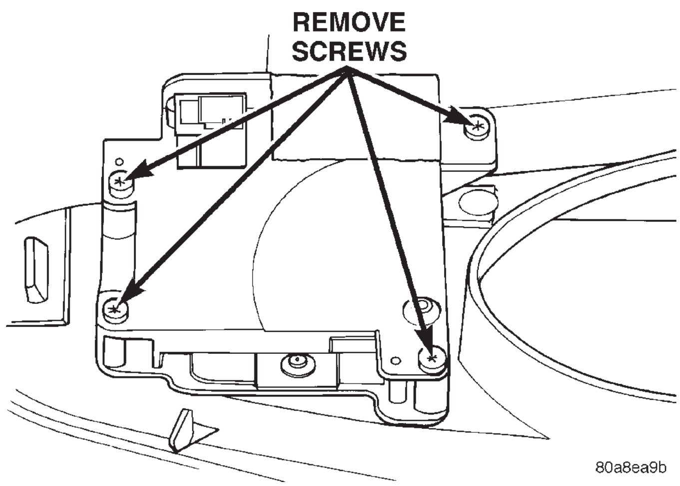


Fig. 10 CMTC Module

CUBBY BIN/LAMP

REMOVAL

(1) Remove center bezel.

(2) Remove instrument cluster hood screws.

(a) Remove two screws adjacent radio.

(b) Remove screw below HVAC control in the center.

(c) Remove screw at left end of panel.

(d) Flex instrument cluster hood slightly to give access to the cubby bin screws.

(3) Remove the cubby bin mounting screws and remove bin.

INSTALLATION

For installation, reverse the above procedures. The cubby bin must engage the console at its forward edge prior to installing the mounting screws.

REMOVAL AND INSTALLATION (Continued)

FUEL GAUGE AND TEMPERATURE GAUGE

REMOVAL

(1) Remove mask/lens retaining screws and remove mask/lens (Fig. 11).

(2) Disconnect odometer/transmission range indicator connector from the printed circuit board (Fig. 12).

(3) Remove screws attaching speedometer/tachometer to housing and remove (Fig. 13).

(4) Remove the fuel/temperature gauge attaching screws from the housing and remove (Fig. 14).

INSTALLATION

For installation, reverse the above procedures.

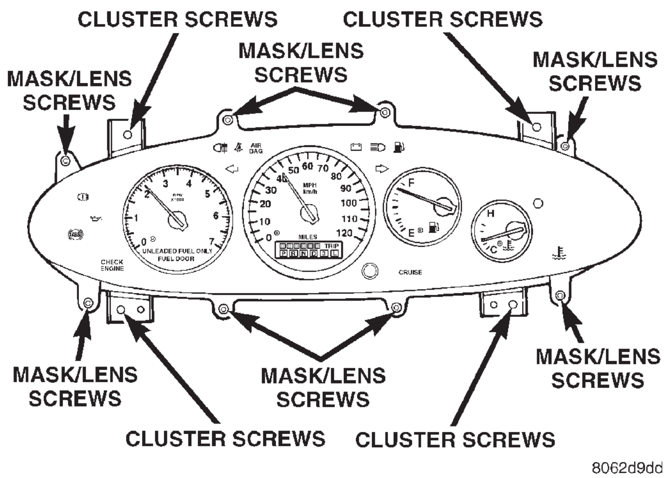


Fig. 11 Mask/Lens Retaining Screws

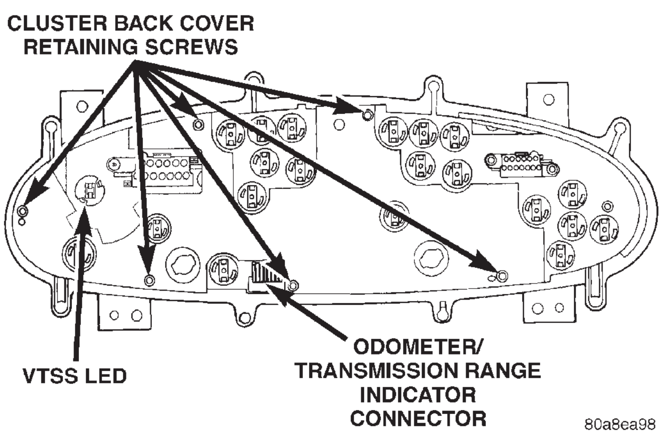


Fig. 12 Back Cover Retaining Screws

GLOVE BOX DOOR HANDLE

REMOVAL

(1) Open glove door.

(2) Remove four door handle attaching screws.

(3) Remove handle.

INSTALLATION

For installation, reverse the above procedures.

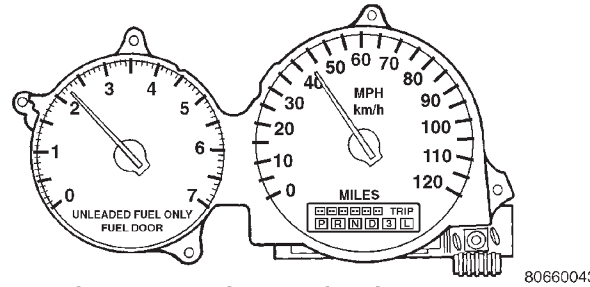


Fig. 13 Speedometer/Tachometer

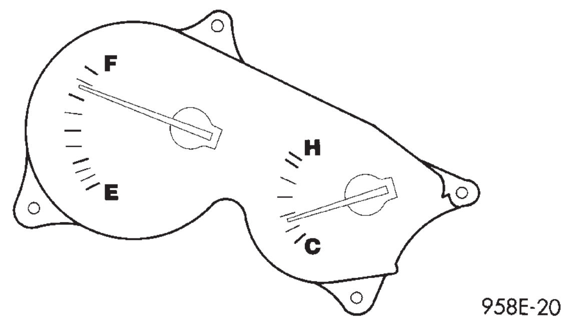


Fig. 14 Fuel Gauge and Temperature Gauge

GLOVE BOX DOOR LOCK

REMOVAL

(1) Remove glove box door handle.

(2) Insert the proper key in lock cylinder, depress the gray locking key on back side housing at the 3 O'clock position.

(3) Rotate the key clockwise to disengage cylinder from housing.

INSTALLATION

For installation, reverse the above procedures.

HVAC CONTROL

REMOVAL

(1) Remove center bezel by pulling rearward to disengage four clips and remove attaching screws from cubby bin (Fig. 6).

(2) Remove the HVAC control attaching screws. Pull the control out to disconnect two electrical connectors and two control cables. Remove HVAC control.

INSTALLATION

For installation, reverse the above procedures. The forward edge of bin must engage the forward console.

INSTRUMENT CLUSTER

REMOVAL

To service any instrument cluster component, the instrument cluster must be removed from the instrument panel.

REMOVAL AND INSTALLATION (Continued)

(1) Remove instrument cluster hood, refer to Cluster Hood Removal and Installation procedures.

(2) Remove the four cluster attaching screws (Fig. 11).

(3) Remove instrument cluster and disconnect wire connectors from instrument panel by pulling cluster rearward.

INSTALLATION

For installation, reverse the above procedures.

INSTRUMENT PANEL

WARNING: DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION PROCEDURE. THIS WILL DISABLE THE AIRBAG SYSTEM. FAILURE TO DISCONNECT BATTERY COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR 2 MINUTES BEFORE REMOVING ANY AIRBAG COMPONENTS.

REMOVAL

When removing a passenger airbag module refer to Group 8M, Restraint Systems for Passenger Air Bag Module Removal.

(1) Disconnect and isolate the battery negative remote cable.

(2) Open both vehicle front doors. Remove left end cover by pulling outboard. Remove right end cover by pulling rearward (Fig. 15).

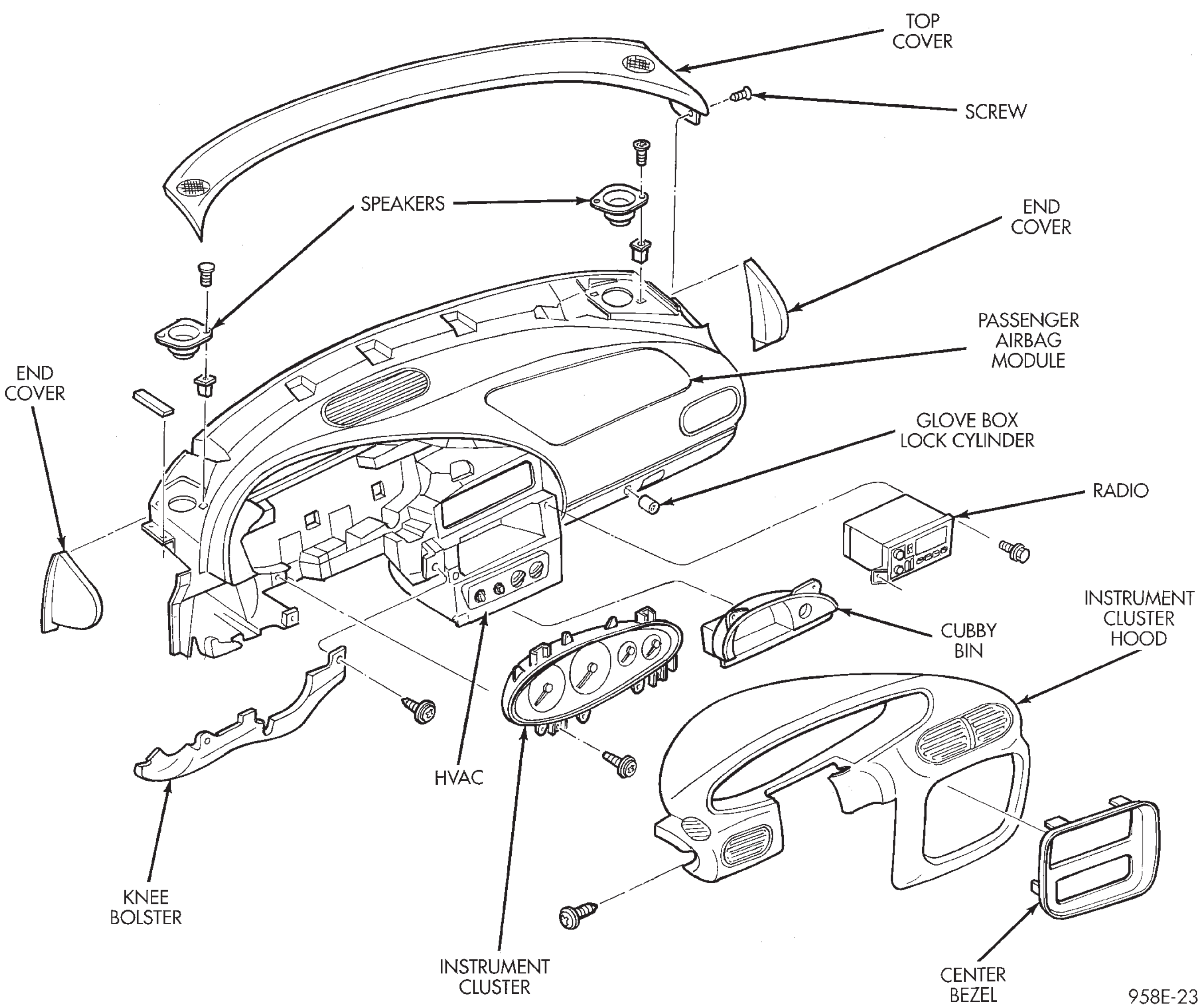


Fig. 15 Instrument Panel Breakdown

REMOVAL AND INSTALLATION (Continued)

(3) Remove transmission range indicator bezel from floor console. Use care not to mar the bezel or console.

(4) Remove floor center console. Remove two mounting screws in the front and two mounting screws under the decorative caps in the rear.

(5) Disconnect Airbag Control Module (ACM).

(6) Remove instrument cluster hood.

(a) Remove two screws adjacent radio.

(b) Remove the screw below HVAC control.

(c) Remove screw at left end of panel.

(d) Pull on hood to disengage the eight clips.

(7) Remove two cubby bin screws and remove.

(8) Remove five knee bolster mounting screws.

(9) Open glove box door and press sidewalls inboard to lower door from panel to access forward floor console.

(10) Remove forward floor console nine attaching screws and one push pin at forward driver's side.

(11) Pull the driver's under panel silencer outboard off the distribution duct.

(12) Remove instrument panel top cover attaching screw on passenger side.

(a) Lift the right rear edge of top cover to disengage the clips along the rear edge. Proceeding from right to the left side. Do not use a nylon trim stick, to avoid marring cover or panel.

(b) Lift rear edge and slide top cover rearward disengaging clips and remove cover.

(13) Remove HVAC control attaching screws.

(14) Remove center distribution duct screws from behind radio and duct.

(15) Remove radio. Access and remove the three HVAC attaching screws to duct and panel. Remove the three HVAC attaching bolts from the cross-car beam.

(16) Close glove box door.

(17) Remove five screws attaching panel retainer to plenum.

(18) Remove steering column intermediate shaft attaching bolt.

(19) Disconnect engine and body wire harness from Junction Block/BCM.

(20) Remove fasteners:

- Four at left end and three at the right end of the cross car beam
- Two at steering column plenum
- One at glove box hinge to cowl
- Two at center support to the floor pan bracket

(21) Remove attaching screw at the rear of HVAC to the center support bracket.

(22) Lift up instrument panel and move rearward to remove.

INSTALLATION

For installation, reverse the above procedures. DO NOT CONNECT battery negative remote cable. Refer to Group 8M, Restraint Systems for Air Bag System test.

INSTRUMENT PANEL END COVERS – LEFT AND RIGHT

REMOVAL

(1) Open the left door and pull on the access handle and pivoting around A-pillar to disengage end cover clips. Fuse Puller, Spare Fuses And Fuse Diagram Are Located On Left End Cover. Fuse Access Is Under Left End Cover (Fig. 15).

(2) Open right door and glove box door.

(3) Remove right end cover by pulling rearward to disengage clips.

INSTALLATION

For installation, reverse the above procedures. Ensure spare fuses are seated to left end cover.

INSTRUMENT PANEL SPEAKERS

REMOVAL

(1) Remove instrument panel top cover, refer to Instrument Panel Top Cover Removal procedures.

(2) Remove two screws on each speaker and lift up, disconnect wiring connector and remove speaker.

INSTALLATION

For installation, reverse the above procedures

INSTRUMENT PANEL TOP COVER

REMOVAL

(1) Open glove box door.

(2) Remove right end cap and remove screw at right end.

(3) Lift the right rear edge of top cover to disengage the clips along the rear edge. Proceeding from right to the left side. Do not use a nylon trim stick, to avoid potential damage (Fig. 16).

(4) Lift rear edge and slide top cover rearward disengaging clips and remove cover.

INSTALLATION

For installation, reverse the above procedures. Ensure the two center clips are engaged first. Place thumb in VIN opening and pull towards pad to ensure VIN alignment. If a gap exist between the top cover and pad after installation check for a damaged clip. The clip must be removed and replaced.

REMOVAL AND INSTALLATION (Continued)

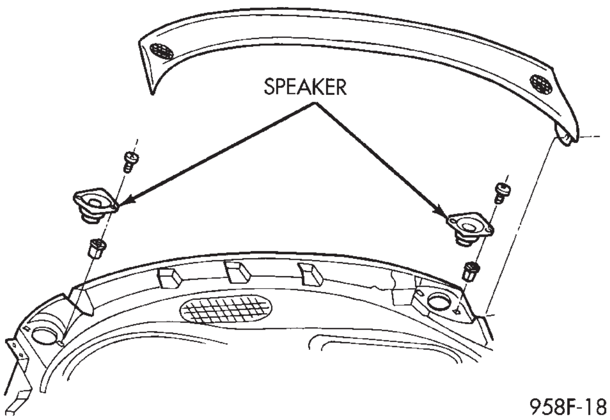


Fig. 16 Top Cover

JUNCTION BLOCK/BODY CONTROL MODULE

JUNCTION BLOCK

REMOVAL

The Junction Block and Body Control Module (BCM) are attached to each other. After removal they can be separated. Junction Block and Body Control Module assemblies are located on the driver's side of the vehicle (Fig. 17).

(1) Open the front driver's door and remove end cap.

(2) Remove center bezel.

(3) Remove instrument cluster hood.

(4) Remove silencer.

(5) Remove wire harness connectors from Junction Block.

(6) Remove Junction Block three mounting screws.

(7) Remove Junction Block/BCM by pulling straight down from the mounting bayonet.

(8) Disconnect BCM wire connectors and remove the assembly.

(9) Remove Junction Block/BCM from vehicle.

INSTALLATION

For installation, reverse the above procedures. Ensure that the wire terminals and connectors are in good condition and connectors are properly installed.

BODY CONTROL MODULE

REMOVAL

(1) The Junction Block/BCM removed from the vehicle, separate the BCM from the Junction Block.

(2) Remove the two BCM attaching screws and release the two BCM locking latches from the Junction Block.

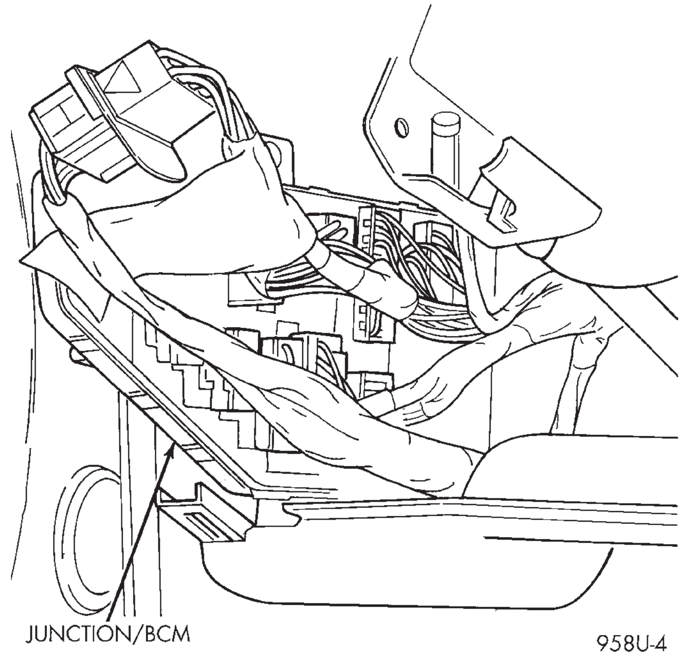


Fig. 17 Junction Block/BCM Location

(3) Disconnect BCM from the Junction Block.

INSTALLATION

For installation, reverse the above procedures.

LEFT UNDER INSTRUMENT PANEL SILENCER/ DUCT

REMOVAL

(1) Remove two lower knee bolster screws and slip silencer off outboard attaching formation.

(2) Maneuver part off of center floor distribution duct to remove.

INSTALLATION

For installation, reverse the above procedures. Install prior to knee bolster.

MASK/LENS

REMOVAL

Remove mask/lens retaining screws and remove mask/lens (Fig. 11).

INSTALLATION

For installation, reverse the above procedures.

REMOVAL AND INSTALLATION (Continued)

ODOMETER/TRANSMISSION RANGE INDICATOR

REMOVAL

(1) Remove speedometer/tachometer, refer to Speedometer/Tachometer and Odometer Transmission Range Indicator Removal and Installation

(2) Remove screws attaching from the back of speedometer and remove the odometer/transmission range indicator display (Fig. 18).

INSTALLATION

For installation, reverse the above procedures.

POWER OUTLET

REMOVAL

(1) Remove cubby bin.

(2) Disconnect the two power outlet wiring connectors from power outlet. Unscrew shell and clamp assembly to replace power outlet.

INSTALLATION

For installation, reverse the above procedures. The clamp has a locating feature. The cubby bin must engage the console at its forward edge prior to installing the mounting screws.

RADIO

For Radio removal procedures, Refer to Group 8F, Audio Systems.

RIGHT UNDER INSTRUMENT PANEL SILENCER/DUCT

REMOVAL

(1) Remove push-in fastener under right end of instrument panel.

(2) Maneuver part off center floor distribution duct to remove.

INSTALLATION

For installation, reverse the above procedures.

SPEEDOMETER/TACHOMETER AND ODOMETER TRANSMISSION RANGE INDICATOR

REMOVAL

(1) Remove mask/lens retaining screws and remove mask/lens (Fig. 11).

(2) Disconnect odometer/transmission range indicator connector from the printed circuit board (Fig. 12).

(3) Remove screws attaching speedometer/tachometer to housing and remove (Fig. 13).

(4) Remove screws attaching from the back of speedometer and remove the odometer/transmission range indicator display (Fig. 18).

INSTALLATION

For installation, reverse the above procedures.

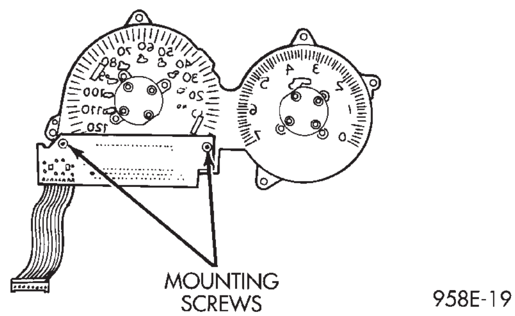


Fig. 18 Odometer/Transmission Range Indicator

VEHICLE THEFT SECURITY SYSTEM LED

REMOVAL

(1) Disconnect Vehicle Theft Security System LED socket assembly indicator from the printed circuit board (Fig. 8).

(2) Rotate LED socket counter clockwise and remove from printed circuit board.

INSTALLATION

For installation, reverse the above procedures.

AUDIO SYSTEM

CONTENTS

GENERAL INFORMATION

INTRODUCTION

For operation of the factory installed standard and optional radios with cassette or compact disc player, refer to the Sound Systems Operating Instructions in the Owners Manual supplied with the vehicle.

The manual antenna mast has a swirl shape to prevent antenna whistle. The power antenna is a one piece design to reduce mast damage because it is more flexible.

The vehicles are shipped with fuse 5 removed from the Junction Block. The fuse replaces the ignition-off draw (IOD) connector. Fuse 5 is a ten amp fuse. When removed it prevents the battery from discharging during storage. For specific wiring and location, refer to Group 8W, Wiring Diagrams.

The vehicle has two speaker systems:

Standard Speaker System

- Two instrument panel speakers
- Two door speakers
- Two rear quarter panel speakers

Infinity Amplified Speaker System

- Amplifier mounted under the passenger seat
- Two instrument panel speakers
- Two door speakers
- Two rear quarter panel speakers

While driving the amplifier provides unique sound equalizations when the convertible top is in the up position or in the down position. The amplifier remembers which mode it is in as long as the battery voltage (B+) is supplied to the amplifier. If the battery voltage is removed for only a few minutes by:

- Disconnecting the battery
- Dead battery
- Fuse Removal
- Amplifier disconnected

The amplifier reverts to a top up condition even if the top is down. If the amplifier mode does not match the convertible top position, operate the convertible top one cycle and the will reset amplifier to the correct mode.

DESCRIPTION AND OPERATION

INTERFERENCE ELIMINATION

Some components used on the vehicles are equipped with a capacitor to suppress radio frequency interference/static.

Capacitors are mounted in various locations internal to the generator, instrument cluster and windshield wiper motor.

To eliminate radio interference, ground straps are used in different areas of the vehicle. These ground circuits should be securely tightened to assure good metal to metal contact. The ground straps conduct very small high frequency electrical signals to ground and require clean surface contact area. The radio ground is supplied from the instrument panel harness and is attached to the rear of the radio. Some engines have other ground straps to eliminate further radio interference:

- Engine to shock tower, 2.0L - 2.4L - 2.5L engines
- Engine to transmission, 2.5L engine
- Muffler to bumper beam, 2.0L - 2.4L engines

Radio resistance type spark plug cables in the high tension circuit of the ignition system complete the interference suppression. Faulty or deteriorated spark plug wires should be replaced.

DESCRIPTION AND OPERATION (Continued)

POWER ANTENNA

The power operated radio antenna is a whip type antenna, extended and retracted by a reversible electric motor.

The Automatic Power Antenna is controlled by a combination of an internal relay and limit switches which, are built into the antenna motor housing. This antenna is actuated when the radio is switched ON and the ignition switch in ON or ACCESSORY position. When the ignition switch or the radio is turned OFF the antenna mast should retract fully.

Many antenna problems may be avoided by frequent cleaning of the antenna mast. Clean the antenna mast with a clean soft cloth.

Before an antenna is removed, the antenna performance should be tested to decide if it is a reception problem or an operational problem.

Whenever a operational malfunction occurs, first verify that the radio antenna wire harness is properly connected. Check all connectors before starting normal diagnosis and repair procedures.

REMOTE AMPLIFIER

The amplifier is located under the right front seat. When the radio system is ON, and all or some speakers are not operating or have a noise distortion refer to the diagnostic tests. Refer to Group 8W, Wiring Diagrams for Pin numbers and location.

REMOTE CD CHANGER

The remote CD changer is located in the center console and is capable of holding up to six disc in a magazine. The magazine can be ejected at anytime that the ignition switch is in the ON position. After the ignition switch is turned OFF, the magazine can only be ejected within one minute. After that period, the magazine will be locked in the CD changer.

DIAGNOSIS AND TESTING

AUDIO DIAGNOSTIC TEST PROCEDURES

CAUTION: The CD changer/player will only operate between approximate temperatures of -23°C and +65°C (-10°F and +145°F).

Whenever a radio malfunction occurs;

(1) First check FUSES in the Junction Block:

(a) Fuse 5, Memory feed – Power Antenna and/or Power Amplifier (if equipped)

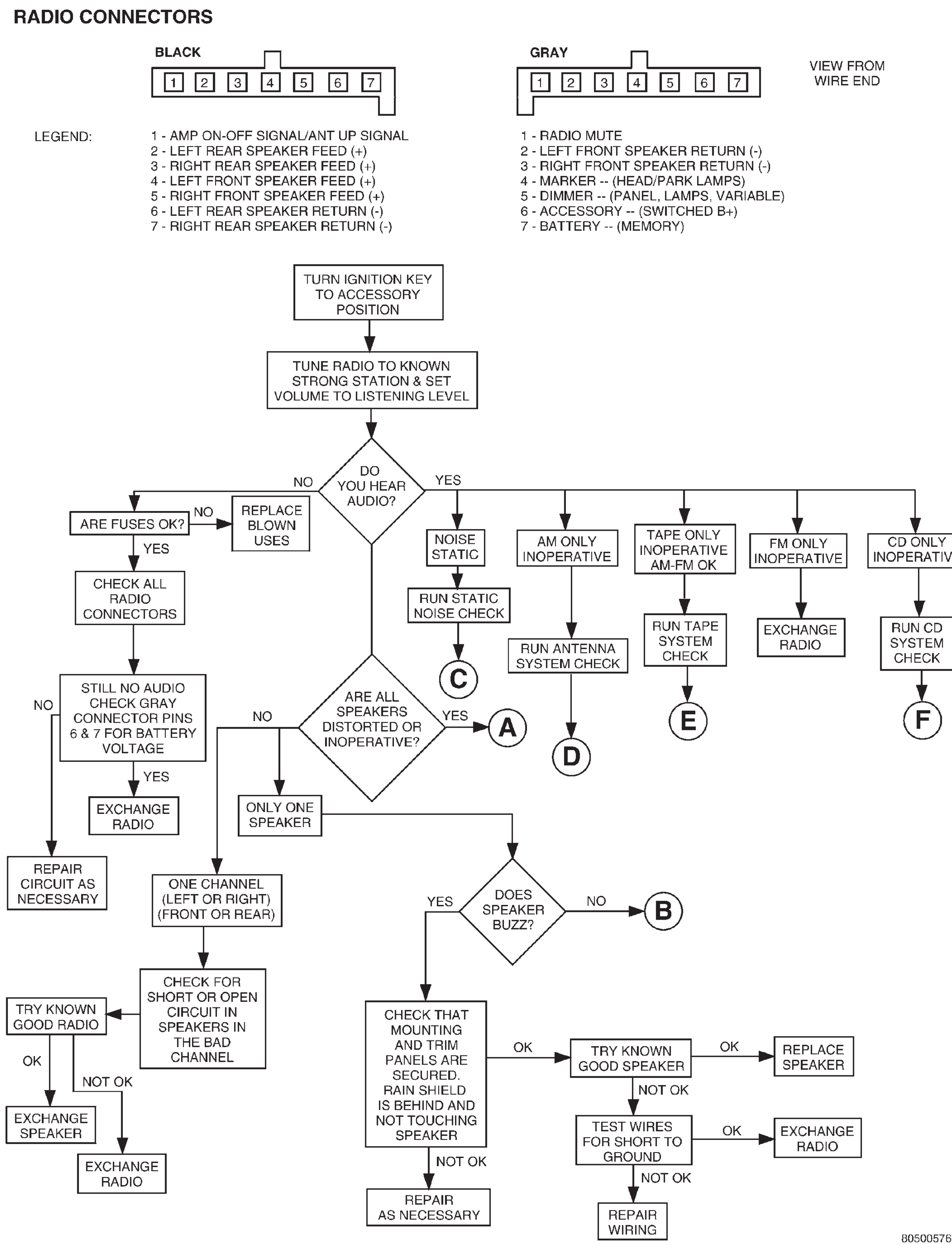
(b) Fuse 7, Illumination

(c) Fuse 14, Ignition feed

NOTE: The vehicles are shipped with the INTERIOR LAMP fuse disconnected.

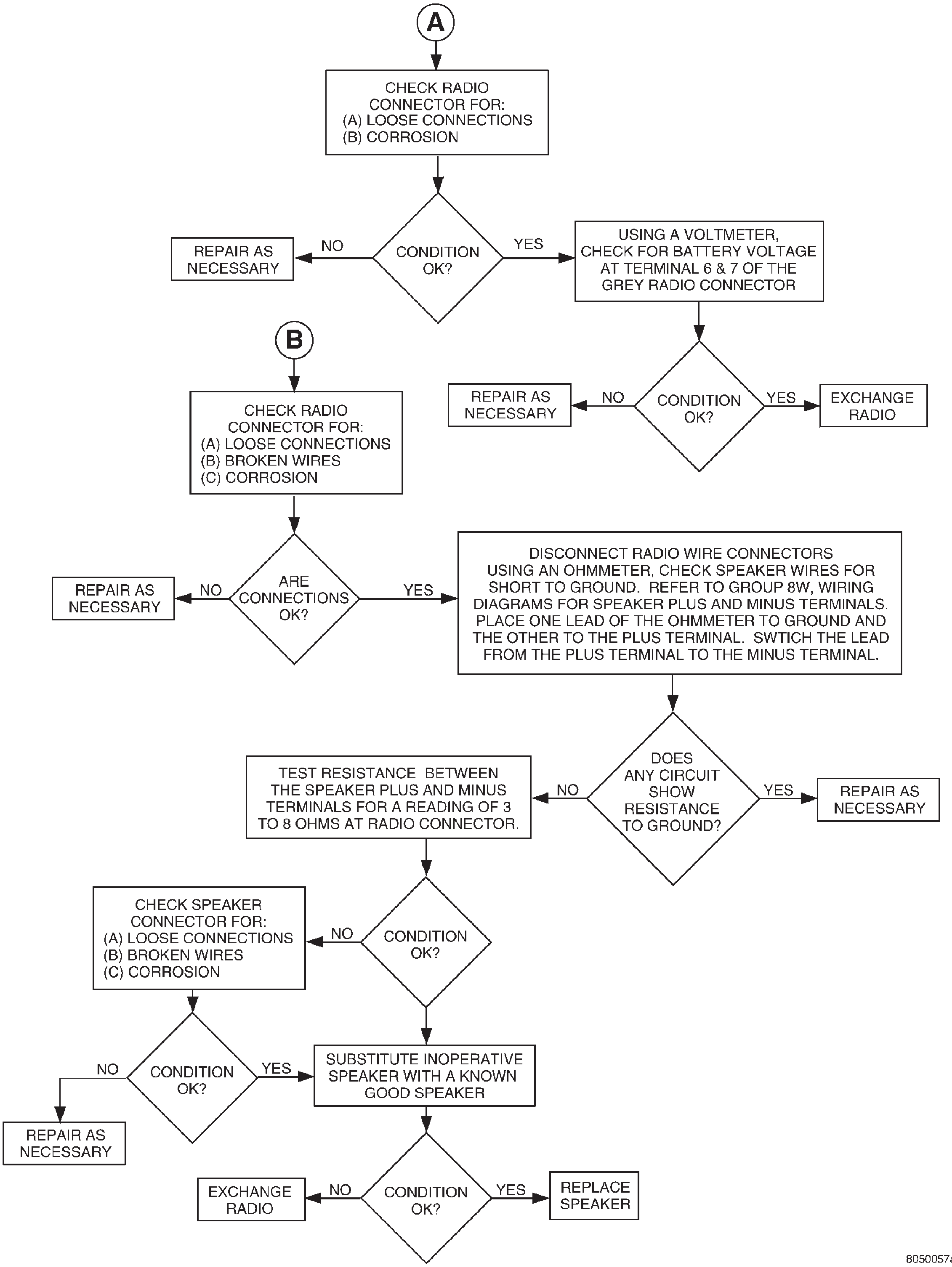
(2) Verify, the radio wire harness are properly connected before starting normal diagnosis and repair procedures. Refer to Audio Diagnostic Charts and/or Group 8W, Wiring Diagrams.

DIAGNOSIS AND TESTING (Continued)



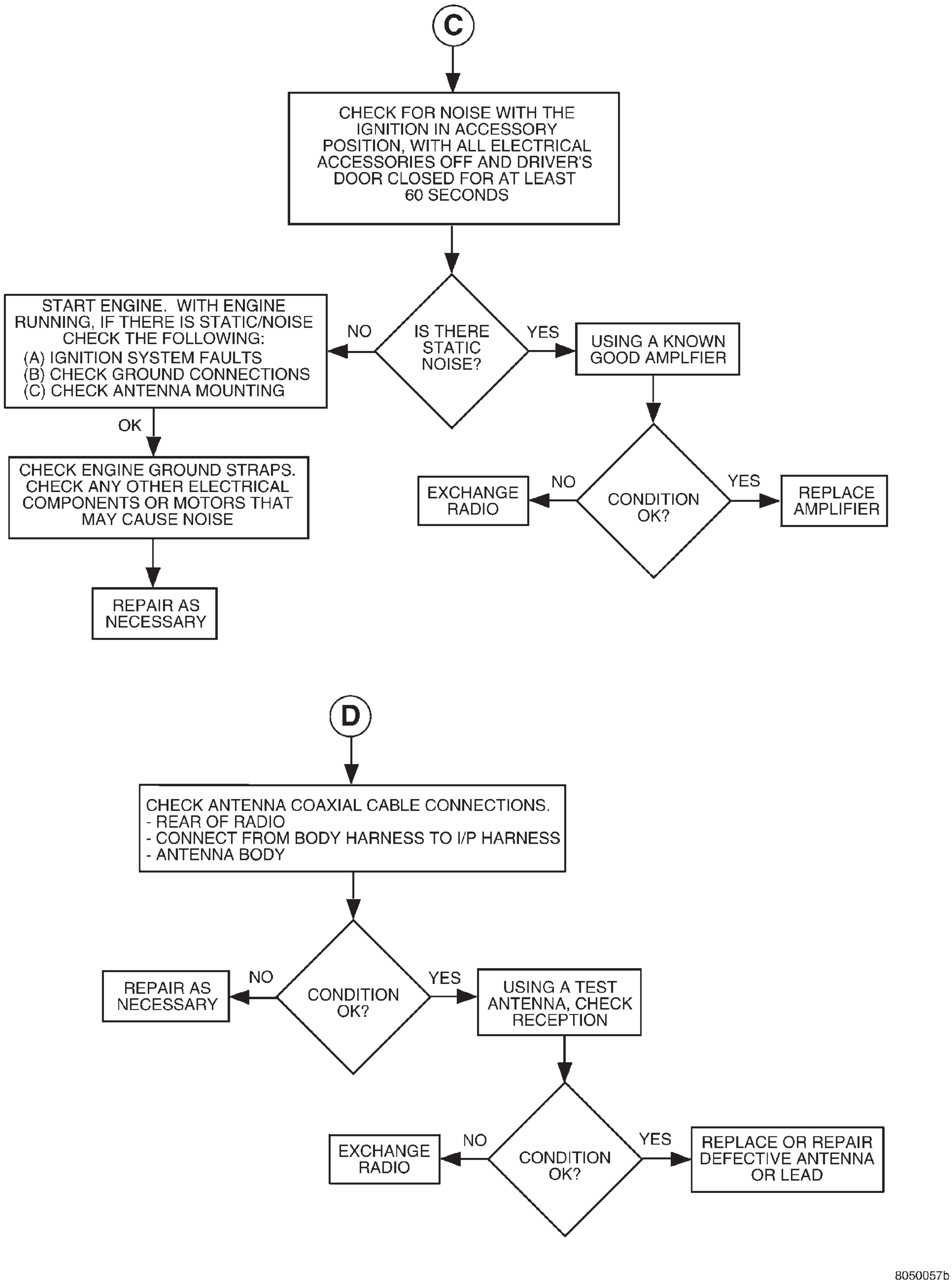
STANDARD SYSTEM

DIAGNOSIS AND TESTING (Continued)



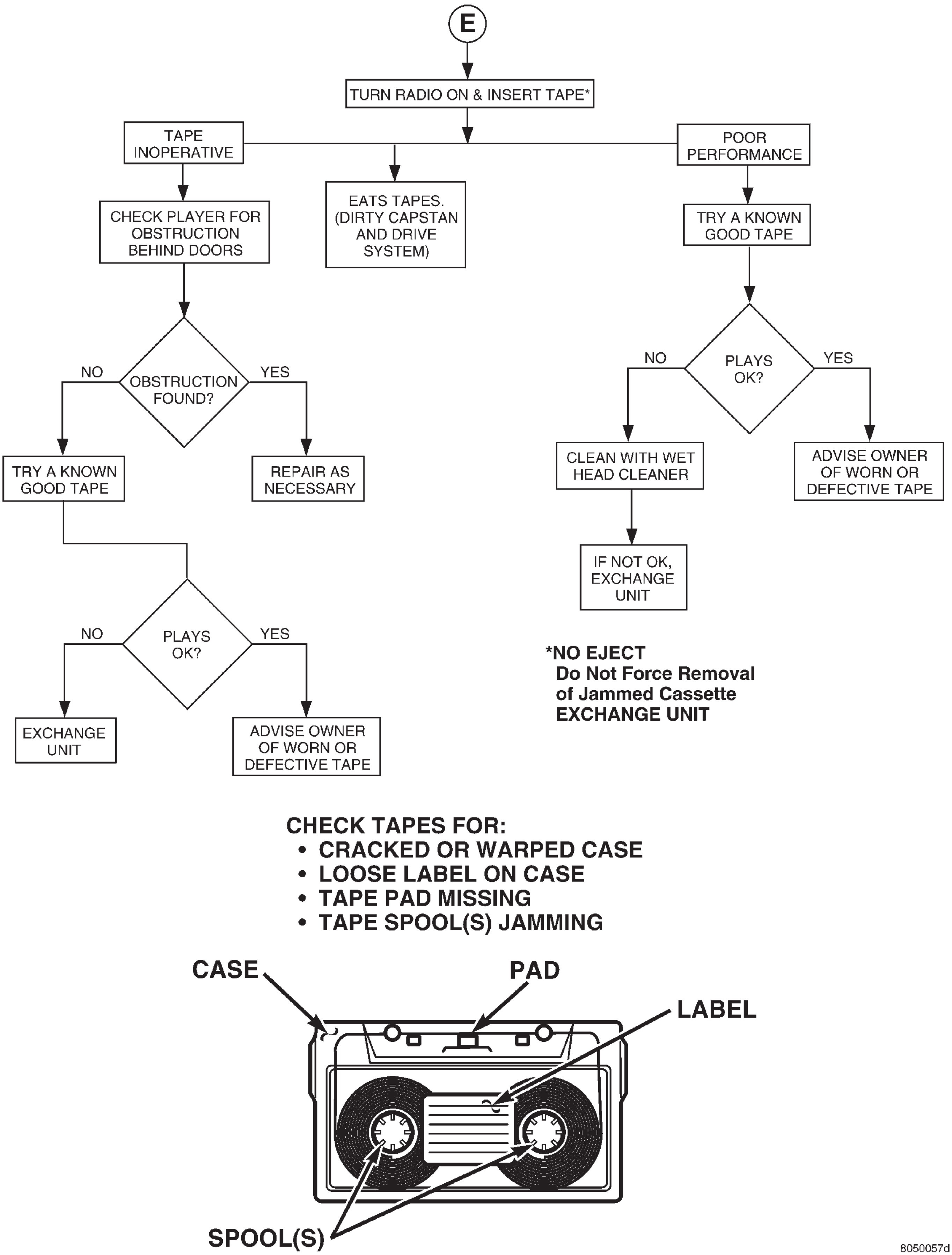
STANDARD SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)



STANDARD SYSTEM CONTINUED

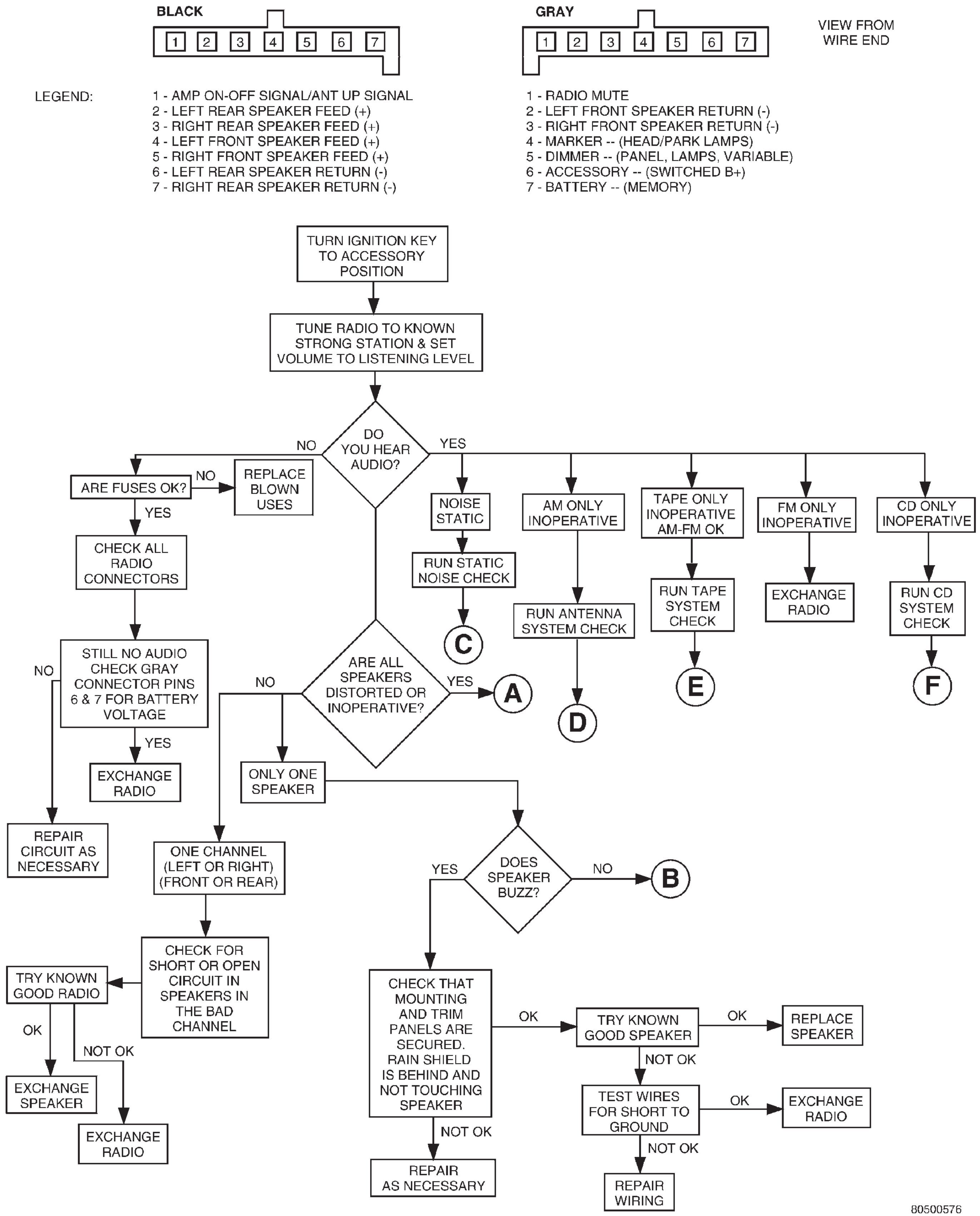
DIAGNOSIS AND TESTING (Continued)



STANDARD SYSTEM CONTINUED

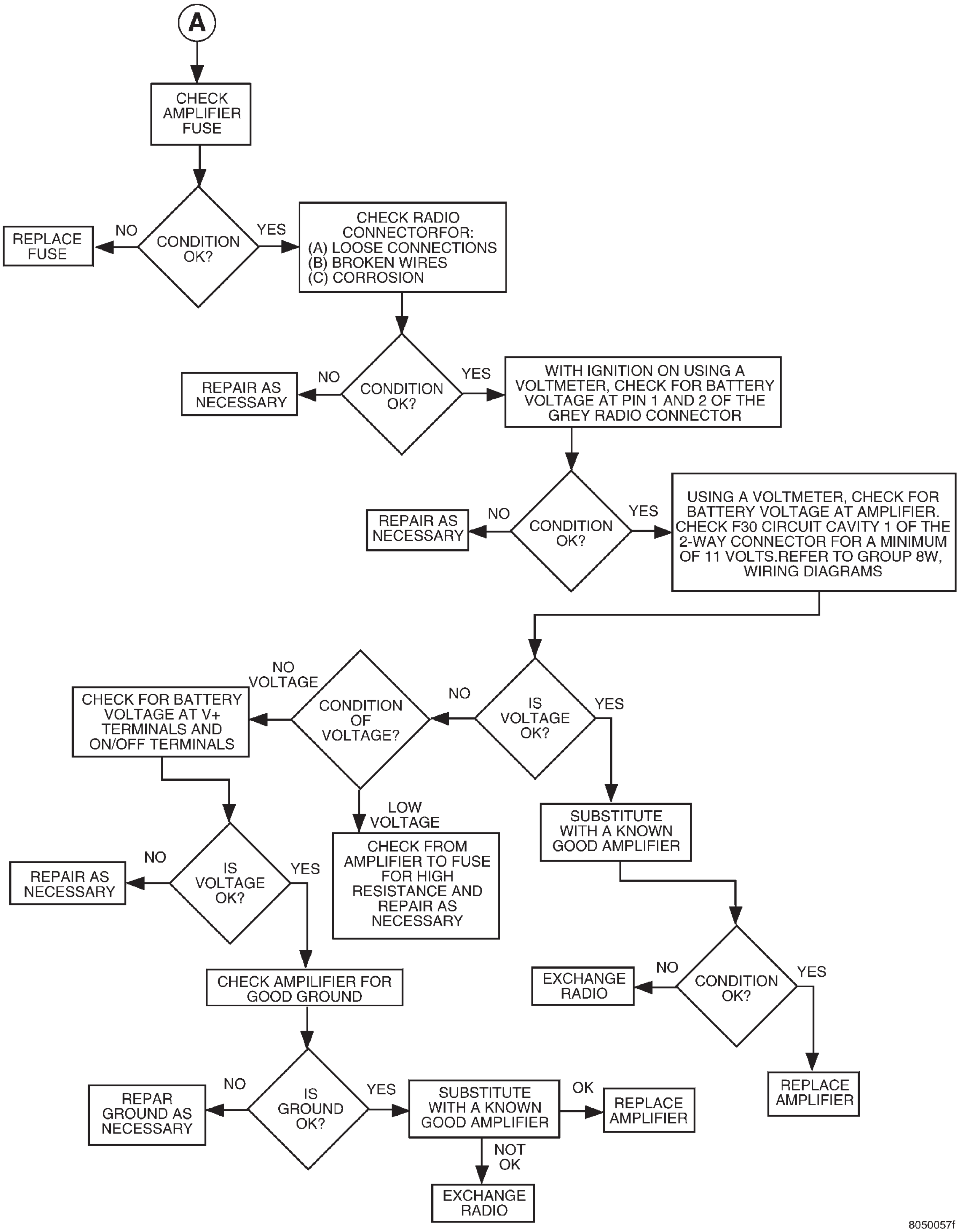
DIAGNOSIS AND TESTING (Continued)

RADIO CONNECTORS



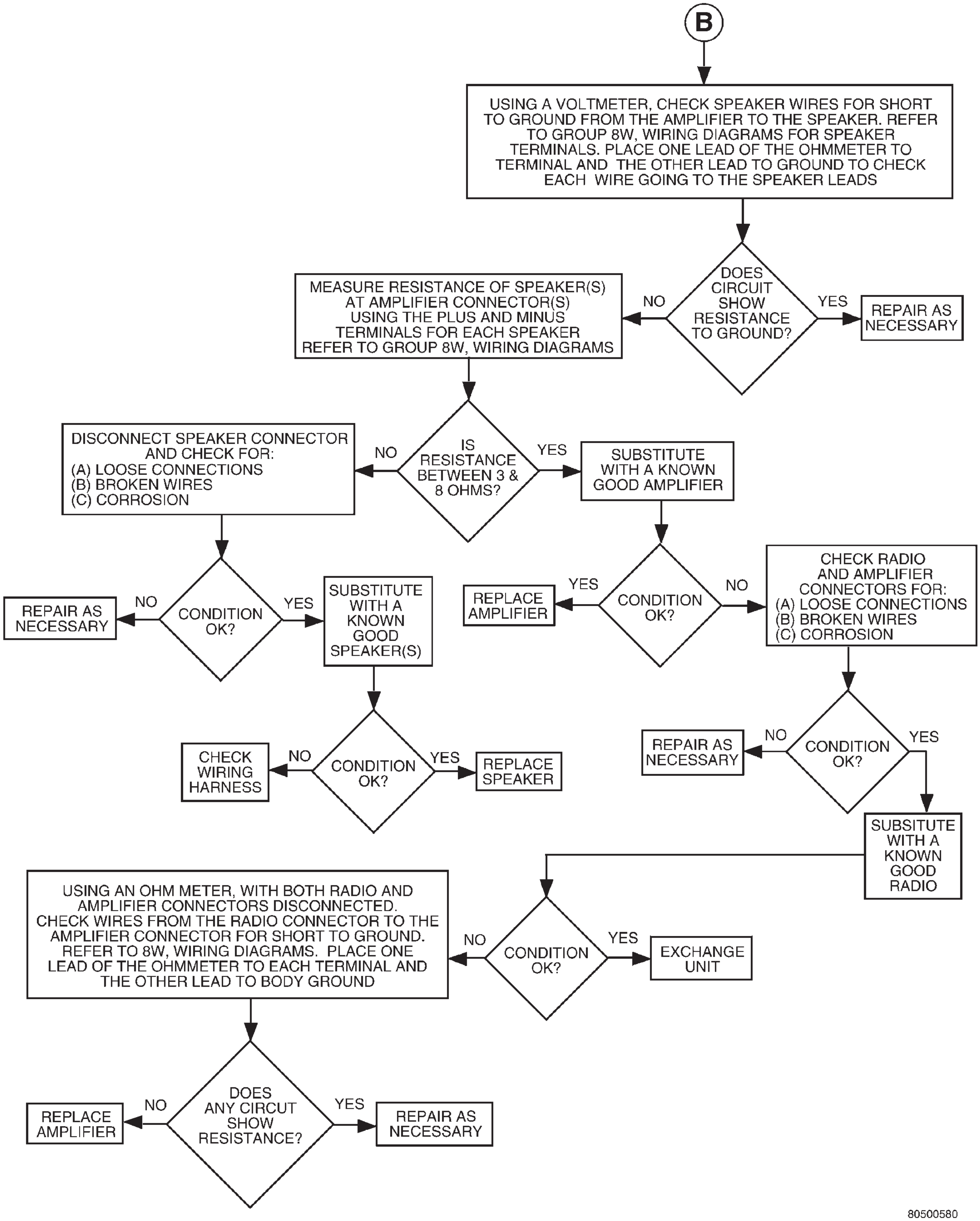
INFINITY AMPLIFIED SYSTEM

DIAGNOSIS AND TESTING (Continued)



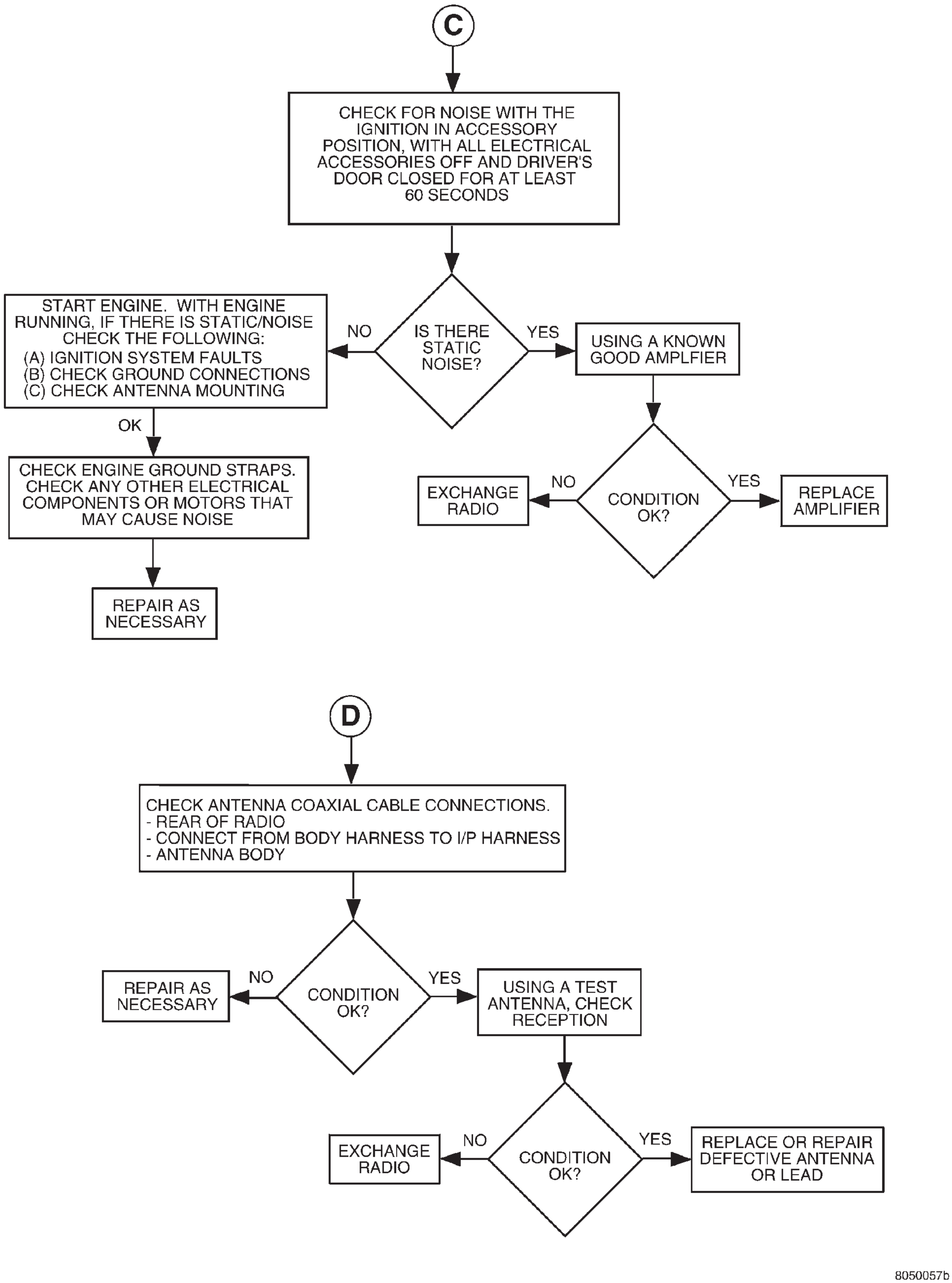
INFINITY AMPLIFIED SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)



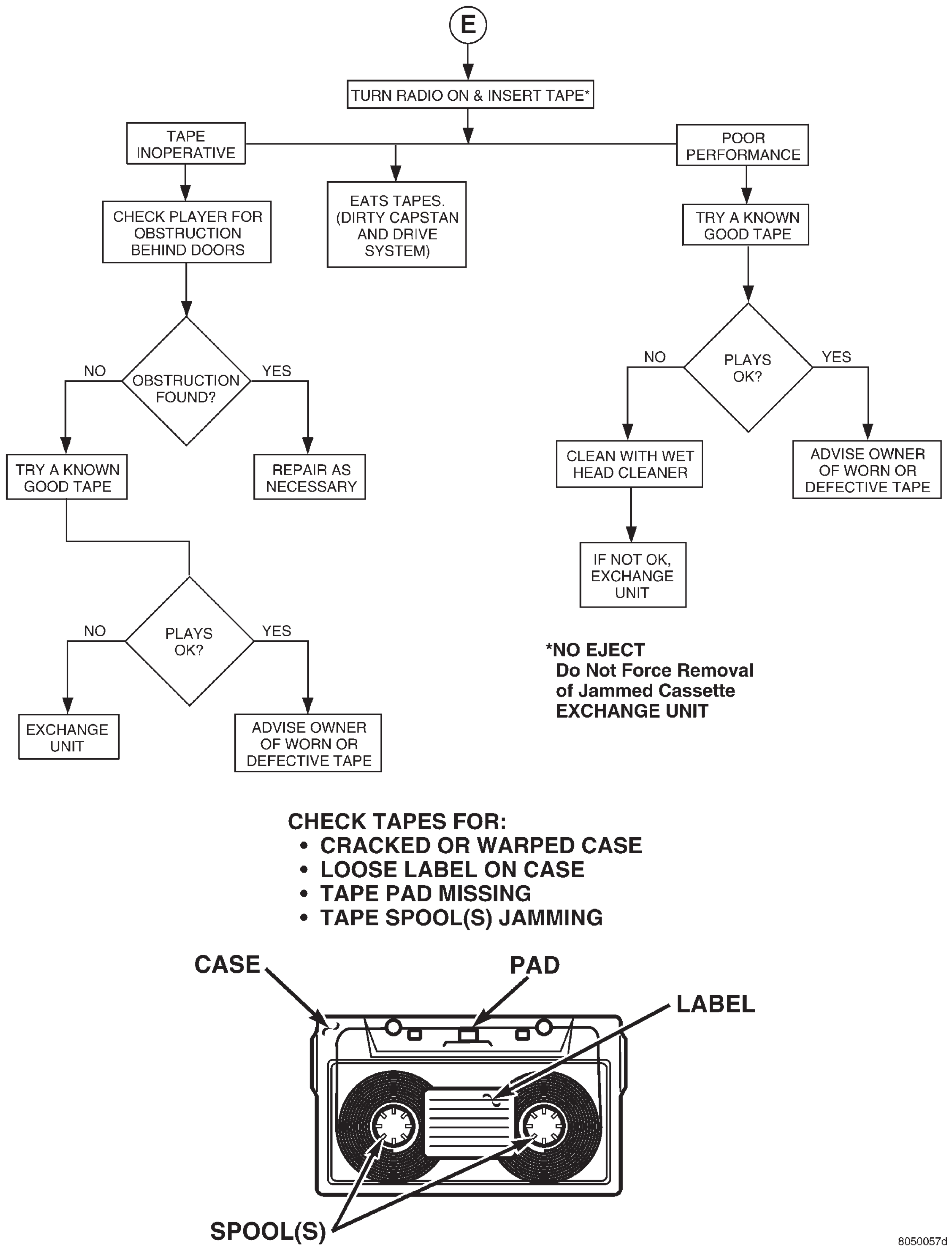
INFINITY AMPLIFIED SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)



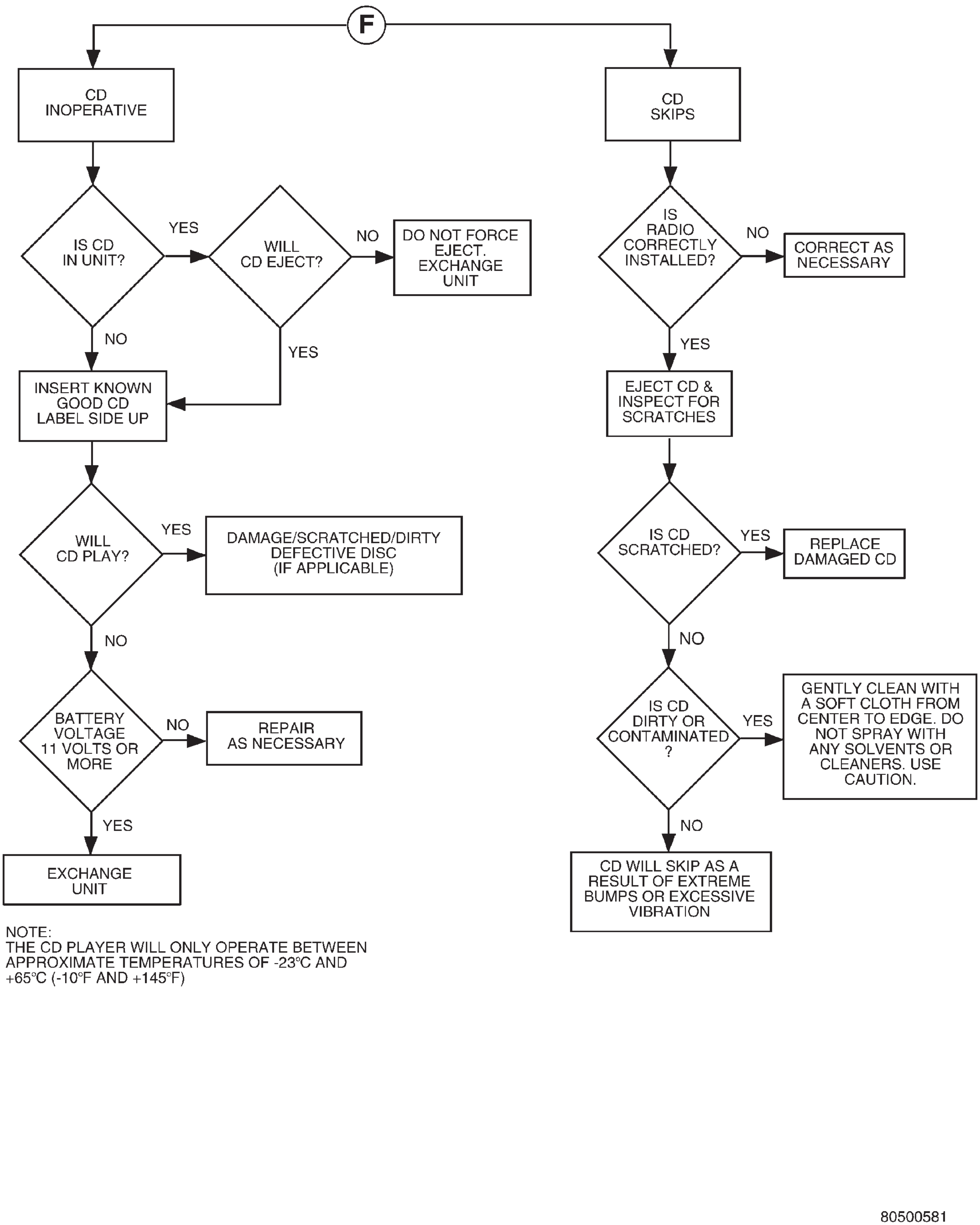
INFINITY AMPLIFIED SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)



INFINITY AMPLIFIED SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)



INFINITY AMPLIFIED SYSTEM CONTINUED

DIAGNOSIS AND TESTING (Continued)

DIAGNOSTIC CONDITIONS

NOISE DISTORTION IN ALL SPEAKERS

Does the distortion occur through all operations:

- AM and FM stations
- Cassette tape
- Compact disc

If not, check for radio interference, damaged tape or disc that may be causing the distortion. Refer to Sound Systems Operating Instructions in the Owners Manual for cleaning procedures of the cassette tape player.

- Check battery voltage, for 11 Volts or more
- Check amplifier connector for proper connection
- If OK, check radio, refer to Radio Diagnosis
- If OK, check circuit between the radio and the amplifier. If OK, check between the amplifier and the speakers.
- If OK, replace amplifier

ELECTRICAL NOISE DISTORTION ONE SPEAKER

- Remove output signal connector from amplifier and check for short to ground on the speaker with the distortion. Refer to Group 8W, Wiring Diagrams for the appropriate pin numbers.
- If shorted to ground, disconnect speaker connector and recheck from the amplifier for short to ground.
- If still shorted to ground, repair wires. Not shorted to ground, replace speaker.
- Not shorted to ground, check speaker resistance at amplifier connector for two to five ohms.
- If resistance is OK, refer to Radio Diagnosis. If radio checks OK, replace amplifier.
- If resistance is less than two ohms, replace speaker. If resistance is OK, repair wires

MECHANICAL NOISE DISTORTION

- Check trim for loose parts, and speaker attachments for buzzes, repair as necessary.
- Remove speaker that is still connected and listen for distortion. If distortion remains, replace speaker.

ONE SPEAKER NON-OPERATIVE

- Remove connector from amplifier and check for two to five ohms resistance to the non-operative speaker. Refer to Group 8W, Wiring Diagrams for the appropriate pin numbers.
- If resistance is less than two ohms, test speaker for resistance.
- If OK, refer to Audio Diagnostic Test Procedures. If not OK, replace speaker.

ALL SPEAKERS NON-OPERATIVE

- Check radio for being ON, are the display lights on
- Radio not ON, refer to Radio Diagnosis
- Check fuses, amplifier connectors and wires for proper connection
- Check for good ground
- Check amplifier, for battery voltage and ON/OFF voltage

(1) Battery voltage OK and NO voltage at the ON/OFF terminal, check for short or open in the ON/OFF circuit.

(2) ON/OFF voltage OK, and NO battery voltage, check for short or open in battery circuit.

(3) Prior to replacing amplifier check fuse 5 in the Junction Block. If not OK, replace fuse. If fuse blows again disconnect amplifier B+ wire connector. Refer to Group 8W, Wiring Diagrams for the proper connector.

(4) If fuse still blows the problem is not the amplifier. If fuse does not blow replace the amplifier.

(5) If shorted or open circuit repair as necessary.

MANUAL ANTENNA

Check for short or open circuits with an ohmmeter or continuity light once the antenna cable is disconnected from the radio. The radio coax cable has a connector that connects behind the between passenger seat and console.

(1) Continuity should be present between the antenna base and radio end pin of antenna cable plug (Fig. 1).

(2) No continuity should be observed or a very high resistance of several megohms between the ground shell of the connector and radio end pin.

(3) Continuity should be observed between the ground shell of the connector and the mounting hardware in the trunk right rear quarter panel

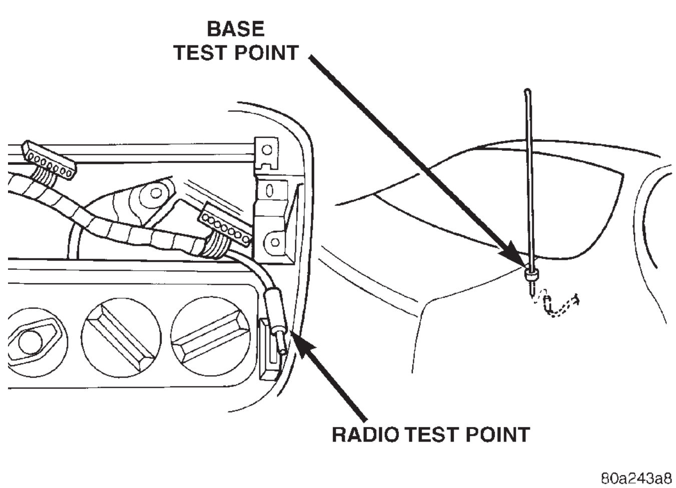


Fig. 1 Antenna Test Points

DIAGNOSIS AND TESTING (Continued)

POWER ANTENNA

(1) Antenna not operating check Fuse 5 in the Junction Block. If not OK, replace fuse. If OK, test for battery at the antenna wire connector. If OK, go to Step 2. If not OK, repair as necessary.

(2) To extend antenna, using jumper wires, attach one end to a battery positive source and the other to the red and green wire terminals for up direction. Connect the second lead to a good ground or to the antenna mounting bracket (Fig. 2).

(3) To retract antenna attach the battery positive source to the red wire terminal for the down direction. Connect the second lead to a good ground or to the antenna mounting bracket.

(4) If the motor will not operate, replace the antenna assembly.

(5) If the motor runs freely and the antenna does not extend or retract, the mast or drive assembly is at fault. Remove the mast and verify that all the drive teeth are intact. If not replace mast.

(6) If the mast jumps or travel rate is slow during operation or the motor labors.

(a) Check for bent mast. If bent replace mast.

(b) Check for dirty mast and clean it as necessary. If corroded, replace mast.

NOTE: Do not grease or lubricate the mast.

(c) If cleaning the antenna mast does not solve the problem, the antenna mast should be replaced.

(7) If mast fails to extend or retract completely, or motor continued to operate after full extension or retraction of mast. Check for broken teeth on the mast drive rod or bent mast.

(8) If the mast checks good, the antenna assembly should be replaced.

REMOTE CD CHANGER TEST

CD changer inoperative.

(1) The CD changer receivers its power and ground through the radio via the DIN connector. Verify that the radio powers up and functions before proceeding.

(2) With the radio turned ON, check the radio display when pushing the MODE/EJECT button to select the CD mode.

(a) If the display shows - - - -, then insert a CD magazine in the changer.

(b) If the display shows nocd, then insert a CD into the magazine.

(c) If the display shows Err xxxx, then check the error message table below.

(d) If the radio only switches between AM and FM turning modes, then perform the following:

(I) Check the connection of the DIN cable to the CD changer and radio.

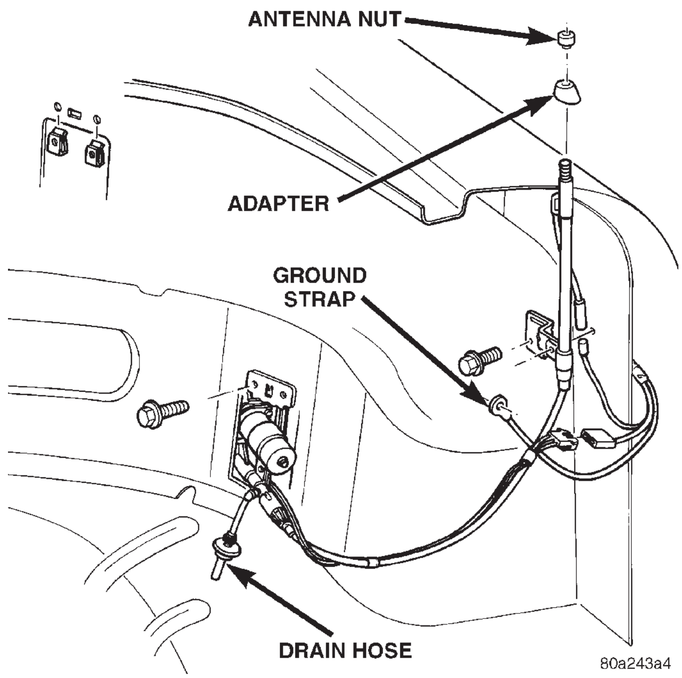


Fig. 2 Power Antenna Assembly

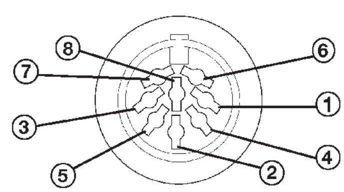
(II) If OK, then check the DIN cable at the CD changer side.

(III) Make sure the DIN cable is connected to the radio and radio is turned ON and operating. Check for battery voltage at Pins 6 and 7 using Pin 8 for ground.

(IV) If OK, then replace CD changer.

(V) If not OK, then remove DIN cable from radio and changer. Check DIN cable for continuity from connector to connector, using a ohmmeter on each Pin.

(VI) If the DIN cable OK, then replace the radio.



DIN Cable Connector

DIN CABLE PIN-OUTS			
PIN 1	DATA BUS (-)	PIN 5	AUDIO IN (L)
PIN 2	AUDIO GRD	PIN 6	BATTERY
PIN 3	DATA BUS (+)	PIN 7	IGNITION
PIN 4	AUDIO IN (R)	PIN 8	GROUND

ERROR MESSAGES		
DIS-PLAY	EXPLANATION	WHAT TO DO
nocd	No disc or discs in magazine	Load discs in magazine
- - - -	No magazine in player	Load magazine in player
Err HOT	Player overheating	Allow to cool down
Err EE EE	Communication problem	Turn ignition OFF to reset, check cable connection. If OK, replace changer.
Err E-01	Deadlock problem	Replace changer.
Err E-02	Disc eject problem	Replace changer.
Err E-06	Elevator problem	Replace Changer.
Err E-07	Magazine eject problem	Check that the magazine is OK. If OK, replace changer.
Err PLAY	Discs cannot play	Check disc loading, or try another disc. If OK, replace changer.

REMOVAL AND INSTALLATION

DOOR MOUNTED SPEAKER

CAUTION: Do not operate the radio with speaker leads detached. Damage to the output devices may result.

REMOVAL

(1) Carefully, pry speaker grille away from door trim panel (Fig. 3).

(2) Remove four speaker retaining screws.

(3) Pull speaker away from door and disconnect wiring.

INSTALLATION

For installation reverse above procedures. Ensure speaker is in the proper position

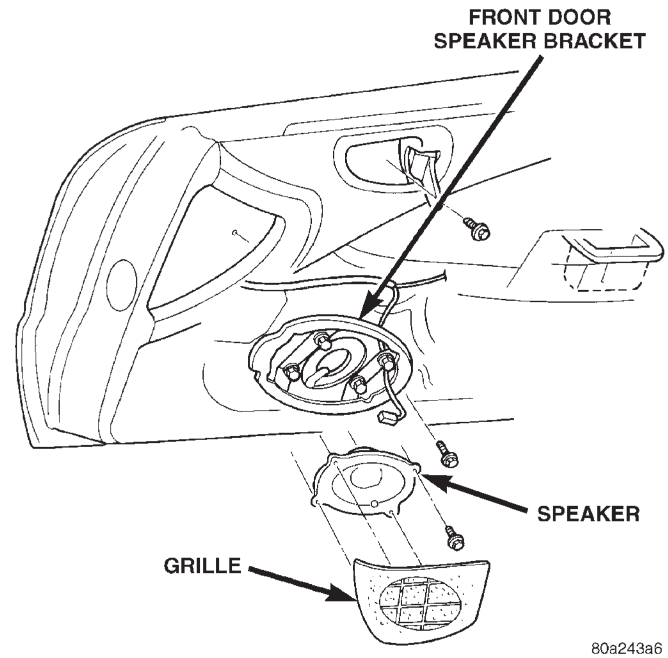


Fig. 3 Door Mounted Speaker

INSTRUMENT PANEL SPEAKER

CAUTION: Do not operate the radio with speaker leads detached. Damage to the output devices may result.

REMOVAL

(1) Remove instrument panel top cover:

(a) Remove screw from right side of the top cover.

(b) Carefully, pry up each end of top cover to disengage clips (Fig. 4).

(c) Lift rear edge of top cover using a trim stick along rear edge.

(d) While lifting rear edge slide top cover rearward to disengage front clips and remove the top cover.

(2) To remove right or left speaker remove two retaining screws. Lift up speaker and disconnect wire connector (Fig. 5).

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

For installation, reverse the above procedures.

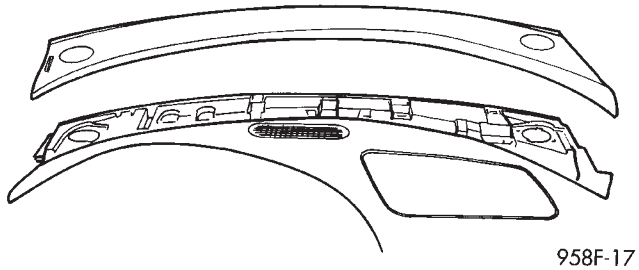


Fig. 4 Instrument Panel Top Cover

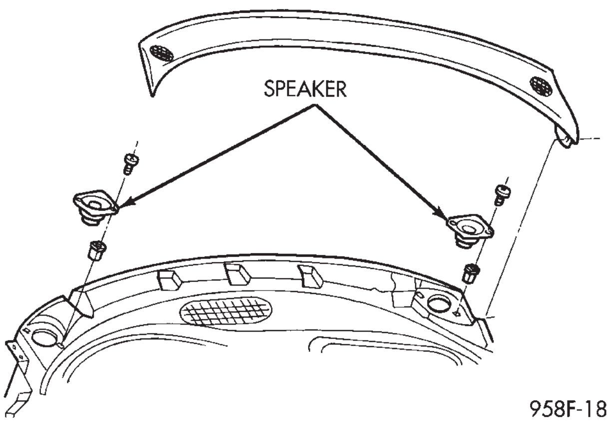


Fig. 5 Instrument Panel Speakers

MANUAL ANTENNA AND MAST

REMOVAL

(1) Inside trunk, pull the right side trunk liner aside.

(2) Unplug antenna lead from base of antenna body.

(3) Remove antenna mast by unscrewing mast from antenna body. Use tape (electrical) to prevent scratching of the mast.

(4) Remove cap nut and adapter (Fig. 6).

(5) Pull antenna body down through the quarter panel.

INSTALLATION

For installation reverse above procedures. Check that the locating tab is in-line with the slot in the body before installing antenna. Tighten cap nut to 7 N·m (65 in. lbs.).

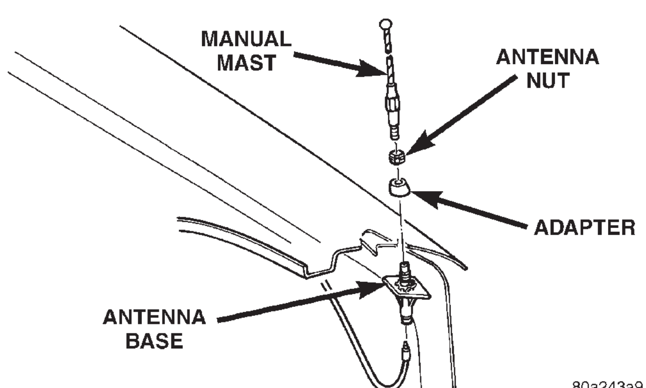


Fig. 6 Antenna Mounting Removal

POWER ANTENNA

REMOVAL

(1) Disconnect battery negative cable.

(2) Inside trunk, pull trunk liner aside.

(3) Remove motor mounting screws.

(4) Unplug antenna lead from pigtail connector, disconnect wire connector, remove drain tube from grommet (Fig. 2).

(5) Remove cap nut and adapter.

(6) Pull antenna body down through the hole in the quarter panel.

INSTALLATION

For installation reverse the above procedures. Tighten antenna cap to 7 N·m (65 in. lbs.) torque.

POWER ANTENNA MAST

REMOVAL

(1) Remove cap nut.

(2) Turn ignition key to ACCESSORY position and turn on radio.

(3) While the mast is moving up pull upward to remove mast, contact spring and drive rod from the mast tube.

INSTALLATION

(1) Insert new drive rod into mast tube with drive teeth toward antenna motor (Fig. 7).

(2) Turn off radio and guide mast into tube. The mast may not be fully lowered when first installed.

(3) Replace the cap nut and tighten to 7 N·m (65 in. lbs.) torque.

(4) Turn radio on and off to extend and retract antenna. Mast should be fully lowered after recycling.

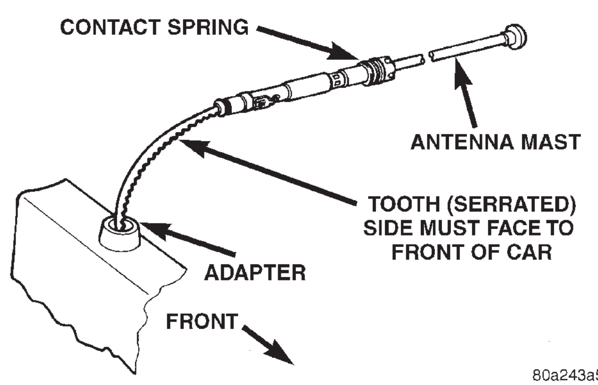


Fig. 7 Power Mast Replacement

REMOVAL AND INSTALLATION (Continued)

RADIO

REMOVAL

(1) Remove center bezel by pulling straight back (Fig. 8).

(2) Remove two radio mounting screws (Fig. 9).

(3) Turn OFF radio and ignition switch. DO NOT disconnect the radio with ignition switch ON.

(4) Pull radio from panel and disconnect wire connectors and antenna lead from radio.

(5) Remove radio.

INSTALLATION

For installation, reverse the above procedure.

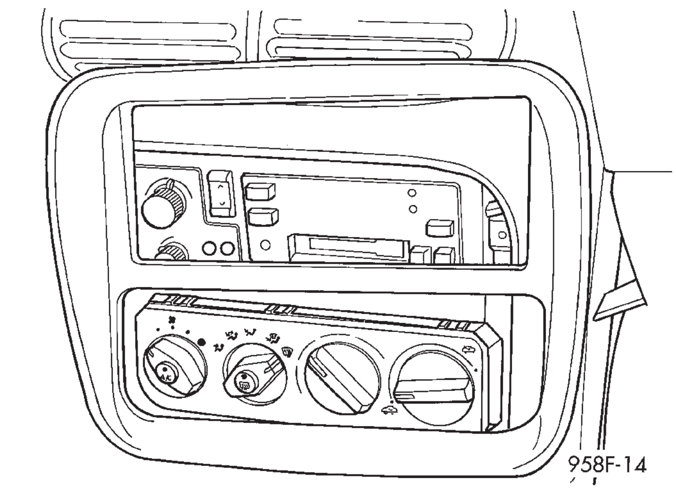


Fig. 8 Center Bezel Removal

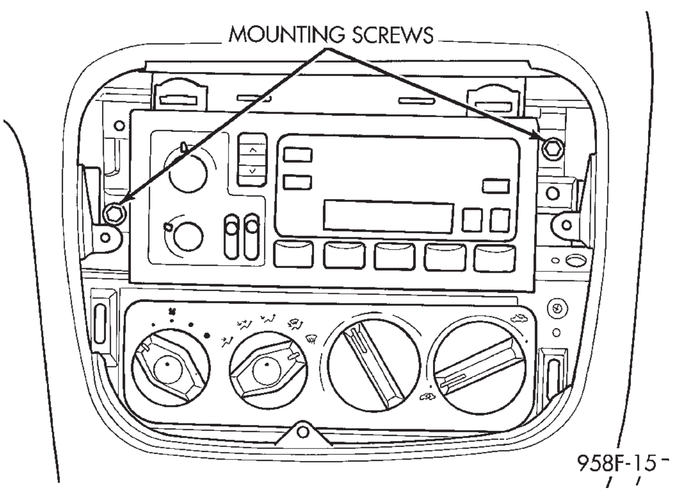


Fig. 9 Radio Assembly

REAR QUARTER PANEL SPEAKER

CAUTION: Do not operate the radio with speaker leads detached. Damage to the output devices may result.

REMOVAL

(1) Remove rear quarter panel trim grille.

(2) Remove four retaining screws (Fig. 10).

(3) Disconnect wire connector and remove speaker.

INSTALLATION

For installation reverse the above procedure. Be sure that the wire connectors are facing rearward in vehicle.

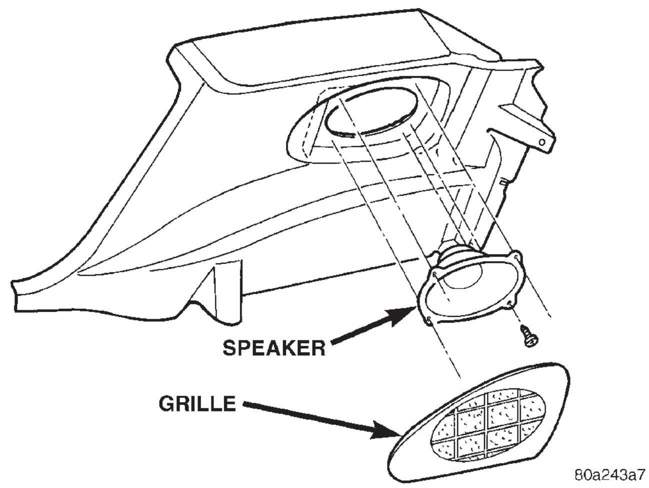


Fig. 10 Rear Speakers

REMOVAL AND INSTALLATION (Continued)

REMOTE AMPLIFIER

REMOVAL

(1) Loosen the two attaching screws and the nut (Fig. 11).

(2) Disconnect the electrical connector and remove amplifier.

INSTALLATION

For installation, reverse the above procedure. Tighten fasteners to 4 N·m (40 in. lbs.) torque.

REMOTE CD CHANGER AND MOUNTING BRACKET

REMOVAL

(1) Turn ignition switch to the OFF position.

(2) Remove the instrument cluster hood. Refer to Group 8E, Instrument Panel and Systems for removal procedures.

(3) Remove the two CD changer attaching screws located under the HVAC control.

(4) Slide the CD changer/power outlet assembly rearward in the vehicle.

(5) Disconnect CD cable, power outlet, and the light socket assembly wire connectors.

(6) Remove the CD changer.

INSTALLATION

For installation, reverse the above procedure.

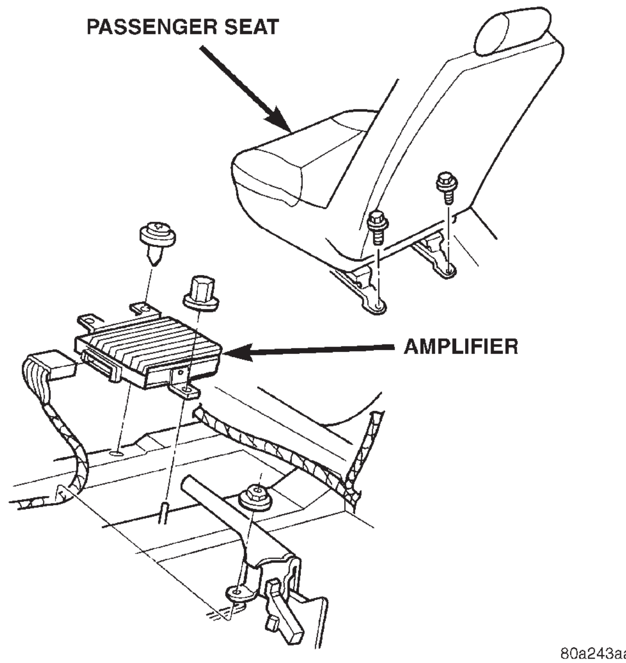


Fig. 11 Amplifier Location

HORNS

CONTENTS

DESCRIPTION AND OPERATION

INTRODUCTION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAG, SEE GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN REMOVAL PROCEDURES.

The horn circuit consists of a horn contact, horn relay, and horns. The horn circuit feed is from the fuse to the horn relay in the Junction Block. When the horn contact is depressed, it completes the ground circuit. Then the horn relay coil closes a set of contacts which allows current to flow to the horns. The horn(s) are grounded at the shock tower. Refer to Group 8W, Wiring Diagrams for horn circuit.

DIAGNOSIS AND TESTING

HORN

(1) Disconnect wire connector at horn.
(2) Using a voltmeter, connect one lead to ground terminal and the other lead to the positive wire terminal (Fig. 1).
(3) Depress the horn switch, battery voltage should be present.
(4) If no voltage, refer to Horn Does Not Sound. If voltage is OK, go to Step 5.
(5) Using ohmmeter, test ground wire for continuity to ground.
(6) If no ground repair as necessary.
(7) If wires test OK and horn does not sound, replace horn.

HORN SWITCH

The horn switch is mounted between the outer and inner covers of the Driver Airbag Module. When the driver airbag module is pressed the horn switch makes contact to ground. The ground signal is carried to the horn relay and horn sounds.

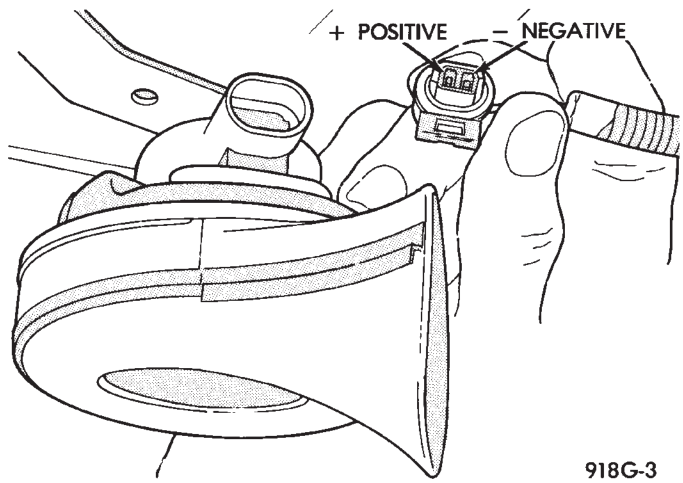


Fig. 1 Horn and Connector

(1) The horn switch grounds to the airbag housing (Fig. 2)
(2) If horn does not sound check for corrosion:
• Horn wire
• Horn switch ground connected to airbag metal housing
• Airbag to steering wheel
• Ensure horn wire is properly connected and insulator is in place on wire
(3) Refer to Group 8W, Wiring Diagrams if wire circuit needs to be repaired.

HORN RELAY

(1) Remove horn relay from the Junction Block (Fig. 3).
(2) Using ohmmeter, test between the Junction Block relay terminal 7 and ground for continuity.
(a) When the horn contact is not depressed, no continuity.
(b) Continuity to ground when horn contact is depressed.
(c) If continuity is not correct, repair horn contact or wiring as necessary. Refer to Group 8W, Wiring diagrams.

DIAGNOSIS AND TESTING (Continued)

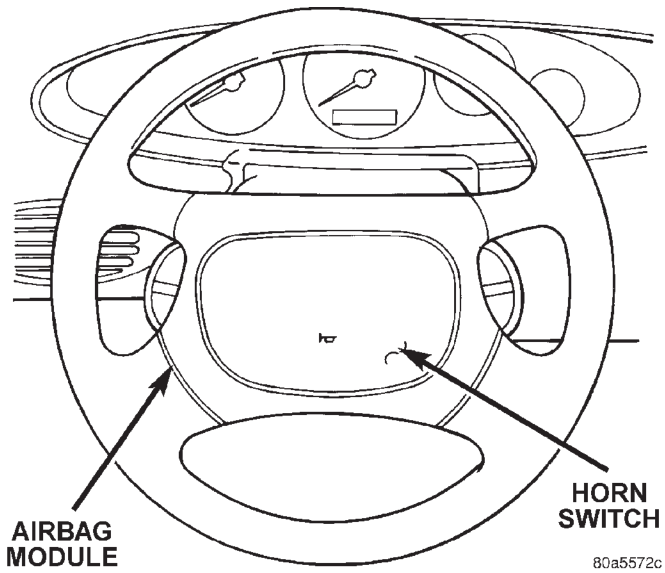


Fig. 2 Horn Switch

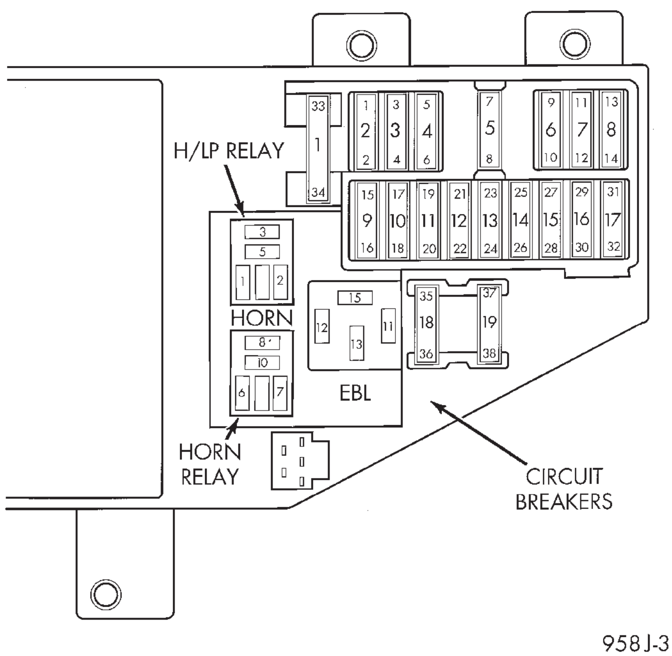


Fig. 3 Horn Relay Location

(3) Insert a jumper wire between terminals 8 and 10 of the horn relay in the Junction Block.

(a) If horns sound replace relay.

(b) If the horns do not sound, install horn relay and refer to Horn Test.

(4) Using voltmeter, test battery voltage:

(a) Test Junction Block horn relay terminals 6 and 8 for voltage from fuse 8.

(b) If not OK, repair as necessary. Refer to Group 8W, Wiring Diagrams.

HORNS WILL NOT SOUND

Check horn fuse 12 in the Power Distribution Center and fuse 8 in the Junction Block. If fuse is blown refer to Fuse Blown section. If fuse is OK, refer to Fuse OK section.

FUSE BLOWN

(1) Verify condition of battery terminals and voltage, refer to Group 8A, Battery. If battery connections and battery charge is OK, go to Step 2.

(2) Using a voltmeter, test for battery voltage at both sides of horn fuse 8. If voltage is OK, on both sides of fuse, go to Fuse OK. If voltage is OK, on one side of fuse, the fuse is blown, go to Step 3.

(3) Using a suitable ammeter in place of the fuse, test amperage draw of the horn circuit. If amperage draw is greater than 20 amps without the horn switch depressed, a grounded circuit exists between the fuse and the horn relay. Go to Step 4. If amperage draw is greater than 20 amps with the horn switch depressed, a grounded circuit exists between the horn relay and the horn. Go to Step 6.

(4) Remove the horn relay from the Junction Block. If the amperage draw drops to 0 amps, the horn switch or circuit is shorted. Refer to group 8W, Wiring Diagrams for circuit information. If amperage does not drop go to Step 5.

(5) Disconnect both horns. If amperage does not drop with both horns disconnected and the horn switch depressed, go to Step 7. If the amperage draw drops go to Step 6.

(6) Disconnect the wire connector from one of the horns. If amperage drops and the connected horn sounds, reverse the procedure, and replace the faulty horn.

(7) Using a continuity tester, with the horns disconnected test continuity of the X2 cavity of the horn relay to ground. Refer to Group 8W, Wiring Diagrams for circuit information. If continuity is detected, the circuit is grounded between the Junction Block and the horns. Locate and repair pinched harness. If the amperage draw does not drop to 0 amps, repair short at the Junction Block.

FUSE OK

(1) Remove the horn relay from the Junction Block.

(2) Using a continuity tester, Depress horn switch and test continuity from the X3 cavity of the horn relay to ground. Refer to Group 8W, Wiring Diagrams for circuit information.

(a) If continuity is detected, go to Step 3.

(b) If NO continuity, go to Step 4.

(3) Using a suitable jumper wire, jump across the fuse F62 cavity and the X2 cavity of the horn relay in the Junction Block.

(a) If the horn sounds, replace the horn relay.

DIAGNOSIS AND TESTING (Continued)

(b) If the horn does not sound, go to Step 4.

(4) Remove driver airbag module from steering wheel. Refer to Group 8M, Restraint Systems for proper procedures.

(5) Test continuity across horn switch wire to the airbag metal housing with horn switch depressed.

(a) If continuity is detected, check for a open circuit between the relay and the horn switch.

(b) If NO continuity:

(I) Remove the horn attaching screws. Refer to Horn Switch Removal and Installation procedures.

(II) Lift top of outer cover and check continuity between the horn wire and the horn switch ground contact. If no continuity replace horn switch. If OK, check airbag module surface for corrosion, repair as necessary.

(6) Install horn relay into Junction Block.

(7) Disconnect the wire connectors from horns.

(8) Using a voltmeter, with the horn switch depressed test voltage across horn connector terminals of the wire harness (Fig. 1).

(a) If voltage is detected, replace horns.

(b) If NO voltage, go to Step 9.

(9) With the horn switch depressed, test for voltage between the X2 circuit and ground.

(a) If voltage OK, repair system ground at right cowl area. Refer to Group 8W, Wiring Diagrams.

(b) If NO voltage, repair open X2 circuit between the relay and the horns.

SYSTEM TEST

CAUTION: Continuous sounding of horns may cause horn relay to fail.

Check fuse 8 in the Junction Block, and refer to Horn System Test.

HORN SYSTEM TEST

CONDITION	POSSIBLE CAUSE	CORRECTION
Horn sounds continuously. NOTE: Immediately unplug horn and relay in the Junction Block	(1) Faulty horn relay. (2) Horn control circuit to relay shorted to ground. (3) Pinched horn switch wire under Driver Airbag Module. (4) Defective horn switch	(1) Refer to horn relay test. (2) Check horn relay terminal 8 in the Junction Block for continuity to ground indicates: (a) Wiring harness shorted to ground. (b) Find the short and repair as necessary. (3) Remove Driver Airbag Module and check for rubbing, shorted or loose wire connector and repair as necessary. (4) Replace Driver Airbag Module.
Horn sound intermittently as the steering wheel is turned.	(1) Horn relay control circuit X3 is shorted to ground inside steering column or the wheel. (2) Pinched horn switch wire under Driver Airbag Module (3) Defective horn switch	(1) Remove Driver Airbag Module and/or steering wheel as needed. Check for rubbing or loose wire/ connector, repair as necessary. (2) Replace Driver Airbag Module. (3) Replace Driver Airbag Module.
Horn does not sound	(1) Check fuse 8 in the Junction Block. (2) No Voltage at horn relay terminals 6 & 8, and fuse is OK. (3) Defective or damaged horn. (4) Defective horn switch	(1) Replace fuse if blown as repair as necessary. (2) No voltage, Repair or replace Junction Block as necessary. (3) Voltage at horn when horn switch is pressed, replace horn. (4) Replace Driver Airbag Module.
Fuse blows when horn is blown	(1) Short circuit in horn or horn wiring	(1) Remove horn relay, check for shorted horn or horn wiring. Disconnect horn wire harness to isolate short and repair as necessary.
Fuse blows without blowing horn NOTE: For wiring repairs refer to Group 8W, Wire Diagrams.	(1) Short circuit	(1) Remove relay, install new fuse, if fuse does not blow replace horn relay. If fuse blows with relay removed, check for short to ground with ohmmeter on circuit between terminals 6 & 8 and the fuse terminal. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

Refer to Group 8W, Wiring Diagrams for circuit and wiring information.

REMOVAL AND INSTALLATION

HORNS

REMOVAL

(1) Hoist and support front vehicle on safety stands.

(2) The horns are located behind the front fascia on the right front frame rail. Remove the splash shield as necessary for access. front.

(3) Disconnect the wire connector from the horn.

(4) Remove mount bracket attaching bolt from the front frame rail. Do not remove horn from mounting bracket (Fig. 4).

(5) Remove horn from vehicle.

INSTALLATION

For installation, reverse the above procedures

HORN SWITCH

The Horn Switch is part of the Driver Airbag Module. Refer to Group 8M Restraint System, Driver Airbag Module Removal and Installation procedures.

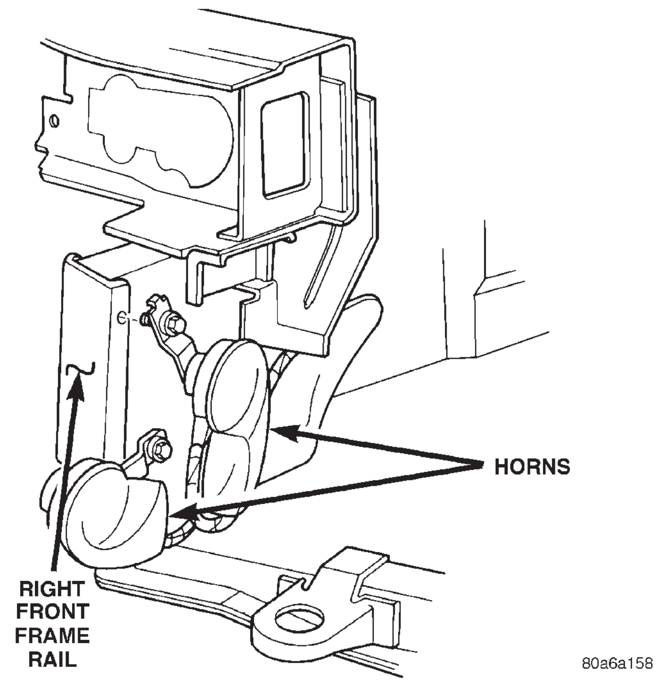


Fig. 4 Horn Location

HORN RELAY

REMOVAL

(1) Open driver's door and remove instrument panel end cover.

(2) Remove horn relay (Fig. 3).

INSTALLATION

For installation, reverse the above procedures.

VEHICLE SPEED CONTROL SYSTEM

CONTENTS

GENERAL INFORMATION

INTRODUCTION

The speed control system is electronically controlled and vacuum operated.The electronic control is integrated into the powertrain control module, located on the left side of the engine compartment next to the air cleaner.The controls are located on the steering wheel and consist of five switches.The ON and OFF buttons are located on the left side of the airbag module.The RESUME/ACCEL, SET/COAST and CANCEL buttons are located on the right side of the airbag module (Fig. 1). For identification and location of the major components (Fig. 2).

The system is designed to operate at speeds above 30 mph (50 km/h).

WARNING: THE USE OF SPEED CONTROL IS NOT RECOMMENDED WHEN DRIVING CONDITIONS DO NOT PERMIT MAINTAINING A CONSTANT SPEED, SUCH AS IN HEAVY TRAFFIC OR ON ROADS THAT ARE WINDING, ICY, SNOW COVERED, OR SLIPPERY.

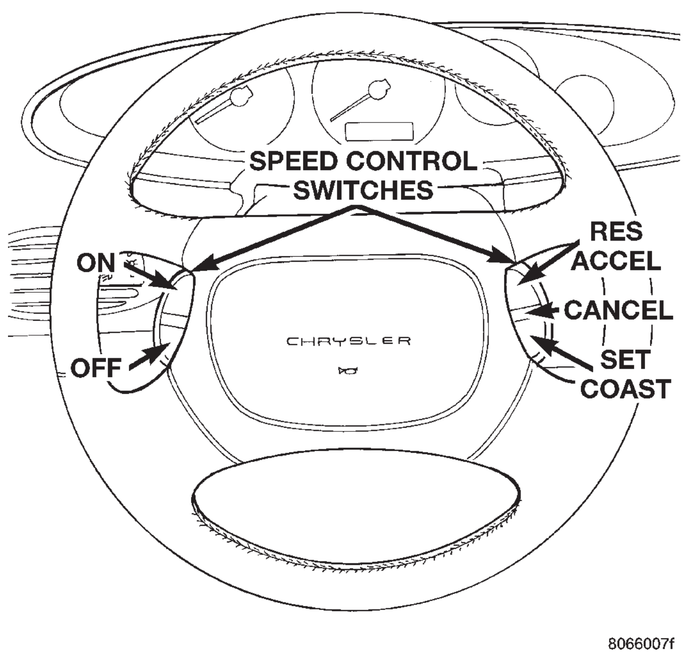


Fig. 1 Speed Control Switch

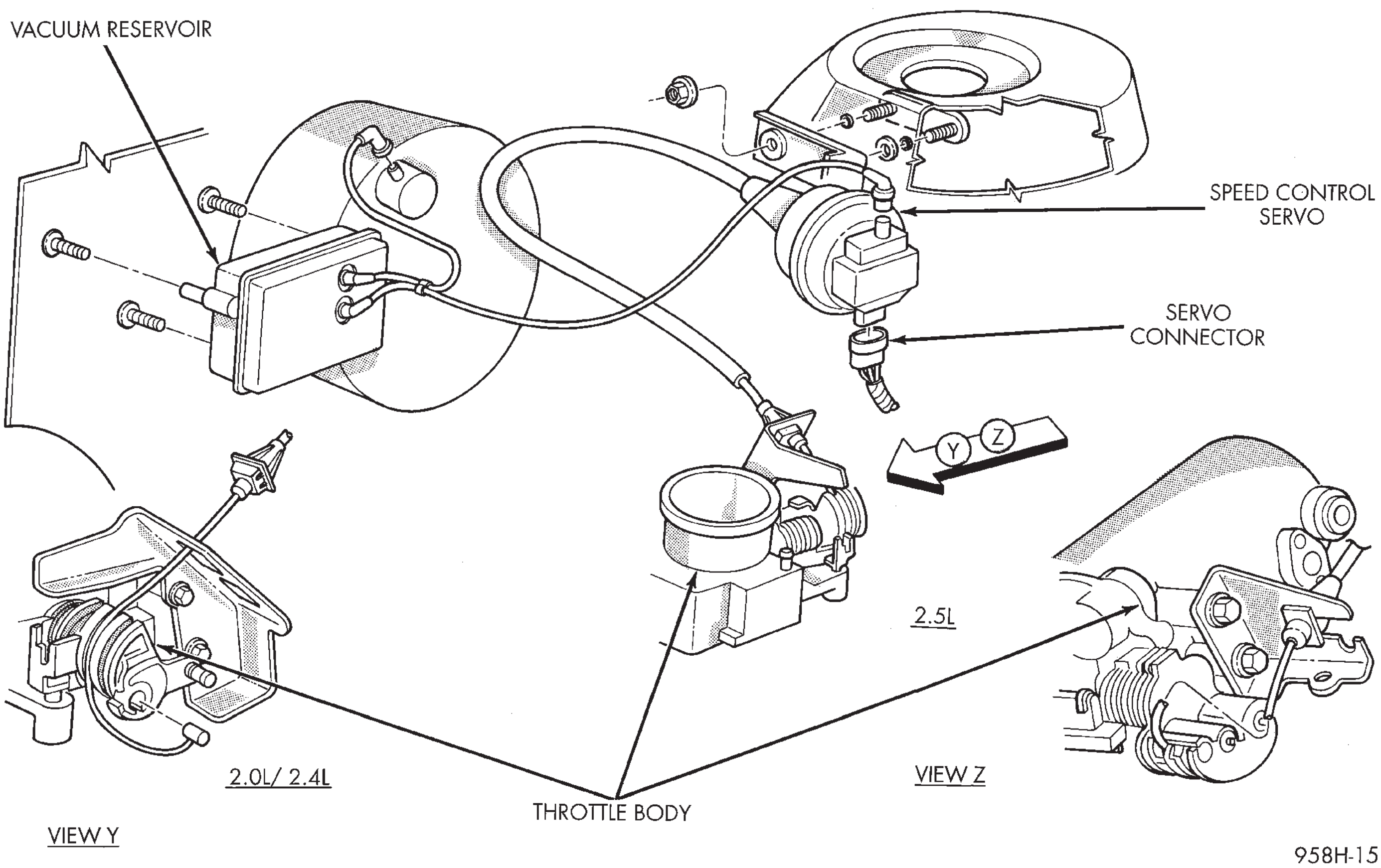


Fig. 2 Speed Control System

DESCRIPTION AND OPERATION

SPEED CONTROL SERVO

The servo unit consists of a solenoid valve body, and a vacuum chamber. The PCM controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

SPEED CONTROL SWITCHES

There are two separate switch pods that operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME/ACCELERATE, SET/COAST and CANCEL modes. Refer to the owner's manual for more information on speed control switch functions and setting procedures.

When speed control is selected by depressing the ON switch, the PCM allows a set speed to be stored in RAM for speed control. To store a set speed, depress the COAST/SET switch while the vehicle is moving at a speed between 30 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- An rpm increase without a VSS signal increase (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is not within 20 mph of the set speed

The previous disengagement conditions are programmed for added safety.

Once the speed control has been disengaged, depressing the RES/ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM.

NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

DESCRIPTION AND OPERATION (Continued)

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the RES/ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the RAM when the RES/ACCEL switch is released. The PCM also has a “tap-up” feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the SET/COAST switch until the desired speed is reached. Then release the switch. The ON and OFF switches operates two components: the PCM's ON/OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

AUTOMATIC SPEED CONTROL OVERSPEED REDUCTION

Transmission control software includes an automatic speed control overspeed reduction feature. This maintains vehicle speed at the selected set point when descending a grade.

The Transmission Control Module (TCM) first senses that the speed control is set. If the set speed is exceeded by more than 4 mph (6.5 km/hr) and the throttle is closed, the TCM causes the transaxle to downshift to THIRD gear. After downshifting, the automatic speed control resumes normal operation. To ensure that an upshift is appropriate after the set speed is reached, the TCM waits until the speed control system opens the throttle at least 8 degrees before upshifting to OVERDRIVE again.

If the driver applies the brakes, canceling automatic speed control operation with the transaxle still in THIRD gear, the TCM maintains this gear until the driver opens the throttle at least 8 degrees to avoid an inappropriate upshift. The upshift is also delayed for 0.5 seconds after reaching the 8 degrees throttle opening in anticipation that the driver might open the throttle enough to require THIRD gear. This will avoid unnecessary and disturbing transmission cycling. If the automatic speed control RESUME feature is used after braking, the upshift is delayed until the set speed is achieved to reduce cycling and provide better response.

STOP LAMP SWITCH

Vehicles equipped with the speed control option use a dual function stop lamp switch. The switch is mounted in the same location as the conventional stop lamp switch, on the brake pedal mounting bracket under the instrument panel. The PCM monitors the state of the dual function stop lamp switch. Refer to Group 5, Brakes for more information on stop lamp switch service and adjustment procedures.

SERVO CABLE

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage. This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

POWERTRAIN CONTROL MODULE

The speed control electronic control circuitry is integrated into the Powertrain Control Module (PCM). The PCM is located in the engine compartment. The PCM speed control functions are monitored by the On-Board Diagnostics (OBD). All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See On-Board Diagnostic Tests in this group for more information. The PCM cannot be repaired and must be replaced if faulty.

VACUUM RESERVOIR

The reservoir contains a one-way check valve to trap engine vacuum in the reservoir. When engine vacuum drops, as in climbing a grade while driving, the reservoir supplies the vacuum needed to maintain proper speed control operation. The vacuum reservoir cannot be repaired and must be replaced if faulty.

VEHICLE SPEED AND DISTANCE

The transmission control module supplies the road speed and distance traveled inputs to the PCM. From these inputs and the throttle position sensor input, the PCM determines when a deceleration condition occurs.

DIAGNOSIS AND TESTING

ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Group 8E,

DIAGNOSIS AND TESTING (Continued)

Instrument Panel and Gauges for speedometer diagnosis.

If a road test verifies an inoperative system, and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a flash lamp code 15, 34 or 77 exists at the Check Engine Lamp (MIL), conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Loose or leaking vacuum hoses or connections.
- Secure attachment at both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Failed speed control servo. Do the servo vacuum test.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

CHECKING FOR DIAGNOSTIC CODES

When trying to verify a speed control system electronic malfunction: Connect a DRB scan tool if available to the data link connector (Fig. 3). The connector is located at left side of the steering column, and at lower edge of the panel.

If a scan tool is not available, use the following procedure:

(1) With key inserted in ignition switch, cycle switch to ON position three times. On third cycle, leave switch in ON position.

(2) After switch has been cycled three times, observe MALFUNCTION INDICATOR LAMP (check engine) indicator on instrument cluster. If a diagnostic code is present, indicator will flash (blink) in a series which will show which diagnostic code is the problem. Example: A series of three flashes in rapid succession, a slight pause, then four flashes in rapid succession would indicate diagnostic code 34.

(3) A speed control malfunction may occur without either diagnostic code being indicated. If no diagnostic code appears or diagnostic code 15 or 34 is observed, refer to the appropriate flow chart.

Refer to Group 25, for further information and useage of the DRB scan tool and a more complete list of Diagnostic Trouble Code.

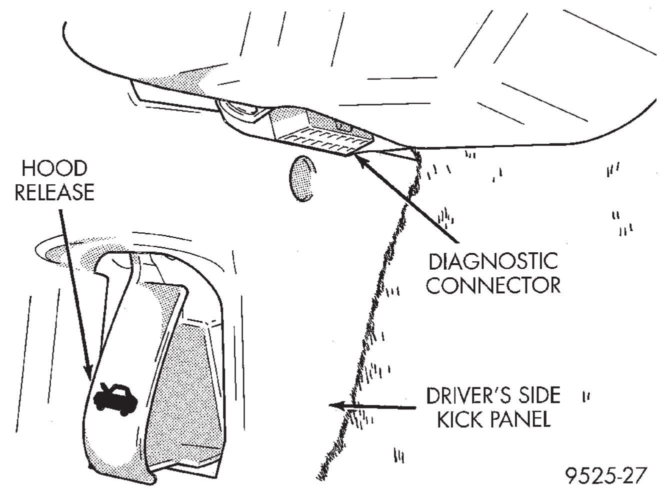


Fig. 3 Data Link Connector Location

SPEED CONTROL ACCELERATES OR TAPS UP BY ITSELF

Check for diagnostic trouble codes. If code 15 refer to the Powertrain Diagnostic Manual, if code 34 perform the following test:

(1) Conduct the speed control switch test on the RESUME/ACCEL switch.

(2) If it fails, replace switch.

(3) If it passes, disconnect the 4 way connector at servo. Test continuity of pin 1 to ground to test for intermittent short. Wiggle wires while preforming test.

(4) If continuity to ground, repair wiring.

(5) If no continuity to ground, replace PCM.

SPEED CONTROL SLOWS DOWN BY ITSELF

Test vehicle speed sensor, refer to group 8E. If sensor fails replace sensor, if it passes perform the following test:

(1) Perform the speed control switch test on the SET/COAST switch, if it fails replace switch.

(2) If the switch passes, conduct the vacuum supply test.

(3) If it passes, conduct the servo vacuum test. If it fails replace servo.

(4) If it passes, test continuity of pin 2 of harness connector to PCM pin 80 for intermittent open. Wiggle wires while performing this test. If no continuity to pin 80, repair harness for open.

(5) If no continuity, replace the PCM.

SPEED CONTROL WILL NOT RESUME-SETS OK

Perform the speed control switch test on the RESUME/ACCEL switch. If the switch fails replace switch.

(1) If switch passes, check continuity from RESUME/ACCEL switch connector pin 1 to pin 31 of

DIAGNOSIS AND TESTING (Continued)

SPEED CONTROL DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Code	Hex Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
15**	23	No Vehicle Speed Sensor Signal	No vehicle distance (speed) sensor signal detected during road load conditions.
34*	OF or 56 or 57	Speed Control Solenoid Circuits MUX S/C Switch High MUX S/C Switch Low	An open or shorted condition detected in the Speed Control vacuum or vent solenoid circuits. Speed Control switch input above the maximum acceptable voltage. Speed Control switch input below the minimum acceptable voltage.
55*		N/A	Completion of fault code display on Check Engine Lamp.
77	52	S/C Power Relay Circuit	Malfunction detected with power feed to speed control servo solneids.
* Check Engine Lamp will not illuminate at all times if this Diagnostic Trouble Code was recorded. Cycle ignition key as described in manual and observe code flashed by Check Engine Lamp.			
** Check Engine Lamp will illuminate during engine operation if this Diagnostic Trouble Code was recorded.			

40 way connector at PCM. Check for intermittent open circuit, wiggle wires while performing test.

(2) If intermittent open, repair circuit.

(3) If continuity is ok, perform continuity test from pin 1 of RESUME/ACCEL switch connector to ground. Check for intermittent short, wiggle wires while performing this test.

(4) If shorted, repair harness for short.

SPEED CONTROL WILL NOT SLOW DOWN

Check for diagnostic trouble codes. If code 34 or no code present, perform the following test:

(1) Conduct the speed control switch test on the resume SET/COAST.

(2) If it fails replace switch.

(3) If it passes use an ohmmeter to test continuity between pin 2 of SET/COAST switch connector and ground. Wiggle wires while preforming test. If no continuity repair circuit.

(4) If continuity, test continuity between pin 1 of SET/COAST switch connector and pin 41 of the PCM 40 way connector. Wiggle wires while preforming test. If no continuity, repair circuit.

(5) If continuity, disconnect the servo connector. Test continuity from pin 2 of connector and ground to test for intermittent short. Wiggle wires while preforming test. If continuity repair circuit.

(6) If no continuity, conduct the servo vacuum test. If it fails replace servo.

(7) If it passes, replace the PCM.

SPEED CONTROL ELECTRICAL TEST

Electronic speed control systems may be tested using two different methods. One involves use of a DRB. If this test method is desired, refer to the Powertrain Diagnostic Test Procedures for charging and speed control system manual.

The other test method uses a volt/ohm meter. The volt/ohm meter method is described in the following tests.

If any information is needed concerning wiring, refer to Group 8W, Wiring Diagrams (Fig. 4).

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals, or seals. If these components are damaged, intermittent or complete system failure may occur.

When electrical connections are removed, corrosion should be removed from electrical terminals and a light coating of Mopar Multi-Purpose Grease, or equivalent, applied. Inspect connectors for damage terminals.

A poor connection can cause a complete or intermittent malfunction and is also the only connection in the circuit, that can not be tested. For this reason, a loose connection may be misdiagnosed as a component malfunction.

DIAGNOSIS AND TESTING (Continued)

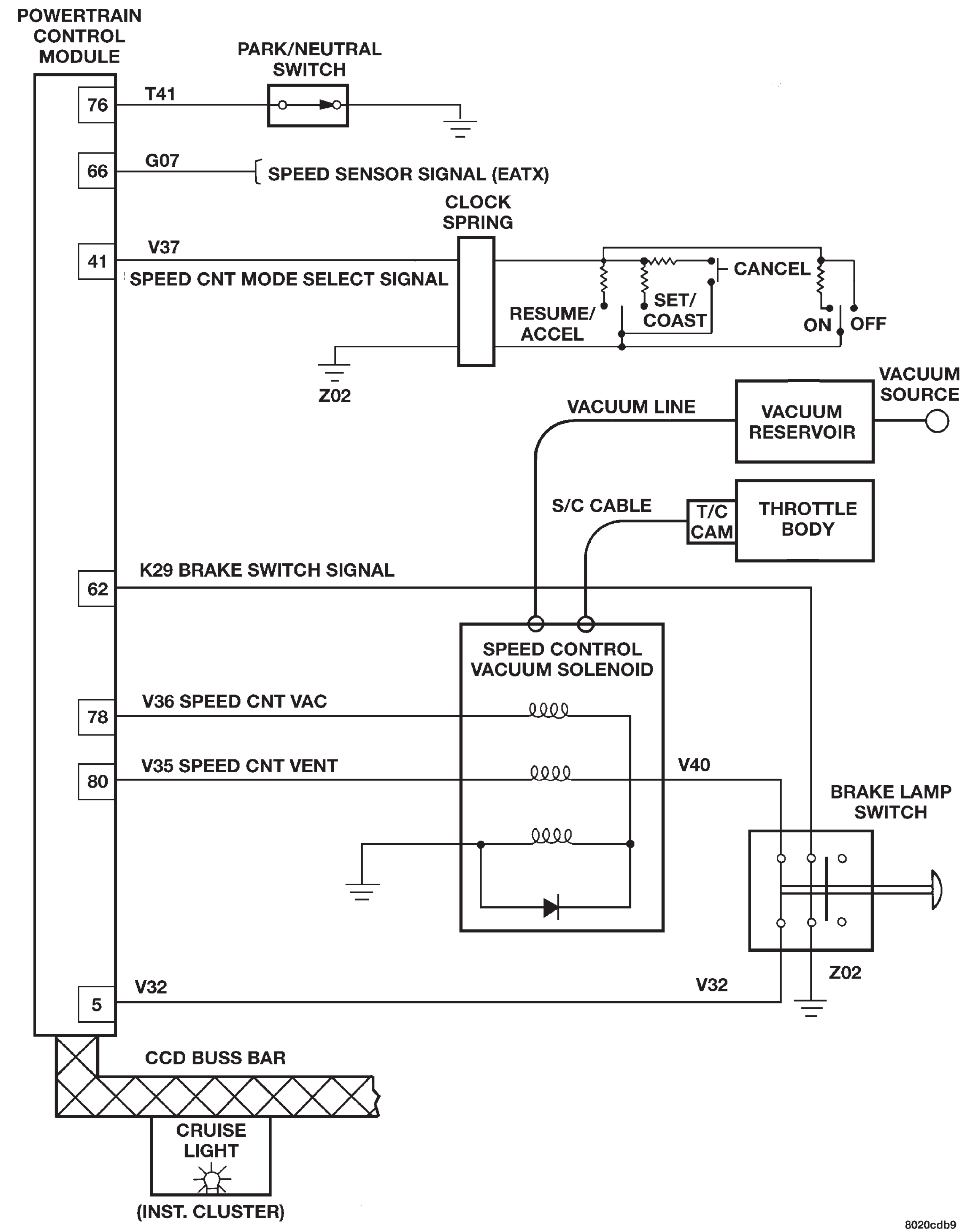


Fig. 4 Speed Control Circuit

DIAGNOSIS AND TESTING (Continued)

OVERSHOOT/UNDERSHOOT ON SPEED CONTROL SET

If the operator repeatedly presses and releases the set button with their foot off of the accelerator (a "lift foot set" to begin speed control operation), the vehicle may accelerate and exceed the desired set speed by up to 5 MPH (8 km/h) and then decelerate to less than the desired set speed before finally achieving the desired set speed.

The Speed Control has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. When the speed control is set with the vehicle operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts. If the lift foot sets are continually used, the speed control overshoot/undershoot condition will develop.

To "unlearn" the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed with the accelerator pedal (not decelerating or accelerating), and then turn the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. This procedure must be performed approximately 10–15 times to completely unlearn the overshoot/undershoot condition.

SERVO VACUUM TEST

(1) Turn ignition switch to the ON position without starting engine. Activate speed control ON switch.

(2) Disconnect the four-way electrical connector and the vacuum harness at the servo (Fig. 5).

(3) Connect a jumper wire from Pin 3 of the servo to Pin 3 of the wire connector.

(4) Ground Pins 2 and 4 in the servo. Do not connect pin 1.

(5) Connect a hand held vacuum pump to the vacuum nipple and apply 10 - 15 inches of vacuum.

(6) If servo pulls cables, replace servo.

(7) Ground Pin 1 on servo.

(8) Check that the throttle cable pulls in and holds as long as the vacuum pump is connected. After one minute, check if cable is still holding. If cable does not hold replace the servo.

(9) Disconnect jumper from pin 3. Cable should return to rest position. If not, replace servo.

(10) Connect 4 way electrical connector and vacuum harness to servo.

SPEED CONTROL SWITCH TEST

The speed control switches mounted on the steering wheel contain five switches and four resistors. The PCM sends 5 volts through pin 41 to the speed control switches. The input on pin 41 is responsible for identifying the following: Resume/Accelerate, Set/Coast, On, Off and Cancel. This is accomplished by multiplexing. Multiplexing allows the PCM to identify more than one signal from a single wire. To accomplish this, the speed control switch uses resistors that cause different voltage signals at pin 41.

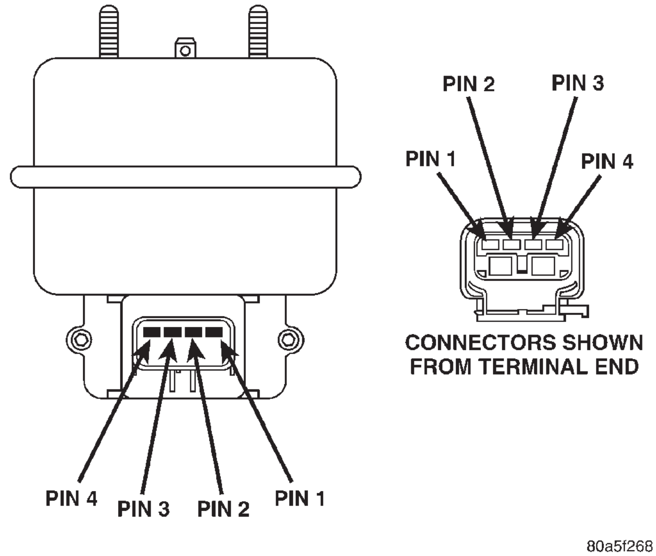


Fig. 5 Servo Harness Connector

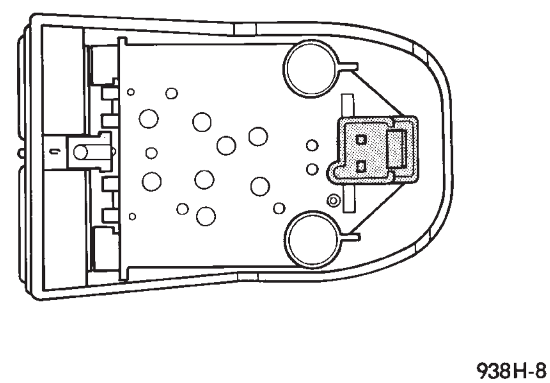


Fig. 6 Speed Control Switch

The 5-volt signal at pin 41 has no path to ground when no buttons are depressed, allowing the PCM to recognize the open circuit. When the ON, OFF switch contacts are closed, the 5 volt signal is pulled through a 15400 ohm resistor to ground providing a voltage of 4.14 to 4.73 volts at pin 41. Once the PCM recognizes the ON signal, the PCM provieds a battery voltage signal to the speed control servo through pin 5 of the 80–way connector.

When the SET/COAST switch is depressed, a momentary contact closes a path to ground through a 2,940 ohm resistor. This causes a voltage of approximately 1.99 to 3.20 volts at pin 41, indicating that the SET/COAST switch has been depressed. When the RES/ACCEL switch is depressed, a momentary

DIAGNOSIS AND TESTING (Continued)

contact closes to ground through a 6,650 ohm resistor. The 5-volt signal then passes through a higher resistance than that of the SET/COAST switch, causing the voltage to be approximately 3.30 to 4.14 volts. When the OFF switch is depressed, the contacts close directly to ground, causing the 5-volt signal to drop to 0 volts. When the CANCEL is pressed the contact closes to ground through a 920 ohm resister, causing voltage at pin 41 of 0.61 to 1.94 volts.

OHMMETER CHECK OF SWITCH

(1) Remove the ON, OFF speed control switch assembly and disconnect the two-way connector (Fig. 6).

(2) Using an ohmmeter, touch one lead to one Pin and the second lead to the other Pin. The meter should read no continuity. Press the OFF button, the ohmmeter should read 0 to 0.5 ohms. Press the ON button, the ohmmeter should read 15,245 to 15,555 ohms. If the resistance does not fall within these values replace switch.

(3) Remove the RESUME/SET/CANCEL speed control switch assembly and disconnect the two-way connector.

(4) Using an ohmmeter, touch one lead to one Pin and the second lead to the other Pin. The meter should read no continuity. Press the SET button, the ohmmeter should read 2,910 to 2,970 ohms. Press the RESUME button, the ohmmeter should read 6,580 to 6,720 ohms. Press the CANCEL button, the ohmmeter should read 900 to 920 ohms. If the resistance values do not fall within these specification replace the switch.

STOP LAMP SWITCH TEST

(1) Remove the stop lamp switch refer to Stop Switch Removal/Installation in this section. Disconnect connector from stop lamp switch (Fig. 7). Using an ohmmeter, switch continuity may be checked as follows:

(2) With switch plunger released, there should be continuity between Pin 5 and Pin 6.

(3) With switch plunger depressed, there should be continuity:

- Between Pin 1 and Pin 2.
- Between Pin 3 and Pin 4.

(4) If the above results are not obtained, the stop lamp switch is defective or out of adjustment.

(5) Stop lamp switch adjustment is detailed in Group 5, Brakes.

ELECTRICAL TESTS AT POWERTRAIN CONTROL MODULE

(1) Unplug 2 40-way connectors from the Powertrain Control Module (PCM), (Fig. 8).

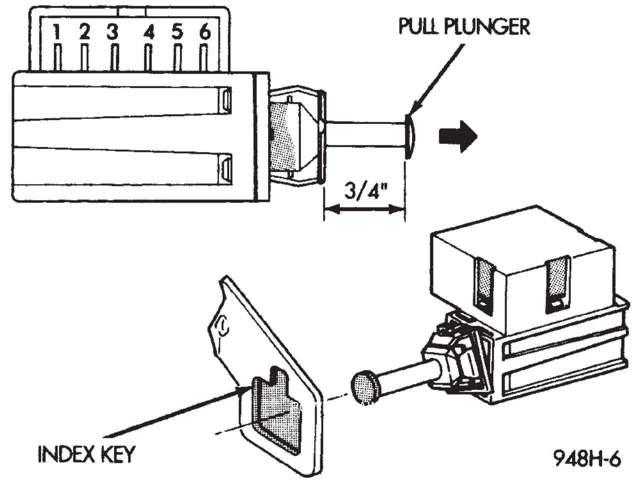


Fig. 7 Stop Lamp Wiring

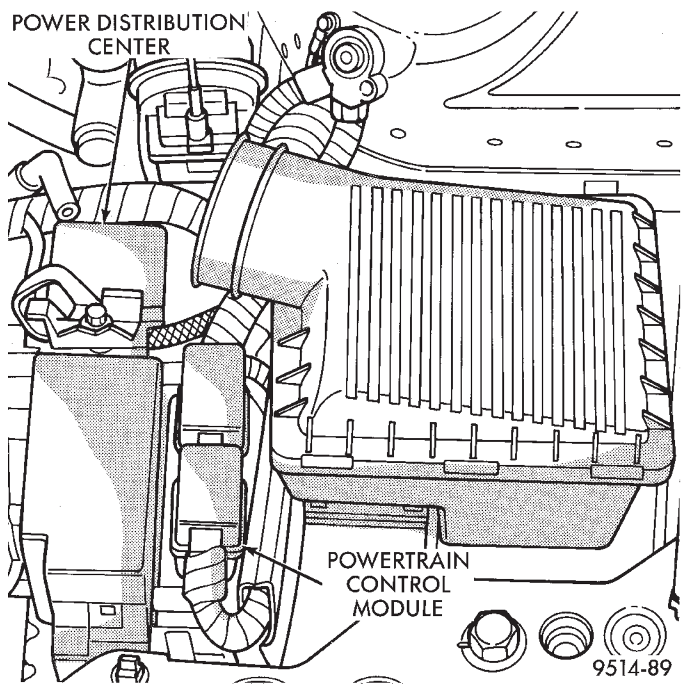


Fig. 8 Powertrain Control Module Location

(2) Remove both steering wheel speed control switches and disconnect the wire connectors.

(a) Using an ohmmeter, check for continuity between pin 41 of the PCM connector and pin 1 of each speed control switch connector (Fig. 9).

(b) If no continuity, repair as necessary.

(c) Using an ohmeter, check for continuity between pin 41 of the PCM connector and ground.

(d) If continuity, repair the short circuit.

(e) If no continuity, perform the Switch Test.

(3) Place ignition switch in the ON position for the following tests.

(a) Connect wire connectors to both switches.

(b) Using a voltmeter, connect the ground lead to ground.

DIAGNOSIS AND TESTING (Continued)

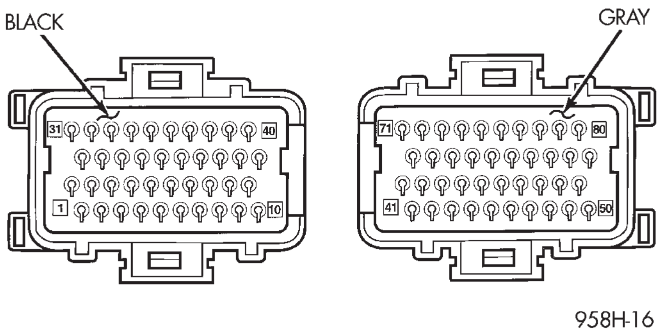


Fig. 9 PCM 40—Way Connectors

(c) Touch the positive lead of the voltmeter to pin 5 on the PCM. Depress the ON switch, the voltmeter should read battery voltage. Depress OFF switch, the voltmeter should read 0 volts. If no voltage, repair wire between pin 80 and pin 2 of the servo. If OK, go to step 4.

(d) Reconnect the BLACK connector (with pins 1–40) to PCM.

(e) Touch the positive lead of the voltmeter to the harness connector pin 80. Depress OFF switch, the voltmeter should read 0 volts. Depress ON switch, the voltmeter should read battery voltage. If no voltage, go to step 5. Repair the wire between pin 78 and 1 of the speed control servo. If OK, go to step 5.

(4) Disconnect the 4 way connector at the servo. Depress the ON switch. The voltmeter should read battery volts at pin 3. If no voltage go to step 7. If voltage is OK, repair wire between pin 80 and pin 2 of the servo.

(5) Reconnect the 4 way connector to servo.

(6) Touch the positive lead of the voltmeter to the harness connector pin 80. Depress OFF switch, the voltmeter should read 0 volts. Depress ON switch, the voltmeter should read battery voltage. If no voltage, go to step 5. Repair the wire between pin 80 and pin 1 of the speed control servo. If OK, go to step 5.

(7) **Turn key off.**

(8) Using an ohmmeter, connect one lead to ground and touch the other lead to pin 62. With the brake pedal released, the meter should show continuity. If no continuity, perform the following test:

(a) Check for continuity between pin 62 and pin 3 of the stop lamp switch connector. If no continuity, repair as necessary.

(b) If continuity, perform Stop Lamp Switch Test.

(9) If the Stop Lamp Switch Test is OK, check for continuity between pin 6 of the stop lamp switch and ground. When the pedal is depressed, the meter should show open circuit. If no continuity repair as necessary. If OK, go to step 8.

(10) Using an ohmmeter, touch one lead to a ground and touch the other lead to pin 76. The meter should show no continuity when transmission is in DRIVE and continuity when in PARK or NEUTRAL. If not, test Neutral Start and Back-Up switch using scan tool.

VACUUM SUPPLY TEST

(1) Disconnect vacuum hose at the servo and install a vacuum gauge in the hose (Fig. 10).

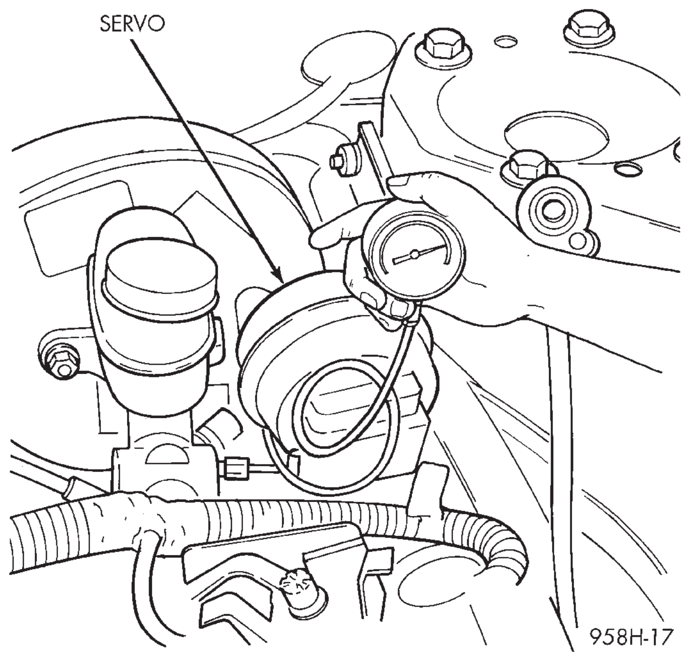


Fig. 10 Vacuum Gauge Test

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury. Shut off engine, the vacuum should continue to hold 10 inches of mercury.

(3) If vacuum does not meet this requirement, check and correct the following vacuum leaks in the vacuum lines, check valve, vacuum reservoir or poor engine performance.

VEHICLE SPEED SENSOR

For diagnosis and testing of the Vehicle Speed Sensor (VSS), refer to the appropriate Powertrain Diagnostic Procedures service manual. Also refer to the DRB scan tool.

REMOVAL AND INSTALLATION

SERVO

REMOVAL

(1) Remove two nuts attaching speed control cable and mounting bracket to servo.

REMOVAL AND INSTALLATION (Continued)

(2) Remove servo from the mounting bracket.
(3) Disconnect electrical connectors and vacuum hose.
(4) Remove cable from thottle cam. Refer to Speed Control Servo Cable Removal/Installation in this section.
(5) Remove clip attaching cable to servo.

INSTALLATION

(1) Install servo cable to servo and install clip.
(2) Install speed control cable to throttle cam.
(3) Connect vacuum hose to servo.
(4) Connect electrical connector.
(5) Insert servo studs through holes in speed control cable and mounting bracket.
(6) Install nuts, tighten to 7 N·m (60 in. lbs.).

SPEED CONTROL SWITCH

The speed control switches are mounted in the steering wheel and wired through the clock spring device under the airbag module (Fig. 1).

WARNING: IF REMOVAL OF AIRBAG MODULE IS NECESSARY, REFER TO GROUP 8M, RESTRAINT SYSTEMS.

REMOVAL

(1) Turn off ignition.
(2) Remove two screws from side of each switch.
(3) Rock switch away from airbag and steering wheel.
(4) Disconnect two-way electrical connector.
(5) Repeat for the other switch.

INSTALLATION

For installation reverse above procedures.

STOP LAMP SWITCH

REMOVAL

Remove the switch from the bracket by depressing the brake pedal and rotating the switch in a counterclockwise direction approximately 30 degrees. Pull the switch rearward and remove from bracket. Disconnect wiring harness connector.

INSTALLATION

Before installing the switch, reset the adjustable switch plunger by pulling on the plunger head until the plunger reaches the end of its travel. A ratcheting sound will be heard during this procedure.

Connect the wiring harness to the switch. Mount the switch into the bracket by holding the switch with the plunger facing forward in car. There is an index key on the switch that mates with the bracket slot at the top of the square hole. Align key and push switch into square hole in bracket while depressing the brake pedal. Once the switch is seated in the hole, rotate clockwise approximately 30 degrees to lock into place. The switch will automatically adjust when the pedal is released. Pull back on the pedal to assure correct adjustment.

SPEED CONTROL SERVO CABLE

REMOVAL

(1) Remove throttle control shield, if equipped (Fig. 11).
(2) Remove throttle cable clasp from the throttle body cam.
(3) Remove speed control cable from throttle cam by sliding clasp out hole used for throttle cable.
(4) Compress the retaining tabs on the cable and slide cable out of bracket.
(5) Remove 2 nuts retaining bracket to servo.
(6) Remove retaining clip holding cable to servo.

INSTALLATION

(1) Install retaining clip to cable at servo.
(2) Slide cable bell housing over servo mounting studs.
(3) Install 2 nuts at cable to servo and servo bracket, tighten to 7 N·m (60 ins. lbs.).
(4) Slide cable into throttle cable bracket and engage retaining tabs.
(5) Rotate the throttle cam forward to the wide open position and install speed control cable clasp.
(6) Rotate the throttle cam forward to the wide open position and install throttle cable clasp.
(7) Install throttle control shield, if equipped.

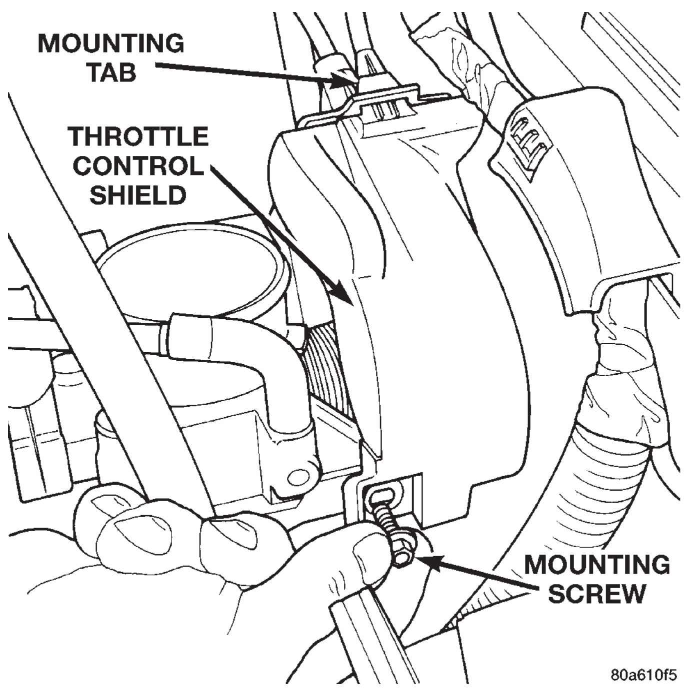


Fig. 11 Throttle Control Shield

REMOVAL AND INSTALLATION (Continued)

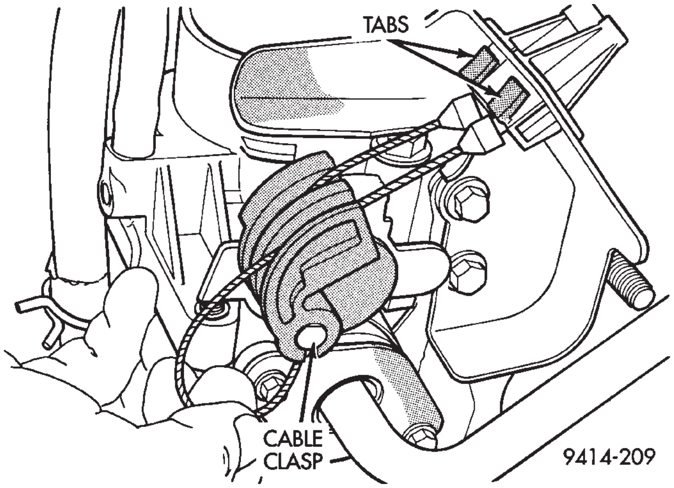


Fig. 12 Disconnecting Throttle Cable—Typical

POWERTRAIN CONTROL MODULE

For Removal/Installation refer to Powertrain Control Module in Group 14, Fuel Injection System.

VACUUM RESERVOIR

The vacuum reservoir is located on the dash panel next to the brake booster.

REMOVAL

(1) **2.5L ONLY** Remove the intake manifold, refer to Group 11 Exhaust System and Intake Manifold.

(2) Disconnect vacuum hoses from reservoir.

(3) Pull vacuum reservoir from dash panel.

INSTALLATION

(1) Push reservoir onto dash panel.

(2) Connect hoses to reservoir.

(3) **2.5L ONLY** Install intake manifold, refer to Group 11 Exhaust System and Intake Manifold.

VEHICLE SPEED SENSOR

For Removal/Installation, refer to Vehicle Speed Sensor in Group 21, Transaxle.

TURN SIGNAL AND FLASHERS

CONTENTS

GENERAL INFORMATION

MULTI-FUNCTION SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAG, SEE GROUP 8M, RESTRAINT SYSTEMS FOR AIRBAG REMOVAL PROCEDURES.

The multi-function switch (Fig. 1) contains:

- Turn signals
- Hazard warning
- Headlamps
- Headlamp beam select
- Parking lamps
- Panel dimmer
- Fog Lamp
- Headlamp optical horn
- Windshield wiper
- Pulse wipe
- Mist wipe
- Windshield washer switches.

The multi-function switch is mounted center of the steering column. There are two levers, one on each side of the steering column. The left side controls the signaling and lighting. The right side controls the windshield wiper and washer system. When the driver wishes to signal his intentions to change direction of travel, he moves the left lever upward to cause the right signals to flash and downward to cause the left signals to flash. After completion of a turn the system is deactivated automatically. As the steering wheel returns to the straight ahead position the turn signals are canceled. A canceling cam is molded to the clockspring mechanism which comes in contact with the cancel actuator on the multi-function switch. The canceling cam lobe pushes on the cancel actuator and returns the switch to the off position.

If only momentary signaling such as indication of a lane change is desired, the switch is actuated to a left or right intermediate detent position. In this position the signal lamps flash as described above, but the switch returns to the OFF position as soon as the lever is released.

When the system is activated, one of two indicator lamps mounted in the instrument cluster flashes in unison with the turn signal lamps, indicating to the driver that the system is operating. The windshield wiper and wash system is covered in Group 8K, Windshield Wipers and Washers.

DESCRIPTION AND OPERATION

COMBINATION FLASHER

The turn signal flasher and the hazard warning flasher are combined into one unit called a combination flasher (combo-flasher). An inoperative or incomplete turn signal circuit will result in an increase in flasher speed.

The flasher is mounted to the back side of the multi-function switch.

EXTERIOR LAMPS

To turn lamps ON:

- Parking lamps, using left stalk turn headlamp switch to the first detent
- Headlamps, turn switch to second detent
- Headlamp beam select, from low beam to high beam or high to low, pull left stalk towards steering wheel. The ignition switch must be in the RUN position for the instrument panel high beam indicator to light.
- Headlamp optical horn, pull left stalk towards steering wheel, headlamps will stay ON as long as stalk is held.

DESCRIPTION AND OPERATION (Continued)

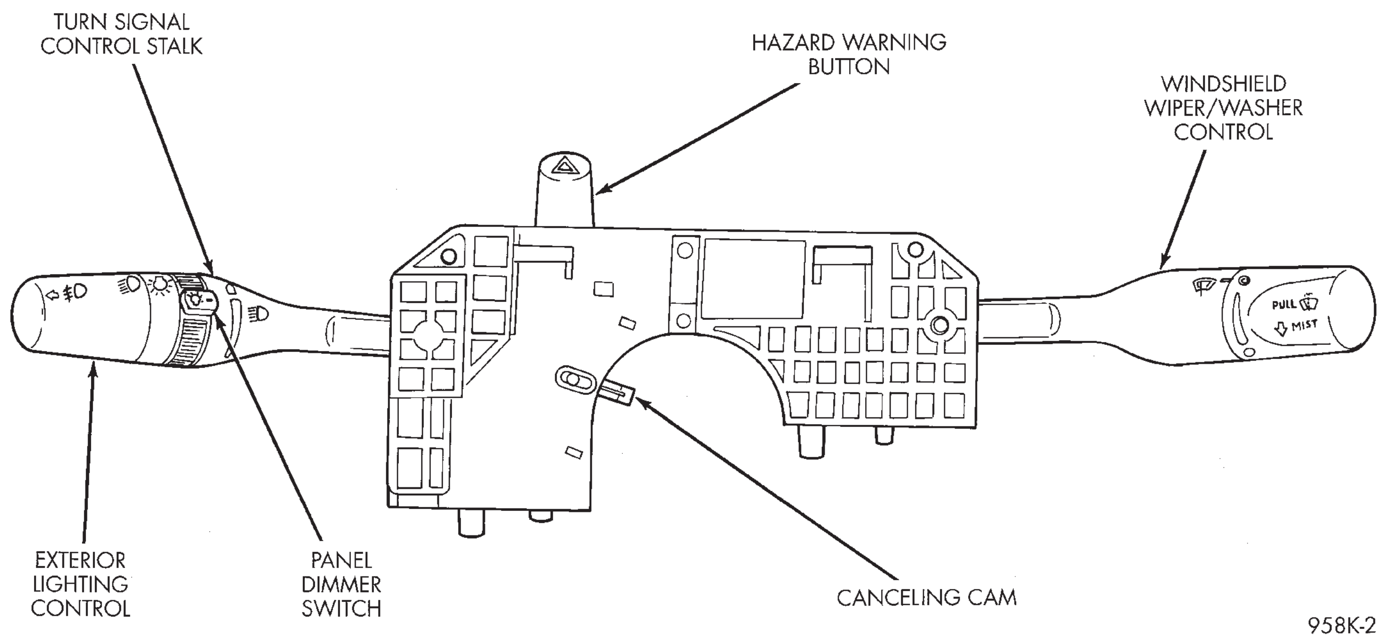


Fig. 1 Multi-Function Switch

• Fog lamps, pull switch outward with headlamps on low beam

• Panel dimmer, rotating dimmer switch regulates density of the instrument panel illumination. There are nine detentes (steps) of density. Detent 1 is full brightness and each detent thereafter is lower. Testing the dimmer switch using the continuity test, the resistance value is measured for each detent. Detents 3 through 8 are measured in equal graduations, up or down and referred to as linear. Example: if detent 3 was 5 ohms and detent 4 was 7 ohms detent 5 should be 9 ohms.

HAZARD WARNING SYSTEM

The hazard warning system is actuated by a push button located on the top of the steering column between the steering wheel and the instrument panel. The hazard switch is identified with a double triangle on top of the button. Push and release the button to turn the hazard function ON or OFF. The button will move out from the steering column in the ON position and will remain in toward the column in the OFF position.

DIAGNOSIS AND TESTING

COMBINATION FLASHER

For test combination flasher, refer to (Fig. 2) for Combination Flasher Diagnosis.

MULTI-FUNCTION SWITCH

(1) Remove multi-function switch, refer to removal and installation procedures below.

(2) Using an ohmmeter, test for continuity (no resistance) between the terminals of the switch as shown in the following continuity charts (Fig. 3).

The switch assembly is mounted center of the steering column. Should any function of the switch fail, the entire switch assembly must be replaced.

DIAGNOSIS AND TESTING (Continued)

COMBINATION FLASHER DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
SYSTEM DOES NOT FLASH ON ONE SIDE, INDICATOR LAMP FLASHES AT DOUBLE NORMAL RATE.	1. Faulty external lamp. 2. Poor ground at lamp. 3. Open circuit in wiring to external lamp. 4. Faulty contact in switch.	1. Replace lamp. 2. Check and/or replace wiring. 3. Replace wiring/ harness. Check connectors. 4. Replace multifunction switch.
INDICATOR LAMP FLASHES AT DOUBLE NORMAL RATE. EXTERNAL LAMP-DIM AND FLASHES RAPIDLY OR NO FLASH.	1. Loose or corroded external lamp connection. 2. Poor ground circuit at external lamp.	1. Replace socket/harness. 2. Replace wiring/harness. Check connectors.
HAZARD WARNING MALFUNCTION/SYSTEM DOES NOT FLASH.	1. Faulty fuse. 2. Faulty flasher. 3. Open circuit in feed wire to switch. 4. Faulty contact in switch. 5. Open or grounded circuit in wiring to external lamps.	1. Replace fuse. 2. Replace flasher. 3. Replace wiring/harness. Check connectors. 4. Replace multifunction switch. 5. Replace wiring/harness.
INDICATOR LAMP FLASHES AT DOUBLE NORMAL RATE. EXTERNAL LAMP DOES NOT LIGHT.	1. Open circuit in wire to external lamp. 2. Burned out lamp.	1. Replace wiring/harness. 2. Replace lamp.
SYSTEM DOES NOT FLASH ON EITHER SIDE.	1. Faulty fuse. 2. Faulty flasher unit. 3. Loose bulkhead connector. 4. Loose or faulty rear wiring Harness or terminals. 5. Open circuit to flasher unit. 6. Open circuit in feed wire to turn signal switch. 7. Faulty switch connection in switch. 8. Open or grounded circuit in wiring to external lamps. 9. Burned out lamps.	1. Replace fuse. 2. Replace flasher. 3. Tighten connector. 4. Replace wiring/harness. 5. Check connectors, replace wiring/ harness. 6. Check connectors, replace wiring/ harness. 7. Replace switch. 8. Replace wiring/harness. 9. Replace lamps.
SYSTEM DOES NOT CANCEL AFTER COMPLETION OF TURN.	1. Broken cancelling finger on switch. 2. Broken or missing cancelling cam on clockspring. 3. Sticking cancelling finger on multifunction switch.	1. Replace multifunction switch. 2. Replace clockspring. 3. Replace multifunction switch.
EXTERNAL LAMPS OPERATE PROPERLY, NO INDICATOR LAMP OPERATION.	1. Faulty indicator lamp in instrument cluster.	1. Replace lamp.

Fig. 2

DIAGNOSIS AND TESTING (Continued)

SWITCH POSITION	MODE	CONTINUITY BETWEEN
TURN SIGNAL with HAZARD WARNING SWITCH OFF	RIGHT	A-1 and B-6
	LEFT	A-1 and B-7
TURN SIGNAL with HAZARD WARNING SWITCH ON	RIGHT or OFF or LEFT	A-1 and B-6 A-2 and A-5 A-1 and B-7 B-6 and B-7
HEADLAMP BEAM ON	PARK	C-2 and C-1
	LOW	C-2 and C-1 C-4 and C-7
	HIGH	C-2 and C-1 C-4 and C-8
PANEL DIMMER DETENT	 1 2 3 to 8 9	A-2 and C-6 <100 Ω 300 to 2630 Ω LINEAR 4.99k to 10.5k Ω
OPTICAL HORN	ON	C-4 and C-8
FRONT FOG	ON	C-9 and C-10
WIPER	INT DETENT 1 2 3 4 5 6	B-3 and B2 11.87k Ω 9.87k Ω 7.87k Ω 5.87k Ω 3.87k Ω 1.87k Ω
	LOW	B-3 and B-2 1.25k Ω
	HIGH	B-3 and B-2 1.82k Ω
MIST	ON	B-3 and B-2 1.25k Ω
WASHER	ON	B-3 and B-1

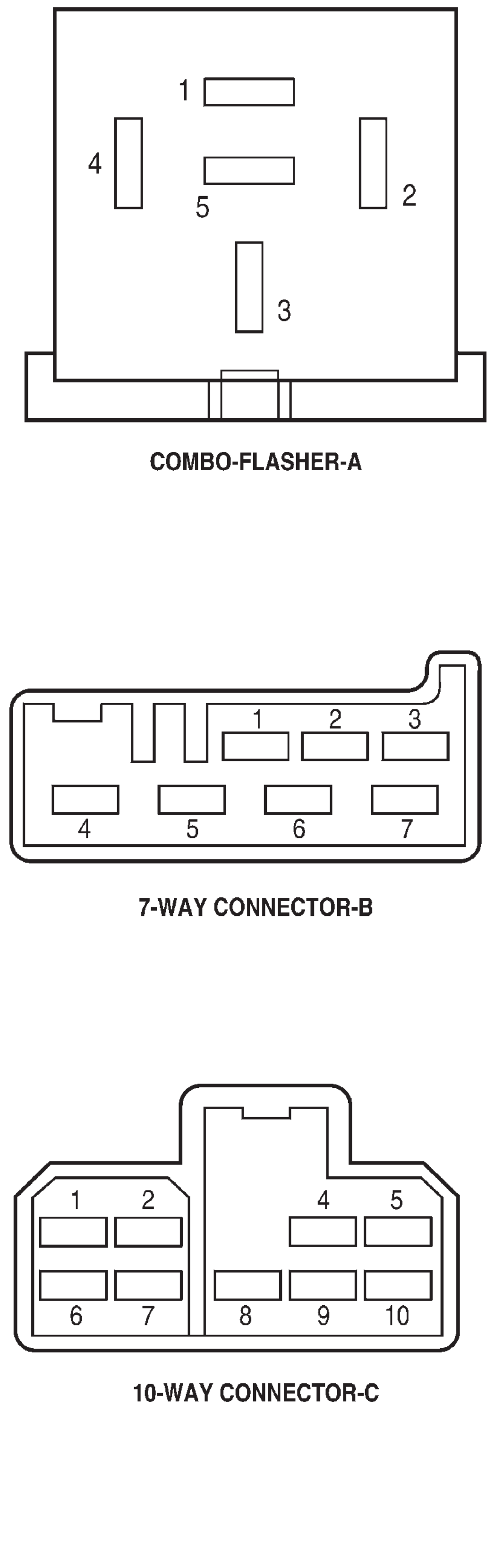


Fig. 3 Multi-Function Switch Continuity Test

REMOVAL AND INSTALLATION

COMBINATION FLASHER

The flasher is mounted to the back side of the multi-function switch. To gain access the upper steering column cover must be removed. Refer to Steering Column Cover removal procedures below. The flasher can be removed by pulling it forward. The flasher is serviced separately from the multi-function switch. The flasher is black in color for ease of identification (Fig. 4).

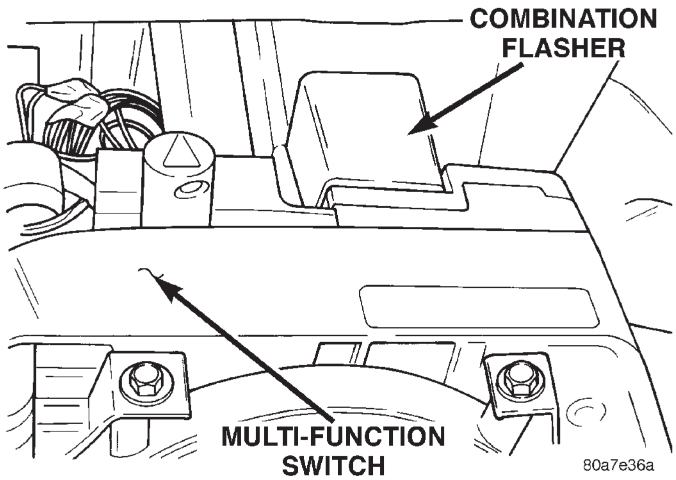


Fig. 4 Combination Flasher Location

MULTI-FUNCTION SWITCH

REMOVAL

(1) Disconnect battery negative cable.

(2) Remove the upper steering column cover. Refer to steering column cover removal procedures below.

(3) Remove multi-function switch mounting screws (Fig. 5).

(4) Disconnect wire connectors. Lift the switch straight up to remove.

INSTALLATION

For installation, reverse the above procedures.

(1) Tighten multi-function switch to column retaining screws to 2.3 N·m (20 in. lbs.) torque.

(2) Tighten steering column cover retaining screws to 2 N·m (17 in. lbs.) torque.

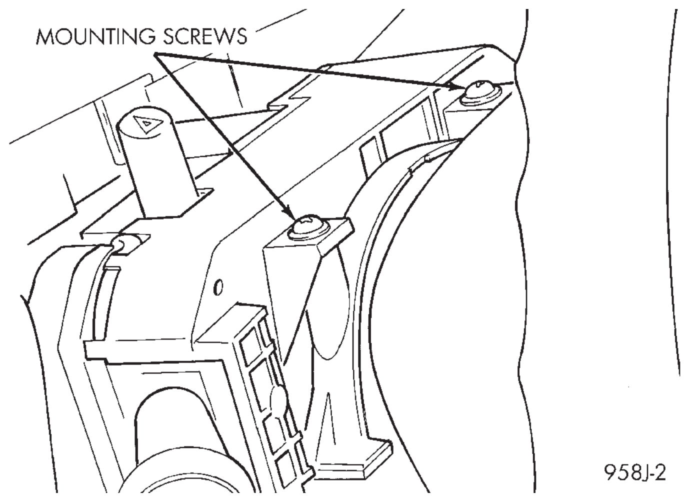


Fig. 5 Multi-Function Switch

STEERING COLUMN COVER

REMOVAL

(1) Remove three lower cover attaching screws.

(2) Remove five knee bolster mounting screws and remove bolster.

(3) Remove upper and lower covers.

(4) If removing the upper half only:

(a) Remove lower cover attaching screws.

(b) Loosen the lower part of instrument cluster hood for clearness as necessary.

(c) Remove upper cover.

INSTALLATION

For installation, reverse the above procedures.

WINDSHIELD WIPERS AND WASHERS

CONTENTS

GENERAL INFORMATION

MULTI-FUNCTION SWITCH

WARNING: VEHICLES ARE EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN SERVICE PROCEDURES.

The multi-function switch (Fig. 1) contains:

- Turn signals
- Hazard warning
- Headlamps
- Headlamp beam select
- Parking lamps
- Panel dimmer
- Fog Lamp
- Headlamp optical horn
- Windshield wiper
- Pulse wipe
- Mist wipe
- Windshield washer switches.

The multi-function switch is mounted center of the steering column. There are two levers, one on each side of the steering column. The left side controls the signaling and lighting. The right side controls the windshield wiper and washer system. To use the washers pull lever toward the driver. The mist is a single wipe operation by pushing lever down and releasing the lever. Intermittent wiper operation is controlled by the Body Control Module (BCM). The lever has a selection of delay intervals and by turning lever the wiper will cycle every half second to 36 seconds depending ON the vehicle's speed. The wiper has two cycle two speeds.

The windshield wipers will only operate when the ignition switch is in the ACCESSORY or IGNITION position. Fuse 15, located in the Junction Block, fuses 8 and 14 in the Power Distribution Center block, protects the wiper/washer system circuitry. The wiper motor also has an internal non-serviceable circuit breaker to provide protection against motor stall conditions.

The wiper and washer motors have magnetic fields created by internal permanent magnet. Electric power applied to the motor armature, located in the magnetic field, causes the motor to turn.

The wiper system internal operation uses the low speed motor circuit in combination with intermittent wipe relay. The washer pump motor has one internal circuit and therefore operates at one speed.

The wiper and washer system switch located on the steering column selects the mode of operation of the motors. The switch provides input to the BCM, which in turn operates the two relays. The intermittent wipe relay turns the wiper ON and OFF. The other changes the HIGH/LOW speeds. The switch also provides power to the washer pump motor.

The intermittent wiper system, in addition to low and high speed, has a delay mode. The delay mode has a range of 1/2 to 18 seconds when the vehicle speed is over 10 m.p.h.. The wiper delay times will automatically double to a range of 1 to 36 seconds when the vehicle speed is less than 10 m.p.h.. The delay is controlled by a variable resistor in the wiper switch and BCM.

GENERAL INFORMATION (Continued)

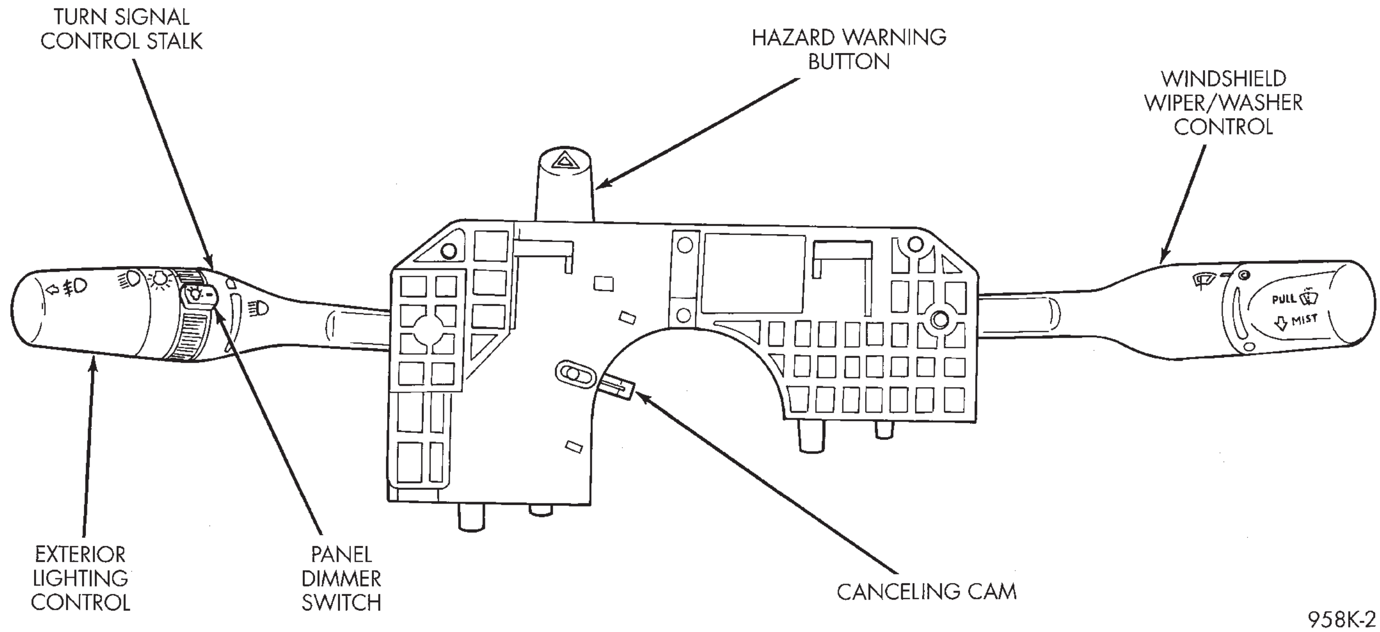


Fig. 1 Multi-Function Switch

The wiper motor and washer motor are designed to reduce radio frequency interference and provide electro-magnetic compatibility (RFI/EMC) in the vehicle environment. This is done with suppression circuits designed into the motors.

The wiper system completes the wipe cycle when the switch is turned OFF. The blades park in the lowest portion of the wipe pattern.

When using a scan tool (DRB) refer to the Body Diagnostic Manual for the procedures.

WINDSHIELD WASHERS

All models are equipped with electric operated windshield washer pumps. The wash function can be accessed in the OFF or ON position of the multi-function wiper control switch.

DESCRIPTION AND OPERATION

WINDSHIELD WASHERS

Pulling the lever towards the driver when the wiper switch is in the OFF position will operate the wipers and washer motor pump continuously until the lever is released. Releasing the lever will stop the washer pump but the wipers will complete the current wipe cycle. Followed by an average of two more wipe cycles (±1) before the wipers park and the module turns off.

The electric pump assembly is mounted with a grommet directly to the reservoir. Fluid is gravity fed from the reservoir to the motor. The fluid is forced by the pump through rubber hoses to the hood mounted nozzles which direct the fluid streams to the windshield. The hose assembly has two one way flow check valves located just before each hood nozzle. The purpose of the check valves is to improve fluid flow response time and to prevent excessive washer fluid staining the surface of the hood. The hood mounted nozzles evenly distribute washer fluid across the surface of the windshield. The nozzles are not adjustable. The pump and reservoir are serviced as separate assemblies.

WIPER BLADES

When the wiper blade rubber element is exposed to the weather for a long period of time, it tends to lose wiping ability. Periodic cleaning of the wiper blade element is suggested to remove the accumulation of salt and road film. The wiper blades, arms, and windshield should be cleaned with a sponge or cloth and a mild detergent or non-abrasive cleaner. If the blades continue to streak or smear, they should be replaced. The driver and the passenger blade elements are 550 mm in length. Only the driver's side wiper blade has a air foil on it (Fig. 2).

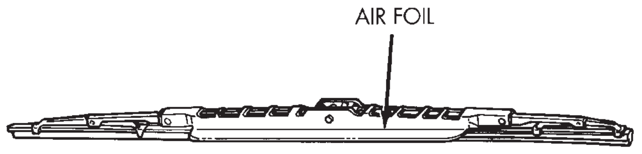


Fig. 2 Driver's Wiper Blade

DIAGNOSIS AND TESTING

MULTI-FUNCTION SWITCH – WINDSHIELD WIPER

To test the multi-function windshield wiper switch, refer to Group 8J Turn Signals and Hazard Warning Flashers, for diagnosis and testing of the Multi-Function Switch.

WINDSHIELD WASHERS

Whenever a windshield washer malfunction occurs, first verify that the windshield washer wire harness is properly connected to all connectors before starting normal diagnosis and repair procedures. Refer to Windshield Washer Diagnosis Chart (Fig. 3).

WINDSHIELD WIPER SYSTEM CONDITIONS

The following is a list of general wiper motor system problems and tests that are to be performed to locate the faulty part, and the corrective action to be taken. These tests will cover both two speed and intermittent wiper functions.

MOTOR WILL NOT RUN IN ANY SWITCH POSITION

(1) Check fuse 15, in the Junction Block and fuse 8 and 18 in the Power Distribution Center (Fig. 4) and (Fig. 5). Refer to Group 8W, Wiring Diagrams for pin call outs.

(a) If fuse(s) are OK, go to Step 2.

(b) If fuse(s) are defective, replace and check motor operation in all switch positions.

(c) If motor is still inoperative and the fuse does not blow, go to Step 2.

(d) If replacement fuse blows, go to Step 11.

(2) Disconnect motor wire harness connector.

(3) Check the wiper motor low speed. Using two jumper wires, connect one jumper wire between the battery positive jump start terminal and Pin B on the wiper motor connector (Fig. 6). Connect the other jumper wire to ground and Pin C on the wiper motor connector. Check the wiper motor high speed, connect the positive jumper wire to Pin A on the wiper motor connector. Connect the negative jumper wire to Pin C on the wiper motor connector.

(a) If motor runs, go to Step 4.

(b) If motor does not run, high or low speed replace the wiper motor.

(4) Using a ohmmeter, check for good ground at Pin C of the wiper motor wire harness connector. If OK, replace motor. If not repair the ground circuit as necessary.

(5) The wiper switch in the ON position. Using an voltmeter, check for battery voltage at terminal 29 of the intermittent wiper relay in the Power Distribution Center. If no voltage check fuse 18 (Fig. 5). If OK, go to Step 6. If not repair as necessary.

Condition	Possible Cause	Correction
Pump runs no fluid flowing.	(1) No fluid in the reservoir.	(1) Fill reservoir.
	(2) Nozzle plugged or frozen.	(2) Thaw and check flow if blocked replace as necessary.
	(3) Broken, loose or pinched hose.	(3) Check flow through hose connections.
	(4) Faulty pump.	(4) Apply battery voltage to motor terminals, replace if pump does not run.
System operates intermittently.	(1) Loose wire connection.	(1) Check wire connections.
	(2) Faulty switch.	(2) Disconnect wire harness use voltmeter to check switch.
System output is low.	(1) Pinched hose.	(1) Check flow through hose connection.
	(2) Hose blocked.	(2) Disconnect hose at nozzle and Y connector check for flow. Replace as necessary.

948K-35

Fig. 3 Winds hield Washer Diagnosis

DIAGNOSIS AND TESTING (Continued)

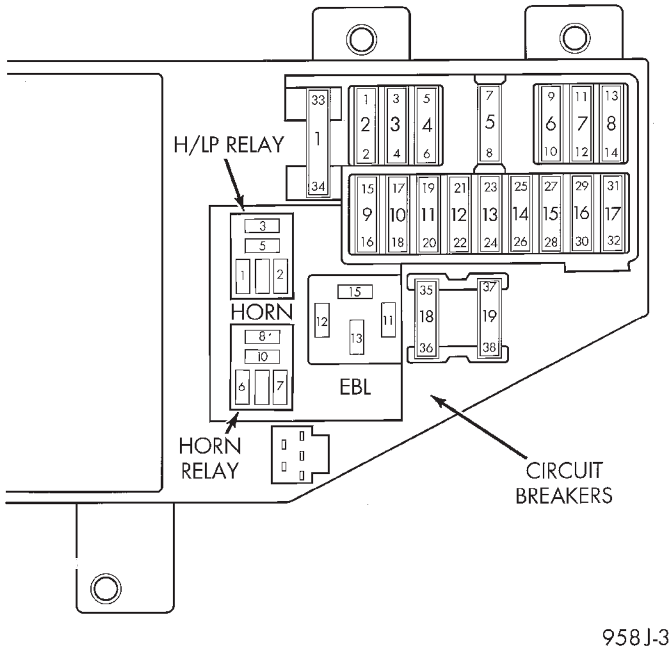


Fig. 4 Junction Block

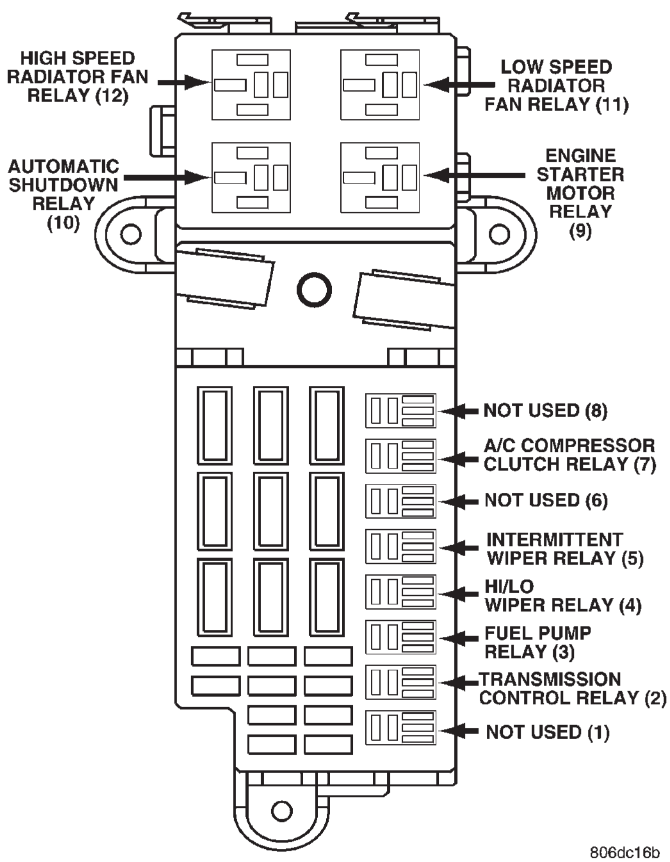


Fig. 5 Power Distribution Center

(6) Using an ohmmeter, check from terminal 28 of the HI-LO wiper relay to Pin A of the motor wire connector for continuity. Check from terminal 11 of the HI-LO wiper relay to Pin B of the motor wire

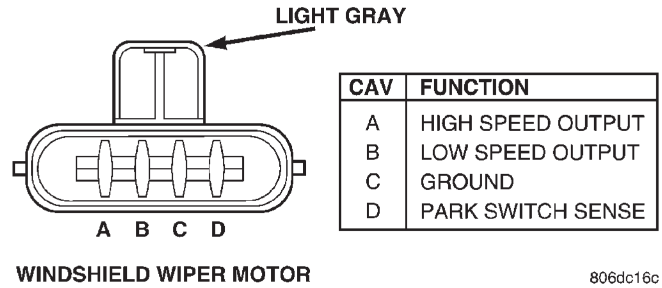


Fig. 6 Motor Wire Connector

connector for continuity. If OK, go to Step 7. If not repair as necessary.

(7) Using an ohmmeter, check for continuity between the HI-LO wiper relay and the intermittent wiper relay. Check from terminal 36 of the HI- LO wiper relay to terminal 37 of the intermittent wiper relay. If OK, check for faulty relays. If not repair as necessary.

(8) Disconnect the J3 14-way connector from the BCM (Fig. 7).

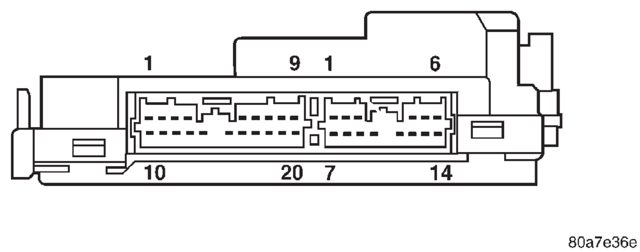


Fig. 7 Body Control Module 14-Way Connector

(9) Using an ohmmeter, check for continuity from terminal 7 of the J3 14-way connector to the terminal 15 of the intermittent wiper relay. If OK, go to Step 10. If not repair as necessary.

(10) Using a voltmeter, connect positive lead to terminal 10 of the BCM J1 22-way connector and negative lead to ground (Fig. 8). Turn ignition switch to the ON position. Slowly move the wiper switch from OFF position through each position to HIGH.

(a) If voltage increases from zero to approximately 10 volts in the HIGH position, replace BCM. If no voltage, go to Step 2.

(b) Using an ohmmeter, check for continuity from terminal 2 of wiper switch connector to terminal 10 of the BCM J3 22-way connector. If no continuity, repair circuit. If OK, go to Step 11.

(11) Disconnect motor connector and replace fuse 15 from the Junction Block.

(a) If fuse does not blow, go to Step 2.

(b) If fuse blows, wiper control circuit is at fault, repair as necessary, refer to Group 8W, Wiring Diagrams.

DIAGNOSIS AND TESTING (Continued)

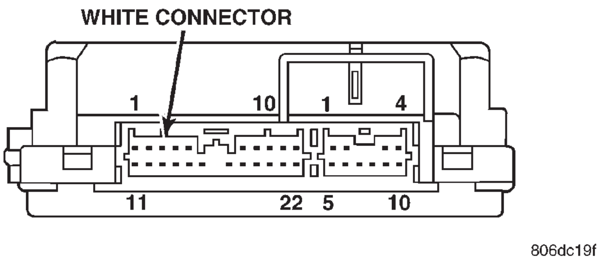


Fig. 8 Body Control Module 22-Way Connector

MOTOR RUNS SLOWLY AT ALL SPEEDS

(1) Disconnect the wire harness from the wiper motor. Remove wiper arms and blades. Disconnect motor drive link from motor. Connect an ammeter between battery negative jump start terminal and Pin C on the wiper motor connector (Fig. 6). Connect battery positive wire to Pin B on the wiper motor connector. When replacing drive link nut tighten to 11 to 12 N·m (98 to 106 in. lbs.) torque.

(a) If average ammeter reading is more than 6 amps, replace motor.

(b) If motor runs and average ammeter reading is less than 6 amps, go to Step 2.

(2) Check to see if wiper linkage or pivots are binding or caught.

MOTOR WILL RUN AT HIGH SPEED, BUT NOT MOVE AT LOW SPEED. MOTOR WILL RUN AT LOW SPEED, BUT WILL NOT MOVE AT HIGH SPEED

(1) Disconnect motor connector.

(2) If motor will not run on low speed, connect a jumper wire between battery positive jump start terminal and Pin B on the wiper motor connector. Connect a second jumper wire between ground and Pin C on the wiper motor connector (Fig. 6).

(a) If motor runs, go to Step 3.

(b) If motor does not run, replace the motor.

(3) If motor will not run on high speed, connect a jumper wire between battery positive remote cable terminal and Pin A. Connect a second jumper wire between ground and Pin C of the motor connector.

(a) If motor runs, go to Step 4.

(b) If motor does not run, replace the motor.

(4) If wipers will not run at low speed, using an ohmmeter, check for open circuit. Check between terminal 11 of the HI-LO wiper relay to Pin B of the wiper motor wire harness connector for continuity. If OK, go to Step 5. If not repair as necessary.

(5) If wiper will not run at the high speed, using an ohmmeter, check for an open circuit. Check between terminal 28 of the HI-LO wiper relay and Pin A of the wiper motor wire harness connector for continuity. If OK, go to Step 6. If not repair as necessary.

(6) Check for faulty HI-LO wiper relay.

WIPERS RUN AT HIGH SPEED WITH SWITCH IN LOW SPEED POSITION. WIPERS OPERATE IN INTERMITTENT MODE, BUT EACH WIPE IS AT HIGH SPEED.

(1) Disconnect motor connector.

(2) Using two jumper wires, connect one between the battery positive jump start terminal and Pin B on the wiper motor connector. Connect the second lead between ground and Pin C on the wiper motor connector (Fig. 6). If motor runs at low speed, go to Step 3. If motor runs at high speed, replace the motor.

(3) Check for faulty HI-LO wiper relay. Check for crossed wires in harness from HI-LO relay to motor.

(4) Disconnect J3 14-way connector from the BCM and remove the intermittent wiper relay.

(5) Using an ohmmeter, check for short to ground Pin 8 of the J3 14–way connector.

(6) If continuity to ground is present, repair as necessary. If no continuity to ground, replace the BCM.

WIPERS RUN AT LOW SPEED WITH SWITCH IN HIGH SPEED POSITION

(1) Check for faulty HI-LO wiper relay.

(2) Using an ohmmeter, check for open circuit between terminal 12 of the HI-LO wiper relay and terminal 8 of the BCM J3 14-way connector. If OK, go to Step 3. If not OK, repair as necessary.

(3) Check wiper switch.

(4) Check for binding linkage

(5) Refer to MOTOR RUNS SLOWLY AT ALL SPEEDS.

MOTOR WILL KEEP RUNNING WITH SWITCH IN OFF POSITION.

Using a ohmmeter, Check Pin 8 of the BCM J3 14–way connector for continuity to ground signal when the wipers are in the park position only.

(1) If no ground signal, test wiper motor.

(2) If a ground is received test the multi-function switch.

(3) If the multi-function switch test OK, replace the BCM.

WIPER WILL RUN CONTINUOUSLY WITH SWITCH IN THE INTERMITTENT POSITION. WHEN COLUMN SWITCH IS TURNED OFF, WIPERS STOP WHEREVER THEY ARE, WITHOUT RETURNING TO PARK POSITION.

(1) Using an ohmmeter, check for ground at Pin D on the wiper motor connector. If grounded, replace motor.

(2) Using an ohmmeter, with the wiper motor in the PARK position, check for continuity between Pin

DIAGNOSIS AND TESTING (Continued)

C and Pin D on the wiper motor connector. If continuous continuity, go to Step 3. If not OK, replace motor.

(3) Disconnect the wiper motor wire harness connector and the J3 14–way connector. Check for continuity between Pin D of the wiper motor wire harness connector and terminal 2 of J3 14-way connector of the BCM. If no continuity, repair as necessary. If continuity is OK, test the wiper motor.

WIPERS DO NOT RUN WHEN WASHER MOTOR IS ENGAGED

(1) Disconnect the J3 14-way connector from the BCM.

(2) Using a voltmeter, connect positive lead to terminal 10 of the 14-way connector and the negative lead to ground.

(3) Engage the washer switch so that the washer motor runs continuously.

(a) If the voltage is zero, check the wiring between the washer motor and the BCM. Repair as necessary.

(b) If the battery voltage, ensure that the 14–way connector is disconnected and check Pin 10 if it has 12 volts. If no voltage replace the BCM. If battery voltage, test for a wiring short refer to Group 8W, Wiring Diagrams.

WIPERS OPERATE IN INTERMITTENT SETTINGS BUT DOES NOT HAVE SIX DIFFERENT SPEEDS.

To test the multi-function windshield wiper switch, refer to Group 8J, Turn Signals and Hazard Warning Flashers, for diagnosis and testing of the Multi-Function Switch.

WIPER MOTOR SYSTEM

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, SEE GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN REMOVAL PROCEDURES.

Whenever a wiper motor malfunction occurs, disconnect motor wire harness and clean the terminals. Ensure the wire harness is properly connected before starting diagnosis and repair procedures. Refer to Wiper Motor Test (Fig. 9).

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER BLADES DO NOT PARK PROPERLY	1. Wiper arms improperly parked. 2. Wiper arms are loose on pivot shaft. 3. Motor crank loose at output shaft.	1. Remove wiper arms and run wiper motor to park position. Refer to Wiper Arm Replacement. 2. Remove wiper arm and run wiper motor to park position. Refer to Wiper Arm Replacement. 3. Remove wiper arm. Run wiper motor to park position and remove the module. Without rotating the motor output shaft, remove the crank and clean the motor shaft of metal filings. Mount the motor crank on the motor shaft toward the motor can side with the linkage in the full reversal position. Tighten to 25 to 30 N•m (19 to 23 ft lbs.) torque, without rotating the motor output shaft. Install wiper system. Refer to Wiper Module Replacement.
MOTOR STOPS IN ANY POSITION WHEN THE SWITCH IS TURNED OFF	1. Open park circuit.	1. Check park switch by disconnecting wire connector and apply battery voltage to pin A. Place a jumper wire from pin B to pin C, then to an external ground. Replace motor if it does not park.
MOTOR WILL NOT STOP WHEN SWITCH IS TURNED OFF	1. Faulty switch. 2. Faulty relay.	1. Check switch in low, high and intermittent position. Replace if necessary.
WIPER BLADES SLAP AGAINST COWL SCREEN OR WINDOW MOLDINGS	1. Wiper arms are parked incorrectly.	1. Repark wiper arms. Refer to Wiper Arm Replacement.
BLADES CHATTER	1. Foreign substance such as polish on glass or blades. 2. Arms twisted, blade at wrong angle on glass. 3. Blade structure bent. 4. Blade element has permanent set.	1. Clean glass and blade element with non-abrasive cleaner. 2. Replace arm. 3. Replace blade. 4. Replace blade element.
WIPER KNOCK AT REVERSAL	1. Linkage bushings worn. 2. Armature endplay in motor.	1. Replace worn link. Refer to Wiper Linkage Removal. 2. Replace wiper motor. Refer to Wiper Motor Replacement.
WIPER MOTOR WILL NOT RUN	1. Blown fuse. 2. New fuse blows again. 3. New fuse blows again. 4. No voltage at motor. 5. Poor ground.	1. Replace fuse, run system. 2. Check for short in wiring or switch. 3. Replace fuse, remove motor connector, turn switch on, fuse does not blow, replace motor. 4. Check switch and wiring. 5. Clean ground wire connection from corrosion.

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Fig. 9 Wiper Motor Test

REMOVAL AND INSTALLATION

MULTI-FUNCTION SWITCH

REMOVAL

(1) Disconnect battery negative cable.
(2) Remove the upper steering column cover. Refer to steering column cover removal procedures below.
(3) Remove multi-function switch mounting screws (Fig. 10).
(4) Disconnect wire connectors. Lift the switch straight up to remove.

INSTALLATION

For installation, reverse the above procedures.
(1) Tighten multi-function switch to column retaining screws to 2.3 N·m (20 in. lbs.) torque.
(2) Tighten steering column cover retaining screws to 2 N·m (17 in. lbs.) torque.

WASHER NOZZLE

REMOVAL

To replace nozzle, disconnect washer fluid hose. Using a needle nose pliers, squeeze together the locking tabs on the nozzle.

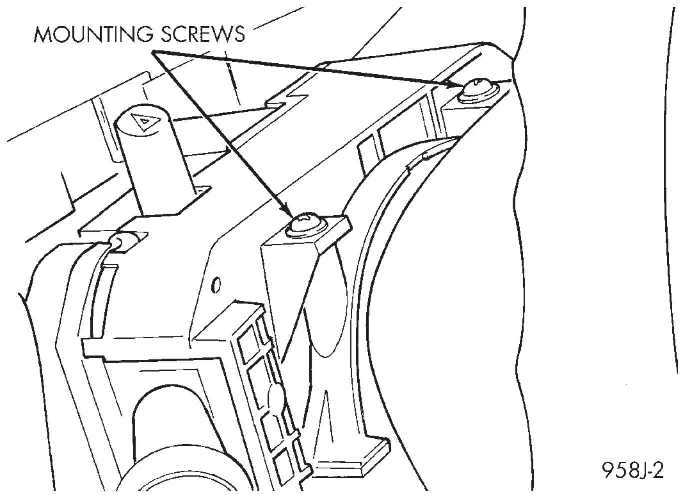


Fig. 10 Multi-Function Switch

INSTALLATION

For installing make sure that both locking tabs are securely snapped into position. Connect washer fluid hose. If no washer spray, check fluid hoses kinks or leaks (Fig. 11).

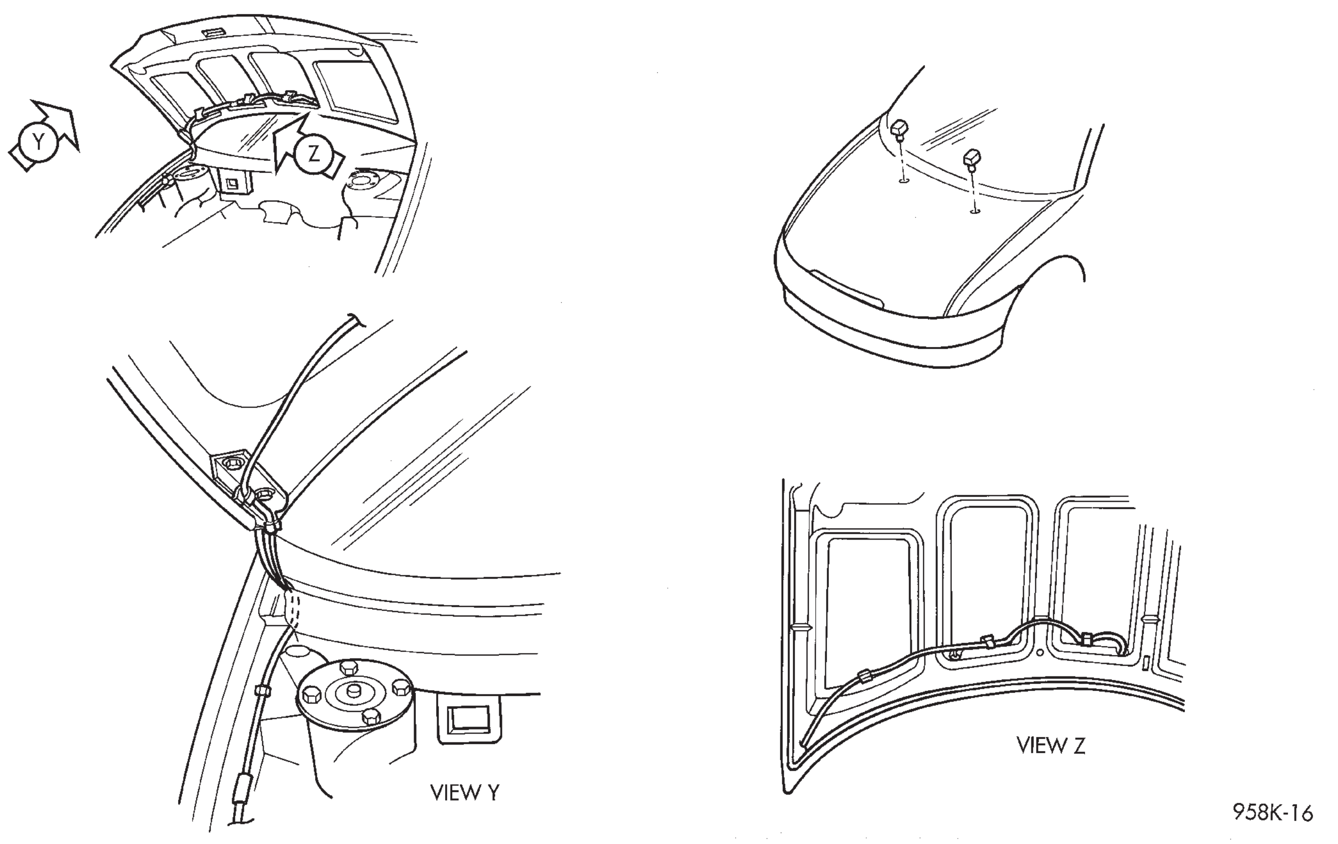


Fig. 11 Washer Fluid Hose Location

REMOVAL AND INSTALLATION (Continued)

WASHER RESERVOIR

REMOVAL

(1) Disconnect washer fluid hose at in-line connector on top of the right shock tower.

(2) Partially remove bumper facia as needed to gain access to the reservoir. Refer to Group 23, Body.

(3) Remove carbon canister.

(4) Disconnect wire connector from washer pump and harness mounting tab (Fig. 12).

(5) Slide rearward and drop down and away from vehicle.

(6) Drain washer fluid from reservoir into an appropriate container.

(7) Disconnect the washer hose from the reservoir.

INSTALLATION

For installation, reverse the above procedures.

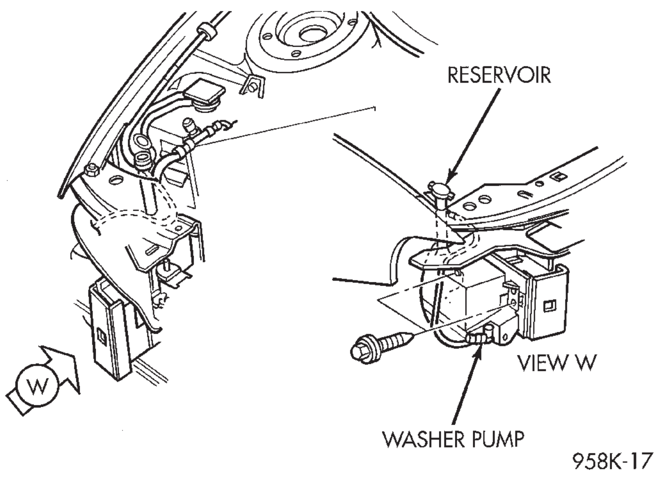


Fig. 12 Reservoir Removal

WASHER RESERVOIR PUMP

REMOVAL

(1) Partially remove the bumper facia as needed to gain access to the reservoir pump. Refer to Group 23, Body.

(2) Place a drain bucket below the reservoir to catch any washer solvent that may leak out.

(3) Firmly grasping pump by hand twist and pull away from reservoir and out of grommet. Care must be taken not to puncture reservoir (Fig. 13).

(4) Remover rubber grommet from reservoir and throw away.

INSTALLATION

For installation, reverse the above procedures. A new grommet is required for installation. Refill reservoir with the washer solvent.

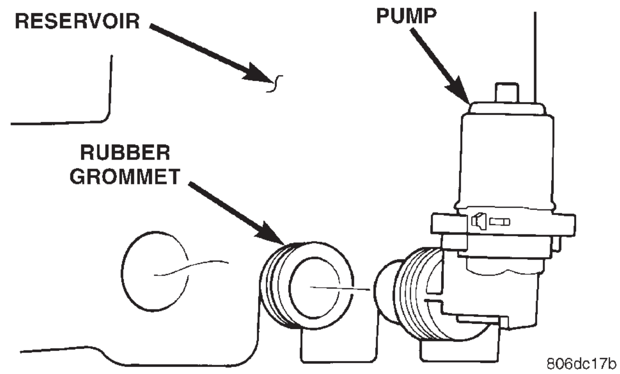


Fig. 13 Washer Pump

WIPER ARM AND BLADE

REMOVAL

(1) Place the wiper arm/blades in the PARK position and turn ignition OFF.

(2) Unsnap arm cover. By hand rock gently side to side and slide away from arm pivot. To remove the left side raise hood for clearance

(3) Loosen retention nut.

(4) Remove the arm from the pivot by using a universal claw puller or by hand rock gently side to side and slide. Raise blade and arm off glass and rock side to side while applying pressure with the puller till loose. Ensure that the puller is not on the collar below the arm.

(5) Remove arm retention nut and arm.

INSTALLATION

(1) Place arm on pivot shaft, align arm with keyway and push down on arm to start on pivot shaft.

(2) Start retention nut.

(3) Raise arm and blade off windshield while tightening retention nut. Tighten nut to 37 to 43 N· mm (27 to 32 ft. lbs.).

(4) Install arm head cover.

WIPER BLADE

REMOVAL

(1) Turn wiper switch ON, position blades to a convenient place on the windshield by turning the ignition switch ON and OFF. Turn ignition switch OFF, when blade is in the desirable position.

(2) Lift wiper arm to raise blade off glass.

(3) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 14) and (Fig. 15).

(4) The driver's side wiper blade has a air foil on it and the air foil points downward as in (Fig. 2).

(5) Gently place wiper arm tip on windshield.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

For installation reverse the above procedures. When complete turn ignition switch ON. Turn wiper switch OFF allowing the wiper blades PARK, then turn ignition switch OFF.

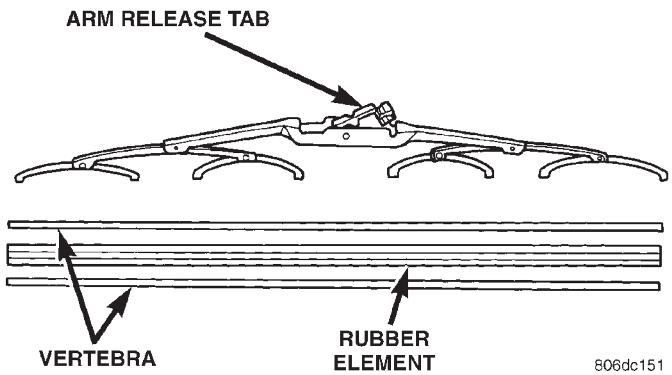


Fig. 14 Wiper Blade and Element

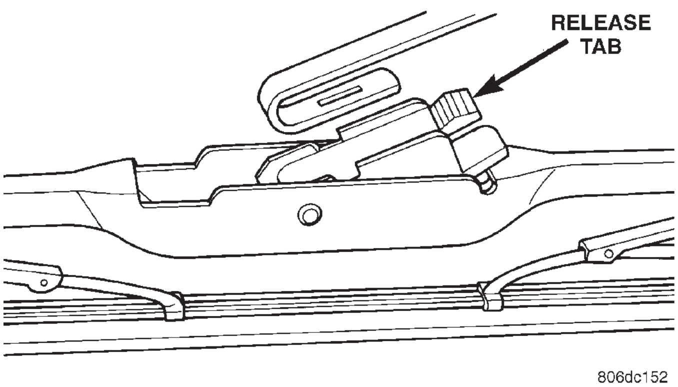


Fig. 15 Remove Blade from Arm

WIPER BLADE ELEMENT

REMOVAL

(1) Lift wiper arm to raise blade off the windshield.

(2) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 14) and (Fig. 15). Gently place wiper arm tip on windshield.

(3) Remove wiping rubber element by pulling stopper of the rubber element, out of the claws of blade assemble (Fig. 16). The wiper rubber element and two vertebra will be removed.

INSTALLATION

(1) Slide the rubber element into the blade assembly through the claws.

(2) Slide the metal vertebra into the top element slot, with the vertebra curved to match the windshield

(3) Ensure that the final blade claw is locked into the slot at the end of the rubber element (Fig. 16).

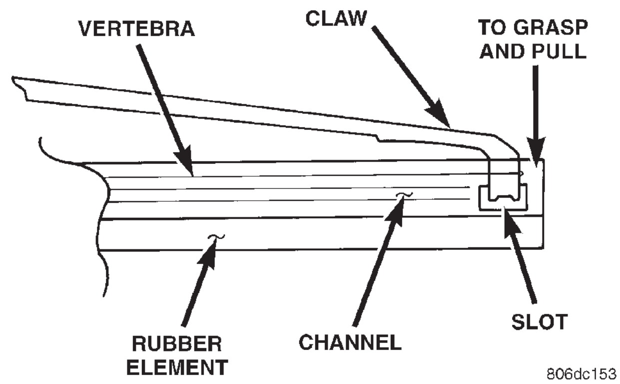


Fig. 16 Wiper Blade and Element

WIPER ARM LINKAGE OR CAP

REMOVAL

(1) Remove wiper arms and blades.

(2) Remove the cowl screen.

(3) Remove wiper motor assembly.

(4) Disconnect wiper arm linkage, by using an ball joint/tie rod separator, separate the right and left ball cap from the ball (Fig. 17).

(5) Disconnect drive link from the motor crank. Using an ball joint/tie rod separator and separate the ball cap from the ball.

INSTALLATION

For installation, reverse the above procedures. Align link ball cap over ball and gently press fit against shoulder of cap to lock cap into position. If motor output crank nut was removed, tighten nut to 25 to 30 N·m (19 to 23 ft. lbs.).

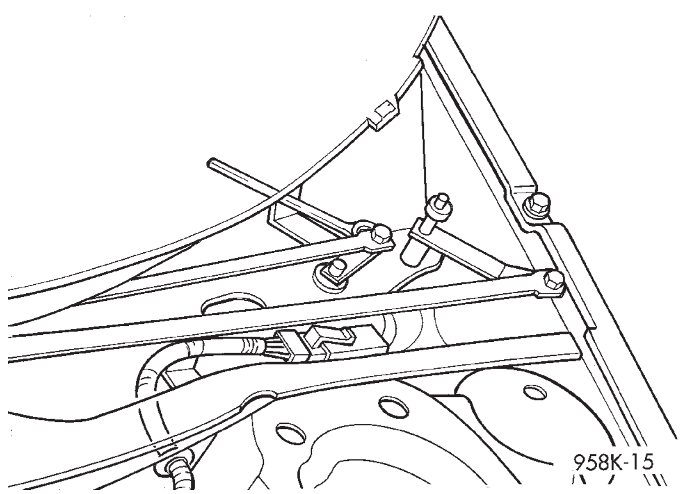


Fig. 17 Linkage Removal

WIPER MOTOR

REMOVAL

(1) Remove wiper arms and blades.

(2) Remove the cowl screen.

(3) Remove wiper motor assembly.

REMOVAL AND INSTALLATION (Continued)

(4) Disconnect drive linkage from motor output crank. Using an ball joint/tie rod separator, separate the ball cap from the ball (Fig. 17).

(5) Remove motor mounting nuts and remove motor.

(6) Disconnect wire connector at motor.

INSTALLATION

For installation, reverse the above procedures. Tighten the mounting screws to 10 to 12 N·m (89 to 106 in. lbs.) torque. Ensure that the motor connector seal is properly positioned. Tighten the motor mounting nuts to 25 to 30 N·m (19 to 23 ft. lbs.) torque.

WIPER MOTOR ASSEMBLY

REMOVAL

(1) Remove wiper arms and blades (Fig. 18).

(2) Remove the cowl screen.

(3) Remove the four wiper motor mounting screws then lift assembly to gain access to clip.

(4) Disconnect harness clip from the forward mounting leg.

(5) Disconnect wire connector at motor and remove assembly.

INSTALLATION

For installation, reverse the above procedures. Tighten the mounting screws to 10 to 12 N·m (89 to 106 in. lbs.) torque. Ensure that the motor connector seal is properly positioned.

WIPER MOTOR ASSEMBLY MOUNTING GROMMET

REMOVAL

(1) Remove wiper arms and blades.

(2) Remove the cowl screen.

(3) Remove wiper motor assembly.

(4) Remove the four grommets.

INSTALLATION

For installation, reverse the above procedures. Ensure proper position of grommets when installing:

(1) The right inboard grommet is installed with insert flat facing down. The remaining grommets installed with insert flat facing up.

(2) The left outboard grommet has a small eyelet.

(3) The right inboard grommet threaded eyelet.

(4) The two center grommets have a large eyelets

CLEANING AND INSPECTION

WIPER BLADES

Wiper blades exposed to the weather for a long period of time tend to lose their wiping effectiveness. Periodic cleaning of the wiper blade is recommended to remove the accumulation of salt and road grime.

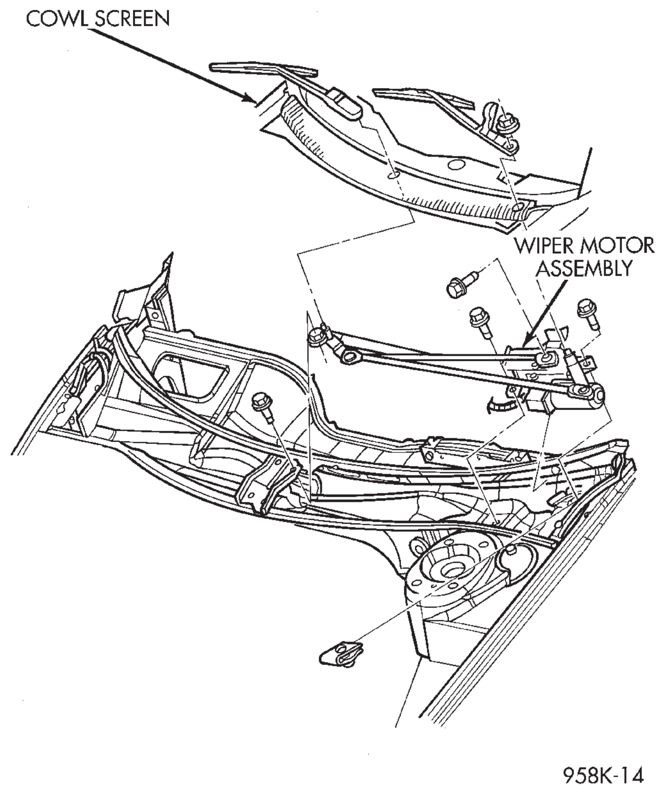


Fig. 18 Wiper Motor and Linkage Module

The wiper blades, arms and windshield should be cleaned with a sponge or cloth and a mild detergent or nonabrasive cleaner. If the wiper blades continue to streak or smear, they should be replaced. The wiper blade should run smoothly across the windshield in both directions. The wiper blade should slightly roll over center when the blade reverses direction. A wiper blade insert that has lost flexibility or a wiper arm that has lost spring tension, will cause the blade to skip or chatter across the windshield. If the wiper blades are new and the wiper arm spring tension is OK and a chattering sound is emitted from the wiper(s), the wiper blade is not rolling over center. If this condition exists, refer to the Wiper Arm Alignment paragraph of this group.

ADJUSTMENTS

WIPER ARM

High speed, wet windshield operation, the right blade tip may override the cowl screen slightly. This is normal and should not affect wiper system performance.

(1) Lift arms and blade assemble to a over centered position.

(2) Turn ignition switch to ON or ACC position.

ADJUSTMENTS (Continued)

(3) Use LOW speed setting and cycle the wiper motor to the PARK position.

(4) Turn ignition OFF.

(5) Carefully lower arm and blades to the windshield.

(6) Measure the distance from the blade tip to the cowl screen edge. The blade should be 18 to 42 mm (.75 to 1.60 ins.).

(7) If not OK, check for worn parts.

(8) In the event the blade tip strikes the cowl screen or molding remove arm. Remove metal keyway from the pivot shaft by cutting or breaking it off. File the surface smooth. Position arm on windshield and tighten to 37 to 43 N·m (27 to 32 ft. lbs.) torque (Fig. 19).

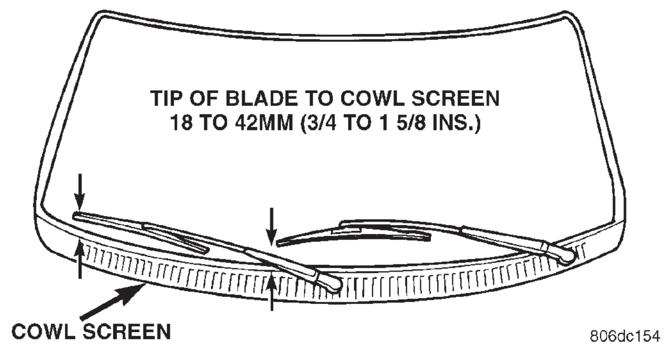


Fig. 19 Arm Adjustment

LAMPS

CONTENTS

GENERAL LIGHTING DIAGNOSIS

INDEX

GENERAL INFORMATION

GENERAL INFORMATION

JX vehicles use lighting on the interior and exterior of the vehicle for illuminating and indicating purposes. Lighting circuits are protected by fuses or circuit breakers. Lighting circuits require an overload protected power source, on/off device, lamps and body ground to operate properly. Plastic lamps require a wire in the harness to supply body ground to the lamp socket. Lamp sockets that are exposed to moisture should be coated with Mopar® Multi-purpose Grease, or equivalent, to avoid corrosion. If a socket has become corroded, clean socket and bulb base with abrasive fiber sanding pad or metallic bristle brush. Replace sockets and bulbs that are deformed from corrosion that could prevent continuous body ground.

Wire connectors can make intermittent contact or become corroded. Before coupling wire connectors, inspect the terminals inside the connector. Male terminals should not be bent or disengaged from the insulator. Female terminals should not be sprung open or disengaged from the insulator. Bent and sprung terminals can be repaired using needle nose pliers and pick tool. Corroded terminals appear chalky or green. Corroded terminals should be replaced to avoid recurrence of the problem symptoms. Wire connector terminals should be coated with Mopar® Multi-purpose Grease, or equivalent, to avoid corrosion.

Begin electrical system failure diagnosis by testing related fuses and circuit breakers in the fuse block and engine compartment. Verify that bulbs are in good condition and test continuity of the circuit ground. Refer to Group 8W, Wiring Diagrams, for component location and circuit information.

SAFETY PRECAUTIONS

WARNING: EYE PROTECTION SHOULD BE USED WHEN SERVICING GLASS COMPONENTS. PERSONAL INJURY CAN RESULT.

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result. Do not use bulbs with higher candle power than indicated in the Bulb Application table at the end of this group. Damage to lamp can result. Do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the Owners Manual.

When it is necessary to remove components to service another, it should not be necessary to apply excessive force or bend a component to remove it. Before damaging a trim component, verify hidden fasteners or captured edges are not holding the component in place.

GENERAL INFORMATION (Continued)

DIAGNOSTIC PROCEDURES

When a vehicle experiences problems with the headlamp system, verify the condition of the battery connections, charging system, headlamp bulbs, wire connectors, relay, high beam dimmer switch and headlamp switch. Refer to Group 8W, Wiring Diagrams for component locations and circuit information.

HEADLAMP DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF	1. Loose or corroded battery cables.	1. Clean and secure battery cable clamps and posts.
	2. Loose or worn generator drive belt.	2. Adjust or replace generator drive belt.
	3. Charging system output too low.	3. Test and repair charging system, refer to Group 8A,
	4. Battery has insufficient charge.	4. Test battery state-of -charge , refer to Group 8A.
	5. Battery is sulfated or shorted.	5. Load test battery, refer to Group 8A.
	6. Poor lighting circuit Z1-ground.	6. Test for voltage drop across Z1-ground locations, refer to Group 8W.
	7. Both headlamp bulbs defective.	7. Replace both headlamp bulbs.
HEADLAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high.	1. Test and repair charging system, refer to Group 8A.
	2. Missing or burned out fuse.	2. Add or replace fuse.
	3. Loose or corroded terminals or splices in circuit.	3. Inspect and repair all connectors and splices, refer to Group 8W.
HEADLAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE	1. Charging system output too low.	1. Test and repair charging system, refer to Group 8A.
	2. Poor lighting circuit Z1-ground.	2. Test for voltage drop across Z1-ground locations, refer to Group 8W.
	3. High resistance in headlamp circuit.	3. Test amperage draw of headlamp circuit.
	4. Both headlamp bulbs defective.	4. Replace both headlamp bulbs.
HEADLAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1-ground.	1. Test for voltage drop across Z1-ground locations, refer to Group 8W.
	2. High resistance in headlamp circuit.	2. Test amperage draw of headlamp circuit.
	3. Faulty headlamps switch circuit breaker.	3. Replace headlamp switch.
	4. Loose or corroded terminals or splices in circuit.	4. Inspect and repair all connectors and splices, refer to Group 8W.
HEADLAMPS DO NOT ILLUMINATE	1. No voltage to headlamps.	1. Repair open headlamp circuit, refer to Group 8W.
	2. No Z1-ground at headlamps.	2. Repair circuit ground, refer to Group 8W.
	3. Faulty headlamp switch.	3. Replace headlamp switch.
	4. Faulty headlamp dimmer (multi-function) switch.	4. Replace multi-function switch.
	5. Broken connector terminal or wire splice in headlamp circuit.	5. Repair connector terminal or wire splice.

GENERAL INFORMATION (Continued)

FOG LAMP DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FOG LAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF.	1. Loose or corroded battery cables. 2. Loose or worn generator drive belt. 3. Charging system output too low. 4. Battery has insufficient charge. 5. Battery is sulfated or shorted. 6. Poor lighting circuit Z1-ground. 7. Both fog lamp bulbs defective.	1. Clean and secure battery cable clamps and posts. 2. Adjust or replace generator drive belt. 3. Test and repair charging system, refer to Group 8A, 4. Test battery state-of -charge, refer to Group 8A. 5. Load test battery, refer to Group 8A. 6. Test for voltage drop across Z1-ground locations, refer to Group 8W. 7. Replace both fog lamp bulbs.
FOG LAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high. 2. Loose or corroded terminals or splices in circuit.	1. Test and repair charging system, refer to Group 8A. 2. Inspect and repair all connectors and splices, refer to Group 8W.
FOG LAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE	1. Charging system output too low. 2. Poor lighting circuit Z1-ground. 3. High resistance in fog lamp circuit. 4. Both fog lamp bulbs defective.	1. Test and repair charging system, refer to Group 8A. 2. Test for voltage drop across Z1-ground locations, refer to Group 8W. 3. Test amperage draw of fog lamp circuit. 4. Replace both fog lamp bulbs.
FOG LAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1-ground. 2. High resistance in fog lamp circuit. 3. Faulty fog lamp switch. 4. Loose or corroded terminals or splices in circuit.	1. Test for voltage drop across Z1-ground locations, refer to Group 8W. 2. Test amperage draw of fog lamp circuit. 3. Replace fog lamp switch. 4. Inspect and repair all connectors and splices, refer to Group 8W.
FOG LAMPS DO NOT ILLUMINATE	1. Blown fuse for fog lamps. 2. No Z1-ground at fog lamps. 3. Faulty fog lamp switch. 4. Broken connector terminal or wire splice in fog lamp circuit.	1. Replace fuse, refer to Group 8W. 2. Repair circuit ground, refer to Group 8W. 3. Replace fog lamp switch. 4. Repair connector terminal or wire splice.

HEADLAMP AND FOG LAMP ALIGNMENT

INDEX

GENERAL INFORMATION

HEADLAMP ALIGNMENT

JX vehicle headlamps are equipped with a bubble level to aid up/down headlamp alignment (Fig. 1). The bubble level is used to assist headlamp alignment when compensating for vehicle ride height changes due to heavy luggage compartment loads. The bubble level cannot be calibrated, the headlamp must be replaced if bubble level vial is faulty. A gauge wheel is located on the top of the headlamp module to assist left/right alignment (Fig. 2).

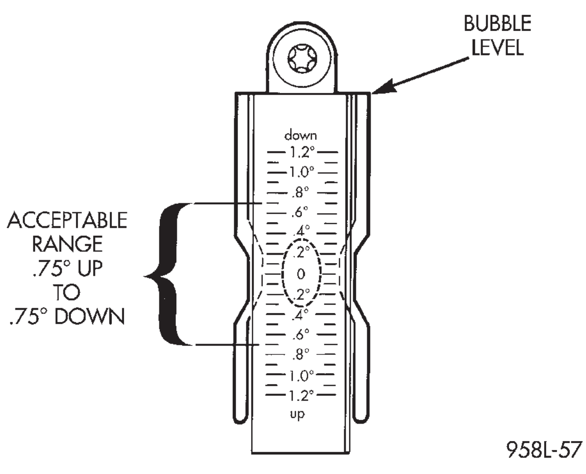


Fig. 1 Bubble Level

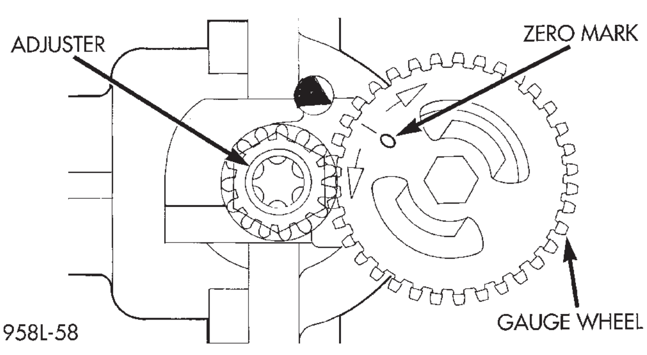


Fig. 2 Gauge Wheel—Typical

HEADLAMP ALIGNMENT PREPARATION

(1) Verify headlamp dimmer switch and high beam indicator operation.

(2) Inspect and correct damaged or defective components that could interfere with proper headlamp alignment.

(3) Verify proper tire inflation.

(4) Clean headlamp lenses.

(5) Verify that luggage area is not heavily loaded.

(6) Fuel tank should be FULL. Add 2.94 kg (6.5 lbs.) of weight over the fuel tank for each estimated gallon of missing fuel.

ADJUSTMENTS

HEADLAMP ADJUSTMENT USING ALIGNMENT SCREEN

ALIGNMENT SCREEN PREPARATION

(1) Position vehicle on a level surface perpendicular to a flat wall 7.62 meters (25 ft) away from front of headlamp lens (Fig. 3).

(2) If necessary, tape a line on the floor 7.62 meters (25 ft) away from and parallel to the wall.

(3) From the ground up 1.27 meters (5 ft), tape a line on the wall at the centerline of the vehicle. Sight along the centerline of the vehicle (from rear of vehicle forward) to verify accuracy of the line placement.

(4) Rock vehicle side-to-side three times to allow suspension to stabilize.

(5) Jounce front suspension three times by pushing downward on front bumper and releasing.

(6) Measure the distance from the center of headlamp lens to the ground. Transfer measurement to the alignment screen (with tape). Use this line for up/down adjustment reference.

(7) Measure distance from the centerline of the vehicle to the center of each headlamp being aligned. Transfer measurements to screen (with tape) to each side of vehicle centerline. Use these lines for left/right adjustment reference.

ADJUSTMENTS (Continued)

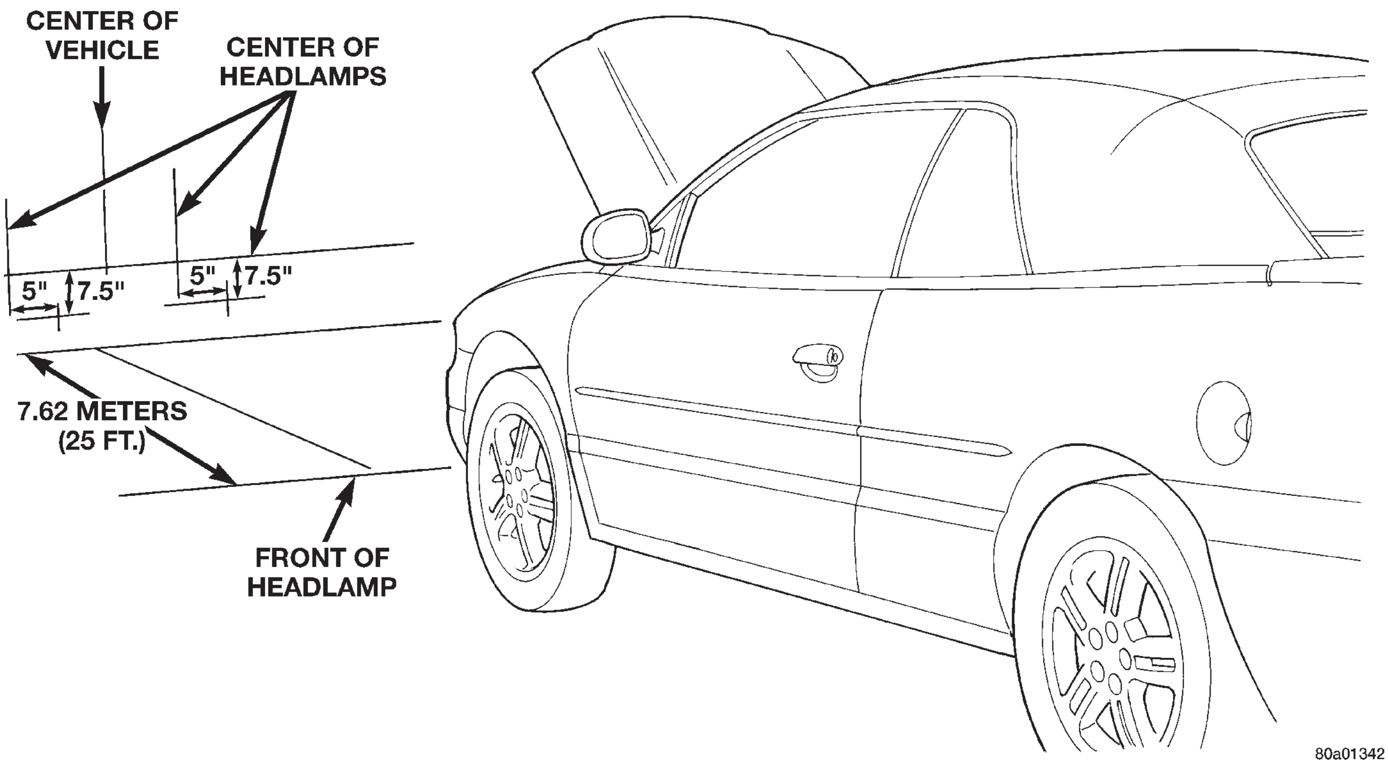


Fig. 3 Headlamp Alignment Screen

HEADLAMP ADJUSTMENT

A properly aimed low beam headlamp will project the center of the low beam hot spot on the alignment screen 190 mm (7.5 in.) below the headlamp centerline. The side-to-side low beam hot spot should be 127 mm (5 in.) right of headlamp centerline (Fig. 3). **The preferred headlamp alignment is 0 (± 0.76°) for the up/down adjustment as indicated on bubble level. Preferred left/right alignment is 0 (± 0.76°) as indicated on the gauge wheel.** The high beam headlamps cannot be aligned. The high beam pattern should be correct when the low beams are aligned properly.

NOTE: The bubble level and gauge wheel is calibrated before the headlamp is installed in the vehicle. The bubble level cannot be calibrated without damaging the headlamp module. If bubble level is faulty, replace headlamp module.

To adjust headlamp alignment, rotate alignment screws to achieve the specified low beam hot spot pattern (Fig. 4).

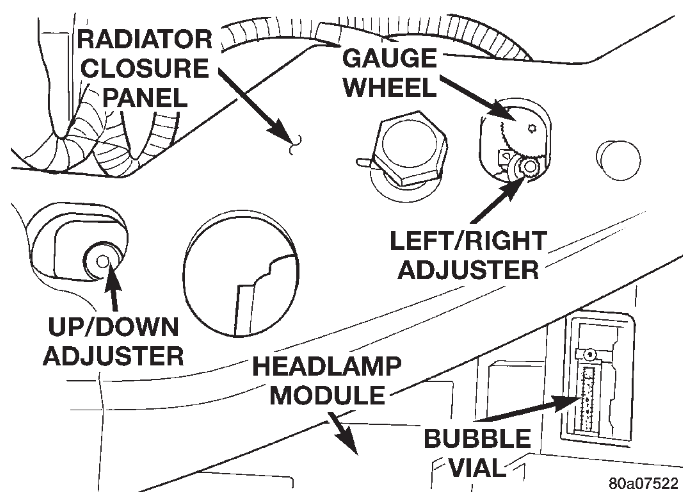


Fig. 4 Headlamp Alignment Screws

ADJUSTMENTS (Continued)

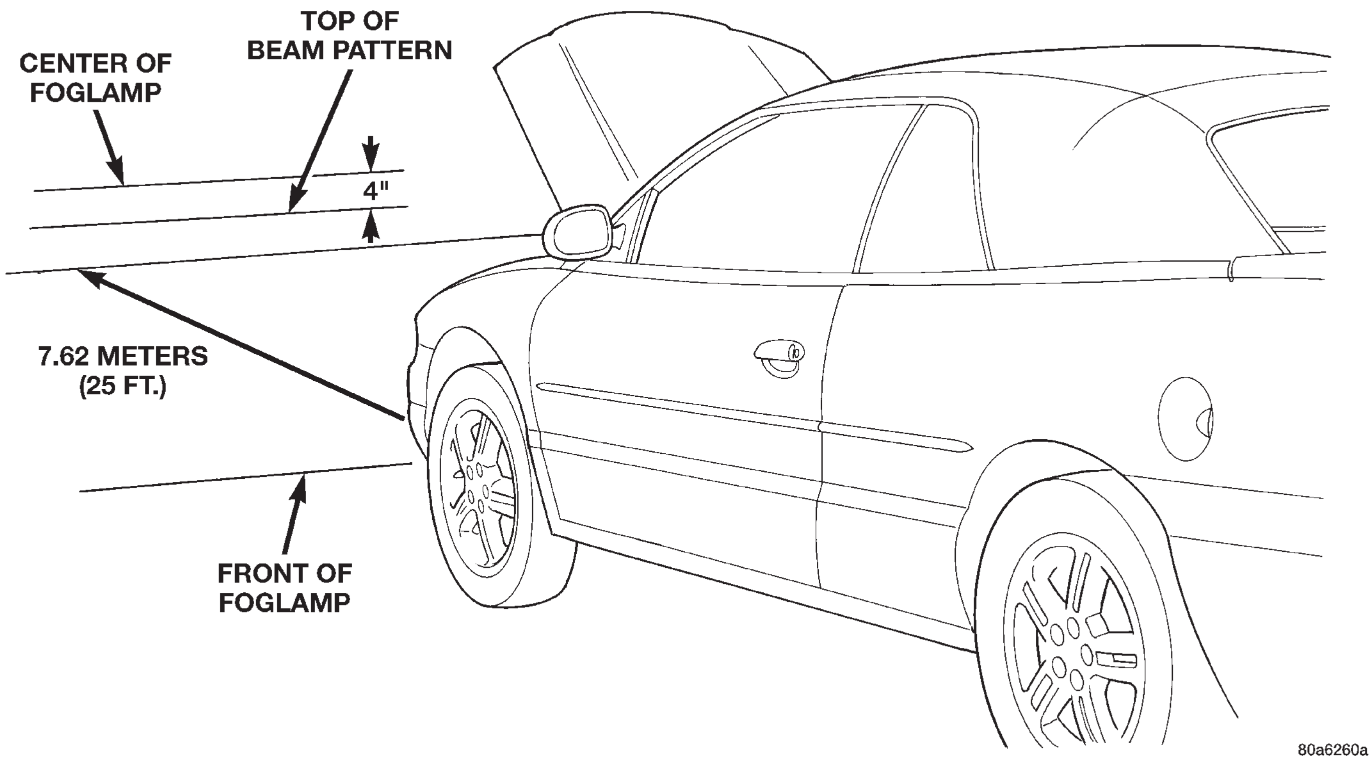


Fig. 5 Fog Lamp Alignment

FOG LAMP ALIGNMENT

Prepare a alignment screen (Fig. 5). Refer to Alignment Screen Preparation paragraph in this section. A properly aligned fog lamp will project a pattern on the alignment screen 100 mm (4 in.) below the fog lamp centerline and straight ahead.

To adjust fog lamp alignment, rotate alignment screw to achieve the specified hot spot pattern (Fig. 6).

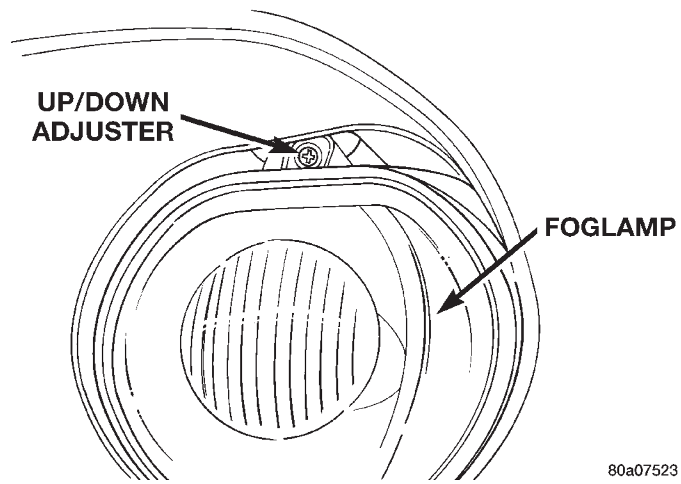


Fig. 6 Fog Lamp Adjuster

EXTERIOR LAMP SWITCHES

INDEX

REMOVAL AND INSTALLATION

HEADLAMP SWITCH

Service procedures for the headlamp switch can be found in Group 8E, Instrument Panel and Gauges. More information can be found in Group 8W, Wiring Diagrams.

HEADLAMP DIMMER SWITCH

The headlamp dimmer switch is incorporated into the turn signal switch. Proper procedures can be found in Group 8J, Turn Signal and Flashers. More information can be found in Group 8W, Wiring Diagrams.

LAMP BULB SERVICE

INDEX

REMOVAL AND INSTALLATION

HEADLAMP BULB

REMOVAL

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.

(1) Release hood latch and open hood.
(2) Remove screws holding headlamp module to radiator closure panel.
(3) Separate headlamp module from radiator closure panel.
(4) Disengage wire connector from back of headlamp bulb.
(5) Rotate retaining ring counterclockwise one quarter turn.
(6) Separate retaining ring from headlamp module.
(7) Pull bulb from headlamp module (Fig. 1).

INSTALLATION

(1) Insert bulb into headlamp module.
(2) Position retaining ring to headlamp module.
(3) Rotate retaining ring clockwise one quarter turn.
(4) Engage wire connector from back of headlamp bulb.
(5) Position headlamp module to radiator closure panel.
(6) Install screws holding headlamp module to radiator closure panel.
(7) Verify proper headlamp alignment. Adjust as necessary.

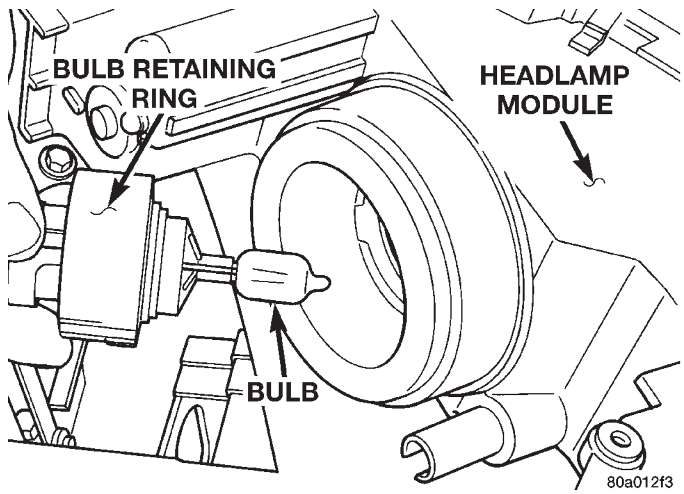


Fig. 1 Headlamp Bulb

PARK AND TURN SIGNAL LAMP BULB

REMOVAL

(1) Release hood latch and open hood.
(2) Remove screws holding headlamp module to radiator closure panel.
(3) Separate headlamp module from radiator closure panel.
(4) Rotate socket counterclockwise one quarter turn.
(5) Pull socket from back of lamp (Fig. 2).
(6) Pull bulb from socket.

INSTALLATION

(1) Push bulb into socket.
(2) Position socket into back of lamp (Fig. 2).
(3) Rotate socket clockwise one quarter turn.
(4) Position headlamp module to radiator closure panel.
(5) Install screws holding headlamp module to radiator closure panel.

REMOVAL AND INSTALLATION (Continued)

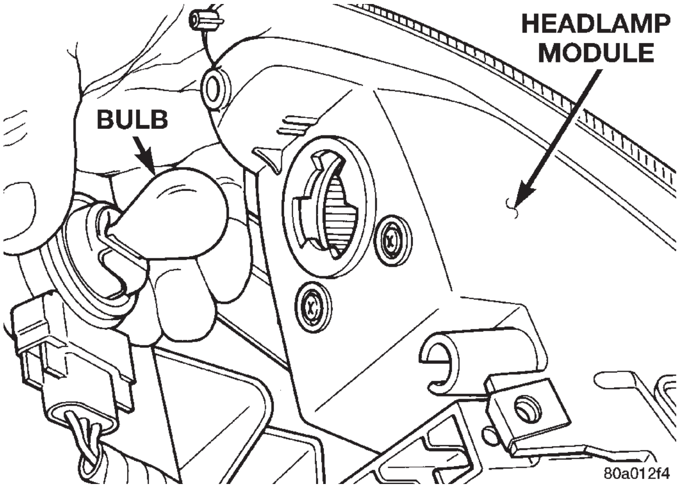


Fig. 2 Park and Turn Signal Lamp Bulb

FOG LAMP BULB

REMOVAL

(1) Raise vehicle with suitable lifting device. Refer to Group 0, Lubrication and Maintenance, for proper procedures.

(2) Rotate bulb one quarter turn counterclockwise.

(3) Pull bulb from back of fog lamp (Fig. 3).

(4) Disengage wire connector from bulb.

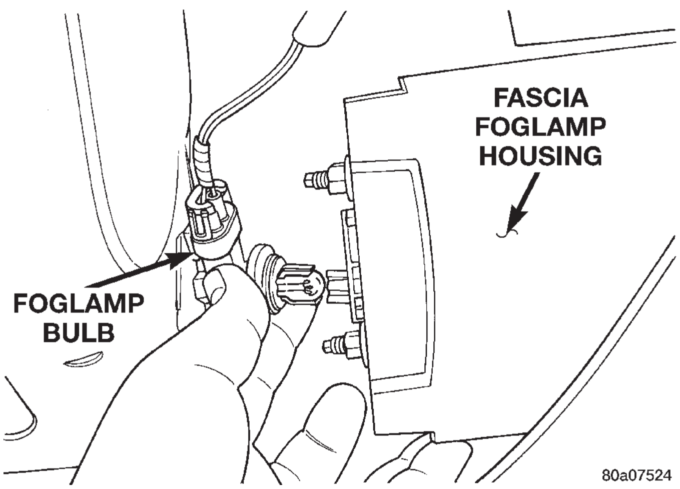


Fig. 3 Fog Lamp Bulb

INSTALLATION

(1) Engage wire connector to fog lamp bulb.

(2) Push bulb into back of fog lamp.

(3) Rotate bulb one quarter turn clockwise.

FRONT MAP LAMP BULB

REMOVAL

(1) Using a small, flat bladed tool inserted into slot in lamp lens, remove map lamp lens.

(2) Pull bulb from map lamp.

INSTALLATION

(1) Push bulb into map lamp.

(2) Install map lamp lens.

GLOVE BOX LAMP BULB

REMOVAL

(1) Open glove box door.

(2) Pull downward on lamp/switch assembly to disengage tabs from instrument panel.

(3) Pull bulb from socket.

INSTALLATION

Push upward on lamp/switch assembly to engage tabs holding assembly to instrument panel.

ASH RECEIVER/CUP HOLDER LAMP BULB

REMOVAL

(1) Using a small, flat bladed pry tool inserted into slot in lamp bezel, release tab holding lamp to cubby bin.

(2) Pull bezel and lamp assembly from cubby bin.

(3) Pull lamp socket from assembly.

(4) Pull bulb from socket.

INSTALLATION

(1) Push bulb into lamp socket.

(2) Push lamp socket into assembly.

(3) Push bezel and lamp assembly into cubby bin to engage tabs.

FLOOR CONSOLE COURTESY LAMP BULB

REMOVAL

(1) Using a small, flat bladed tool inserted into top edge of courtesy lamp, separate courtesy lamp from floor console (Fig. 4).

(2) Rotate bulb socket counterclockwise one quarter turn.

(3) Pull bulb socket from courtesy lamp.

(4) Pull bulb from bulb socket (Fig. 5).

INSTALLATION

(1) Push bulb into bulb socket.

(2) Push bulb socket into courtesy lamp.

(3) Rotate bulb socket clockwise one quarter turn.

(4) Position lower edge of courtesy lamp to floor console.

(5) Snap courtesy lamp into floor console.

LIGHTED PRNDL LETTER BEZEL

The lighted PRNDL letter bezel has no serviceable bulb. If the lamp does not function properly, the lighted PRNDL letter bezel assembly must be replaced.

REMOVAL AND INSTALLATION (Continued)

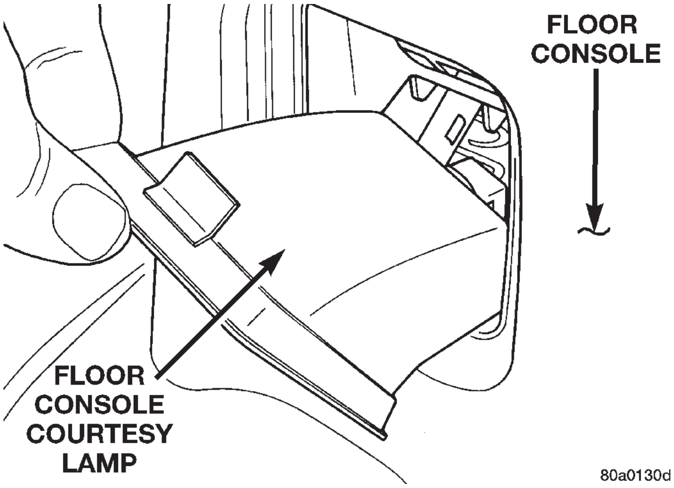


Fig. 4 Floor Console Courtesy Lamp

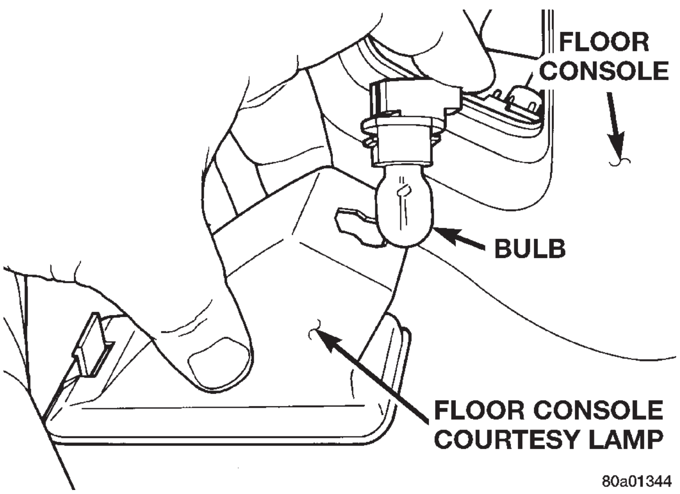


Fig. 5 Floor Console Courtesy Lamp Bulb

DOOR COURTESY LAMP BULB

REMOVAL

(1) Using a small, flat bladed tool inserted into rear edge of door courtesy lamp lens, remove lens.

(2) Pull courtesy lamp bulb from bulb socket (Fig. 6).

INSTALLATION

(1) Push courtesy lamp bulb into bulb socket.

(2) Insert front edge of courtesy lamp lens to lamp housing.

(3) Snap lamp lens into lamp housing.

TAIL/STOP AND TURN SIGNAL LAMP BULB

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Remove trunk lining as necessary to gain access to tail lamp nuts.

(3) Remove plastic nuts holding tail lamp to rear closure panel.

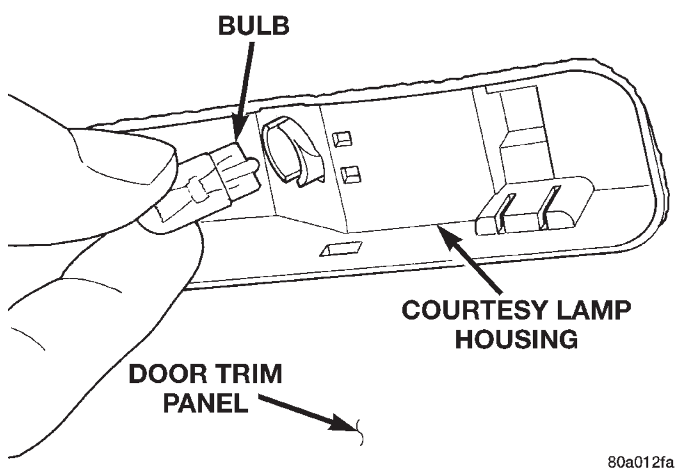


Fig. 6 Door Courtesy Lamp Bulb

(4) Separate lamp from opening in quarter panel.

(5) Rotate socket counterclockwise one quarter turn.

(6) Pull socket from back of lamp (Fig. 7).

(7) Pull bulb from socket.

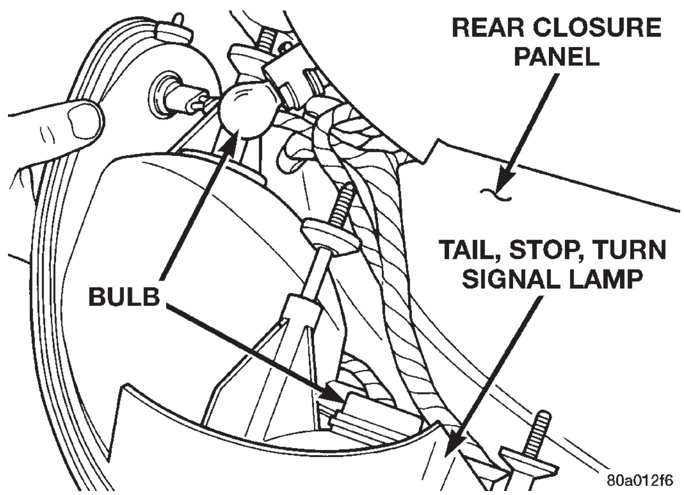


Fig. 7 Tail, Stop, and Turn Signal Lamp Bulb

INSTALLATION

(1) Push bulb into socket.

(2) Push socket into back of lamp.

(3) Rotate socket clockwise one quarter turn.

(4) Position lamp to opening in quarter panel.

(5) Install plastic nuts holding tail lamp to rear closure panel.

(6) Install trunk lining.

BACK-UP LAMP BULB

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Remove trunk lining as necessary to gain access to tail lamp nuts.

REMOVAL AND INSTALLATION (Continued)

(3) Remove plastic nuts holding tail lamp to rear closure panel.
(4) Separate lamp from opening in quarter panel.
(5) Rotate socket counterclockwise one quarter turn.
(6) Pull socket from back of lamp.
(7) Pull bulb from socket.

INSTALLATION

(1) Push bulb into socket.
(2) Push socket into back of lamp.
(3) Rotate socket clockwise one quarter turn.
(4) Position tail lamp to opening in quarter panel.
(5) Install plastic nuts holding tail lamp to rear closure panel.
(6) Install trunk lining.

CENTER HIGH MOUNTED STOP LAMP (CHMSL) BULB

The center high mounted stop lamp (CHMSL) has no serviceable bulb. If the lamp does not function properly, the CHMSL assembly must be replaced.

LICENSE PLATE LAMP BULB

REMOVAL

(1) Remove screws holding license plate lamp to rear bumper fascia.
(2) Separate license plate lamp from rear fascia.
(3) Rotate socket counterclockwise one quarter turn.
(4) Pull socket from back of lamp (Fig. 8).
(5) Pull bulb from socket.

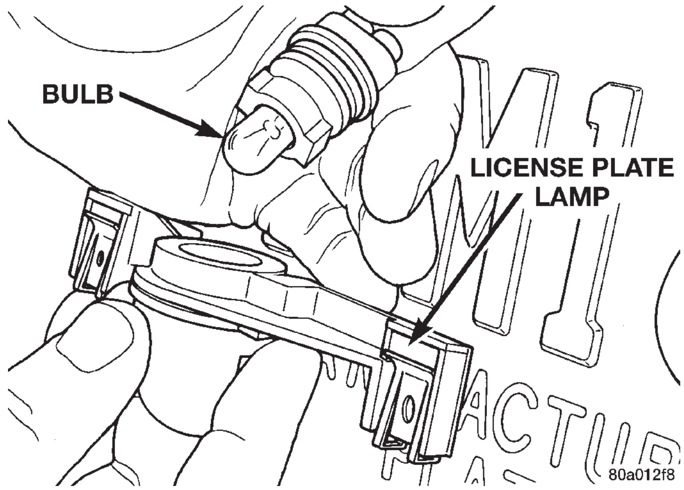


Fig. 8 License Plate Lamp Bulb

INSTALLATION

(1) Push bulb into socket.
(2) Push socket into back of lamp.
(3) Rotate socket clockwise one quarter turn.
(4) Position license plate lamp to rear fascia.
(5) Install screws holding license plate lamp to rear bumper fascia.

LAMP SERVICE

INDEX

REMOVAL AND INSTALLATION

FOG LAMP

REMOVAL

(1) Raise vehicle with suitable lifting device. Refer to Group 0, Lubrication and Maintenance, for proper procedures.

(2) Disengage wire connector from fog lamp bulb.

(3) Remove nuts holding fog lamp to front fascia.

(4) Separate fog lamp from front fascia.

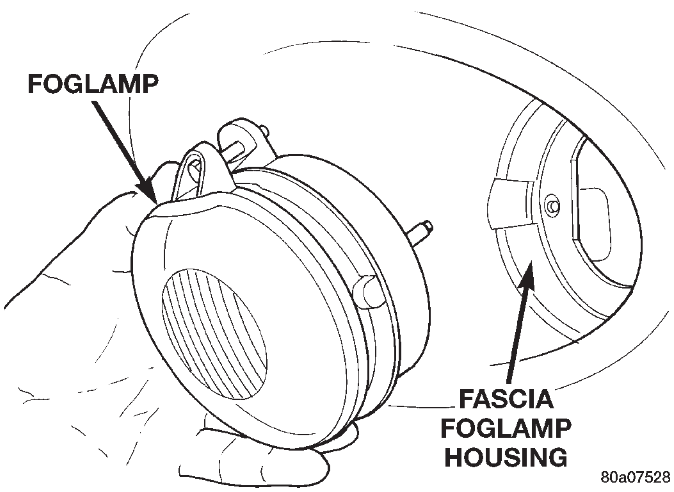


Fig. 1 Fog Lamp

INSTALLATION

(1) Position fog lamp in front fascia.

(2) Install nuts holding fog lamp to front fascia.

(3) Engage wire connector to fog lamp bulb.

HEADLAMP MODULE

The headlamp module contains the park and turn signal lamps and is serviced as an assembly.

REMOVAL

(1) Release hood latch and open hood.

(2) Remove screws holding headlamp module to radiator closure panel and headlamp adapter (Fig. 2).

(3) Separate headlamp module from radiator closure panel (Fig. 3).

(4) Disengage wire connector from headlamp bulb socket.

(5) Rotate park/turn signal lamp socket one quarter turn counterclockwise.

(6) Pull park/turn signal socket from headlamp module.

(7) Separate headlamp module from vehicle.

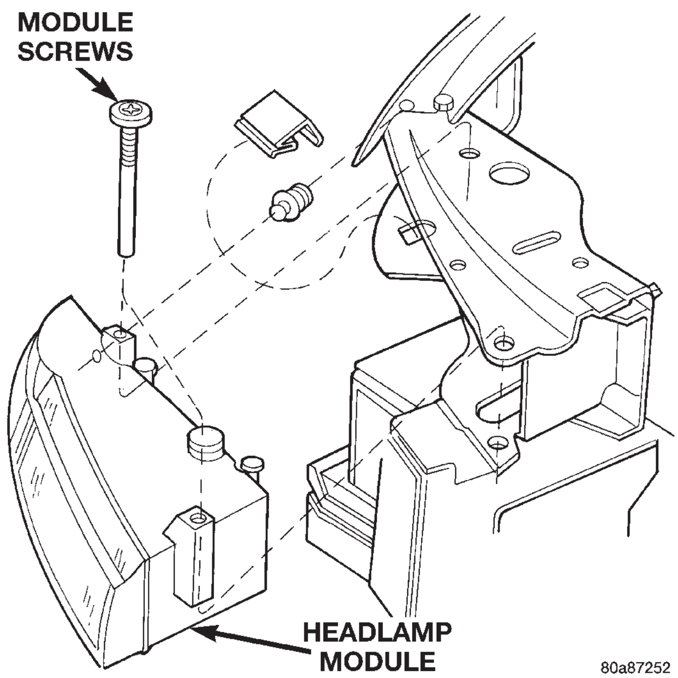


Fig. 2 Headlamp Module Screws

INSTALLATION

(1) Position headlamp module to vehicle.

(2) Push park/turn signal socket into headlamp module.

REMOVAL AND INSTALLATION (Continued)

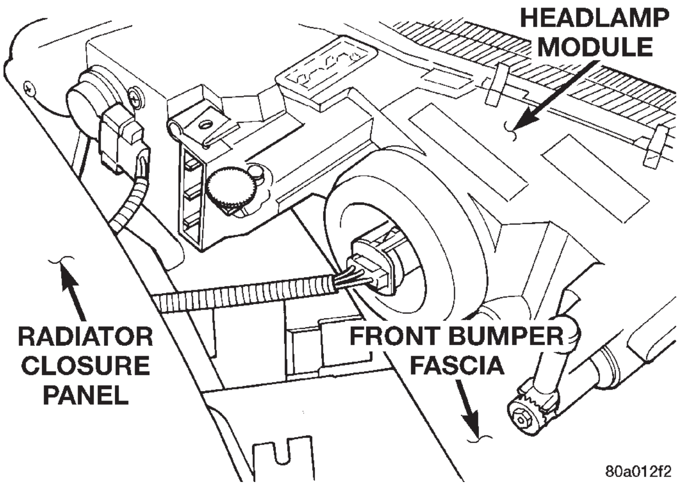


Fig. 3 Headlamp Module

(3) Rotate park/turn signal lamp socket one quarter turn clockwise.

(4) Engage wire connector to headlamp bulb socket.

(5) Position headlamp module to radiator closure panel.

(6) Install screws holding headlamp module to radiator closure panel.

TAIL/STOP, TURN SIGNAL, BACKUP AND SIDEMARKER LAMPS

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Remove trunk lining as necessary to gain access to tail lamp nuts.

(3) Remove plastic nuts holding tail lamp to rear closure panel.

(4) Separate lamp from opening in quarter panel (Fig. 4).

(5) Rotate bulb sockets counterclockwise one quarter turn.

(6) Pull bulb sockets from back of lamp.

(7) Separate tail/stop, turn signal,backup and sidemarker lamps from vehicle.

INSTALLATION

(1) Position tail/stop, turn signal, backup and sidemarker lamp to vehicle.

(2) Push bulb sockets into back of lamp.

(3) Rotate bulb sockets clockwise one quarter turn.

(4) Position lamp to opening in quarter panel.

(5) Install plastic nuts to hold tail lamp to rear closure panel in the following sequence: outboard, center, inboard.

(6) Install trunk lining.

FRONT MAP LAMP

The front map lamp is not a serviceable component. If the front map lamp does not operate properly, the rear view mirror assembly must be replaced.

GLOVE BOX LAMP

REMOVAL

(1) Release glove box latch and open glove box.

(2) Reach inside glove box to rear side of glove box lamp and release tabs holding lamp to instrument panel.

(3) Pull lamp from glove box.

(4) Disengage wire connector from lamp.

(5) Separate lamp from vehicle.

INSTALLATION

(1) Position lamp to vehicle.

(2) Engage wire connector from lamp.

(3) Push lamp into opening in glove box.

ASH RECEIVER/CUP HOLDER LAMP

REMOVAL

(1) Using a small, flat bladed pry tool inserted into slot in lamp bezel, release tab holding lamp to cubby bin.

(2) Pull bezel and lamp assembly from cubby bin.

(3) Disengage wire connector from lamp assembly.

(4) Separate lamp assembly from vehicle.

INSTALLATION

(1) Position lamp assembly to vehicle.

(2) Engage wire connector to lamp assembly.

(3) Push bezel and lamp assembly into cubby bin to engage tabs.

FLOOR CONSOLE COURTESY LAMP

REMOVAL

(1) Using a small, flat bladed tool inserted into slot in top edge of courtesy lamp, separate courtesy lamp from floor console (Fig. 5).

(2) Rotate bulb socket counterclockwise one quarter turn.

(3) Pull bulb socket from courtesy lamp (Fig. 6).

(4) Separate console courtesy lamp from vehicle.

INSTALLATION

(1) Separate console courtesy lamp from vehicle.

(2) Push bulb socket into courtesy lamp.

(3) Rotate bulb socket clockwise one quarter turn.

(4) Position lower edge of courtesy lamp to floor console.

(5) Snap courtesy lamp into floor console.

REMOVAL AND INSTALLATION (Continued)

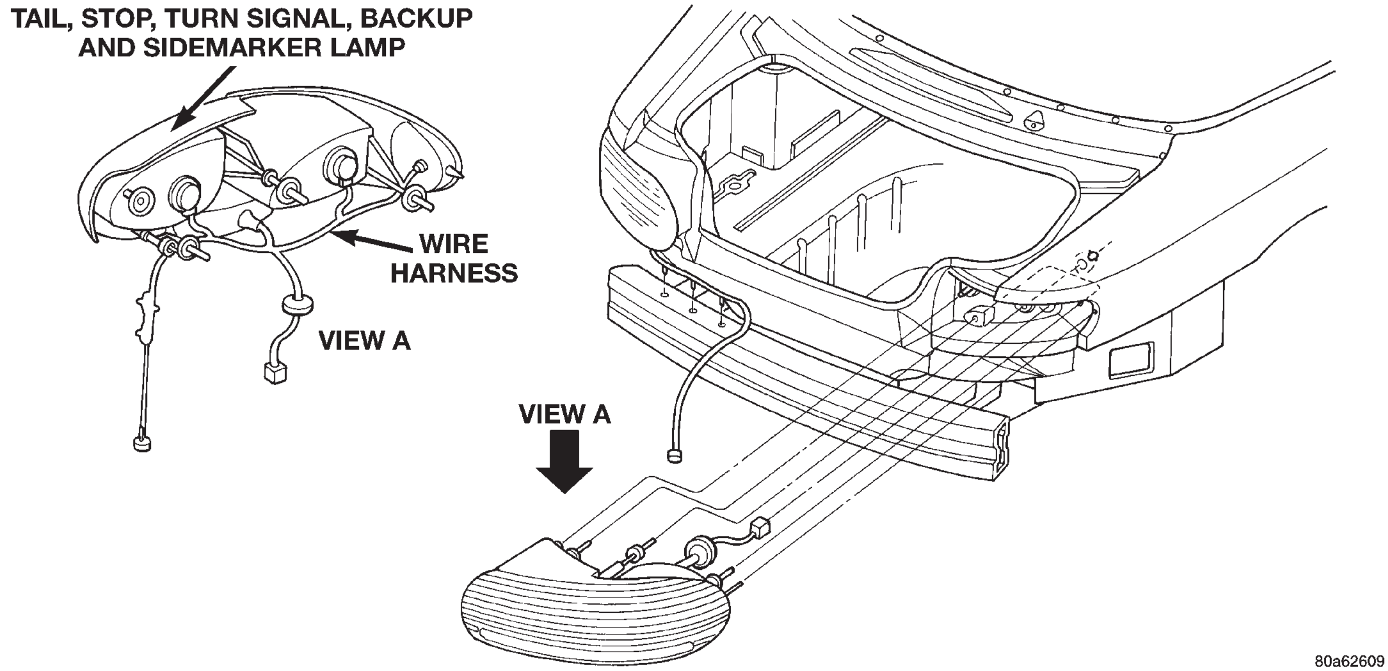


Fig. 4 Tail/Stop, Turn Signal, Backup and Side Marker Lamp

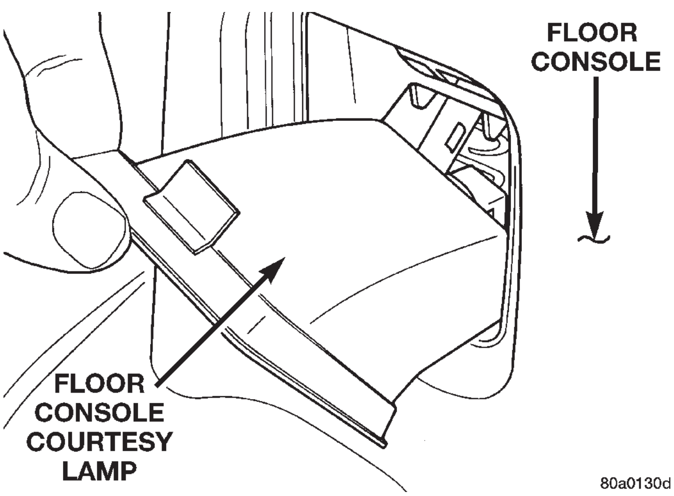


Fig. 5 Floor Console Courtesy Lamp

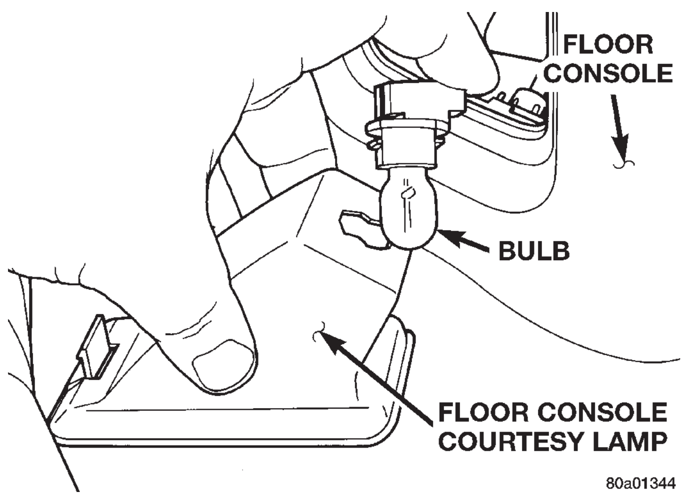


Fig. 6 Floor Console Courtesy Lamp Bulb

LIGHTED PRNDL LETTER BEZEL

REMOVAL

(1) Remove floor console. Refer to Group 23, Body, for proper procedure.

(2) Disengage wire harness connector on bottom-side of floor console.

(3) Disengage inverter for lighted PRNDL letter bezel from shifter cover.

(4) Pull bezel downward through access hole in floor console.

(5) Separate lighted PRNDL letter bezel from vehicle.

INSTALLATION

(1) Position lighted PRNDL letter bezel to vehicle.

(2) Push bezel upward through access hole in floor console.

(3) Engage inverter for lighted PRNDL letter bezel to shifter cover.

(4) Engage wire harness connector on bottom-side of floor console.

(5) Install floor console. Refer to Group 23, Body, for proper procedure.

DOOR COURTESY LAMP

REMOVAL

(1) Using a small, flat bladed tool inserted into rear edge of door courtesy lamp lens, remove lens (Fig. 7).

REMOVAL AND INSTALLATION (Continued)

(2) Pull courtesy lamp from door trim panel (Fig. 8).

(3) Disengage wire connector from courtesy lamp bulb socket.

(4) Separate courtesy lamp from vehicle.

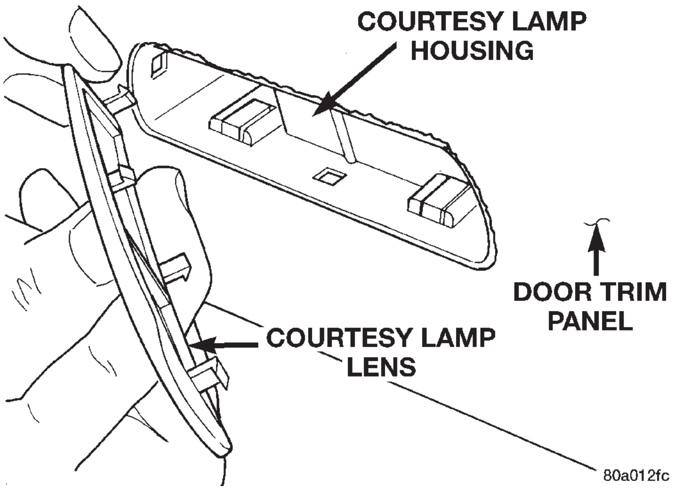


Fig. 7 Courtesy Lamp Lens

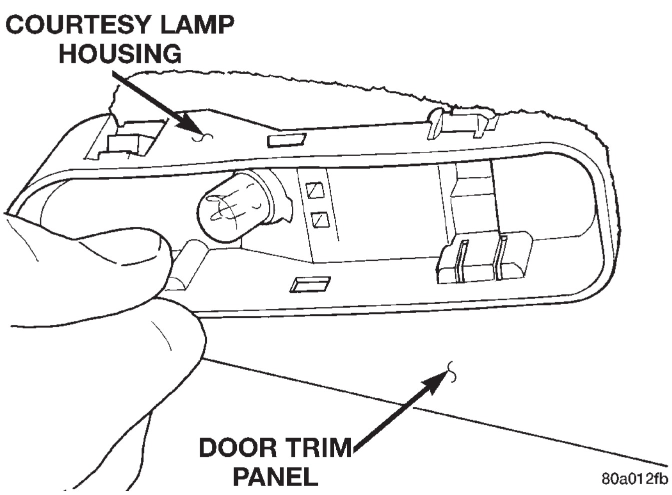


Fig. 8 Courtesy Lamp

INSTALLATION

(1) Position courtesy lamp from vehicle.

(2) Engage wire connector to courtesy lamp bulb socket.

(3) Push courtesy lamp into door trim panel (Fig. 8).

(4) Insert front edge of courtesy lamp lens to lamp housing.

(5) Snap lamp lens into lamp housing.

CENTER HIGH MOUNTED STOP LAMP (CHMSL)

REMOVAL

(1) Remove upper deck molding. Refer to Group 23, Body, for proper procedure.

(2) Remove screws holding CHMSL assembly to upper deck molding (Fig. 9).

(3) Remove trunk trim panel as necessary to disengage CHMSL wire connector.

(4) Separate CHMSL from upper deck molding.

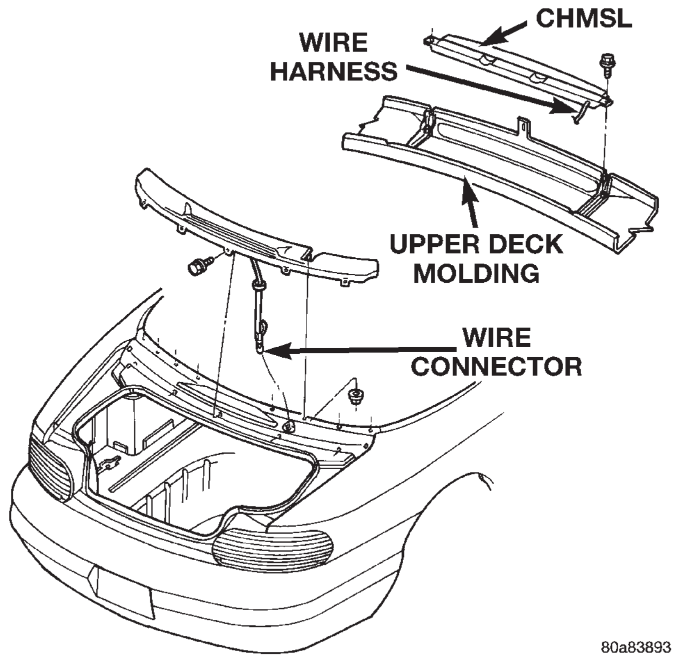


Fig. 9 Center High Mount Stop Lamp

INSTALLATION

(1) Position CHMSL to upper deck molding.

(2) Engage CHMSL wire connector and reposition trunk trim panel.

(3) Install screws holding CHMSL assembly to upper deck molding.

(4) Install upper deck molding. Refer to Group 23, Body, for proper procedure.

LICENSE PLATE LAMP

REMOVAL

(1) Remove screws holding license plate lamp to rear bumper fascia.

(2) Separate license plate lamp from rear fascia (Fig. 10).

(3) Rotate socket counterclockwise one quarter turn.

(4) Pull socket from back of lamp.

(5) Separate license plate lamp from vehicle.

INSTALLATION

(1) Position license plate lamp to vehicle.

(2) Push socket into back of lamp.

(3) Rotate socket clockwise one quarter turn.

(4) Position license plate lamp to rear fascia.

(5) Install screws holding license plate lamp to rear bumper fascia.

SPECIAL TOOLS (Continued)

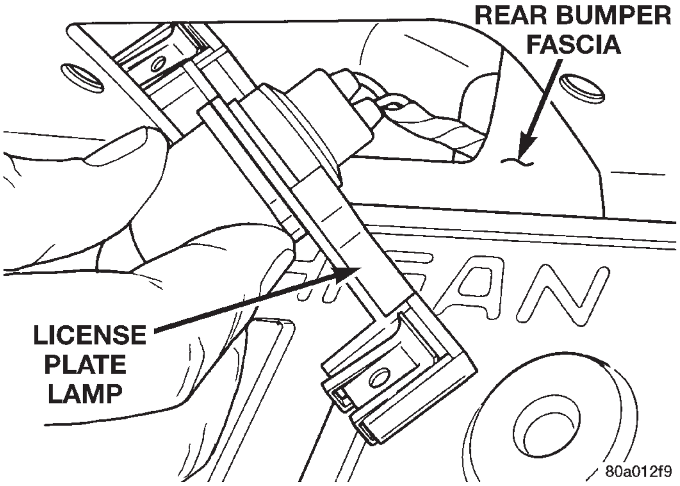
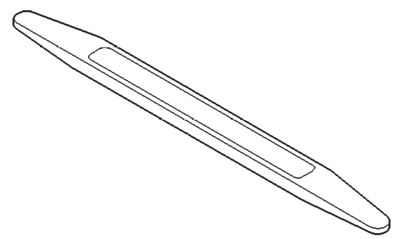


Fig. 10 License Plate Lamp

SPECIAL TOOLS

LAMP SERVICE



Trim Stick C-4755

LAMP SYSTEMS

INDEX

DESCRIPTION AND OPERATION

DAYTIME RUNNING LAMP (CANADA)

JX vehicles built for use in Canada are equipped with a Daytime Running Lamp (DRL) system. The DRL system operates the headlamps at 50% illumination with the headlamp switch OFF, park brake released and the ignition ON. The DRL system is controlled by the Daytime Running Lamp Module located on the back of the multi-function module behind the instrument panel (Fig. 1). The DRL module overrides the headlamp switch when the headlamps are turned OFF. The headlamps operate normally when the headlamps are turned ON. Refer to Group 8W, Wiring Diagrams, for component locations and circuit information.

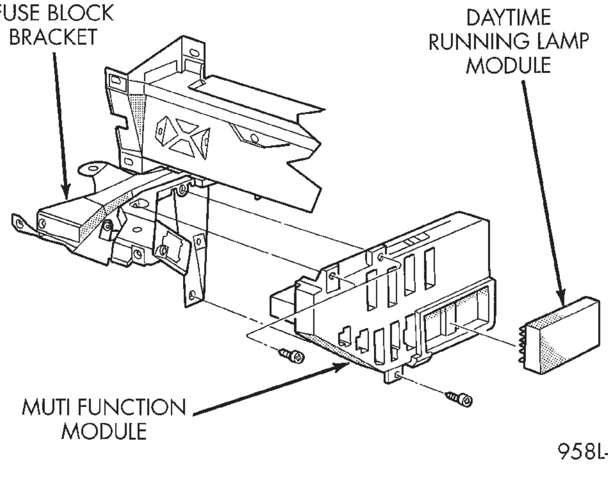


Fig. 1 Daytime Running Lamp Module

HEADLAMP TIME DELAY SYSTEM

The optional Headlamp Time Delay system is controlled by the Body Controller (BC) and a relay located in the junction block. The headlamp time delay system can be activated by turning ON the headlamps when the engine is running, turn OFF the ignition switch, then turn OFF the headlamp switch. The BC will allow the headlamps to remain ON for 90 seconds before they automatically turn off. Refer to the Owner's Manual for more information.

ILLUMINATED ENTRY

The Illuminated Entry System is available on vehicles equipped with the Remote Keyless Entry system. The Illuminated Entry System turns ON the courtesy lamps when the remote keyless entry system is activated. The Remote Keyless Entry Module and the Body Controller are used to control the system. Courtesy lamps will turn on for 30 seconds (± 1 second) and fade to OFF over a five second period.

The Illuminated Entry System also turns ON the courtesy lamps (and ignition switch lamp) when door is opened. The courtesy lamps will remain ON while the door is open, then fade to OFF 30 seconds (±1 second) after the last door is closed.

The courtesy and ignition switch lamps will fade to OFF immediately when the ignition is switched to ON.

The Illuminated Entry System cannot be activated during the 30 second (±1 second) period after the ignition switch is turned OFF. After a door is opened and closed during this 30 second period, the system will function as previously described.

When the battery voltage has been interrupted to the Illuminated Entry System, the system will not function until the remote keyless entry UNLOCK is actuated.

DIAGNOSIS AND TESTING

GENERAL LAMP SYSTEM DIAGNOSTIC PROCEDURES

Refer to Group 8W, Wiring Diagrams for component location and circuit information. Refer to the Body Systems Diagnostic Procedures Manual for more information.

DIAGNOSIS AND TESTING (Continued)

ILLUMINATED ENTRY DIAGNOSTIC PROCEDURES

When testing the system, all doors must be closed to prevent courtesy lamps from lighting. Verify that remote keyless entry system is operating properly before testing illuminated entry circuits. The body controller uses input from the remote keyless entry system to switch ON the courtesy lamps.

Refer to Group 8W, Wiring Diagrams for component location and circuit information. Refer to Body Systems Diagnostic Procedures Manual for more information.

BULB APPLICATION

INDEX

SPECIFICATIONS

GENERAL INFORMATION

The following Bulb Application Tables lists the lamp title on the left side of the column and trade number or part number on the right.

CAUTION: Do not use bulbs that have a higher candle power than the bulb listed in the Bulb Application Table. Damage to lamp can result.

CAUTION: Do not touch halogen bulbs with fingers or other oily surfaces. Bulb life will be reduced.

EXTERIOR LAMPS

Headlamp	9007
Foglamp	9006
Park/Turn Signal	3157NA
Center High Mounted Stop	921
Tail/Stop/Turn Signal	3157
Back-up	921
Side Marker	168
License Plate	168

INTERIOR LAMPS

DIMMER CONTROLLED LAMPS

Service procedures for most of the lamps in the instrument panel, instrument cluster and switches are located in Group 8E, Instrument Panel and Gauges. Some components have lamps that can only be serviced by a Authorized Service Center (ASC) after the component is removed from the vehicle. Contact local dealer for location of nearest ASC.

A/C Heater Control	37
A/C Heater ISO Symbols	LED
Ash Receiver	37
Instrument Cluster	PC194
Radio	ASC

INDICATOR LAMPS

Service procedures for most of the lamps in the instrument panel, instrument cluster and switches are located in Group 8E, Instrument Panel and Gauges.

A/C Compressor	LED
Air Bag	PC194
Anti-lock Brake	PC194
Brake Warning	PC194
Check Engine	PC194
Console Shift Indicator	LED
Engine Oil Pressure	PC194
Engine Temperature	PC194
Fog Lamp	PC161
Generator	PC194
High Beam	PC194
Low Fuel	PC194
Rear Window Defogger	LED
Seat Belt	PC194
Security Alarm	LED
Shift Indicator	VF Display
Speed Control	PC194
Turn Signal	PC194

NON-DIMMING LAMPS

Service procedures for most of the lamps in the following list can be found in Group 8L, Lamps. Some components have lamps that can only be serviced by a Authorized Service Center (ASC) after the component is removed from the vehicle. Contact local dealer for location of nearest ASC.

Door Courtesy Lamp	168
Floor Console Courtesy Lamp	906
Glove Box Lamp	194
Ignition Lock	4856321
Map Lamp	212–2
Trunk	912
Visor Vanity	6501966

RESTRAINT SYSTEM

CONTENTS

GENERAL INFORMATION

WARNINGS AND PRECAUTIONS

WARNING: THIS SYSTEM IS A SENSITIVE, COMPLEX ELECTRO–MECHANICAL UNIT. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE CABLE BEFORE BEGINNING AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION PROCEDURES. THIS WILL DISABLE THE AIRBAG SYSTEM. FAILURE TO DISCONNECT THE BATTERY COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR TWO MINUTES BEFORE REMOVING AIRBAG COMPONENTS.

DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A SOLID SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED AND COULD RESULT IN PERSONAL INJURY. WHEN CARRYING OR HANDLING AN UNDEPLOYED AIRBAG MODULE, THE TRIM SIDE OF THE AIRBAG SHOULD BE POINTING AWAY FROM THE BODY TO MINIMIZE POSSIBILITY OF INJURY IF ACCIDENTAL DEPLOYMENT OCCURS.

REPLACE AIRBAG SYSTEM COMPONENTS WITH MOPAR® REPLACEMENT PARTS. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.

WEAR SAFETY GLASSES, RUBBER GLOVES, AND LONG SLEEVED CLOTHING WHEN CLEANING POWDER RESIDUE FROM VEHICLE AFTER AIRBAG DEPLOYMENT. SODIUM HYDROXIDE POWDER RESIDUE EMITTED FROM A DEPLOYED AIRBAG CAN CAUSE SKIN IRRITATION. FLUSH AFFECTED AREA WITH COOL WATER IF IRRITATION IS EXPERIENCED. IF NASAL OR THROAT IRRITATION IS EXPERIENCED, EXIT THE VEHICLE FOR FRESH AIR UNTIL THE IRRITATION CEASES. IF IRRITATION CONTINUES, SEE A PHYSICIAN.

DO NOT USE A REPLACEMENT AIRBAG THAT IS NOT IN THE ORIGINAL PACKAGING, IMPROPER DEPLOYMENT AND PERSONAL INJURY CAN RESULT.

THE FACTORY INSTALLED FASTENERS, SCREWS AND BOLTS USED TO FASTEN AIRBAG COMPONENTS HAVE A SPECIAL COATING AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. DO NOT USE SUBSTITUTE FASTENERS, USE ONLY ORIGINAL EQUIPMENT FASTENERS LISTED IN THE PARTS CATALOG WHEN FASTENER REPLACEMENT IS REQUIRED.

NOTE: Airbags should be stored in a cool dry location away from excessive heat and static electrical activity with the fabric airbag facing UP, or a premature deployment can result.

If the Driver/Passenger Airbag Module is defective and not deployed, refer to Chrysler Corporation current return list for proper handling procedures.

DESCRIPTION AND OPERATION

AIRBAG CONTROL MODULE

The Airbag Control Module (ACM) contains the impact sensor and energy reserve capacitor. The impact sensor acts as a threshold sensitive switch that completes a circuit when an impact provides sufficient deceleration. The sensor is calibrated for the specific vehicle and reacts to the severity and direction of the impact.

The ACM monitors the system to determine the system readiness. The ACM stores sufficient energy to deploy the airbags for approximately two minutes after the battery is disconnected. The ACM contains on-board diagnostics, and illuminates the AIRBAG warning lamp in the cluster when a diagnostic trouble code occurs. The warning equipment is tested for a few seconds every time the vehicle is started.

CLOCKSPRING

The clockspring is mounted to the steering column behind the steering wheel. The clockspring is used to maintain a continuous electrical circuit between the wiring harness and the:

- Driver's airbag module
- Speed control switches
- Horn switch

The clockspring consists of a flat, ribbon like, electrically conductive tape that winds and unwinds with the steering wheel rotation.

DRIVER AND PASSENGER AIRBAG MODULE

WARNING: NEVER DISASSEMBLE THE DRIVER AIRBAG MODULE THERE ARE NO OTHER SERVICEABLE PARTS IN THE MODULE.

The Driver Airbag Module located in the center of the steering wheel and is the most visible part of the system (Fig. 1). The airbag module contains a housing in which the cushion, inflator and cover are attached to.

The driver side inflator assembly is mounted from the back of the module housing. When supplied with the proper electrical signal, the inflator assembly produces a gas and discharges it directly into the cushion. A protective cover is fitted to the front of the Driver Airbag Module, forms a decorative cover, and a horn contact area, in the center of the steering wheel. The Driver Airbag Module is mounted directly to the steering wheel.

WARNING: NEVER DISASSEMBLE THE PASSENGER AIRBAG MODULE, THERE ARE NO SERVICEABLE PARTS WITHIN THE MODULE.

The Passenger Airbag Module is located beneath the decorative cover of the instrument panel, facing the passenger seat (Fig. 1).

The passenger inflator assembly is within the module housing. The module is mounted to the instrument panel retainer and support structure. When supplied with the proper electrical signal the inflator will produce a gas and discharge it directly into the cushion. A protective cover is fitted into the instrument panel over the airbag module and forms a decorative cover.

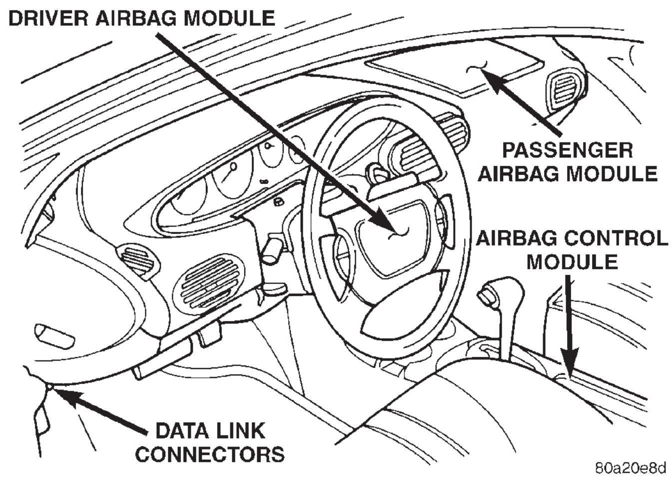


Fig. 1 Driver and Passenger Airbags

The Passenger Airbag (PAB) Module consists of:

- Inflator assembly
- Reaction canister
- Airbag Pillow
- Deployment door

STRUCTURAL SEAT BELT SYSTEM

The structural seat with integrated Retractor Integrated Height Adjuster allows the seat belts to comfortably fit a large range of occupants. The seat belts are attached to the seat instead of the body, this allows better passenger access to the rear seat.

Since the retractor is mounted on a seat back that can recline, a typical seat back g-sensor cannot be used in the retractor. Instead, a solenoid inside the retractor is used to lock and unlock the seat belt when electrically signaled by a remote g-sensor. The remote g-sensor is located inside the Seat belt Control Timer Module. The Seat Belt Control Timer Module is located under the center console. The seat retractor and solenoid is located in the seat back and is serviced as a assembly. The removal procedures are located in Group 23, Body.

When the solenoids are powered, the seat belt can be moved. When the solenoids are not powered, the seat belts can not be extracted. This is necessary to ensure that occupants are always safe, even in the case of a power loss during an accident. Whether the

DESCRIPTION AND OPERATION (Continued)

seat belts are in lock or unlock position, an occupant can always release the seat belt and it will retract.

The Seat Belt Control Timer Module controls the power to the seat belt solenoids. It supplies power continuously to the seat belts whenever the ignition key is in the RUN or ACCESSORY position. The module has two other unique functions: that of a timer and a g-sensor.

The Seat Belt Control Timer Module was designed with a timer function so that when the vehicle is not in use, the battery would not be prematurely drained. The module times out after approximately 30 minutes if no inputs are send to the module. The module will power the seat belts for a set period of time when there is a input:

- Either door ajar switch (open or closed)
- Ignition switch moved from RUN or ACCESSARY to the OFF position.

Each time one of these input occurs, the timer is reset to keep the belts powered for 30 minutes.

The G-Sensor function of the Seat Belt Control Timer Module will cut power to the seat belt whenever:

- The vehicle accelerates or decelerates at a rate greater than or equal to 0.7g in any direction.
- The vehicle is tilted to an angle greater than or equal to 45 degrees.

Input of ignition switch in the RUN or ACCESSORY position will cause the module to power the seat belts as long as the condition exists.

DIAGNOSIS AND TESTING

AIRBAG SYSTEM

(1) Connect the scan tool to the Data Link connector which is located on the left side kick panel just above the hood release.

(2) Turn the ignition key to the ON position. Exit vehicle with the scan tool. Use the latest version of the diagnostic cartridge.

(3) After checking that no one is inside the vehicle, connect the battery negative remote terminal.

(4) Using the scan tool, read and record the active diagnostic trouble code data.

(5) Read and record any stored diagnostic trouble codes.

(6) Refer to the proper Passive Restraint Diagnostic Test Manual if any diagnostic trouble codes are found in Step 4 and Step 5.

(7) Erase stored diagnostic trouble codes if there are no active diagnostic trouble codes. If problems remain, diagnostic trouble codes will not erase. Refer to the proper Passive Restraint Diagnostic Test Manual to diagnose the problem. If the airbag warning lamp either fails to light, or goes on and stays on, there is a system malfunction. Refer to the proper Passive Restraint Diagnostic Test Manual to diagnose the problem. To test the airbag warning lamp operation in the cluster only, refer to Group 8E, Instrument Panel and Systems for procedures.

STRUCTURAL SEAT BELT SYSTEM CONDITIONS

Refer to Group 8W, wiring Diagrams for circuit and pin locations.

Do Not Disconnect or Connect the module while battery is connected.

Both seat belts locked all the time

Turn the ignition switch to the ACCESSORY position to ensure power to the Seat Belt Control Timer Module is ON and will not time out.

(1) Using a voltmeter, check for battery voltage at Pin 4 and 5 of the Seat Belt Control Timer Module 13 way connector. If no voltage, go to Step 5. If OK, go to Step 4.

(2) Check fuses:

- Fuse 13 in the Power Distribution Center
- Fuse 15 in the Junction Block

If fuses are OK, go to Step 4. If not OK, replace fuse(s), if fuse blows again go to Step 3.

(3) Disconnect Seat Belt Control Timer Module connector and replace fuse, check if fuse blows. If fuse blows check circuit for shorts to ground between the module and fuse. If OK, connect module and if fuse blows check for shorts to ground between the module and the seat belt solenoid. Repair as necessary.

(4) If voltage is OK, go to Step 5. If no voltage check for an open circuit between fuse and module. Repair as necessary.

(5) Check for voltage at the seat belt solenoid under the seat. If OK, test solenoid(s). If no voltage, check for open circuit between the module and seat belt connector. If OK, replace Seat Belt Control Timer Module. If not OK, repair as necessary.

Both seat belts locked in the ignition switch OFF position when not timed out

With a door open and ensure that the timer has not timed out.

(1) Using a voltmeter, check for battery voltage at Pin 5 of the Seat Belt Control Timer Module 13 way connector. If no voltage, go to Step 2. If OK, go to Step 5.

(2) Check fuses:

- Fuse 13 in the Power Distribution Center
- Fuse 15 in the Junction Block

If fuses are OK, go to Step 4. If not OK, replace fuse(s), if fuse blows again go to Step 3.

(3) Disconnect Seat Belt Control Timer Module connector and replace fuse, check if fuse blows. If fuse blows check circuit for shorts to ground between the module and fuse. If OK, connect module and if

DIAGNOSIS AND TESTING (Continued)

fuse blows check for shorts to ground between the module and the seat belt solenoid. Repair as necessary.

(4) If voltage is OK, go to Step 5. If no voltage check for an open circuit between fuse and module. Repair as necessary.

(5) Using a ohmmeter check from the module connector, the door ajar switches and circuits for a open circuit and check for a shorted to ground circuit. If open or shorted circuit repair as necessary. If OK, replace Seat Belt Control Timer Module.

Both seat belts lock and unlock with ignition switch ON or when passenger door ajar switch activated but not when the driver door ajar switch is activated.

Using a ohmmeter, check from the module the driver door ajar switch and circuit for a open circuit and for a shorted to ground circuit. Check Pin 2 of the Seat Belt Control Timer Module to ground for continuity. If not OK, check for open or shorted circuit and repair as necessary or replace the door ajar switch. If OK, replace Seat Belt Control Timer Module.

Both seat belts lock and unlock with ignition switch ON or when driver door ajar switch activated but not when the passenger door ajar switch is activated.

Using a ohmmeter check from the module the passenger door ajar switch and circuit for a open or shorted circuit. Check Pin 3 of the Seat Belt Control Timer Module to ground for continuity. If not OK, check for open or shorted circuit and repair as necessary or replace the door ajar switch. If OK, replace Seat Belt Control Timer Module.

Driver seat belt locked, passenger seat belt unlock.

Using a ohmmeter, check the seat belt solenoid from Pin 7 of the Seat Belt Control Timer Module to ground for a reading of 50 to 60 ohms. If OK, replace Seat Belt Control Timer Module. If not OK, check for open or shorted circuit and repair as necessary or replace the seat belt solenoid.

Passenger seat belt locked, driver seat belt unlock.

Using a ohmmeter, check the seat belt solenoid from Pin 8 of the Seat Belt Control Timer Module to ground for a reading of 50 to 60 ohms. If OK, replace Seat Belt Control Timer Module. If not OK, check for open or shorted circuit and repair as necessary or replace the seat belt solenoid.

SERVICE PROCEDURES

CLEANUP PROCEDURE

Roll or fold the Passenger Airbag Module towards the instrument panel surface and close the door over the folded bag. Then tape the door shut.

Use a vacuum cleaner to remove any residual powder from the vehicle interior. Work from the outside in to avoid kneeling or sitting in a contaminated area. Vacuum the heater and A/C outlets as well (Fig. 2). If the heater or air conditioner was in RECIRC mode at time of airbag deployment, operate blower motor on low speed and vacuum powder residue expelled from the heater and A/C outlets. Multiple vacuum cleaning may to necessary to decontaminate the interior of the vehicle.

NOTE: Dispose deployed airbag properly, contact dealer or government agency for disposal recommendations.

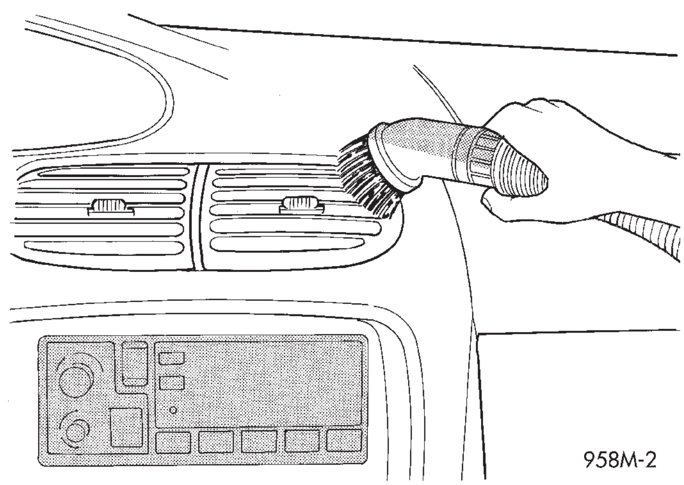


Fig. 2 Vacuum Heater and A/C Outlets

SERVICE OF DEPLOYED AIRBAG MODULE

DRIVER AIRBAG

After a Driver Airbag Module has been deployed:
- Driver Airbag Module
- Steering wheel
- Clockspring assembly

The component above must be replaced because they cannot be reused. Replace any other driver airbag system components if damaged.

PASSENGER AIRBAG

After a Passenger Airbag Module has been deployed:
- Passenger Airbag Module
- Instrument panel plastic retainer and steel reinforcement assembly

The components above must be replaced because of visible or non visible structural damage.

SERVICE PROCEDURES (Continued)

The glove box, top cover, cluster hood, steering column cover, right trim bezel and/or end cap, or any other components should be checked and replaced if damaged.

HANDLING AIRBAG MODULE

DEPLOYED MODULE

The vehicle interior may contain a very small amount of sodium hydroxide powder, a by-product of airbag deployment. Sodium hydroxide powder can irritate the skin, eyes, nose and throat. Wear safety glasses, rubber gloves, and long sleeved clothing when cleaning any of the powder residue from the vehicle.

If you find that the cleanup is irritating your skin, run cool water over the affected area. Also, if you experience nasal or throat irritation, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.

UNDEPLOYED

The airbag modules must be stored in its original special container until used for service. At no time should a source of electricity be permitted near the inflator on the back of an airbag module. When carrying or handling an undeployed airbag module, the trim side of the airbag should be pointing away from the body to minimize possibility of injury if accidental deployment occurs. Do not place undeployed airbag face down on a solid surface, the airbag will propel into the air if accidentally deployment occurs.

MAINTENANCE INSPECTION

Check the airbag warning lamp for proper operation as follows:

(1) Turn the ignition switch to the ON position. The airbag warning lamp should illuminate. If does not, test the system using a scan tool and Passive Restraint System Diagnostic Procedures Manual. Repair as required.

(2) The airbag warning lamp lights, but fails to go out after ten seconds. Test the system using a scan tool and Passive Restraint System Diagnostic Procedures Manual. Repair as required.

(3) Erasing stored Diagnostic Trouble Codes is not required.

REMOVAL AND INSTALLATION

AIRBAG CONTROL MODULE (ACM)

WARNING: REPLACE AIRBAG SYSTEM COMPONENTS WITH CHRYSLER MOPAR® SPECIFIED REPLACEMENT PARTS. SUBSTITUTE PARTS MAY VISUALLY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.

THE ACM CONTAINS AN IMPACT SENSOR THAT ENABLES THE SYSTEM TO DEPLOY THE AIRBAGS. TO AVOID ACCIDENTAL DEPLOYMENT, NEVER CONNECT ACM ELECTRICALLY TO THE SYSTEM WHILE VEHICLE BATTERY IS CONNECTED.

REMOVAL

(1) Disconnect and isolate the battery negative remote cable (Fig. 3).

(2) Raise parking brake lever as high as possible.

(3) Loosen set screw on front of shifter knob and remove shift lever knob.

(4) Remove plastic plunger rod from shifter lever.

(5) Remove lighted PRNDL letter bezel.

(6) Remove screws next to floor shifter and in console storage compartment, holding floor console to the brackets on the floor pan.

(7) Disconnect wire connector for floor console accessories at floor pan.

(8) Separate console from vehicle.

(9) Remove the park brake lever assembly, refer to Group 5 Brakes, for Park Brake Lever Removal (Fig. 4).

(10) Disconnect wire harness connector from the Airbag Control Module.

(11) Remove four module mounting nuts and remove module.

INSTALLATION

CAUTION: USE SUPPLIED NUTS ONLY

(1) Install ACM, position ACM (arrow pointing forward) on center tunnel area mounting studs. Attach the two rear mounting nuts and tighten to 14 to 19 N·m (125 to 170 in. lbs.) torque.

(2) Position console in vehicle.

(3) Verify that the rear locator pin on the bottom of the storage bin is engaged to the slot in the body bracket.

(4) Connect the wire connector for the floor console accessories at floor pan.

(5) Install lighted PRNDL letter bezel.

(6) Install plastic plunger rod to shifter lever.

(7) Install shift lever knob and tighten set screw on front of shifter knob.

(8) Do not connect battery negative remote cable. Refer above to Diagnosis and Testing for Airbag System Test procedures.

REMOVAL AND INSTALLATION (Continued)

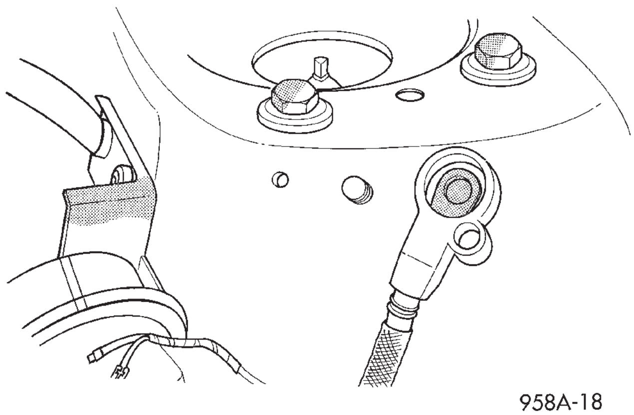


Fig. 3 Disconnect Battery Negative Remote Cable

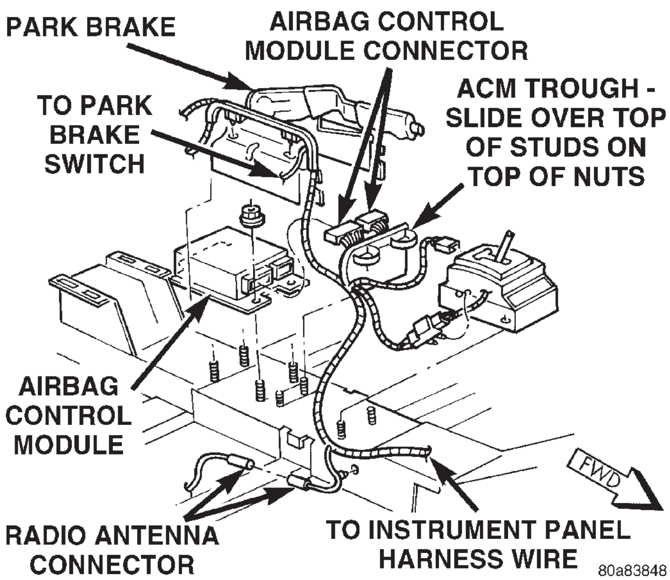


Fig. 4 Airbag Control Module

CLOCKSPRING

REMOVAL

When removing a deployed module, rubber gloves, eye protection and long sleeve shirt should be worn, as there may be deposits on the surface which could irritate the skin and eyes.

(1) Disconnect and isolate the battery negative remote cable (Fig. 3).

(2) Remove the two steering column lower cover attaching screws. Remove upper cover.

(3) Remove the Driver Airbag Module. Refer to Driver Airbag Module Removal and Installation for proper procedures.

(4) Remove the speed control switch screws from back of the steering wheel. Pull the switch pods out and disconnect the wires.

(5) Remove the steering wheel. Refer to Steering Wheel Removal and Installation for proper procedures. Carefully feed all wires through the steering wheel armature to avoid damaging wires. When replacing a deployed Driver Airbag Module, a new clockspring must be installed (Fig. 5).

(6) Remove the multi-function switch. Disconnect the natural 3-way and the yellow 2-way connectors from back side of the clockspring.

(7) Remove the clockspring by lifting the top locking tab up slightly to guide it over the lock housing. The clockspring cannot be serviced.

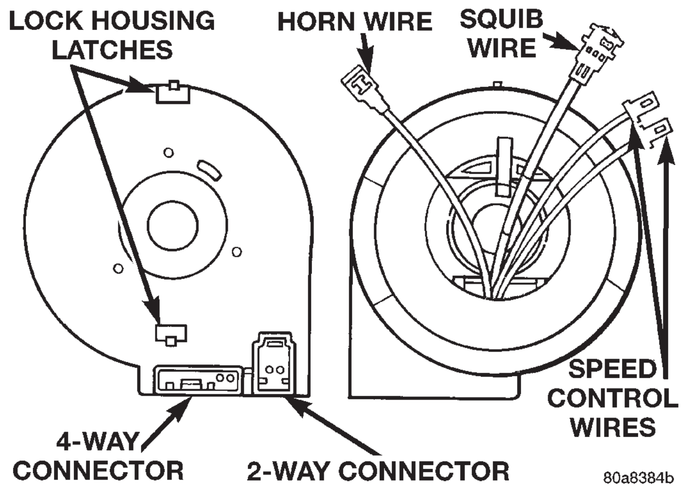


Fig. 5 Clockspring

INSTALLATION

(1) Adjust the steering wheel so that the tires are in a straight ahead position.

(2) Ensure that the clockspring is centered by using the yellow indicator in the centering window. Refer to Clockspring Centering Procedure.

(3) Locate the clockspring on the lock housing and gently push into place. Connect the natural 3-way and the yellow 2-way connectors to the back side of the clockspring.

(4) Install the multi-function switch and tighten to 1.5 to 2.5 N·m (14 to 22 in. lbs.) torque.

(5) Install the steering column shrouds and tighten to 1.7 to 2.3 N·m (15 to 20 in. lbs.) torque.

(6) Carefully route the wires through the hole in the steering wheel armature. Install steering wheel and Tighten to 61 N·m (45 ft. lbs.) torque.

(7) Route the speed control wires under the horn mechanism and through the speed control switch pockets. Connect speed control wires to switches and install switches. Tighten bolts to 0.7 to 2.7 N·m (6 to 24 in. lbs.) torque.

(8) Connect the horn wire.

(9) Connect the yellow airbag lead to the airbag module and push secondary latch into place (Fig. 5). Check that the wires do not get pinched during installation.

REMOVAL AND INSTALLATION (Continued)

(10) Install the Driver Airbag Module bolts and tighten to 10 to 11 N·m (90 to 100 in. lbs.) torque. Tighten the left side first.

(11) Install the steering column cover shrouds.

(12) Do not connect battery negative remote cable. Refer to Diagnosis and Testing for Airbag System Test procedures.

DRIVER AIRBAG MODULE

REMOVAL

WARNING: DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION PROCEDURE. THIS WILL DISABLE THE AIRBAG SYSTEM. FAILURE TO DISCONNECT BATTERY COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR 2 MINUTES BEFORE REMOVING ANY AIRBAG COMPONENTS.

When removing a deployed module, rubber gloves, eye protection, and long sleeves should be worn, as there may be deposits on the surface that could irritate the skin and eyes.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the speed control switches or covers from steering wheel back shroud and disconnect the wires.

(3) Remove two bolts attaching the Driver Airbag Module from the sides of steering wheel (Fig. 6).

(4) Lift module and disconnect the airbag squib wire connector and the horn wire.

(5) Remove the Driver Airbag Module.

(6) When replacing a deployed Driver Airbag Module, the clockspring must also be replaced. Refer to Clockspring Removal and Installation for the proper procedure.

INSTALLATION

For installation, reverse the above procedures.

(1) Connect the squib wire to the Driver Airbag Module. Make the airbag connection by pressing straight in on the connector. The connector should be fully seated. Feel for positive snap to ensure a positive connection.

(2) Connect the horn wire.

(3) Install two bolts and tighten to 10 to 11 N·m (90 to 100 in. lbs.) torque.

(4) Install covers to the steering wheel back shroud or connect the wire connectors to the speed control switches and install switches. Tighten fastener to 2 N·m (20 in. lbs.) torque.

(5) Do not connect the battery negative cable. Refer to Diagnosis and Testing for Airbag System Test procedures.

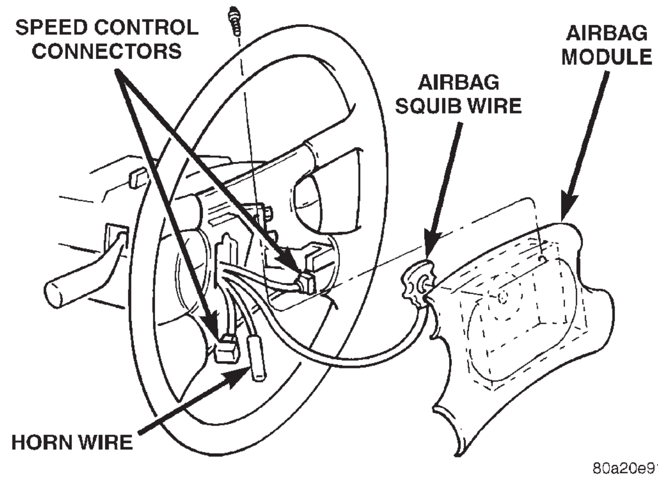


Fig. 6 Driver Airbag Module

PASSENGER AIRBAG MODULE

DEPLOYED MODULE

When removing a deployed Passenger Airbag Module:

- Rubber gloves
- Eye protection
- Long sleeves should be worn.

There may be deposits on the surface which could irritate the skin and eyes.

REMOVAL

(1) Disconnect and isolate the battery negative remote cable (Fig. 3).

(2) Open both vehicle front doors. Remove left end cover by pulling outboard. Remove right end cover by pulling rearward (Fig. 7).

(3) Remove the transmission range indicator bezel from floor console. Use care not to mar the bezel or console.

(4) Remove the floor center console. Remove two mounting screws in the front and two mounting screws under the decorative caps in the rear.

(5) Disconnect Airbag Control Module (ACM).

(6) Remove the instrument cluster hood.

(a) Remove two screws along side of the radio.

(b) Remove two screws below the HVAC control.

(c) Remove the screw at left end of the panel.

(d) Pull hood rearward to disengage the eight clips.

(7) Remove two cubby bin screws and remove.

(8) Remove five knee blocker mounting screws.

(9) Open glove box door and press the sidewalls inboard to lower door from panel to access forward floor console.

REMOVAL AND INSTALLATION (Continued)

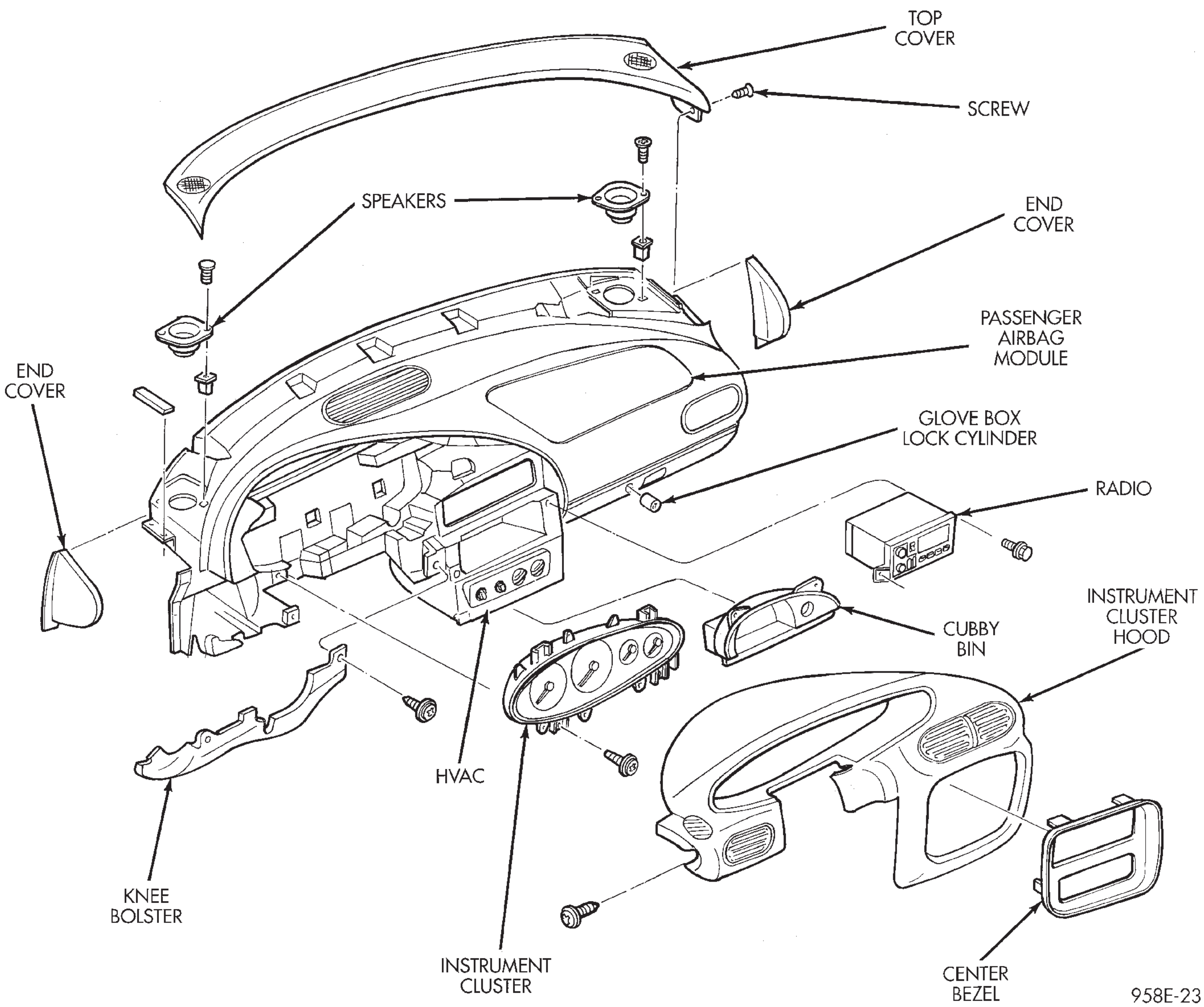


Fig. 7 Instrument Panel Components

(10) Remove the forward floor console nine attaching screws and one push pin at forward driver's side.

(11) Pull the driver's under panel silencer outboard off the distribution duct.

(12) Remove the instrument panel top cover attaching screw on passenger side.

(a) Starting from right to the left side. Lift the right rear edge of top cover to disengage the clips along the rear edge. Do not use a nylon trim stick, to avoid marring cover or panel.

(b) Lift rear edge and pull the top cover rearward disengaging clips and remove cover.

(13) Remove the HVAC control attaching screws.

(14) Remove the radio. Access and remove the three HVAC attaching screws to duct and panel. Remove the three HVAC attaching bolts from the cross-car beam.

(15) Close the glove box door.

(16) Remove five screws attaching panel retainer to plenum.

(17) Remove the steering column attaching bolts.

(18) Disconnect the engine and body wire harness from Junction Block/BCM.

(19) Remove the fasteners:

- Four at the left end and three at the right end of the cross car beam
- Two at the steering column plenum
- One at the glove box hinge to cowl
- Two at the center support to the floor pan bracket

(20) Lift up the instrument panel and move it rearward to remove.

(21) After removal of the instrument panel disconnect Driver Airbag Module wire connector.

(22) Remove the six Driver Airbag Module fasteners and remove the airbag module.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

For installation, reverse the above procedures.

(1) Remove all of the instrument panel components that are not damaged and replace any components that are damaged.

(2) Use a new instrument panel pad.

(3) Install all of the components.

(4) Install a new Passenger Airbag Module and tighten nuts to 11 N·m (100 in. lbs.) and screws to 2 N·m (20 in. lbs.) torque. Do not connect battery negative remote cable. Refer Diagnosis and Testing for Airbag System Test procedures.

UNDEPLOYED MODULE

REMOVAL

When removing a module for any reason other than DEPLOYMENT.

(1) Disconnect and isolate the battery negative remote cable (Fig. 3).

(2) Open and lower glove box fully to gain access to Passenger Airbag Module (PAB) attaching screws inside of the glove box (Fig. 8). Glove box removal not required.

(3) Disconnect wire connector from the Passenger Airbag Module.

(4) Remove the four nuts and two screws attaching airbag assembly to the instrument panel collar.

(5) Lift Passenger Airbag Module up and out of panel cavity.

INSTALLATION

For installation, reverse the above procedures. Install new Passenger Airbag Module and tighten nuts to 11 N·m (100 in. lbs.) and screws to 2 N·m (20 in. lbs.) torque. Do not connect battery negative remote cable. Refer to Diagnosis and Testing for Airbag System Test procedures.

SEAT BELT CONTROL TIMER MODULE

REMOVAL

(1) Raise parking brake lever as high as possible.

(2) Loosen set screw on front of shifter knob and remove shift lever knob.

(3) Remove plastic plunger rod from shifter lever.

(4) Remove cap covering screw head near shifter lever.

(5) Remove lighted PRNDL bezel.

(6) Remove screws next to floor shifter and in console storage compartment, holding floor console to the brackets on the floor pan.

(7) Disconnect wire connector for floor console accessories at floor pan.

(8) Separate console from vehicle.

(9) Remove the two mounting nuts from the Seat Belt Control Timer Module.

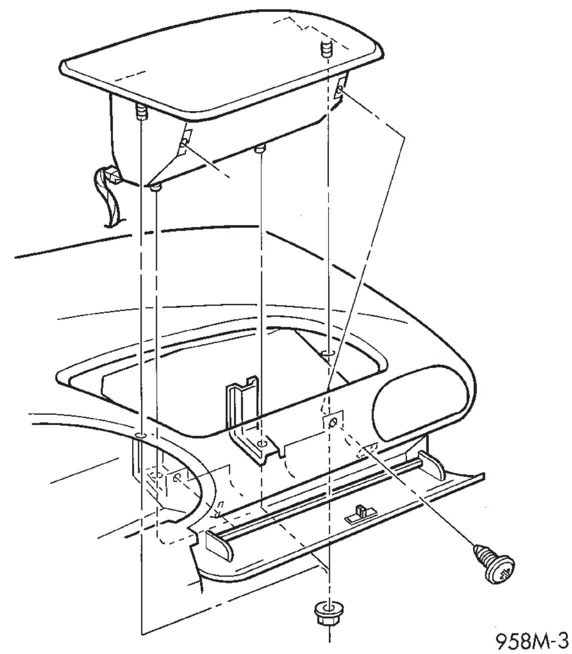


Fig. 8 Passenger Airbag Removal

(10) Remove battery power before removing the wire harness connector from the module and remove module (Fig. 9).

INSTALLATION

CAUTION: USE SUPPLIED NUTS ONLY

(1) Install the module and tighten the mounting nuts to the proper torque.

(2) Position console in vehicle.

(3) Verify that the rear locator pin on the bottom of the storage bin is engaged to the slot in the body bracket.

(4) Connect the wire connector for the floor console accessories at floor pan.

(5) Install lighted PRNDL letter bezel.

(6) Install cap to cover screw head near shifter lever.

(7) Install plastic plunger rod to shifter lever.

(8) Install shift lever knob and tighten set screw on front of shifter knob.

REMOVAL AND INSTALLATION (Continued)

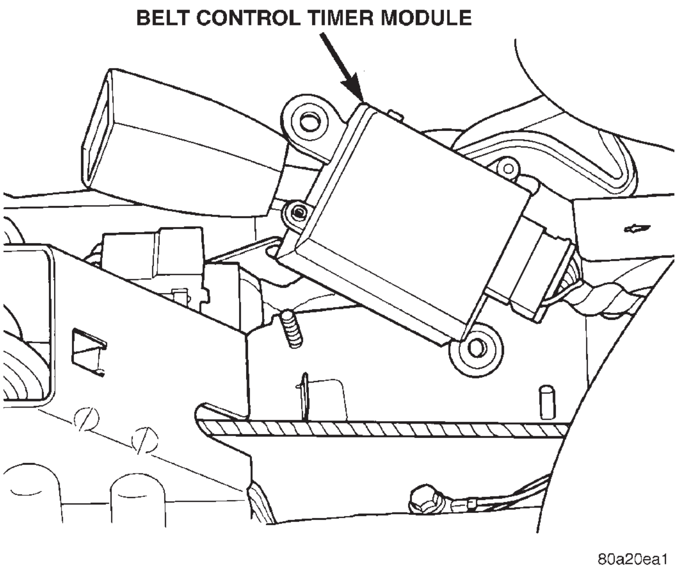


Fig. 9

STEERING WHEEL

WARNING: DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION PROCEDURE. THIS WILL DISABLE THE AIRBAG SYSTEM. FAILURE TO DISCONNECT BATTERY COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR 2 MINUTES BEFORE REMOVING ANY AIRBAG COMPONENTS.

REMOVAL

(1) Adjust the steering wheel so that the tires are in the straight ahead position then:

- Rotate the steering wheel half turn (180 degrees) to the right (clockwise)
- Lock column with the ignition cylinder lock

(2) Disconnect and isolate the battery negative cable.

(3) Remove the speed control switches and disconnect the wire connectors or covers.

(4) Remove the Driver Airbag Module attaching bolts from the back of steering wheel.

(5) Lift module and disconnect the airbag and horn wire connectors.

(6) Remove steering wheel retaining nut.

(7) Remove the steering wheel with a steering wheel puller. While removing the steering wheel take care to feed the wires gently through the holes in the clockspring armature.

INSTALLATION

(1) Confirm that:

- The steering wheel position is a half turn (180 degrees) to the right (clockwise)
- The column is locked with the ignition cylinder lock.
- Check that the turn signal stalk is in the neutral position

(2) Install the steering wheel ensuring the flats on hub align with the clockspring. Pull the horn lead, airbag and speed control leads through the larger slot. Ensure leads do not get pinched under the steering wheel.

(3) Install the steering wheel retaining nut, and tighten it to 61 N·m (45 ft. lbs.) torque.

(4) Install the airbag module. Refer to Driver Airbag Module Removal and Installation for proper procedures.

(5) Do not connect the battery negative cable. Refer to Diagnosis and Testing for Airbag System Test procedures.

ADJUSTMENTS

CLOCKSPRING CENTERING PROCEDURE

If the rotating tape within the clockspring is not positioned properly with the steering wheel and the front wheels, the clockspring may fail during use. The clockspring is centered when yellow appears in the centering window and the arrow on the rotor points to the window. If clockspring is not centered, the following procedure MUST BE USED to center the clockspring:

(1) To center the clockspring, with steering wheel removed, depress the two plastic locking pins to disengage the mechanism. Rotate clockspring until yellow appears in the centering window.

(2) The arrow on the rotor will be pointing at the window if the clockspring is centered. Release locking pins to engage locking mechanism.

(3) For installation, refer to Clockspring Installation. Do not connect the battery negative remote cable. Refer to Diagnosis and Testing for Airbag System Test procedures.

ELECTRICALLY HEATED SYSTEMS

CONTENTS

DESCRIPTION AND OPERATION

INTRODUCTION

For proper operation of the Rear Window Defogger system refer to the Owner's Manual.

The system consists of a rear glass with two vertical bus bars and a series of electrically connected grid lines on the inside surface (Fig. 1). The control switch is located in the HVAC Control Module. The relay is located in the junction block. The timer is located in the Body Control Module (BCM).

Circuit protection for heated grid is provided by:

- Fuse 12 (EBL) located in the power distribution center
- Rear window defogger relay (EBL) located in the Junction Block

When the button is depress to the ON position, current is directed to the rear defogger grid lines. A yellow indicator within the center of the button will illuminate while the defogger is ON. The heated grid lines will heat the rear glass and clear the window surface of fog or frost.

CAUTION: Grid lines can be damaged or scraped off with sharp instruments, care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

HVAC CONTROL MODULE

The rear window control switch and circuit are integrated into the HVAC control module (Fig. 2). When actuating the switch it sends a ground signal to the Body Control Module (BCM). The BCM actuates the relay allowing current to flow through the grid lines for ten minutes upon initial actuation. Then 5 minutes with each subsequent actuation or until either the switch or ignition is turned off. An indicating lamp illuminates the rear window defogger switch.

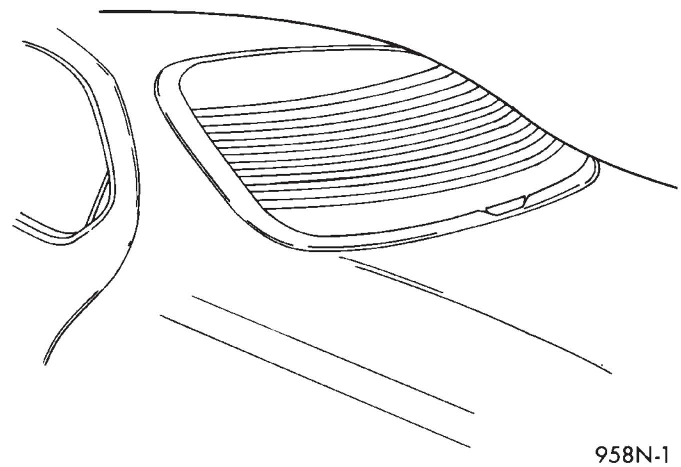


Fig. 1 Rear Window Defogger

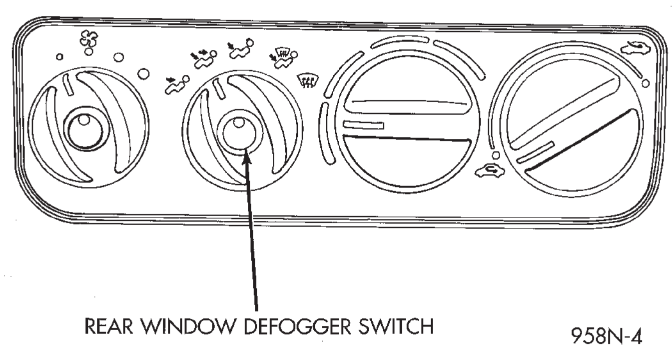


Fig. 2 HVAC Control Module

DIAGNOSIS AND TESTING

SYSTEM TEST

Electrically heated rear window defogger operation can be checked in vehicle in the following manner:

(1) Turn ignition switch to the ON position.

(2) Make sure defogger switch is OFF.

(3) Remove the battery negative remote cable from the terminal. Using a ammeter, connect the ammeter is series between the battery cable and the remote terminal. Turn the Defogger control switch ON, a distinct increase in amperage draw should be noted.

(4) The rear window defogger operation can be checked by feeling the glass. A distinct difference in temperature between the grid lines and adjacent clear glass can be detected in 3 to 4 minutes of operation.

(5) Using a DC voltmeter (Fig. 3) contact terminal B with the negative lead, and terminal A with the positive lead. The voltmeter should read 10-14 volts.

(6) Step 3, Step 4, and Step 5 above will confirm system operation. Indicator light illumination means that there is power available at the output of the relay only, and does not necessarily verify system operation.

(7) If turning the switch ON produced no distinct current draw on the ammeter the problem should be isolated in the following manner:

(a) Confirm the ignition switch is ON.

(b) Ensure that the heated rear glass feed wire is connected to the terminal or pigtail and that the ground wire is in fact grounded.

(c) Ensure that fuse 12 (EBL) in the Power Distribution Center is OK.

(8) When the above steps have been completed and the system is still inoperative, one or more of the following is defective:

(a) Control switch in the HVAC control module

(b) Rear window defogger relay (EBL) in the Junction Block

(c) Timer circuit in the Body Control Module

(d) Rear window grid lines, all grid lines would have to be broken or one of the feed wires are not connected for the system to be inoperative.

(9) If depressing the switch button ON produces severe voltmeter deflection, the circuit should be closely checked for a shorting condition.

(10) If the system operation has been verified but indicator bulb does not light, check fuse 6 in the junction block. If not OK, replace as necessary. If OK, test the HVAC control module.

(11) For detailed wiring information, refer to group 8W, Wiring Diagrams.

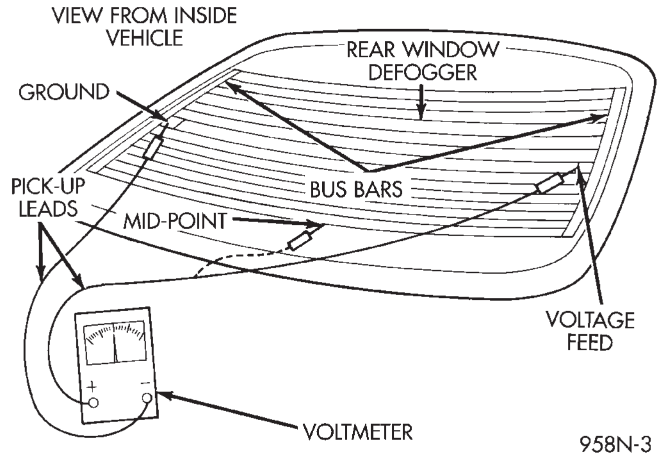


Fig. 3 Grid Line Test

GRID LINES

The horizontal grid lines and vertical bus bar lines printed and fired on inside surface of rear window glass (Fig. 3) comprise an electrical parallel circuit. The electrically conductive lines are composed of a silver-ceramic material which when fired on glass becomes bonded to the glass and is highly resistant to abrasion. It is possible, however, that a break may occur in an individual grid line resulting in no current flow through the line. To detect breaks in grid lines the following procedure is required:

(1) Turn ignition switch to the ON position. Depress the control switch button to ON position. The indicator light should come on.

(2) Using a DC voltmeter with 0-15 volt range, contact terminal B with negative lead of voltmeter. With positive lead of voltmeter, contact terminal A (Fig. 3). The voltmeter should read 10-14 volts. A lower voltage reading indicates a poor ground connection.

(3) Connect the negative lead of voltmeter to a good body ground point. The voltage reading should not change.

(4) Connect negative lead of voltmeter to terminal B and touch each grid line at Mid-Point with Positive lead. A reading of approximately 6 volts indicates a line is good. A reading of 0 volts indicates a break in line between Mid-Point C and terminal A. A reading of 10-14 volts indicates a break between Mid-Point C and terminal B. Move toward break and voltage will change as soon as break is crossed (Fig. 3). Refer to Group 8W, Wiring Diagrams for circuit information.

HVAC CONTROL MODULE

The control switch and timer circuit may be tested in the vehicle with or without scan tool (DRB).

TESTING WITH SCAN TOOL

If using the scan tool, refer to the proper Body Diagnostic Procedures Manual.

TESTING WITHOUT SCAN TOOL

DIAGNOSIS AND TESTING (Continued)

(1) Remove the control switch from console and do not disconnect control switch (Fig. 4).

(2) Using a ohmmeter, check leads between Pins 5 and 8 of the 8-way connector. Depress the rear window defogger button and the resistance reading should be 500 to 520 ohms. If not OK, replace HVAC. If OK, check:

- Rear window relay (EBL)
- Blown fuse
- Cut wire
- Poor ground
- Poor connection
- Defective BCM
- Bulkhead connector inoperative

Refer to Group 8W, Wiring Diagrams.

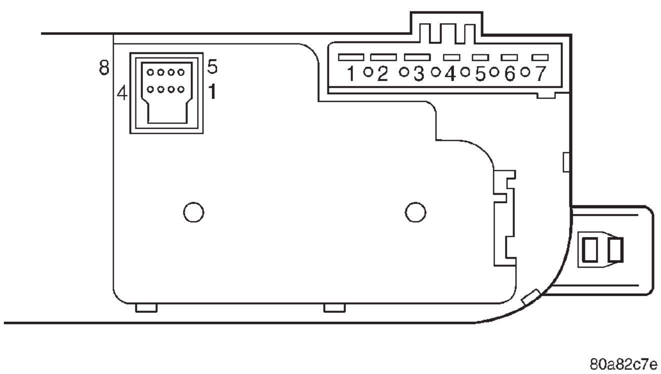


Fig. 4 HVAC Control Module Connectors

REAR WINDOW DEFOGGER RELAY

(1) Check fuses.

(a) Fuse 15 in the Junction Block

(b) Fuse 8 and 12 in the Power Distribution Center.

(2) Remove the rear window defogger relay (EBL) from the Junction Block (Fig. 5).

(3) Using voltmeter, test battery voltage:

(a) Test rear window defogger relay terminals 11 for battery voltage. If voltage is OK, go to Step 2. If voltage is not OK, repair A4 circuit.

(b) Test rear window defogger relay terminals 15 for battery voltage. If voltage is OK, go to Step 3. If voltage is not OK, repair circuit between terminal 15 and fuse 15 in the Junction Block.

(c) Use a known good relay. If not OK, repair circuits as necessary. Refer to Group 8W, Wiring Diagrams. If OK, replace relay.

SERVICE PROCEDURES

REPAIR GRID LINES, TERMINALS AND PIGTAILS

WARNING: REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION.

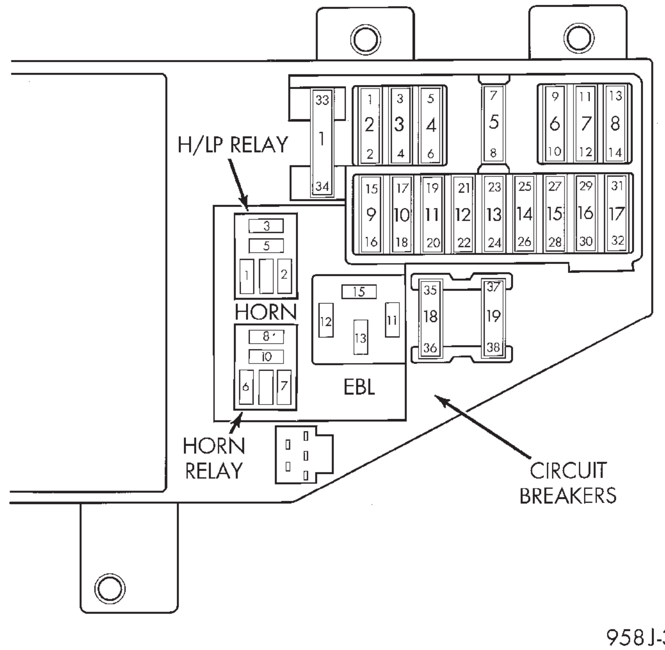


Fig. 5 Rear Window Defogger Relay (EBL)

THE KIT CONTAINS EPOXY RESIN AND AMINE TYPE HARDENER AND HARMFUL:

- **DO NOT TAKE INTERNALLY, IF SWALLOWED INDUCE VOMITING AND CALL A PHYSICIAN IMMEDIATELY.**
- **IF CONTACTED WITH SKIN, WASH AFFECTED AREAS WITH SOAP AND WATER.**
- **IF CONTACTED WITH EYES, FLUSH WITH PLENTY OF WATER.**

USE WITH ADEQUATE VENTILATION.

DO NOT USE NEAR FIRE OR OPEN FLAME THE CONTENTS CONTAIN FLAMMABLE SOLVENTS.

KEEP OUT OF REACH OF CHILDREN.

The repair of the grid lines or the terminal is possible using the Mopar® Repair Package or equivalent.

(1) Mask repair area so conductive epoxy can be extended onto the line or the bus bar (Fig. 6).

(2) Follow instructions in repair kit for preparing damaged area.

(3) Remove package separator clamp and mix plastic conductive epoxy thoroughly. Fold in half and cut center corner to dispense epoxy.

(4) For grid line, mark off area to be repaired with masking tape or a template (Fig. 6).

(5) Apply conductive epoxy through slit in masking tape. Overlap both ends of the break by 19 mm (3/4 inch).

(6) For a terminal or pigtail replacement, mask adjacent areas so epoxy can be extended onto line as well as bus bar. Apply a thin layer of epoxy to area where terminal was fastened and to adjacent line.

SERVICE PROCEDURES (Continued)

(7) Apply a thin layer of conductive epoxy on terminal and place terminal on desired location. To prevent terminal from moving while the epoxy is curing, it must be wedged or clamped.

(8) Carefully remove masking tape from grid line.

CAUTION: Do not allow the glass surface to exceed 204°C (400°F), glass may fracture.

(9) Allow epoxy to cure 24 hours at room temperature or use heat gun with a 260°-371°C (500°-700°F) range for 15 minutes. Hold gun approximately 254 mm (10 inches) from repaired area.

(10) After conductive epoxy is properly cured remove wedge from terminal and check out operation of rear window defogger. Do not attach connectors until curing is complete.

REMOVAL AND INSTALLATION

HVAC CONTROL

Refer to Group 8E, Instrument Panel and Systems for proper Removal and Installation procedures.

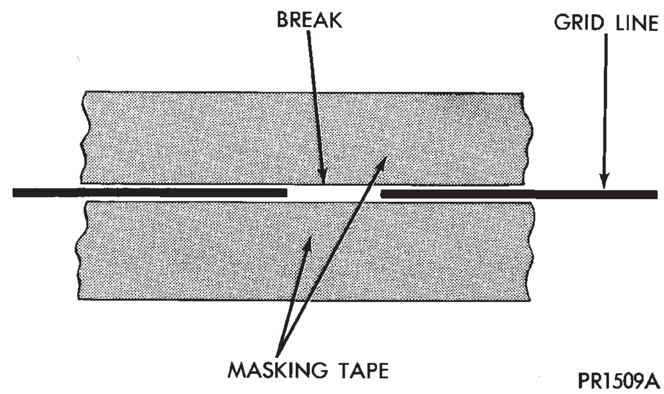


Fig. 6 Grid Line Repair

REAR WINDOW DEFOGGER RELAY

(1) Open the driver's door and remove instrument panel end cover.

(2) Remove rear window defogger relay from the Junction Block (Fig. 5).

POWER DOOR LOCKS

CONTENTS

POWER DOOR LOCKS

INDEX

GENERAL INFORMATION

INTRODUCTION

The doors can be locked or unlocked electrically by operating the switch on either front door panels or with the locking knobs from within the vehicle.

The doors can be locked or unlocked mechanically from the outside with the key or electrically by using the Key Fob Transmitter. Both front doors can also be unlocked by actuation of the inside remote door handle.

DESCRIPTION AND OPERATION

AUTOMATIC DOOR LOCKS

The system includes an automatic door locking feature actuated by the Body Control Module (BCM). **The vehicle is built with the system enabled.**

When the system is disabled the door locks will operate by use of the door lock switches only. When this system is enabled the automatic door locks will operate automatically.

The Body Control Module controls the power locks when the door lock switch is activated. If the door lock switch is pressed for longer than eight consecutive seconds, the BCM will de-energize the door lock relay. Also, the BCM will automatically lock all doors when all of the conditions below are met:

- All doors are closed
- The vehicle speed exceeds 15 ± 1 M.P.H.
- The throttle position sensor tip-in is greater than 10 ± 2 degrees

The Body Control Module will automatically re-lock all doors if the above conditions are met and if either door opens and then closes again.

CENTRAL LOCKING SYSTEM

The central locking system is part of the Vehicle Theft Security System. Using the key, turn the driver's or passenger door cylinder lock to the lock position, both doors will lock. This feature operates differently on each door. Turn key in the driver's door to the unlock position once will unlock driver's door only. Turning the key a second time to the unlock position within five seconds of the first time will unlock both doors. Turn key once in the passenger's door to the unlock position will unlock both doors.

The lock/unlock operation will arm/disarm the Vehicle Theft Security System and will also activate/cancel the illuminated entry feature.

DESCRIPTION AND OPERATION (Continued)

DOOR LOCK INHIBIT

With the key in the ignition switch in any position and the driver's door open the Body Control Module will not allow the door locks switches to lock the doors. Once the key is removed, or the driver's door is closed, the Body Control Module will allow the power door locks to lock.

KEYLESS ENTRY SYSTEM

The system allows locking/unlocking of vehicle door(s), releasing of the deck lid and panic mode by using a hand held remote key fob transmitter.

DIAGNOSIS AND TESTING

DECK LID

For vehicles equipped with electric deck lid release.

(1) Confirm deck lid release solenoid lead wire is connected to the deck lid relay. Check at the deck lid release solenoid for 10 volts or more while the relay is energized. Ensure that the visor lamps are operating they are on the same G38 circuit.

(2) Check for a proper ground through latch mounting screws and the Pin 14 of the BCM 20–way connector.

(3) Remove latch and examine plunger. Plunger should spring back when pressed.

(4) Insure that solenoid plunger travel is adequate approximately 16 mm (5/8 inch).

DOOR LOCK MOTOR/LATCH

Ensure battery is in good condition before performing the circuit tests.

To determine which latch is faulty, check each individual door for electrical lock and unlock or disconnect the latch connectors one at a time, while operating the door lock switch. In the event that none of the latches work, the problem maybe caused by a short or a bad switch. Disconnecting the defective latch will allow the others to work.

To test an individual door latch, disconnect the electrical connector from the latch. To lock the door, connect a 12 volt power source to the positive pin of the latch and a ground wire to the other pin (Fig. 1). To unlock the door reverse the wire connections at the latch pin terminals. If these results are NOT obtained, replace the door latch assembly.

DOOR LOCK SWITCH

Remove the door lock switch from its mounting location. Refer to Door Lock Switch Removal and Installation procedures. Using an ohmmeter, test door lock switch continuity. Refer to (Fig. 2) and move the switch to the Lock and Unlock positions. If the resistance values are not obtained, replace the switch.

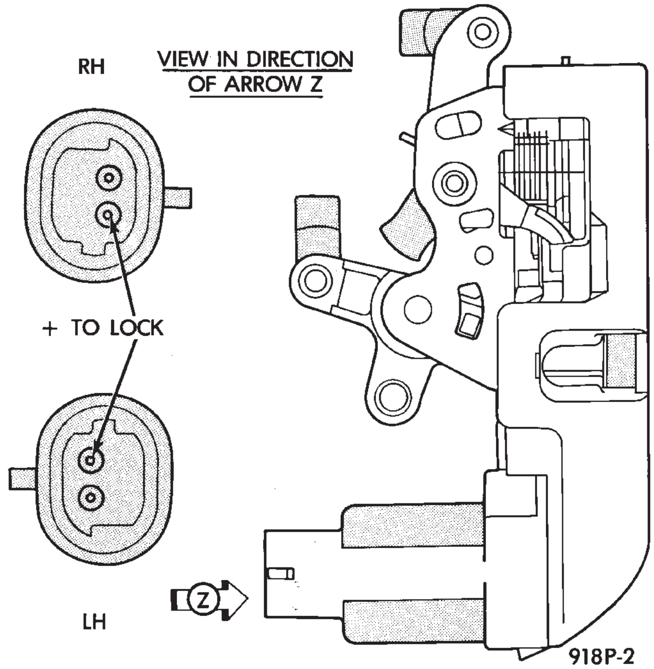
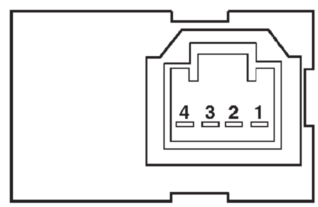


Fig. 1 Door motor/Latch Assembly



SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE VALUE
UNLOCK	1 AND 4	2700 Ω ± 10%
LOCK	1 AND 4	620 Ω ± 10%

80a18d3a

Fig. 2 Door Lock Switch Continuity Test

DOOR LOCK SYSTEM

For complete testing of the automatic door lock systems, refer to the proper Body Diagnostic Procedures Manual.

VOLTAGE

The following circuit test sequence determines whether or not voltage is continuous through the body harness to switch.

(1) Remove the driver door trim panel. Refer to Group 23, Body for proper procedures.

(2) Carefully separate multiple terminal block on wiring harness from switch body. Refer to Group 8W, Wiring Diagrams.

(3) Using a voltmeter, connect the ground lead to the Pin 3 of the door lock connector.

(a) Using the positive lead, check Pin 1 of the connector for battery voltage. If OK, go to Step 2. If

DIAGNOSIS AND TESTING (Continued)

not OK, check fuse 5 in the Junction Block, if fuse is OK, repair wire as necessary.

(b) Check Pin 2 of the connector for battery voltage. If OK, go to Switch Test. If not OK, check fuse 4 in the Junction Block, if fuse is OK, repair wire as necessary.

SERVICE PROCEDURES

AUTOMATIC DOOR LOCKS ENABLED/DISABLED

To disable the Automatic Door Lock feature, do the following:

(1) Close all doors.

(2) Place the ignition switch in the OFF position for at least 20 seconds.

(3) Turn the ignition switch to the RUN position and to the OFF position without cranking the engine four times. The Malfunction lamp will come on each time the ignition switch is in the RUN position.

(4) Press the power door lock button to lock the doors.

To enable the automatic feature, repeat Step 1 through Step 4.

REMOVAL AND INSTALLATION

DECK LID SOLENOID

REMOVAL

(1) Raise deck lid to the full up position.

(2) Remove latch cover attaching screws then remove cover.

(3) Remove two mounting deck lid solenoid screws and remote key cable retainers then remove solenoid.

INSTALLATION

For installation, reverse the above procedures.

DOOR LOCK MOTOR/LATCH

REMOVAL

(1) Remove door trim panel, refer to Group 23 Body, for removal procedures.

(2) Disconnect motor/latch wire connector (Fig. 1).

(3) Disconnect linkage from:

- Outside door handle
- Inside door handle
- Locking knobs
- Key cylinder

(4) Remove motor/latch assembly attaching screws and remove assembly.

INSTALLATION

For installation, reverse the above procedures.

DOOR LOCK SWITCH

REMOVAL

(1) Start at the rear center of the bezel. Using your fingers or a trim stick, lift the bezel upwards and slightly inboard to disconnect the two rear clips (Fig. 3). Use care not to mar the door trim.

(2) With the rear of the bezel raised, pull the forward end up to release the third clip.

(3) Disconnect the power window switches and door lock switch wire connectors.

(4) Release the locking tabs and remove door lock switch.

INSTALLATION

For installation, reverse the above procedures.

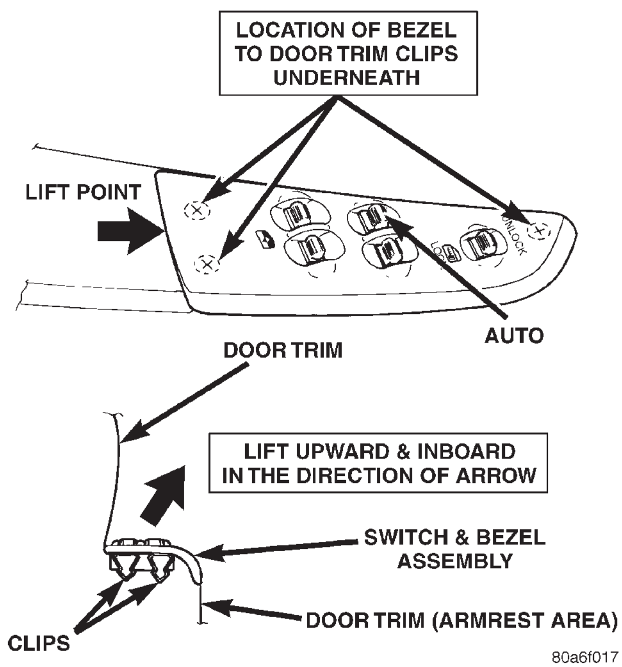


Fig. 3 Door and Switch Bezel

ADJUSTMENTS

DECK LID

Adjust the deck lid latch and striker so that deck lid latches with a moderate slam. Push deck lid release switch and the deck lid should release. Should latch fail to lock or unlock replace latch assembly.

REMOTE KEYLESS ENTRY

INDEX

GENERAL INFORMATION

INTRODUCTION

The Remote Keyless Entry System (RKE) allows locking/unlocking of vehicle door(s) and releasing the deck lid by remote control using a hand held radio frequency key fob transmitter.

The Body Control Module (BCM) may receive signals from up to four key fob transmitters. Each key fob transmitter has its own ID code, with the rolling code, and the code is programmed and stored into BCM memory. The ID code of the key fob transmitter never changes. However the rolling code portion changes every time a button is pressed. If the key fob transmitter is replaced or an additional transmitter is added, the codes of all units may have to be reprogrammed into the BCM memory. If a BCM is replaced, the key fob transmitter codes must be programmed in the new BCM memory. If a programmed key fob transmitter button is pressed more than 250 times outside of the vehicle range, the rolling code will go out of synchronization. In this case the rolling code has to be synchronized again for complete operation. Refer to Synchronization of Rolling Code.

The Deck Lid Release switch is located in the center console, and is disabled whenever the Vehicle Theft Security System (VTSS) is activated.

OPERATION

The key fob transmitter has four buttons for operation (Fig. 1). They are LOCK, UNLOCK, DECK LID and PANIC.

Depressing the button:

• UNLOCK button will unlock the driver's door and enable illuminated entry, if equipped. Pushing and releasing the button once will unlock the driver's door. Pushing and releasing the button two times, within five seconds interval, will unlock all doors.

• LOCK button, the horn will sound a short CHIRP to notify that the all door lock signal was received and set. The illuminated entry operation will be cancelled and all interior lamps will immediately turn OFF.

• DECK LID button will release the deck lid when the button is pressed twice within two seconds.

• PANIC button will start the panic mode when the button is pressed for more than one second. The driver door will unlock. The horn will sound and the headlamps flash approximately once a second. The interior lamps will come ON. The PANIC mode can be canceled by pressing the unlock button, or will time out in approximately three minutes.

The BCM is capable of retaining Vehicle Access Code (VAC) even when power is removed.

Each Remote Keyless Entry Module must have at least one and no more than four key fob transmitters.

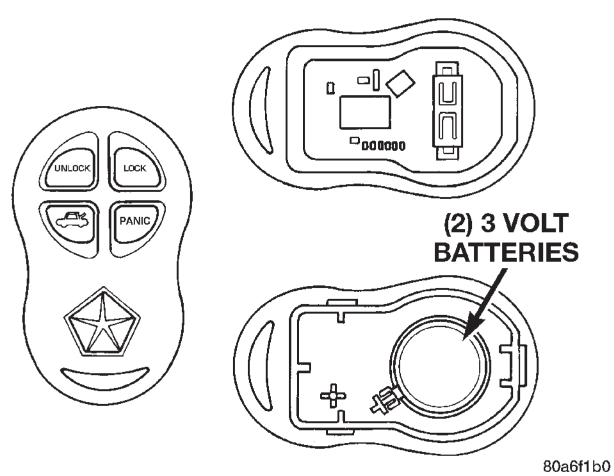


Fig. 1 Key Fob Transmitter

DESCRIPTION AND OPERATION

DECK LIP RELEASE RELAY

The Deck Lid Relase circuit works in conjunction with the BCM to prevent unwanted operation after the Vehicle Theft Security System is set. The VTSS portion of the BCM will also disable the Universal Transmitter (garage door opener). The relay is energized from either the deck lid release switch or from the BCM from a signal from the Remote RKE fob transmitter.

TRANSMITTER BATTERY

The transmitter has two 3 volt batteries, which can be removed and replaced without special tools. The battery is available at local retail stores. Recommended battery is CR2016 Panasonic or equivalent. Battery life is about one to two years (Fig. 1).

DIAGNOSIS AND TESTING

DECK LID RELEASE RELAY TEST

RELAY TEST

The deck lid release relay is located on the right side of the brake pedal mounting bracket (Fig. 2).

Remove the starter relay from mounting bracket to perform the following tests:

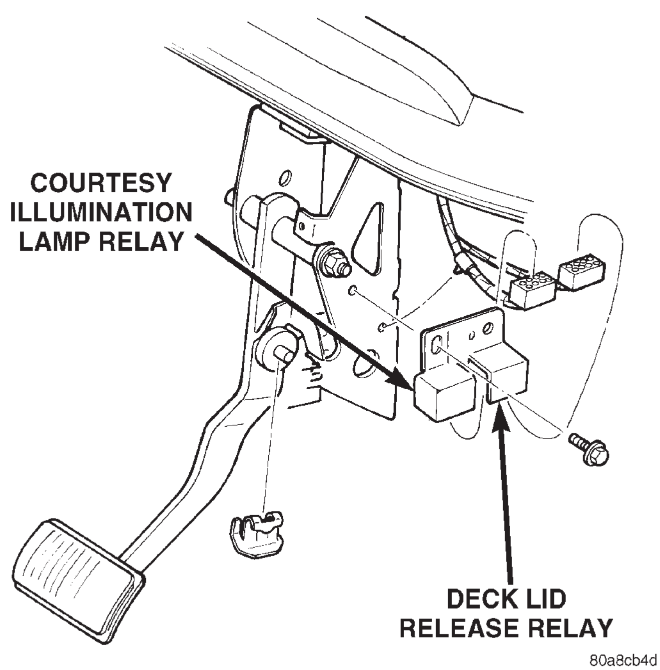
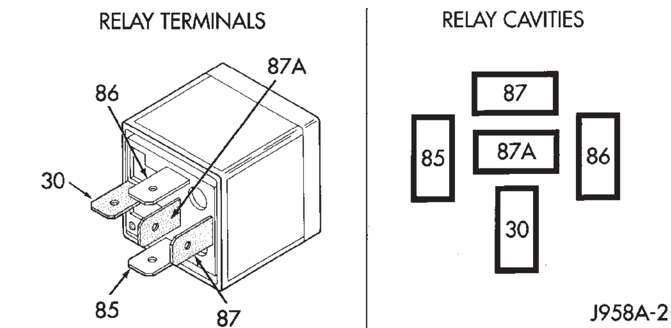


Fig. 2 Deck Lid Release Relay Location

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery B+ lead to terminals 86 and a ground lead to terminal 85 to energize the relay. The relay should click. Also test for continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, refer to Relay Circuit Test procedure. If not OK, replace the faulty relay.



TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Deck Lid Release Relay

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the circuit breaker as required.

(2) The relay normally open terminal (87) is connected to the common feed (movable contact) terminal (30) in the energized position. This terminal when energized supplies battery voltage to the deck lid release solenoid. If OK, go to Step 3. If not OK, repair the open circuit to the deck lid release solenoid as required.

(3) The coil battery (+) terminal (86) is connected to the electromagnet in the relay. It has battery (+) at all times. Check for battery voltage at cavity (86) of the relay connector. If OK, go to Step 4. If not OK, check for an open circuit to the deck lid release relay and repair as necessary.

(4) The relay coil ground (-) terminal (85) is connected to the Body Control Module Q33 circuit and deck lid release switch. This terminal will receive a ground (-) through the BCM, or the deck lid release switch, when the key fob transmitter button, or the deck lid release switch is depressed. If not OK, check for an open circuit to the BCM and repair as necessary.

(5) When the Vehicle Theft Security System is armed the BCM opens the ground circuit to the deck lid release switch.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSTIC CONDITIONS

When trouble shooting problems with the Remote Keyless Entry System, always verify that the power door lock/unlock switches are functional. If the doors do not lock/unlock with the power switches, the following modules should be analyzed: Lock/Unlock Switches, Body Control Module, and the door lock/ unlock latches. Refer to Group 8W, Wiring Diagrams.

FUSE TEST

If the following modules do not work:

- Remote Keyless Entry System
- Body Control Module
- Door lock switches

A blown fuse is the probable cause. The Body Control Module (BCM) battery feed fuse are located in the Power Distribution Center (PDC). Check fuses 4, 15 and 18 in the PDC and fuses 4, 5 and 9 in the Junction Block.

Key fob transmitter will not lock or unlock doors.

(1) Check that the BCM has power and ground.

(2) If the RKE still doesn't function. Check the key fob transmitter batteries for 3 Volts each. If less than 3 Volts, replace the battery.

(3) If the system still does not work, replace the key fob transmitter. Refer to Programing Remote Keyless Entry key fob Transmitter.

All doors will not unlock with the key fob transmitter.

(1) Using a voltmeter, check Pin 4 of the BCM 20 Pin connector for a voltage pulse (Fig. 3). Press the lock button once.

(2) If no voltage pulse, replace RKE module. If voltage is measured, repair the harness between the BCM and the driver door latch.

(3) Check Pins 1, 2 and 3 of the BCM 20 Pin connector for quick voltage pulse when the lock button is pressed.

(4) If no voltage pulse is measured at Pin 1, 2 and/or 3 replace the BCM. Repair the harness between terminal and lock latch.

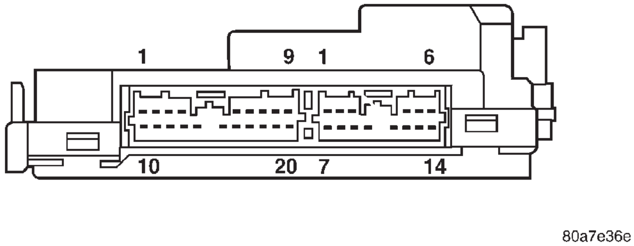


Fig. 3 BCM 20-Way Connector

Driver door will NOT unlock with the key fob transmitter, but passenger door will unlock.

(1) Using a voltmeter, check Pin 4 of the BCM 20 Pin connector for a voltage pulse (Fig. 3). Depress the lock button, the voltmeter should read battery voltage for approximately 1 second.

(2) If no voltage pulse is measured, replace the BCM. If voltage is measured repair harness from BCM to the driver door latch.

Driver door will unlock with the key fob transmitter, but passenger door will not lock.

(1) Using a voltmeter, check Pin 1, 2 and 3 of the BCM 20 Pin connector for a voltage pulse (Fig. 3). Press the lock button.

(2) If no voltage pulse is measured, replace the BCM. If voltage is measured, repair the harness to the door latch.

Doors do not lock with the key fob transmitter.

(1) Using a voltmeter, check Pins 10, 11, 12 and 13 of the BCM 20 Pin connector for a voltage pulse (Fig. 3). Press the lock button on the transmitter. Wait for quick voltage pulse. It may be necessary to press the key fob transmitter several times. The voltage pulse only appears for milliseconds.

(2) If no voltage pulse is measured, replace BCM. If a voltage is measured, repair the Junction Block as necessary.

Doors will lock with the key fob transmitter but there is no horn CHIRP.

(1) Press horn button, listen horn sound.

(2) If the horn does not CHIRP, check if horn is disabled with the scan tool (DRB). Then check the horn relay and the horn(s). Repair as necessary.

(3) Using a voltmeter, check horn relay for voltage pulse (Fig. 3). Press the lock button on the key fob transmitter.

(4) If no voltage pulse measured, replace the BCM. If voltage is measured, repair harness to the horn relay.

Unable to program BCM with a new key fob transmitter, door locks will not cycle.

Refer to the proper Body Diagnostic Procedure Manual.

Unable to program BCM with a new key fob transmitter, door locks cycle. The locks will not cycle when the transmitter button is depressed.

Refer to the proper Body Diagnostic Procedure Manual.

SERVICE PROCEDURES

HORN CHIRP ENABLE/DISABLE

The scan tool (DRB) must be used to enable/disable the Horn Chirp. Refer to the scan tool (DRB) for the procedure.

SYNCHRONIZATION OF ROLLING CODE

The key fob transmitter code will go out of synchronization if any button is press more than 250 times outside the range of the receiver which is inside of the BCM. In other words the transmitter will not work. To synchronize the code of a particular key fob transmitter with the receiver, press and hold the lock button then the deck lid button simultaneously for at lease five seconds. Then wait until the doors unlock indicating that the code has been synchronized. This may take as long as six minutes. This is for a key fob transmitter that has been previously programed to this vehicle only.

REMOVAL AND INSTALLATION

DECK LID RELEASE RELAY

REMOVAL

(1) The relay is located above the brake pedal to the right side (Fig. 2).

(2) Grasp the relay and pull downward to disconnect the relay.

INSTALLATION

Align the relay pins with the connector terminals and push the relay in to place.

JUNCTION BLOCK/BODY CONTROL MODULE

Refer to Group 8E, Instrument Panel and Systems.

ADJUSTMENTS

PROGRAMMING RKE MODULE

The scan tool (DRB) and the transmitter must be used to program the Remote Keyless Entry Module. Refer to the scan tool (DRB) for the procedure.

SPECIFICATIONS

TRANSMITTER CONTROL RANGE

Operation range is within 7 meters (23 ft.) of the BCM.

VEHICLE THEFT/SECURITY SYSTEM

CONTENTS

DESCRIPTION AND OPERATION

INTRODUCTION

The Vehicle Theft Security System (VTSS) is passive system and is designed to protect against whole vehicle theft. The system monitors vehicle doors, trunk key cylinder, and ignition action for unauthorized operation.

The VTSS also deactivates the Universal Transmitter (garage door opener) and trunk lid release button when the vehicle is armed. The trunk lid can only be opened using the key or RKE transmitter when the VTSS is armed. When the vehicle is disarmed, the systems are restored to normal operation.

The VTSS alarm activates:

- Sounding of the horn
- Flashing of the interior lamps
- Flashing of the headlamps
- An engine kill feature

Passive arming occurs upon normal vehicle exit: Open door, lock with power locks, close door. The Vehicle Theft security LED lamp in the instrument cluster will flash quickly for 15 seconds, indicating that arming is in progress. If no monitored switches are activated during this period, the system will arm. After 15 seconds the LED lamp will continue to flash but at a slower rate. This indicates that the system is armed. If the trunk key cylinder switch is not sensed by the system, the LED lamp will remain lit during the arming process, although the system will still arm.

The system is to be considered as an active armed system when using:

- The Remote Keyless Entry
- The Central Lock Feature.

If the LED lamp does not illuminate at all upon door closing it indicates that the system is not arming or the LED lamp is not operation. Refer to the System Self-Tests

Passive disarming occurs upon normal vehicle entry by unlocking either door with the ignition key/remote transmitter. This disarming will also halt the alarm once it has been activated.

A tamper alert exists to notify the driver that the alarm had been activated. If the alarm has since timed-out for at least 3 minutes but not more than 18 minutes the tamper alert will sound. If the trunk lid has been activated the tamper alert will sound till the VTSS is disarmed. The temper alert consists of 3 horn pulses when the vehicle is disarmed.

The alarm system will not arm if the doors are locked manually by pushing the lock knobs. This will manually override the system.

CENTRAL LOCK/UNLOCK SYSTEM

The central lock/unlock system uses the Vehicle Theft Security System door switch to lock and unlock all doors using the key. Turning the key to the lock position in the driver's or passenger's door will lock all doors. Turning the key in the driver's door to the unlock position once will unlock driver's door only. Turning the key a second time within five seconds of the first time will unlock all doors. Turning the key in the passenger's door to the unlock position will unlock all doors.

Using the door key cylinder or the RKE transmitter lock/unlock operation will arm/disarm the Vehicle Theft Security System.

TRIGGERING THE VTSS

Using the power door switch, ignition key or the keyless transmitter will arm the system. Any of the following actions will trigger the system:

(1) Opening any door.
(2) Removing the trunk lock cylinder.
(3) Turning the ignition to the ON position.

DESCRIPTION AND OPERATION (Continued)

NOTE: The ignition switch can be turned to the accessory position without triggering alarm system.

DIAGNOSIS AND TESTING

HEADLAMP RELAY

For test of headlamp relay use a known good relay. Refer to Group 8W. Wiring Diagrams for circuits.

HORN RELAY

Refer to Group 8G, Horns for test procedures.

SYSTEM SELF-TESTS

A diagnostics test mode is available in the system to verify operation of all monitored switches or circuits. To enter diagnostics mode, use a scan tool (DRB) and Body Diagnostic Procedure Manual.

The horn will pulse twice to indicate that the trunk key cylinder is in its proper position. Placing the key in the ignition will allow the warning lamp, headlamps and interior lamps to be checked for proper flashing operation. If any door is open the interior lamps will not flash. Remove the ignition key from the ignition switch in order to check for door lock cylinder switch operation. At the completion of each of the following operations, a horn pulse will occur to indicate proper operation. Each action must be separated by a minimum of one second or horn pulse will not occur.

- Activate the power door locks in both the lock and unlock positions.
- Open then close each door one at a time.
- Rotate the ignition key in each of the door lock cylinders to the lock and unlock positions.
- Cycle the ignition switch key to the ON position as the last step. A single horn pulse will indicate proper operation of the ignition switch. This will also take the system out of the stand alone diagnostic mode.

The self diagnostic mode may also be exited by using the scan tool.

Activating the Remote Keyless Entry System (RKE) to exercise any of the above inputs will also cause the horn to pulse. When the RKE lock button is pressed, the RKE module itself will also pulse the horn. This is part of the RKE normal operation.

REMOVAL AND INSTALLATION

JUNCTION BLOCK/BODY CONTROL MODULE

Refer to Group 8E, Instrument Panel and Systems.

VTSS DOOR LOCK SWITCH

REMOVAL

(1) Refer to Group 23, Body for door trim and water shield removal.

(2) Remove illuminated entry switch wiring clip and disconnect connector (Fig. 1).

(3) Remove disarming switch from door handle.

INSTALLATION

For installation reverse above procedures.

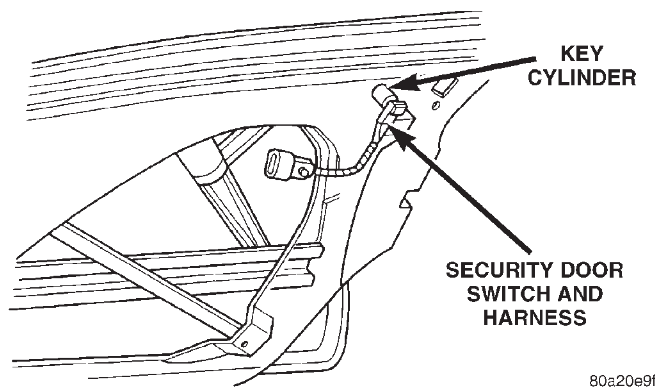


Fig. 1 VTSS Door Lock Switch Location

VTSS TRUNK LOCK SWITCH

The VTSS trunk lock switch is part of the trunk latch. For replacement, the trunk latch will need to be replaced. Refer to Group 23, Body for trunk lock removal.

POWER SEATS

CONTENTS

DESCRIPTION AND OPERATION

INTRODUCTION

Power seats can be adjusted in 8 different directions:
- Up or down
- Forward or back
- Tilt forward or rearward
- Recliner up or down

A two single armature permanent magnet reversible motors are coupled through cables to worm gear box assemblies. They are located in the seat tracks and upper supports. The two single gear motor assemblies attach to the seat tracks provide the various seat movements.

The electrical circuit is protected by a 20 amp circuit breaker located in the junction block.

DIAGNOSIS AND TESTING

DIAGNOSTIC PROCEDURE

Before any testing is attempted the battery should be carefully charged and all connections and terminals cleaned and tightened to insure proper continuity and grounds.

With dome lamp on, apply switch in direction of failure. If dome lamp dims the seat motor is trying to work indicating mechanical jamming. If dome lamp does not dim, then proceed with the following electrical tests.

CIRCUIT BREAKER

Find correct circuit breaker on fuse block. Pull out slightly but be sure that circuit breaker terminals still contact terminals in fuse block. Connect ground wire of voltmeter to a good ground. With probe of voltmeter positive wire, check both terminals of circuit breaker for battery voltage. If only one terminal checks at battery voltage, circuit breaker is defective and must be replaced. If neither terminal shows battery voltage, check for open or shorted circuit to circuit breaker.

TRACTION CONTROL SWITCH

(1) Remove over steering column bezel. Refer to Over Steering Column Bezel. Removal procedures.

(2) Using an ohmmeter check for continuity reading between pins.

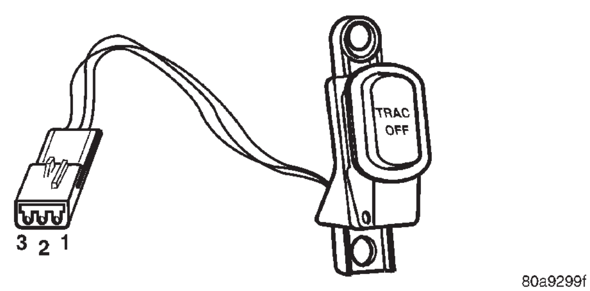


Fig. 1 Traction Control Switch Connector

SEAT MOTOR SWITCH

(1) Remove switch from mounting position (Fig. 2).

(2) Using an ohmmeter, perform the switch continuity tests in (Fig. 3). If there is no continuity at any of the switch positions, replace switch.

VOLTAGE

The following test will determine whether or not voltage is continuous through the body harness to the switch.

(1) Remove power seat switch from mounting position and disconnect switch from wiring harness.

(2) Using a voltmeter, connect the ground lead to Pin 5 of the switch harness connector. Connect the positive lead to Pin 1. If battery voltage the ground and B+ circuit is OK. If no voltage check circuit breaker and repair as necessary.

REMOVAL AND INSTALLATION (Continued)

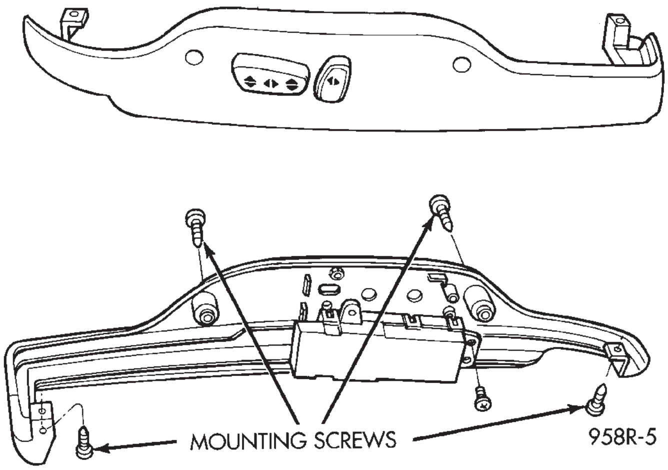


Fig. 2 Switch Removal

SWITCH POSITION	CONTINUITY BETWEEN PINS DRIVER
OFF	PIN 5 to 4 PIN 5 to 3 PIN 5 to 2 PIN 5 to 6 PIN 5 to 7 PIN 5 to 8 PIN 5 to 9 PIN 5 to 10
FRONT RISER UP	PIN 5 to 6 PIN 1 to 9
FRONT RISER DOWN	PIN 5 to 9 PIN 1 to 6
CENTER SWITCH FORWARD	PIN 5 to 3 PIN 1 to 10
CENTER SWITCH REARWARD	PIN 5 to 10 PIN 3 to 1
REAR RISER UP	PIN 5 to 7 PIN 1 to 8
REAR RISER DOWN	PIN 5 to 8 PIN 1 to 7
RECLINER UP	PIN 5 to 2 PIN 4 to 1
RECLINER DOWN	PIN 5 to 4 PIN 2 to 1

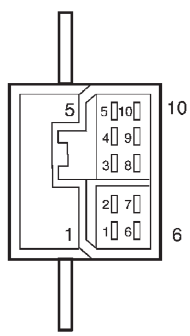


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Fig. 3 Seat Motor Switch Test

REMOVAL AND INSTALLATION

SEAT ASSEMBLY

REMOVAL

(1) Remove adjuster attaching bolts from floor pan. Move seat as necessary for access.

(2) Disconnect battery negative cable.

(3) Disconnect wiring harness power lead at carpet.

(4) Remove assembly from vehicle.

INSTALLATION

For installation, reverse the above procedure. Install and torque mounting bolts and nuts to 60 to 80 N·m (44 to 59 ft. lbs.). Connect the battery negative cable and check seat operation.

SEAT SWITCH

REMOVAL

(1) Remove left cushion side shield (Fig. 2).

(2) Disconnect wiring from switch.

(3) Remove the seat and recliner switch knobs.

(4) Remove attaching screws and switch from bezel.

INSTALLATION

For installation, reverse the above procedure.

SEAT TRACK

REMOVAL

(1) Seat removed from vehicle. Using a clean area to place seat.

(2) Remove two seat back mounting screws and also remove two seat back recliner screws (Fig. 4).

(3) Remove four seat track mounting screws from cushion pan.

(4) Remove track from seat.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

For installation, reverse the above procedure.

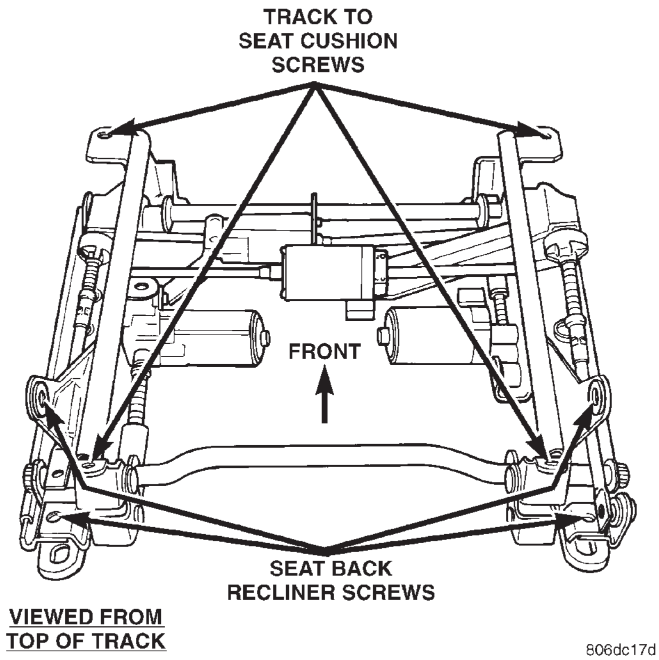

Fig. 4 Seat Track Removal

POWER WINDOWS

CONTENTS

GENERAL INFORMATION

INTRODUCTION

Front and rear door window lift motors are of the permanent magnet type. A battery positive and negative connection to either of the two motor terminals will cause the motor to rotate in one direction. Reversing current through these same two connections will cause the motor to rotate in the opposite direction.

Each individual motor is grounded through the master switch.

WINDOW DROP RELAY ASSEMBLY

The Window Drop Relay Assembly allows the windows to be automatically lowered when the convertible top is raised or lowered. The window timer module will lower the windows for 280 to 380 milliseconds when the top switch is pressed up or down. This will lower the windows approximately 1 to 3 inches so that the windows are clear of the top while raising or lowering.

DIAGNOSIS AND TESTING

VOLTAGE

The following circuit test sequence determines whether or not voltage is continuous through the body harness to switch.

(1) Remove the driver door trim panel. Refer to Group 23, Body for proper procedures.

(2) Carefully separate wiring harness connector from switch body. Refer to Group 8W, Wiring Diagrams.

(3) Using a voltmeter, connect the ground lead to the Pin 10 of the wiring harness connector.

(4) Using the positive lead, check Pin 1 of the harness connector for battery voltage. If OK, go to Window Switch Test below. If not OK, check 20 amp circuit breaker in the Junction Block, if the circuit breaker is OK, repair wire as necessary. For wiring, specific connector type and location, refer to Group 8W, Wiring Diagrams.

WINDOW DROP RELAY ASSEMBLY CONDITIONS

When testing for a voltage signal, use a digital voltmeter, because the signal will last only 280 to 380 milliseconds. Place the ignition switch in the run position with out engine running. Refer to Group 8W, Wiring Diagrams circuit and pin locations (Fig. 1).

When pressing the top switch all windows do not lower

(1) Check for battery voltage at Pin 1 and 2 of the window timer module wire connector. If OK, go to Step 2. If not OK, check circuit breaker top switch. Repair as necessary.

(2) Using a ohmmeter, check Pin 9 of the window timer module wire connector for ground. If OK, go to Step 3. If not OK, repair as necessary.

(3) Using a digital voltmeter, check Pin 7 of the window timer module wire connector for voltage signal for 280 to 380 milliseconds while pressing the top switch. If not OK, replace the window timer module. If OK, check power window circuit connections.

When pressing the top switch the front window(s) do not lower

(1) Using a digital voltmeter, check Pin 4 of both window motor relay wire connectors for voltage signal while pressing the top switch. If there is a momentary voltage, go to Step 2. If not OK, window timer relay.

(2) Using a ohmmeter, check Pin 6 of the both window motor relays wire connector for ground. If OK, go to Step 3. If not OK, repair ground as necessary.

(3) Using a ohmmeter, check Pin 85 to Pin 86 of window motor relay with connector disconnected for open circuit. If OK, check power window circuit connections. If open circuit replace window motor relay.

DIAGNOSIS AND TESTING (Continued)

When pressing the top switch the rear window(s) do not lower

(1) Using a digital voltmeter, check Pin 4 and Pin 6 of the window timer module wire connector for battery voltage while pressing the top switch. If no voltage replace the window timer module. If voltage, check power window circuit connections.

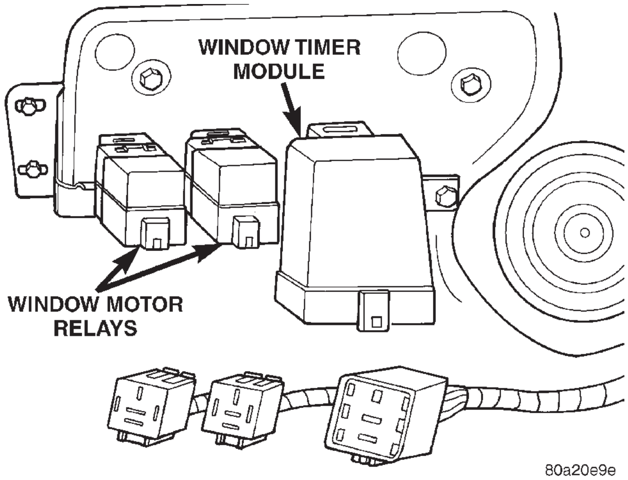

Fig. 1 Power Drop Relay Assembly

WINDOW MOTOR

(1) Remove door trim panel, refer to Group 23 Body for removal procedures.

(2) Connect positive (+) lead from a test battery to either of the two motor terminals.

(3) Connect negative (-) lead from test battery to remaining motor terminal.

(4) The motor should now rotate in one direction to either move window up or down.

(a) If window happens to already be in full UP position and motor is connected so as to move it in UP direction no movement will be observed.

(b) Likewise, motor connected to move window in DOWN direction no movement will be observed if window is already in full DOWN position.

(c) Reverse battery leads in Step 1 and Step 2 and window should now move. If window does not move, remove motor. See below for motor removal from vehicle.

(5) If window moved completely up or down, the test leads should be reversed one more time to complete a full window travel inspection.

(6) If window does not move, check to make sure that it is free.

(7) It is necessary that the window be free to slide up and down in the glass channels. If the window is not free to move up and down, the window lift motor will not be able to move the glass.

(8) To determine if the glass is free is to disconnect the regulator from the glass lift plate. Remove the two attaching screws, and slide the window up and down by hand.

WINDOW SWITCH

For switch testing, remove the switch from its mounting, refer to Switch Removal. Using an ohmmeter, refer to Window Switch Continuity Charts to determine if continuity is correct (Fig. 2) and (Fig. 3). If the results are not obtained, replace the switch.

The master window switch has an Auto-Down feature. Actuation of the master switch to the second down position will move the drivers side window completely down. The electronic switch will automatically disconnect the motor approximately 1 second after the window bottoms out. Failure of the electronic switch to detect stall current, will cause the switch to disconnect after approximately 13 seconds. The auto down function can be canceled by any movement of the switch.

SWITCH POSITION		CONTINUITY BETWEEN TERMINALS
OFF		PIN 10 to 2
		PIN 10 to 3
		PIN 10 to 4
		PIN 10 to 7
		PIN 10 to 8
		PIN 10 to 9
		PIN 10 to 11
		PIN 10 to 12
UP	DRIVER'S	PIN 1 to 7
		PIN 8 to 10
UP	RIGHT FRONT	PIN 1 to 12
		PIN 10 to 11
UP	LEFT REAR	PIN 3 to 10
		PIN 1 to 2
UP	RIGHT REAR	PIN 1 to 4
		PIN 9 to 10
DOWN	DRIVER'S	PIN 1 to 8
		PIN 7 to 10
DOWN	RIGHT FRONT	PIN 1 to 11
		PIN 10 to 12
DOWN	LEFT REAR	PIN 3 to 1
		PIN 2 to 10
DOWN	RIGHT REAR	PIN 1 to 9
		PIN 4 to 10

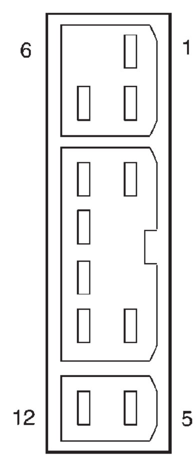

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Fig. 2 Master Window Switch

REMOVAL AND INSTALLATION

WINDOW DROP RELAY ASSEMBLY

REMOVAL

(1) Remove door trim panel, refer to Group 23, Body for removal procedures.

(2) Disconnect the wire connectors (Fig. 1).

(3) Remove the attaching screws.

(4) Remove relay assembly.

REMOVAL AND INSTALLATION (Continued)

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
OFF	PIN 2 to 5 PIN 1 to 4
UP	PIN 1 to 4 PIN 5 to 6
DOWN	PIN 2 to 5 PIN 1 to 6

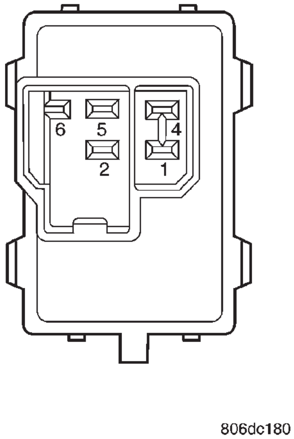


Fig. 3 Passenger Window Switch

INSTALLATION

For installation, reverse the above procedures.

WINDOW MOTOR

WARNING: DO NOT HAVE ANY HANDS OR FINGERS IN SECTOR GEAR AREA WHERE THEY CAN BE PINCHED BY SMALL MOVEMENTS OF REGULATOR LINKAGE.

REMOVAL

(1) Move the window to the 3/4 down position, if possible.

(2) Remove door trim panel and window regulator, refer to Group 23 Body for removal procedures.

WARNING: FAILURE TO CLAMP THE SECTOR GEAR TO THE MOUNTING PLATE WHEN REMOVING THE MOTOR CAN RESULT IN INJURY.

(3) Disconnect wiring connector from motor.

(4) Secure the sector gear and mounting plate with a C clamp or similar clamping tool. This will prevent a sudden and forceful movement of the regulator when the motor is removed.

(5) Remove three mounting screws that hold motor gearbox to regulator (Fig. 4).

(6) Remove motor from regulator.

INSTALLATION

(1) Install new motor on regulator by positioning motor gearbox so that it engages regulator sector teeth.

(2) A slight rotational or rocking movement may be necessary to bring three motor gearbox screw holes into proper position.

(3) Install three gearbox screws and one tie down bracket screw, if applicable. Tighten to 8.4 to 13 N·m (74 to 115 in. lbs.) torque.

(4) Install regulator, using the switch, test operation of motor.

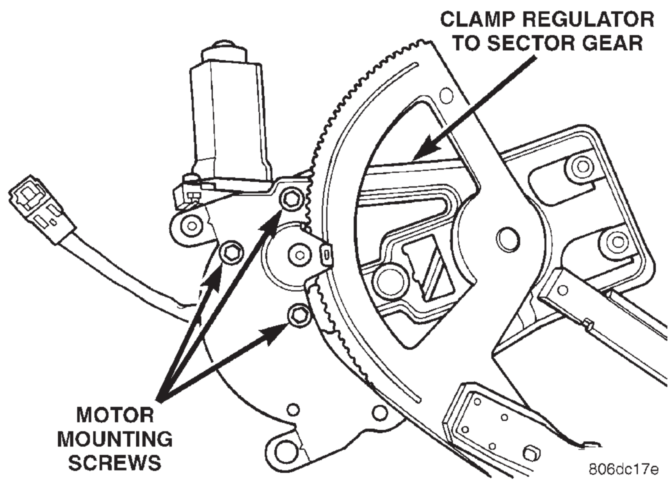


Fig. 4 Motor Removal

REMOVAL AND INSTALLATION (Continued)

WINDOW SWITCH AND BEZEL

REMOVAL

(1) Start at the rear center of the bezel. Using your fingers or a trim stick, lift the bezel upwards and slightly inboard to disconnect the two rear clips (Fig. 5). Use care not to mar the door trim.

(2) With the rear of the bezel raised, pull the forward end up to release the third clip.

(3) Disconnect the power window switches and door lock switch wire connectors.

(4) Remove attaching screws and remove window switch.

INSTALLATION

For installation, reverse the above procedures.

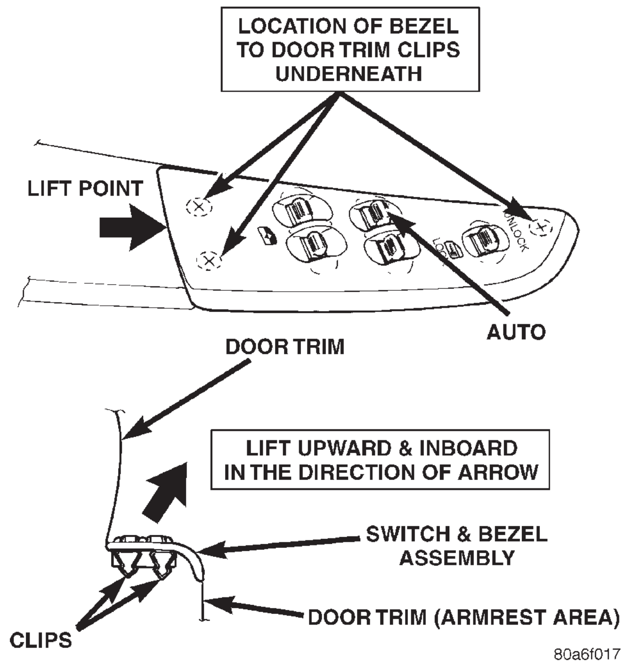


Fig. 5 Window Switch Bezel

POWER MIRRORS

CONTENTS

DESCRIPTION AND OPERATION

INTRODUCTION

Power mirrors are controlled by a single switch located on the driver's door. The switch has a rocker buttons mark L (left) and R (right) for mirror selection and four buttons for mirror direction movement (Fig. 1).

The motors which operate the mirrors are part of the mirror assembly and cannot be replaced separately.

The vehicle is equipped with an Ignition-Off Draw Fuse which is used when it is originally shipped from the factory. This fuse is located in the junction block and helps to prevent battery discharge during storage when disconnected.

This fuse is included in the power mirror circuity and should be checked if the mirrors are inoperative.

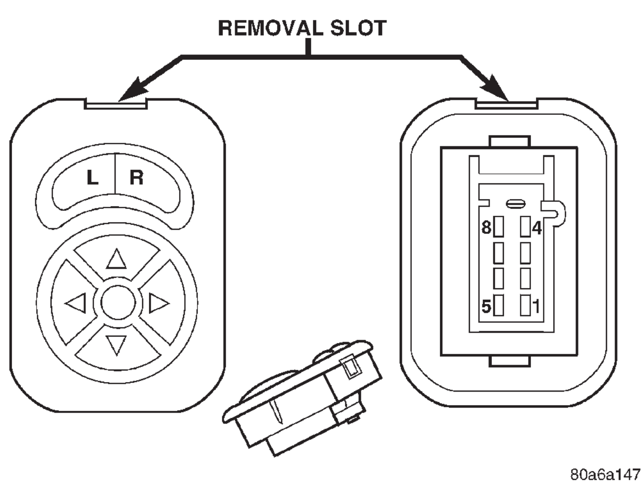


Fig. 1 Power Mirror Switch

HEATED MIRROR

Heated mirrors are available with Power Mirrors and Rear Window Defogger only. The heated mirror is controlled by the rear window defogger switch. Only time that the heated mirror is on is when the rear window defogger is on. The mirror should become warm to the touch.

DIAGNOSIS AND TESTING

HEATED MIRROR

(1) Using a ohmmeter, check Pin 1 of the mirror motor harness connector for continuity to ground. If OK, go to Step 2. If not OK, repair as necessary. Refer to Group 8W, Wiring Diagrams.

(2) Activate the rear window defogger switch, use a voltmeter and check Pin 2 for battery voltage.

(a) If OK, go to Step 3. If not OK, check fuse 5 in the Junction Block and repair as necessary.

(b) Check rear window defogger switch, refer to Group 8N, Rear Window Defogger. If OK, go to Step 3. If not OK, replace HVAC control.

(c) If no voltage repair wire as necessary. Refer to Group 8W, Wiring Diagrams.

(3) Remove mirror glass and check wires. If wires are OK, replace mirror glass. If not OK, repair as necessary or replace mirror.

MIRROR MOTOR

(1) Remove door trim panel. Refer to Group 23, Body.

(2) Disconnect wire connector from the switch.

(3) Using two jumper wires, one connected to a 12 volt battery source, and the other connected to a good body ground. Refer to the Mirror Test (Fig. 2) for appropriate mirror response, using the mirror switch wiring harness connector.

(4) If test results are not obtained as shown in the (Fig. 2), check for open or shorted circuit, or replace mirror assembly as necessary.

MIRROR SWITCH

(1) Remove switch from door trim panel.

(2) Disconnect wire connector.

DIAGNOSIS AND TESTING (Continued)

MIRROR SWITCH HARNESS CONNECTOR			
		Mirror Reaction	
12 Volt	Ground	Left	Right
PIN 4	PIN 5		UP
PIN 8	PIN 5	UP	
PIN 5	PIN 4		DOWN
PIN 5	PIN 8	DOWN	
PIN 6	PIN 3		RIGHT
PIN 6	PIN 7	RIGHT	
PIN 3	PIN 6		LEFT
PIN 7	PIN 6	LEFT	

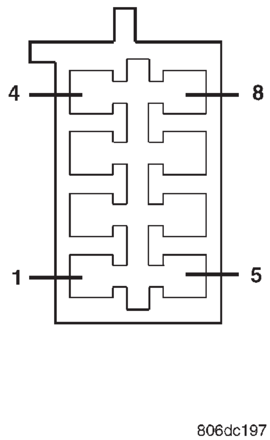


Fig. 2 Mirror Motor Test

(3) Using an ohmmeter, test for continuity between the terminals of the switch as shown in the Mirror Switch Test (Fig. 3).

(4) If test results are not obtained as shown in the (Fig. 3), replace the switch.

SWITCH POSITION Move Button	CONTINUITY BETWEEN TERMINALS
Mirror in L Position	
▲	PIN 1 to 5 PIN 2 to 8
▶	PIN 1 to 7 PIN 2 to 6
▼	PIN 1 to 8 PIN 2 to 5
◀	PIN 1 to 6 PIN 2 to 7
Mirror in R Position	
▲	PIN 1 to 5 PIN 2 to 4
▶	PIN 1 to 3 PIN 2 to 6
▼	PIN 1 to 4 PIN 2 to 5
◀	PIN 1 to 6 PIN 2 to 3

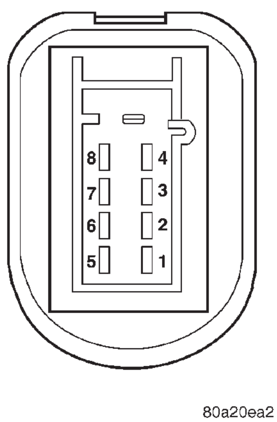


Fig. 3 Mirror Switch Test

REMOVAL AND INSTALLATION

INSIDE MIRROR/READING LAMP ASSEMBLY

REMOVAL

(1) Remove attaching screws from header (Fig. 4).

(2) Lower mirror, and disconnect the wire harness connector.

(3) Remove mirror assembly.

INSTALLATION

For installation, reverse the above procedure.

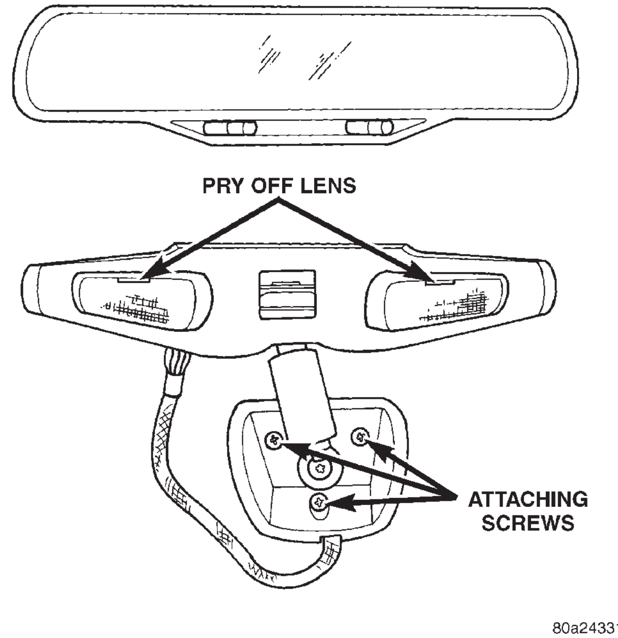


Fig. 4 Inside Mirror/Reading Lamps

INSIDE MIRROR/READING LAMP BULB/LENS

REMOVAL

(1) Using a small thin blade tool, pry at the center of the lens nearest the mirror to remove lens (Fig. 4).

(2) Remove lamp and replace if necessary.

INSTALLATION

Install lens by setting into position and apply pressure until it is locked into position.

MIRROR ASSEMBLY

REMOVAL

(1) For door trim panel and mirror removal, refer to Group 23, Body.

(2) Disconnect mirror.

(3) Remove attaching nuts.

(4) Test operation of mirror before installing door trim panel.

INSTALLATION

For installation, reverse the above procedures.

MIRROR SWITCH

REMOVAL

(1) Place a small flat blade tool into the slot above the L–R selector end of the switch. Pushing against the switch and pulling upward will release the mounting clip located directly below. This will allow the switch to be release from the door trim panel.

(2) Disconnect wire connector.

INSTALLATION

For installation, reverse the above procedures.

CHIME WARNING/REMINDER SYSTEM

CONTENTS

GENERAL INFORMATION

INTRODUCTION

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO THE AIRBAG PORTION OF THIS SECTION FOR STEERING WHEEL OR SWITCH REMOVAL AND INSTALLATION PROCEDURES.

The chime warning/reminder system includes signals for fasten seat belts, exterior lamps left ON, key left in ignition and door ajar (Fig. 1).

When using the scan tool (DRB), refer to the proper Body Chassis Diagnostic Manual.

FASTEN SEAT BELTS

A warning lamp on the instrument panel, and an audible chime tone are used as the fasten seat belt warning/reminder.

EXTERIOR LAMPS LEFT ON

An audible chime tone that indicates the exterior lamps were left on.

KEY LEFT IN IGNITION

An audible chime tone that indicates the key was left in ignition.

DESCRIPTION AND OPERATION

DOOR AJAR CHIME

An audible chime will sound when the vehicle begins to move and the transmission range indicator display will indicate DOOR.

EXTERIOR LAMPS LEFT ON

To test the headlamps left on function, turn ignition off, turn exterior lamps on with driver's door open. Chime should sound until headlamps are turned off or drivers door is closed.

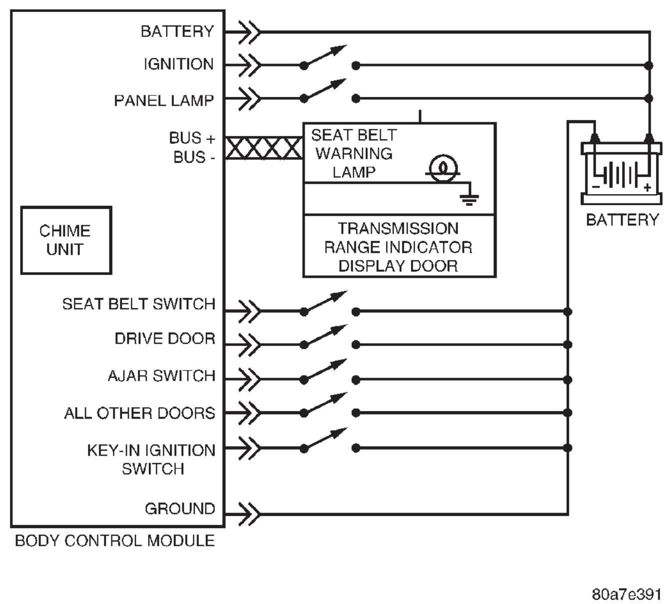


Fig. 1 Chime Warning/Reminder Wiring

FASTEN SEAT BELTS

To test, the ignition switch must be in the off position before testing the fasten seat belts. Turn the ignition switch to the ON position with the driver's seat belt unbuckled and fully retracted. The seat belt warning lamp should light for 4 to 8 seconds and the tone should sound 4 to 8 seconds.

KEY LEFT IN IGNITION SWITCH

To test the key left in ignition function:

- The ignition switch must be in the OFF position with key in ignition.
- Driver's door open.
- Chime should sound until key is removed from ignition or drivers door is closed.

DIAGNOSIS AND TESTING

CHIME CONDITIONS

NO TONE WHEN IGNITION SWITCH IS TURNED ON AND DRIVERS SEAT BELT IS UNBUCKLED AND FULLY RETRACTED

(1) Check driver's seat belt retractor switch for a ground when belt is retracted.

(2) Use scan tool to perform CCD diagnostics on Body Control Module for battery, ignition and seat belt switch inputs.

(3) Use scan tool to perform actuator diagnostics on Body Control Module Chime.

(4) Check for tone in any other function.

(5) Remove Body Control Module from Junction Block. Check for battery voltage at terminal JB-12 and ignition feed at terminal JB-6 of Body Control Module (Fig. 2). Refer to Group 8W, Wiring Diagrams for terminal location.

(6) If voltage not OK, repair as necessary.

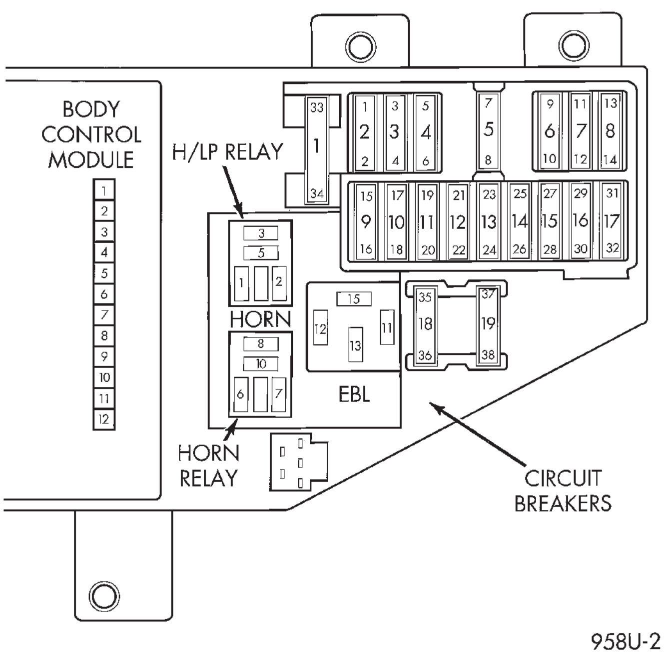


Fig. 2 Junction Block Connector to the BCM

NO FASTEN SEAT BELT LAMP WHEN IGNITION SWITCH IS TURNED ON

(1) Use scan tool to perform CCD diagnostics on Body Control Module for battery and ignition switch inputs.

(2) Check for burned out bulb.

(3) Using the scan tool, do the actuator test on cluster. Refer to proper Body Diagnostic Manual.

(4) Remove Body Control Module from Junction Block. Check for battery voltage at terminal JB-12 and ignition feed at terminal JB-6 of Body Control Module. Refer to Group 8W, Wiring Diagrams for terminal location.

(5) If voltage not OK, repair as necessary.

FASTEN SEAT BELT LAMP OR TONE CONTINUE FOR MORE THAN 10 SECONDS AFTER SEAT BELTS ARE FASTENED AND IGNITION ON

(1) Use scan tool to perform CCD diagnostics on Body Control Module for battery and ignition switch input.

(2) Inspect Body Control Module connectors and wires for proper connection.

NO TONE OR DOOR INDICATED IN PLACE OF ODOMETER WHEN A DOOR IS AJAR AND VEHICLE BEGINS MOVING

The vehicle must be moving for the chime to occur. However the door indicator will come ON regardless of the vehicle movement. The CCD bus, Transmission Control Module (TCM) and Powertrain Control Module (PCM) must be operational.

(1) Check all door jamb switches.

(2) Use scan tool to perform CCD diagnostics on Body Control Module for battery and ignition switch input

(3) Inspect Body Control Module connectors and wires for proper connection.

(4) Remove Body Control Module from Junction Block. Check for battery voltage at terminal JB-12 and ignition feed at terminal JB-6 of Body Control Module. Refer to Group 8W, Wiring Diagrams for the location of the terminals.

(5) If voltage not OK, repair as necessary.

NO TONE WHEN HEADLAMPS ARE ON, IGNITION SWITCH IS OFF AND DRIVER'S DOOR IS OPEN.

(1) Check left door jamb switch for good ground when driver's door is open.

(2) Use scan tool to perform CCD diagnostics on Body Control Module for battery, ignition switch input, headlamp and driver's door input and Chime Output Test.

(3) Check headlamp switch.

(4) Inspect Body Control Module connectors and wires for proper connection.

(5) Remove Body Control Module from Junction Block. Check for battery voltage at terminal JB-12 and ignition feed at terminal JB-6 of Body Control Module. Refer to Group 8W, Wiring Diagrams for terminal location.

(6) If voltage not OK, repair as necessary.

DIAGNOSIS AND TESTING (Continued)

NO TONE WHEN IGNITION KEY IS LEFT IN IGNITION SWITCH AND IT IS IN THE OFF POSITION WITH DRIVER'S DOOR IS OPEN

(1) Check left door jamb switch for good ground when drivers door is open.

(2) Use scan tool to perform CCD diagnostics on Body Control Module for battery, ignition switch input, key-in-switch and driver's door input and Chime Output Test.

(3) Check key-in switch.

(4) Inspect Body Control Module connectors and wires for proper connection.

(5) Remove Body Control Module from Junction Block. Check for battery voltage at terminal JB-12 and ignition feed at terminal JB-6 of Body Control Module. Refer to Group 8W, Wiring Diagrams for terminal location.

(6) If voltage not OK, repair as necessary.

CHIMES CONTINUE WHEN HEADLAMPS ARE TURNED OFF AND/OR KEY IS REMOVED FROM IGNITION

(1) Use scan tool to perform CCD diagnostics on Body Control Module for headlamp or key-in-ignition inputs.

(2) Check wiring for a grounded condition between key-in switch and Body Control Module. Check headlamp switch to Body Control Module wiring for short to battery.

(3) Inspect Body Control Module connectors and wires for proper connection.

REMOVAL AND INSTALLATION

HEADLAMP SWITCH

Refer to Group 8E, Instrument Panel and Systems.

JUNCTION BLOCK/BODY CONTROL MODULE

Refer to Group 8E, Instrument Panel and Systems.

KEY-IN SWITCH

The Key-in switch is built into the ignition switch assembly. Should the Key-in switch require service, the ignition switch assembly must be replaced. Refer to Group 8D, Ignition System for service procedures.

SEAT BELT BUCKLE

Refer to Group 23, Body for service procedures.

WIRING DIAGRAMS

CONTENTS

8W-01 GENERAL INFORMATION

INDEX

DESCRIPTION AND OPERATION

HOW TO USE THIS GROUP

The purpose of this group is to show the electrical circuits in a clear, simple fashion and to make troubleshooting easier. Components that work together are shown together. All electrical components used in a specific system are shown on one diagram. The feed for a system is shown at the top of the page. All wires, connectors, splices, and components are shown in the flow of current to the bottom of the page. Wiring which is not part of the circuit represented is referenced to another page/section, where the complete circuit is shown. In addition, all switches, components, and modules are shown in the **at rest position with the doors closed and the key removed from the ignition.**

If a component is part of several different circuits, it is shown in the diagram for each. For example, the headlamp switch is the main part of the exterior lighting, but it also affects the interior lighting and the chime warning system. **It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.**

SECTION IDENTIFICATION

Sections in Group 8W are organized by sub-systems. The sections contain circuit operation descriptions, helpful information, and system diagrams. The intention is to organize information by system, consistently from year to year.

CONNECTOR/GROUND LOCATIONS

Section 8W-90 contains connector/ground location illustrations. The illustrations contain the connector name (or number)/ground number and component identification. Connector/ground location charts in Section 8W-90 reference the illustration number for components and connectors.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the Diagram pages.

SPLICE LOCATIONS

Splice Location charts in Section 8W-70 show the entire splice, and provide references to other sections the splice serves.

Section 8W-95 contains illustrations that show the general location of the splices in each harness. The illustrations show the splice by number, and provide a written location.

NOTES, CAUTIONS, and WARNINGS

Throughout this group additional important information is presented in three ways; Notes, Cautions, and Warnings.

DESCRIPTION AND OPERATION (Continued)

NOTES are used to help describe how switches or components operate to complete a particular circuit. They are also used to indicate different conditions that may appear on the vehicle. For example, an up-to and after condition.

CAUTIONS are used to indicate information that could prevent making an error that may damage the vehicle.

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER, AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY, AND LOOSE CLOTHING.

WIRE CODE IDENTIFICATION

Each wire shown in the diagrams contains a code (Fig. 1) which identifies the main circuit, part of the main circuit, gauge of wire, and color. The color is shown as a two letter code which can be identified by referring to the Wire Color Code Chart (Fig. 2)

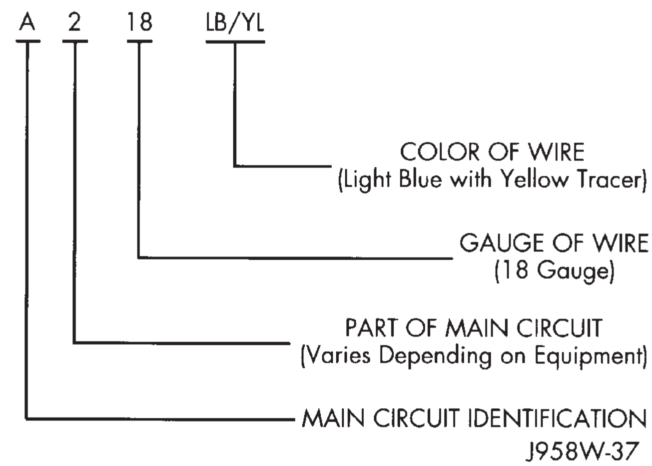


Fig. 1 Wire Code Identification

COLOR CODE	COLOR	STANDARD TRACER COLOR	COLOR CODE	COLOR	STANDARD TRACER CODE
BL	BLUE	WT	OR	ORANGE	BK
BK	BLACK	WT	PK	PINK	BK OR WT
BR	BROWN	WT	RD	RED	WT
DB	DARK BLUE	WT	TN	TAN	WT
DG	DARK GREEN	WT	VT	VIOLET	WT
GY	GRAY	BK	WT	WHITE	BK
LB	LIGHT BLUE	BK	YL	YELLOW	BK
LG	LIGHT GREEN	BK	*	WITH TRACER	

918W-136

Fig. 2 Wire Color Code Chart

CIRCUIT IDENTIFICATION

All circuits in the diagrams use an alpha/numeric code to identify the wire and its function (Fig. 3). To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

DESCRIPTION AND OPERATION (Continued)

CIRCUIT	FUNCTION
A	Battery Feed
B	Brake Controls
C	Climate Controls
D	Diagnostic Circuits
E	Dimming Illumination Circuits
F	Fused Circuits (Secondary Feed)
G	Monitoring Circuits (Gauges)
H	Open
I	Not Used
J	Open
K	Powertrain Control Module
L	Exterior Lighting
M	Interior Lighting
N	ESA Module
O	Not Used
P	Power Option (Battery Feed)
Q	Power Options (Battery Feed)
R	Passive Restraint
S	Suspension/Steering
T	Transmission/Transaxle/Transfer Case
U	Open
V	Speed Control, Washer/Wiper
W	Open
X	Audio Systems
Y	Open
Z	Grounds

948W-190

Fig. 3 Circuit Identification

CONNECTORS

Connectors shown in the diagrams are identified using the international standard arrows for male and female terminals (Fig. 4). A connector identifier is placed next to the arrows to indicate the connector number (Fig. 4).

For viewing connector pin outs, with two terminals or greater, refer to section 8W-80. This section identifies in-line connectors by number, and component connectors by name. If a component has two or more connectors they will be identified as C1, C2, C3...etc. This sections also provides terminal numbering, circuit identification, wire colors, and functions.

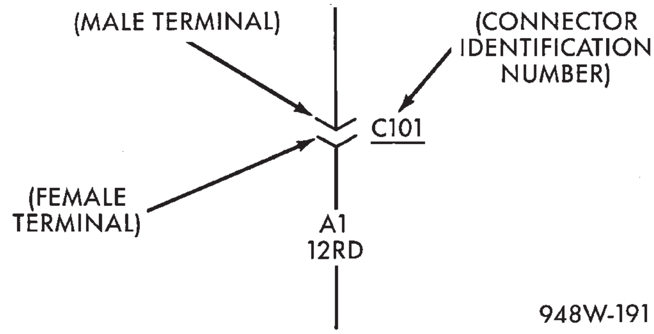


Fig. 4 Connector Identification

All connectors are viewed from the terminal end unless otherwise specified. To find the connector location in the vehicle refer to section 8W-90. This section uses the connector identification number from the wiring diagrams to provide a figure number reference.

TAKE OUTS

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component.

SYMBOLS

Various symbols are used throughout the Wiring Diagrams. These symbols can be identified by referring to the symbol identification chart (Fig. 5).

DESCRIPTION AND OPERATION (Continued)

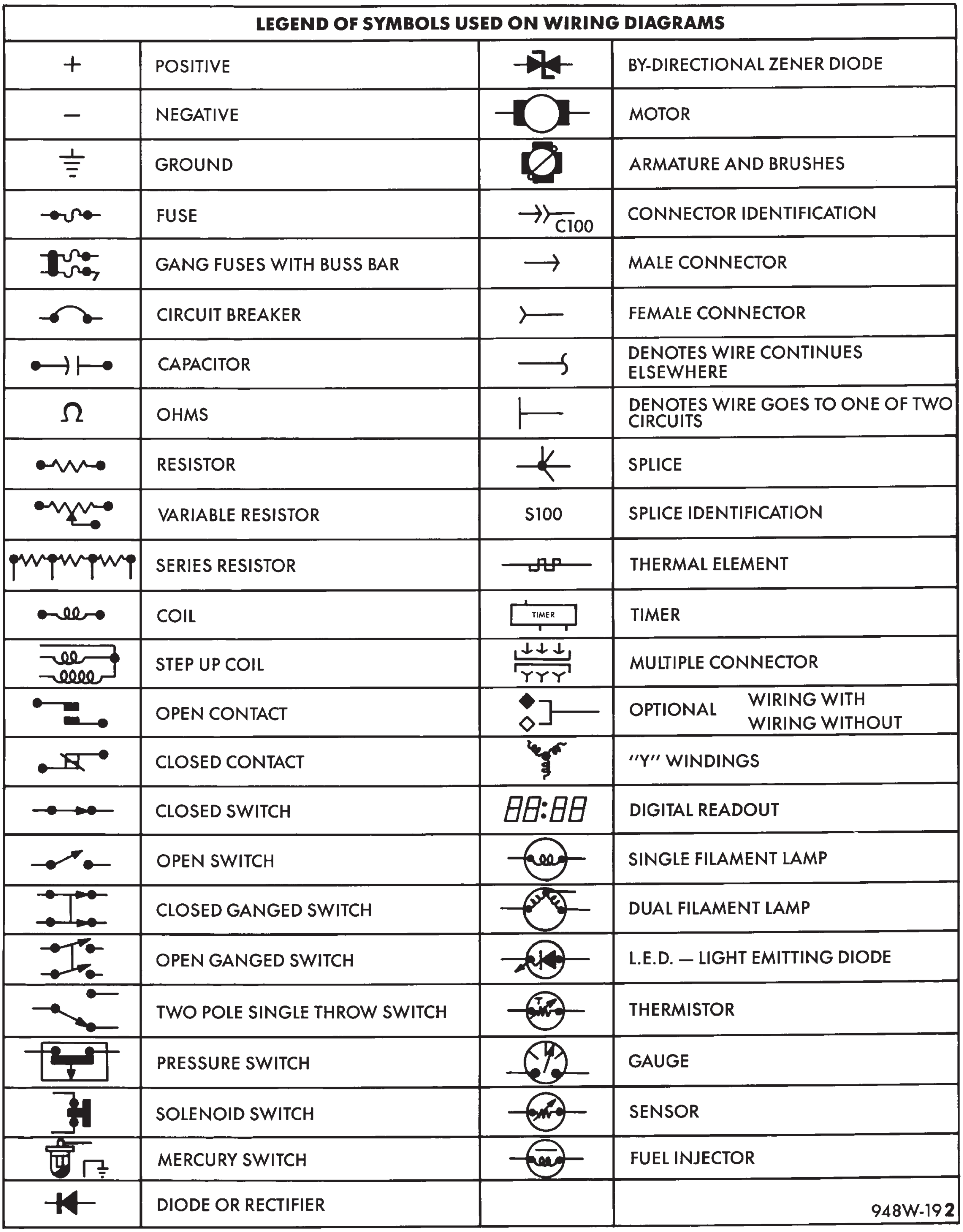


Fig. 5 Symbol Identification

DESCRIPTION AND OPERATION (Continued)

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are solid state and a symbol (Fig. 6) is used to indicate this. When handling any component with this symbol comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

(1) Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.

(2) Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.

(3) When using a voltmeter, be sure to connect the ground lead first.

(4) Do not remove the part from its protective packing until it is time to install the part.

(5) Before removing the part from its package, ground the package to a known good ground on the vehicle.

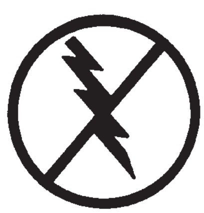


Fig. 6 Electrostatic Discharge Symbol

FASTENERS

CAUTION: At no time when servicing a vehicle, can a sheet metal screw, bolt, or other metal fastener be installed in the strut tower to take the place of an original plastic clip. Also, NO holes can be drilled into the front strut tower in the area shown in (Fig. 7) for the installation of any metal fasteners into the strut tower. Because of the minimum clearance in this area (Fig. 7) installation of metal fasteners could damage the coil spring coating and lead to a corrosion failure of the spring. If a plastic clip is missing, or is lost or broken during servicing a vehicle, replace only with the equivalent part listed in the parts catalog.

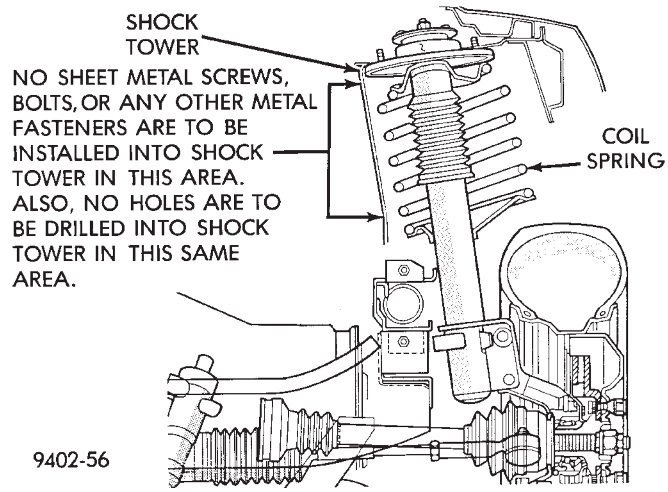


Fig. 7 Shock Tower to Spring Minimum Clearance Area

DIAGNOSIS AND TESTING

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

• Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: NEVER USE A JUMPER WIRE ACROSS A LOAD, SUCH AS A MOTOR, CONNECTED BETWEEN A BATTERY FEED AND GROUND.

• Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicle are solid state. When checking voltages in these circuits use a meter with a 10-megohm or greater impedance.

• Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: - Most of the electrical components used in today's vehicle are Solid State. When checking resistance in these circuits use a meter with a 10-megohm or greater impedance. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle electrical system can cause damage to the equipment and provide false readings.

• Probing Tools - These tools are used for probing terminals in connectors (Fig. 8). Select the proper

DIAGNOSIS AND TESTING (Continued)

size tool from Special Tool Package 6807, and insert it into the terminal being tested. Use the other end of the tool to insert the meter probe.

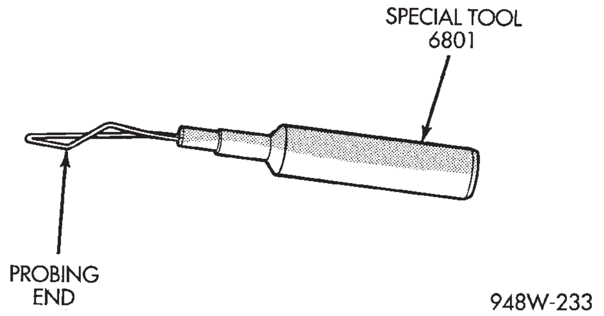


Fig. 8 Probing Tool

INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked in position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt and moisture
- Wire insulation that has rubbed through causing a short to ground
- Wiring broke inside of the insulation

CHECKING FOR TERMINAL SPREADING

When an intermittent or open circuit is suspected it is important to check for a spread terminal. To accomplish this remove the suspect female terminal from its connector.

Check the female terminal for drag when mated with the appropriate male terminal. If the terminal is spread (no or little drag felt) replace the terminal using the procedures covered in this section of the wiring diagrams.

TROUBLESHOOTING TESTS

Before beginning any tests on a vehicles electrical system use the Wiring Diagrams and study the circuit. Also refer to the Troubleshooting Wiring Problems section in this section.

TESTING FOR VOLTAGE

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 9).

(2) Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.

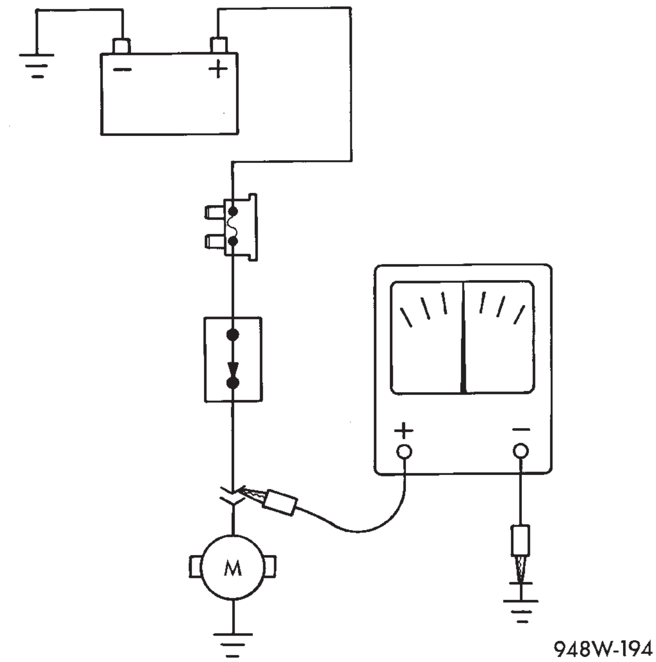


Fig. 9 Testing for Voltage

TESTING FOR CONTINUITY

(1) Remove the fuse for the circuit being checked or, disconnect the battery.

(2) Connect one lead of the ohmmeter to one side of the circuit being tested (Fig. 10).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

TESTING FOR A SHORT TO GROUND

(1) Remove the fuse and disconnect all items involved with the fuse.

(2) Connect a test light or a voltmeter across the terminals of the fuse.

(3) Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.

(4) If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

(1) Refer to the wiring diagrams and disconnect or isolate all items on the fused circuit.

(2) Replace the blown fuse.

(3) Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.

DIAGNOSIS AND TESTING (Continued)

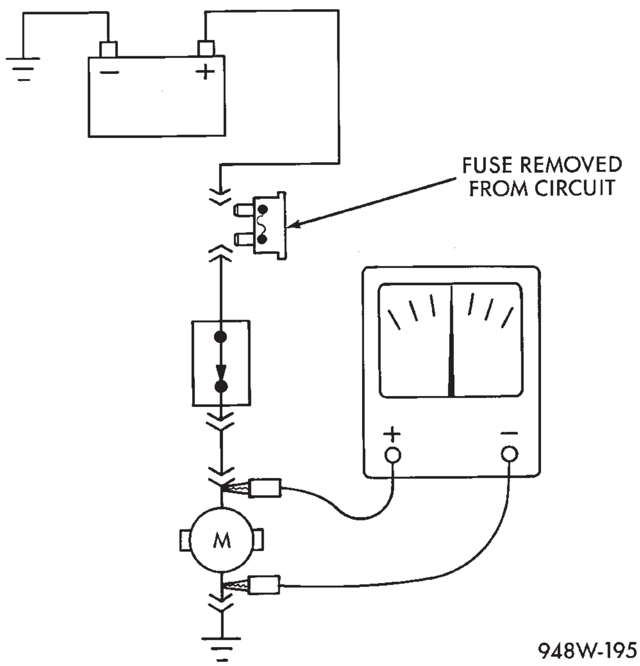


Fig. 10 Testing for Continuity

(4) Start connecting the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 11).

(2) Connect the other lead of the voltmeter to the other side of the switch or component.

(3) Operate the item.

(4) The voltmeter will show the difference in voltage between the two points.

TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

(1) Verify the problem.

(2) Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.

(3) Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.

(4) Isolate the problem area.

(5) Repair the problem.

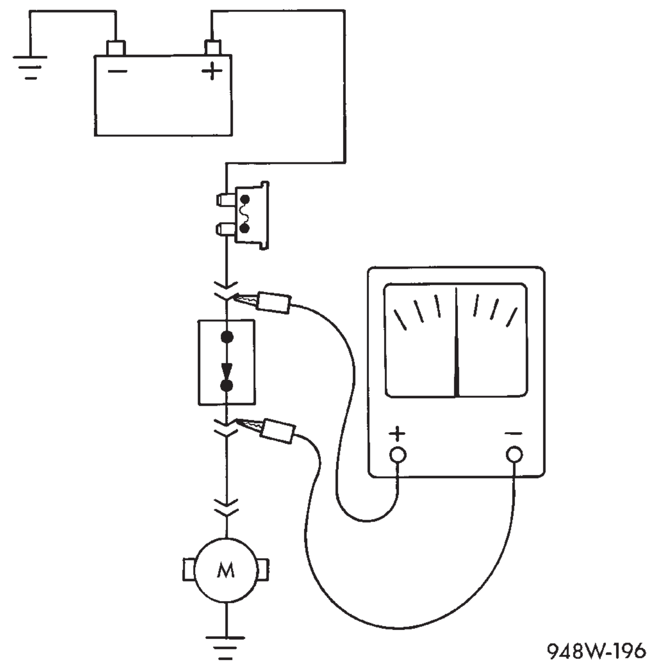


Fig. 11 Testing for Voltage Drop

(6) Verify proper operation. For this step check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

SERVICE PROCEDURES

WIRING REPAIR

When replacing or repairing a wire, it is important that the correct gauge be used as shown in the wiring diagrams. The wires must also be held securely in place to prevent damage to the insulation.

(1) Disconnect battery negative cable

(2) Remove 1 inch of insulation from each end of the wire.

(3) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(4) Spread the strands of the wire apart on each part of the exposed wire (example 1). (Fig. 12)

(5) Push the two ends of wire together until the strands of wire are close to the insulation (example 2) (Fig. 12)

(6) Twist the wires together (example 3) (Fig. 12)

(7) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(8) Center the heat shrink tubing over the joint, and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

(9) Secure the wire to the existing ones to prevent chafing or damage to the insulation

SERVICE PROCEDURES (Continued)

(10) Connect battery and test all affected systems.

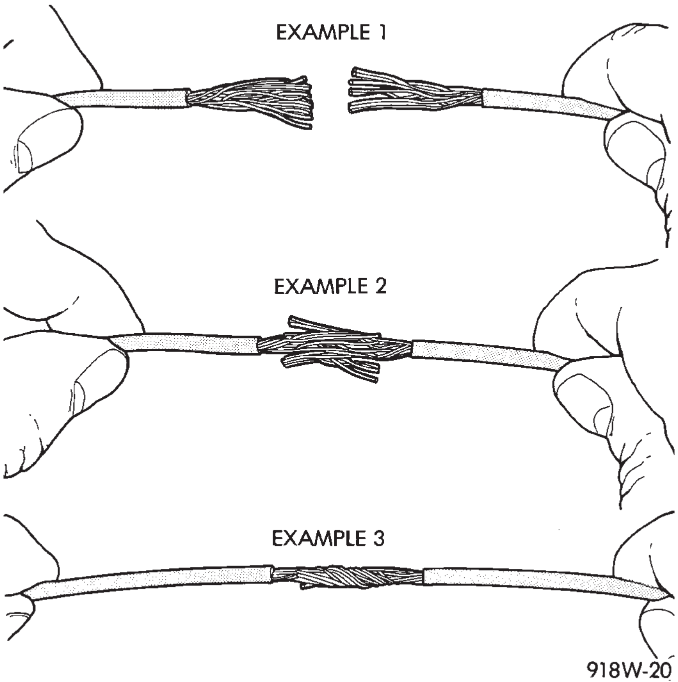


Fig. 12 Wire Repair

TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/ component.

(3) Insert the terminal releasing special tool 6742 into the terminal end of the connector (Fig. 13).

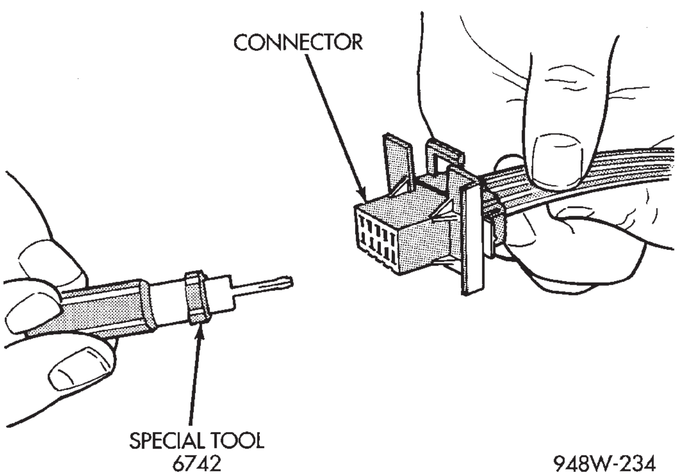


Fig. 13 Molex Connector Repair

(4) Using special tool 6742 release the locking fingers on the terminal (Fig. 14).

(5) Pull on the wire to remove it from the connector.

(6) Repair or replace the connector or terminal, as necessary.

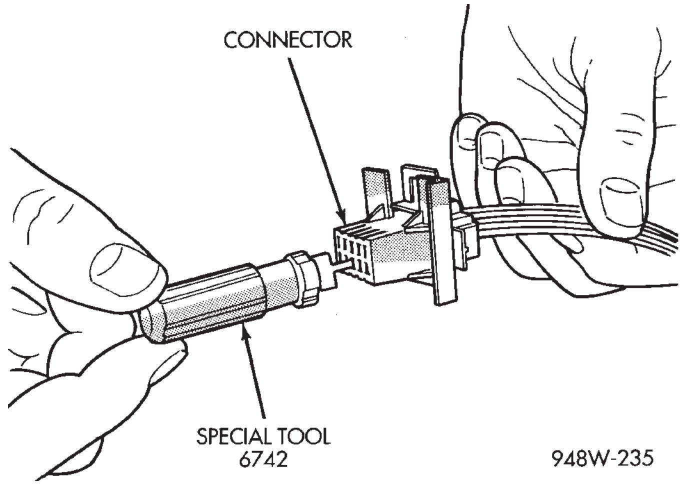


Fig. 14 Using Special Tool 6742

CONNECTOR REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector that is to be repaired from its mating half/component

(3) Remove the connector locking wedge, if required (Fig. 15)

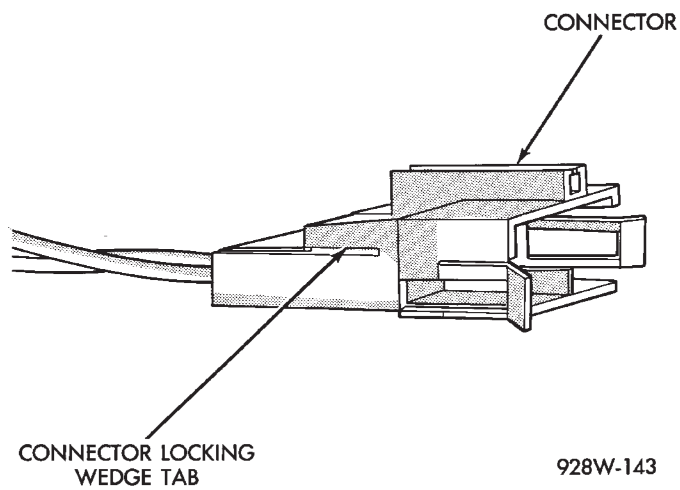


Fig. 15 Connector Locking Wedge

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 16) (Fig. 17).

(5) Reset the terminal locking tang, if it has one.

(6) Insert the removed wire in the same cavity on the repair connector.

(7) Repeat steps four through six for each wire in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.

(8) Insert the connector locking wedge into the repaired connector, if required.

(9) Connect connector to its mating half/component.

SERVICE PROCEDURES (Continued)

(10) Connect battery and test all affected systems.

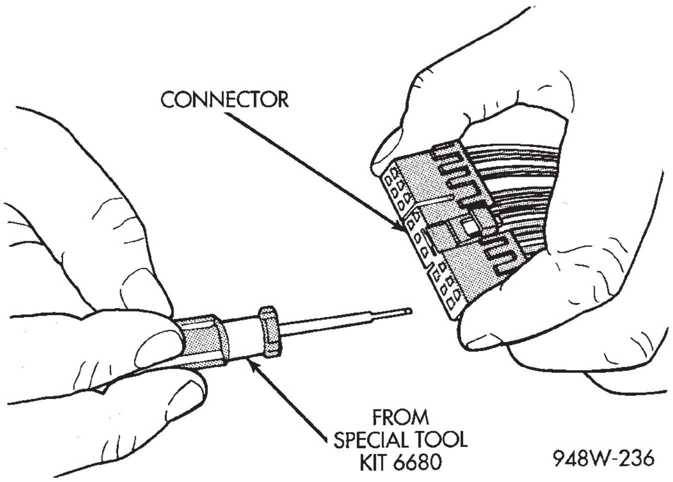


Fig. 16 Terminal Removal

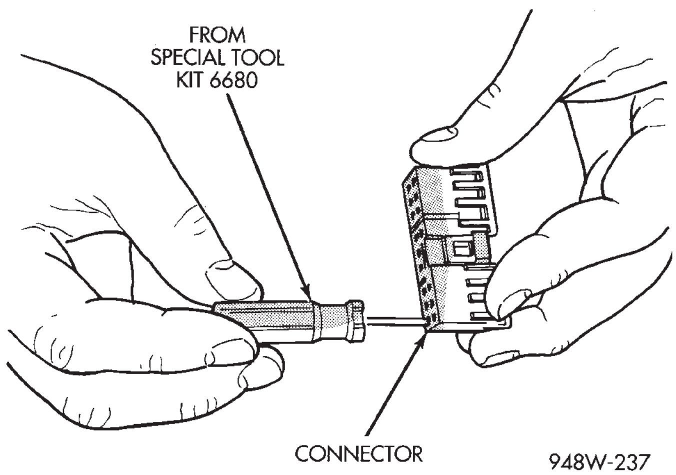


Fig. 17 Terminal Removal Using Special Tool

CONNECTOR AND TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector (that is to be repaired) from its mating half/component.

(3) Cut off the existing wire connector directly behind the insulator. Remove six inches of tape from the harness.

(4) Stagger cut all wires on the harness side at 1/2 inch intervals (Fig. 18).

(5) Remove 1 inch of insulation from each wire on the harness side.

(6) Stagger cut the matching wires on the repair connector assembly in the opposite order as was done on the harness side of the repair. Allow extra length for soldered connections. Check that the overall length is the same as the original (Fig. 18).

(7) Remove 1 inch of insulation from each wire.

(8) Place a piece of heat shrink tubing over one side of the wire. Be sure the tubing will be long enough to cover and seal the entire repair area.

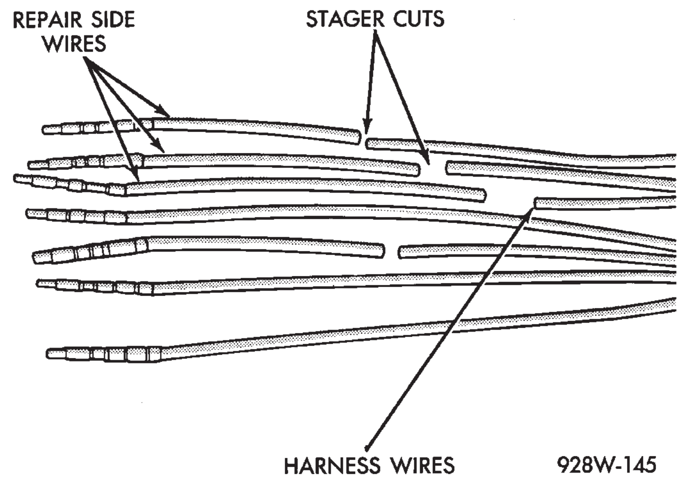


Fig. 18 Stagger Cutting Wires

(9) Spread the strands of the wire apart on each part of the exposed wires.

(10) Push the two ends of wire together until the strands of wire are close to the insulation.

(11) Twist the wires together.

(12) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(13) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing

(14) Repeat steps 8 through 13 for each wire.

(15) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(16) Re-connect the repaired connector.

(17) Connect the battery, and test all affected systems.

TERMINAL/CONNECTOR REPAIR- AUGAT CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/ component.

(3) Push down on the yellow connector locking tab to release the terminals (Fig. 19).

(4) Using special tool 6932, push the terminal to remove it from the connector (Fig. 20).

(5) Repair or replace the connector or terminal as necessary.

(6) When re-assembling the connector, the locking wedge must be placed in the locked position to prevent terminal push out.

TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector being repaired from its mating half. Remove connector locking wedge, if required (Fig. 21).

SERVICE PROCEDURES (Continued)

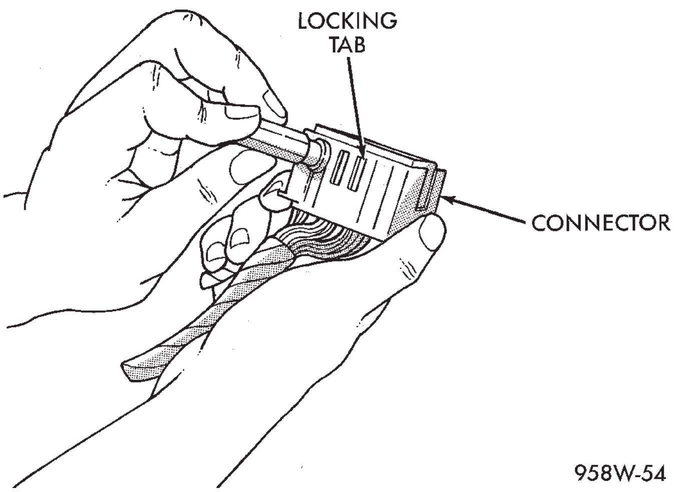


Fig. 19 Augat Connector Repair

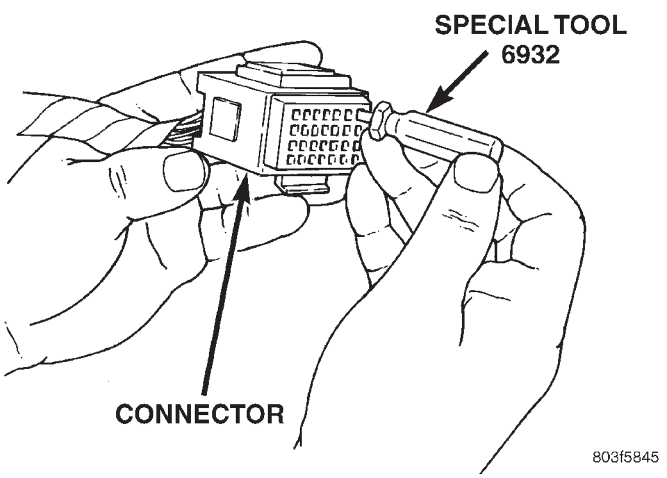


Fig. 20 Using Special Tool 6932

(3) Remove connector locking wedge, if required (Fig. 21).

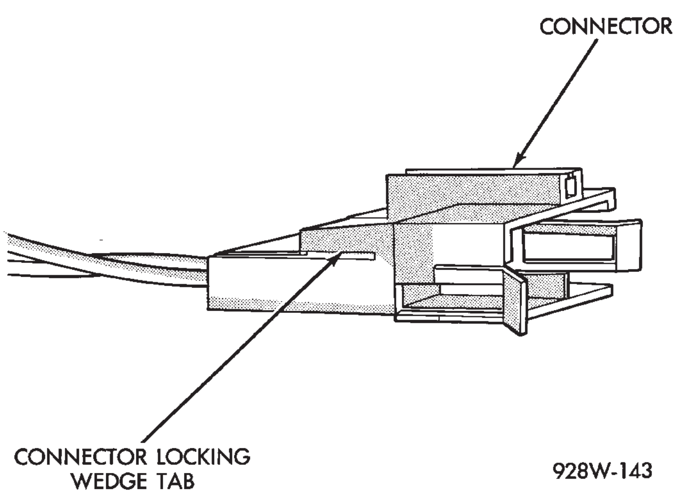


Fig. 21 Connector Locking Wedge Tab (Typical)

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 22) (Fig. 23).

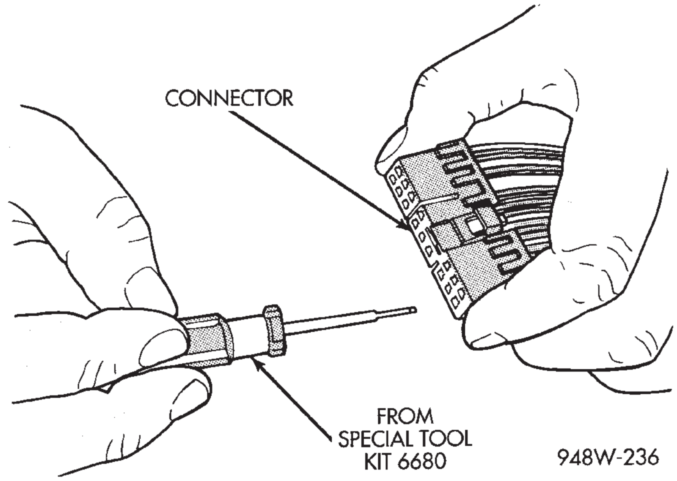


Fig. 22 Terminal Removal

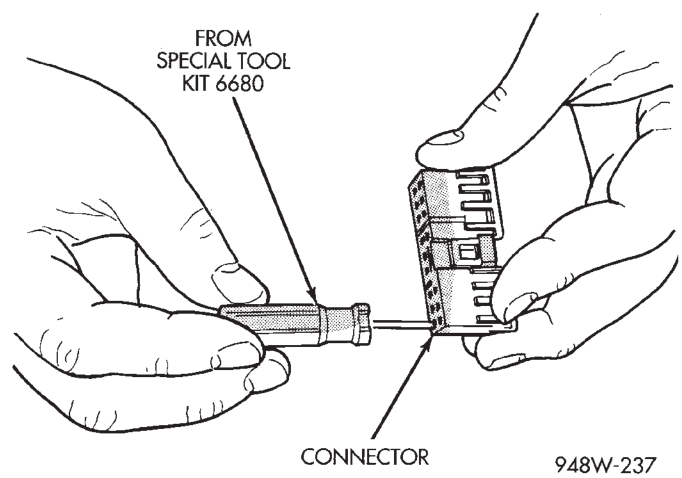


Fig. 23 Terminal Removal Using Special Tool

(5) Cut the wire 6 inches from the back of the connector.

(6) Remove 1 inch of insulation from the wire on the harness side.

(7) Select a wire from the terminal repair assembly that best matches the color wire being repaired.

(8) Cut the repair wire to the proper length and remove 1 inch of insulation.

(9) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.1

(10) Spread the strands of the wire apart on each part of the exposed wires.

(11) Push the two ends of wire together until the strands of wire are close to the insulation.

(12) Twist the wires together.

(13) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

SERVICE PROCEDURES (Continued)

(14) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

(15) Insert the repaired wire into the connector.

(16) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(17) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(18) Connect battery, and test all affected systems.

DIODE REPLACEMENT

(1) Disconnect the battery.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 24).

(4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(5) Install the new diode in the harness, making sure current flow is correct. If necessary refer to the appropriate wiring diagram for current flow.

(6) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

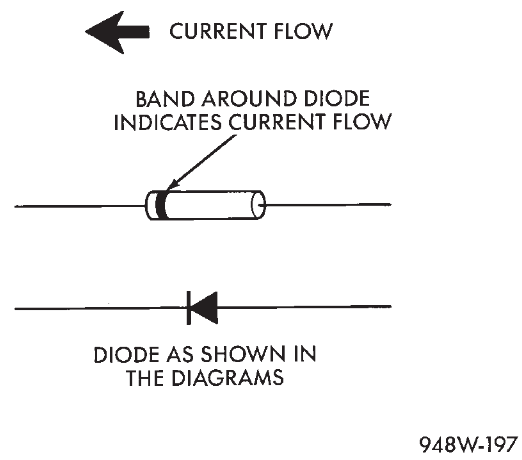


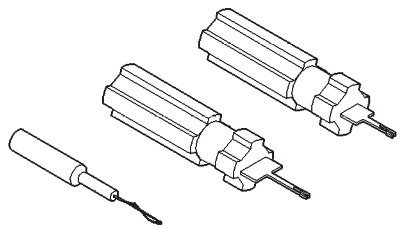
Fig. 24 Diode Identification

(7) Tape the diode to the harness using electrical tape making, sure the diode is completely sealed from the elements.

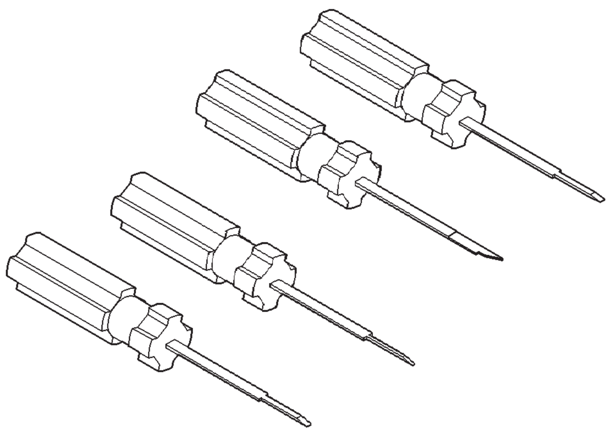
(8) Re-connect the battery, and test affected systems.

SPECIAL TOOLS

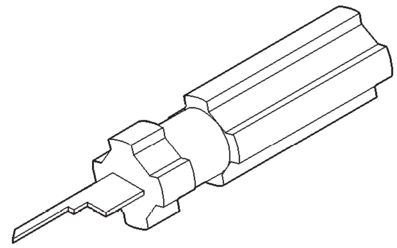
WIRING/TERMINAL



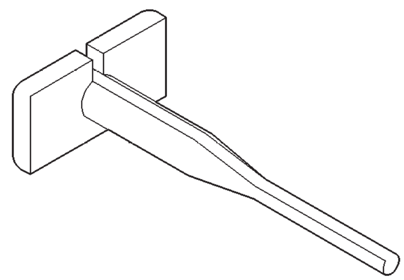
Probing Tool Package 6807



Terminal Pick 6680



Terminal Removing Tool 6932



Terminal Removing Tool 6934

8W-02 COMPONENT INDEX

INDEX

COMPONENT INDEX

8W-02 COMPONENT INDEX

GENERAL INFORMATION

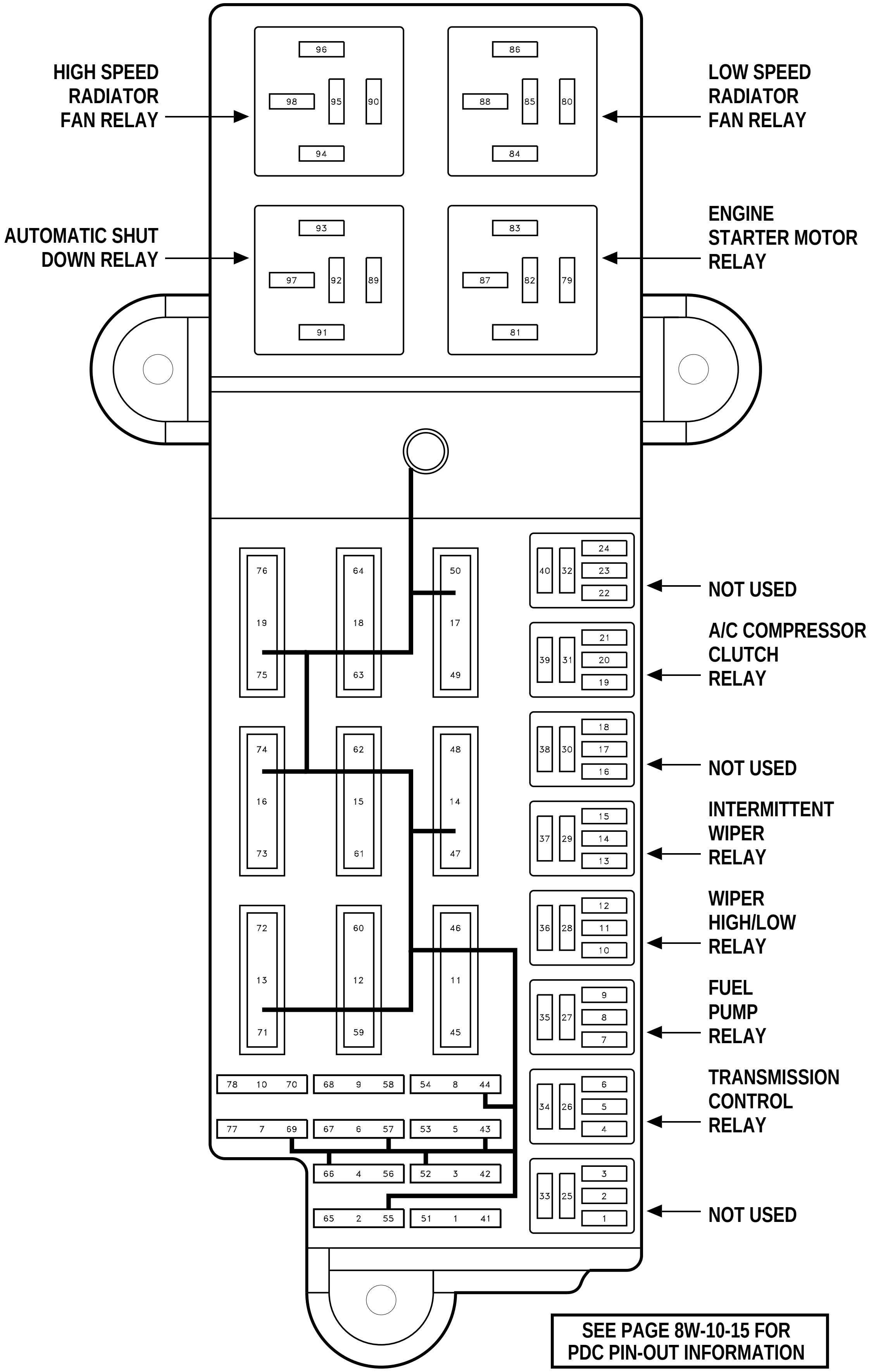
INTRODUCTION

This section provides an alphabetical listing of all the components covered in group 8W. For information on system operation, refer to the appropriate section of the wiring diagrams.

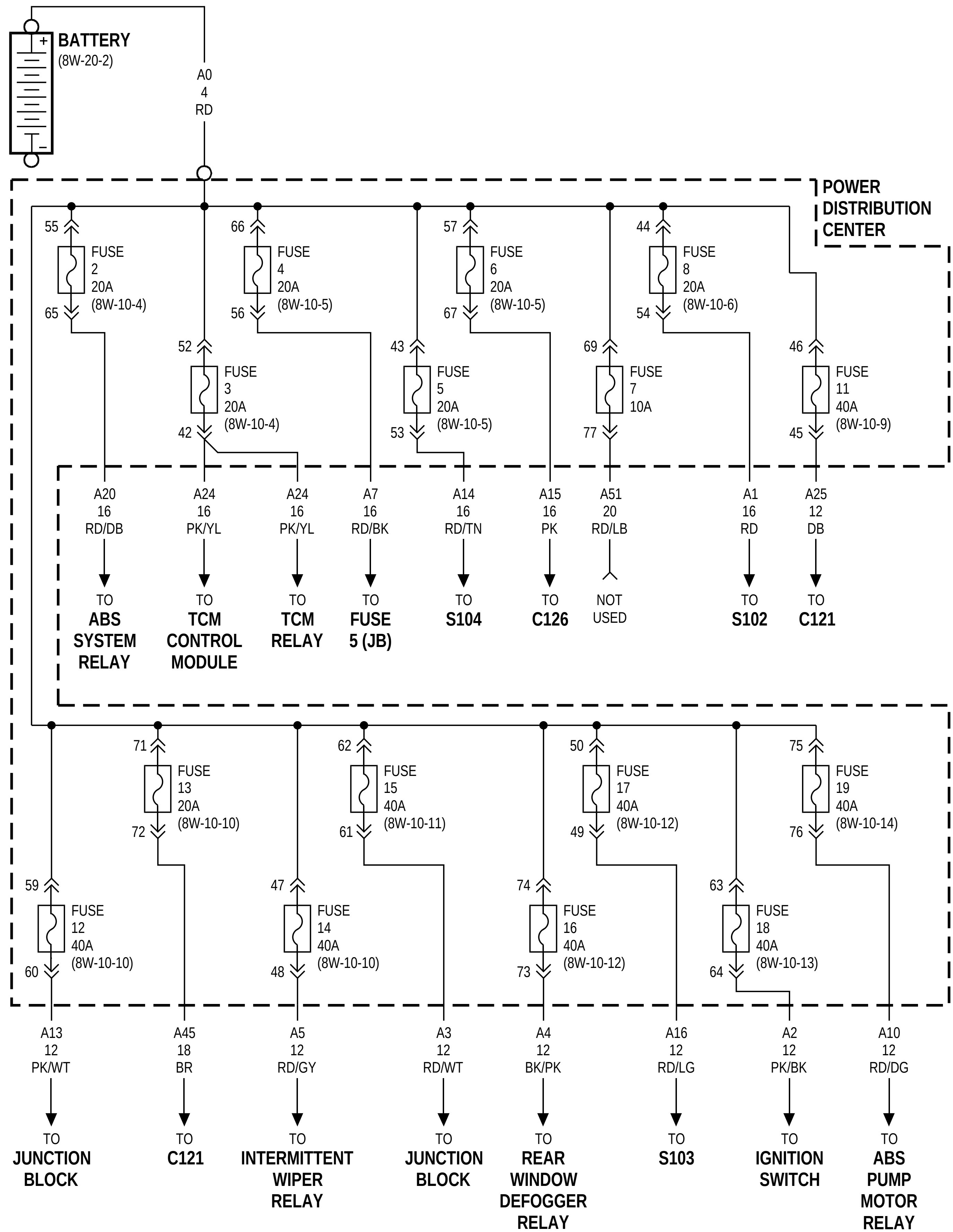
8W-10 POWER DISTRIBUTION

INDEX

POWER DISTRIBUTION CENTER



SEE PAGE 8W-10-15 FOR
PDC PIN-OUT INFORMATION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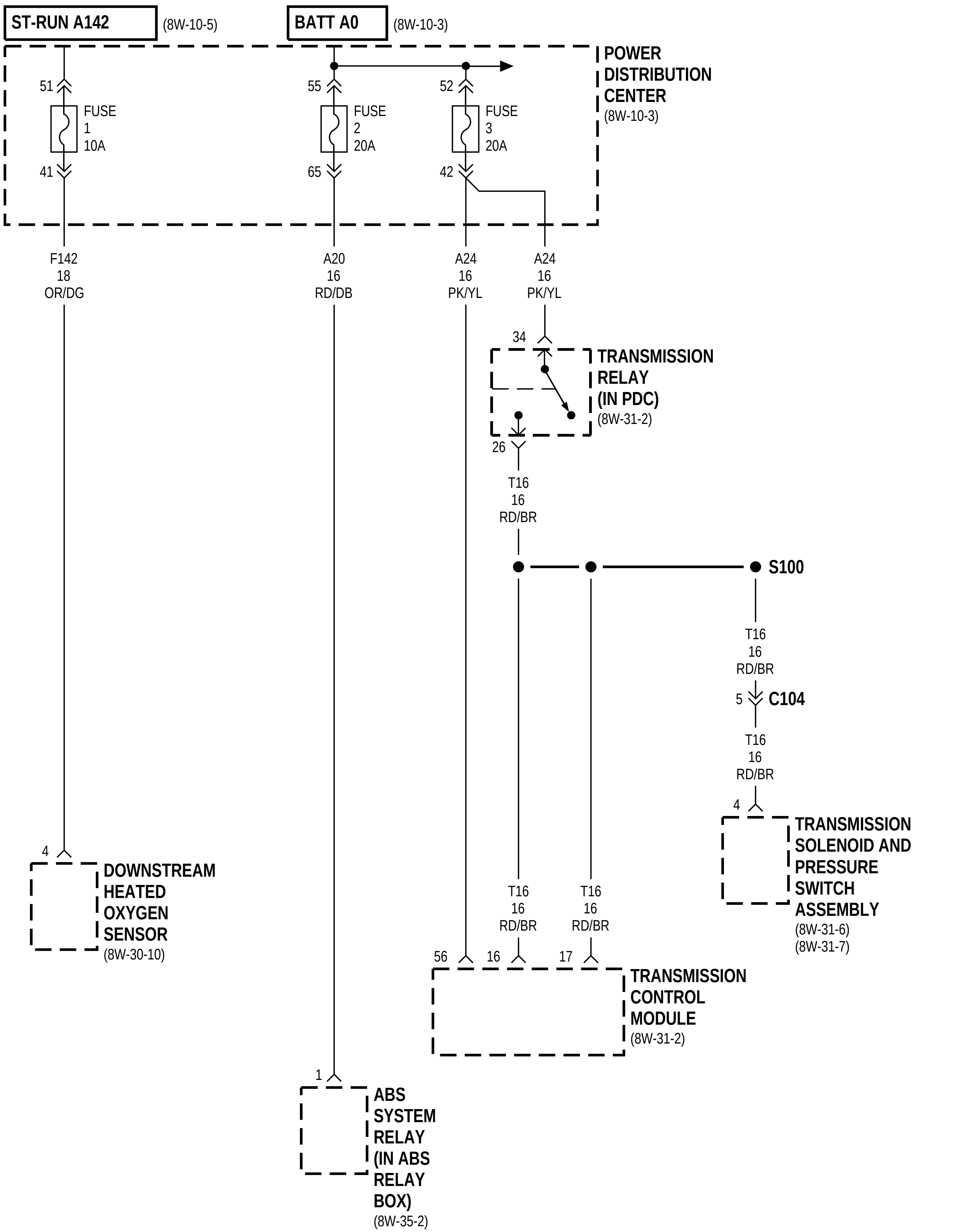
A0
4
RD
POWER
DISTRIBUTION
CENTER
FUSE
2
20A
(8W-10-4)
FUSE
3
20A
(8W-10-4)
FUSE
4
20A
(8W-10-5)
FUSE
5
20A
(8W-10-5)
FUSE
6
20A
(8W-10-5)
FUSE
7
10A
FUSE
8
20A
(8W-10-6)
FUSE
11
40A
(8W-10-9)
A20 16 RD/DB
TO ABS SYSTEM RELAY
A24 16 PK/YL
TO TCM CONTROL MODULE
A24 16 PK/YL
TO TCM RELAY
A7 16 RD/BK
TO FUSE 5 (JB)
A14 16 RD/TN
TO S104
A15 16 PK
TO C126
A51 20 RD/LB
NOT USED
A1 16 RD
TO S102
A25 12 DB
TO C121
FUSE
12
40A
(8W-10-10)
FUSE
13
20A
(8W-10-10)
FUSE
14
40A
(8W-10-10)
FUSE
15
40A
(8W-10-11)
FUSE
16
40A
(8W-10-12)
FUSE
17
40A
(8W-10-12)
FUSE
18
40A
(8W-10-13)
FUSE
19
40A
(8W-10-14)
A13 12 PK/WT
TO JUNCTION BLOCK
A45 18 BR
TO C121
A5 12 RD/GY
TO INTERMITTENT WIPER RELAY
A3 12 RD/WT
TO JUNCTION BLOCK
A4 12 BK/PK
TO REAR WINDOW DEFOGGER RELAY
A16 12 RD/LG
TO S103
A2 12 PK/BK
TO IGNITION SWITCH
A10 12 RD/DG
TO ABS PUMP MOTOR RELAY

JXI00130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(8W-10-3)
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(8W-10-3)
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FUSE 1 10A
41
55
FUSE 2 20A
65
52
FUSE 3 20A
42
F142 18 OR/DG
A20 16 RD/DB
A24 16 PK/YL
A24 16 PK/YL
34
TRANSMISSION RELAY (IN PDC)
(8W-31-2)
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T16 16 RD/BR
S100
T16 16 RD/BR
5
C104
T16 16 RD/BR
4
TRANSMISSION SOLENOID AND PRESSURE SWITCH ASSEMBLY
(8W-31-6)
(8W-31-7)
4
DOWNSTREAM HEATED OXYGEN SENSOR
(8W-30-10)
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T16 16 RD/BR
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16
17
TRANSMISSION CONTROL MODULE
(8W-31-2)
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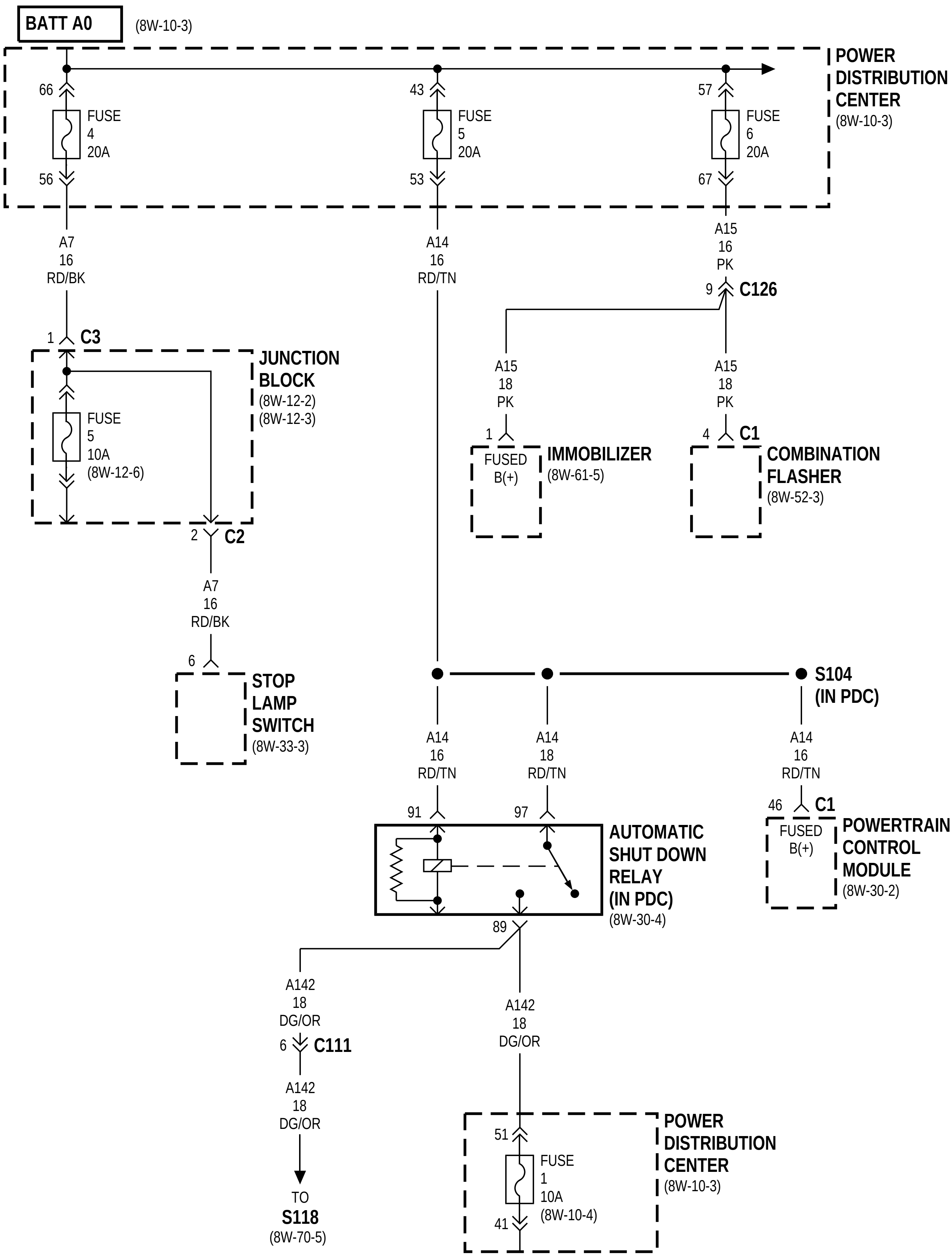
ABS SYSTEM RELAY (IN ABS RELAY BOX)
(8W-35-2)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DISTRIBUTION
CENTER
(8W-10-3)
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FUSE
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20A
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FUSE
5
20A
53
57
FUSE
6
20A
67
A7
16
RD/BK
A14
16
RD/TN
A15
16
PK
9
C126
1
C3
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
5
10A
(8W-12-6)
A15
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PK
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PK
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B(+)
IMMOBILIZER
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COMBINATION
FLASHER
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C2
A7
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RD/BK
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STOP
LAMP
SWITCH
(8W-33-3)
S104
(IN PDC)
A14
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RD/TN
A14
18
RD/TN
A14
16
RD/TN
91
97
AUTOMATIC
SHUT DOWN
RELAY
(IN PDC)
(8W-30-4)
46
C1
FUSED
B(+)
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
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A142
18
DG/OR
6
C111
A142
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DG/OR
A142
18
DG/OR
TO
S118
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DISTRIBUTION
CENTER
(8W-10-3)
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FUSE
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10A
(8W-10-4)
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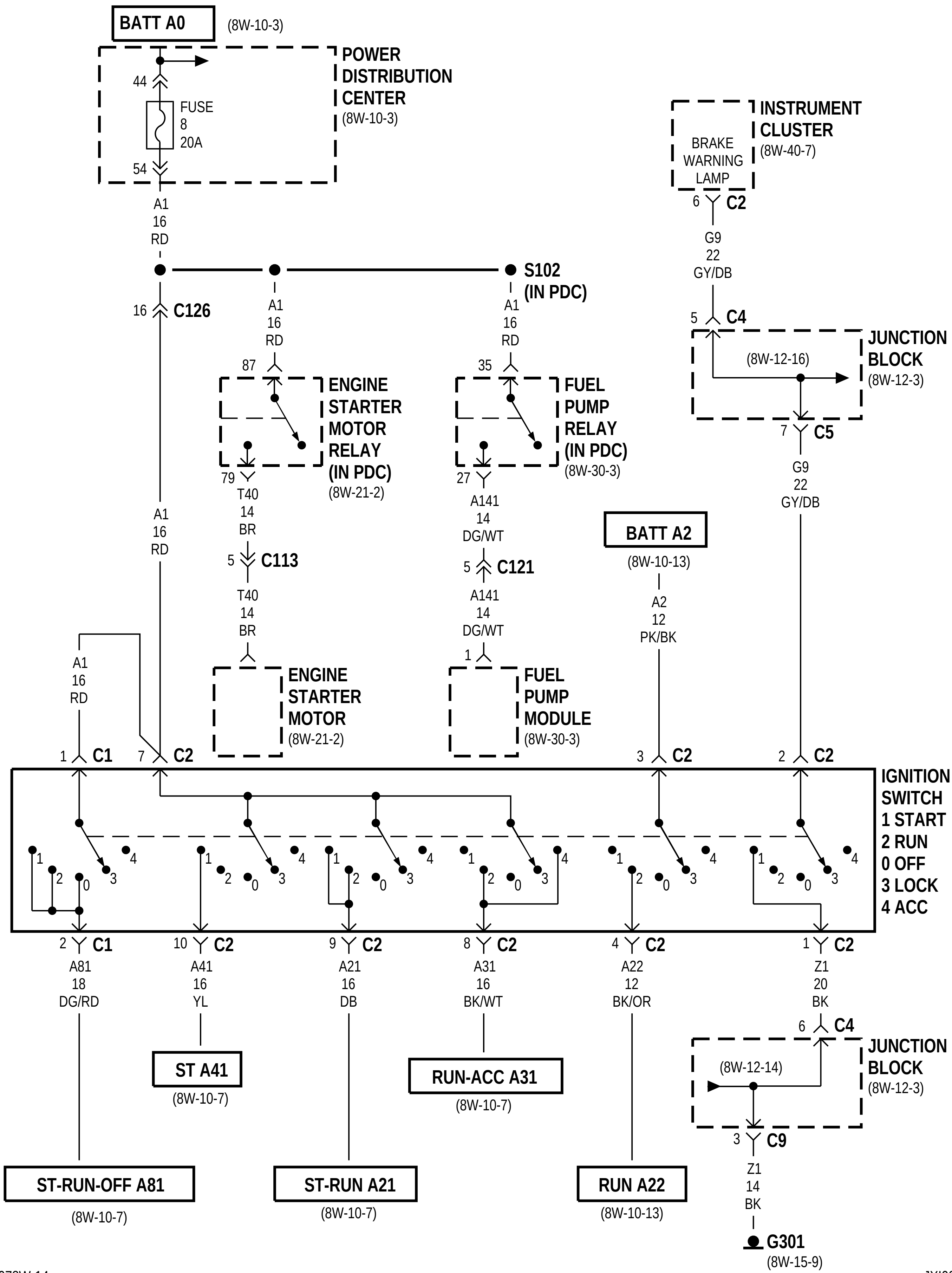
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(8W-10-3)
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54
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C126
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
FUEL PUMP RELAY (IN PDC)
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T40 14 BR
C113
A141 14 DG/WT
C121
ENGINE STARTER MOTOR
(8W-21-2)
FUEL PUMP MODULE
(8W-30-3)
INSTRUMENT CLUSTER
(8W-40-7)
BRAKE WARNING LAMP
G9 22 GY/DB
JUNCTION BLOCK
(8W-12-16)
(8W-12-3)
BATT A2
(8W-10-13)
A2 12 PK/BK
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
A81 18 DG/RD
A41 16 YL
A21 16 DB
A31 16 BK/WT
A22 12 BK/OR
Z1 20 BK
ST A41
(8W-10-7)
RUN-ACC A31
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(8W-12-14)
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Z1 14 BK
G301
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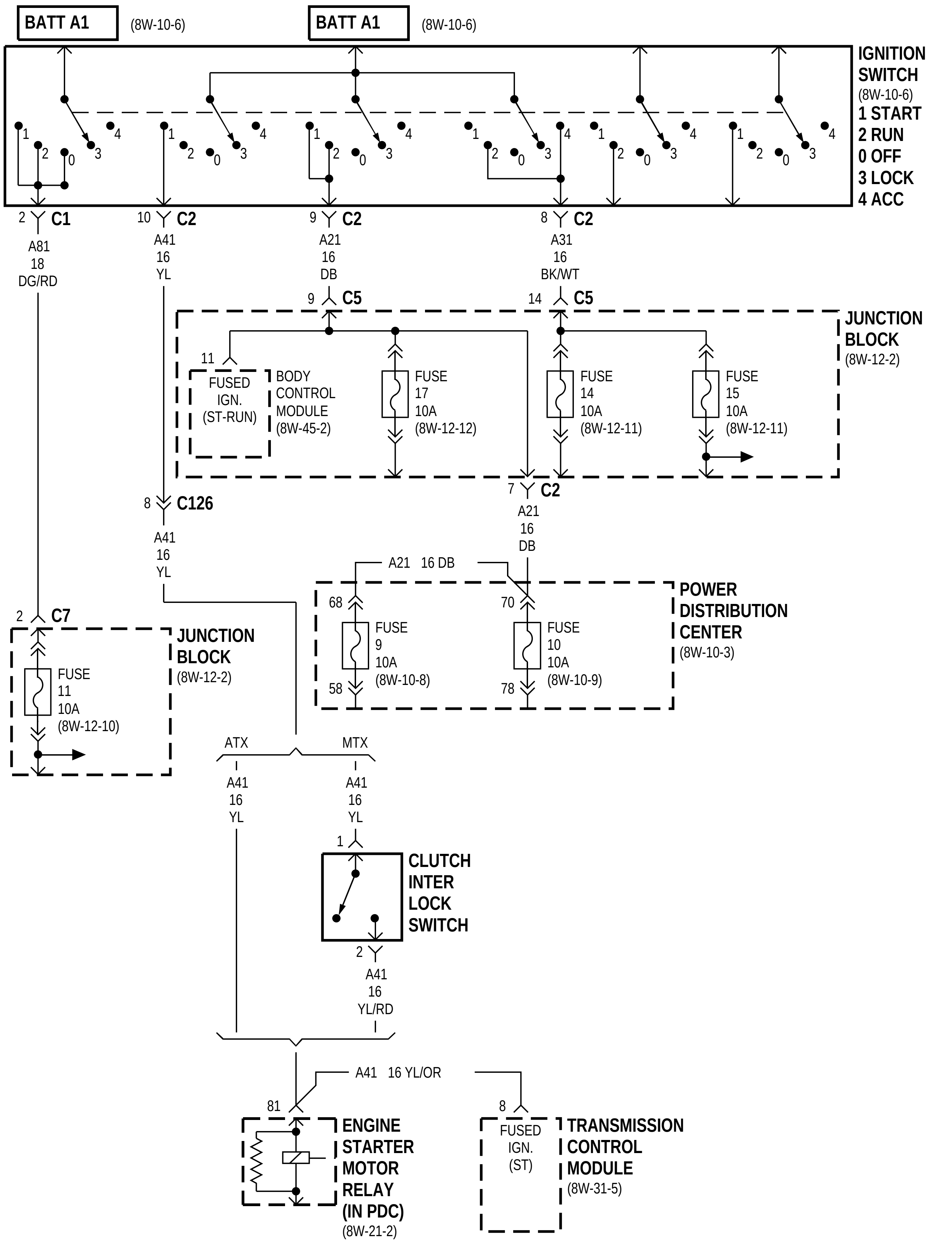
ST-RUN A21
(8W-10-7)
RUN A22
(8W-10-13)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(8W-10-6)
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(8W-10-6)
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3 LOCK
4 ACC
2 C1
A81
18
DG/RD
10 C2
A41
16
YL
9 C2
A21
16
DB
8 C2
A31
16
BK/WT
9 C5
14 C5
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IGN.
(ST-RUN)
BODY
CONTROL
MODULE
(8W-45-2)
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17
10A
(8W-12-12)
FUSE
14
10A
(8W-12-11)
FUSE
15
10A
(8W-12-11)
7 C2
A21
16
DB
8 C126
A41
16
YL
A21 16 DB
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70
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE
9
10A
(8W-10-8)
58
FUSE
10
10A
(8W-10-9)
78
2 C7
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-10)
ATX
MTX
A41
16
YL
A41
16
YL
1
CLUTCH INTER LOCK SWITCH
2
A41
16
YL/RD
A41 16 YL/OR
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ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
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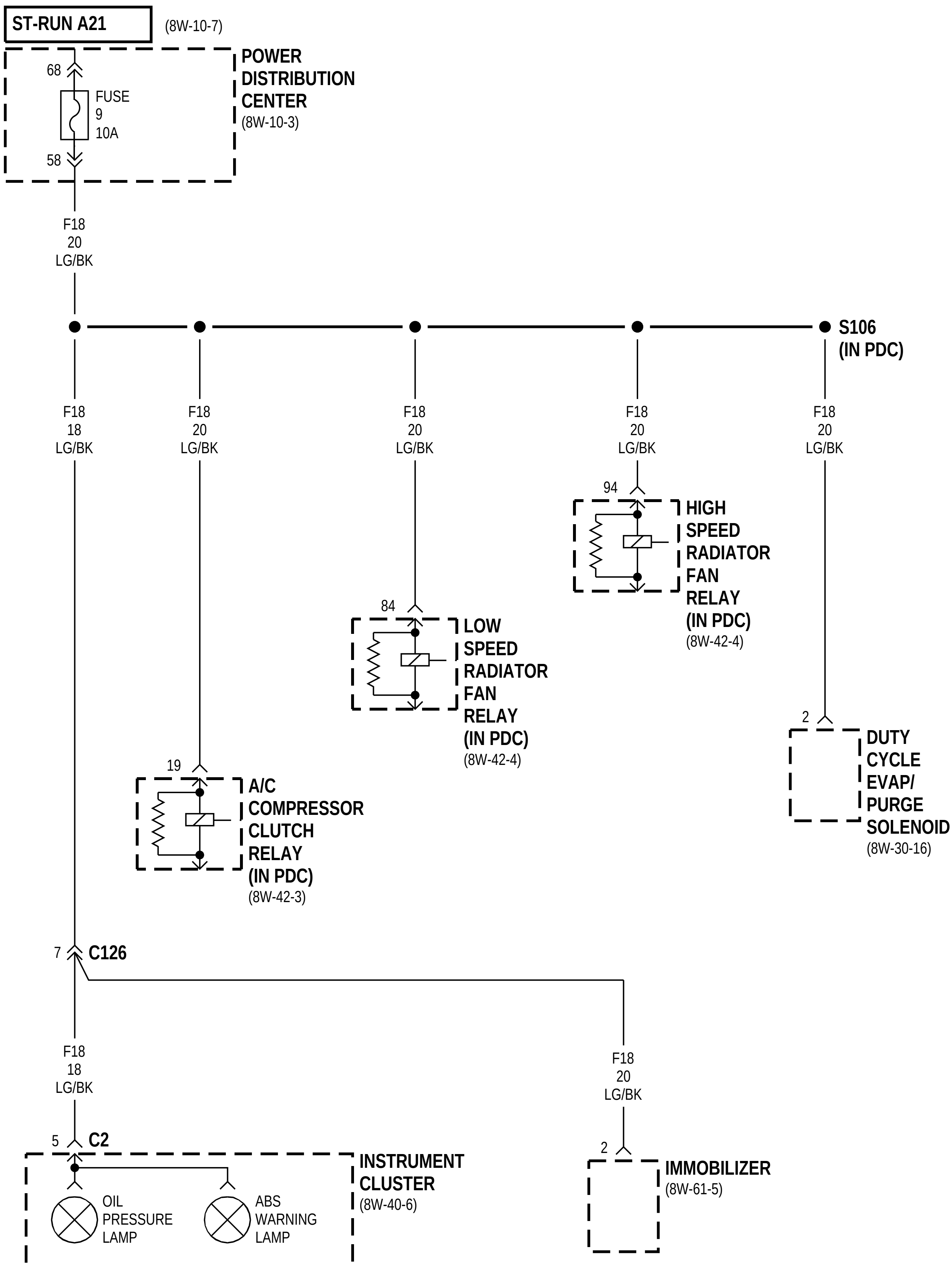
FUSED
IGN.
(ST)
TRANSMISSION CONTROL MODULE
(8W-31-5)



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FUSE
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10A
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POWER
DISTRIBUTION
CENTER
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LG/BK
S106
(IN PDC)
F18
18
LG/BK
F18
20
LG/BK
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LG/BK
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LG/BK
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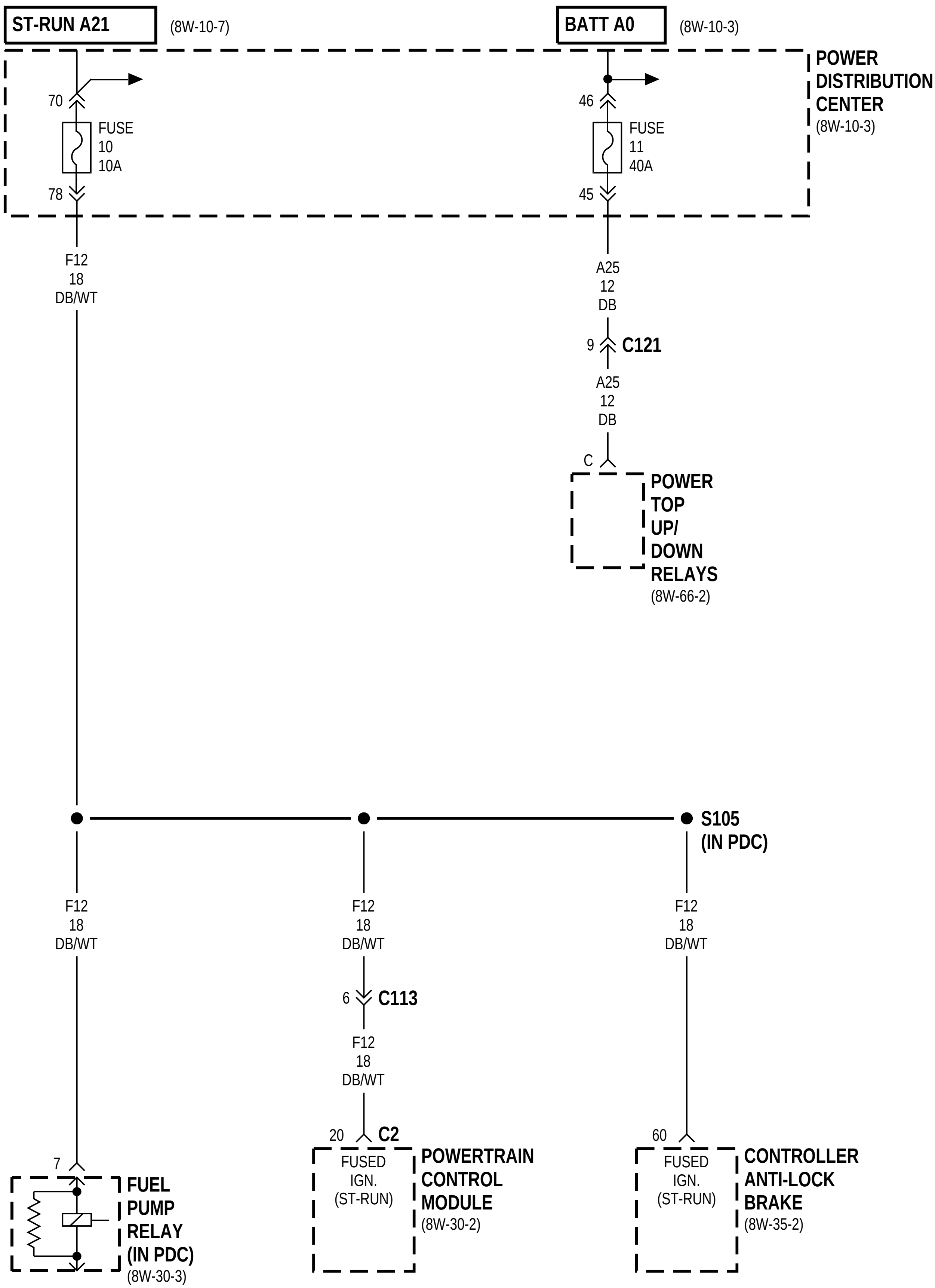
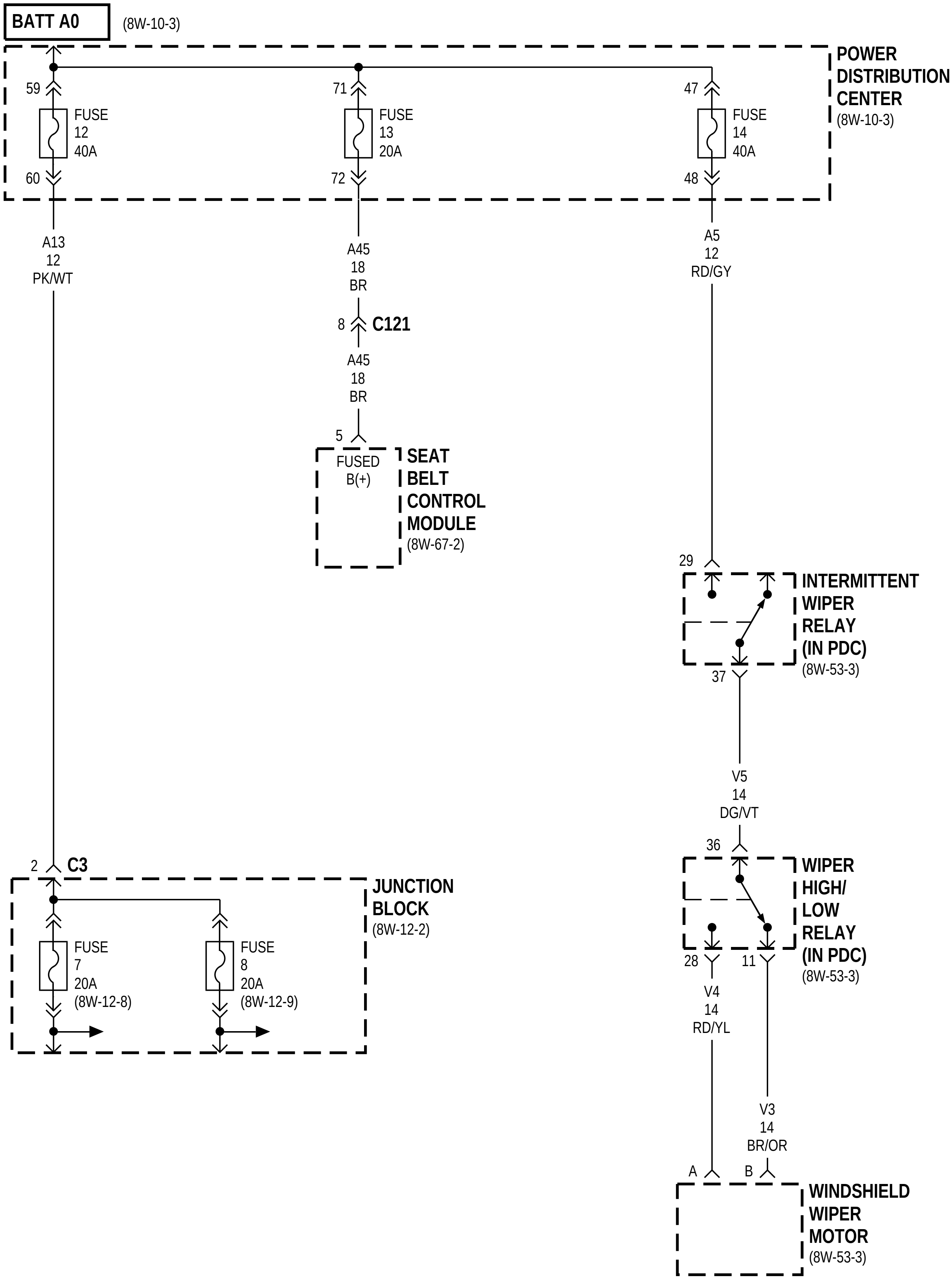
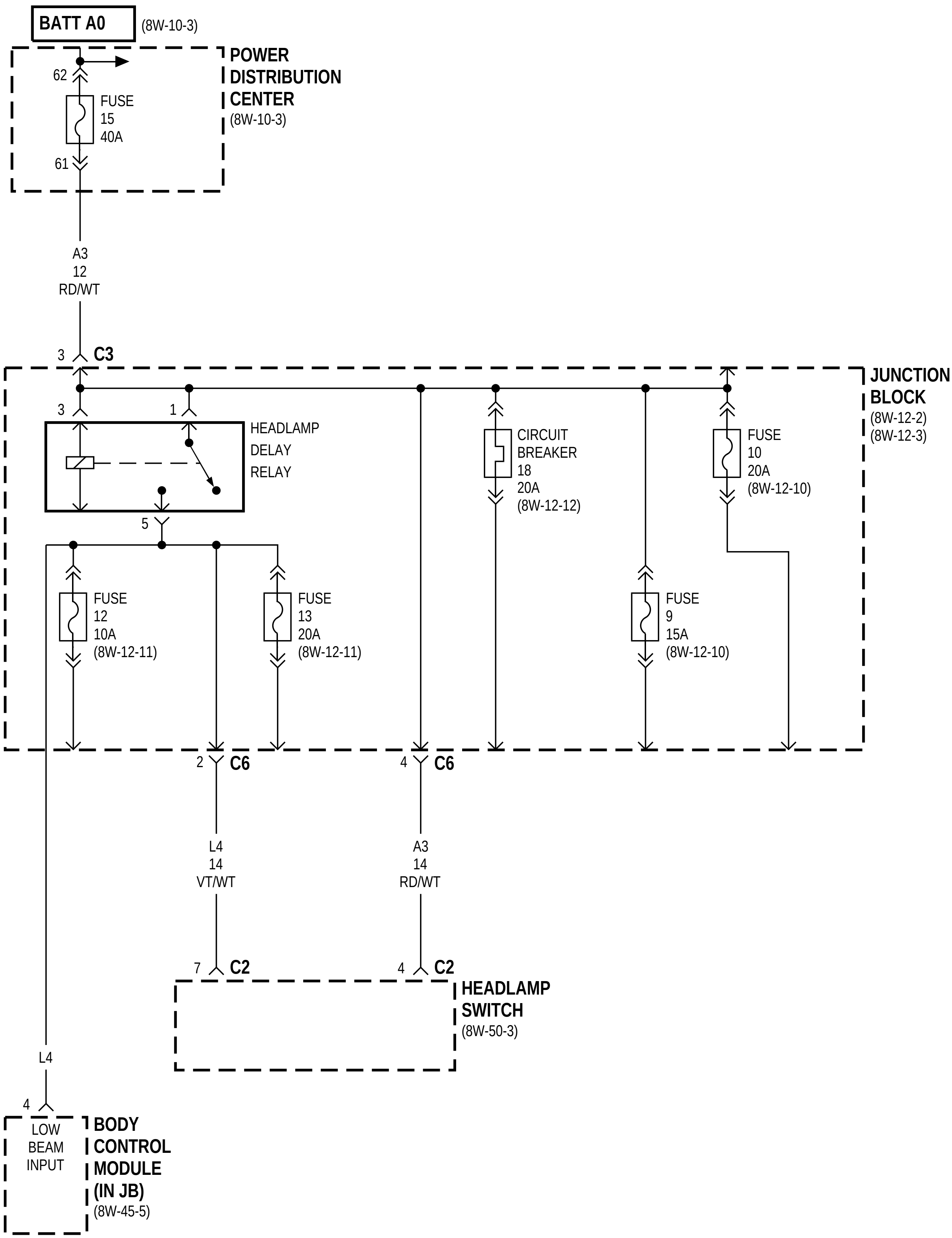
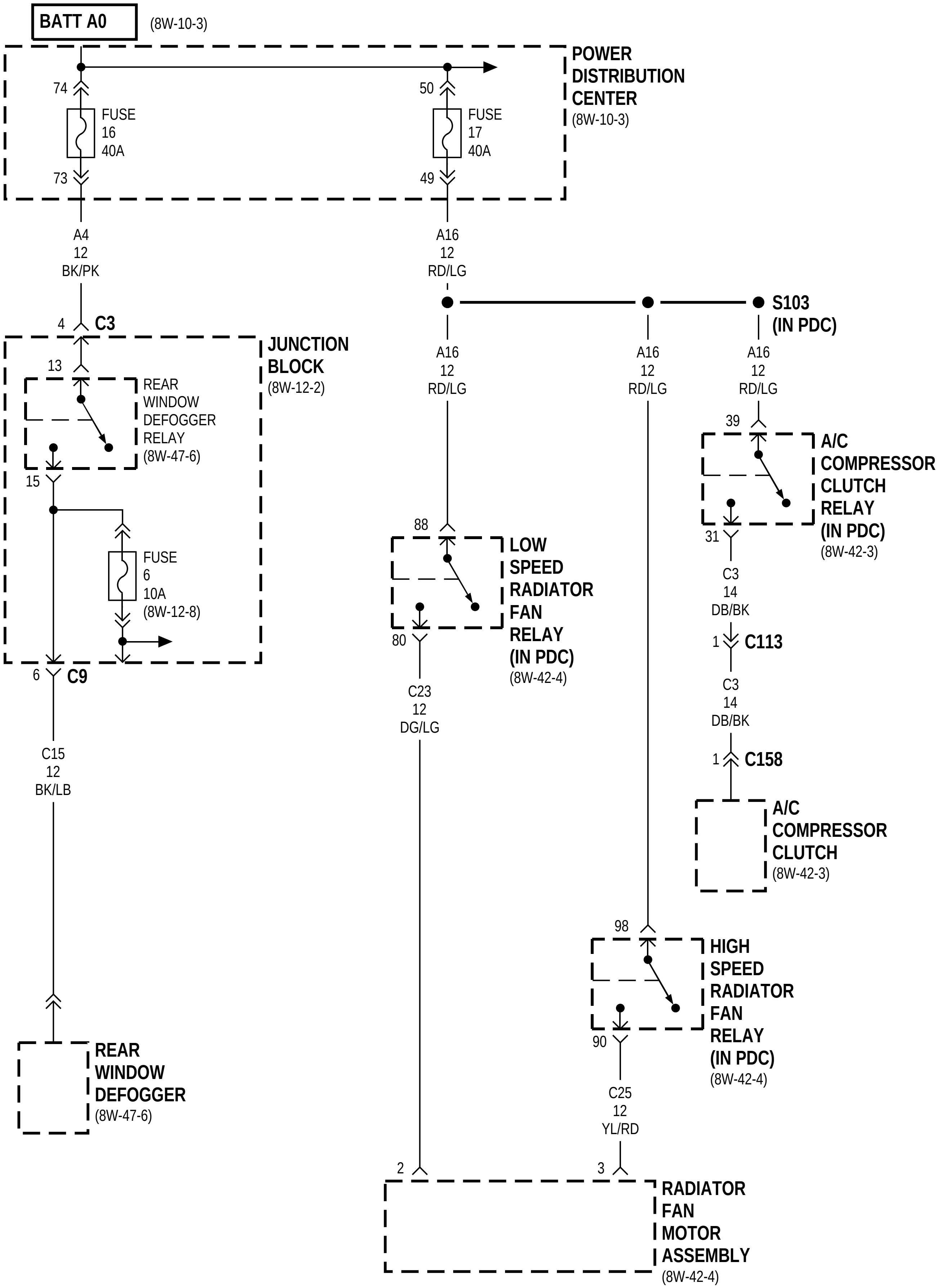
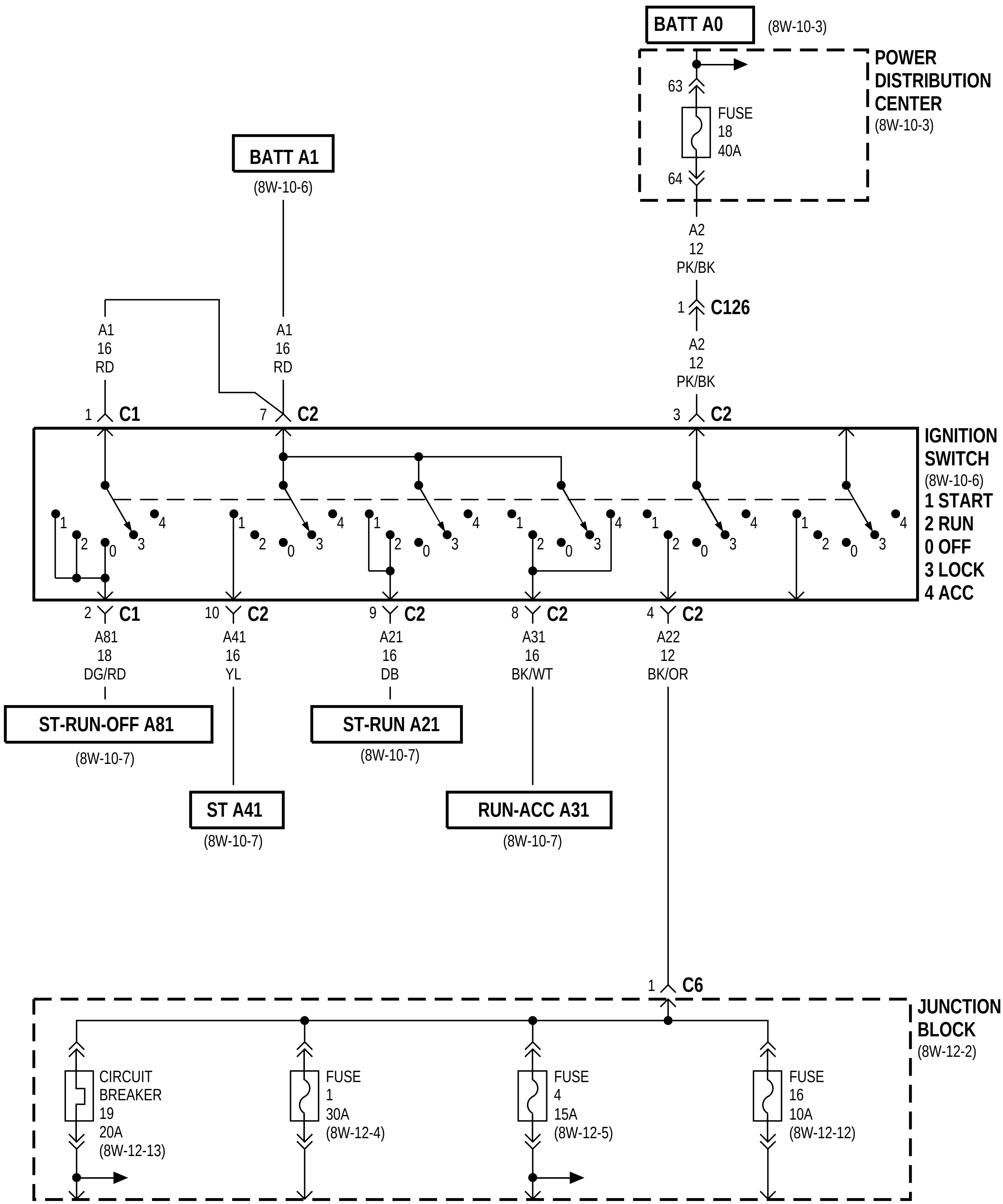
20
LG/BK
94
HIGH
SPEED
RADIATOR
FAN
RELAY
(IN PDC)
(8W-42-4)
84
LOW
SPEED
RADIATOR
FAN
RELAY
(IN PDC)
(8W-42-4)
2
DUTY
CYCLE
EVAP/
PURGE
SOLENOID
(8W-30-16)
19
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
(8W-42-3)
7
C126
F18
18
LG/BK
F18
20
LG/BK
5
C2
INSTRUMENT
CLUSTER
(8W-40-6)
OIL
PRESSURE
LAMP
ABS
WARNING
LAMP
2
IMMOBILIZER
(8W-61-5)

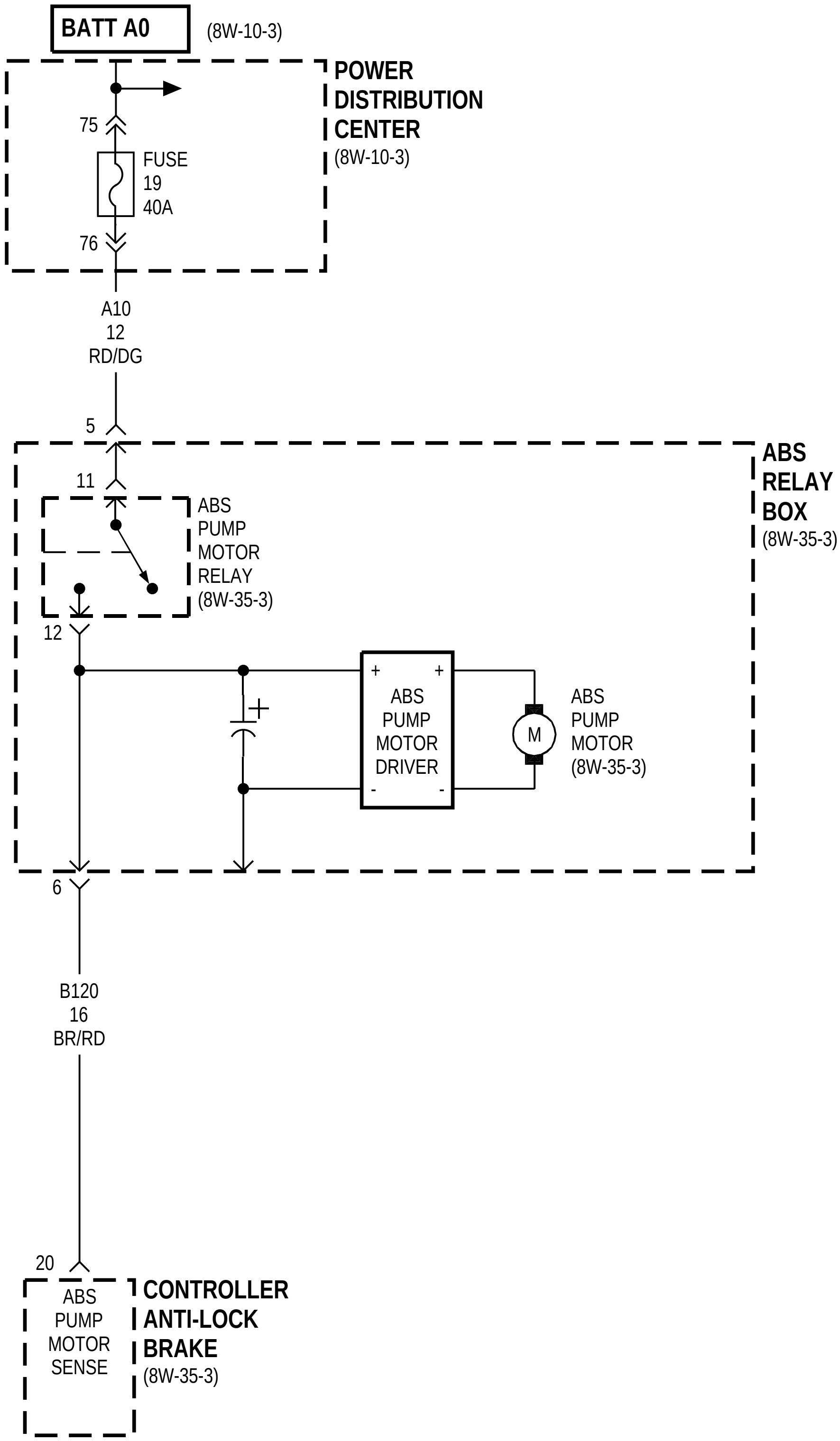

ST-RUN A21
(8W-10-7)
BATT A0
(8W-10-3)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
70
FUSE
10
10A
78
46
FUSE
11
40A
45
F12
18
DB/WT
A25
12
DB
9
C121
A25
12
DB
C
POWER
TOP
UP/
DOWN
RELAYS
(8W-66-2)
S105
(IN PDC)
F12
18
DB/WT
F12
18
DB/WT
F12
18
DB/WT
6
C113
F12
18
DB/WT
7
FUEL
PUMP
RELAY
(IN PDC)
(8W-30-3)
20
C2
FUSED
IGN.
(ST-RUN)
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
60
FUSED
IGN.
(ST-RUN)
CONTROLLER
ANTI-LOCK
BRAKE
(8W-35-2)


BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
59
60
FUSE 12 40A
71
72
FUSE 13 20A
47
48
FUSE 14 40A
A13 12 PK/WT
A45 18 BR
8
C121
A45 18 BR
5
FUSED B(+)
SEAT BELT CONTROL MODULE
(8W-67-2)
A5 12 RD/GY
29
INTERMITTENT WIPER RELAY (IN PDC)
(8W-53-3)
37
V5 14 DG/VT
36
WIPER HIGH/ LOW RELAY (IN PDC)
(8W-53-3)
28
11
V4 14 RD/YL
V3 14 BR/OR
A
B
WINDSHIELD WIPER MOTOR
(8W-53-3)
2
C3
JUNCTION BLOCK
(8W-12-2)
FUSE 7 20A
(8W-12-8)
FUSE 8 20A
(8W-12-9)


BATT A0
(8W-10-3)
62
FUSE
15
40A
61
POWER
DISTRIBUTION
CENTER
(8W-10-3)
A3
12
RD/WT
3
C3
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
3
1
HEADLAMP
DELAY
RELAY
CIRCUIT
BREAKER
18
20A
(8W-12-12)
FUSE
10
20A
(8W-12-10)
5
FUSE
12
10A
(8W-12-11)
FUSE
13
20A
(8W-12-11)
FUSE
9
15A
(8W-12-10)
2
C6
4
C6
L4
14
VT/WT
A3
14
RD/WT
7
C2
4
C2
HEADLAMP
SWITCH
(8W-50-3)
L4
4
LOW
BEAM
INPUT
BODY
CONTROL
MODULE
(IN JB)
(8W-45-5)


BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
74
FUSE 16 40A
73
50
FUSE 17 40A
49
A4 12 BK/PK
A16 12 RD/LG
S103 (IN PDC)
4 C3
JUNCTION BLOCK
(8W-12-2)
13
REAR WINDOW DEFOGGER RELAY
(8W-47-6)
15
FUSE 6 10A
(8W-12-8)
6 C9
C15 12 BK/LB
REAR WINDOW DEFOGGER
(8W-47-6)
A16 12 RD/LG
A16 12 RD/LG
A16 12 RD/LG
88
LOW SPEED RADIATOR FAN RELAY (IN PDC)
(8W-42-4)
80
C23 12 DG/LG
39
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-3)
31
C3 14 DB/BK
1 C113
C3 14 DB/BK
1 C158
A/C COMPRESSOR CLUTCH
(8W-42-3)
98
HIGH SPEED RADIATOR FAN RELAY (IN PDC)
(8W-42-4)
90
C25 12 YL/RD
2
3
RADIATOR FAN MOTOR ASSEMBLY
(8W-42-4)


BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
63
FUSE
18
40A
64
A2
12
PK/BK
1
C126
A2
12
PK/BK
BATT A1
(8W-10-6)
A1
16
RD
A1
16
RD
1 C1
7 C2
3 C2
IGNITION SWITCH
(8W-10-6)
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
2 C1
10 C2
9 C2
8 C2
4 C2
A81
18
DG/RD
A41
16
YL
A21
16
DB
A31
16
BK/WT
A22
12
BK/OR
ST-RUN-OFF A81
(8W-10-7)
ST-RUN A21
(8W-10-7)
ST A41
(8W-10-7)
RUN-ACC A31
(8W-10-7)
1 C6
JUNCTION BLOCK
(8W-12-2)
CIRCUIT BREAKER
19
20A
(8W-12-13)
FUSE
1
30A
(8W-12-4)
FUSE
4
15A
(8W-12-5)
FUSE
16
10A
(8W-12-12)


BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
75
FUSE
19
40A
76
A10
12
RD/DG
5
ABS RELAY BOX
(8W-35-3)
11
ABS PUMP MOTOR RELAY
(8W-35-3)
12
+
+
ABS PUMP MOTOR DRIVER
-
-
M
ABS PUMP MOTOR
(8W-35-3)
6
B120
16
BR/RD
20
ABS PUMP MOTOR SENSE
CONTROLLER ANTI-LOCK BRAKE
(8W-35-3)

FUSES

FUSE #	AMPS	FUSED CIRCUIT	FEED CIRCUIT
1	10A	F142 18DG/OR	A142 18DG/OR
2	20A	A20 16RD/DB	A0 4RD
3	20A	A24 16PK/YL A24 16PK/YL	A0 4RD
4	20A	A7 16RD/BK	A0 4RD
5	20A	A14 16RD/TN	A0 4RD
6	20A	A15 16PK	A0 4RD
7	10A	A51 20RD/LB	A0 4RD
8	20A	A1 16RD	A0 4RD
9	10A	F18 20LG/BK	A21 16DB
10	10A	F12 18DB/WT	A21 16DB A21 16DB
11	20A	A25 12DB	A0 4RD
12	40A	A13 12PK/WT	A0 4RD
13	40A	A45 18BR	A0 4RD
14	40A	A5 12RD/GY	A0 4RD
15	40A	A3 12RD/WT	A0 4RD
16	40A	A4 12BK/PK	A0 4RD
17	40A	A16 12RD/LG	A0 4RD
18	40A	A2 12PK/BK	A0 4RD
19	40A	A10 12RD/DG	A0 4RD

RELAYS

NOT USED (1)

CAVITY	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
25	-	-
33	-	-

TRANSMISSION RELAY (2)

CAVITY	CIRCUIT	FUNCTION
4	T15 20LG/YL	12 VOLT SUPPLY
5	-	-
6	Z13 20BK/RD	GROUND
26	T16 16RD/BR	TRANS CONTROL RELAY OUTPUT (SWITCHED B(+))
34	A24 16PK/YL	FUSED B(+)

FUEL PUMP RELAY (3)

CAVITY	CIRCUIT	FUNCTION
7	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
8	-	-
9	K31 20BR/LG	FUEL PUMP RELAY CONTROL
27	A141 14DG/WT	FUEL PUMP RELAY CONTROL
35	A1 16RD	FUSED B(+)

WIPER HIGH/LOW RELAY (4)

CAVITY	CIRCUIT	FUNCTION
10	F13 18DB/GY	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
11	V3 14BR/OR	WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
12	V16 20VT/PK	WIPER HIGH/LOW RELAY CONTROL
28	V4 14RD/YL	WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
36	V5 14DG/VT	WIPER RELAY COMMON

INTERMITTENT WIPER RELAY (5)

CAVITY	CIRCUIT	FUNCTION
13	F13 18DB/GY	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
	F13 18DB/GY	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
14	Z1 16BK	GROUND
15	V14 20PK/WT	WIPER ON/OFF RELAY CONTROL
29	A5 12RD/GY	FUSED B(+)
37	V5 14DG/VT	WIPER RELAY COMMON

NOT USED (6)

CAVITY	CIRCUIT	FUNCTION
16	-	-
17	-	-
18	-	-
30	-	-
38	-	-

A/C COMPRESSOR CLUTCH RELAY (7)

CAVITY	CIRCUIT	FUNCTION
19	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
20	-	-
21	C28 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
31	C3 14DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
39	A16 12RD/LG	FUSED B(+)

NOT USED (9)

CAVITY	CIRCUIT	FUNCTION
22	-	-
23	-	-
24	-	-
32	-	-
40	-	-

ENGINE STARTER MOTOR RELAY (9)

CAVITY	CIRCUIT	FUNCTION
79	T40 14BR	STARTER RELAY OUTPUT
81	A41 26YL	IGNITION SWITCH OUTPUT (START)
	T141 16YL/RD*	IGNITION SWITCH OUTPUT (START)
82	-	-
83	T41 20BK/WT	PARK/NEUTRAL POSITON SWITCH SENSE
	T41 20BK/LB	PARK/NEUTRAL POSITION SWITCH SENSE
97	A14 18RD/TN	FUSED B(+)

AUTOMATIC SHUT DOWN RELAY (10)

CAVITY	CIRCUIT	FUNCTION
89	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
91	A14 16RD/TN	FUSED B(+)
92	-	-
93	K51 20DB/VT	AUTOMATIC SHUT DOWN RELAY CONTROL
87	A1 16RD	FUSED B(+)

LOW SPEED RADIATOR FAN RELAY (11)

CAVITY	CIRCUIT	FUNCTION
80	C23 12DG/LG	LOW SPEED RADIATOR FAN RELAY OUTPUT
84	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
85	-	-
86	C24 20DB/TN	LOW SPEED RADIATOR FAN RELAY CONTROL
88	A16 12RD/LG	FUSED B(+)

HIGH SPEED RADIATOR FAN RELAY (12)

CAVITY	CIRCUIT	FUNCTION
90	C25 12YL/RD	HIGH SPEED RADIATOR FAN RELAY OUTPUT
94	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
95	-	-
96	C27 20DB/PK	LOW SPEED RADIATOR FAN RELAY CONTROL
98	A16 12RD/LG	FUSED B(+)

* MTX

8W-10 POWER DISTRIBUTION

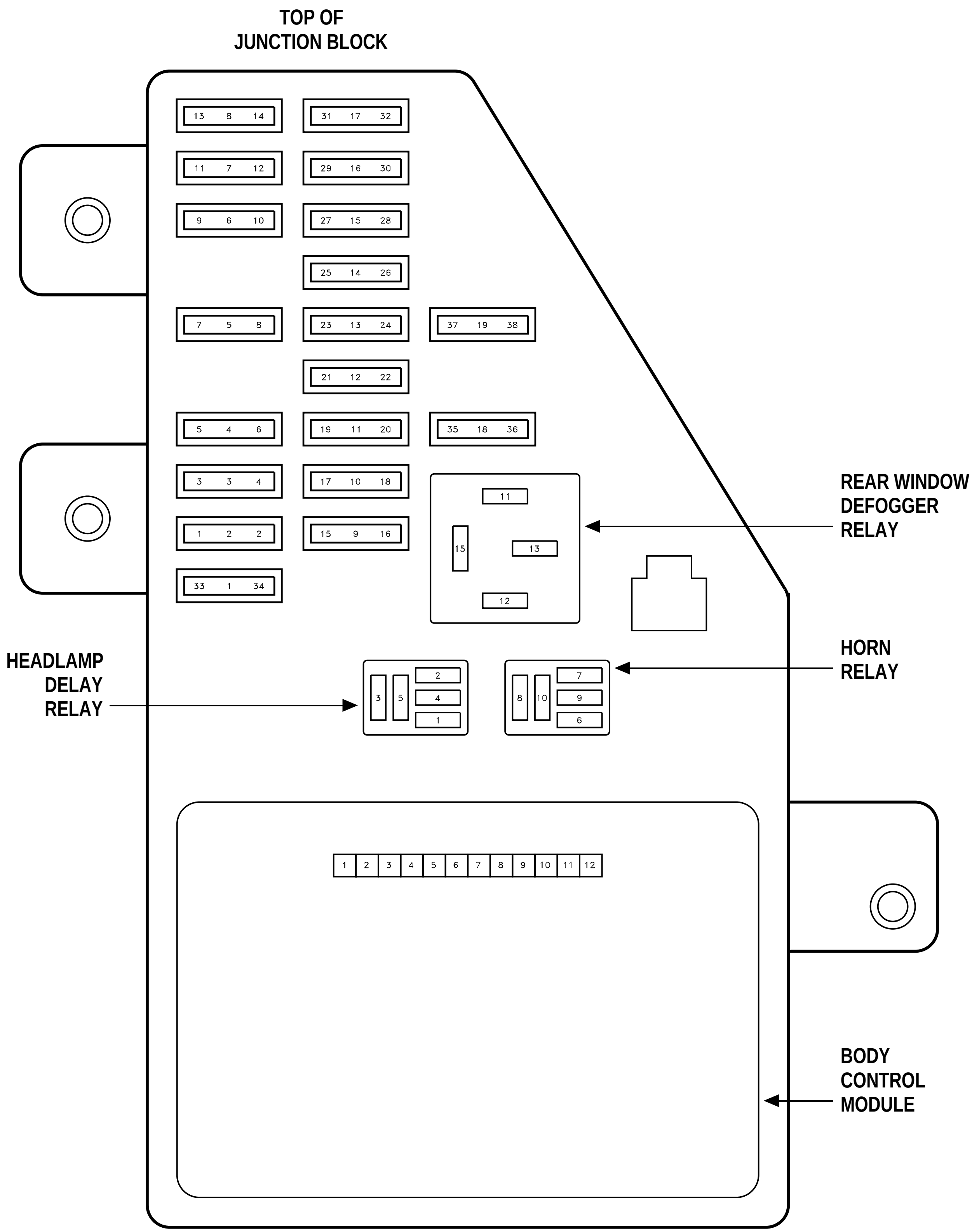
DESCRIPTION AND OPERATION

INTRODUCTION

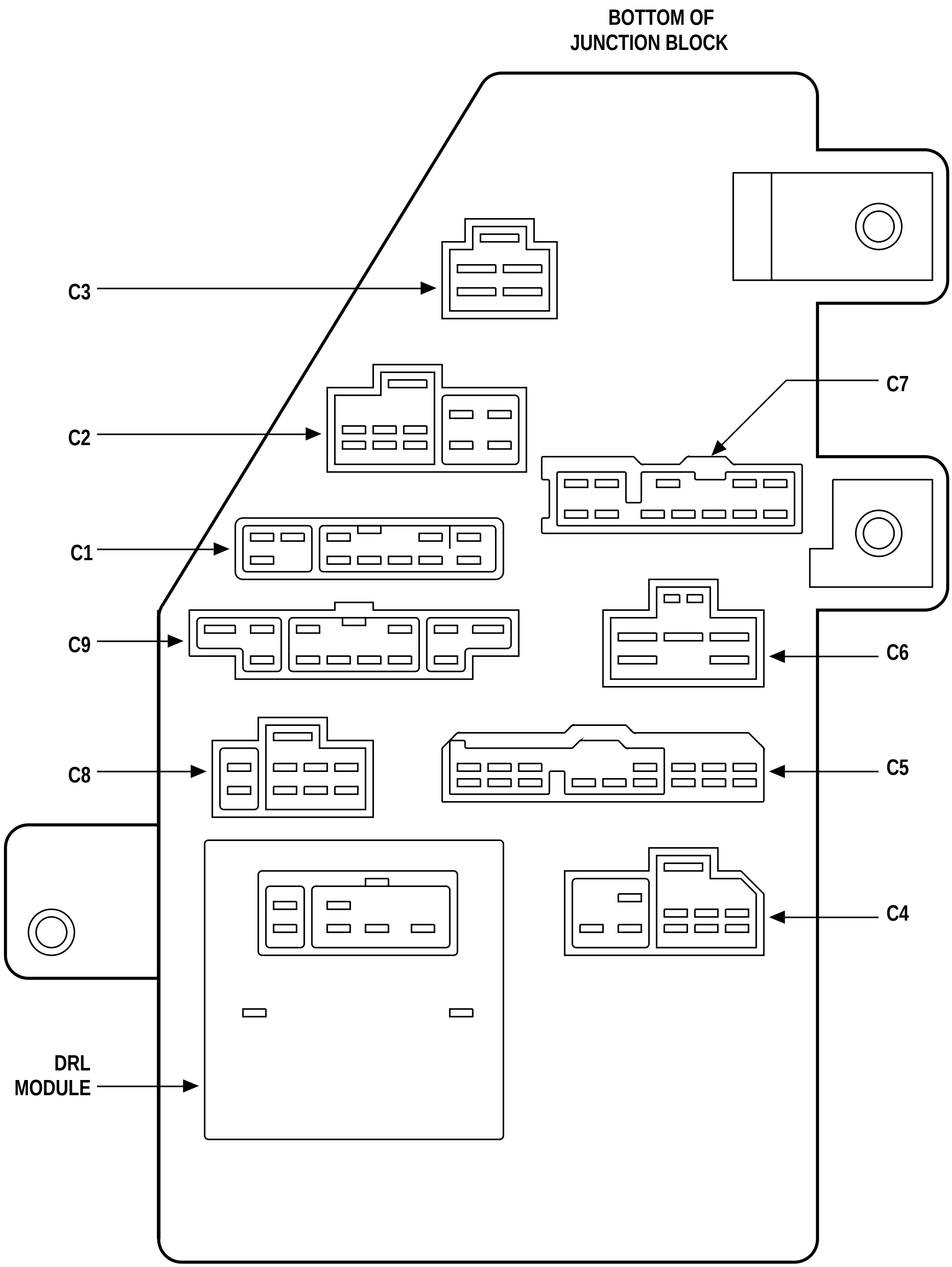
This section covers the power distribution center and all circuits involved with it. For additional information on system operation, refer to the appropriate section of the wiring diagrams.

8W-12 JUNCTION BLOCK

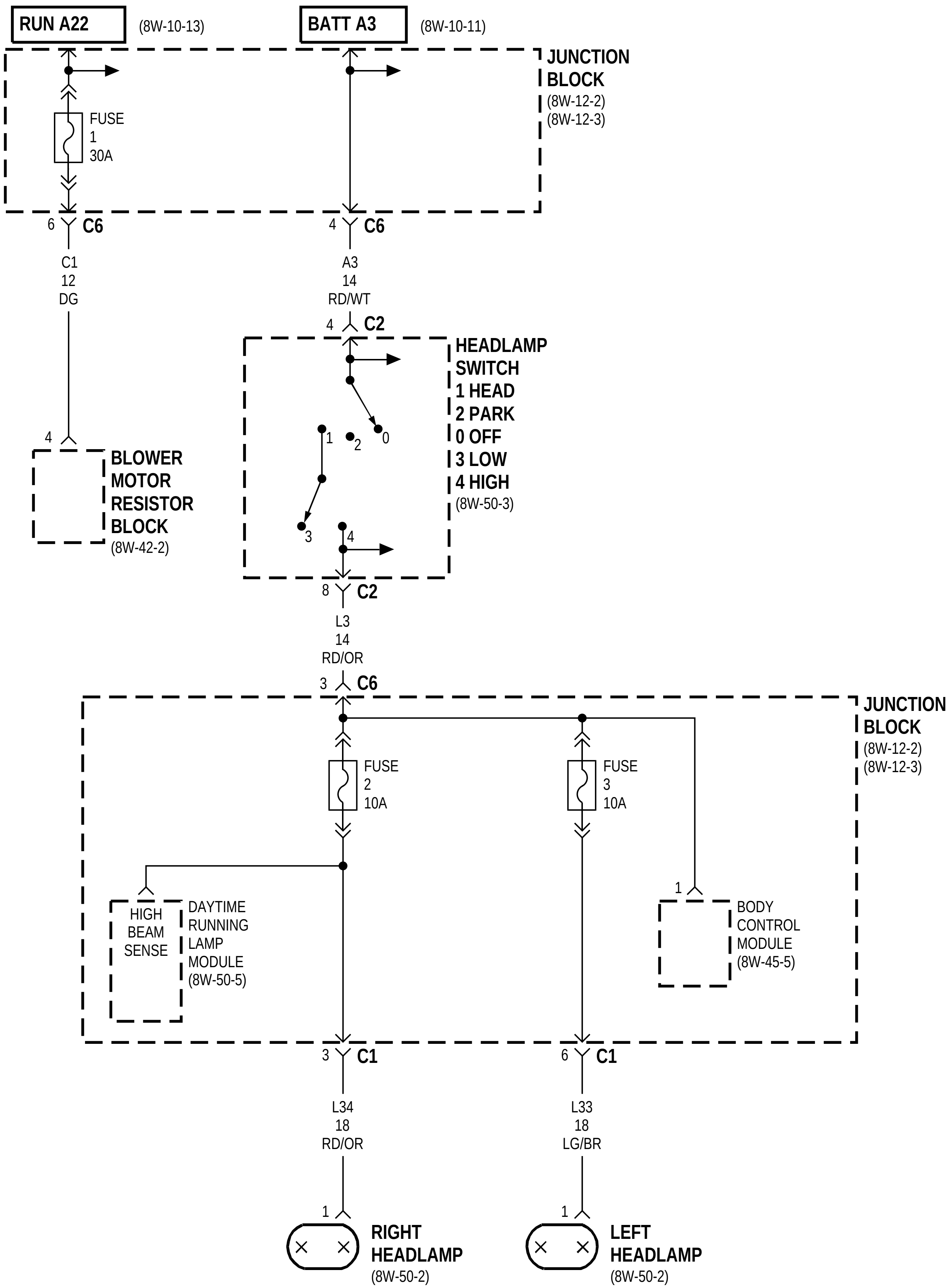
INDEX

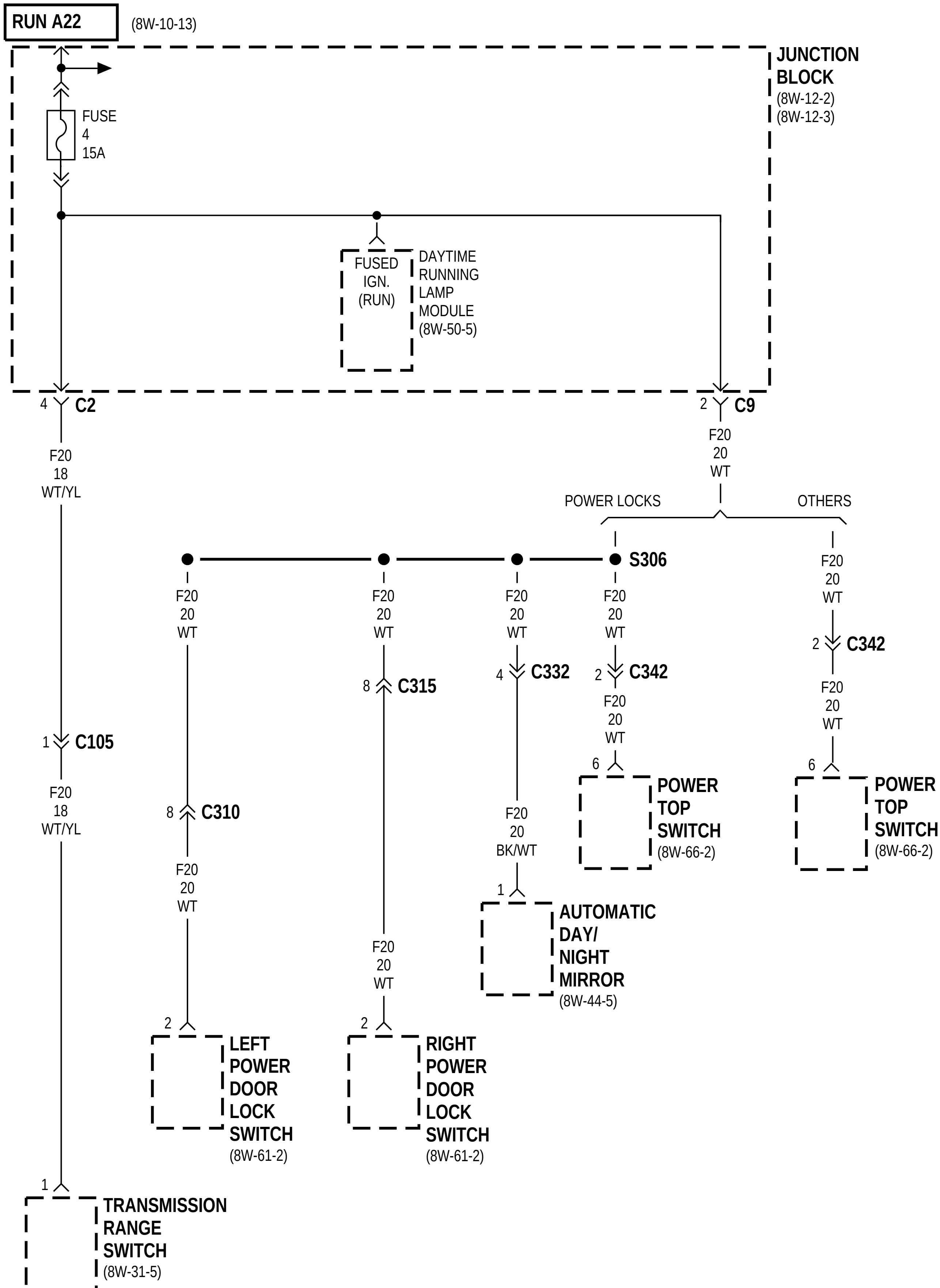


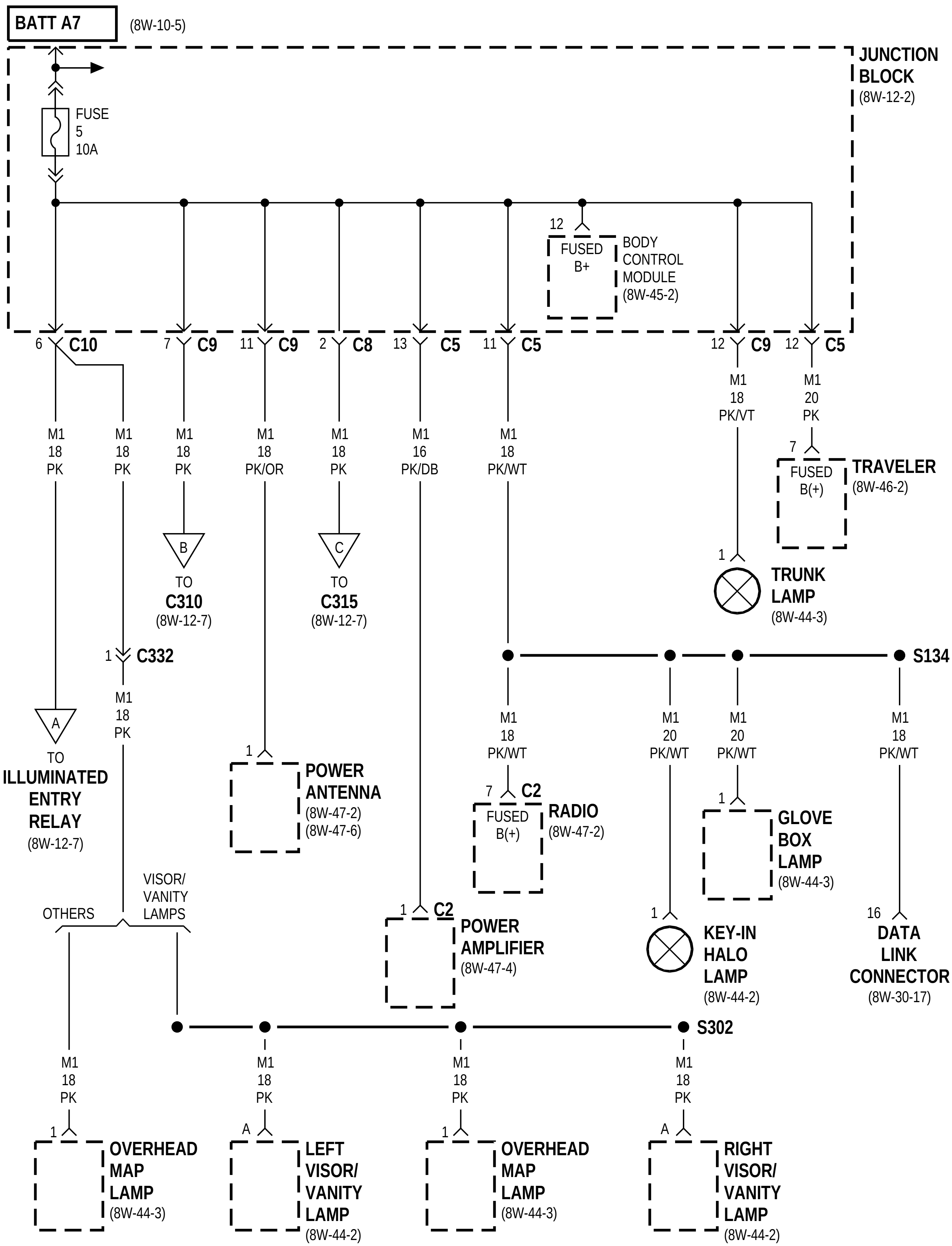
SEE PAGE 8W-12-19 FOR
JUNCTION BLOCK PIN-OUT INFORMATION

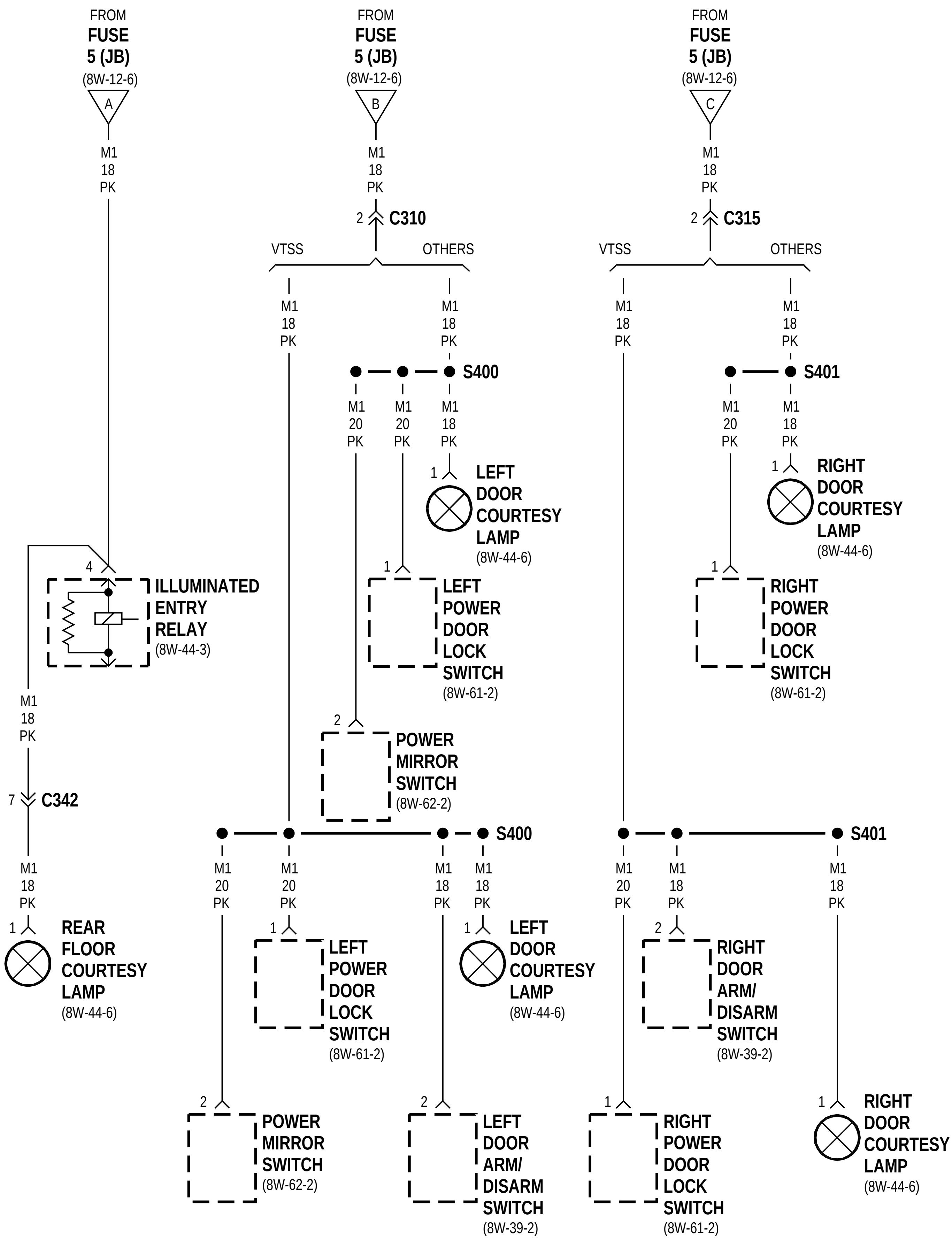


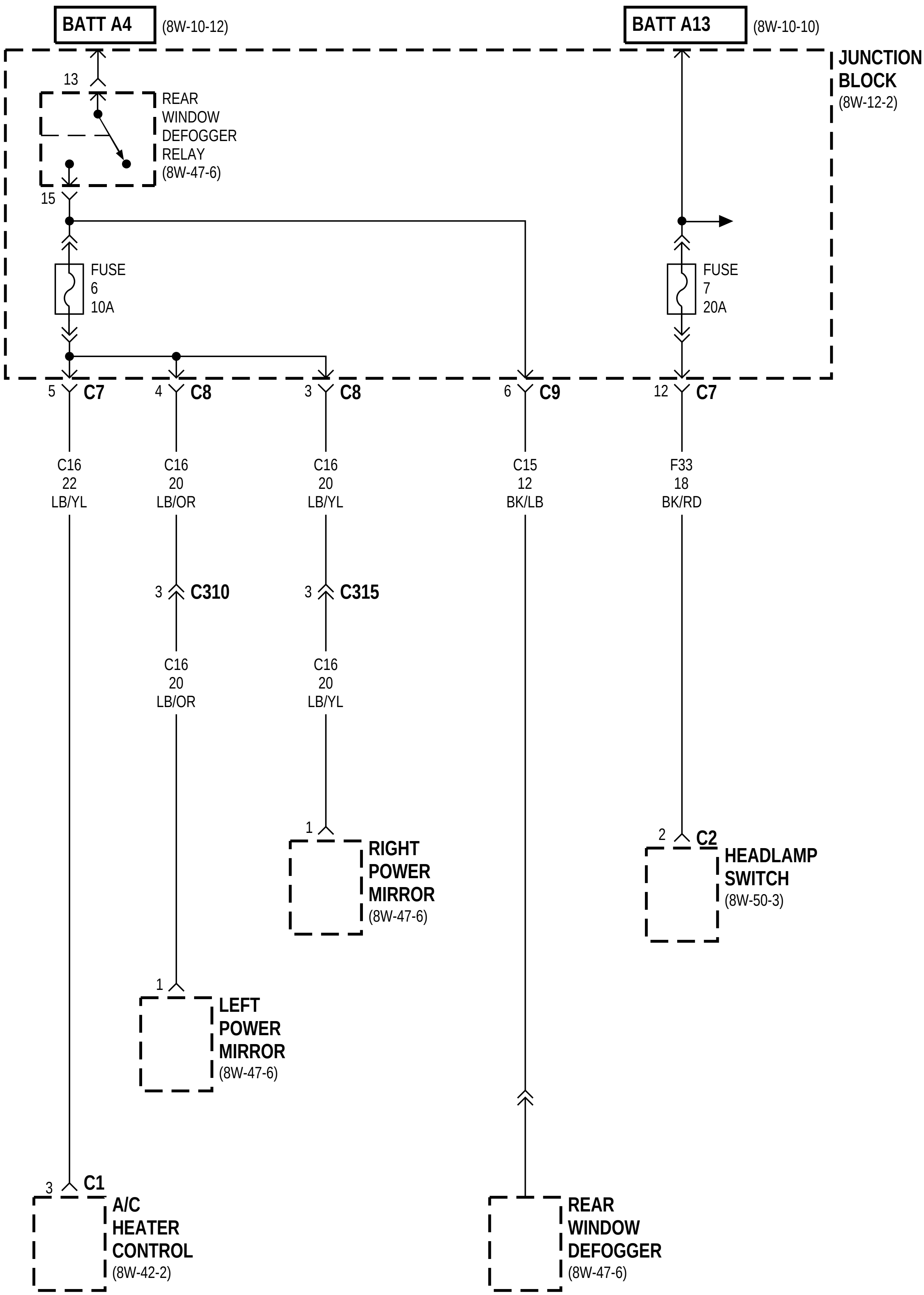
JXI00143 978W-14


RUN A22
(8W-10-13)
BATT A3
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 1 30A
6 C6
4 C6
C1 12 DG
A3 14 RD/WT
4 C2
HEADLAMP SWITCH
1 HEAD
2 PARK
0 OFF
3 LOW
4 HIGH
(8W-50-3)
4
BLOWER MOTOR RESISTOR BLOCK
(8W-42-2)
8 C2
L3 14 RD/OR
3 C6
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 2 10A
FUSE 3 10A
HIGH BEAM SENSE
DAYTIME RUNNING LAMP MODULE
(8W-50-5)
1
BODY CONTROL MODULE
(8W-45-5)
3 C1
6 C1
L34 18 RD/OR
L33 18 LG/BR
1
RIGHT HEADLAMP
(8W-50-2)
1
LEFT HEADLAMP
(8W-50-2)

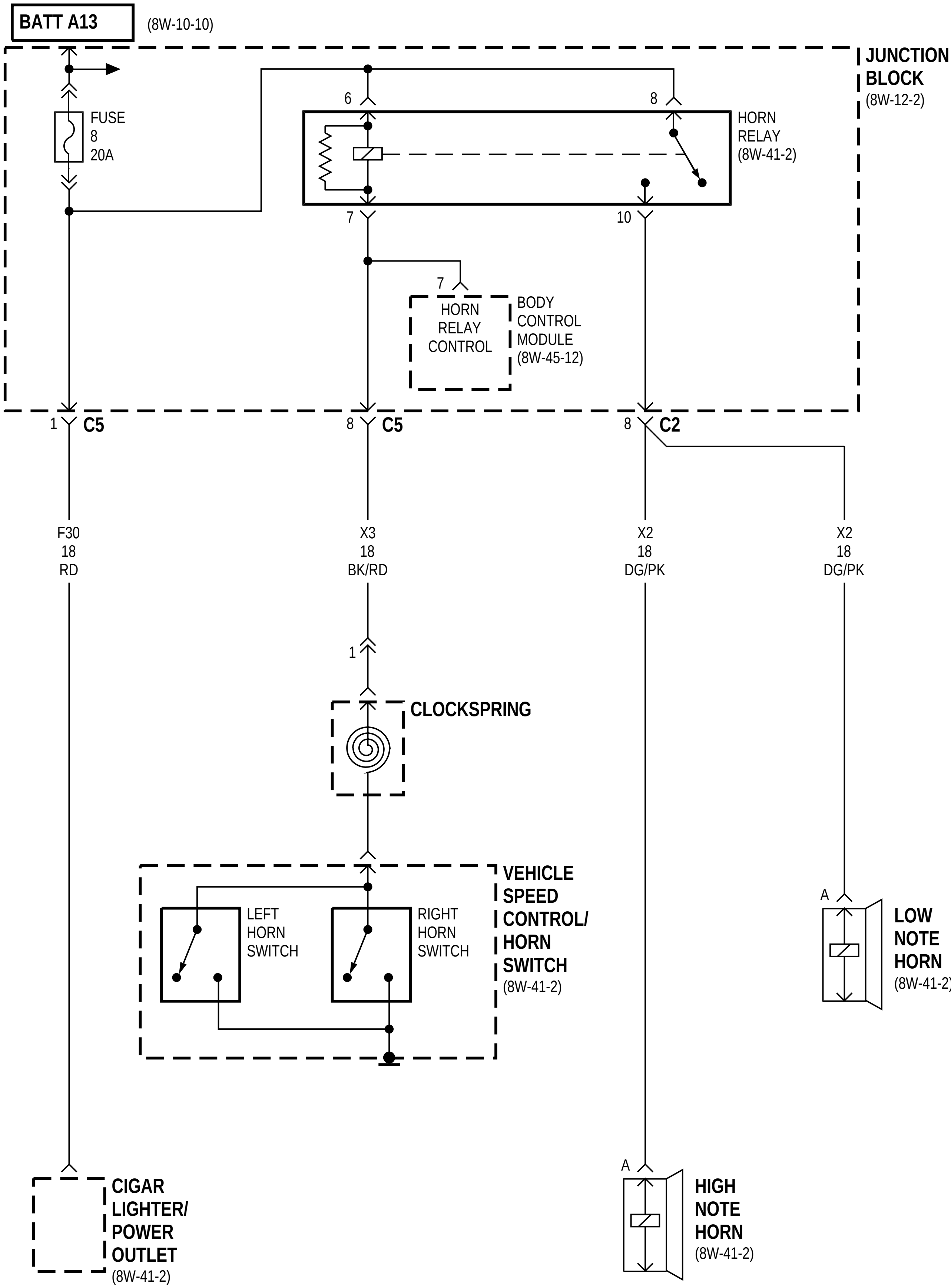

RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
4
15A
FUSED IGN. (RUN)
DAYTIME RUNNING LAMP MODULE
(8W-50-5)
4 C2
2 C9
F20
18
WT/YL
F20
20
WT
POWER LOCKS
OTHERS
S306
1 C105
8 C310
8 C315
4 C332
2 C342
2 C342
F20
20
BK/WT
6
POWER TOP SWITCH
(8W-66-2)
6
POWER TOP SWITCH
(8W-66-2)
1
AUTOMATIC DAY/ NIGHT MIRROR
(8W-44-5)
2
LEFT POWER DOOR LOCK SWITCH
(8W-61-2)
2
RIGHT POWER DOOR LOCK SWITCH
(8W-61-2)
1
TRANSMISSION RANGE SWITCH
(8W-31-5)

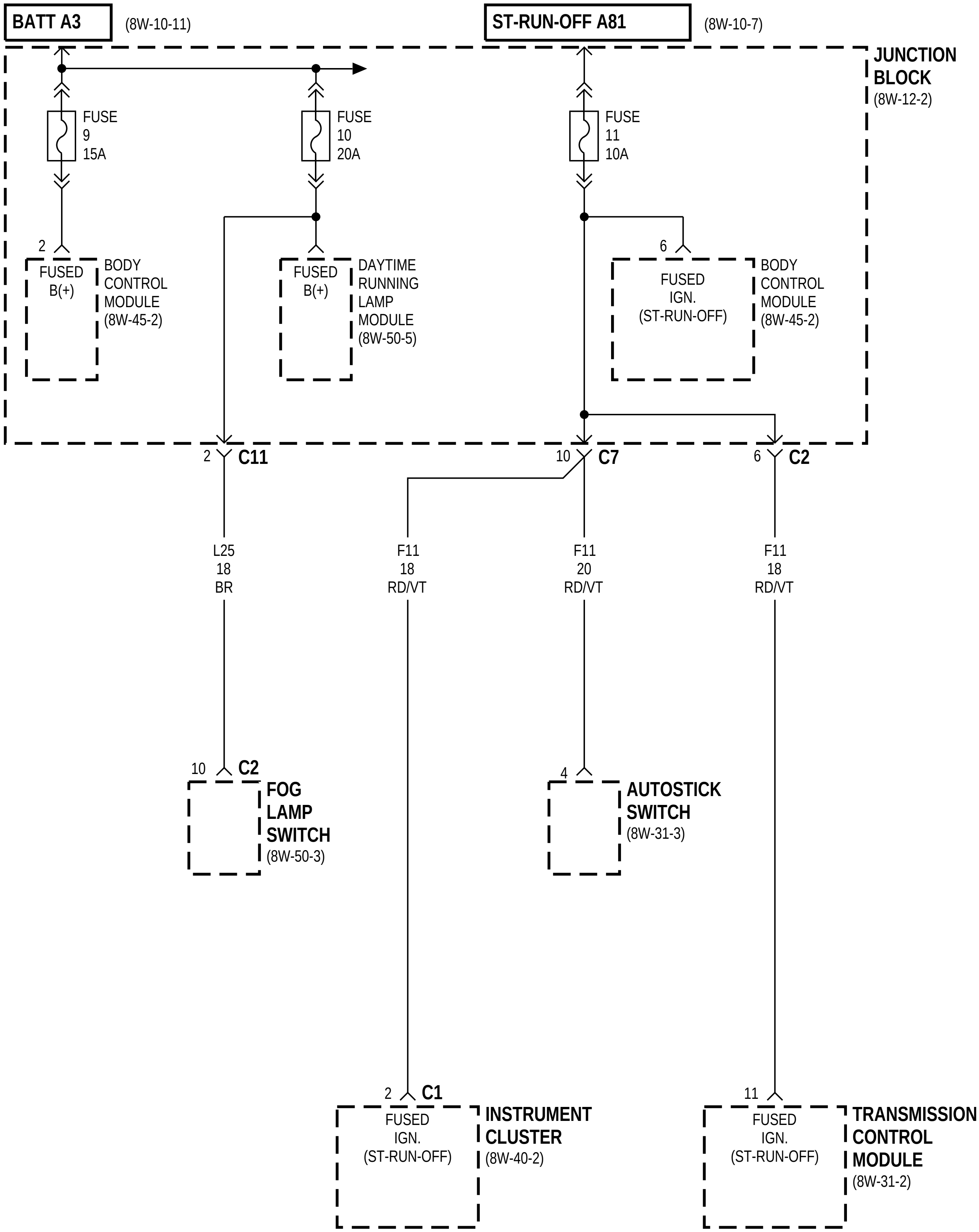

BATT A7
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE 5 10A
12
FUSED B+
BODY CONTROL MODULE
(8W-45-2)
6 C10
7 C9
11 C9
2 C8
13 C5
11 C5
12 C9
12 C5
M1 18 PK
M1 18 PK
M1 18 PK
M1 18 PK/OR
M1 18 PK
M1 16 PK/DB
M1 18 PK/WT
M1 18 PK/VT
M1 20 PK
7
FUSED B(+)
TRAVELER
(8W-46-2)
1
TRUNK LAMP
(8W-44-3)
B
TO
C310
(8W-12-7)
C
TO
C315
(8W-12-7)
1 C332
M1 18 PK
A
TO
ILLUMINATED ENTRY RELAY
(8W-12-7)
S134
M1 18 PK/WT
M1 20 PK/WT
M1 20 PK/WT
M1 18 PK/WT
1
POWER ANTENNA
(8W-47-2)
(8W-47-6)
7 C2
FUSED B(+)
RADIO
(8W-47-2)
1
GLOVE BOX LAMP
(8W-44-3)
VISOR/ VANITY LAMPS
OTHERS
1 C2
POWER AMPLIFIER
(8W-47-4)
1
KEY-IN HALO LAMP
(8W-44-2)
16
DATA LINK CONNECTOR
(8W-30-17)
S302
M1 18 PK
M1 18 PK
M1 18 PK
M1 18 PK
1
OVERHEAD MAP LAMP
(8W-44-3)
A
LEFT VISOR/ VANITY LAMP
(8W-44-2)
1
OVERHEAD MAP LAMP
(8W-44-3)
A
RIGHT VISOR/ VANITY LAMP
(8W-44-2)

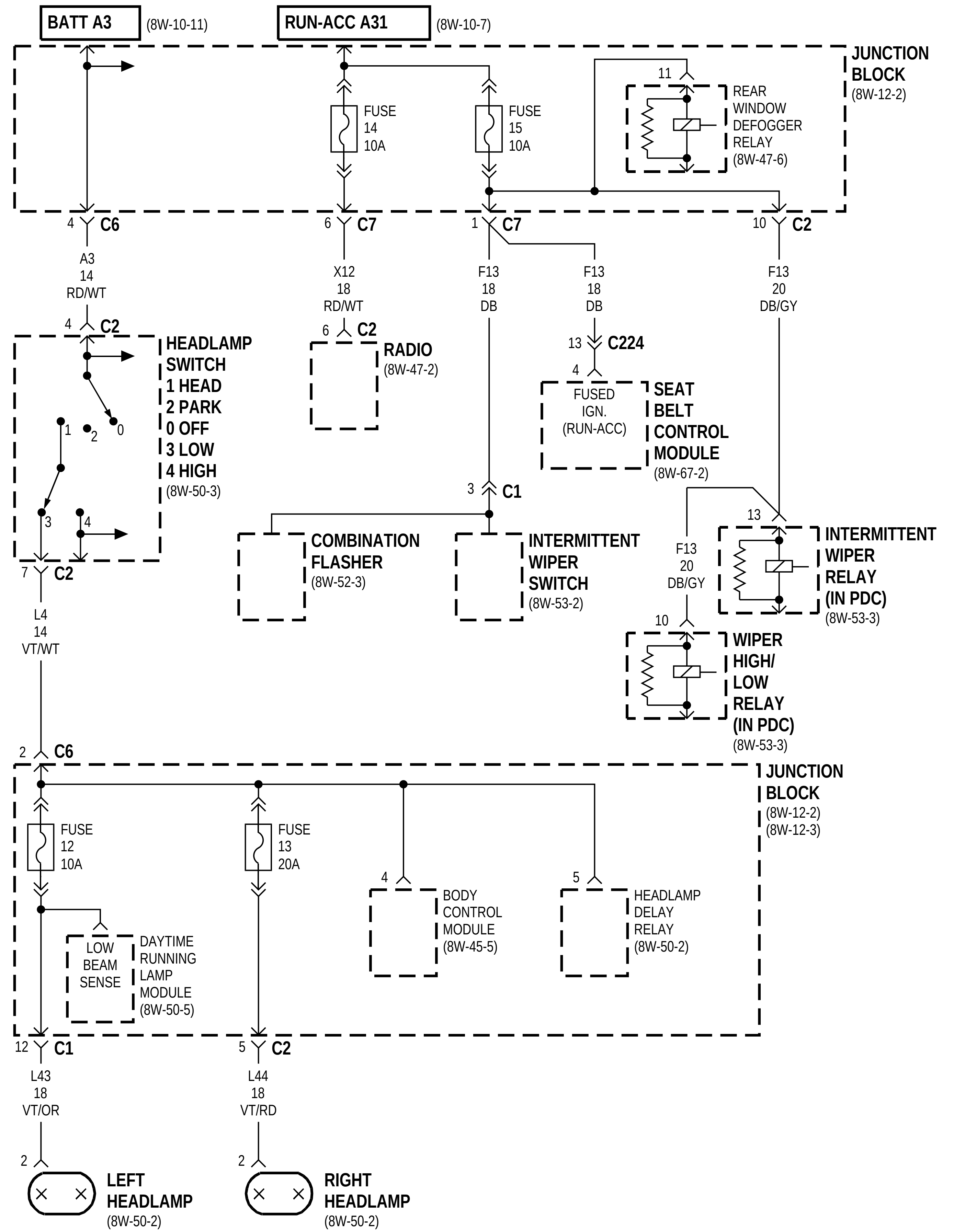

FROM
FUSE
5 (JB)
(8W-12-6)
A
B
C
M1
18
PK
2
C310
C315
VTSS
OTHERS
S400
S401
M1
20
PK
1
LEFT
DOOR
COURTESY
LAMP
(8W-44-6)
RIGHT
DOOR
COURTESY
LAMP
(8W-44-6)
4
ILLUMINATED
ENTRY
RELAY
(8W-44-3)
LEFT
POWER
DOOR
LOCK
SWITCH
(8W-61-2)
RIGHT
POWER
DOOR
LOCK
SWITCH
(8W-61-2)
POWER
MIRROR
SWITCH
(8W-62-2)
7
C342
REAR
FLOOR
COURTESY
LAMP
(8W-44-6)
RIGHT
DOOR
ARM/
DISARM
SWITCH
(8W-39-2)
LEFT
DOOR
ARM/
DISARM
SWITCH
(8W-39-2)



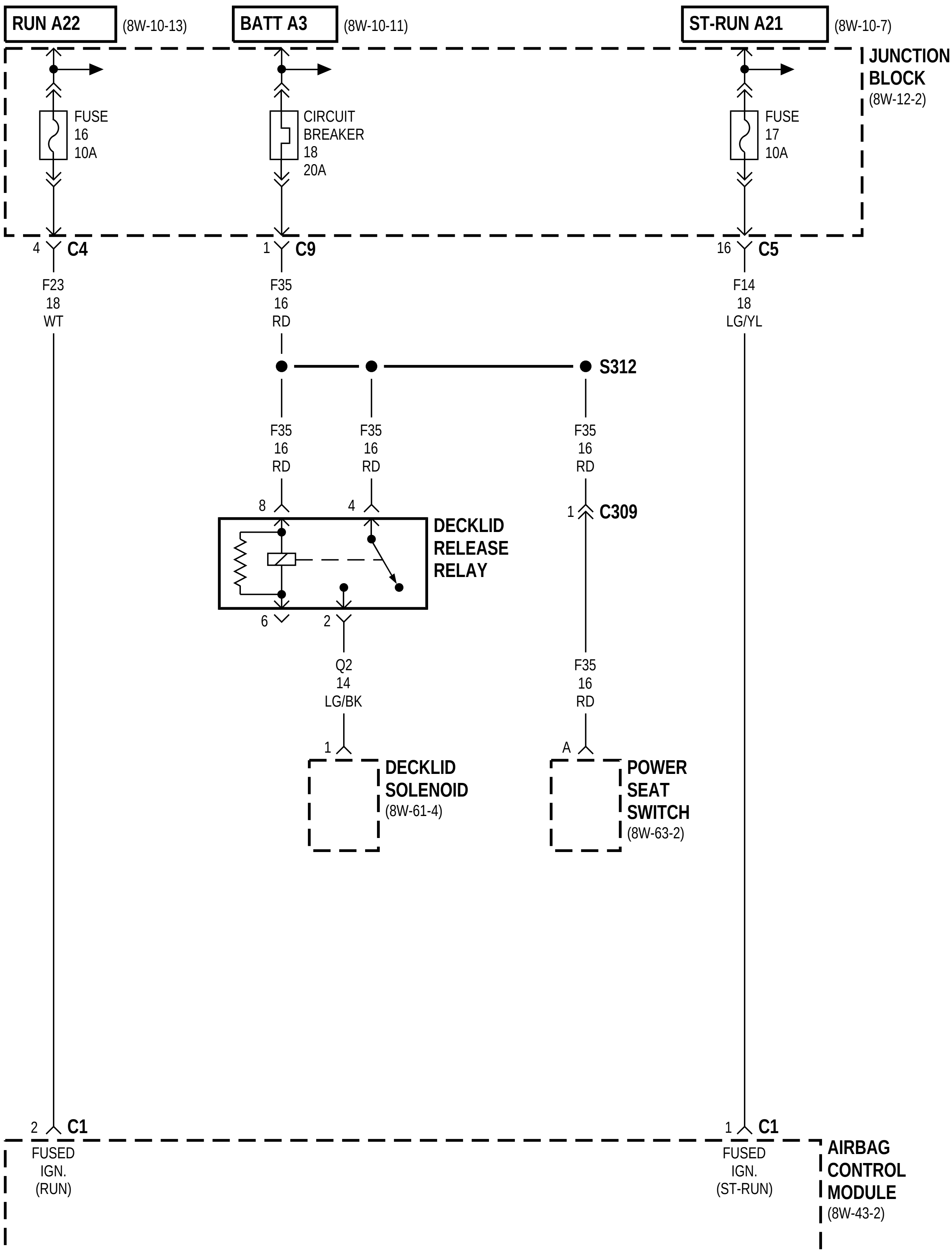
BATT A4
(8W-10-12)
BATT A13
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
13
REAR WINDOW DEFOGGER RELAY
(8W-47-6)
15
FUSE 6 10A
FUSE 7 20A
5 C7
4 C8
3 C8
6 C9
12 C7
C16 22 LB/YL
C16 20 LB/OR
C16 20 LB/YL
C15 12 BK/LB
F33 18 BK/RD
3 C310
3 C315
C16 20 LB/OR
C16 20 LB/YL
1
RIGHT POWER MIRROR
(8W-47-6)
2 C2
HEADLAMP SWITCH
(8W-50-3)
1
LEFT POWER MIRROR
(8W-47-6)
3 C1
A/C HEATER CONTROL
(8W-42-2)
REAR WINDOW DEFOGGER
(8W-47-6)

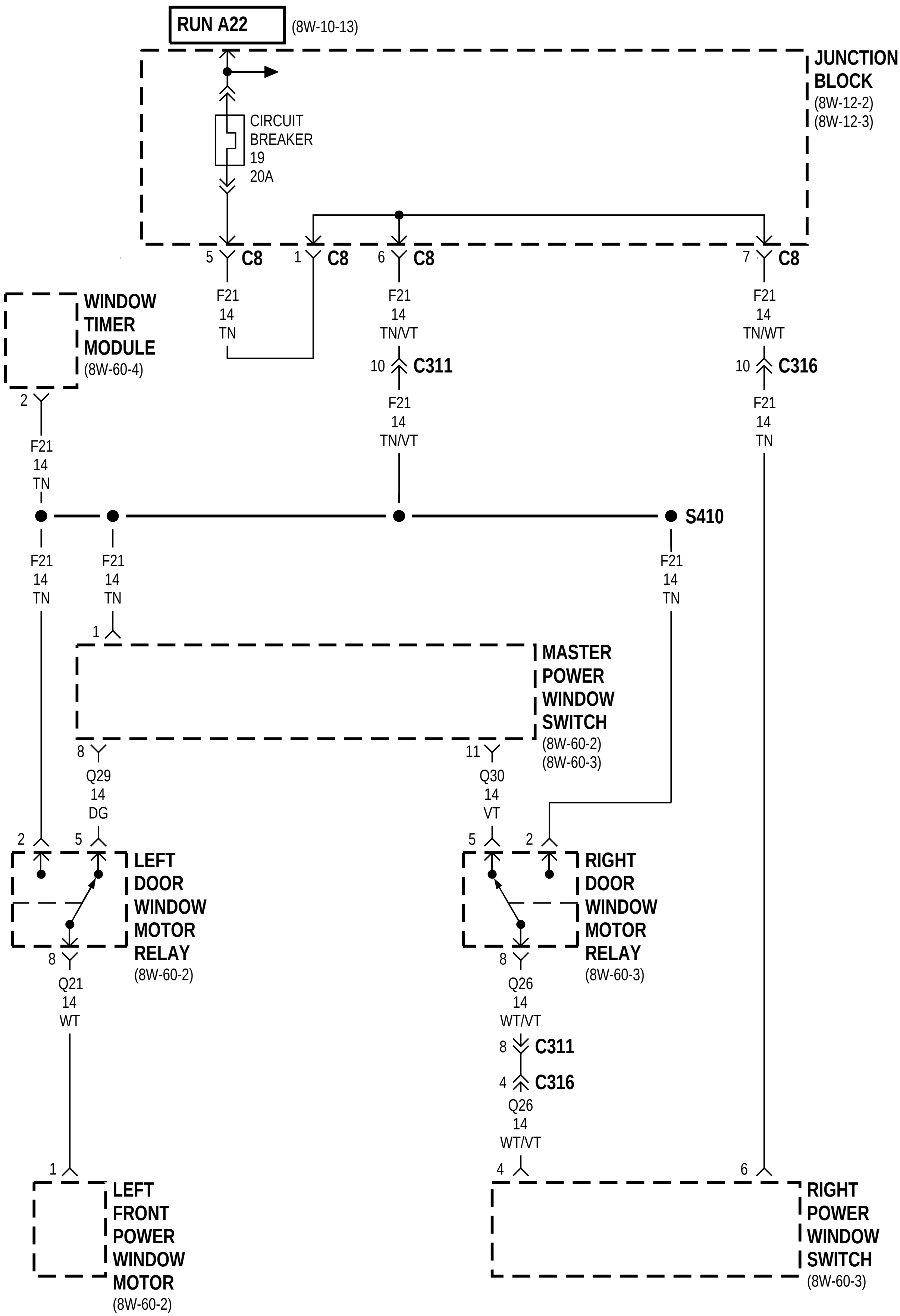

BATT A13
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
8
20A
6
8
HORN RELAY
(8W-41-2)
7
10
7
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-12)
1
C5
8
C5
8
C2
F30
18
RD
X3
18
BK/RD
X2
18
DG/PK
X2
18
DG/PK
1
CLOCKSPRING
LEFT HORN SWITCH
RIGHT HORN SWITCH
VEHICLE SPEED CONTROL/ HORN SWITCH
(8W-41-2)
A
LOW NOTE HORN
(8W-41-2)
CIGAR LIGHTER/ POWER OUTLET
(8W-41-2)
A
HIGH NOTE HORN
(8W-41-2)

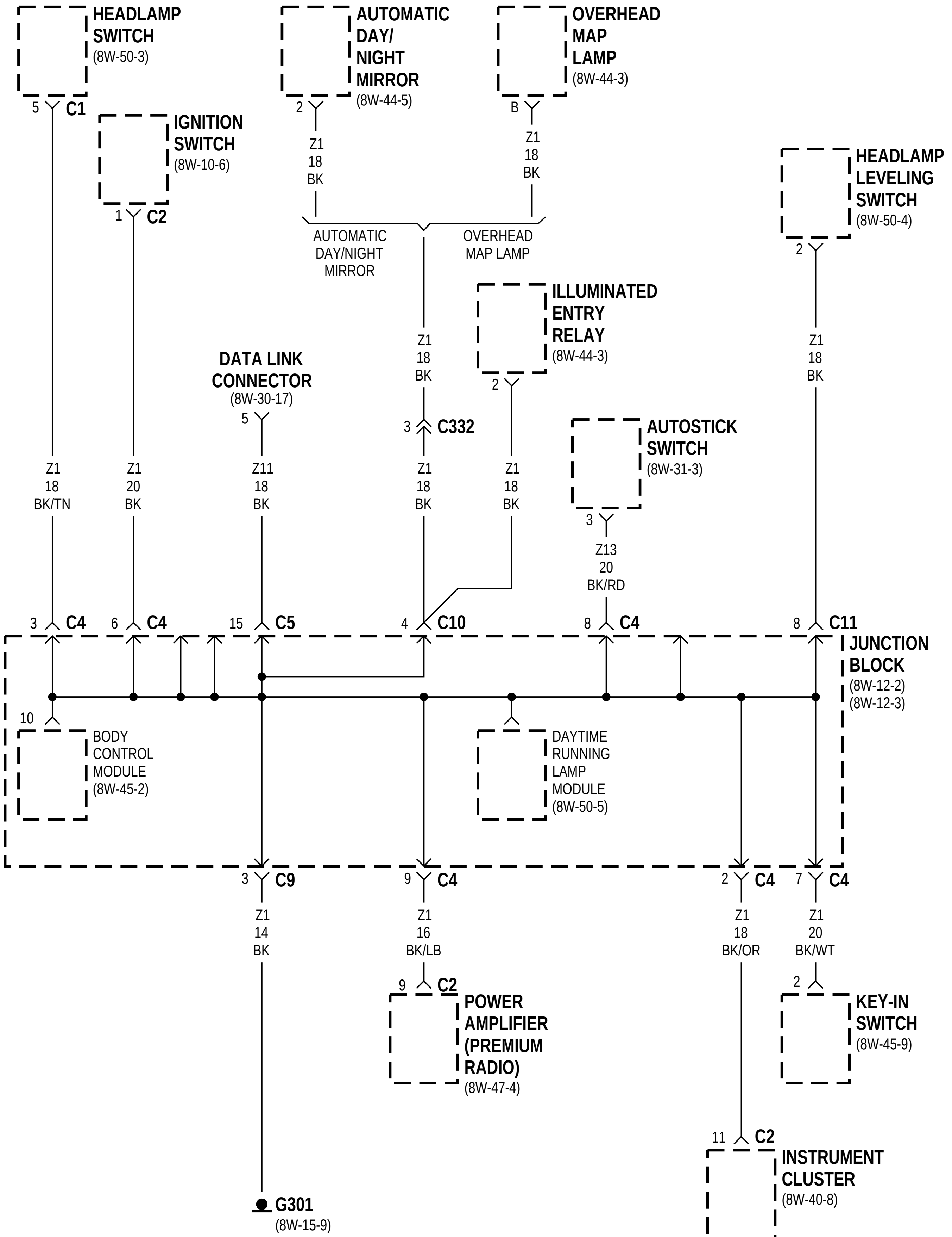

BATT A3
(8W-10-11)
ST-RUN-OFF A81
(8W-10-7)
JUNCTION
BLOCK
(8W-12-2)
FUSE
9
15A
FUSE
10
20A
FUSE
11
10A
2
FUSED
B(+)
BODY
CONTROL
MODULE
(8W-45-2)
FUSED
B(+)
DAYTIME
RUNNING
LAMP
MODULE
(8W-50-5)
6
FUSED
IGN.
(ST-RUN-OFF)
BODY
CONTROL
MODULE
(8W-45-2)
2
C11
10
C7
6
C2
L25
18
BR
F11
18
RD/VT
F11
20
RD/VT
F11
18
RD/VT
10
C2
FOG
LAMP
SWITCH
(8W-50-3)
4
AUTOSTICK
SWITCH
(8W-31-3)
2
C1
FUSED
IGN.
(ST-RUN-OFF)
INSTRUMENT
CLUSTER
(8W-40-2)
11
FUSED
IGN.
(ST-RUN-OFF)
TRANSMISSION
CONTROL
MODULE
(8W-31-2)

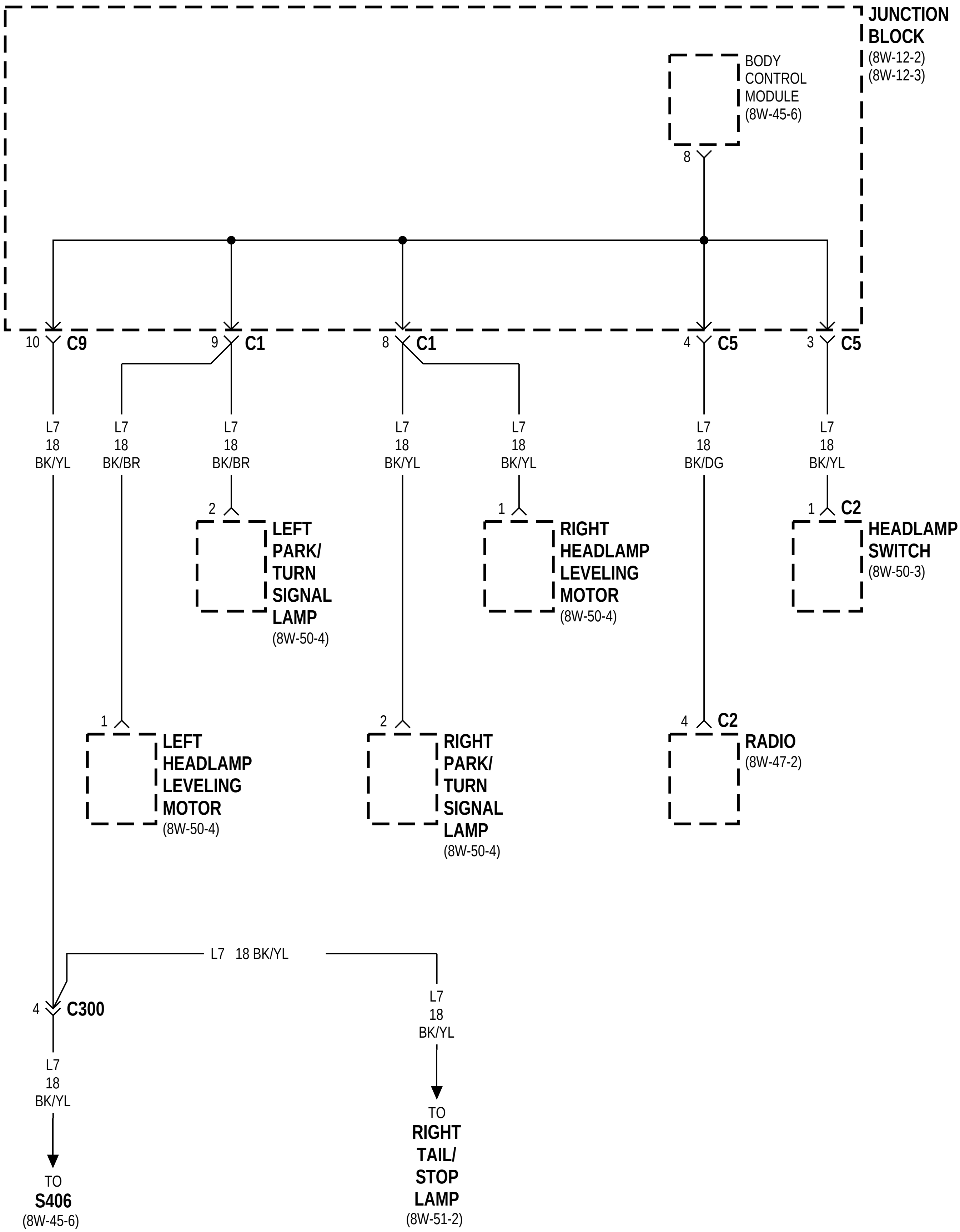

BATT A3
(8W-10-11)
RUN-ACC A31
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE 14 10A
FUSE 15 10A
11
REAR WINDOW DEFOGGER RELAY
(8W-47-6)
4 C6
6 C7
1 C7
10 C2
A3 14 RD/WT
X12 18 RD/WT
F13 18 DB
F13 18 DB
F13 20 DB/GY
4 C2
HEADLAMP SWITCH
1 HEAD
2 PARK
0 OFF
3 LOW
4 HIGH
(8W-50-3)
6 C2
RADIO
(8W-47-2)
13 C224
4
FUSED IGN. (RUN-ACC)
SEAT BELT CONTROL MODULE
(8W-67-2)
3 C1
COMBINATION FLASHER
(8W-52-3)
INTERMITTENT WIPER SWITCH
(8W-53-2)
13
INTERMITTENT WIPER RELAY (IN PDC)
(8W-53-3)
F13 20 DB/GY
10
WIPER HIGH/ LOW RELAY (IN PDC)
(8W-53-3)
7 C2
L4 14 VT/WT
2 C6
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
FUSE 13 20A
4
5
BODY CONTROL MODULE
(8W-45-5)
HEADLAMP DELAY RELAY
(8W-50-2)
LOW BEAM SENSE
DAYTIME RUNNING LAMP MODULE
(8W-50-5)
12 C1
5 C2
L43 18 VT/OR
L44 18 VT/RD
2
2
LEFT HEADLAMP
(8W-50-2)
RIGHT HEADLAMP
(8W-50-2)

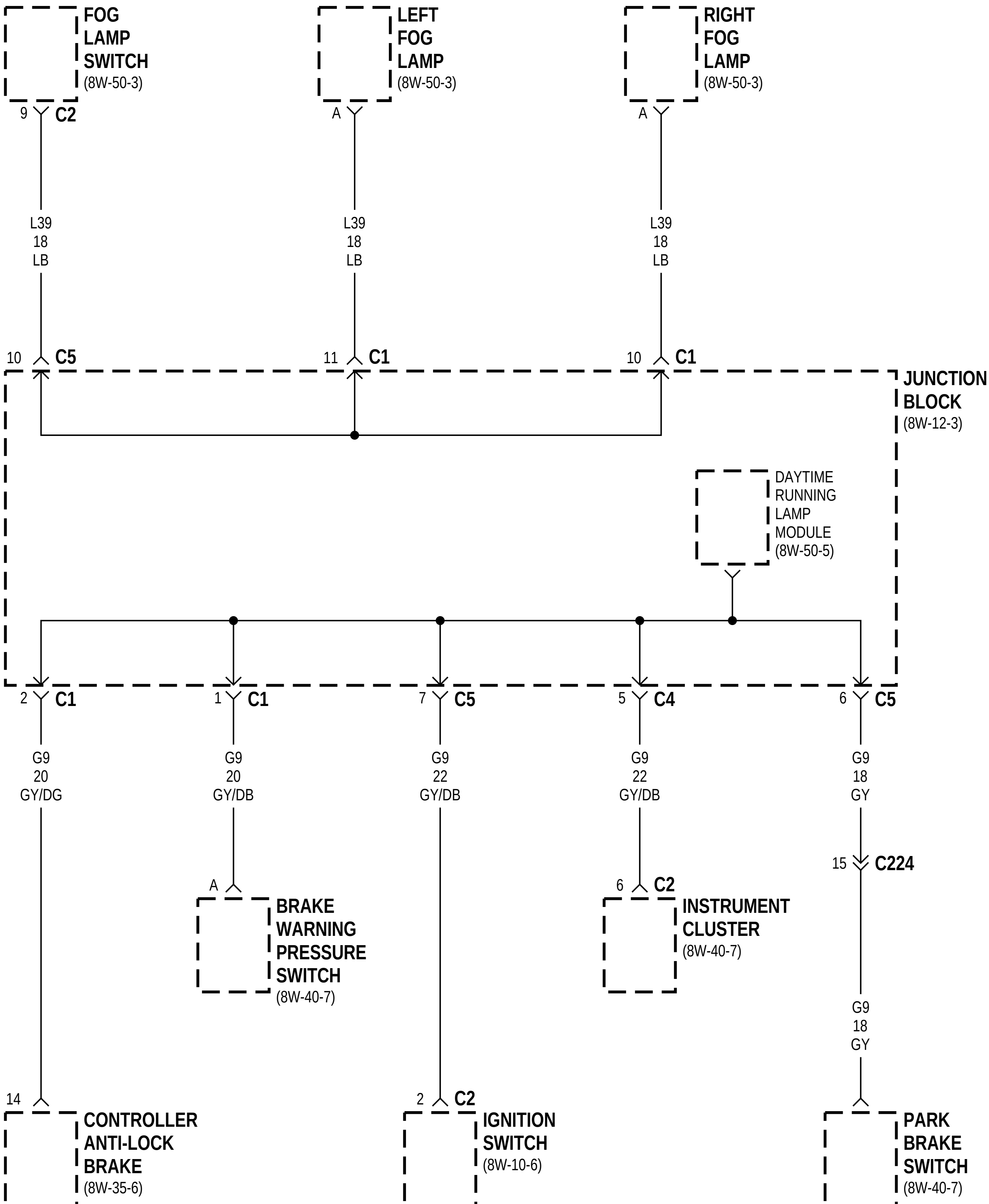
JXI00151

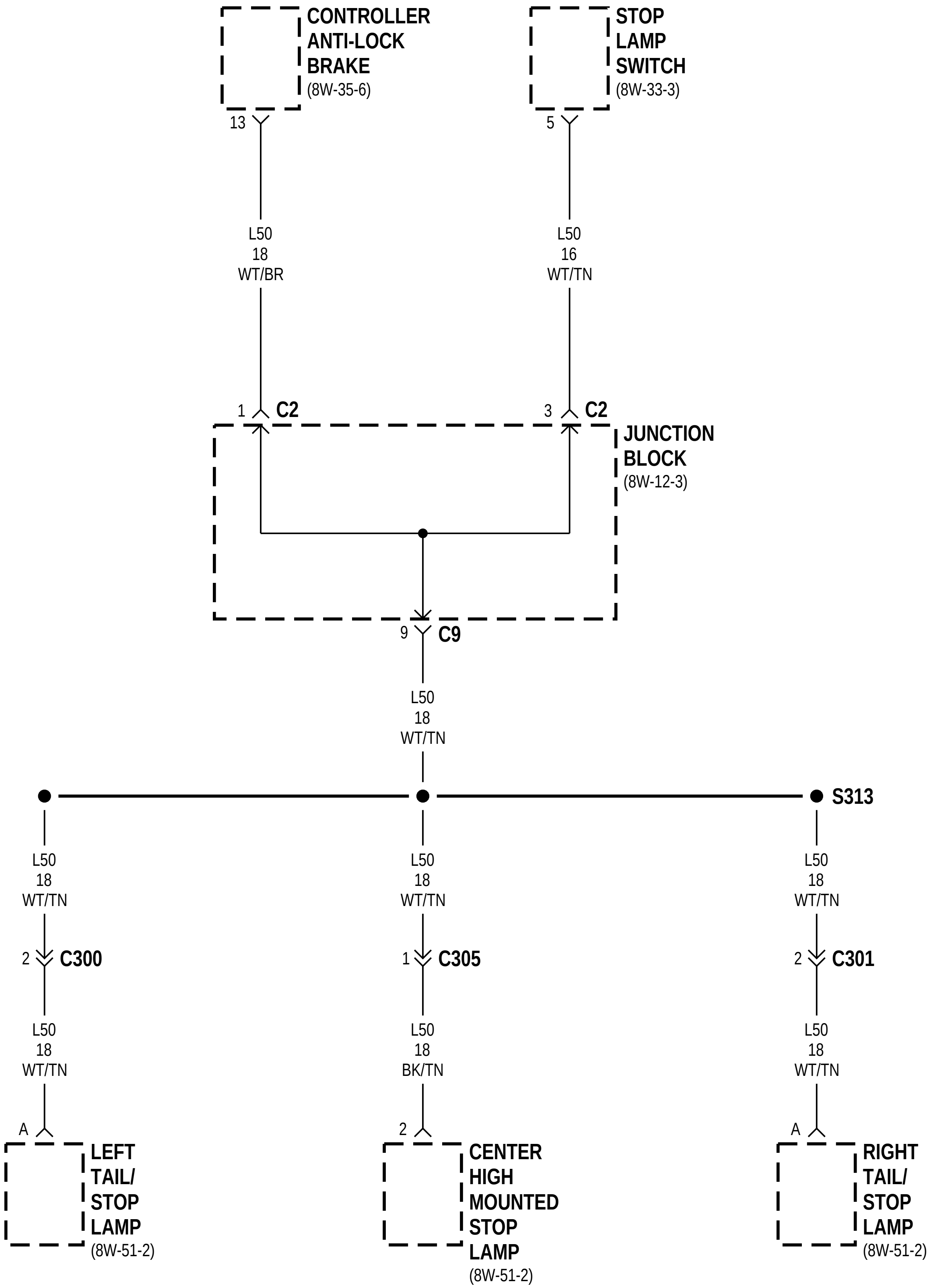

RUN A22
(8W-10-13)
BATT A3
(8W-10-11)
ST-RUN A21
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE 16 10A
CIRCUIT BREAKER 18 20A
FUSE 17 10A
4 C4
1 C9
16 C5
F23 18 WT
F35 16 RD
F14 18 LG/YL
S312
F35 16 RD
F35 16 RD
F35 16 RD
8
4
1 C309
DECKLID RELEASE RELAY
6
2
Q2 14 LG/BK
F35 16 RD
1
A
DECKLID SOLENOID
(8W-61-4)
POWER SEAT SWITCH
(8W-63-2)
2 C1
1 C1
FUSED IGN. (RUN)
FUSED IGN. (ST-RUN)
AIRBAG CONTROL MODULE
(8W-43-2)

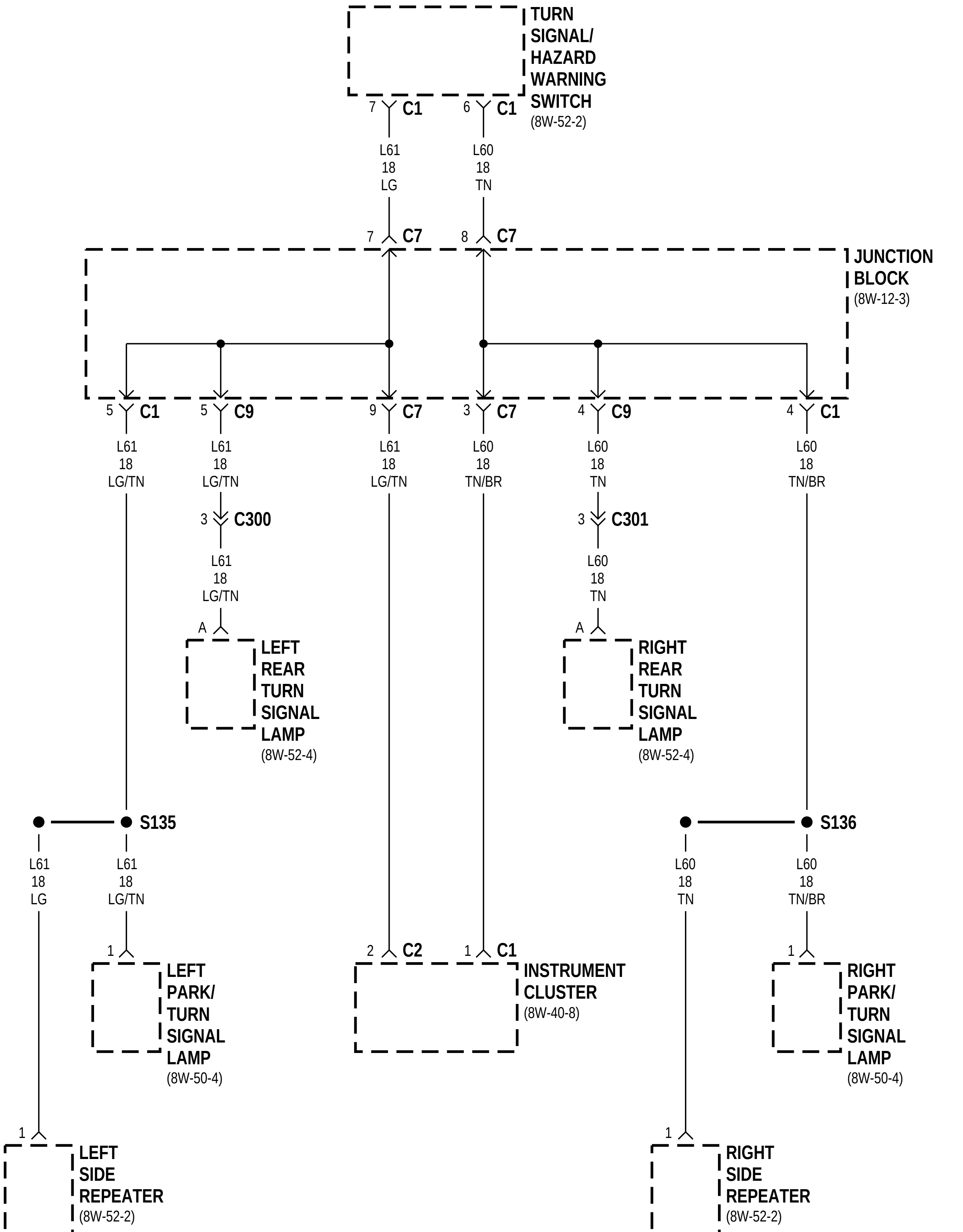

RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER 19 20A
5 C8
1 C8
6 C8
7 C8
F21 14 TN
F21 14 TN/VT
F21 14 TN/WT
10 C311
10 C316
F21 14 TN/VT
F21 14 TN
WINDOW TIMER MODULE
(8W-60-4)
2
F21 14 TN
S410
F21 14 TN
F21 14 TN
F21 14 TN
1
MASTER POWER WINDOW SWITCH
(8W-60-2)
(8W-60-3)
8
11
Q29 14 DG
Q30 14 VT
2
5
5
2
LEFT DOOR WINDOW MOTOR RELAY
(8W-60-2)
RIGHT DOOR WINDOW MOTOR RELAY
(8W-60-3)
8
8
Q21 14 WT
Q26 14 WT/VT
8 C311
4 C316
Q26 14 WT/VT
1
4
6
LEFT FRONT POWER WINDOW MOTOR
(8W-60-2)
RIGHT POWER WINDOW SWITCH
(8W-60-3)


HEADLAMP SWITCH (8W-50-3)
5 C1
IGNITION SWITCH (8W-10-6)
1 C2
AUTOMATIC DAY/ NIGHT MIRROR (8W-44-5)
2
Z1 18 BK
OVERHEAD MAP LAMP (8W-44-3)
B
Z1 18 BK
AUTOMATIC DAY/NIGHT MIRROR
OVERHEAD MAP LAMP
HEADLAMP LEVELING SWITCH (8W-50-4)
2
Z1 18 BK
ILLUMINATED ENTRY RELAY (8W-44-3)
2
Z1 18 BK
DATA LINK CONNECTOR (8W-30-17)
5
3 C332
AUTOSTICK SWITCH (8W-31-3)
3
Z13 20 BK/RD
Z1 18 BK/TN
Z1 20 BK
Z11 18 BK
Z1 18 BK
Z1 18 BK
3 C4
6 C4
15 C5
4 C10
8 C4
8 C11
JUNCTION BLOCK (8W-12-2) (8W-12-3)
10
BODY CONTROL MODULE (8W-45-2)
DAYTIME RUNNING LAMP MODULE (8W-50-5)
3 C9
9 C4
2 C4
7 C4
Z1 14 BK
Z1 16 BK/LB
Z1 18 BK/OR
Z1 20 BK/WT
9 C2
POWER AMPLIFIER (PREMIUM RADIO) (8W-47-4)
2
KEY-IN SWITCH (8W-45-9)
11 C2
INSTRUMENT CLUSTER (8W-40-8)
G301 (8W-15-9)


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-6)
8
10 C9
9 C1
8 C1
4 C5
3 C5
L7 18 BK/YL
L7 18 BK/BR
L7 18 BK/BR
L7 18 BK/YL
L7 18 BK/YL
L7 18 BK/DG
L7 18 BK/YL
2
LEFT PARK/ TURN SIGNAL LAMP
(8W-50-4)
1
RIGHT HEADLAMP LEVELING MOTOR
(8W-50-4)
1 C2
HEADLAMP SWITCH
(8W-50-3)
1
LEFT HEADLAMP LEVELING MOTOR
(8W-50-4)
2
RIGHT PARK/ TURN SIGNAL LAMP
(8W-50-4)
4 C2
RADIO
(8W-47-2)
L7 18 BK/YL
4 C300
L7 18 BK/YL
L7 18 BK/YL
TO S406
(8W-45-6)
TO RIGHT TAIL/ STOP LAMP
(8W-51-2)


FOG LAMP SWITCH (8W-50-3)
9 C2
LEFT FOG LAMP (8W-50-3)
A
RIGHT FOG LAMP (8W-50-3)
A
L39 18 LB
L39 18 LB
L39 18 LB
10 C5
11 C1
10 C1
JUNCTION BLOCK (8W-12-3)
DAYTIME RUNNING LAMP MODULE (8W-50-5)
2 C1
1 C1
7 C5
5 C4
6 C5
G9 20 GY/DG
G9 20 GY/DB
G9 22 GY/DB
G9 22 GY/DB
G9 18 GY
15 C224
A
BRAKE WARNING PRESSURE SWITCH (8W-40-7)
6 C2
INSTRUMENT CLUSTER (8W-40-7)
G9 18 GY
14
CONTROLLER ANTI-LOCK BRAKE (8W-35-6)
2 C2
IGNITION SWITCH (8W-10-6)
PARK BRAKE SWITCH (8W-40-7)


CONTROLLER
ANTI-LOCK
BRAKE
(8W-35-6)
13
STOP
LAMP
SWITCH
(8W-33-3)
5
L50
18
WT/BR
L50
16
WT/TN
1
C2
3
C2
JUNCTION
BLOCK
(8W-12-3)
9
C9
L50
18
WT/TN
S313
L50
18
WT/TN
L50
18
WT/TN
L50
18
WT/TN
2
C300
1
C305
2
C301
L50
18
WT/TN
L50
18
BK/TN
L50
18
WT/TN
A
LEFT
TAIL/
STOP
LAMP
(8W-51-2)
2
CENTER
HIGH
MOUNTED
STOP
LAMP
(8W-51-2)
A
RIGHT
TAIL/
STOP
LAMP
(8W-51-2)



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FUSES

FUSE #	AMPS	COLOR	FUSED CIRCUIT	FEED CIRCUIT
1	30A	GREEN	C1 DG	A22 BK/OR
2	10A	BLUE	L34 RD/OR	L3 RD/OR
3	10A	BLUE	L33 LG/BR	L3 RD/OR
4	15A	RED	F20 WT, F20 WT/YL	A22 BK/OR
5	10A	BLUE	M1 PK	A7 RD/BK
6	10A	BLUE	C16 LB/YL	A4 BK/PK
7	20A	YELLOW	F33 BK/RD	A13 PK/WT
8	20A	YELLOW	F30 RD	A13 PK/WT
9	15A	RED	F135	A3 RD/WT
10	20A	YELLOW	L25, L25 OR	A3 RD/WT
11	10A	BLUE	F11 RD/VT	A81 DG/RD
12	10A	BLUE	L43 VT/OR	L4 VT/WT
13	20A	YELLOW	L44 VT/RD	L4 VT/WT
14	10A	BLUE	X12 RD/WT	A31 BK/WT
15	10A	BLUE	F13 DB, F13 DB/GY	A31 BK/WT
16	10A	BLUE	F23 WT	A22 BK/OR
17	10A	BLUE	F14 LG/YL	A21 DB
18	C.B. 20A	SILVER	F35 RD	A3 RD/WT
19	C.B. 20A	SILVER	F21 TN	A22 BK/OR

HEADLAMP DELAY RELAY

CAVITY	CIRCUIT	FUNCTION	SECTION
1	A3 RD/WT	FUSED B(+)	8W-50
2	G50	RELAY CONTROL (BCM)	8W-50
3	A3 RD/WT	FUSED B(+)	8W-50
4	-	-	-
5	L4	RELAY OUTPUT (BCM)	8W-50

HORN RELAY

CAVITY	CIRCUIT	FUNCTION	SECTION
6	F30 RD	FUSED B(+)	8W-41
7	X3 BK/RD	RELAY CONTROL	8W-41
8	F30 RD	FUSED B(+)	8W-41
9	-	-	-
10	X2 DG/PK	RELAY OUTPUT	8W-41

REAR WINDOW DEFOGGER RELAY

CAVITY	CIRCUIT	FUNCTION	SECTION
11	F13	FUSED IGN. (ACC/RUN)	8W-48
12	C80	RELAY CONTROL (BCM)	8W-48
13	A4 BK/PK	FUSED B(+)	8W-48
14	-	-	-
15	C15 BK/LB	RELAY OUTPUT	8W-48

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8W-12 JUNCTION BLOCK

DESCRIPTION AND OPERATION

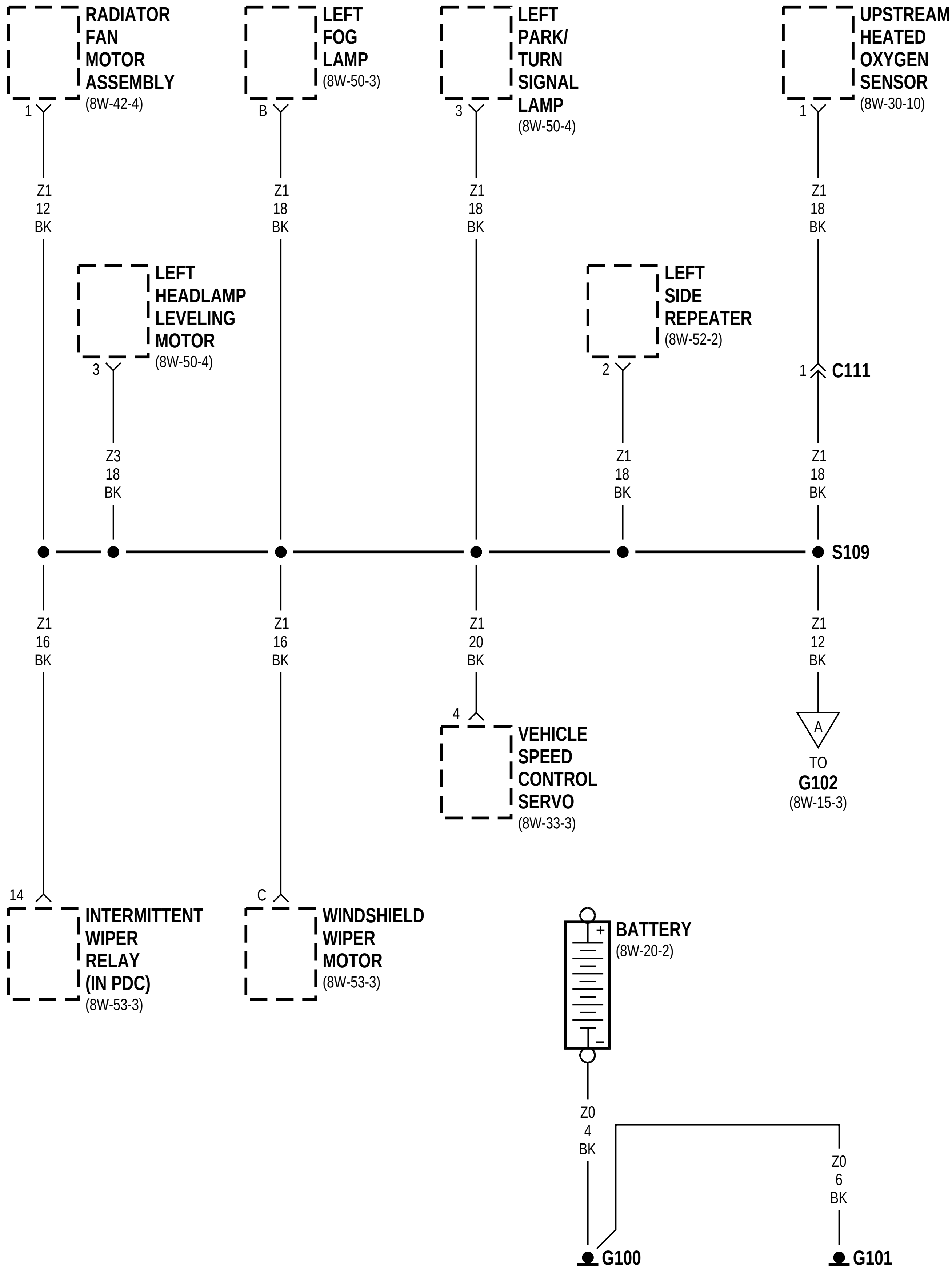
INTRODUCTION

This section covers the junction block and all circuits involved with it. For additional information on system operation, please refer to the appropriate section of the wiring diagrams.

This section identifies the fuses, relays, modules, and internal circuity of the junction block. For additional information on system operation, refer to the appropriate group of the wiring diagrams.

8W-15 GROUND DISTRIBUTION

INDEX



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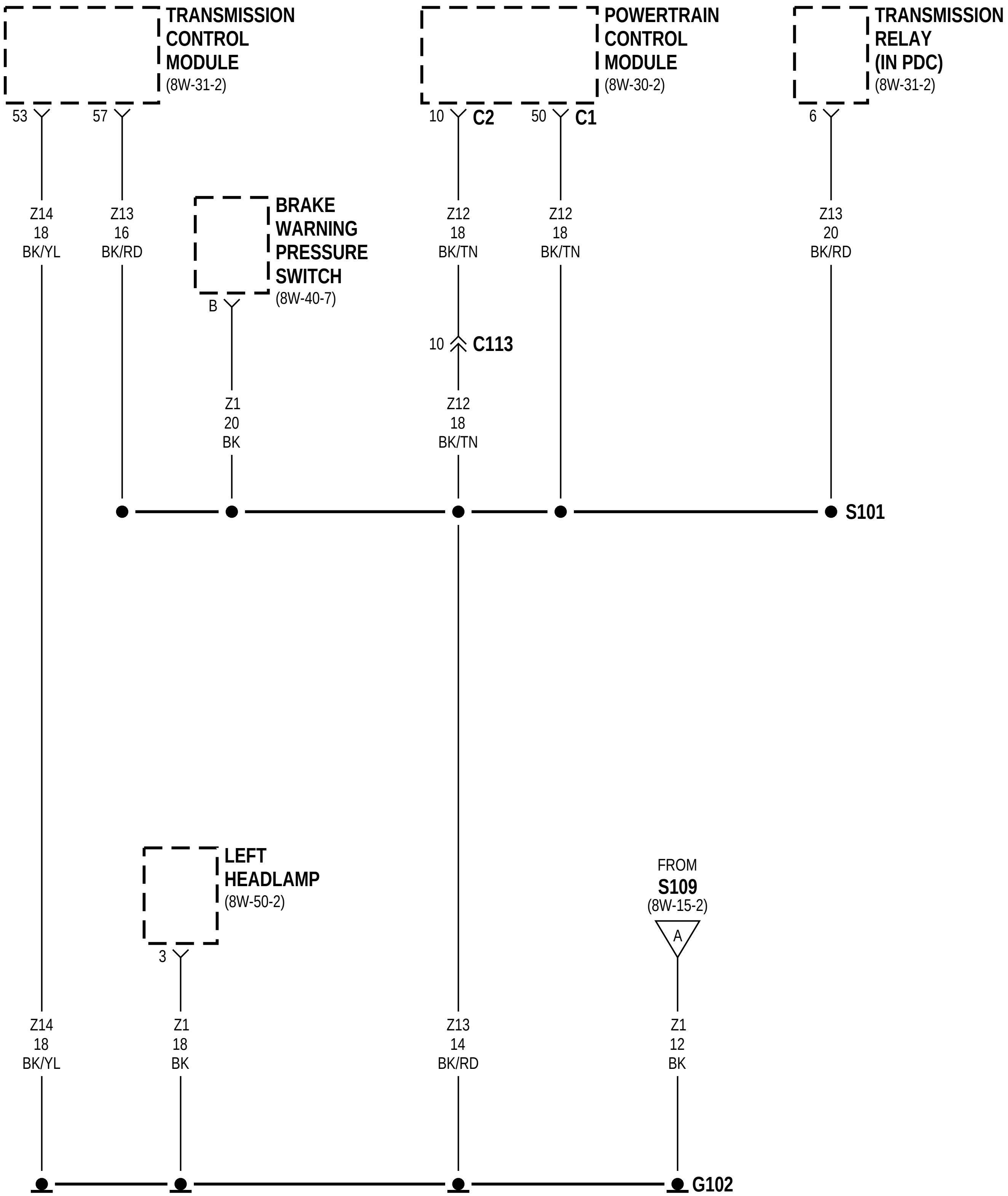
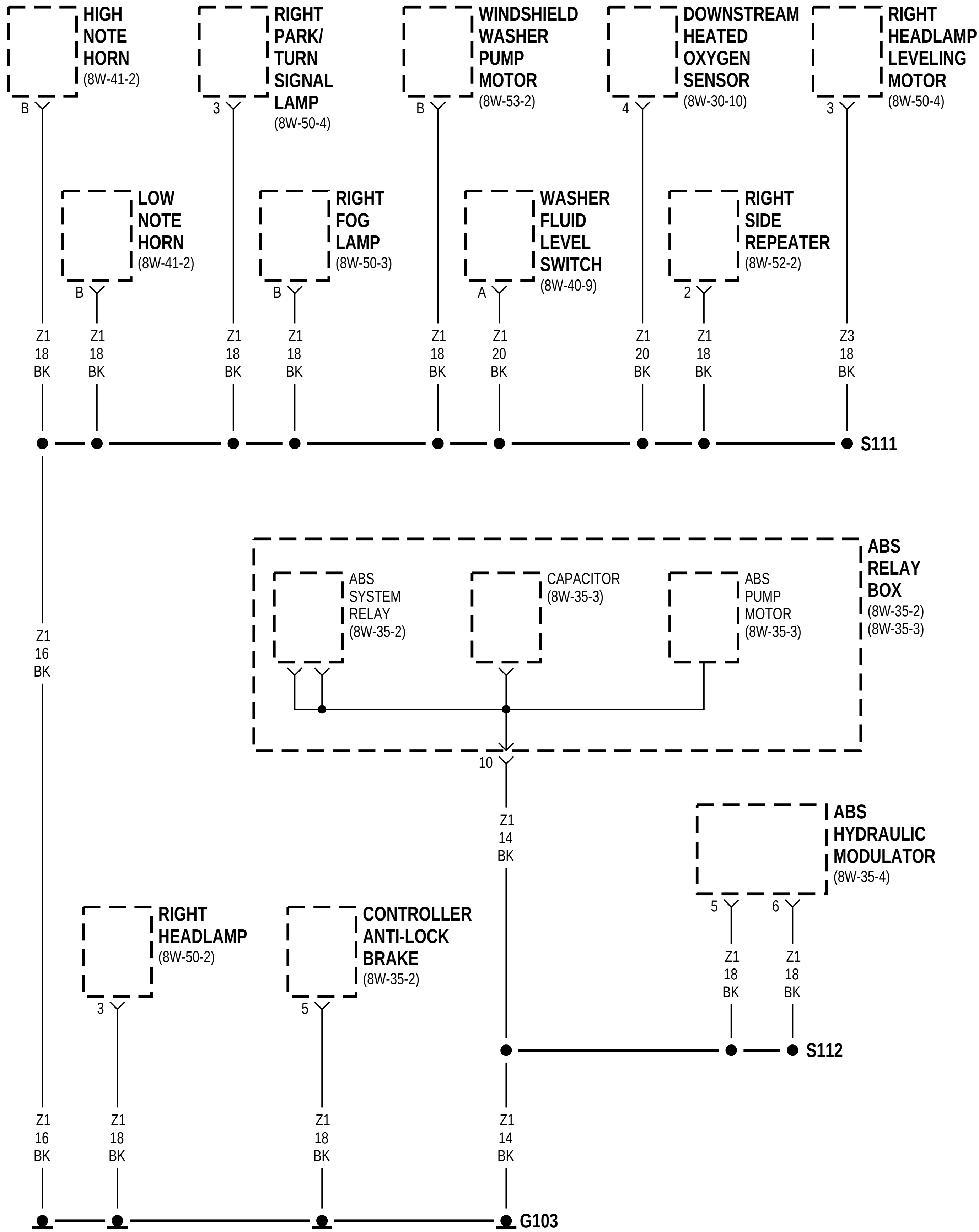
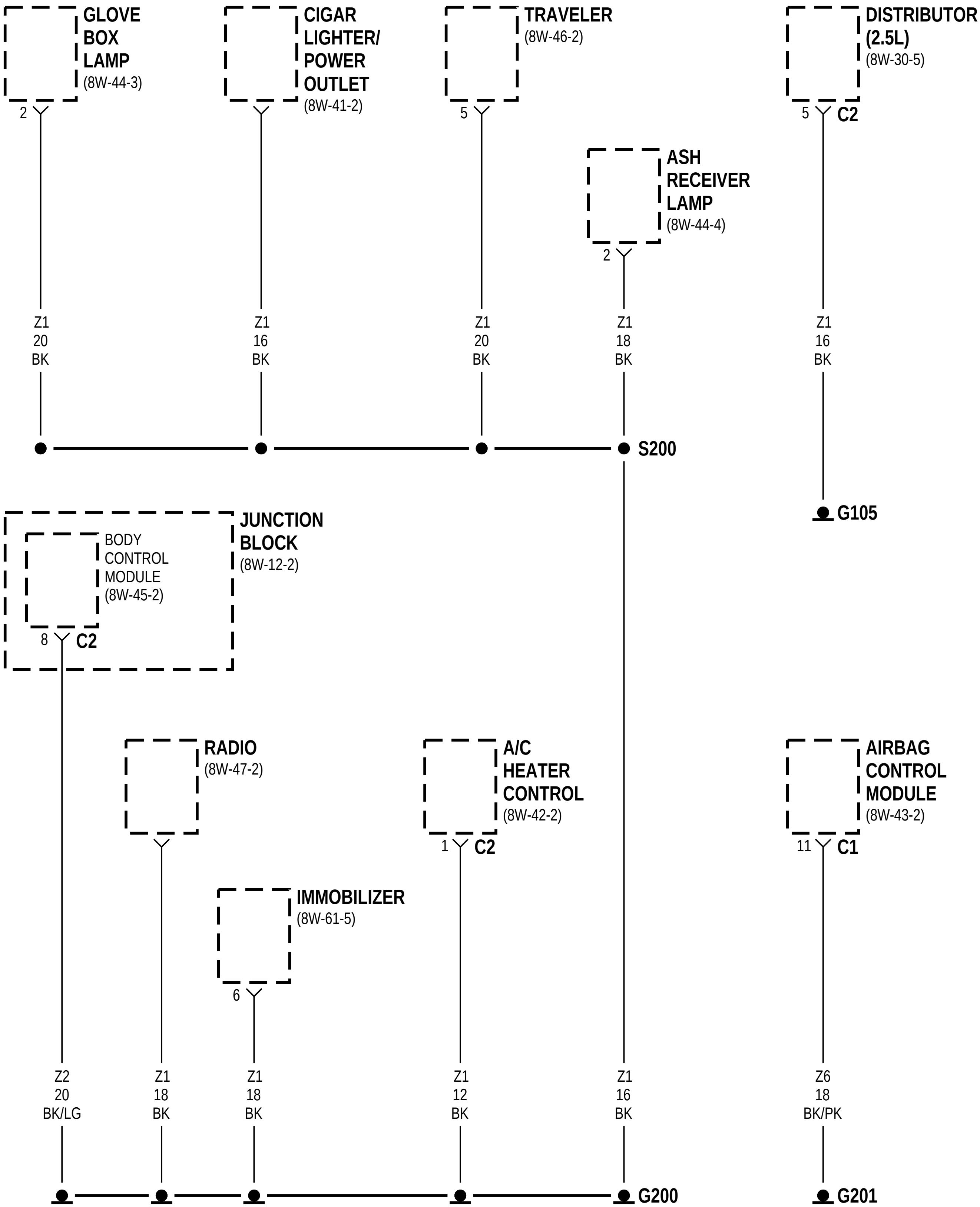
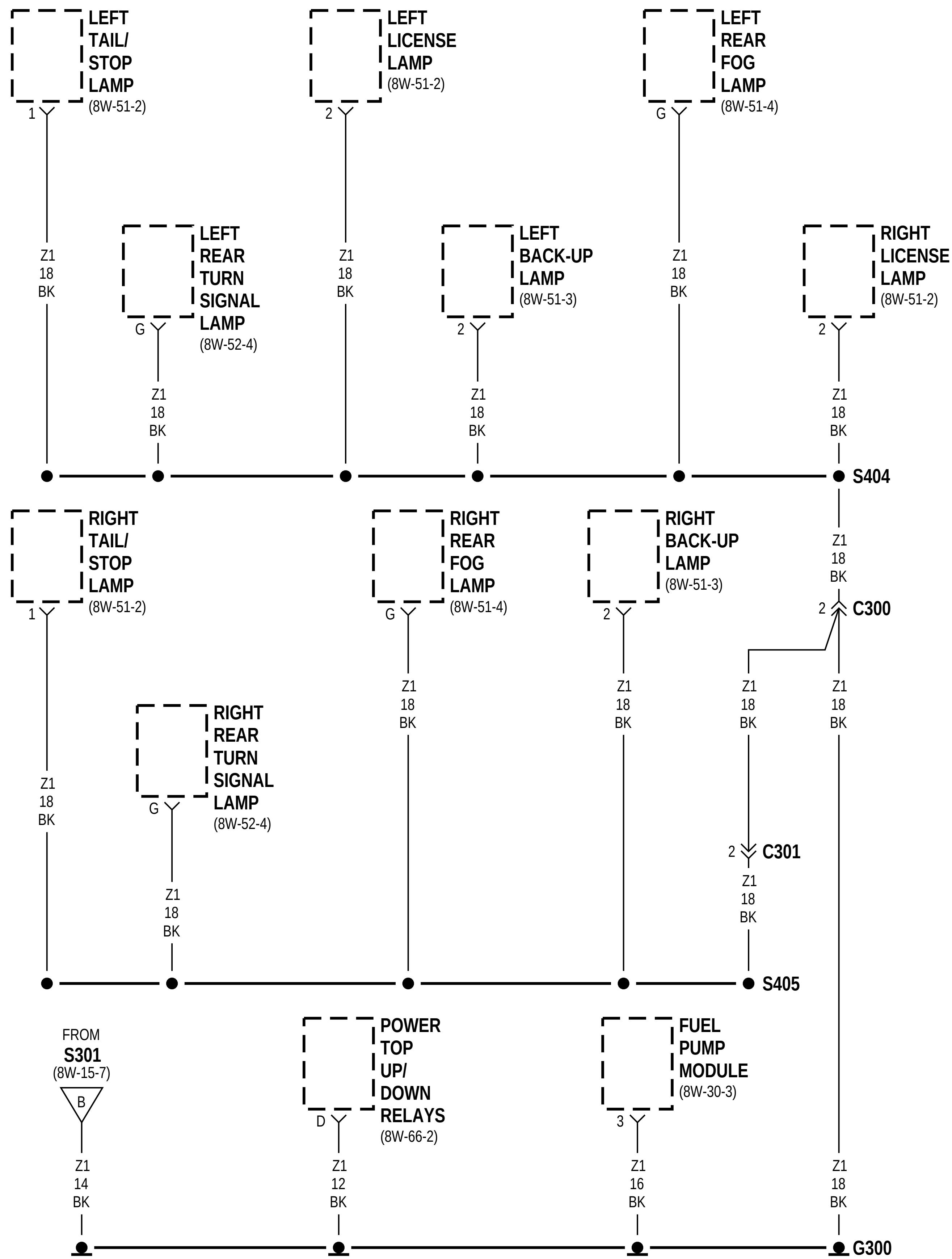
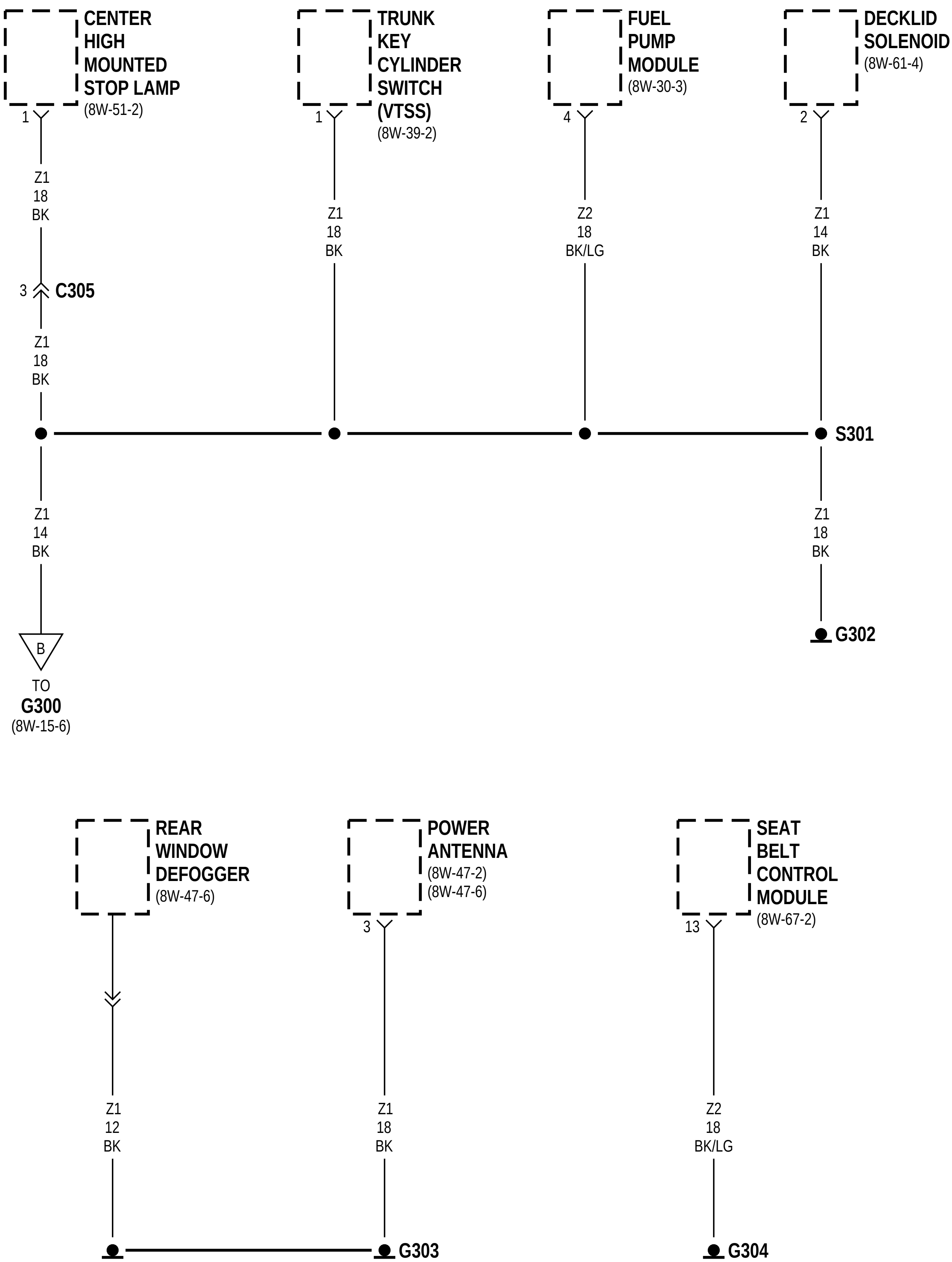

TRANSMISSION
CONTROL
MODULE
(8W-31-2)
53
57
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
10 C2
50 C1
TRANSMISSION
RELAY
(IN PDC)
(8W-31-2)
6
Z14
18
BK/YL
Z13
16
BK/RD
BRAKE
WARNING
PRESSURE
SWITCH
(8W-40-7)
B
Z12
18
BK/TN
Z12
18
BK/TN
Z13
20
BK/RD
10 C113
Z1
20
BK
Z12
18
BK/TN
S101
LEFT
HEADLAMP
(8W-50-2)
3
FROM
S109
(8W-15-2)
A
Z14
18
BK/YL
Z1
18
BK
Z13
14
BK/RD
Z1
12
BK
G102



978W-14 JXI00162


GLOVE BOX LAMP (8W-44-3)
CIGAR LIGHTER/ POWER OUTLET (8W-41-2)
TRAVELER (8W-46-2)
DISTRIBUTOR (2.5L) (8W-30-5)
C2
ASH RECEIVER LAMP (8W-44-4)
Z1 20 BK
Z1 16 BK
Z1 20 BK
Z1 18 BK
Z1 16 BK
S200
G105
JUNCTION BLOCK (8W-12-2)
BODY CONTROL MODULE (8W-45-2)
C2
RADIO (8W-47-2)
A/C HEATER CONTROL (8W-42-2)
C2
AIRBAG CONTROL MODULE (8W-43-2)
C1
IMMOBILIZER (8W-61-5)
Z2 20 BK/LG
Z1 18 BK
Z1 18 BK
Z1 12 BK
Z1 16 BK
Z6 18 BK/PK
G200
G201


LEFT TAIL/ STOP LAMP (8W-51-2)
LEFT LICENSE LAMP (8W-51-2)
LEFT REAR FOG LAMP (8W-51-4)
LEFT REAR TURN SIGNAL LAMP (8W-52-4)
LEFT BACK-UP LAMP (8W-51-3)
RIGHT LICENSE LAMP (8W-51-2)
Z1 18 BK
S404
RIGHT TAIL/ STOP LAMP (8W-51-2)
RIGHT REAR FOG LAMP (8W-51-4)
RIGHT BACK-UP LAMP (8W-51-3)
C300
RIGHT REAR TURN SIGNAL LAMP (8W-52-4)
C301
S405
FROM S301 (8W-15-7)
POWER TOP UP/ DOWN RELAYS (8W-66-2)
FUEL PUMP MODULE (8W-30-3)
Z1 14 BK
Z1 12 BK
Z1 16 BK
G300



JXI00165

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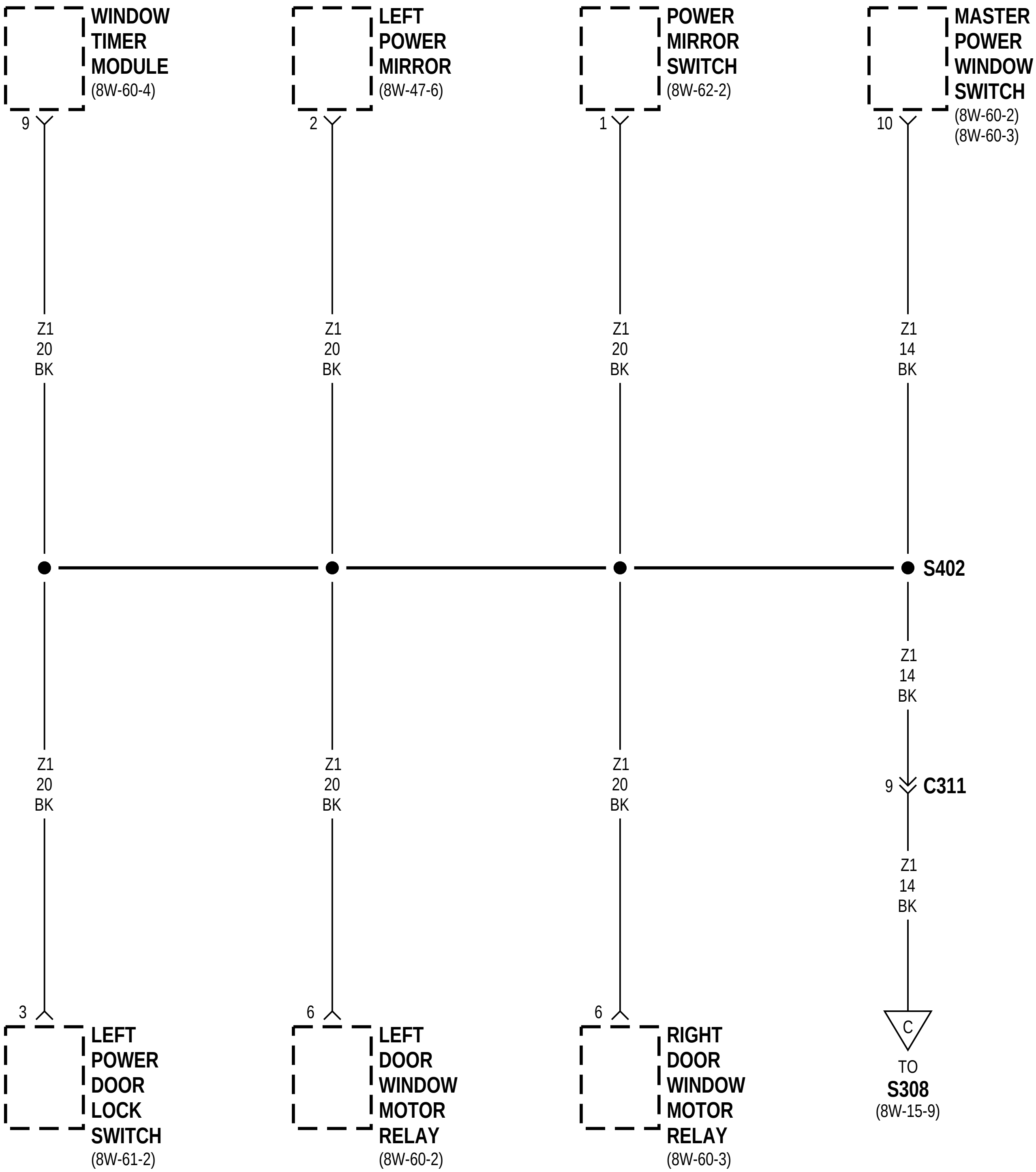
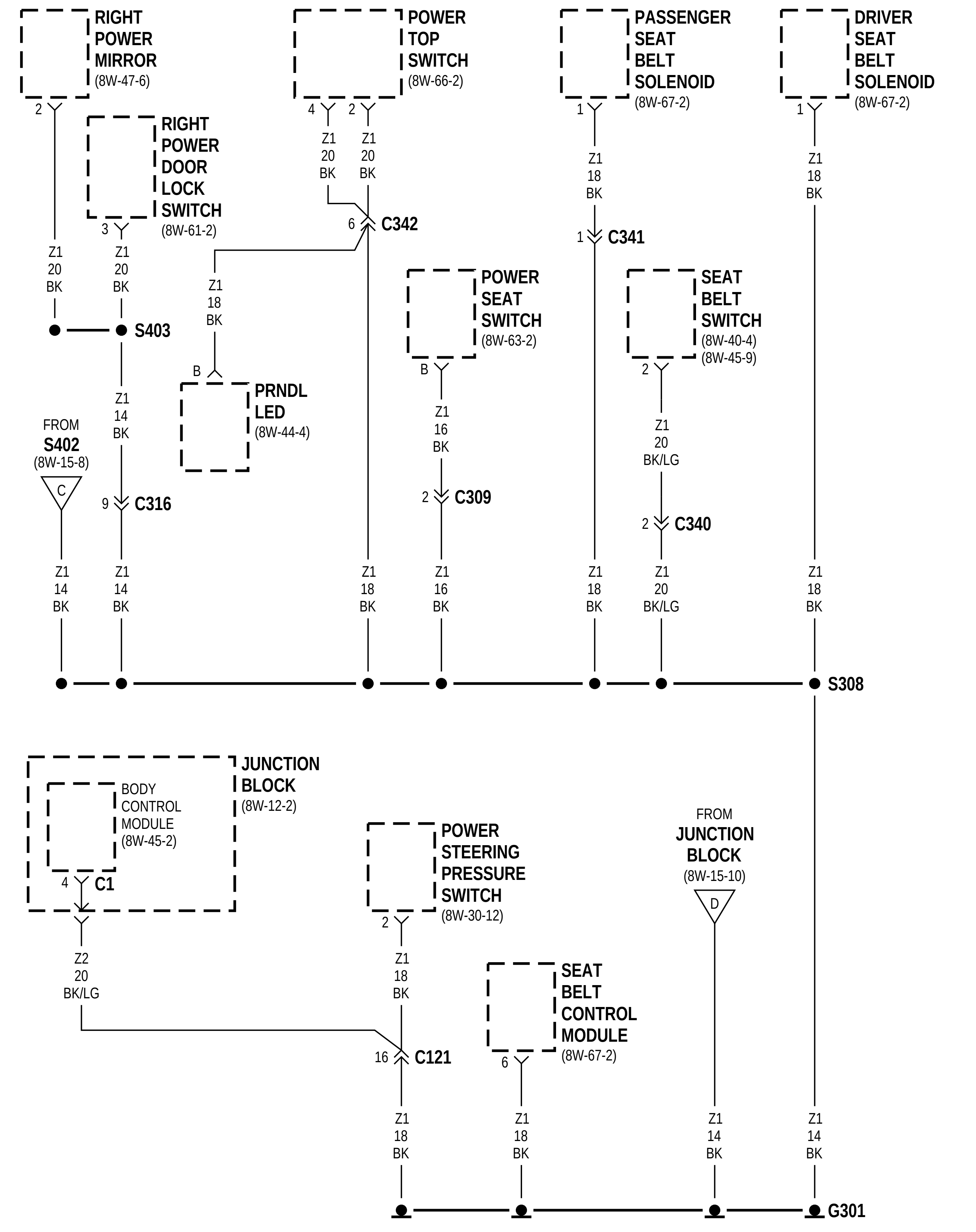
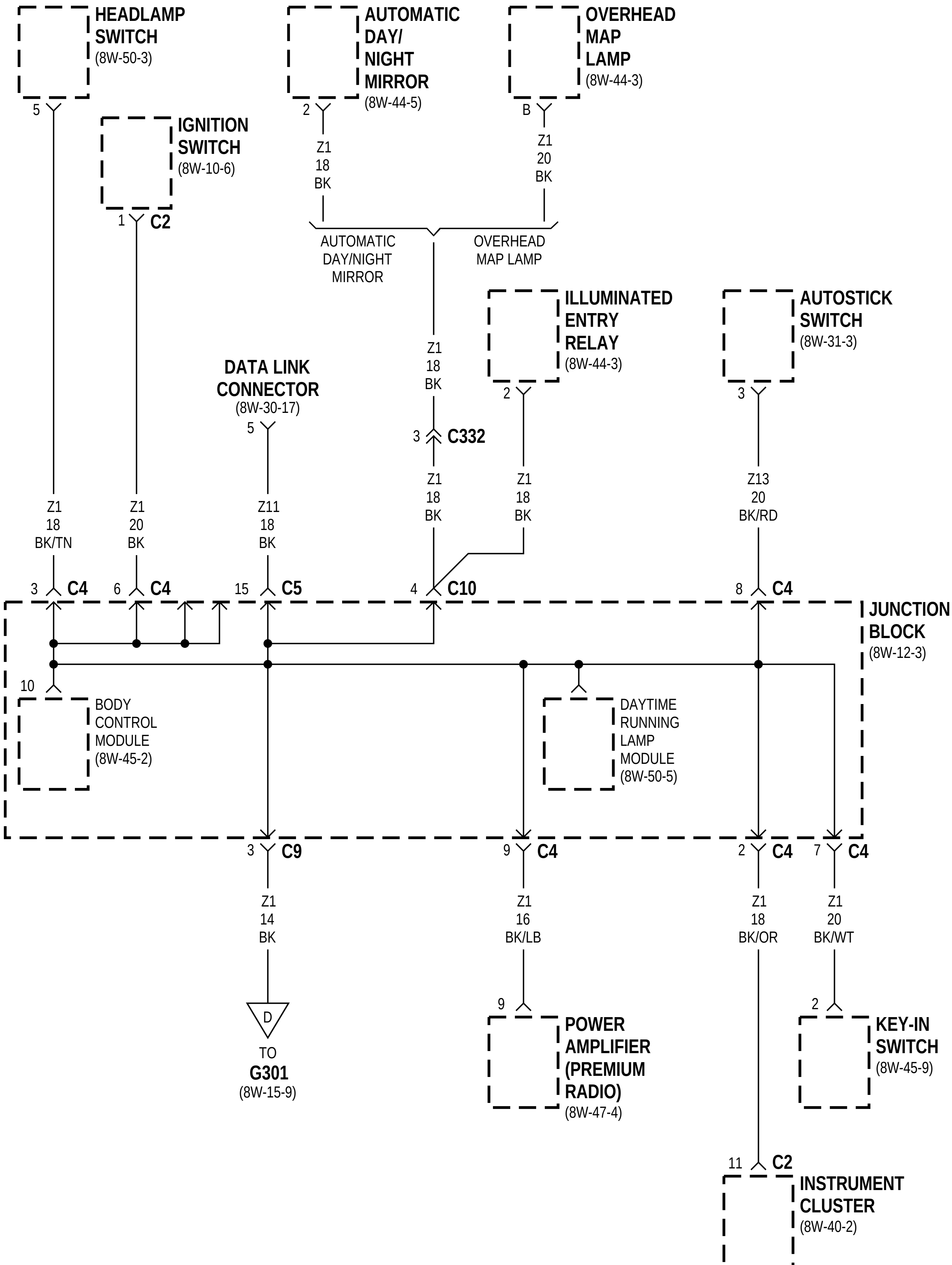

WINDOW TIMER MODULE
(8W-60-4)
LEFT POWER MIRROR
(8W-47-6)
POWER MIRROR SWITCH
(8W-62-2)
MASTER POWER WINDOW SWITCH
(8W-60-2)
(8W-60-3)
9
2
1
10
Z1
20
BK
Z1
14
BK
S402
9
C311
3
6
6
LEFT POWER DOOR LOCK SWITCH
(8W-61-2)
LEFT DOOR WINDOW MOTOR RELAY
(8W-60-2)
RIGHT DOOR WINDOW MOTOR RELAY
(8W-60-3)
C
TO
S308
(8W-15-9)


RIGHT POWER MIRROR (8W-47-6)
2
RIGHT POWER DOOR LOCK SWITCH (8W-61-2)
3
POWER TOP SWITCH (8W-66-2)
4
2
PASSENGER SEAT BELT SOLENOID (8W-67-2)
1
DRIVER SEAT BELT SOLENOID (8W-67-2)
1
Z1 20 BK
Z1 20 BK
Z1 18 BK
Z1 18 BK
6 C342
1 C341
Z1 20 BK
Z1 20 BK
Z1 18 BK
S403
B
PRNDL LED (8W-44-4)
POWER SEAT SWITCH (8W-63-2)
B
SEAT BELT SWITCH (8W-40-4) (8W-45-9)
2
Z1 14 BK
FROM S402 (8W-15-8)
C
9 C316
Z1 16 BK
2 C309
Z1 20 BK/LG
2 C340
Z1 14 BK
Z1 14 BK
Z1 18 BK
Z1 16 BK
Z1 18 BK
Z1 20 BK/LG
Z1 18 BK
S308
JUNCTION BLOCK (8W-12-2)
BODY CONTROL MODULE (8W-45-2)
4 C1
POWER STEERING PRESSURE SWITCH (8W-30-12)
2
FROM JUNCTION BLOCK (8W-15-10)
D
Z2 20 BK/LG
Z1 18 BK
SEAT BELT CONTROL MODULE (8W-67-2)
16 C121
6
Z1 18 BK
Z1 18 BK
Z1 14 BK
Z1 14 BK
G301



HEADLAMP SWITCH
(8W-50-3)
5
IGNITION SWITCH
(8W-10-6)
1 C2
AUTOMATIC DAY/ NIGHT MIRROR
(8W-44-5)
2
Z1
18
BK
OVERHEAD MAP LAMP
(8W-44-3)
B
Z1
20
BK
AUTOMATIC DAY/NIGHT MIRROR
OVERHEAD MAP LAMP
Z1
18
BK
3 C332
ILLUMINATED ENTRY RELAY
(8W-44-3)
2
AUTOSTICK SWITCH
(8W-31-3)
3
DATA LINK CONNECTOR
(8W-30-17)
5
Z1
18
BK/TN
Z1
20
BK
Z11
18
BK
Z1
18
BK
Z1
18
BK
Z13
20
BK/RD
3 C4
6 C4
15 C5
4 C10
8 C4
JUNCTION BLOCK
(8W-12-3)
10
BODY CONTROL MODULE
(8W-45-2)
DAYTIME RUNNING LAMP MODULE
(8W-50-5)
3 C9
9 C4
2 C4
7 C4
Z1
14
BK
Z1
16
BK/LB
Z1
18
BK/OR
Z1
20
BK/WT
D
TO
G301
(8W-15-9)
9
POWER AMPLIFIER (PREMIUM RADIO)
(8W-47-4)
2
KEY-IN SWITCH
(8W-45-9)
11 C2
INSTRUMENT CLUSTER
(8W-40-2)

8W-15 GROUND DISTRIBUTION

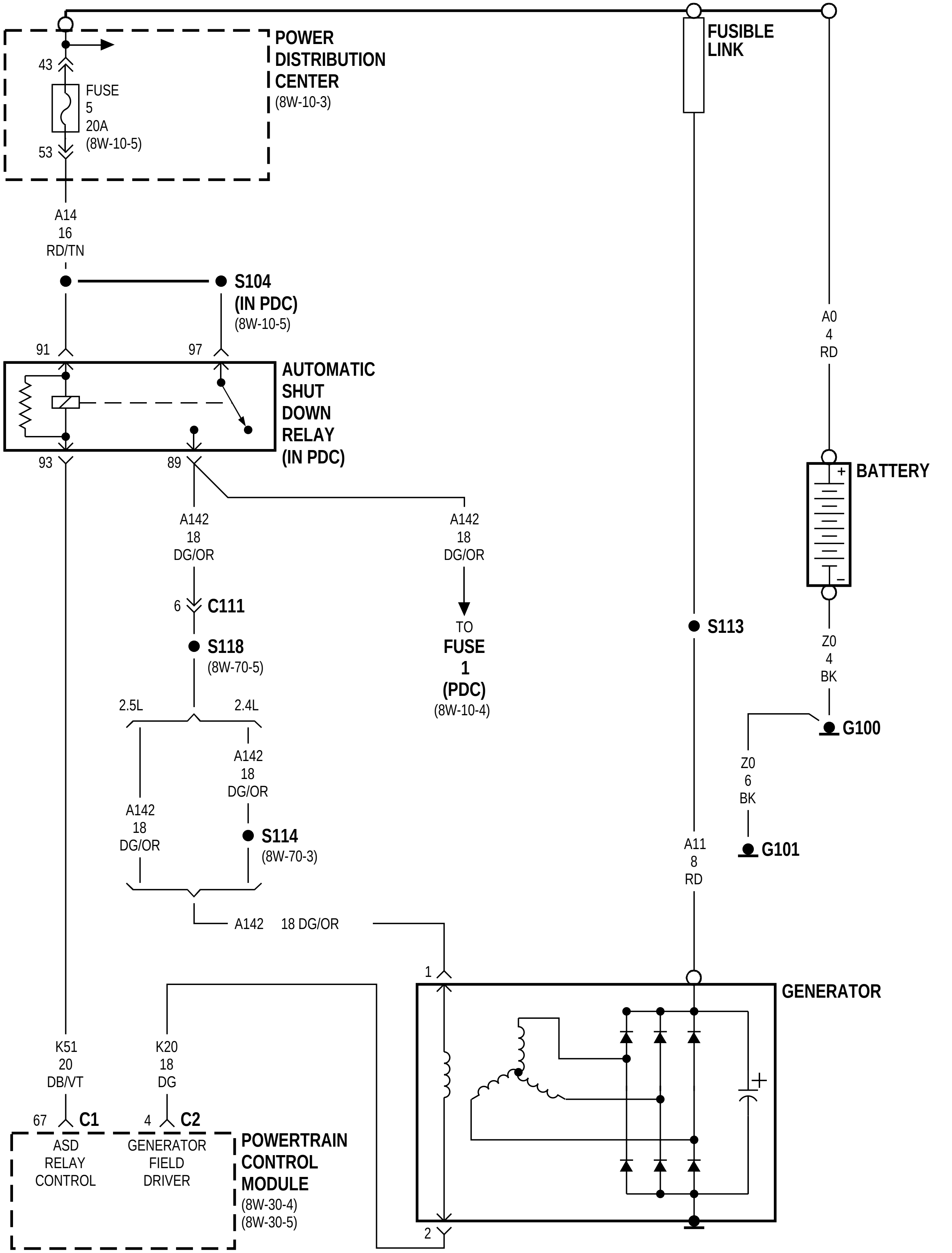
DESCRIPTION AND OPERATION

INTRODUCTION

This section identifies the grounds, splices that connect to those grounds, and the components that connect those grounds. For additional information on system operation, refer to the appropriate section of the wiring diagrams. For an illustration of the physical location of each ground, refer to group 8W-90.

8W-20 CHARGING SYSTEM

INDEX


POWER
DISTRIBUTION
CENTER
(8W-10-3)
43
FUSE
5
20A
(8W-10-5)
53
FUSIBLE
LINK
A14
16
RD/TN
S104
(IN PDC)
(8W-10-5)
91
97
AUTOMATIC
SHUT
DOWN
RELAY
(IN PDC)
93
89
A0
4
RD
BATTERY
A142
18
DG/OR
A142
18
DG/OR
6
C111
TO
FUSE
1
(PDC)
(8W-10-4)
S113
S118
(8W-70-5)
Z0
4
BK
2.5L
2.4L
G100
A142
18
DG/OR
Z0
6
BK
A142
18
DG/OR
S114
(8W-70-3)
A11
8
RD
G101
A142 18 DG/OR
1
GENERATOR
K51
20
DB/VT
K20
18
DG
67
C1
4
C2
ASD
RELAY
CONTROL
GENERATOR
FIELD
DRIVER
POWERTRAIN
CONTROL
MODULE
(8W-30-4)
(8W-30-5)
2

8W-20 CHARGING SYSTEM

DESCRIPTION AND OPERATION

CHARGING SYSTEM

The charging system is an integral part of the battery and starter systems. Since these systems work together, any diagnosis and testing should be done in conjunction.

The charging system is protected by a 10 gauge fusible link located in the A11 circuit. The fusible link isconnected into the A0 circuit. The A0 circuit is connected to the battery feed terminal of the Power Distribution Center (PDC) and the engine starter motor.

The generator is case-grounded through its attaching bracket. This generator uses a voltage regulator internal to the Powertrain Control Module (PCM).

When the vehicle is running, battery voltage is applied to the generator field terminal through the A142 circuit, on all engine applications. This circuit is controlled by the Automatic Shut-Down (ASD) relay. The ground, or voltage regulated side, of the generator field is controlled by the K20 circuit. Circuit K20 connects to cavity 4 of the PCM.

When there is current present in the field, and the rotor is turning, the stator in the generator produces a B+ voltage that is supplied to the battery through the A11 and A0 circuits. The A11 circuit is connected to the output terminal of the generator and spliced to the A0 circuit. The A0 circuit is a direct feed from the PDC to the engine starter motor.

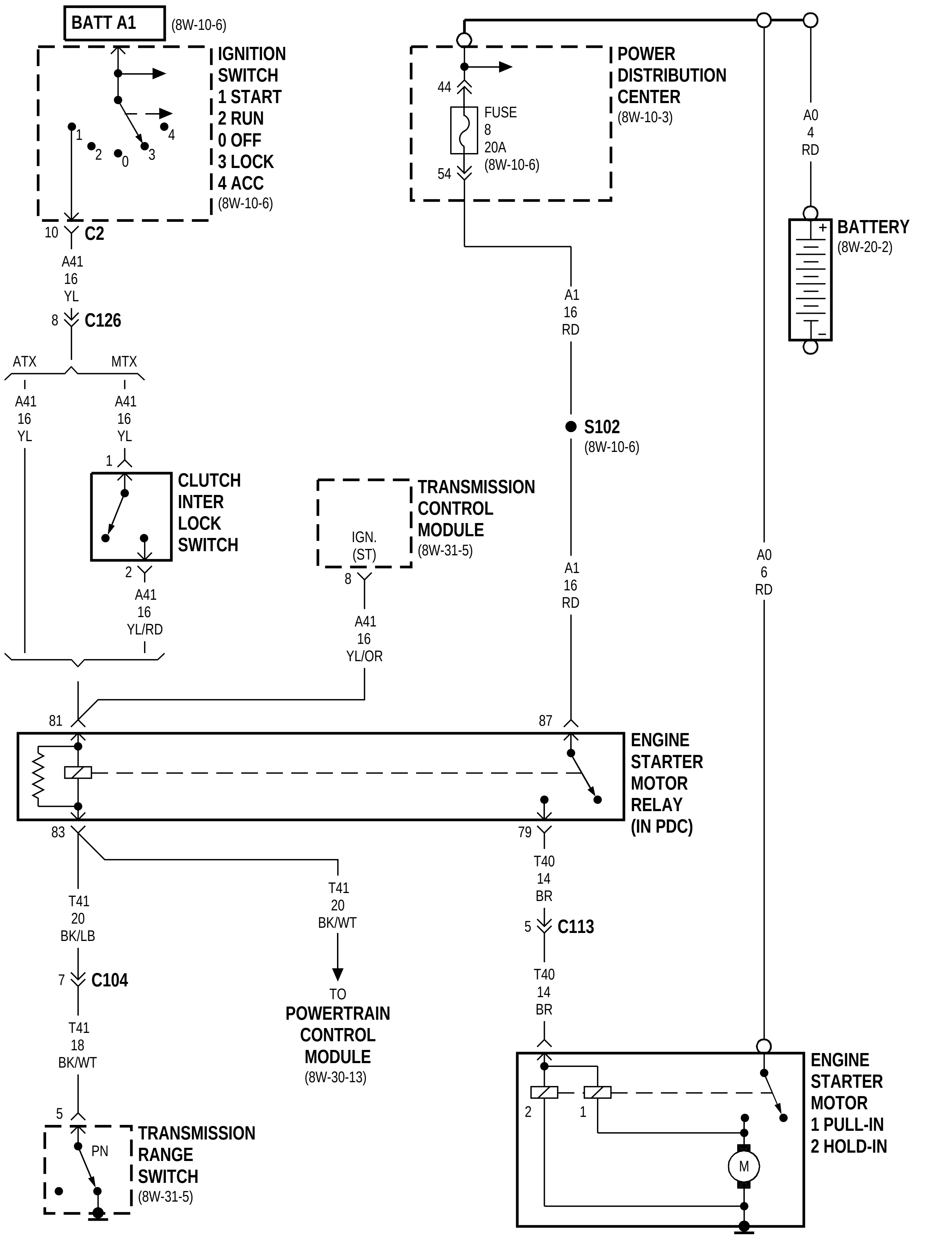
Grounding for the system is accomplished at the battery negative terminal. These grounds go to the engine and body.

HELPFUL INFORMATION

- Inspect for a blown fusible link in the A11 circuit between the generator and the battery feed terminal at the PDC
- For additional information on charging system diagnosis, refer to the appropriate group of the Service Manual or Diagnostic Test Procedures Manual

8W-21 STARTING SYSTEM

INDEX


BATT A1
(8W-10-6)
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-6)
10 C2
A41 16 YL
8 C126
ATX
MTX
A41 16 YL
A41 16 YL
1
CLUTCH INTER LOCK SWITCH
2
A41 16 YL/RD
POWER DISTRIBUTION CENTER
(8W-10-3)
44
FUSE 8 20A (8W-10-6)
54
A0 4 RD
BATTERY
(8W-20-2)
A1 16 RD
S102
(8W-10-6)
TRANSMISSION CONTROL MODULE
(8W-31-5)
IGN. (ST)
8
A41 16 YL/OR
A1 16 RD
A0 6 RD
81
87
ENGINE STARTER MOTOR RELAY (IN PDC)
83
79
T40 14 BR
5 C113
T40 14 BR
T41 20 BK/LB
T41 20 BK/WT
7 C104
TO POWERTRAIN CONTROL MODULE
(8W-30-13)
T41 18 BK/WT
5
PN
TRANSMISSION RANGE SWITCH
(8W-31-5)
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN

8W-21 STARTING SYSTEM

DESCRIPTION AND OPERATION

STARTING SYSTEM (MANUAL TRANSAXLE)

The Power Distribution Center (PDC) supplies battery voltage to the engine starter motor solenoid through circuit T40 when the coil side of the engine starter motor relay energizes. Circuit A1 contains a 20 amp fuse, and feeds the contact side of the engine starter motor relay. Both the 20 amp fuse and the engine starter motor relay are located in the PDC.

The ignition switch supplies battery voltage to the coil side of the engine starter motor relay on circuit A41 when the key is moved to the START position and the operator has pressed the clutch pedal to CLOSE the clutch pedal position switch. Circuit Z1 is the ground for the coil side of the engine starter motor relay. When the coil side of the relay energizes, the contacts CLOSE, supplying battery voltage to the engine starter motor solenoid.

Circuit A0 (battery positive cable) supplies battery voltage to the engine starter motor when the solenoid energizes. Ground for the engine starter motor is supplied through the starter motor case.

HELPFUL INFORMATION

- Check for blown engine starter motor fuse in cavity 8 of the PDC
- Move the ignition key to the START position and with the clutch pedal pressed, listen for the starter motor relay to click. The engine starter motor relay is located in the PDC
- Check for a good ground at the starter motor

STARTING SYSTEM (AUTOMATIC TRANSAXLE)

The Power Distribution Center (PDC) supplies battery voltage to the engine starter motor solenoid through circuit T40 when the coil side of the engine starter motor relay energizes. Circuit A1 contains a 20 amp fuse, and feeds the contact side of the engine starter motor relay. Both the 20 amp fuse and the engine starter motor relay are located in the PDC.

The ignition switch supplies battery voltage to the coil side of the engine starter motor relay on circuit A41 when the key is moved to the START position and the PARK/NEUTRALportion of the Transmission Range Sensor (TRS) is CLOSED. Circuit A41 also provides an ignition start input to the Transmission Control Module (TCM).

Ground for the coil side of the engine starter motor relay is supplied on the T41 circuit by the TRS, which is case-grounded. The T41 circuit is also an input to the Powertrain Control Module (PCM), cavity 76, and the TCM, cavity 41. This input is used to indicate when the vehicle is in the PARK or NEUTRAL positions.

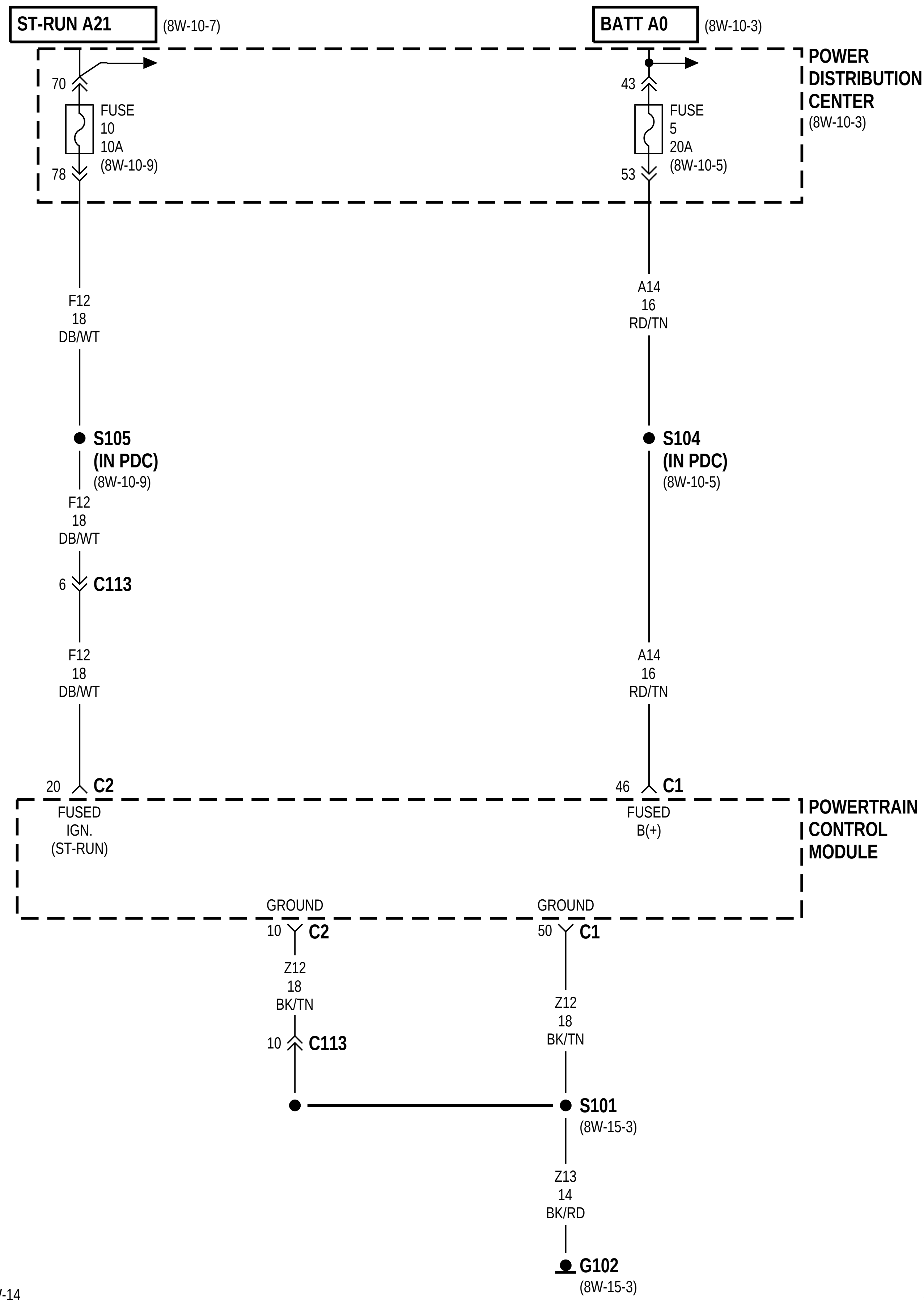
Circuit A0 (battery positive cable) supplies battery voltage to the engine starter motor when the solenoid energizes. Ground for the engine starter motor is supplied through the starter motor case.

HELPFUL INFORMATION

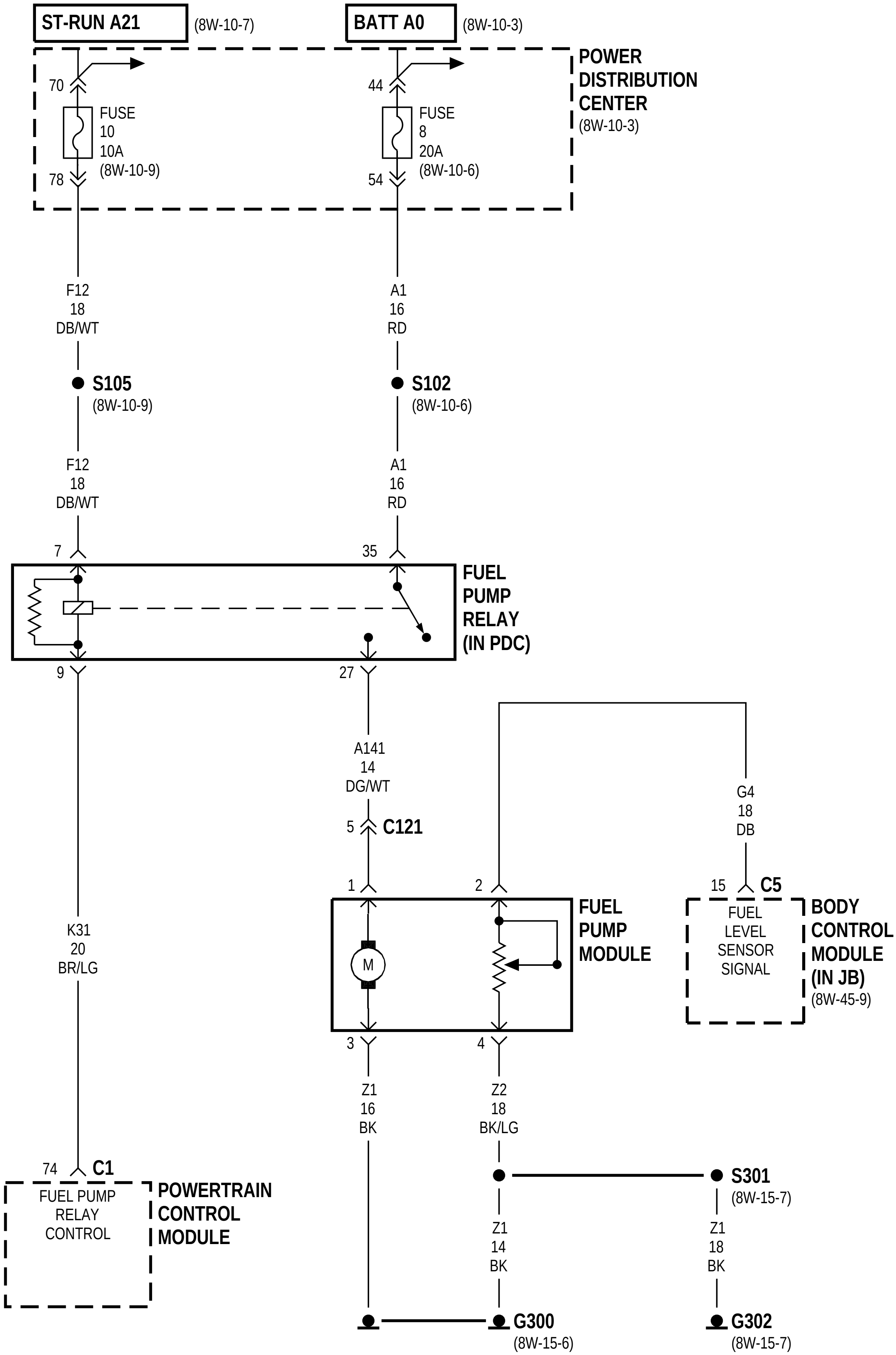
- Check for blown engine starter motor fuse in cavity 8 of the PDC
- With the gear selector in the PARK or NEUTRAL position, move the ignition key to the START position and listen for the starter motor relay to click. The engine starter motor relay is located in the PDC
- Check for a good ground at the starter motor
- The TRS is case-grounded and supplies the ground for the coil side of the starter relay

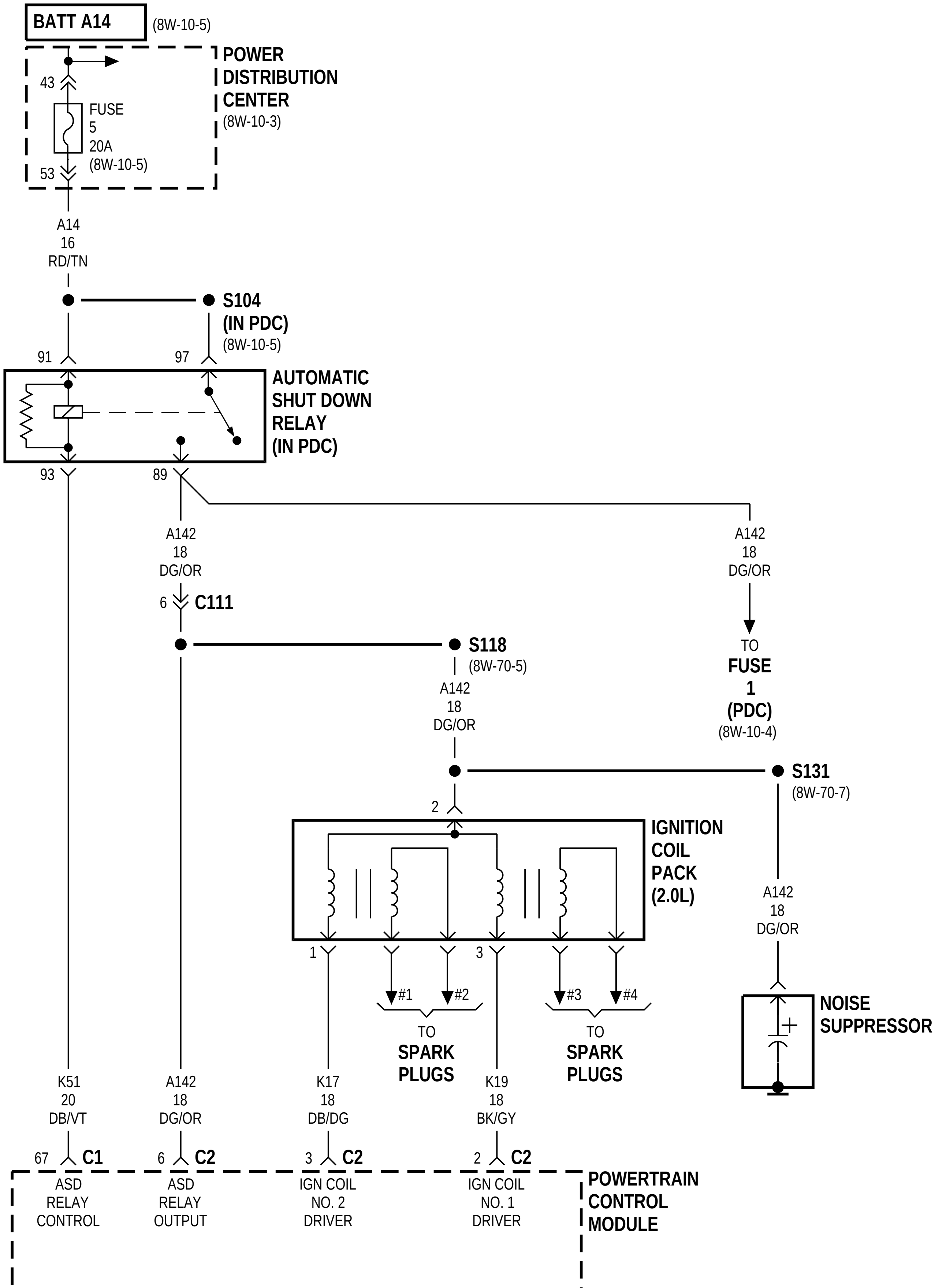
8W-30 FUEL/IGNITION SYSTEM

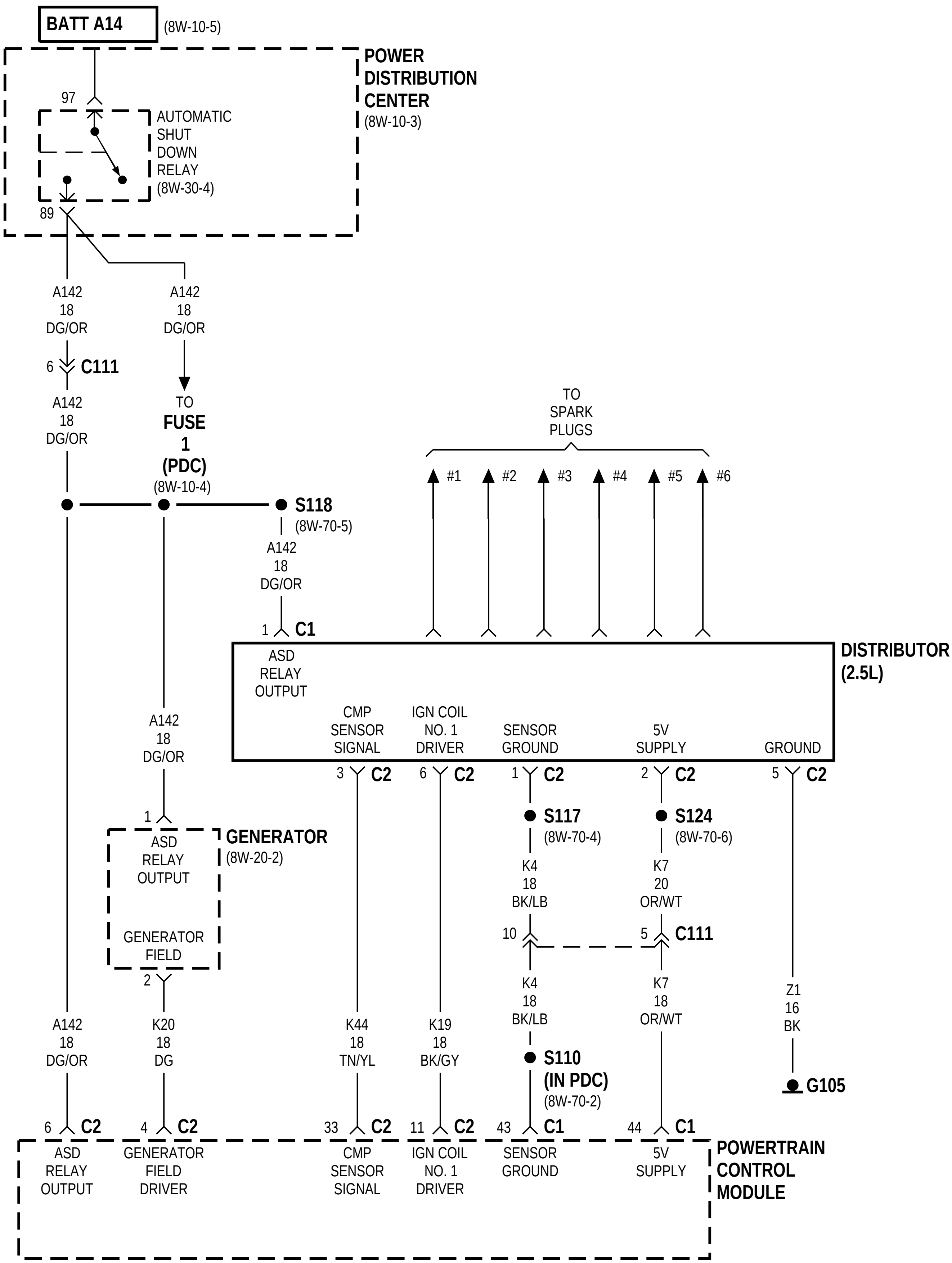
INDEX

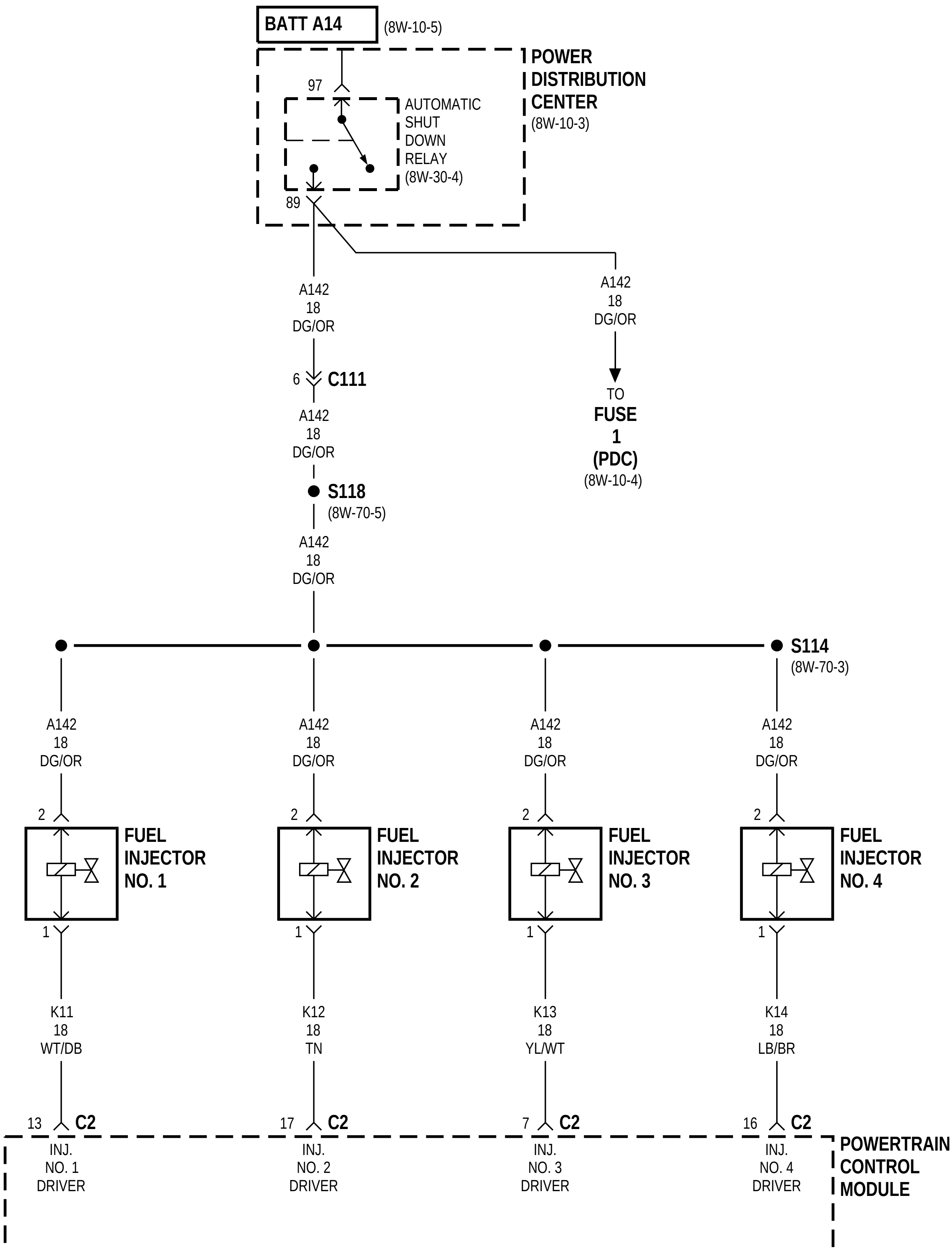


ST-RUN A21
(8W-10-7)
BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
70
FUSE
10
10A
(8W-10-9)
78
43
FUSE
5
20A
(8W-10-5)
53
F12
18
DB/WT
A14
16
RD/TN
S105
(IN PDC)
(8W-10-9)
S104
(IN PDC)
(8W-10-5)
F12
18
DB/WT
6
C113
F12
18
DB/WT
A14
16
RD/TN
20
C2
46
C1
FUSED
IGN.
(ST-RUN)
FUSED
B(+)
POWERTRAIN CONTROL MODULE
GROUND
GROUND
10
C2
50
C1
Z12
18
BK/TN
Z12
18
BK/TN
10
C113
S101
(8W-15-3)
Z13
14
BK/RD
G102
(8W-15-3)


ST-RUN A21
(8W-10-7)
BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
70
FUSE
10
10A
(8W-10-9)
78
44
FUSE
8
20A
(8W-10-6)
54
F12
18
DB/WT
S105
(8W-10-9)
F12
18
DB/WT
A1
16
RD
S102
(8W-10-6)
A1
16
RD
7
35
FUEL PUMP RELAY (IN PDC)
9
27
A141
14
DG/WT
5
C121
G4
18
DB
K31
20
BR/LG
1
2
M
FUEL PUMP MODULE
15
C5
FUEL LEVEL SENSOR SIGNAL
BODY CONTROL MODULE (IN JB)
(8W-45-9)
3
4
Z1
16
BK
Z2
18
BK/LG
74
C1
FUEL PUMP RELAY CONTROL
POWERTRAIN CONTROL MODULE
S301
(8W-15-7)
Z1
14
BK
Z1
18
BK
G300
(8W-15-6)
G302
(8W-15-7)


BATT A14
(8W-10-5)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
43
FUSE
5
20A
(8W-10-5)
53
A14
16
RD/TN
S104
(IN PDC)
(8W-10-5)
91
97
AUTOMATIC
SHUT DOWN
RELAY
(IN PDC)
93
89
A142
18
DG/OR
A142
18
DG/OR
6
C111
S118
(8W-70-5)
A142
18
DG/OR
TO
FUSE
1
(PDC)
(8W-10-4)
S131
(8W-70-7)
2
IGNITION
COIL
PACK
(2.0L)
A142
18
DG/OR
1
3
#1
#2
#3
#4
TO
SPARK
PLUGS
TO
SPARK
PLUGS
NOISE
SUPPRESSOR
K51
20
DB/VT
A142
18
DG/OR
K17
18
DB/DG
K19
18
BK/GY
67 C1
6 C2
3 C2
2 C2
ASD
RELAY
CONTROL
ASD
RELAY
OUTPUT
IGN COIL
NO. 2
DRIVER
IGN COIL
NO. 1
DRIVER
POWERTRAIN
CONTROL
MODULE


BATT A14
(8W-10-5)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
97
AUTOMATIC
SHUT
DOWN
RELAY
(8W-30-4)
89
A142
18
DG/OR
A142
18
DG/OR
6
C111
A142
18
DG/OR
TO
FUSE
1
(PDC)
(8W-10-4)
S118
(8W-70-5)
A142
18
DG/OR
TO
SPARK
PLUGS
#1
#2
#3
#4
#5
#6
1
C1
ASD
RELAY
OUTPUT
DISTRIBUTOR
(2.5L)
CMP
SENSOR
SIGNAL
IGN COIL
NO. 1
DRIVER
SENSOR
GROUND
5V
SUPPLY
GROUND
3 C2
6 C2
1 C2
2 C2
5 C2
A142
18
DG/OR
S117
(8W-70-4)
S124
(8W-70-6)
1
GENERATOR
(8W-20-2)
ASD
RELAY
OUTPUT
K4
18
BK/LB
K7
20
OR/WT
10
5
C111
GENERATOR
FIELD
2
K4
18
BK/LB
K7
18
OR/WT
Z1
16
BK
A142
18
DG/OR
K20
18
DG
K44
18
TN/YL
K19
18
BK/GY
S110
(IN PDC)
(8W-70-2)
G105
6 C2
4 C2
33 C2
11 C2
43 C1
44 C1
ASD
RELAY
OUTPUT
GENERATOR
FIELD
DRIVER
CMP
SENSOR
SIGNAL
IGN COIL
NO. 1
DRIVER
SENSOR
GROUND
5V
SUPPLY
POWERTRAIN
CONTROL
MODULE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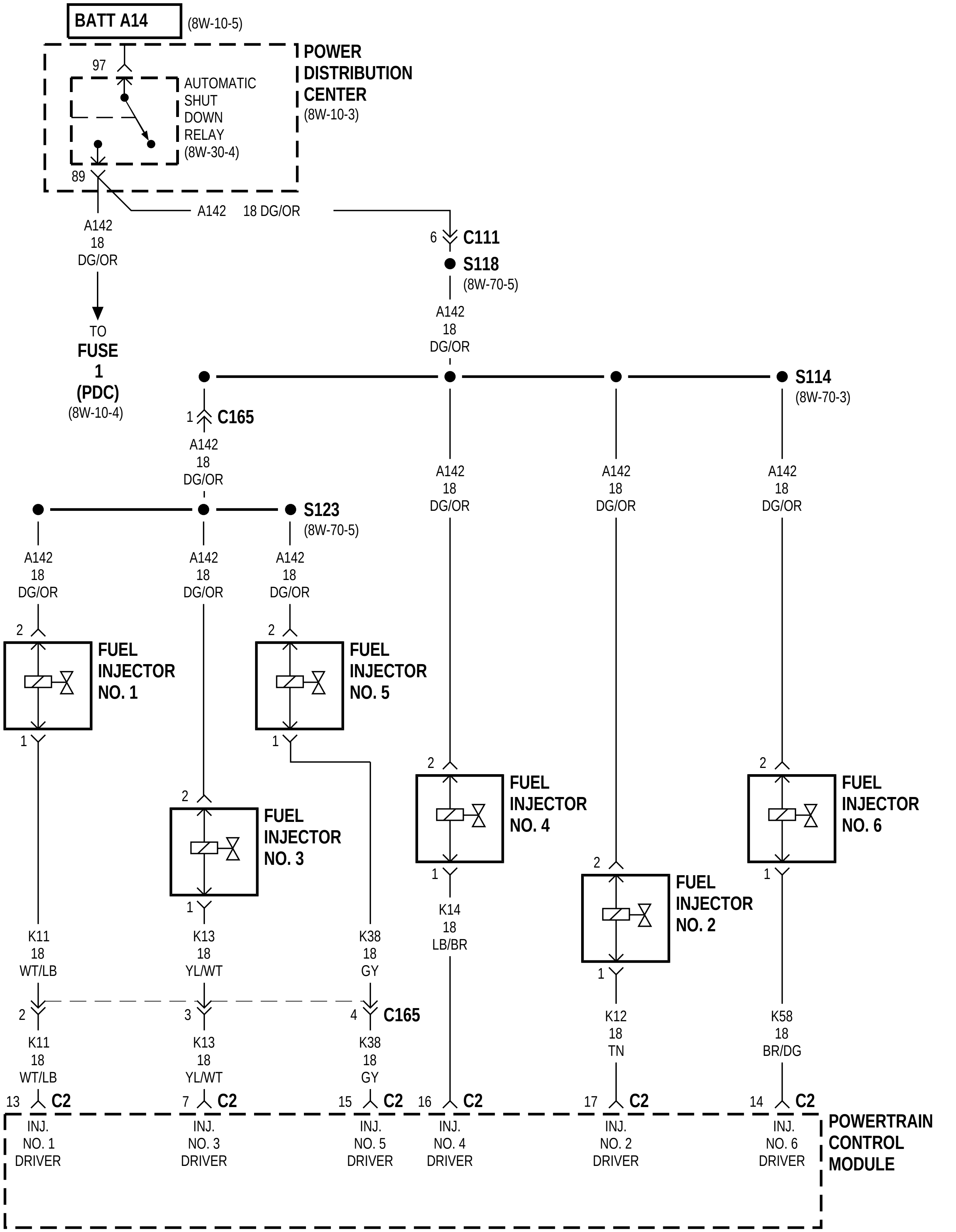
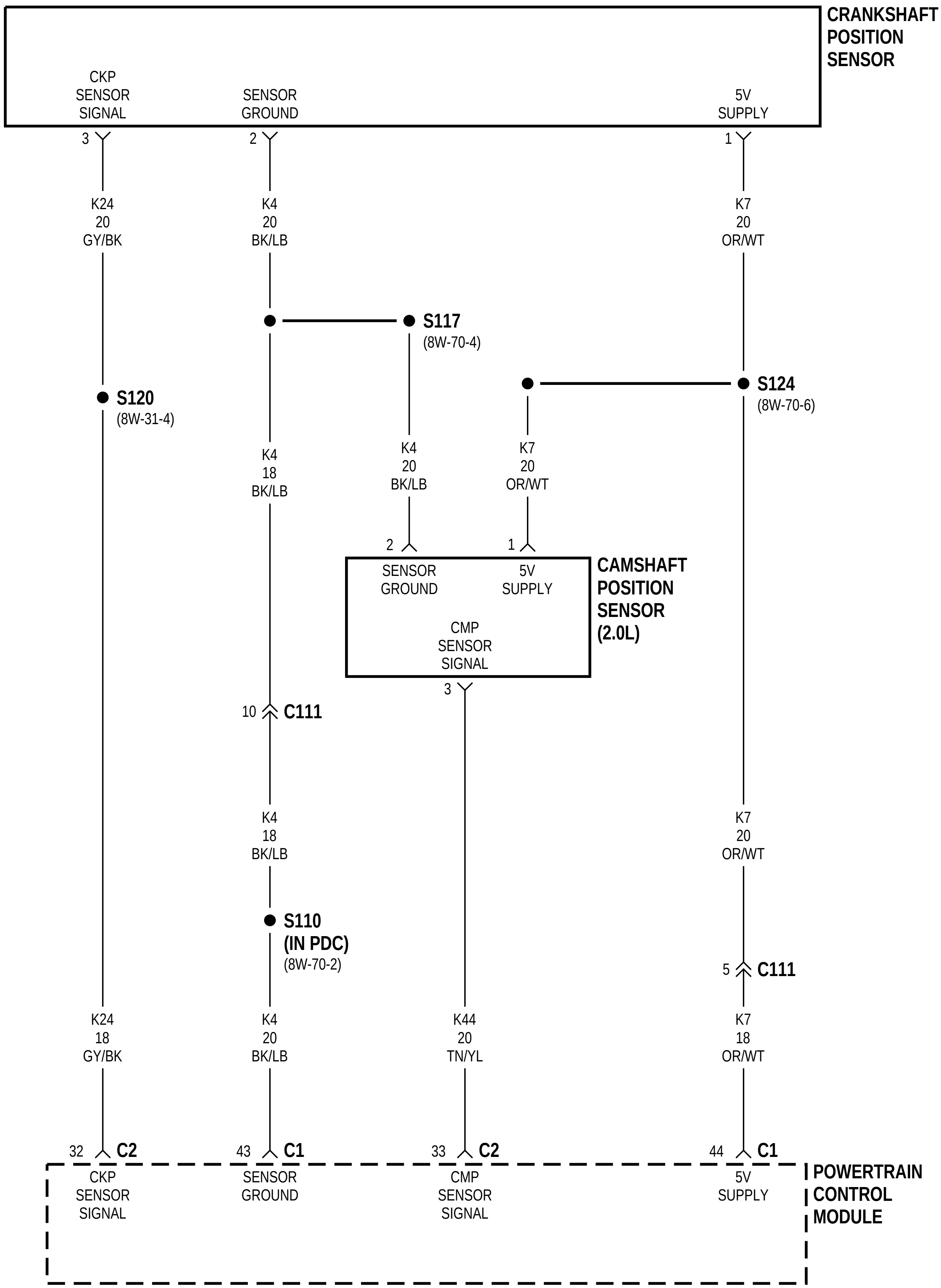
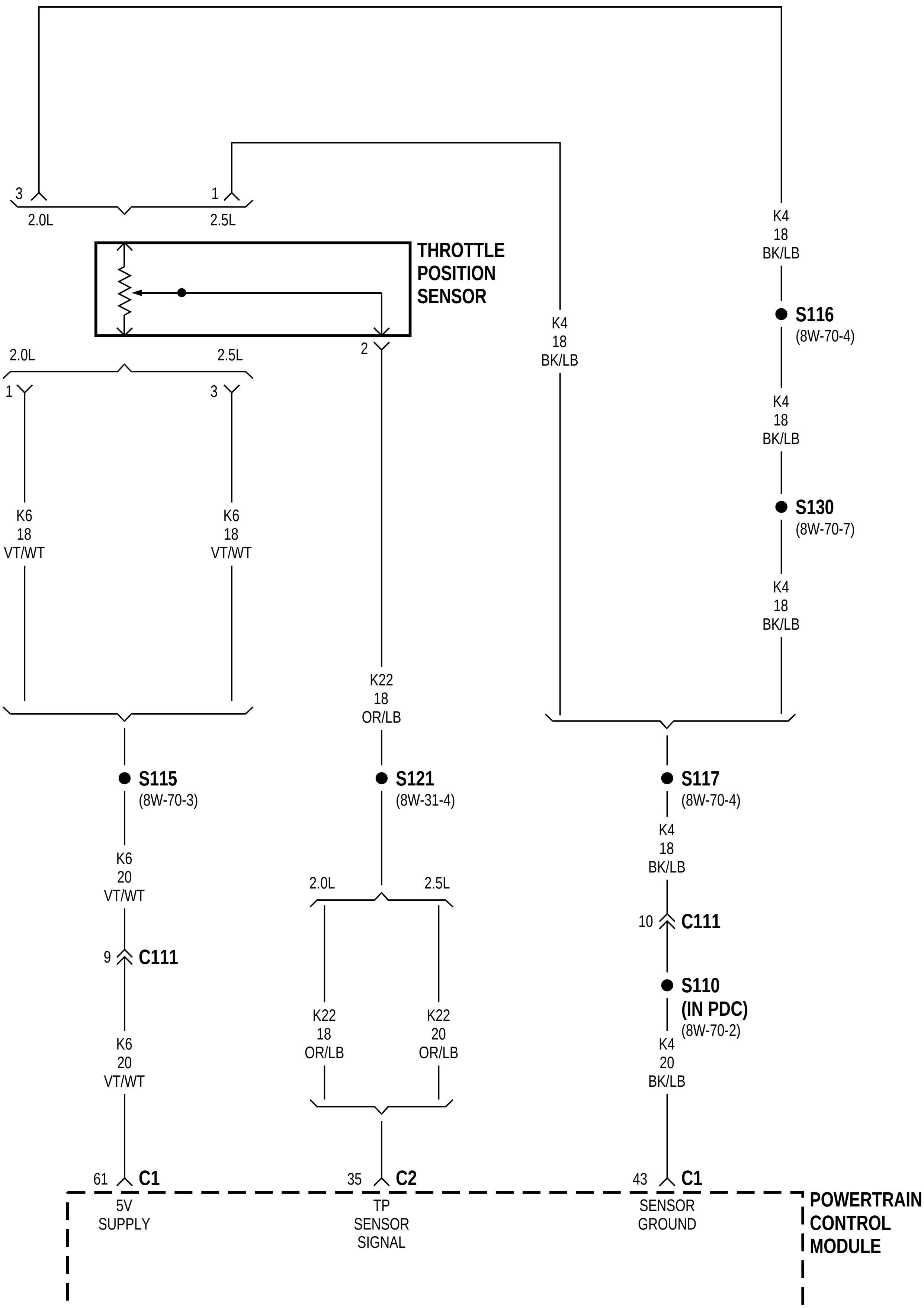
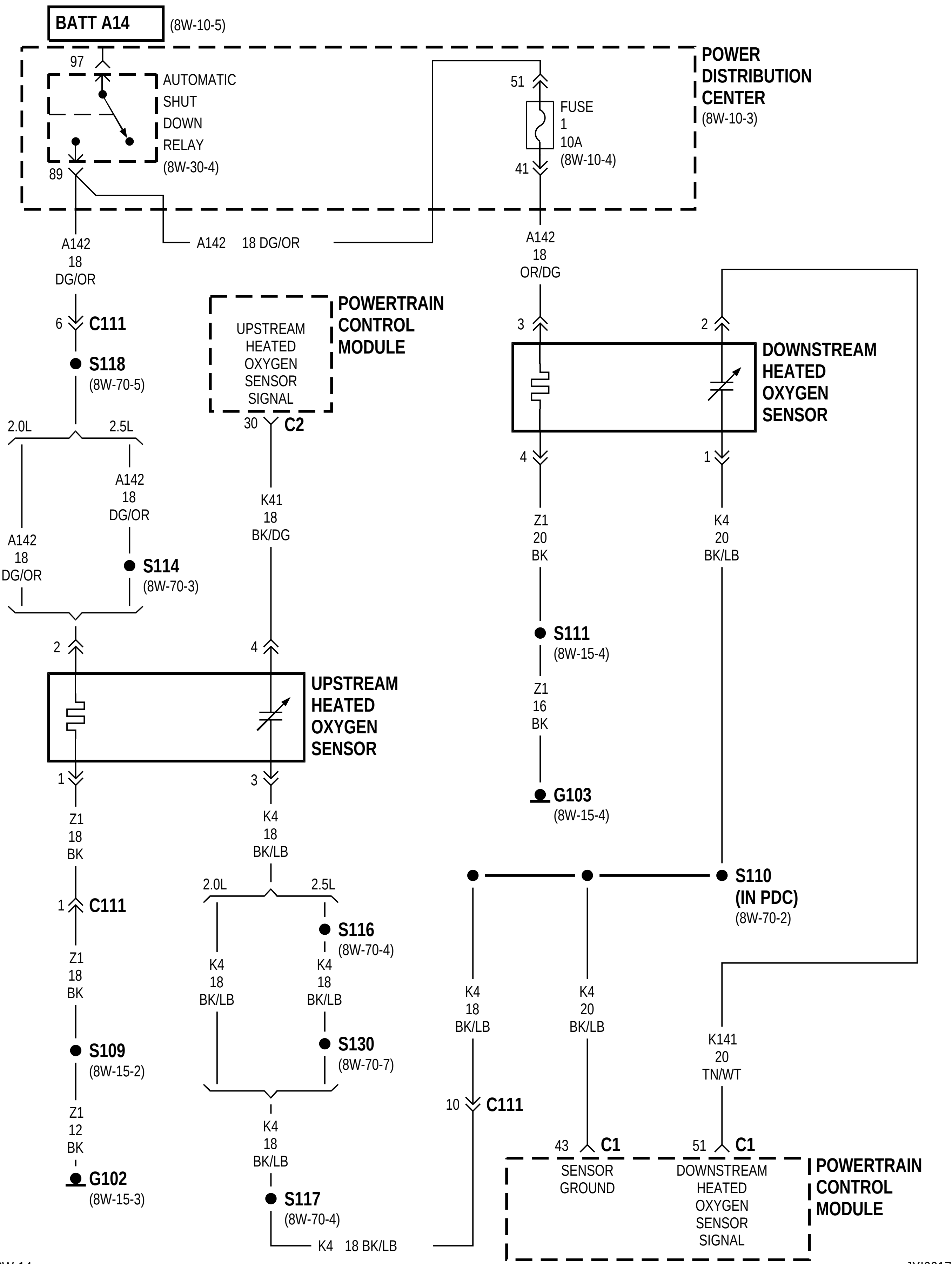
(8W-10-5)
97
AUTOMATIC
SHUT
DOWN
RELAY
(8W-30-4)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
89
A142
18
DG/OR
A142
18
DG/OR
TO
FUSE
1
(PDC)
(8W-10-4)
6
C111
A142
18
DG/OR
S118
(8W-70-5)
A142
18
DG/OR
S114
(8W-70-3)
A142
18
DG/OR
A142
18
DG/OR
A142
18
DG/OR
A142
18
DG/OR
2
FUEL
INJECTOR
NO. 1
2
FUEL
INJECTOR
NO. 2
2
FUEL
INJECTOR
NO. 3
2
FUEL
INJECTOR
NO. 4
1
1
1
1
K11
18
WT/DB
K12
18
TN
K13
18
YL/WT
K14
18
LB/BR
13
C2
17
C2
7
C2
16
C2
INJ.
NO. 1
DRIVER
INJ.
NO. 2
DRIVER
INJ.
NO. 3
DRIVER
INJ.
NO. 4
DRIVER
POWERTRAIN
CONTROL
MODULE


BATT A14
(8W-10-5)
97
AUTOMATIC
SHUT
DOWN
RELAY
(8W-30-4)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
89
A142 18 DG/OR
A142
18
DG/OR
TO
FUSE
1
(PDC)
(8W-10-4)
6 C111
S118
(8W-70-5)
S114
(8W-70-3)
1 C165
S123
(8W-70-5)
FUEL
INJECTOR
NO. 1
FUEL
INJECTOR
NO. 5
FUEL
INJECTOR
NO. 3
FUEL
INJECTOR
NO. 4
FUEL
INJECTOR
NO. 2
FUEL
INJECTOR
NO. 6
K11
18
WT/LB
K13
18
YL/WT
K38
18
GY
K14
18
LB/BR
K12
18
TN
K58
18
BR/DG
C165
13 C2
7 C2
15 C2
16 C2
17 C2
14 C2
INJ.
NO. 1
DRIVER
INJ.
NO. 3
DRIVER
INJ.
NO. 5
DRIVER
INJ.
NO. 4
DRIVER
INJ.
NO. 2
DRIVER
INJ.
NO. 6
DRIVER
POWERTRAIN
CONTROL
MODULE


CRANKSHAFT POSITION SENSOR
CKP SENSOR SIGNAL
SENSOR GROUND
5V SUPPLY
3
2
1
K24 20 GY/BK
K4 20 BK/LB
K7 20 OR/WT
S117
(8W-70-4)
S124
(8W-70-6)
S120
(8W-31-4)
K4 18 BK/LB
K4 20 BK/LB
K7 20 OR/WT
2
1
SENSOR GROUND
5V SUPPLY
CMP SENSOR SIGNAL
CAMSHAFT POSITION SENSOR (2.0L)
3
10
C111
K4 18 BK/LB
K7 20 OR/WT
S110
(IN PDC)
(8W-70-2)
5
C111
K24 18 GY/BK
K4 20 BK/LB
K44 20 TN/YL
K7 18 OR/WT
32 C2
43 C1
33 C2
44 C1
CKP SENSOR SIGNAL
SENSOR GROUND
CMP SENSOR SIGNAL
5V SUPPLY
POWERTRAIN CONTROL MODULE


3
1
2.0L
2.5L
THROTTLE
POSITION
SENSOR
2
2.0L
2.5L
1
3
K6
18
VT/WT
K6
18
VT/WT
K22
18
OR/LB
K4
18
BK/LB
K4
18
BK/LB
S116
(8W-70-4)
K4
18
BK/LB
S130
(8W-70-7)
K4
18
BK/LB
S115
(8W-70-3)
S121
(8W-31-4)
S117
(8W-70-4)
K6
20
VT/WT
9
C111
K4
18
BK/LB
10
C111
2.0L
2.5L
S110
(IN PDC)
(8W-70-2)
K6
20
VT/WT
K22
18
OR/LB
K22
20
OR/LB
K4
20
BK/LB
61
C1
35
C2
43
C1
5V
SUPPLY
TP
SENSOR
SIGNAL
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE



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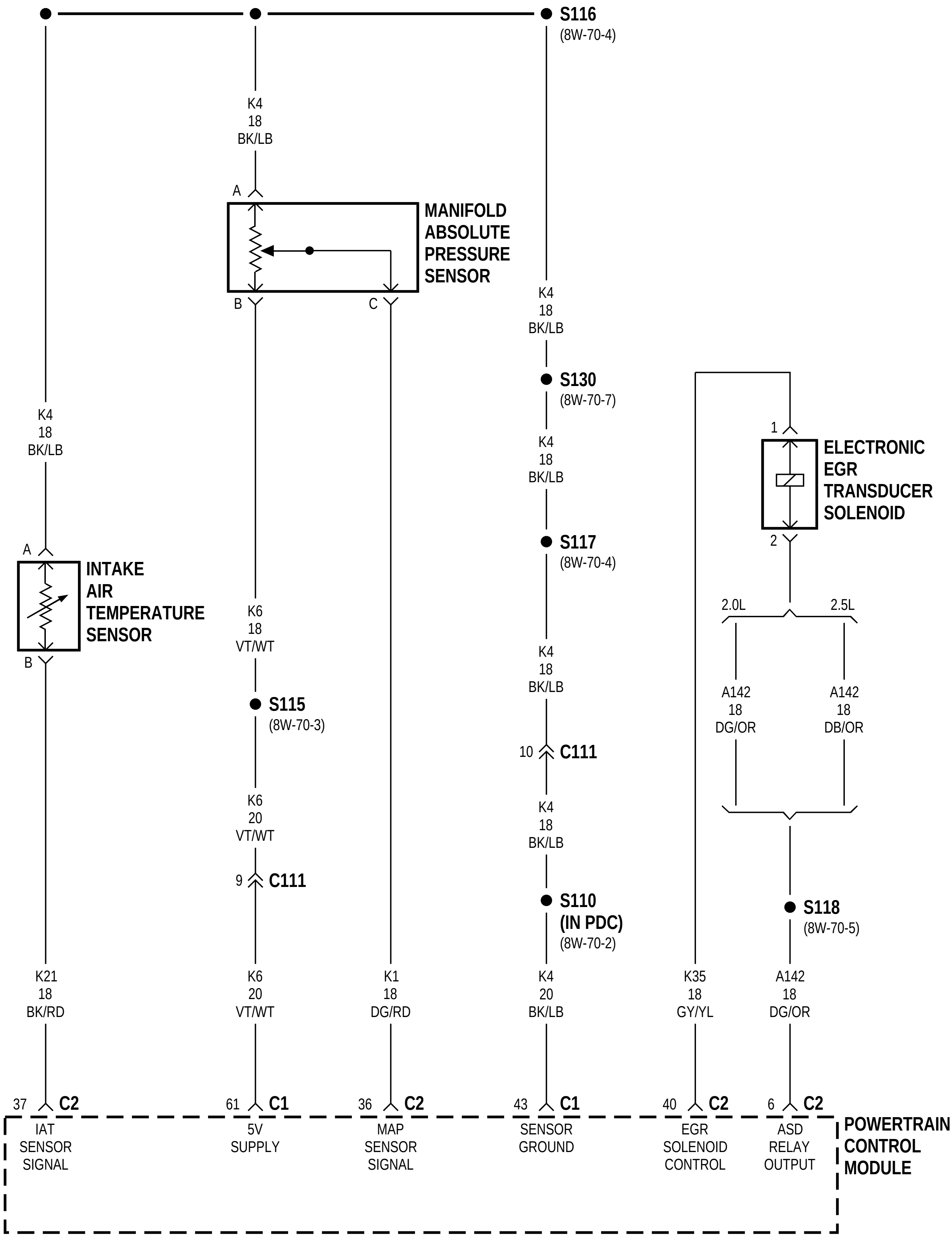
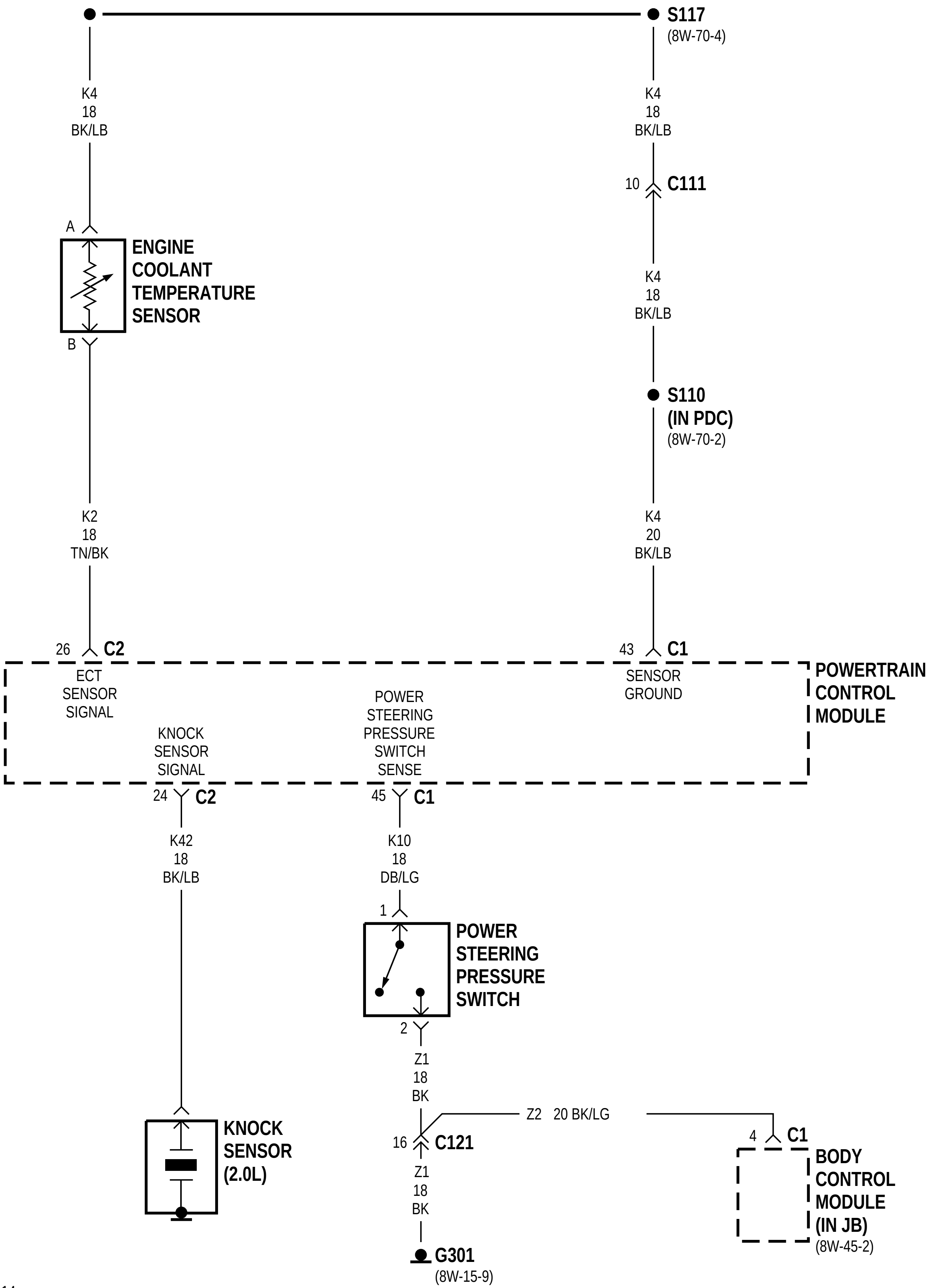
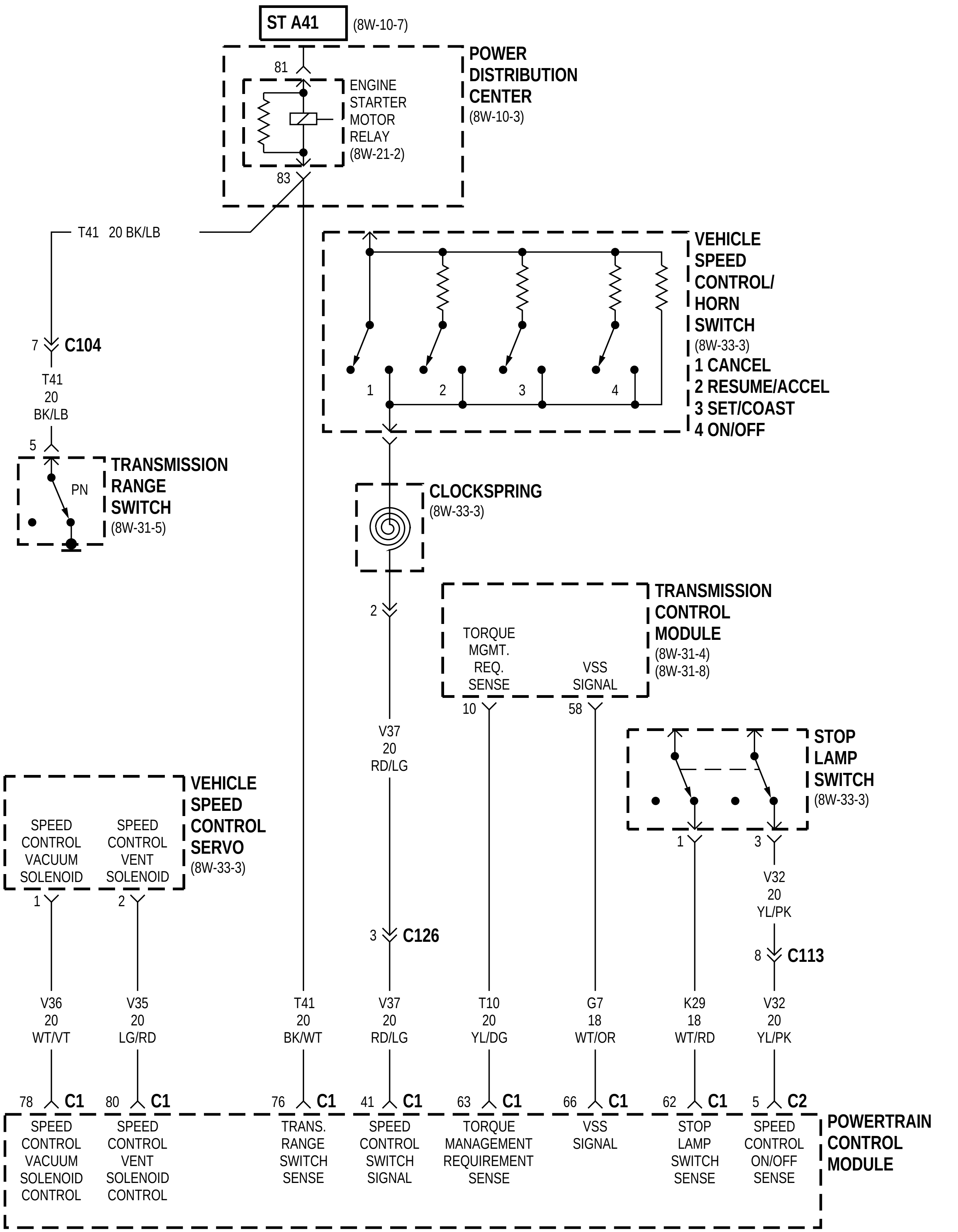
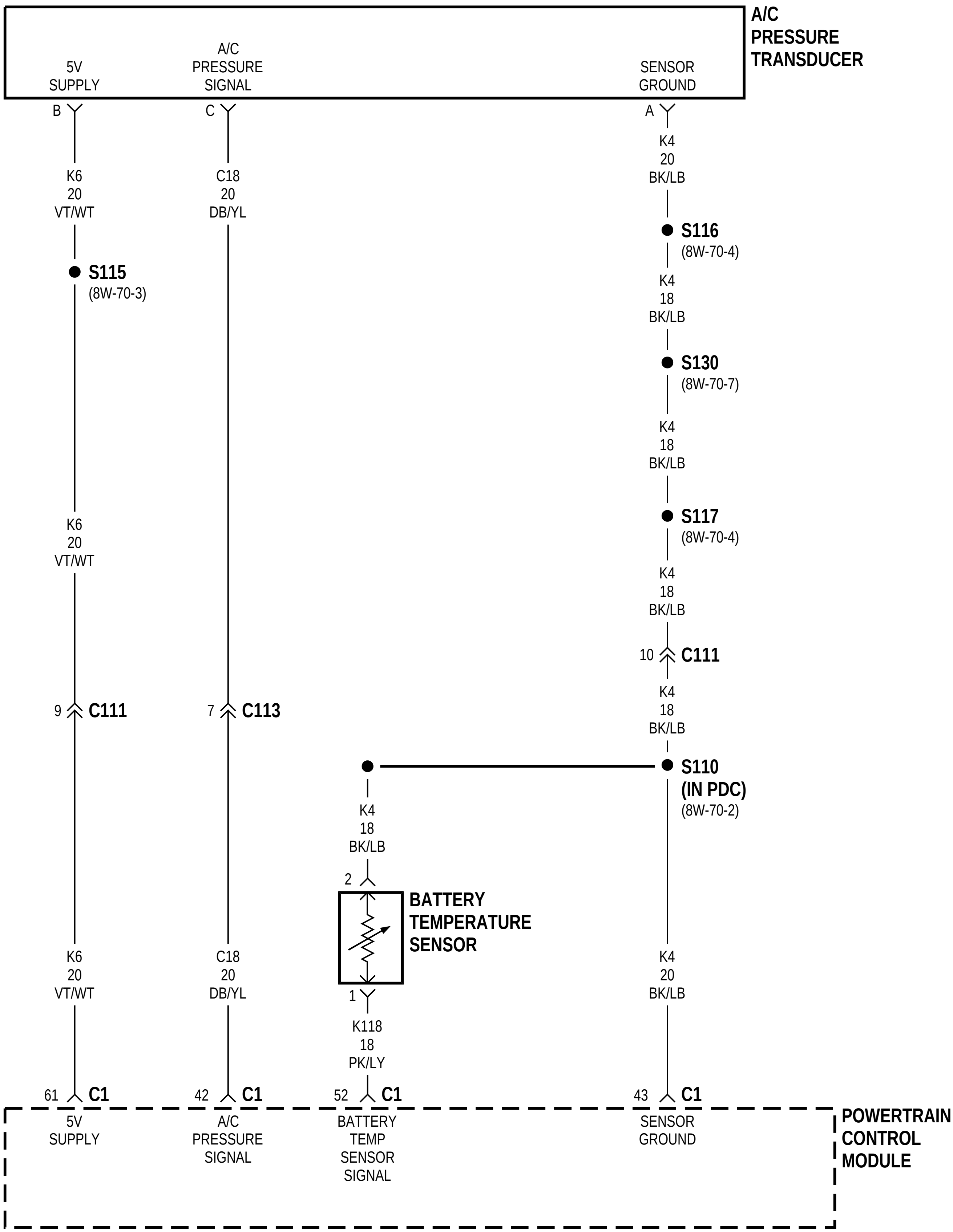
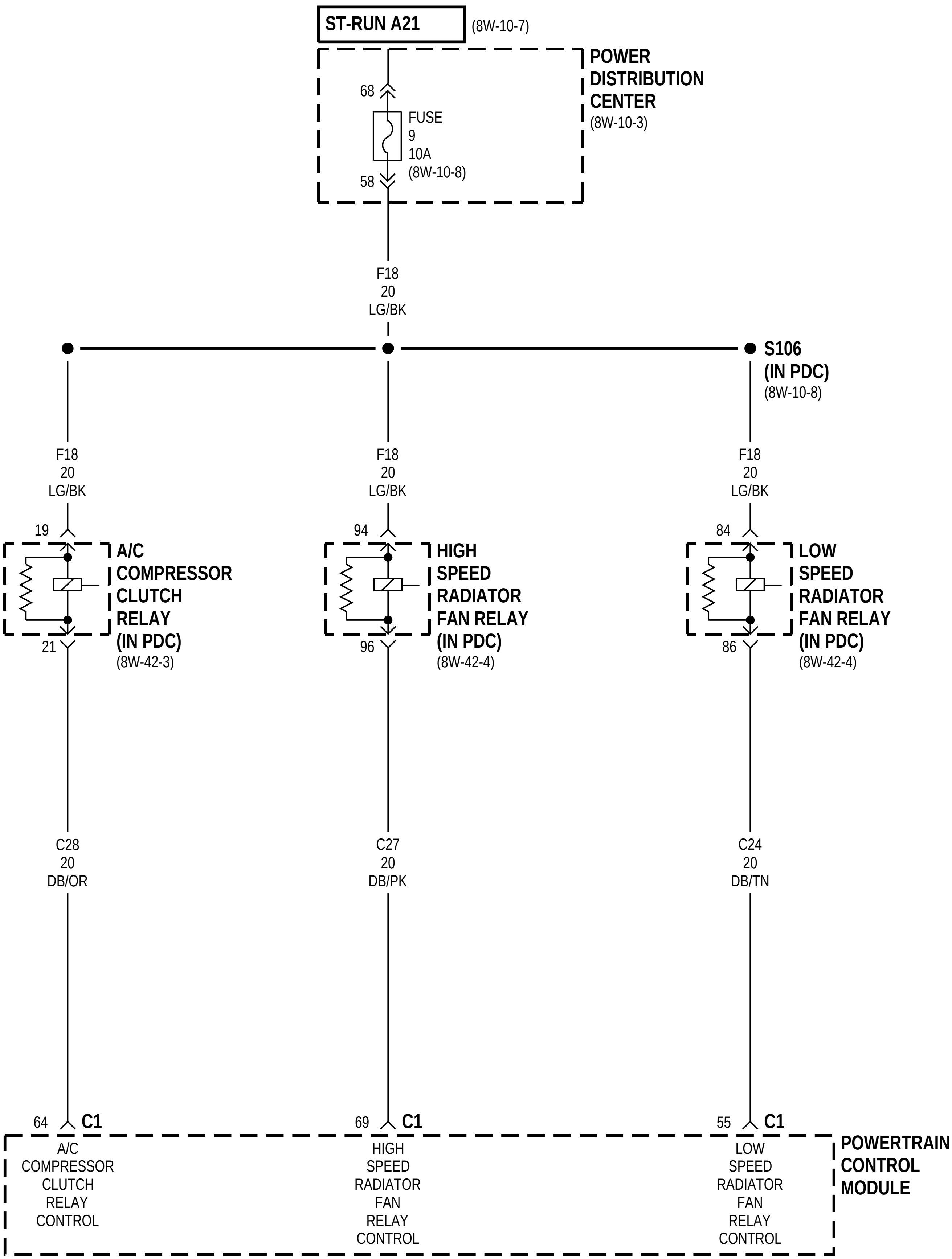

S116
(8W-70-4)
K4
18
BK/LB
A
MANIFOLD
ABSOLUTE
PRESSURE
SENSOR
B
C
K4
18
BK/LB
S130
(8W-70-7)
K4
18
BK/LB
S117
(8W-70-4)
1
ELECTRONIC
EGR
TRANSDUCER
SOLENOID
2
2.0L
2.5L
K4
18
BK/LB
A
INTAKE
AIR
TEMPERATURE
SENSOR
B
K6
18
VT/WT
S115
(8W-70-3)
K4
18
BK/LB
10
C111
A142
18
DG/OR
A142
18
DB/OR
K6
20
VT/WT
9
C111
K4
18
BK/LB
S110
(IN PDC)
(8W-70-2)
S118
(8W-70-5)
K21
18
BK/RD
K6
20
VT/WT
K1
18
DG/RD
K4
20
BK/LB
K35
18
GY/YL
A142
18
DG/OR
37
C2
61
C1
36
C2
43
C1
40
C2
6
C2
IAT
SENSOR
SIGNAL
5V
SUPPLY
MAP
SENSOR
SIGNAL
SENSOR
GROUND
EGR
SOLENOID
CONTROL
ASD
RELAY
OUTPUT
POWERTRAIN
CONTROL
MODULE

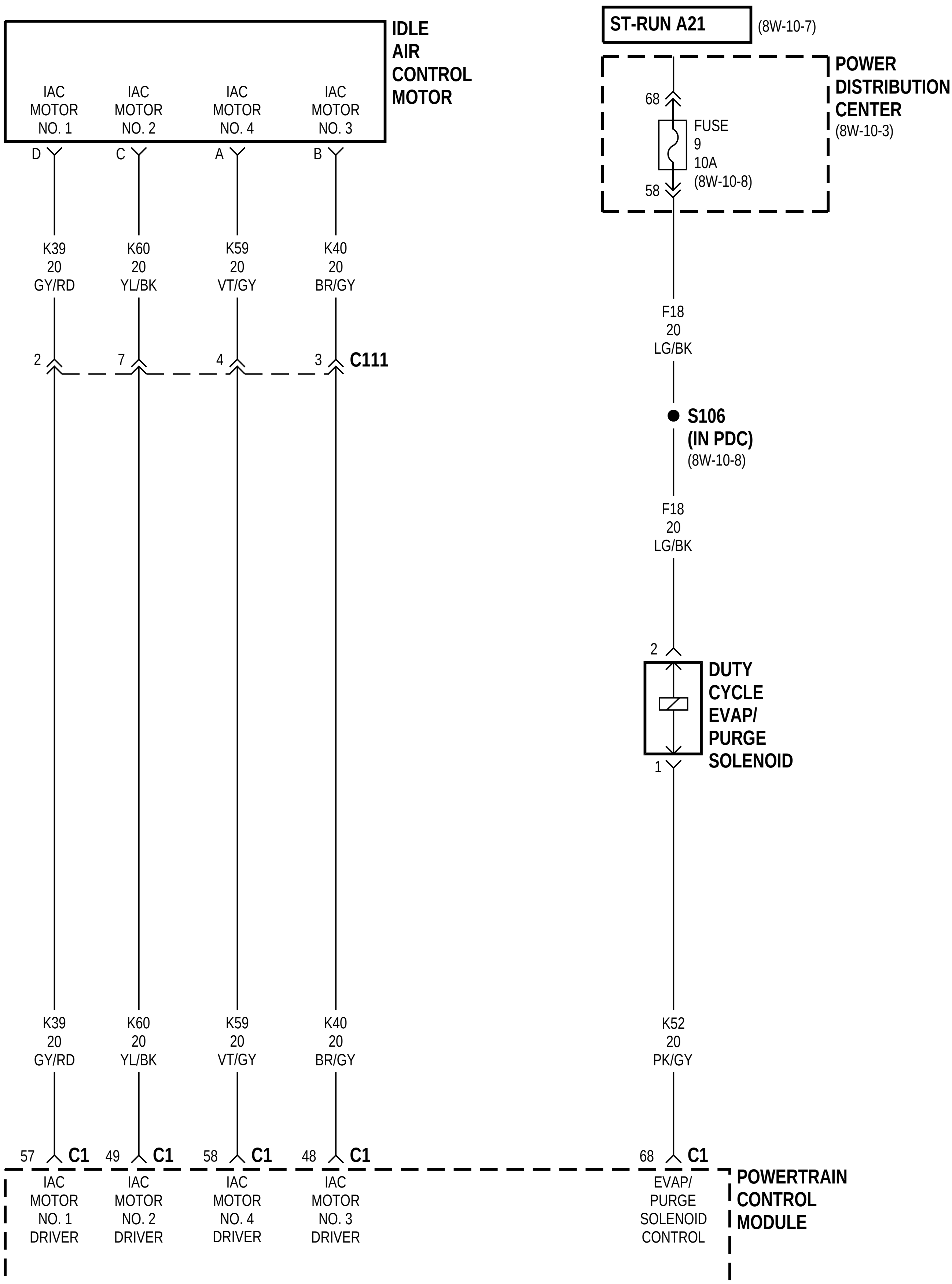

S117
(8W-70-4)
K4
18
BK/LB
K4
18
BK/LB
10
C111
A
ENGINE
COOLANT
TEMPERATURE
SENSOR
B
K4
18
BK/LB
S110
(IN PDC)
(8W-70-2)
K2
18
TN/BK
K4
20
BK/LB
26
C2
43
C1
ECT
SENSOR
SIGNAL
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE
KNOCK
SENSOR
SIGNAL
POWER
STEERING
PRESSURE
SWITCH
SENSE
24
C2
45
C1
K42
18
BK/LB
K10
18
DB/LG
1
POWER
STEERING
PRESSURE
SWITCH
2
Z1
18
BK
Z2 20 BK/LG
4
C1
KNOCK
SENSOR
(2.0L)
16
C121
Z1
18
BK
BODY
CONTROL
MODULE
(IN JB)
(8W-45-2)
G301
(8W-15-9)



JXI00182 978W-14


A/C
PRESSURE
TRANSDUCER
5V
SUPPLY
A/C
PRESSURE
SIGNAL
SENSOR
GROUND
B
C
A
K6
20
VT/WT
C18
20
DB/YL
K4
20
BK/LB
S116
(8W-70-4)
S115
(8W-70-3)
K4
18
BK/LB
S130
(8W-70-7)
K4
18
BK/LB
K6
20
VT/WT
S117
(8W-70-4)
K4
18
BK/LB
10
C111
9
C111
7
C113
K4
18
BK/LB
S110
(IN PDC)
(8W-70-2)
K4
18
BK/LB
2
BATTERY
TEMPERATURE
SENSOR
K6
20
VT/WT
C18
20
DB/YL
1
K4
20
BK/LB
K118
18
PK/LY
61
C1
42
C1
52
C1
43
C1
5V
SUPPLY
A/C
PRESSURE
SIGNAL
BATTERY
TEMP
SENSOR
SIGNAL
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE


ST-RUN A21
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
68
FUSE
9
10A
(8W-10-8)
58
F18
20
LG/BK
S106
(IN PDC)
(8W-10-8)
F18
20
LG/BK
F18
20
LG/BK
F18
20
LG/BK
19
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
(8W-42-3)
21
94
HIGH
SPEED
RADIATOR
FAN RELAY
(IN PDC)
(8W-42-4)
96
84
LOW
SPEED
RADIATOR
FAN RELAY
(IN PDC)
(8W-42-4)
86
C28
20
DB/OR
C27
20
DB/PK
C24
20
DB/TN
64 C1
69 C1
55 C1
A/C
COMPRESSOR
CLUTCH
RELAY
CONTROL
HIGH
SPEED
RADIATOR
FAN
RELAY
CONTROL
LOW
SPEED
RADIATOR
FAN
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE


IDLE AIR CONTROL MOTOR
IAC MOTOR NO. 1
IAC MOTOR NO. 2
IAC MOTOR NO. 4
IAC MOTOR NO. 3
D
C
A
B
K39 20 GY/RD
K60 20 YL/BK
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DUTY CYCLE EVAP/ PURGE SOLENOID
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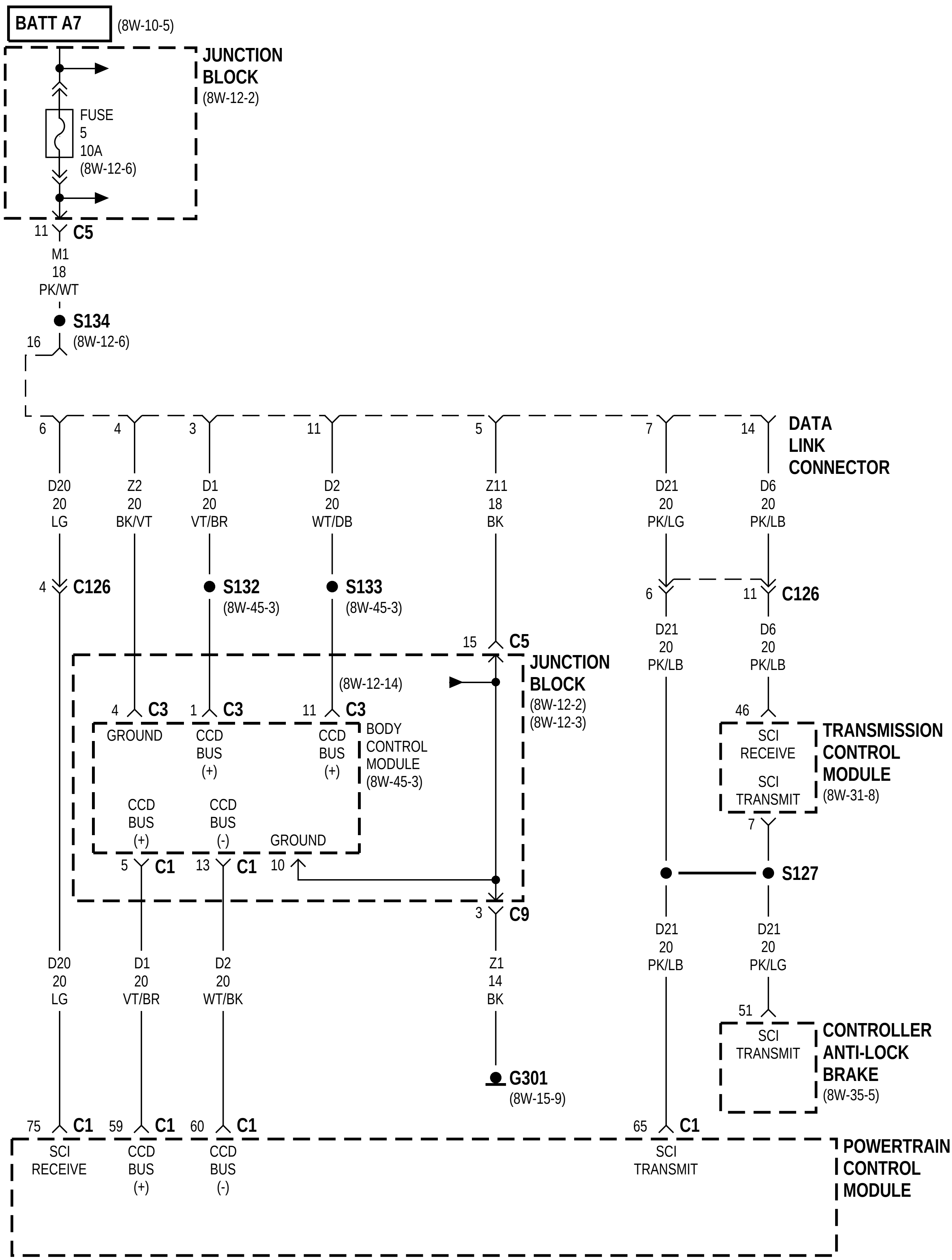
K39 20 GY/RD
K60 20 YL/BK
K59 20 VT/GY
K40 20 BR/GY
K52 20 PK/GY
57 C1
49 C1
58 C1
48 C1
68 C1
IAC MOTOR NO. 1 DRIVER
IAC MOTOR NO. 2 DRIVER
IAC MOTOR NO. 4 DRIVER
IAC MOTOR NO. 3 DRIVER
EVAP/ PURGE SOLENOID CONTROL
POWERTRAIN CONTROL MODULE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(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
11 C5
M1
18
PK/WT
S134
16 (8W-12-6)
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Z2 20 BK/VT
D1 20 VT/BR
D2 20 WT/DB
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D21 20 PK/LG
D6 20 PK/LB
4 C126
S132 (8W-45-3)
S133 (8W-45-3)
6 11 C126
D21 20 PK/LB
D6 20 PK/LB
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CCD BUS (+)
BODY CONTROL MODULE
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CCD BUS (+)
CCD BUS (-)
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SCI TRANSMIT
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SCI TRANSMIT
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8W-30 FUEL/IGNITION SYSTEM

INDEX

DESCRIPTION AND OPERATION

IGNITION SWITCH

When the ignition switch is in the START/RUN position, it connects circuit A1 from the Power Distribution Center (PDC) to circuit A21 through the ignition switch. A 20 amp fuse in cavity 8 of the PDC protects circuits A1 and A21. Circuit A1 is spliced and provides power to the fuel pump relay, Powertrain Control Module (PCM), and the engine starter motor relay.

The A21 circuit connects from the ignition switch to the junction block on circuit F12. The F12 circuit is protected by a 10 amp fuse located in cavity 10. Circuit F12 is spliced and connects to the Powertrain Control Module (PCM), fuel pump relay, and the ABS Control Module, and distributor (2.5L only).

BATTERY FEED

Circuit A14 is used to provide a constant battery feed to the Powertrain Control Module (PCM). This circuit originates in the Power Distribution Center (PDC) and is protected by a 20 amp fuse located in cavity 5. It is also spliced and provides power for the Automatic Shut- Down (ASD) relay, coil and contact sides.

POWER (DEVICE) GROUND

Circuit Z12 connects to cavities 10 and 50 of the Powertrain Control Module (PCM) connector. The Z12 circuits provides ground for the PCM internal drivers that operate high current devices like fuel injectors and ignition coils.

Internal to the PCM, the power (device) ground circuit connects to the PCM sensor return circuit from circuit K4.

HELPFUL INFORMATION

Circuit Z12 which supplies a ground for the PCM high current drivers, terminates at the left strut tower.

If the system loses ground for the Z12 circuit the vehicle will not operate.

UNIVERSAL DATA LINK CONNECTOR

Circuit M1 supplies battery voltage to the universal data link connector. This circuit is protected by a 10 amp fuse located in cavity 5 of the junction block. Circuit M1 is the Ignition-Off Draw circuit and supplies power to the Body Control Module (BCM), radio memory, interior lamps, and other components.

A twisted pair of wires, circuits D1 and D2, connect to the data link connector. These wires are connected to the CCD Bus. The CCD Bus is used for diagnosing vehicle components and modules.

Circuits D20 and D21 from the Powertrain Control Module (PCM) connect to the data link connector. Circuit D20 connects to cavity 75 of the PCM and is the SCI receive circuit. Circuit D21 connects to cavity 65 of the PCM and is the SCI transmit. The D21 circuit is also spliced and connects to the Transmission Control Module (TCM), and the Controller Anti Lock Brakes (CAB), if equipped.

The D6 circuit is also connected to the universal data link connector. This cirucit is used as a SCI line from the TCM.

DESCRIPTION AND OPERATION (Continued)

The universal data link connector is also interfaced with the CCD Bus. Circuit D1 is used for CCD (+) and D2 is used for CCD (-).

There are also two grounds used for the universal data link connector. One is a power ground and one is a regular ground.

AUTOMATIC SHUT-DOWN RELAY

The Automatic Shut-Down (ASD) relay is located in the Power Distribution Center (PDC). Power for the coil and contact side of the relay is provided by circuit A14. This circuit is HOT at all times and protected by a 20 amp fuse located in cavity 5 of the PDC.

The Powertrain Control Module (PCM) controls the ground path for the relay on circuit K51. This circuit connects to cavity 67 of the PCM connector.

When the relay is energized, the contacts internal to the relay CLOSE connecting circuits A14 and A142. The A142 circuit is spliced and provides power to the fuel injectors, generator, electronic EGR transducer solenoid, and the ignition coil.

The A142 circuit is also spliced and connects to the PCM connector, cavity 6. This input is used for ASD sense by the PCM.

HELPFUL INFORMATION

• Refer to group 14, for system operation.

Check the 20 amp fuse located in cavity 5 of the PDC.

FUEL PUMP MOTOR

The fuel pump motor, located in the fuel tank, is controlled by the fuel pump relay located in the Power Distribution Center (PDC). Power for the coil side of the relay is provided by circuit F12. The F12 circuit is HOT in the START and RUN position only and protected by a 10 amp fuse located in cavity 10 of the PDC.

Circuit A21 is used to power the fuse and is connected between the ignition switch and the PDC. Power for the A21 circuit is provided by circuit A1. This circuit originates in the PDC and is protected by a 20 amp fuse located in cavity 8.

The F12 circuit is spliced and provides voltage to the Powertrain Control Module (PCM) and the Controller Anti-Lock Brake (CAB) module.

The ground for the coil side of the relay is controlled by the PCM through circuit K31. The K31 circuit connects to cavity 74 of the PCM. Logic internal to the PCM determines when the coil side of the relay should be grounded.

When the PCM grounds circuit K31, the contacts in the fuel pump relay CLOSE connecting circuits A1 and A141. Circuit A1 is connected to the BUS bar in the PDC, HOT at all times, and protected by a 20 amp fuse located in cavity 8. Circuit A141 is connected from the relay to the fuel pump motor. Ground for the fuel pump motor is provided on circuit Z1.

HELPFUL INFORMATION

• Check the 20 amp fuse located in cavity 8 of the PDC

• Check the 10 amp fuse located in cavity 10 of the PDC

• Check the ground

• Refer to group 14 of the Service Manual or the appropriate Diagnostic Test Procedures Manual for additional information.

VEHICLE SPEED INPUT

Circuit G7 provides an input to the Powertrain Control Module (PCM) on circuit G7 from the Transmission Control Module (TCM). This circuit connects to cavity 66 of the PCM connector, and cavity 58 of the TCM connector.

If the vehicle is equipped with speed proportional steering, the G7 circuit is spliced and provides an input to the module.

HEATED OXYGEN SENSORS

Circuit A14 is connected to the BUS bar in the Power Distribution Center (PDC), which connects to battery voltage. The contact side of the Automatic Shut-Down (ASD) relay connects circuit A14 and circuit A142. A 20 amp fuse, located in cavity 5 of the PDC, protects circuits A14 and A142.

Circuit A14 also supplies voltage to the coil side of the ASD relay. The Powertrain Control Module (PCM) controls the ground path circuit for the coil side of the ASD relay on circuit K51. Circuit K51 connects to cavity 67 of the PCM.

The A142 circuit also splices to cavity 6 of the PCM connector. The input by circuit A142 tells the PCM that the ASD relay is energized.

The A142 circuit supplies voltage for the upstream heated oxygen sensor and circuit F142 supplies voltage to the downstream heated oxygen sensor. The F142 circuit is protected by a 10 amp fuse located in cavity 1 of the PDC. Power for the fuse is supplied by circuit A142.

Circuit K41 delivers the signal from the upstream heated oxygen sensor to the PCM. Circuit K41 connects to cavity 30 of the PCM connector.

Circuit K141 delivers the signal from the downstream heated oxygen sensor to the PCM. Circuit K141 connects to cavity 51 of the PCM connector.

The PCM provides a ground for the upstream (left) and downstream (right) heated oxygen sensor signals (circuits K41 and K141) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

DESCRIPTION AND OPERATION (Continued)

Circuit Z1 provides the ground path for the heater circuits in the sensors. This ground terminates at the right frame rail.

HELPFUL INFORMATION

Circuit A142 splices to supply voltage to the fuel injectors, ignition coil (2.4L only), distributor (2.5L only), ASD relay, generator, and the EGR solenoid. The PCM controls the ground path for each of the components powered by circuit A142.

Circuit K4 splices to supply ground for the signals for the following:

- Intake air temperature sensor
- Engine coolant temperature sensor
- Manifold absolute pressure sensor
- Throttle position sensor
- A/C pressure switch
- Camshaft position sensor
- Crankshaft position sensor
- Vehicle speed sensor

CRANKSHAFT POSITION SENSOR

All engine packages in this vehicle use a crankshaft position sensor.

Circuit K7 supplies 8 volts from the Powertrain Control Module (PCM) to the crankshaft position sensor. The K7 circuit connects to cavity 44 of the PCM.

Circuit K24 from the sensor provides an input signal to the PCM. The K24 circuit connects to cavity 32 of the PCM. On automatic transmission vehicles this circuit is splices and provides an input to the Transmission Control Module (TCM).

The PCM provides a ground for the crankshaft position sensor signal (circuit K24) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

On the 2.4L engine the K7 circuit is spliced and provides 8 volts for the camshaft position sensor. On the 2.5L engine the K7 circuit supplies 8 volts to the distributor.

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Engine coolant temperature sensor
- Manifold absolute pressure sensor
- Throttle position sensor
- A/C pressure switch
- Camshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

CAMSHAFT POSITION SENSOR (2.4L)

Circuit K7 supplies 8 volts from the Powertrain Control Module (PCM) to the camshaft position sensor. The K7 circuit connects to cavity 44 of the PCM connector.

Circuit K44 from the sensor provides an input signal to the PCM. The K44 circuit connects to cavity 33 of the PCM.

The PCM provides a ground for the camshaft position sensor signal (circuit K44) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

On the 2.4L engine the K7 circuit is spliced and provides 8 volts for the crankshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Engine coolant temperature sensor
- Manifold absolute pressure sensor
- Throttle position sensor
- A/C pressure switch
- Crankshaft position sensor
- Heated oxygen sensors

CAMSHAFT POSITION SENSOR (2.5L)

This engine uses a camshaft position sensor internal to the distributor. Refer to distributor operation in this section for operation of the sensor.

ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K2. This sensor input is also used for the instrument cluster coolant temperature gauge. Refer to Section 8W-40 for engine coolant temperature gauge description.

From circuit K2, the engine coolant temperature sensor draws up to 5 volts from the PCM. The sensor is a variable resistor. As coolant temperature changes the resistance in the sensor changes, causing a change in current draw. The K2 circuit connects to cavity 26 of the PCM connector. The PCM provides a ground for the engine coolant temperature sensor signal (circuit K2) through circuit K4. Circuit K4 connects to cavity 43 of the PCM.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Camshaft position sensor
- Manifold absolute pressure sensor
- Throttle position sensor
- A/C pressure switch
- Crankshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

DESCRIPTION AND OPERATION (Continued)

THROTTLE POSITION SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the Throttle Position Sensor (TPS). Circuit K6 connects to cavity 61 of the PCM connector.

Circuit K22 delivers the TPS signal to the PCM. Circuit K22 connects to cavity 35 of the PCM connector.

The PCM provides a ground path for the TPS signal (circuit K22) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

Refer to group 14 for throttle position sensor operation.

Circuit K6 is spliced and provides 5 volts to the A/C pressure switch and the map sensor.

On automatic transmission vehicles, circuit K22 is spliced and provides an input to the Transmission Control Module (TCM).

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Camshaft position sensor
- Manifold absolute pressure sensor
- Ambient temperature sensor
- A/C pressure switch
- Crankshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

MANIFOLD ABSOLUTE PRESSURE SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the Manifold Absolute Pressure (MAP) sensor. Circuit K6 connects to cavity 61 of the PCM connector.

Circuit K1 delivers the MAP signal to the PCM. Circuit K1 connects to cavity 36 of the PCM connector.

The PCM provides a ground path for the MAP signal (circuit K1) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

Refer to group 14 for MAP sensor operation.

Circuit K6 is spliced and provides 5 volts to the A/C pressure switch and the throttle position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Camshaft position sensor
- Throttle position sensor
- Ambient temperature sensor
- A/C pressure switch
- Crankshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

INTAKE AIR TEMPERATURE SENSOR

On the 2.0L engine the intake air temperature sensor is combination unit with the map sensor.

The intake air temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K21. The K21 circuit connects to cavity 37 of the PCM connector.

From circuit K21, the intake air temperature sensor draws voltage from the PCM. The sensor is a variable resistor. As intake air temperature changes, the resistance in the sensor changes, causing a change in current draw.

The PCM provides a ground path for the intake air temperature sensor signal (circuit K21) through circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

Refer to group 14 for intake air temperature sensor operation.

Circuit K4 splices to supply ground for the signals from the following:

- Manifold absolute pressure sensor
- Camshaft position sensor
- Throttle position sensor
- Ambient temperature sensor
- A/C pressure switch
- Crankshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

KNOCK SENSOR (2.4L only)

The knock sensor provides an input to the Powertrain Control Module (PCM) on circuit K42. Circuit K42 connects to cavity 24 of the PCM connector.

The knock sensor is case grounded to the engine block.

HELPFUL INFORMATION

Refer to group 14, for knock sensor operation.

AMBIENT (BATTERY) TEMPERATURE SENSOR

The ambient temperature sensor draws voltage from the Powertrain Control Module (PCM) on circuit K118. The sensor is a variable resistor. As temperature changes, the resistance draw in the sensor changes causing a change in current draw. Circuit K118 connects to cavity 52 of the PCM connector.

The PCM provides a ground for the ambient temperature sensor on circuit K4. Circuit K4 connects to cavity 43 of the PCM connector.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Intake air temperature sensor
- Camshaft position sensor

DESCRIPTION AND OPERATION (Continued)

- Manifold absolute pressure sensor
- Throttle position sensor
- A/C pressure switch
- Crankshaft position sensor
- Vehicle speed sensor
- Heated oxygen sensors

FUEL INJECTORS

Circuit A14 is connected to the BUS bar in the Power Distribution Center (PDC), and connects to battery voltage. The contact side of the Automatic Shut-Down (ASD) relay connects circuit A14 and A142. A 20 amp fuse, in cavity 5 of the PDC, protects circuits A14 and A142.

Circuit A14 also supplies voltage to the coil side of the ASD relay. The Powertrain Control Module (PCM) controls the ground path circuit for the coil side of the ASD relay on circuit K51. Circuit K51 connects to cavity 67 of the PCM.

Circuit A142 supplies voltage for the fuel injectors. The PCM controls the ground circuit of each injector, as follows:

- Circuit K11 is the ground circuit for Injector #1. Circuit K11 connects to cavity 13 of the PCM.
- Circuit K12 is the ground circuit for Injector #2. Circuit K12 connects to cavity 17 of the PCM.
- Circuit K13 is the ground circuit for Injector #3. Circuit K13 connects to cavity 7 of the PCM.
- Circuit K14 is the ground circuit for Injector #4. Circuit K14 connects to cavity 16 of the PCM.

On the 2.5L engine there are two additional injectors used. The PCM controls the ground path for these injectors as follows:

- Circuit K38 is the ground circuit for Injector #5. Circuit K38 connects to cavity 15 of the PCM.
- Circuit K58 is the ground circuit for Injector #6. Circuit K58 connects to cavity 14 of the PCM.

HELPFUL INFORMATION

Circuit A142 splices to supply voltage to the fuel injectors, ignition coil, ASD relay, generator, and the upstream and downstream (2.5L only) heated oxygen sensors. The PCM controls the ground circuit for each of the components powered by circuit A142.

The injectors operate in sequence. Refer to group 14 for system operation.

IGNITION COIL PACK (2.4L)

Circuit A14 is connected to the BUS bar in the Power Distribution Center (PDC), and connects to battery voltage. The contact side of the Automatic Shut-Down (ASD) relay connects circuit A14 and A142. A 20-amp fuse, in cavity 5 of the PDC, protects circuits A14 and A142.

Circuit A14 also supplies voltage to the coil side of the ASD relay. The Powertrain Control Module (PCM) controls the ground path circuit for the coil side of the ASD relay on circuit K51. Circuit K51 connects to cavity 67 of the PCM.

Circuit A142 supplies voltage for the ignition coil pack. The coil pack consists of two individual coils molded together. The PCM controls the ground circuit of each coil.

- Circuit K17 is the ground circuit for the ignition coil that fires spark plugs #1 and #4. Circuit K17 connects to cavity 3 of the PCM.
- Circuit K19 is the ground circuit for the ignition coil that fires spark plugs #2 and #3. Circuit K19 connects to cavity 2 of the PCM.

HELPFUL INFORMATION

Circuit A142 splices to supply voltage to the fuel injectors, ASD relay, generator, and the upstream and downstream heated oxygen sensors. The PCM controls the ground circuit for each of the components powered by circuit A142.

DISTRIBUTOR (2.5L)

The 2.5L V-6 engine uses a distributor. The distributor is used for firing the spark plugs and for providing camshaft position input to the Powertrain Control Module (PCM). Circuit K44 is used to indicate to the PCM camshaft position and connects to cavity 33 of the PCM. Circuit K4 is used for the sensor return to the PCM and connects to cavity 43.

The K19 circuit is an output from the PCM to the distributor and is used for the coil driver. Grounding for the distributor is provided on the Z1 circuit and terminates at the left strut tower.

Battery voltage for the distributor is provided from two sources, circuits A142 and K7. The K7 circuit is the 8 volt output from the PCM. Circuit A142 is HOT when the contacts in the Automatic Shut Down (ASD) relay are CLOSED.

HELPFUL INFORMATION

- Refer to group 14 for system operation.

IDLE AIR CONTROL MOTOR

The Powertrain Control Module (PCM) operates the idle air control motor through 4 circuits - K39, K40, K59, and K60. Each circuit connects to separate cavities in the PCM connector.

- Circuit K39 connects to cavity 57 of the PCM connector
- Circuit K40 connects to cavity 48 of the PCM connector
- Circuit K59 connects to cavity 58 of the PCM connector
- Circuit K60 connects to cavity 49 of the PCM connector

DESCRIPTION AND OPERATION (Continued)

HELPFUL INFORMATION

• Refer to group 14 of the Service Manual or the appropriate Diagnostic Test Procedures Manual for additional information.

POWER STEERING PRESSURE SWITCH

The power steering pressure switch opens and closes circuit K10 between the Powertrain Control Module (PCM) and ground. Circuit K10 connects to cavity 45 of the PCM connector.

Circuit Z1 provides a ground for the power steering pressure switch. The ground is terminated at the Body Control Module (BCM).

DUTY CYCLE EVAP/PURGE SOLENOID

Circuit F18 supplies battery voltage to the duty cycle EVAP/Purge solenoid. This circuit is HOT in the START and RUN position only. It is also spliced and provides power for the Anti-Lock warning lamp, A/C clutch relay, and high speed radiator fan relay.

Circuit F18 connects to the PDC, cavity 9, and is protected by a 10 amp fuse. Power for the fuse is supplied on circuit A21 from the ignition switch. Circuit A1 provides power for the A21 circuit and is protected by a 20 amp fuse located in cavity 8 of the Power Distribution Center (PDC).

The Powertrain Control Module (PCM) controls the ground path for the solenoid on circuit K52. Circuit K52 connects to cavity 68 of the PCM connector.

HELPFUL INFORMATION

• Refer to group 14 and group 25, for system operation

• Check the 10 amp fuse located in cavity 9 of the PDC.

• Check the 20 amp fuse located in cavity 8 of the PDC

ELECTRONIC EGR TRANSDUCER (EET) SOLENOID

Circuit A142 supplies voltage to the EET solenoid. The Powertrain Control Module (PCM) controls the ground path for the solenoid on circuit K35 and connects to cavity 40 of the PCM connector.

Circuit A142 is spliced and connects with the fuel injectors, generator, and the Automatic Shut-Down (ASD) relay. This circuit is HOT when the ASD relay is energized.

HELPFUL INFORMATION

• Refer to Group 14, for system operation.

VAPOR CANISTER LEAK DETECTOR

Power for the vapor canister leak detector is provided on circuit F18. This circuit is protected by a 10 amp fuse located in cavity 9 of the junction block. Power for the fuse is supplied on circuit A21 from the ignition switch. Circuit A21 is HOT in the START and RUN positions only.

The Powertrain Control Module (PCM) controls the ground path for the leak detection pump solenoid and leak detection pump switch.

Circuit K106 is connected to cavity 77 of the PCM connector and to the leak detection solenoid.

Circuit K107 is connected to cavity 72 of the PCM connector and to the leak detection pump switch.

HELPFUL INFORMATION

• Check the 10 amp fuse located in cavity 9 of the junction block.

• Refer to the appropriate section of the service manual, or the diagnostic test procedures manual.

PARK/NEUTRAL SWITCH INPUT

When CLOSED the Transmission Range Switch (TRS) provides an input to the Powertrain Control Module (PCM) on circuit T41. This circuit connects to cavity 76 of the PCM connector. The T41 circuit is spliced and provides a ground path for the engine starter relay, and the Transmission Control Module (TCM).

CCD BUS

The CCD Bus is used to allow the Powertrain Control Module (PCM) and other modules to communicate with each other and the universal data link connector.

Circuit D1 is used for CCD (+) and connects to cavity 59 of the PCM connector. Circuit D2 is used for CCD (-) and connects to cavity 60 of the PCM connector.

8W-31 TRANSMISSION CONTROL SYSTEM

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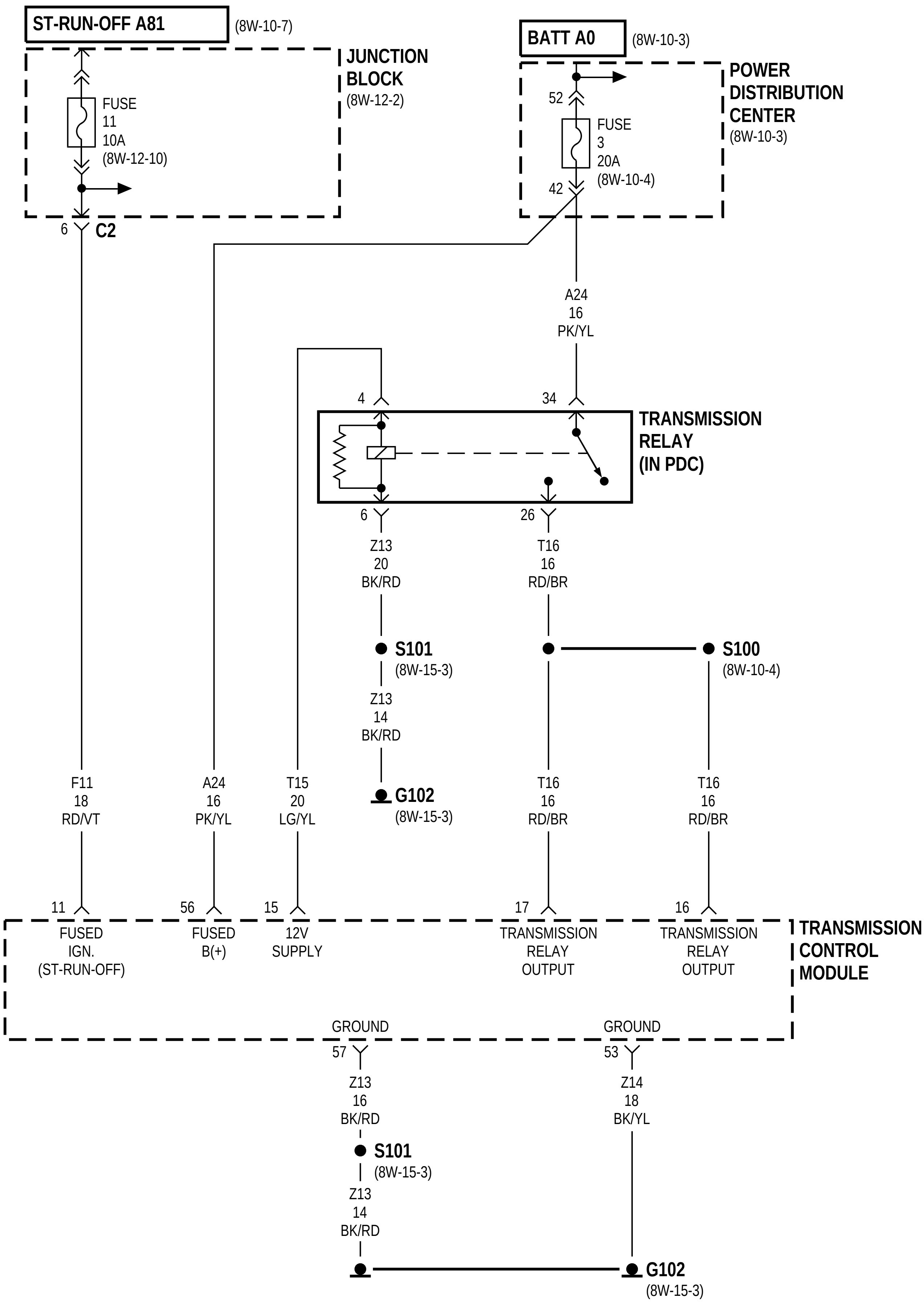
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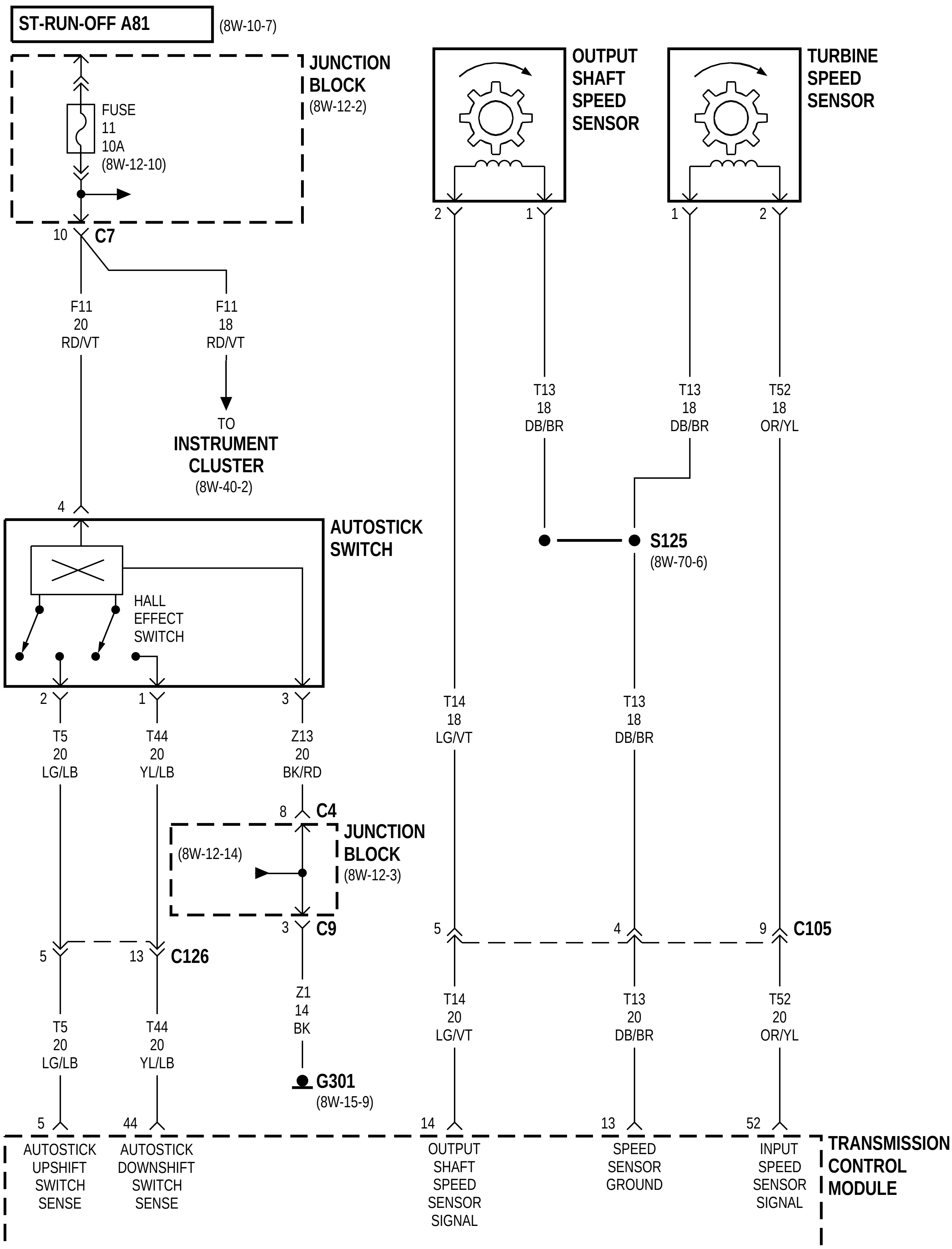
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AUTOSTICK DOWNSHIFT SWITCH SENSE
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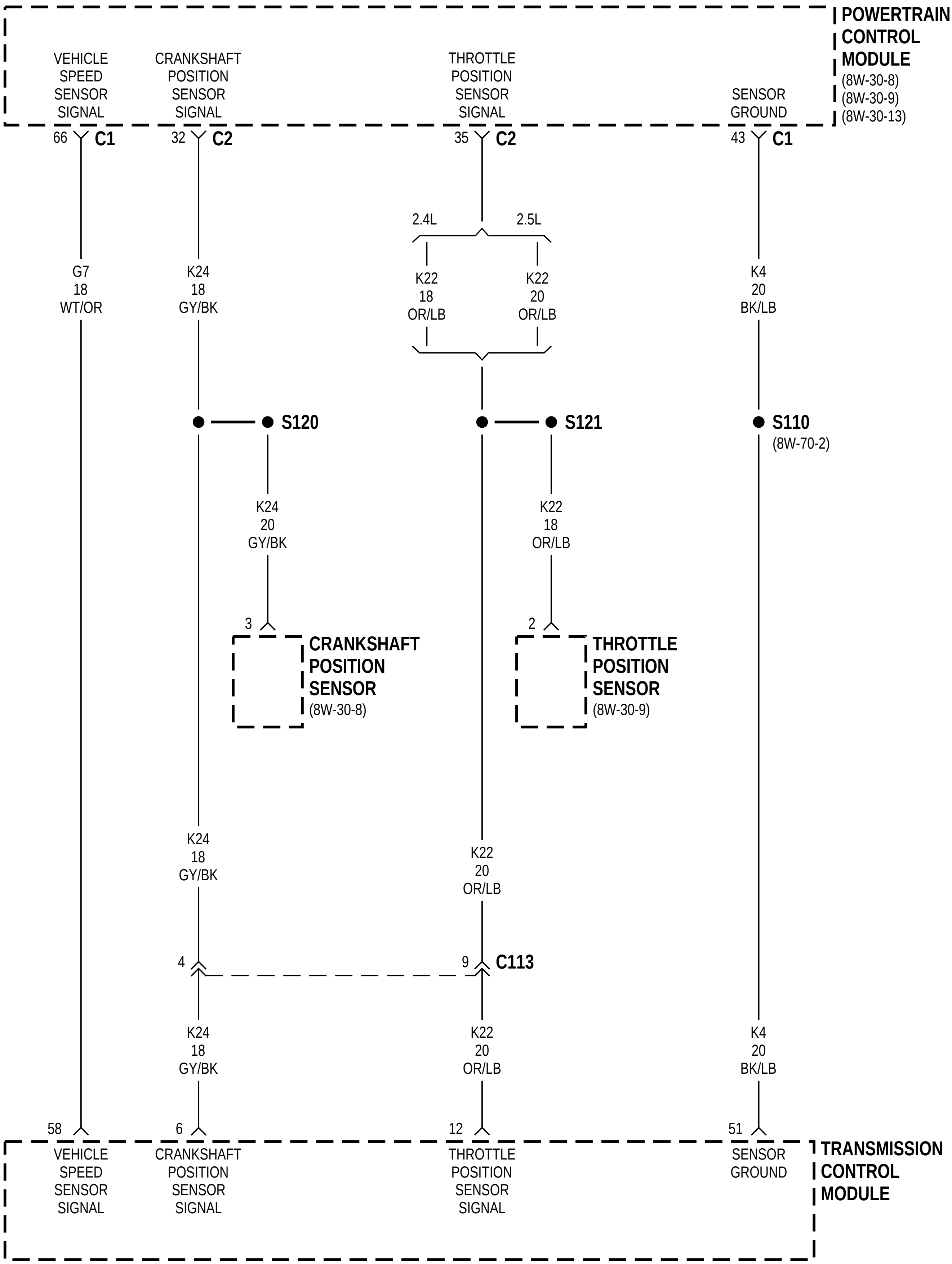
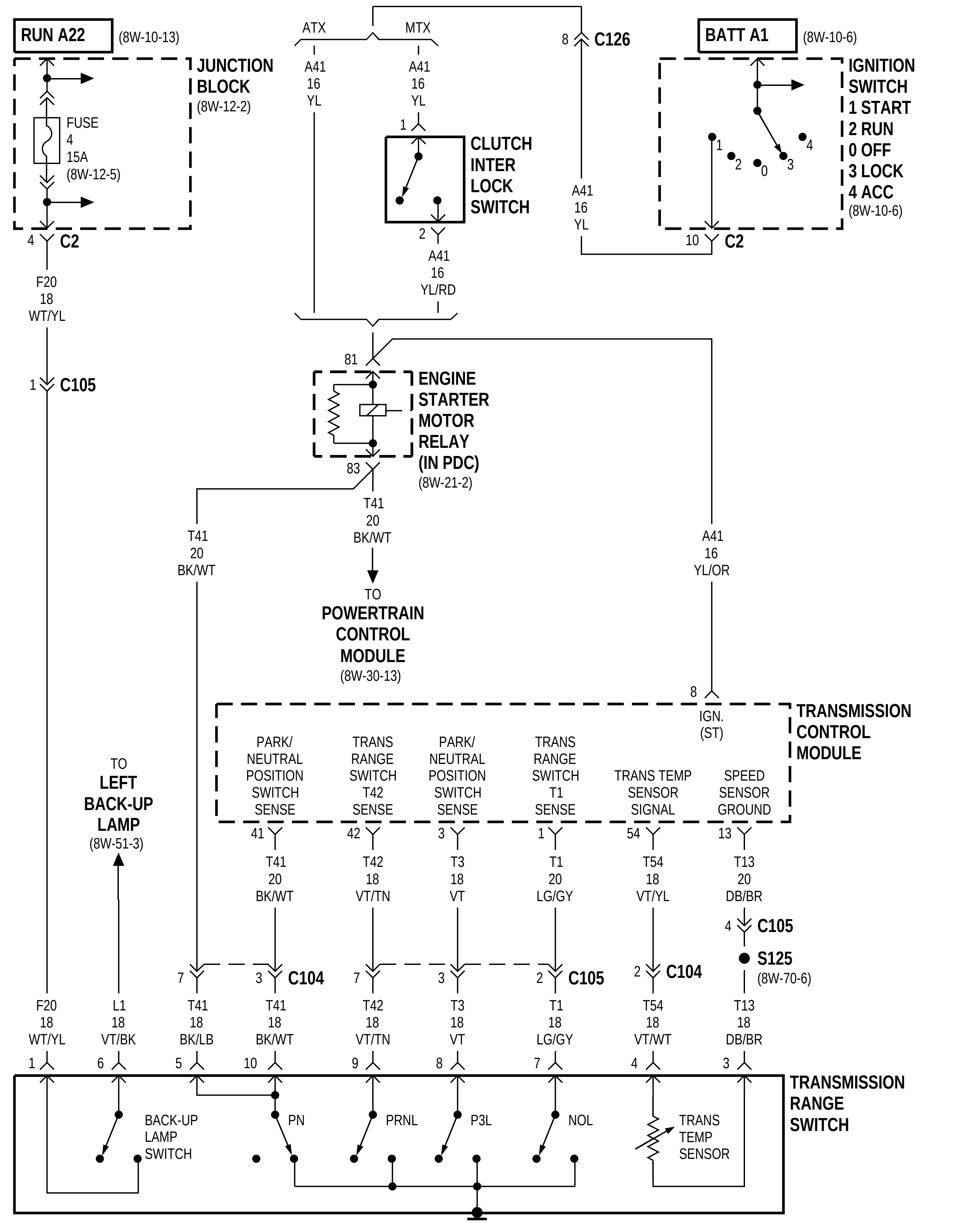
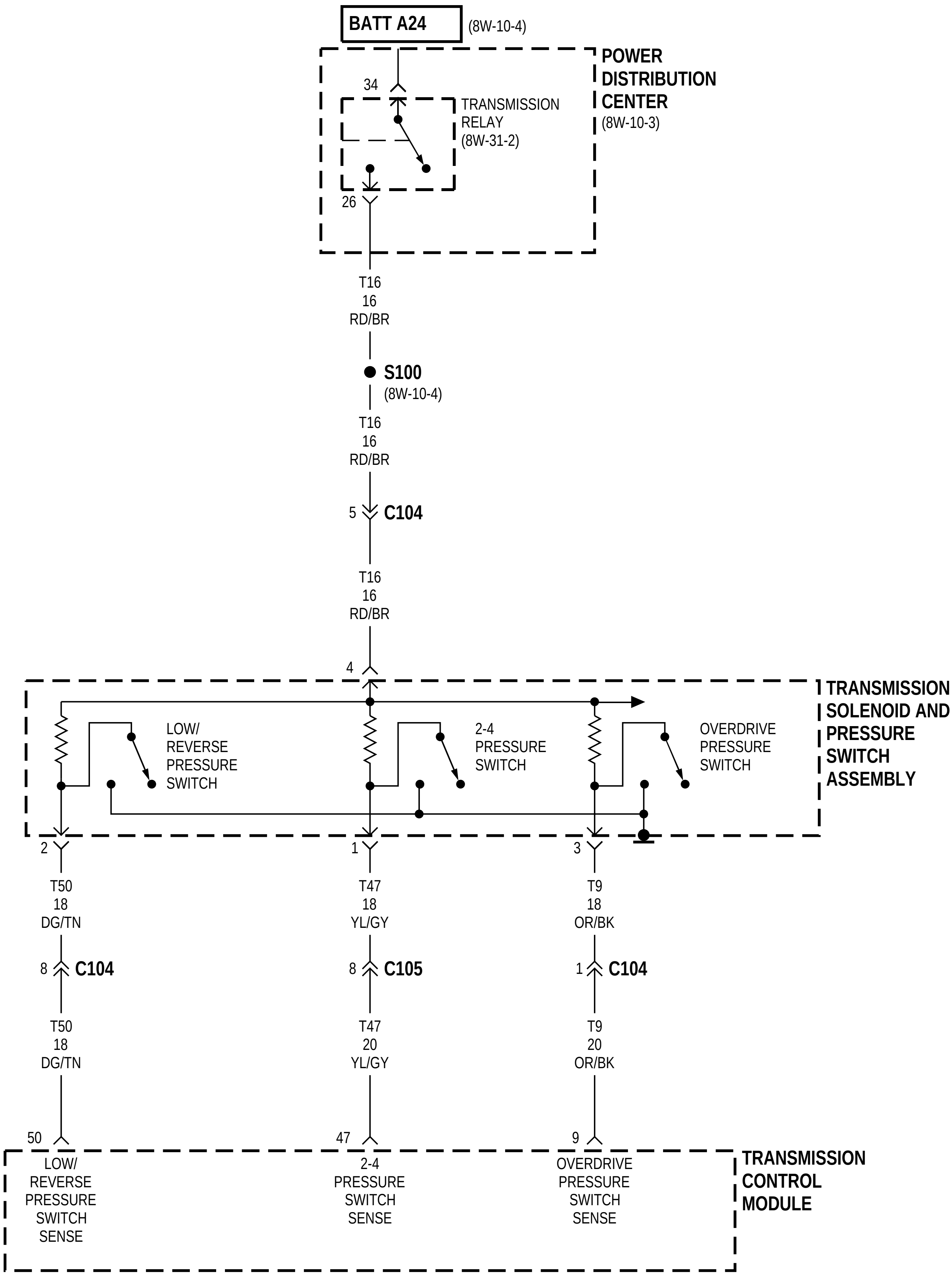
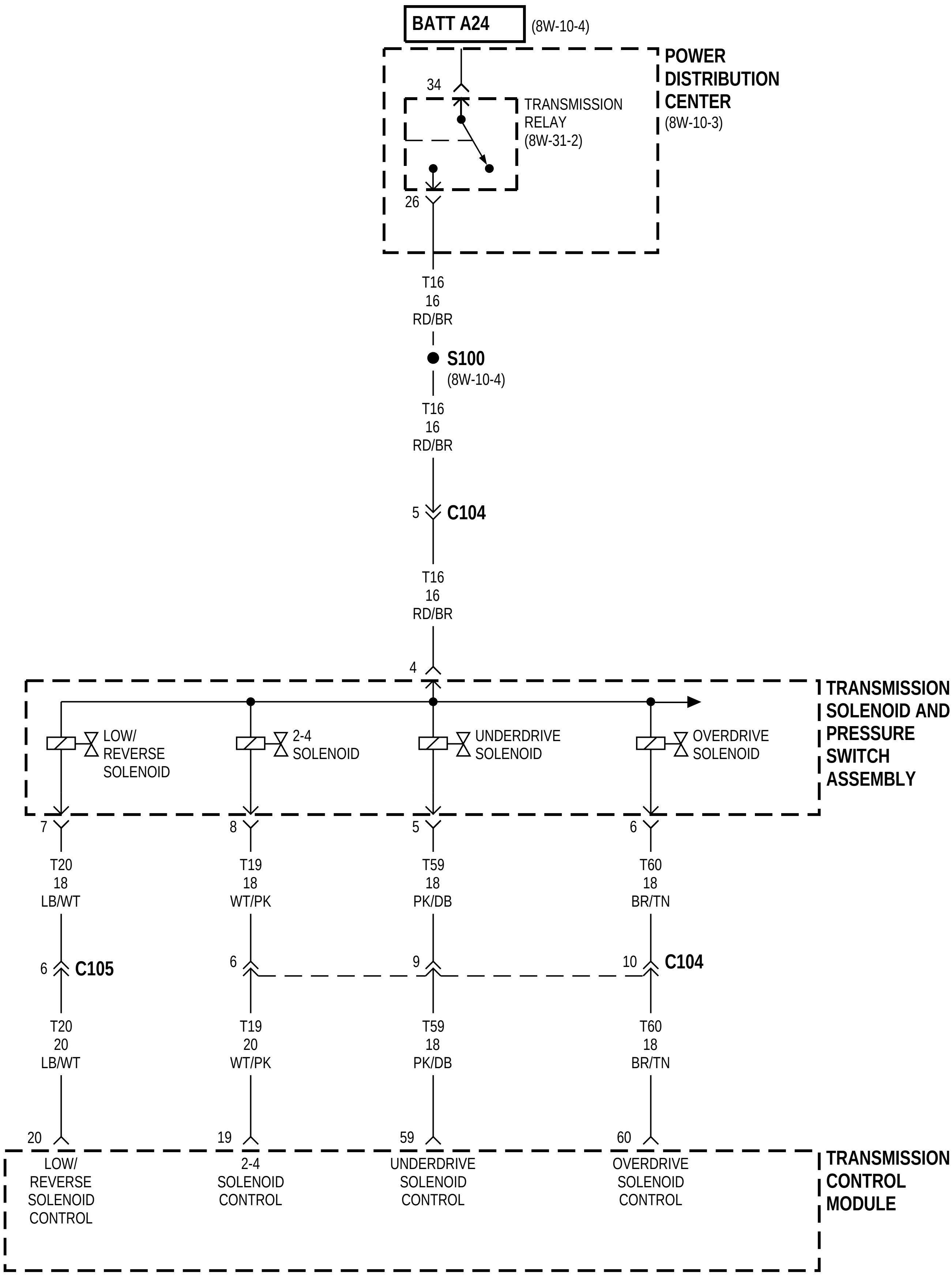
SPEED SENSOR GROUND
INPUT SPEED SENSOR SIGNAL
TRANSMISSION CONTROL MODULE

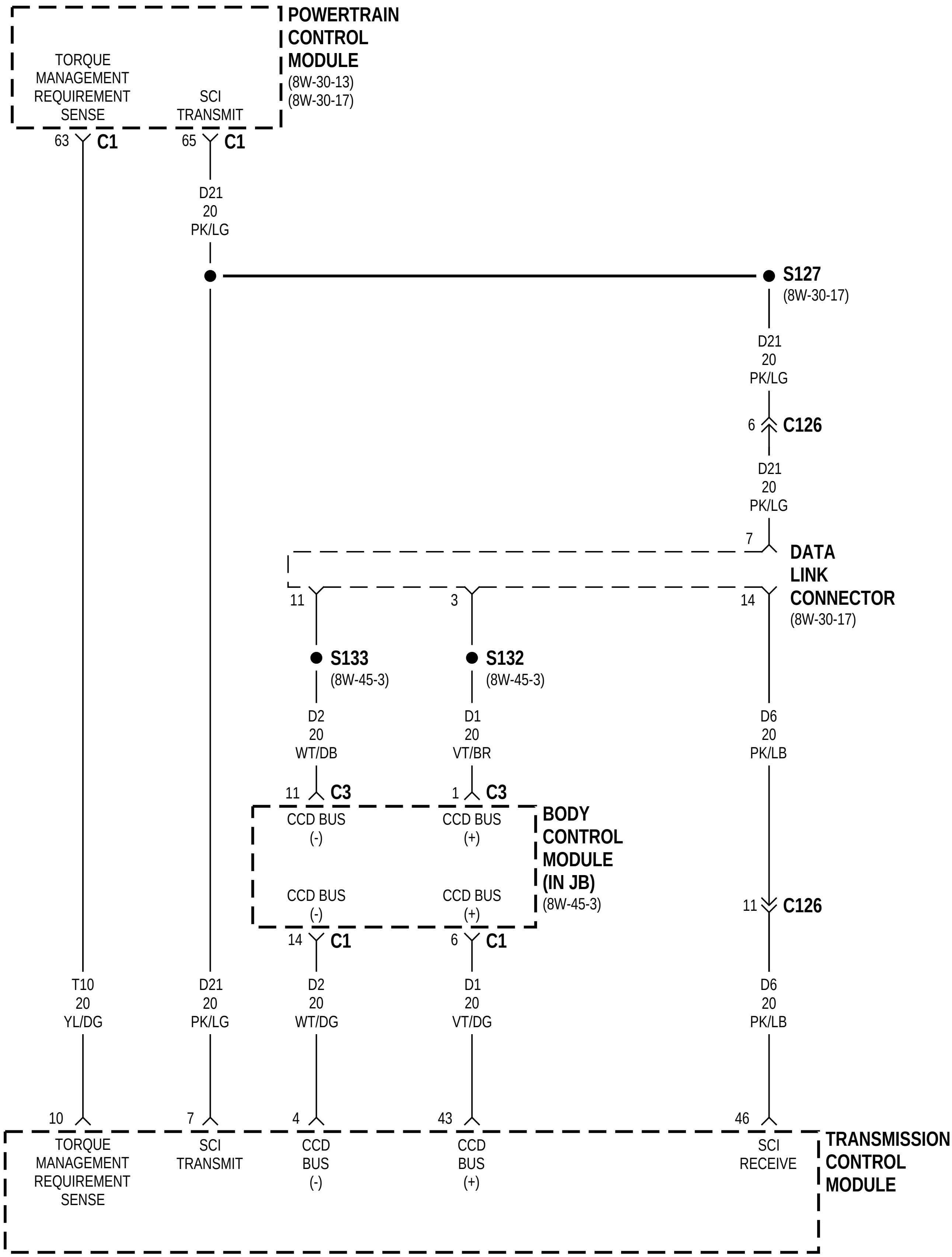


978W-14 JXI00189


RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
FUSE
4
15A
(8W-12-5)
4 C2
F20 18 WT/YL
1 C105
ATX
MTX
A41 16 YL
A41 16 YL
1
CLUTCH INTER LOCK SWITCH
2
A41 16 YL/RD
8 C126
A41 16 YL
BATT A1
(8W-10-6)
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-6)
1
2
0
3
4
10 C2
81
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
83
T41 20 BK/WT
T41 20 BK/WT
TO
POWERTRAIN CONTROL MODULE
(8W-30-13)
A41 16 YL/OR
8
IGN. (ST)
TRANSMISSION CONTROL MODULE
PARK/ NEUTRAL POSITION SWITCH SENSE
TRANS RANGE SWITCH T42 SENSE
PARK/ NEUTRAL POSITION SWITCH SENSE
TRANS RANGE SWITCH T1 SENSE
TRANS TEMP SENSOR SIGNAL
SPEED SENSOR GROUND
41
42
3
1
54
13
T41 20 BK/WT
T42 18 VT/TN
T3 18 VT
T1 20 LG/GY
T54 18 VT/YL
T13 20 DB/BR
4 C105
S125
(8W-70-6)
TO
LEFT BACK-UP LAMP
(8W-51-3)
7
3 C104
7
3
2 C105
2 C104
F20 18 WT/YL
L1 18 VT/BK
T41 18 BK/LB
T41 18 BK/WT
T42 18 VT/TN
T3 18 VT
T1 18 LG/GY
T54 18 VT/WT
T13 18 DB/BR
1
6
5
10
9
8
7
4
3
TRANSMISSION RANGE SWITCH
BACK-UP LAMP SWITCH
PN
PRNL
P3L
NOL
TRANS TEMP SENSOR


BATT A24
(8W-10-4)
34
POWER
DISTRIBUTION
CENTER
(8W-10-3)
TRANSMISSION
RELAY
(8W-31-2)
26
T16
16
RD/BR
S100
(8W-10-4)
T16
16
RD/BR
5
C104
T16
16
RD/BR
4
TRANSMISSION
SOLENOID AND
PRESSURE
SWITCH
ASSEMBLY
LOW/
REVERSE
PRESSURE
SWITCH
2-4
PRESSURE
SWITCH
OVERDRIVE
PRESSURE
SWITCH
2
1
3
T50
18
DG/TN
T47
18
YL/GY
T9
18
OR/BK
8
C104
8
C105
1
C104
T50
18
DG/TN
T47
20
YL/GY
T9
20
OR/BK
50
47
9
LOW/
REVERSE
PRESSURE
SWITCH
SENSE
2-4
PRESSURE
SWITCH
SENSE
OVERDRIVE
PRESSURE
SWITCH
SENSE
TRANSMISSION
CONTROL
MODULE


BATT A24
(8W-10-4)
34
POWER
DISTRIBUTION
CENTER
(8W-10-3)
TRANSMISSION
RELAY
(8W-31-2)
26
T16
16
RD/BR
S100
(8W-10-4)
T16
16
RD/BR
5
C104
T16
16
RD/BR
4
TRANSMISSION
SOLENOID AND
PRESSURE
SWITCH
ASSEMBLY
LOW/
REVERSE
SOLENOID
2-4
SOLENOID
UNDERDRIVE
SOLENOID
OVERDRIVE
SOLENOID
7
8
5
6
T20
18
LB/WT
T19
18
WT/PK
T59
18
PK/DB
T60
18
BR/TN
6
C105
6
9
10
C104
T20
20
LB/WT
T19
20
WT/PK
T59
18
PK/DB
T60
18
BR/TN
20
19
59
60
LOW/
REVERSE
SOLENOID
CONTROL
2-4
SOLENOID
CONTROL
UNDERDRIVE
SOLENOID
CONTROL
OVERDRIVE
SOLENOID
CONTROL
TRANSMISSION
CONTROL
MODULE


POWERTRAIN CONTROL MODULE
(8W-30-13)
(8W-30-17)
TORQUE MANAGEMENT REQUIREMENT SENSE
SCI TRANSMIT
63 C1
65 C1
D21 20 PK/LG
S127
(8W-30-17)
D21 20 PK/LG
6 C126
D21 20 PK/LG
7
DATA LINK CONNECTOR
(8W-30-17)
11
3
14
S133
(8W-45-3)
S132
(8W-45-3)
D2 20 WT/DB
D1 20 VT/BR
D6 20 PK/LB
11 C3
1 C3
BODY CONTROL MODULE (IN JB)
(8W-45-3)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
11 C126
14 C1
6 C1
T10 20 YL/DG
D21 20 PK/LG
D2 20 WT/DG
D1 20 VT/DG
D6 20 PK/LB
10
7
4
43
46
TORQUE MANAGEMENT REQUIREMENT SENSE
SCI TRANSMIT
CCD BUS (-)
CCD BUS (+)
SCI RECEIVE
TRANSMISSION CONTROL MODULE

8W-31 TRANSMISSION CONTROL SYSTEM

INDEX

DESCRIPTION AND OPERATION

TRANSMISSION CONTROL MODULE (TCM)

The Transmission Control System is used on all automatic transmission applications. It provides smooth and accurate shift points and can adjust as the transmission wears.

Power for the Transmission Control Module (TCM) is supplied from three sources. One is a direct battery feed on circuit A24. This circuit is protected by a 20 amp fuse located in the Power Distribution Center (PDC) cavity 3. It is also spliced and supplies power for the transmission control relay, contact side.

Power is also supplied on circuit A41. This is the power supply is for the engine starter relay, coil side, and is HOT in the START position only. Circuit A1, which connects to the ignition switch, supplies power to circuit A41 in the START position and is protected by a 20 amp fuse located in cavity 8 of the PDC.

Circuit F11 also supplies power to the TCM. This circuit is protected by a 10 amp fuse located in cavity 11 of the junction block. Power for the fuse is supplied on circuit A81. This circuit is protected by a 20 amp fuse located in cavity 8 of the PDC. The F11 circuit also supplies power to the optional Auto Stick switches.

Ground for the TCM is supplied on the Z13 circuit, which is a power ground, and circuit Z14, which is a signal ground. Both grounds terminate at the left strut tower.

The CCD Data Bus is used to allow the controller to communicate with other controllers and the Universal Data Link connector. The circuits involved are, D1 for CCD positive, and D2 for CCD negative.

Circuits D6 and D21 are connected from the TCM to the universal data link connector. The D6 ciruit is used for SCI receive, and the D21 circuit is used for SCI transmit.

TRANSMISSION CONTROL RELAY

The Transmission Control Relay, located in the Power Distribution Center (PDC), is used to power the Transmission Solenoids and Pressure Switches. Power for the coil side of the relay is supplied from the TCM on circuit T15. Ground for the coil side is provided on circuit Z1 and terminates at the left strut tower.

When the relay is energized, contacts inside the relay CLOSE and connect circuits A24, which is a direct battery feed, and circuit T16, which connects to the solenoid and pressure switch assembly. Circuit T16 is also spliced to the TCM and is used to control the switched battery feed.

BACK UP LAMPS

AUTOMATIC TRANSMISSION

Operation of the back-up lamps is controlled by a switch located internal to the Transmission Range Sensor (TRS).

Power for the back-up lamp switch is supplied on circuit F20 which is protected by a 15 amp fuse located in cavity 4 of the junction block. This fuse is HOT in the RUN position only.

Power for the fuse is supplied by cirucit A22. This circuit connects from the ignition switch to the junction block. Power for the A22 circuit is supplied by circuit A2. This circuit originates in the Power Distribution Center and is protected by a 40 amp fuse located in cavity 18.

When the operator places the vehicle in REVERSE circuits F20 and L1 are connected. Circuit L1 connects from the TRS to the back-up lamps.

Ground for the lamps is supplied on circuit Z1.

SOLENOIDS AND PRESSURE SWITCHES

The Solenoid and Pressure Switch assembly, located in the transmission, is used to control the shifting of the transmission. Power for the assembly is provided on circuit T16 from the transmission control relay. The Transmission Control Module (TCM) provides the ground path for the various solenoids depending on operating conditions. This assembly is also case grounded to the

DESCRIPTION AND OPERATION (Continued)

transmission. The case ground supplies the ground path for the pressure switches.

The following circuits are controlled by the TCM for the Solenoid and Pressure Switch Assembly.

- T20- Low/Reverse solenoid
- T19- 2/4 solenoid
- T60- Overdrive solenoid
- T59- Underdrive Pressure Switch
- T50- Low/Reverse pressure switch
- T47- Kick down pressure switch
- T9- Overdrive pressure switch

Circuits T9, T47, and T50 are switch inputs to the TCM.

TURBINE SPEED SENSOR

The Turbine Speed sensor is used to measure the speed of the torque converter turbine. Circuit T52 is an input to the Transmission Control Module (TCM). Ground for the sensor is provided on circuit T13. This ground is spliced and shared with the Output Speed sensor.

OUTPUT SPEED SENSOR

The Output Speed sensor is used to measure the speed of the output shaft of the transmission. Circuit T14 supplies an input to the Transmission Control Module (TCM). Ground for the sensor is provided on circuit T13. This ground is spliced and shared with the Turbine Speed sensor.

AUTO STICK

The auto stick is used to allow the operator to control the shifting of the transmission. This system uses hall effect switched located at the base of the shifter.

There are two hall effect switched used. One is for Upshift. Circuit T5 connects from the Upshift switch to the Transmission Control Module (TCM). Circuit T44 connects from the Downshift switch to the TCM.

Power for the switched is supplied on circuit F11. This circuit is HOT in the OFF/RUN/START position. This circuit is protected by a 10 amp fuse located in cavity 10 of the junction block.

Ground for the switch is supplied on circuit Z1.

TRANSMISSION TEMPERATURE SENSOR

The transmission temperature sensor is used to monitor the temperature of the transmission fluid. The sensor is a variable resistor and is part of the Transmission Range Sensor (TRS).

Power for the sensor is supplied by the Transmission Control Module (TCM) on circuit T54. The T54 circuit connects to cavity 54 of the TCM connector.

Ground for the sensor is supplied on circuit T13. This circuit is spliced with the turbine speed and output speed sensor. This circuit connects to cavity 13 of the TCM connector.

TRANSMISSION RANGE SENSOR

The Transmission Range Sensor (TRS) is located internal to the transmission. This sensor provides the Transmission Control Module (TCM) with information on shift lever position, contains the transmission temperature sensor, and contains the switch for the back-up lamps.

Operation of the transmission temperature sensor and the back-up lamps is covered in this section.

Circuit T1 provides an input to the TCM when the shift lever is in the NEUTRAL/OVERDRIVE or LOW position.

Circuit T3 provides an input to the TCM when the shift lever is in the PARK, 3, or LOW position.

Circuit T42 provides an input to the TCM when the shift lever is in the PARK, REVERSE, NEUTRAL, or LOW position.

Circuit T41 provides an input to the TCM when the shift lever is in the PARK, or NEUTRAL position. This circuit is also the ground circuit for the coil side of the engine starter motor relay.

The TRS is case grounded to the transmission.

TORQUE MANAGEMENT INPUT

Circuit T10 connects from the Transmission Control Module (TCM) to the Powertrain Control Module (PCM) cavity 63. This is the torque management request from the TCM to the PCM.

FUEL/IGNITION SYSTEM INPUTS

The following inputs are used by the Transmission Control Module (TCM) to determine proper vehicle shift points.

- Circuit K22 is used to provide the TCM with the throttle position
- Circuit K4 is used to provide the throttle position sensor ground to the Powertrain Control Module (PCM)
- Circuit K24 is used to provide the TCM with the engine speed input

VEHICLE SPEED INPUT

The Powertrain Control Module (PCM) receives an input on vehicle speed from the Transmission Control Module (TCM).

Circuit G7, from the TCM, provides an input signal to the PCM. The G7 circuit connects to cavity 66 of the PCM connector.

HELPFUL INFORMATION

- Refer to the appropriate group of the Service Manual or the Diagnostic Test Procedures Manual for diagnostic procedures.

8W-33 VEHICLE SPEED CONTROL

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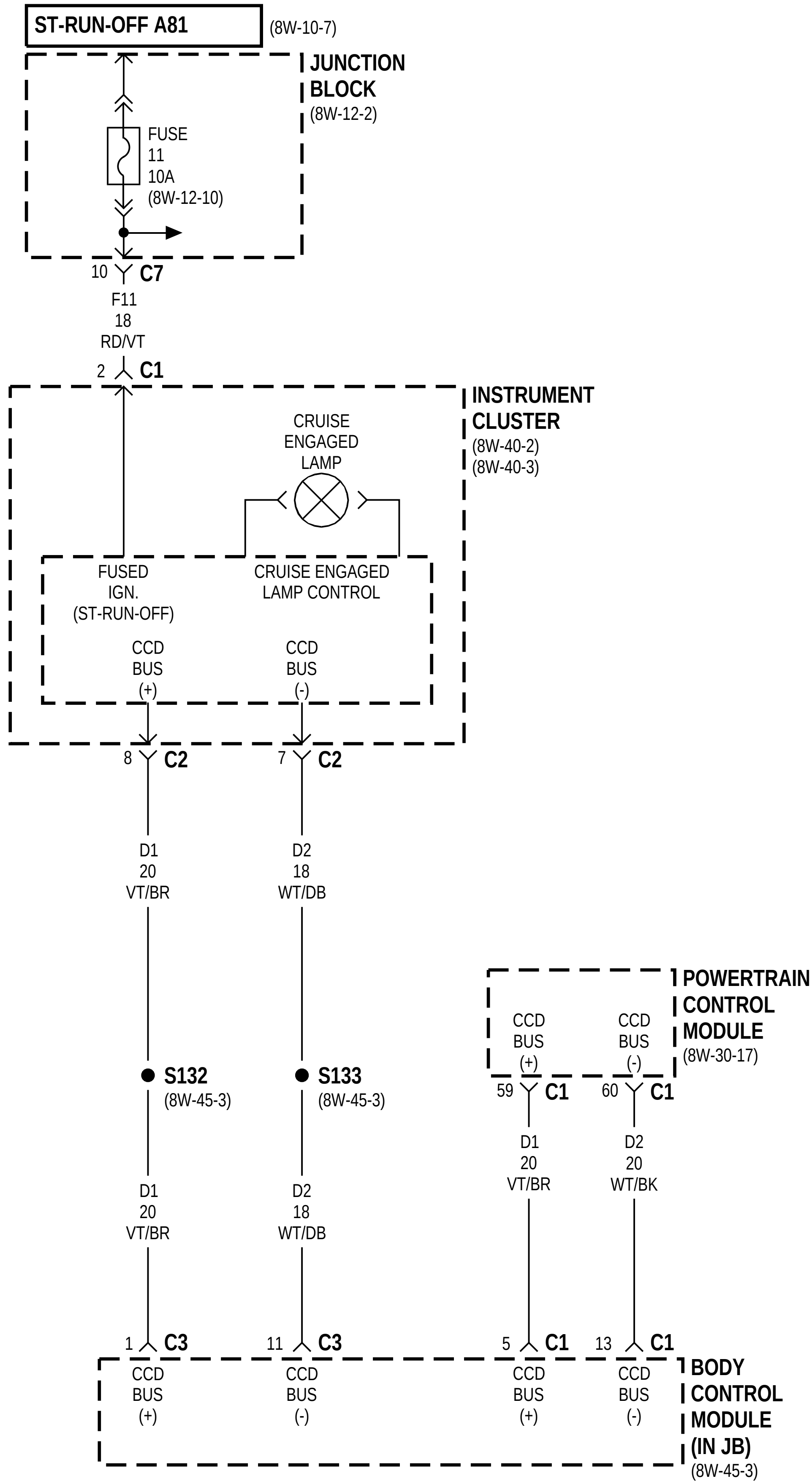
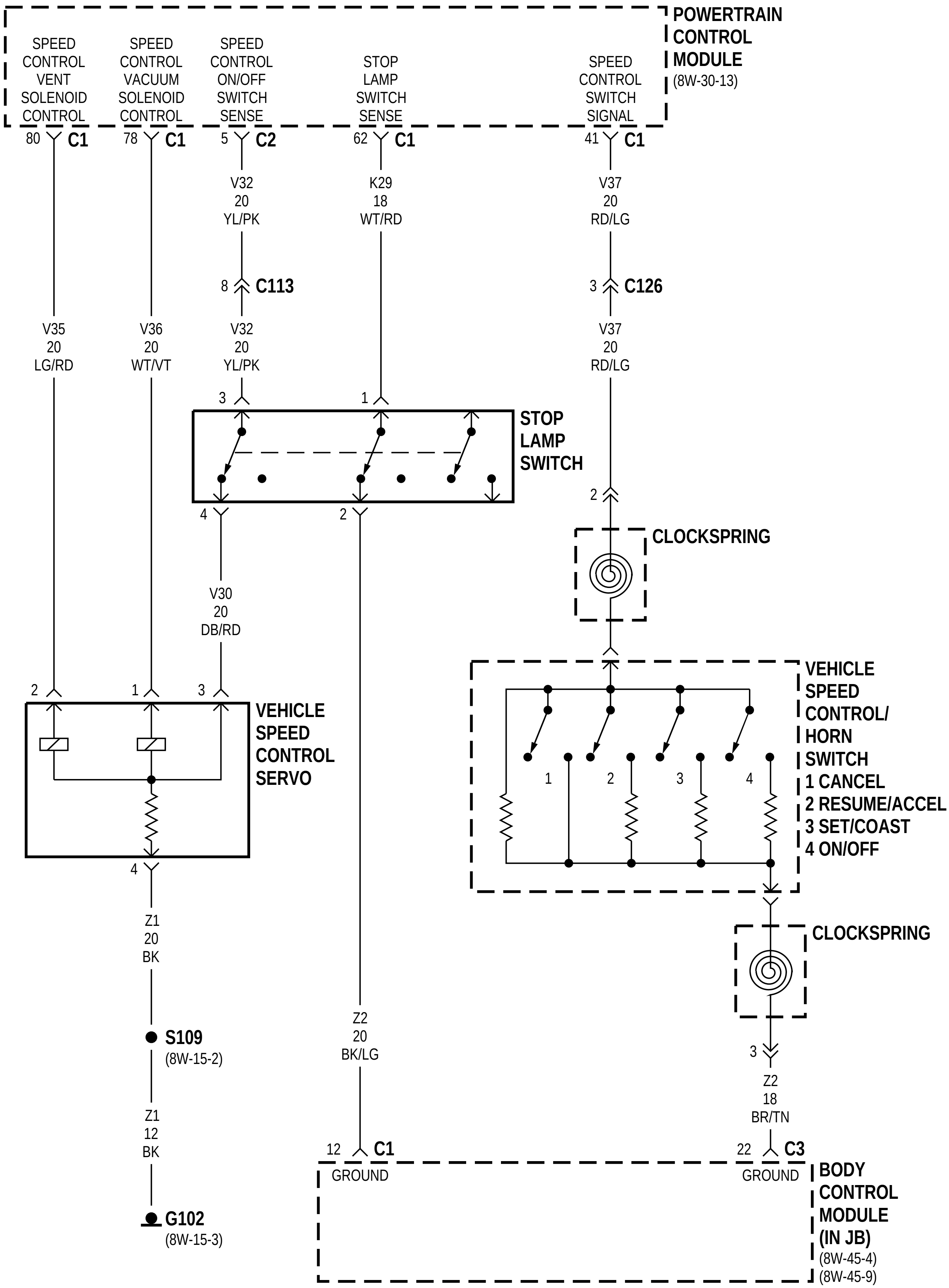


ST-RUN-OFF A81
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-10)
10
C7
F11
18
RD/VT
2
C1
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-3)
CRUISE ENGAGED LAMP
FUSED IGN. (ST-RUN-OFF)
CRUISE ENGAGED LAMP CONTROL
CCD BUS (+)
CCD BUS (-)
8
C2
7
C2
D1
20
VT/BR
D2
18
WT/DB
S132
(8W-45-3)
S133
(8W-45-3)
POWERTRAIN CONTROL MODULE
(8W-30-17)
CCD BUS (+)
CCD BUS (-)
59
C1
60
C1
D1
20
VT/BR
D2
20
WT/BK
D1
20
VT/BR
D2
18
WT/DB
1
C3
11
C3
5
C1
13
C1
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
BODY CONTROL MODULE (IN JB)
(8W-45-3)


POWERTRAIN CONTROL MODULE
(8W-30-13)
SPEED CONTROL VENT SOLENOID CONTROL
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL ON/OFF SWITCH SENSE
STOP LAMP SWITCH SENSE
SPEED CONTROL SWITCH SIGNAL
80 C1
78 C1
5 C2
62 C1
41 C1
V32 20 YL/PK
K29 18 WT/RD
V37 20 RD/LG
8 C113
3 C126
V35 20 LG/RD
V36 20 WT/VT
V32 20 YL/PK
V37 20 RD/LG
STOP LAMP SWITCH
CLOCKSPRING
V30 20 DB/RD
VEHICLE SPEED CONTROL SERVO
VEHICLE SPEED CONTROL/ HORN SWITCH
1 CANCEL
2 RESUME/ACCEL
3 SET/COAST
4 ON/OFF
CLOCKSPRING
Z1 20 BK
S109
(8W-15-2)
Z1 12 BK
G102
(8W-15-3)
Z2 20 BK/LG
Z2 18 BR/TN
12 C1
22 C3
GROUND
GROUND
BODY CONTROL MODULE (IN JB)
(8W-45-4)
(8W-45-9)

8W-33 VEHICLE SPEED CONTROL

INDEX

DESCRIPTION AND OPERATION

VEHICLE SPEED CONTROL

The vehicle speed control system is powered by the Powertrain Control Module (PCM). The vehicle speed control switches, located in the steering wheel, use resistors internal to the switch to send a signal to the PCM indicating what the operator is requesting. The V37 circuit, from cavity 41 of the PCM supplies power for the switch. Circuit Z2 is the ground for the switch. The Z2 circuit terminates at the instrument panel left side cowl.

The V37 and Z2 circuits are spliced internal to the clockspring to provide power and ground for the two switches.

When the system is turned ON, the vehicle is moving forward, vehicle speed is above 35 mph (50kph), and the SET switch is pressed, the PCM looks at the vehicle speed.

With this information, the PCM sends a signal to the vehicle speed control servo, on the V36 circuit, and the servo applies vacuum to hold the desired speed. Circuit V36 connects to cavity 78 of the PCM.

When the operator selects the COAST feature in the system, the PCM measures the resistance on the V37 circuit and uses this information to apply voltage on the V35 circuit, which is the vent side of the vehicle speed control servo. Circuit V35 connects to cavity 80 of the PCM.

Grounding for the vehicle speed control servo is supplied on the Z2 circuit. Circuit Z2 terminates at the left strut tower. An additional input to the servo is provided by the stop lamp switch on the V30 circuit. When the operator presses on the brakes the ground path for the V30 circuit is broken. This break in the ground path causes the vehicle speed control servo to vent and disengage the system.

Circuits V32 and K29 are used as inputs to the PCM to indicate when the operator is applying the brakes, as vehicle speed control is canceled when this happens. Circuit V32 connects to cavity 5 of the PCM. Circuit K29 connects to cavity 62 of the PCM.

CRUISE (VEHICLE SPEED CONTROL) ENGAGED LAMP

The CRUISE lamp is used to indicate to the operator when the vehicle speed control is engaged. The signal to illuminate the lamp is carried over the CCD Bus from the Body Control Module (BCM).

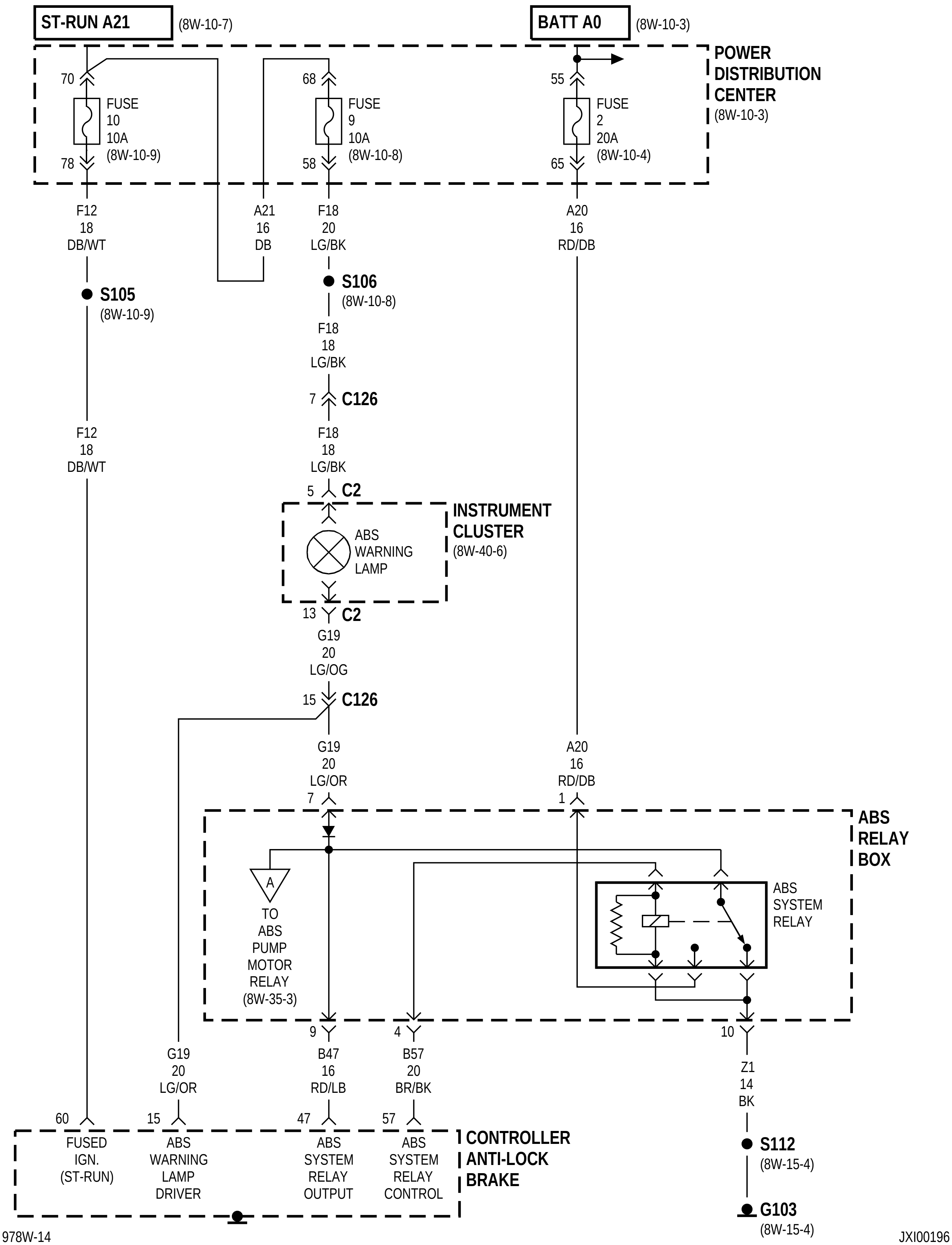
The BCM receives information on vehicle speed control engagement from the PCM over the CCD Bus. This lamp also is illuminated, for a few seconds, when the ignition switch is moved from the OFF to the RUN position as a bulb check. The bulb check operation is controlled by the PCM.

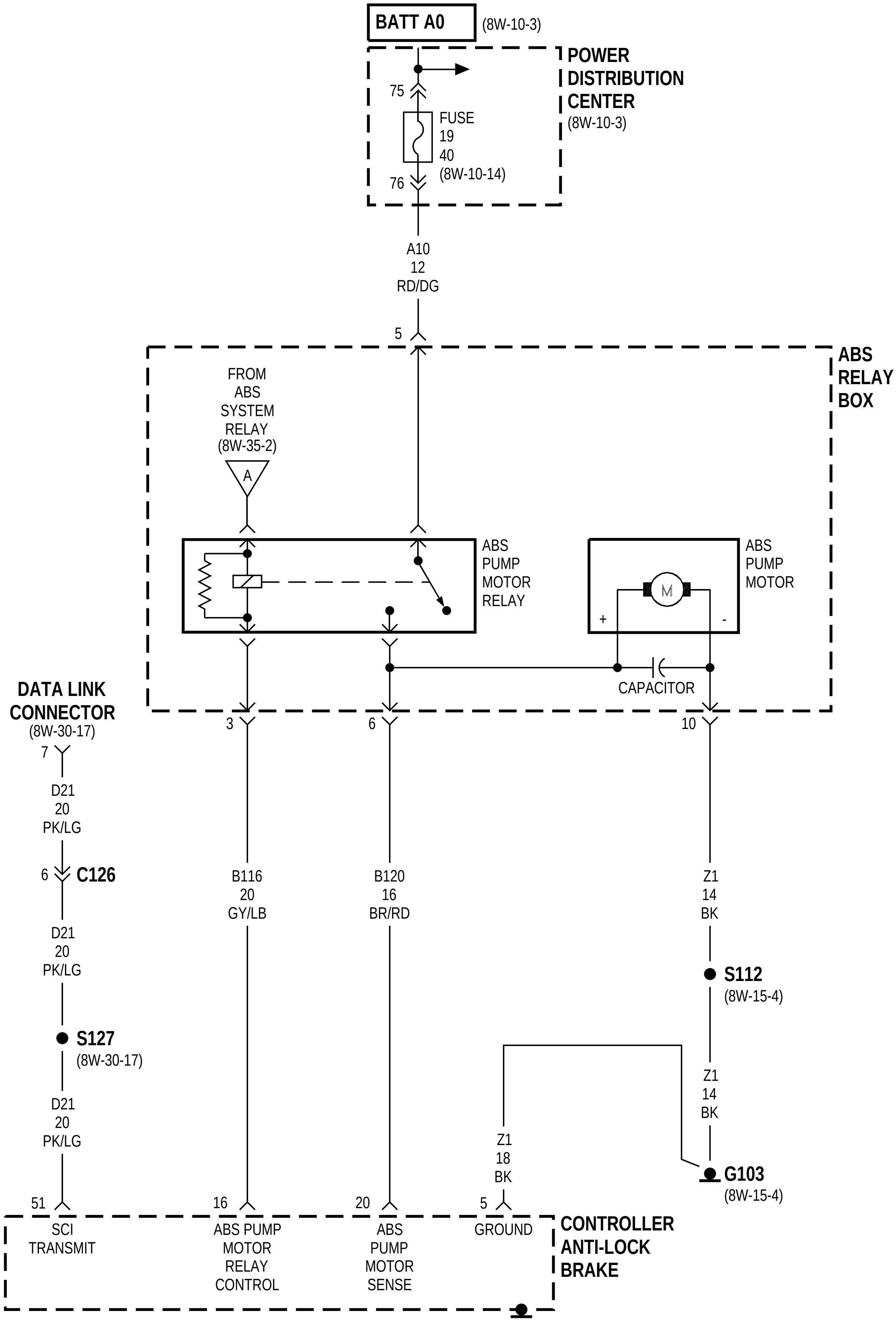
HELPFUL INFORMATION

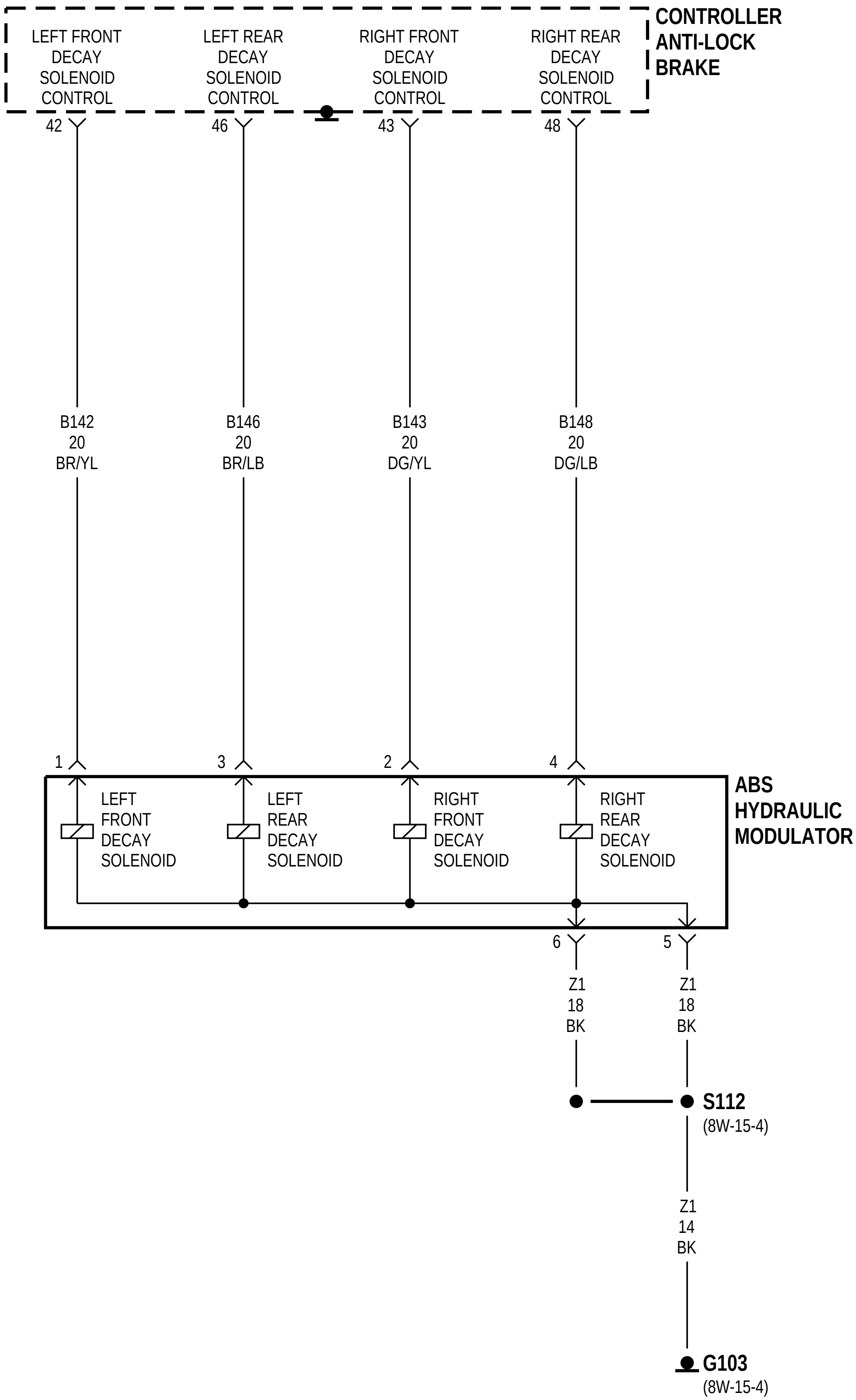
- Refer to Group 8H for diagnosis procedures

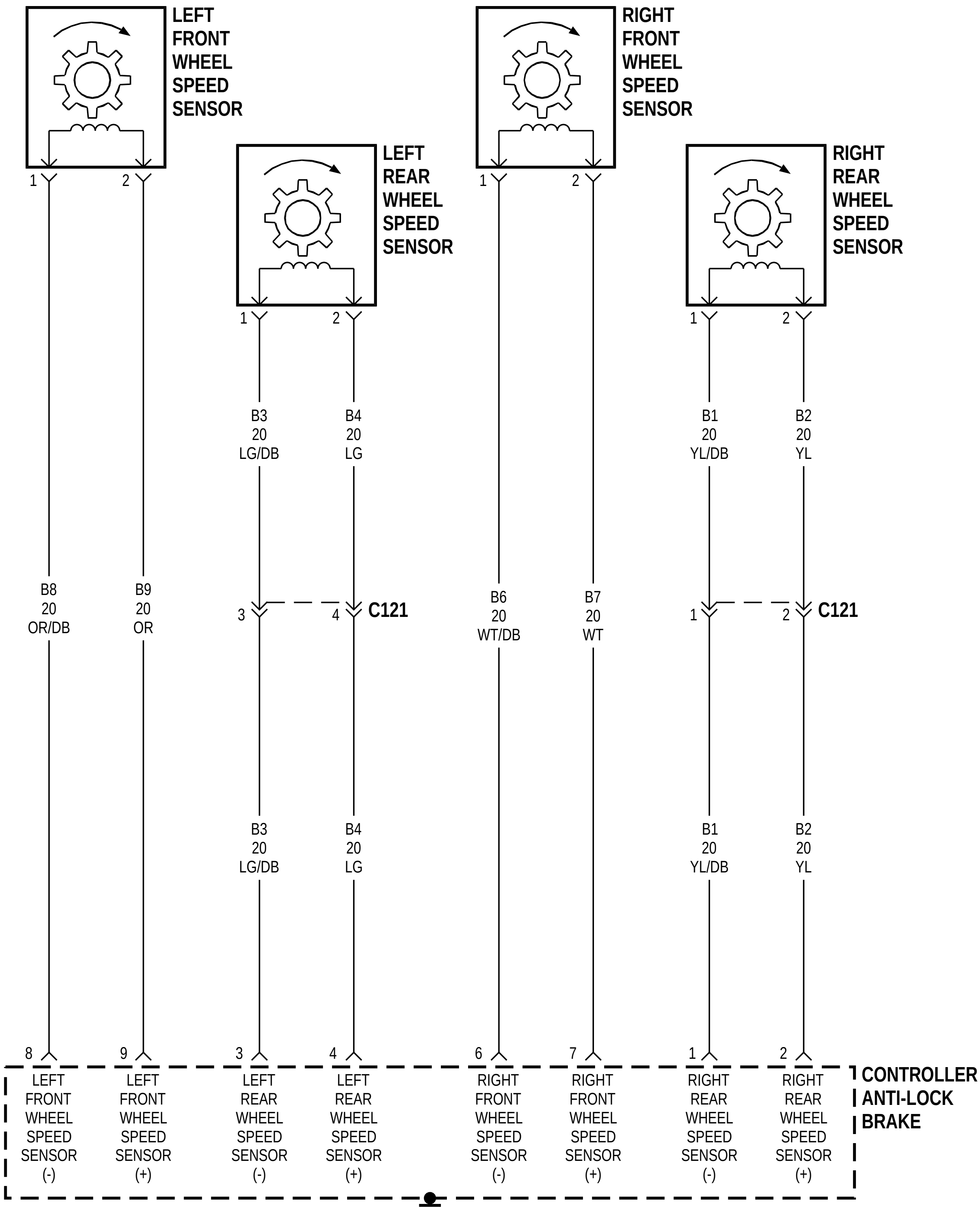
8W-35 ANTI-LOCK BRAKES

INDEX

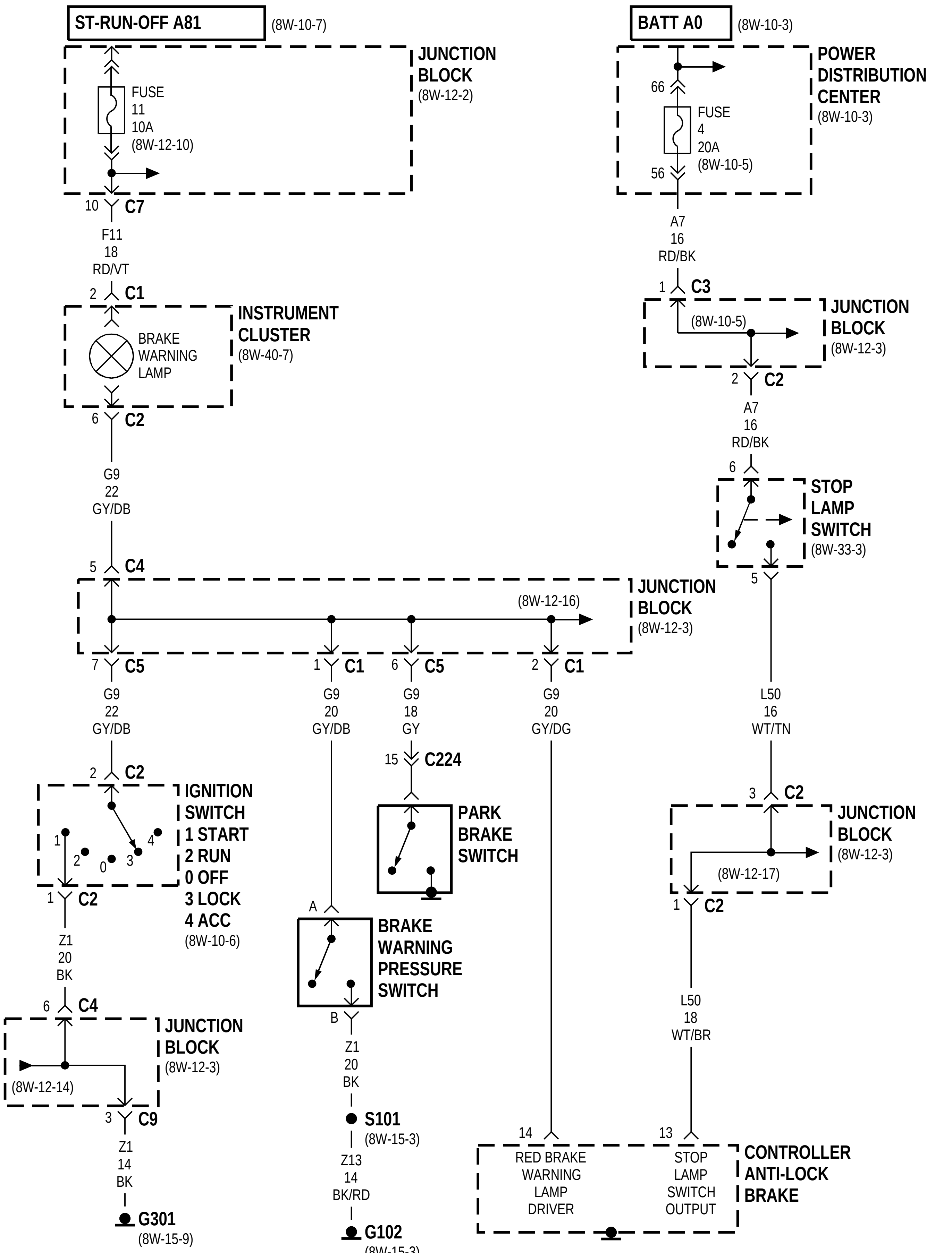

ST-RUN A21
(8W-10-7)
BATT A0
(8W-10-3)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
70
FUSE
10
10A
(8W-10-9)
78
68
FUSE
9
10A
(8W-10-8)
58
55
FUSE
2
20A
(8W-10-4)
65
F12
18
DB/WT
A21
16
DB
F18
20
LG/BK
A20
16
RD/DB
S105
(8W-10-9)
S106
(8W-10-8)
F18
18
LG/BK
7
C126
F12
18
DB/WT
F18
18
LG/BK
5
C2
INSTRUMENT
CLUSTER
(8W-40-6)
ABS
WARNING
LAMP
13
C2
G19
20
LG/OG
15
C126
G19
20
LG/OR
A20
16
RD/DB
7
1
ABS
RELAY
BOX
A
TO
ABS
PUMP
MOTOR
RELAY
(8W-35-3)
ABS
SYSTEM
RELAY
9
4
10
G19
20
LG/OR
B47
16
RD/LB
B57
20
BR/BK
Z1
14
BK
60
15
47
57
FUSED
IGN.
(ST-RUN)
ABS
WARNING
LAMP
DRIVER
ABS
SYSTEM
RELAY
OUTPUT
ABS
SYSTEM
RELAY
CONTROL
CONTROLLER
ANTI-LOCK
BRAKE
S112
(8W-15-4)
G103
(8W-15-4)
978W-14
JXI00196


BATT A0
(8W-10-3)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
75
FUSE
19
40
(8W-10-14)
76
A10
12
RD/DG
5
ABS
RELAY
BOX
FROM
ABS
SYSTEM
RELAY
(8W-35-2)
A
ABS
PUMP
MOTOR
RELAY
ABS
PUMP
MOTOR
M
+
-
CAPACITOR
DATA LINK
CONNECTOR
(8W-30-17)
7
3
6
10
D21
20
PK/LG
6
C126
B116
20
GY/LB
B120
16
BR/RD
Z1
14
BK
S112
(8W-15-4)
S127
(8W-30-17)
Z1
18
BK
G103
(8W-15-4)
51
16
20
5
SCI
TRANSMIT
ABS PUMP
MOTOR
RELAY
CONTROL
ABS
PUMP
MOTOR
SENSE
GROUND
CONTROLLER
ANTI-LOCK
BRAKE


CONTROLLER
ANTI-LOCK
BRAKE
LEFT FRONT DECAY SOLENOID CONTROL
LEFT REAR DECAY SOLENOID CONTROL
RIGHT FRONT DECAY SOLENOID CONTROL
RIGHT REAR DECAY SOLENOID CONTROL
42
46
43
48
B142 20 BR/YL
B146 20 BR/LB
B143 20 DG/YL
B148 20 DG/LB
1
3
2
4
ABS
HYDRAULIC
MODULATOR
LEFT FRONT DECAY SOLENOID
LEFT REAR DECAY SOLENOID
RIGHT FRONT DECAY SOLENOID
RIGHT REAR DECAY SOLENOID
6
5
Z1 18 BK
Z1 18 BK
S112
(8W-15-4)
Z1 14 BK
G103
(8W-15-4)


LEFT FRONT WHEEL SPEED SENSOR
LEFT REAR WHEEL SPEED SENSOR
RIGHT FRONT WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
1
2
B8 20 OR/DB
B9 20 OR
B3 20 LG/DB
B4 20 LG
B6 20 WT/DB
B7 20 WT
B1 20 YL/DB
B2 20 YL
C121
3
4
8
9
6
7
LEFT FRONT WHEEL SPEED SENSOR (-)
LEFT FRONT WHEEL SPEED SENSOR (+)
LEFT REAR WHEEL SPEED SENSOR (-)
LEFT REAR WHEEL SPEED SENSOR (+)
RIGHT FRONT WHEEL SPEED SENSOR (-)
RIGHT FRONT WHEEL SPEED SENSOR (+)
RIGHT REAR WHEEL SPEED SENSOR (-)
RIGHT REAR WHEEL SPEED SENSOR (+)
CONTROLLER ANTI-LOCK BRAKE

JXI00199


ST-RUN-OFF A81
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-10)
10 C7
F11
18
RD/VT
2 C1
INSTRUMENT CLUSTER
(8W-40-7)
BRAKE WARNING LAMP
6 C2
G9
22
GY/DB
5 C4
JUNCTION BLOCK
(8W-12-3)
(8W-12-16)
7 C5
1 C1
6 C5
2 C1
G9
22
GY/DB
G9
20
GY/DB
G9
18
GY
G9
20
GY/DG
15 C224
PARK BRAKE SWITCH
2 C2
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-6)
1
2
0
3
4
1 C2
Z1
20
BK
6 C4
JUNCTION BLOCK
(8W-12-3)
(8W-12-14)
3 C9
Z1
14
BK
G301
(8W-15-9)
A
BRAKE WARNING PRESSURE SWITCH
B
Z1
20
BK
S101
(8W-15-3)
Z13
14
BK/RD
G102
(8W-15-3)
BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
66
FUSE
4
20A
(8W-10-5)
56
A7
16
RD/BK
1 C3
JUNCTION BLOCK
(8W-12-3)
(8W-10-5)
2 C2
A7
16
RD/BK
6
STOP LAMP SWITCH
(8W-33-3)
5
L50
16
WT/TN
3 C2
JUNCTION BLOCK
(8W-12-3)
(8W-12-17)
1 C2
L50
18
WT/BR
14
13
RED BRAKE WARNING LAMP DRIVER
STOP LAMP SWITCH OUTPUT
CONTROLLER ANTI-LOCK BRAKE

8W-35 ANTI-LOCK BRAKES

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DESCRIPTION AND OPERATION

ANTI-LOCK BRAKES

There are two Anti-Lock Brake Systems (ABS) used in this vehicle.. One is the standard system and the other is equipped with traction control.

Power for either of the Anti-Lock Brake (ABS) system is supplied by three fuses. There is a 15 amp fuse located in the junction block cavity 4. This fuse supplies power to the ABS controller, Powertrain Control Module (PCM) and the fuel pump relay on the F20 circuit. Power for the fuse is supplied on the A22 circuit from the ignition switch. This fuse is HOT when the ignition switch is in the RUN position.

The second fuse is located in the PDC cavity 19. It is a 40 amp fuse and used to supply power to the ABS Pump Motor relay on circuit A10. This relay is located in the ABS relay box. The fuse is HOT at all times and powers the contact side of the relay.

The third fuse is also located in the PDC cavity 2. It is a 20 amp fuse and used to power the contact side of the ABS System relay on circuit A20. The fuse is HOT at all times.

There are 3 grounding points used in the ABS system. One is a case ground on the Controller Anti Lock Brake (CAB). The second is on the Z1 circuit from the ABS Hydraulic Control Unit/ABS Relay Box. This ground terminates at the right frame rail.

The third ground is also on the a Z1 circuit from the CAB and terminates at the right frame rail.

Additional information on circuit functions of the ABS system follows. For diagnostic and testing procedures refer to the appropriate group of the Service Manual or the Diagnostic Test Procedures Manual.

ABS WARNING LAMP

The ABS warning lamp is controlled by the Controller Anti Lock Brake (CAB) and/or the Hydraulic control unit. It is used to alert the operator of a problem in the ABS system. The G19 circuit from the CAB and the ABS system relay is used to detect a problem. If a problem is detected, the CAB grounds the G19 circuit and illuminates the lamp in the instrument cluster.

Circuit G19 is also grounded through the ABS system relay, contact side.

ABS SYSTEM RELAY

The system relay is used for the operation of the ABS system. Power for the relay is supplied on the B57 circuit from cavity 57 of the Controller Anti Lock Brake (CAB).

Ground for the relay is on the Z1 circuit. This ground is spliced in with the pump motor, and terminates at the right strut tower.

When the system is operating normally, power for the contact side of the relay is supplied from the CAB on the B57 circuit. It passes through the relay to the Z1 ground and terminates at the right frame rail. If a problem is detected in the system, the relayis de-energized by circuit B57. This causes the ABS warning lamp in the instrument cluster to illuminate.

ABS PUMP MOTOR RELAY

The ABS pump motor relay controls when the pump motor runs. Power for the coil side of the relay is supplied from cavity 47 of the Controller Anti Lock Brake (CAB) on the B120 circuit. This circuit also supplies voltage for the contact side of the system relay. The ground side of the coil is controlled by the B116 circuit. Circuit B116 connects to cavity 16 of the CAB connector.

Circuit B10 from the relay box powers the ABS pump motor. This circuit is also used as an input to the CAB for pump motor monitoring.

HYDRAULIC MODULATOR

The hydraulic modulator is used for controlling the brake system pressure to the wheels. The modulator is composed of four solenoids.

Circuits involved are: B142 for the left front wheel, B143 for the right front wheel, B146 for the left rear wheel, and B148 for the right rear wheel.

DESCRIPTION AND OPERATION (Continued)

The solenoids use a common ground on the Z1 circuit. There are two Z1 circuits from the modulator. Both of these grounds terminate at the right frame rail, and are spliced in with the ABS pump motor and the ABS system relay.

WHEEL SPEED SENSORS

There are four wheel-speed sensors, one at each wheel. The sensors use a tone wheel to determine wheel speed. Input to the Controller Anti Lock Brakes (CAB) is done on the following circuits, each of which is a twisted pair:

B8 and B9 for the left front wheel (cavity 8 and cavity 9).

B6 and B7 for the right front wheel (cavity 6 and cavity 7).

B3 and B4 for the left rear wheel (cavity 3 and cavity 4).

B1 and B2 for the right rear wheel (cavity 1 and cavity 2).

BRAKE SWITCH INPUT

Circuit L50 is an input to the Controller Anti Lock Brake (CAB). The L50 connects to cavity 13 of the CAB connector. Circuit L50 is spliced in with the stop lamps, and is used to provide the CAB with information on when the brakes are being applied.

DATA LINK CONNECTOR

Circuit D21 is used for diagnostics of a fault within the ABS system. It is spliced in with the Powertrain Control Module (PCM) circuits, and is used as an output from the Controller Anti Lock Brake (CAB). Circuit D21 connects to cavity 51 of the CAB connector.

HELPFUL INFORMATION

- Check the 10 amp fuse located in cavity 10 of the PDC
- Check the 40 amp fuse located in cavity 13 of the PDC
- Check the 20 amp fuse located in cavity 2 of the PDC
- Check for a good ground at the right strut tower
- Check the case ground on the CAB
- Refer to the appropriate group of the Service Manual, or the Diagnostic Test Procedures Manual.

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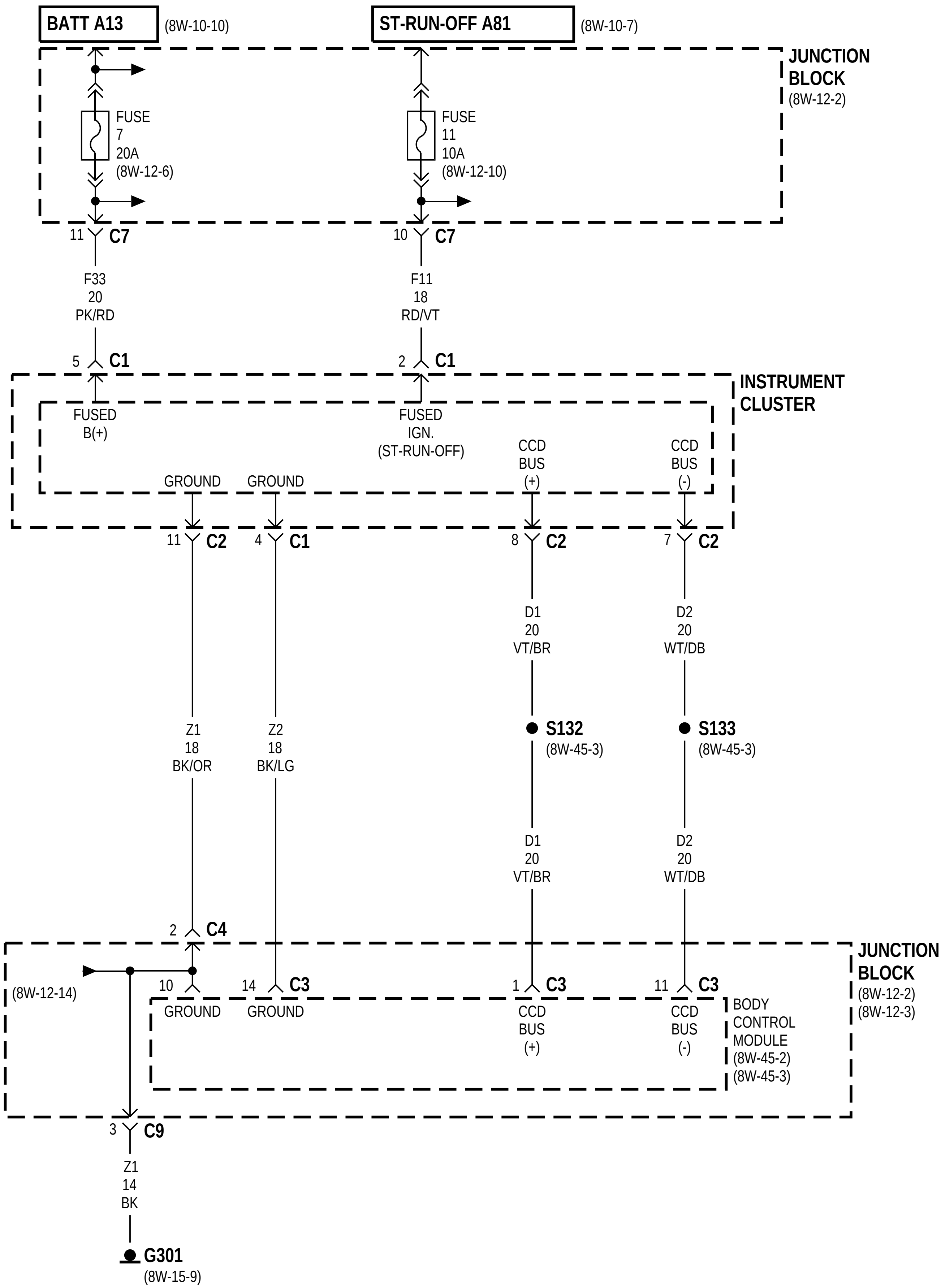
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(8W-10-10)
ST-RUN-OFF A81
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE 7 20A (8W-12-6)
FUSE 11 10A (8W-12-10)
11 C7
10 C7
F33 20 PK/RD
F11 18 RD/VT
5 C1
2 C1
INSTRUMENT CLUSTER
FUSED B(+)
FUSED IGN. (ST-RUN-OFF)
CCD BUS (+)
CCD BUS (-)
GROUND
GROUND
11 C2
4 C1
8 C2
7 C2
D1 20 VT/BR
D2 20 WT/DB
Z1 18 BK/OR
Z2 18 BK/LG
S132 (8W-45-3)
S133 (8W-45-3)
D1 20 VT/BR
D2 20 WT/DB
2 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
(8W-12-14)
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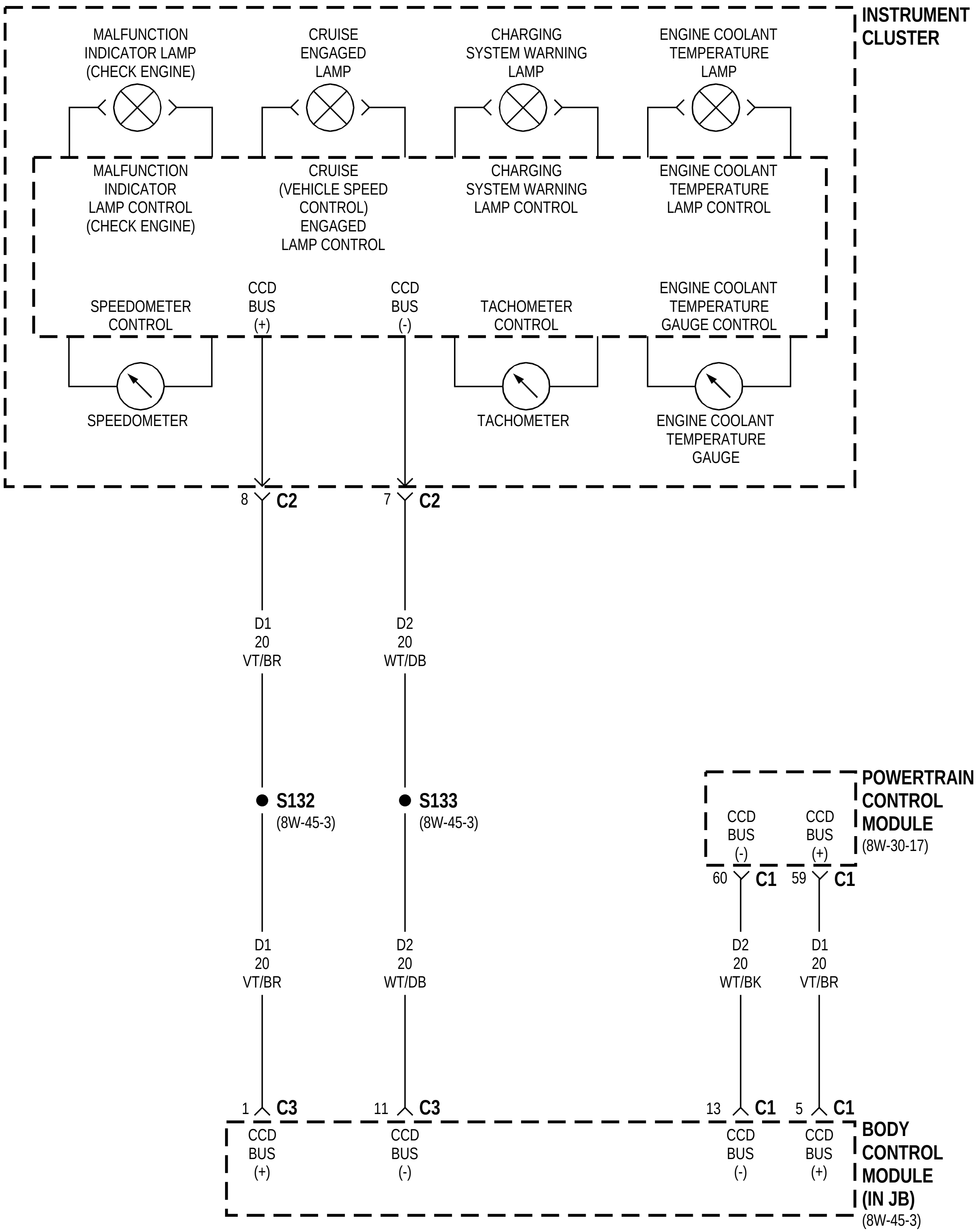
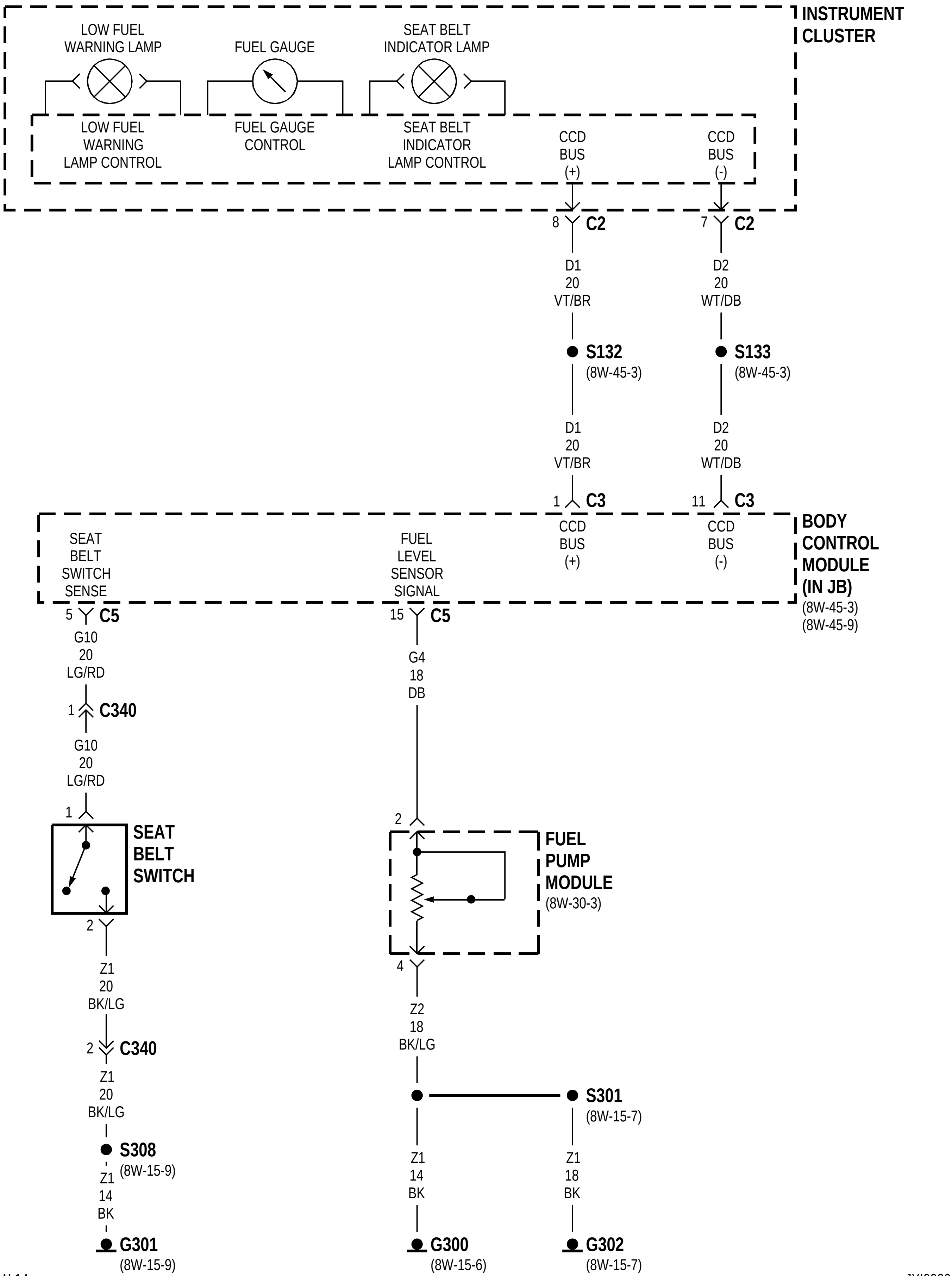
14 C3
1 C3
11 C3
GROUND
GROUND
CCD BUS (+)
CCD BUS (-)
BODY CONTROL MODULE
(8W-45-2)
(8W-45-3)
3 C9
Z1 14 BK
G301
(8W-15-9)


INSTRUMENT CLUSTER
MALFUNCTION INDICATOR LAMP (CHECK ENGINE)
CRUISE ENGAGED LAMP
CHARGING SYSTEM WARNING LAMP
ENGINE COOLANT TEMPERATURE LAMP
MALFUNCTION INDICATOR LAMP CONTROL (CHECK ENGINE)
CRUISE (VEHICLE SPEED CONTROL) ENGAGED LAMP CONTROL
CHARGING SYSTEM WARNING LAMP CONTROL
ENGINE COOLANT TEMPERATURE LAMP CONTROL
SPEEDOMETER CONTROL
CCD BUS (+)
CCD BUS (-)
TACHOMETER CONTROL
ENGINE COOLANT TEMPERATURE GAUGE CONTROL
SPEEDOMETER
TACHOMETER
ENGINE COOLANT TEMPERATURE GAUGE
8 C2
7 C2
D1 20 VT/BR
D2 20 WT/DB
S132 (8W-45-3)
S133 (8W-45-3)
POWERTRAIN CONTROL MODULE (8W-30-17)
CCD BUS (-)
CCD BUS (+)
60 C1
59 C1
D1 20 VT/BR
D2 20 WT/DB
D2 20 WT/BK
D1 20 VT/BR
1 C3
11 C3
13 C1
5 C1
CCD BUS (+)
CCD BUS (-)
CCD BUS (-)
CCD BUS (+)
BODY CONTROL MODULE (IN JB) (8W-45-3)


INSTRUMENT CLUSTER
LOW FUEL WARNING LAMP
FUEL GAUGE
SEAT BELT INDICATOR LAMP
LOW FUEL WARNING LAMP CONTROL
FUEL GAUGE CONTROL
SEAT BELT INDICATOR LAMP CONTROL
CCD BUS (+)
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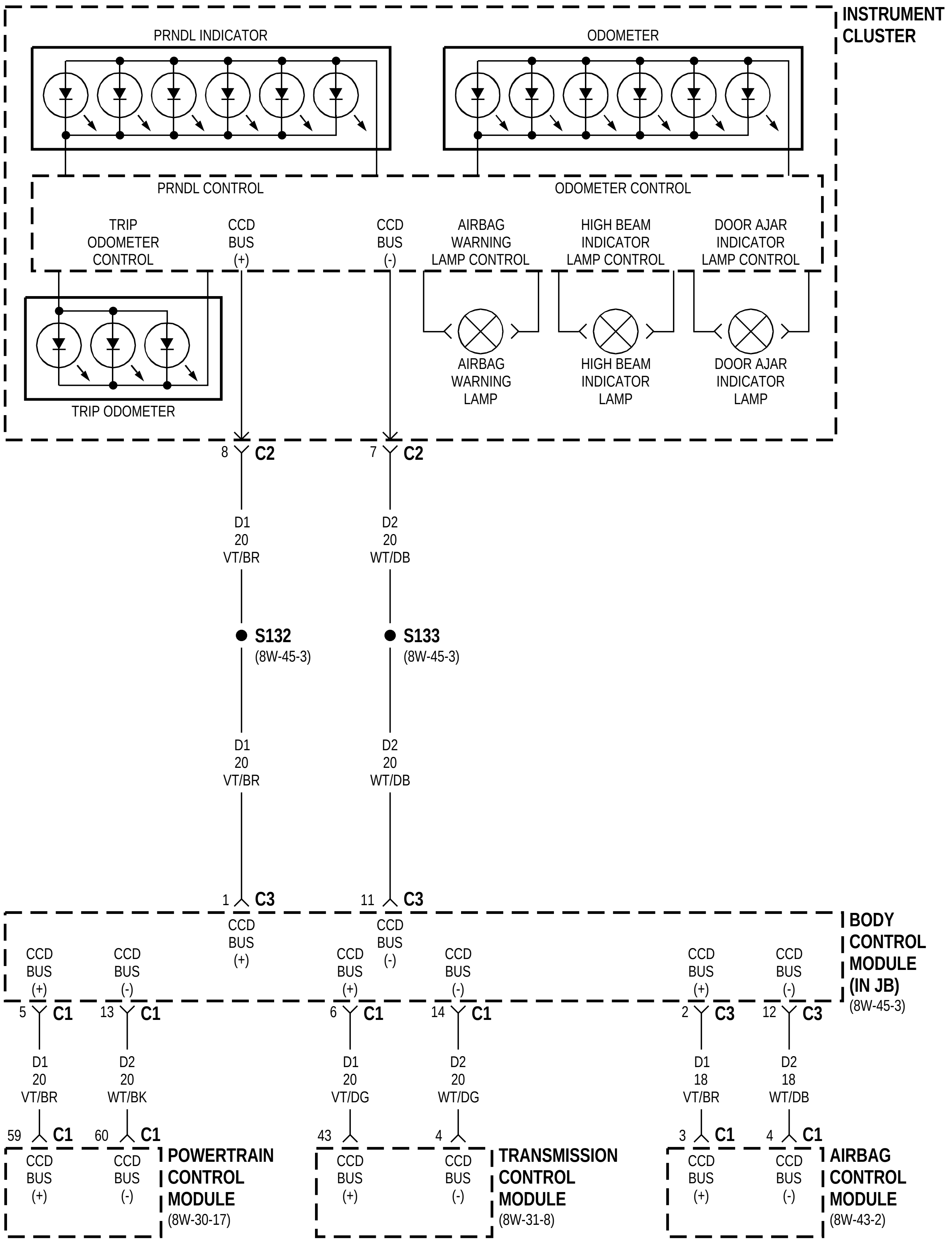
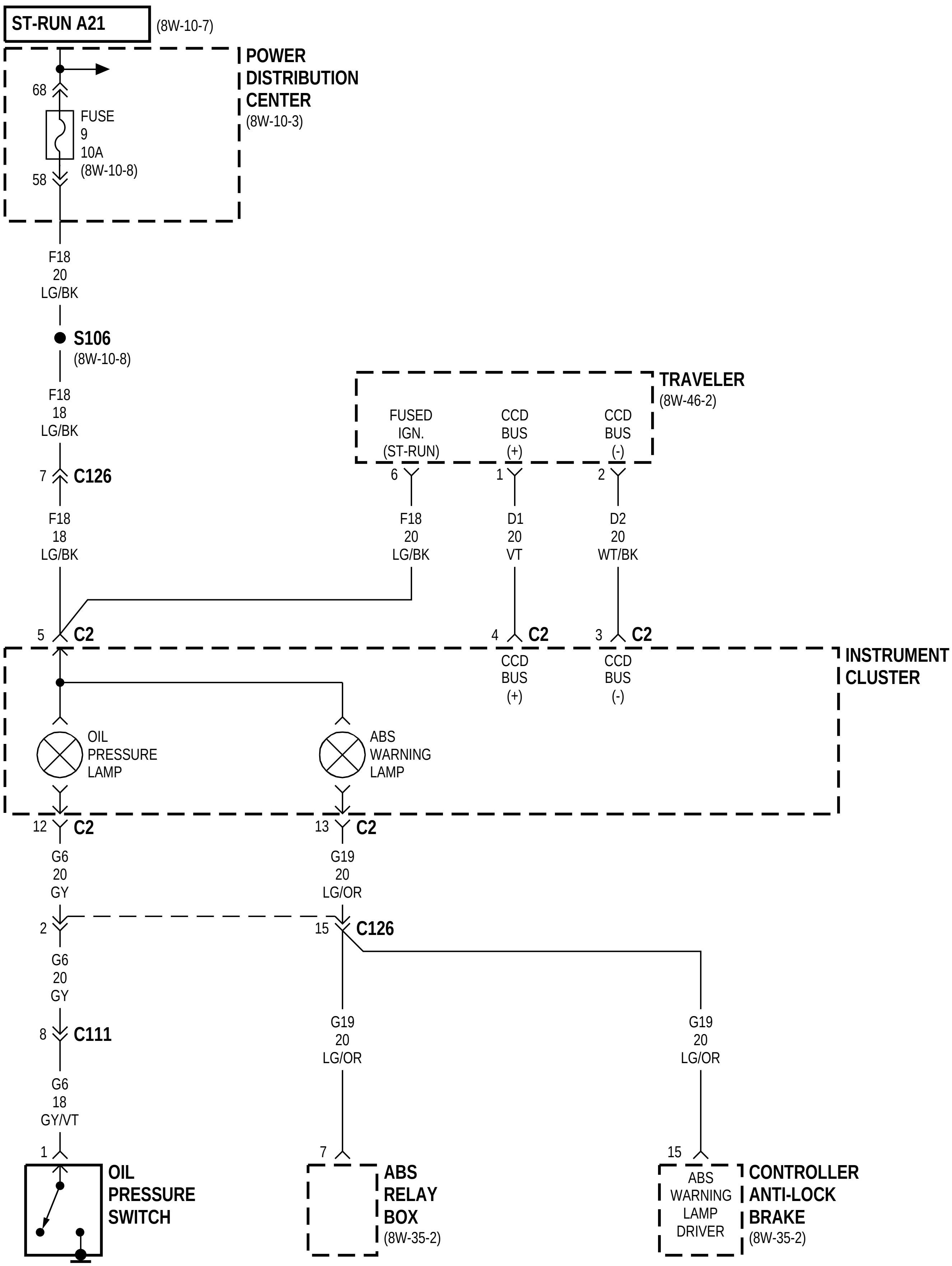
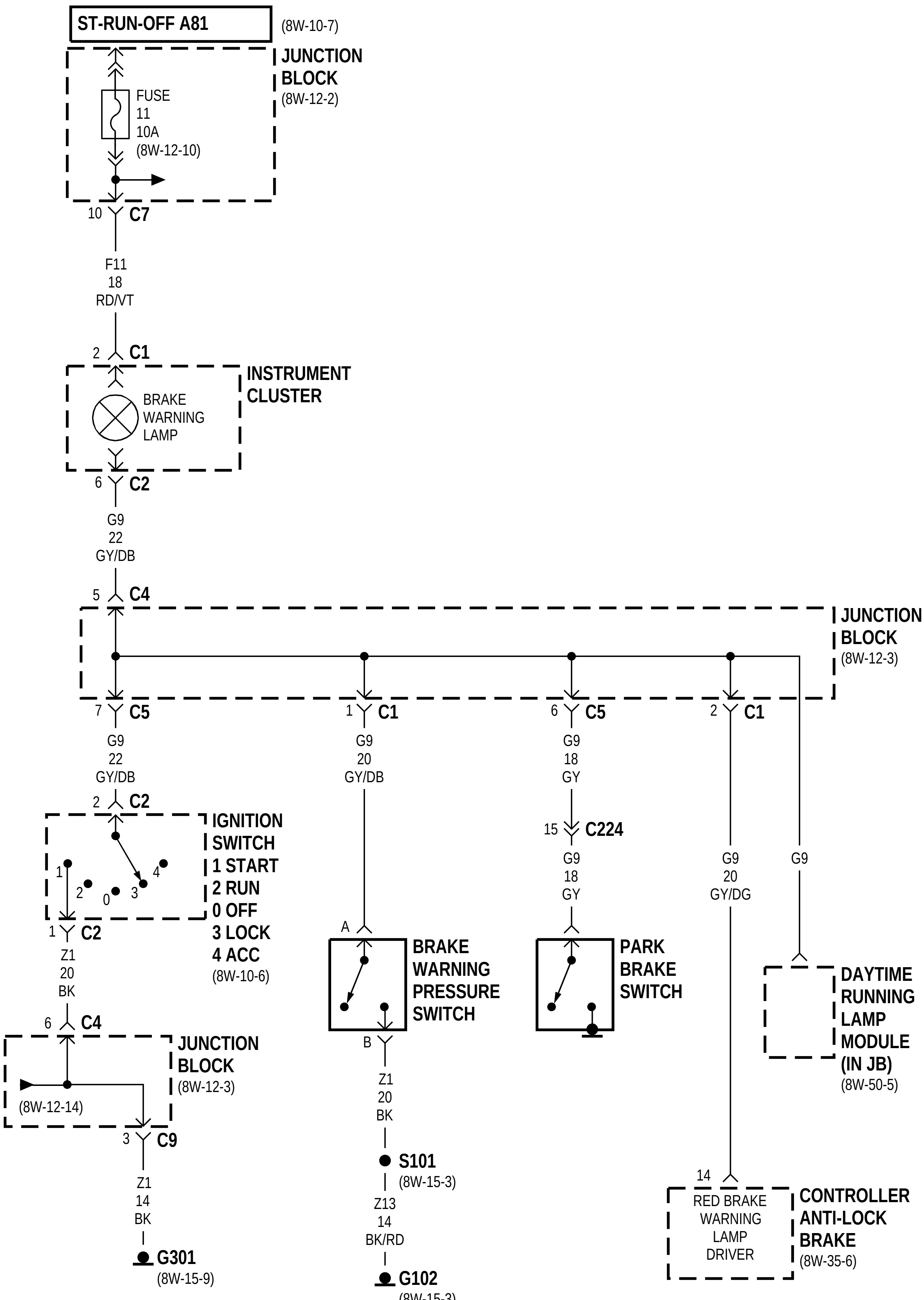
8 C2
7 C2
D1 20 VT/BR
D2 20 WT/DB
S132 (8W-45-3)
S133 (8W-45-3)
D1 20 VT/BR
D2 20 WT/DB
1 C3
11 C3
BODY CONTROL MODULE (IN JB) (8W-45-3) (8W-45-9)
SEAT BELT SWITCH SENSE
FUEL LEVEL SENSOR SIGNAL
CCD BUS (+)
CCD BUS (-)
5 C5
15 C5
G10 20 LG/RD
1 C340
G10 20 LG/RD
1
SEAT BELT SWITCH
2
Z1 20 BK/LG
2 C340
Z1 20 BK/LG
S308 (8W-15-9)
Z1 14 BK
G301 (8W-15-9)
G4 18 DB
2
FUEL PUMP MODULE (8W-30-3)
4
Z2 18 BK/LG
S301 (8W-15-7)
Z1 14 BK
Z1 18 BK
G300 (8W-15-6)
G302 (8W-15-7)


INSTRUMENT CLUSTER
PRNDL INDICATOR
ODOMETER
PRNDL CONTROL
ODOMETER CONTROL
TRIP ODOMETER CONTROL
CCD BUS (+)
CCD BUS (-)
AIRBAG WARNING LAMP CONTROL
HIGH BEAM INDICATOR LAMP CONTROL
DOOR AJAR INDICATOR LAMP CONTROL
TRIP ODOMETER
AIRBAG WARNING LAMP
HIGH BEAM INDICATOR LAMP
DOOR AJAR INDICATOR LAMP
8 C2
7 C2
D1 20 VT/BR
D2 20 WT/DB
S132 (8W-45-3)
S133 (8W-45-3)
D1 20 VT/BR
D2 20 WT/DB
1 C3
11 C3
CCD BUS (+)
CCD BUS (-)
BODY CONTROL MODULE (IN JB) (8W-45-3)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
5 C1
13 C1
6 C1
14 C1
2 C3
12 C3
D1 20 VT/BR
D2 20 WT/BK
D1 20 VT/DG
D2 20 WT/DG
D1 18 VT/BR
D2 18 WT/DB
59 C1
60 C1
43
4
3 C1
4 C1
CCD BUS (+)
CCD BUS (-)
POWERTRAIN CONTROL MODULE (8W-30-17)
CCD BUS (+)
CCD BUS (-)
TRANSMISSION CONTROL MODULE (8W-31-8)
CCD BUS (+)
CCD BUS (-)
AIRBAG CONTROL MODULE (8W-43-2)


ST-RUN A21
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
68
FUSE
9
10A
(8W-10-8)
58
F18
20
LG/BK
S106
(8W-10-8)
F18
18
LG/BK
7
C126
F18
18
LG/BK
TRAVELER
(8W-46-2)
FUSED
IGN.
(ST-RUN)
CCD
BUS
(+)
CCD
BUS
(-)
6
1
2
F18
20
LG/BK
D1
20
VT
D2
20
WT/BK
5
C2
4
C2
3
C2
CCD
BUS
(+)
CCD
BUS
(-)
INSTRUMENT
CLUSTER
OIL
PRESSURE
LAMP
ABS
WARNING
LAMP
12
C2
13
C2
G6
20
GY
G19
20
LG/OR
2
15
C126
G6
20
GY
8
C111
G19
20
LG/OR
G19
20
LG/OR
G6
18
GY/VT
1
7
15
OIL
PRESSURE
SWITCH
ABS
RELAY
BOX
(8W-35-2)
ABS
WARNING
LAMP
DRIVER
CONTROLLER
ANTI-LOCK
BRAKE
(8W-35-2)


ST-RUN-OFF A81
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-10)
10 C7
F11
18
RD/VT
2 C1
INSTRUMENT CLUSTER
BRAKE WARNING LAMP
6 C2
G9
22
GY/DB
5 C4
JUNCTION BLOCK
(8W-12-3)
7 C5
G9
22
GY/DB
1 C1
G9
20
GY/DB
6 C5
G9
18
GY
2 C1
2 C2
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-6)
1 C2
Z1
20
BK
6 C4
JUNCTION BLOCK
(8W-12-3)
(8W-12-14)
3 C9
Z1
14
BK
G301
(8W-15-9)
A
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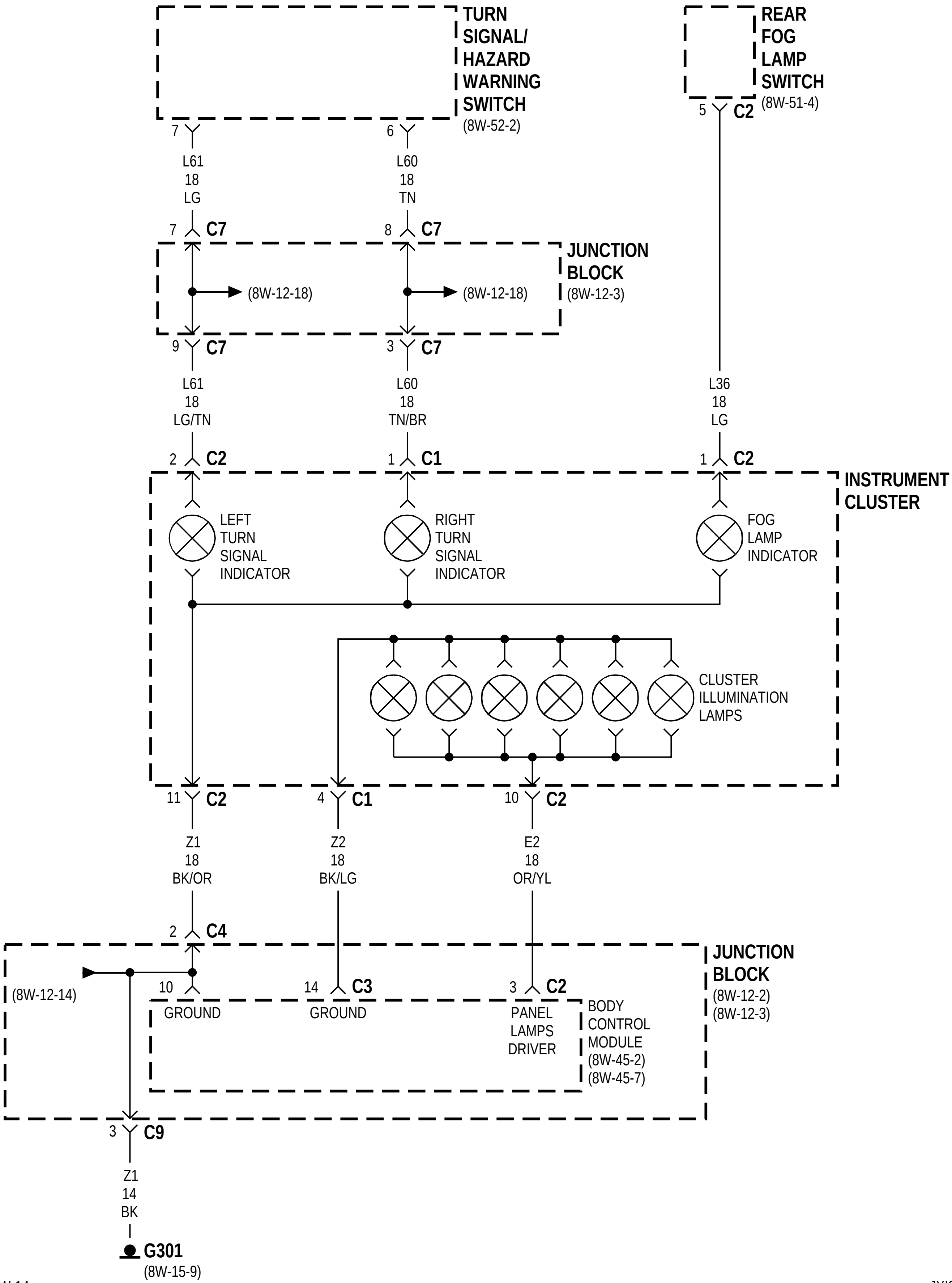
B
Z1
20
BK
S101
(8W-15-3)
Z13
14
BK/RD
G102
(8W-15-3)
15 C224
G9
18
GY
PARK BRAKE SWITCH
G9
20
GY/DG
G9
DAYTIME RUNNING LAMP MODULE (IN JB)
(8W-50-5)
14
RED BRAKE WARNING LAMP DRIVER
CONTROLLER ANTI-LOCK BRAKE
(8W-35-6)


TURN SIGNAL/ HAZARD WARNING SWITCH
(8W-52-2)
7
6
L61 18 LG
L60 18 TN
REAR FOG LAMP SWITCH
(8W-51-4)
5 C2
7 C7
8 C7
JUNCTION BLOCK
(8W-12-3)
(8W-12-18)
(8W-12-18)
9 C7
3 C7
L61 18 LG/TN
L60 18 TN/BR
L36 18 LG
2 C2
1 C1
1 C2
INSTRUMENT CLUSTER
LEFT TURN SIGNAL INDICATOR
RIGHT TURN SIGNAL INDICATOR
FOG LAMP INDICATOR
CLUSTER ILLUMINATION LAMPS
11 C2
4 C1
10 C2
Z1 18 BK/OR
Z2 18 BK/LG
E2 18 OR/YL
2 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
(8W-12-14)
10
GROUND
14 C3
GROUND
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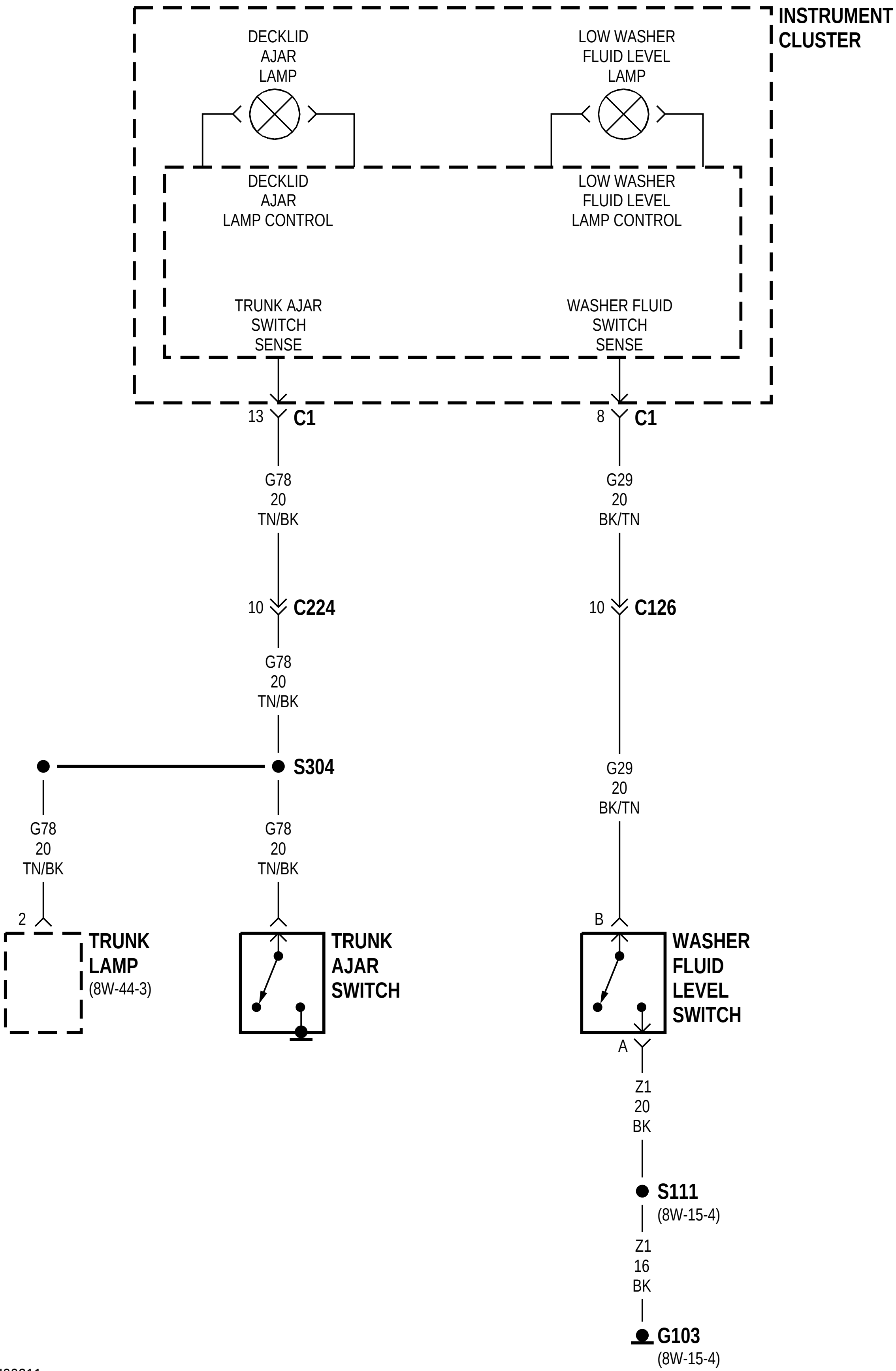
BODY CONTROL MODULE
(8W-45-2)
(8W-45-7)
3 C9
Z1 14 BK
G301
(8W-15-9)


INSTRUMENT CLUSTER
DECKLID AJAR LAMP
LOW WASHER FLUID LEVEL LAMP
DECKLID AJAR LAMP CONTROL
LOW WASHER FLUID LEVEL LAMP CONTROL
TRUNK AJAR SWITCH SENSE
WASHER FLUID SWITCH SENSE
13 C1
8 C1
G78 20 TN/BK
G29 20 BK/TN
10 C224
10 C126
G78 20 TN/BK
S304
G29 20 BK/TN
G78 20 TN/BK
G78 20 TN/BK
2
TRUNK LAMP (8W-44-3)
TRUNK AJAR SWITCH
B
WASHER FLUID LEVEL SWITCH
A
Z1 20 BK
S111 (8W-15-4)
Z1 16 BK
G103 (8W-15-4)

8W-40 INSTRUMENT CLUSTER

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DESCRIPTION AND OPERATION

INSTRUMENT CLUSTER

The Instrument Cluster, located on the left side of the instrument panel, provides the operator with gauges and warning lamps indicating vehicle operation. All gauges, regardless of engine type, are driven by the CCD Bus from the Body Control Module (BCM).

The indicator lamps for the Seat Belt, Charging System, Vehicle Speed Control (Cruise), Airbag, Check Engine (Malfunction Indicator Lamp), Low Fuel, High Beam, Traction Control Active, Traction Control Off, and Engine Coolant Temperature are also driven by the BCM.

Battery voltage for the instrument cluster is provided from two different sources. One is the F33 circuit which supplies battery voltage for the cluster. This circuit is protected by 20 amp fuse and located in cavity 7 of the junction block. Power for the fuse is supplied by circuit A13. This fuse is HOT at all times and protected by a 40 amp fuse located in cavity 12 of the Power Distribution Center (PDC). Circuit A13 also supplies power to the fuses for the horns, and the cigar lighter.

The second power source for the cluster is the F11 circuit. This circuit is HOT in the OFF, START, and RUN positions. The F11 circuit is protected by a 10 amp fuse located in cavity 11 of the junction block.

Illumination lamps, internal to the cluster, receive battery voltage on the E2 circuit. This circuit originates in the BCM and lamp intensity is controlled by the BCM. Ground for the lamps is provided on the Z1 circuit and terminates at the instrument panel left side cowl.

CCD BUS

The CCD Bus is used to supply all of the communications between the Body Control Module (BCM) and the instrument cluster. The bus wires are a twisted pair. There are two different circuits used for the bus.

The positive side of the bus wire is accomplished on the D1 circuit, and the negative is on the D2 circuit.

SPEEDOMETER

The speedometer receives its information across the CCD Bus from the Body Control Module (BCM). Information on vehicle speed is transmitted from the Powertrain Control Module (PCM) across the CCD Bus to the BCM.

The PCM receives its information on vehicle speed on the G7 circuit from the Transmission Control Module (TCM) on automatic transmission vehicles.

The BCM calculates the position of the speedometer pointer based on the input from the PCM and adjusts the position of the gauge pointer as necessary. This signal is sent over the CCD Bus to the instrument cluster.

TACHOMETER

The tachometer receives its information across the CCD Bus from the Body Control Module (BCM). Information on engine RPM is transmitted from the Powertrain Control Module (PCM) across the CCD Bus to the BCM. The BCM calculates the position of

DESCRIPTION AND OPERATION (Continued)

the tachometer pointer based on the input from the PCM and adjusts the position of the gauge pointer to the necessary position. This signal is sent over the CCD Bus to the instrument cluster.

ENGINE COOLANT TEMPERATURE GAUGE

The engine coolant temperature gauge receives its information across the CCD Bus from the Body Control Module (BCM). The engine coolant temperature sensor uses a variable resistor to send a signal to the Powertrain Control Module (PCM) indicating coolant temperature. The PCM then sends this information to the BCM across the CCD Bus.

The BCM calculates the position of the engine coolant temperature gauge and based on the information received from the PCM it adjusts the position of the gauge pointer. This signal is sent over the CCD Bus to the instrument cluster.

FUEL GAUGE

The Body Control Module (BCM) calculates the pointer position of the fuel gauge based on the input of the fuel tank gauge level sending unit relative to fuel tank ground. The G4 circuit sends the signal to the BCM.

The fuel pump module, located in the fuel tank, contains the fuel pump and the variable resistor for the fuel gauge. Ground for the resistor is located on the left rear quarter panel. As the position of the float arm changes, the resistor changes the current flow through the G4 circuit. The change in current flow is then measured by the BCM and pointer position is adjusted to reflect the fuel tank level. The signal is sent over the CCD Bus to the instrument cluster.

PRNDL (Electronic)

On vehicles equipped with an automatic transmission an electronic PRNDL is used to indicate to the operator gearshift position.

When the ignition switch is in the OFF (unlock), RUN, or START position the Body Control Module (BCM) transmits a message over the CCD Bus instructing the instrument cluster to illuminate the proper display.

The BCM receives its information over the CCD Bus from the Transmission Control Module (TCM). When the ignition switch is moved to the RUN position, the BCM instructs the instrument cluster to illuminate all segments of the PRNDL as a check.

ODOMETER

The Odometer function of the instrument cluster is controlled by the Body Control Module (BCM). To calculate the proper milage for the vehicle the BCM receives information from the Powertrain Control Module (PCM) and the Transmission Control Module (TCM) over the CCD Bus. It then calculates this information and sends the proper signal over the CCD Bus to the instrument cluster.

TRIP ODOMETER

The trip odometer function of the instrument cluster is controlled by the Body Control Module (BCM). All information is sent across the CCD Bus.

CHECK ENGINE (MALFUNCTION INDICATOR) LAMP

The check engine lamp is used to indicate to the operator a problem in the engine control system. If a problem is detected, the Powertrain Control Module (PCM) sends a message, over the CCD Bus, to the Body Control Module (BCM).

The BCM interprets this message and sends a signal to the instrument cluster to illuminate the lamp. This lamp also is illuminated, for a few seconds, when the ignition switch is moved from the OFF to the RUN position as a bulb check. The bulb check operation is controlled by the PCM.

SEAT BELT INDICATOR

The fasten seat belt indicator is used with the warning chime to tell the operator to fasten the seat belt. The seat belt switch is normally OPEN when the seat belt is buckled.

If the seat belt is not buckled, the switch CLOSES, and a ground path is completed on the G10 circuit to the Z1 circuit. The G10 circuit is connected to the Body Control Module (BCM). When the ground path is complete a signal is sent over the CCD Bus to the instrument cluster. This illuminates the lamp in the instrument cluster.

When the ignition switch is moved to the START position, the lamp is illuminated as a bulb check. Logic internal to the BCM determines the length of time the lamp remains illuminated.

DECK LID AJAR LAMP

The deck lid ajar lamp is used to indicate to the operator when the deck lid is ajar.

Power for the lamp is supplied by the ground side of the trunk lamp on circuit G78.

When the deck lid is ajar, battery voltage flows through the trunk lamp on circuit M1, to circuit G78, through the CLOSED deck lid ajar switch to ground.

Power for the trunk lamp is supplied on circuit M1. This is the Ignition-Off Draw (IOD) circuit, and is protected by a 10 amp fuse located in cavity 5 of the junction block.

CHARGING SYSTEM WARNING LAMP

The charging system lamp is used to alert the operator that the charging system voltage has risen

DESCRIPTION AND OPERATION (Continued)

above or fallen below the normal operating range. When the Powertrain Control Module (PCM) determines a problem, a message is sent across the CCD Bus to the Body Control Module (BCM).

The BCM processes this message and sends a signal on the CCD Bus to the instrument cluster for lamp illumination. This lamp also is illuminated, for a few seconds, when the ignition switch is moved from the OFF to the RUN position as a bulb check.

ENGINE COOLANT TEMPERATURE LAMP

The engine coolant temperature lamp is used to alert the operator that the coolant temperature has risen above the normal operating range. When the Powertrain Control Module (PCM) determines a problem, a message is sent across the CCD Bus to the Body Control Module (BCM).

The PCM receives coolant temperature information from the engine coolant temperature sensor. This sensor uses a variable resistor to send a signal to the PCM indicating engine coolant temperature.

The BCM processes this message and sends a signal on the CCD Bus to the instrument cluster for lamp illumination. This lamp also is illuminated, for a few seconds, when the ignition switch is moved from the OFF to the RUN position as a bulb check.

CRUISE (VEHICLE SPEED CONTROL) ENGAGED LAMP

The CRUISE lamp is used to indicate to the operator when the vehicle speed control is engaged. The signal to illuminate the lamp is carried over the CCD Bus from the Body Control Module (BCM).

The BCM receives information on vehicle speed control engagement from the PCM over the CCD Bus. This lamp also is illuminated, for a few seconds, when the ignition switch is moved from the OFF to the RUN position as a bulb check. The bulb check operation is controlled by the PCM.

AIRBAG WARNING LAMP

Illumination of the Airbag warning lamp is controlled by the Body Control Module (BCM) and the CCD Bus. When the Airbag Control Module (ACM) detects a problem in the system it sends a signal on the CCD Bus to the BCM. The BCM process the signal and illuminates the AIRBAG lamp in the instrument cluster.

OIL PRESSURE LAMP

The low oil pressure lamp is used to alert the operator that engine oil pressure has dropped below a predetermined pressure. The oil pressure switch uses a switch that CLOSES when the pressure is below the predetermined level. The switch is case grounded to the engine block.

Power for the lamp is supplied on the F18 circuit. This circuit also powers the Anti-Lock lamp, located internal to the cluster, high speed fan relay, A/C Clutch relay, and the Powertrain Control Module (PCM). This circuit is protected by a 10 amp fuse located in cavity 9 of the Power Distribution Center (PDC).

The ground side of the lamp is controlled by the G6 circuit. This circuit is connected from the instrument cluster to the engine oil pressure switch.

RIGHT AND LEFT TURN SIGNAL INDICATORS

These lamps are used to indicate to the operator which turn signal is ON. Power for the lamps is supplied from the turn signal switch. The L60 circuit is used for the right turn indicator, and the L61 is used for the left turn indicator.

Ground for the lamps is provided on the Z1 circuit and terminates at the instrument panel left side cowl panel.

BRAKE WARNING LAMP

The brake warning lamp is used to alert the operator of a problem in the vehicles braking system. This lamp also illuminates when the ignition switch is turned to the START position to perform a self check.

Power for the lamp is supplied on circuit F11. This circuit is HOT when the ignition switch is in the OFF, START, and RUN positions. The F11 circuit is protected by a 10 amp fuse located in cavity 11 of the junction block.

There are two switches used in this system and they are wired in parallel form. A parking brake switch, located on the parking brake mechanism, will illuminate the lamp if the normally OPEN switch is CLOSED. This switch is case grounded.

The second switch used is the brake warning lamp switch. This switch in normally OPEN. When the brake system pressure is below the predetermined level the switch CLOSES and completes a path to ground.

The G9 circuit is used to connect the switches to the cluster. Grounding for the brake warning lamp switch is completed on the Z1 circuit which terminates at the left strut tower.

If the vehicle is built for sale in Canada the parking brake switch is used for the Daytime Running Lamp (DRL) system. For further information on the DRL refer to Section 8W-50.

ABS WARNING LAMP

The ABS warning lamp is controlled by the Controller Anti Lock Brake (CAB) and/or the Hydraulic control unit. It is used to alert the operator of a problem in the ABS system. The G19 circuit from the

DESCRIPTION AND OPERATION (Continued)

CAB and the ABS system relay is used to detect a problem. If a problem is detected, the CAB grounds the G19 circuit and illuminates the lamp in the instrument cluster.

Circuit G19 is also grounded through the ABS system relay, contact side.

REAR FOG LAMP ON INDICATOR

On vehicles equipped with optional Fog Lamps, a lamp internal to the cluster is illuminated when the system is turned ON. The lamp is powered by the fog lamp switch on circuit L36. Ground for the lamp is provided on the Z1 circuit and terminates at the instrument panel left side cowl.

For additional information on fog lamp operation refer to section 8W-51.

LOW FUEL WARNING LAMP

When the Body Control Module (BCM) detects a low fuel condition based on the fuel level sensor input, it transmits a message across the CCD Bus to the instrument cluster to illuminate the low fuel lamp.

LOW WASHER FLUID LAMP

The low washer fluid lamp is used to alert the operator that the washer fluid level is below a predetermined level. Power for the switch is supplied on circuit G29 from the instrument cluster.

When the washer fluid level is low, the switch CLOSES completing a path to ground through the switch, illuminating the lamp.

HIGH BEAM INDICATOR LAMP

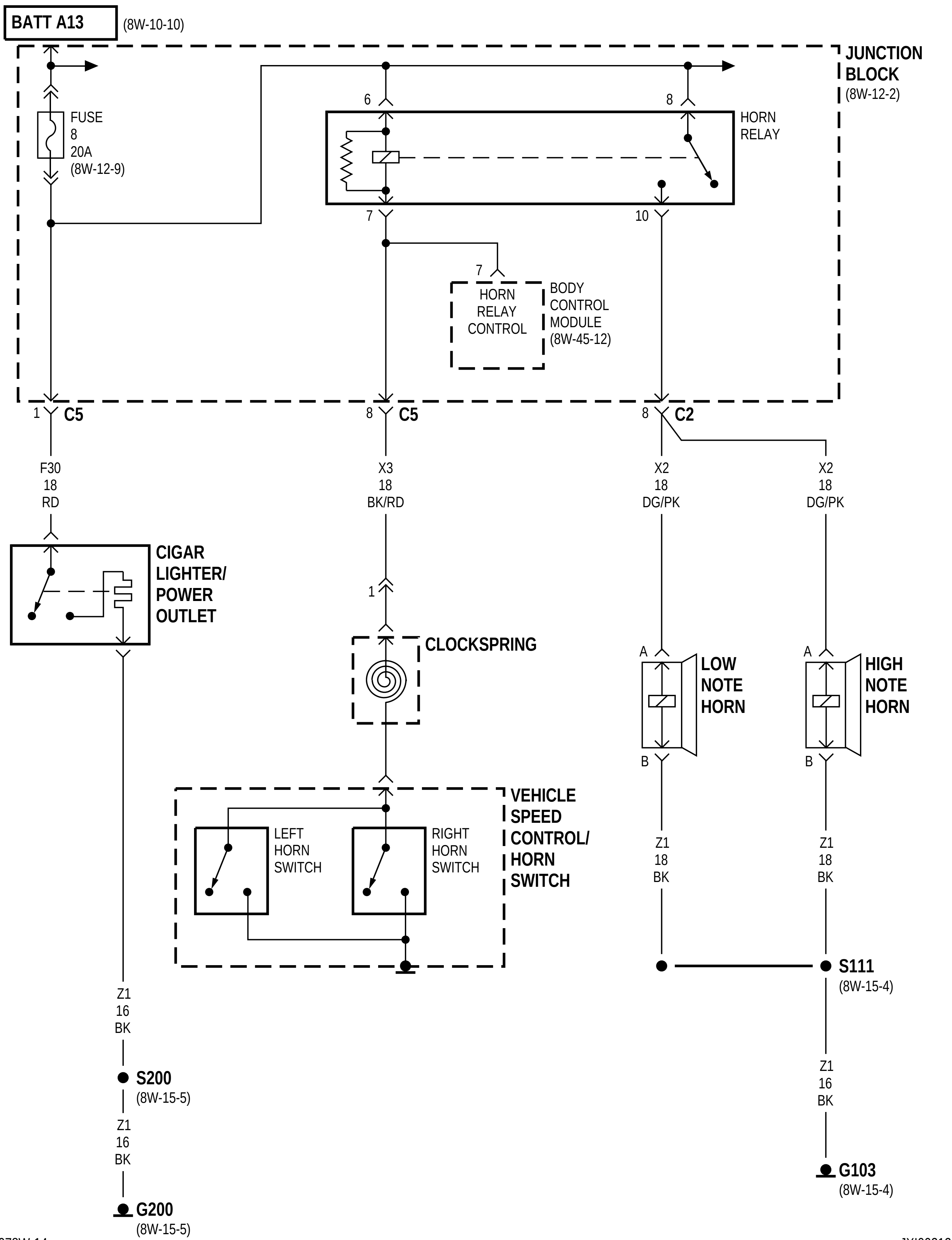
Operation of the high beam indicator lamp is controlled by the Body Control Module (BCM). The BCM receives a high beam ON signal from the headlamp switch and sends a message over the CCD bus to the instrument cluster for lamp illumination.

HELPFUL INFORMATION

- Check the 10 amp fuse located in cavity 9 of the PDC.
- Check the 20 amp fuse located in cavity 7 of the junction block.
- Check the 10 amp fuse located in cavity 11 of the junction block.
- Check for a good ground at the instrument panel left side cowl.
- For additional diagnostic test, refer to the appropriate group of the Service Manual or the Diagnostic Test Procedures Manual.

8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

INDEX


BATT A13
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
8
20A
(8W-12-9)
6
8
HORN RELAY
7
10
7
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-12)
1
C5
8
C5
8
C2
F30
18
RD
X3
18
BK/RD
X2
18
DG/PK
X2
18
DG/PK
CIGAR LIGHTER/ POWER OUTLET
1
CLOCKSPRING
A
LOW NOTE HORN
A
HIGH NOTE HORN
B
B
VEHICLE SPEED CONTROL/ HORN SWITCH
LEFT HORN SWITCH
RIGHT HORN SWITCH
Z1
18
BK
Z1
18
BK
S111
(8W-15-4)
Z1
16
BK
S200
(8W-15-5)
Z1
16
BK
Z1
16
BK
G103
(8W-15-4)
G200
(8W-15-5)

8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

DESCRIPTION AND OPERATION

HORNS

The horn system is powered by a 20 amp fuse located in cavity 8 of the junction block. The fuse is HOT at all times on circuit F30. This circuit supplies voltage to the coil and to the contact side of the horn relay. Circuit F30 is spliced internal to the junction block and supplies voltage to the cigar lighter/power outlet and the power amplifier.

Power for the fuse is supplied on circuit A13 which originates in the Power Distribution Center (PDC) and is protected by a 40 amp fuse located in cavity 14.

When the operator presses the horn switch, a ground path is completed on the coil side of the horn relay through the switch, on circuit X3. The horn relay, located in the junction block, then CLOSES the relay contacts. Voltage is passed through the CLOSED relay contacts on circuit X2 to the horns. Grounding for the horns is on the Z1 circuit.

On vehicles equipped with Vehicle Theft Security System (VTSS), the X3 circuit is spliced to the Body Control Module (BCM). For operation of the VTSS, refer to section 8W-39.

HELPFUL INFORMATION

- Check the 20 amp fuse in cavity 8 of the junction block
- Check the 40 amp fuse located in cavity 12 of the PDC
- Press the horn switch and listen for the horn relay to click. A clicking relay indicates voltage is present up to the switch
- Check for a good ground at the left strut tower for the left horn, and at the right frame rail for the right horn

CIGAR LIGHTER/POWER OUTLET

The cigar lighter/power outlet is powered by a 40 amp fuse located in the Power Distribution Center (PDC). There is also a 20 amp fuse located in cavity 8 of the junction block.

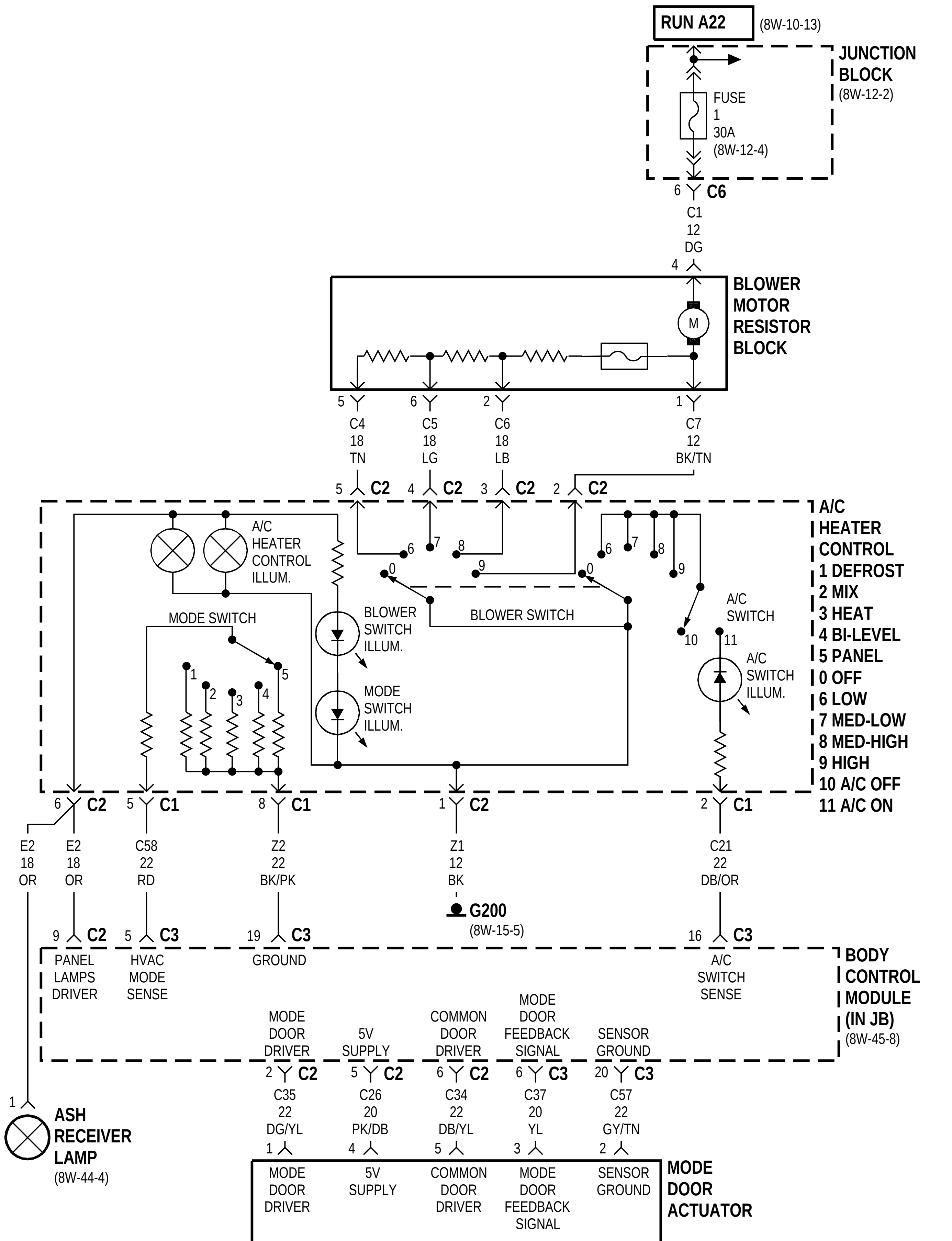
When the operator presses the lighter, the contacts inside of the lighter element CLOSE, and voltage flows through the heating element to ground. Ground for the lighter/power outlet is provided on the Z1 circuit and terminates at the instrument panel ground.

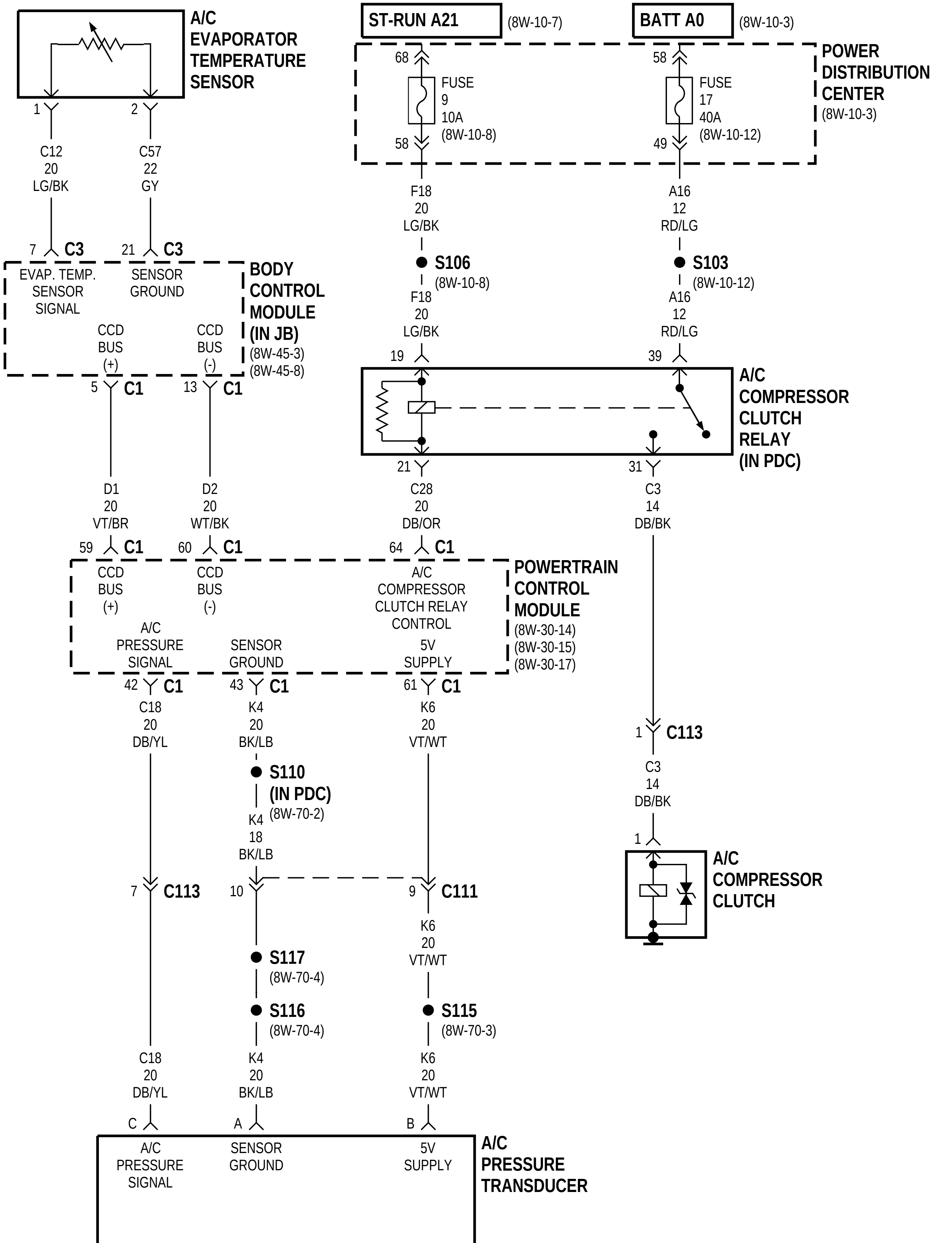
HELPFUL INFORMATION

- Check the 40 amp fuse located in cavity 12 of the PDC
- Check the 20 amp fuse located in cavity 8 of the junction block
- Check for a good ground at the instrument panel ground
- Check the cigar lighter element

8W-42 AIR CONDITIONING-HEATER

INDEX


RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
FUSE 1 30A (8W-12-4)
6 C6
C1 12 DG
4
BLOWER MOTOR RESISTOR BLOCK
M
5 C4 18 TN
6 C5 18 LG
2 C6 18 LB
1 C7 12 BK/TN
5 C2
4 C2
3 C2
2 C2
A/C HEATER CONTROL
1 DEFROST
2 MIX
3 HEAT
4 BI-LEVEL
5 PANEL
0 OFF
6 LOW
7 MED-LOW
8 MED-HIGH
9 HIGH
10 A/C OFF
11 A/C ON
A/C HEATER CONTROL ILLUM.
BLOWER SWITCH ILLUM.
MODE SWITCH ILLUM.
MODE SWITCH
BLOWER SWITCH
A/C SWITCH
A/C SWITCH ILLUM.
6 C2
5 C1
8 C1
1 C2
2 C1
E2 18 OR
E2 18 OR
C58 22 RD
Z2 22 BK/PK
Z1 12 BK
C21 22 DB/OR
G200
(8W-15-5)
9 C2
5 C3
19 C3
16 C3
PANEL LAMPS DRIVER
HVAC MODE SENSE
GROUND
A/C SWITCH SENSE
BODY CONTROL MODULE (IN JB)
(8W-45-8)
MODE DOOR DRIVER
5V SUPPLY
COMMON DOOR DRIVER
MODE DOOR FEEDBACK SIGNAL
SENSOR GROUND
2 C2
5 C2
6 C2
6 C3
20 C3
C35 22 DG/YL
C26 20 PK/DB
C34 22 DB/YL
C37 20 YL
C57 22 GY/TN
1
4
5
3
2
1
ASH RECEIVER LAMP
(8W-44-4)
MODE DOOR DRIVER
5V SUPPLY
COMMON DOOR DRIVER
MODE DOOR FEEDBACK SIGNAL
SENSOR GROUND
MODE DOOR ACTUATOR



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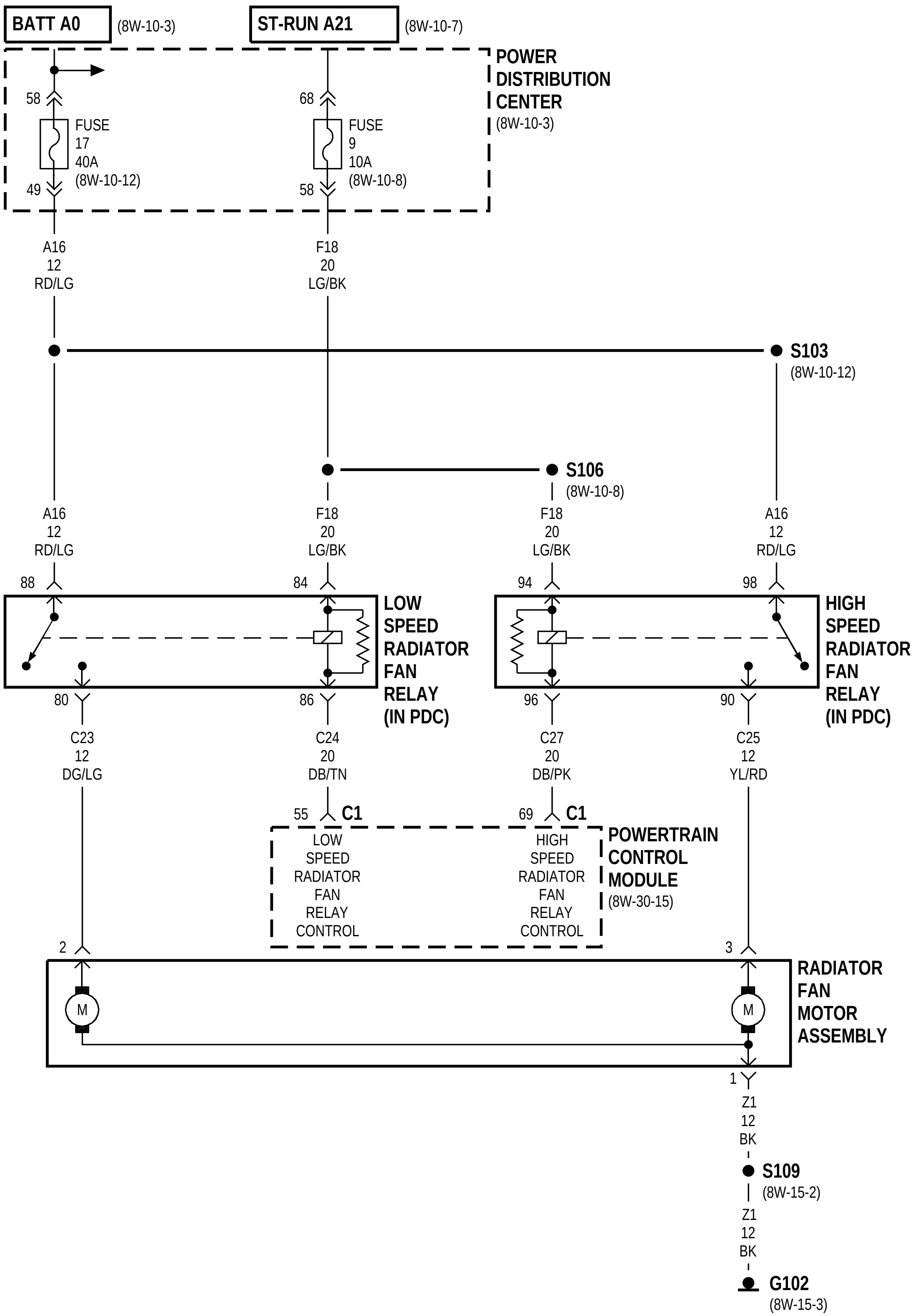
BATT A0
(8W-10-3)
ST-RUN A21
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
58
FUSE
17
40A
(8W-10-12)
49
68
FUSE
9
10A
(8W-10-8)
58
A16
12
RD/LG
F18
20
LG/BK
S103
(8W-10-12)
S106
(8W-10-8)
A16
12
RD/LG
F18
20
LG/BK
F18
20
LG/BK
A16
12
RD/LG
88
84
94
98
LOW
SPEED
RADIATOR
FAN
RELAY
(IN PDC)
HIGH
SPEED
RADIATOR
FAN
RELAY
(IN PDC)
80
86
96
90
C23
12
DG/LG
C24
20
DB/TN
C27
20
DB/PK
C25
12
YL/RD
55 C1
69 C1
LOW
SPEED
RADIATOR
FAN
RELAY
CONTROL
HIGH
SPEED
RADIATOR
FAN
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
(8W-30-15)
2
3
M
M
RADIATOR
FAN
MOTOR
ASSEMBLY
1
Z1
12
BK
S109
(8W-15-2)
Z1
12
BK
G102
(8W-15-3)

8W-42 AIR CONDITIONING-HEATER

INDEX

DESCRIPTION AND OPERATION

A/C-HEATER CONTROL

The air conditioning-heater system is controlled by the Body Control Module (BCM). The BCM senses voltage of the A/C-Heater control on circuit C58. The control uses resistors to internal to the control. These resistors are connected to the Z2 ground circuit.

When the operator requests a function in the system the BCM measures the voltage, on circuit C58, and activates the mode actuator door to the proper position.

A separate A/C switch is used in the system. This switch works the same as the mode actuator switches. When the operator presses the switch the BCM measures the voltage on the C21 circuit and activates the proper functions. Internal to the A/C-Heater control the A/C switch is connected to the blower motor switch. This allows the A/C system to only operate when the blower switch in an ON position.

Ground for the A/C switch is provided through the blower motor switch to the Z1 circuit. This circuit terminates at the instrument panel ground. A Light Emitting Diode (LED) is connected in the C21 circuit and illuminates when the A/C system is operating.

Illumination lamps and LED's are internal to the control. These are controlled by the BCM. The E2 circuit from the BCM provides the voltage to the control for lamp and LED illumination. Ground for the lamps and LED's is provided on the Z1 circuit which terminates at the instrument panel left side cowl.

MODE DOOR ACTUATOR (MANUAL A/C)

The mode door actuator is located on the lower left side of the A/C- Heater housing. This actuator controls the position of the panel/bi-level door and the floor/defrost door.

Power for the mode door actuator is provided by the Body Control Module (BCM) on the C26 circuit. This is a 5 volt feed.

Circuit C35 is the mode drive circuit from the BCM to the actuator.

The C37 circuit is the feedback from the actuator to the BCM. The BCM uses this information to adjust the door to the proper position.

Circuit C57 is the sensor return to the BCM. This circuit is spliced with the blend air door actuator.

Circuit C34 is the common line that is spliced, and connects, to the blend air door actuator and the recirculation door actuator.

A/C EVAPORATOR TEMPERATURE SENSOR

The A/C evaporator temperature sensor, located in the A/C-Heater housing, provides the Body Control Module (BCM) with the evaporator temperature to prevent the evaporator from freezing. Power for the sensor is provided from the BCM to the sensor on circuit C12. The ground for the sensor is on circuit C57 to the BCM.

Information on evaporator temperature is sent to the Powertrain Control Module (PCM) across the CCD Bus. The PCM uses this information to control operation of the A/C compressor clutch.

A/C OPERATION

When the A/C switch is CLOSED or the Defrost switch is moved to the ON position, and the evaporator temperature is in the normal limits, the Body Control Module (BCM) sends a signal to the Powertrain Control Module (PCM), over the CCD Bus, requesting A/C operation.

After receiving this input, the PCM activates the A/C compressor by grounding the C28 circuit, which is attached to the coil side of the A/C clutch relay. This relay is located in the Power Distribution Center (PDC). Power for the coil side of the relay is supplied on the F18 circuit. The F18 circuit is protected by a 10 amp fuse located in cavity 9 of the Power Distribution Center (PDC).

When the coil is energized contacts in the relay CLOSE connecting circuits A16 and C3. Circuit A16 is protected by a 40 amp fuse located in cavity 17 of the PDC and also supplies power for the radiator fan relays. The C3 circuit connects from the relay to the A/C compressor clutch.

DESCRIPTION AND OPERATION (Continued)

The A/C compressor clutch receives this current and creates a magnetic field, energizing the clutch. The A/C compressor clutch is case grounded to the A/C compressor.

The A/C compressor clutch has a diode located in it. This diode is used to control the induced voltage resulting from the magnetic field collapsing when the clutch is disengaged.

The A/C compressor clutch relay is also used by the PCM to disengage the compressor in a Wide-Open Throttle (W.O.T.) condition.

A/C PRESSURE TRANSDUCER

The A/C pressure transducer is located on the discharge line near the compressor. Circuit C18 connects from the Powertrain Control Module (PCM), cavity 42, to the transducer. The PCM uses information from the transducer to control operation of the radiator fans.

Ground for the transducer is supplied on circuit K4. This circuit connects to cavity 43 of the PCM. The K4 circuit is spliced in with many of the sensors used in the fuel injection system.

RADIATOR FAN OPERATION

The radiator fan system uses two relays located in the Power Distribution Center (PDC). One relay is used for LOW speed fan operation and the other is for HIGH speed operation. The Powertrain Control Module (PCM) controls the operation of the relays depending on engine coolant temperature or A/C operation.

Power for the coil side of both relays is provided on circuit F18. This circuit is protected by a 10 amp fuse located in cavity 9 of the Power Distribution Center (PDC). Power for the contact side of the relays is provided on circuit A16. This circuit is protected by a 40 amp fuse located in cavity 17 of the PDC.

When LOW speed fan operation is required the PCM grounds circuit C24. This causes the contacts in the relay to CLOSE connecting circuits A16 and C23. Circuit C23 connects from the relay to the low speed portion of the fan motor. Ground for the motor is provided on circuit Z1, which terminates at the left strut tower.

When HIGH speed fan operation is required the PCM grounds circuit C27. This causes the contacts in the relay to CLOSE connecting circuits A16 and C25. Circuit C25 connects from the relay to the high speed portion of the fan motor. Ground for the motor is provided on circuit Z1, which terminates at the left strut tower.

BLOWER MOTOR OPERATION

With the ignition switch is in the RUN position, power flows from the 30 amp fuse located in the junction block, cavity 1, to the blower motor. Blower motor speed is controlled by the fan control switch located in the A/C—Heater control head, and by the resistor block.

Blower motor LOW speed operation is accomplished on the C4 circuit. When the control switch is moved to the LOW speed position, current flows from the C1 circuit to the blower motor resistor. Power flows through the blower motor back to the resistor. Voltage is passed through the resistor to circuit C4. Circuit C4 connects from the resistor block to the fan control switch. Ground flows through the switch to the Z1 circuit. The Z1 circuit terminates at a grounding point located at the instrument panel.

The operation of blower motor M1 and M2 speed operations is the same as the LOW speed except that circuit C5 is used for the M1 speed, and circuit C6 is used for the M2 speed operation.

Blower motor HIGH speed operation is accomplished on the C7 circuit. There are no resistors used in the HIGH speed mode.

HELPFUL INFORMATION

Check the 10 amp fuse located in cavity 9 of the junction block.

Check the 40 amp fuse located in cavity 17 of the PDC.

Check the 30 amp fuse located in cavity 1 of the junction block.

Check for a good ground at the instrument panel left side cowl.

Check for a good ground at the left strut tower.

Check the A/C refrigerant level. The system will not operate with a low level of refrigerant.

8W-43 AIRBAG SYSTEM

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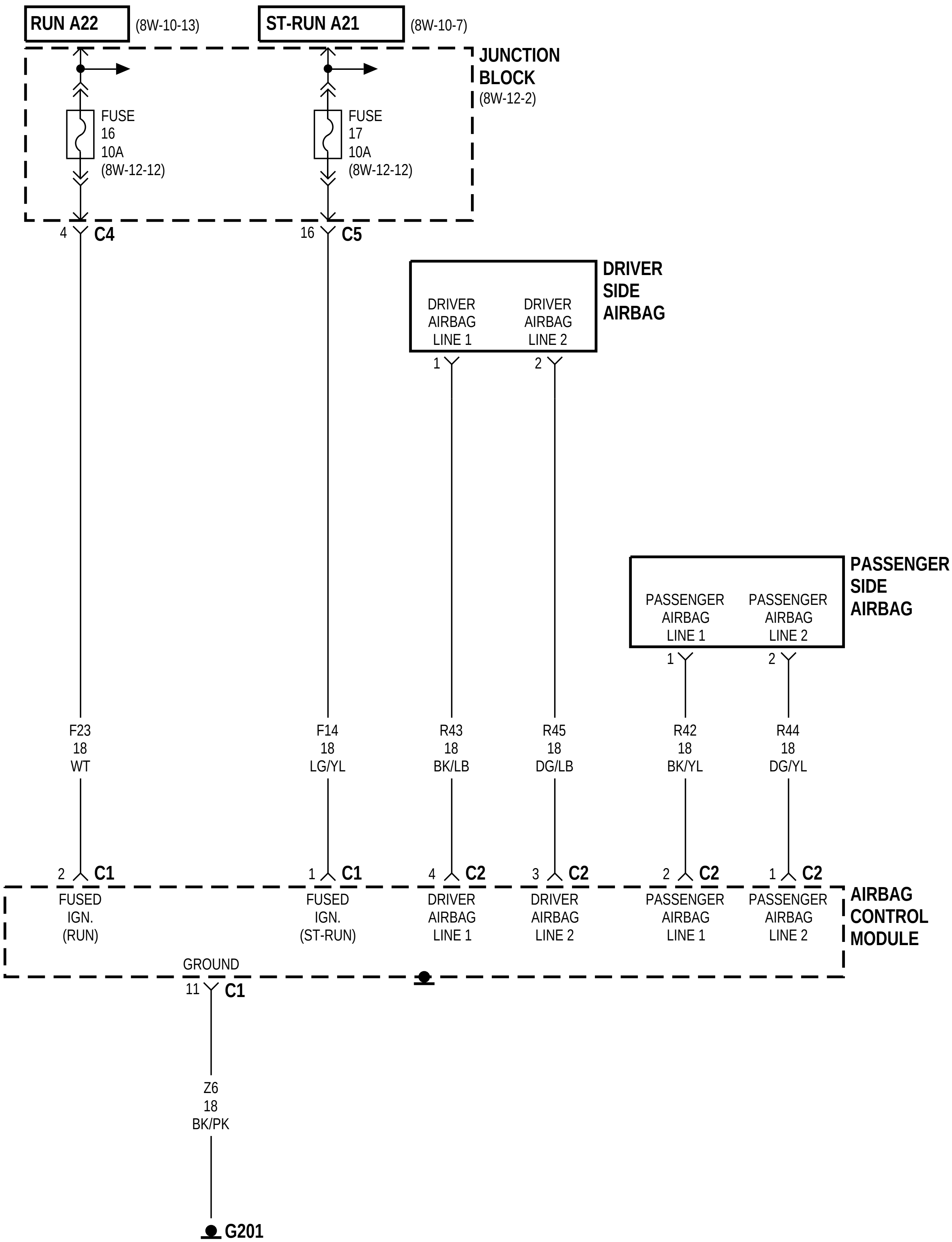
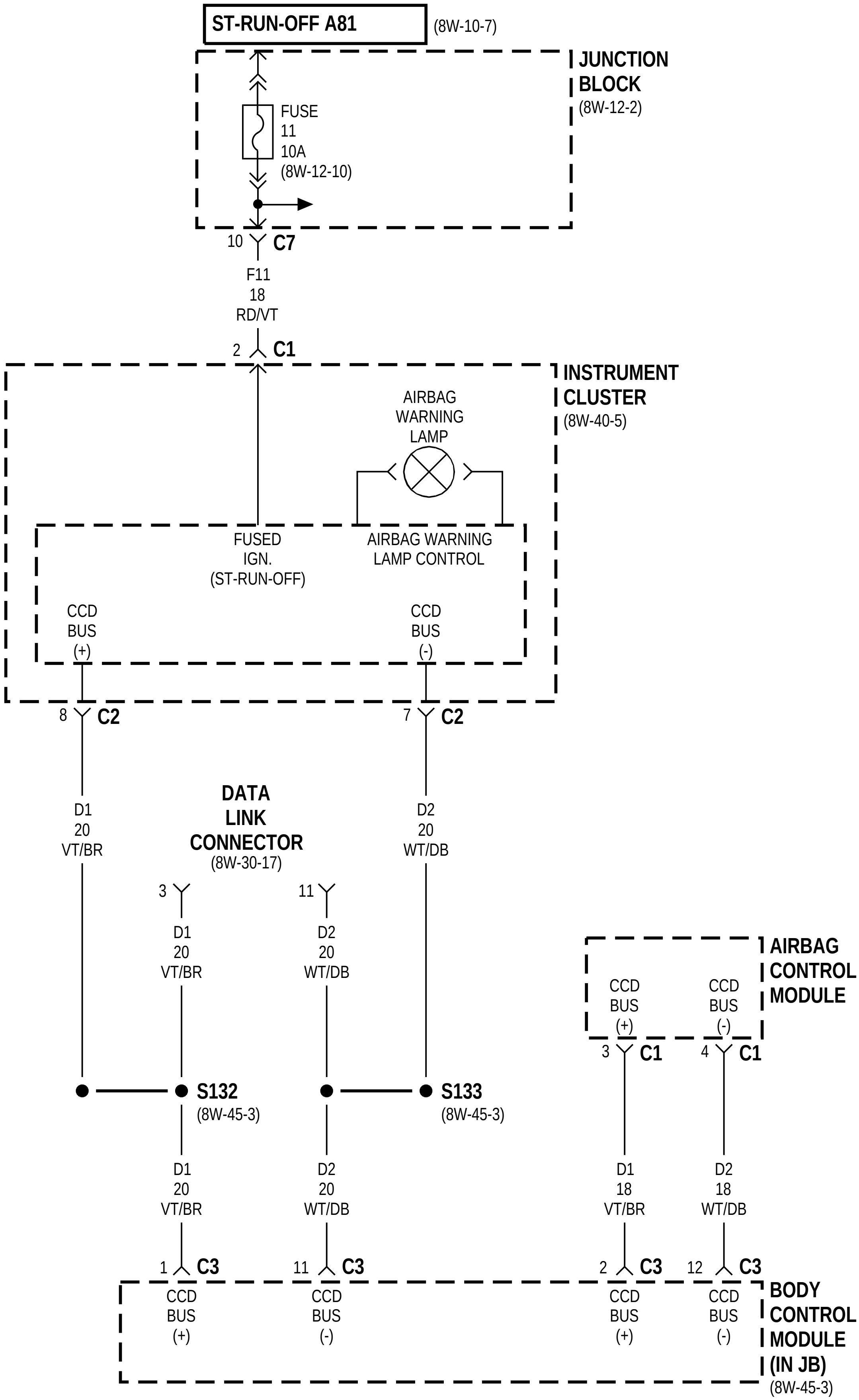

RUN A22
(8W-10-13)
ST-RUN A21
(8W-10-7)
JUNCTION
BLOCK
(8W-12-2)
FUSE
16
10A
(8W-12-12)
FUSE
17
10A
(8W-12-12)
4
C4
16
C5
DRIVER
SIDE
AIRBAG
DRIVER
AIRBAG
LINE 1
DRIVER
AIRBAG
LINE 2
1
2
PASSENGER
SIDE
AIRBAG
PASSENGER
AIRBAG
LINE 1
PASSENGER
AIRBAG
LINE 2
1
2
F23
18
WT
F14
18
LG/YL
R43
18
BK/LB
R45
18
DG/LB
R42
18
BK/YL
R44
18
DG/YL
2
C1
1
C1
4
C2
3
C2
2
C2
1
C2
AIRBAG
CONTROL
MODULE
FUSED
IGN.
(RUN)
FUSED
IGN.
(ST-RUN)
DRIVER
AIRBAG
LINE 1
DRIVER
AIRBAG
LINE 2
PASSENGER
AIRBAG
LINE 1
PASSENGER
AIRBAG
LINE 2
GROUND
11
C1
Z6
18
BK/PK
G201


ST-RUN-OFF A81
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-10)
10
C7
F11
18
RD/VT
2
C1
INSTRUMENT CLUSTER
(8W-40-5)
AIRBAG WARNING LAMP
FUSED IGN. (ST-RUN-OFF)
AIRBAG WARNING LAMP CONTROL
CCD BUS (+)
CCD BUS (-)
8
C2
7
C2
D1
20
VT/BR
DATA LINK CONNECTOR
(8W-30-17)
D2
20
WT/DB
3
11
D1
20
VT/BR
D2
20
WT/DB
AIRBAG CONTROL MODULE
CCD BUS (+)
CCD BUS (-)
3
C1
4
C1
S132
(8W-45-3)
S133
(8W-45-3)
D1
20
VT/BR
D2
20
WT/DB
D1
18
VT/BR
D2
18
WT/DB
1
C3
11
C3
2
C3
12
C3
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
BODY CONTROL MODULE (IN JB)
(8W-45-3)

8W-43 AIRBAG SYSTEM

INDEX

DESCRIPTION AND OPERATION

AIRBAG CONTROL MODULE (ACM)

Two different circuits supply battery voltage from the junction block to the Airbag Control Module (ACM), they are F14 and F23. The F14 and F23 circuits are connected to separate bus bars internal to the junction block. Different circuits from the Power Distribution Center (PDC) and the ignition switch supply battery voltage to the junction block bus bars.

The F23 circuit supplies battery voltage to the ACM only when the ignition switch is in the RUN position. The F14 circuit powers the ACM when the ignition switch is in either the START or RUN position.

A bus bar internal to the ignition switch connects the A1 circuit from the Power Distribution Center (PDC) to the A21 circuit when the switch is in either the START or RUN position. The A21 circuit supplies battery voltage to the junction block bus bar that feeds the F14 circuit. A 20 amp fuse in the PDC, cavity 8, protects the A1 and A21 circuits. A 10 amp fuse in cavity 17 of the unction block protects the F14 circuit.

When the ignition switch is in the RUN position, it connects the A2 circuit from the PDC to the A22 circuit. The A22 circuit supplies battery voltage to the junction block bus bar that feeds the F23 circuit. A 40 amp fuse in cavity 18 of the PDC protects the A2 and A22 circuits. A 10 amp fuse in cavity 16 of the junction block protects the F23 circuit.

The ACM has a case ground and an external dedicated ground, circuit Z6. The dedicated ground connects to the floor pan near the ACM.

The ACM is also interfaced with the CCD Bus. Circuit D1 is used for CCD (+), and circuit D2 is used for CCD (-).

AIRBAG IMPACT SENSOR

The Airbag system uses a sensor internal to the Airbag Control Module (ACM) to detect impact. For information regarding operation of this sensor, refer to the appropriate group of the Service Manual.

AIRBAG SQUIB (AIRBAG IGNITER)

DRIVER'S SIDE AIRBAG

Two circuits, R43 and R45, connect the Airbag Control Module (ACM) to the driver's side Airbag squib (igniter) after passing through the clock spring connector. Circuit R43 from cavity 4 of the ACM 4-way connector connects to the squib. Circuit R45 from cavity 3 of the ACM 4-way connector connects to the squib. R43 and R45 are a twisted pair of wires.

PASSENGER'S SIDE AIRBAG

Two circuits, R42 and R44, connect the Airbag Control Module (ACM) to the passenger's side Airbag squib (igniter). Circuit R42 from cavity 2 of the ACM 4-way connector connects to the squib. Circuit R44 from cavity 1 of the ACM 4-way connector connects to the squib. R42 and R44 are a twisted pair of wires.

AIRBAG WARNING LAMP

Illumination of the Airbag warning lamp is controlled by the Body Control Module (BCM) and the CCD Bus. When the Airbag Control Module (ACM) detects a problem in the system it sends a signal on the CCD Bus to the BCM. The BCM process the signal and illuminates the AIRBAG lamp in the instrument cluster.

HELPFUL INFORMATION

- Check for blown fuses in the circuits that connect to the ignition switch and in those that connect to the ACM
- While the bus bars in the junction block power the ACM, they also feed additional components on separate fuse-protected circuits
- The ACM has a case ground and an external dedicated ground. The dedicated ground connects to the floor pan near the ACM

8W-44 INTERIOR LIGHTING

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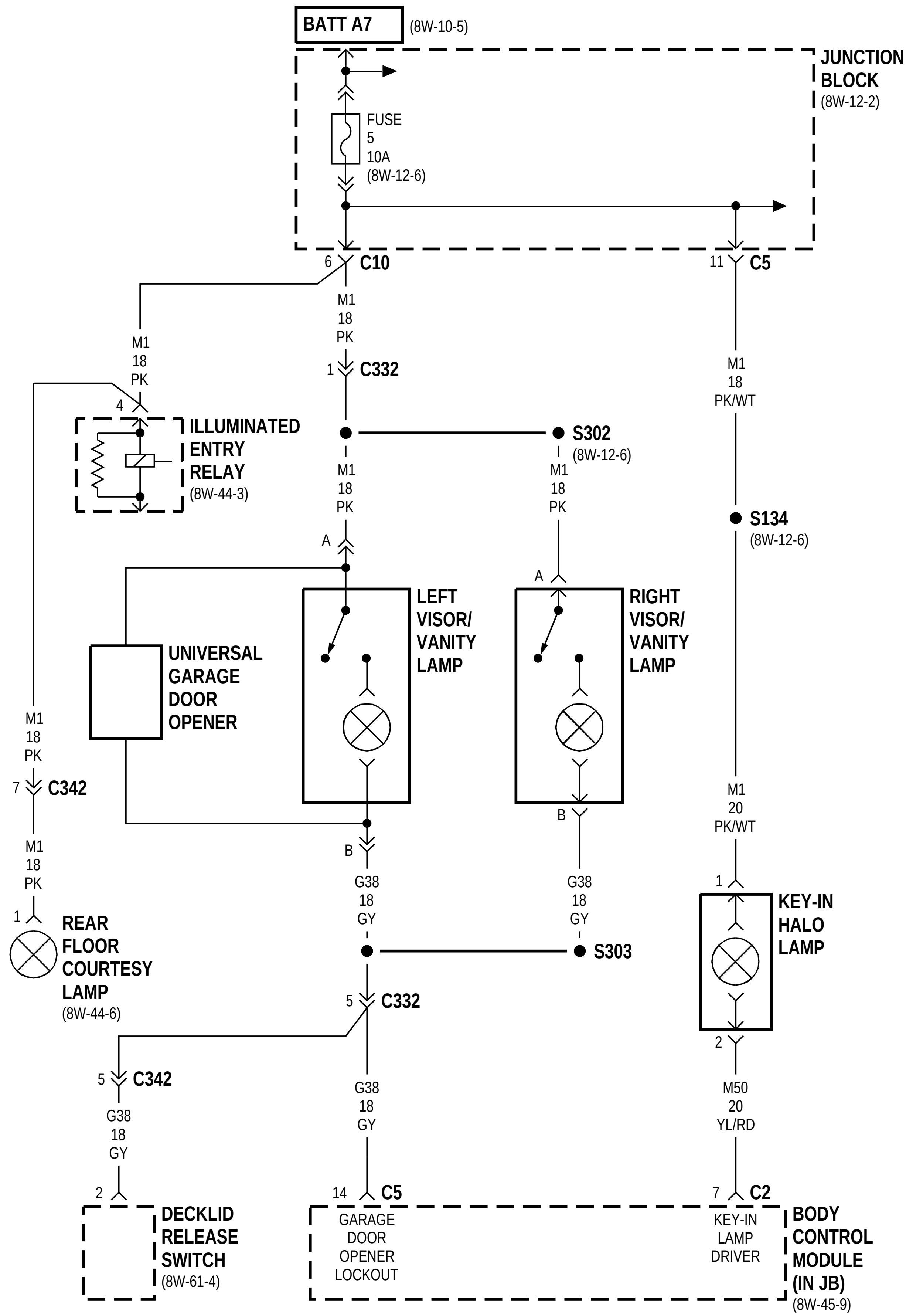
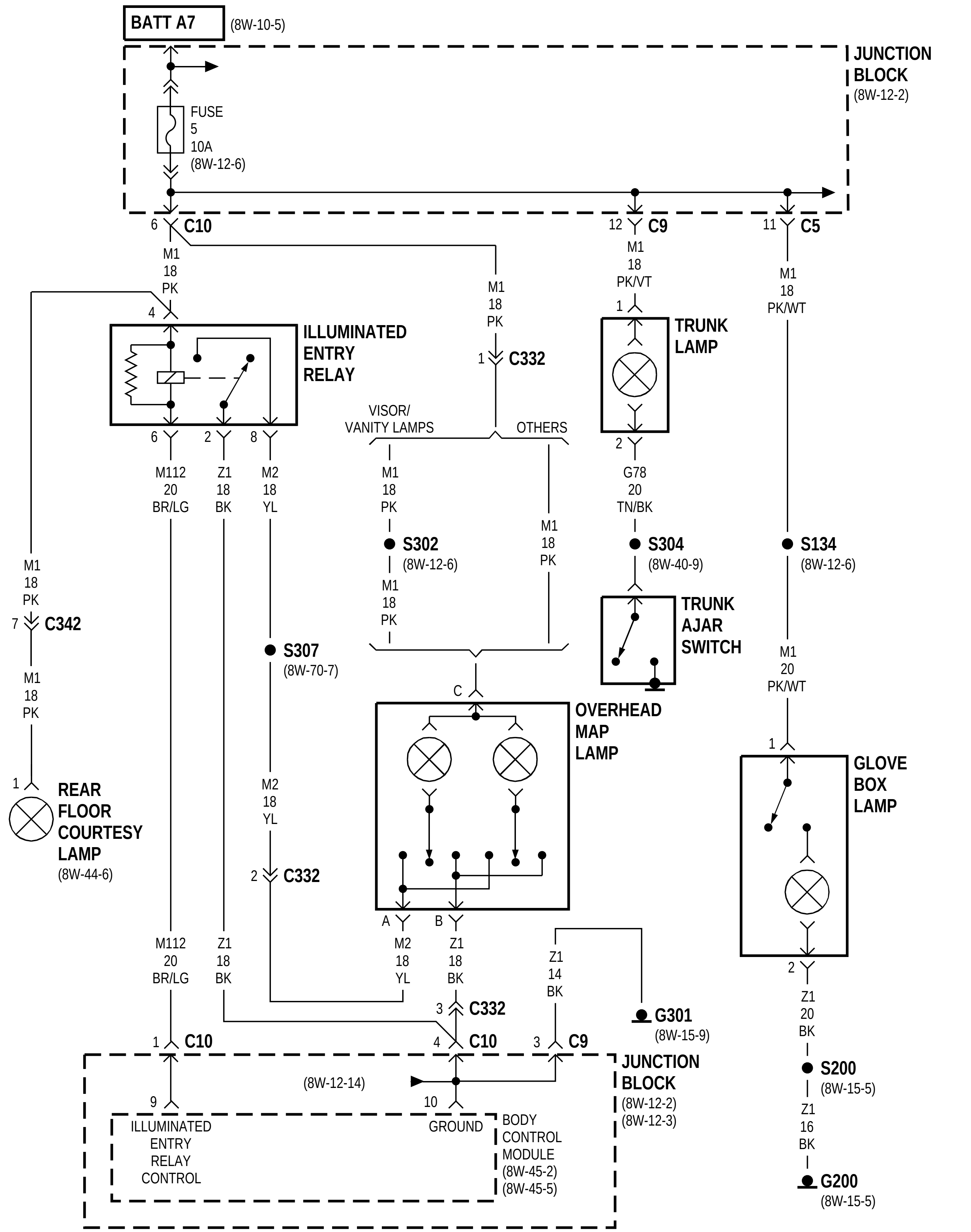

BATT A7
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
6
C10
11
C5
M1
18
PK
M1
18
PK
1
C332
M1
18
PK/WT
4
ILLUMINATED ENTRY RELAY
(8W-44-3)
S302
(8W-12-6)
M1
18
PK
M1
18
PK
S134
(8W-12-6)
A
A
LEFT VISOR/ VANITY LAMP
RIGHT VISOR/ VANITY LAMP
UNIVERSAL GARAGE DOOR OPENER
M1
18
PK
7
C342
M1
20
PK/WT
B
B
M1
18
PK
1
G38
18
GY
G38
18
GY
1
KEY-IN HALO LAMP
REAR FLOOR COURTESY LAMP
(8W-44-6)
S303
5
C332
2
5
C342
G38
18
GY
G38
18
GY
M50
20
YL/RD
2
DECKLID RELEASE SWITCH
(8W-61-4)
14
C5
7
C2
GARAGE DOOR OPENER LOCKOUT
KEY-IN LAMP DRIVER
BODY CONTROL MODULE (IN JB)
(8W-45-9)



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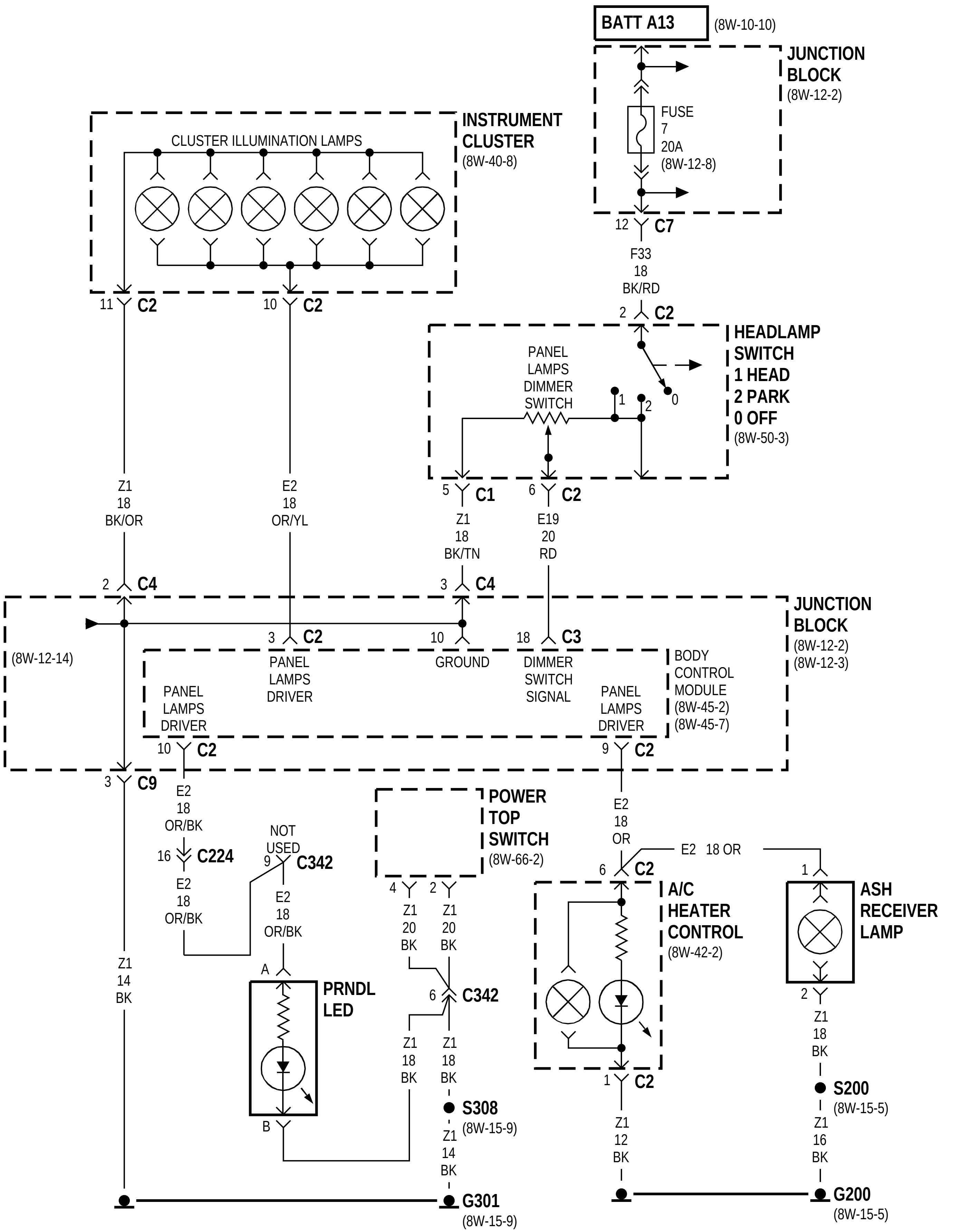
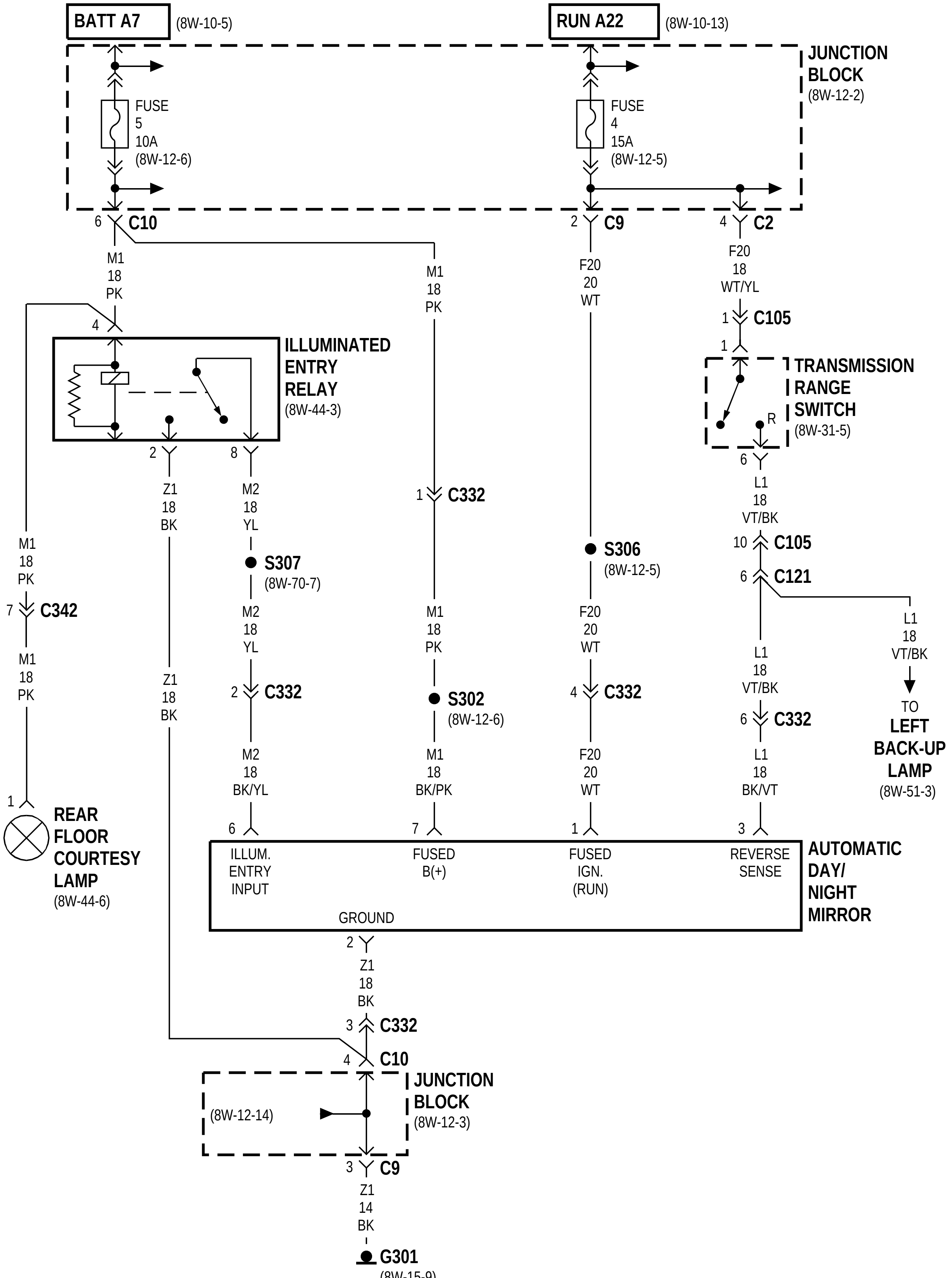
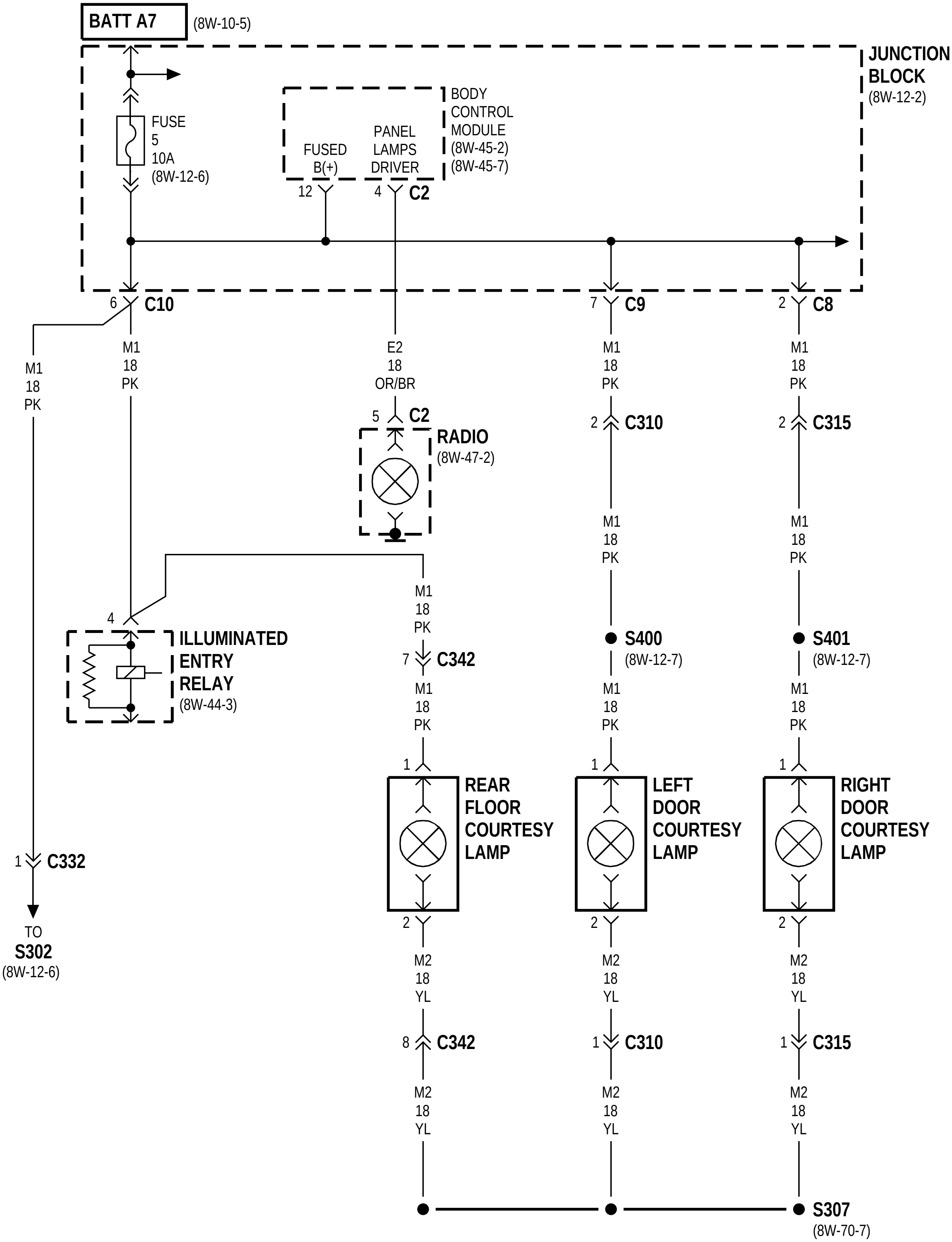

BATT A13
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 7 20A (8W-12-8)
12 C7
F33 18 BK/RD
2 C2
INSTRUMENT CLUSTER
(8W-40-8)
CLUSTER ILLUMINATION LAMPS
11 C2
10 C2
HEADLAMP SWITCH
1 HEAD
2 PARK
0 OFF
(8W-50-3)
PANEL LAMPS DIMMER SWITCH
1
2
0
5 C1
6 C2
Z1 18 BK/OR
E2 18 OR/YL
Z1 18 BK/TN
E19 20 RD
2 C4
3 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
(8W-12-14)
3 C2
10
18 C3
PANEL LAMPS DRIVER
GROUND
DIMMER SWITCH SIGNAL
BODY CONTROL MODULE
(8W-45-2)
(8W-45-7)
PANEL LAMPS DRIVER
PANEL LAMPS DRIVER
10 C2
9 C2
3 C9
E2 18 OR/BK
16 C224
NOT USED
9 C342
E2 18 OR/BK
E2 18 OR/BK
POWER TOP SWITCH
(8W-66-2)
4
2
Z1 20 BK
Z1 20 BK
E2 18 OR
E2 18 OR
6 C2
1
A/C HEATER CONTROL
(8W-42-2)
ASH RECEIVER LAMP
A
PRNDL LED
B
6 C342
Z1 14 BK
Z1 18 BK
Z1 18 BK
S308
(8W-15-9)
Z1 14 BK
1 C2
2
Z1 18 BK
S200
(8W-15-5)
Z1 12 BK
Z1 16 BK
G301
(8W-15-9)
G200
(8W-15-5)


BATT A7
(8W-10-5)
RUN A22
(8W-10-13)
JUNCTION
BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
FUSE
4
15A
(8W-12-5)
6 C10
2 C9
4 C2
M1
18
PK
F20
20
WT
F20
18
WT/YL
1 C105
4
ILLUMINATED
ENTRY
RELAY
(8W-44-3)
TRANSMISSION
RANGE
SWITCH
(8W-31-5)
R
2
8
6
Z1
18
BK
M2
18
YL
1 C332
L1
18
VT/BK
S307
(8W-70-7)
S306
(8W-12-5)
10 C105
6 C121
7 C342
2 C332
S302
(8W-12-6)
4 C332
6 C332
M1
18
BK/PK
M2
18
BK/YL
L1
18
BK/VT
TO
LEFT
BACK-UP
LAMP
(8W-51-3)
1
REAR
FLOOR
COURTESY
LAMP
(8W-44-6)
6
7
1
3
ILLUM.
ENTRY
INPUT
FUSED
B(+)
FUSED
IGN.
(RUN)
REVERSE
SENSE
GROUND
AUTOMATIC
DAY/
NIGHT
MIRROR
2
3 C332
4 C10
JUNCTION
BLOCK
(8W-12-3)
(8W-12-14)
3 C9
Z1
14
BK
G301
(8W-15-9)


BATT A7
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
BODY CONTROL MODULE
(8W-45-2)
(8W-45-7)
FUSED B(+)
PANEL LAMPS DRIVER
12
4
C2
6
C10
7
C9
2
C8
M1
18
PK
E2
18
OR/BR
5
C2
RADIO
(8W-47-2)
2
C310
2
C315
4
ILLUMINATED ENTRY RELAY
(8W-44-3)
7
C342
S400
(8W-12-7)
S401
(8W-12-7)
1
C332
TO
S302
(8W-12-6)
REAR FLOOR COURTESY LAMP
LEFT DOOR COURTESY LAMP
RIGHT DOOR COURTESY LAMP
M2
18
YL
8
C342
1
C310
1
C315
S307
(8W-70-7)

8W-44 INTERIOR LIGHTING

INDEX

DESCRIPTION AND OPERATION

INTRODUCTION

The interior lamps system is powered at all times by the 10 amp fuse located in cavity 5 of the junction block. This is the Ignition-Off Draw (IOD) fuse. Circuit M1 is connected from the fuse to the trunk lamp, vanity lamps, dome lamp, and overhead lamps.

Power for the fuse is supplied on circuit A7 from the Power Distribution Center (PDC). The A7 circuit is protected by a 20 amp fuse located in cavity 4 of the PDC.

DIMMER CONTROL

The dimmer control is used to control the intensity of the instrument panel lamps. It is located in the left multi-function switch. Power for the control is supplied from the L7 circuit, which is the feed for the parking lamps. This circuit is HOT when the parking lamp switch is in the ON position. Ground for the control is provided on the Z1 circuit which terminates at the instrument panel left side cowl.

The control uses a variable resistor and is connected to circuit E19. Circuit E19 connects to the Body Control Module (BCM). When the operator moves the control, resistance in the circuit changes and the signal sent to the BCM changes. With the change is resistance the BCM sends a signal over the CCD Bus to the instrument panel changing the lamp intensity.

For the other lamps the E2 circuit is connected from the BCM to the lamps. The operation of these lamps is the same as the instrument cluster lamps.

ILLUMNATED ENTRY

The illuminated entry relay located in the junction block is used to control the ground path for the interior lamps. Power for the relay is supplied on circuit M1. This is the Ignition-Off Draw (IOD) circuit and is protected by a 10 amp fuse located in cavity 5 of the junction block.

Ground for the relay is supplied on circuit M112. This circuit connects from the relay to the Body Control Module (BCM). When the BCM provides a ground path for the relay, circuits M2 and Z1 are connected illuminating the interior lamps.

IGNITION KEY HALO LAMP

The Body Control Module (BCM) controls the operation of the halo lamp upon vehicle entry. When the drivers door is OPENED the door ajar switch CLOSES and circuit G75 is grounded. The BCM sees that the door is ajar and provides a ground path for circuit M50 from the lamp. Power for the lamp is provided on circuit M1. This is the Ignition-Off Draw (IOD) circuit and is protected by a 10 amp fuse located in cavity 5 of the junction block.

VISOR/VANITY LAMPS

The visor/vanity lamps are operated by a switch internal to the assembly. Power for the lamps is provided by circuit M1. The M1 circuit is spliced and provides power to both lamps and is HOT at all times.

When the operator lifts the cover on the lamp, the switch CLOSES, completing a path to ground on circuit Z1. This circuit terminates at the instrument panel left side cowl after passing through the ground joint in the junction block.

On vehicles equipped with the optional garage door opener the ground circuit is changed from Z1 to G38. The G38 circuit connects from the lamps to the Body Control Module (BCM). This input to the BCM allows for a garage door opener lock-out feature.

COURTESY LAMPS

The door and rear floor courtesy lamps are powered by a 10 amp fuse located in cavity 5 of the junction block. This is the Ignition-Off Draw (IOD) fuse and HOT at all times. Circuit M1 connects from the fuse to the lamps.

DESCRIPTION AND OPERATION (Continued)

Ground for the lamps is supplied on circuit M2. This circuit connects from the lamps to the illuminated entry relay located in the junction block.

The Body Control Module (BCM) controls the operation of the relay on circuit M112. When the relay is energized, the contacts in the relay CLOSE connecting circuits M2 and Z1. This completes the ground path for the lamps. The Z1 circuit terminates at the instrument panel left side cowl.

OVERHEAD MAP LAMPS

The overhead map lamps are powered by the 10 amp fuse located in the junction block on the M1 circuit. This fuse is the Ignition-Off Draw (IOD) fuse and is located in cavity 5. This circuit is HOT at all times.

Ground for the lamps is supplied on two different circuits. One way is when the operator turns the lamp ON by CLOSING the switch. A ground path is completed on circuit Z1. This ground terminates at the instrument panel left side cowl.

Ground for the lamp(s) can also be supplied on circuit M2 when the Body Control Module (BCM) supplies a ground path for the illuminated entry relay.

GLOVE BOX LAMP

The glove box lamp is powered by the 10 amp fuse located in the junction block on the M1 circuit. This is the Ignition-Off Draw (IOD) fuse and is located in cavity 5. This circuit is HOT at all times.

The glove box switch is normally OPEN. When the operator opens the glove box door the switch CLOSES completing a path to ground through the switch and the lamp on circuit Z1. This ground terminates at the instrument panel left side cowl.

ASH RECEIVER LAMP

The ash receiver lamp receives power on the E2 circuit from the Body Control Module (BCM). This circuit is HOT when the operator has turned the headlamp switch to the PARK or ON position. Lamp intensity is controlled by the input of the dimmer switch to the BCM on circuit E19.

Ground for the lamp is provided by the Z1 circuit. This circuit terminates at the instrument panel left side cowl after passing through the ground joint in the junction block.

PRNDL ILLUMINATION

Power for the PRNDL illumination diode is supplied on circuit E2. This circuit is controlled by the Body Control Module (BCM) based on input from the headlamp dimmer switch on circuit E19.

Ground for the diode is supplied on circuit Z1. This ground terminates at the left side cowl.

TRUNK LAMP

The trunk lamp uses a switch located in the trunk latch which is case grounded. The switch is normally OPEN. When the trunk is opened, the switch CLOSES, completing a path to ground on circuit G78. The M1 circuit provides power to the lamp, and is HOT at all times.

Circuit G78 is spliced and provides an input to the instrument cluster indicating the trunk is ajar.

HELPFUL INFORMATION

Check the 10 amp fuse located in cavity 5 of the PDC.

Check for a good ground located at the instrument panel left side cowl.

Check the door switches for a good ground.

Check the illuminated entry relay located in the junction block.

8W-45 BODY CONTROL MODULE

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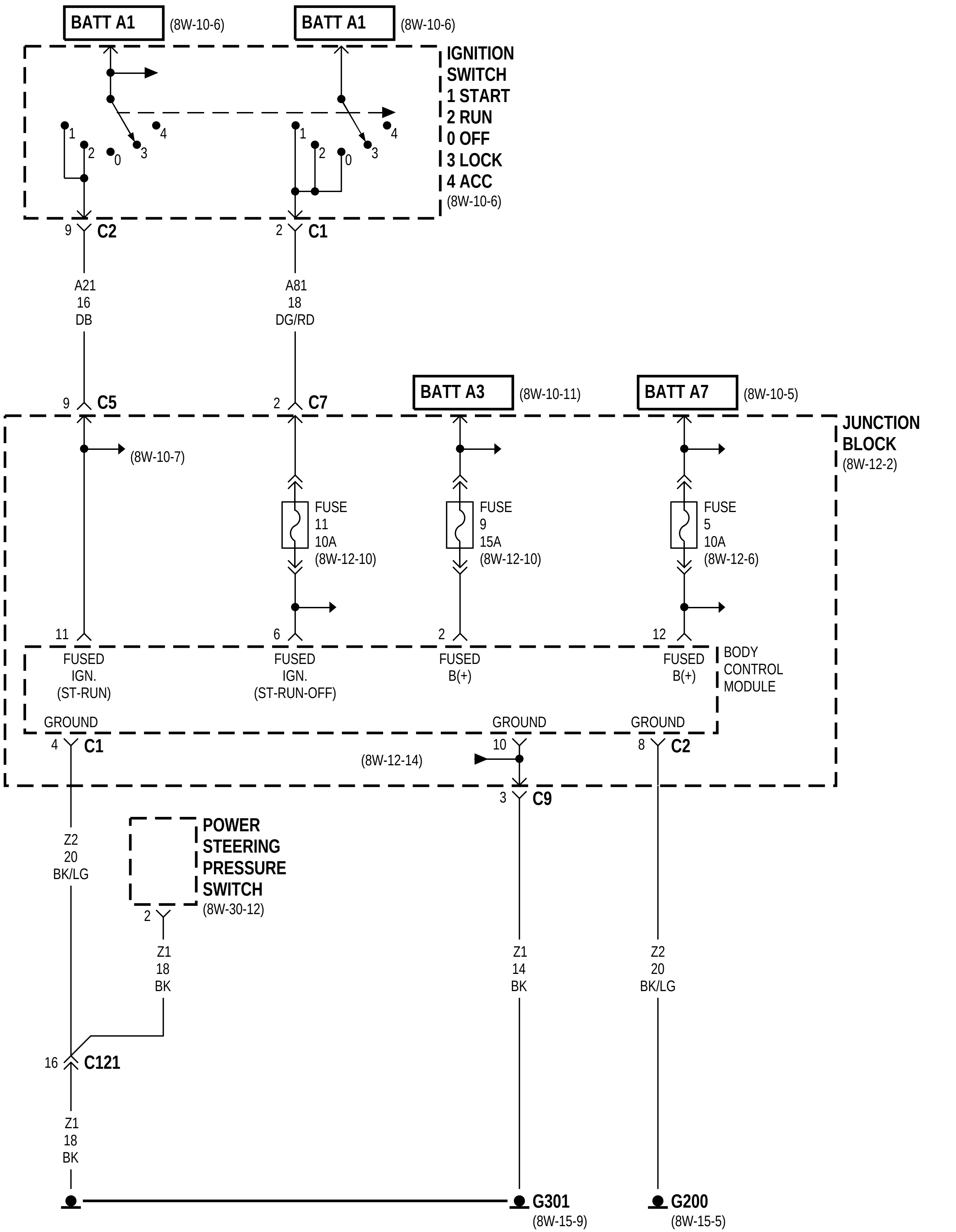
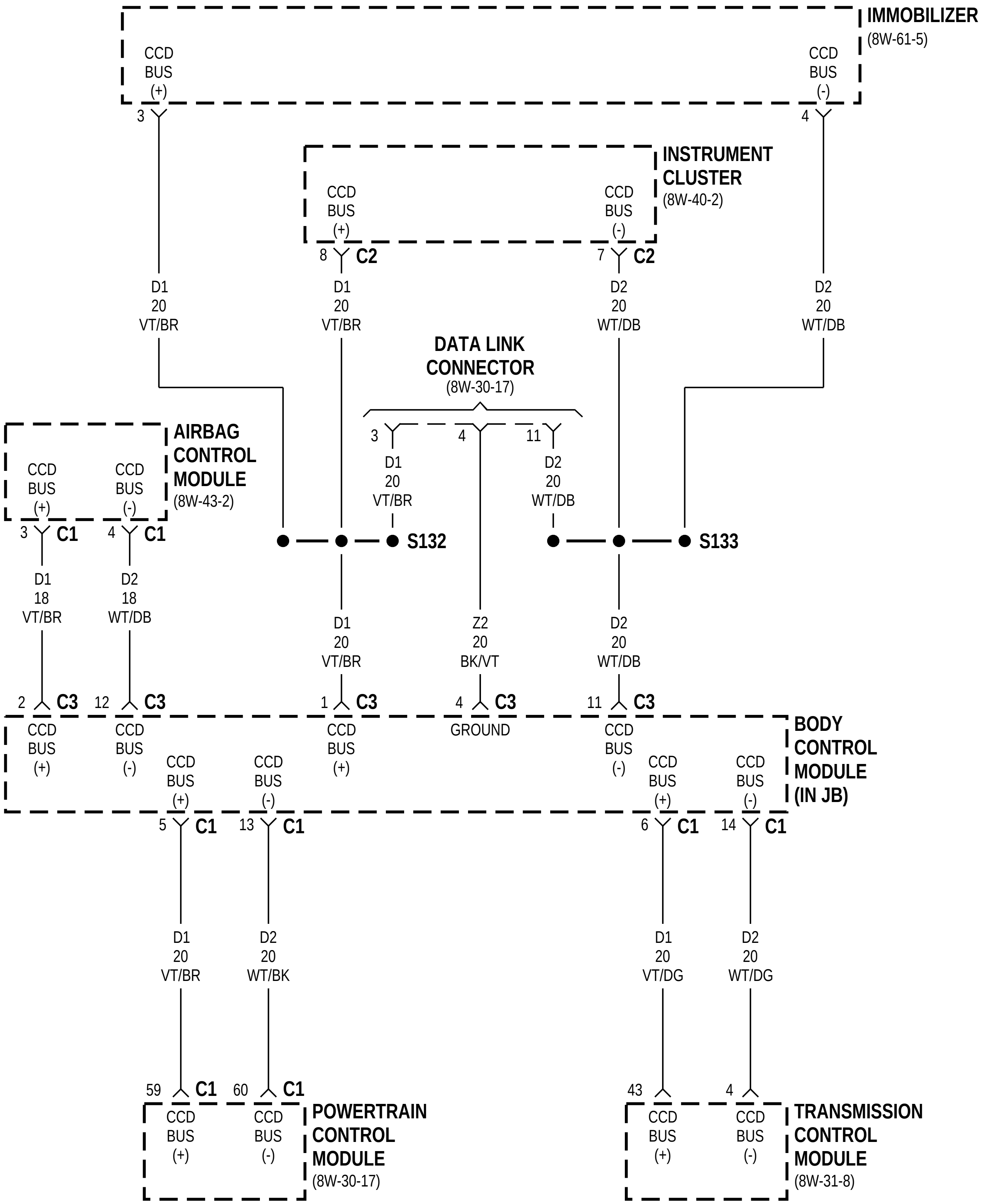
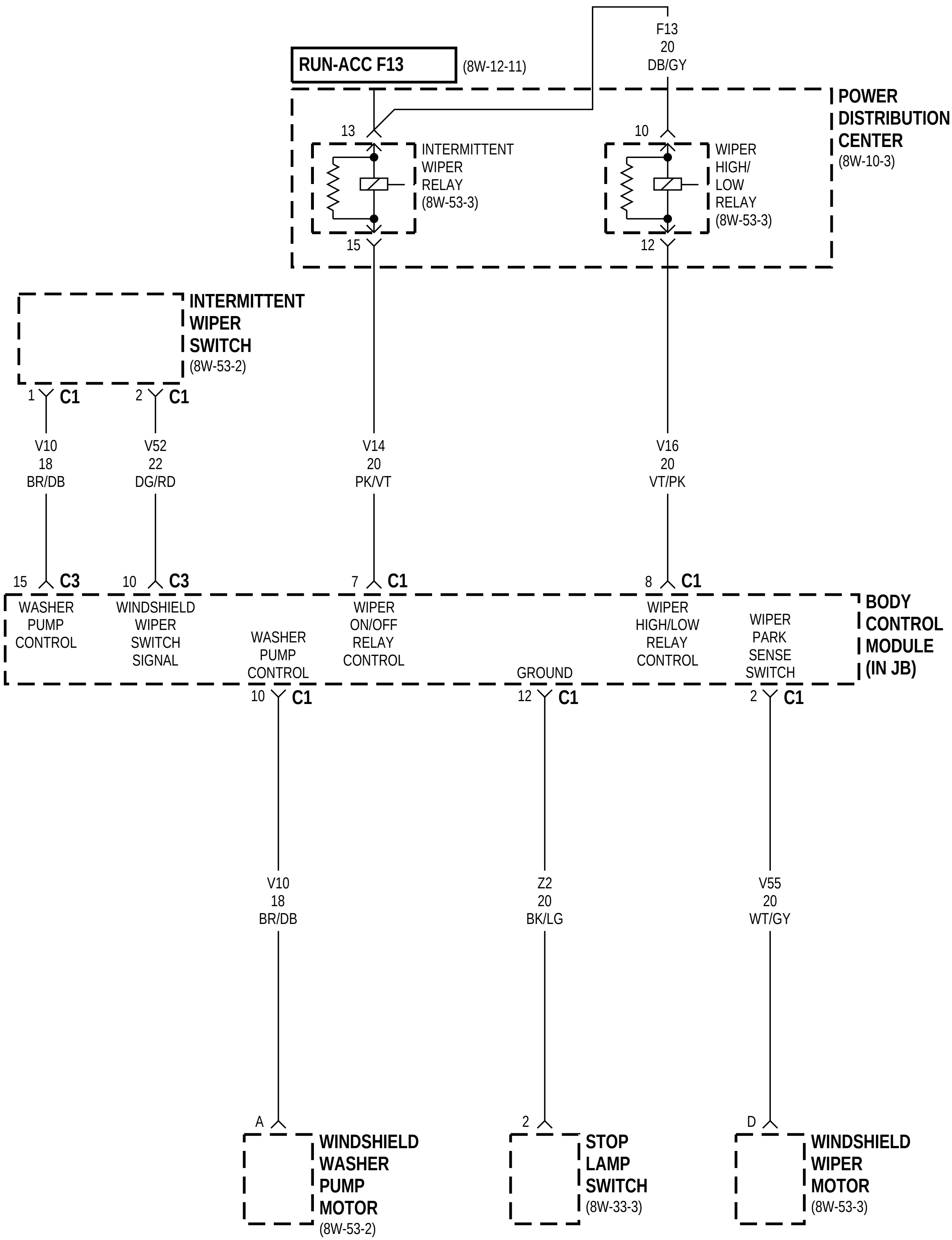
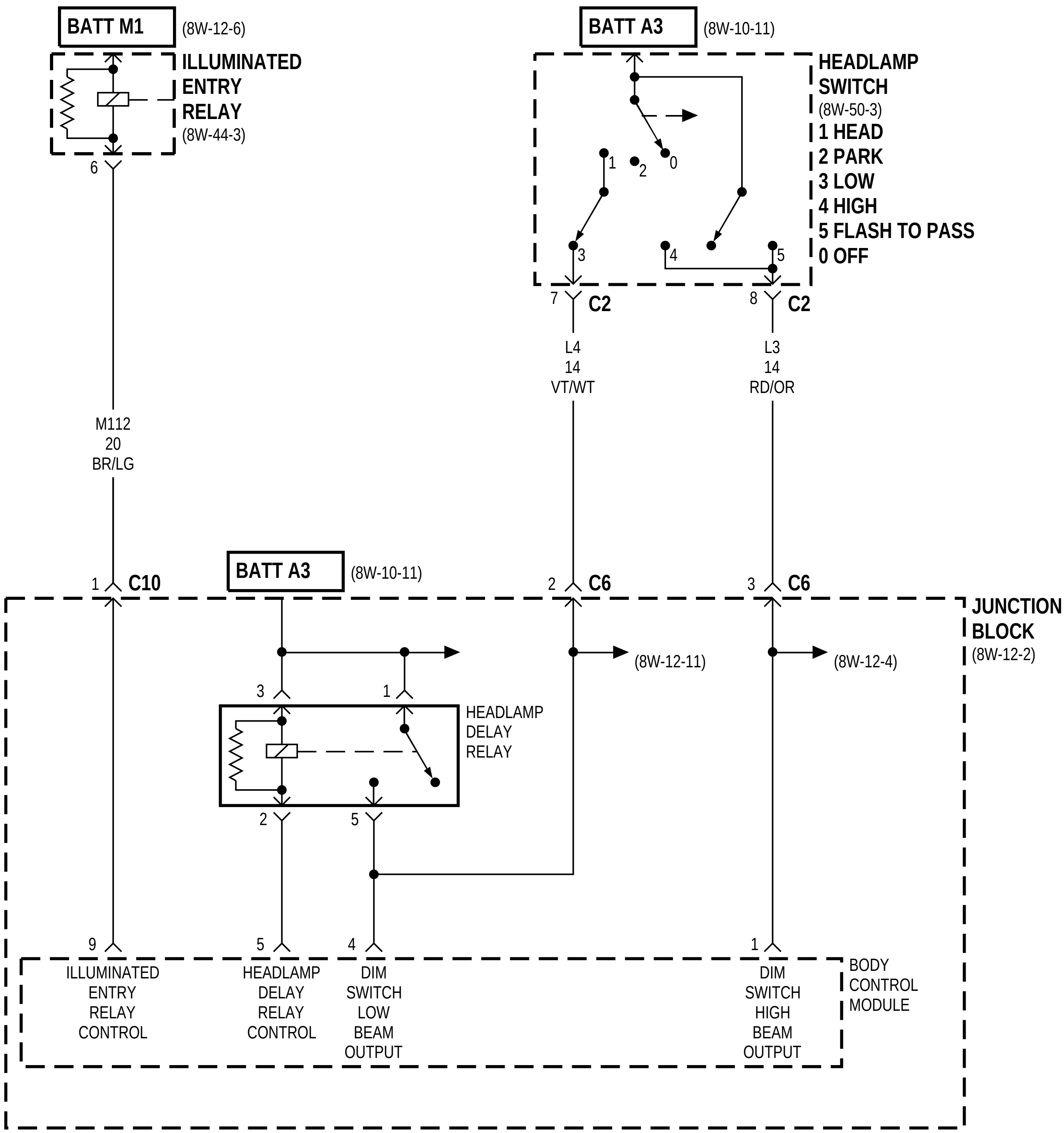
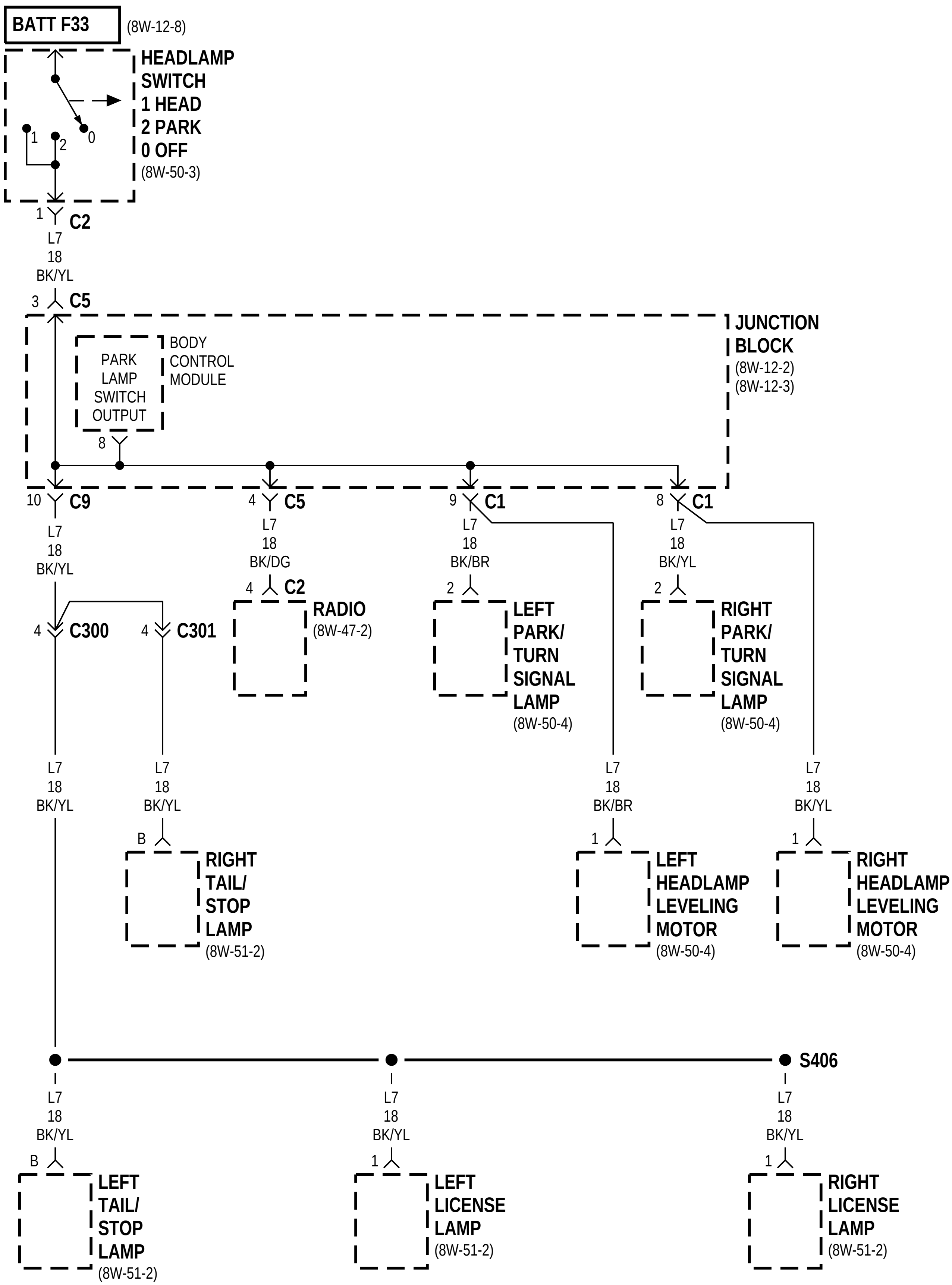
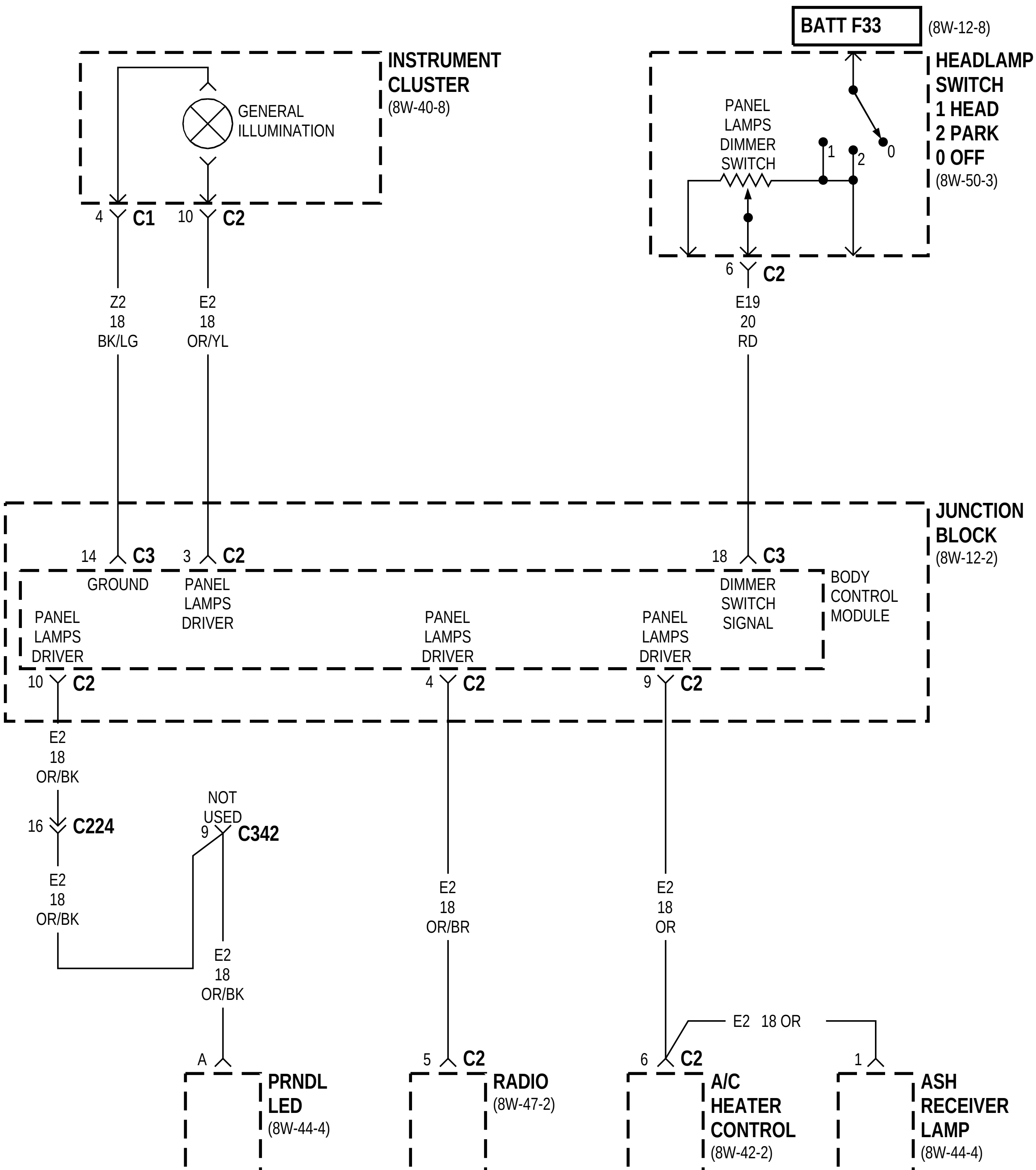

BATT A1
(8W-10-6)
BATT A1
(8W-10-6)
IGNITION
SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-6)
9 C2
2 C1
A21
16
DB
A81
18
DG/RD
BATT A3
(8W-10-11)
BATT A7
(8W-10-5)
9 C5
2 C7
JUNCTION
BLOCK
(8W-12-2)
(8W-10-7)
FUSE
11
10A
(8W-12-10)
FUSE
9
15A
(8W-12-10)
FUSE
5
10A
(8W-12-6)
11
6
2
12
FUSED
IGN.
(ST-RUN)
FUSED
IGN.
(ST-RUN-OFF)
FUSED
B(+)
FUSED
B(+)
BODY
CONTROL
MODULE
GROUND
GROUND
GROUND
4 C1
(8W-12-14)
10
8 C2
3 C9
Z2
20
BK/LG
POWER
STEERING
PRESSURE
SWITCH
(8W-30-12)
2
Z1
18
BK
Z1
14
BK
Z2
20
BK/LG
16 C121
Z1
18
BK
G301
(8W-15-9)
G200
(8W-15-5)

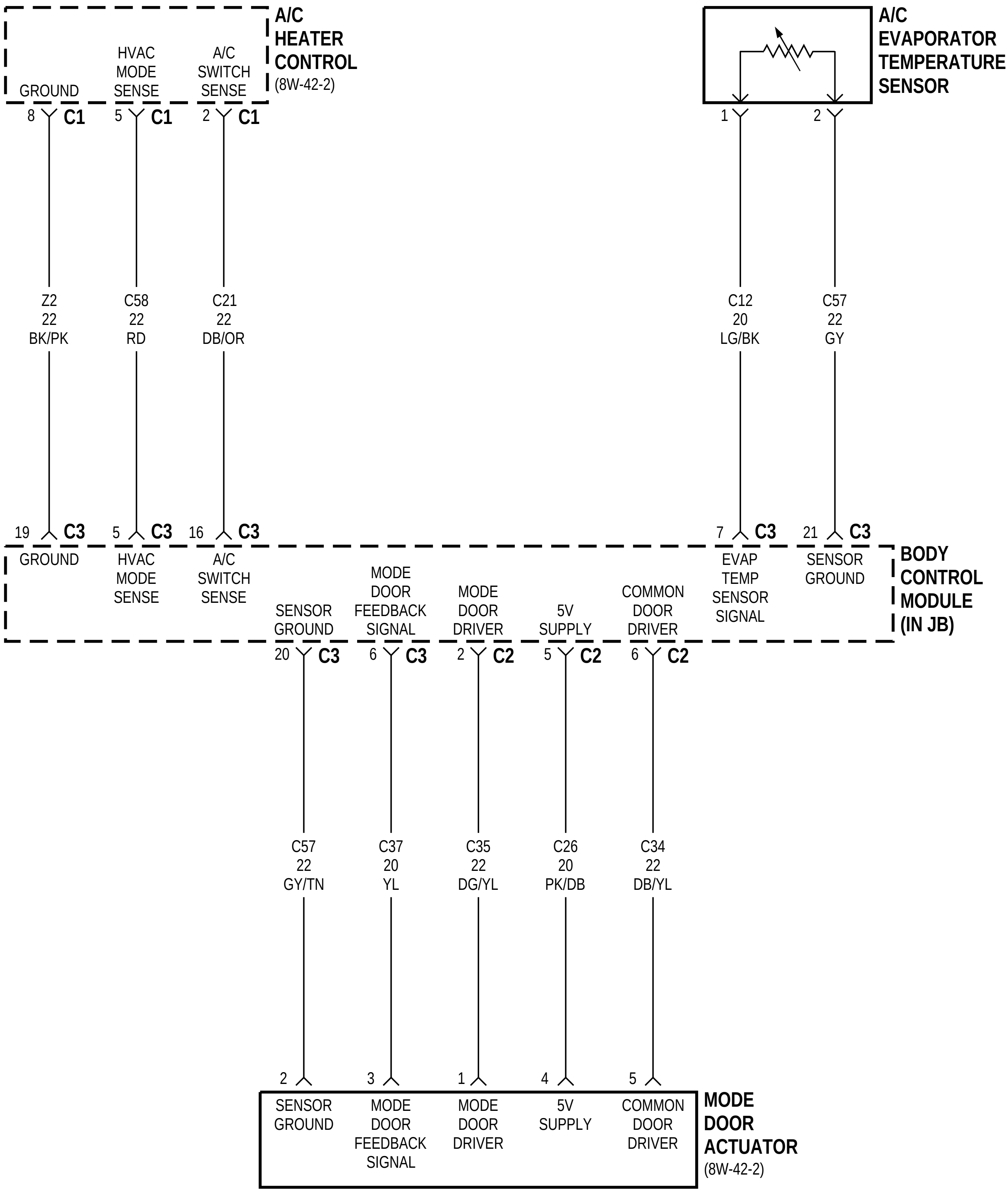

IMMOBILIZER
(8W-61-5)
CCD BUS (+)
CCD BUS (-)
3
4
INSTRUMENT CLUSTER
(8W-40-2)
CCD BUS (+)
CCD BUS (-)
8 C2
7 C2
D1 20 VT/BR
D1 20 VT/BR
D2 20 WT/DB
D2 20 WT/DB
DATA LINK CONNECTOR
(8W-30-17)
3
4
11
D1 20 VT/BR
D2 20 WT/DB
AIRBAG CONTROL MODULE
(8W-43-2)
CCD BUS (+)
CCD BUS (-)
3 C1
4 C1
S132
S133
D1 18 VT/BR
D2 18 WT/DB
D1 20 VT/BR
Z2 20 BK/VT
D2 20 WT/DB
2 C3
12 C3
1 C3
4 C3
11 C3
BODY CONTROL MODULE (IN JB)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
GROUND
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
5 C1
13 C1
6 C1
14 C1
D1 20 VT/BR
D2 20 WT/BK
D1 20 VT/DG
D2 20 WT/DG
59 C1
60 C1
43
4
POWERTRAIN CONTROL MODULE
(8W-30-17)
CCD BUS (+)
CCD BUS (-)
TRANSMISSION CONTROL MODULE
(8W-31-8)
CCD BUS (+)
CCD BUS (-)

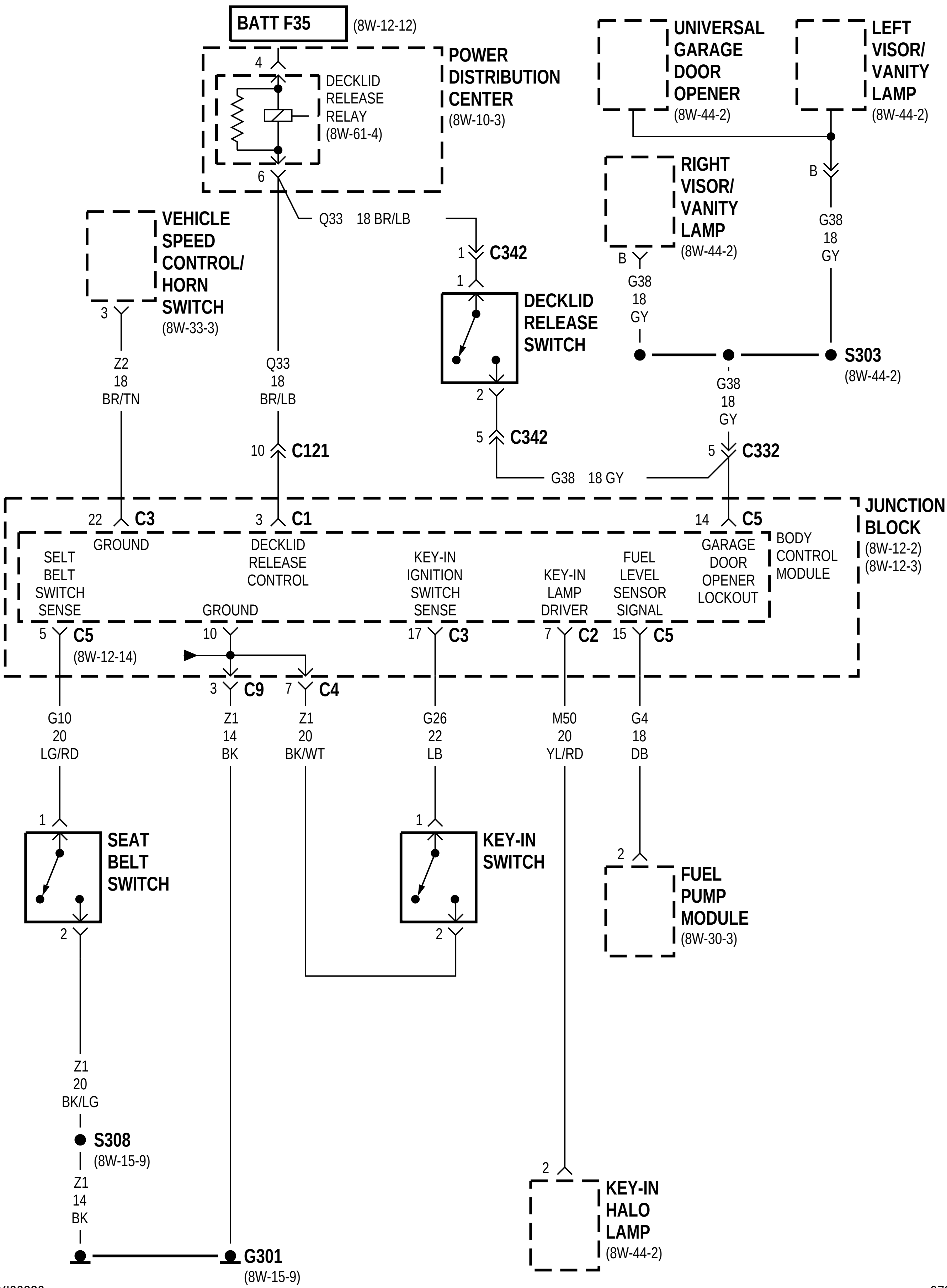

F13
20
DB/GY
RUN-ACC F13
(8W-12-11)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
13
INTERMITTENT
WIPER
RELAY
(8W-53-3)
15
10
WIPER
HIGH/
LOW
RELAY
(8W-53-3)
12
INTERMITTENT
WIPER
SWITCH
(8W-53-2)
1 C1
2 C1
V10
18
BR/DB
V52
22
DG/RD
V14
20
PK/VT
V16
20
VT/PK
15 C3
10 C3
7 C1
8 C1
WASHER
PUMP
CONTROL
WINDSHIELD
WIPER
SWITCH
SIGNAL
WASHER
PUMP
CONTROL
WIPER
ON/OFF
RELAY
CONTROL
GROUND
WIPER
HIGH/LOW
RELAY
CONTROL
WIPER
PARK
SENSE
SWITCH
BODY
CONTROL
MODULE
(IN JB)
10 C1
12 C1
2 C1
V10
18
BR/DB
Z2
20
BK/LG
V55
20
WT/GY
A
WINDSHIELD
WASHER
PUMP
MOTOR
(8W-53-2)
2
STOP
LAMP
SWITCH
(8W-33-3)
D
WINDSHIELD
WIPER
MOTOR
(8W-53-3)

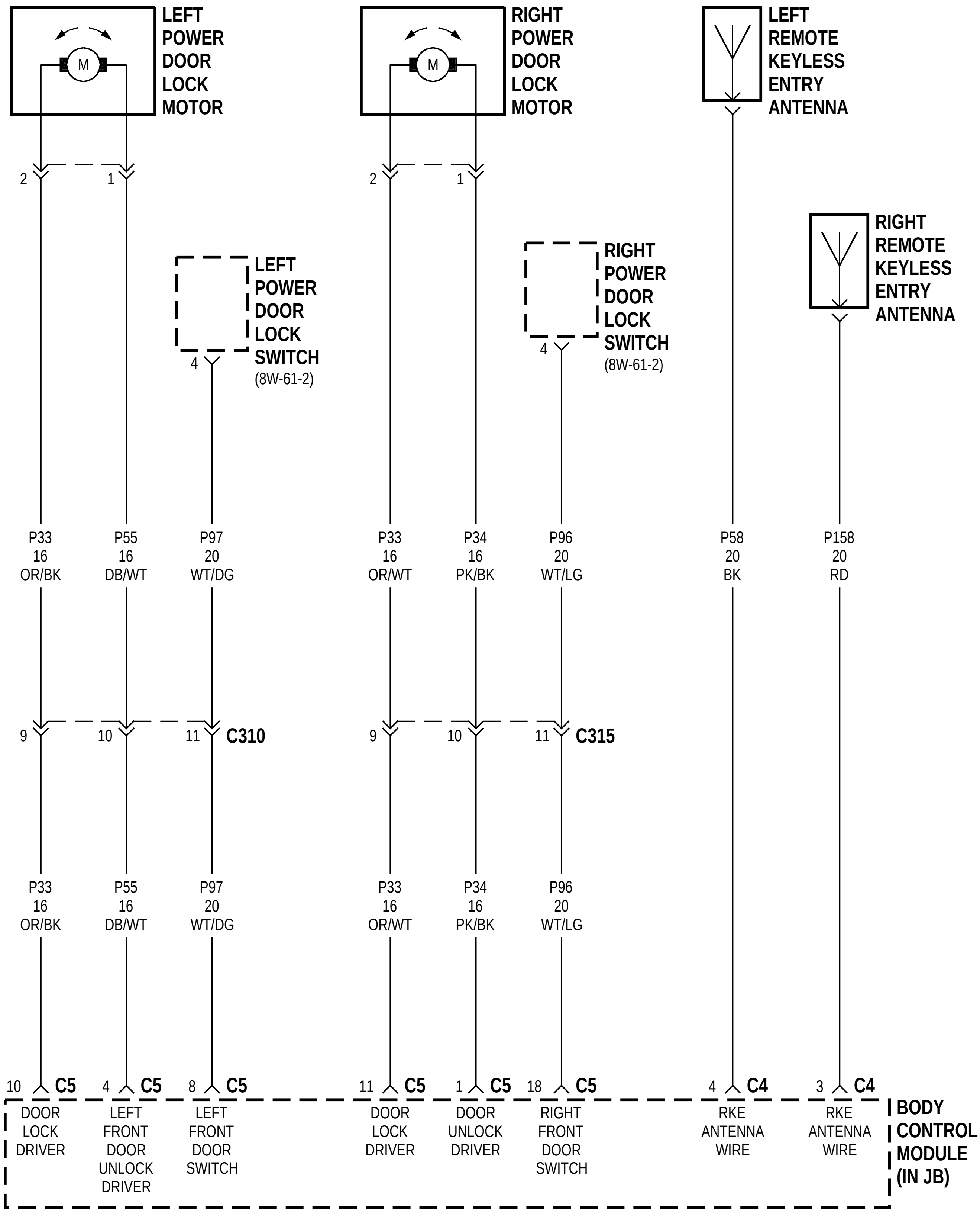

BATT M1
(8W-12-6)
ILLUMINATED
ENTRY
RELAY
(8W-44-3)
6
M112
20
BR/LG
BATT A3
(8W-10-11)
HEADLAMP
SWITCH
(8W-50-3)
1 HEAD
2 PARK
3 LOW
4 HIGH
5 FLASH TO PASS
0 OFF
1
2
0
3
4
5
7
C2
8
C2
L4
14
VT/WT
L3
14
RD/OR
1
C10
BATT A3
(8W-10-11)
2
C6
3
C6
JUNCTION
BLOCK
(8W-12-2)
(8W-12-11)
(8W-12-4)
3
1
HEADLAMP
DELAY
RELAY
2
5
9
5
4
1
ILLUMINATED
ENTRY
RELAY
CONTROL
HEADLAMP
DELAY
RELAY
CONTROL
DIM
SWITCH
LOW
BEAM
OUTPUT
DIM
SWITCH
HIGH
BEAM
OUTPUT
BODY
CONTROL
MODULE

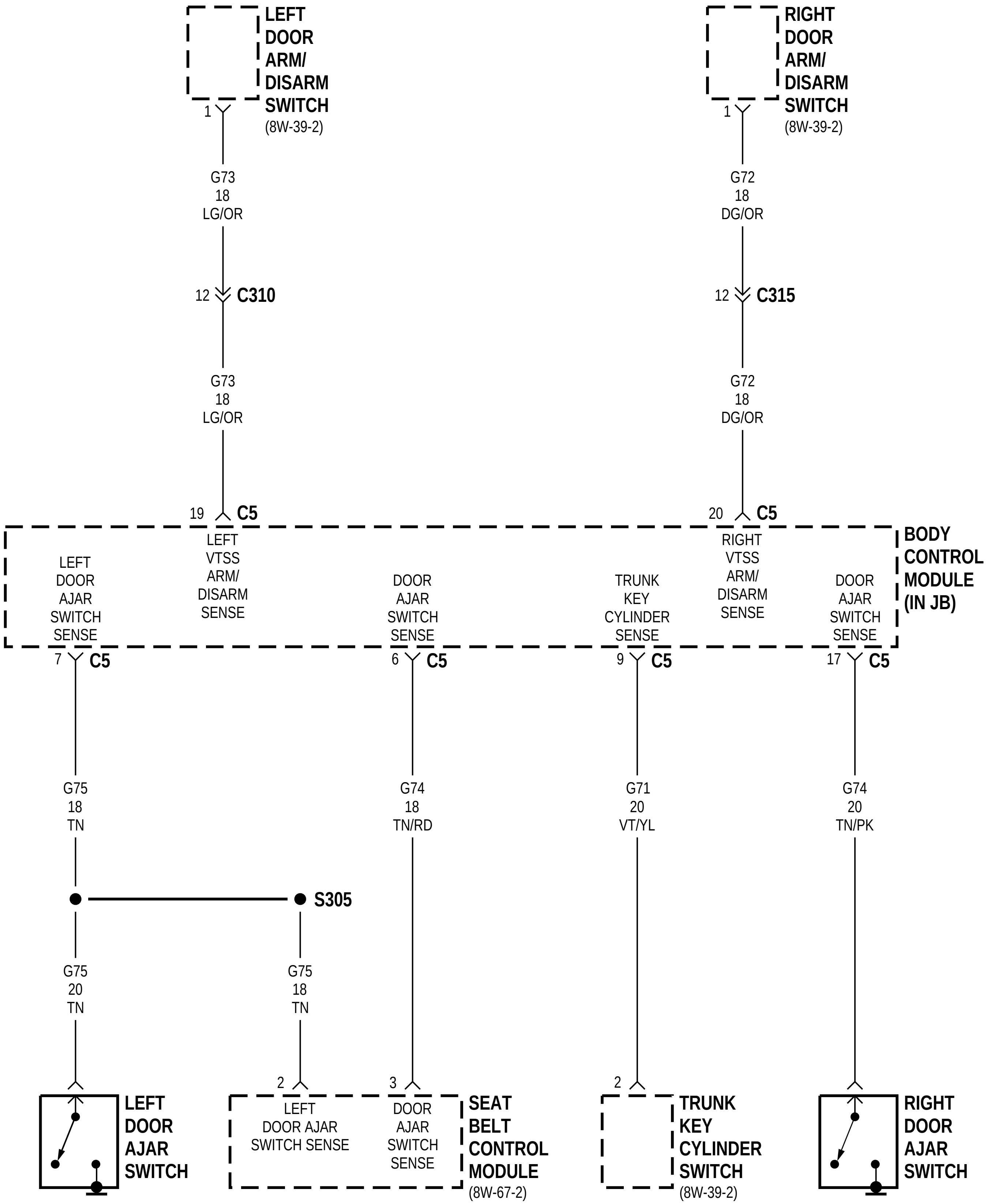

BATT F33
(8W-12-8)
HEADLAMP SWITCH
1 HEAD
2 PARK
0 OFF
(8W-50-3)
1
2
0
1 C2
L7
18
BK/YL
3 C5
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
PARK LAMP SWITCH OUTPUT
8
10 C9
4 C5
9 C1
8 C1
L7
18
BK/YL
L7
18
BK/DG
L7
18
BK/BR
L7
18
BK/YL
4 C2
RADIO
(8W-47-2)
2
LEFT PARK/ TURN SIGNAL LAMP
(8W-50-4)
2
RIGHT PARK/ TURN SIGNAL LAMP
(8W-50-4)
4 C300
4 C301
L7
18
BK/YL
L7
18
BK/YL
L7
18
BK/BR
L7
18
BK/YL
B
RIGHT TAIL/ STOP LAMP
(8W-51-2)
1
LEFT HEADLAMP LEVELING MOTOR
(8W-50-4)
1
RIGHT HEADLAMP LEVELING MOTOR
(8W-50-4)
S406
L7
18
BK/YL
L7
18
BK/YL
L7
18
BK/YL
B
LEFT TAIL/ STOP LAMP
(8W-51-2)
1
LEFT LICENSE LAMP
(8W-51-2)
1
RIGHT LICENSE LAMP
(8W-51-2)

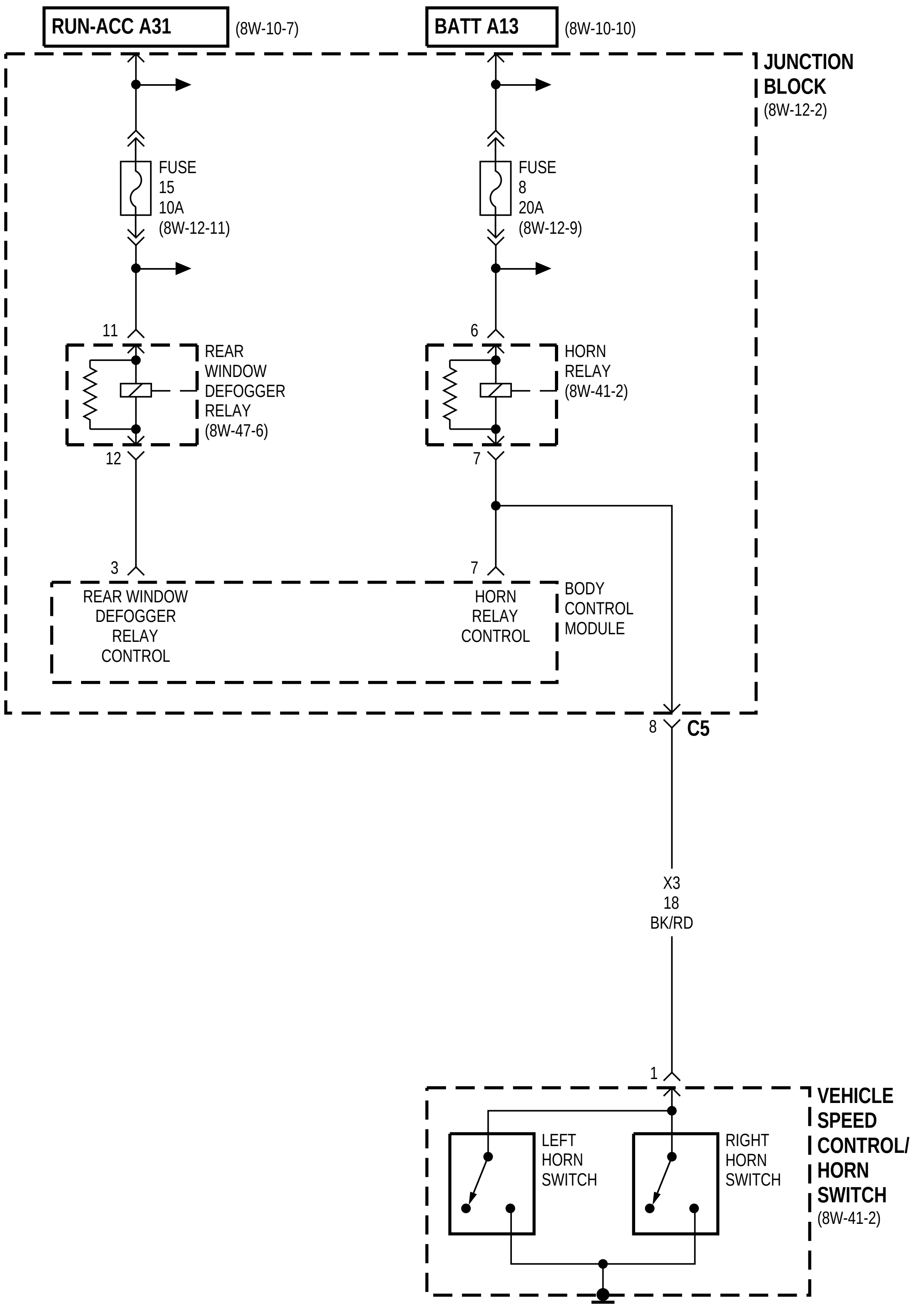

BATT F33
(8W-12-8)
INSTRUMENT CLUSTER
(8W-40-8)
GENERAL ILLUMINATION
HEADLAMP SWITCH
1 HEAD
2 PARK
0 OFF
(8W-50-3)
PANEL LAMPS DIMMER SWITCH
4 C1
10 C2
6 C2
Z2 18 BK/LG
E2 18 OR/YL
E19 20 RD
JUNCTION BLOCK
(8W-12-2)
14 C3
3 C2
18 C3
GROUND
PANEL LAMPS DRIVER
DIMMER SWITCH SIGNAL
BODY CONTROL MODULE
PANEL LAMPS DRIVER
PANEL LAMPS DRIVER
PANEL LAMPS DRIVER
10 C2
4 C2
9 C2
E2 18 OR/BK
16 C224
NOT USED
9 C342
E2 18 OR/BK
E2 18 OR/BK
E2 18 OR/BR
E2 18 OR
E2 18 OR
A
5 C2
6 C2
1
PRNDL LED
(8W-44-4)
RADIO
(8W-47-2)
A/C HEATER CONTROL
(8W-42-2)
ASH RECEIVER LAMP
(8W-44-4)


A/C HEATER CONTROL
(8W-42-2)
GROUND
HVAC MODE SENSE
A/C SWITCH SENSE
8 C1
5 C1
2 C1
Z2 22 BK/PK
C58 22 RD
C21 22 DB/OR
A/C EVAPORATOR TEMPERATURE SENSOR
1
2
C12 20 LG/BK
C57 22 GY
19 C3
5 C3
16 C3
7 C3
21 C3
GROUND
HVAC MODE SENSE
A/C SWITCH SENSE
SENSOR GROUND
MODE DOOR FEEDBACK SIGNAL
MODE DOOR DRIVER
5V SUPPLY
COMMON DOOR DRIVER
EVAP TEMP SENSOR SIGNAL
SENSOR GROUND
BODY CONTROL MODULE (IN JB)
20 C3
6 C3
2 C2
5 C2
6 C2
C57 22 GY/TN
C37 20 YL
C35 22 DG/YL
C26 20 PK/DB
C34 22 DB/YL
2
3
1
4
5
SENSOR GROUND
MODE DOOR FEEDBACK SIGNAL
MODE DOOR DRIVER
5V SUPPLY
COMMON DOOR DRIVER
MODE DOOR ACTUATOR
(8W-42-2)


BATT F35
(8W-12-12)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
DECKLID
RELEASE
RELAY
(8W-61-4)
4
6
Q33 18 BR/LB
UNIVERSAL
GARAGE
DOOR
OPENER
(8W-44-2)
LEFT
VISOR/
VANITY
LAMP
(8W-44-2)
RIGHT
VISOR/
VANITY
LAMP
(8W-44-2)
B
G38
18
GY
VEHICLE
SPEED
CONTROL/
HORN
SWITCH
(8W-33-3)
3
Z2
18
BR/TN
Q33
18
BR/LB
1 C342
DECKLID
RELEASE
SWITCH
2
5 C342
S303
(8W-44-2)
10 C121
5 C332
G38 18 GY
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
BODY
CONTROL
MODULE
22 C3
GROUND
3 C1
DECKLID
RELEASE
CONTROL
14 C5
GARAGE
DOOR
OPENER
LOCKOUT
SELT
BELT
SWITCH
SENSE
GROUND
KEY-IN
IGNITION
SWITCH
SENSE
KEY-IN
LAMP
DRIVER
FUEL
LEVEL
SENSOR
SIGNAL
5 C5
(8W-12-14)
10
17 C3
7 C2
15 C5
3 C9
7 C4
G10
20
LG/RD
Z1
14
BK
Z1
20
BK/WT
G26
22
LB
M50
20
YL/RD
G4
18
DB
SEAT
BELT
SWITCH
KEY-IN
SWITCH
FUEL
PUMP
MODULE
(8W-30-3)
Z1
20
BK/LG
S308
(8W-15-9)
Z1
14
BK
G301
(8W-15-9)
KEY-IN
HALO
LAMP
(8W-44-2)


LEFT POWER DOOR LOCK MOTOR
M
2
1
RIGHT POWER DOOR LOCK MOTOR
M
2
1
LEFT REMOTE KEYLESS ENTRY ANTENNA
RIGHT REMOTE KEYLESS ENTRY ANTENNA
LEFT POWER DOOR LOCK SWITCH
(8W-61-2)
4
RIGHT POWER DOOR LOCK SWITCH
(8W-61-2)
4
P33 16 OR/BK
P55 16 DB/WT
P97 20 WT/DG
P33 16 OR/WT
P34 16 PK/BK
P96 20 WT/LG
P58 20 BK
P158 20 RD
9
10
11
C310
9
10
11
C315
P33 16 OR/BK
P55 16 DB/WT
P97 20 WT/DG
P33 16 OR/WT
P34 16 PK/BK
P96 20 WT/LG
10 C5
4 C5
8 C5
11 C5
1 C5
18 C5
4 C4
3 C4
DOOR LOCK DRIVER
LEFT FRONT DOOR UNLOCK DRIVER
LEFT FRONT DOOR SWITCH
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
RIGHT FRONT DOOR SWITCH
RKE ANTENNA WIRE
RKE ANTENNA WIRE
BODY CONTROL MODULE (IN JB)


LEFT DOOR ARM/ DISARM SWITCH
(8W-39-2)
1
G73
18
LG/OR
12
C310
G73
18
LG/OR
19
C5
RIGHT DOOR ARM/ DISARM SWITCH
(8W-39-2)
1
G72
18
DG/OR
12
C315
G72
18
DG/OR
20
C5
BODY CONTROL MODULE (IN JB)
LEFT DOOR AJAR SWITCH SENSE
LEFT VTSS ARM/ DISARM SENSE
DOOR AJAR SWITCH SENSE
TRUNK KEY CYLINDER SENSE
RIGHT VTSS ARM/ DISARM SENSE
DOOR AJAR SWITCH SENSE
7
C5
6
C5
9
C5
17
C5
G75
18
TN
G74
18
TN/RD
G71
20
VT/YL
G74
20
TN/PK
S305
G75
20
TN
G75
18
TN
2
3
LEFT DOOR AJAR SWITCH
LEFT DOOR AJAR SWITCH SENSE
DOOR AJAR SWITCH SENSE
SEAT BELT CONTROL MODULE
(8W-67-2)
2
TRUNK KEY CYLINDER SWITCH
(8W-39-2)
RIGHT DOOR AJAR SWITCH


RUN-ACC A31
(8W-10-7)
BATT A13
(8W-10-10)
JUNCTION
BLOCK
(8W-12-2)
FUSE
15
10A
(8W-12-11)
FUSE
8
20A
(8W-12-9)
11
6
REAR
WINDOW
DEFOGGER
RELAY
(8W-47-6)
HORN
RELAY
(8W-41-2)
12
7
3
7
REAR WINDOW
DEFOGGER
RELAY
CONTROL
HORN
RELAY
CONTROL
BODY
CONTROL
MODULE
8
C5
X3
18
BK/RD
1
LEFT
HORN
SWITCH
RIGHT
HORN
SWITCH
VEHICLE
SPEED
CONTROL/
HORN
SWITCH
(8W-41-2)

8W-45 BODY CONTROL MODULE

INDEX

DESCRIPTION AND OPERATION

INTRODUCTION

The Body Control Module (BCM) is used to supply the vehicles occupants with visual and audible information, control various vehicle functions, and provide a centralized power distribution for the passenger compartment. To both provide and receive vehicle information the BCM is interfaced to the CCD Bus.

Power for the BCM is supplied from four sources. One is the M1 circuit. This circuit is HOT at all times, and is the Ignition-Off Draw (IOD) circuit. This circuit is protected by a 10 amp fuse located in cavity 5 of the junction block.

Power is also supplied to the BCM on circuit A21. This circuit is HOT when the ignition switch is in the START/RUN position only, and connects from the ignition switch to the BCM. Power for the A21 circuit is supplied by circuit A1. Circuit A1 is connected between the PDC and the ignition switch and is protected by a 20 amp fuse located in cavity 8 of the PDC.

Circuit F11, which is HOT when the ignition switch is in the OFF/RUN/START position, supplies a constant feed to the BCM. This circuit is protected by a 10 amp fuse located in cavity 11 of the junction block. Power for the fuse is supplied on circuit A81 from the ignition switch. Circuit A81 receives its power from circuit A1 which originates in the PDC and is protected by a 20 amp fuse located in cavity 8.

Circuit F135 also supplies power to the BCM and is protected by a 15 amp fuse located in cavity 9 of the junction block. This circuit is used for the feed to the power door lock motors.

Ground for the BCM is provided by circuits Z1 and Z2. These circuits terminate at the instrument panel left side cowl.

CCD Bus interface is accomplished on circuits D1 and D2. The D1 circuit is used for Bus (+), and D2 is for Bus (-).

ILLUMNATED ENTRY

The illuminated entry relay located in the junction block is used to control the ground path for the interior lamps. Power for the relay is supplied on circuit M1. This is the Ignition-Off Draw (IOD) circuit and is protected by a 10 amp fuse located in cavity 5 of the junction block.

Ground for the relay is supplied on circuit M112. This circuit connects from the relay to the Body Control Module (BCM). When the BCM provides a ground path for the relay, circuits M2 and Z1 are connected illuminating the interior lamps.

SEAT BELT WARNING

The seat belt chime is used to indicate to the operator that the seat belt is not fastened when the ignition switch is in the RUN position. The seat belt switch, located in the left B-Pillar, is normally OPEN with the seat belt buckled. Circuit G10 is connected between the Body Control Module (BCM) and the switch. Ground for the switch is provided on circuit Z1. The Z1 circuit terminates at the deck lid ground.

EXTERIOR LAMP-ON WARNING

The exterior lamp ON chime is used to indicate to the operator that the lamps are ON with the drivers door OPEN and the key removed from the ignition. The Body Control Module (BCM) uses information from circuit L7 to determine if the lamps are ON, and circuit G75 for drivers door ajar. The chime function will not operate when the headlamp delay feature is active.

DOOR AJAR WARNING

This feature is used to alert the operator the drivers door is ajar while the vehicle is in motion. The Body Control Module (BCM) uses information on vehicle speed from the CCD Bus and circuit G75 which connects to the drivers door ajar switch.

DESCRIPTION AND OPERATION (Continued)

DOOR LOCK INHIBIT

When the Key-In switch is CLOSED (circuit G26 connected to circuit Z1) the Body Control Module (BCM) ignores the operators request for power door lock operation.

KEY-IN IGNITION WARNING

The Key-In chime is used to indicate to the operator that the key is in the ignition with the driver's door OPEN. If the key is in the ignition, a ground path is completed from the G26 circuit at the Body Control Module (BCM), through the CLOSED switch, to the Z1 circuit. The Z1 circuit is the ground circuit and terminates at the body ground located at the left kick panel.

When the driver's door is open the normally OPEN door ajar switch CLOSES completing a path to ground on circuit G75. The BCM processes this information and turns on the chime.

FUNERAL MODE DISPLAY ILLUMINATION

The Body Control Module (BCM) controls the intensity of the instrument cluster vacuum florescent displays. This is accomplished using the input from the headlamp dimmer switch on circuit E19. When the exterior lamps are ON, and the dimmer switch is moved to the high end of it's travel, the BCM sends a message over the CCD Bus to the instrument cluster for full lamp intensity.

INSTRUMENT PANEL LAMP DIMMING

The Body Control Module (BCM) controls the instrument panel lamp intensity using input from the dimmer switch, circuit E19. The BCM uses the CCD Bus to send a signal to the instrument cluster for proper lamp intensity.

VEHICLE IMMOBILIZER MODULE

The vehicle immobilizer module is interfaces with the Body Control Module (BCM). Circuits D1 and D2 are used to provide CCD communications between the BCM and the module. Ground for the module is supplied on circuit Z1.

Battery voltage for the module is supplied on circuit A15. This circuit is HOT at all times and protected by a 20 amp fuse located in the Power Distribution Center (PDC). Circuit F18 is used to provide a RUN/START input to the module.

Circuit G37 is connected between the module and the Powertrain Control Module (PCM). Circuit P102 is used as a wake up signal from the BCM.

HELPFUL INFORMATION

Refer to the appropriate group of the Service Manual of the Diagnostic Test Procedures Manual.

8W-46 TRAVELER

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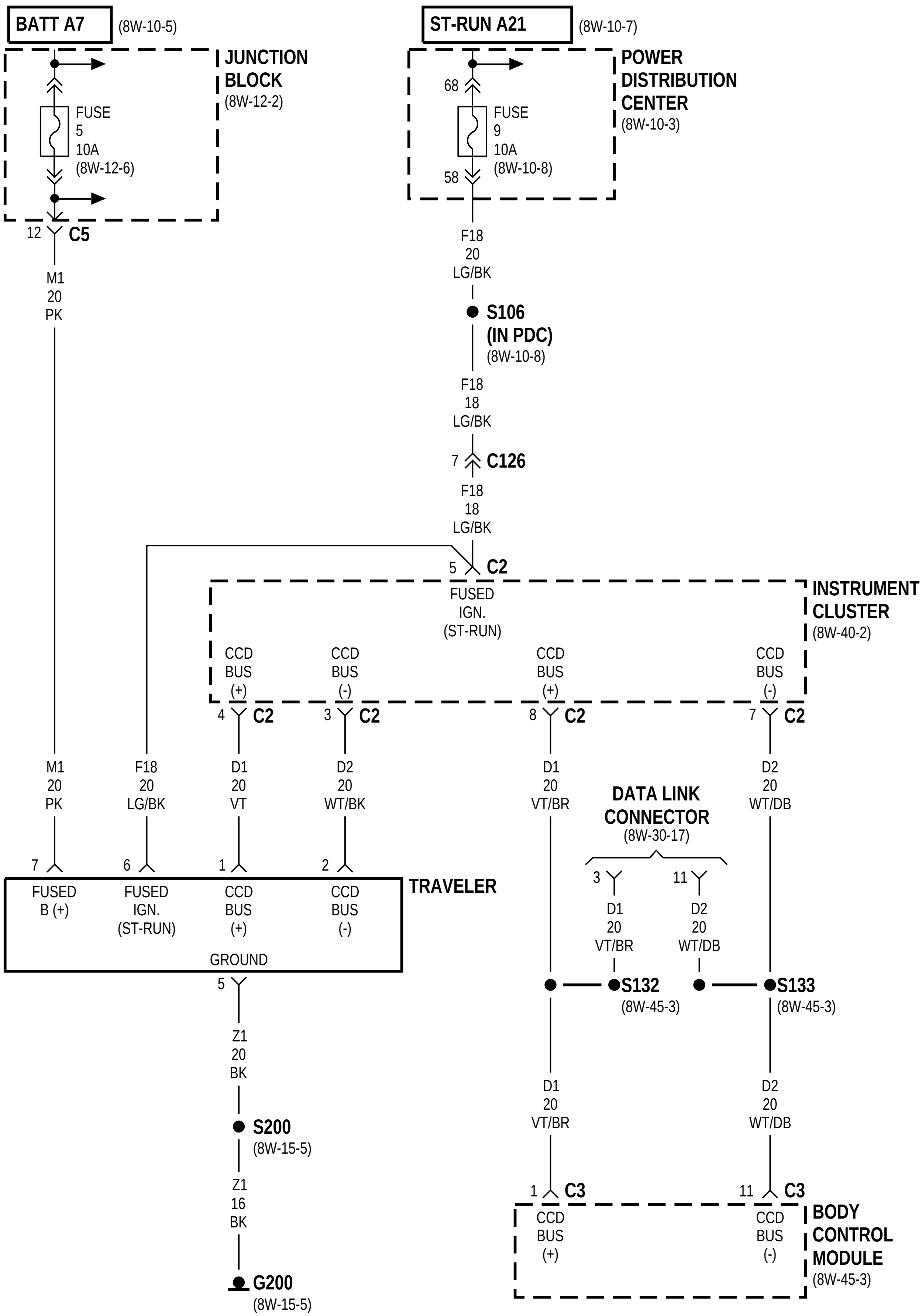
BATT A7
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE 5 10A (8W-12-6)
12 C5
M1 20 PK
ST-RUN A21
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-3)
68
FUSE 9 10A (8W-10-8)
58
F18 20 LG/BK
S106 (IN PDC)
(8W-10-8)
F18 18 LG/BK
7 C126
F18 18 LG/BK
5 C2
FUSED IGN. (ST-RUN)
INSTRUMENT CLUSTER
(8W-40-2)
CCD BUS (+)
CCD BUS (-)
CCD BUS (+)
CCD BUS (-)
4 C2
3 C2
8 C2
7 C2
M1 20 PK
F18 20 LG/BK
D1 20 VT
D2 20 WT/BK
D1 20 VT/BR
DATA LINK CONNECTOR
(8W-30-17)
D2 20 WT/DB
3
11
D1 20 VT/BR
D2 20 WT/DB
7
6
1
2
TRAVELER
FUSED B (+)
FUSED IGN. (ST-RUN)
CCD BUS (+)
CCD BUS (-)
GROUND
5
S132
(8W-45-3)
S133
(8W-45-3)
Z1 20 BK
S200
(8W-15-5)
Z1 16 BK
G200
(8W-15-5)
D1 20 VT/BR
D2 20 WT/DB
1 C3
11 C3
CCD BUS (+)
CCD BUS (-)
BODY CONTROL MODULE
(8W-45-3)

8W-46 TRAVELER

DESCRIPTION AND OPERATION

TRAVELER

Battery voltage for the traveler is supplied from two (2) sources. One is the M1 circuit. This is the Ignition-Off Draw (IOD) circuit and is protected by a 10 amp fuse located in the junction block. This circuit is HOT at all times.

Circuit A21 also supplies battery voltage to the traveler when the ignition switch is in the START/RUN position.

Ground for the traveler is supplied on circuit Z1.

To allow the traveler to send and receive information it is interfaced with the CCD Bus. Circuit D1 is used for CCD (+), and circuit D2 is used for CCD (-).

Illumination lamps internal to the traveler are controlled by circuit E2. This circuit is an output form the Body Control Module (BCM).

Circuit C4 supplies a blower motor ON/OFF sense to the traveler.

8W-47 AUDIO SYSTEM

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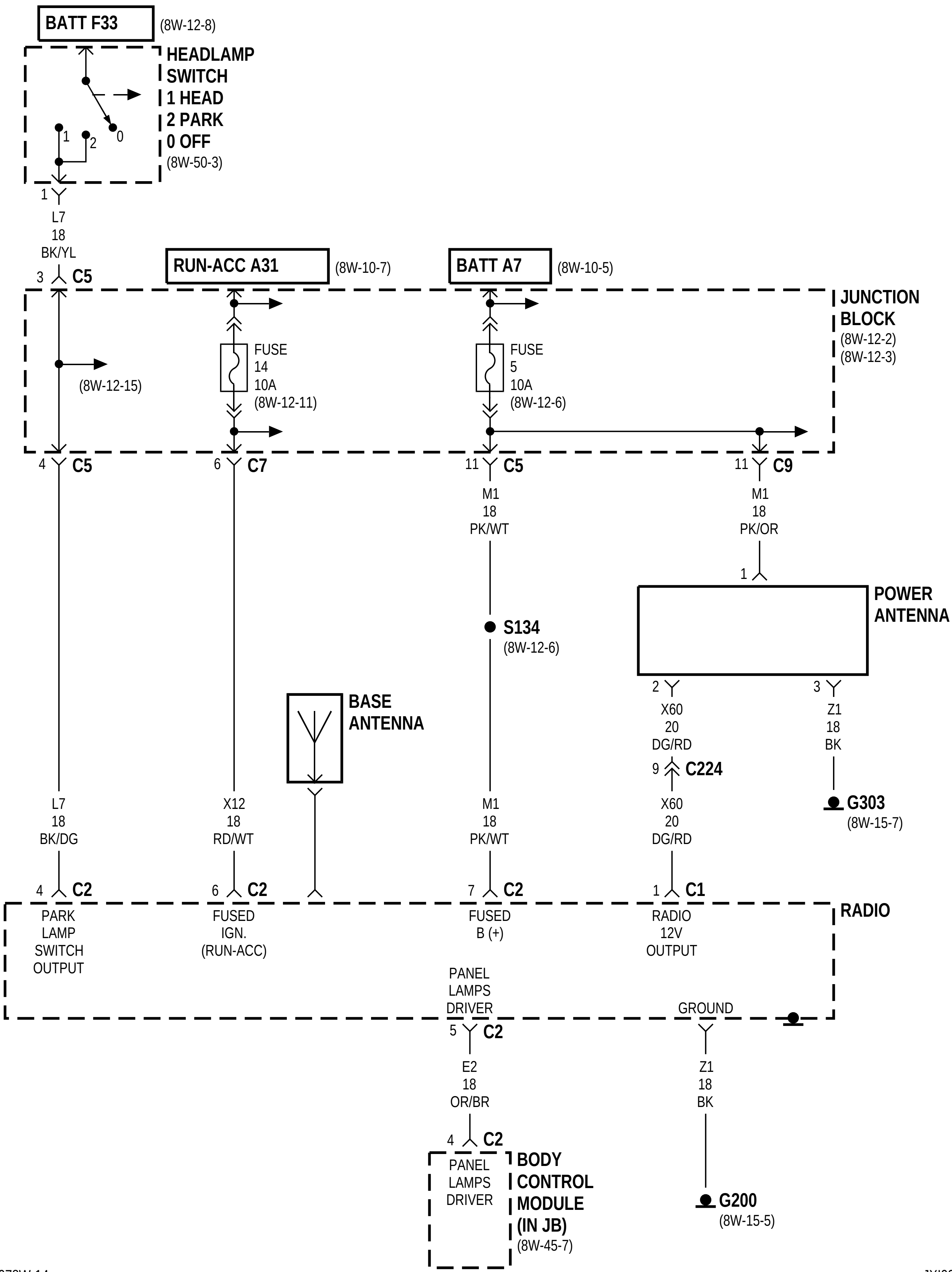
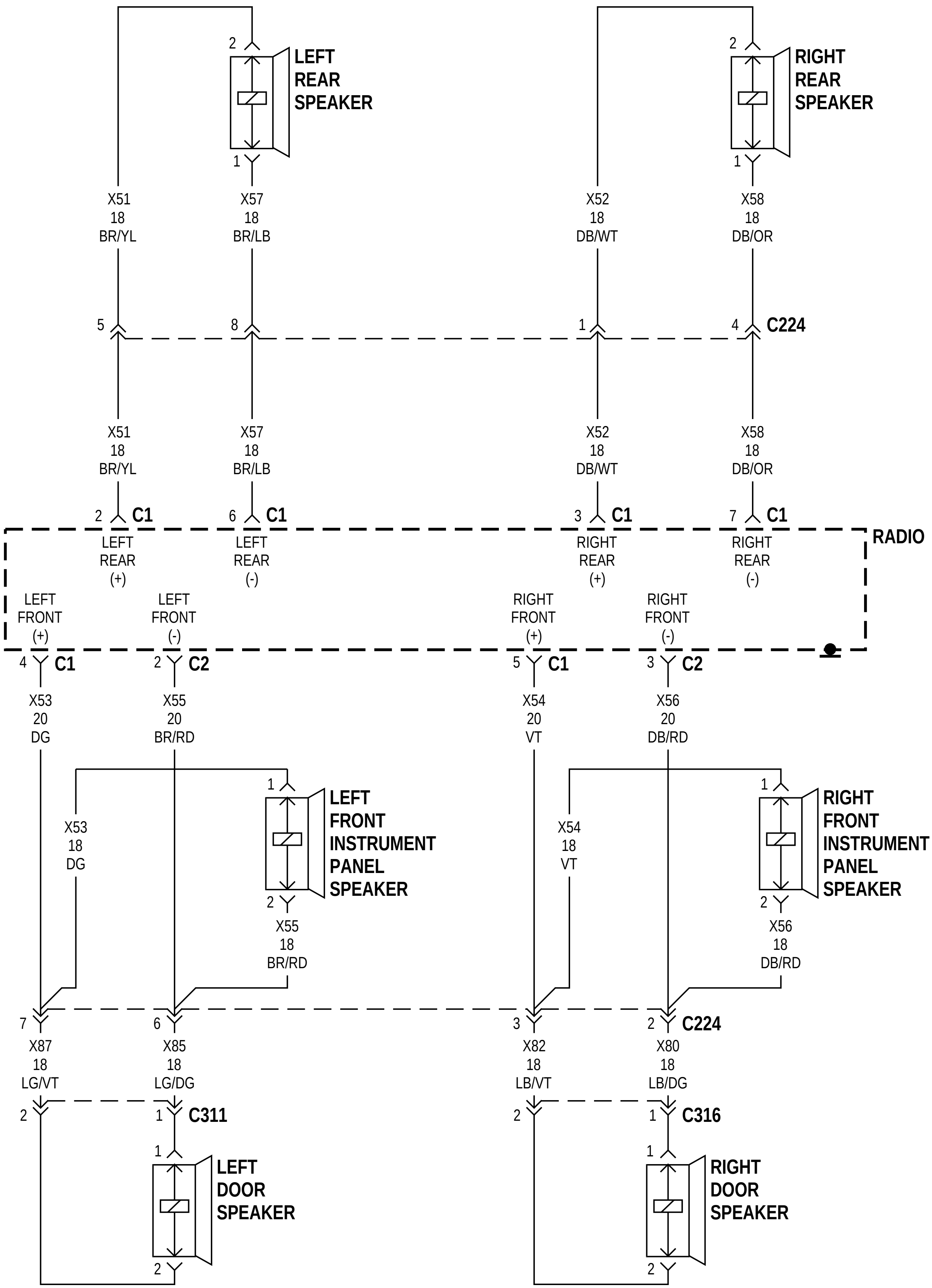
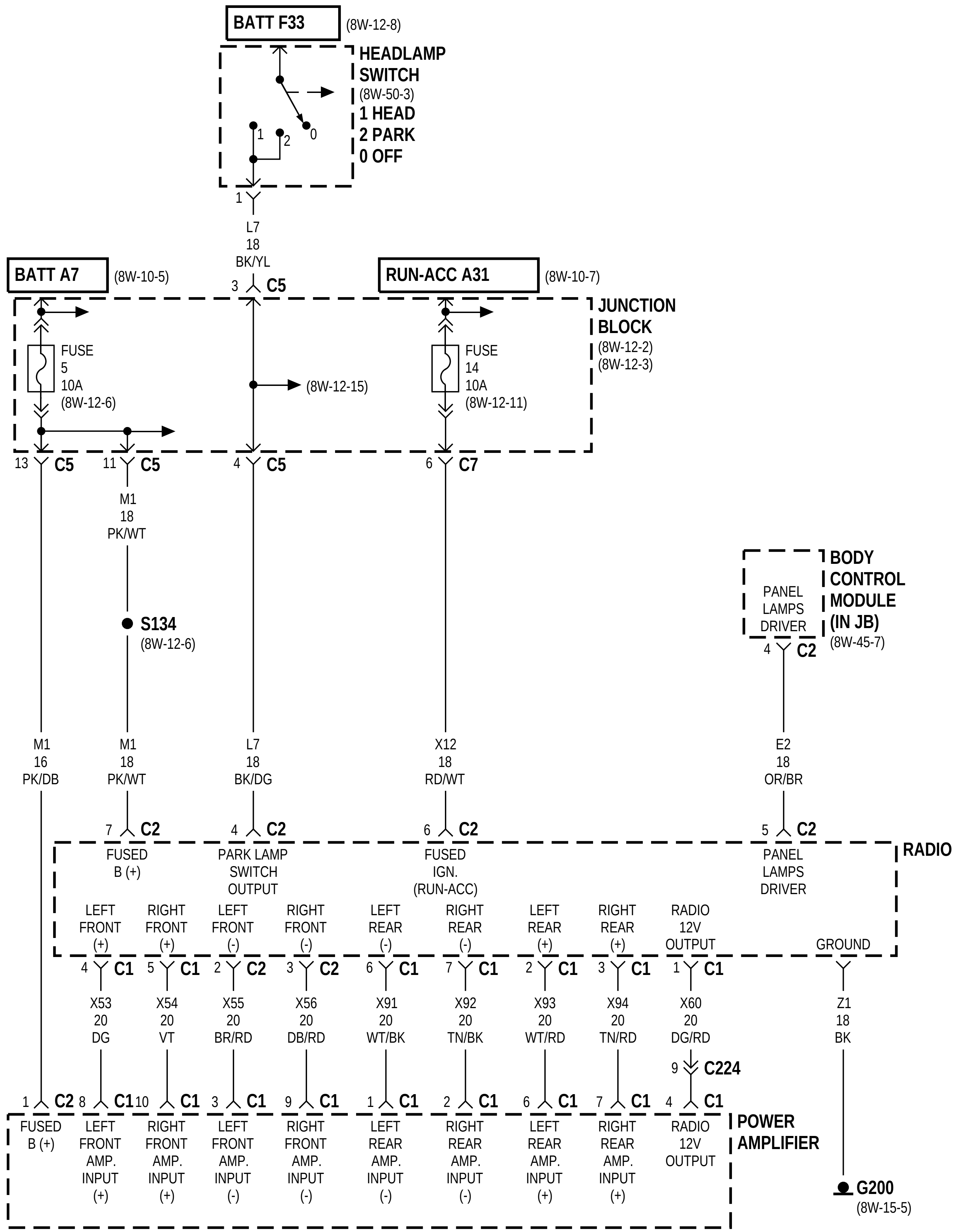
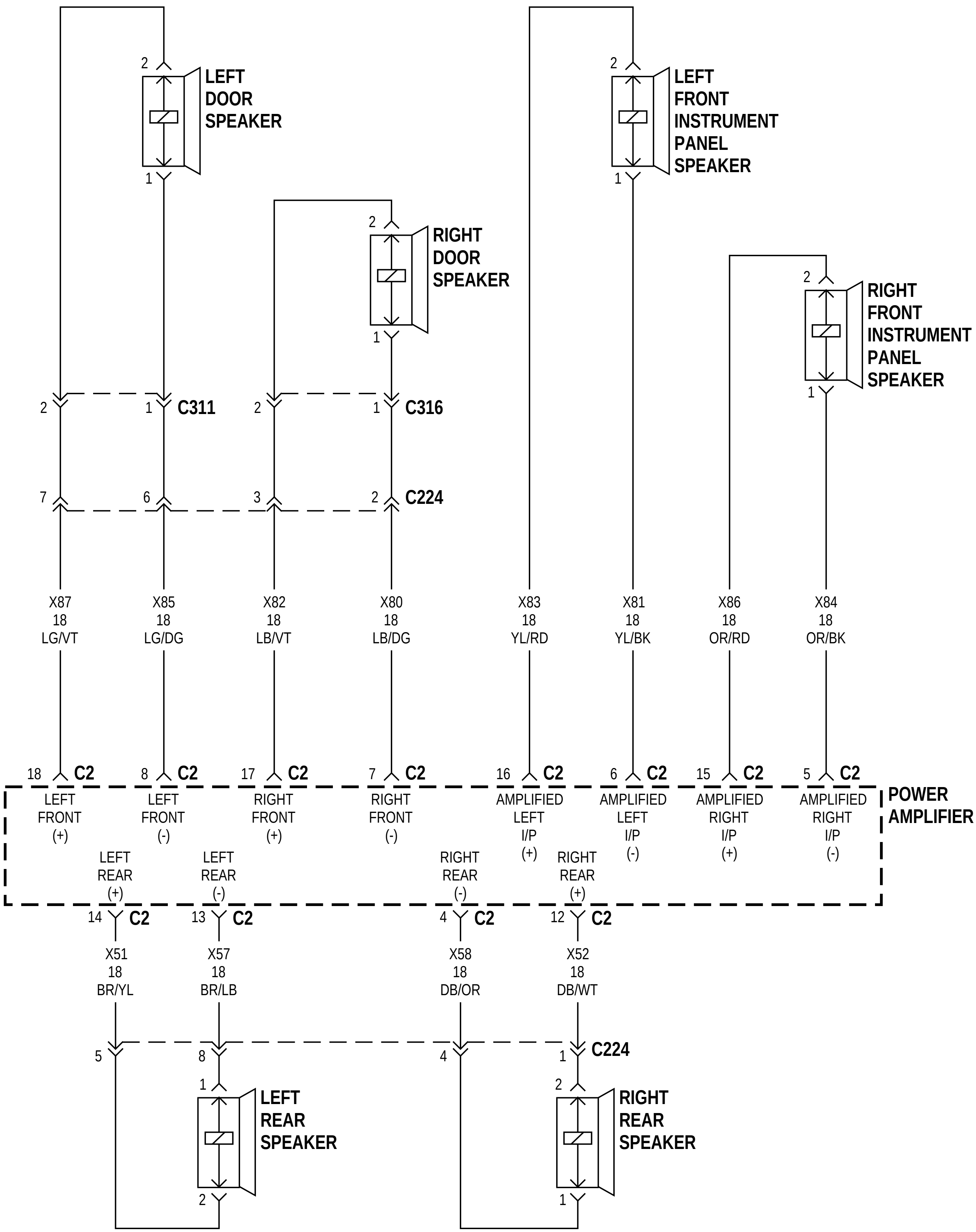

BATT F33
(8W-12-8)
HEADLAMP
SWITCH
1 HEAD
2 PARK
0 OFF
(8W-50-3)
1
2
0
1
L7
18
BK/YL
3 C5
RUN-ACC A31
(8W-10-7)
BATT A7
(8W-10-5)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
(8W-12-15)
FUSE
14
10A
(8W-12-11)
FUSE
5
10A
(8W-12-6)
4 C5
6 C7
11 C5
11 C9
M1
18
PK/WT
M1
18
PK/OR
1
POWER
ANTENNA
S134
(8W-12-6)
2
3
X60
20
DG/RD
Z1
18
BK
9 C224
G303
(8W-15-7)
BASE
ANTENNA
L7
18
BK/DG
X12
18
RD/WT
M1
18
PK/WT
X60
20
DG/RD
4 C2
6 C2
7 C2
1 C1
RADIO
PARK
LAMP
SWITCH
OUTPUT
FUSED
IGN.
(RUN-ACC)
FUSED
B (+)
RADIO
12V
OUTPUT
PANEL
LAMPS
DRIVER
GROUND
5 C2
E2
18
OR/BR
Z1
18
BK
4 C2
PANEL
LAMPS
DRIVER
BODY
CONTROL
MODULE
(IN JB)
(8W-45-7)
G200
(8W-15-5)

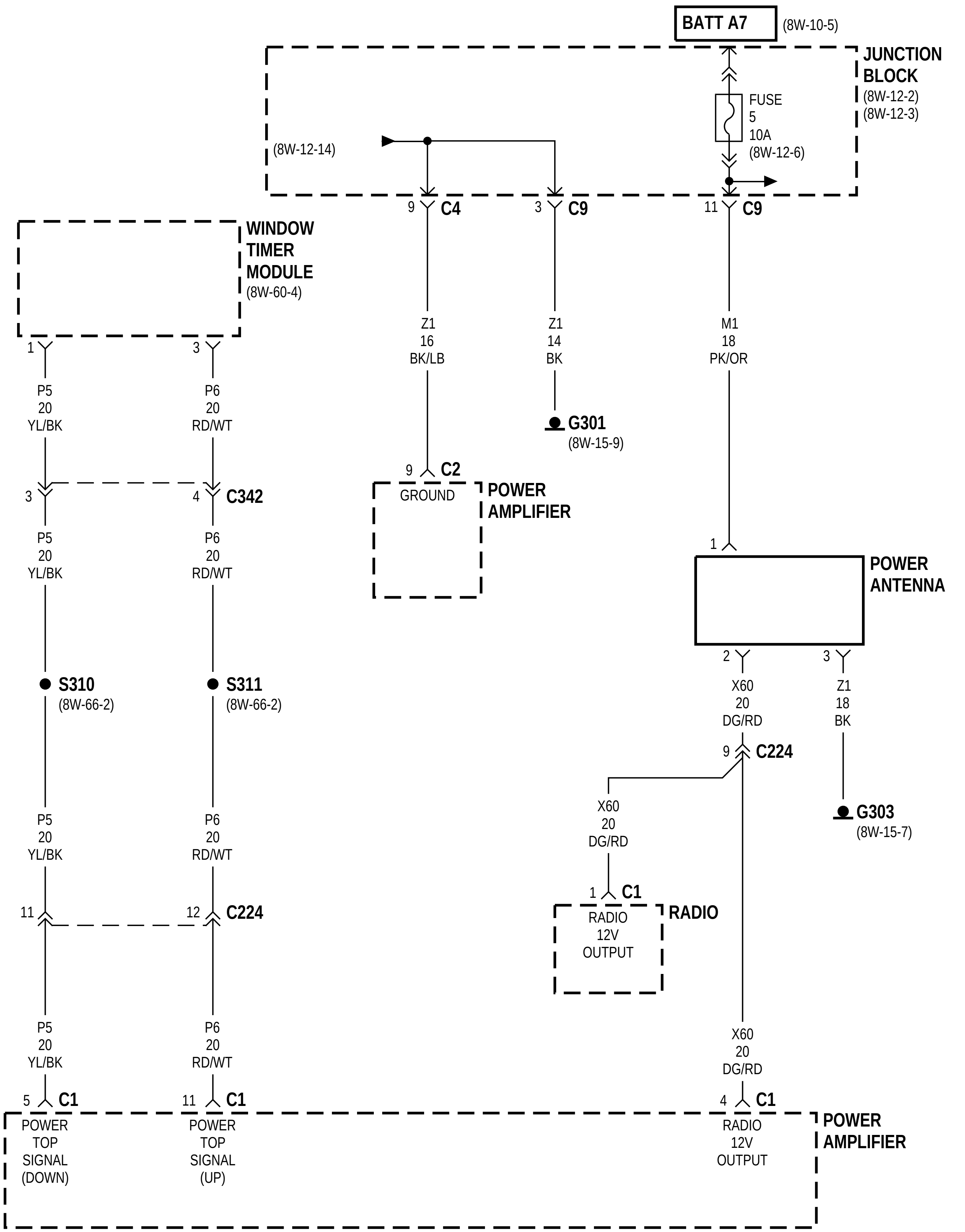

LEFT REAR SPEAKER
RIGHT REAR SPEAKER
X51 18 BR/YL
X57 18 BR/LB
X52 18 DB/WT
X58 18 DB/OR
C224
C1
C2
RADIO
LEFT REAR (+)
LEFT REAR (-)
RIGHT REAR (+)
RIGHT REAR (-)
LEFT FRONT (+)
LEFT FRONT (-)
RIGHT FRONT (+)
RIGHT FRONT (-)
X53 20 DG
X55 20 BR/RD
X54 20 VT
X56 20 DB/RD
X53 18 DG
X55 18 BR/RD
X54 18 VT
X56 18 DB/RD
LEFT FRONT INSTRUMENT PANEL SPEAKER
RIGHT FRONT INSTRUMENT PANEL SPEAKER
X87 18 LG/VT
X85 18 LG/DG
X82 18 LB/VT
X80 18 LB/DG
C311
C316
LEFT DOOR SPEAKER
RIGHT DOOR SPEAKER



978W-14 JXI00237



JXI00238 978W-14



BATT A7
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
5
10A
(8W-12-6)
(8W-12-14)
9 C4
3 C9
11 C9
WINDOW TIMER MODULE
(8W-60-4)
1
3
Z1
16
BK/LB
Z1
14
BK
M1
18
PK/OR
P5
20
YL/BK
P6
20
RD/WT
G301
(8W-15-9)
9 C2
GROUND
POWER AMPLIFIER
3
4 C342
1
POWER ANTENNA
2
3
S310
(8W-66-2)
S311
(8W-66-2)
X60
20
DG/RD
Z1
18
BK
9 C224
G303
(8W-15-7)
1 C1
RADIO
RADIO
12V
OUTPUT
11
12 C224
5 C1
11 C1
4 C1
POWER TOP SIGNAL (DOWN)
POWER TOP SIGNAL (UP)
RADIO 12V OUTPUT
POWER AMPLIFIER

8W-47 AUDIO SYSTEM

INDEX

DESCRIPTION AND OPERATION

RADIO OPERATION

There are two audio systems offered on this vehicle. The base system uses six speakers and a standard antenna. The optional system has six speakers, power amplifier, and a power antenna.

Both systems are powered by a 10 amp fuse located in cavity 14 of the junction block on circuit X12. This fuse is HOT when the ignition switch is in the ACCESSORY or RUN position.

The A31 circuit, which receives it's power from the ignition switch, on circuit A1, is protected by a 20 amp fuse located in cavity 8 of the Power Distribution Center (PDC).

Both the standard and optional radios use an external case ground. This case ground attaches to the rear of the radio and the instrument panel. There is also a ground for the radio provided on circuit Z1. This circuit attaches to the rear of the radio and terminates at the instrument panel ground.

RADIO MEMORY

Both the base and premium systems use the M1 circuit to maintain radio memory. This circuit is connected to the battery through the Power Distribution Center (PDC), and protected by a 10 amp Ignition-Off Draw (IOD) fuse. The M1 circuit is used to supply power to the Body Control Module (BCM), Power Mirrors, and the Power Door Locks. This fuse is also used in several other circuits, refer to section 8W-12 for additional information on the IOD fuse. The IOD fuse is removed during vehicle shipping to prevent excessive battery draw.

RADIO ILLUMINATION

When the parking lamps or the headlamps are ON, circuits E2 and L7 are used to power the radio illumination lamps. Circuit E2 is controlled by the Body Control Module (BCM). Circuit L7 is controlled by the park lamp switch.

CCD BUS

The CCD Bus and the universal data link connector are used for access to the diagnostic capabilities of the radio. Circuits D1 and D2 are used.

The D1 circuit is used for CCD (+) and circuit D2 is used for CCD (-).

SPEAKERS (BASE SYSTEM)

Circuits X53 and X87 are the feeds to the left front door and instrument panel speakers. Circuits X55 and X85 are the returns from the speakers to the radio.

Circuits X54 and X82 are the feeds to the right front door and instrument panel speaker. Circuits X56 and X80 are the returns from the speakers to the radio.

Circuit X51 is the feed to the left rear speaker. Circuit X57 is the return from the speaker to the radio.

Circuit X52 is the feed to the right rear speaker. Circuit X58 is the return from the speaker to the radio.

POWER AMPLIFIER

The power amplifier is used in the premium system only. It is placed between the radio and the speakers. The feed for the amplifier is provided on the F30 circuit.

The F30 circuit is protected by a 20 amp fuse located in cavity 8 of the junction block. Circuit F30 is spliced and provides power to the horns and the cigar lighter. Ground is provided on the Z1 circuit and terminates at the instrument panel left side cowl.

An additional feed input to the power amplifier is on circuit X60. This circuit is HOT when the radio is in the ON position.

Circuits P5 and P6 also connect to the power amplifier. These circuits are spliced in with the power top switch.

DESCRIPTION AND OPERATION (Continued)

SPEAKERS (PREMIUM SYSTEM)

Circuit X53 is the feed for the left front speaker to the power amplifier. Circuit X55 is the return from the amplifier to the radio.

Circuit X54 is the feed for the right front speaker to the power amplifier. Circuit X55 is the return from the amplifier to the radio.

Circuit X51 is the feed for the left rear speaker from the radio. Circuit X57 is the return from the speaker to the radio.

Circuit X52 is the feed for the right rear speaker from the radio. Circuit X58 is the return from the speaker to the radio.

Circuits X84 and X86 supply power and ground for the right front instrument panel speaker.

Circuits X83 and X81 supply power and ground for the left front instrument panel speaker.

Circuits X87 and X85 supply power and ground for the left front door speaker.

Circuits X82 and X80 supply power and ground for the right front door speaker.

POWER ANTENNA

The power antenna is used on the premium systems only. Battery feed for the antenna is provided from two different circuits.

One is the M1 circuit. The M1 circuit is used to supply power to the Body Control Module (BCM), Power Mirrors, and the Power Door Locks. This fuse is also used in several other circuits, refer to section 8W-10 for additional information on the IOD fuse. The IOD fuse is removed during vehicle shipping to prevent excessive battery draw.

The other circuit is the X60 circuit from the radio. This circuit is HOT when the radio is in the ON position. Ground for the antenna is a case ground.

HELPFUL INFORMATION

- Check for a blown 10 amp fuse in cavity 14 of the junction block
- Check the 20 amp fuse located in cavity 8 of the PDC
- Check the case ground attached to the rear of the radio
- Check the 10 amp IOD fuse located in cavity 5 of the junction block

8W-48 REAR WINDOW DEFOGGER

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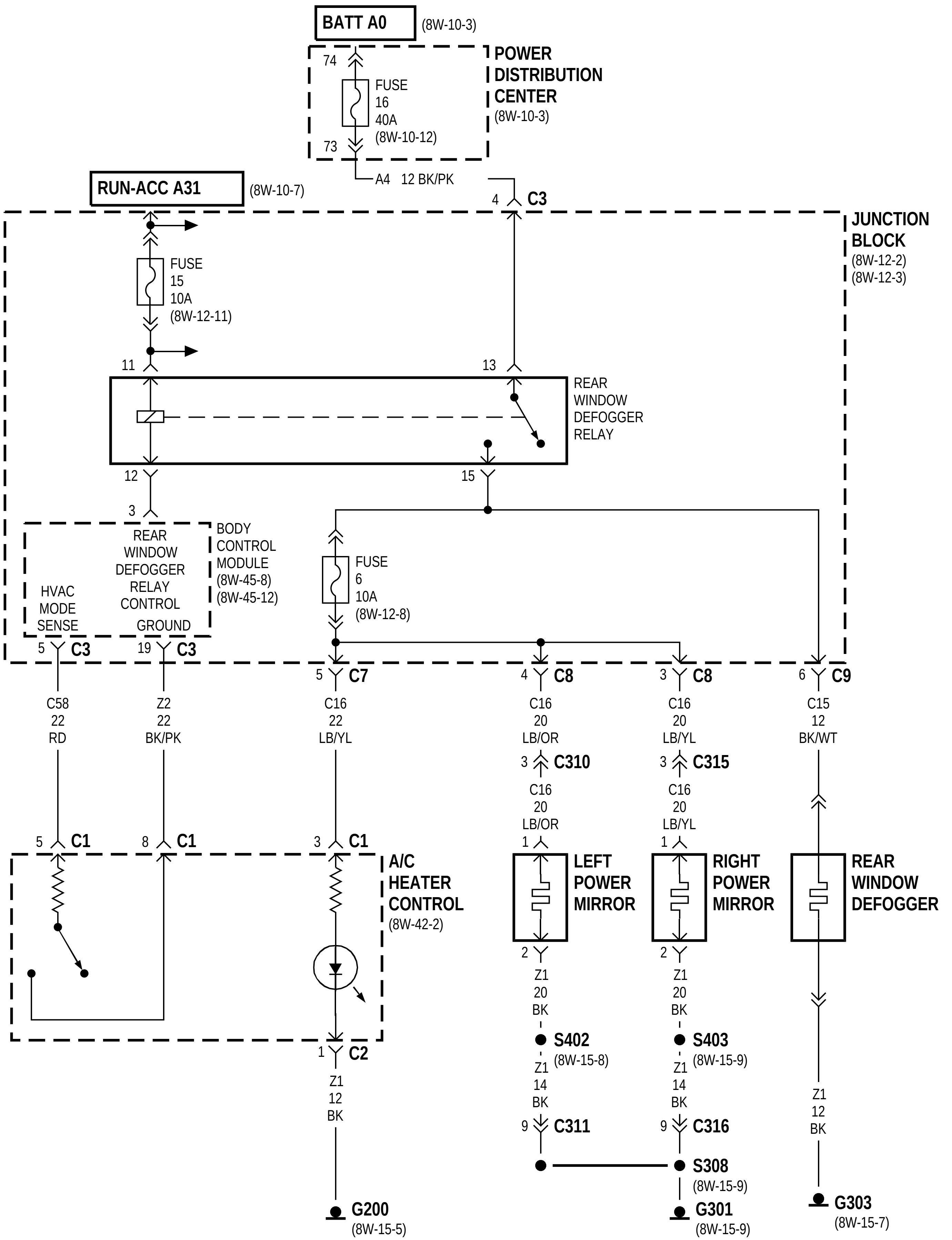

BATT A0
(8W-10-3)
74
FUSE
16
40A
(8W-10-12)
73
POWER
DISTRIBUTION
CENTER
(8W-10-3)
A4 12 BK/PK
4 C3
RUN-ACC A31
(8W-10-7)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
(8W-12-11)
11
13
REAR
WINDOW
DEFOGGER
RELAY
12
15
3
REAR
WINDOW
DEFOGGER
RELAY
CONTROL
BODY
CONTROL
MODULE
(8W-45-8)
(8W-45-12)
HVAC
MODE
SENSE
GROUND
FUSE
6
10A
(8W-12-8)
5 C3
19 C3
5 C7
4 C8
3 C8
6 C9
C58
22
RD
Z2
22
BK/PK
C16
22
LB/YL
C16
20
LB/OR
C16
20
LB/YL
C15
12
BK/WT
3 C310
3 C315
C16
20
LB/OR
C16
20
LB/YL
5 C1
8 C1
3 C1
1
1
A/C
HEATER
CONTROL
(8W-42-2)
LEFT
POWER
MIRROR
RIGHT
POWER
MIRROR
REAR
WINDOW
DEFOGGER
2
2
Z1
20
BK
Z1
20
BK
1 C2
S402
(8W-15-8)
S403
(8W-15-9)
Z1
12
BK
Z1
14
BK
Z1
14
BK
Z1
12
BK
9 C311
9 C316
S308
(8W-15-9)
G200
(8W-15-5)
G301
(8W-15-9)
G303
(8W-15-7)

8W-48 REAR WINDOW DEFOGGER

DESCRIPTION AND OPERATION

REAR WINDOW DEFOGGER

The rear window defogger system uses a relay located in the junction block. This relay is protected by two fuses and controlled by the Body Control Module (BCM). When the operator pushes the ON switch for the rear window defogger a signal is sent to the BCM on circuit C58. The A/C- Heater control uses resistors internal to the unit and the BCM measures the voltage on the circuit to determine operator request. Ground for the control is provided on circuit Z2.

When the signal is processed by the BCM it grounds circuit C80. This is the coil of the relay. Power for the coil is provided on circuit F13. This circuit also supplies power for the windshield wipers and combo flasher. Circuit F13 is protected by a 10 amp fuse in cavity 15 of the junction block and is HOT in the ACCESSORY and RUN position only. Power for the fuse is provided on circuit A31 from the ignition switch.

The A31 circuit receives power from the A1 circuit which originates in the Power Distribution Center (PDC) and is protected by a 20 amp fuse located in cavity 8.

As current flows through the relay, contacts in the relay CLOSE connecting circuits A4 and C15. The A4 circuit is protected by a 40 amp fuse located in cavity 16 of the PDC. Circuit C15 connects from the relay to the rear window defogger grid and the heated mirrors.

The rear window defogger grid consists of two BUS bars and grid lines that form a parallel circuit. When current flows through the grid the grid lines heat up and transfer the heat to the window. Ground for the grid is provided on circuit Z1 and terminates at the right rear wheel well.

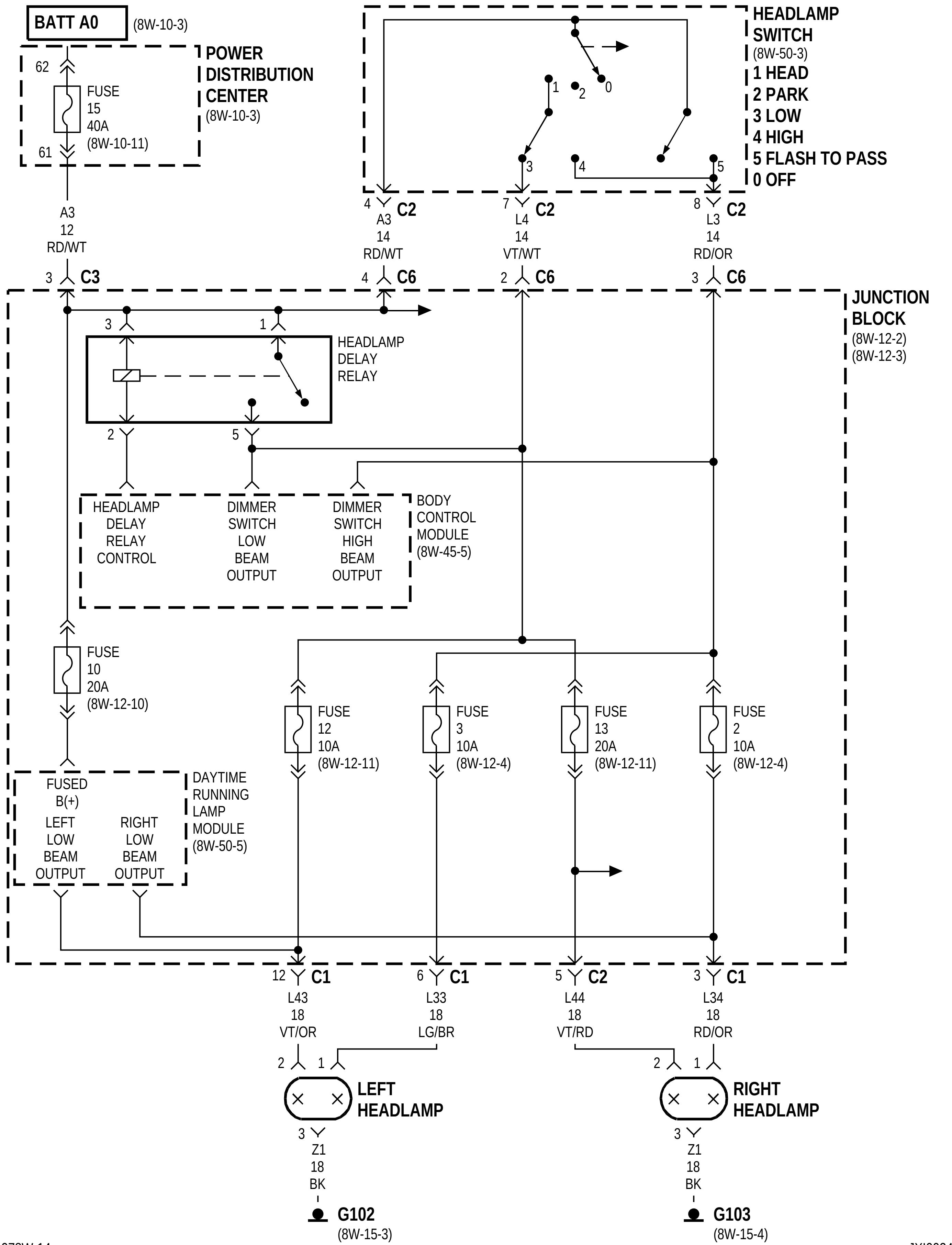
When the system is in operation a Light Emitting Diode (LED) located in the A/C-Heater control is illuminated.

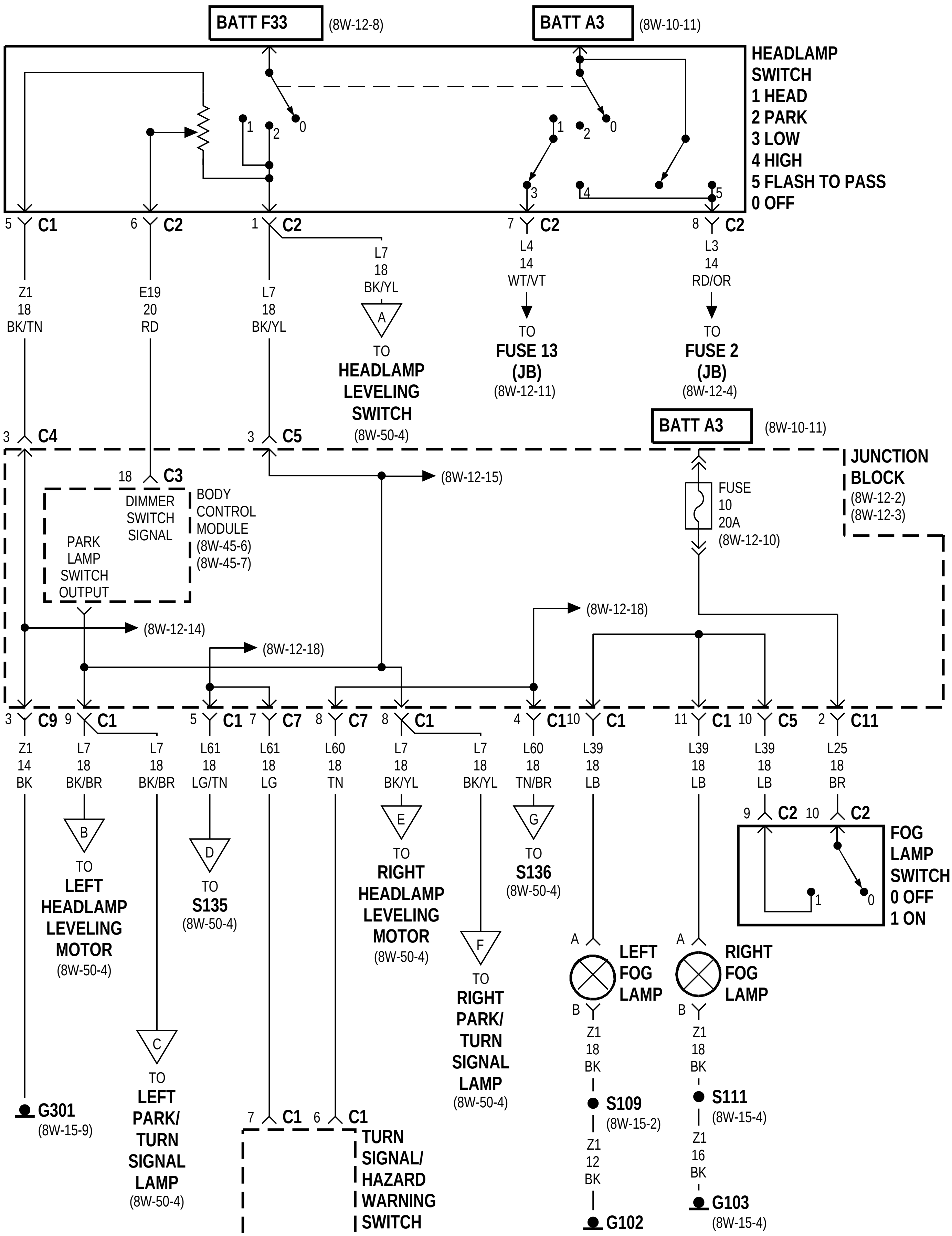
HELPFUL INFORMATION

- Check the 10 amp fuse located in the junction block cavity 15
- Check the 40 amp fuse located in cavity 16 of the PDC
- Check for broken grid lines on the window
- Check for a broken BUS bar or disconnected leads at the window
- Check for a good ground at the right rear wheel well

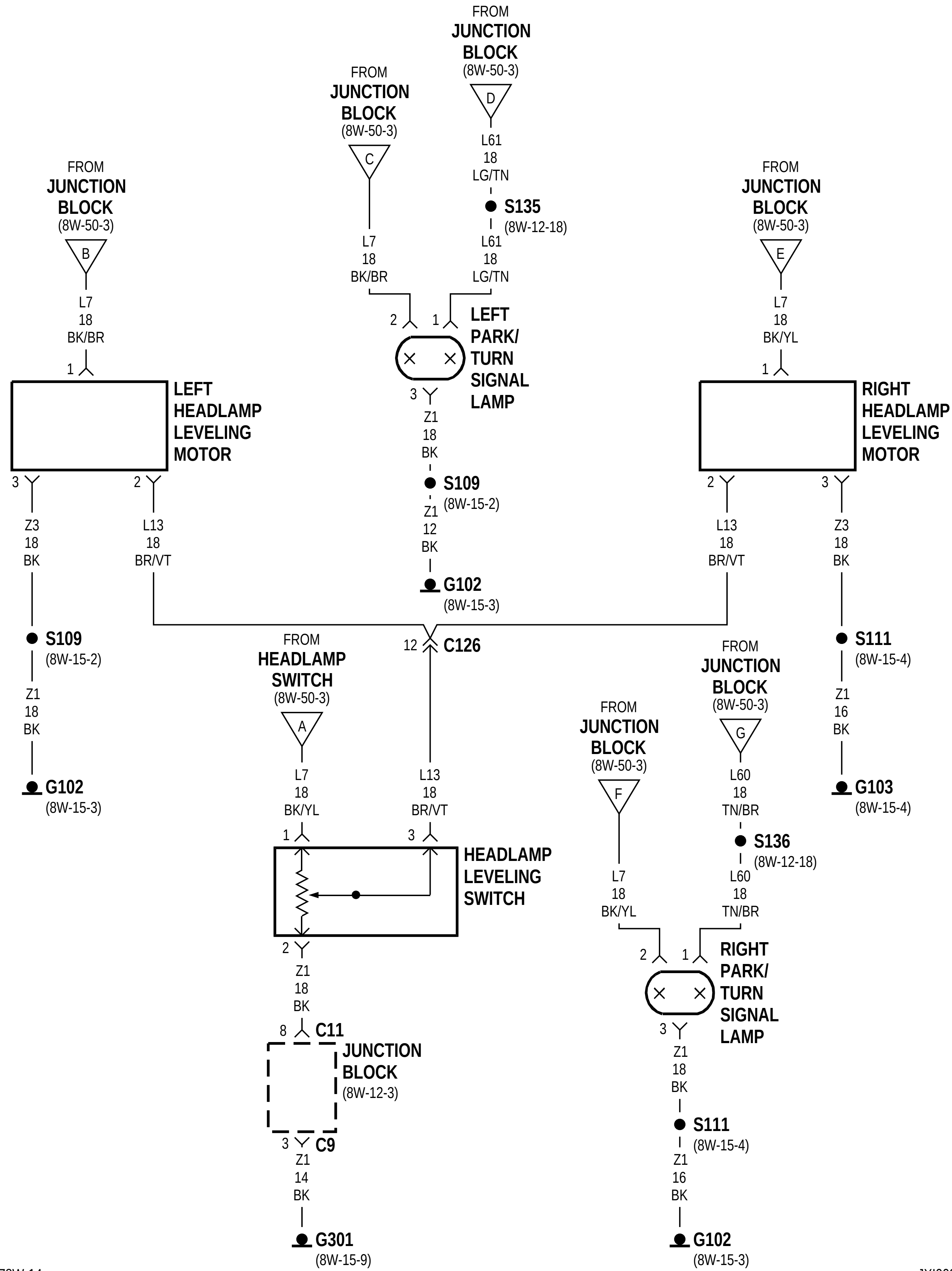
8W-50 FRONT LIGHTING

INDEX


BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
62
FUSE 15 40A (8W-10-11)
61
A3 12 RD/WT
HEADLAMP SWITCH
(8W-50-3)
1 HEAD
2 PARK
3 LOW
4 HIGH
5 FLASH TO PASS
0 OFF
1 2 0 3 4 5
4 C2 A3 14 RD/WT
7 C2 L4 14 VT/WT
8 C2 L3 14 RD/OR
3 C3
4 C6
2 C6
3 C6
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
HEADLAMP DELAY RELAY
3 1 2 5
HEADLAMP DELAY RELAY CONTROL
DIMMER SWITCH LOW BEAM OUTPUT
DIMMER SWITCH HIGH BEAM OUTPUT
BODY CONTROL MODULE
(8W-45-5)
FUSE 10 20A (8W-12-10)
FUSE 12 10A (8W-12-11)
FUSE 3 10A (8W-12-4)
FUSE 13 20A (8W-12-11)
FUSE 2 10A (8W-12-4)
FUSED B(+)
LEFT LOW BEAM OUTPUT
RIGHT LOW BEAM OUTPUT
DAYTIME RUNNING LAMP MODULE
(8W-50-5)
12 C1 L43 18 VT/OR
6 C1 L33 18 LG/BR
5 C2 L44 18 VT/RD
3 C1 L34 18 RD/OR
2 1
LEFT HEADLAMP
2 1
RIGHT HEADLAMP
3 Z1 18 BK
G102
(8W-15-3)
3 Z1 18 BK
G103
(8W-15-4)



BATT F33
(8W-12-8)
BATT A3
(8W-10-11)
HEADLAMP SWITCH
1 HEAD
2 PARK
3 LOW
4 HIGH
5 FLASH TO PASS
0 OFF
C1
C2
Z1 18 BK/TN
E19 20 RD
L7 18 BK/YL
L4 14 WT/VT
L3 14 RD/OR
TO HEADLAMP LEVELING SWITCH (8W-50-4)
TO FUSE 13 (JB) (8W-12-11)
TO FUSE 2 (JB) (8W-12-4)
BATT A3
(8W-10-11)
JUNCTION BLOCK (8W-12-2) (8W-12-3)
C4
C5
C3
DIMMER SWITCH SIGNAL
BODY CONTROL MODULE (8W-45-6) (8W-45-7)
PARK LAMP SWITCH OUTPUT
(8W-12-15)
FUSE 10 20A (8W-12-10)
(8W-12-14)
(8W-12-18)
(8W-12-18)
C9
C1
C7
C11
C5
Z1 14 BK
L7 18 BK/BR
L61 18 LG/TN
L61 18 LG
L60 18 TN
L7 18 BK/YL
L60 18 TN/BR
L39 18 LB
L25 18 BR
TO LEFT HEADLAMP LEVELING MOTOR (8W-50-4)
TO S135 (8W-50-4)
TO RIGHT HEADLAMP LEVELING MOTOR (8W-50-4)
TO S136 (8W-50-4)
TO RIGHT PARK/ TURN SIGNAL LAMP (8W-50-4)
TO LEFT PARK/ TURN SIGNAL LAMP (8W-50-4)
FOG LAMP SWITCH
0 OFF
1 ON
LEFT FOG LAMP
RIGHT FOG LAMP
Z1 18 BK
S109 (8W-15-2)
S111 (8W-15-4)
Z1 12 BK
Z1 16 BK
G301 (8W-15-9)
G102 (8W-15-3)
G103 (8W-15-4)
TURN SIGNAL/ HAZARD WARNING SWITCH (8W-52-2)



FROM JUNCTION BLOCK (8W-50-3)
D
L61 18 LG/TN
S135 (8W-12-18)
L61 18 LG/TN
FROM JUNCTION BLOCK (8W-50-3)
C
L7 18 BK/BR
FROM JUNCTION BLOCK (8W-50-3)
B
L7 18 BK/BR
LEFT PARK/ TURN SIGNAL LAMP
Z1 18 BK
S109 (8W-15-2)
Z1 12 BK
G102 (8W-15-3)
FROM JUNCTION BLOCK (8W-50-3)
E
L7 18 BK/YL
LEFT HEADLAMP LEVELING MOTOR
RIGHT HEADLAMP LEVELING MOTOR
Z3 18 BK
L13 18 BR/VT
C126
S109 (8W-15-2)
Z1 18 BK
G102 (8W-15-3)
FROM HEADLAMP SWITCH (8W-50-3)
A
L7 18 BK/YL
L13 18 BR/VT
HEADLAMP LEVELING SWITCH
Z1 18 BK
C11
JUNCTION BLOCK (8W-12-3)
C9
Z1 14 BK
G301 (8W-15-9)
FROM JUNCTION BLOCK (8W-50-3)
G
L60 18 TN/BR
S136 (8W-12-18)
L60 18 TN/BR
FROM JUNCTION BLOCK (8W-50-3)
F
L7 18 BK/YL
RIGHT PARK/ TURN SIGNAL LAMP
Z1 18 BK
S111 (8W-15-4)
Z1 16 BK
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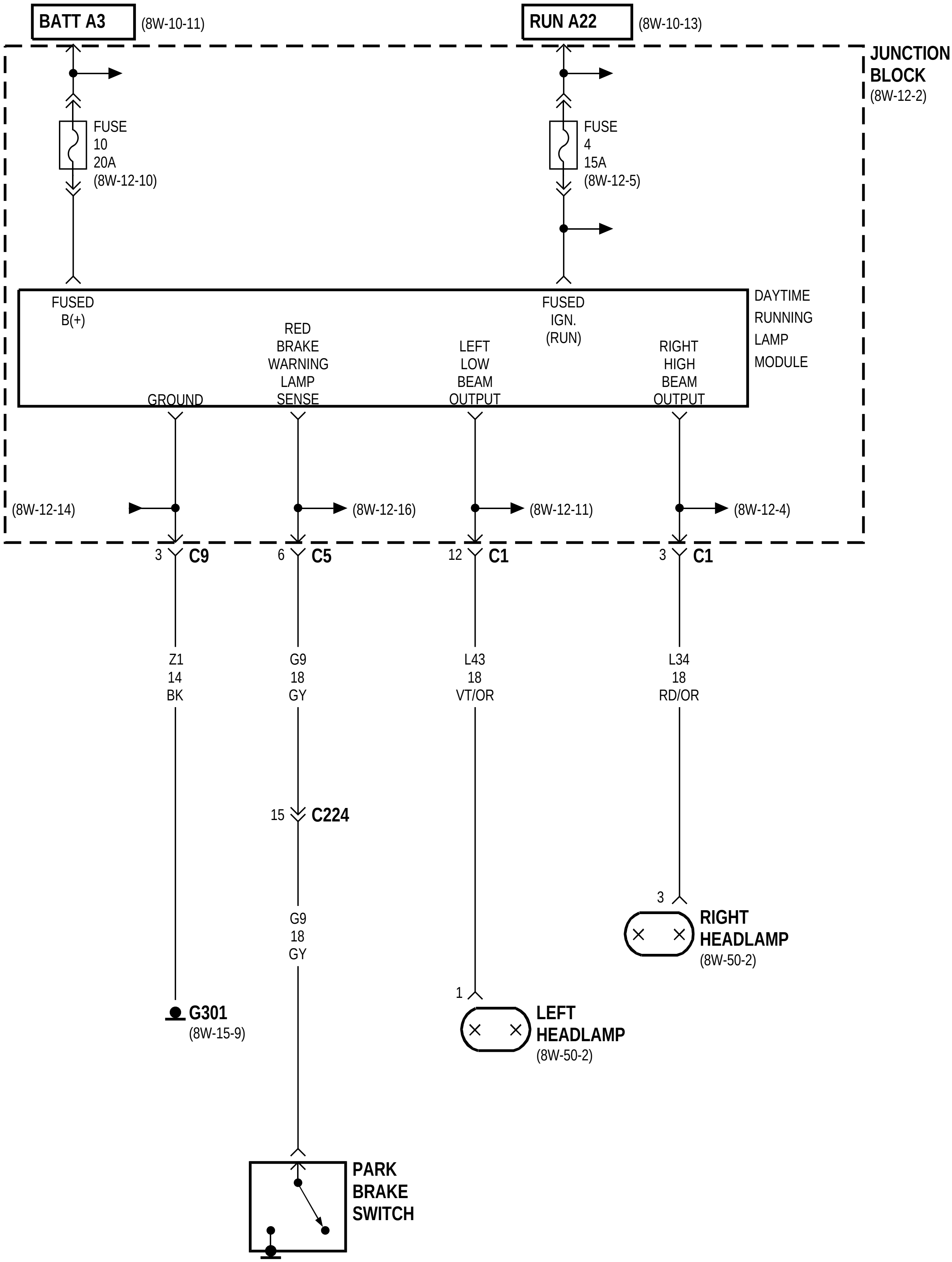
Z1 16 BK
G103 (8W-15-4)



BATT A3
(8W-10-11)
RUN A22
(8W-10-13)
JUNCTION
BLOCK
(8W-12-2)
FUSE
10
20A
(8W-12-10)
FUSE
4
15A
(8W-12-5)
FUSED
B(+)
FUSED
IGN.
(RUN)
DAYTIME
RUNNING
LAMP
MODULE
GROUND
RED
BRAKE
WARNING
LAMP
SENSE
LEFT
LOW
BEAM
OUTPUT
RIGHT
HIGH
BEAM
OUTPUT
(8W-12-14)
(8W-12-16)
(8W-12-11)
(8W-12-4)
3 C9
6 C5
12 C1
3 C1
Z1
14
BK
G9
18
GY
L43
18
VT/OR
L34
18
RD/OR
15 C224
G9
18
GY
3
RIGHT
HEADLAMP
(8W-50-2)
1
LEFT
HEADLAMP
(8W-50-2)
G301
(8W-15-9)
PARK
BRAKE
SWITCH

8W-50 FRONT LIGHTING

INDEX

GENERAL INFORMATION

INTRODUCTION

The headlamp switch has three positions, OFF, PARK (parking lamps), and ON. Power for the headlamp portion of the headlamp switch is provided on circuit A3. This circuit originates in the Power Distribution Center (PDC) and is protected by a 40 amp fuse located in cavity 15. The headlamp switch has a LOW beam and HIGH beam select position.

Power for the parking lamp portion of the headlamp switch is provided on circuit F33. Circuit A13 in the Power Distribution Center (PDC) powers a 20 amp fuse located in cavity 7 of the junction block. The A13 circuit is protected by a 40 amp fuse located in cavity 12 of the PDC. Circuit F33, which connects to the other side of the fuse in the junction block, connects to the headlamp switch and is spliced to provide power for the instrument cluster.

DESCRIPTION AND OPERATION

PARKING LAMPS

Power for the parking lamp portion of the headlamp switch is provided on circuit F33. Circuit A13 in the Power Distribution Center (PDC) powers a 20 amp fuse located in cavity 7 of the junction block. The A13 circuit is protected by a 40 amp fuse located in cavity 12 of the PDC. Circuit F33, which connects to the other side of the fuse in the junction block, connects to the headlamp switch and is spliced to provide power for the instrument cluster.

When the headlamp switch is in the PARK or ON position, it connects circuit F33 to circuit L7. From the headlamp switch, circuit L7 splices to power the front parking lamps, rear tail lamps, and the license lamp. It also provides an input to the Body Control Module (BCM) indicating the lamps are ON, to the radio for illumination, and to the dimmer switch.

HELPFUL INFORMATION

- Check for a blown 40 amp fuse located in cavity 12 of the PDC.
- Check for a blown 20 amp fuse located in cavity 7 of the junction block.
- For the left front lamps check the grounding point at the left strut tower.
- For the right front lamps check the grounding point at the right frame rail.

HEADLAMPS

When the headlamp switch is in the ON position, the A3 circuit from the Power Distribution Center (PDC) connects to circuit L4 (for LOW beam operation). The L4 circuit is spliced and connects a BUS bar in the junction block and to the Body Control Module (BCM). Circuits L43 and L44 connect to the BUS bar in the junction block, and power the low-beam headlamps. Circuit L43 supplies power to the left headlamp. Circuit L44 supplies power to the right headlamp. The L43 and L44 circuits each have separate fuses in the junction block. The L43 circuit is protected by a 10 amp fuse in cavity 12, and L44 is protected by a 20 amp fuse in cavity 13.

When the operator selects high-beam operation, with the turn signal stalk of the multi-function switch, circuit A3 connects to the L3 circuit. Circuit L3 powers high-beam operation. This circuit is spliced and provides an input to the BCM, along with supplying power to the high-beam fuses in the junction block.

Circuit L33 is used for left high-beam operation and is protected by a 10 amp fuse located in cavity 3 of the junction block. Circuit L34 is used for the right high-beam and is protected by a 10 amp fuse located in cavity 2 of the junction block.

HEADLAMP GROUND

Although circuit Z1 provides ground for the right and left headlamps, it has different termination points. For the right headlamp, the Z1 circuit is terminated at the right frame rail. For the left headlamp, the Z1 terminates at the left strut tower.

DESCRIPTION AND OPERATION (Continued)

HELPFUL INFORMATION

- Check for a blown 40 amp fuse located in cavity 15 of the PDC.
- Check for a blown 20 amp fuse located in cavity 7 of the junction block.
- For the left front lamps check the grounding point at the left strut tower.
- For the right front lamps check the grounding point at the right frame rail.

HEADLAMP LEVELING MOTORS

Power fort the headlamp leveling switch is supplied from the headlamp switch on circuit L7. This circuit is HOT when the headlamp switch is in the PARK or ON position. This circuit provides power to the parking lamps. Ground for the switch is supplied on circuit Z1.

The L7 circuit also supplies power to the headlamp leveling motors. Ground for the headlamp leveling motors is supplied on circuit Z3.

Circuit L13 connects from the headlamp leveling motors to the switch. This circuit is used to provide power or ground to the motors depending on switch position.

FOG LAMPS

The fog lamps operate only when the headlamp switch is in the ON position and the operator has selected LOW-beam operation. When the headlamps are in HIGH-beam mode, the fog lamps will not operate.

When the operator tunrs the fog lamps switch ON circuit L44 is connected to circuit L39. The L44 circuit is protected by a 20 amp fuse located in cavity 13 of the junction block, and powers the LOW beam headlamps.

Circuit L39 connects from the switch to the fog lamps.

Ground for the lamps is different for the left and right lamps. For the right fog lamp, the ground is provided on circuit Z1 and terminates at the right frame rail. For the left fog lamp, the ground is provided on circuit Z1 and terminates at the left strut tower.

HELPFUL INFORMATION

- Check for a blown 40 amp fuse in cavity 14, and 15 of the PDC. If this fuse is blown the headlamps will not operate.
- Check for a blown 20 amp fuse in cavity 10 of the junction block. If this fuse is blown the right low-beam headlamp will not operate.
- Check for a good ground at the right frame rail for the right fog lamp.
- Check for a good ground at the left strut tower for the left fog lamp.

HEADLAMP DELAY

The headlamp delay uses a relay located in the junction block. Power for the relay is supplied on circuit A3. This circuit powers the coil and contact sides of the relay and is protected by a 40 amp fuse located in the Power Distribution Center (PDC) cavity 15.

The relay is activated by the operator turning OFF the ignition with the headlamps ON. The Body Control Module (BCM) controls the ground for the coil side of the relay and the amount of time the headlamps stay ON. Circuit G50 connects the coil side of the relay to the BCM.

When the relay is energized, the contacts in the relay CLOSE connecting circuits A3 and L4. Circuit L4 is used to power the fuses used for low-beam headlamp operation.

8W-51 REAR LIGHTING

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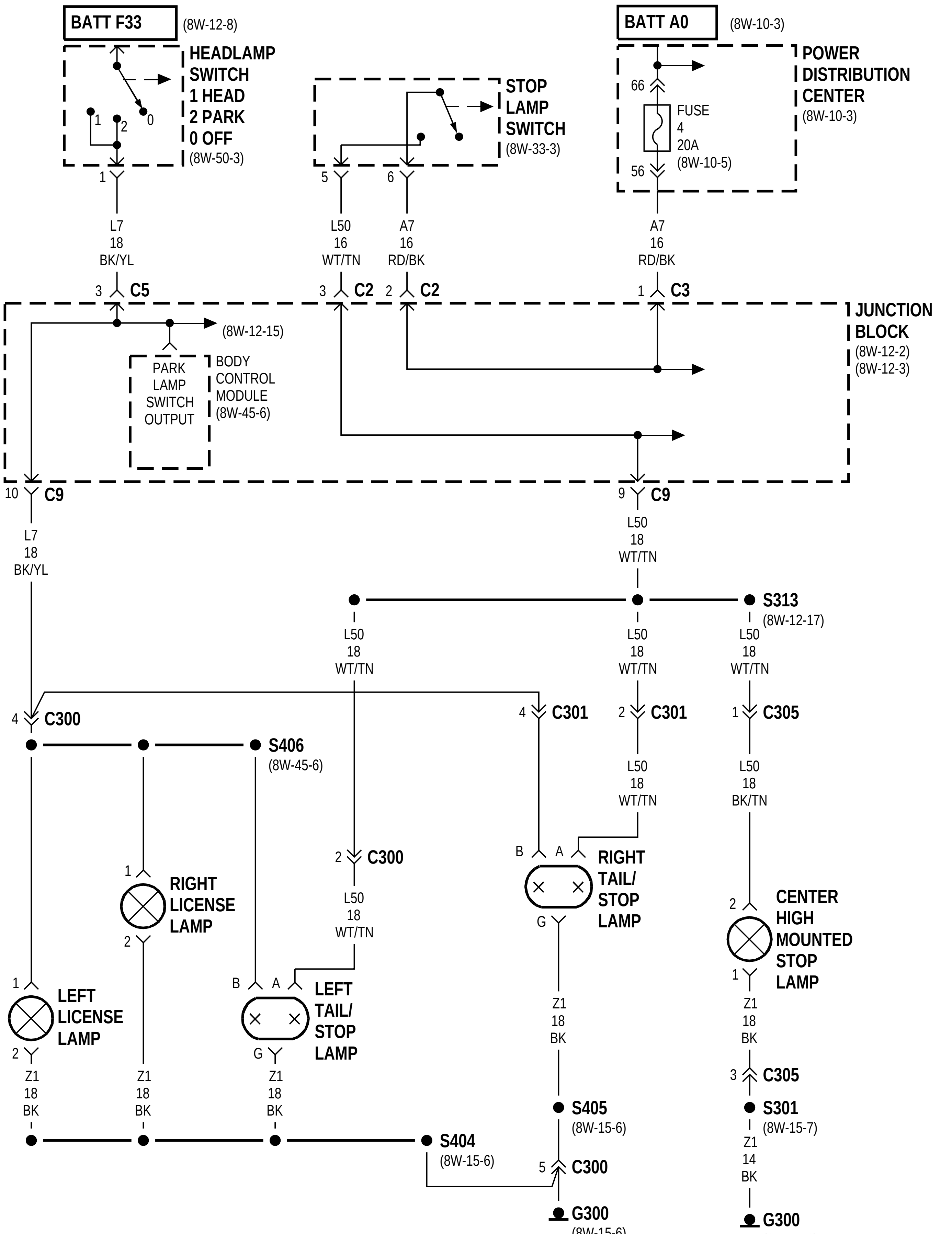
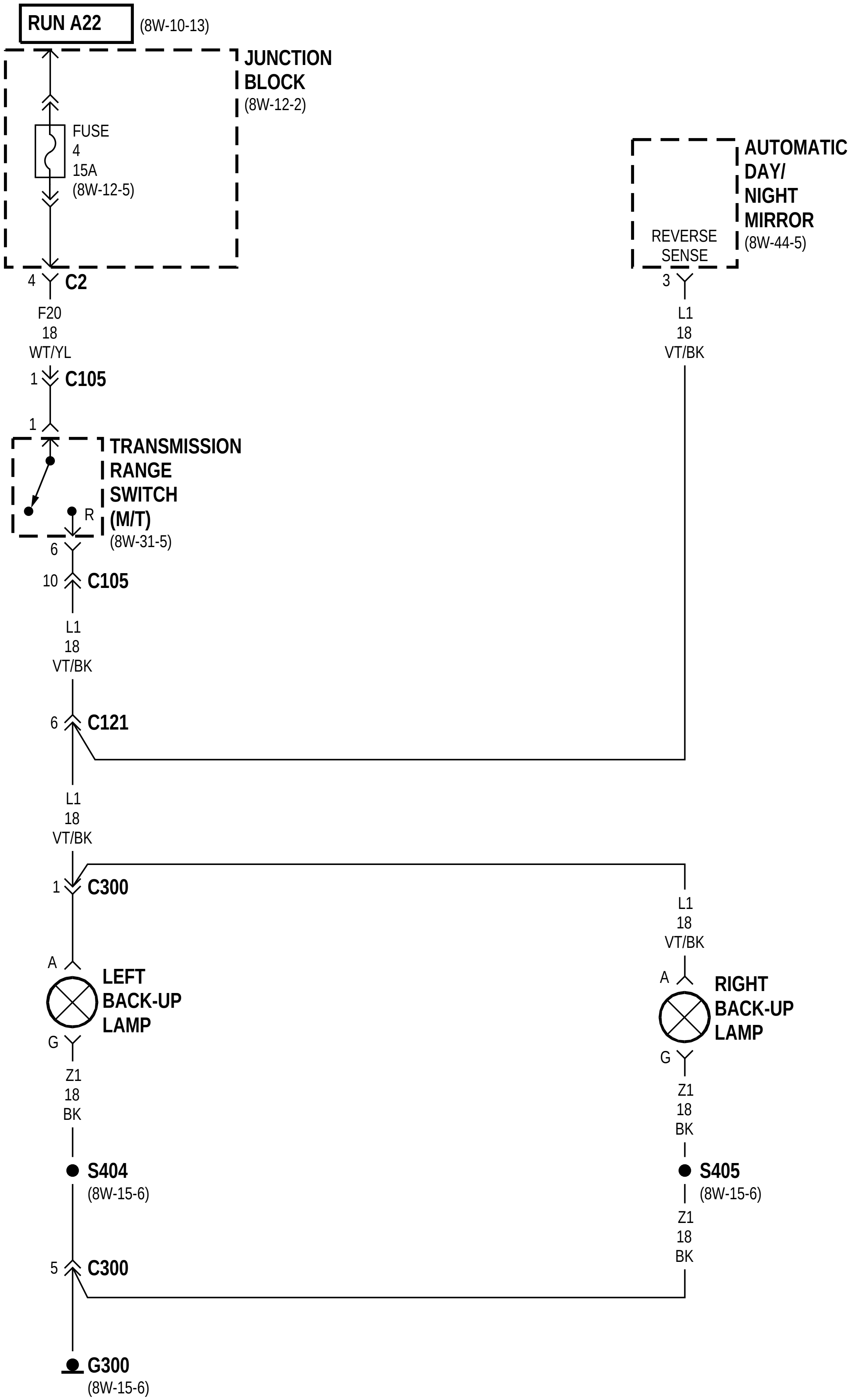
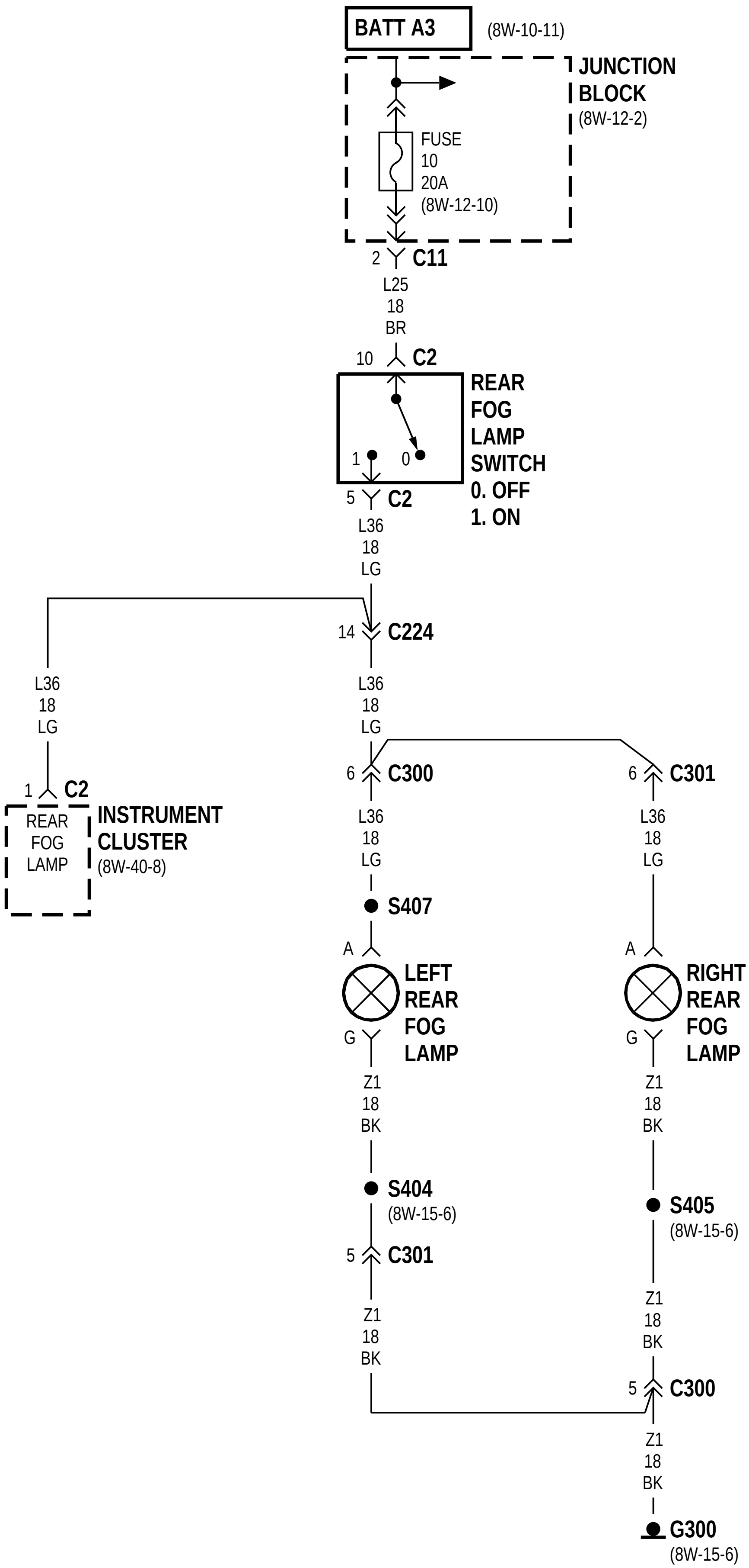


978W-14 JXI00245


RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
FUSE
4
15A
(8W-12-5)
4
C2
F20
18
WT/YL
1
C105
1
TRANSMISSION RANGE SWITCH (M/T)
(8W-31-5)
R
6
10
C105
L1
18
VT/BK
6
C121
L1
18
VT/BK
1
C300
AUTOMATIC DAY/ NIGHT MIRROR
(8W-44-5)
REVERSE SENSE
3
L1
18
VT/BK
L1
18
VT/BK
A
LEFT BACK-UP LAMP
G
Z1
18
BK
S404
(8W-15-6)
5
C300
G300
(8W-15-6)
A
RIGHT BACK-UP LAMP
G
Z1
18
BK
S405
(8W-15-6)
Z1
18
BK


BATT A3
(8W-10-11)
JUNCTION
BLOCK
(8W-12-2)
FUSE
10
20A
(8W-12-10)
2 C11
L25
18
BR
10 C2
REAR
FOG
LAMP
SWITCH
0. OFF
1. ON
1 0
5 C2
L36
18
LG
14 C224
L36
18
LG
1 C2
REAR
FOG
LAMP
INSTRUMENT
CLUSTER
(8W-40-8)
6 C300
6 C301
S407
A
LEFT
REAR
FOG
LAMP
RIGHT
REAR
FOG
LAMP
G
Z1
18
BK
S404
(8W-15-6)
S405
(8W-15-6)
5 C301
5 C300
G300
(8W-15-6)

8W-51 REAR LIGHTING

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DESCRIPTION AND OPERATION

TAIL LAMPS AND REAR LICENSE LAMPS

Circuit A13 in the Power Distribution Center (PDC) powers a 20 amp fuse located in cavity 7 of the junction block. The A13 circuit is protected by a 40 amp fuse located in cavity 12. Circuit F33, which connects to the other side of the fuse in the junction block, connects to the headlamp switch and is spliced to provide power for the instrument cluster.

The headlamp switch has three positions: OFF, PARK (parking lamps), and ON. When the headlamp switch is in the PARK or ON position, it connects circuit F33 to circuit L7. From the headlamp switch, circuit L7 splices to power the front parking lamps, rear tail lamps, and the license lamp. It also provides an input to the Body Control Module (BCM) indicating the lamps are ON, to the radio for illumination, and to the dimmer switch.

GROUND CIRCUIT

Circuit Z1 provides a ground for the tail lamps, parking lamps, headlamps, and the license plate lamp, although different grounding points are used.

HELPFUL INFORMATION

- Check for a blown 40 amp fuse located in cavity 12 of the PDC
- Check for a blown 20 amp fuse located in cavity 7 of the junction block
- For all of the rear lamps check the grounding point at the deck lid ground

COMBINED REAR LIGHTING MODULE

The combined rear lighting module is used to direct the voltage to the proper lamps. Power for the module is supplied on circuit A15. This circuit is protected by a 20 amp fuse located in the Power Distribution Center (PDC), cavity 6.

Ground for the module is supplied on circuit Z1.

STOP LAMPS

Circuit A7 supplies power for the stop lamp switch. This circuit originates in the Power Distribution Center (PDC) and is protected by a 20 amp fuse. The A7 circuit is spliced in the junction block and supplies voltage for the Ignition-Off Draw (IOD) fuse.

When the operator presses the brake pedal, the stop lamp switch CLOSES, and connects circuit A7 to circuit L50. Circuit L50 connects from the stop lamp switch to the stop lamps and the Center High Mounted Stop Lamp (CHMSL). Ground for the lamps is provided on circuit Z1 and terminates at the deck lid ground.

HELPFUL INFORMATION

- Check for a blown 20 amp fuse located in cavity 4 of the PDC.
- Check the grounding point for the rear lamps.
- Check for continuity across the stop lamp switch when it is closed.

BACK-UP LAMPS

Refer to section 8W-31 for lamp operation.

REAR FOG LAMPS

Power for the rear fog lamps is supplied on circuit L36. This circuit connects from the fog lamp switch to the rear fog lamps. Power for this circuit is supplied by circuit L92. The L92 circuit is protected by a 20 amp fuse located in cavity 13 of the junction block.

When the operator turns the switch ON circuits L92 and L36 are connected. Ground for the lamps is supplied on circuit Z1.

8W-52 TURN SIGNALS

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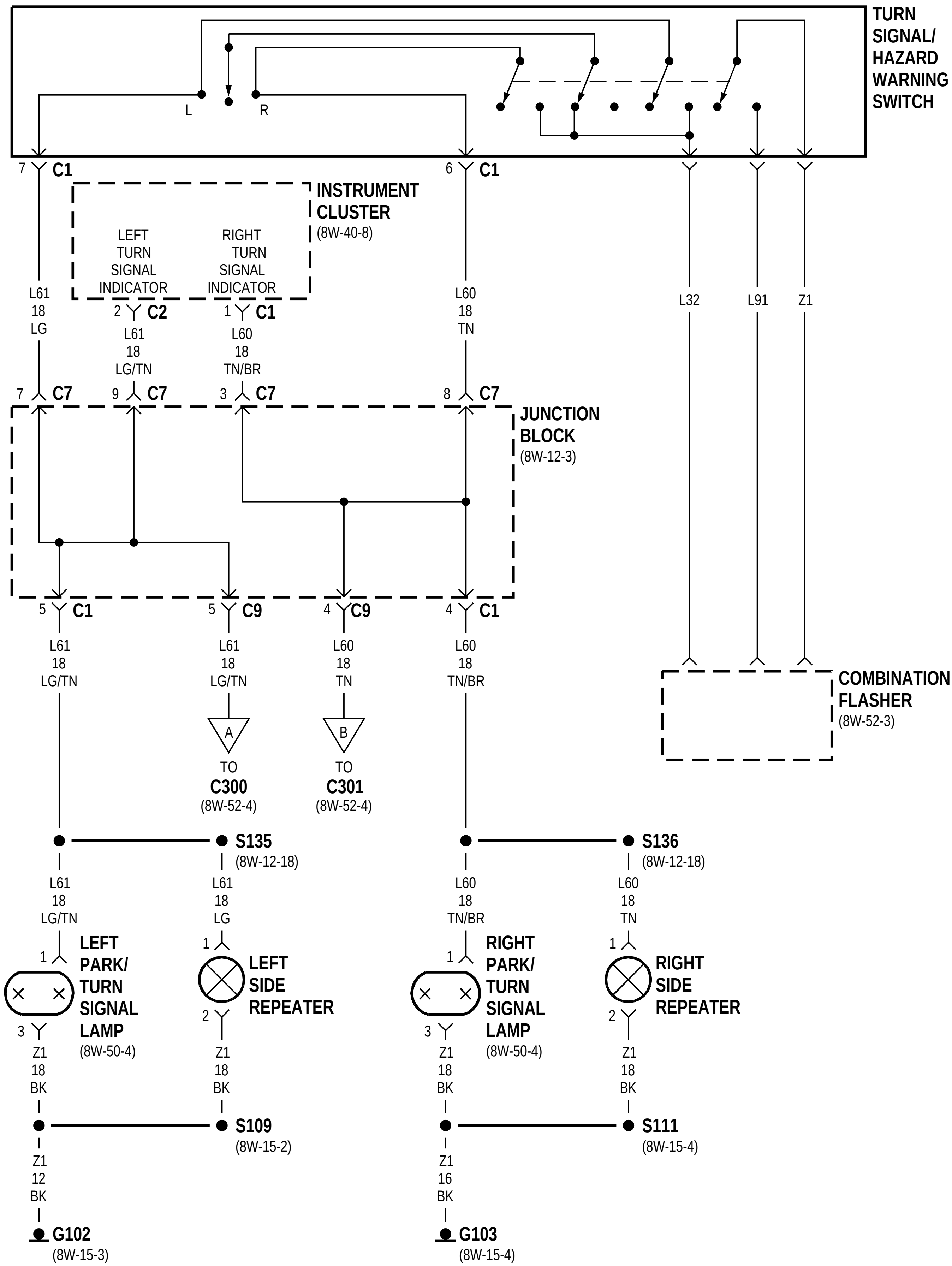
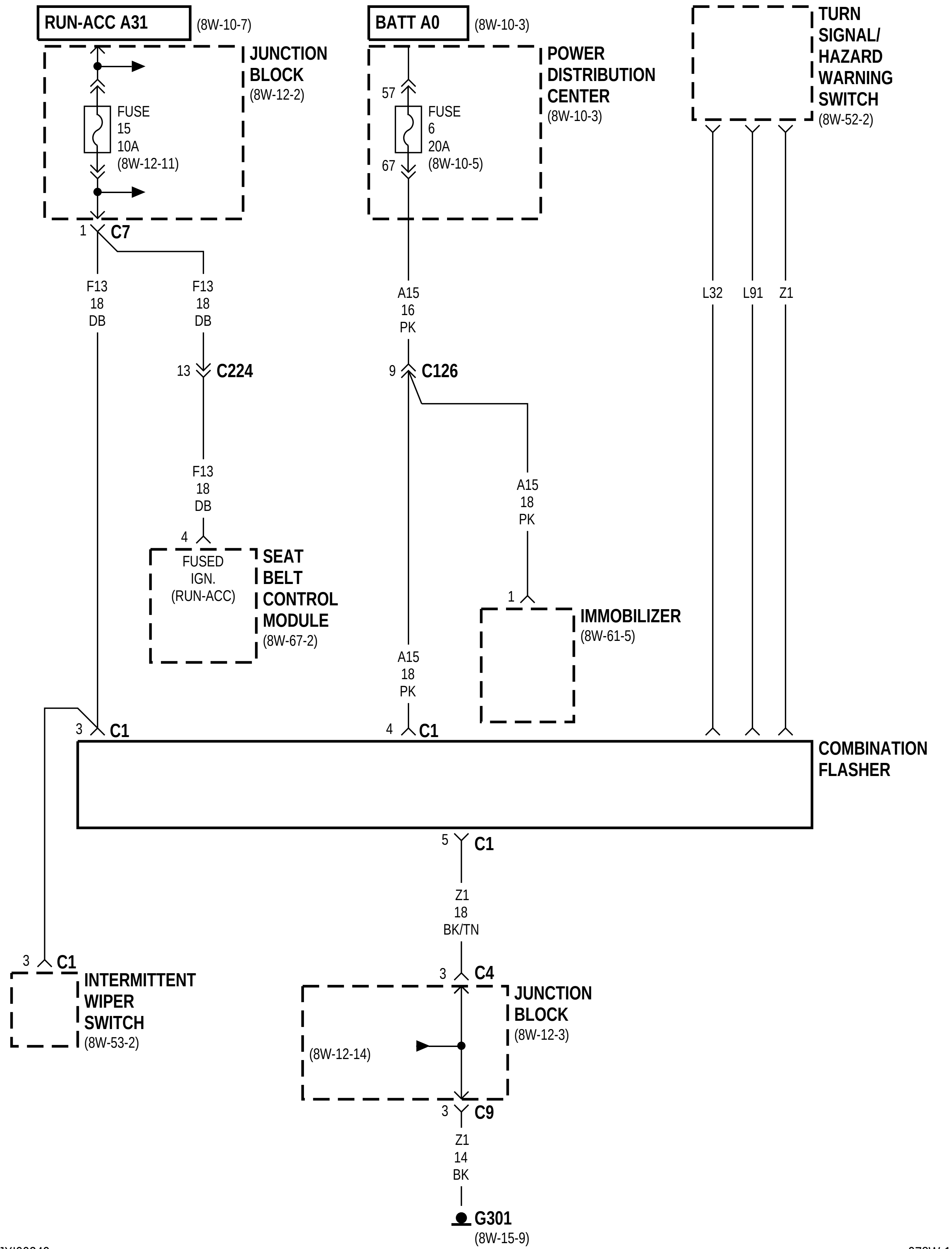
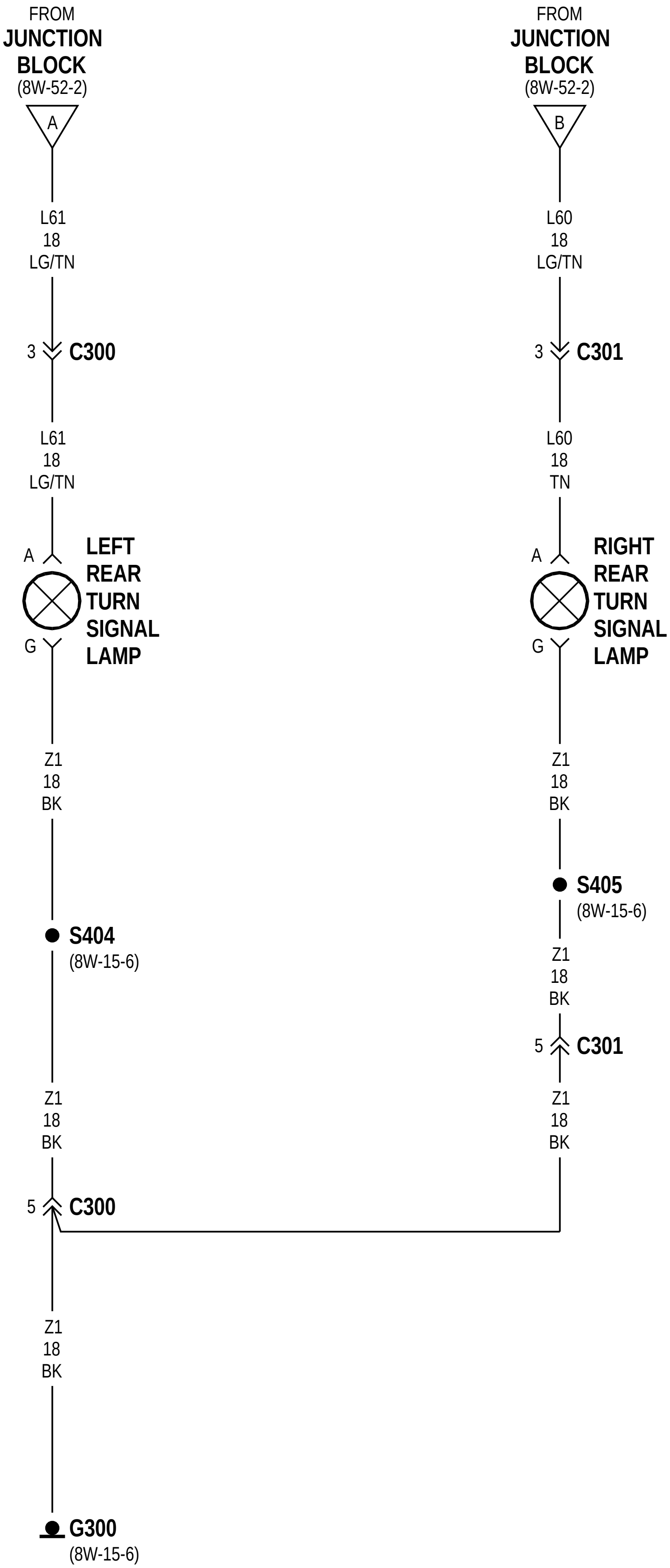

TURN SIGNAL/ HAZARD WARNING SWITCH
L
R
7 C1
6 C1
INSTRUMENT CLUSTER
(8W-40-8)
LEFT TURN SIGNAL INDICATOR
RIGHT TURN SIGNAL INDICATOR
2 C2
1 C1
L61 18 LG
L61 18 LG/TN
L60 18 TN/BR
L60 18 TN
L32
L91
Z1
7 C7
9 C7
3 C7
8 C7
JUNCTION BLOCK
(8W-12-3)
5 C1
5 C9
4 C9
4 C1
L61 18 LG/TN
L61 18 LG/TN
L60 18 TN
L60 18 TN/BR
COMBINATION FLASHER
(8W-52-3)
A
B
TO C300
(8W-52-4)
TO C301
(8W-52-4)
S135
(8W-12-18)
S136
(8W-12-18)
L61 18 LG/TN
L61 18 LG
L60 18 TN/BR
L60 18 TN
1
LEFT PARK/ TURN SIGNAL LAMP
(8W-50-4)
3
1
LEFT SIDE REPEATER
2
1
RIGHT PARK/ TURN SIGNAL LAMP
(8W-50-4)
3
1
RIGHT SIDE REPEATER
2
Z1 18 BK
Z1 18 BK
Z1 18 BK
Z1 18 BK
S109
(8W-15-2)
S111
(8W-15-4)
Z1 12 BK
Z1 16 BK
G102
(8W-15-3)
G103
(8W-15-4)


RUN-ACC A31
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
15
10A
(8W-12-11)
1 C7
F13
18
DB
F13
18
DB
13 C224
F13
18
DB
4
FUSED IGN. (RUN-ACC)
SEAT BELT CONTROL MODULE
(8W-67-2)
BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
57
FUSE
6
20A
(8W-10-5)
67
A15
16
PK
9 C126
A15
18
PK
1
IMMOBILIZER
(8W-61-5)
A15
18
PK
TURN SIGNAL/ HAZARD WARNING SWITCH
(8W-52-2)
L32
L91
Z1
3 C1
4 C1
COMBINATION FLASHER
5 C1
Z1
18
BK/TN
3 C1
INTERMITTENT WIPER SWITCH
(8W-53-2)
3 C4
JUNCTION BLOCK
(8W-12-3)
(8W-12-14)
3 C9
Z1
14
BK
G301
(8W-15-9)


FROM
JUNCTION
BLOCK
(8W-52-2)
A
L61
18
LG/TN
3
C300
L61
18
LG/TN
A
LEFT
REAR
TURN
SIGNAL
LAMP
G
Z1
18
BK
S404
(8W-15-6)
Z1
18
BK
5
C300
Z1
18
BK
G300
(8W-15-6)
FROM
JUNCTION
BLOCK
(8W-52-2)
B
L60
18
LG/TN
3
C301
L60
18
TN
A
RIGHT
REAR
TURN
SIGNAL
LAMP
G
Z1
18
BK
S405
(8W-15-6)
Z1
18
BK
5
C301
Z1
18
BK

8W-52 TURN SIGNALS

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DESCRIPTION AND OPERATION

TURN SIGNALS

Power for the turn signals flows from the Power Distribution Center (PDC) to the ignition switch on circuit A1. The A1 circuit is protected by a 20 amp fuse located in cavity 8 of the PDC. With the key in the ACCESSORY or RUN position, the ignition switch connects voltage from the A1 circuit to the A31 circuit.

Circuit A31 connects to the junction block and powers fuse 15. This is a 10 amp fuse. From the fuse, circuit F13 supplies voltage to the combination flasher. The F13 circuit also supplies power to the windshield wipers and the rear window defogger relay.

Circuit A15 also supplies voltage to the combination flasher. This circuit is HOT at all times and is protected by a 20 amp fuse located in cavity 6 of the PDC.

The L32 circuit connects between the combination flasher and the turn signal portion of the multi-function switch. Circuit L32 connects to a BUS bar internal to the switch that powers the turn signals and the hazard flasher.

RIGHT TURN SIGNAL

When the operator selects the right turn signal, the multi-function switch connects power from circuit L32 to circuit L60. Circuit L60 supplies power for the front lamp and provides an input to the combined rear lighting module and side repeater lamp. This circuit also splices and supplies power to the instrument cluster indicator lamp.

Circuit L62 connects from the combined rear lighting module to the right rear lamps.

Ground for the rear lamp is provided on circuit Z1 and terminates at the left rear wheel well. The ground for the front lamp is provided on circuit Z1 and terminates at the right frame rail.

LEFT TURN SIGNAL

When the operator selects the left turn signal, the multi-function switch connects power from circuit L32 to circuit L61. Circuit L61 supplies power for the front lamp and also provides an input to the combined rear lighting module and side repeater lamp. This circuit also splices and supplies power to the instrument cluster indicator lamp.

Circuit L63 connects from the combined rear lighting module to the left rear lamps.

Ground for the rear lamp is provided on circuit Z1 and terminates at the left rear wheel well. The ground for the front lamp is provided on circuit Z1 and terminates at the left strut tower.

HELPFUL INFORMATION

- Check the 20 amp fuses located in cavities 6, and 8 of the PDC
- Check the 10 amp fuse located in cavity 15 of the junction block
- For the left front turn signal lamp check the grounding point at the left strut tower
- For the right front turn signal lamp check the grounding point at the right frame rail
- For the left and right rear turn signal lamps check the grounding point at the left rear wheel well.

HAZARD FLASHERS

Power for the hazard flashers flows from the Power Distribution Center (PDC) to the ignition switch on circuit A1. The A1 circuit is protected by a 20 amp fuse located in cavity 8 of the PDC. With the key in the ACCESSORY or RUN position, the ignition switch connects voltage from the A1 circuit to the A31 circuit.

Circuit A31 connects to the junction block and powers fuse 15. This is a 10 amp fuse. From the fuse, circuit F13 supplies voltage to the combination flasher. The F13 circuit also supplies power to the windshield wipers and the rear window defogger relay.

Circuit A15 also supplies voltage to the combination flasher. This circuit is HOT at all times and is protected by a 20 amp fuse located in cavity 6 of the PDC.

The L32 circuit connects between the combination flasher and the BUS bar that powers the turn signals and the hazard flasher internal to the switch.

When the hazard flashers are ON the multi-function switch connects circuit L32 to circuits L60 and L61. It also connects circuits L91 and Z1. Circuit Z1 is the ground path for the combination flasher and terminates at the instrument panel left side cowl.

DESCRIPTION AND OPERATION (Continued)

Circuit L60 supplies voltage for the right front lamps and provides an input to the combined rear lighting module and side repeater lamp. Circuit L61 powers the left front lamps and provides an input to the combined rear lighting module and side repeater lamp. These circuits also splice and supply voltage for the indicator lamps in the instrument cluster.

Circuit L62 connects from the combined rear lighting module to the right rear lamps. Circuit L63 connects from the combined rear lighting module to the left rear lamps.

HELPFUL INFORMATION

- Check the 20 amp fuses located in cavities 6, and 8 of the PDC.
- Check the 10 amp fuse located in cavity 15 of the junction block.
- For the left front lamp check the grounding point at the left strut tower.
- For the right front lamp check the grounding point at the right frame rail.
- For the left and right rear lamps check the grounding point at the left rear wheel well.
- Check the grounding point for the combination flasher located at the instrument panel left side cowl.

8W-53 WIPERS

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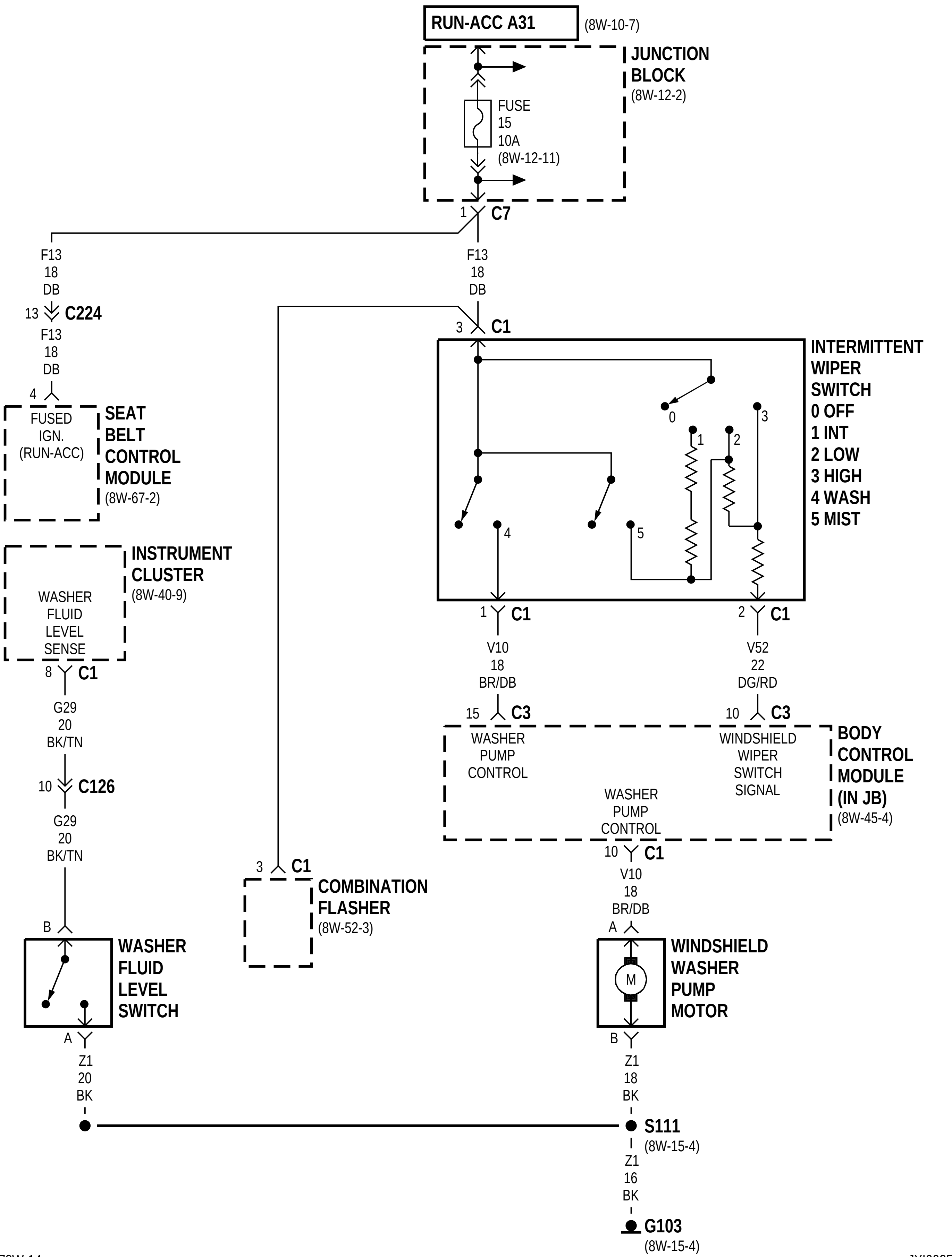
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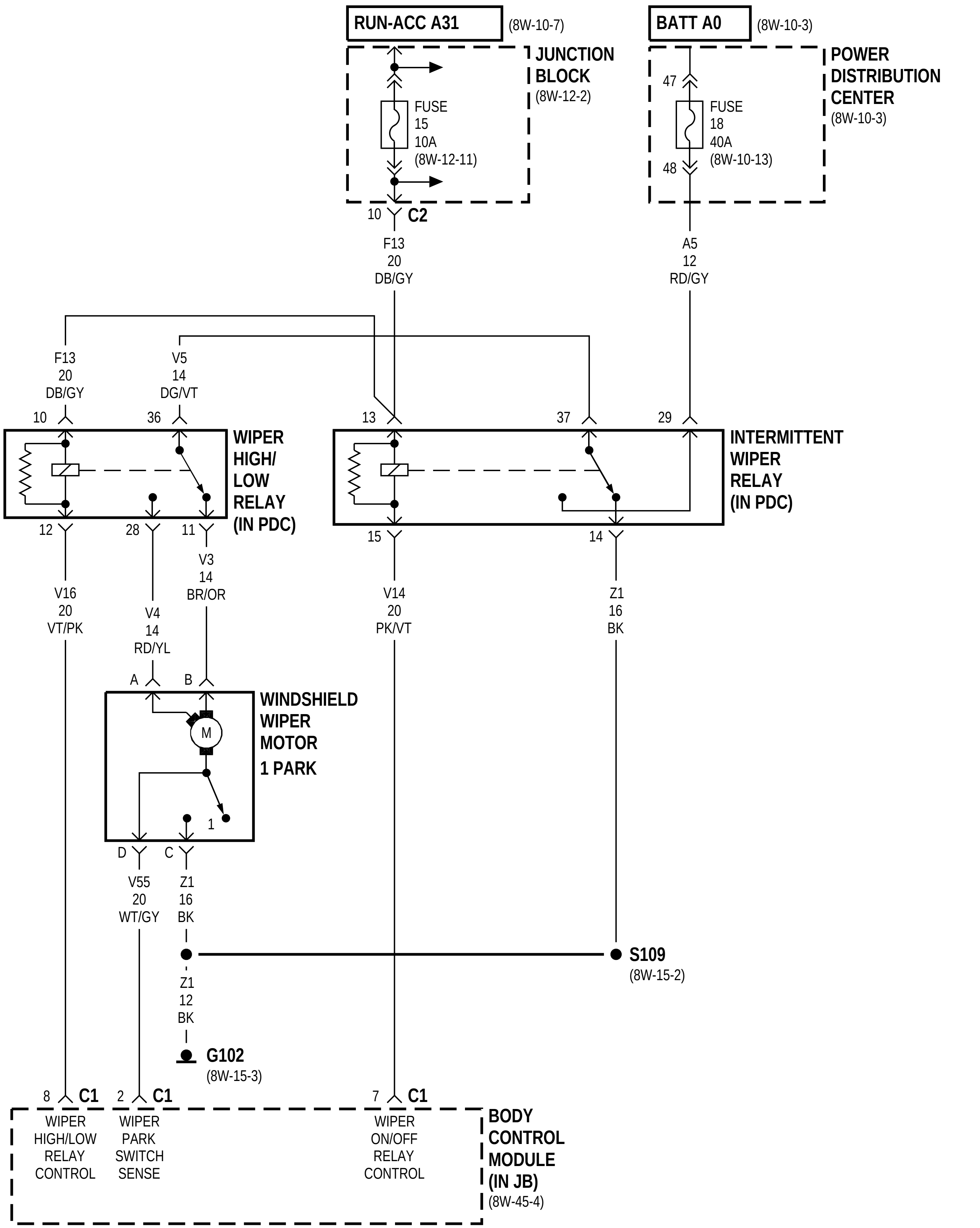
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE 15 10A
(8W-12-11)
1 C7
F13 18 DB
F13 18 DB
13 C224
F13 18 DB
4
FUSED IGN. (RUN-ACC)
SEAT BELT CONTROL MODULE
(8W-67-2)
3 C1
INTERMITTENT WIPER SWITCH
0 OFF
1 INT
2 LOW
3 HIGH
4 WASH
5 MIST
0
1
2
3
4
5
INSTRUMENT CLUSTER
(8W-40-9)
WASHER FLUID LEVEL SENSE
8 C1
G29 20 BK/TN
10 C126
G29 20 BK/TN
1 C1
V10 18 BR/DB
2 C1
V52 22 DG/RD
15 C3
10 C3
WASHER PUMP CONTROL
WINDSHIELD WIPER SWITCH SIGNAL
WASHER PUMP CONTROL
BODY CONTROL MODULE (IN JB)
(8W-45-4)
10 C1
V10 18 BR/DB
3 C1
COMBINATION FLASHER
(8W-52-3)
B
WASHER FLUID LEVEL SWITCH
A
Z1 20 BK
A
M
WINDSHIELD WASHER PUMP MOTOR
B
Z1 18 BK
S111
(8W-15-4)
Z1 16 BK
G103
(8W-15-4)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(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE
15
10A
(8W-12-11)
10
C2
F13
20
DB/GY
BATT A0
(8W-10-3)
POWER DISTRIBUTION CENTER
(8W-10-3)
47
FUSE
18
40A
(8W-10-13)
48
A5
12
RD/GY
F13
20
DB/GY
V5
14
DG/VT
10
36
WIPER HIGH/ LOW RELAY (IN PDC)
12
28
11
V3
14
BR/OR
V16
20
VT/PK
V4
14
RD/YL
13
37
29
INTERMITTENT WIPER RELAY (IN PDC)
15
14
V14
20
PK/VT
Z1
16
BK
A
B
WINDSHIELD WIPER MOTOR
M
1 PARK
1
D
C
V55
20
WT/GY
Z1
16
BK
S109
(8W-15-2)
Z1
12
BK
G102
(8W-15-3)
8
C1
2
C1
7
C1
WIPER HIGH/LOW RELAY CONTROL
WIPER PARK SWITCH SENSE
WIPER ON/OFF RELAY CONTROL
BODY CONTROL MODULE (IN JB)
(8W-45-4)

8W-53 WIPERS

INDEX

DESCRIPTION AND OPERATION

WINDSHIELD WIPERS

The windshield wiper system is powered by a 10-amp fuse located in cavity 15 of the junction block. This fuse is HOT in the ACCESSORY and RUN positions only. Power for the fuse is supplied on the A31 circuit.

The A31 circuit originates at the ignition switch. Power for the A31 circuit is supplied by circuit A1 from the Power Distribution Center (PDC) and protected by a 20 amp fuse located in cavity 8.

The F13 circuit supplies the power from the fuse in the junction block to the wiper switch, coil side if the intermittent wiper relay, and the coil side of the HI/LOW Wiper relay. This circuit is spliced and also supplies power to the Rear Window Defogger relay, and the Turn Signal Combo Flasher. Both of the relays used in the wiper system are located in the PDC.

The Body Control Module (BCM) controls all functions of the wiper system. This is accomplished through a multi-plexed input from the wiper switch to the BCM on circuit V52.

INTERMITTENT WIPER OPERATION

When the operator selects intermittent wiper operation a multi-plexed signal is sent to the Body Control Module (BCM) on the V52 circuit. The BCM then grounds circuit V14, which is the coil side of the intermittent wiper relay. This causes the relay to switch from its normally grounded position and connect circuit A5 to circuit V5. The A5 circuit is protected by a 40 amp fuse located in cavity 14 of the Power Distribution Center (PDC).

The V5 circuit is connected to the HI/LOW Wiper relay LOW speed side. Voltage is passed through the relay to circuit V3, then to the LOW speed side of the wiper motor. Ground for the wiper motor is provided on circuit Z1.

When the wiper motor completes one cycle, the BCM turns OFF the motor by deactivating the wiper relays. The amount of delay between wipes is dependent on the voltage level being sent to the BCM from the wiper switch.

As the windshield wiper motor turns, the park switch internal to the motor moves from its grounded position to the open RUN position. The BCM uses input from the park switch, on circuit V55, for wiper position and system operation.

The delay times are also compensated for vehicle speed. If the vehicle is moving less than 10 mph, the delay time is doubled. Once the vehicle speed exceeds 10 mph, the normal delay times are used.

WIPER AFTER WASH

When the wash button is pressed momentarily a signal is sent to the Body Control Module (BCM) on circuit V10. The BCM then turns the wipers ON low speed for three consecutive wipes after the button is released.

The BCM turns the wipers ON by providing a ground path for circuit V14. This causes the intermittent wipe relay to switch from its normally grounded position and connect circuit A5 to circuit V5. The A5 circuit is protected by a 40 amp fuse located in cavity 14 of the PDC.

The V5 circuit is connected to the HI/LOW Wiper relay low speed side. Voltage is passed through the relay to circuit V3, then to the LOW speed side of the wiper motor. Ground for the wiper motor is provided on circuit Z1.

As the windshield wiper motor turns, the park switch internal to the motor moves from its grounded position to the open RUN position. The BCM uses input from the park switch, on circuit V55, for wiper position and system operation.

MIST FUNCTION

When the MIST switch is activated, and the wiper switch is in the OFF position, a multi-plexed signal is sent to the Body Control Module (BCM) on circuit V52. The BCM then turns the wipers on LOW speed for as long as the switch is held.

The BCM turns the wipers ON by providing a ground path for circuit V14. This causes the intermit-

DESCRIPTION AND OPERATION (Continued)

tent wipe relay to switch from its normally grounded position and connect circuit A5 to circuit V5. The A5 circuit is protected by a 40 amp fuse located in cavity 14 of the PDC.

The V5 circuit is connected to the HI/LOW Wiper relay low speed side. Voltage is passed through the relay to circuit V3, then to the LOW speed side of the wiper motor. Ground for the wiper motor is provided on circuit Z1.

If after the MIST switch is released and the wiper control switch is no longer in the OFF position, the wipers will enter the mode indicated by the wiper control switch.

As the windshield wiper motor turns, the park switch internal to the motor moves from its grounded position to the open RUN position. The BCM uses input from the park switch, on circuit V55, for wiper position and system operation.

LOW SPEED OPERATION

When the LOW speed switch is activated a multiplexed signal is sent to the Body Control Module (BCM) on circuit V52. The BCM then turns the wipers ON LOW speed by providing a ground path for circuit V14. This causes the intermittent wipe relay to switch from its normally grounded position and connect circuit A5 to circuit V5. The A5 circuit is protected by a 40 amp fuse located in cavity 14 of the PDC.

The V5 circuit is connected to the HI/LOW Wiper relay low speed side. Voltage is passed through the relay to circuit V3, then to the LOW speed side of the wiper motor. Ground for the wiper motor is provided on circuit Z1.

As the windshield wiper motor turns, the park switch internal to the motor moves from its grounded position to the open RUN position. The BCM uses input from the park switch, on circuit V55, for wiper position and system operation.

HI SPEED OPERATION

When HIGH speed operation is selected, a multiplexed signal is sent to the Body Control Module (BCM) on circuit V52. The BCM then turns the wipers ON by grounding the V14 and V16 circuits.

By grounding the V14 circuit the intermittent wiper relay is switched from its normally grounded position to connect circuits A5 and V5. The A5 circuit, which originates in the PDC and is protected by a 40 amp fuse located in cavity 14, then supplies power to the HI/LOW wiper relay through circuit V5.

When the V16 circuit is grounded the HI/LOW relay switches, from its normal position of LOW speed, to the HIGH speed contact. Power for the coil side of the relay is supplied by the F13 circuit. This circuit also is the feed for the wiper switch and the intermittent wiper relay.

Power for the windshield wiper motor is supplied from the HI/LOW wiper relay to the motor on circuit V4. Ground for the wiper motor is provided on circuit Z1.

As the windshield wiper motor turns, the park switch internal to the motor moves from its grounded position to the open RUN position. The BCM uses input from the park switch, on circuit V55, for wiper position and system operation.

WASHER OPERATION

When the operator presses the WASH switch power is supplied on the F13 circuit, through the CLOSED switch contacts, to circuit V10. The V10 circuit is spliced and conects to the Body Control Module (BCM) and the windshield washer pump motor. The pump motor, which is located in the washer fluid reservoir, is grounded at the right frame rail.

HELPFUL INFORMATION

- Check the 10 amp fuse located in cavity 15 of the junction block
- Check the 40 amp fuse located in cavity 14 of the PDC
- Check for a good ground at the instrument panel left side cowl
- Check for a good ground at the right frame rail

8W-60 POWER WINDOWS

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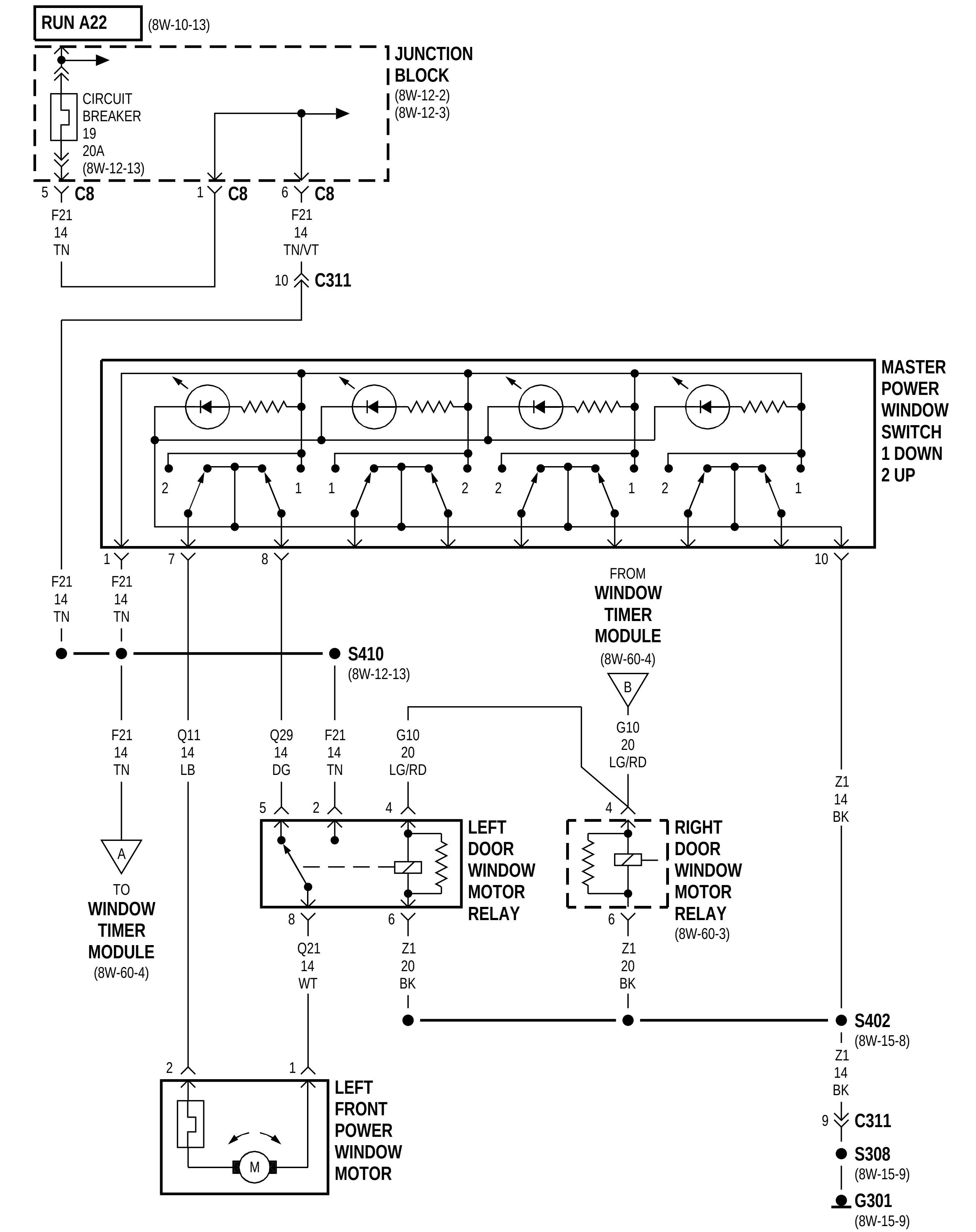
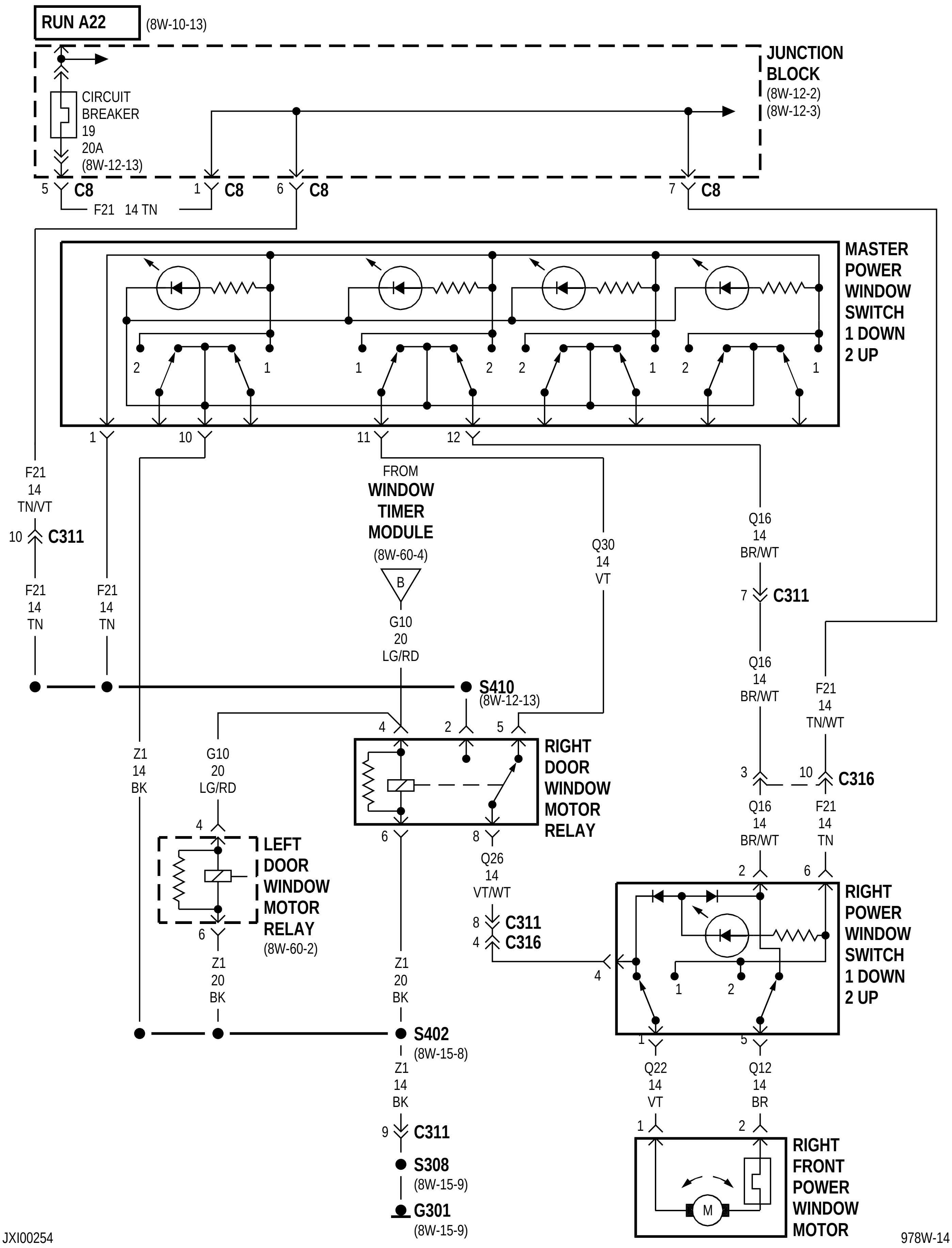

RUN A22
(8W-10-13)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER 19 20A (8W-12-13)
5 C8
1 C8
6 C8
F21 14 TN
F21 14 TN/VT
10 C311
MASTER POWER WINDOW SWITCH 1 DOWN 2 UP
2 1 1 2 2 1 2 1
1 7 8 10
F21 14 TN
F21 14 TN
S410
(8W-12-13)
FROM WINDOW TIMER MODULE
(8W-60-4)
B
F21 14 TN
Q11 14 LB
Q29 14 DG
F21 14 TN
G10 20 LG/RD
G10 20 LG/RD
Z1 14 BK
A
TO WINDOW TIMER MODULE
(8W-60-4)
5 2 4
LEFT DOOR WINDOW MOTOR RELAY
8 6
4
RIGHT DOOR WINDOW MOTOR RELAY
(8W-60-3)
6
Q21 14 WT
Z1 20 BK
Z1 20 BK
S402
(8W-15-8)
Z1 14 BK
9 C311
S308
(8W-15-9)
G301
(8W-15-9)
2 1
M
LEFT FRONT POWER WINDOW MOTOR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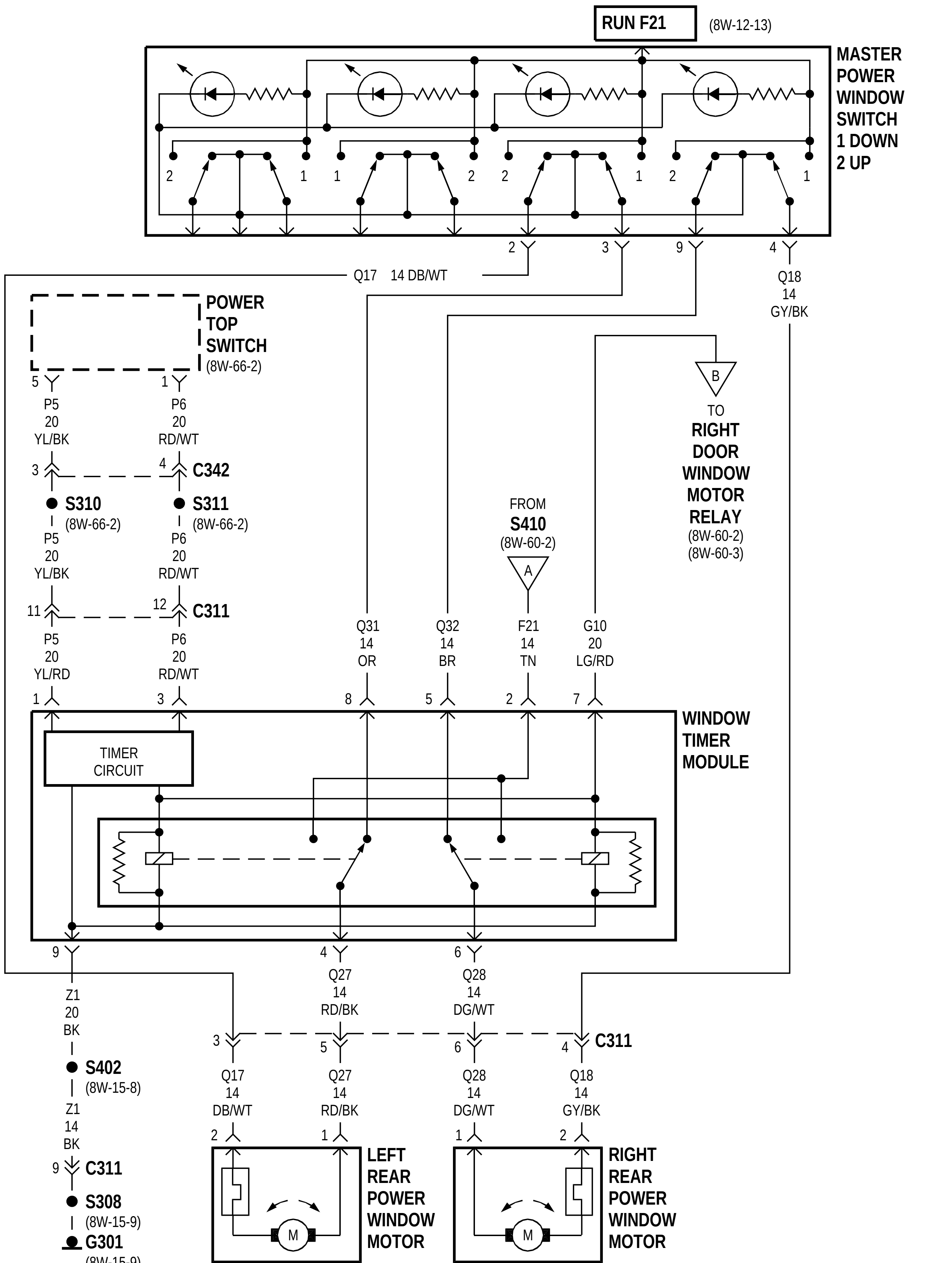
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER 19 20A (8W-12-13)
5 C8
1 C8
6 C8
7 C8
F21 14 TN
MASTER POWER WINDOW SWITCH 1 DOWN 2 UP
F21 14 TN/VT
10 C311
F21 14 TN
F21 14 TN
FROM WINDOW TIMER MODULE
(8W-60-4)
B
G10 20 LG/RD
Q30 14 VT
Q16 14 BR/WT
7 C311
Q16 14 BR/WT
F21 14 TN/WT
S410
(8W-12-13)
RIGHT DOOR WINDOW MOTOR RELAY
Z1 14 BK
G10 20 LG/RD
LEFT DOOR WINDOW MOTOR RELAY
(8W-60-2)
Q26 14 VT/WT
8 C311
4 C316
3 10 C316
Q16 14 BR/WT
F21 14 TN
RIGHT POWER WINDOW SWITCH 1 DOWN 2 UP
Z1 20 BK
Z1 20 BK
S402
(8W-15-8)
Z1 14 BK
9 C311
S308
(8W-15-9)
G301
(8W-15-9)
Q22 14 VT
Q12 14 BR
RIGHT FRONT POWER WINDOW MOTOR
M


RUN F21
(8W-12-13)
MASTER POWER WINDOW SWITCH 1 DOWN 2 UP
Q17 14 DB/WT
Q18 14 GY/BK
POWER TOP SWITCH
(8W-66-2)
P5 20 YL/BK
P6 20 RD/WT
C342
S310
(8W-66-2)
S311
(8W-66-2)
C311
P5 20 YL/RD
B
TO
RIGHT DOOR WINDOW MOTOR RELAY
(8W-60-2)
(8W-60-3)
FROM
S410
(8W-60-2)
A
Q31 14 OR
Q32 14 BR
F21 14 TN
G10 20 LG/RD
WINDOW TIMER MODULE
TIMER CIRCUIT
Z1 20 BK
Q27 14 RD/BK
Q28 14 DG/WT
S402
(8W-15-8)
Z1 14 BK
C311
S308
(8W-15-9)
G301
(8W-15-9)
LEFT REAR POWER WINDOW MOTOR
RIGHT REAR POWER WINDOW MOTOR
M

8W-60 POWER WINDOWS

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DESCRIPTION AND OPERATION

POWER WINDOWS (NORMAL OPERATION)

NOTE: The power window system used in this vehicle is different from other vehicles in that a window timer module along with window down relays are used. This module allows for notmal window operation when the window switches are activated. However, when the power top switch is activated the module will partially lower all windows

The power window system is powered by a 20 amp circuit breaker located in the junction block cavity 19. This circuit breaker also supplies power to the window down module and normally OPEN contacts of the window down relays.

The circuit breaker receives its feed from the ignition switch on the A22 circuit. This circuit breaker is HOT when the ignition switch is in the RUN position only.

Circuit F21 is the feed circuit from the circuit breaker to the power window switches. The ground path for the power windows, window timer module, and window down relays is on the Z1 circuit and terminates at the instrument panel left side cowl.

Both of the door switches have a Light Emitting Diode (L.E.D.) located inside of the switch. This diode allows the operator to see the switch when it is dark. The diodes are powered at all times when the ignition switch is in the RUN position.

Resistors and diodes internal to the switches are used for the L.E.D's. No attempt should be made to repair these items. If the L.E.D. is not working, the switch should be replaced.

Each window motor has an internal circuit breaker to protect the motor from excessive electrical loads. This circuit breaker is not serviceable.

LEFT FRONT WINDOW OPERATION

When the operator selects window DOWN operation power is supplied on the F21 circuit through the switch to circuit Q29. Circuit Q29 connects from the switch to the left power window down relay. The feed is passed through the normally CLOSED contacts in the relay to circuit Q21. Circuit Q21 connects from the relay to the motor. Ground for the motor is supplied on circuit Q11 back to the master switch to the Z1 ground circuit.

For window UP operation the circuits are reversed. Circuit Q11 is the feed and circuits Q21 and Q29 are the ground.

RIGHT FRONT WINDOW OPERATION

When the DRIVER selects window DOWN operation power is supplied on the F21 circuit through the switch to circuit Q30. Circuit Q30 connects from the drivers door switch to the right front down relay. The feed is passed through the normally CLOSED contacts in the relay to circuit Q26. Circuit Q26 connects to the passenger switch. The motor current then runs through th eswitch to circuit Q22 which connects to the motor. The ground returns through circuit Q12 through the passengers switch contacts to circuit Q16. Circuit Q16 connects to th master switch then to the Z1 ground circuit.

For window UP operation the circuits are reversed. Circuit Q16 is the feed and circuits Q26 and Q30 are the ground.

If the switch is being operated from the PASSENGER'S front door, and the operator is requesting window DOWN operation, power is supplied on the F21 circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and back to the master switch on circuit Q16. A bus bar, internal to the switch, connects the Q16 circuit to the Z1 circuit. The Z1 circuit is terminated at the instrument panel left side cowl.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuits Q22 and Q26 are the ground.

LEFT REAR WINDOW

When the DRIVER selects window DOWN operation power is supplied on the F21 circuit through the switch to circuit Q31. Circuit Q31 connects from the drivers door switch to the window timer module. The power is passed though the normally CLOSED contacts in the module to circuit Q27. Circuit Q27 connects from the module to the motor.

DESCRIPTION AND OPERATION (Continued)

Ground for the window motor is supplied on the Q17 circuit. Circuit Q17 connects from the left rear window motor to the master switch. A bus bar, internal to the switch, connects the Q17 circuit to the Z1 circuit. The Z1 circuit is terminated at the instrument panel left side cowl.

For window UP operation the circuits are reversed. Circuit Q17 is the feed, and circuit Q31 and circuit Q27 are the ground.

RIGHT REAR WINDOW

When the DRIVER selects window DOWN operation power is supplied on the F21 circuit through the switch to circuit Q32. Circuit Q32 connects from the drivers door switch to the window timer module. The power is passed though the normally CLOSED contacts in the module to circuit Q28. Circuit Q28 connects from the module to the motor.

Ground for the window motor is supplied on the Q18 circuit. Circuit Q18 connects from the right rear window motor to the master switch. A bus bar, internal to the switch, connects the Q18 circuit to the Z1 circuit. The Z1 circuit is terminated at the Instrument Panel left side cowl.

For window UP operation the circuits are reversed. Circuit Q18 is the feed, and circuit Q32 and circuit Q28 are the ground.

POWER WINDOW OPERATION (W/POWER TOP OPERATION)

NOTE: The power windows on this vehicle operate automatically in the down mode when the power top switch is activated. Refer to the following circuit descriptions for operation in this mode. For regular power window operation refer to the previous circuit description.

The power window system on this vehicle utilizes a pair of external relays (2) and a window timer module located in the left door to control the operation of the windows when the power top is activated.

Power for the window timer module is supplied on circuit P5 or P6. The F21 circuit supplies power for the power window switches, and the contact side of the power window relays. Ground for the module is supplied on circuit Z1.

When the power top switch is activated circuit P6 for top UP, or P5 for top DOWN, sends a voltage signal to the window timer module. The window timer module then provides voltage to the coil side of the relays. This causes the normally OPEN contacts in the relays to CLOSE connecting power to the DOWN side of wach window motor. All windows then operate in the DOWN mode for a pre-determined length of time.

HELPFUL INFORMATION

- Check the 20 amp circuit breaker located in cavity 19 of the junction block
- Check the 40 amp fuse located in cavity 18 of the PDC
- Check for a good ground at the instrument panel left side cowl
- Refer to the appropriate group of the Service Manual for additional test procedures

8W-61 POWER DOOR LOCKS

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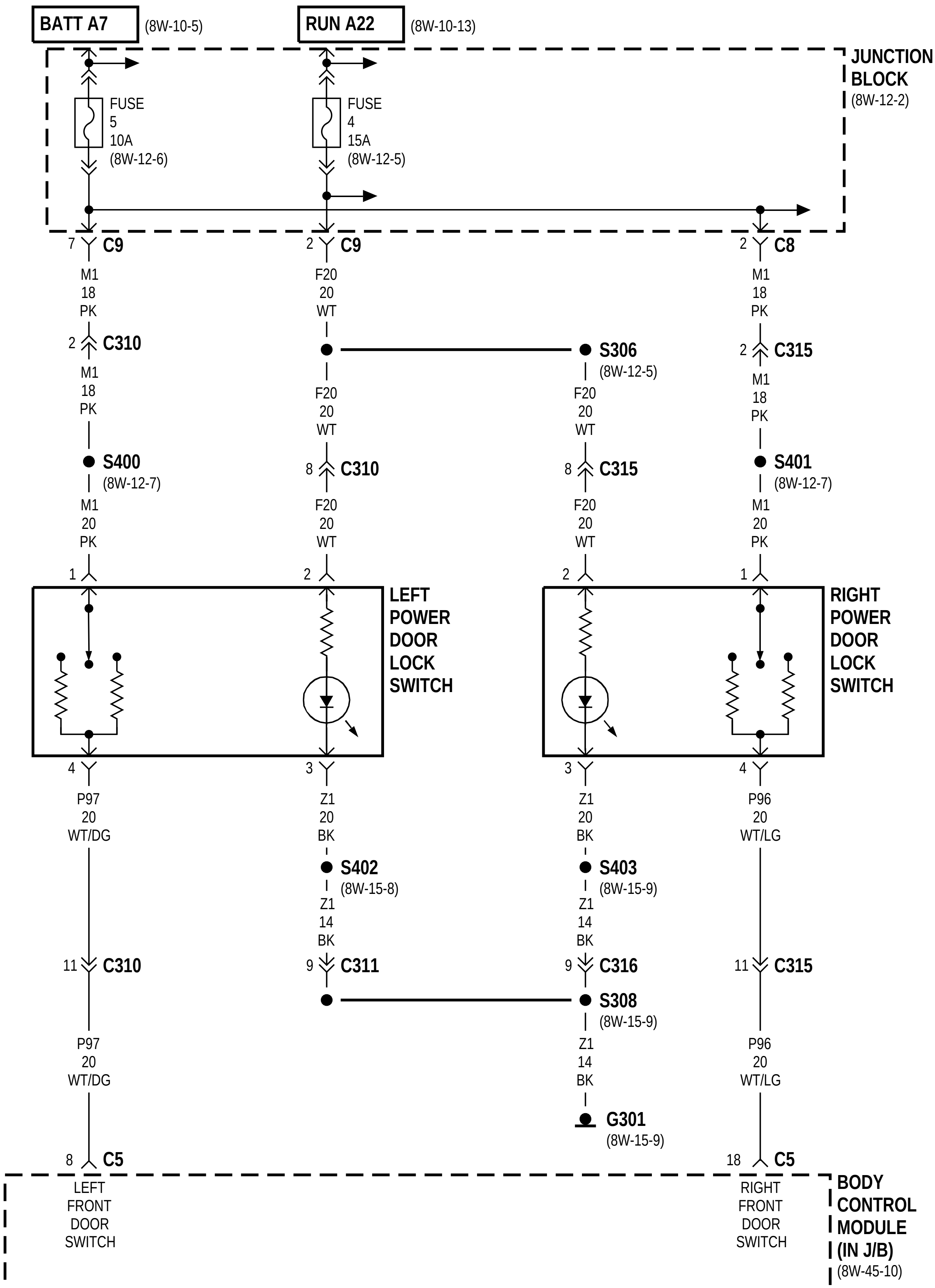
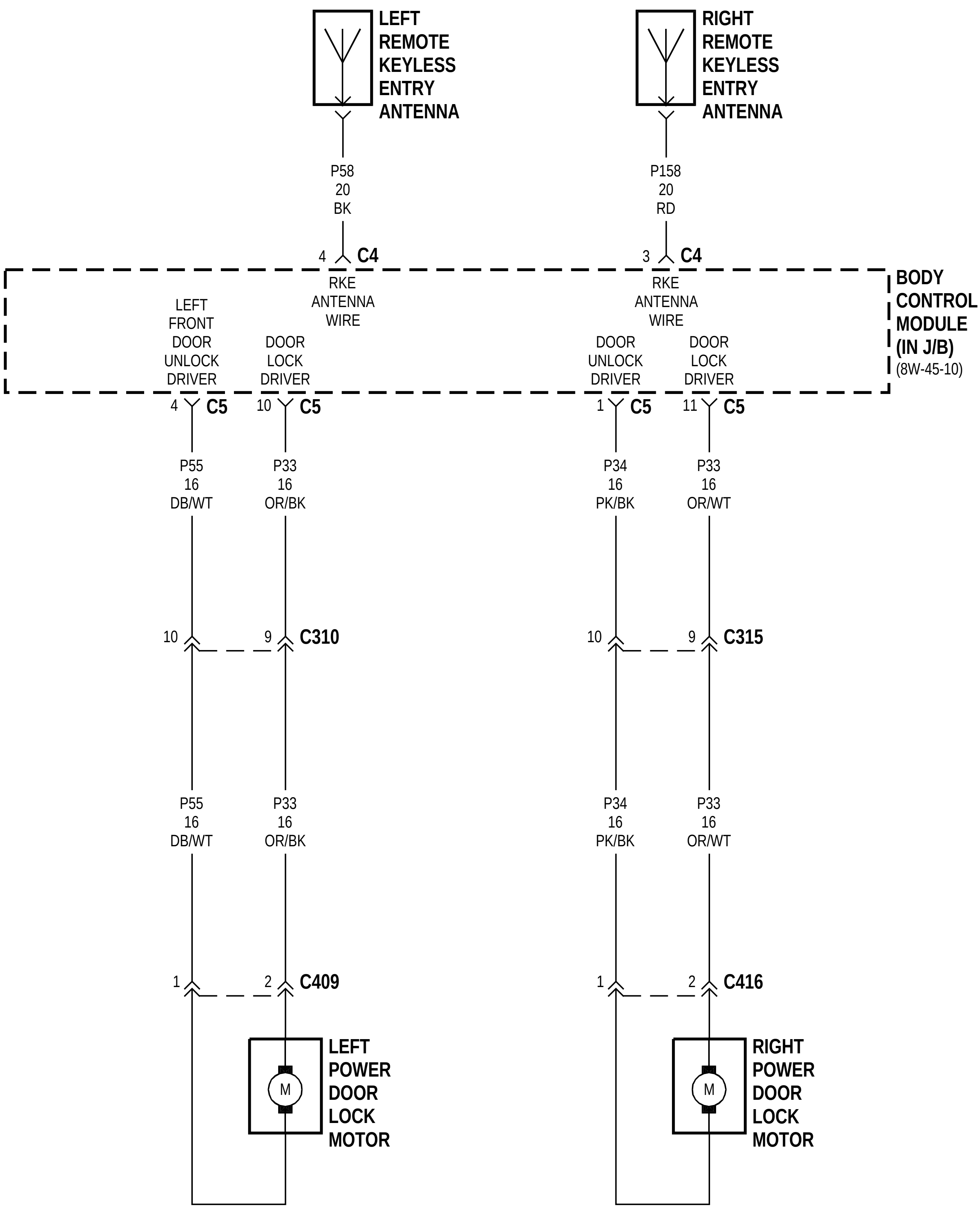
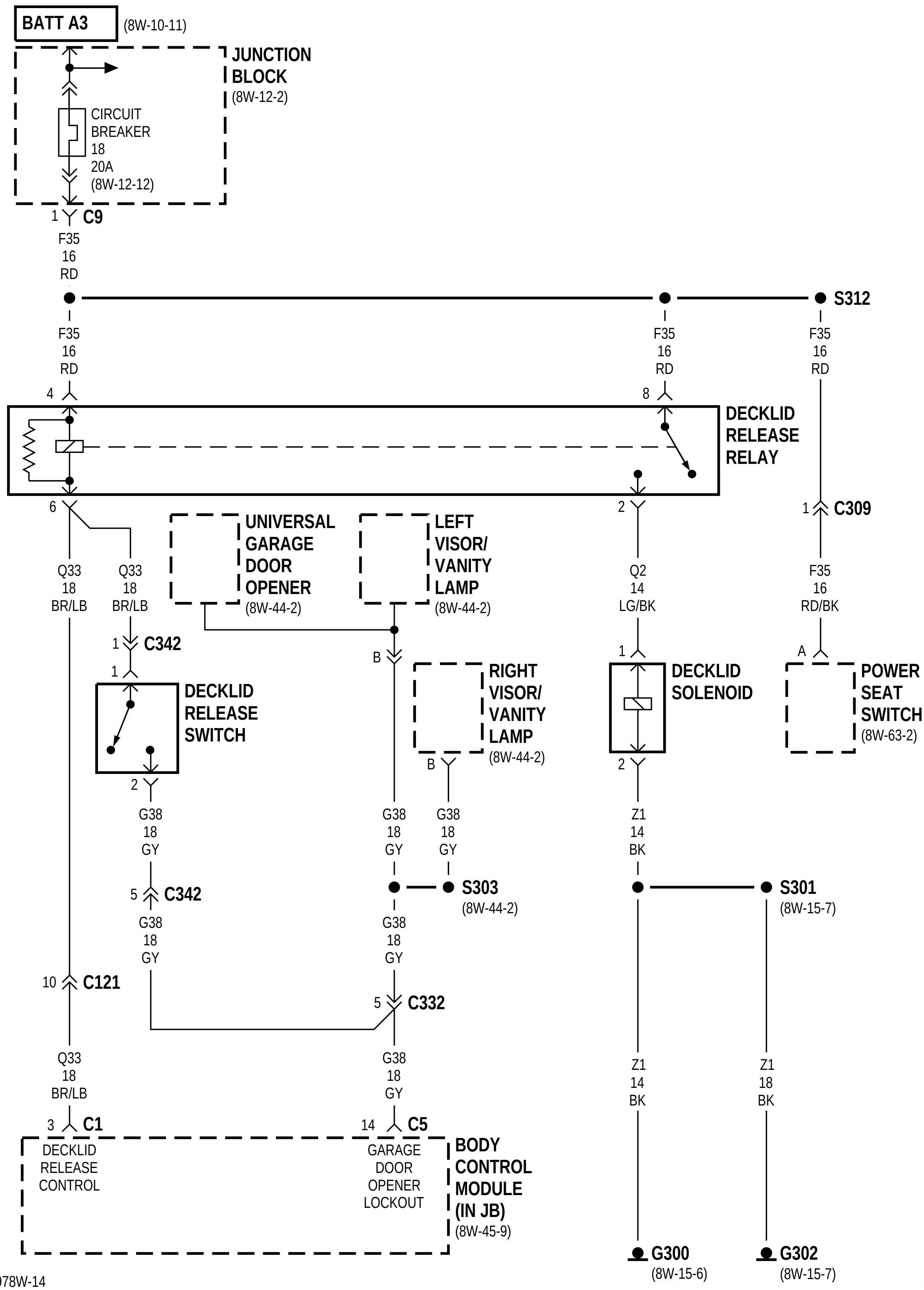
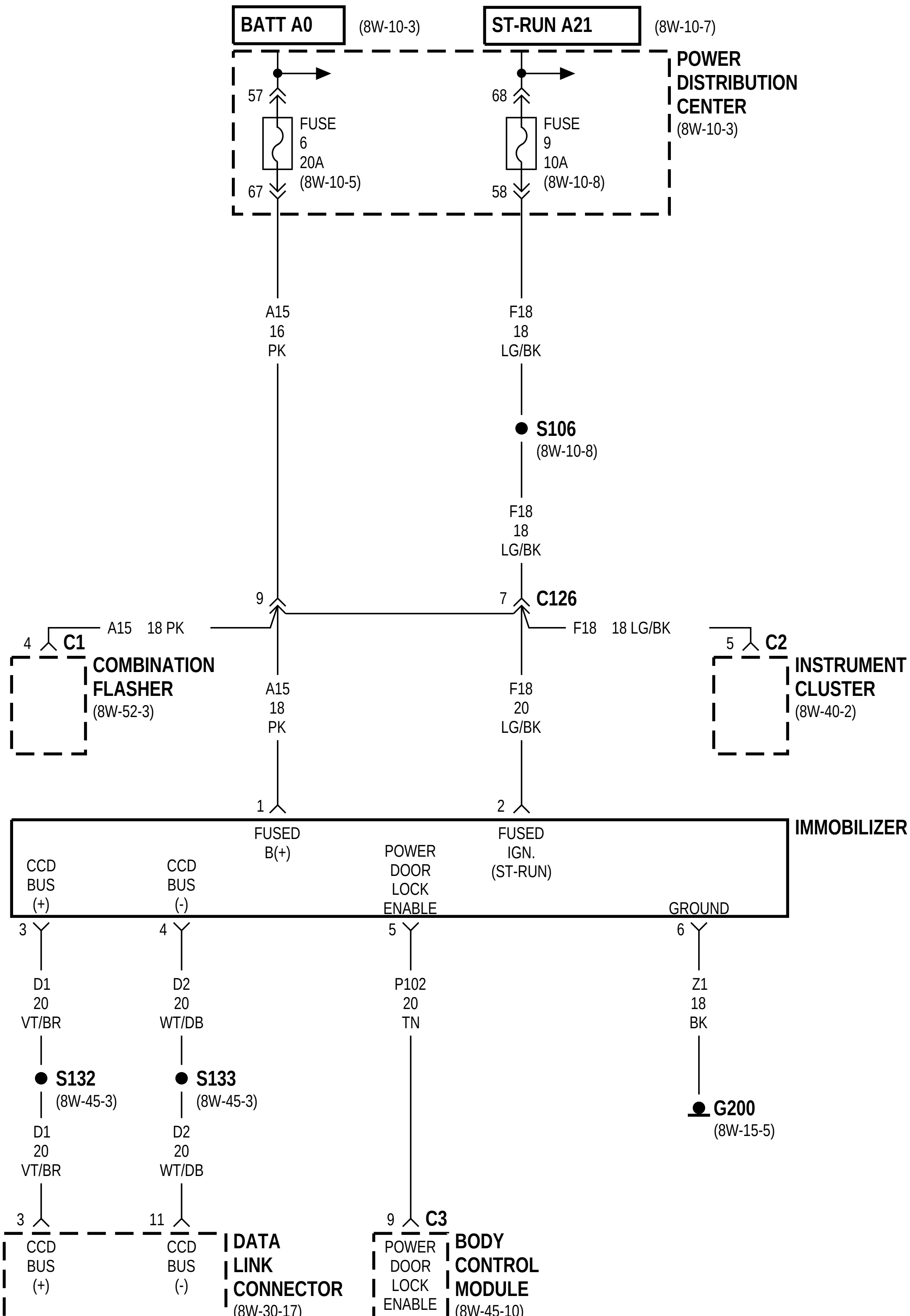

BATT A7
(8W-10-5)
RUN A22
(8W-10-13)
JUNCTION
BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
FUSE
4
15A
(8W-12-5)
7
C9
2
C9
2
C8
M1
18
PK
F20
20
WT
M1
18
PK
2
C310
S306
(8W-12-5)
2
C315
M1
18
PK
F20
20
WT
F20
20
WT
M1
18
PK
S400
(8W-12-7)
8
C310
8
C315
S401
(8W-12-7)
M1
20
PK
F20
20
WT
F20
20
WT
M1
20
PK
1
2
2
1
LEFT
POWER
DOOR
LOCK
SWITCH
RIGHT
POWER
DOOR
LOCK
SWITCH
4
3
3
4
P97
20
WT/DG
Z1
20
BK
Z1
20
BK
P96
20
WT/LG
S402
(8W-15-8)
S403
(8W-15-9)
Z1
14
BK
Z1
14
BK
11
C310
9
C311
9
C316
11
C315
S308
(8W-15-9)
P97
20
WT/DG
Z1
14
BK
P96
20
WT/LG
G301
(8W-15-9)
8
C5
18
C5
LEFT
FRONT
DOOR
SWITCH
RIGHT
FRONT
DOOR
SWITCH
BODY
CONTROL
MODULE
(IN J/B)
(8W-45-10)


LEFT REMOTE KEYLESS ENTRY ANTENNA
RIGHT REMOTE KEYLESS ENTRY ANTENNA
P58
20
BK
P158
20
RD
4
C4
3
C4
BODY CONTROL MODULE (IN J/B)
(8W-45-10)
RKE ANTENNA WIRE
RKE ANTENNA WIRE
LEFT FRONT DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
4
C5
10
C5
1
C5
11
C5
P55
16
DB/WT
P33
16
OR/BK
P34
16
PK/BK
P33
16
OR/WT
10
9
C310
10
9
C315
P55
16
DB/WT
P33
16
OR/BK
P34
16
PK/BK
P33
16
OR/WT
1
2
C409
1
2
C416
M
LEFT POWER DOOR LOCK MOTOR
M
RIGHT POWER DOOR LOCK MOTOR


BATT A3
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
CIRCUIT BREAKER
18
20A
(8W-12-12)
1 C9
F35 16 RD
S312
F35 16 RD
F35 16 RD
F35 16 RD
4
8
DECKLID RELEASE RELAY
6
2
1 C309
UNIVERSAL GARAGE DOOR OPENER
(8W-44-2)
LEFT VISOR/ VANITY LAMP
(8W-44-2)
Q33 18 BR/LB
Q33 18 BR/LB
Q2 14 LG/BK
F35 16 RD/BK
1 C342
1
B
1
A
DECKLID RELEASE SWITCH
RIGHT VISOR/ VANITY LAMP
(8W-44-2)
DECKLID SOLENOID
POWER SEAT SWITCH
(8W-63-2)
2
B
2
G38 18 GY
G38 18 GY
G38 18 GY
Z1 14 BK
5 C342
S303
(8W-44-2)
S301
(8W-15-7)
G38 18 GY
G38 18 GY
10 C121
5 C332
Q33 18 BR/LB
G38 18 GY
Z1 14 BK
Z1 18 BK
3 C1
14 C5
DECKLID RELEASE CONTROL
GARAGE DOOR OPENER LOCKOUT
BODY CONTROL MODULE (IN JB)
(8W-45-9)
G300
(8W-15-6)
G302
(8W-15-7)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(8W-10-3)
ST-RUN A21
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
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6
20A
(8W-10-5)
67
68
FUSE
9
10A
(8W-10-8)
58
A15
16
PK
F18
18
LG/BK
S106
(8W-10-8)
F18
18
LG/BK
9
7
C126
A15 18 PK
F18 18 LG/BK
4
C1
COMBINATION
FLASHER
(8W-52-3)
5
C2
INSTRUMENT
CLUSTER
(8W-40-2)
A15
18
PK
F18
20
LG/BK
1
2
IMMOBILIZER
FUSED
B(+)
FUSED
IGN.
(ST-RUN)
CCD
BUS
(+)
CCD
BUS
(-)
POWER
DOOR
LOCK
ENABLE
GROUND
3
4
5
6
D1
20
VT/BR
D2
20
WT/DB
P102
20
TN
Z1
18
BK
S132
(8W-45-3)
S133
(8W-45-3)
G200
(8W-15-5)
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VT/BR
D2
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WT/DB
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11
9
C3
CCD
BUS
(+)
CCD
BUS
(-)
DATA
LINK
CONNECTOR
(8W-30-17)
POWER
DOOR
LOCK
ENABLE
BODY
CONTROL
MODULE
(8W-45-10)

8W-61 POWER DOOR LOCKS

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DESCRIPTION AND OPERATION

POWER DOOR LOCKS

The power door lock system is controlled by the Body Control Module (BCM). The door lock switches, located in the front doors, are supplied power on the M1 circuit. This circuit is the Ignition-Off Draw (IOD) circuit. It is protected by a 10 amp fuse located in cavity 5 of the junction block.

Both switches have a Light Emitting Diode (LED) located internal to the switch for night illumination. Power for the LED's is supplied on circuit F20. The F20 circuit is protected by a 15 amp fuse located in cavity 4 of the junction block. Power for the fuse is supplied on circuit A22. The A22 circuit connects to the ignition switch and is HOT in the RUN position only.

Circuit A22 is powered by circuit A2 from the PDC. This circuit is protected by a 40 amp fuse located in cavity 18 of the PDC. Ground for the LED's is supplied on circuit Z1 and terminates at the instrument panel left side cowl.

Power for the door lock motors is supplied to the BCM on circuit F135. This circuit is protected by a 15 amp fuse located in cavity 9 of the junction block. Circuit A3 is used to supply power to the fuse.

Circuit A3 is HOT at all times and is protected by a 40 amp fuse located in cavity 15 of the PDC. This circuit also supplies power for the Power Seat circuit breaker, and the Headlamp Delay Relay.

DOOR SWITCH OPERATION

The door lock switches use resistors internal to the switch. There are different resistors used for the LOCK and UNLOCK functions. Both switches have the same amount of resistance for the LOCK and UNLOCK functions.

When the operator selects the LOCK or UNLOCK function, from either switch, voltage is passed through the CLOSED contacts in the switch, through the appropriate resistor, to the P96 circuit for the right front door, and circuit P97 for the left front door. These circuits then connect to the Body Control Module (BCM).

The BCM then process this request and supplies power and ground to the appropriate circuits. When the LOCK function is selected power is supplied on circuit P33 to all the motors. Ground is supplied on circuit P34 and P55. For the UNLOCK function the circuits are reversed.

REMOTE KEYLESS ENTRY

Operation of the Remote Keyless Entry (RKE) system is controlled by the Body Control Module (BCM).

When the BCM receives a signal from the RKE transmitter it supplies power and ground to the appropriate circuits dependent upon the operators request.

Operation of the door lock motors is the same with or without RKE.

DECK LID RELEASE

W/O REMOTE KEYLESS ENTRY

The deck lid release system uses a switch, located in the center console, and a release solenoid located on the deck lid latch assembly.

Power for the switch is supplied on circuit F35. This circuit is HOT at all times and protected by a 20 amp circuit breaker located in cavity 18 of the junction block. The F35 circuit is spliced and supplies power for the power seats.

Power for the circuit breaker is supplied on circuit A3. This circuit is HOT at all times and protected by a 40 amp fuse located in cavity 15 of the Power Distribution Center (PDC).

When the switch is CLOSED, power flows through the switch to circuit Q2. The Q2 circuit connects from the switch to the deck lid release solenoid. Ground for the solenoid is supplied on circuit Z1.

W/ REMOTE KEYLESS ENTRY

On vehicles equipped with Remote Keyless Entry (RKE) a relay is placed in the F35 and Q2 circuits. This relay allows the operator to unlock the trunk with the RKE transmitter. Power for the coil and contact sides of the relay is supplied on circuit F35. Ground for the coil side of the relay is controlled by the Body Control Module (BCM).

DESCRIPTION AND OPERATION (Continued)

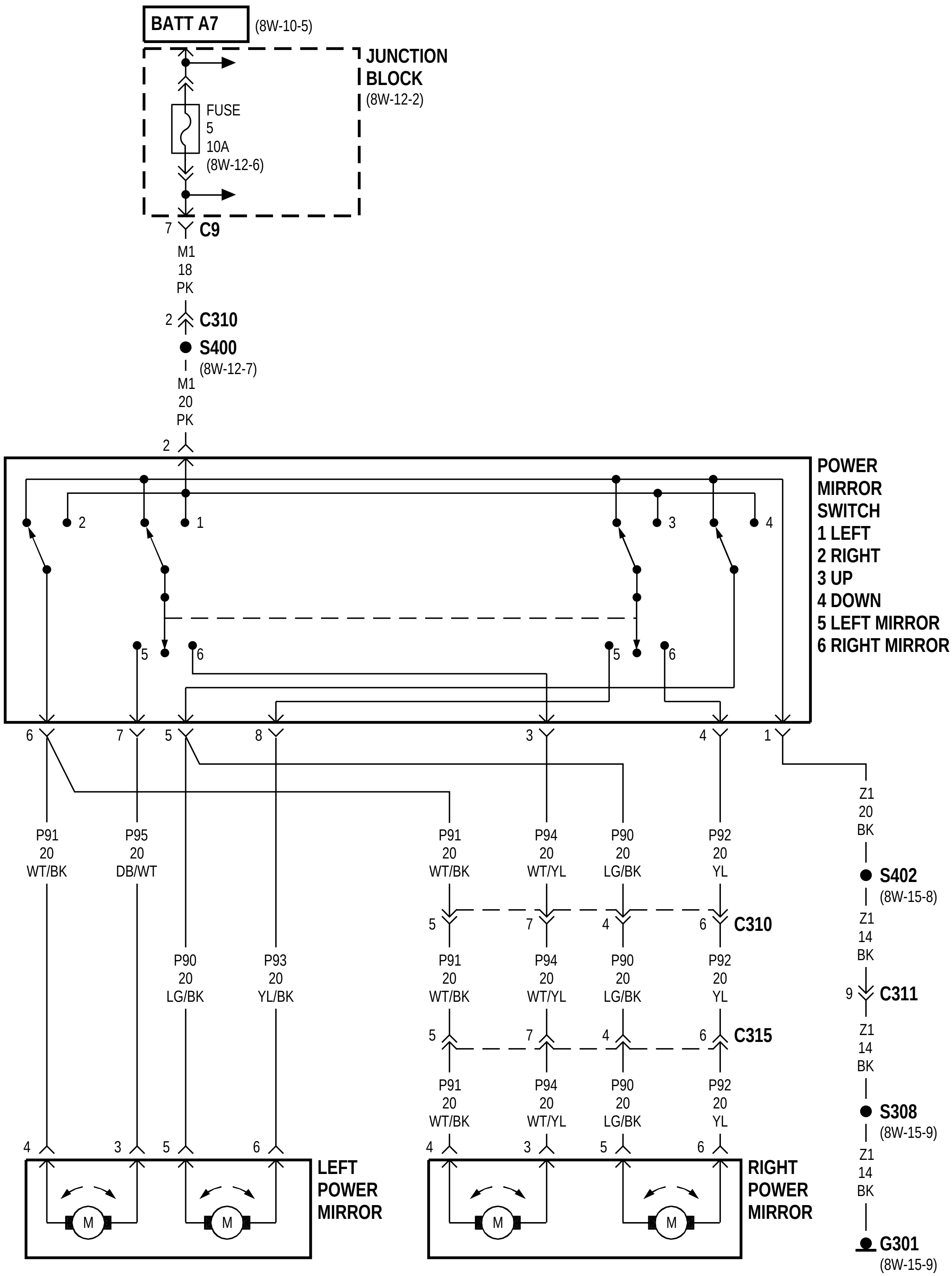
When the RKE transmitter is activated the BCM provides a ground path for circuit Q33. This causes the contacts in the relay to CLOSE connecting circuits F35 and Q2. The Q2 circuit connects to the deck lid release solenoid.

HELPFUL INFORMATION

- Check the 40 amp fuse located in cavity 15 of the PDC
- Check the 15 amp fuse located in cavity 9 of the junction block
- Check the IOD fuse located in cavity 5 of the PDC
- Check for a good door switch ground at the instrument panel left side cowl
- Refer to the appropriate group of the Service Manual or the Diagnostic Test Procedures Manual for further diagnostic procedures

8W-62 POWER MIRRORS

INDEX


BATT A7
(8W-10-5)
JUNCTION
BLOCK
(8W-12-2)
FUSE
5
10A
(8W-12-6)
7 C9
M1
18
PK
2 C310
S400
(8W-12-7)
M1
20
PK
2
1
2
3
4
5
6
5
6
POWER
MIRROR
SWITCH
1 LEFT
2 RIGHT
3 UP
4 DOWN
5 LEFT MIRROR
6 RIGHT MIRROR
6 7 5 8 3 4 1
P91
20
WT/BK
P95
20
DB/WT
P91
20
WT/BK
P94
20
WT/YL
P90
20
LG/BK
P92
20
YL
Z1
20
BK
S402
(8W-15-8)
5 7 4 6 C310
Z1
14
BK
P90
20
LG/BK
P93
20
YL/BK
P91
20
WT/BK
P94
20
WT/YL
P90
20
LG/BK
P92
20
YL
9 C311
Z1
14
BK
5 7 4 6 C315
P91
20
WT/BK
P94
20
WT/YL
P90
20
LG/BK
P92
20
YL
S308
(8W-15-9)
Z1
14
BK
4 3 5 6
4 3 5 6
M
M
M
M
LEFT
POWER
MIRROR
RIGHT
POWER
MIRROR
G301
(8W-15-9)

8W-62 POWER MIRRORS

INDEX

DESCRIPTION AND OPERATION

POWER MIRRORS

The power mirrors use a single switch located in the left door trim panel. The feed for the system is supplied from the 10 amp Ignition-Off Draw (IOD) fuse located in the junction block cavity 5. This fuse also supplies power for the radio, interior lamps and other components. Grounding for the power mirrors, along with power door locks and A/C Heater control, is provided through the Z1 circuit, which attaches to the left side cowl.

SWITCH AND MIRROR OPERATION

The power mirror switch has a right and a left position. Moving the switch to either of these positions changes the voltage path internal to the switch (changes polarity at the motors).

When the switch is moved to the LEFT position and mirror movement UP is selected, voltage is supplied through the P93 circuit and the ground path is through circuit P90. When the DOWN movement is selected, the power and ground are reversed.

If a LEFT door mirror movement LEFT is selected, voltage is supplied through the P95 circuit and the ground is passed through circuit P91. When the left door mirror RIGHT movement is selected, the power and ground are reversed.

When the switch is moved to the RIGHT position and mirror movement UP is selected, voltage is supplied through the P92 circuit and the ground path is through circuit P90. When the DOWN movement is selected, the power and ground are reversed.

If a RIGHT door mirror movement LEFT is selected, voltage is supplied through the P94 circuit and the ground is passed through circuit P91. When the left door mirror RIGHT movement is selected, the power and ground are reversed.

HEATER OPERATION

The mirrors are also equipped with heating elements. These elements are activated when the operator has turned ON the rear window defogger. Circuit C16 provides power for the heaters. The C15 circuit is the power supply for the rear window defogger grid.

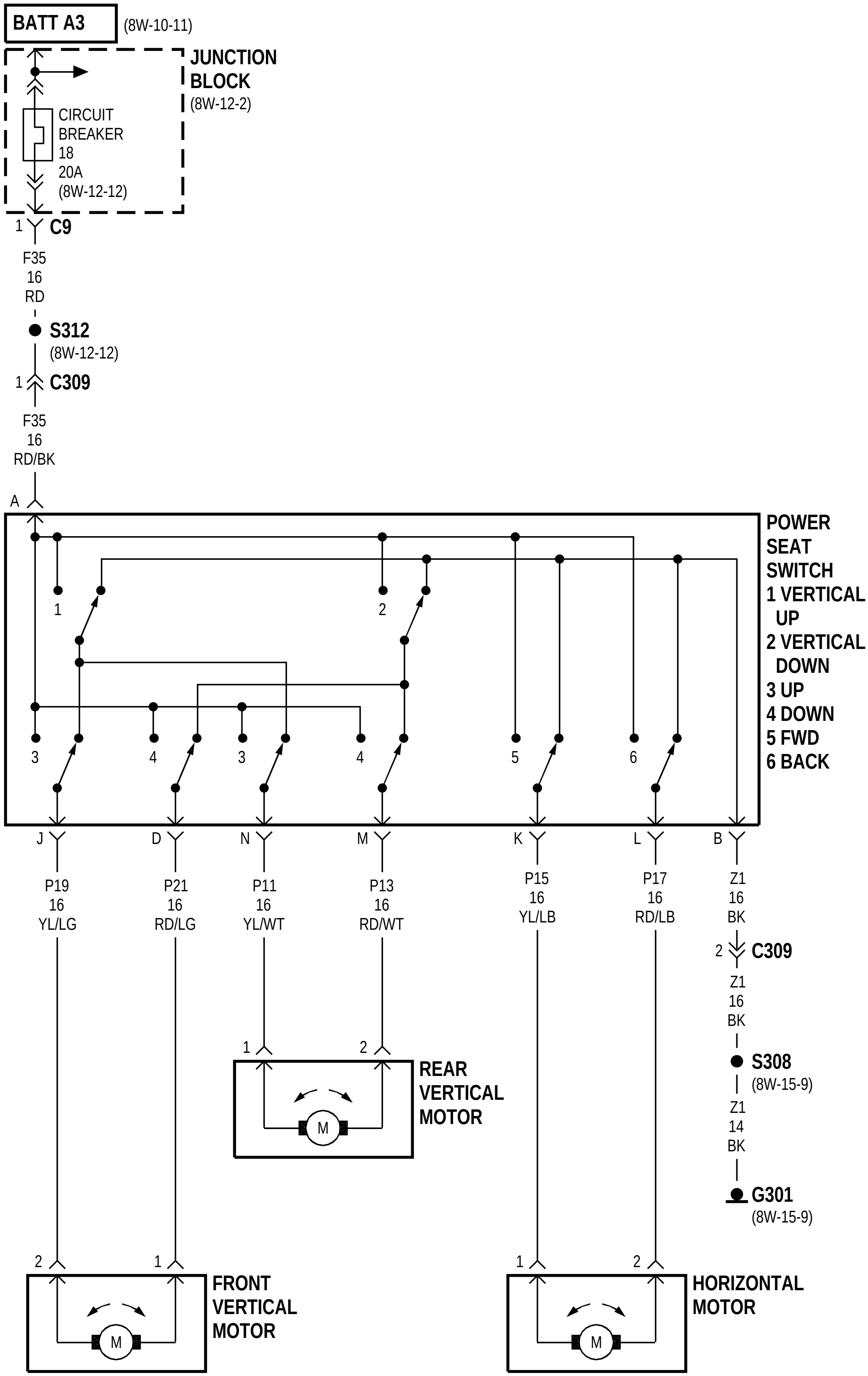
The heated mirrors and rear window defogger switch are protected by a 10 amp fuse located in the junction block cavity 15. Grounding for the mirror heaters is provided on the Z1 circuit and terminates at the left side cowl.

HELPFUL INFORMATION

- Check the IOD fuse located in the junction block
- Circuit M1 supplies voltage to the radio, cargo lamp, dome lamp, time delay relay, glove box lamp, and vanity lamps. Check for proper operation of these items
- Move the switch to its various positions and listen for the motors to click or try to move. Some movement or clicking indicates a poor connection or a mechanical problem with a mirror

8W-63 POWER SEAT

INDEX


BATT A3
(8W-10-11)
JUNCTION
BLOCK
(8W-12-2)
CIRCUIT
BREAKER
18
20A
(8W-12-12)
1
C9
F35
16
RD
S312
(8W-12-12)
1
C309
F35
16
RD/BK
A
POWER
SEAT
SWITCH
1 VERTICAL
UP
2 VERTICAL
DOWN
3 UP
4 DOWN
5 FWD
6 BACK
1
2
3
4
3
4
5
6
J
D
N
M
K
L
B
P19
16
YL/LG
P21
16
RD/LG
P11
16
YL/WT
P13
16
RD/WT
P15
16
YL/LB
P17
16
RD/LB
Z1
16
BK
2
C309
Z1
16
BK
S308
(8W-15-9)
Z1
14
BK
G301
(8W-15-9)
1
2
M
REAR
VERTICAL
MOTOR
2
1
M
FRONT
VERTICAL
MOTOR
1
2
M
HORIZONTAL
MOTOR

8W-63 POWER SEAT

INDEX

DESCRIPTION AND OPERATION

POWER SEAT

The power seat system is protected by a 20 amp circuit breaker located in cavity 18 of the junction block. This circuit breaker is HOT at all times. Circuit A3 is the power supply for the circuit breaker.

The A3 circuit originates in the Power Distribution Center (PDC) and is protected by a 40 amp fuse located in cavity 15. This circuit is also the feed for the Daytime Running Lamps, Headlamp Relay, and Power Door Locks.

Circuit F35 is the feed for the switch and the seat motors from the circuit breaker. A BUS bar internal to the switch feeds all the contacts. Grounding for the seat is provided on the Z1 circuit.

When the operator selects the FRONT VERTICAL UP function power is passed on the F35 circuit through the CLOSED contacts in the switch to the P19 circuit. The P19 circuit connects to the motor. Ground is provided on the P21 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For FRONT VERTICAL DOWN function the circuits are reversed. P21 is the feed and P19 is the ground.

When the operator selects the HORIZONTAL FORWARD function power is passed on the F35 circuit through the CLOSED contacts in the switch to the P15 circuit. The P15 circuit connects to the motor. Ground is provided on the P17 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For HORIZONTAL REARWARD function the circuits are reversed. P17 is the feed and P15 is the ground.

When the operator selects the REAR VERTICAL UP function power is passed on the F35 circuit through the CLOSED contacts in the switch to the P11 circuit. The P11 circuit connects to the motor. Ground is provided on the P13 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For REAR VERTICAL DOWN function the circuits are reversed. P13 is the feed and P11 is the ground.

POWER HEATED SEATS

Power for the heated seat switch is supplied on circuit F11. This circuit is protected by a 10 amp fuse located in the junction block. Ground for the switch is supplied on circuit Z3.

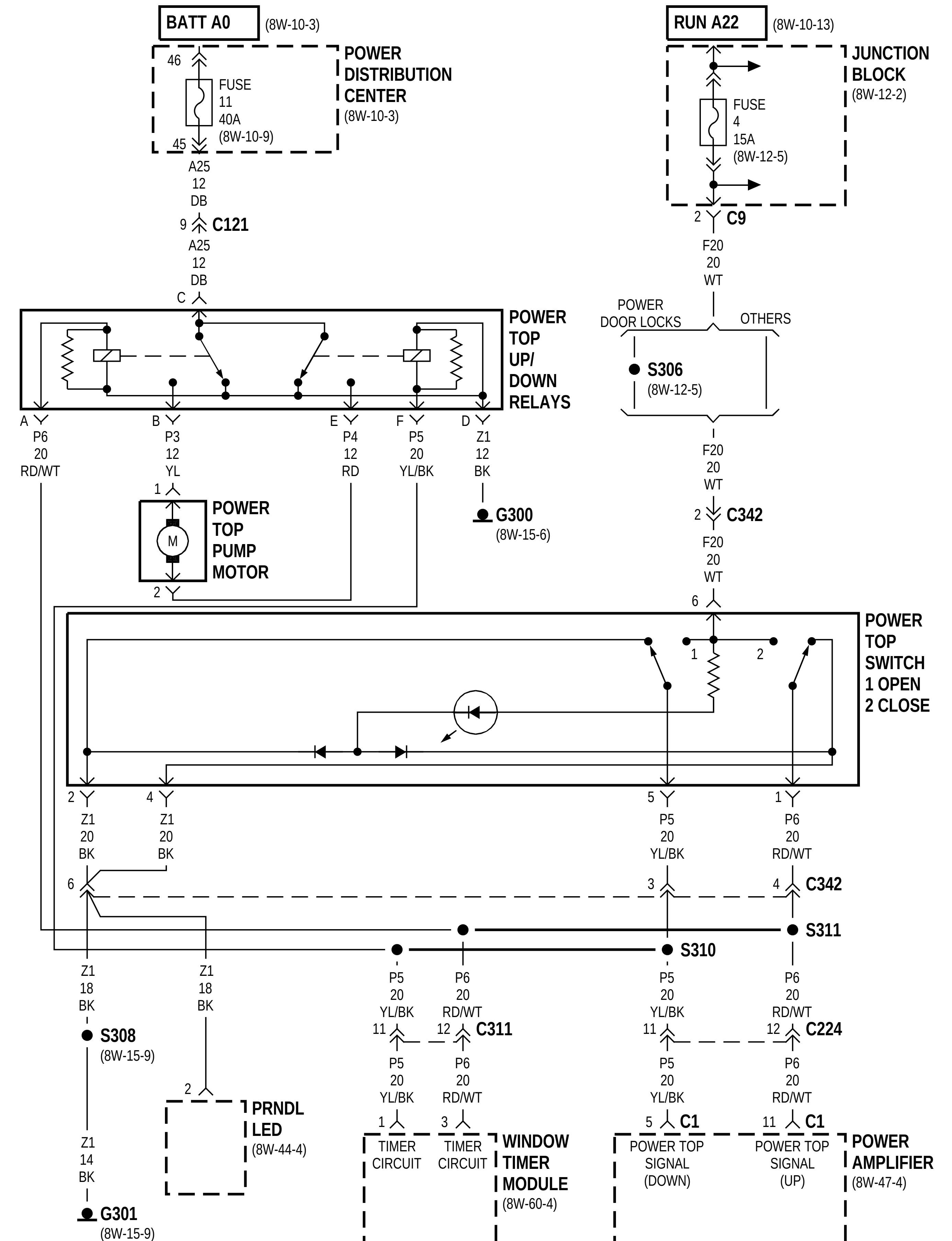
Power for the heated seat modules is supplied on circuit P86. This circuit is protected by a 20 amp fuse located in the Power Distribution Center (PDC). Ground for the heated seat modules is supplied on circuit Z3.

HELPFUL INFORMATION

- Check the 20 amp circuit breaker in located in cavity 18 of the junction block
- Check the 40 amp fuse located in cavity 15 of the PDC
- Check for a good ground at the instrument panel left side cowl

8W-66 POWER TOP

INDEX



978W-14

JXI00262

8W-66 POWER TOP

DESCRIPTION AND OPERATION

POWER TOP OPERATION W/POWER WINDOWS

This vehicle uses a unique power window system that works with the operation of the power top system. The windows will operate in the DOWN mode, for a specified period of time, when the power top switch is activated.

NOTE: Refer to section 8W-60 for circuit operation of this system. For further information on system operation, refer to group 8S-Power Windows in this service manual.

POWER TOP

The power top system uses a switch, a hydraulic pump motor, and two relays.

Power for the switch is supplied on circuit F20. This circuit is HOT when the ignition switch is in the RUN position and is protected by a 15 amp fuse located in cavity 4 of the junction block.

Circuit A22 is connected between the ignition switch and the fuse. Power for the A22 circuit is supplied by circuit A2. This circuit originates in the Power Distribution Center (PDC) and is protected by a 40 amp fuse located in cavity 18.

Ground for the switch is supplied on circuit Z1. This circuit terminates at the instrument panel left side cowl.

The switch has a Light Emitting Diode (LED) for night illumination. The LED is powered by the F20 circuit.

DOWN OPERATION

When the operator selects top DOWN, circuit F20 is connected to circuit P5. The P5 circuit connects from the switch to the power top DOWN relay. Voltage flowing through the coil side of the relay causes the contacts in the relay to CLOSE connecting circuits A25 and P4.

The A25 circuit is protected by a 40 amp fuse located in cavity 11 of the PDC.

Circuit P4 connects from the relay to the pump motor. Voltage flows through the motor to circuit P3. The P3 circuit provides the ground path for the motor back to the relay assembly. Internal to the relay circuit P3 connects to circuit Z1. The Z1 ground circuit terminates at the instrument panel left side cowl.

UP OPERATION

When the operator selects top UP, circuit F20 is connected to circuit P6. The P6 circuit connects from the switch to the power top UP relay. Voltage flowing through the coil side of the relay causes the contacts in the relay to CLOSE connecting circuits A25 and P3.

The A25 circuit is protected by a 40 amp fuse located in cavity 11 of the PDC.

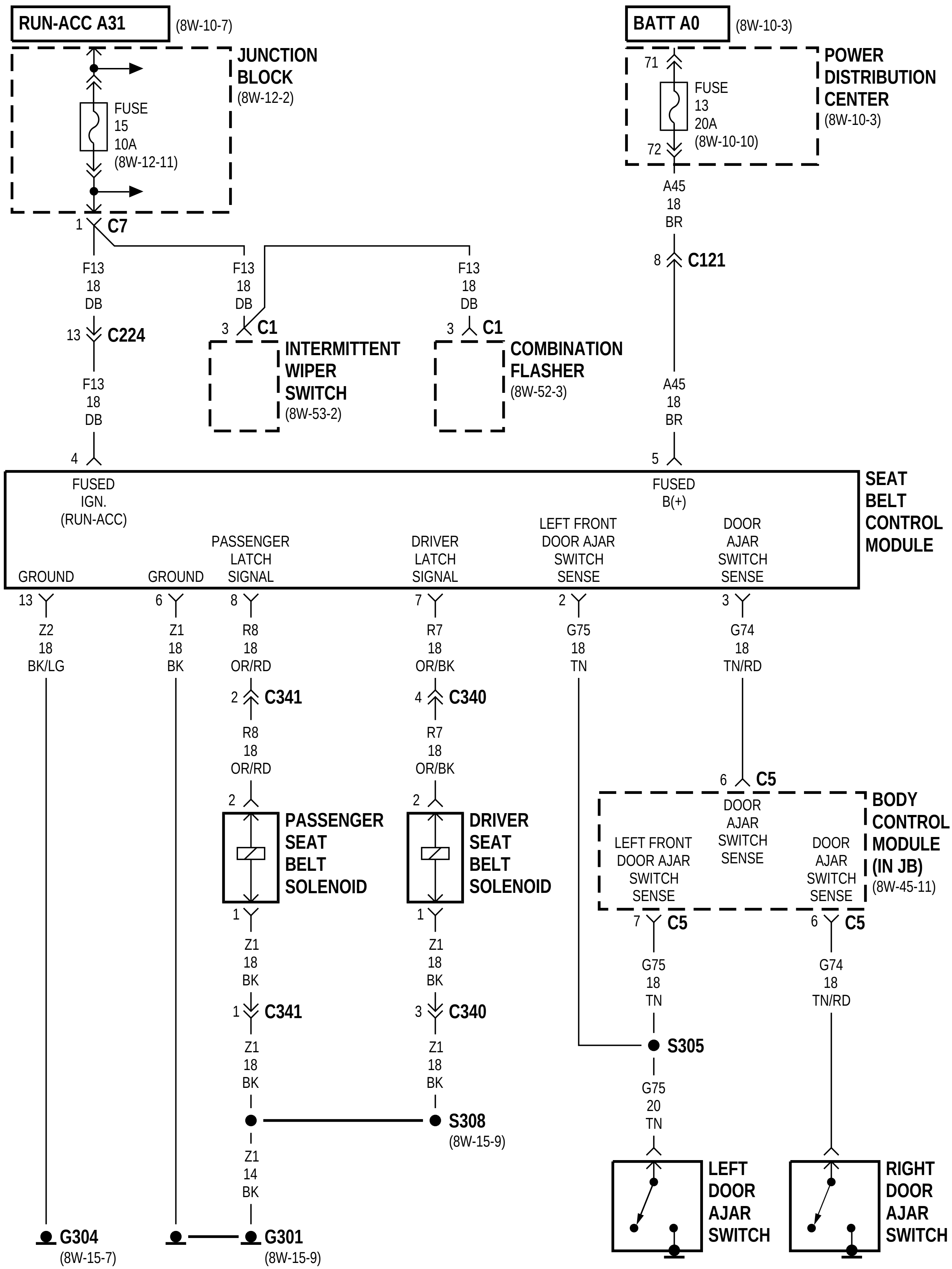
Circuit P3 connects from the relay to the pump motor. Voltage flows through the motor to circuit P4. The P4 circuit provides the ground path for the motor back to the relay assembly. Internal to the relay circuit P4 connects to circuit Z1. The Z1 ground circuit terminates at the instrument panel left side cowl.

HELPFUL INFORMATION

- Check the 40 amp fuses located in cavities 11 and 18 of the PDC
- Check the 15 amp fuse located in cavity 4 of the junction block
- Check for a good ground at the instrument panel left side cowl

8W-67 RESTRAINT SYSTEM

INDEX



978W-14 JXI00263

8W-67 RESTRAINT SYSTEM

DESCRIPTION AND OPERATION

RESTRAINT SYSTEM

The seat belt system is used to lock and unlock the seat belts. It consists of a seat belt control timer module, door ajar switches, ignition switch, and solenoids located in the seats.

When the operator OPENS the door, the door ajar switch completes a path to ground on circuit G75 for the drivers door, and G74 for the passengers door. The seatbelt control module then supplies voltage to the solenoids located in the seats, unlocking the seat belts.

Circuit R7 provides power from the module to the drivers seat solenoid, and circuit R8 provides power to the passengers seat solenoid from the control module. Logic internal to the module determines the amount of time the solenoids remain energized. Ground for the solenoids is supplied on circuit Z1.

Power for the seatbelt control module is supplied on circuits A45 and F13. The A45 circuit is a direct battery feed and is protected by a 20 amp fuse located in cavity 13 of the Power Distribution Center (PDC).

Circuit F13 is HOT when the ignition switch is in the ACCESSORY and RUN position only. This circuit is protected by a 10 amp fuse located in cavity 15 of the junction block.

Ground for the module is supplied on circuits Z1 and Z2.

HELPFUL INFORMATION

- Check the 20 amp fuse located in cavity 13 of the PDC
- Check the 10 amp fuse located in cavity 15 of the junction block
- Check the grounding points for the door ajar switches
- Check the grounding point for the seatbelt control module
- Open and close the driver and passenger door, and cycle the ignition switch to reactivate the seatbelt control module is the vehicle has been sitting for an extended period of time

8W-70 SPLICE INFORMATION

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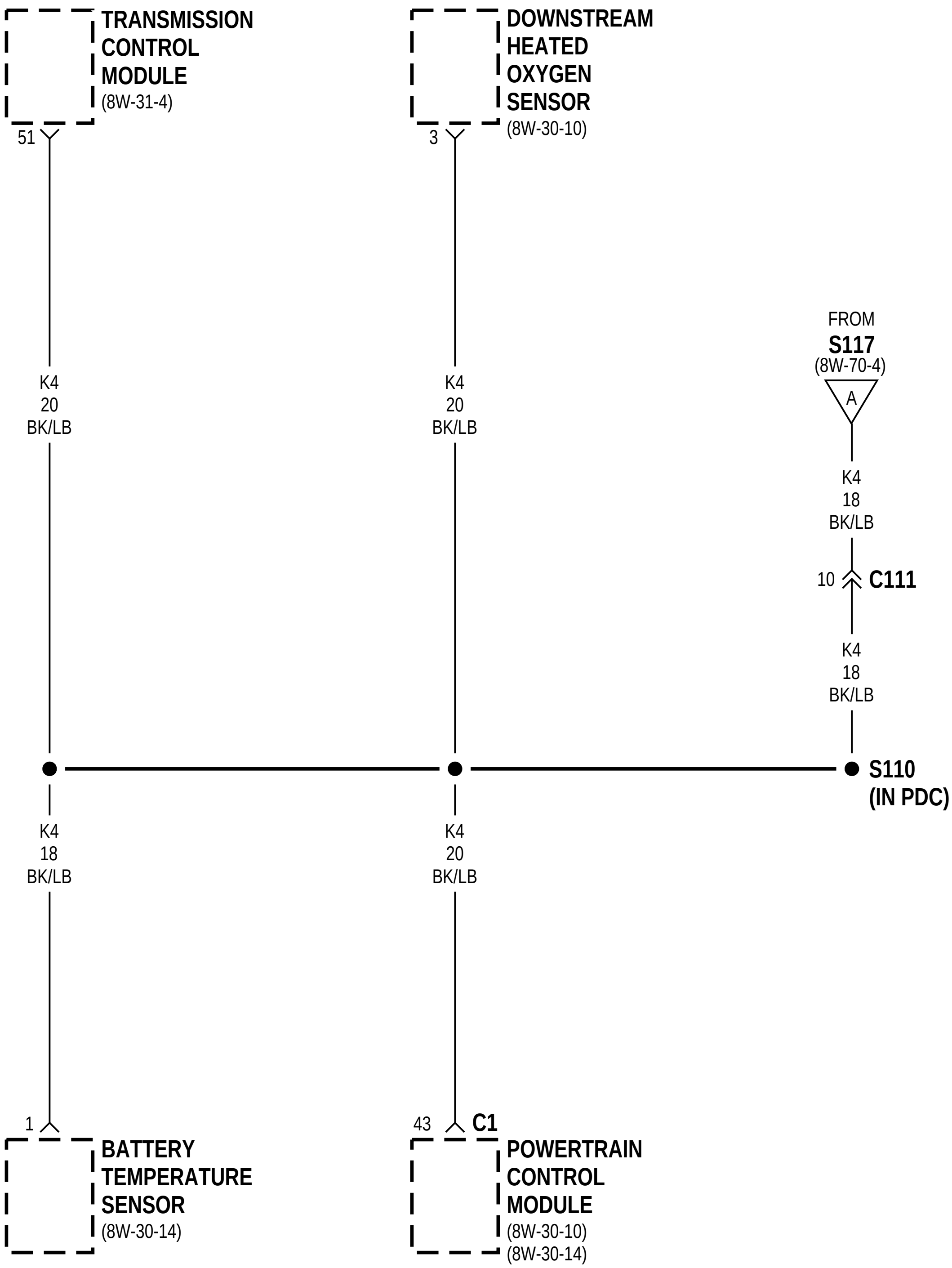
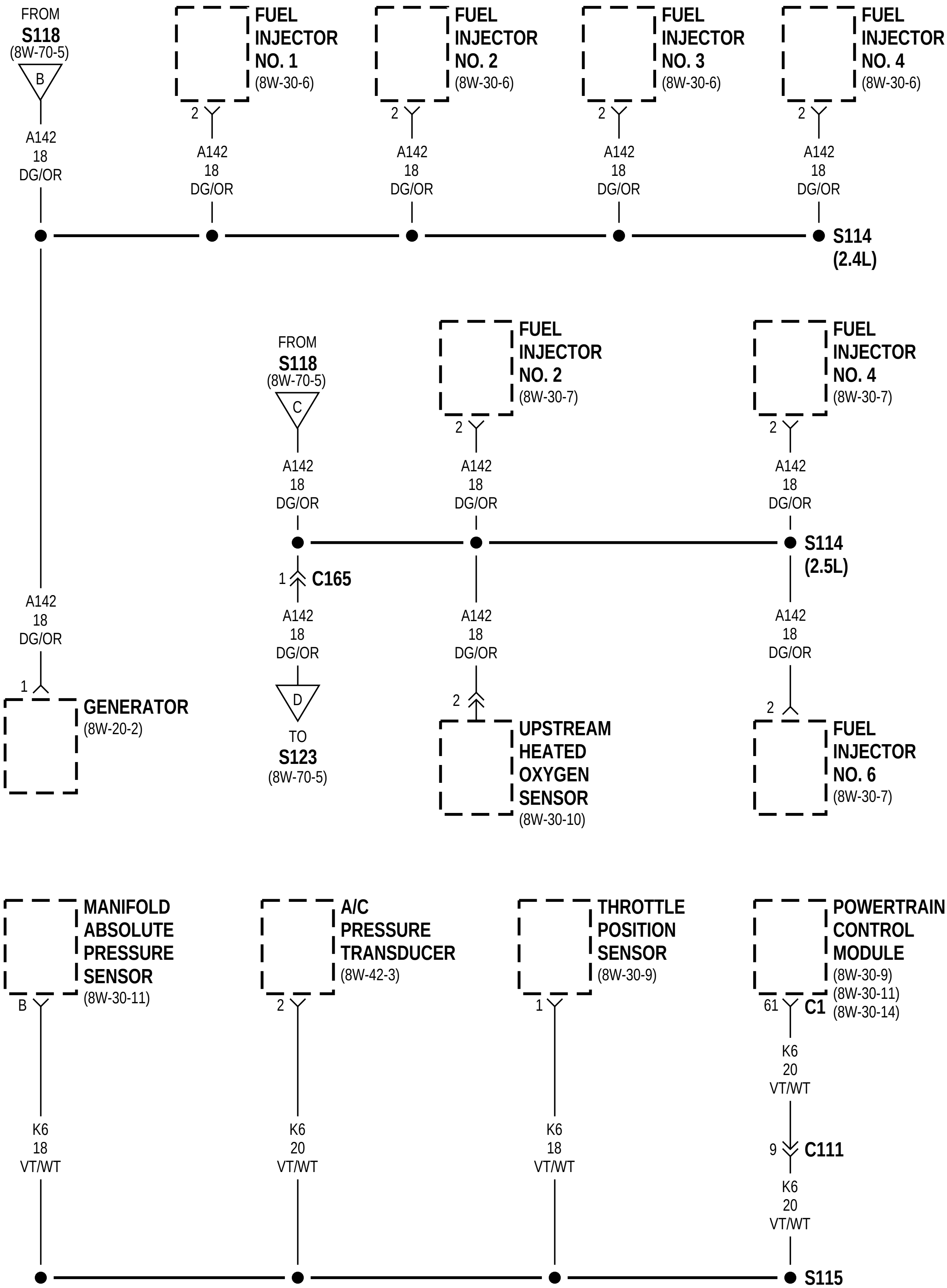
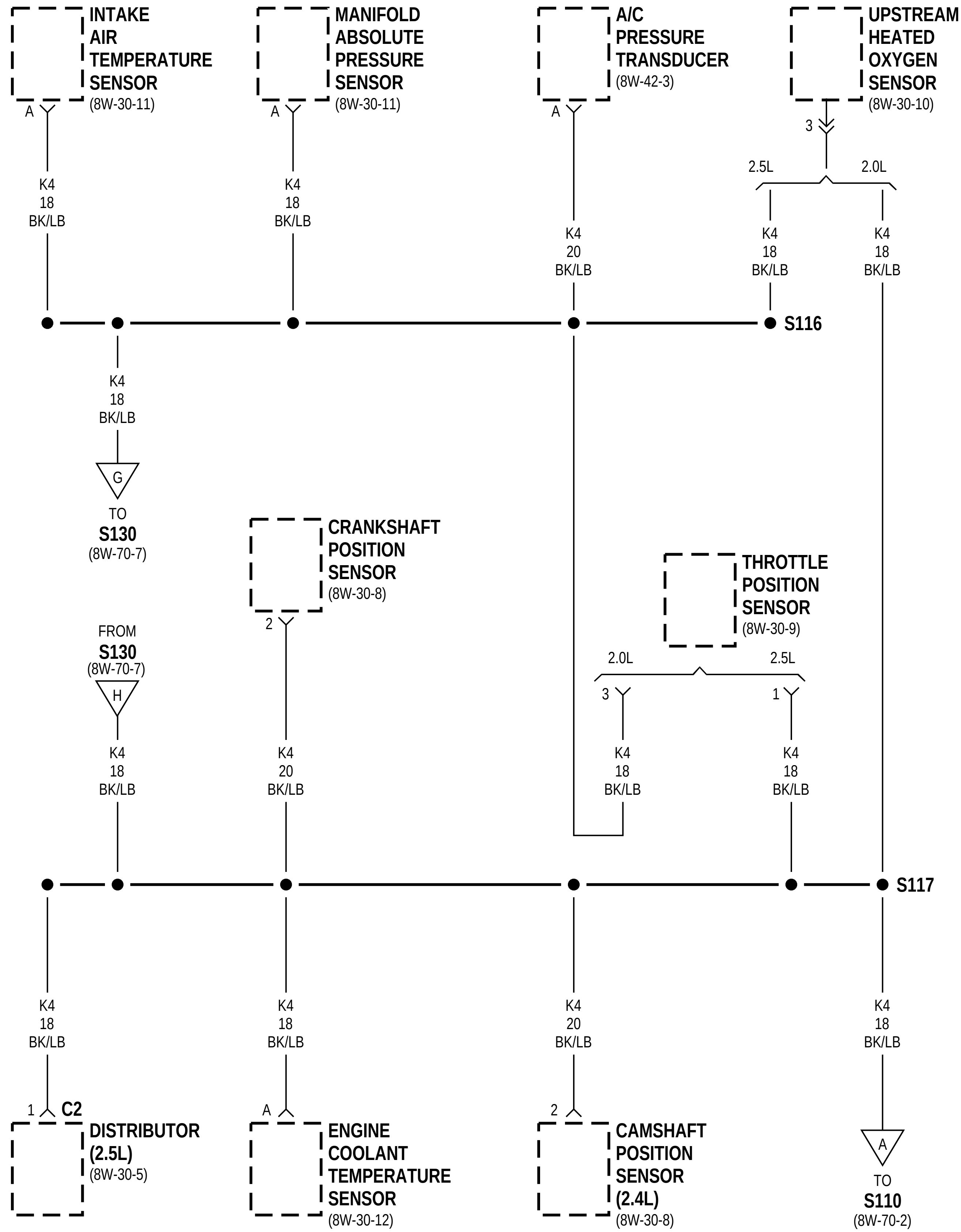
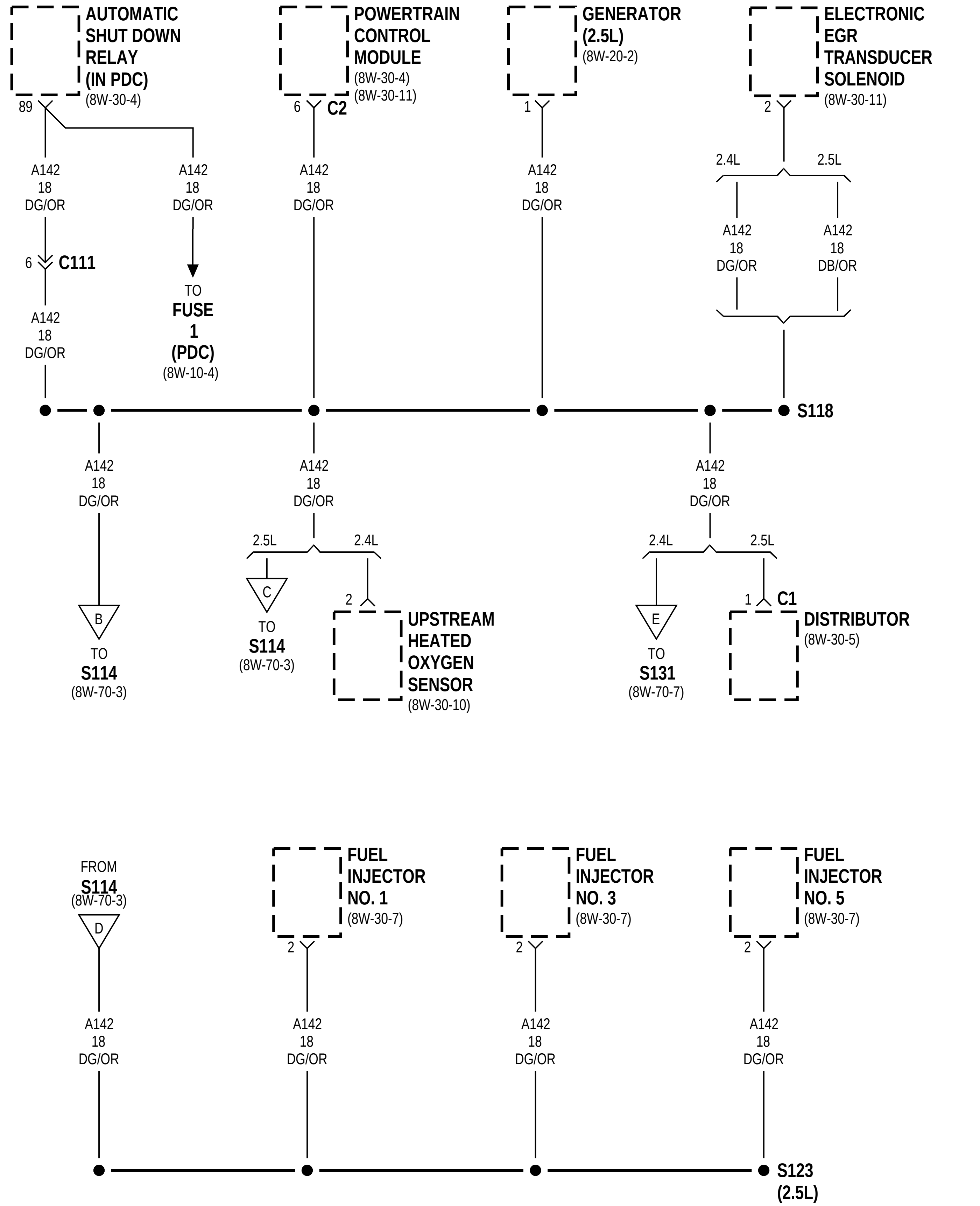
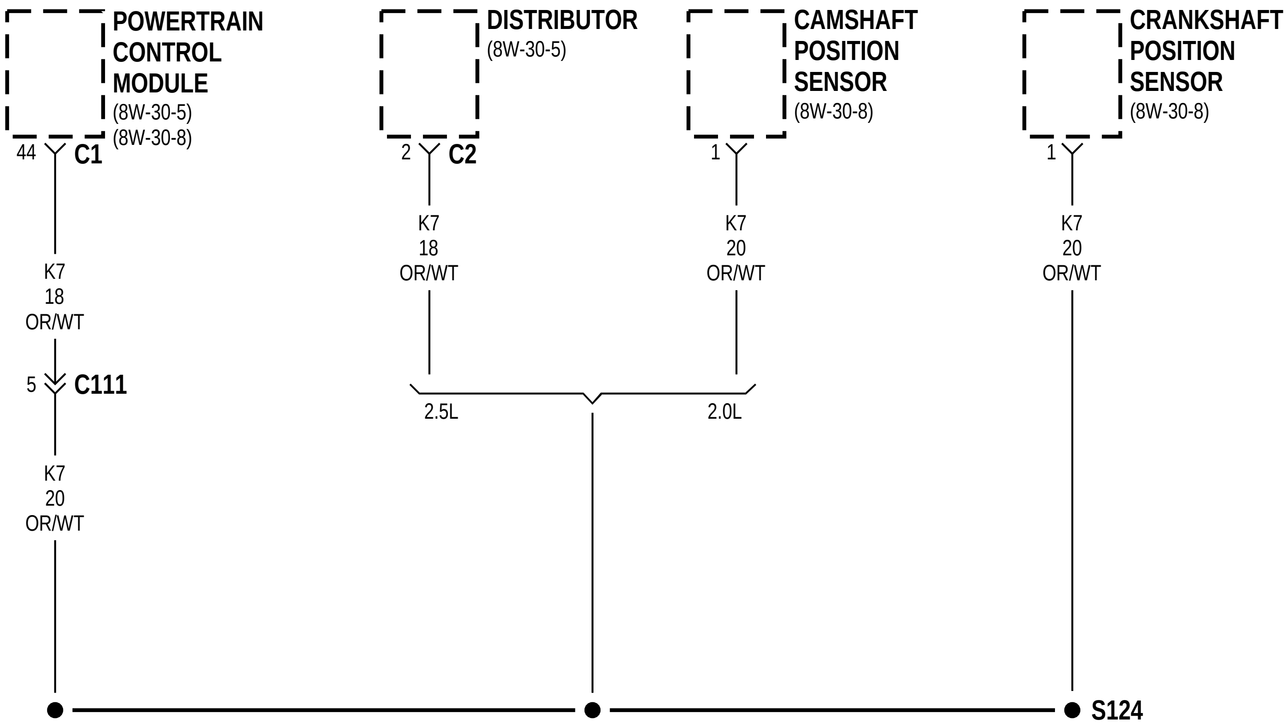

TRANSMISSION
CONTROL
MODULE
(8W-31-4)
51
DOWNSTREAM
HEATED
OXYGEN
SENSOR
(8W-30-10)
3
K4
20
BK/LB
K4
20
BK/LB
FROM
S117
(8W-70-4)
A
K4
18
BK/LB
10
C111
K4
18
BK/LB
S110
(IN PDC)
K4
18
BK/LB
K4
20
BK/LB
1
BATTERY
TEMPERATURE
SENSOR
(8W-30-14)
43
C1
POWERTRAIN
CONTROL
MODULE
(8W-30-10)
(8W-30-14)

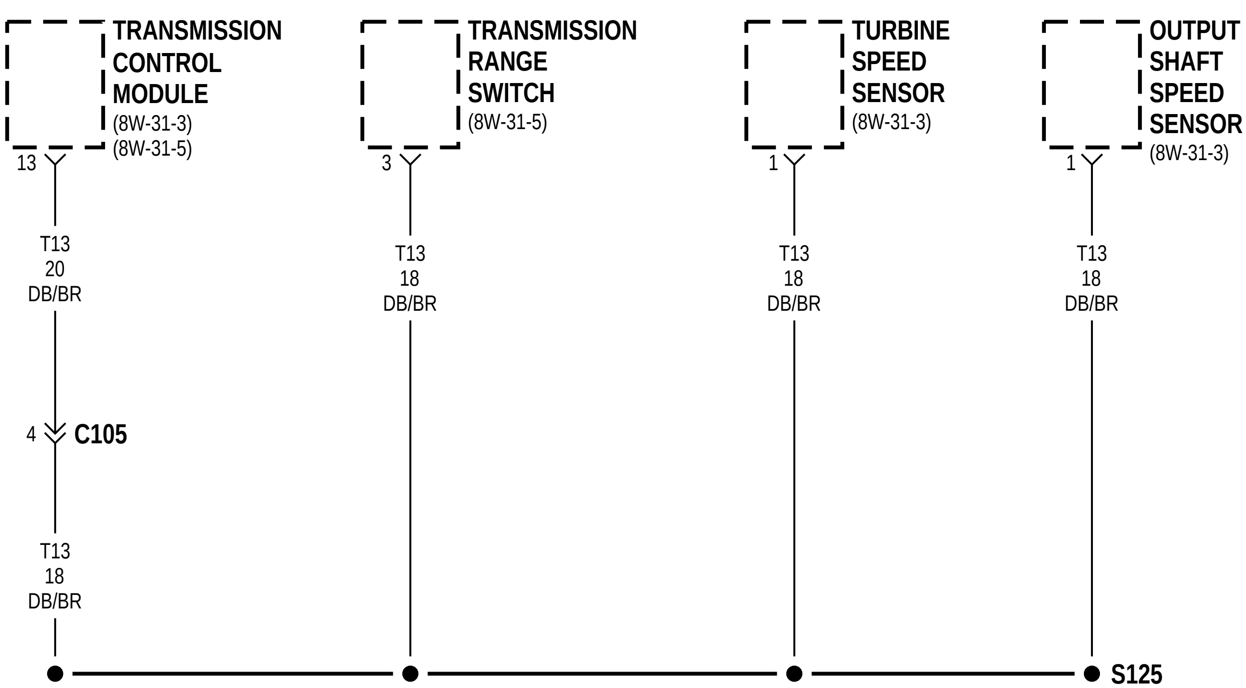

FROM
S118
(8W-70-5)
B
A142
18
DG/OR
FUEL INJECTOR NO. 1
(8W-30-6)
FUEL INJECTOR NO. 2
(8W-30-6)
FUEL INJECTOR NO. 3
(8W-30-6)
FUEL INJECTOR NO. 4
(8W-30-6)
2
S114
(2.4L)
FROM
S118
(8W-70-5)
C
FUEL INJECTOR NO. 2
(8W-30-7)
FUEL INJECTOR NO. 4
(8W-30-7)
S114
(2.5L)
1
C165
D
TO
S123
(8W-70-5)
GENERATOR
(8W-20-2)
UPSTREAM HEATED OXYGEN SENSOR
(8W-30-10)
FUEL INJECTOR NO. 6
(8W-30-7)
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-11)
A/C PRESSURE TRANSDUCER
(8W-42-3)
THROTTLE POSITION SENSOR
(8W-30-9)
POWERTRAIN CONTROL MODULE
(8W-30-9)
(8W-30-11)
(8W-30-14)
61
C1
K6
20
VT/WT
9
C111
K6
18
VT/WT
S115

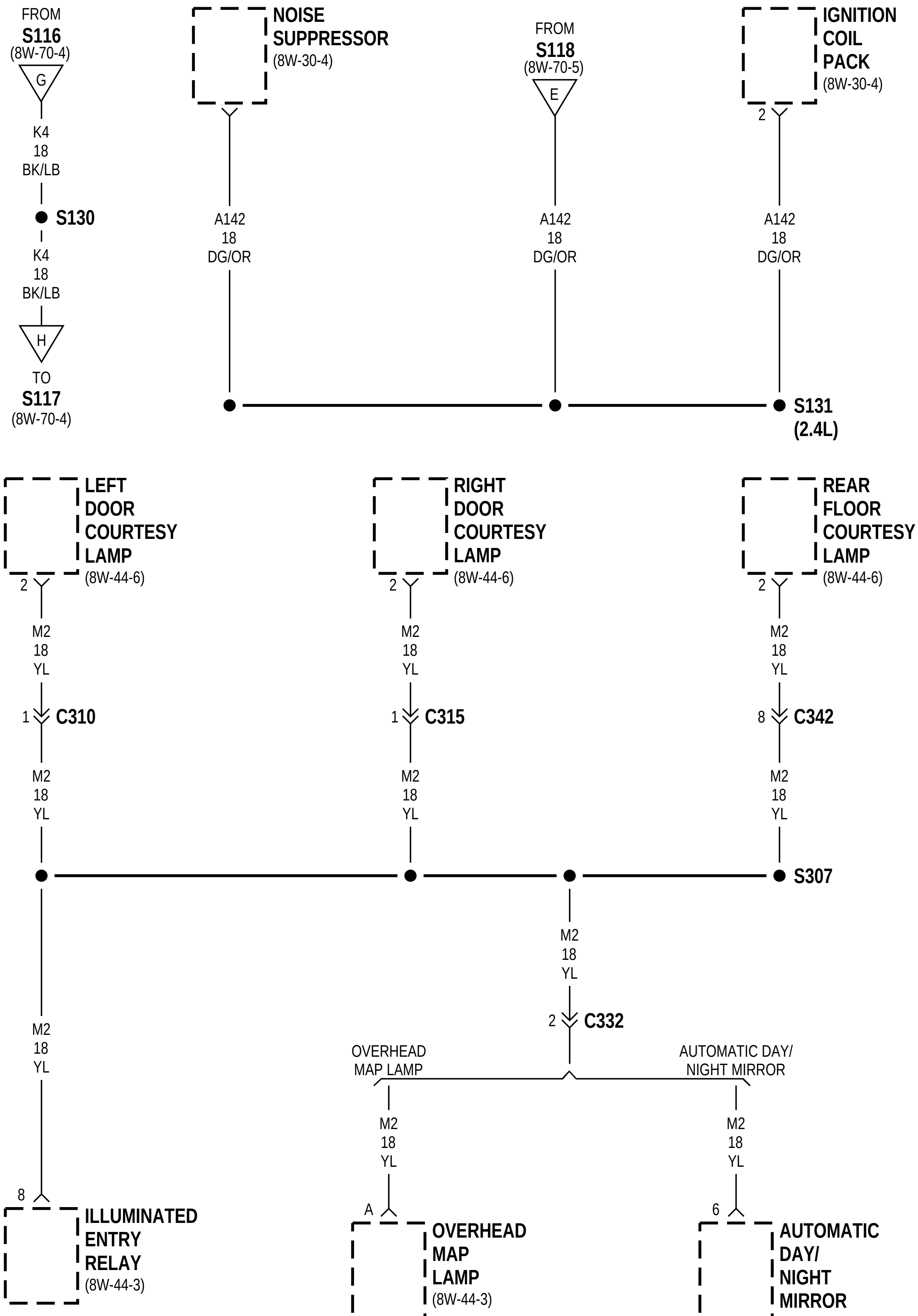
JXI00265


INTAKE AIR TEMPERATURE SENSOR
(8W-30-11)
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-11)
A/C PRESSURE TRANSDUCER
(8W-42-3)
UPSTREAM HEATED OXYGEN SENSOR
(8W-30-10)
A
3
2.5L
2.0L
K4
18
BK/LB
K4
20
BK/LB
S116
G
TO
S130
(8W-70-7)
CRANKSHAFT POSITION SENSOR
(8W-30-8)
THROTTLE POSITION SENSOR
(8W-30-9)
FROM
S130
(8W-70-7)
H
2
1
S117
C2
DISTRIBUTOR (2.5L)
(8W-30-5)
ENGINE COOLANT TEMPERATURE SENSOR
(8W-30-12)
CAMSHAFT POSITION SENSOR (2.4L)
(8W-30-8)
TO
S110
(8W-70-2)


AUTOMATIC SHUT DOWN RELAY (IN PDC) (8W-30-4)
89
POWERTRAIN CONTROL MODULE (8W-30-4) (8W-30-11)
6 C2
GENERATOR (2.5L) (8W-20-2)
1
ELECTRONIC EGR TRANSDUCER SOLENOID (8W-30-11)
2
2.4L
2.5L
A142 18 DG/OR
A142 18 DB/OR
6 C111
TO FUSE 1 (PDC) (8W-10-4)
S118
B
TO S114 (8W-70-3)
C
TO S114 (8W-70-3)
2
UPSTREAM HEATED OXYGEN SENSOR (8W-30-10)
E
TO S131 (8W-70-7)
1 C1
DISTRIBUTOR (8W-30-5)
FROM S114 (8W-70-3)
D
FUEL INJECTOR NO. 1 (8W-30-7)
FUEL INJECTOR NO. 3 (8W-30-7)
FUEL INJECTOR NO. 5 (8W-30-7)
2
S123 (2.5L)


POWERTRAIN CONTROL MODULE
(8W-30-5)
(8W-30-8)
44
C1
K7
18
OR/WT
5
C111
K7
20
OR/WT
DISTRIBUTOR
(8W-30-5)
2
C2
K7
18
OR/WT
CAMSHAFT POSITION SENSOR
(8W-30-8)
1
K7
20
OR/WT
2.5L
2.0L
CRANKSHAFT POSITION SENSOR
(8W-30-8)
1
K7
20
OR/WT
S124


TRANSMISSION CONTROL MODULE
(8W-31-3)
(8W-31-5)
13
T13
20
DB/BR
4
C105
T13
18
DB/BR
TRANSMISSION RANGE SWITCH
(8W-31-5)
3
T13
18
DB/BR
TURBINE SPEED SENSOR
(8W-31-3)
1
T13
18
DB/BR
OUTPUT SHAFT SPEED SENSOR
(8W-31-3)
1
T13
18
DB/BR
S125


FROM
S116
(8W-70-4)
G
K4
18
BK/LB
S130
K4
18
BK/LB
H
TO
S117
(8W-70-4)
NOISE
SUPPRESSOR
(8W-30-4)
A142
18
DG/OR
FROM
S118
(8W-70-5)
E
A142
18
DG/OR
IGNITION
COIL
PACK
(8W-30-4)
2
A142
18
DG/OR
S131
(2.4L)
LEFT
DOOR
COURTESY
LAMP
(8W-44-6)
2
M2
18
YL
1
C310
M2
18
YL
RIGHT
DOOR
COURTESY
LAMP
(8W-44-6)
2
M2
18
YL
1
C315
M2
18
YL
REAR
FLOOR
COURTESY
LAMP
(8W-44-6)
2
M2
18
YL
8
C342
M2
18
YL
S307
M2
18
YL
2
C332
OVERHEAD
MAP LAMP
AUTOMATIC DAY/
NIGHT MIRROR
M2
18
YL
M2
18
YL
M2
18
YL
8
ILLUMINATED
ENTRY
RELAY
(8W-44-3)
A
OVERHEAD
MAP
LAMP
(8W-44-3)
6
AUTOMATIC
DAY/
NIGHT
MIRROR
(8W-44-5)

8W-70 SPLICE INFORMATION

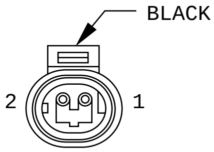
DESCRIPTION AND OPERATION

INTRODUCTION

This section identifies all splices shown in the diagrams. It also shows the splices in there entirity. All circuits that are part of the splices are shown and the systems they affect are referanced. For viewing the splices location in the vehicle, refer to section 8W-95.

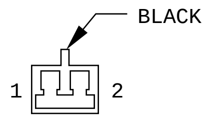
8W-80 CONNECTOR PIN-OUTS

INDEX



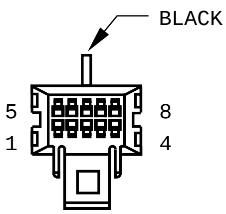
A/C COMPRESSOR CLUTCH

CAV	CIRCUIT	FUNCTION
1	C3 14DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
2	-	-



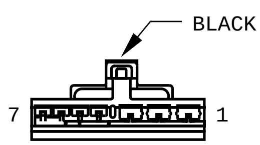
A/C EVAPORATOR TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	C12 20LG/BK	EVAPORATOR TEMPERATURE SENSOR SIGNAL
2	C57 22GY	SENSOR GROUND



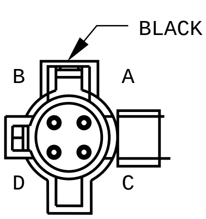
A/C-HEATER CONTROL - C1

CAV	CIRCUIT	FUNCTION
1	-	-
2	C21 22DB/OR	A/C SWITCH SENSE
3	C16 22LB/YL	REAR DEFOGGER LAMP DRIVER
4	-	-
5	C58 22RD	HVAC MODE SENSE
6	-	-
7	-	-
8	Z2 22BK/PK	GROUND



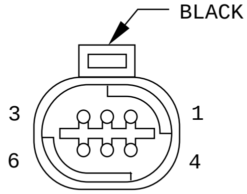
A/C-HEATER CONTROL - C2

CAV	CIRCUIT	FUNCTION
1	Z1 12BK	GROUND
2	C7 12BK/TN	HI BLOWER MOTOR DRIVER
3	C6 18LB	M2 BLOWER MOTOR DRIVER
4	C5 18LG	M1 BLOWER MOTOR DRIVER
5	C4 18TN	LO BLOWER MOTOR DRIVER
6	E2 18OR	PANEL LAMPS DRIVER
	E2 18OR	PANEL LAMPS DRIVER
7	-	-



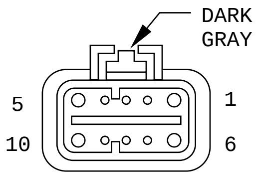
A/C PRESSURE TRANSDUCER

CAV	CIRCUIT	FUNCTION
A	K4 20BK/LB	SENSOR GROUND
B	K6 20VT/WT	5 VOLT SUPPLY
C	C18 20DB/YL	A/C PRESSURE SIGNAL
D	-	-



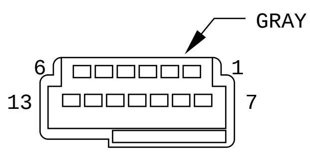
ABS HYDRAULIC MODULATOR

CAV	CIRCUIT	FUNCTION
1	B142 20BR/YL	LEFT FRONT DECAY SOLENOID CONTROL
2	B143 20DG/YL	RIGHT FRONT DECAY SOLENOID CONTROL
3	B146 20BR/LB	LEFT REAR DECAY SOLENOID CONTROL
4	B148 20DG/LB	RIGHT REAR DECAY SOLENOID CONTROL
5	Z1 18BK	GROUND
6	Z1 18BK	GROUND



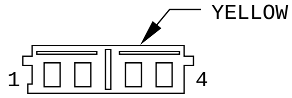
ABS RELAY BOX

CAV	CIRCUIT	FUNCTION
1	A20 16RD/DB	FUSED B(+)
2	-	-
3	B116 20GY/LB	ABS PUMP MOTOR RELAY CONTROL
4	B57 20BR/BK	ABS SYSTEM RELAY CONTROL
5	A10 12RD/DG	FUSED B(+)
6	B120 16BR/RD	ABS PUMP MOTOR SENSE
7	G19 20LG/OR	ABS WARNING LAMP DRIVER
8	-	-
9	B47 16RD/LB	ABS SYSTEM RELAY OUTPUT
10	Z1 14BK	GROUND



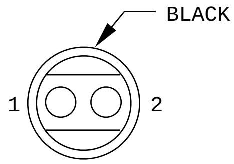
AIRBAG CONTROL MODULE - C1

CAV	CIRCUIT	FUNCTION
1	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN/START)
2	F23 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
3	D1 18VT/BR	CCD BUS (+)
4	D2 18WT\DB	CCD BUS (-)
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	Z6 18BK/PK	GROUND
12	-	-
13	-	-



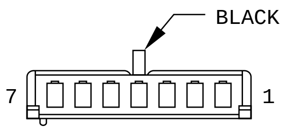
AIRBAG CONTROL MODULE - C2

CAV	CIRCUIT	FUNCTION
1	R44 18DG/YL	PASSENGER AIRBAG LINE 2
2	R42 18BK/YL	PASSENGER AIRBAG LINE 1
3	R45 18DG/LB	DRIVER AIRBAG LINE 2
4	R43 18BK/LB	DRIVER AIRBAG LINE 1



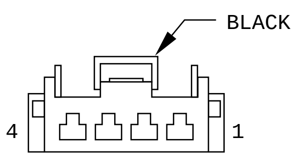
ASH RECEIVER LAMP

CAV	CIRCUIT	FUNCTION
1	E2 18OR	PANEL LAMPS DRIVER
2	Z1 18BK	GROUND



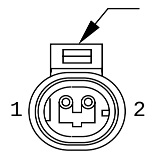
AUTOMATIC DAY/NIGHT MIRROR

CAV	CIRCUIT	FUNCTION
1	F20 20WT	AUTOMATIC DAY/NIGHT MIRROR BATTERY FEED
2	Z1 18BK	MAP LAMP GROUND
3	L1 18VT/BK	BACKUP LAMP SENSE
4	-	-
5	-	-
6	M2 18YL	COURTESY LAMP FEED
7	M1 18BK/PK	LAMP FEED

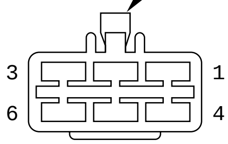


AUTOSTICK SWITCH

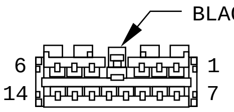
CAV	CIRCUIT	FUNCTION
1	T44 20YL/LB	AUTOSTICK DOWNSHIFT SWITCH SENSE
2	T5 20LG/LB	AUTOSTICK UPSHIFT SWITCH SENSE
3	Z13 20BK/RD	GROUND
4	F11 20RD/VT	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)



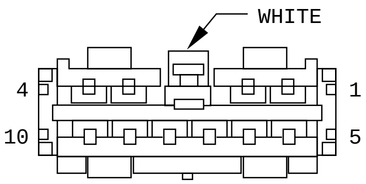
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



CAV	CIRCUIT	FUNCTION
1	C7 12BK/TN	HI BLOWER MOTOR DRIVER
2	C6 18LB	M2 BLOWER MOTOR DRIVER
3	-	-
4	C1 12DG	FUSED IGNITION SWITCH OUTPUT (RUN)
5	C4 18TN	LO BLOWER MOTOR DRIVER
6	C5 18LG	M1 BLOWER MOTOR DRIVER

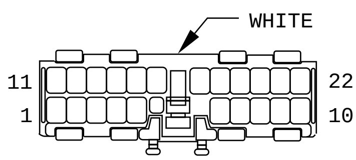


CAV	CIRCUIT	FUNCTION
1	-	-
2	V55 20WT/GY	WIPER PARK SWITCH SENSE
3	Q33 18BR/LB	DECKLID RELEASE RELAY CONTROL
4	Z2 20BK/LG	GROUND
5	D1 20VT/BR	CCD BUS (+)
6	D1 20VT/DG	CCD BUS (+)
7	V14 20PK/VT	WIPER ON/OFF RELAY CONTROL
8	V16 20VT/PK	WIPER HI/LO RELAY CONTROL
9	-	-
10	V10 18BR/DB	WASHER PUMP CONTROL
11	-	-
12	Z2 20BK/LG	GROUND
13	D2 20WT/BK	CCD BUS (-)
14	D2 20WT/DG	CCD BUS (-)



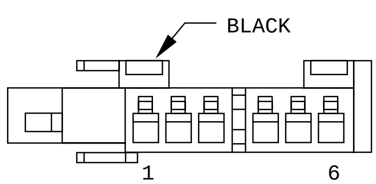
BODY CONTROL MODULE - C2

CAV	CIRCUIT	FUNCTION
1	-	-
2	C35 22DG/YL	MODE DOOR DRIVER
3	E2 18OR/YL	PANEL LAMPS DRIVER
4	E2 18OR/BR	PANEL LAMPS DRIVER
5	C26 20PK/DB	5 VOLT SUPPLY
6	C34 22DB/YL	COMMON DOOR DRIVER
7	M50 20YL/RD	KEY-IN LAMP DRIVER
8	Z2 20BK/LG	GROUND
9	E2 18OR	PANEL LAMPS DRIVER
10	E2 18OR/BK	PANEL LAMPS DRIVER



BODY CONTROL MODULE - C3

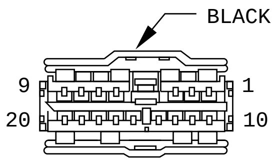
CAV	CIRCUIT	FUNCTION
1	D1 20VT/BR	CCD BUS (+)
2	D1 18VT/BR	CCD BUS (+)
3	-	-
4	Z2 20BK/VT	GROUND
5	C58 22RD	HVAC MODE SENSE
6	C37 20YL	MODE DOOR FEEDBACK SIGNAL
7	C12 20LG/BK	EVAPORATOR TEMPERATURE SENSOR SIGNAL
8	-	-
9	P102 20TN	POWER DOOR LOCK ENABLE
10	V52 22DG/RD	WINDSHIELD WIPER SWITCH SIGNAL
11	D2 20WT/DB	CCD BUS (-)
12	D2 18WT/DB	CCD BUS (-)
13	-	-
14	Z2 18BK/LG	GROUND
15	V10 18 BR/DB	WASHER PUMP CONTROL
16	C21 22DB/OR	A/C SWITCH SENSE
17	G26 22LB	KEY-IN IGNITION SWITCH SENSE
18	E19 20RD	DIMMER SWITCH SIGNAL
19	Z2 22BK/PK	GROUND
20	C57 22GY/TN	SENSOR GROUND
21	C57 22GY	SENSOR GROUND
22	Z2 18BR/TN	GROUND



BODY CONTROL MODULE - C4

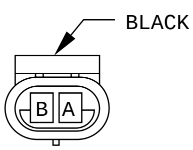
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P158 20RD	RIGHT RKE ANTENNA
4	P58 20BK	LEFT RKE ANTENNA
5	-	
6	-	-

* WITH VTSS



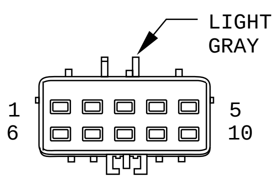
BODY CONTROL MODULE - C5

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	RIGHT FRONT DOOR UNLOCK DRIVER
2	-	-
3	-	-
4	P34 16DB/WT*	LEFT FRONT DOOR UNLOCK DRIVER
4	P55 16DB/WT**	LEFT FRONT DOOR UNLOCK DRIVER
5	G10 20LG/RD	SEAT BELT SWITCH SENSE
6	G74 18TN/RD	LEFT REAR DOOR AJAR SWITCH SENSE
7	G75 18TN	LEFT FRONT DOOR AJAR SWITCH SENSE
8	P97 20WT/DG	LEFT FRONT DOOR SWITCH MUX
9	G71 20VT/YL**	TRUNK KEY CYLINDER SWITCH SENSE
10	P33 16OR/BK	LEFT FRONT DOOR LOCK DRIVER
11	P33 16OR/WT	RIGHT FRONT DOOR LOCK DRIVER
12	-	-
13	-	-
14	G38 18GY	GARAGE DOOR OPENER LOCKOUT
15	G4 18DB	FUEL LEVEL SENSOR SIGNAL
16	-	-
17	G74 20TN/PK	RIGHT FRONT DOOR AJAR SWITCH SENSE
18	P96 20WT/LG	RIGHT FRONT DOOR SWITCH MUX
19	G73 18LG/OR**	LEFT VTSS ARM/DISARM SENSE
20	G72 18DG/OR**	RIGHT VTSS ARM/DISARM SENSE



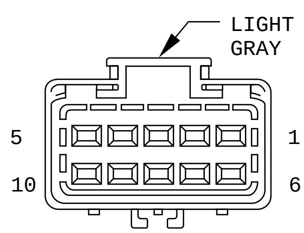
BRAKE WARNING PRESSURE SWITCH

CAV	CIRCUIT	FUNCTION
A	G9 20GY/DB	RED BRAKE WARNING LAMP DRIVER
B	Z1 20BK	GROUND



C104

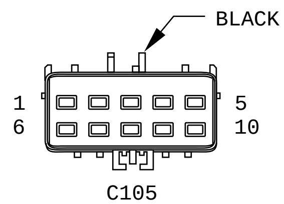
CAV	CIRCUIT
1	T9 18OR/BK
2	T54 18VT/WT
3	T41 18BK/WT
4	-
5	T16 16RD/BR
6	T19 18WT/PK
7	T41 18BK/LB
8	T50 18DG/TN
9	T59 18PK/DB
10	T60 18BR/TN



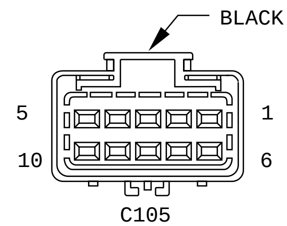
C104

CAV	CIRCUIT
1	T9 20OR/BK
2	T54 18VT/WT
3	T41 20BK/WT
4	-
5	T16 16RD/BR
6	T19 20WT/PK
7	T41 20BK/LB
8	T50 18DG/TN
9	T59 18PK/DB
10	T60 18BR/TN

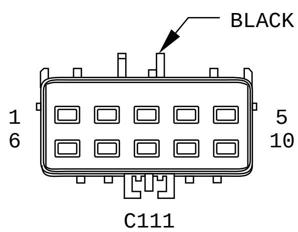
* WITHOUT VTSS
** WITH VTSS



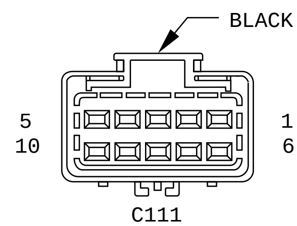
CAV	CIRCUIT
1	F20 18WT/YL
2	T1 18LG/GY
3	T3 18VT
4	T13 20DB/BR
5	T14 18LG/VT
6	T20 18LB/WT
7	T42 18VT/TN
8	T47 18YL/GY
9	T52 18OR/YL
10	L1 18VT/BK



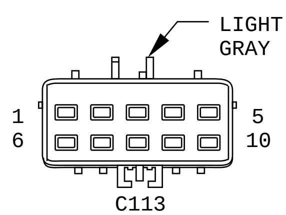
CAV	CIRCUIT
1	F20 18WT/YL
2	T1 20LG/GY
3	T3 18VT
4	T13 20DB/BR
5	T14 20LG/VT
6	T20 20LB/WT
7	T42 18VT/TN
8	T47 20YL/GY
9	T52 20RD/YL
10	L1 18VT/BK



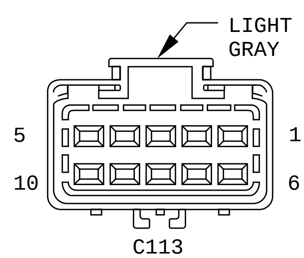
CAV	CIRCUIT
1	Z1 16BK ●
1	Z1 18BK ●●
2	K39 20GY/RD
3	K40 18BR/GY
4	K59 20VT/GY
5	K7 18OR/WT ●
5	K7 20OR/WT ●●
6	A142 18DG/OR
7	K60 20YL/BK
8	G6 18GY/VT
9	K6 20VT/WT
10	K4 18BK/LB



CAV	CIRCUIT
1	Z1 16BK*
1	Z1 18BK**
2	K39 20GY/RD
3	K40 20BR/GY
4	K59 20VT/GY
5	K7 18OR/WT
6	A142 18DG/OR
7	K60 20YL/BK
8	G6 20GY
9	K6 20VT/WT
10	K4 18BK/LB



CAV	CIRCUIT
1	C3 14DB/BK
2	-
3	-
4	K24 18GY/BK
5	T40 14BR
6	F12 18DB/WT
7	C18 20DB/YL
8	V32 20YL/PK
9	K22 18OR/LB ●
9	K22 20OR/LB ●●
10	Z12 18BK/TN



CAV	CIRCUIT
1	C3 14DB/BK
2	-
3	-
4	K24 18GY/BK
5	T40 14BR
6	F12 18DB/WT
7	C18 20DB/YL
8	V32 20YL/PK
9	K22 20OR/LB
10	Z12 18BK/TN

● 2.0L ENG
●● 2.5L ENG

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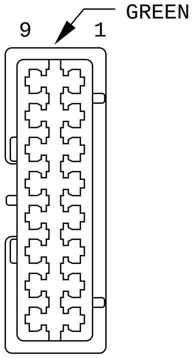
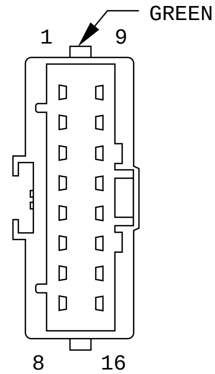


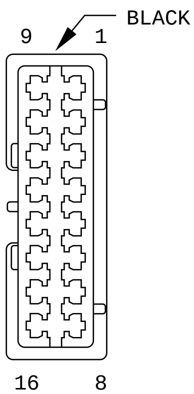
C121

CAV	CIRCUIT
1	B1 20YL/DB
2	B2 20YL
3	B3 20LG/DB
4	B4 20LG
5	A141 14DG/WT
6	L1 18VT/BK
7	-
8	A45 18BR
9	A25 12DB
10	Q33 18BR/LB
11	-
12	-
13	-
14	-
15	-
16	Z1 18BK
	Z2 20BK/LG



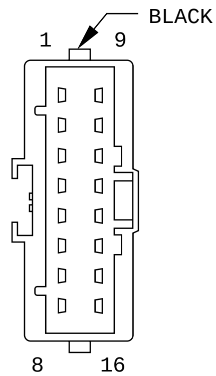
C121

CAV	CIRCUIT
1	B1 20YL/DB
2	B2 20YL
3	B3 20LG/DB
4	B4 20LG
5	A141 14DG/WT
6	L1 18VT/BK
	L1 18VT/BK
7	-
8	A45 18BR
9	A25 12DB
10	Q33 18BR/LB
11	-
12	-
13	-
14	-
15	-
16	Z1 18BK



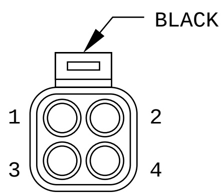
C126

CAV	CIRCUIT
1	A2 12PK/BK
2	G6 20GY
3	V37 20RD/LG
4	D20 20LG
5	T5 20LG/LB
6	D21 20PK/LG
7	F18 18LG/BK
8	A41 16YL
	A41 16YL/OR*
9	A15 16PK
10	G29 20BK/TN
11	D6 20PK/LB
12	L13 18BR/VT
	L13 18BR/VT
13	T44 20YL/LB
14	
15	G19 20LG/OR
	G19 20LG/OR
16	A1 16RD



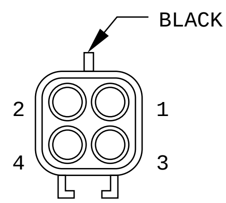
C126

CAV	CIRCUIT
1	A2 12PK/BK
2	G6 20GY
3	V37 20RD/LG
4	D20 20LG
5	T5 20LG/LB●
6	D21 20PK/LG
7	F18 18LG/BK
	F18 20LG/BK
8	A41 16YL
9	A15 18PK
	A15 18PK
10	G29 20BK/TN
11	D6 20PK/LB
12	L13 18BR/VT
13	T44 20YL/LB●
14	-
15	G19 20LG/OR
16	A1 16RD



C165 (2.5L ENGINE ONLY)

CAV	CIRCUIT
1	A142 18DG/OR
2	K11 18WT/LB
3	K13 18YL/WT
4	K38 18GY



C165 (2.5L ENGINE ONLY)

CAV	CIRCUIT
1	A142 18DG/OR
2	K11 18WT/LB
3	K13 18YL/WT
4	K38 18GY

● AUTOSTICK
* MTX

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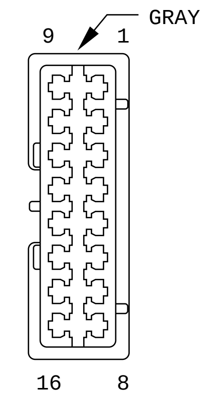
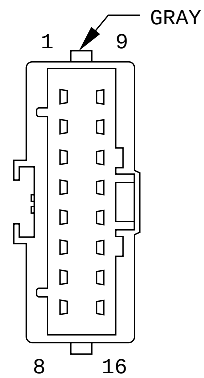


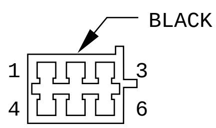
C224

CAV	CIRCUIT
1	X52 18DB/WT
2	X80 18LB/DG
3	X82 18LB/VT
4	X58 18DB/OR
5	X51 18BR/YL
6	X85 18LG/DG
7	X87 18LG/VT
8	X57 18BR/LB
9	X60 20DG/RD**
9	X60 20DG/RD
10	G78 20TN/BK
11	P5 20YL/BK**
12	P6 20RD/WT**
13	F13 18DB
14	L36 18LG
15	G9 18GY
16	E2 18OR\BK



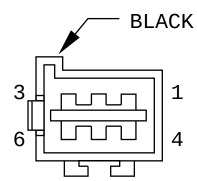
C224

CAV	CIRCUIT
1	X52 18DB/WT
2	X56 20DB/RD*
	X56 18DB/RD*
2	X80 18LB/DG**
3	X54 20VT*
	X54 18VT*
3	X82 18LB/VT**
4	X58 18DB/OR
5	X51 18BR/YL
6	X55 20BR/RD*
	X55 18BR/RD*
6	X85 18LG/DG**
7	X53 20DG*
	X53 18DG*
7	X87 18LG/VT**
8	X57 18BR/LB
9	X60 20DG/RD**
	X60 20DG/RD**
9	X60 20DG/RD
10	G78 20TN/BK
11	P5 20YL/BK**
12	P6 20RD/WT**
13	F13 18DB
14	L36 18LG**
	L36 18LG**
15	G9 18GY
16	E2 18OR/BK



C300

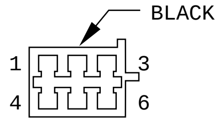
CAV	CIRCUIT
1	L1 18VT/BK
2	L50 18WT/TN
3	L61 18LG/TN
4	L7 18BK/YL
5	Z1 18BK
6	L36 18LG



C300

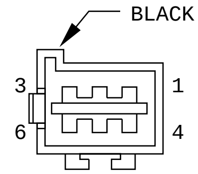
CAV	CIRCUIT
1	L1 18VT/BK
	L1 18VT/BK
2	L50 18WT/TN
3	L61 18LG/TN
4	L7 18BK/YL
	L7 18BK/YL
5	Z1 18BK
	Z1 18BK
6	L36 18LG
	L36 18LG

* STANDARD RADIO
** PREMIUM RADIO



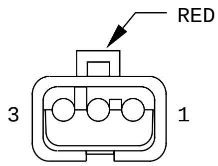
C301

CAV	CIRCUIT
1	L1 18VT/BK
2	L50 18WT/TN
3	L60 18TN
4	L7 18BK/YL
5	Z1 18BK
6	L36 18LG



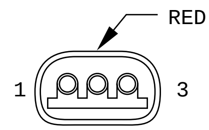
C301

CAV	CIRCUIT
1	L1 18VT/BK
2	L50 18WT/TN
3	L60 18TN
4	L7 18BK/YL
5	Z1 18BK
6	L36 18LG



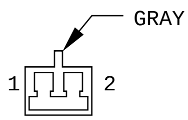
C305

CAV	CIRCUIT
1	L50 18BK/TN
2	-
3	Z1 18BK



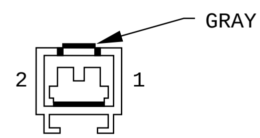
C305

CAV	CIRCUIT
1	L50 18WT/TN
2	-
3	Z1 18BK



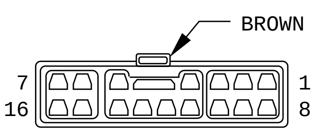
C309 (WITH POWER SEAT)

CAV	CIRCUIT
1	F35 16RD
2	Z1 16BK



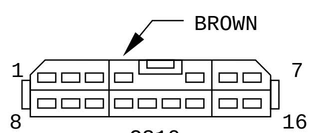
C309 (WITH POWER SEAT)

CAV	CIRCUIT
1	F35 16RD
2	Z1 16BK



C310

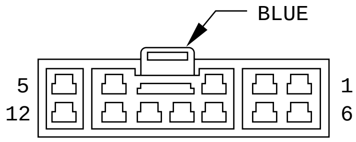
CAV	CIRCUIT
1	M2 18YL
2	M1 18PK
3	C16 20LB/OR
4	P90 20LG/BK
5	P91 20WT/BK
6	P92 20YL
7	P94 20WT/YL
8	F20 20WT
9	P33 16OR/BK
10	P55 16DB/WT
11	P97 20WT/DG
12	G73 18LG/OR●
13	-
14	-
15	-
16	-



C310

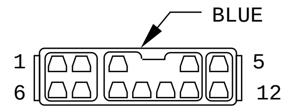
CAV	CIRCUIT
1	M2 18YL
2	M1 18PK
3	C16 LB/OR
4	P90 20LG/BK
5	P91 20WT/BK
6	P92 20YL
7	P94 20WT/YL
8	F20 20WT
9	P33 16OR/BK
10	P55 16DB/WT
11	P97 20WT/DG
12	G73 18LG/OR●
13	-
14	-
15	-
16	-

● WITH VTSS



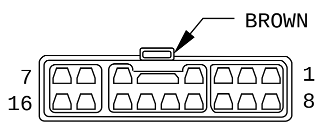
C311

CAV	CIRCUIT
1	X85 18LG/DG
2	X87 18LG/VT
3	Q17 14DB/WT
4	Q18 14GY/BK
5	Q27 14RD/BK
6	Q28 14DG/WT
7	Q16 14BR/WT
8	Q26 14VT/WT
9	Z1 14BK
10	F21 14TN/VT
11	P5 20YL/BK
12	P6 20RD/WT



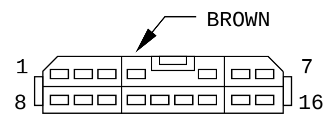
C311

CAV	CIRCUIT
1	X85 18LG/DG
2	X87 18LG/VT
3	Q17 14DB/WT
4	Q18 14GY/BK
5	Q27 14RD/BK
6	Q28 14DG/WT
7	Q16 14BR/WT
8	Q26 14VT/WT
9	Z1 14BK
10	F21 14TN/VT
11	P5 20YL/BK
12	P6 20RD/WT



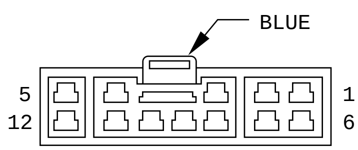
C315

CAV	CIRCUIT
1	M2 18YL
2	M1 18PK
3	C16 20LB/YL
4	P90 20LG/BK
5	P91 20 WT/BK
6	P92 20YL
7	P94 20WT/YL
8	F20 20WT
9	P33 16OR/WT
10	P34 16PK/BK
11	P96 20WT/LG
12	G72 18DG/OR*
13	-
14	-
15	-
16	-



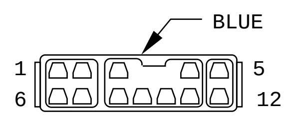
C315

CAV	CIRCUIT
1	M2 18YL
2	M1 18PK
3	C16 20LB/YL
4	P90 20LG/BK
5	P91 20 WT/BK
6	P92 20YL
7	P94 20WT/YL
8	F20 20WT
9	P33 16OR/WT
10	P34 16PK/BK
11	P96 20WT/LG
12	G72 18DG/OR*
13	-
14	-
15	-
16	-



C316

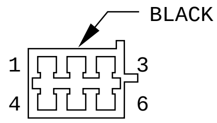
CAV	CIRCUIT
1	X80 18LB/DG
2	X82 18LB/VT
3	Q16 14BR/WT
4	Q26 14VT/WT
5	-
6	-
7	-
8	-
9	Z1 14BK
10	F21 14TN/WT
11	-
12	-



C316

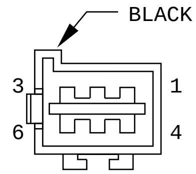
CAV	CIRCUIT
1	X80 18LB/DG
2	X82 18LB/VT
3	Q16 14BR/WT
4	Q26 14VT/WT
5	-
6	-
7	-
8	-
9	Z1 14BK
10	F21 14TN
11	-
12	-

* WITH VTSS



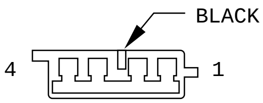
C332

CAV	CIRCUIT
1	M1 18PK
2	M2 18YL
3	Z1 18BK
4	F20 20WT
5	G38 18GY
5	G38 18GY
6	L1 18VT/BK



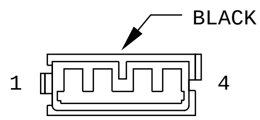
C332

CAV	CIRCUIT
1	M1 18PK
2	M2 18YL
3	Z1 18BK
4	F20 20WT●
5	G38 18GY
5	G38 18GY●●
6	L1 18VT/BK●



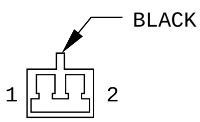
C340

CAV	CIRCUIT
1	G10 20LG/RD
2	Z1 20BK/LG
3	Z1 18BK
4	R7 18OR/BK



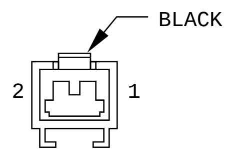
C340

CAV	CIRCUIT
1	G10 20LG/RD
2	Z1 20BK/LG
3	Z1 18BK
4	R7 18OR/BK



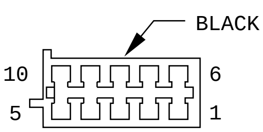
C341

CAV	CIRCUIT
1	Z1 18BK
2	R8 18OR/RD



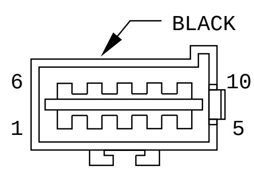
C341

CAV	CIRCUIT
1	Z1 18BK
2	R8 18OR/RD



C342

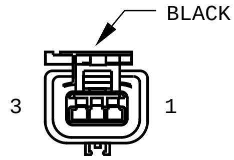
CAV	CIRCUIT
1	Q33 18BR/LB**
2	F20 20WT
3	P5 20YL/BK
4	P6 20RD/WT
5	G38 18GY
5	G38 18GY
6	Z1 20BK
6	Z1 20BK
7	M1 18PK
8	M2 18YL
9	-
10	-



C342

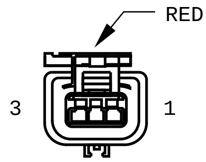
CAV	CIRCUIT
1	Q33 18BR/LB
2	F20 20WT
3	P5 20YL/BK
4	P6 20RD/WT
5	G38 18GY
6	Z1 18BK
6	Z1 18BK
7	M1 18PK
8	M2 18YL
9	E2 18OR/BK
9	E2 18OR/BK
10	-

● AUTOMATIC DAY/NIGHT MIRROR
●● REMOTE DECKLID RELEASE



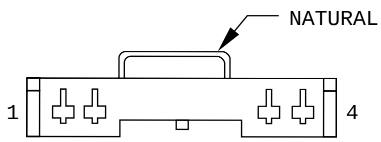
CAMSHAFT POSITION SENSOR (2.0L ENGINE ONLY)

CAV	CIRCUIT	FUNCTION
1	K7 20OR/WT	5 VOLT SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	K44 20TN/YL	CAMSHAFT POSITION SENSOR SIGNAL



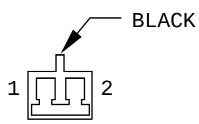
CENTER HIGH MOUNTED STOP LAMP (CHMSL)

CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	-	-
3	Z1 18BK	GROUND



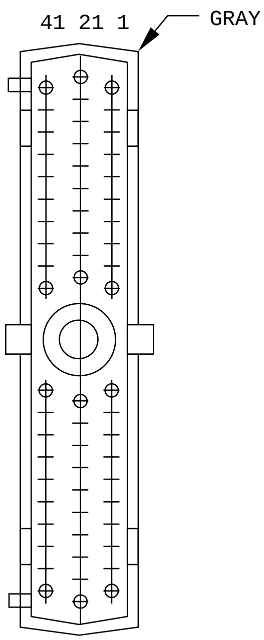
CLOCKSPRING

CAV	CIRCUIT	FUNCTION
1	X3 18BK/RD	HORN RELAY CONTROL
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
3	Z2 18BR/TN	GROUND
4	-	-



CLUTCH INTERLOCK SWITCH

CAV	CIRCUIT	FUNCTION
1	A41 16YL/OR	IGNITION SWITCH OUTPUT (START)
2	T141 16YL/RD	IGNITION SWITCH OUTPUT (START)



CONTROLLER
ANTILOCK
BRAKE

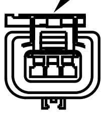
CAV	CIRCUIT	FUNCTION
1	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)
2	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR (+)
3	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
4	B4 20LG	LEFT REAR WHEEL SPEED SENSOR (+)
5	Z1 18BK	GROUND
6	B6 20WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
7	B7 20WT	RIGHT FRONT WHEEL SPEED SENSOR (+)
8	B8 20OR/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
9	B9 20OR	LEFT FRONT WHEEL SPEED SENSOR (+)
10	-	-
11	-	-
12	-	-
13	L50 18WT/BR	STOP LAMP SWITCH OUTPUT
14	G9 20GY/DG	RED BRAKE WARNING LAMP DRIVER
15	G19 20LG/OR	ABS WARNING LAMP DRIVER
16	B116 20GY/LB	ABS PUMP/MOTOR RELAY CONTROL
17	-	-
18	-	-
19	-	-
20	B120 16BR/RD	ABS PUMP MOTOR SENSE
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	-	-
37	-	-
38	-	-
39	-	-
40	-	-
41	-	-
42	B142 20BR/YL	LEFT FRONT DECAY SOLENOID CONTROL
43	B143 20DG/YL	RIGHT FRONT DECAY SOLENOID CONTROL
44	-	-
45	-	-

(CONTINUED ON NEXT PAGE)

(CONTINUED FROM PREVIOUS PAGE)

CAV	CIRCUIT	FUNCTION
46	B146 20BR/LB	LEFT REAR DECAY SOLENOID CONTROL
47	B47 16RD/LB	ABS SYSTEM RELAY OUTPUT
48	B148 20DG/LB	RIGHT REAR DECAY SOLENOID CONTROL
49	-	-
50	-	-
51	D21 20PK/LG	SCI TRANSMIT -
52	-	-
53	-	-
54	-	-
55	-	-
56	-	-
57	B57 20BR/BK	ABS SYSTEM RELAY CONTROL
58	-	-
59	-	-
60	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)

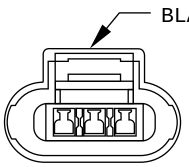
BLACK

3  1

CRANKSHAFT POSITION
SENSOR
(2.0L ENGINE ONLY)

CAV	CIRCUIT	FUNCTION
1	K7 20OR/WT	5 VOLT SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL

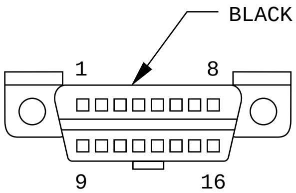
BLACK



3 1

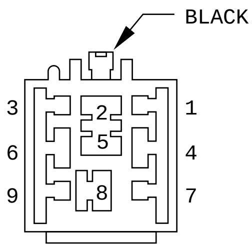
CRANKSHAFT POSITION
SENSOR
(2.5L ENG)

CAV	CIRCUIT	FUNCTION
1	K7 20OR/WT	5 VOLT SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL



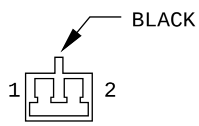
DATA LINK CONNECTOR

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	D1 20VT/BR	CCD BUS (+)
4	Z2 20BK/VT	GROUND
5	Z11 18BK	GROUND
6	D20 20LG	SCI RECEIVE
7	D21 20PK/LG	SCI TRANSMIT
8	-	-
9	-	-
10	-	-
11	D2 20WT/DB	CCD BUS (-)
12	-	-
13	-	-
14	D6 20PK/LB	SCI RECEIVE
15	-	-
16	M1 18PK/WT	FUSED B(+)



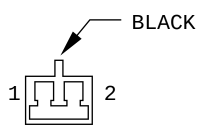
DECKLID RELEASE RELAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Q2 14LG/BK	DECKLID SOLENOID FEED
3	-	-
4	F35 16RD	FUSED B(+)
5	-	-
6	Q33 18BR/LB	REMOTE DECKLID RELEASE CONTROL
	Q33 18BR/LB	GARAGE DOOR OPENER LOCKOUT
7	-	-
8	F35 16RD	FUSED B(+)
9	-	-



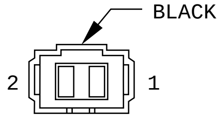
DECKLID RELEASE SWITCH

CAV	CIRCUIT	FUNCTION
1	Q33 18BR/LB	FUSED B(+)
2	G38 18GY	DECKLID RELEASE SWITCH OUTPUT



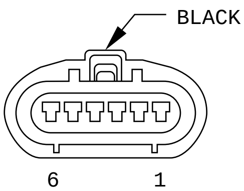
DECKLID SOLENOID

CAV	CIRCUIT	FUNCTION
1	Q2 14LG/BK	DECKLID RELEASE SWITCH OUTPUT
2	Z1 14BK	GROUND



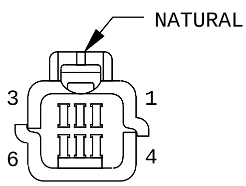
DISTRIBUTOR - C1
(2.5L ENGINE)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	-	-



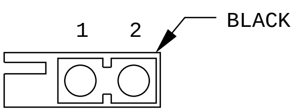
DISTRIBUTOR - C2
(2.5L ENGINE)

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K7 18OR/WT	8 VOLT SUPPLY
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
4	-	-
5	Z1 16BK	GROUND
6	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER



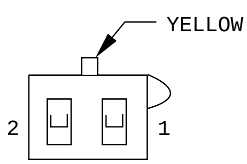
DOWNSTREAM HEATED
OXYGEN SENSOR

CAV	CIRCUIT	FUNCTION
1	K141 20TN/WT	DOWNSTREAM HEATED WXYGEN SENSOR SIGNAL
2	-	-
3	K4 20BK/LB	SENSOR GROUND
4	F142 18OR/DG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
5	-	-
6	Z1 20BK	GROUND



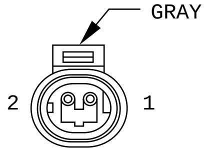
DRIVER SEAT
BELT SOLENOID

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	R7 18OR/BK	DRIVER LATCH SIGNAL



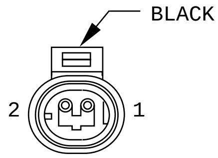
DRIVER SIDE
AIRBAG SQUIB

CAV	CIRCUIT	FUNCTION
1	R43 18BK/LB	DRIVER AIRBAG LINE 1
2	R45 18DG/LB	DRIVER AIRBAG LINE 2



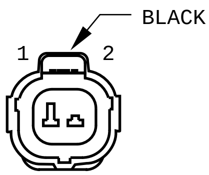
DUTY CYCLE
EVAP/PURGE
SOLENOID

CAV	CIRCUIT	FUNCTION
1	K52 20PK/GY	EVAP/PURGE SOLENOID CONTROL
2	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)



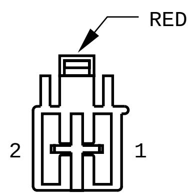
ELECTRONIC EGR
TRANSDUCER SOLENOID

CAV	CIRCUIT	FUNCTION
1	K35 18GY/YL	EGR SOLENOID CONTROL
2	A142 18DG/OR*	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	A142 18DB/OR**	AUTOMATIC SHUT DOWN RELAY OUTPUT



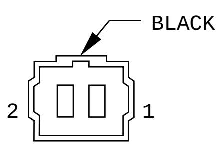
ENGINE COOLANT
TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



FRONT VERTICAL
MOTOR

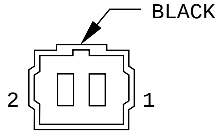
CAV	CIRCUIT	FUNCTION
1	P21 16RD/LG	POWER SEAT FRONT VERTICAL (DOWN)
2	P19 16YL/LG	POWER SEAT FRONT VERTICAL (UP)



FUEL INJECTOR
NO. 1

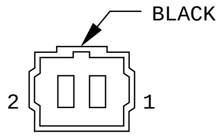
CAV	CIRCUIT	FUNCTION
1	K11 18WT/LB	INJECTOR NO. 1 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT

* 2.0L ENGINE
** 2.5L ENGINE



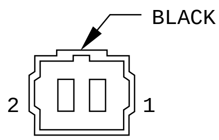
FUEL INJECTOR
NO. 2

CAV	CIRCUIT	FUNCTION
1	K12 18TN	INJECTOR NO. 2 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



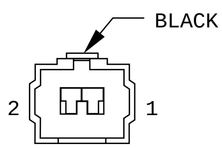
FUEL INJECTOR
NO. 3

CAV	CIRCUIT	FUNCTION
1	K13 18YL/WT	INJECTOR NO. 3 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



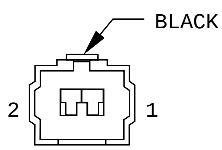
FUEL INJECTOR
NO. 4

CAV	CIRCUIT	FUNCTION
1	K14 18LB/BR	INJECTOR NO. 4 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



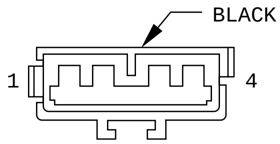
FUEL INJECTOR
NO. 5
(2.5L ENGINE)

CAV	CIRCUIT	FUNCTION
1	K38 18GY	INJECTOR NO. 5 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



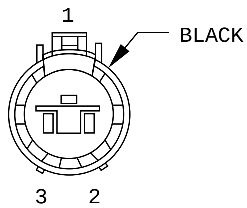
FUEL INJECTOR
NO. 6
(2.5L ENGINE)

CAV	CIRCUIT	FUNCTION
1	K58 18BR/DG	INJECTOR NO. 6 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



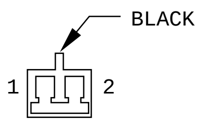
FUEL PUMP MODULE

CAV	CIRCUIT	FUNCTION
1	A141 14DG/WT	FUEL PUMP RELAY OUTPUT
2	G4 18DB	FUEL LEVEL SENSOR SIGNAL
3	Z1 16BK	GROUND
4	Z2 18BK/LG	GROUND



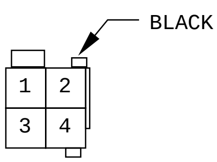
GENERATOR

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K20 18DG	GENERATOR FIELD DRIVER
3	-	-



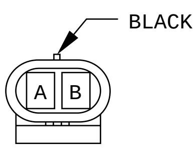
GLOVE BOX LAMP

CAV	CIRCUIT	FUNCTION
1	M1 20PK/WT	FUSED B(+)
2	Z1 20BK	GROUND



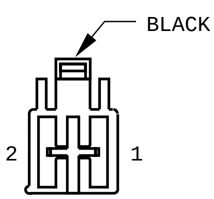
HEADLAMP LEVELING SWITCH

CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	HD/LP LAMP SWITCH OUTPUT
2	Z1 18BK	GROUND
3	L13 18BR/VT	HEADLAMP ADJUST SIGNAL



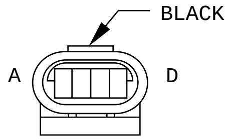
HIGH NOTE HORN

CAV	CIRCUIT	FUNCTION
A	X2 18DG/PK	HORN RELAY OUTPUT
B	Z1 18BK	GROUND



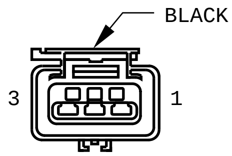
HORIZONTAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P15 16YL/LB	POWER SEAT HORIZONTAL MOTOR
2	P17 16RD/LB	POWER SEAT HORIZONTAL MOTOR



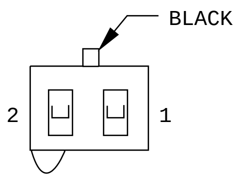
IDLE AIR CONTROL MOTOR

CAV	CIRCUIT	FUNCTION
A	K59 20VT/GY	IAC MOTOR NO. 4 DRIVER
B	K40 20BR/GY	IAC MOTOR NO. 3 DRIVER
C	K60 20YL/BK	IAC MOTOR NO. 2 DRIVER
D	K39 20GY/RD	IAC MOTOR NO. 1 DRIVER



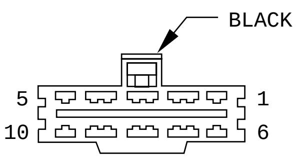
IGNITION COIL PACK
(2.0L ENGINE)

CAV	CIRCUIT	FUNCTION
1	K17 18DB/DG	IGNITION COIL NO. 2 DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER



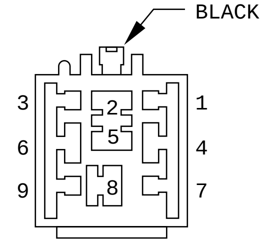
IGNITION SWITCH - C1

CAV	CIRCUIT	FUNCTION
1	A1 16RD	FUSED B(+)
2	A81 18DG/RD	IGNITION SWITCH OUTPUT (OFF/RUN/START)



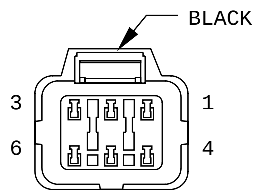
IGNITION SWITCH - C2

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G9 22GY/DB	RED BRAKE WARNING LAMP DRIVER
3	A2 12PK/BK	FUSED B(+)
4	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
5	-	-
6	-	-
7	A1 16RD	FUSED B(+)
7	A1 16RD	FUSED B(+)
8	A31 16BK/WT	IGNITION SWITCH OUTPUT (ACC/RUN)
9	A21 16DB	IGNITION SWITCH OUTPUT (RUN/START)
10	A41 16YL	IGNITION SWITCH OUTPUT (START)



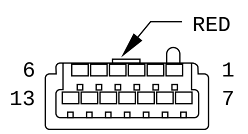
ILLUMINATED ENTRY RELAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 18BK	GROUND
3	-	-
4	M1 18PK	FUSED B(+)
	M1 18PK	FUSED B(+)
5	-	-
6	M112 20BR/LG	ILLUMINATED ENTRY RELAY CONTROL
7	-	-
8	M2 18YL	COURTESY LAMPS DRIVER
9	-	-



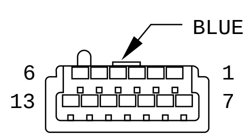
IMMOBILIZER

CAV	CIRCUIT	FUNCTION
1	A15 18PK	FUSED B(+)
2	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT
3	D1 20VT/BR	CCD BUS(+)
4	D2 20WT/DB	CCD BUS(-)
5	P102 20TN	POWER DOOR LOCK ENABLE
6	Z1 18BK	GROUND



INSTRUMENT CLUSTER - C1

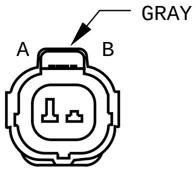
CAV	CIRCUIT	FUNCTION
1	L60 18TN/BR	RIGHT TURN SIGNAL
2	F11 18RD/VT	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)
3	-	-
4	Z2 18BK/LG	GROUND
5	F33 20PK/RD	FUSED B(+)
6	-	-
7	-	-
8	G29 20BK/TN	WASHER FLUID SWITCH SENSE
9	-	-
10	-	-
11	-	-
12	-	-
13	G78 20TN/BK	TRUNK AJAR SWITCH SENSE



INSTRUMENT CLUSTER - C2

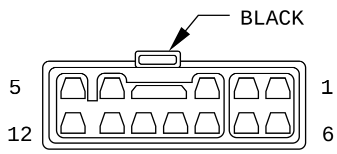
CAV	CIRCUIT	FUNCTION
1	L36 18LG	REAR FOG LAMP
2	L61 18LG/TN	LEFT TURN SIGNAL
3	D2 20WT/BK**	TRAVELER CCD BUS (-)
4	D1 20VT**	TRAVELER CCD BUS (+)
5	F18 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
6	G9 22GY/DB	RED BRAKE WARNING LAMP DRIVER
7	D2 20WT/DB	CCD BUS (-)
8	D1 20VT/BR	CCD BUS (+) -
9		
10	E2 18OR/YL	PANEL LAMPS DRIVER
11	Z1 18BK/OR	GROUND -
12	G6 20GY	OIL PRESSURE SWITCH SENSE
13	G19 20LG/OR	ABS WARNING LAMP DRIVER

* WITH VTSS
** WITH TRAVELER



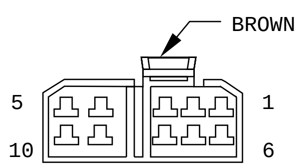
INTAKE AIR
TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
A	K4 18BK/LB	SENSOR GROUND
B	K21 18BK/RD	INTAKE AIR TEMPERATURE SIGNAL



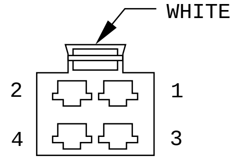
JUNCTION BLOCK - C1

CAV	CIRCUIT	FUNCTION
1	G9 20GY/DB	RED BRAKE WARNING LAMP DRIVER
2	G9 20GY/DG	RED BRAKE WARNING LAMP DRIVER
3	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
4	L60 18TN/BR	RIGHT TURN SIGNAL
5	L61 18LG/TN	LEFT TURN SIGNAL
6	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
7	-	-
8	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
8	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
9	L7 18BK/BR	PARK LAMP SWITCH OUTPUT
9	L7 18BK/BR	PARK LAMP SWITCH OUTPUT
10	L39 18LB	FOG LAMP SWITCH OUTPUT
11	L39 18 LB	FOG LAMP FEED
12	L43 18VT/OR	FUSED LEFT LOW BEAM OUTPUT



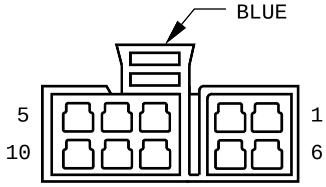
JUNCTION BLOCK - C2

CAV	CIRCUIT	FUNCTION
1	L50 18WT/BR	STOP LAMP SWITCH OUTPUT
2	A7 16RD/BK	FUSED B(+)
3	L50 16WT/TN	BRAKE LAMP SWITCH OUTPUT
4	F20 18WT/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
5	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
6	F11 18RD/VT	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)
7	A21 16DB	IGNITION SWITCH OUTPUT (RUN/START)
8	X2 18DG/PK	HORN RELAY OUTPUT
	X2 18DG/PK	HORN RELAY OUTPUT
9	-	-
10	F13 20DB/GY	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)



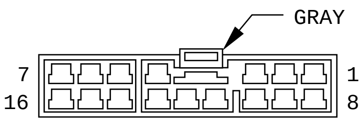
JUNCTION BLOCK - C3

CAV	CIRCUIT	FUNCTION
1	A7 16RD/BK	FUSED B(+)
2	A13 12PK/WT	FUSED B(+)
3	A3 12RD/WT	FUSED B(+)
4	A4 12BK/PK	FUSED B(+)



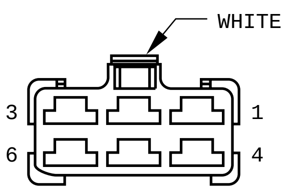
JUNCTION BLOCK - C4

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 18BK/OR	GROUND
3	Z1 18BK/TN	GROUND
4	F23 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
5	G9 22GY/DB	RED BRAKE WARNING LAMP DRIVER
6	Z1 20BK	GROUND
7	Z1 20BK/WT	GROUND
8	Z13 20BK/RD	GROUND -
9	Z1 16BK/LB**	GROUND
10	-	-



JUNCTION BLOCK - C5

CAV	CIRCUIT	FUNCTION
1	F30 18RD	FUSED B(+)
2	-	-
3	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
4	L7 18BK/DG	PARK LAMP SWITCH OUTPUT
5	-	-
6	G9 18GY	RED BRAKE WARNING LAMP DRIVER
7	G9 22GY/DB	RED BRAKE WARNING LAMP DRIVER
8	X3 18BK/RD	HORN RELAY CONTROL
9	A21 16DB	IGNITION SWITCH OUTPUT (RUN/START)
10	L39 18LB*	FOG LAMP SWITCH OUTPUT
11	M1 18PK/WT	FUSED B(+)
12	M1 20PK	FUSED B(+)
13	M1 16PK/DB**	FUSED B(+)
14	A31 16BK/WT	IGNITION SWITCH OUTPUT (ACC/RUN)
15	Z11 18BK	GROUND
16	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN/START)



JUNCTION BLOCK - C6

CAV	CIRCUIT	FUNCTION
1	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
2	L4 14VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
3	L3 14RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
4	A3 14RD/WT	FUSED B(+)
5	-	-
6	C1 12DG	FUSED IGNITION SWITCH OUTPUT (RUN)

* WITH FOG LAMPS
** WITH PREMIUM SOUND

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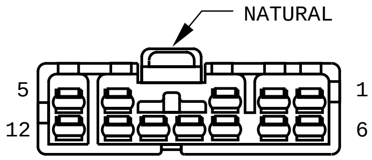
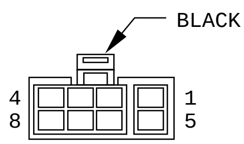


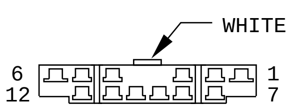
JUNCTION BLOCK - C7

CAV	CIRCUIT	FUNCTION
1	F13 18DB	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
	F13 18DB	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
2	A81 18DG/RD	IGNITION SWITCH OUTPUT (OFF/RUN/START)
3	L60 18TN/BR	RIGHT TURN SIGNAL
4	-	-
5	C16 22LB/YL	REAR DEFOGGER LAMP DRIVER
6	X12 18RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
7	L61 18LG	LEFT TURN SIGNAL
8	L60 18TN	RIGHT TURN SIGNAL
9	L61 18LG/TN	LEFT TURN SIGNAL
10	F11 18RD/VT	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)
	F11 20RD/VT●	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)
11	F33 20PK/RD	FUSED B(+)
12	F33 18BK/RD	FUSED B(+)



JUNCTION BLOCK - C8

CAV	CIRCUIT	FUNCTION
1	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
2	M1 18PK*	FUSED B(+)
3	C16 20LB/YL**	REAR WINDOW DEFOGGER LAMP DRIVER
4	C16 20LB/OR**	REAR WINDOW DEFOGGER LAMP DRIVER
5	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
6	F21 14TN/VT	FUSED IGNITION SWTICH OUTPUT (RUN)
7	F21 14TN/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
8	-	-



JUNCTION BLOCK - C9

CAV	CIRCUIT	FUNCTION
1	F35 16RD	FUSED B(+)
2	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
3	Z1 14BK	GROUND
4	L60 18TN	RIGHT TURN SIGNAL
5	L61 18LG/TN	LEFT TURN SIGNAL
6	C15 12BK/LB	REAR DEFOGGER RELAY OUTPUT
7	M1 18PK	FUSED B(+)
8	-	-
9	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
10	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
11	M1 18PK/OR	FUSED B(+)
12	M1 18PK/VT	FUSED B(+)

* WITH POWER LOCKS
** WITH HEATED MIRRORS
● WITH AUTOSTICK

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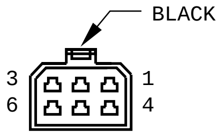
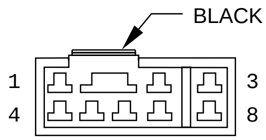


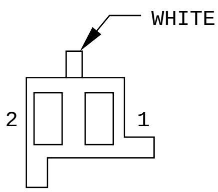
JUNCTION BLOCK - C10

CAV	CIRCUIT	FUNCTION
1	M112 20BR/LG	ILLUMINATED ENTRY RELAY CONTROL
2	-	-
3	-	-
4	Z1 18BK	GROUND
	Z1 18BK	GROUND
5	-	-
6	MI 18PK	FUSED B(+)
	MI 18PK	FUSED B(+)



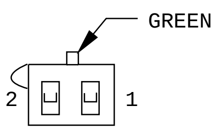
JUNCTION BLOCK - C11

CAV	CIRCUIT	FUNCTION
1	L25 18BR**	FUSED B(+)
2	Z1 18BK	GROUND



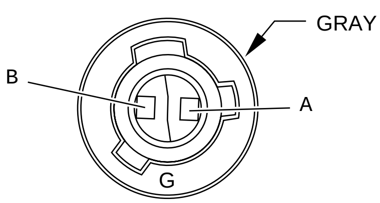
KEY-IN HALO LAMP

CAV	CIRCUIT	FUNCTION
1	M1 20PK/WT	FUSED B(+)
2	M50 20YL/RD	KEY-IN LAMP DRIVER



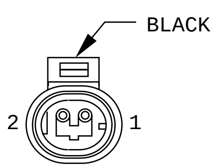
KEY-IN SWITCH

CAV	CIRCUIT	FUNCTION
1	G26 22LB	KEY-IN IGNITION SWITCH SENSE
2	Z1 20BK/WT	GROUND



LEFT BACK-UP LAMP

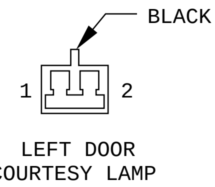
CAV	CIRCUIT	FUNCTION
A	L1 18VT/BK	BACK UP LAMP FEED
G	Z1 18BK	GROUND



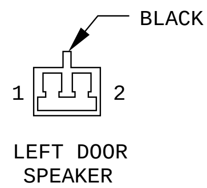
LEFT DOOR
ARM/DISARM SWITCH

CAV	CIRCUIT	FUNCTION
1	G73 18 LG/OR	LEFT VTSS DISARM SENSE
2	M1 18PK	FUSED B(+)

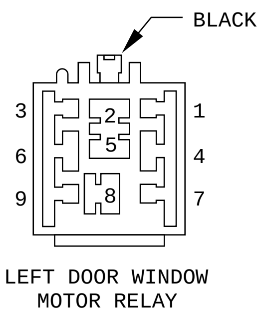
** PREMIUM SOUND



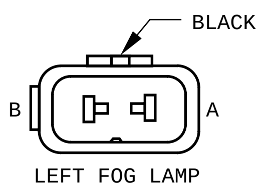
CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 18YL	COURTESY LAMPS DRIVER



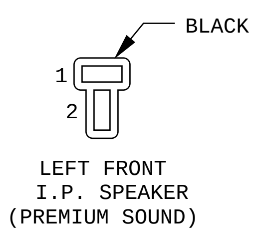
CAV	CIRCUIT	FUNCTION
1	X85 18LG/DG	LEFT FRONT (+)
2	X87 18LG/VT	LEFT FRONT (-)



CAV	CIRCUIT	FUNCTION
1	-	-
2	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
3	-	-
4	G10 20LG/RD	WINDOW MOTOR RELAY CONTROL
5	Q29 14DG	LEFT FRONT WINDOW DRIVER (DOWN)
6	Z1 20BK	GROUND
7	-	-
8	Q21 14WT	LEFT FRONT WINDOW DRIVER (DOWN)
9	-	-

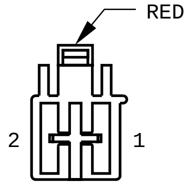


CAV	CIRCUIT	FUNCTION
A	L39 18 LB	FOG LAMP SWITCH OUTPUT
B	Z1 18BK	GROUND



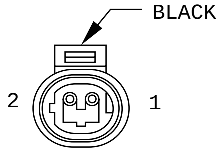
CAV	CIRCUIT	FUNCTION
1	X53 18DG*	LEFT FRONT (+)
	X81 18YL/BK**	AMPLIFIED LEFT INSTRUMENT PANEL (+)
2	X55 18BR/RD*	LEFT FRONT (-)
	X83 18YL/RD**	AMPLIFIED LEFT INSTRUMENT PANEL (-)

* STANDARD SOUND
** PREMIUM SOUND



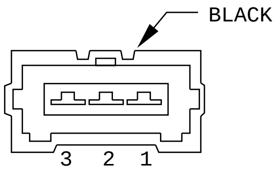
LEFT FRONT POWER
WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q21 14WT	LEFT FRONT WINDOW DRIVER (DOWN)
2	Q11 14LB	LEFT FRONT WINDOW DRIVER (UP)



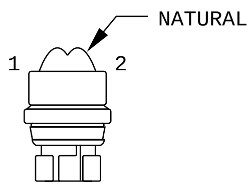
LEFT FRONT WHEEL
SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B8 20OR/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
2	B9 20OR	LEFT FRONT WHEEL SPEED SENSOR (+)



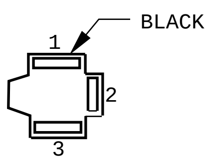
LEFT HEADLAMP
LEVELING MOTOR

CAV	CIRCUIT	FUNCTION
1	L7 18BK/BR	HD/LP LAMP SWITCH OUTPUT
2	L13 18BR/VT	HEADLAMP ADJUST SIGNAL
3	Z3 18BK	INSTRUMENT PANEL GROUND



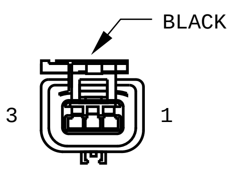
LEFT LICENSE LAMP

CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
2	Z1 18BK	GROUND



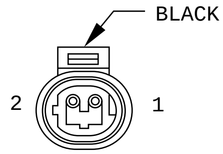
LEFT HEADLAMP

CAV	CIRCUIT	FUNCTION
1	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
2	L43 18VT/OR	FUSED LEFT LOW BEAM OUTPUT
3	Z1 18BK	GROUND



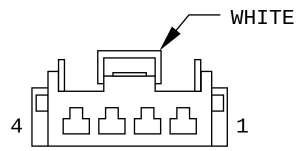
LEFT PARK/TURN
SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
1	L61 18LG/TN	LEFT TURN SIGNAL
2	L7 18BK/BR	PARK LAMP RELAY OUTPUT
3	Z1 18BK	GROUND



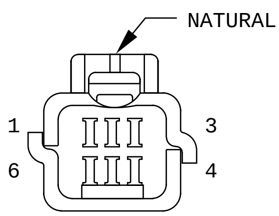
LEFT POWER
DOOR LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P55 16DB/WT	LEFT FRONT DOOR UNLOCK DRIVER
2	P33 16OR/BK	LEFT FRONT DOOR LOCK DRIVER



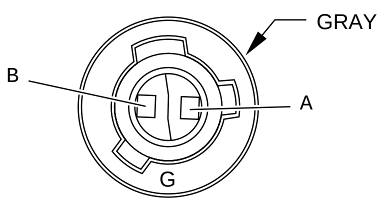
LEFT POWER
DOOR LOCK SWITCH

CAV	CIRCUIT	FUNCTION
1	M1 20 PK	FUSED B(+)
2	F20 20WT	FUSED IGNITION SWITCH OUTPUT
3	Z1 20BK	GROUND
4	P97 22WT/DG	LEFT FRONT DOOR SWITCH MUX



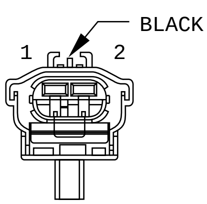
LEFT POWER
MIRROR

CAV	CIRCUIT	FUNCTION
1	C16 20LB/OR	REAR WINDOW DEFOGGER LAMP DRIVER
2	Z1 20BK	GROUND
3	P95 20DB/WT	POWER MIRROR HORIZONTAL (LEFT)
4	P91 20WT/BK	POWER MIRROR HORIZONTAL (RIGHT)
5	P90 20LG/BK	POWER MIRROR VERTICAL (DOWN)
6	P93 20YL/BK	POWER MIRROR VERTICAL (UP)



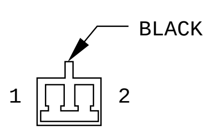
LEFT REAR FOG LAMP

CAV	CIRCUIT	FUNCTION
A	L36 18LG	REAR FOG LAMP
G	Z1 18BK	GROUND



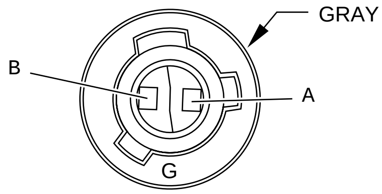
LEFT REAR POWER
WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q27 14RD/BK	LEFT REAR WINDOW DRIVER (DOWN)
2	Q17 14DB/WT	LEFT REAR WINDOW DRIVER (UP)



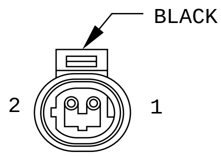
LEFT REAR
SPEAKER

CAV	CIRCUIT	FUNCTION
1	X57 18BR/LB	LEFT REAR (-)
2	X51 18BR/YL	LEFT REAR (+)



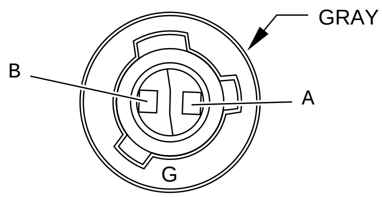
LEFT REAR TURN SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
A	L61 18LG/TN	LEFT TURN SIGNAL
G	Z1 18BK	GROUND



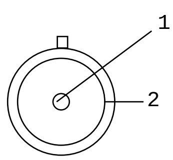
LEFT REAR WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B3 20LG/DB	LR WHEEL SPEED SENSOR (-)
2	B4 20LG	LR WHEEL SPEED SENSOR (+)



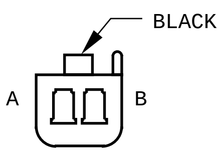
LEFT TAIL/STOP LAMP

CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L7 18BK/YL	HD/LP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



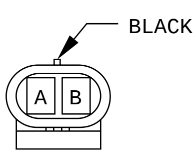
LEFT SIDE REPEATER

CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	Z1 18BK	GROUND



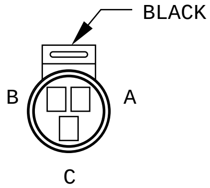
LEFT VISOR/ VANITY LAMP

CAV	CIRCUIT	FUNCTION
A	M1 18PK	FUSED B(+)
B	G38 18GY	LEFT VISOR VANITY LAMP



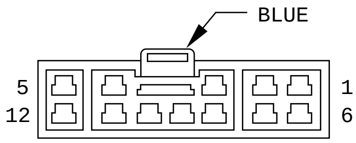
LOW NOTE HORN

CAV	CIRCUIT	FUNCTION
A	X2 18DG/PK	HORN RELAY OUTPUT
B	Z1 18BK	GROUND



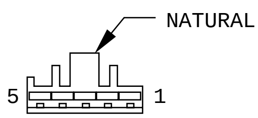
MANIFOLD ABSOLUTE PRESSURE SENSOR

CAV	CIRCUIT	FUNCTION
A	K4 18BK/LB	SENSOR GROUND
B	K6 18VT/WT	5-VOLT SUPPLY
C	K1 18DG/RD	MAP SENSOR SIGNAL



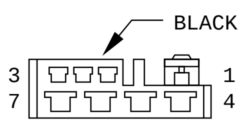
MASTER POWER WINDOW SWITCH

CAV	CIRCUIT	FUNCTION
1	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
2	Q17 14DB/WT	LEFT REAR WINDOW DRIVER (UP)
3	Q31 14OR	LEFT REAR WINDOW DRIVER (DOWN)
4	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER (UP)
5	-	-
6	-	-
7	Q11 14LB	LEFT FRONT WINDOW DRIVER (UP)
8	Q29 14DG	LEFT FRONT WINDOW DRIVER (DOWN)
9	Q32 14BR	RIGHT REAR WINDOW DRIVER (DOWN)
10	Z1 14BK	GROUND
11	Q30 14VT	RIGHT FRONT WINDOW DRIVER (DOWN)
12	Q16 14BR/WT	RIGHT FRONT WINDOW DRIVER (UP)



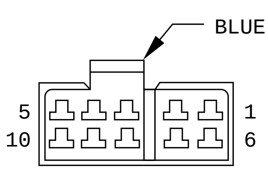
MODE DOOR ACTUATOR

CAV	CIRCUIT	FUNCTION
1	C35 22DG/YL	MODE DOOR DRIVER
2	C57 22GY/TN	SENSOR GROUND
3	C37 20YL	MODE DOOR FEEDBACK SIGNAL
4	C26 20PK/DB	5 VOLT SUPPLY
5	C34 22DB/YL	COMMON DOOR DRIVER



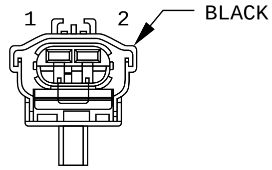
MULTI-FUNCTION SWITCH - C1

CAV	CIRCUIT	FUNCTION
1	V10 18BR/DB	WASHER PUMP CONTROL
2	V52 22DG/RD	WINDSHIELD WIPER SWITCH SIGNAL
3	F13 18DB	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
4	A15 18PK	FUSED B(+)
5	Z1 18BK/TN	GROUND
6	L60 18TN	RIGHT TURN SIGNAL
7	L61 18LG	LEFT TURN SIGNAL



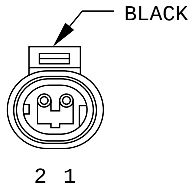
MULTI-FUNCTION SWITCH - C2

CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
2	F33 18BK/RD	FUSED B(+)
3		-
4	A3 14RD/WT	FUSED B(+)
5	L36 18LG	REAR FOG LAMP -
6	E19 20RD	DIMMER SWITCH SIGNAL
7	L4 14VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
8	L3 14RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
9	L39 18LB	FOG LAMP SWITCH OUTPUT
10	L25 18BR	REAR FOG LAMP FEED



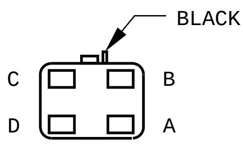
OIL PRESSURE SWITCH

CAV	CIRCUIT	FUNCTION
1	G6 18GY/VT	OIL PRESSURE SWITCH SENSE
2	-	-



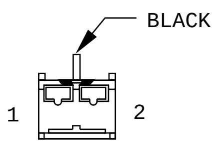
OUTPUT SHAFT
SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	T13 18DB/BR	SPEED SENSOR GROUND
2	T14 18LG/VT	OUTPUT SHAFT SPEED SENSOR SIGNAL



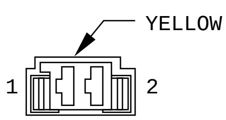
OVERHEAD MAP LAMP

CAV	CIRCUIT	FUNCTION
A	M2 18YL	COURTESY LAMPS DRIVER
B	Z1 18BK	GROUND
C	M1 18PK	FUSED B(+)
D	-	-



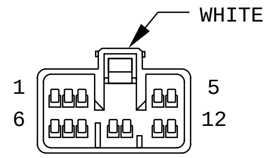
PASSENGER SEAT
BELT SOLENOID

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	R8 18OR/RD	PASSENGER LATCH SIGNAL



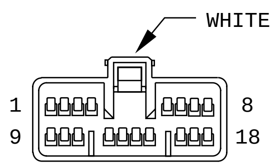
PASSENGER SIDE
AIRBAG SQUIB

CAV	CIRCUIT	FUNCTION
1	R42 18BK/YL	PASSENGER AIRBAG LINE 1
2	R44 18DG/YL	PASSENGER AIRBAG LINE 2



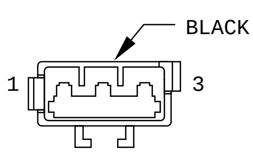
POWER AMPLIFIER - C1

CAV	CIRCUIT	FUNCTION
1	X91 20WT/BK	LEFT REAR AMP INPUT (-)
2	X92 20TN/BK	RIGHT REAR AMP INPUT (-)
3	X55 20BR/RD	LEFT FRONT AMP INPUT (-)
4	X60 20DG/RD	REMOTE ON FOR AMP
5	P5 20YL/BK	POWER TOP SWITCH TO RELAY B(+) DOWN
6	X93 20WT/RD	LEFT REAR AMP INPUT (+)
7	X94 20TN/RD	RIGHT REAR AMP INPUT (+)
8	X53 20DG	LEFT FRONT AMP INPUT (+)
9	X56 20DB/RD	RIGHT FRONT AMP INPUT (-)
10	X54 20VT	RIGHT FRONT AMP INPUT (+)
11	P6 20RD/WT	POWER TOP SWITCH TO RELAY B(+) UP
12	-	-



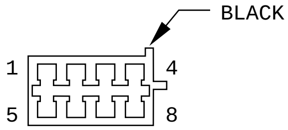
POWER AMPLIFIER - C2

CAV	CIRCUIT	FUNCTION
1	M1 16PK/DB	FUSED BATT FEED TO AMP
2	-	-
3	-	-
4	X58 18DB/OR	RIGHT REAR SPEAKER AMP OUTPUT (-)
5	X84 18OR/BK	RIGHT PANEL SPEAKER (-)
6	X81 18YL/BK	LEFT PANEL SPEAKER (-)
7	X80 18LB/DG	RIGHT DOOR SPEAKER (-)
8	X85 18LG/DG	LEFT DOOR SPEAKER (-)
9	Z1 16BK/LB	AMP GROUND
10	-	-
11	-	-
12	X52 18DB/WT	RIGHT REAR SPEAKER AMP OUTPUT (+)
13	X57 18BR/LB	LEFT REAR SPEAKER AMP OUTPUT (-)
14	X51 18BR/YL	LEFT REAR SPEAKER AMP OUTPUT (+)
15	X86 18OR/RD	RIGHT PANEL SPEAKER (+)
16	X83 18YL/RD	LEFT PANEL SPEAKER (+)
17	X82 18LB/VT	RIGHT DOOR SPEAKER (+)
18	X87 18LG/VT	LEFT DOOR SPEAKER (+)



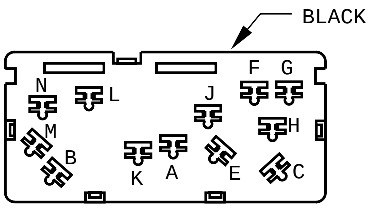
POWER ANTENNA

CAV	CIRCUIT	FUNCTION
1	M1 18PK/OR	FUSED B(+)
2	X60 20DG/RD	RADIO 12 VOLT OUTPUT
3	Z1 18BK	GROUND



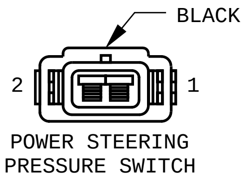
POWER MIRROR SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	M1 20PK	FUSED B(+)
3	P94 20WT/YL	POWER MIRROR HORIZONTAL (RIGHT)
4	P92 20YL	POWER MIRROR VERTICAL (RIGHT)
5	P90 20LG/BK	POWER MIRROR VERTICAL (LEFT/RIGHT)
	P90 20LG/BK	POWER MIRROR VERTICAL (LEFT)
6	P91 20WT/BK	POWER MIRROR HORIZONTAL (LEFT/RIGHT)
	P91 20WT/BK	POWER MIRROR HORIZONTAL (LEFT)
7	P95 20DB/WT	POWER MIRROR HORIZONTAL (LEFT)
8	P93 20YL/BK	POWER MIRROR VERTICAL (LEFT)

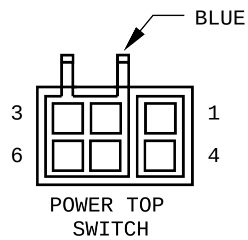


POWER SEAT SWITCH

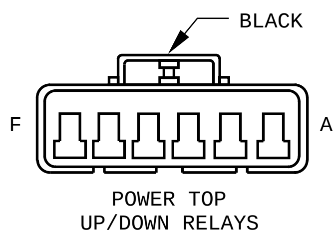
CAV	CIRCUIT	FUNCTION
A	F35 16RD	FUSED B (+)
B	Z1 16BK	GROUND
C	-	-
D	P21 16RD/LG	POWER SEAT FRONT VERTICAL (DOWN)
E	-	-
F	-	-
G	-	-
H	-	-
J	P19 16YL/LG	POWER SEAT FRONT VERTICAL (UP)
K	P15 16YL/LB	POWER SEAT HORIZONTAL (FORWARD)
L	P17 16RD/LB	POWER SEAT HORIZONTAL (REARWARD)
M	P13 16RD/WT	POWER SEAT REAR VERTICAL (DOWN)
N	P11 16YL/WT	POWER SEAT REAR VERTICAL (UP)



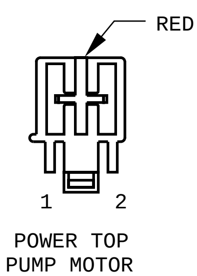
CAV	CIRCUIT	FUNCTION
1	K10 18DB/LG	POWER STEERING PRESSURE SWITCH SENSE
2	Z1 18BK	GROUND



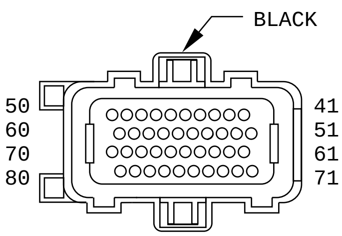
CAV	CIRCUIT	FUNCTION
1	P6 20RD/WT	POWER TOP SIGNAL (UP)
2	Z1 20BK	GROUND
3	-	-
4	Z1 20BK	GROUND
5	P5 20YL/BK	POWER TOP SIGNAL (DOWN)
6	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)



CAV	CIRCUIT	FUNCTION
A	P6 20RD/WT	POWER TOP SIGNAL (UP)
B	P3 12YL	PUMP MOTOR CONTROL (UP)
C	A25 12DB	FUSED B(+)
D	Z1 12BK	GROUND
E	P4 12RD	PUMP MOTOR CONTROL (DOWN)
F	P5 20YL/BK	POWER TOP SIGNAL (DOWN)

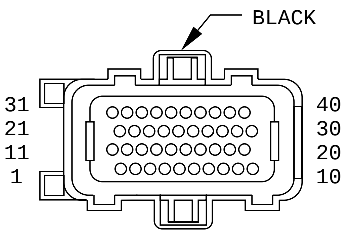


CAV	CIRCUIT	FUNCTION
1	P3 12YL	CONVERTIBLE TOP UP
2	P4 12RD	CONVERTIBLE TOP RELAY DOWN B(+)



POWERTRAIN
CONTROL MODULE - C1

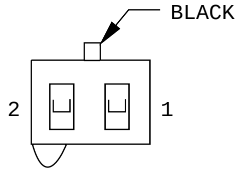
CAV	CIRCUIT	FUNCTION
41	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
42	C18 20DB/YL	A/C PRESSURE SIGNAL
43	K4 20BK/LB	SENSOR GROUND
44	K7 18OR/WT	8 VOLT SUPPLY
45	K10 18DB/LG	POWER STEERING PRESSURE SWITCH SENSE
46	A14 16RD/TN	FUSED B(+)
47	-	-
48	K40 20BR/GY	IDLE AIR CONTROL MOTOR NO. 3 DRIVER
49	K60 20YL/BK	IDLE AIR CONTROL MOTOR NO. 2 DRIVER
50	Z12 18BK/TN	GROUND
51	K141 20TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL
52	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
53	-	-
54	-	-
55	C24 20DB/TN	LOW SPEED RADIATOR FAN RELAY CONTROL
56	-	-
57	K39 20GY/RD	IDLE AIR CONTROL MOTOR NO. 1 DRIVER
58	K59 20VT/GY	IDLE AIR CONTROL MOTOR NO. 4 DRIVER
59	D1 20VT/BR	CCD BUS (+)
60	D2 20WT/BK	CCD BUS (-)
61	K6 20VT/WT	5 VOLT SUPPLY
62	K29 18WT/RD	STOP LAMP SWITCH SENSE
63	T10 20YL/DG	TORQUE MANAGEMENT REQUEST SENSE
64	C28 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
65	D21 20PK/LG	SCI TRANSMIT
66	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL
67	K51 20DB/VT	AUTOMATIC SHUT DOWN RELAY CONTROL
68	K52 20PK/GY	EVAP/PURGE SOLENOID CONTROL
69	C27 20DB/PK	HIGH SPEED RADIATOR FAN RELAY CONTROL
70	-	-
71	-	-
72	-	-
73	-	-
74	K31 20BR/LG	FUEL PUMP RELAY CONTROL
75	D20 20LG	SCI RECEIVE
76	T41 20BK/WT**	PARK/NEUTRAL POSITION SWITCH SENSE
77	-	-
78	V36 20WT/VT	SPEED CONTROL VACUUM SOLENOID CONTROL
79	-	-
80	V35 20LG/RD	SPEED CONTROL VENT SOLENOID CONTROL



POWERTRAIN
CONTROL MODULE - C2

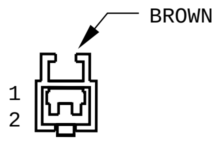
CAV	CIRCUIT	FUNCTION
1	-	-
2	K19 18BK/GY*	IGNITION COIL NO. 1 DRIVER
3	K17 18DB/DG*	IGNITION COIL NO. 2 DRIVER
4	K20 18DG	GERNERATOR FIELD DRIVER
5	V32 20YL/PK	SPEED CONTROL ON/OFF SWITCH SENSE
6	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
7	K13 18YL/WT	INJECTOR NO. 3 DRIVER
8	-	-
9	-	-
10	Z12 18BK/TN	GROUND
11	K19 18BK/GY**	IGNITION COIL NO. 1 DRIVER
12	-	-
13	K11 18WT/LB	INJECTOR NO. 1 DRIVER
14	K58 18BR/DG**	INJECTOR NO. 6 DRIVER
15	K38 18GY**	INJECTOR NO. 5 DRIVER
16	K14 18LB/BR	INJECTOR NO. 4 DRIVER
17	K12 18TN	INJECTOR NO. 2 DRIVER
18	-	-
19	-	-
20	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
21	-	-
22	-	-
23	-	-
24	K42 18BK/LB	KNOCK SENSOR SIGNAL
25	-	-
26	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
27	-	-
28	-	-
29	-	-
30	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL
31	-	-
32	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
33	K44 20TN/YL*	CAMSHAFT POSITION SENSOR SIGNAL
33	K44 18TN/YL**	CAMSHAFT POSITION SENSOR SIGNAL
34	-	-
35	K22 18OR/LB*	THROTTLE POSITION SENSOR SIGNAL
35	K22 20OR/LB**	THROTTLE POSITION SENSOR SIGNAL
36	K1 18DG/RD	MAP SENSOR SIGNAL
37	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
38	-	-
39	-	-
40	K35 18GY/YL	EGR SOLENOID CONTROL

* WITH 2.0L ENGINE
** WITH 2.5L ENGINE



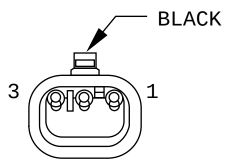
PRNDL FEED

CAV	CIRCUIT	FUNCTION
1	A1 16RD	FUSED B(+)
2	A81 18DG/RD	IGNITION SWITCH OUTPUT



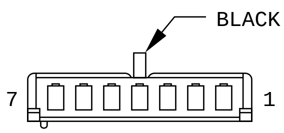
PRNDL ILLUMINATION LED

CAV	CIRCUIT	FUNCTION
1	E2 18OR/BK	PANEL LAMPS DRIVER
2	Z1 18BK	GROUND



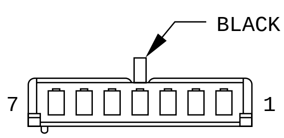
RADIATOR FAN
MOTOR
ASSEMBLY

CAV	CIRCUIT	FUNCTION
1	Z1 12BK	GROUND
2	C23 12DG/LG	LOW SPEED RADIATOR FAN RELAY OUTPUT
3	C25 12YL/RD	HIGH SPEED RADIATOR FAN RELAY OUTPUT



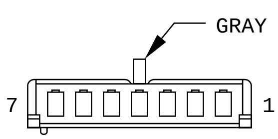
RADIO - C1
(STANDARD)

CAV	CIRCUIT	FUNCTION
1	X60 20DG/RD*	RADIO 12 VOLT OUTPUT
2	X51 18BR/YL	LEFT REAR AMP INPUT(+)
3	X52 18DB/WT	RIGHT REAR AMP INPUT(+)
4	X53 20DG	LEFT FRONT DOOR (+)
5	X54 20VT	RIGHT FRONT DOOR (+)
6	X57 18BR/LB	LEFT REAR AMP INPUT(-)
7	X58 18DB/OR	RIGHT REAR AMP INPUT(-)



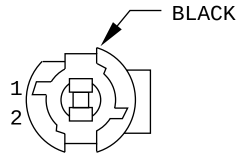
RADIO - C1
(PREMIUM)

CAV	CIRCUIT	FUNCTION
1	X60 20DG/RD*	RADIO 12 VOLT OUTPUT
2	X93 20WT/RD	LEFT REAR AMP INPUT(+)
3	X94 20TN/RD	RIGHT REAR AMP INPUT(+)
4	X53 20DG	LEFT FRONT DOOR (+)
5	X54 20VT	RIGHT FRONT DOOR (+)
6	X91 20WT/BK	LEFT REAR AMP INPUT(-)
7	X92 20TN/BK	RIGHT REAR AMP INPUT(-)



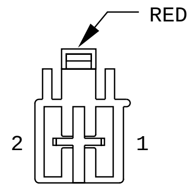
RADIO - C2

CAV	CIRCUIT	FUNCTION
1	-	-
2	X55 20BR/RD	LEFT FRONT DOOR (-)
3	X56 20DB/RD	RIGHT FRONT DOOR (-)
4	L7 18BK/DG	PARK LAMP SWITCH OUTPUT
5	E2 18OR/BR	PANEL LAMPS DRIVER
6	X12 18RD/WT	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
7	M1 18PK/WT	FUSED B(+)



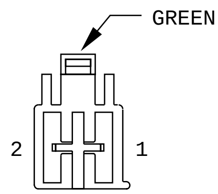
REAR FLOOR
COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 18YL	COURTESY LAMPS DRIVER



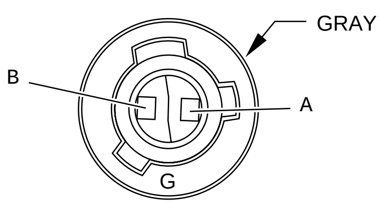
REAR VERTICAL
MOTOR

CAV	CIRCUIT	FUNCTION
1	P11 16YL/WT	POWER SEAT REAR VERTICAL (UP)
2	P13 16RD/WT	POWER SEAT REAR VERTICAL (DOWN)



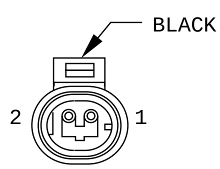
RECLINE MOTOR

CAV	CIRCUIT	FUNCTION
1	P41 16GY/WT	POWER SEAT RECLINER MOTOR
2	P43 16GY/LB	POWER SEAT RECLINER MOTOR



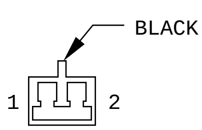
RIGHT BACK-UP LAMP

CAV	CIRCUIT	FUNCTION
A	L1 18VT/BK	BACK UP LAMP FEED
G	Z1 18BK	GROUND



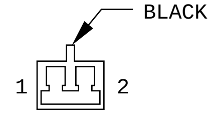
RIGHT DOOR
ARM/DISARM SWITCH

CAV	CIRCUIT	FUNCTION
1	G72 18DG/OR	RIGHT VTSS DISARM SENSE
2	M1 18PK	FUSED B(+)



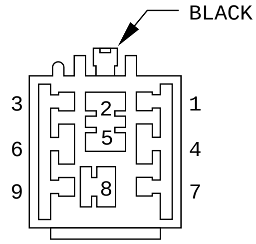
RIGHT DOOR
COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 18YL	COURTESY LAMPS DRIVER



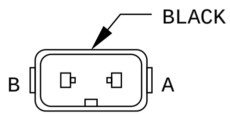
RIGHT DOOR SPEAKER

CAV	CIRCUIT	FUNCTION
1	X80 18LB/DG	RIGHT FRONT (-)
2	X82 18LB/VT	RIGHT FRONT (+)



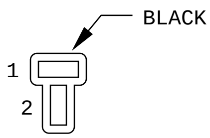
RIGHT DOOR WINDOW MOTOR RELAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
3	-	-
4	G10 20LG/RD	WINDOW MOTOR RELAY CONTROL
	G10 20LG/RD	WINDOW MOTOR RELAY CONTROL
5	Q30 14VT	RIGHT FRONT WINDOW DRIVER (DOWN)
6	Z1 20BK	GROUND
7	-	-
8	Q26 14VT/WT	RIGHT FRONT WINDOW DRIVER (DOWN)
9	-	-



RIGHT FOG LAMP

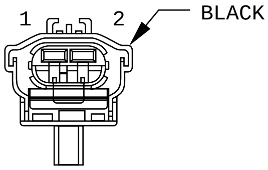
CAV	CIRCUIT	FUNCTION
A	L39 18LB	FOG LAMP SWITCH OUTPUT
B	Z1 18BK	GROUND



RIGHT FRONT I.P. SPEAKER

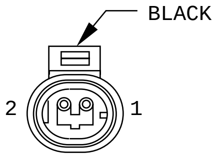
CAV	CIRCUIT	FUNCTION
1	X54 18VT*	RIGHT FRONT (+)
1	X84 18OR/BK**	AMPLIFIED RIGHT INSTRUMENT PANEL (-)
2	X86 18OR/RD**	AMPLIFIED RIGHT INSTRUMENT PANEL (+)
2	X56 18DB/RD*	RIGHT FRONT (-)

* WITH BASE RADIO
** WITH PREMIUM RADIO



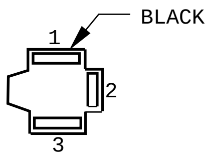
RIGHT FRONT POWER WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	RIGHT FRONT WINDOW DRIVER (DOWN)
2	Q12 14BR	RIGHT FRONT WINDOW DRIVER (UP)



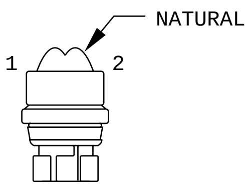
RIGHT FRONT WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B6 20WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 20WT	RIGHT FRONT WHEEL SPEED SENSOR (+)



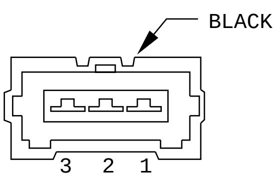
RIGHT HEADLAMP

CAV	CIRCUIT	FUNCTION
1	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
2	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
3	Z1 18BK	GROUND



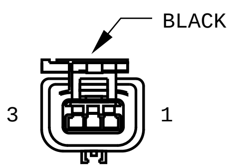
RIGHT LICENSE LAMP

CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
2	Z1 18BK	GROUND



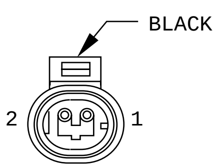
RIGHT HEADLAMP LEVELING MOTOR

CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	HD/LP LAMP SWITCH OUTPUT
2	L13 18BR/VT	HEADLAMP ADJUST SIGNAL
3	Z3 18BK	INSTRUMENT PANEL GROUND



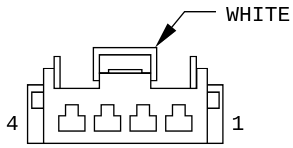
RIGHT PARK/TURN SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
1	L60 18TN/BR	RIGHT TURN SIGNAL
2	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



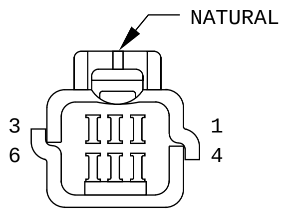
RIGHT POWER DOOR LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	RIGHT FRONT DOOR UNLOCK DRIVER
2	P33 16OR/WT	RIGHT FRONT DOOR LOCK DRIVER



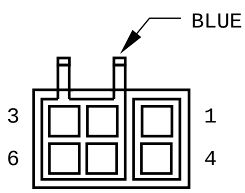
RIGHT POWER
DOOR LOCK SWITCH

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	F20 20WT	FUSED IGNITION SWITCH OUTPUT
3	Z1 20BK	GROUND
4	P96 20WT/LG	RIGHT FRONT DOOR SWITCH MUX



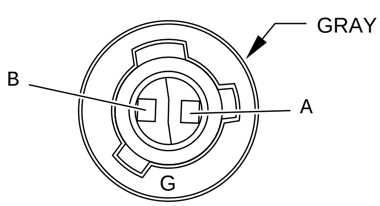
RIGHT POWER
MIRROR

CAV	CIRCUIT	FUNCTION
1	C16 20LB/YL	REAR DEFOGGER LAMP DRIVER
2	Z1 20BK	GROUND
3	P94 20WT/YL	POWER MIRROR VERTICAL (RIGHT)
4	P91 20WT/BK	POWER MIRROR HORIZONTAL (RIGHT)
5	P90 20LG/BK	POWER MIRROR VERTICAL (RIGHT)
6	P92 20YL	POWER MIRROR HORIZINTAL (RIGHT)



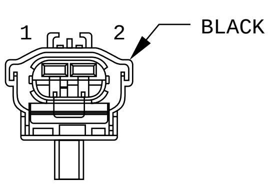
RIGHT POWER
WINDOW SWITCH

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	RIGHT FRONT WINDOW DRIVER (DOWN)
2	Q16 14BR/WT	RIGHT FRONT WINDOW DRIVER (UP)
3	-	-
4	Q26 14VT/WT	RIGHT FRONT WINDOW DRIVER (DOWN)
5	Q12 14BR	RIGHT FRONT WINDOW DRIVER (UP)
6	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)



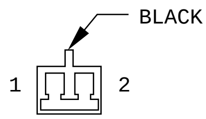
RIGHT REAR FOG LAMP

CAV	CIRCUIT	FUNCTION
A	L36 18LG	REAR FOG LAMP
G	Z1 18BK	GROUND



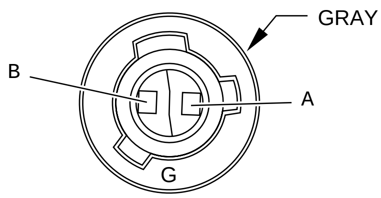
RIGHT REAR POWER
WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q28 14DG/WT	RIGHT REAR WINDOW DRIVER (DOWN)
2	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER (UP)



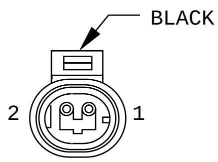
RIGHT REAR SPEAKER

CAV	CIRCUIT	FUNCTION
1	X58 18DB/OR	RIGHT REAR (-)
2	X52 18DB/WT	RIGHT REAR (+)



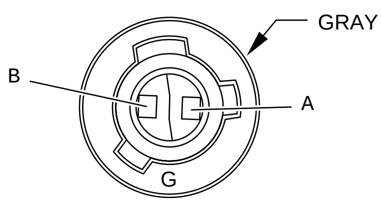
RIGHT REAR TURN
SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
A	L60 18TN	BACK UP LAMP FEED
G	Z1 18BK	GROUND



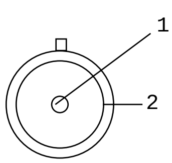
RIGHT REAR WHEEL
SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)
2	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR (+)



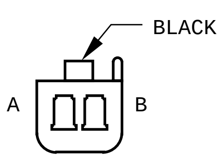
RIGHT TAIL/STOP LAMP

CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L7 18BK/YL	HD/LP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



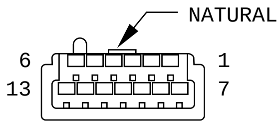
RIGHT SIDE REPEATER

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	Z1 18BK	GROUND



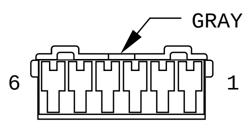
RIGHT VISOR/
VANITY LAMP

CAV	CIRCUIT	FUNCTION
A	M1 18PK	FUSED B(+)
B	G38 18GY	VISOR VANITY LAMP



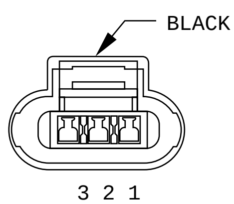
SEAT BELT CONTROL MODULE

CAV	CIRCUIT	FUNCTION
1	-	-
2	G75 18TN	LEFT FRONT DOOR AJAR SWITCH SENSE
3	G74 18TN/RD	DOOR AJAR SWITCH SENSE
4	F13 18DB	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
5	A45 18BR	FUSED B(+)
6	Z1 18BK	GROUND
7	R7 18OR/BK	DRIVER LATCH SIGNAL
8	R8 18OR/RD	PASSENGER LATCH SIGNAL
9	-	-
10	-	-
11	-	-
12	-	-
13	Z2 18BK/LG	GROUND



STOP LAMP SWITCH

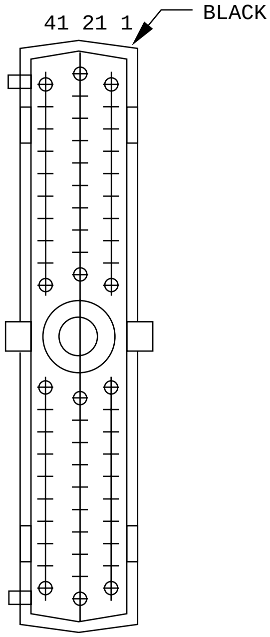
CAV	CIRCUIT	FUNCTION
1	K29 18WT/RD	STOP LAMP SWITCH SENSE
2	Z2 20BK/LG	GROUND
3	V32 20YL/PK	SPEED CONTROL ON/OFF SWITCH SENSE
4	V30 20DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
5	L50 16WT/TN	STOP LAMP SWITCH OUTPUT
6	A7 16RD/BK	FUSED B(+)



THROTTLE POSITION SENSOR

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB**	SENSOR GROUND
1	K6 18VT/WT*	5 VOLT SUPPLY
2	K22 18OR/LB	THROTTLE POSITION SENSOR SIGNAL
3	K6 18VT/WT**	5 VOLT SUPPLY
3	K4 18BK/LB*	SENSOR GROUND

* WITH 2.0L ENGINE
** WITH 2.5L ENGINE



TRANSMISSION
CONTROL
MODULE

CAV	CIRCUIT	FUNCTION
1	T1 20LG/GY	TRANSMISSION RANGE SWITCH T1 SENSE
2	-	-
3	T3 18VT	PARK/NEUTRAL POSITION SWITCH SENSE
4	D2 20WT/DG	CCD BUS(-)
5	T5 20LG/LB	AUTOSTICK UPSHIFT SWITCH SENSE
6	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
7	D21 20PK/LB	SCI TRANSMIT
8	A41 16YL/OR	IGNITION SWITCH OUTPUT (START)
9	T9 20OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 20YL/DG	TORQUE MANAGEMENT REQUEST SENSE
11	F11 18RD/VT	FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START)
12	K22 20OR/LB	THROTTLE POSITION SENSOR SIGNAL
13	T13 20DB/BR	SPEED SENSOR GROUND
14	T14 20LG/VT	OUTPUT SHAFT SPEED SENSOR SIGNAL (+)
15	T15 20LG/YL	12 VOLT SUPPLY
16	T16 16RD/BR	TRANS OUTPUT CTRL RLY (SWITCHED B(+))
17	T16 16RD/BR	TRANS OUTPUT CTRL RLY (SWITCHED B(+))
18	-	-
19	T19 20WT/PK	2-4 SOLENOID CONTROL
20	T20 20LB/WT	LOW/REVERSE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-
33	-	-
34	-	-

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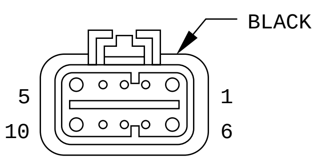
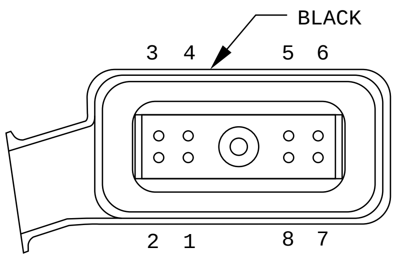
CAV	CIRCUIT	FUNCTION
35	-	-
36	-	-
37	-	-
38	-	-
39	-	-
40	-	-
41	T41 20BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
42	T42 18VT/TN	TRANSMISSION RANGE SWITCH T42 SENSE
43	D1 20VT/DG	CCD BUS(+)
44	T44 20YL/LB	AUTOSTICK DOWNSHIFT SWITCH SENSE
45	-	-
46	D6 20PK/LB	SCI RECEIVE
47	T47 20YL/GY	2-4 PRESSURE SWITCH SENSE
48	-	-
49	-	-
50	T50 18DG/TN	LOW/REVERSE PRESSURE SWITCH SENSE
51	K4 20BK/LB	SENSOR GROUND
52	T52 20RD/YL	INPUT SPEED SENSOR SIGNAL
53	Z14 18BK/YL	GROUND
54	T54 18VT/WT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	-	-
56	A24 16PK/YL	FUSED B(+)
57	Z13 16BK/RD	GROUND
58	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL
59	T59 18PK/DB	UNDERDRIVE SOLENOID CONTROL
60	T60 18BR/TN	OVERDRIVE SOLENOID CONTROL



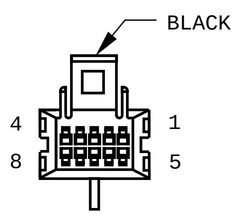
TRANSMISSION
RANGE SWITCH

CAV	CIRCUIT	FUNCTION
1	F20 18WT/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-
3	T13 18DB/BR	SPEED SENSOR GROUND
4	T54 18VT/WT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	T41 20BK/LB	PARK/NEUTRAL POSITION SWITCH SENSE
6	L1 18VT/BK	REVERSE LAMP SENSE
7	T1 18LG/GY	TRANSMISSION RANGE SWITCH T1 SENSE
8	T3 18VT	PARK/NEUTRAL POSITION SWITCH SENSE
9	T42 18VT/TN	TRANSMISSION RANGE SWITCH T42 SENSE
10	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE



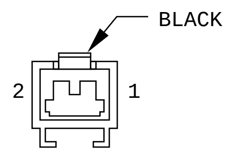
TRANSMISSION SOLENOID AND PRESSURE SWITCH ASSEMBLY

CAV	CIRCUIT	FUNCTION
1	T47 18YL/GY	2-4 PRESSURE SWITCH SENSE
2	T50 18DG/TN	LOW/REVERSE PRESSURE SWITCH SENSE
3	T9 18OR/BK	OVERDRIVE OFF SWITCH SENSE
4	T16 16RD/BR	TRANSMISSION CONTROL RELAY OUTPUT
5	T59 18PK/DB	UNDERDRIVE SOLENOID CONTROL
6	T60 18BR/TN	OVERDRIVE SOLENOID CONTROL
7	T20 18LB/WT	LOW/REVERSE SOLENOID CONTROL
8	T19 18WT/PK	2-4 SOLENOID CONTROL



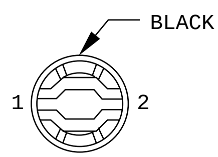
TRAVELER

CAV	CIRCUIT	FUNCTION
1	D1 20VT	TRAVELER CCD BUS (+)
2	D2 20WT/BK	TRAVELER CCD BUS (-)
3	-	-
4	-	-
5	Z1 20BK	GROUND
6	F18 20LG/BK	IGNITION FEED TO TRAVELER
7	M1 20PK	FUSED BATTERY FEED TO TRAVELER
8	-	-



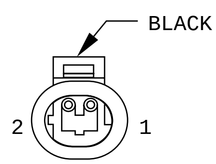
TRUNK KEY CYLINDER SWITCH (WITH VTSS)

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	G71 20VT/YL	TRUNK KEY CYLINDER SENSE



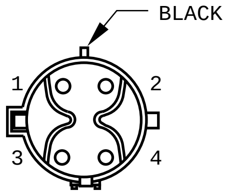
TRUNK LAMP

CAV	CIRCUIT	FUNCTION
1	M1 18PK/VT	FUSED B(+)
2	G78 20TN/BK	TRUNK AJAR SWITCH SENSE



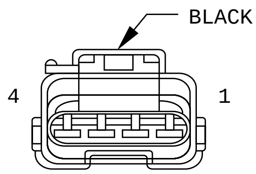
TURBINE SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	T13 18DB/BR	SPEED SENSOR GROUND
2	T52 18OR/YL	INPUT SPEED SENSOR SIGNAL



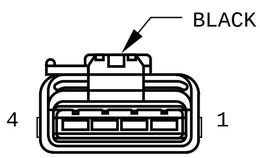
UPSTREAM HEATED
OXYGEN SENSOR

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL



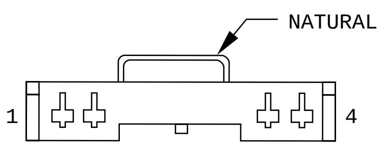
VAPOR
CANISTER
LEAK DETECTOR

CAV	CIRCUIT	FUNCTION
1	-	-
2	F18 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
3	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE



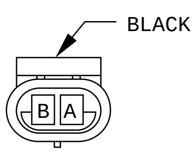
VEHICLE SPEED
CONTROL SERVO

CAV	CIRCUIT	FUNCTION
1	V36 20WT/VT	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 20LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	SPEED CONTROL ON/OFF SWITCH OUTPUT
4	Z1 20BK	GROUND



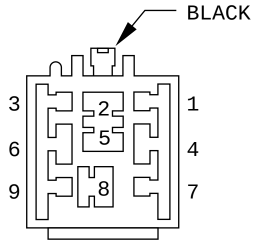
VEHICLE SPEED CONTROL
AND HORN SWITCHES

CAV	CIRCUIT	FUNCTION
1	X3 18BK/RD	HORN RELAY CONTROL
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
3	Z2 18BK/TN	GROUND
4	-	-



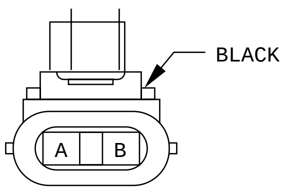
WASHER FLUID
LEVEL SWITCH

CAV	CIRCUIT	FUNCTION
A	Z1 20BK	GROUND
B	G29 20BK/TN	WASHER FLUID LEVEL SWITCH



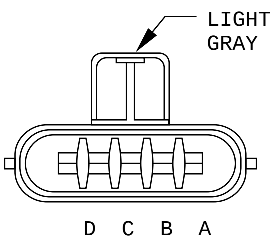
WINDOW TIMER MODULE

CAV	CIRCUIT	FUNCTION
1	P5 20YL/BK	POWER TOP SIGNAL (DOWN)
2	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
3	P6 20RD/WT	POWER TOP SIGNAL (UP)
4	Q27 14RD/BK	LEFT REAR WINDOW DRIVER (DOWN) (MOTOR)
5	Q32 14BR	RIGHT REAR WINDOW DRIVER (DOWN) (SWITCH)
6	Q28 14DG/WT	RIGHT REAR WINDOW DRIVER (DOWN) (MOTOR)
7	G10 20LG/RD	WINDOW MOTOR RELAY CONTROL
8	Q31 14OR	LEFT REAR WINDOW DRIVER (DOWN) (SWITCH)
9	Z1 20BK	GROUND



WINDSHIELD WASHER PUMP MOTOR

CAV	CIRCUIT	FUNCTION
A	V10 18BR/DB	WASHER PUMP CONTROL
B	Z1 18BK	GROUND



WINDSHIELD WIPER MOTOR

CAV	CIRCUIT	FUNCTION
A	V4 14RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
B	V3 14BR/OR	WIPER SWITCH LOW SPEED OUTPUT
C	Z1 16BK	GROUND
D	V55 20WT/GY	WIPER PARK SWITCH SENSE

8W-80 CONNECTOR PIN-OUTS

DESCRIPTION AND OPERATION

INTRODUCTION

The pages refernced in this section show the connector, the circuits in the connector and what pin the circuit occupies. Individual connector numbers are referenced on diagram pages through out Group 8W.

WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

8W-90 CONNECTOR/GROUND LOCATIONS

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying the general location of components, grounds, and connectors in the vehicle. A index is provided. Use the wiring diagrams in each section for connector/ground number identification. Refer to the index for the proper figure number.

CONNECTOR/GROUND LOCATIONS

For items not shown in this section a N/S is placed in the Fig. column

Connector Name/Number	Color	Location	Fig.
A/C Compressor Clutch	GY	Top of Compressor	4, 5
A/C Evap Temp Sensor	BK	RT Side of HVAC	11
A/C-Heater Control C1	BK	Rear of Control	11
A/C-Heater Control C2	BK	Rear of Control	11
A/C Pressure Transducer	GY	Top of A/C Compressor	4, 5
ABS Hydraulic Modulator	BK	Right Cowl Panel	3
ABS Relay Box	DK/ GY	Right Cowl Panel	3
Airbag Control Module C1	GY	At Module	14
Airbag Control Module C2	YL	At Module	14
Ash Receiver Lamp	BK	Rear of Lamp	N/S
Automatic Day/Night Mirror	BK	At Mirror	12
Autostick Switch	BK	Base of Shifter	N/S
Back-Up Lamp Switch	GY	Rear of Transmission	6
Battery Temp Sensor	BK	Near Battery	2
Blower Motor Resistor Block	BK	RT Side of HVAC	11
Body Control Module C1	BK	At Module	10
Body Control Module C2	WT	At Module	9
Body Control Module C3	WT	At Module	9

Connector Name/Number	Color	Location	Fig.
Body Control Module C4	BL	At Module	N/S
Body Control Module C5	BK	At Module	10
Brake Warn Press Sw	BK	On Master Cylinder	2
C104	LT/ GY	Under PDC	2
C105	BK	Under PDC	2
C111	BK	Rear of PCM	2
C113	GY	Rear of PCM	2
C121	GN	Left Side Cowl Panel	13
C126	BK	Near Junction Block	10
C165 (2.5L)	BK	Left Side of Intake	5
C224	BK	Left Side of Steering Column	8
C300	BK	At Lamp	N/S
C301	BK	RT Quarter Panel	N/S
C305	BK	Near Trunk Latch	15
C309	BK	Under Seat	14
C310	BR	Left A-Pillar	17
C311	BL	Left A-Pillar	17
C315	BR	Right A-Pillar	18
C316	BL	Right A-Pillar	18
C332	BK	Left Side Cowl	12
C340	BK	Under Drivers Seat	14

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
C341	BK	Under Passengers Seat	14
C342	BK	Front of Floor Console	14
Camshaft Position Sensor	BK	Left Side of Cyl Head	4
CHMSL	BK	At Lamp	16
Clockspring	NAT	Rear of Clockspring	7
Clutch Pedal Position Switch	YL	Top of Clutch Pedal Bracket	N/S
Combined Rear Lighting Module	BK	Left Rear Quarter Panel	15
Controller Anti-Lock Brake	GY	Right Fender Side Shield	3
Crankshaft Position Sensor 2.0L/2.4L	BK	Rear of Cyl Block	4
Crankshaft Position Sensor 2.5L	BK	Under Distributor	5
Data Link	BK	LT Side of Steering Column	9
Decklid Release Relay	BK	RT of Steering Column	N/S
Decklid Release Switch	BK	Center Console	N/S
Decklid Solenoid	BK	On Decklid Latch	16
Distributor C1	BK	On Distributor	5
Distributor C2	BK	On Distributor	5
Downstream Heated O2 Sensor	BK	Rear of Engine	3, 5
Driver Seat Belt Solenoid	BK	In Seat	N/S
Driver Side Airbag Squib	YL	Rear of Clockspring	7
Duty Cycle/ EVAP Purge Solenoid	GY	At Solenoid	2
Electronic EGR Transducer Solenoid	BK	At Solenoid	4, 5

Connector Name/Number	Color	Location	Fig.
Engine Coolant Temp Sensor	BK	At Sensor	4, 5
Front Vertical Motor	BK	At Motor	N/S
Fuel Injector #1 (2.0L/2.4L)	BK	At Injector	4
Fuel Injector #1 (2.5L)	BK	At Injector	N/S
Fuel Injector #2 (2.0L/2.4L)	BK	At Injector	4
Fuel Injector #2 (2.5L)	BK	At injector	5
Fuel Injecotr #3 (2.0L/2.4L)	BK	At Injector	4
Fuel Injector #3 (2.5L)	BK	At Injector	N/S
Fuel Injector #4 (2.0L/2.4L)	BK	At Injector	4
Fuel Injector #4 (2.5L)	BK	At Injector	5
Fuel Injector #5 (2.5L)	BK	At Injector	N/S
Fuel Injector #6 (2.5L)	BK	At Injector	5
Fuel Pump Module	BK	Right Side of Trunk Area	16
G100		Left Strut Tower	2
G101		Rear of Transmission	6
G102		Left Strut Tower	1
G103		Right Strut Tower	3
G200		Right I.P. Center Support	8
G201		Base of Gearshift	14
G300		Left Side of Trunk Opening	15
G301		Left Side Cowl	13
G302		Center of Deck Lid	16
G303		Right Rear Quarter Panel	15
G304		Base of Gearshift	14

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Generator (2.0L/2.4L)	BK	Rear of Generator	4
Generator (2.5L)	BK	Rear of Generator	5
Glove Box Lamp	BK	At Lamp	N/S
Headlamp Switch	BK	At Switch	N/S
High Note Horn	BK	Right Front Fender	3
Horizontal Motor	BK	At Motor	N/S
Idle Air Control Motor	BK	On Throttle Body	4, 5
Ignition Coil Pack	BK	Top of Valve Cover	4
Ignition Switch C1	BK	At Switch	7
Ignition Switch C2	BK	At Switch	7
Illuminated Entry Relay	BK	RT of Steering Column	13
Instrument Cluster C1	RD	Rear of Clustrer	9
Instrument Cluster C2	BL	Rear of Cluster	9
Intake Air Temp Sensor (2.5L)	GY	Rear of Intake	5
Intake Air Temp/Map Sensor (2.0L/2.4L)	BK	On Intake	4
Junction Block C1	BK	At Junction Block	10
Junction Block C2	BR	At Junction Block	10
Junction Block C3	WT	At Junction Block	10
Junction BLock C4	BL	At Junction Block	9
Junction Block C5	GY	At Junction Block	9
Junction Block C6	WT	At Junction Block	9
Junction Block C7	NAT	At Junction Block	9
Junction Block C8	BK	At Junction Block	10

Connector Name/Number	Color	Location	Fig.
Junction Block C9	WT	At Junction Block	10
Junction Block C10	BK	At Junction Block	13
Key-In Halo Lamp	WT	At Lamp	7
Key-In Switch	GN	At Switch	7
Left Back-Up Lamp	BK	At Lamp	N/S
Left Fog Lamp	GY	At Lamp	1
Left Door Arm/Disarm Switch	BK	At Switch	17
Left Door Courtesy Lamp	BK	At Lamp	17
Left Front Door Speaker	BK	At Speaker	17
Left Front Power Door Lock Motor	BK	At Motor	17
Left Front Power Door Lock Switch	WT	At Switch	17
Left Front Power Window Motor	BK	At Motor	17
Left Front Wheel Speed Sensor	BK	Left Fender Side Shield	1
Left Headlamp	BK	At Lamp	1
Left Park/Trun Signal Lamp	BK	At Lamp	1
Left Power Mirror	RD	At Mirror	17
Left Rear Power Window Motor	RD	At Motor	N/S
Left Rear Speaker	BK	At Speaker	14
Left Rear Wheel Speed Sensor	BK	Left Quarter Panel	16
Left Tail/Stop/ Turn Lamp C1	BK	At Lamp	15
Left Visor/Vanity Lamp	BK	At Lamp	12
License Plate Lamp	BK	At Lamp	N/S

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Low Note Horn	BK	Right Front Fender	3
MAP Sensor (2.5L)	BK	Rear of Intake	5
Master Power WIndow Switch	BK	At Switch	17
Mode Door Actuator	NAT	LT Side of HVAC	11
Multi-Function Switch (Left)	BK	Left Side of Switch	7
Multi-Function Switch (Right)	BL	Right Side of Switch	7
Oil Pressure Switch	BK	At Switch	4, 5
Output Shaft Speed Sensor	BK	Front of Transmission	6
Overhead Map Lamp	BK	At Lamp	12
Passenger Side Airbag	YL	At Airbag	9
Power Amplifier C1	GY	At Amplifier	N/S
Power Amplifier C2	BK	At Amplifier	N/S
Power Amplifier C3	BL	At Amplifier	14
Power Mirror Switch	BK	At Switch	17
Power Seat Switch	BK	Under Seat	N/S
Power Steering Pressure Switch	BL	Left Side of Steering Gear	1
Power Top Pump Motor	RD	Front Center of Trunk Area	16
Power Top Switch	BK	Center Console	N/S
Power Top Up/Down Relays	BK	Front Center of Trunk Area	16
Powertrain Control Module C1	BK	Side of PDC	1
Powertrain Control Module C2	BK	Side of PDC	2
PRNDL Illumination LED	BK	Base of Gearshifter	N/S

Connector Name/Number	Color	Location	Fig.
Radiator Fan Motor	BK	Rear of Motor	1
Radio C1	BK	Rear of Radio	8
Radio C2	GY	Rear of Radio	8
Radio CCD Bus C3	BK	Rear of Radio	8
Rear Floor Courtesy Lamp	BK	At Lamp	N/S
Rear Vertical Motor	BK	At Motor	N/S
Recline Motor	BK	At Motor	N/S
Right Back-Up Lamp	BK	At Lamp	N/S
Right Fog Lamp	GY	At Lamp	3
Right Front Door Arm/ Disarm Switch	BK	At Switch	18
Right Front Door Courtesy Lamp	BK	At Lamp	N/S
Right Front Door Speaker	BK	At Speaker	18
Right Door Window Motor Relay	BK	In Left Door	N/S
Right Front I.P. Speaker	BK	At Speaker	8
Right Front Power Door Lock Motor	BK	At Motor	18
Right Front Power Door Lock Switch	WT	At Switch	18
Right Front Power Window Motor	BK	At Motor	18
Right Front Power Window Switch	BL	At Switch	18
Right Front Wheel Speed Sensor	BK	Right Fender Side Shield	3
Right Headlamp	BK	At Lamp	3
Right Park/Turn Signal Lamp	BK	At Lamp	3
Right Power Mirror	RD	At Mirror	18

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Right Rear Power Window Motor	RD	At Motor	N/S
Right Rear Speaker	BK	At Speaker	N/S
Right Rear Wheel Speed Sensor	BK	Right Side Trunk Area	16
Right Tail/Stop/ Turn Lamp	BK	At Lamp	N/S
Right Visor/ Vanity Lamp	BK	At Lamp	15
Seat Belt Control Module	BK	Rear of Center Console	14
Seat Belt Switch	BK	In Buckle	12
Speed Proporitional Steering Module	BK	Left Side of Steering Gear	1
Stop Lamp Switch	GY	Top of Brake Pedal	13
Throttle Position Sensor	BK	On Throttle Body	4, 5
Transmission Control Module	BK	Next to PDC	2
Transmission Range Switch	BK	Front of Transmision	6
Transmission Solenoids and Pressure Switches	BK	Front of Transmission	6

Connector Name/Number	Color	Location	Fig.
Traveler	BK	Rear of Traveler	N/S
Trunk Key Cylinder Switch	BK	At Switch	16
Trunk Lamp	BK	At Lamp	15
Turbine Speed Sensor	BK	Front of Transmission	6
Upstream Heated O2 Sensor	BK	Rear of Generator	4, 5
Vapor Canister/Leak Detection Pump	BK	Right Front Fender	3
Vehicle Speed Control Servo	BK	At Servo	2
Vehicle Speed Control and Horn Switches	BK	Rear of Clockspring	N/S
Windshiel Washer Pump Motor	BK	Bottom of Reservior	3
Windshield Wiper Motor	LT/ GY	Left Strut Tower	1

DESCRIPTION AND OPERATION (Continued)

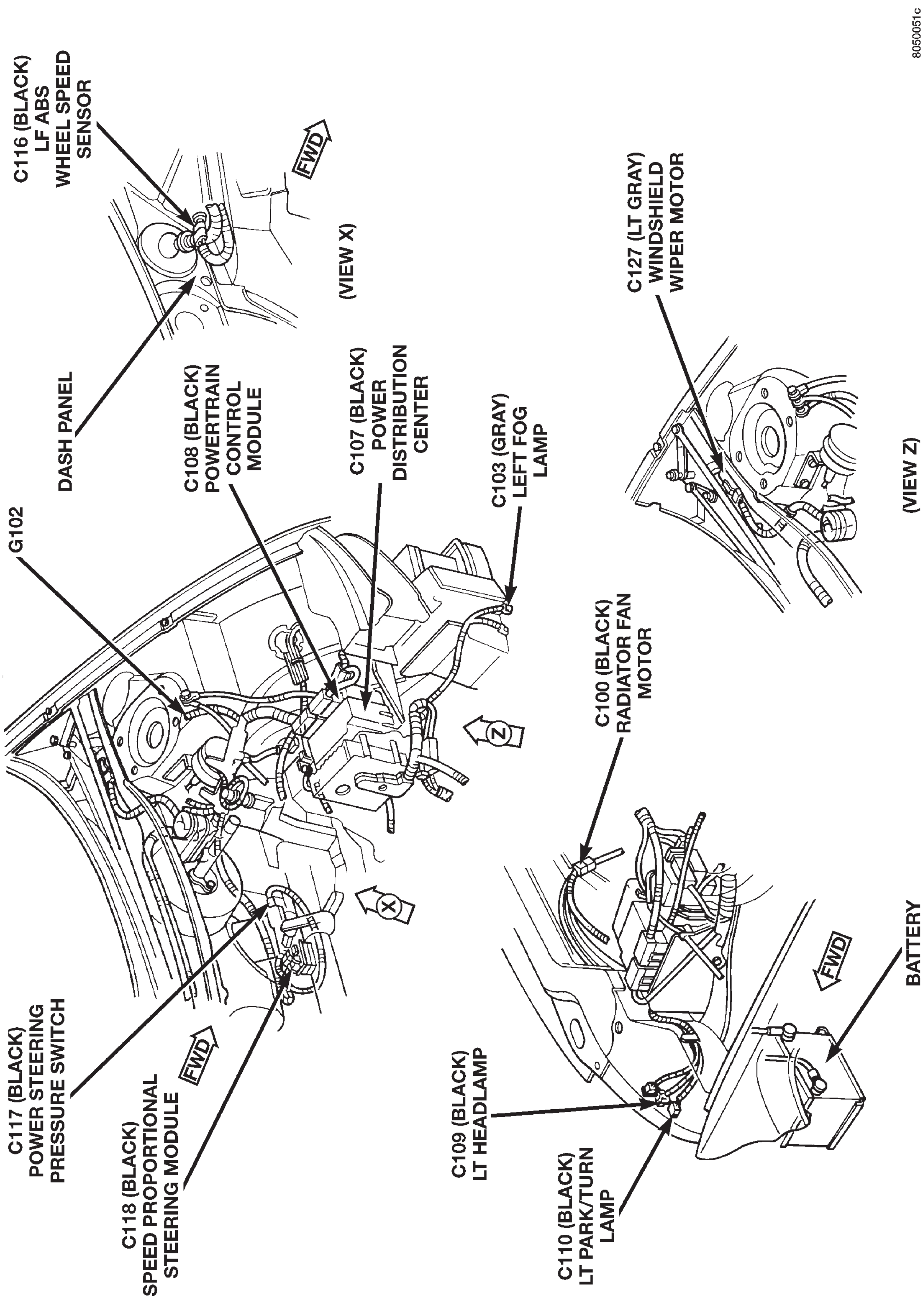


Fig. 1 Engine Compartment Connections (Left Side)

DESCRIPTION AND OPERATION (Continued)

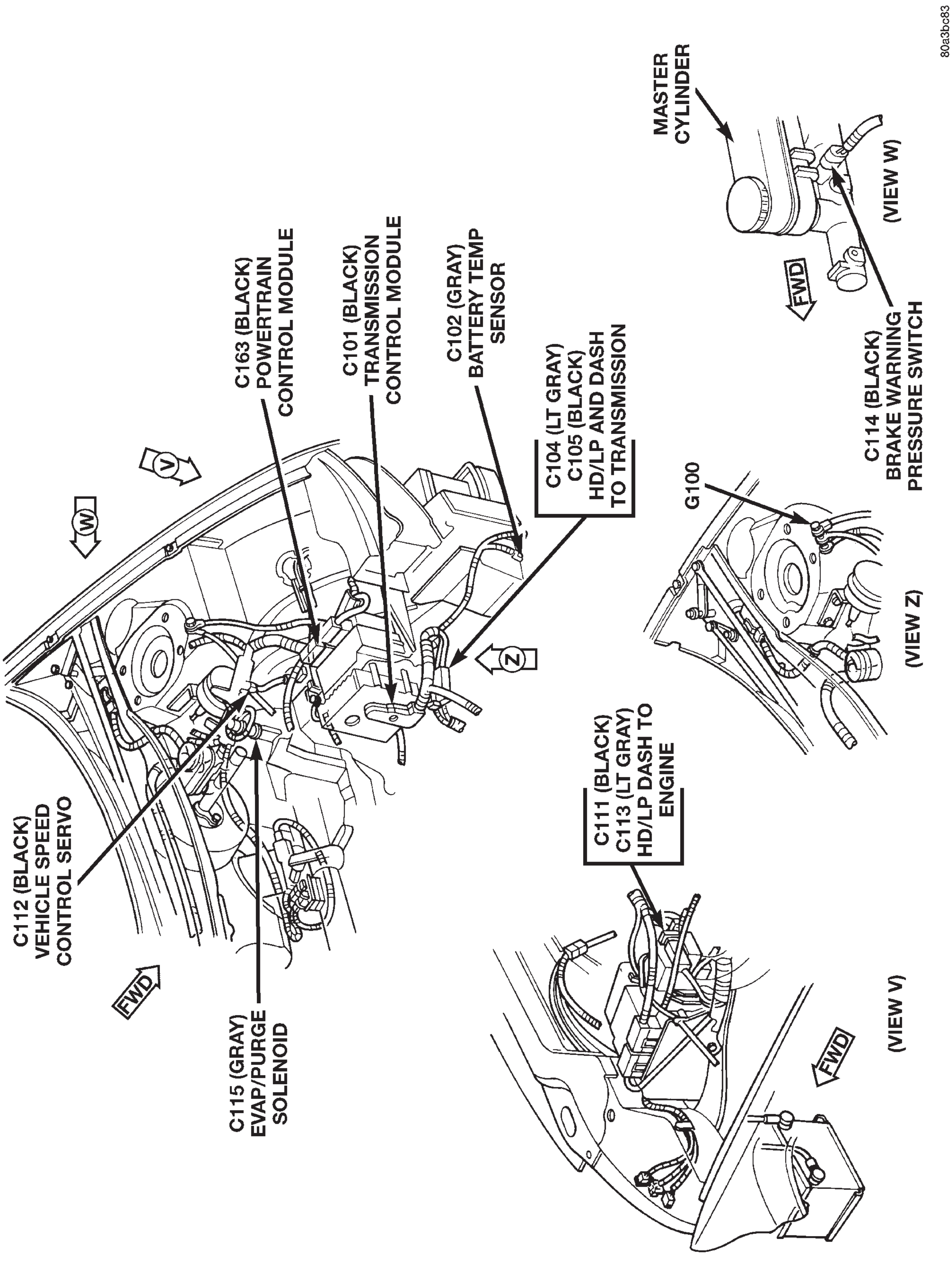


Fig. 2 Engine Compartment Connections (Left Side)

DESCRIPTION AND OPERATION (Continued)

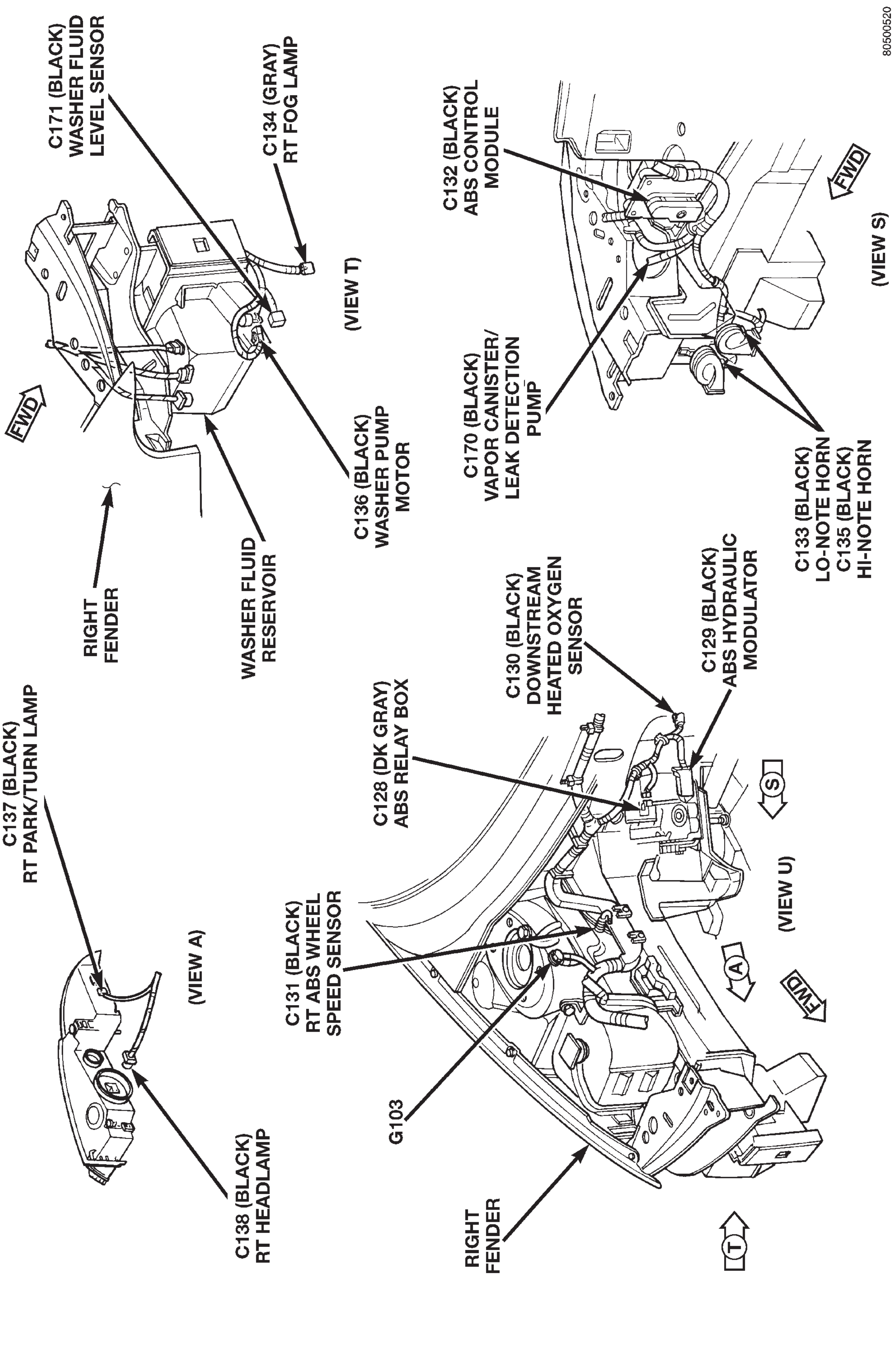


Fig. 3 Engine Compartment Connections (Right Side)

DESCRIPTION AND OPERATION (Continued)

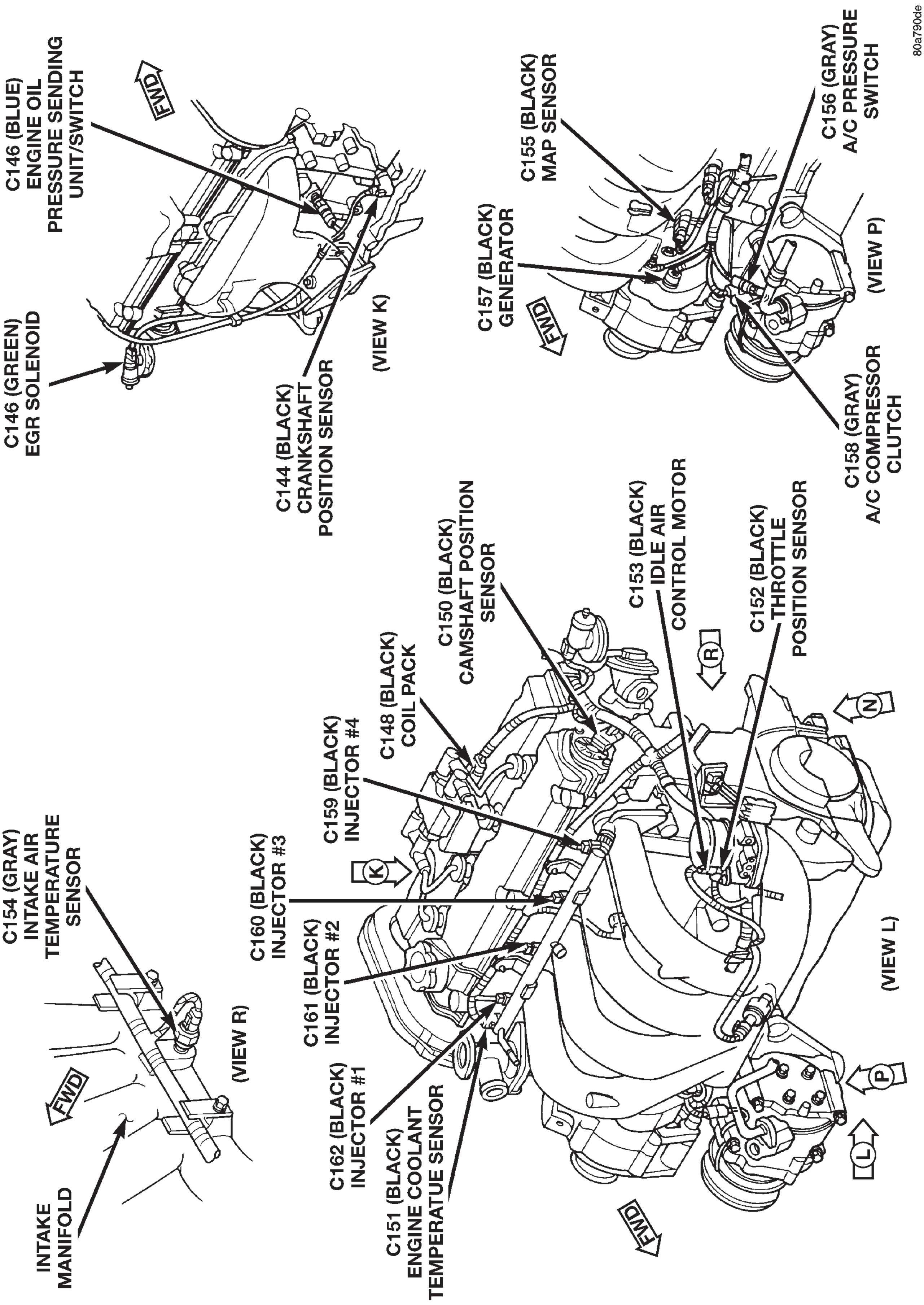


Fig. 4 Engine Connections (2.4L)

DESCRIPTION AND OPERATION (Continued)

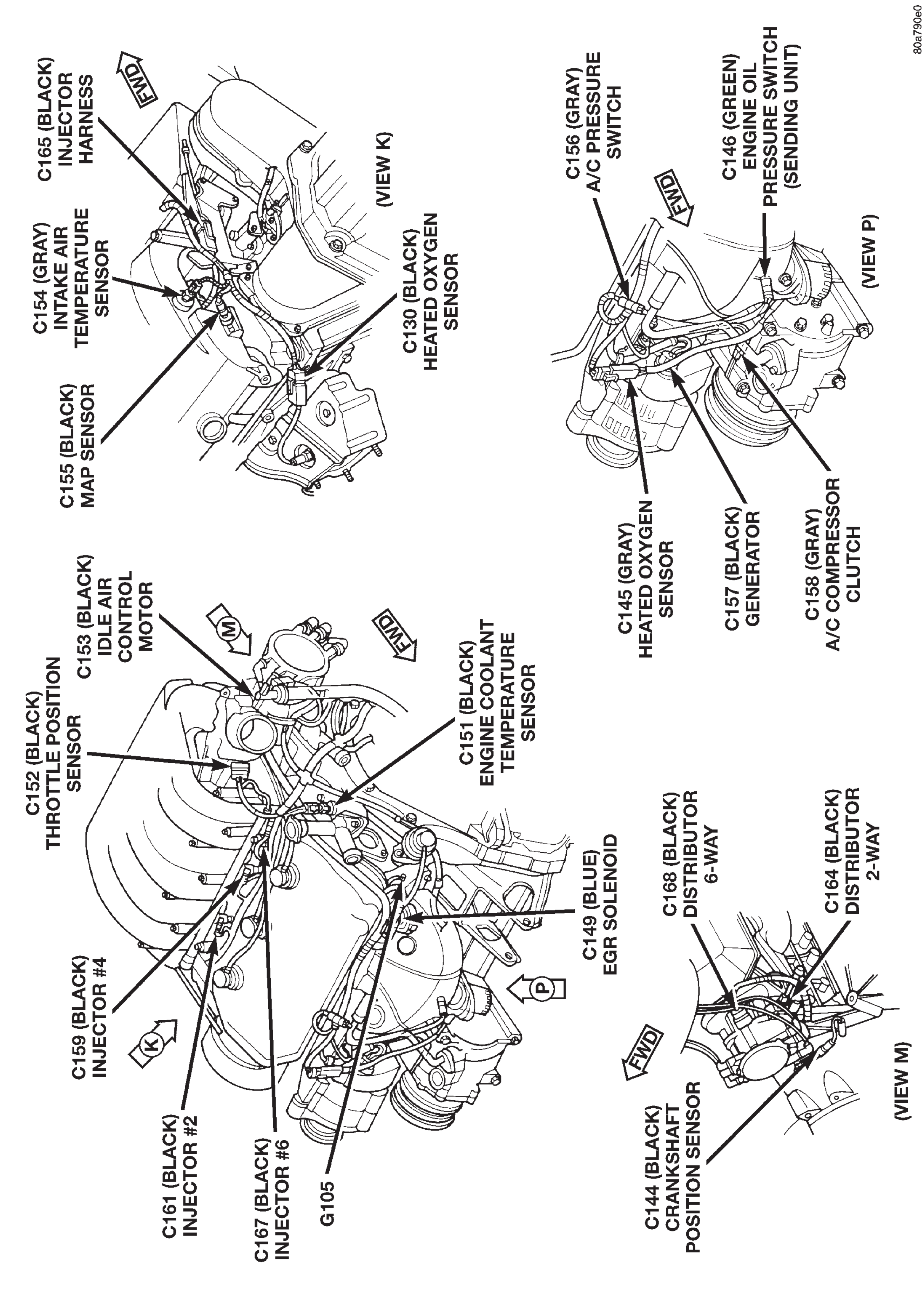


Fig. 5 Engine Connections (2.5L)

DESCRIPTION AND OPERATION (Continued)

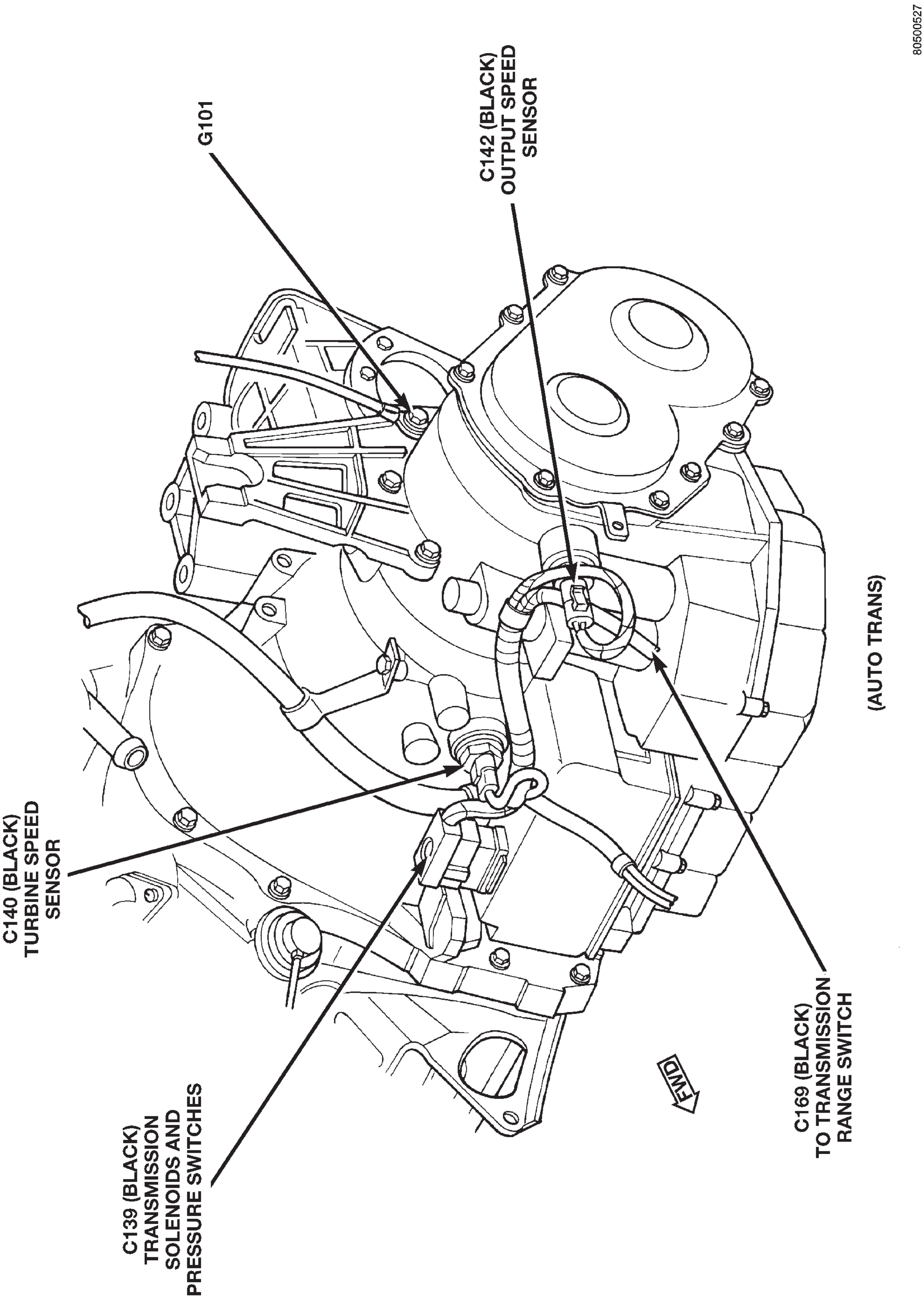


Fig. 6 Transmission Connections

DESCRIPTION AND OPERATION (Continued)

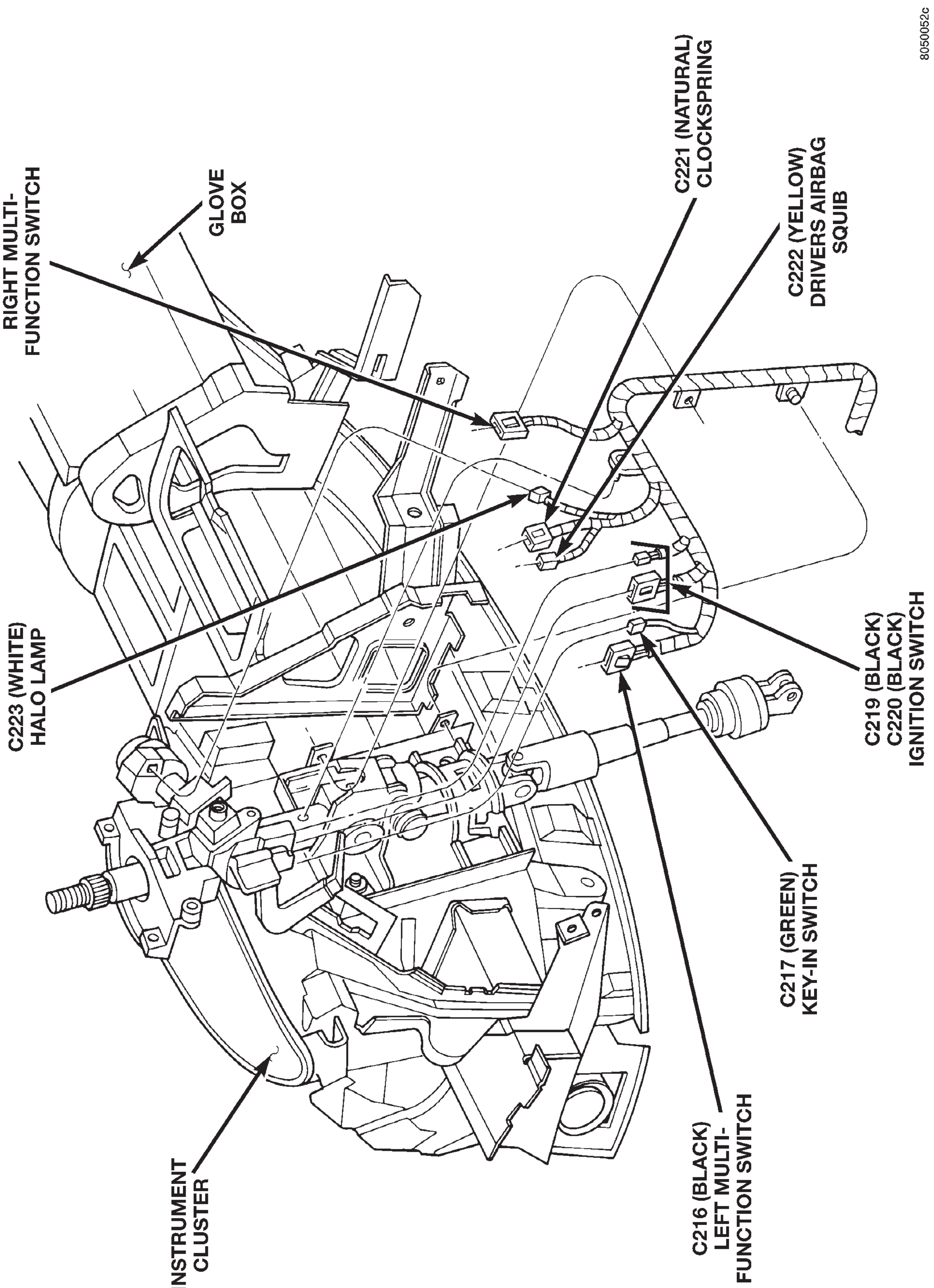


Fig. 7 Steering Column Connections

DESCRIPTION AND OPERATION (Continued)

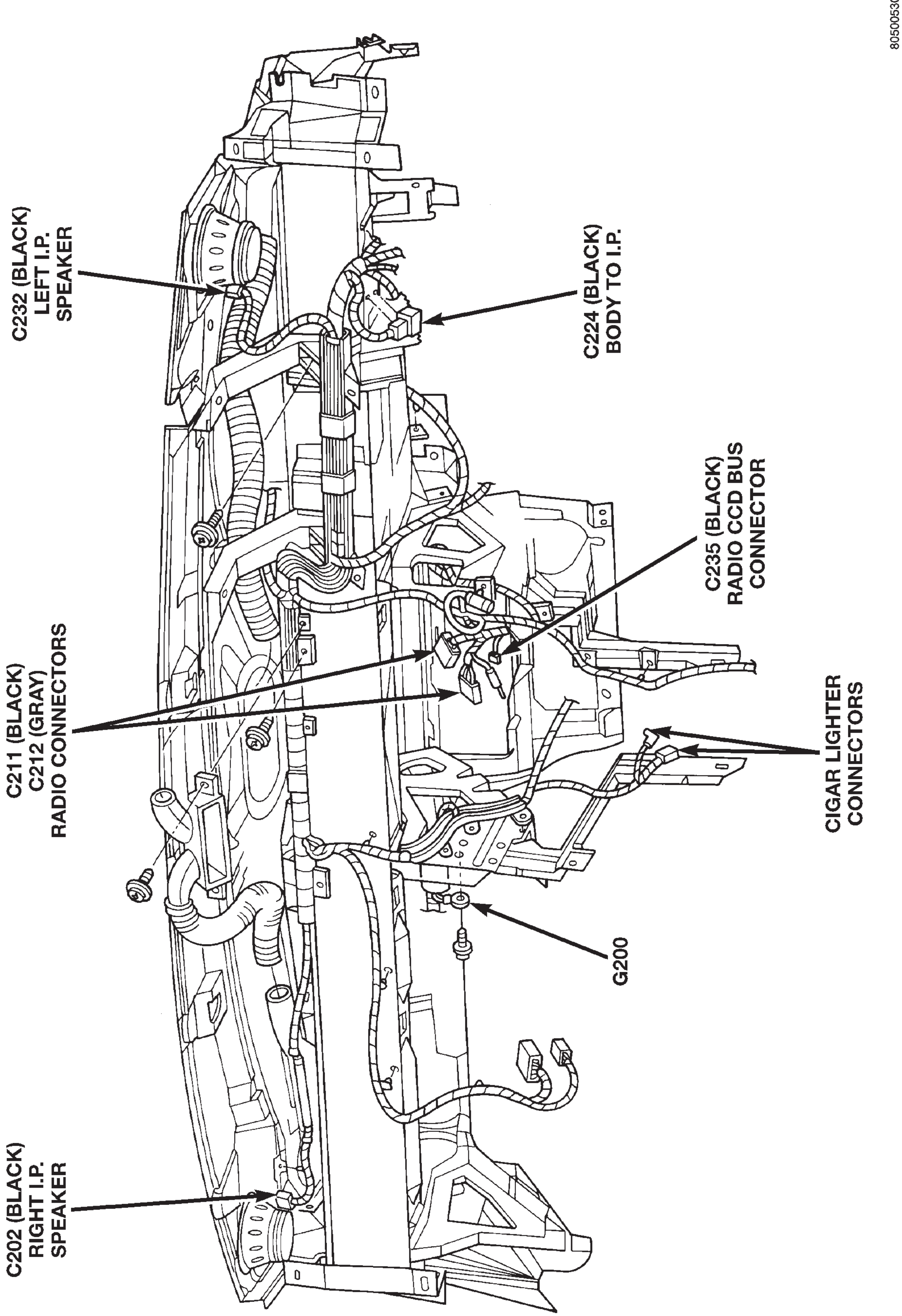


Fig. 8 Instrument Panel Connections

DESCRIPTION AND OPERATION (Continued)

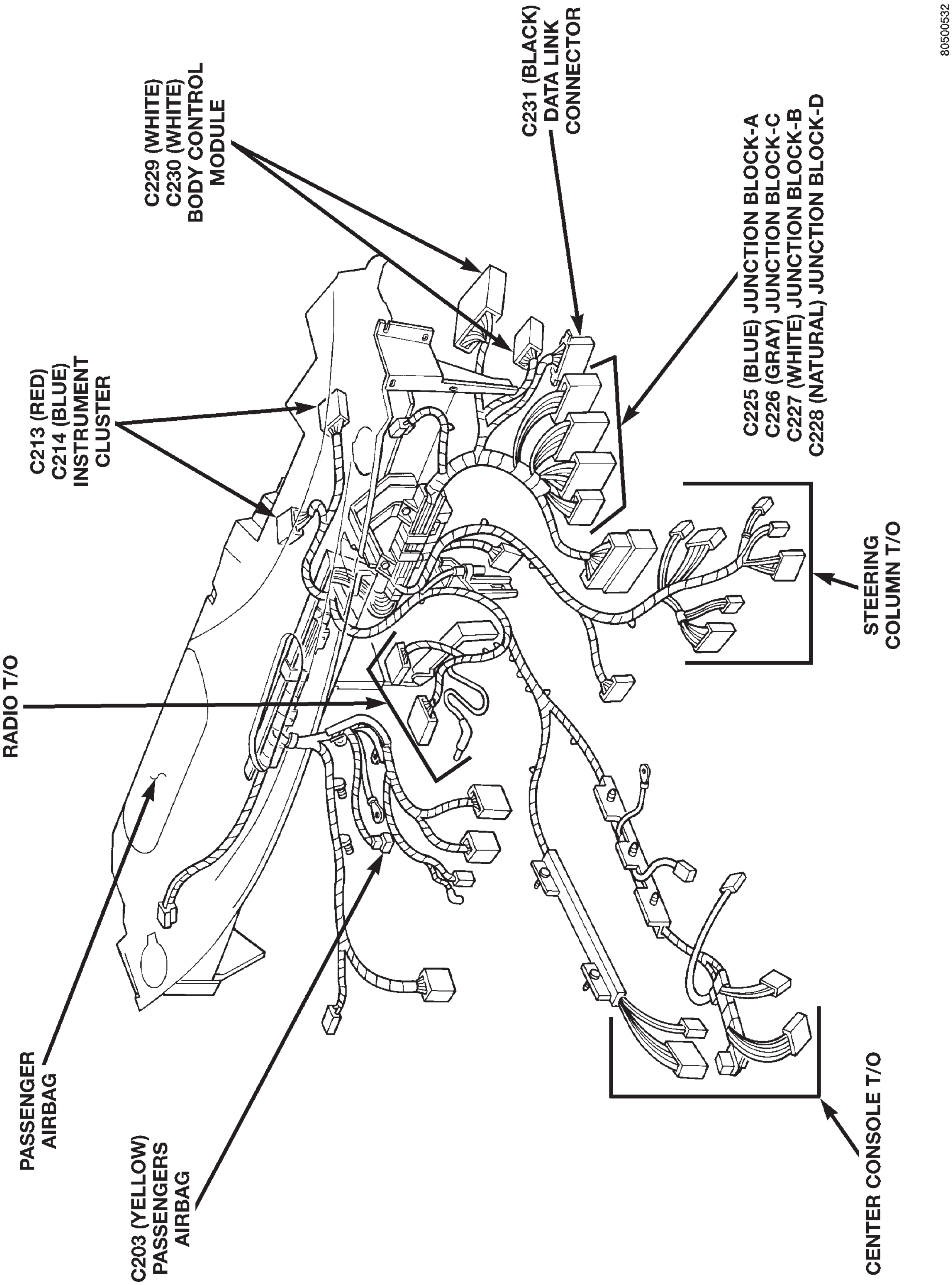


Fig. 9 Instrument Panel Connections

DESCRIPTION AND OPERATION (Continued)

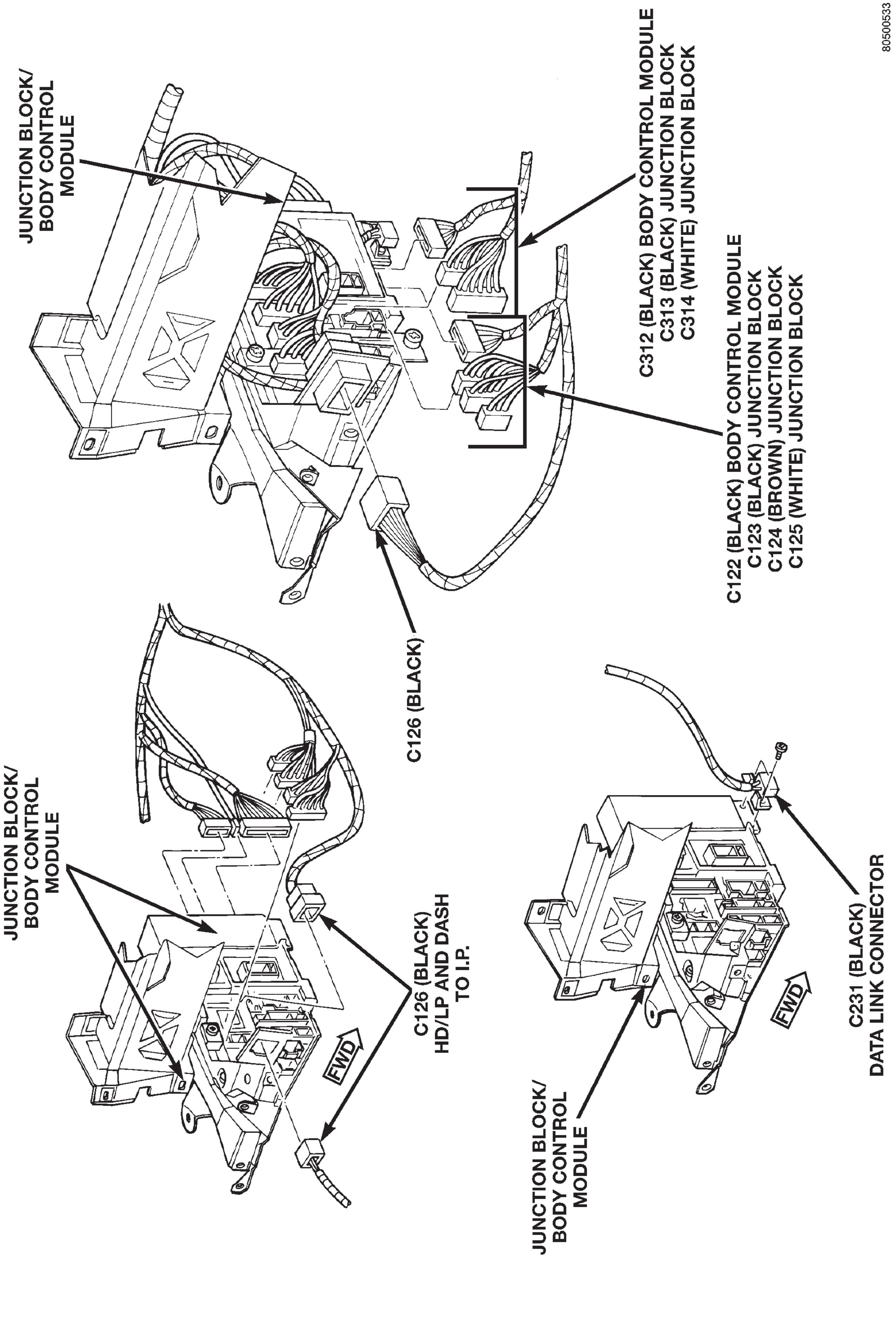


Fig. 10 Junction Block Connections

DESCRIPTION AND OPERATION (Continued)

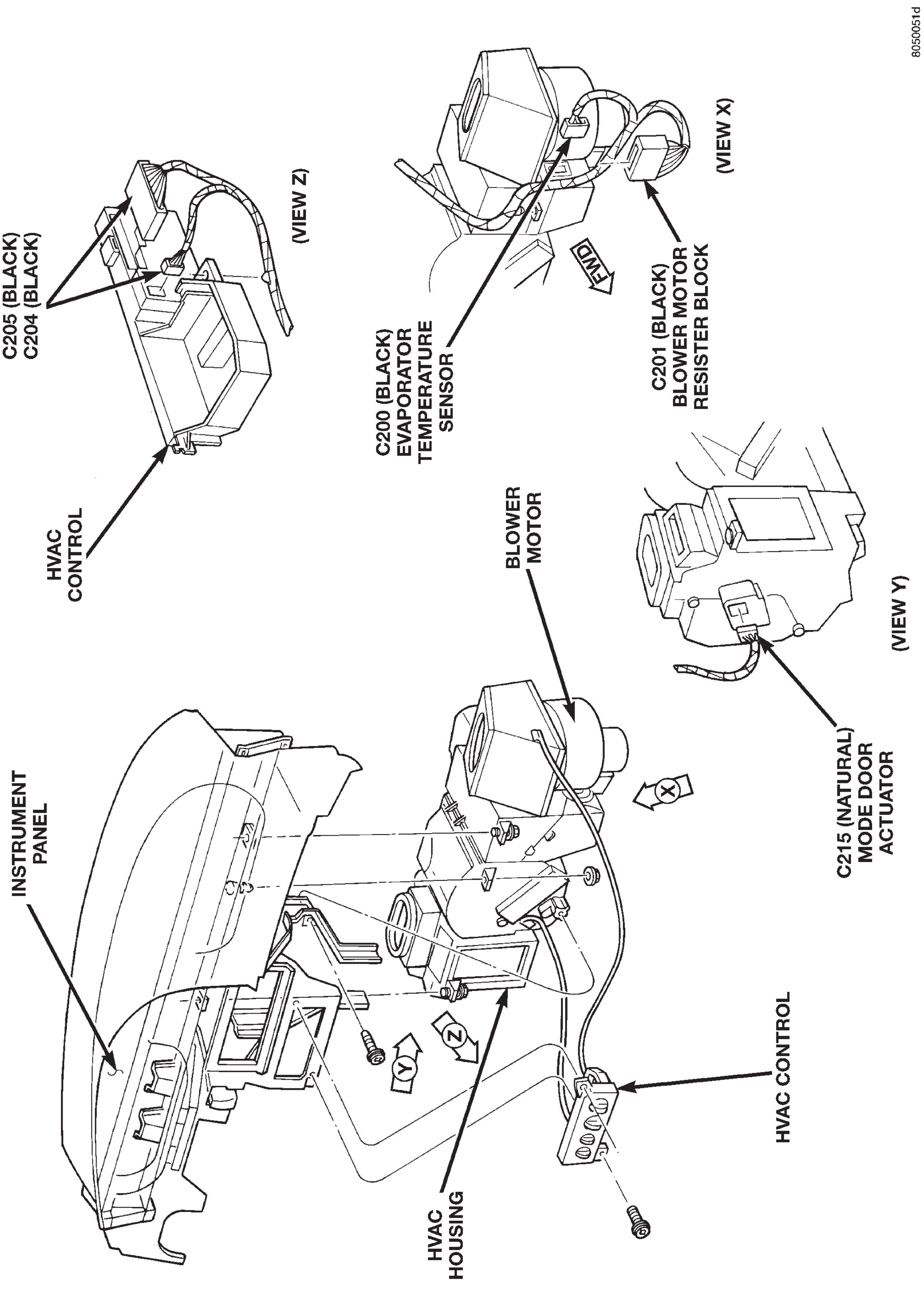


Fig. 11 HVAC Connections

DESCRIPTION AND OPERATION (Continued)

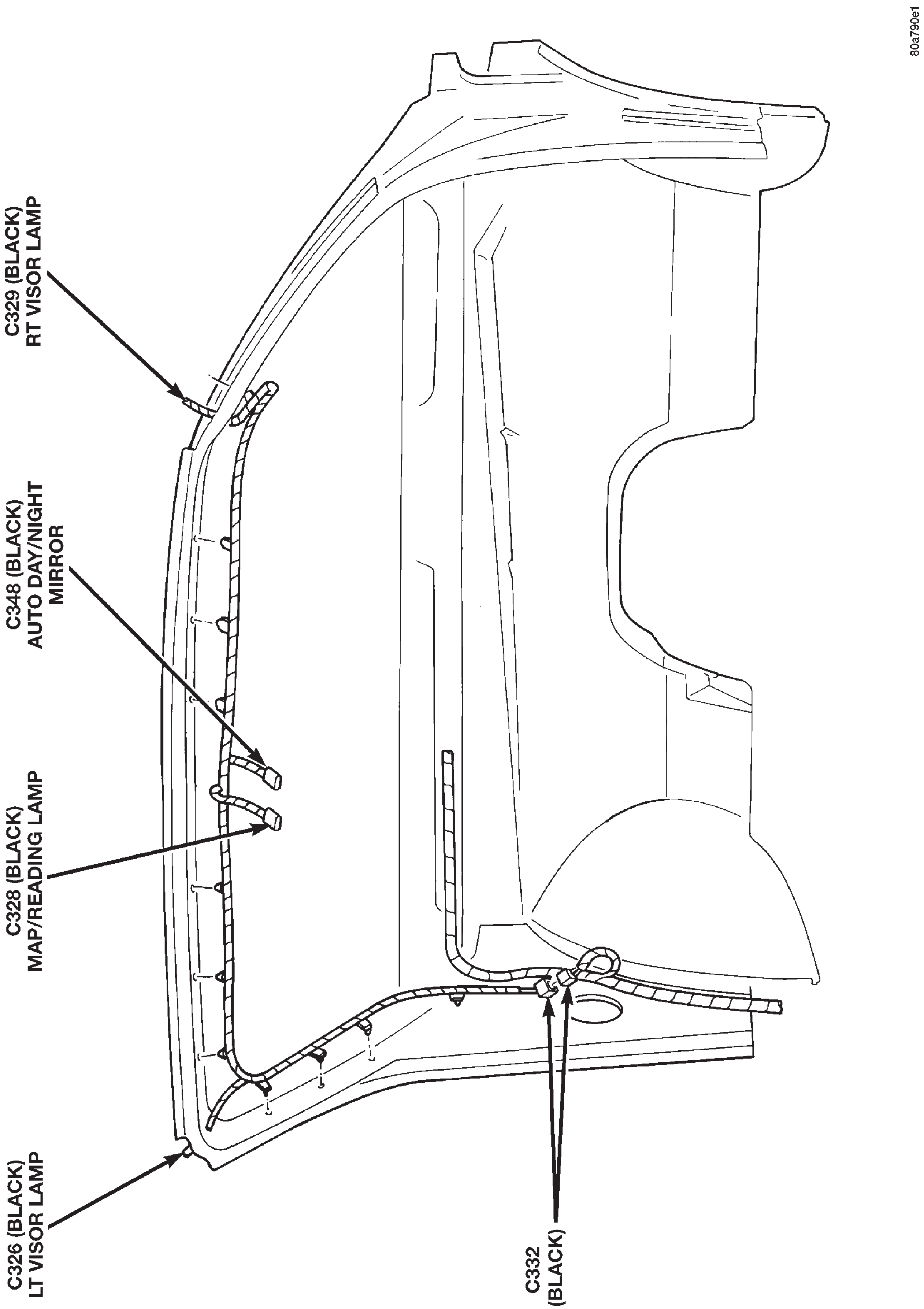


Fig. 12 Windshield Header Connections

DESCRIPTION AND OPERATION (Continued)

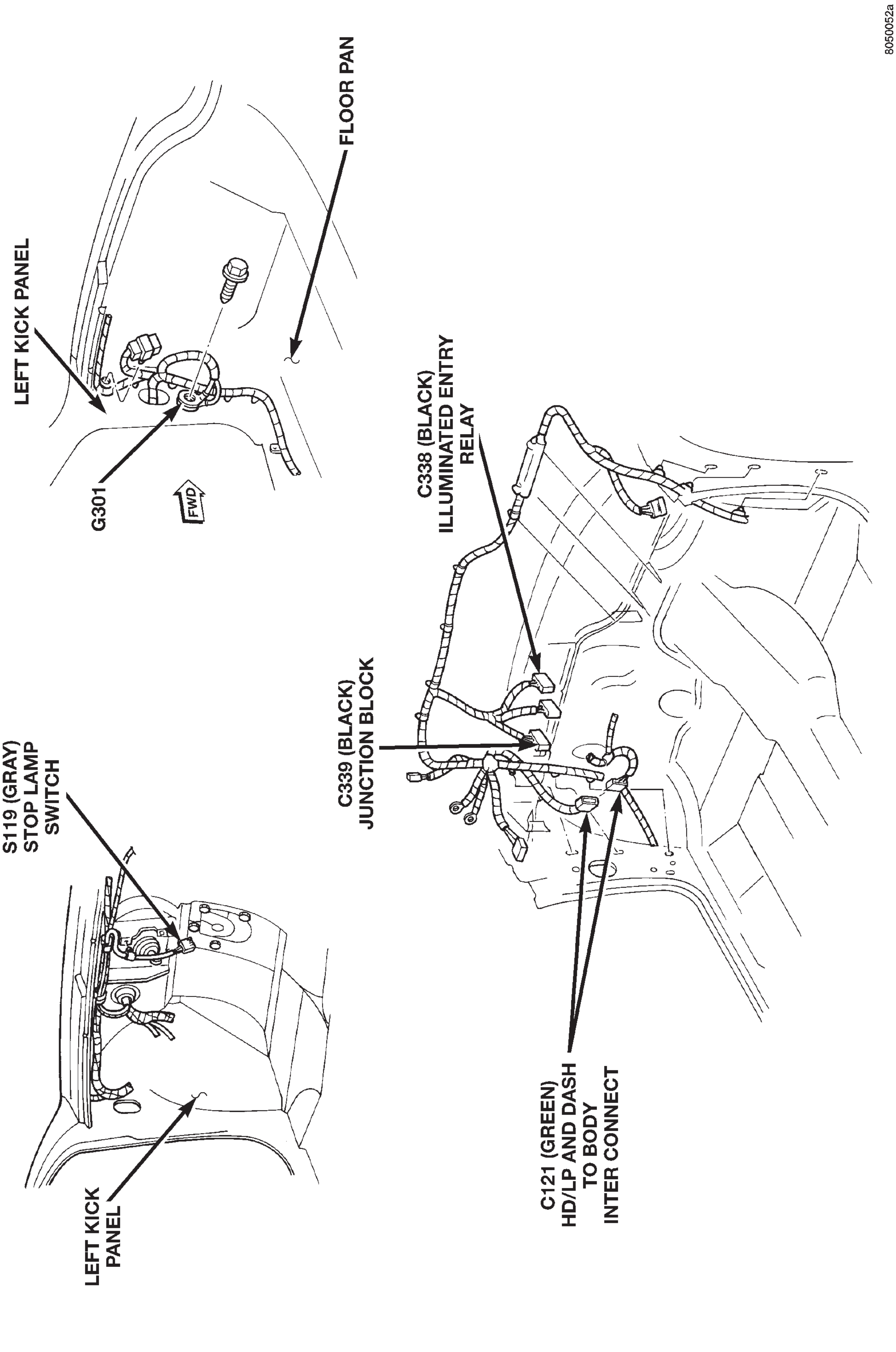


Fig. 13 Cowl Panel Connections

DESCRIPTION AND OPERATION (Continued)

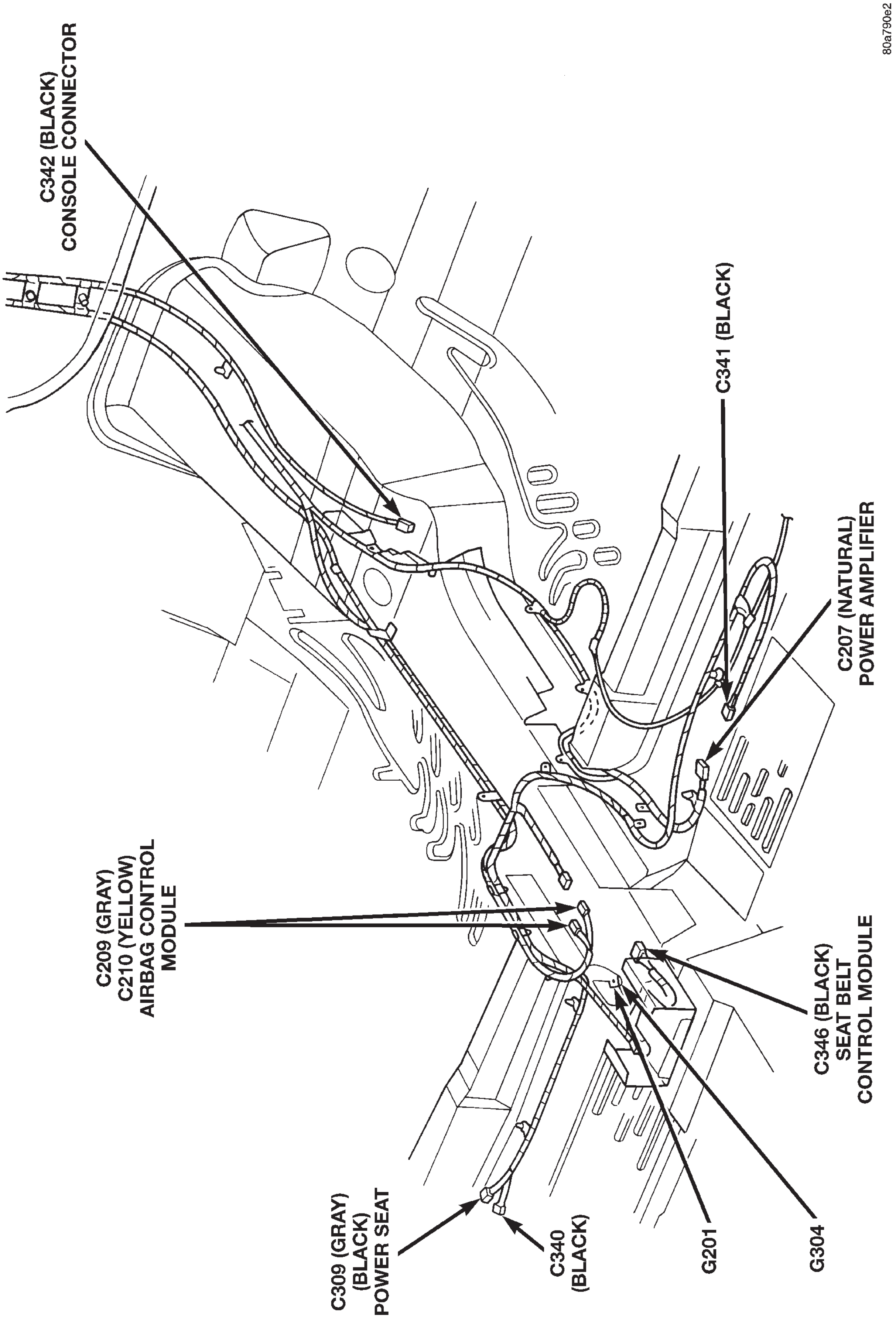


Fig. 14 Console Connections

DESCRIPTION AND OPERATION (Continued)

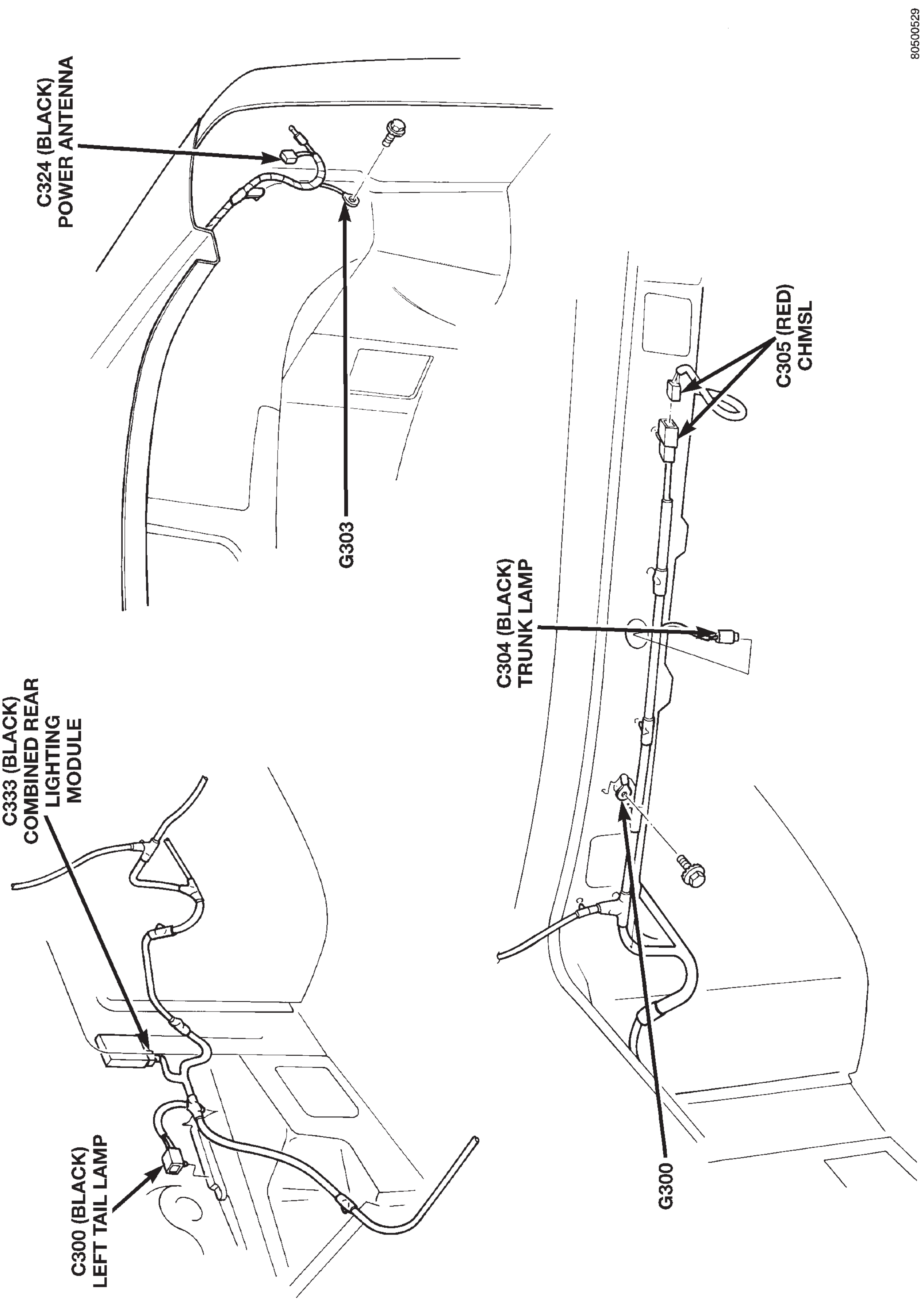


Fig. 15 Trunk Connections

DESCRIPTION AND OPERATION (Continued)

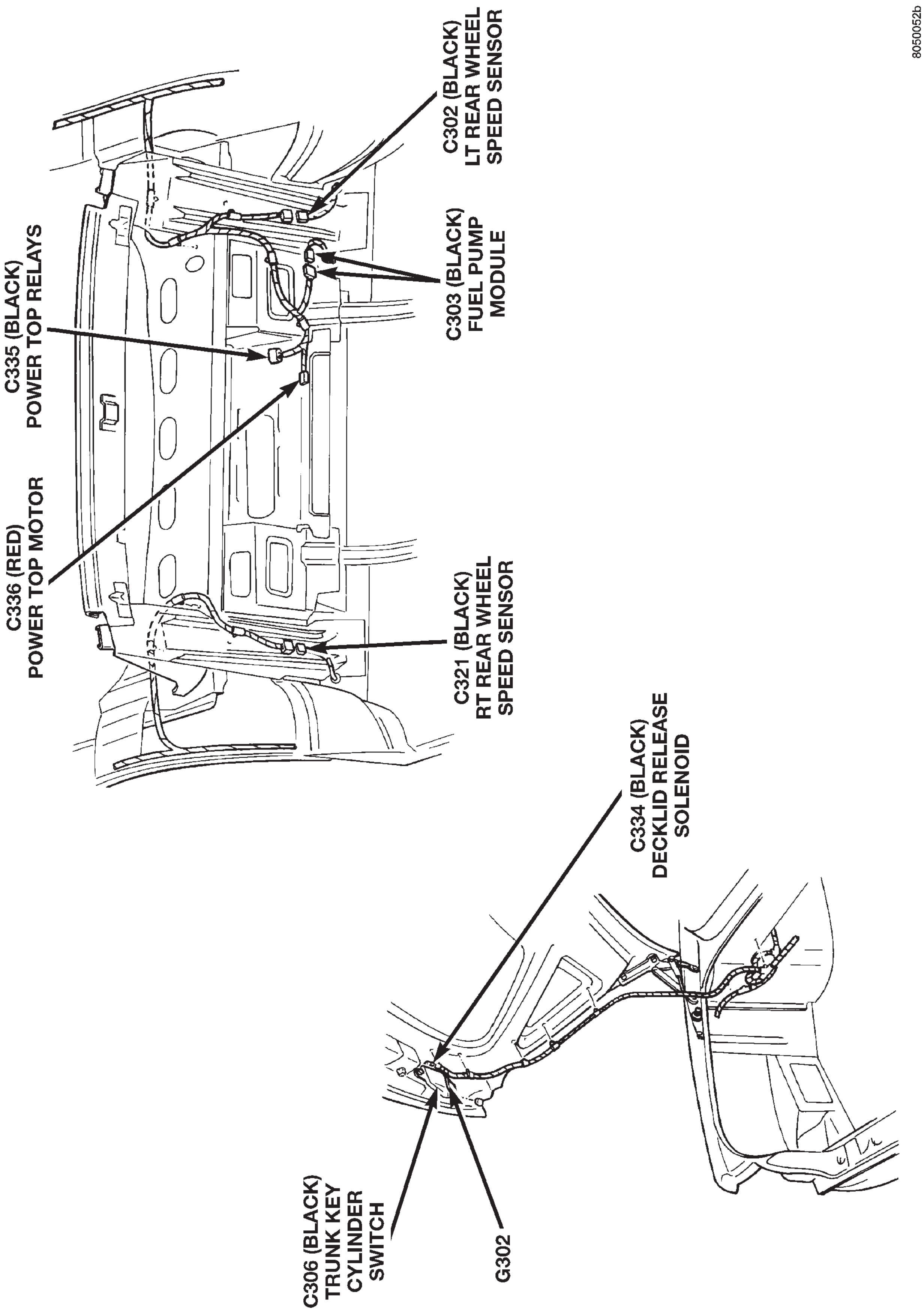


Fig. 16 Body Connections

DESCRIPTION AND OPERATION (Continued)

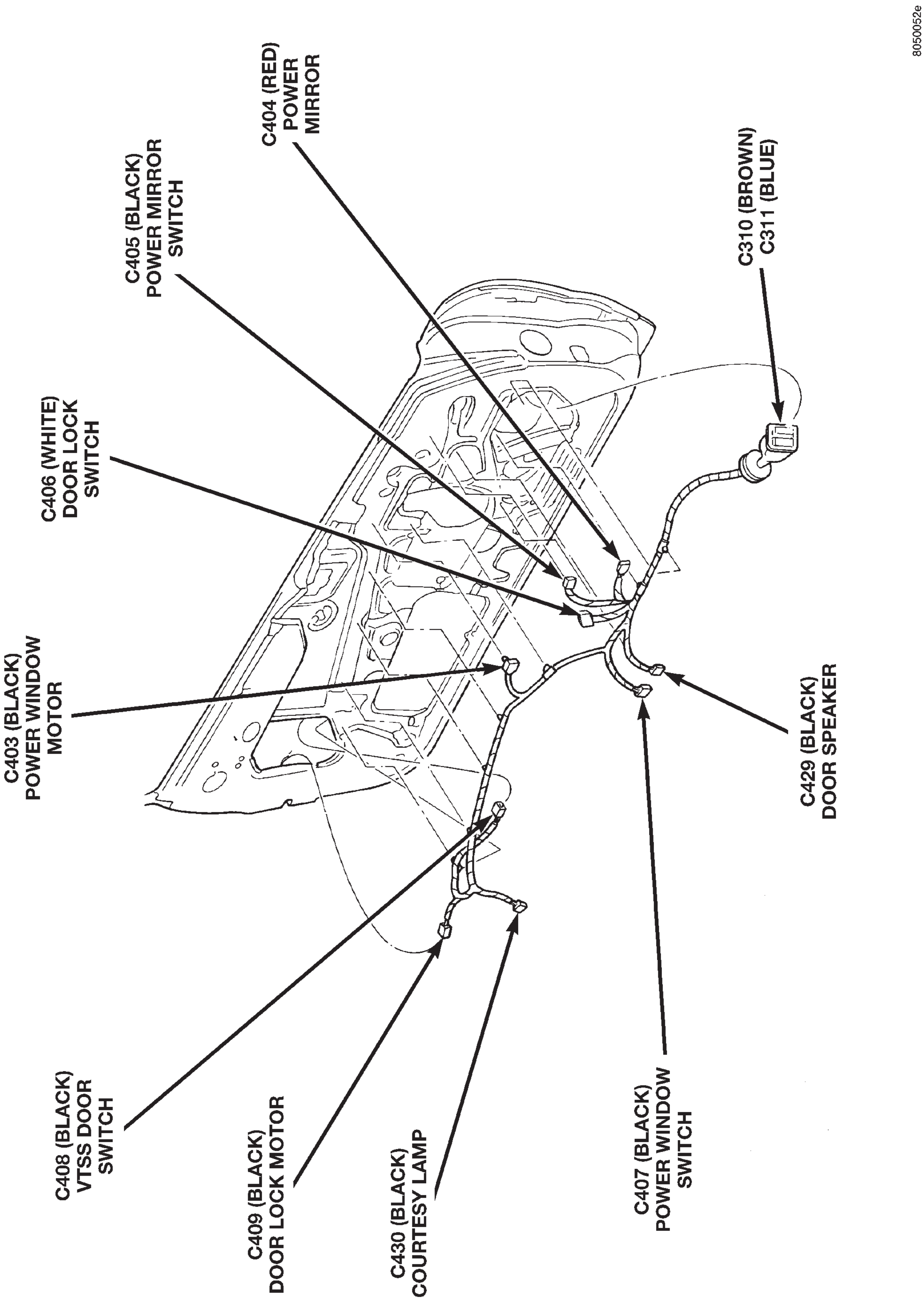


Fig. 17 Door Connections (Left)

DESCRIPTION AND OPERATION (Continued)

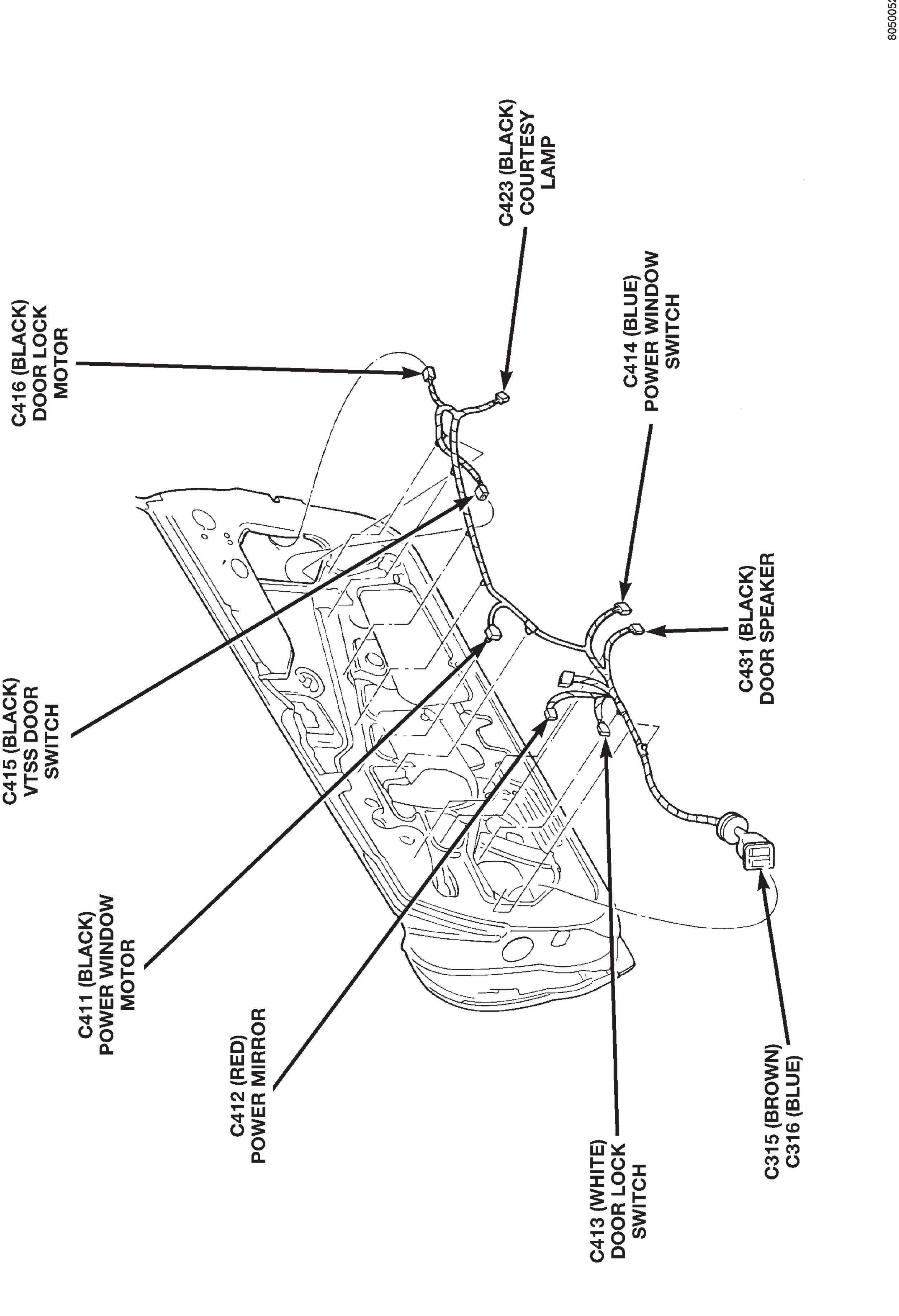


Fig. 18 Door Connections (Right)

8W-95 SPLICE LOCATIONS

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying the general location of the splices in this vehicle. A splice index is provided. Use the wiring diagrams in each section for splice number identification. Refer to the index for the proper splice number.

SPLICE LOCATIONS

For splices not shown in this section a N/S is placed in the Fig. column.

Splice Number	Location	Fig.
S100	In T/O for TCM	1
S101	Left Strut Tower	1
S102	Internal to the PDC	1
S103	Internal to the PDC	1
S104	Internal to the PDC	1
S105	Internal to the PDC	1
S106	Internal to the PDC	1
S107	Internal to the PDC	1
S108	Near T/O for PCM connector	1
S109	Left Strut Tower	1
S110	Internal to the PDC	1
S111	Right Strut Tower	3
S112	Rt Side of Dash Panel	3
S113 (2.4L)	Near T/O for MAP/IAT Sensor	5
S113 (2.5L)	In Generator T/O	6
S114 (2.4L)	In Injector T/O	5
S114 (2.5L)	Between Inj #2 and #4	N/S
S115 (2.4L)	Near T/O for MAP/IAT Sensor	5
S115 (2.5L)	Near EGR T/O	6
S116 (2.4L)	Near T/O for MAP/IAT Sensor	5
S116 (2.5L)	Near Inj #6 T/O	6
S117 (2.4L)	Near T/O for Cam Sensor	5
S117 (2.5L)	Near IAC Motor T/O	6
S118 (2.4L)	Near Engine Starter Motor T/O	5
S118 (2.5L)	Near T/O for ECT Sensor	6
S119	In Starter Motor T/O	N/S
S120	Near T/O for PCM	2, 6
S121 (2.5L)	In T/O for PCM	2
S122	In T/O for PCM	2
S123	In Fuel Rail Harness	6
S124 (2.4L)	Near T/O for Nosie Suppressor	N/S
S124 (2.5L)	Near Distributor T/O	6
S125	Near T/O for Turbine Speed Sensor	4
S126	Near EGR T/O	N/S
S127	Near T/O for PDC	1
S129	Near Stop Lamp SW T/O	N/S
S130	Near T/O for PCM Connector	2
S131 (2.4L)	In T/O for PCM Connector	2
S132 (2.4L)	In T/O for PCM Connector	2
S133 (2.4L)	In Ignition Coil T/O	5
S200	In T/O for Cigar Lighter	7
S201	Near T/O for Red Cluster Connector	7
S202	Near T/O for Red Cluster Connector	7
S203	Near T/O for Mode Door Actuator	N/S
S301	Near T/O for Combined Rear Lighting Module	9
S302	Near Map/Reading Lamp T/O	8
S303	Near LT Visor Lamp T/O	8
S304	Near T/O for Rear Wdo Defogger Feed T/O	9
S305	In T/O for BCM	8
S306	In T/O for BCM	8
S307	In T/O for BCM	8
S308	Near T/O for Courtesy Lamp Relay	8
S310	Near T/O for Courtesy Lamp Relay	8
S311	Near T/O for Courtesy Lamp Relay	8
S312	Left Kick Panel	8
S400	Near Door Speaker T/O	10
S401	Near Door Speaker T/O	10
S402	Near Door Connector	10
S403	Near Door Connector	10
S404	Near Back Up Lamp T/O	N/S
S405	Near Gromet	N/S
S406	In Tail Lamp	N/S
S407	In Tail Lamp	N/S
S408	In Tail Lamp	N/S
S409	In Tail Lamp	N/S

DESCRIPTION AND OPERATION (Continued)

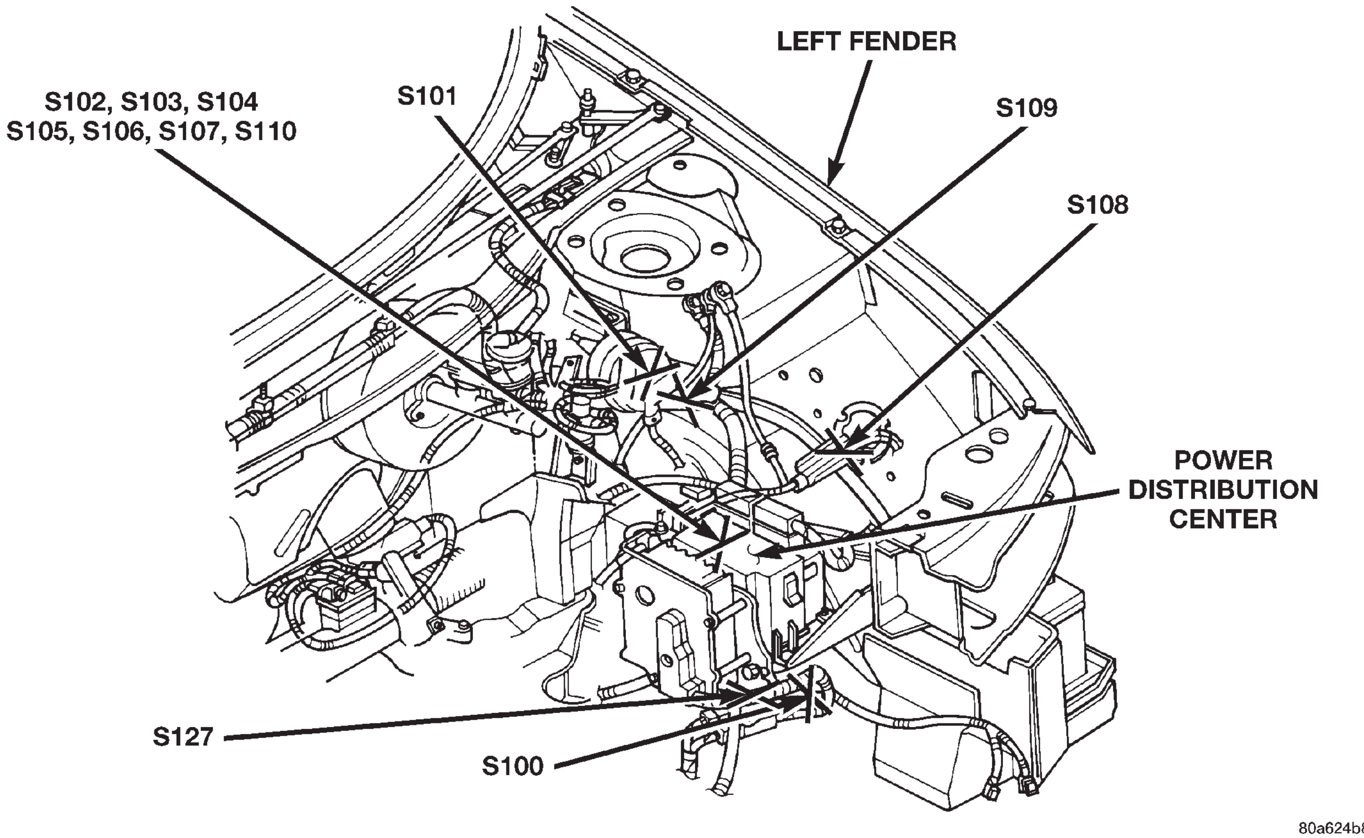


Fig. 1 Engine Compartment Splices

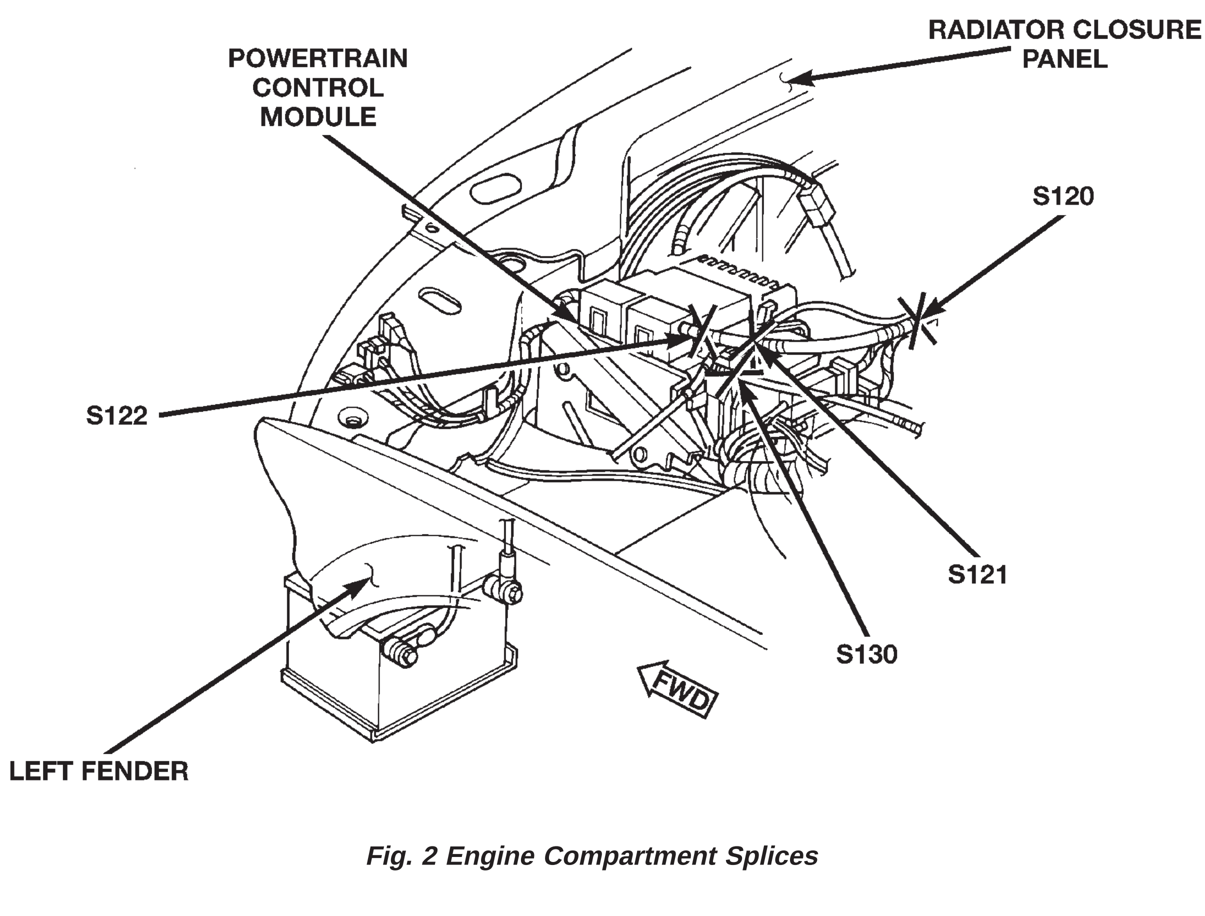


Fig. 2 Engine Compartment Splices

DESCRIPTION AND OPERATION (Continued)

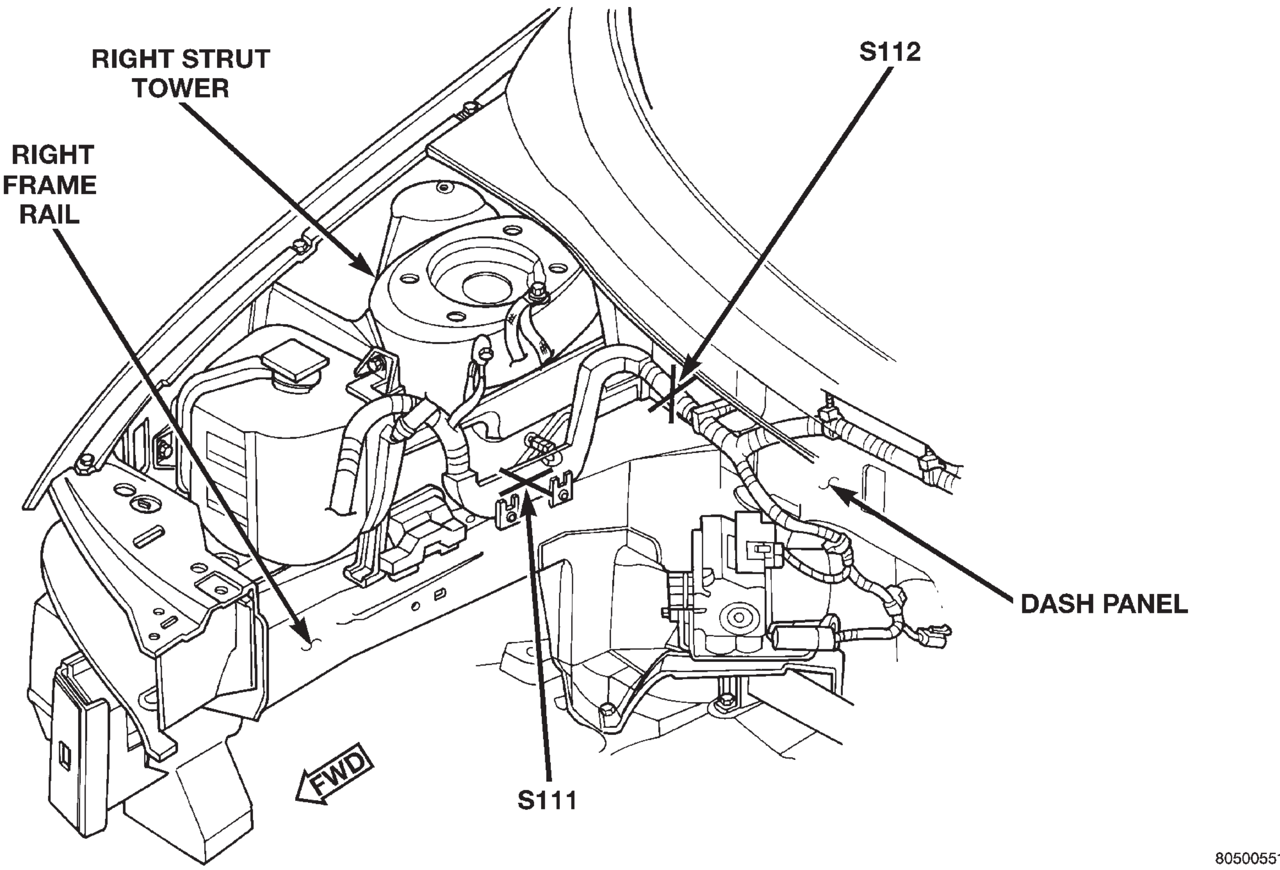


Fig. 3 Engine Compartment Splices

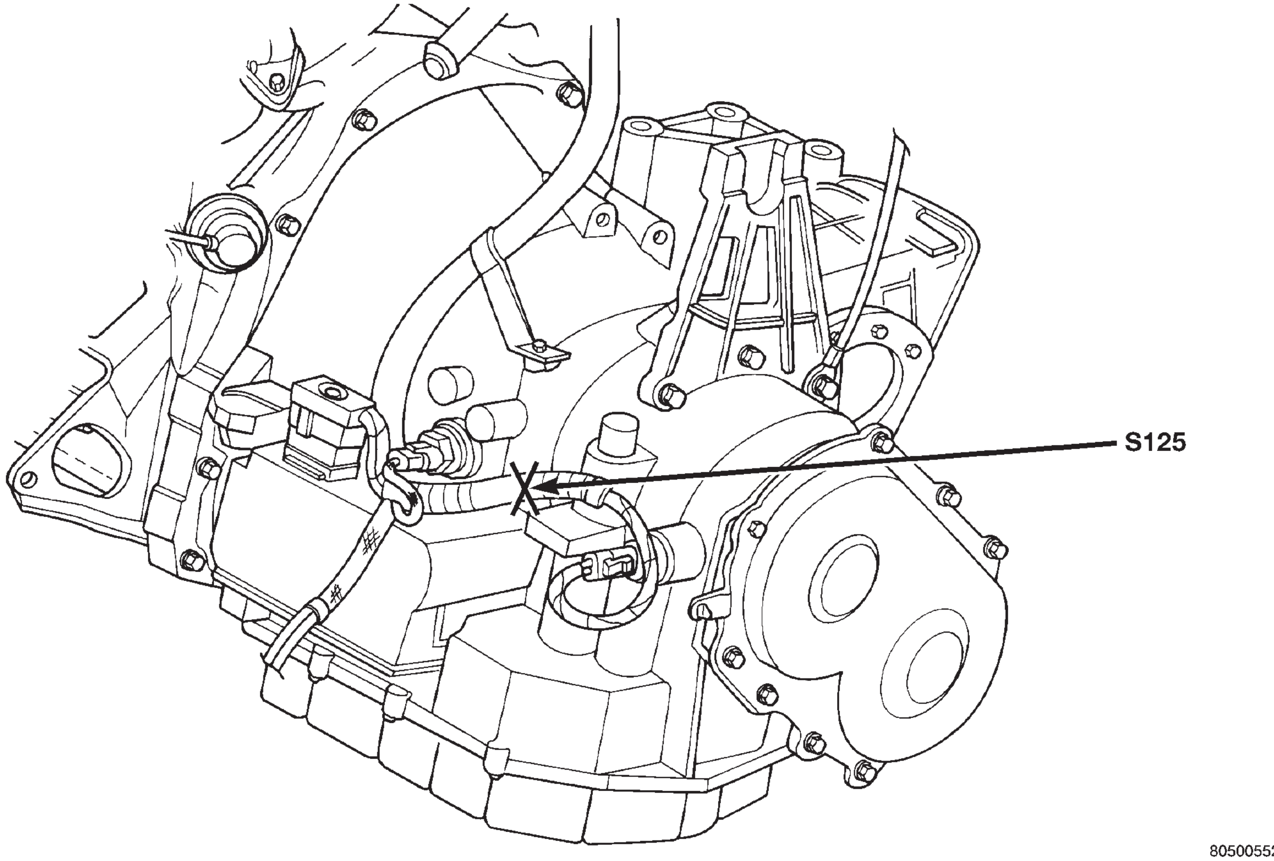


Fig. 4 Transmission Splices

DESCRIPTION AND OPERATION (Continued)

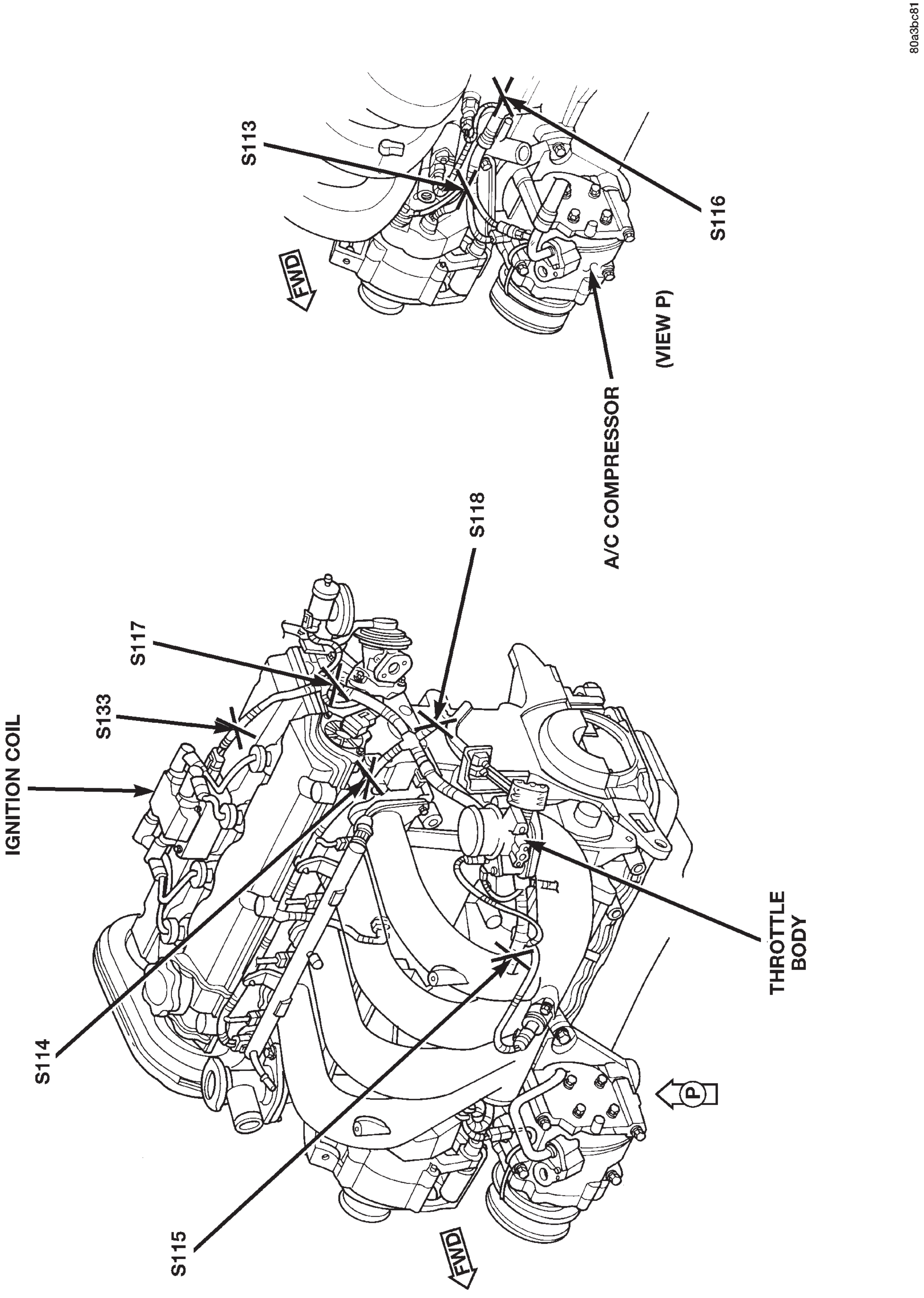


Fig. 5 Engine Splices 2.4L

DESCRIPTION AND OPERATION (Continued)

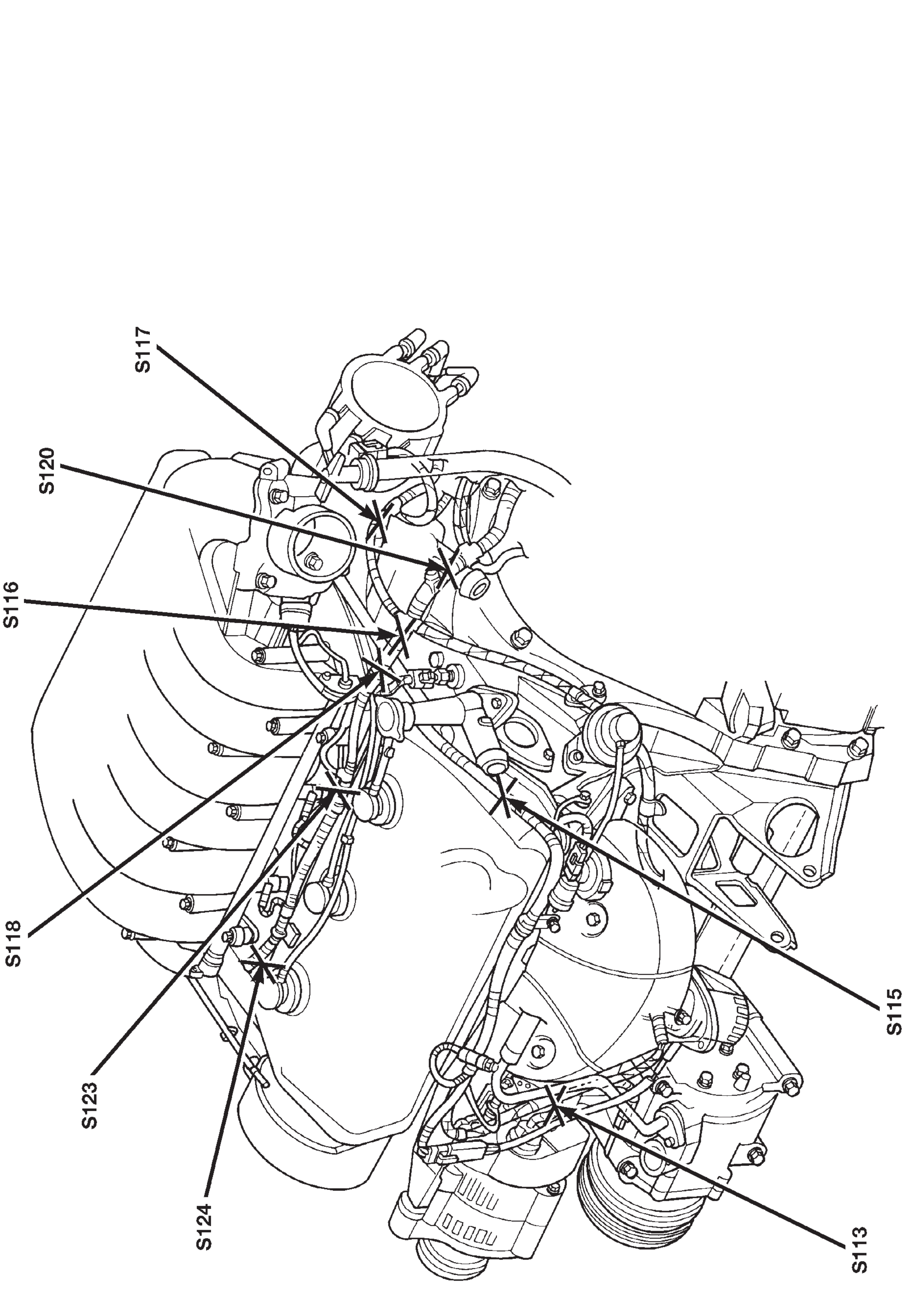


Fig. 6 Engine Splices 2.5L

DESCRIPTION AND OPERATION (Continued)

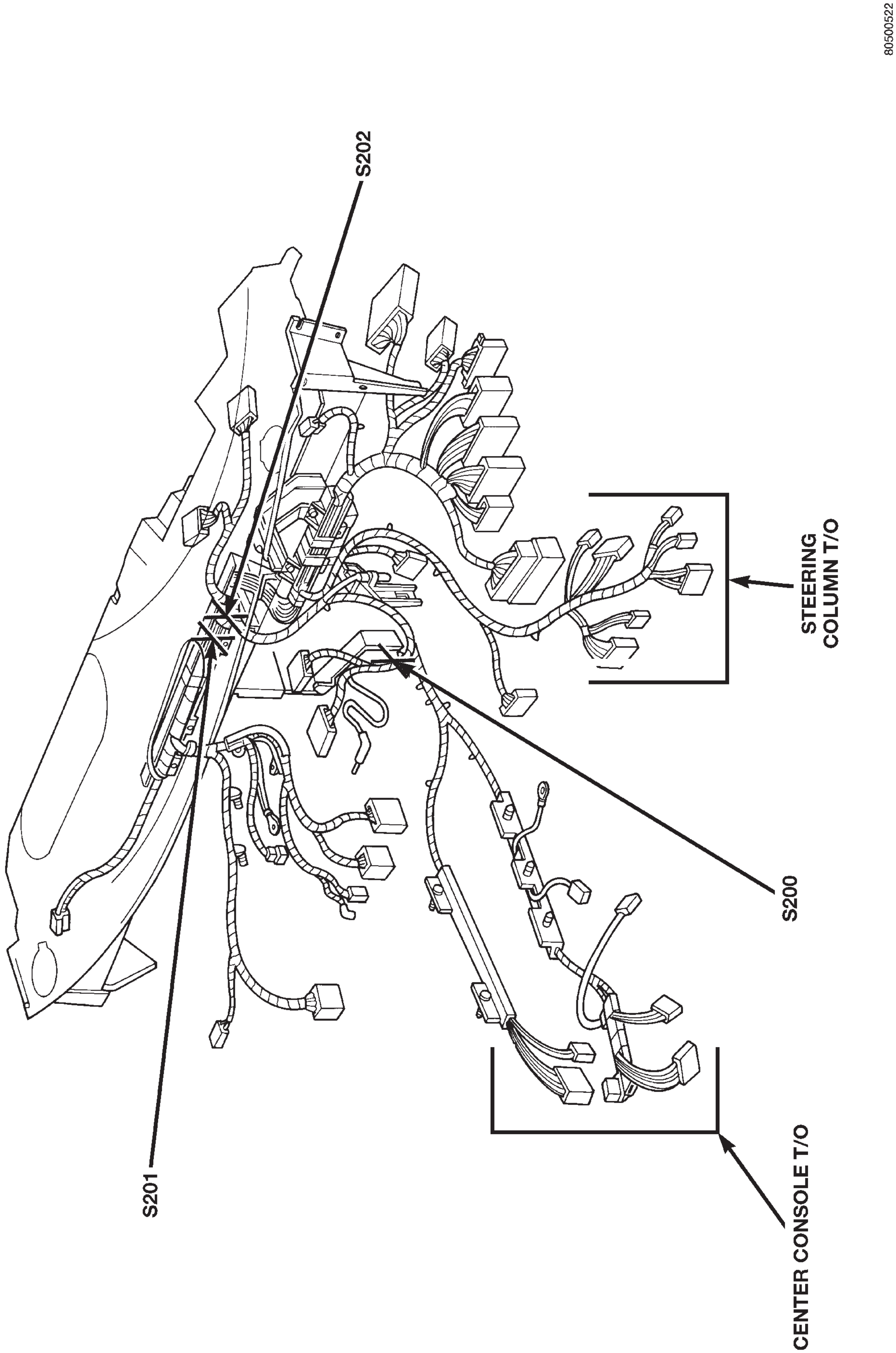


Fig. 7 Instrument Panel Splices

DESCRIPTION AND OPERATION (Continued)

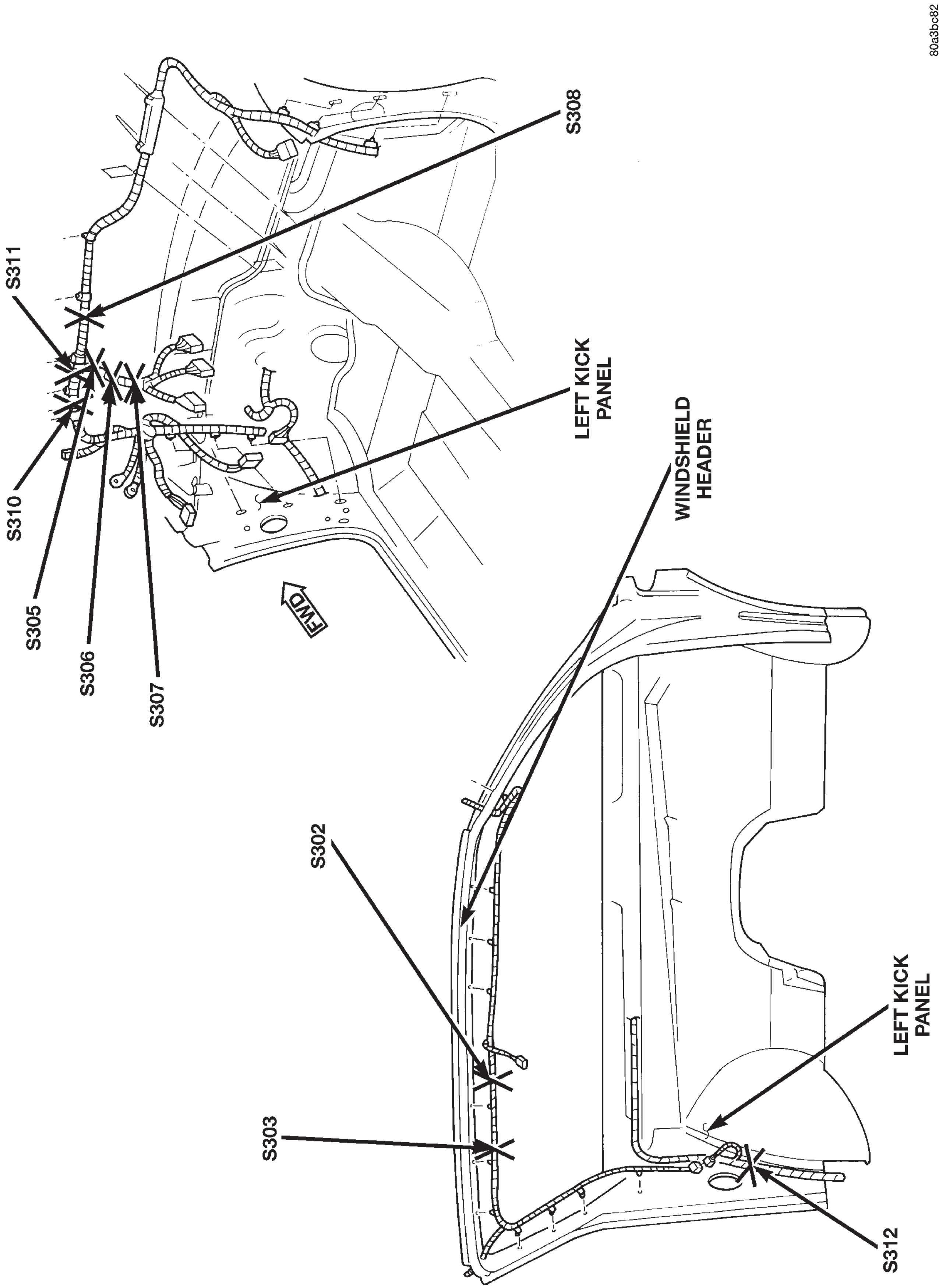


Fig. 8 Body Splices

DESCRIPTION AND OPERATION (Continued)

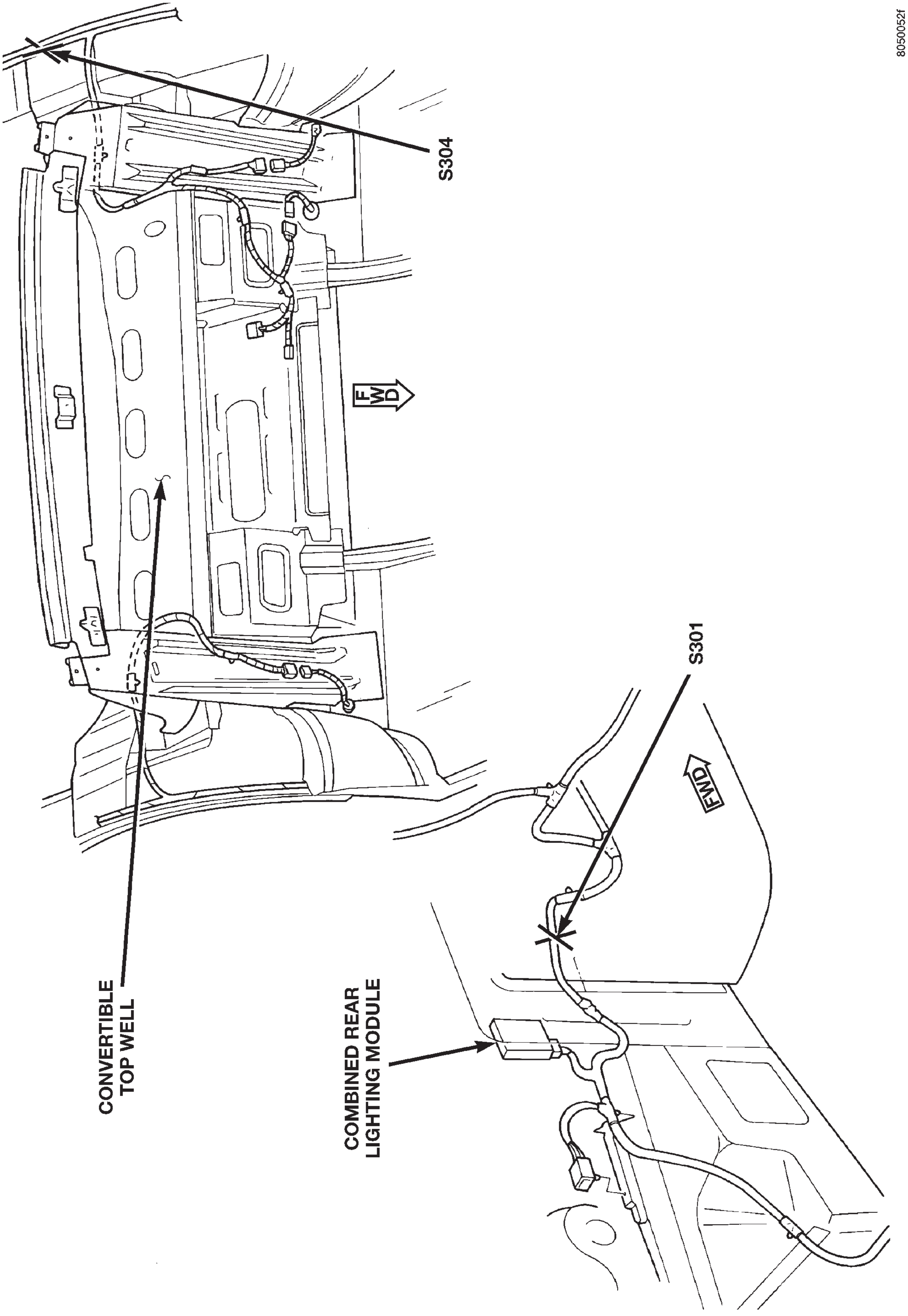


Fig. 9 Rear Body Splices

DESCRIPTION AND OPERATION (Continued)

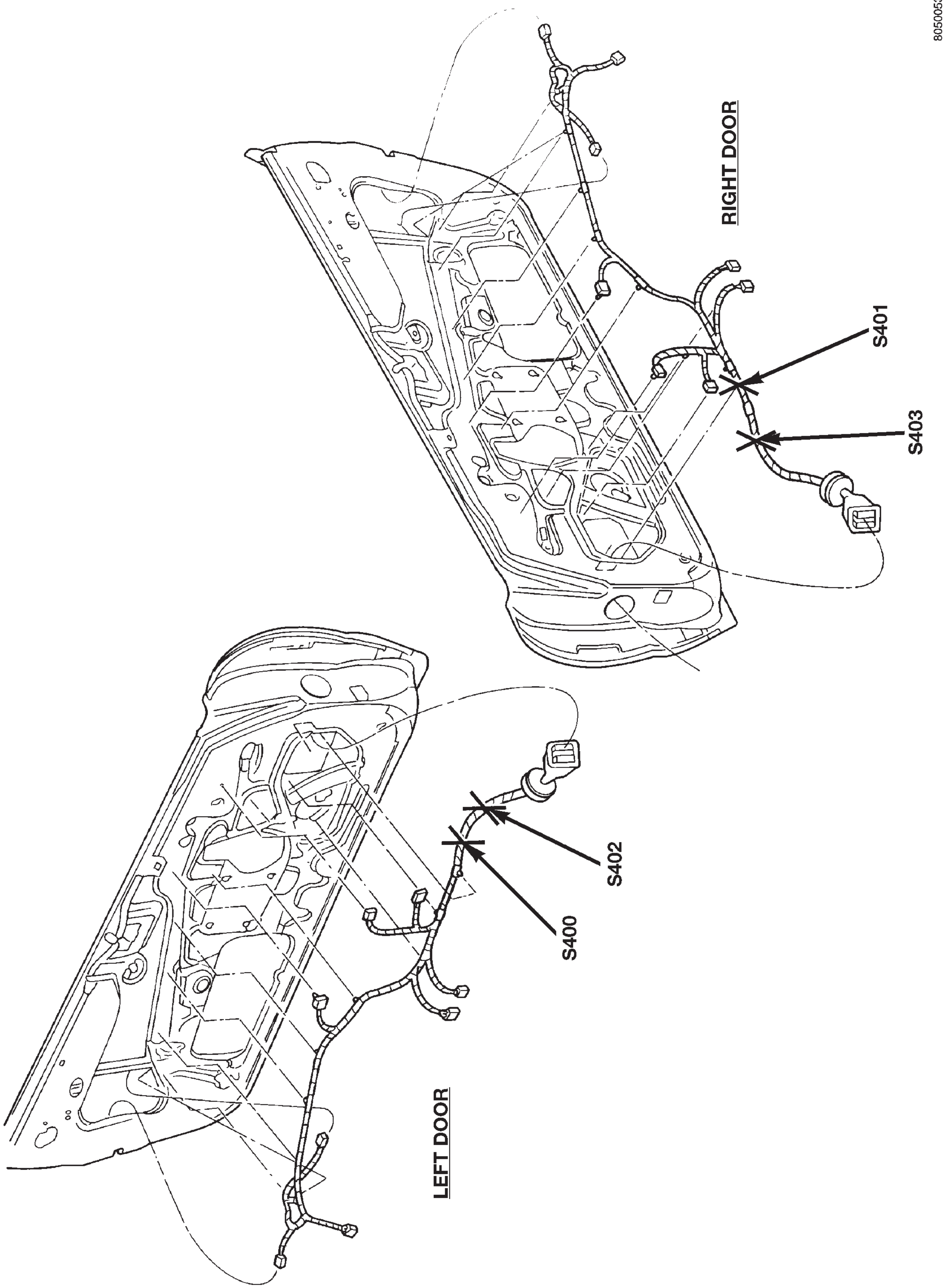


Fig. 10 Door Splices

ENGINE

CONTENTS

STANDARD SERVICE PROCEDURES

INDEX

GENERAL INFORMATION

FORM-IN-PLACE GASKETS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets. **Do not use form-in-place gasket material unless specified** . Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over, a continuous bead of the proper width is essential to obtain a leak-free joint.

Two types of form-in-place gasket materials are used in the engine. **Mopar** Silicone Rubber Adhesive Sealant and **Mopar** Gasket Maker, (anaerobic) each have different properties and cannot be used interchangeably.

CAUTION: Silicone sealer and anaerobic sealers each will inhibit the cure of the other and care should be taken to keep usages separated as much as possible.

MOPAR SILICONE RUBBER ADHESIVE SEALANT

Mopar Silicone Rubber Adhesive Sealant or equivalent, normally black in color, is available in three ounce tubes. Moisture in the air causes the **Mopar** Silicone Rubber Adhesive Sealant material to cure. This material is normally used on flexible metal flanges. It has a shelf life of one year and will not properly cure if over age. Always inspect the package for the expiration date before use.

MOPAR GASKET MAKER

Mopar Gasket Maker is an anaerobic type gasket material normally red in color. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. It is normally red in color. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR TORQUE CURE GASKET MAKER

Mopar Torque Cure Gasket Maker is a unique anaerobic type gasket material to be used **ONLY** between the bedplate and engine block. The material cures in the absence of air when torqued between two metallic surfaces. It will not cure if left in the uncovered tube. This anaerobic material is specially made to seal the area between the bedplate and cylinder block without disturbing the bearing clearance or alignment of these components.

GASKET DISASSEMBLY

Parts assembled with form-in-place gaskets may be disassembled without unusual effort. In some

GENERAL INFORMATION (Continued)

instances, it may be necessary to lightly tap the part with a mallet or other suitable tool to break the seal between the mating surfaces. A flat gasket scraper may also be lightly tapped into the joint but care must be taken not to damage the mating surfaces.

SURFACE PREPARATION

Scrape clean or wire brush all gasket surfaces to remove all loose material. Inspect stamped parts to ensure gasket rails are flat. Flatten rails with a hammer on a flat plate if required. Gasket surfaces must be free of oil and dirt. Make sure old gasket material is removed from blind attaching holes.

FORM-IN-PLACE GASKET APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier then using precut gaskets.

Mopar Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing the material off location.

The **Mopar** Silicone Rubber Adhesive Sealant gasket material or equivalent should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towels. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing of material off location.

ENGINE CORE PLUGS

REMOVAL

Using a blunt tool such as a drift or a screwdriver and a hammer, strike the bottom edge of the cup plug (Fig. 1). With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 1).

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

INSTALLATION

Thoroughly remove all rust and clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with sealer. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 inch.) inside the lead in chamfer (Fig. 1).

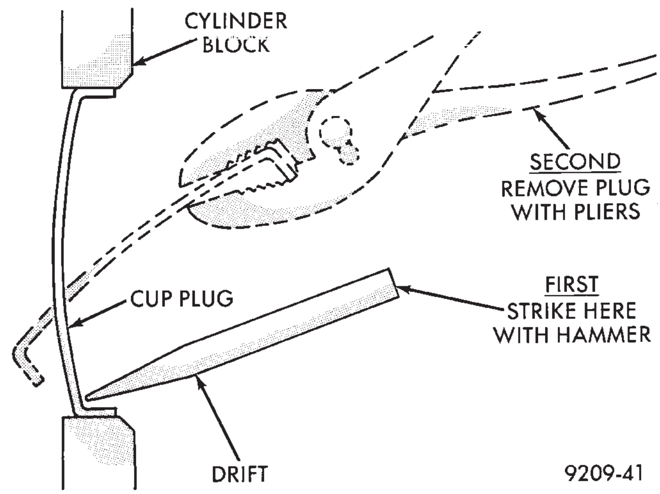


Fig. 1 Core Hole Plug Removal

It is in not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

ENGINE PERFORMANCE

If a loss of performance is noticed, ignition timing should be checked. timing belt or chain may have skipped one or two teeth. Camshaft and crankshaft timing should also be checked. Refer to Group 9, Engine Timing belt or chain installation.

To provide best vehicle performance and lowest vehicle emissions, it is most important that the tune-up be done accurately. Use the specifications listed on the Vehicle Emission Control Information label found in the engine compartment.

(1) Test cranking amperage draw. See Starting Motor Cranking Amperage Draw Electrical Section of this manual.

(2) Check intake manifold for vacuum leaks.

PERFORM CYLINDER COMPRESSION TEST

(1) Check engine oil level and add oil if necessary.

(2) Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.

(3) Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.

(4) Disconnect coil wire from distributor and secure to good ground to prevent a spark from start-

GENERAL INFORMATION (Continued)

ing a fire (Conventional Ignition System). For Direct Ignition System DIS disconnect the coil connector.

(5) Be sure throttle blade is fully open during the compression check.

(6) Insert compression gage adaptor into the #1 spark plug hole in cylinder head. Crank engine until maximum pressure is reached on gage. Record this pressure as #1 cylinder pressure.

(7) Repeat the previous step for all remaining cylinders.

(8) Compression should not be less than (689kPa) 100 psi and not vary more than 25 percent from cylinder to cylinder.

(9) If one or more cylinders have abnormally low compression pressures, repeat the compression test.

(10) If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

(11) Clean or replace spark plugs as necessary and adjust gap as specified in Group 8, Electrical. Tighten to specifications.

(1) Test resistance of spark plug cables. Refer to Group 8, Electrical Ignition System Secondary Circuit Inspection.

(2) Test coil output voltage, primary and secondary resistance. Replace parts as necessary. Refer to Group 8, Electrical Ignition System.

(3) Check fuel pump pressure at idle and different RPM ranges. Refer to Group 14, Fuel System for Specifications.

(4) The air filter elements should be replaced as specified in Group 0, Lubrication and Maintenance,.

(5) Inspect crankcase ventilation system as out lined in Group 0, Lubrication and Maintenance. For emission controls see Group 25, Emission Controls for service procedures.

(6) Inspect and adjust accessory belt drives referring to Group 7, Cooling System, Accessory Drive Belts for proper adjustments.

(7) Road test vehicle as a final test.

HONING CYLINDER BORES

(1) Used carefully, the cylinder bore resizing hone C-823 equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones, if the cylinder bore is straight and round. 20-60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes, using a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.**

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 50-60 degrees, the cross hatch angle is most satisfactory for proper seating of rings (Fig. 2).

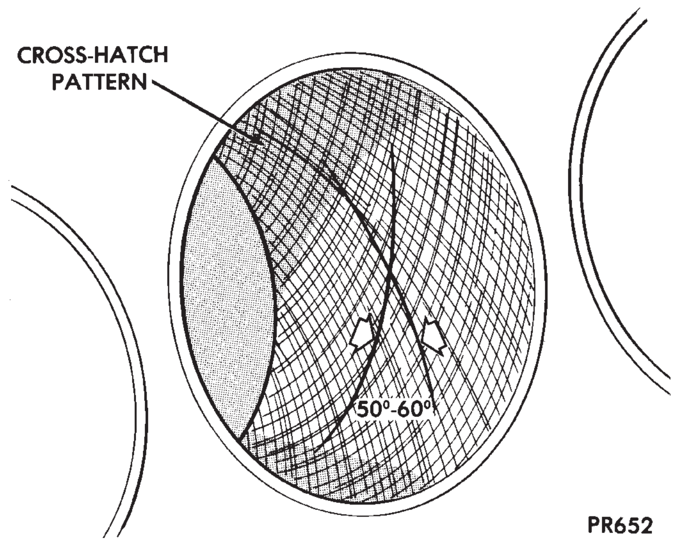


Fig. 2 Cylinder Bore Cross-Hatch Pattern

(4) A controlled hone motor speed between 200-300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 50-60 degree angle. Faster up and down strokes increase the cross-hatch angle.

(5) After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

CAUTION: Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

GENERAL INFORMATION (Continued)

MEASURING MAIN BEARING AND CONNECTING ROD BEARING CLEARANCES

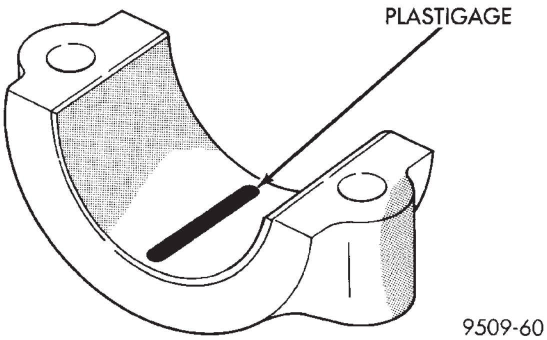


Fig. 3 Plastigage Placed in Lower Shell

PLASTIGAGE METHOD

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

NOTE: The total clearance of the main bearings can only be determined by removing the weight of the crankshaft. This can be accomplished by either of two methods:

PREFERRED METHOD

Shimming the bearings adjacent to the bearing to be checked in order to remove the clearance between upper bearing shell and the crankshaft. This can be accomplished by placing a minimum of 0.254 mm (0.010 in.) shim (e. g. cardboard, matchbook cover, etc.) between the bearing shell and the bearing cap on the adjacent bearings and tightening bolts to 14-20 N·m (10-15 ft. lbs.). The number of main bearing will vary from engine to engine.

ENGINE WITH 5 MAIN BEARINGS

- When checking #1 main bearing shim #2 main bearing.
- When checking #2 main bearing shim #1 & 3 main bearing.
- When checking #3 main bearing shim #2 & 4 main bearing.
- When checking #4 main bearing shim #3 & 5 main bearing.
- When checking #5 main bearing shim #4 main bearing.

ENGINE WITH 4 MAIN BEARING

- When checking #1 main bearing shim # 2 main bearing.
- When checking #2 main bearing shim #1 & #3 main bearing.
- When checking #3 main bearing shim #2 & #4 main bearing.
- When checking #4 main bearing shim #3 main bearing.

NOTE: REMOVE ALL SHIMS BEFORE REASSEMBLING ENGINE

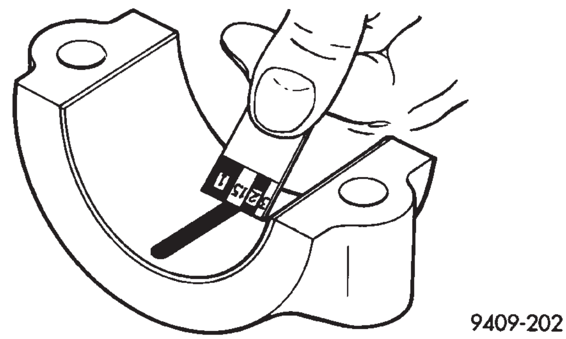


Fig. 4 Clearance Measurement

ALTERNATIVE METHOD

The weight of the crankshaft can be supported by a jack under the counterweight adjacent to the bearing being checked.

PLASTIGAGE PROCEDURE

(1) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(2) Place a piece of Plastigage across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes (Fig. 3). (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap bolts of the bearing being checked to the proper specifications.

(3) Remove the bearing cap and compare the width of the flattened Plastigage (Fig. 4) with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Refer to Engine Specifications. **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

CONNECTING ROD BEARING CLEARANCE

Engine connecting rod bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

GENERAL INFORMATION (Continued)

(1) Rotate the crankshaft until the connecting rod to be checked is at the bottom of its stroke.

(2) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(3) Place a piece of Plastigage across the entire width of the bearing shell in the bearing cap approximately 6.35 mm (1/4 in.) off center and away from the oil hole (Fig. 3). In addition, suspect areas can be checked by placing plastigage in the suspect area.

(4) Assemble the rod cap with Plastigage in place. Tighten the rod cap to the specified torque. **Do not rotate the crankshaft while assembling the cap or the Plastigage may be smeared, giving inaccurate results.**

(5) Remove the bearing cap and compare the width of the flattened Plastigage (Fig. 4) with the scale provided on the package. Locate the band closest to the same width. This band indicates the amount of oil clearance. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Refer to Engine Specifications. **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale. If the bearing clearance exceeds 0.076 mm (0.003 in.) replace bearing.**

NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (including aluminum head spark plug threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original centerline.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, these steps should be used.

CAUTION: Do Not Use Starter Motor To Rotate Engine, severe damage may occur.

(1) Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.

(2) Remove negative battery cable.

(3) Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.

(4) With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.

(5) Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).

(6) Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., Connecting Rods, Pistons, Valves etc.)

(7) Repair engine or components as necessary to prevent this problem from occurring again.

CAUTION: Squirt approximately 1 teaspoon of oil into cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

(8) Install new spark plugs.

(9) Drain engine oil and remove oil filter.

(10) Fill engine with specified amount of approved oil and install new oil filter.

(11) Connect negative battery cable.

(12) Start engine and check for any leaks.

CHECKING ENGINE OIL LEVEL

The best time to check engine oil level is after it has sat overnight, or if the engine has been running, allow the engine to be shut off for at least 5 minutes before checking oil level.

Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Add only when the level is at or below the ADD mark (Fig. 5).

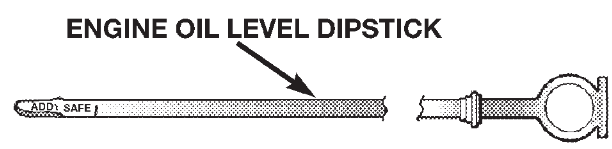


Fig. 5 Oil Level

GENERAL INFORMATION (Continued)

ENGINE OIL SERVICE

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified or an oil that conforms to the API Service Grade SH or SH/CD. MOPAR provides engine oils that conform to all of these service grades.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 30 specifies a single viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 6).

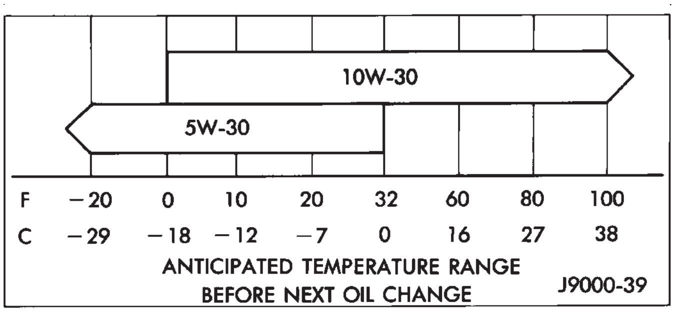


Fig. 6 Temperature/Engine Oil Viscosity

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. They are designated as either ENERGY CONSERVING or ENERGY CONSERVING II.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 7).

Fig. 7 Engine Oil Container Standard Notations

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in the Maintenance Schedule.

TO CHANGE ENGINE OIL

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands. Refer to Hoisting and Jacking Recommendations.

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.

(6) Install drain plug in crankcase.

(7) Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.

(8) Install oil fill cap.

(9) Start engine and inspect for leaks.

(10) Stop engine and inspect oil level.

ENGINE OIL FILTER CHANGE

FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. Chrysler Corporation recommends a Mopar or equivalent oil filter be used.

OIL FILTER REMOVAL

Refer to Removal and Installation Section in Group 9, Engine for procedure.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

ENGINE DIAGNOSIS

INDEX

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine tune-ups.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to the Service Diagnosis—Mechanical Chart and the Service Diagnosis—Performance Chart, for possible causes and corrections of malfunctions. Refer to Group 14, Fuel System, for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Engine Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis

INTAKE MANIFOLD LEAKAGE DIAGNOSIS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.

(2) Spray a small stream of water (Spray Bottle) at the suspected leak area.

(3) If a change in RPM'S, the area of the suspected leak has been found.

(4) Repair as required.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Check engine oil level and add oil if necessary.

(2) Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.

(3) Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.

(4) Disconnect coil wire from distributor and secure to good ground to prevent a spark from starting a fire (Conventional Ignition System). For Direct Ignition System DIS disconnect the coil connector.

(5) Be sure throttle blade is fully open during the compression check.

(6) Insert compression gage adaptor into the #1 spark plug hole in cylinder head. Crank engine until maximum pressure is reached on gage. Record this pressure as #1 cylinder pressure.

(7) Repeat the previous step for all remaining cylinders.

(8) Compression should not be less than (689kPa) 100 psi and not vary more than 25 percent from cylinder to cylinder.

(9) If one or more cylinders have abnormally low compression pressures, repeat the compression test.

(10) If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the**

DIAGNOSIS AND TESTING (Continued)

cause of low compression unless some malfunction is present.

(11) Clean or replace spark plugs as necessary and adjust gap as specified in Group 8, Electrical. Tighten to specifications.

(12) Test resistance of spark plug cables. Refer to Group 8, Electrical Ignition System Secondary Circuit Inspection.

(13) Test coil output voltage, primary and secondary resistance. Replace parts as necessary. Refer to Group 8, Electrical Ignition System.

(14) Check fuel pump pressure at idle and different RPM ranges. Refer to Group 14, Fuel System for Specifications.

(15) The air filter elements should be replaced as specified in Group 0, Lubrication and Maintenance,.

(16) Inspect crankcase ventilation system as out lined in Group 0, Lubrication and Maintenance. For emission controls see Group 25, Emission Controls for service procedures.

(17) Inspect and adjust accessory belt drives referring to Group 7, Cooling System, Accessory Drive Belts for proper adjustments.

(18) Road test vehicle as a final test.

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE RADIATOR CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the radiator cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1 379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

LASH ADJUSTER (TAPPET) NOISE DIAGNOSIS

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

(3) During this time, turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor pressed into the vertical oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and disassemble **Do not reuse retainer caps** . Do not interchange parts and make sure that care and cleanliness is exercised in the handling of parts.

c. Clean out dirt and varnish with solvent.

d. Reassemble with engine oil.

e. Check for sponginess.

f. If still spongy, replace with new adjuster.

INSPECTION (ENGINE OIL LEAKS IN GENERAL)

Begin with a through visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

DIAGNOSIS AND TESTING (Continued)

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.

(5) **If the oil leak source is not positively identified at this time** , proceed with the air leak detection test method as follows:

(6) Disconnect the fresh air hose (makeup air) at the cylinder head cover and plug or cap the nipple on the cover.

(7) Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.

(8) Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

(9) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(10) If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(11) If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose. Proceed to next step.

(12) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area remove transmission for further inspection.

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, oil galley cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.

(4) If no leaks are detected, pressurized the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

(7) After the oil leak root cause and appropriate corrective action have been identified. Refer to Rear Crankshaft Seals, for proper replacement procedures.

DIAGNOSIS AND TESTING (Continued)

ENGINE DIAGNOSIS—PERFORMANCE

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery specific gravity. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. Refer to Group 8A, Battery/Starter/ Charging System Diagnostics.
	4. Moisture on ignition wires.	4. Wipe wires clean and dry.
	5. Faulty ignition cables.	5. Replace any cracked or shorted cables.
	6. Faulty coil or control unit.	6. Test and replace, if necessary (refer to Group 8D, Ignition System).
	7. Incorrect spark plug gap.	7. Set gap (refer to Group 8D, Ignition System).
	8. Dirt or water in fuel system.	8. Clean system and replace fuel filter.
	9. Faulty fuel pump.	9. Install new fuel pump (refer to Group 14, Fuel System).
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set too low.	1. Refer to Group 14, Fuel System.
	2. Idle mixture too lean or too rich.	2. Refer to Group 14, Fuel System.
	3. Leak in intake manifold.	3. Inspect intake manifold gasket and vacuum hoses. Replace, if necessary (refer to Group 11), Exhaust System & Intake Manifold).
	4. Incorrect ignition wiring.	4. Install correct wiring.
	5. Faulty coil.	5. Test and replace, if necessary (refer to Group 8D, Ignition System).
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. Clean plugs and set gap (refer to Group 8D, Ignition System).
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Install new fuel pump.
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Blown cylinder head gasket.	5. Install new cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped or pitted valves.	7. Install new valves.
	8. Plugged or restricted exhaust system.	8. Install new parts, as necessary.
	9. Faulty ignition cables.	9. Replace any cracked or shorted cables.
	10. Faulty coil.	10. Test and replace, as necessary (refer to Group 8D, Ignition System).
ENGINE MISSES ON ACCELERATION	1. Dirty or gap set too wide in spark plug.	1. Clean spark plugs and set gap (refer to Group 8D, Ignition System).
	2. Dirt in fuel system.	2. Clean fuel system.
	3. Burned, warped or pitted valves.	3. Install new valves.
	4. Faulty coil.	4. Test and replace, if necessary (refer to Group 8D, Ignition System).
ENGINE MISSES AT HIGH SPEED	1. Dirty or gap set too wide in spark plug.	1. Clean spark plugs and set gap (refer to Group 8D, Ignition System).
	2. Faulty coil.	2. Test and replace, as necessary (refer to Group 8D, Ignition System).
	3. Dirty injector.	3. Clean injectors.
	4. Dirt or water in fuel system.	4. Clean system and replace fuel filter.

DIAGNOSIS AND TESTING (Continued)

ENGINE DIAGNOSIS—MECHANICAL

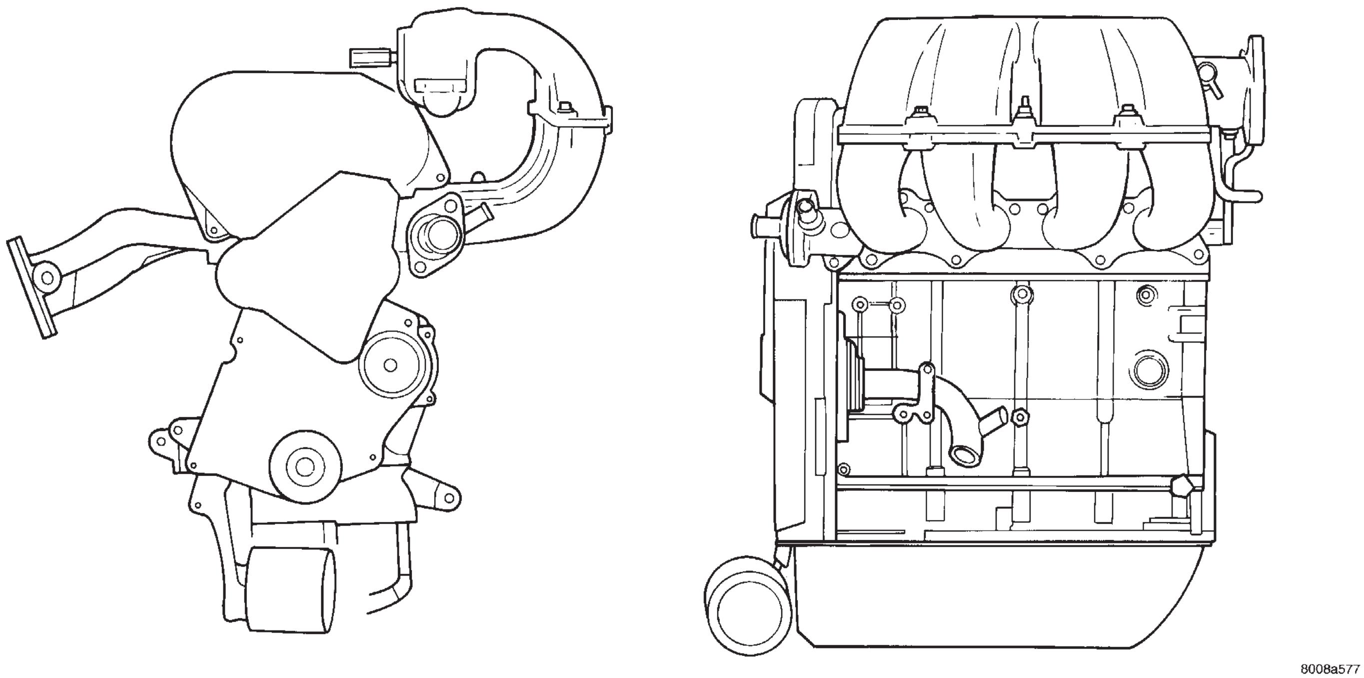
CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Checkfor correct oil level (refer to Group 0, Lubrication and Maintenance).
	2. Thin or diluted oil.	2. Change oil (refer to Group 0, Lubrication and Maintenance.
	3. Low oil pressure.	3. Check engine oil level.
	4. Dirt in tappets/lash adjsuters.	4. Replace rocker arm/hydraulic lash adjuster assembly.
	5. Worn rocker arms.	5. Inspect oil supply to rocker arms.
	6. Worn tappets/lash adjusters.	6. Install new rocker arm/hydraulic lash adjuster assembly.
	7. Worn valve guides.	7. Ream and install new valves with oversize stems.
	8. Excessive runout of valve seats.	8. Grind valve seats and valves.
	9. Missing adjuster pivot.	9. Replace rocker arm/hydraulic lash adjuster assembly.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level (refer to Group 0, Lubrication and Maintenance.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Excessive bearing clearance.	4. Measure bearings for correct clearance. Repair as necessary.
	5. Connecting rod journal out-of-round.	5. Replace crankshaft or grind journals.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level (refer to Group 0, Lubrication and Maintenance).
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Excessive bearing clearance.	4. Measure bearings for correct clearance. Repair as necessary.
	5. Excessive end play.	5. Check thrust bearing for wear on flanges.
	6. Crankshaft journal out-of-round, worn.	6. Grind journals or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level.	1. Check engine oil level.
	2. Faulty oil pressure sending unit.	2. Install new sending unit.
	3. Low oil pressure.	3. Check sending unit and check main bearing oil clearance.
	4. Clogged oil filter.	4. Install new oil filter.
	5. Worn parts in oil pump.	5. Replace worn parts or pump.
	6. Thin or diluted oil.	6. Change oil to correct viscosity.
	7. Excessive bearing clearance.	7. Measure bearings for correct clearance.
	8. Oil pump relief valve stuck.	8. Remove valve and inpsect, clean and install.
	9. Oil pump suction tube loose, bent cracked, or blocked.	9. Remove oil pan and install new tube, or clean if necessary.
	10. Oil pump cover warped or cracked.	10. Install new oil pump.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace the gasket.
	2. Loose fastener, broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Misaligned or deteriorated cup or threaded plug.	3. Replace.
OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. PCV system malfunction.	1. Check system. Clean and repair, as necessary (refer to Group 25, Emissions Control System).
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slot.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove the rings. Check grooves. If groove is not proper width, replace piston.
	5. Worn valve guides.	5. Ream guides and replace valves with oversize valves and seals.
	6. Valve stem unseated or defective.	6. Repair or replace seal.

2.4L ENGINE

INDEX

DESCRIPTION AND OPERATION

ENGINE



Engine—2.4L

ENGINE IDENTIFICATION

The engine identification number is located on the rear of the cylinder block (Fig. 1).

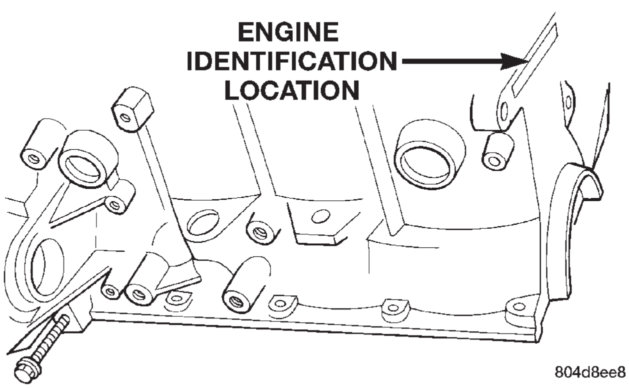


Fig. 1 Engine Identification

GENERAL SPECIFICATIONS

Type . . . . In-Line OHV, DOHC
Bore . . . . 87.5 mm (3.444 Inch)
Stroke . . . . 101 mm (3.976 Inches)
Compression Ratio 9.4:1
Displacement . . . . 2.4 Liters (148 Cubic Inches)
Firing Order 1, 3, 4, 2
Compression Pressure . 1069 - 1172 kPa (170 - 225 psi)
Maximum Variation Between Cylinders 25%
Lubrication; Pressure Feed-Full Flow Filtration (Direct Crankshaft Driven Pump Engine Oil Capacity . Including Oil Filter 4.25 Liter (4.5 Qts.) Without Oil Filter 3.8 Liter (4.0 Qts.)

DESCRIPTION AND OPERATION (Continued)

ENGINE COMPONENTS

BALANCE SHAFTS: 2.4L engines are equipped with two balance shafts installed in a carrier attached to the lower crankcase. The shafts interconnect through gears to rotate in opposite directions. These gears are driven by a short chain from the crankshaft, to rotate at two times crankshaft speed. This counterbalances certain engine reciprocating masses.

CYLINDER BLOCK AND BEDPLATE ASSEMBLY: A closed deck design is used for cooling and weight reduction with water pump molded into the block. Nominal wall thickness is 4.5 mm. The bedplate incorporates main bearing caps. Rear seal retainer is integral with the block.

CRANKSHAFT: A nodular cast iron crankshaft is used. The engine has 5 main bearings, with number 3 flanged to control thrust. The 60 mm diameter main and 50 mm diameter crank pin journals (all) have undercut fillets that are deep rolled for added strength. To evenly distribute bearing loads and minimize internal stress, 8 counterweights are used. Hydrodynamic seals provide end sealing, where the crankshaft exits the block. Anaerobic gasket material is used for parting line sealing in the block. A sintered powder metal timing belt sprocket is mounted on the crankshaft nose. This sprocket provides motive power; via timing belt to the camshaft sprockets (providing timed valve actuation) and to the water pump.

PISTONS: There is provisions for free wheeling valve train. Piston has a unique height. All engines use pressed in piston pins to attach forged powder metal connecting rods. Incorporate hex head cap screw threaded into the connecting rod. Piston and Rods are serviced as a assembly.

PISTONS RINGS: The piston rings include a molybdenum faced top ring for reliable compression sealing and a chrome plated taper faced intermediate ring for additional cylinder pressure control. There are also standard oil control rings.

CYLINDER HEAD: Features a Dual Over Head Camshaft (DOHC) 4 valves per cylinder cross flow design. The valves are arranged in two inline banks, with the ports of the bank of two intake valves per cylinder facing toward the radiator side of engine and ports of the bank of two exhaust valves per cylinder facing toward the dash panel. Incorporates powder metal valve guides and seats. Integral oil galleys within the cylinder head supplies oil to the hydraulic lash adjusters, camshaft and valve mechanisms.

CAMSHAFTS: The nodular iron camshafts have six bearing journals and 2 cam lobes per cylinder. Flanges at the rear journals control camshaft end play. Provision for cam position sensor is located on the intake camshaft at the rear of cylinder head. A hydrodynamic oil seal is used for oil control at the front of the camshaft.

VALVES: 4 valves per cylinder are actuated by roller cam followers which pivot on stationary hydraulic lash adjusters. All valves have 6 mm diameter chrome plated valve stems. The valve sizes are 34.8 mm (1.370 inch.) diameter intake valves and 30.5 mm (1.20 inch.) diameter exhaust valves. Viton rubber valve stem seals are integral with the spring seats. Valve springs, spring retainers, and locks are conventional.

INTAKE MANIFOLD: The intake manifold is a one piece aluminum casting, attached to the cylinder head with ten screws. This long branch fan design enhances low and midspeed torque.

EXHAUST MANIFOLD: The exhaust manifold is made of cast iron for strength and high temperatures.

ENGINE LUBRICATION: Refer to Group 0 Lubrication and Maintenance for recommended oil to be used in various engine application. System is full flow filtration, pressure feed type. The oil pump is mounted in the front engine cover and driven by the crankshaft. Pressurized oil is then routed through the main oil gallery, running the length of the cylinder block, supplying main and rod bearings with further routing. Pistons are lubricated from rod bearing throw off and lubricating slots on the connecting rod assemblies. Camshaft and valve mechanisms are lubricated from a full length cylinder head oil gallery supplied from the crankcase main oil gallery.

ENGINE LUBRICATION SYSTEM

OIL PAN

A structural die cast aluminum oil pan provides lower engine protection as well as serving as the engine oil reservoir. Oil pan is attached to block and sealed with a gasket. The oil pickup tube has a strainer and cover.

PRESSURE LUBRICATION

Oil drawn up through the pickup tube is pressurized by the pump and routed through the full flow filter to the main oil gallery running the length of the cylinder block. Oil pickup, pump and check valve provide oil flow to the main oil gallery.

MAIN/ROD BEARINGS

A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals.

DESCRIPTION AND OPERATION (Continued)

CAMSHAFT/HYDRAULIC LASH ADJUSTERS

A vertical hole at the number five bulkhead routes pressurized oil through a restrictor up past a cylinder head bolt to an oil gallery running the length of the cylinder head. The camshaft journals are partially slotted to allow a predetermined amount of pressurized oil to pass into the bearing cap cavities with small holes directed to spray lubricate the camshaft lobes.

BALANCE SHAFTS

Balance shaft lubrication is provided through an oil passage from the number 1 main bearing cap through the balance shaft carrier support leg. This passage directly supplies oil to the front bearings and internal machined passages in the shafts that routes oil from front to rear shaft bearing journals

SPLASH LUBRICATION

Oil returning to the pan from pressurized components supplies lubrication to the valve stems. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit and install gauge assembly C-3292.

(2) Run engine until thermostat opens.

CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM

(3) Oil Pressure: **Curb Idle** 25 kPa (4 psi) minimum **3000 RPM** 170/550 kPa (25/80 psi).

(4) If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open or a clogged oil pickup screen.

SERVICE PROCEDURES

CYLINDER BORE AND SIZING PISTON

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin about 14 mm (9/16 inch.) from the bottom of the skirt as shown in (Fig. 4). Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line shown in (Fig. 2). Refer to (Fig. 3) for specifications. Correct piston to bore clearance must be established in order to assure quiet and economical operation.

Chrysler engines use pistons designed specifically for each engine model. Clearance and sizing locations vary with respect to engine model.

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).

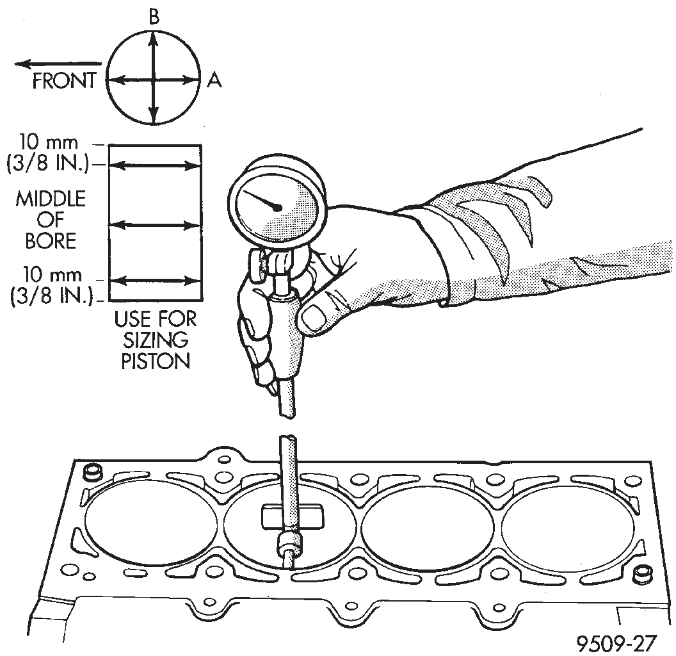


Fig. 2 Checking Cylinder Bore Size

Standard Bore	Maximum Out-of-Round	Maximum Taper
87.5 mm (3.445 in.)	0.051 mm (0.002 in.)	0.051 mm (0.002 in.)
Standard Piston Size		
87.450 - 87.468 mm (3.4434 - 3.4441 in.)		
Piston to Bore Clearance: 0.024 - 0.057 mm (.0009 to .0022 in.)		
Measurements taken at Piston Size location.		
9509-208		

Fig. 3 Cylinder Bore and Piston Specifications

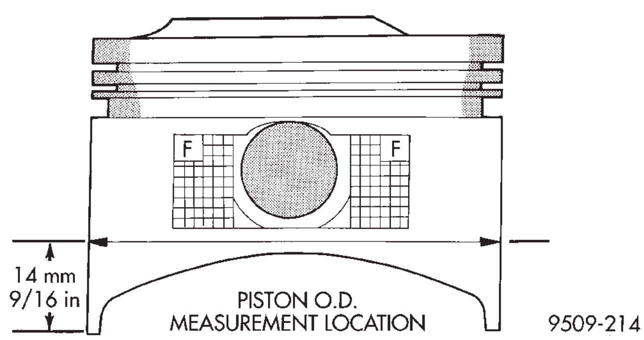


Fig. 4 Piston Measurement

FITTING PISTON RINGS

(1) Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring

SERVICE PROCEDURES (Continued)

positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge (Fig. 5). Refer to specification in piston ring specifications table.

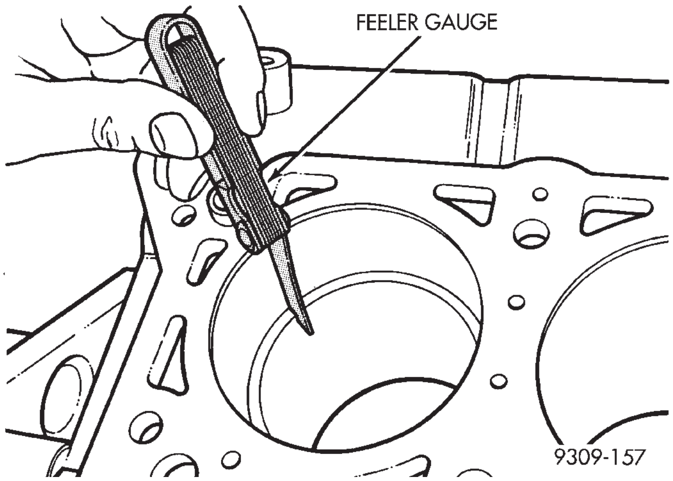


Fig. 5 Piston Ring Gap

PISTON RING SPECIFICATIONS

Ring Position	Ring Gap	Wear Limit
Upper Ring	0.025 to 0.51 mm (0.0098 to 0.020 in.)	0.8 mm (0.031 in.)
Intermediate Ring	0.23 to 0.48 mm (0.009 to 0.018 in.)	0.8 mm (0.031 in.)
Oil Control Ring	0.25 to 0.64 mm (0.0098 to 0.025 in.)	1.0 mm (0.039 in.)
Ring Position	**Groove Clearance**	**Max. Clearance**
Upper Ring	0.030 to 0.080 mm (0.0011 to 0.0031 in.)	0.10 mm (0.004 in.)
Intermediate Ring	0.025 to 0.065 mm (0.0010 to 0.0026 in.)	0.10 mm (0.004 in.)
Oil Control Ring - Three Piece. Oil Ring Side Rails Must Be Free To Rotate After Assembly.		

(2) Check piston ring to groove side clearance (Fig. 6). Refer to specification in piston ring specifications table.

PISTON RINGS—INSTALLATION

(1) Install rings with manufacturers I.D. mark facing up, to the top of the piston (Fig. 7).

CAUTION: Install piston rings in the following order:

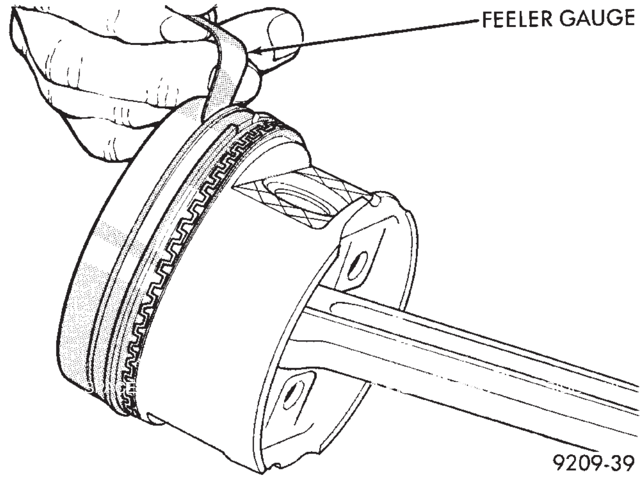


Fig. 6 Piston Ring Side Clearance

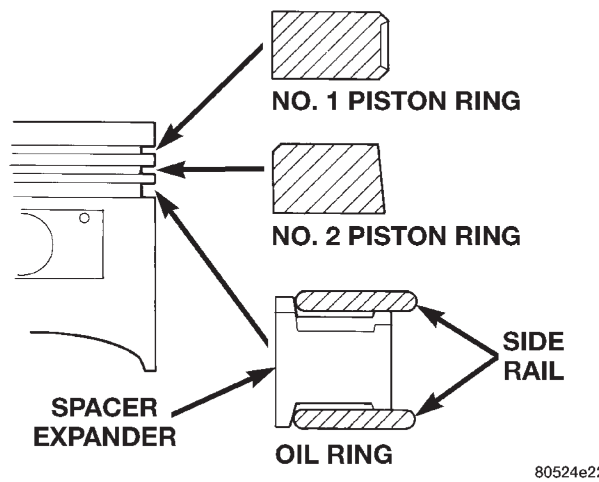


Fig. 7 Piston Ring Installation

a. Oil ring expander.
b. Upper oil ring side rail.
c. Lower oil ring side rail.
d. No. 2 Intermediate piston ring.
e. No. 1 Upper piston ring.

(2) Install the side rail by placing one end between the piston ring groove and the expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander** (Fig. 8).

(3) Install upper side rail first and then the lower side rail.

(4) Install No. 2 piston ring and then No. 1 piston ring.

(5) Position piston ring end gaps as shown in (Fig. 9).

(6) Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.

SERVICE PROCEDURES (Continued)

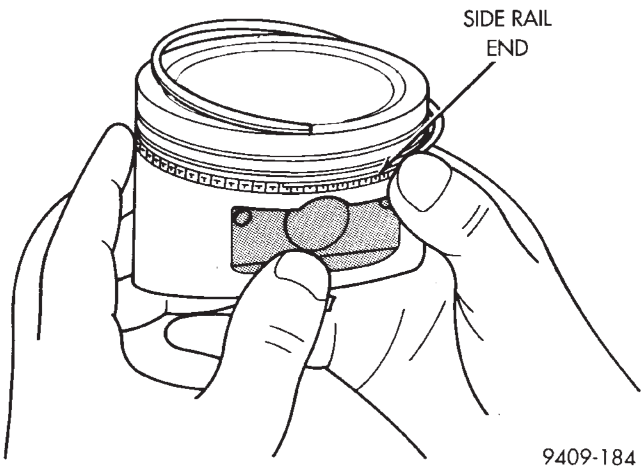


Fig. 8 Installing Side Rail

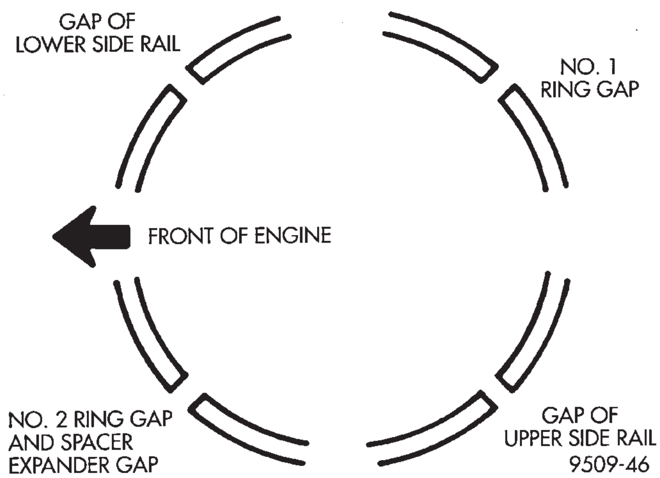


Fig. 9 Piston Ring End Gap Position

FITTING CONNECTING ROD BEARINGS

Engine connecting rod bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

(1) Rotate the crankshaft until the connecting rod to be checked is at the bottom of its stroke.

(2) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(3) Place a piece of Plastigage across the entire width of the bearing shell in the bearing cap approximately 6.35 mm (1/4 in.) off center and away from the oil hole (Fig. 10). In addition, suspect areas can be checked by placing plastigage in the suspect area.

(4) Before assembling the rod cap with Plastigage in place, the crankshaft must be rotated until the connecting rod being checked starts moving toward the top of the engine. Only then should the cap be assembled and torqued to specifications. **Do not rotate the crankshaft while assembling the cap or the Plastigage may be smeared, giving inaccurate results.**

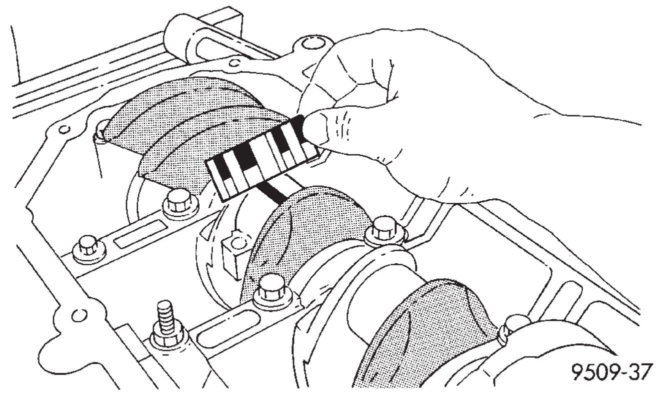


Fig. 10 Measuring Plastigage Width

(5) Remove the bearing cap and compare the width of the flattened Plastigage (Fig. 10) with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Refer to Engine Specifications. **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

(6) Plastigage is available in a variety of clearance ranges. The 0.025-0.076 mm (.001-.003 in.) is usually the most appropriate for checking engine bearing proper specifications.

FITTING MAIN BEARINGS

Refer to the Engine General Information Section for Measuring Main Bearings. For Crankshaft specifications refer to Crankshaft Specification Table.

CRANKSHAFT SPECIFICATION TABLE

Crankshaft End-Play New Part: 0.09 - 0.24 mm (0.0035 - 0.0094 in.) Wear Limit: 0.37 mm (0.015 in.)
Main Bearing Clearance New Part: 0.018 - 0.058 mm (0.0007 - 0.0023 in.)
Connecting Rod Bearing Clearance New Part: 0.025 - 0.071 mm (0.001 - 0.003 in.) Wear Limit: 0.075 mm (0.003 in.)
Crankshaft Journal Sizes Main Bearing Journal Diameter Standard 60.000 ± 0.008 mm (2.3622 ± 0.0003 in.) 1 st Undersize 59.975 ± 0.008 mm (2.361 ± 0.0003 in.)
Connecting Rod Journals Standard 49.992 ± 0.008 mm (1.968 ± 0.0003 in.) 1 st Undersize 49.967 ± 0.008 mm (1.967 ± 0.0003 in.)

SERVICE PROCEDURES (Continued)

CRANKSHAFT MAIN BEARINGS

The crankshaft is supported in five main bearings. All upper and lower bearing shells in the crankcase have oil grooves. The number three lower main thrust bearing is plain. Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal (Fig. 11).

Upper and lower Number 3 bearing halves are flanged to carry the crankshaft thrust loads and are NOT interchangeable with any other bearing halves in the engine (Fig. 11). All bearing cap bolts removed during service procedures are to be cleaned and oiled before installation. Bearing shells are available in standard and the following undersized: 0.025 mm (0.001 in.), 0.050 mm (0.002 in.), 0.250 mm (0.010 inch.) 0.275 mm (0.011 inch.) 0.300 mm (0.012 inch.). Never install an undersize bearing that will reduce clearance below specifications.

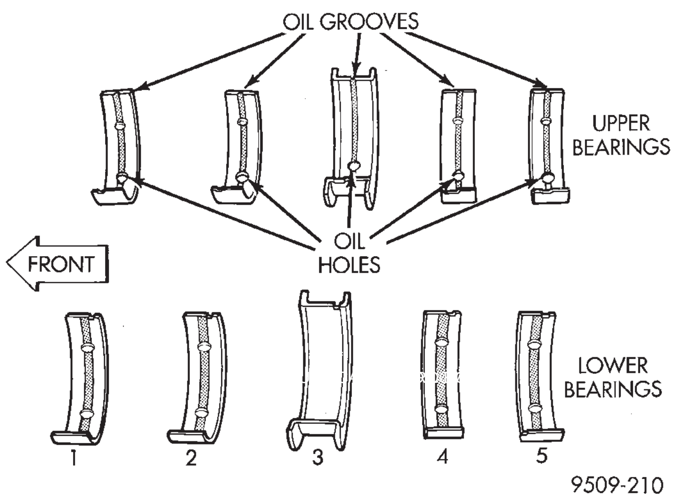


Fig. 11 Main Bearing Identification

MAIN BEARING INSTALLATION

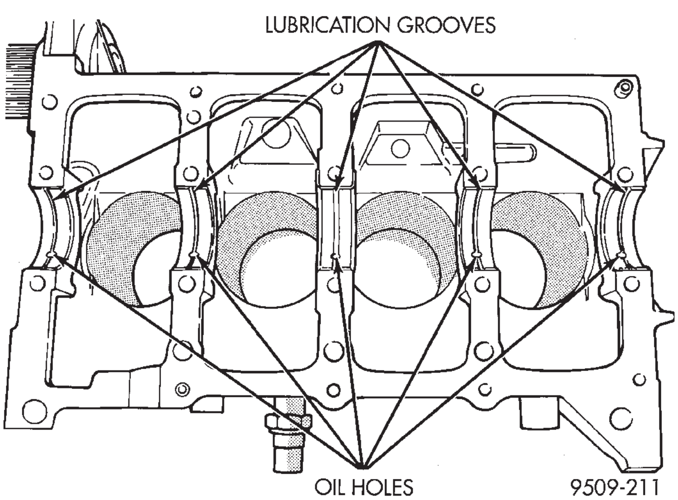


Fig. 12 Installing Main Bearing Upper Shell

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 12).

(2) Make certain oil holes in block line up with oil holes in bearings. Bearing tabs must seat in the block tab slots.

CAUTION: Do not get oil on the bedplate mating surface. It will may effect the sealer ability to seal the bedplate to cylinder block.

(3) Oil the bearings and journals and install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bedplate or damage may occur to the engine. Ensure that both cylinder block and bedplate surfaces are clean.

(4) Apply 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of anaerobic sealer Mopar Torque Cure Gasket Maker to cylinder block as shown in (Fig. 13).

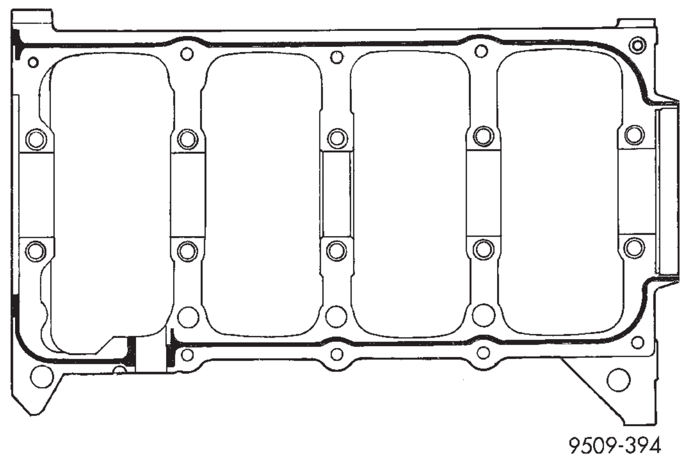


Fig. 13 Main Bearing Caps/Bedplate Sealing

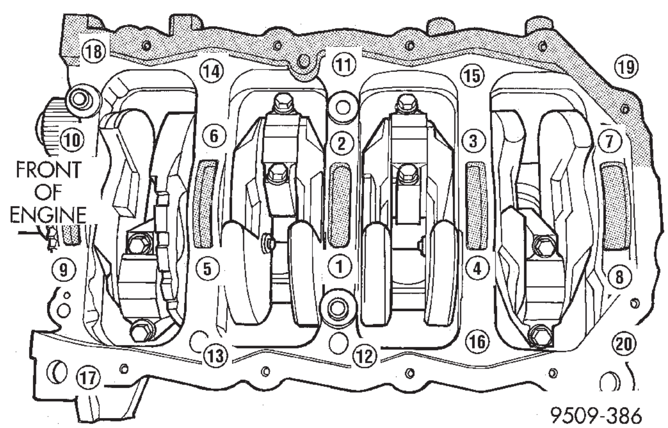


Fig. 14 Main Bearing Caps/Bedplate TorqueSequence

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are

SERVICE PROCEDURES (Continued)

seated into the bedplate slots. Install the main bearing/bedplate into engine block.

(6) Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.

(7) Install main bearing bedplate to engine block bolts 11, 17 and 20 finger tight. Tighten these bolts down together until the bedplate contacts the cylinder block. Then torque these bolts to 28 N·m (20 ft. lbs.).

(8) Install main bearing bedplate to engine block bolts (1 through 10) and torque each bolt to 41 N·m (30 ft. lbs.) in sequence then in sequence turn each bolt 1/4 turn shown in (Fig. 14).

(9) Install main bearing bedplate to engine block bolts (11 through 20), and torque each bolt to 28 N·m (20 ft. lbs.) in sequence shown in (Fig. 14).

(10) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

CRANKSHAFT END PLAY

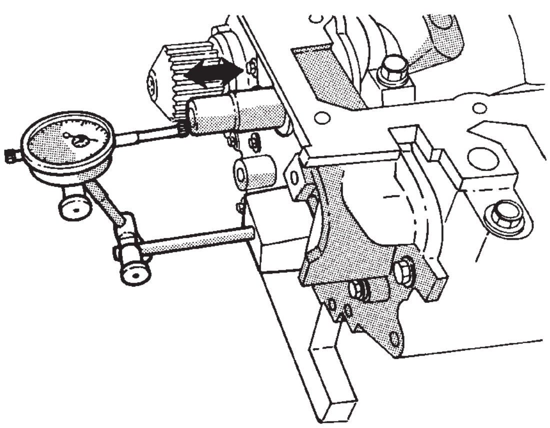


Fig. 15 Checking Crankshaft End Play—Typical

(1) Mount a dial indicator to front of engine, locating probe on nose of crankshaft (Fig. 15).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

(4) Move crankshaft all the way to the front and read the dial indicator. Refer to Crankshaft Specification Table for end-play specification.

CRANKSHAFT SPECIFICATION TABLE

Crankshaft End-Play
New Part: 0.09 - 0.24mm (0.0035 - 0.0094 in.)
Wear Limit: 0.37 mm (0.015 in.)

OPTIONAL CRANKSHAFT END PLAY CHECK

(1) Move crankshaft all the way to the rear of its travel using a lever inserted between a main bearing cap and a crankshaft cheek, using care not to damage any bearing surface. **DO NOT** loosen main bearing cap.

(2) Use a feeler gauge between number three thrust bearing and machined crankshaft surface to determine end play.

CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft **WITHOUT** cam follower assemblies. Install rear cam caps and tighten screws to specified torque.

(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 16).

(4) Move camshaft as far forward as it will go.

(5) End play travel: 0.05 - 0.15 mm (0.002 - 0.010 in.).

(6) If end play is excessive check cylinder head and camshaft for wear; replace as necessary.

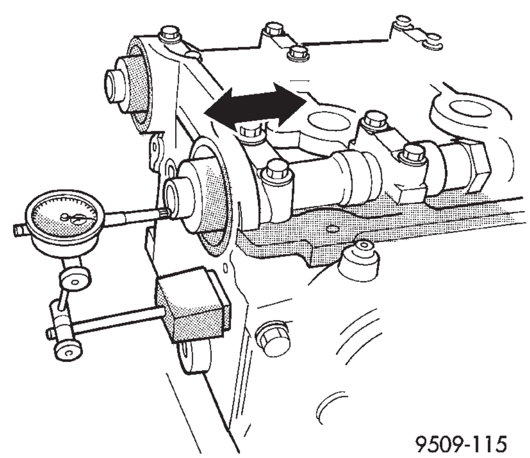


Fig. 16 Camshaft End Play

REMOVAL AND INSTALLATION

ENGINE SUPPORT MODULE (FRONT AND REAR MOUNTS)

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove thru bolt at rear mount and remove bolts attaching module to crossmember.

(3) Remove upper attaching bolt from rear support strut bracket (Fig. 17).

(4) Remove front attaching bolts from support module to lower radiator support.

(5) Support cooling module.

(6) Remove lower radiator support bolts, and remove support.

(7) Remove thru bolt at front mount and remove support module.

REMOVAL AND INSTALLATION (Continued)

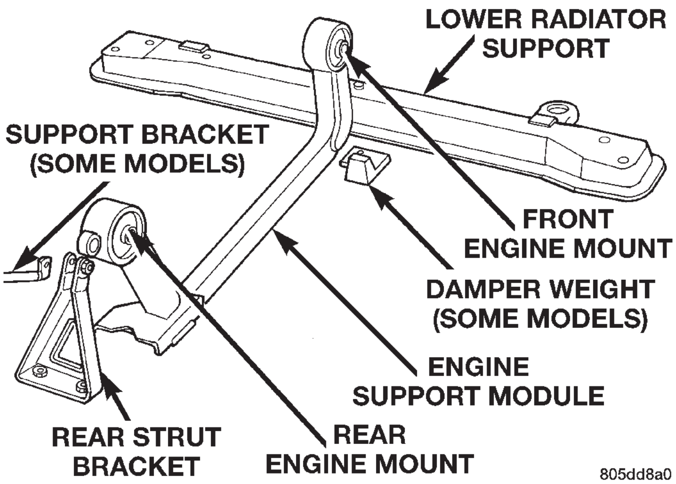


Fig. 17 Engine Support Module

INSTALLATION

(1) Install thru bolt at front mount. Do not tighten at this time.

(2) Install lower radiator support.

(3) Install attaching bolts from support module to lower radiator support.

(4) Install upper bolt at rear support strut bracket.

(5) Install thru bolt at rear mount see (Fig. 18) or (Fig. 19) tighten to 61 N·m (45 ft. lbs.).

(6) Tighten thru bolt at front mount see (Fig. 20) tighten to 61 N·m (45 ft. lbs.).

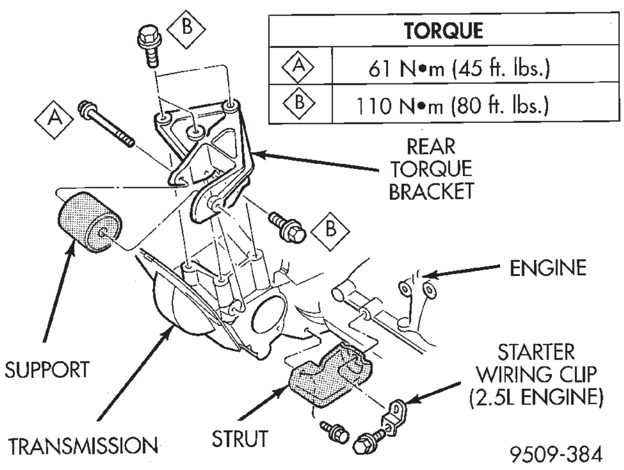


Fig. 18 Engine Mounting—Rear 2.4 and2.5L

LEFT SIDE MOUNT

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section.

The left side engine mount is a Hydro-Mount and may show surface cracks this will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

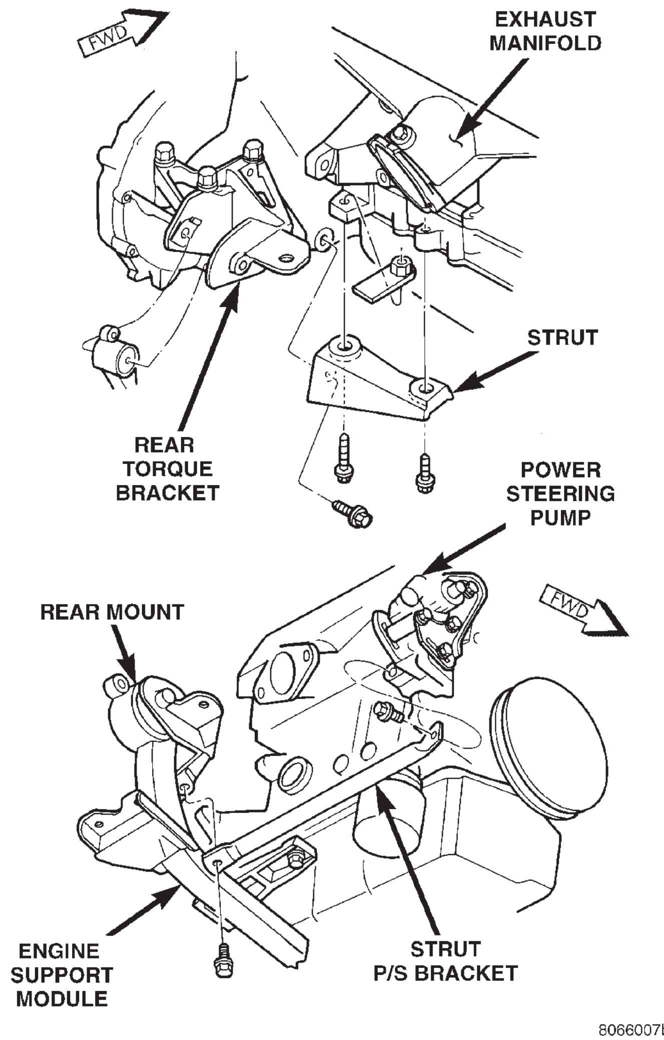


Fig. 19 Engine Mounting—Rear 2.0L

(1) Support the transmission with a transmission jack.

(2) Remove the three vertical bolts, from the mount to the transmission.

(3) Remove the transmission mount fasteners and remove mount.

(4) Reverse removal procedure for installation. Refer to (Fig. 21) for bolt tightening specifications.

(5) Engine support assemblies adjustment, Refer to Engine Support Assembly Adjustment of this section.

ENGINE MOUNT—RIGHT/ENGINE SUPPORT BRACKET

NOTE: The right side engine mount is a Hydro-Mount and may show surface cracks this will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

REMOVAL AND INSTALLATION (Continued)

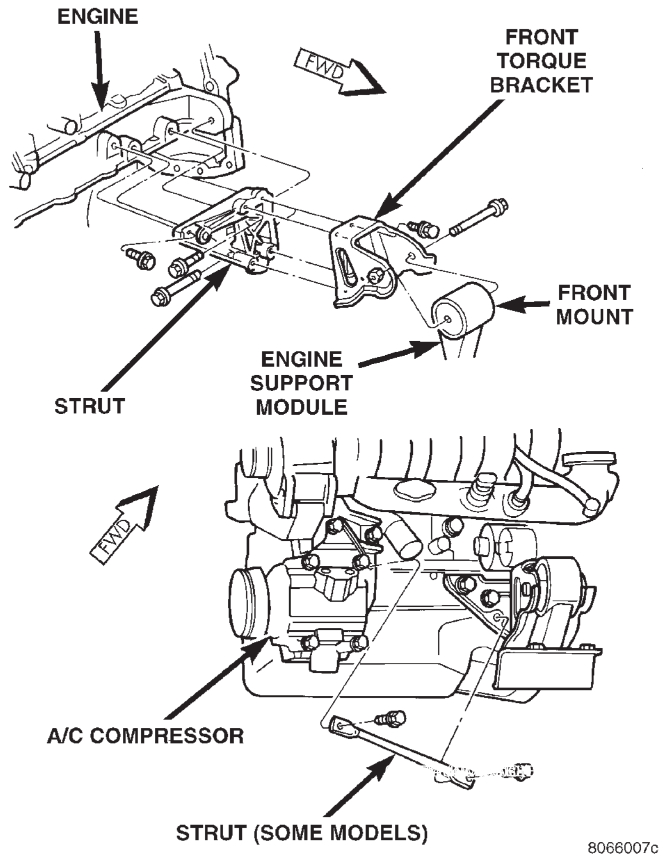


Fig. 20 Engine Mounting—Front 2.0 and2.4L

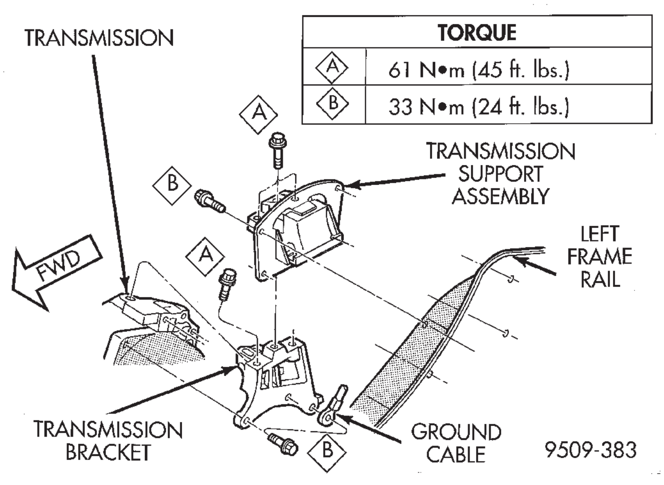


Fig. 21 Typical Engine Mounting—Left

(1) Raise vehicle on a hoist and remove inner splash shield. Remove the right engine support assembly vertical fasteners from frame rail (Fig. 22).

(2) Lower vehicle. Remove the load on the engine motor mounts by carefully supporting the engine assembly with a floor jack.

(3) Remove the three bolts attaching the engine support assembly to the engine bracket.

(4) Move the air conditioning dryer aside.

(5) Remove coolant recovery system tank. Refer to Group 7, Cooling System for procedure.

(6) Remove right engine support.

(7) Remove the three bolts attaching the engine support bracket to the cylinder block.

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section.

(8) Reverse removal procedure for installation. Refer to (Fig. 22) for torque specifications.

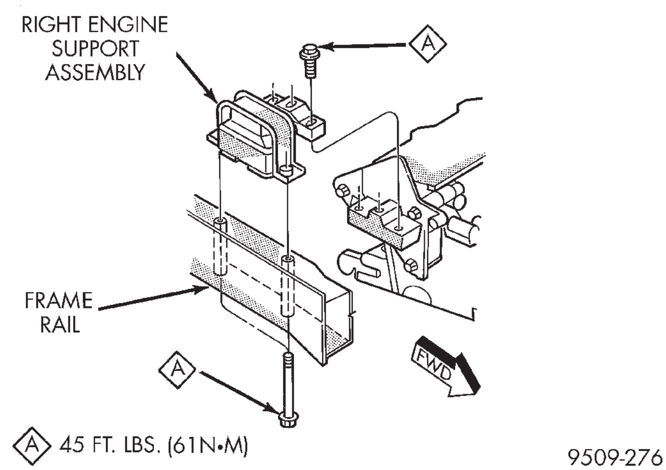


Fig. 22 Engine Mounting—Right Side

ENGINE ASSEMBLY

REMOVAL

(1) Perform fuel pressure release procedure. Refer to Group 14, Fuel System for procedure. Remove fuel line to fuel rail.

(2) Disconnect battery and remove air cleaner and hoses.

(3) Drain cooling system. Refer to Draining Cooling System in Group 7.

(4) Discharge Air Conditioning System.

(5) Disconnect automatic transmission cooler lines and plug, if equipped.

(6) Remove cooling module assembly (radiator, fan module, and condenser).

(7) Disconnect transmission shift linkage.

(8) Disconnect throttle body linkage.

(9) Disconnect engine and transmission wiring harness.

(10) Disconnect heater hoses.

(11) Hoist vehicle and remove right inner splash shield. Remove battery splash shield.

(12) Drain engine oil.

(13) Remove accessory drive belts. Refer to Accessory Drive Belt Removal in Group 7.

(14) Remove axle shafts.

(15) Disconnect exhaust pipe from manifold.

REMOVAL AND INSTALLATION (Continued)

(16) Remove engine support module.

(17) Remove front and rear mount brackets from the engine and transmission.

(18) Remove rear engine/transmission bending brace. Remove flex plate cover. Remove converter bolts and mark converter for reassembly.

(19) Lower vehicle.

(20) Remove power steering pump, reservoir and hoses. Position components for engine removal.

(21) Remove A/C suction line at compressor. Cap suction port and line.

(22) Remove ground straps to body.

(23) Raise vehicle enough to allow engine dolly 6135 and cradle 6710 with posts 6848 to be installed under vehicle (Fig. 23).

(24) Loosen cradle engine mounts to allow movement for positioning onto engine locating holes on the engine bedplate, compressor and support bracket. Install adapters 6909 to the two post at rear of engine Lower vehicle and position cradle mounts until the engine is resting on mounts. Tighten mounts to cradle frame. This will keep mounts from moving when removing or installing engine and transmission.

(25) Lower vehicle so weight of the engine and transmission ONLY is on the cradle.

(26) Remove engine and transmission mount bolts.

(27) Raise vehicle slowly. It may be necessary to move the engine/transmission assembly on the cradle to allow for removal around body flanges.

INSTALLATION

(1) Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine and transmission.

(2) Align engine and transmission mounts to attaching points. Install mounting bolts at the right engine and left transmission mounts. Refer to procedures outlined in this section.

(3) Slowly raise vehicle enough to remove the engine dolly and cradle Special Tools 6135 and 6710.

(4) Install axle shafts.

(5) Install front and rear mount brackets.

(6) Install transmission and engine bending brace.

(7) Install engine support module.

(8) Connect exhaust system to manifold.

(9) Install power steering pump, reservoir and hoses.

(10) Install A/C suction line at compressor.

(11) Install accessory drive belts. Refer to Accessory Drive Belt Installation in Group 7.

(12) Install right inner splash shield and battery splash shield. Install wheels and tires.

(13) Install cooling module assembly (radiator, fan module, and condenser).

(14) Connect automatic transmission cooler lines and shifter linkage.

(15) Connect fuel line and heater hoses.

(16) Install ground straps. Connect engine and throttle body connections and harnesses.

(17) Connect throttle body linkage.

(18) Fill cooling system.

(19) Connect battery.

(20) Install air cleaner and hoses.

(21) Install oil filter. Fill engine crankcase with proper oil to correct level.

(22) Start engine and run until operating temperature is reached.

(23) Adjust transmission linkage, if necessary.

REMOVAL AND INSTALLATION (Continued)

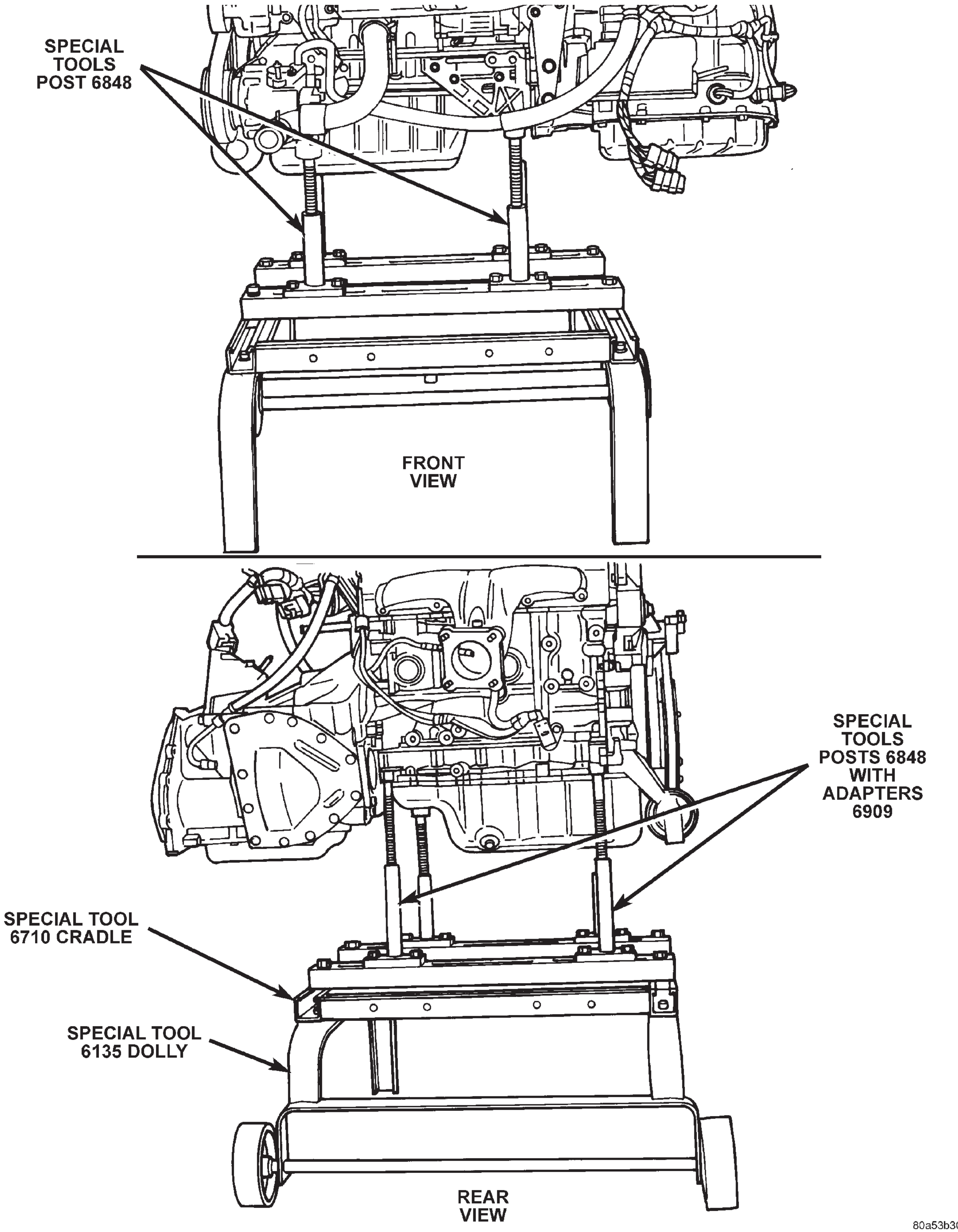


Fig. 23 Positioning Engine Cradle SupportPost Mounts

REMOVAL AND INSTALLATION (Continued)

CYLINDER HEAD COVER

REMOVAL

(1) Remove ignition coil pack and plug wires (Fig. 24). Remove ground strap.

(2) Remove the cylinder head cover fasteners.

(3) Remove cylinder head cover from cylinder head.

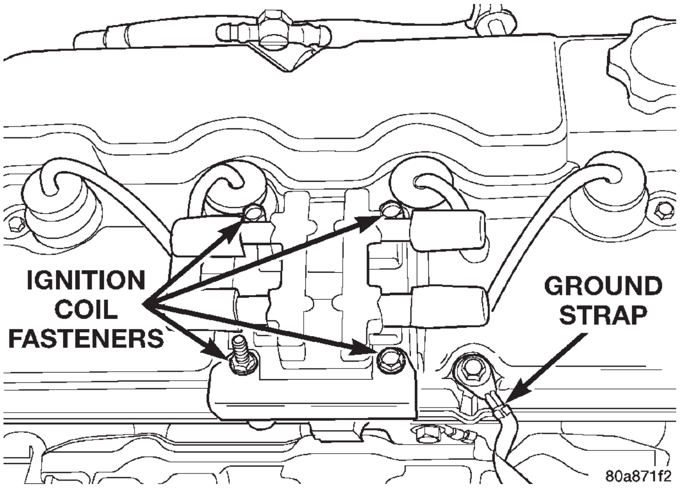


Fig. 24 Ignition Coil Pack and Ground Strap

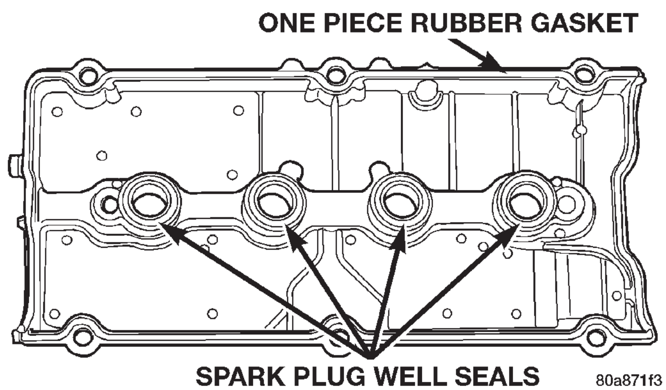


Fig. 25 Cylinder Head Cover Gasket and SparkPlug Seals

INSTALLATION

NOTE: Replace spark plug well seals when installing a new cylinder head cover gasket.

(1) Install new cylinder head cover gaskets and spark plug seals (Fig. 25).

CAUTION: Do not allow oil or solvents to contact the timing belt as they can deteriorate the rubber and cause tooth skipping.

(2) Apply Mopar Silicone Rubber Adhesive Sealant at the camshaft cap corners and at the top edge of the 1/2 round seal.

(3) Install cylinder head cover assembly to head and tighten fasteners in sequence shown in (Fig. 26). Using the 3 step torque method:

(a) Tighten all fasteners to 4.5 N·m (40 in. lbs.)

(b) Tighten all fasteners to 9.0 N·m (80 in. lbs.)

(c) Tighten all fasteners to 12 N·m (105 in. lbs.)

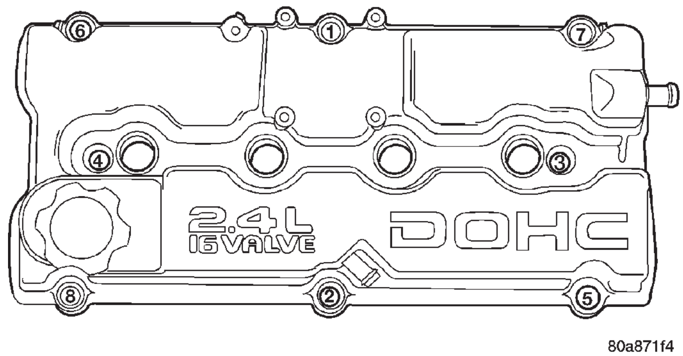


Fig. 26 Cylinder Head Cover Tightening Sequence

(4) Install ignition coil pack and plug wires. Tighten fasteners to 12 N·m (105 in. lbs.).

(5) Install ground strap.

CAMSHAFT

REMOVAL

(1) Remove cylinder head cover using procedure outlined in this section.

(2) Remove timing belt, sprockets and covers. Refer to Timing Belt Service outlined in this section.

(3) Bearing caps are identified for location. Remove the outside bearing caps first (Fig. 27).

(4) Loosen the camshaft bearing cap attaching fasteners in sequence shown (Fig. 28) one camshaft at a time.

CAUTION: Camshafts are not interchangeable. The intake cam number 6 thrust bearing face spacing is wider.

(5) Identify the camshafts before removing from the head. The camshafts are not interchangeable.

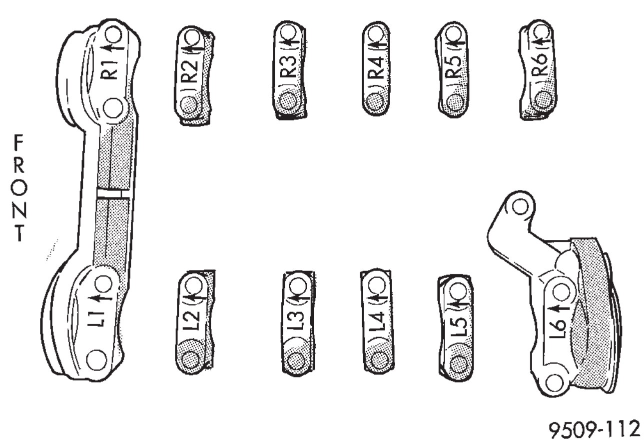


Fig. 27 Camshaft Bearing Cap Identification

REMOVAL AND INSTALLATION (Continued)

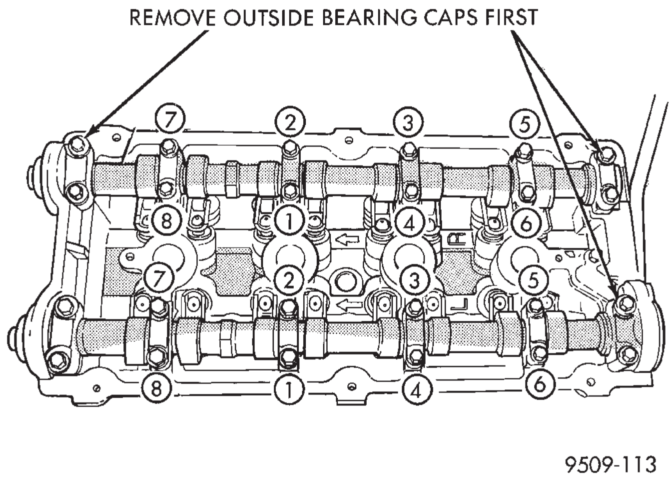


Fig. 28 Camshaft Bearing Cap— Removal

CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft **WITHOUT** cam follower assemblies. Install rear cam caps and tighten screws to specified torque.

(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 29).

(4) Move camshaft as far forward as it will go.

(5) End play travel: 0.05–0.15 mm (0.002–0.010 in.).

(6) If end play is excessive check cylinder head and camshaft for wear; replace as necessary.

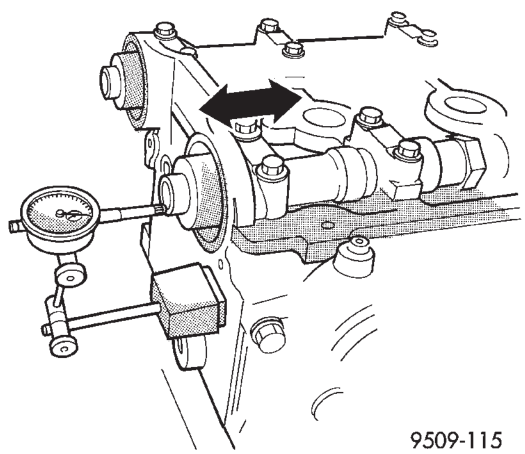


Fig. 29 Camshaft End Play

INSTALLATION

CAUTION: Ensure that NONE of the pistons are at top dead center when installing the camshafts.

(1) Remove camshaft retaining caps and lubricate bearing journals. Install cam followers and camshafts with clean oil. Install right and left camshaft bearing caps #2 thru #5 and right #6. Tighten M6 fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 30).

(2) Apply Mopar Gasket Maker to No. 1 and No. 6 bearing caps (Fig. 31). Install bearing caps and tighten M8 fasteners to 28 N·m (250 in. lbs.).

(3) Bearing end caps must be installed before seals can be installed.

(4) Install timing belt, sprockets and covers. Refer to timing belt service outlined in this section.

(5) Install cylinder head cover using procedure outlined in this section.

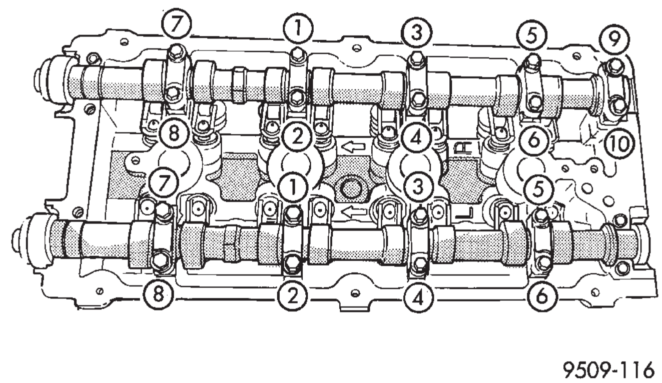


Fig. 30 Camshaft Bearing Cap Tightening Sequence

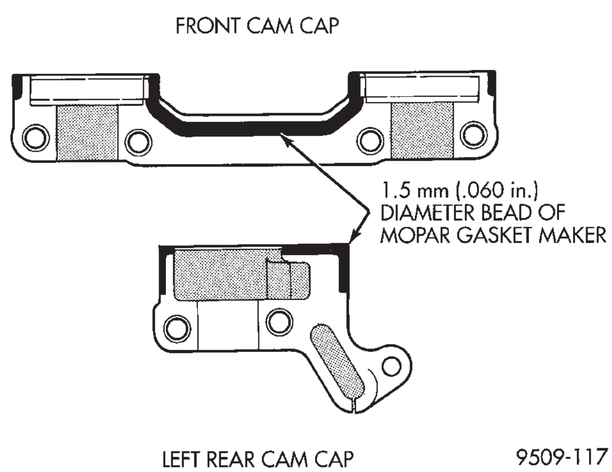


Fig. 31 Camshaft Bearing Cap Sealing

REMOVAL AND INSTALLATION (Continued)

CAMSHAFT FOLLOWER

REMOVAL

(1) Remove cylinder head cover using procedure outlined in this section.

(2) Remove timing belt, sprockets and covers using procedure outlined in this section.

(3) Remove camshaft. Refer to procedure previously outline this section.

(4) Remove cam follower assemblies from cylinder head. Keep the cam followers in the order they have been removed from the head for reassembly.

INSPECTION

Inspect the cam follower assembly for wear or damage (Fig. 32). Replace as necessary.

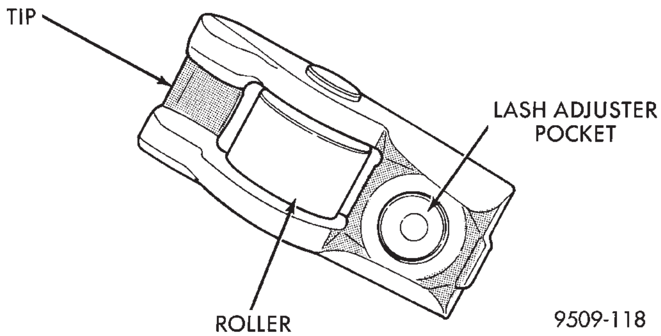


Fig. 32 Cam Follower Assembly

INSTALLATION

(1) Lubricate with clean oil and install cam follower assemblies in their original position on the hydraulic adjuster and valve stem (Fig. 33).

(2) Install the camshafts. Refer to procedure previously outlined in this section.

(3) Install timing belt, sprockets and covers using procedure outlined in this section.

(4) Install cylinder head cover using procedure outlined in this section.

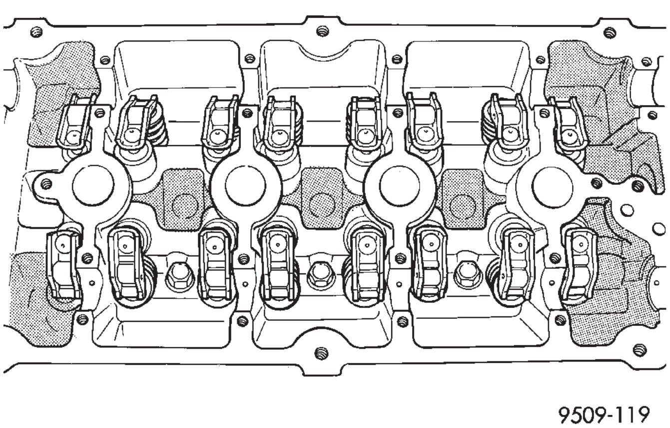


Fig. 33 Cam Follower Assemblies—Installation

BALANCE SHAFTS CARRIER ASSEMBLY

BALANCE SHAFTS

REMOVAL

Refer to Timing Belt Cover, and Timing Belt removal procedure in this section. To repair balance shafts carrier assembly.

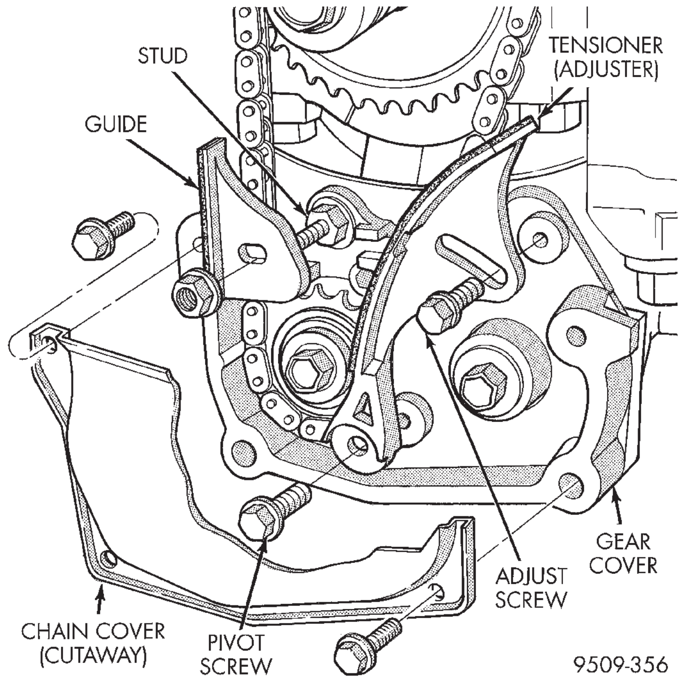


Fig. 34 Chain Cover, Guide and Tensioner

(1) Remove chain cover, guide and tensioner (Fig. 34). Also see Carrier Assembly Removal for service procedures requiring only temporary relocation of assembly.

(2) Remove gear cover retaining stud (double ended to also retain chain guide). Remove cover and balance shaft gears (Fig. 34).

(3) Remove balance shaft gear and chain sprocket retaining screws and crankshaft chain sprocket. Remove chain and sprocket assembly (Fig. 35). Using two wide pry bars, work the sprocket back and forth until it is off the shaft.

(4) Remove carrier gear cover and balance shafts (Fig. 36).

(5) Remove four carrier to crankcase attaching bolts to separate carrier from engine bedplate.

BALANCE SHAFT CARRIER

REMOVAL

The following components will remain intact during carrier removal. Gear cover, gears, balance shafts and the rear cover (Fig. 37).

(1) Remove chain cover and driven balance shaft chain sprocket screw.

REMOVAL AND INSTALLATION (Continued)

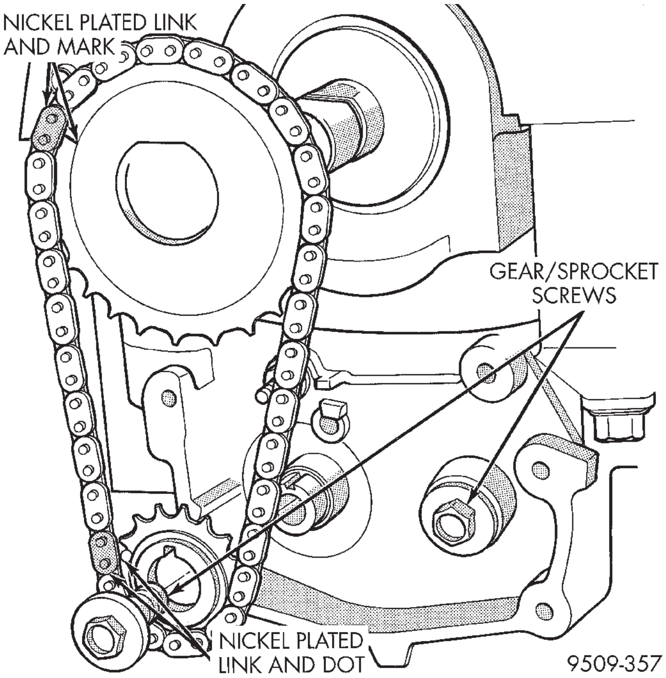


Fig. 35 Drive Chain and Sprockets

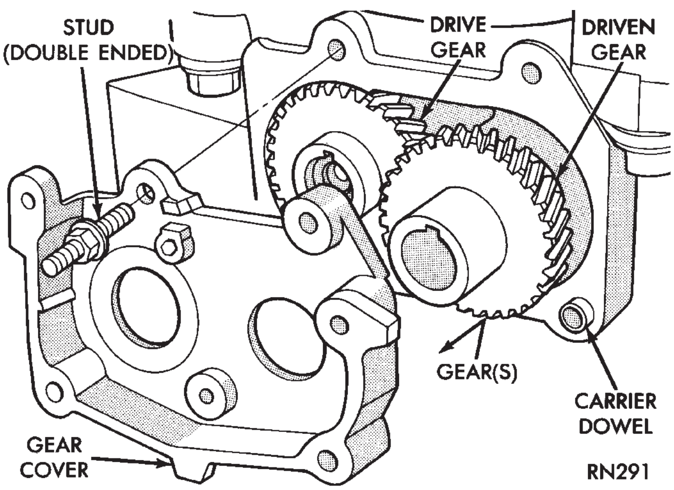


Fig. 36 Gear Cover and Gears

(2) Loosen tensioner pivot and adjusting screws, move driven balance shaft inboard through driven chain sprocket. Sprocket will hang in lower chain loop.

(3) Remove carrier to crankcase attaching bolts to remove carrier.

Balance Shaft Installation

Balance shaft and carrier assembly installation is the reverse of the removal procedure. **During installation crankshaft to balance shaft timing must be established. Refer to Timing procedure outlined in this section.**

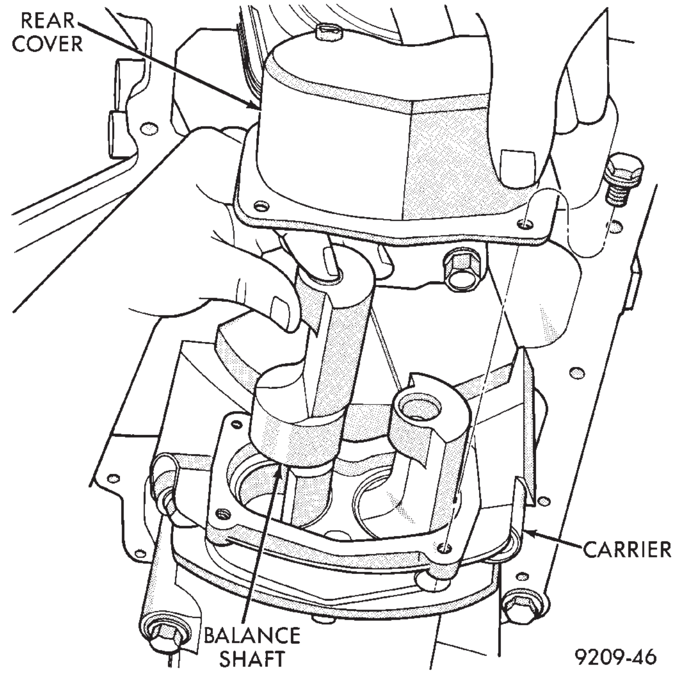


Fig. 37 Balance Shaft(s)—Removal/Installation

TIMING

(1) With balance shafts installed in carrier (Fig. 38) position carrier on crankcase and install four attaching bolts and tighten to 54 N·m (40 ft. lbs.).

(2) Turn balance shafts until both shaft key ways are up Parallel to vertical centerline of engine. Install short hub drive gear on sprocket driven shaft and long hub gear on gear driven shaft. After installation gear and balance shaft keyways must be up with gear timing marks meshed as shown in (Fig. 39).

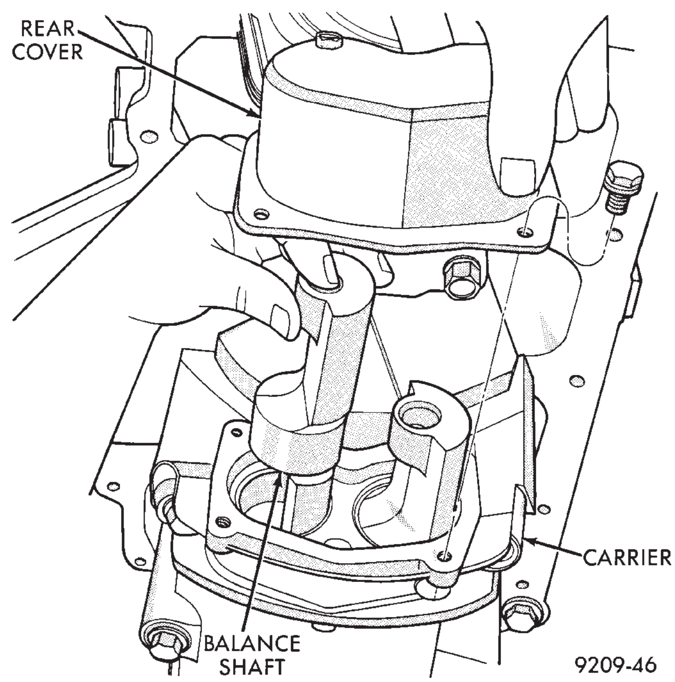


Fig. 38 Balance Shaft(s)—Removal/Installation

REMOVAL AND INSTALLATION (Continued)

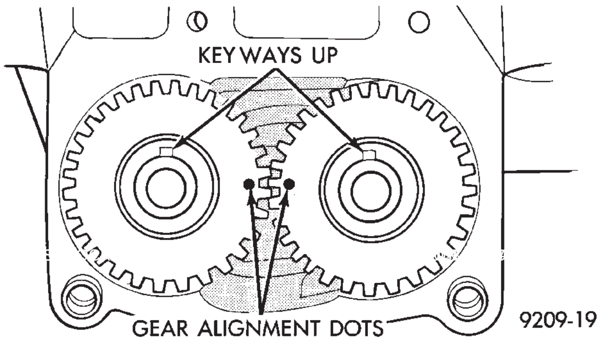


Fig. 39 Gear Timing

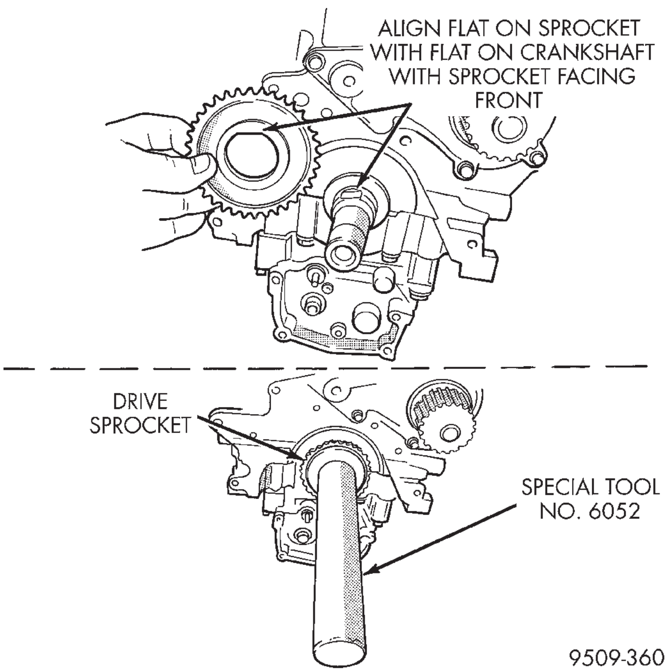


Fig. 40 Crankshaft Sprocket—Installation

(3) Install gear cover and tighten double ended stud/washer fastener to 12 N·m (105 in. lbs.).

(4) Install crankshaft sprocket using Special Tool 6052 (Fig. 40).

(5) Turn crankshaft until number one cylinder is at Top Dead Center (TDC). The timing marks on the chain sprocket should line up with the parting line on the left side of number one main bearing cap. (Fig. 41).

(6) Place chain over crankshaft sprocket so that the nickel plated link of the chain is over the number 1 cylinder timing mark on the crankshaft sprocket (Fig. 41).

(7) Place balance shaft sprocket into the timing chain (Fig. 41) so that the timing mark on the sprocket (yellow dot) mates with the (lower) nickel plated link on the chain

(8) With balance shaft keyways pointing up (12 o'clock) slide the balance shaft sprocket onto the nose of the balance shaft. The balance shaft may have to be pushed in slightly to allow for clearance.

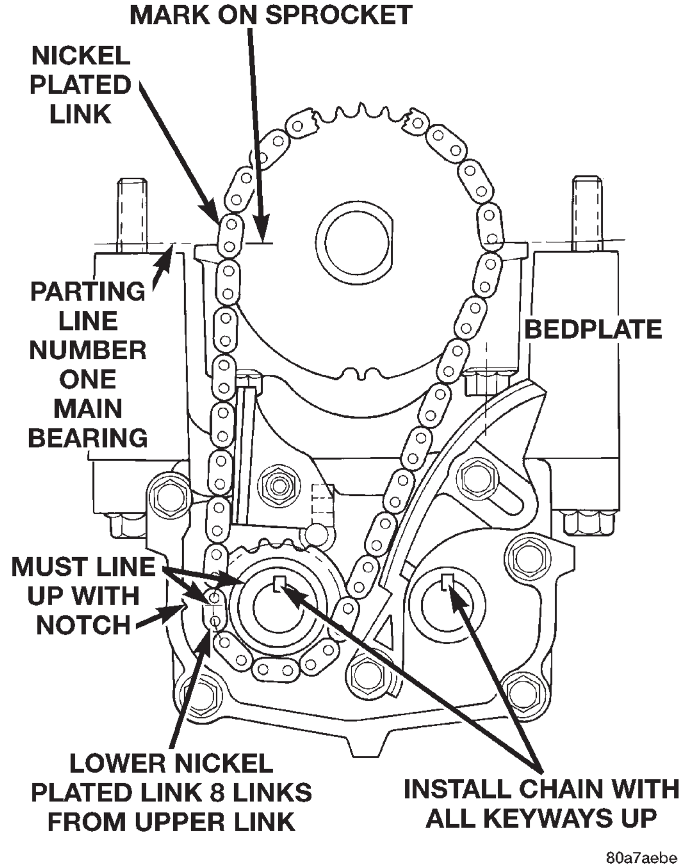


Fig. 41 Balance Shaft Timing

NOTE: THE TIMING MARK ON THE SPROCKET, THE (LOWER) NICKEL PLATED LINK, AND THE ARROW ON THE SIDE OF THE GEAR COVER SHOULD LINE UP WHEN THE BALANCE SHAFTS ARE TIMED CORRECTLY.

(9) If the sprockets are timed correctly install the balance shaft bolts and tighten to 28 N·m (250 in. lbs.). A wood block placed between crankcase and crankshaft counterbalance will prevent crankshaft and gear rotation.

CHAIN TENSIONING

(1) Install chain tensioner loosely assembled.

(2) Position guide on double ended stud making sure tab on the guide fits into slot on the gear cover. Install and tighten nut/washer assembly to 12 N·m (105 in. lbs.).

(3) Place a shim 1 mm (0.039 in.) thick x 70 mm (2.75 in.) long or between tensioner and chain. Push tensioner and shim up against the chain. **Apply firm pressure (5.5 to 6.6 lbs.) directly behind the adjustment slot to take up all slack.** Chain must have shoe radius contact as shown in (Fig. 42).

REMOVAL AND INSTALLATION (Continued)

(4) With the load applied, tighten top tensioner bolt first, then bottom pivot bolt. Tighten bolts to 12 N·m (105 in. lbs.). Remove shim.

(5) Install carrier covers and tighten screws to 12 N·m (105 in. lbs.).

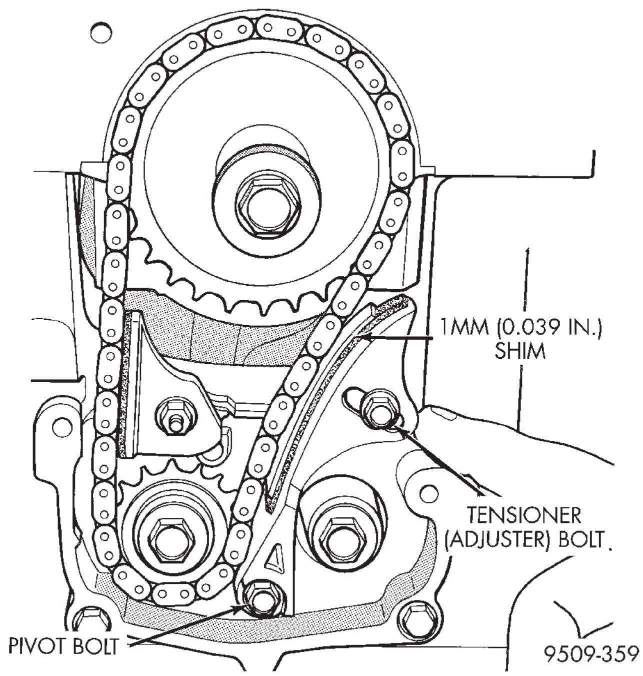


Fig. 42 Chain Tension Adjustment

HYDRAULIC LASH ADJUSTER

REMOVAL

(1) Remove cylinder head cover. Refer to procedure outlined in this section.

(2) Remove cam follower assembly. Refer to camshaft removal procedure outlined in this section to gain access to cam followers and lash adjusters.

(3) Mark hydraulic lash adjusters for reassembly in their original position. Lash adjusters are serviced as a assembly.

INSTALLATION

(1) Install hydraulic lash adjuster assembly making sure adjusters are at least partially full of oil. This is indicated by little or no plunger travel when the lash adjuster is depressed.

(2) Install cam follower assembly as previously outlined in this section.

(3) Install camshaft as previously outlined in this section.

(4) Install cylinder head cover as previously outlined in this section.

VALVE SPRINGS AND VALVE SEALS IN VEHICLE

REMOVAL

(1) Remove camshafts as previously outlined in this section.

(2) Rotate crankshaft until piston is at TDC on compression.

(3) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.

(4) Using Special Tool MD-998772-A with adapter 6779 (Fig. 43) compress valve springs and remove valve locks.

(5) Remove valve spring.

(6) Remove valve stem seal by a using valve stem seal tool.

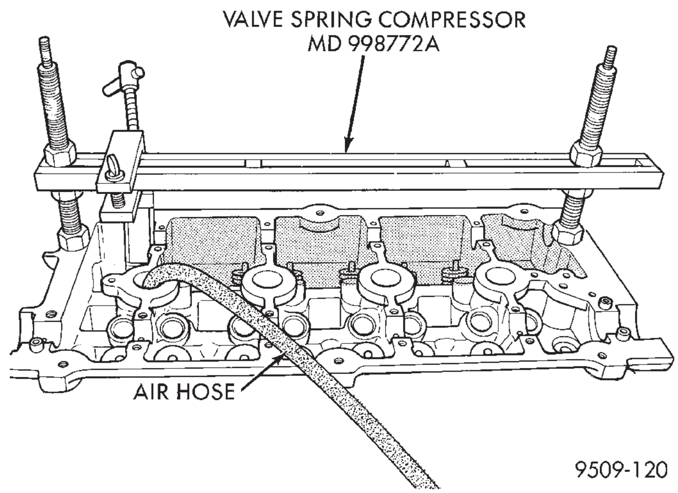


Fig. 43 Valve Spring—Removal/Installation

INSTALLATION

(1) Install valve seal/valve spring seat assembly (Fig. 44). Push the assembly down to seat it onto the valve guide.

(2) Install valve spring and retainer, use Special Tool MD-998772-A with adapter 6779 to compress valve springs only enough to install locks (Fig. 43). Correct alignment of tool is necessary to avoid nicking valve stems.

(3) Remove air hose and install spark plugs.

(4) Install camshafts as previously outlined in this section.

(5) Install cylinder head cover as previously outlined in this section.

REMOVAL AND INSTALLATION (Continued)

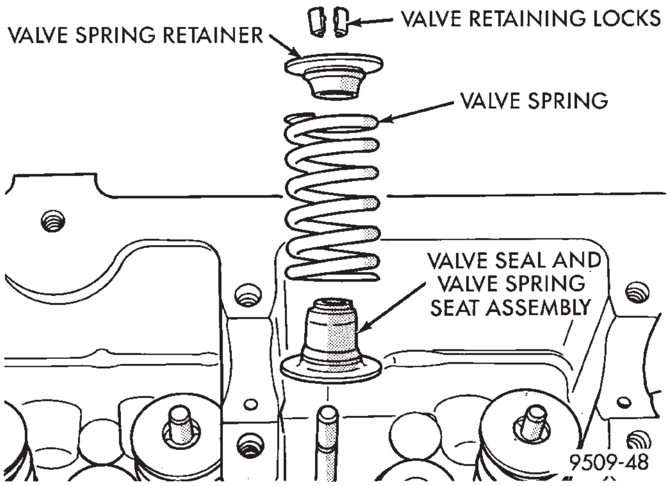


Fig. 44 Valve Stem Seal/Valve Spring Seat

CYLINDER HEAD

REMOVAL

(1) Perform fuel system pressure release procedure **before attempting any repairs.** Refer to Group 14, Fuel System for procedure.

(2) Disconnect negative battery cable. Drain cooling system. Refer to Group 7, Cooling System for procedure.

(3) Remove air cleaner and disconnect all vacuum lines, electrical wiring and fuel lines from throttle body.

(4) Remove throttle linkage. Refer to Group 14, Fuel System for procedures

(5) Remove accessory drive belts. Refer to Group 7, Cooling System for procedure.

(6) Remove power brake vacuum hose from intake manifold.

(7) Raise vehicle and remove exhaust pipe from manifold.

(8) Remove power steering pump assembly and set aside.

(9) Disconnect coil pack wiring connector and remove coil pack and plug wires from engine.

(10) Remove cam sensor and fuel injectors wiring connectors.

(11) Remove timing belt and camshaft sprocket. Refer to procedure outlined in this section.

(12) Remove timing belt idler pulley and rear timing belt cover.

(13) Remove cylinder head cover using procedure outlined in this section.

(14) Remove camshafts and cam followers. Refer to procedures outlined in this section for procedures.

(15) Remove cylinder head bolts and remove cylinder head from engine block.

(16) Inspect and clean cylinder head. Refer to Cleaning and Inspection outlined in this section for procedures.

INSTALLATION

NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced (Fig. 45).

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt should be replaced.

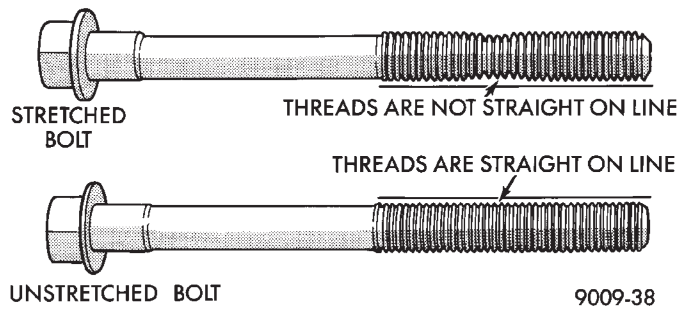


Fig. 45 Checking Bolts for Stretching (Necking)

(1) Before installing the bolts, the threads should be coated with engine oil.

(2) Tighten the cylinder head bolts in the sequence shown in (Fig. 46). Using the 4 step torque turn method, tighten according to the following values:

- First All to 34 N·m (25 ft. lbs.)
- Second All to 68 N·m (50 ft. lbs.)
- Third All to 68 N·m (50 ft. lbs.)

CAUTION: Do not use a torque wrench for the following step.

- Fourth Turn an additional 1/4 Turn,

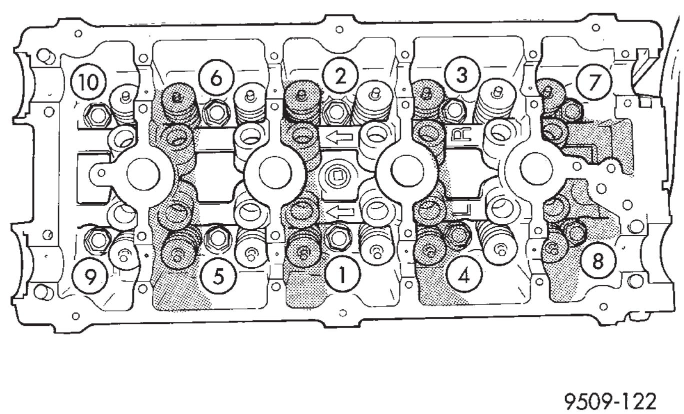


Fig. 46 Cylinder Head Tightening Sequence

(3) Install camshafts and cam followers. Refer to procedures outlined in this section for procedures.

(4) Install cylinder head cover using procedure outlined in this section.

REMOVAL AND INSTALLATION (Continued)

(5) Install rear timing belt cover and timing belt idler pulley.

(6) Install timing belt and camshaft sprocket. Refer to procedure outlined in this section.

(7) Install cam sensor and fuel injectors wiring connectors.

(8) Install coil pack and plug wires onto the engine. Connect coil pack wiring connector.

(9) Install power steering pump assembly.

(10) Raise vehicle and install the exhaust pipe to the manifold.

(11) Install power brake vacuum hose to the intake manifold.

(12) Install accessory drive belts. Refer to Group 7, Cooling System for procedure.

(13) Install throttle linkage. Refer to Group 14, Fuel System for procedures.

(14) Install air cleaner and connect all vacuum lines, electrical wiring and fuel lines to the throttle body.

(15) Fill cooling system. Refer to Group 7, Cooling System for procedure. Connect negative battery cable.

VALVES AND VALVE SPRINGS

REMOVAL

(1) With cylinder head removed, compress valve springs using a universal valve spring compressor.

(2) Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.

(3) Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves to insure installation in original location.

(4) Inspect and clean the valves. Refer to Cleaning and Inspection outlined in this section for procedure.

INSTALLATION

(1) Coat valve stems with clean engine oil and insert in cylinder head.

(2) Install new valve stem seals on all valves using a valve stem seal tool (Fig. 47). The valve stem seals should be pushed firmly and squarely over valve guide.

CAUTION: When oversize valves are used, the corresponding oversize valve seal must also be used. Excessive guide wear may result if oversize seals are not used with oversize valves.

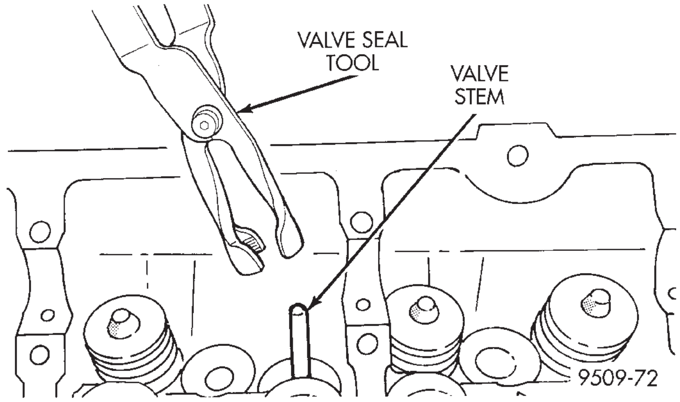


Fig. 47 Valve Stem Oil Seal Tool

(3) Install valve springs and retainers. Compress valve springs only enough to install locks, taking care not to misalign the direction of compression. Nicked valve stems may result from misalignment of the valve spring compressor.

CAUTION: When depressing the valve spring retainers with valve spring compressor the locks can become dislocated. Ensure both locks are in the correct location after removing tool.

(4) Check the valve spring installed height B after refacing the valve and seat (Fig. 48). Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a .762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.

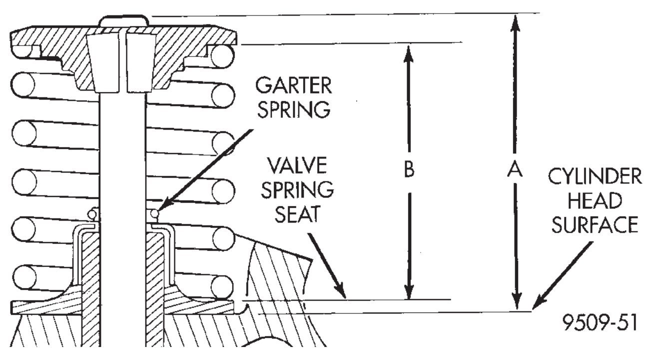


Fig. 48 Checking Spring Installed Heightand Valve Tip Height Dimensions

REMOVAL AND INSTALLATION (Continued)

VIBRATION DAMPER

REMOVAL

Remove crankshaft vibration damper bolt. Remove damper by using Special Tool 1026 and Insert 6827–A (Fig. 49).

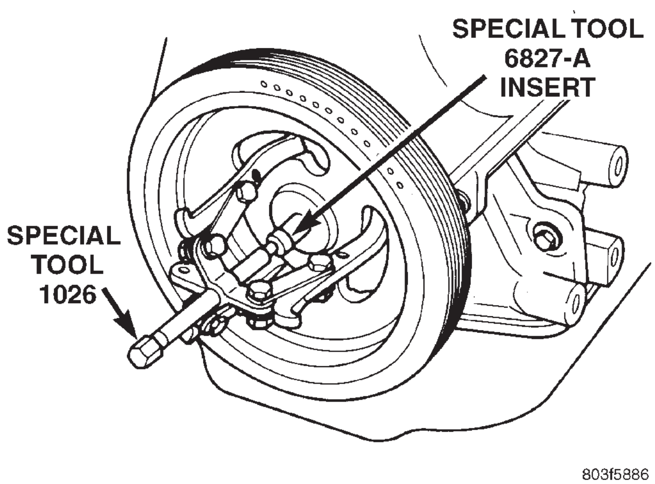


Fig. 49 Crankshaft Vibration Damper—Removal

INSTALLATION

Install crankshaft vibration damper using M12 1.75 x 150 mm bolt, washer, thrust bearing and nut from Special Tool 6792. Install crankshaft vibration damper bolt and tighten to 142 N·m (105 ft. lbs.) (Fig. 50).

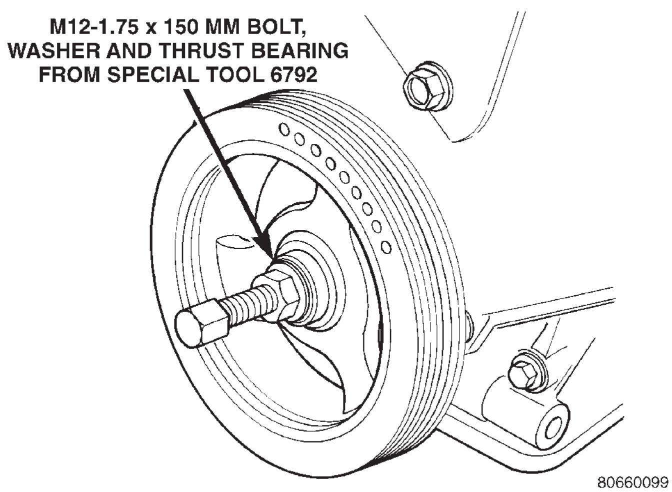


Fig. 50 Crankshaft Vibration Damper—Installation

TIMING BELT COVER

FRONT COVER

REMOVAL

(1) Remove crankshaft damper. Refer to crankshaft damper removal for procedure.

(2) Remove front timing belt cover fasteners (Fig. 51) and remove cover.

(3) Remove engine mount bracket (Fig. 51).

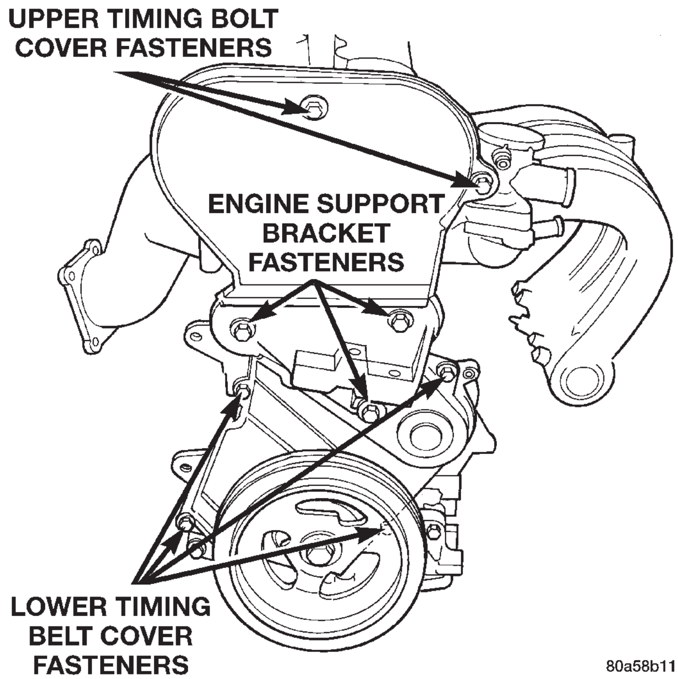


Fig. 51 Front Timing Belt Covers

INSTALLATION

(1) Install the engine mount bracket and front timing belt cover (Fig. 51).

(2) Install crankshaft damper. Refer to crankshaft damper installation for procedure.

REAR COVER

REMOVAL

(1) Remove Front Cover. Refer to Front Cover Removal procedure outlined in this section.

(2) Remove Timing Belt. Refer to procedure outlined in this section.

(3) Remove idler pulleys (Fig. 52).

(4) Remove both camshaft sprockets.

(5) Remove rear timing belt fasteners and remove cover from engine (Fig. 52).

INSTALLATION

(1) Install rear timing belt cover and fasteners (Fig. 52).

(2) Install idler (Fig. 52).

(3) Install camshaft sprockets.

(4) Install Timing Belt. Refer to procedure outlined in this section.

(5) Install front cover. Refer to Front Cover installation procedure outlined in this section.

REMOVAL AND INSTALLATION (Continued)

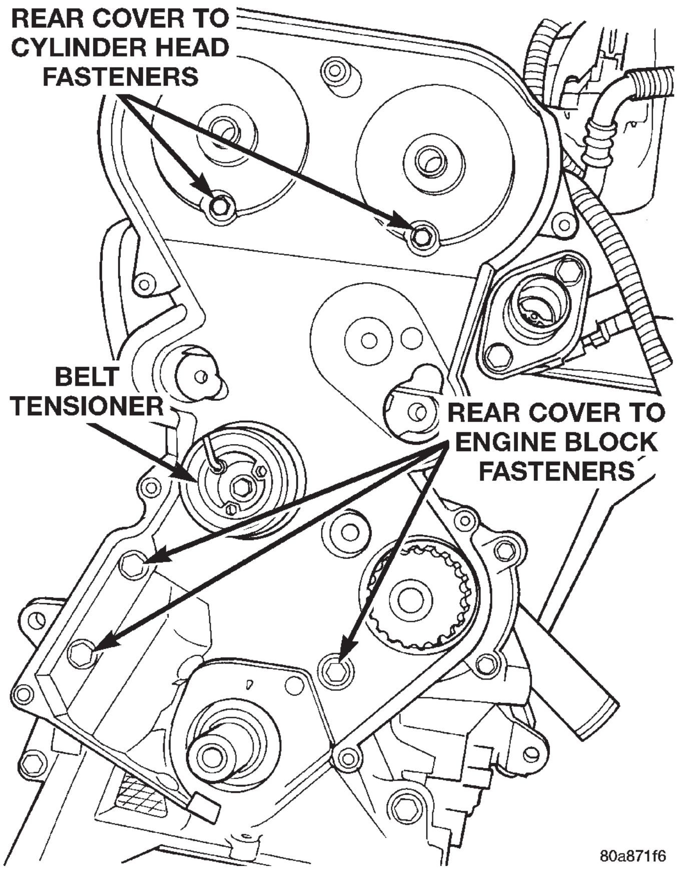


Fig. 52 Rear Timing Belt Cover Fasteners

TIMING BELT

REMOVAL

(1) Raise vehicle on hoist. Remove right front wheel.

(2) Remove right inner splash shield.

(3) Remove accessory drive belts. Refer to Group 7, Cooling System.

(4) Remove crankshaft damper bolt, and remove damper. Refer to Removal and Installation procedure in this section.

(5) Remove lower timing belt cover fasteners and remove cover (Fig. 53).

(6) Lower vehicle and remove upper timing belt cover fasteners and remove cover.

(7) Remove right engine mount and support bracket. Refer to Removal and Installation procedure in this section.

CAUTION: When aligning crankshaft and camshaft timing marks always rotate engine from crankshaft. Camshaft should not be rotated after timing belt is removed. Damage to valve components may occur. Always align timing marks before removing timing belt.

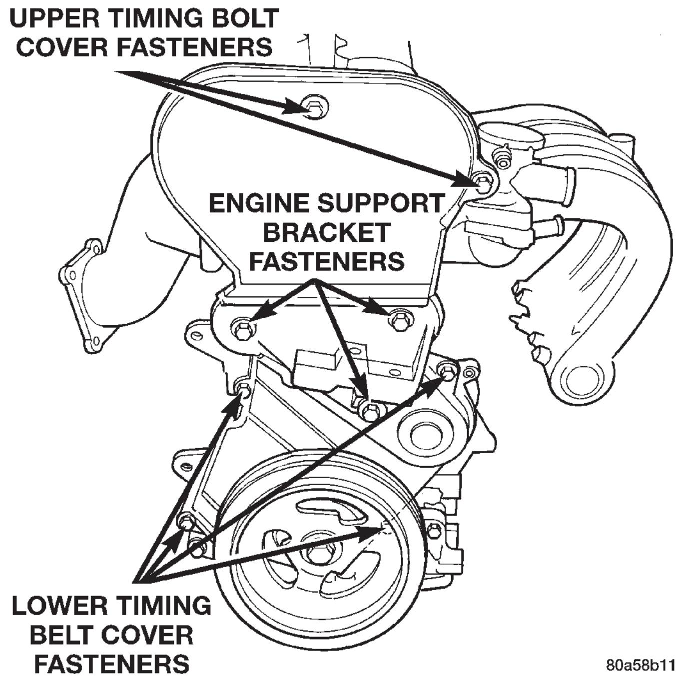


Fig. 53 Timing Belt Covers

(8) Align crankshaft and camshafts timing marks (Fig. 54) to TDC.

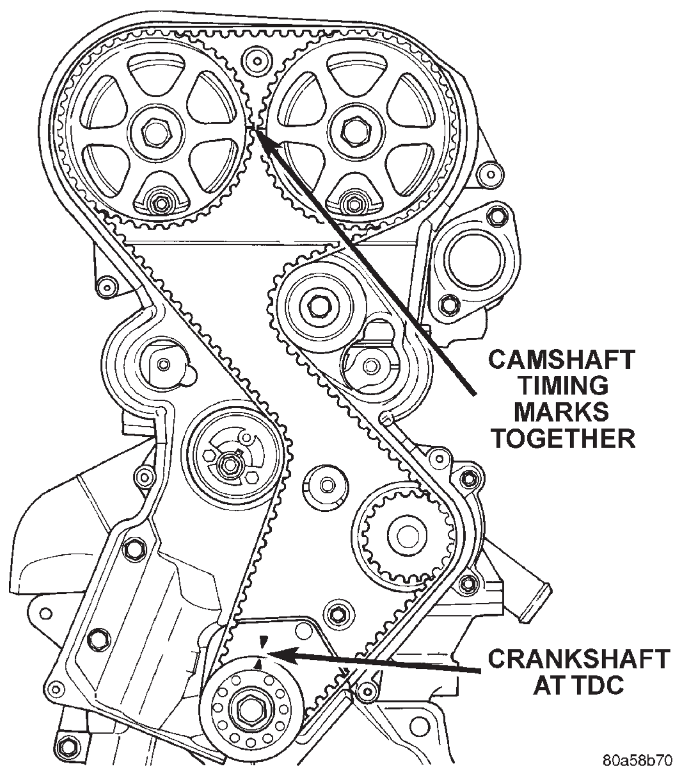


Fig. 54 Crankshaft and Camshaft Timing

REMOVAL AND INSTALLATION (Continued)

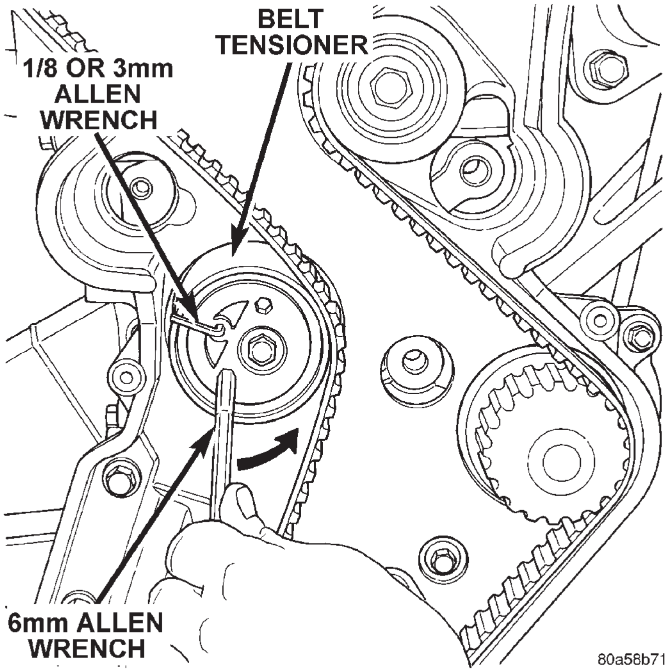


Fig. 55 Locking Timing Belt Tensioner

(9) Install 6 mm Allen wrench into belt tensioner. Before rotating the tensioner insert the long end of a 1/8” or 3 mm Allen wrench into the pin hole on the front of the tensioner (Fig. 55). While rotating the tensioner counterclockwise push in lightly on the 1/8” or 3 mm Allen wrench, until it slides into the locking hole.

(10) Remove timing belt.

TIMING BELT TENSIONER

(1) If replacing timing belt tensioner, remove the bolt from the center of the tensioner. Remove tensioner.

(2) When installing the tensioner align the flat on the tensioner bracket with the flat on the tensioner (Fig. 56).

(3) Torque tensioner center bolt to 28 N·m (252 in. lbs.)

INSTALLATION

(1) Set crankshaft sprocket to TDC by aligning the sprocket with the arrow on the oil pump housing.

(2) Set camshafts timing marks so that the exhaust camshaft sprocket is a 1/2 notch below the intake camshaft sprocket (Fig. 57).

CAUTION: Ensure that the arrows on both camshaft sprockets are facing up.

(3) Install timing belt. Starting at the crankshaft, go around the water pump sprocket, idler pulley, camshaft sprockets and then around the tensioner (Fig. 58).

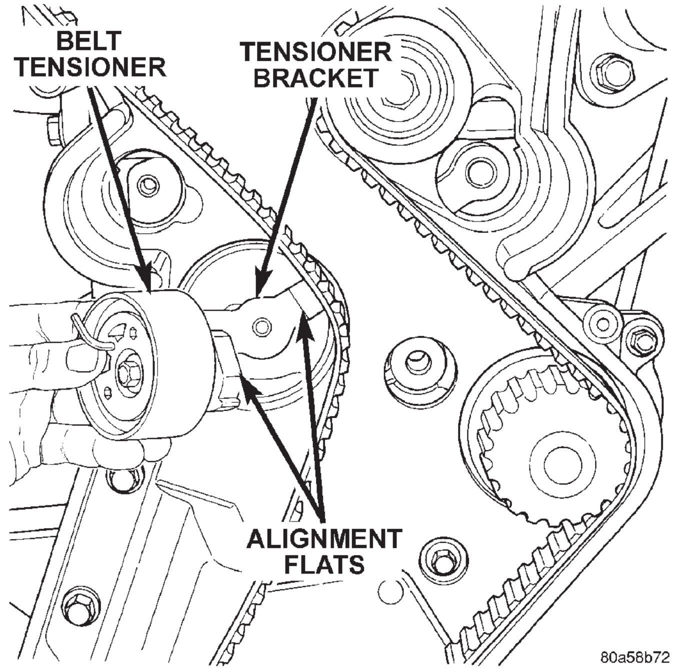


Fig. 56 Tensioner to Bracket Alignment

(4) Move the exhaust camshaft sprocket counterclockwise (Fig. 58) to align marks and take up belt slack.

NOTE: A new tensioner is held in the wound position by a pull pin.

(5) Remove the pull pin or Allen wrench from the belt tensioner.

(6) Rotate crankshaft 2 revolutions and check the alignment of the timing marks (Fig. 54).

(7) Install right engine mount and support bracket. Refer to Removal and Installation procedure in this section.

(8) Install upper timing belt cover bolts 4.5 N·m (40 in. lbs.).

(9) Install the lower timing belt cover bolts 4.5 N·m (40 in. lbs.).

(10) Install crankshaft damper. Refer to Service procedure outlined in this section.

(11) Install accessory drive belts. Refer to Group 7, Cooling System.

(12) Install right inner splash shield.

(13) Install right front wheel.

TIMING BELT TENSIONER

For Removal and Installation procedure for belt tensioner. Refer to Timing Belt Removal and Installation in this section.

OIL PAN

REMOVAL

(1) Drain engine oil.

REMOVAL AND INSTALLATION (Continued)

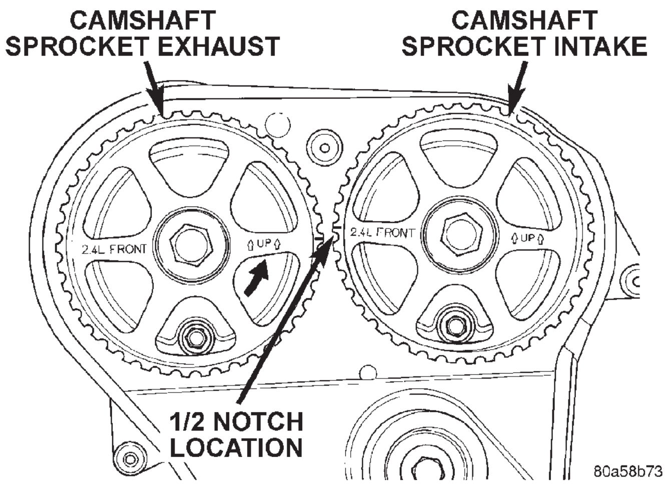


Fig. 57 Camshaft Sprocket Alignment

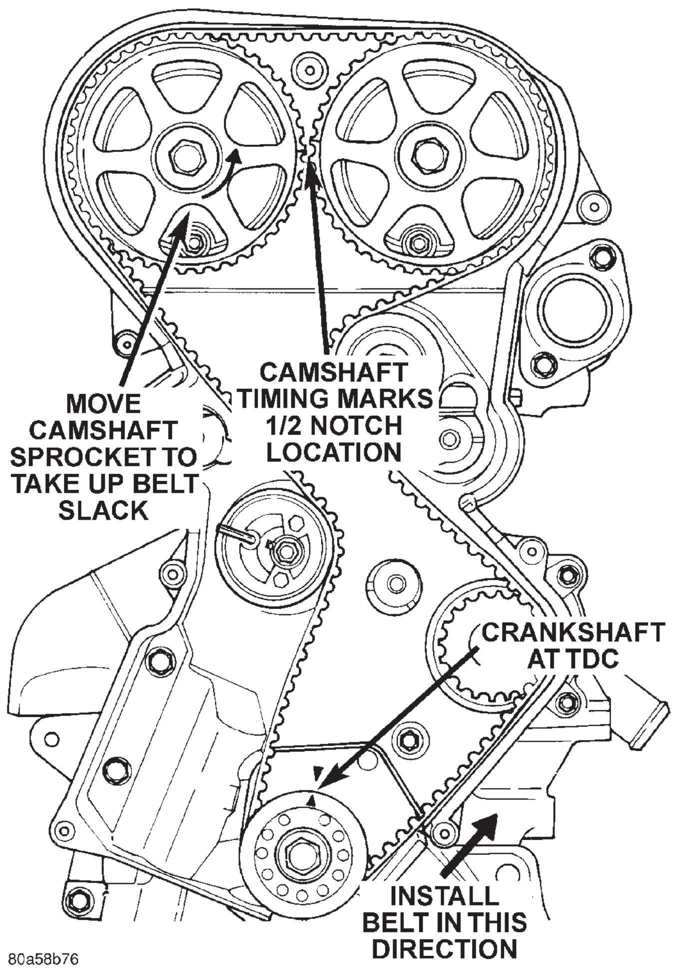


Fig. 58 Timing Belt—Installation

(2) Remove engine support module. Refer to Removal and Installation procedure in this section.

(3) Remove collar from rear of pan and transmission.

(4) Remove oil pan.

(5) Clean oil pan and all gasket surfaces.

INSTALLATION

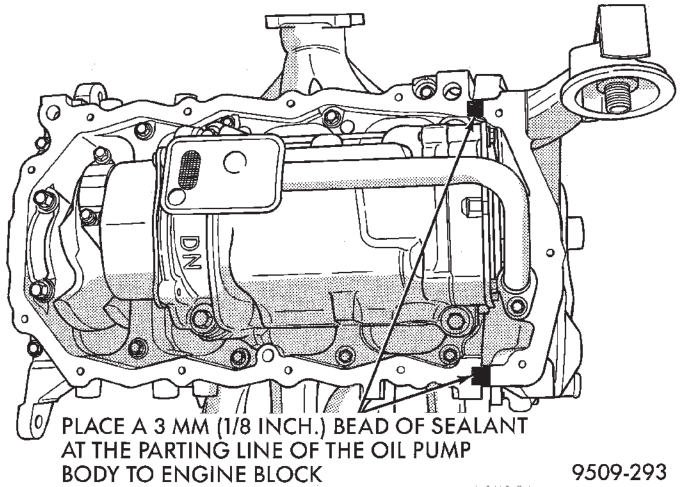


Fig. 59 Oil Pan Sealing

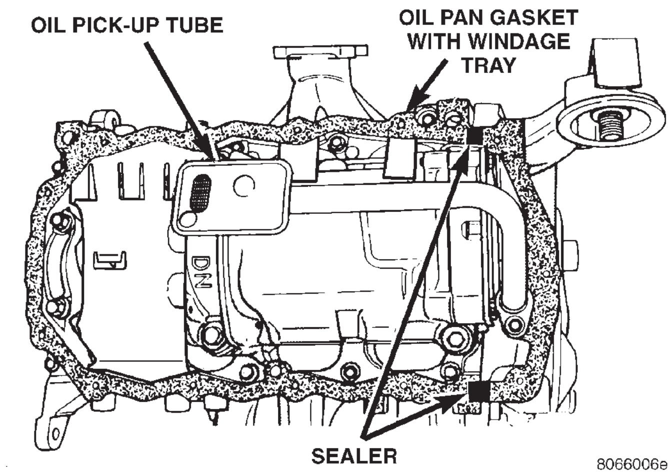


Fig. 60 Oil Pan Gasket Installation

(1) Apply Mopar Silicone Rubber Adhesive Sealant or equivalent at the oil pump to engine block parting line (Fig. 59).

(2) Install the oil pan gasket to the block (Fig. 60).

(3) Install pan and tighten the screws to 12 N·m (105 in. lbs.).

CAUTION: Torque procedure for the collar must be followed or damage could occur to oil pan or collar.

(4) Install the 2 **center** collar to oil pan bolts. Torque to 3 N·m (30 in. lbs.)

(5) Install collar to transmission bolts and tighten to 108 N·m (80 ft. lbs.).

(6) Install the 2 remaining collar to pan bolts. Starting with the center bolts and working outward torque all 4 bolts to 34 N·m (250 in. lbs.).

(7) Install engine support module. Refer to Removal and Installation procedure in this section.

REMOVAL AND INSTALLATION (Continued)

FRONT CAMSHAFT OIL SEAL

REMOVAL

(1) Remove front timing belt cover and timing belt. Refer to procedure outlined in this section.

(2) Hold camshaft sprocket with Special Tool C-4687 and adapter C-4687-1 while removing center bolt (Fig. 61).

(3) Remove camshaft seal using Special Tool C-4679-A (Fig. 62).

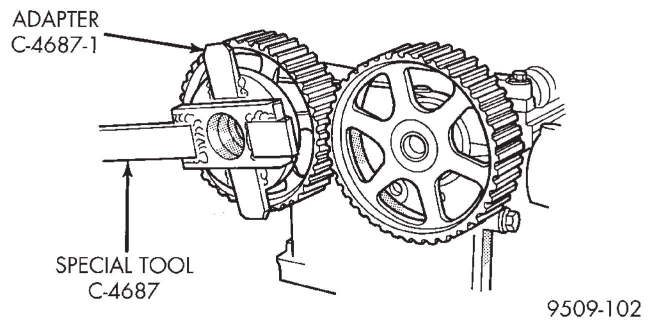


Fig. 61 Camshaft Sprocket—Removal/Installation

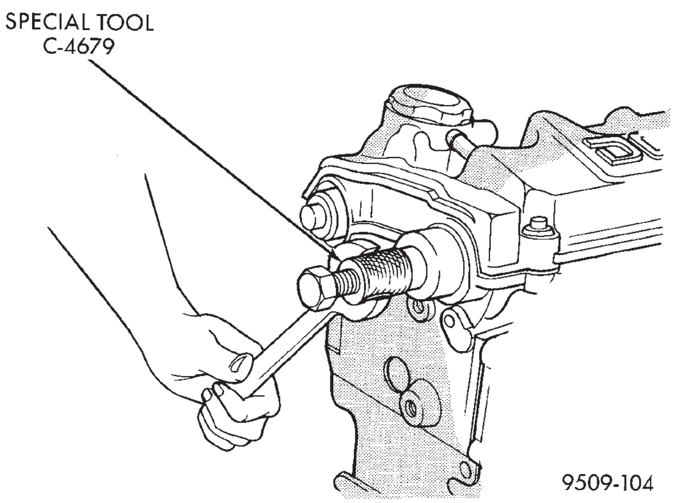


Fig. 62 Camshaft Oil Seal—Removal WithC-4679–A

CAUTION: Do not nick shaft seal surface or seal bore

INSTALLATION

(1) Shaft seal surface must be free of varnish, dirt or nicks. Polish with 400 grit paper if necessary.

(2) Install camshaft seal into cylinder head using Special Tool MD-998306 until flush with head (Fig. 63).

(3) Install camshaft sprocket and tighten center bolt to 101 N·m (75 ft. lbs.) (Fig. 61).

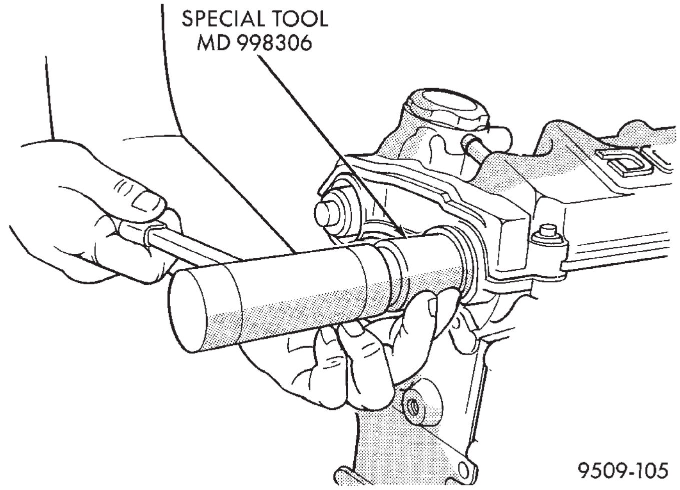


Fig. 63 Camshaft Seal—Installation

FRONT CRANKSHAFT OIL SEAL

REMOVAL

(1) Using large side of Special Tool 1026 and Insert 6827-A, remove crankshaft damper (Fig. 64).

(2) Remove outer timing belt cover and timing belt. Refer to Timing Belt System outlined in this section.

(3) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 65).

CAUTION: Do not nick shaft seal surface or seal bore.

(4) Using Tool 6771 to remove front crankshaft oil seal (Fig. 66). Be careful not to damage the seal surface of cover.

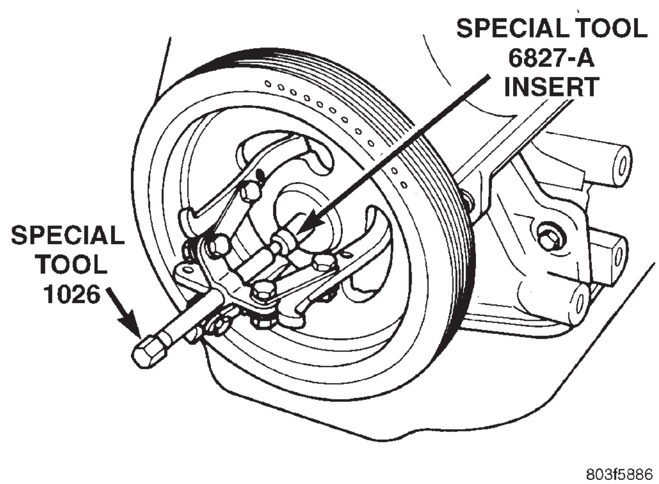


Fig. 64 Crankshaft Damper—Removal

INSTALLATION

(1) Install new seal by using Tool 6780 (Fig. 67).

REMOVAL AND INSTALLATION (Continued)

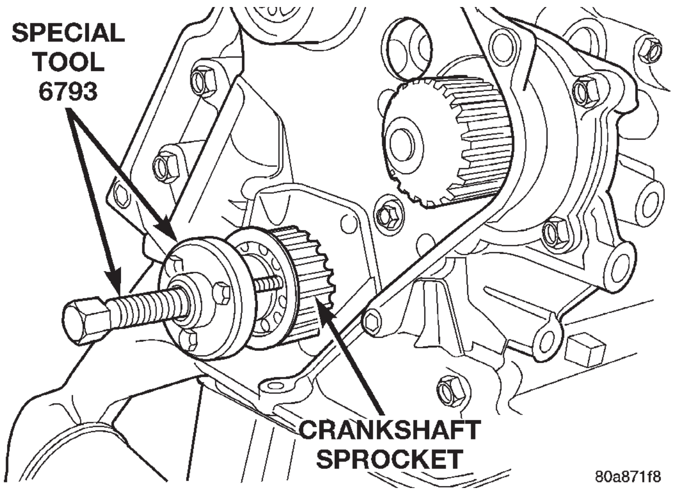


Fig. 65 Crankshaft Sprocket—Removal

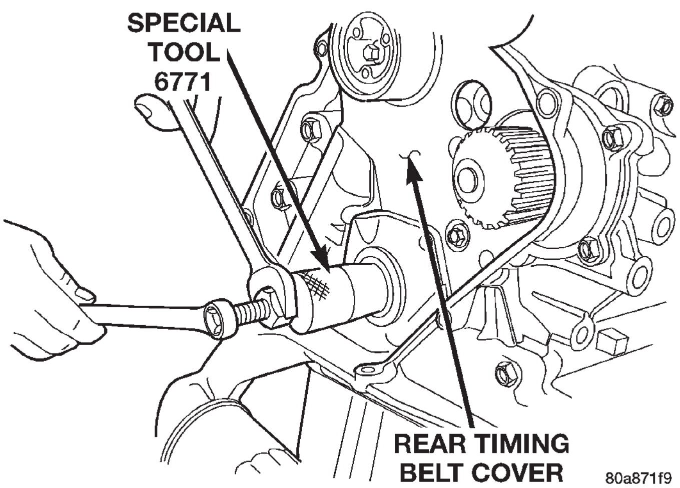


Fig. 66 Front Crankshaft Oil Seal—Removal

(2) Place seal into opening with seal spring towards the inside of engine. Install seal until flush with cover.

(3) Install crankshaft sprocket (Fig. 68). Using Special Tool 6792.

(4) Install timing belt and timing belt covers. Refer to Timing System Section for timing belt covers and belt.

(5) Install crankshaft damper (Fig. 69). Use thrust bearing/washer and 12M 1.75 x 150 mm bolt from Special Tool 6792. Install crankshaft damper bolt and tighten to 142 N·m (105 ft. lbs.)

REAR CRANKSHAFT SEAL

REMOVAL

(1) Insert a 3/16 flat bladed screwdriver between the dust lip and the metal case of the crankshaft seal. Angle the screwdriver (Fig. 70) through the dust lip against metal case of the seal. Pry out seal.

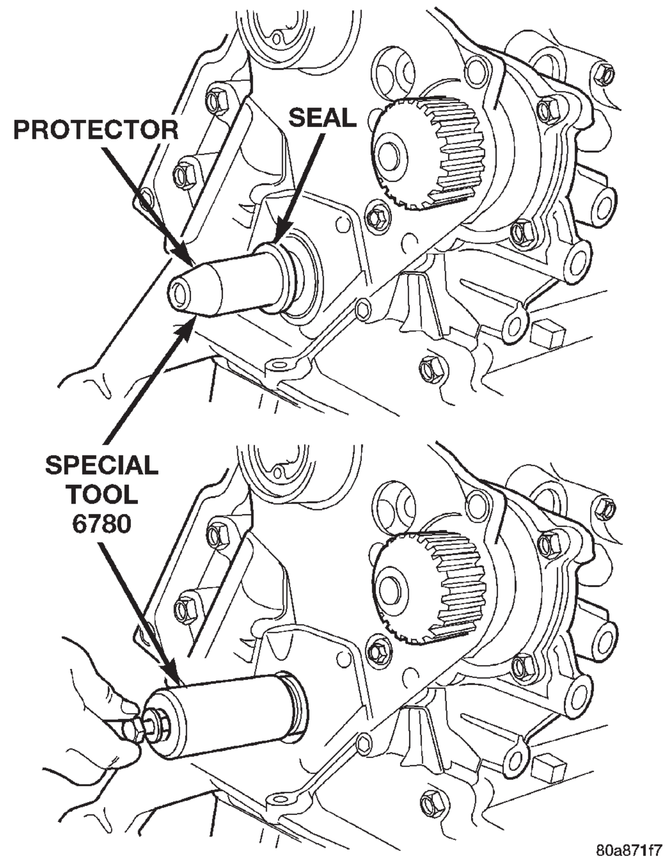


Fig. 67 Front Crankshaft Oil Seal—Installation

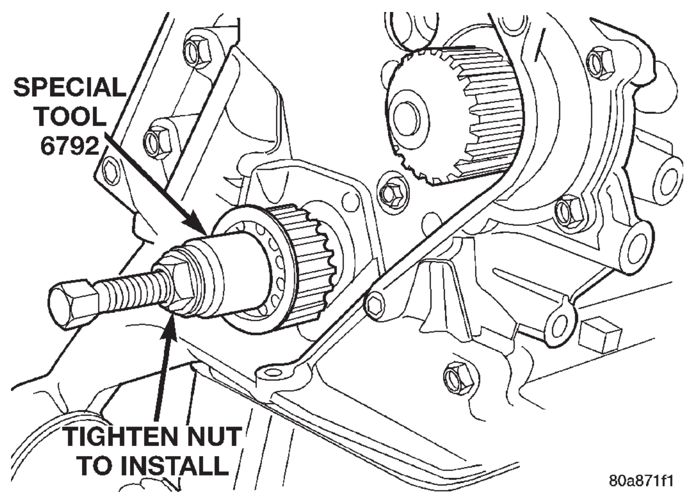


Fig. 68 Crankshaft Sprocket—Installation

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

REMOVAL AND INSTALLATION (Continued)

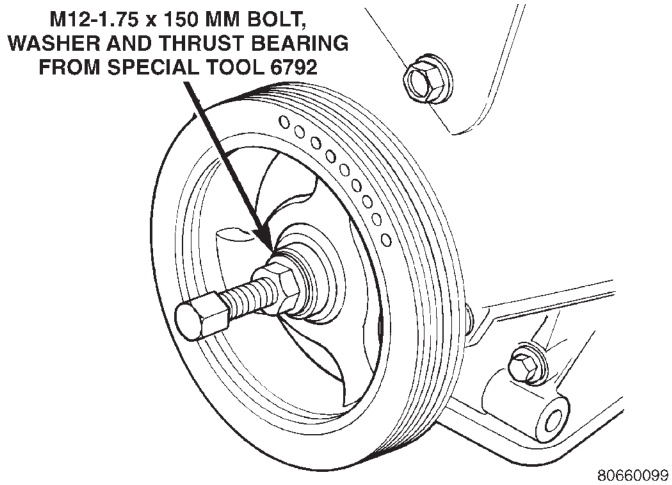


Fig. 69 Crankshaft Damper—Installation

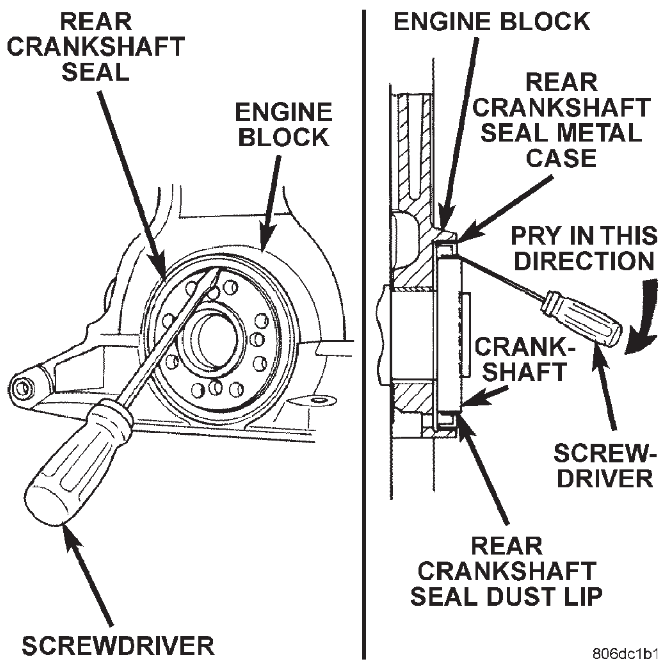


Fig. 70 Rear Crankshaft Oil Seal—Removal

INSTALLATION

CAUTION: If burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

NOTE: When installing seal, no lube on seal is needed.

(1) Place Special Tool 6926-1 on crankshaft. This is a pilot tool with a magnetic base (Fig. 71).

(2) Position seal over pilot tool. Make sure you can read the words **THIS SIDE OUT** on seal (Fig. 71). Pilot tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.

CAUTION: If the seal is driven into the block past flush, this may cause an oil leak.

(3) Drive the seal into the block using Special Tool 6926-2 and handle C-4171 (Fig. 72) until the tool bottoms out against the block (Fig. 73).

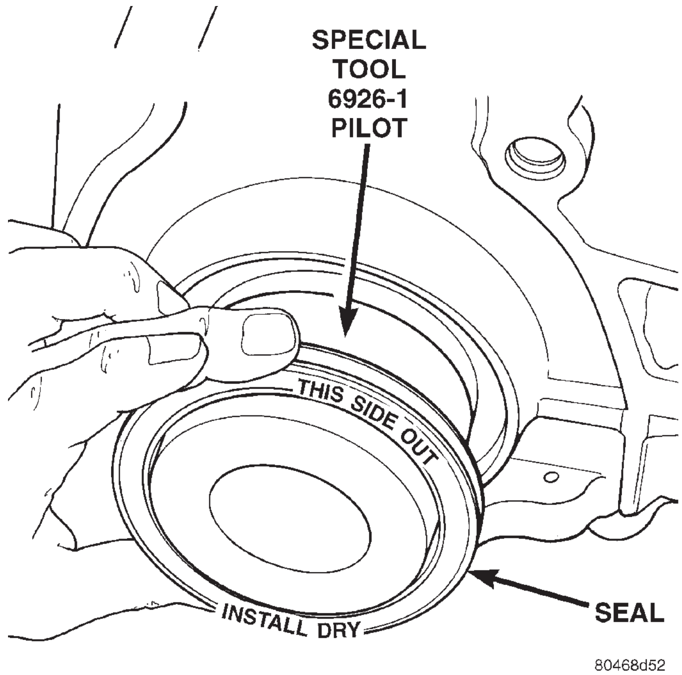


Fig. 71 Rear Crankshaft Seal and SpecialTool 6926-1

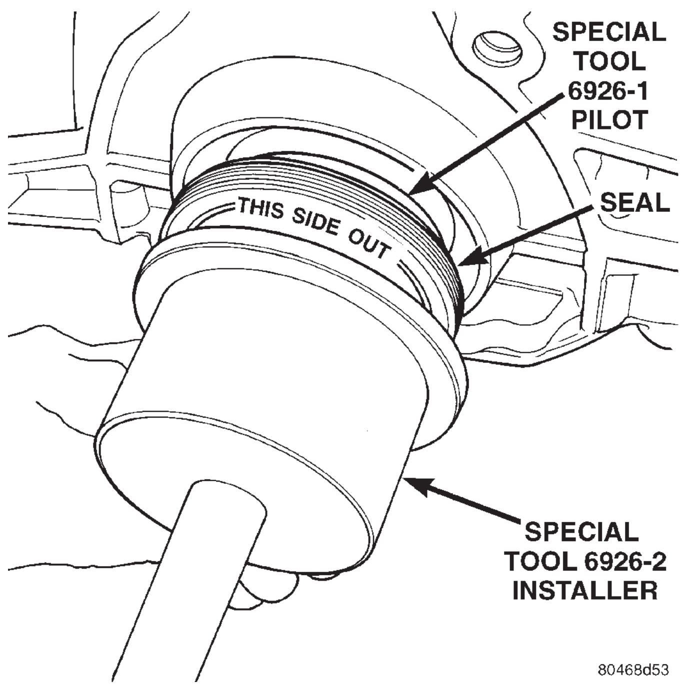


Fig. 72 Crankshaft Seal Special Tool 6926-2

REMOVAL AND INSTALLATION (Continued)

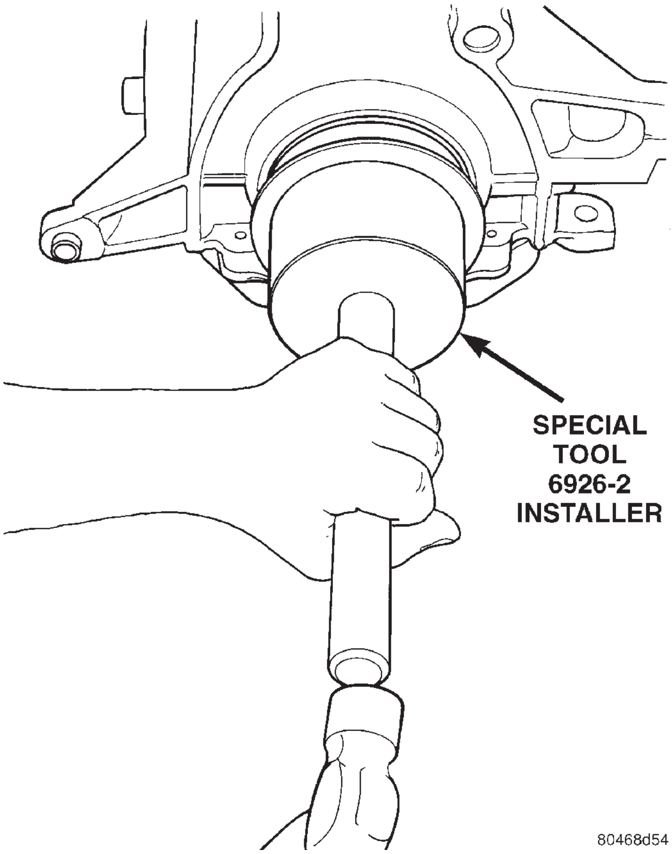


Fig. 73 Rear Crankshaft Seal—Installation

CRANKSHAFT

REMOVAL

NOTE: Crankshaft can not be removed when engine is in vehicle.

(1) Remove oil filter and oil pan. Refer to procedure outlined in this section.

(2) Remove Timing Belt Cover, Timing Belt and Oil Pump. Refer to procedure outlined in this section.

(3) Remove Balance Shafts Assembly. Refer to procedure outlined in this section.

(4) Remove all main bearing cap bedplate bolts from the engine block. Refer to procedure outlined in this section.

(5) Using a mallet gently tap the bedplate loose from the engine block dowel pins.

CAUTION: Do not pry up on one side of the bedplate. Damage may occur to cylinder block to bedplate alignment and thrust bearing.

(6) Bedplate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.

(7) Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

INSTALLATION

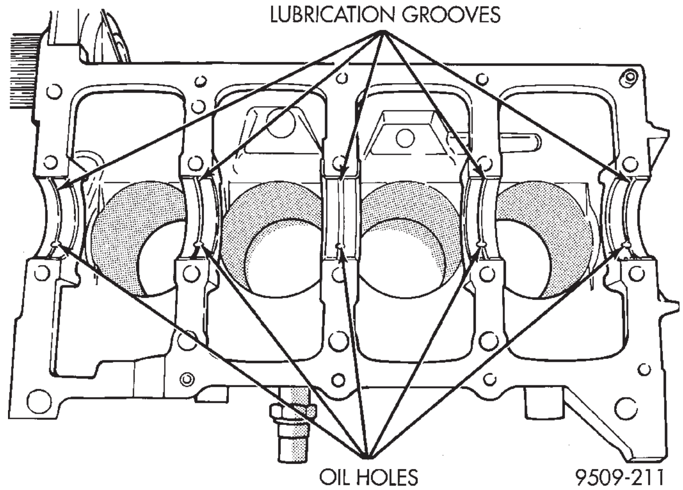


Fig. 74 Installing Main Bearing Upper Shell

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 74).

(2) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

CAUTION: Do not get oil on the bedplate mating surface. It will may effect the sealer ability to seal the bedplate to cylinder block.

(3) Oil the bearings and journals. Install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bedplate or damage may occur to the engine.

(4) Apply 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar Torque Cure Gasket Maker to cylinder block as shown in (Fig. 75).

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are seated into the bedplate slots. Install the main bearing/bedplate into engine block.

(6) Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.

(7) Install main bearing bedplate to engine block bolts 11, 17 and 20 finger tight. Tighten this bolts down together until the bedplate contacts the cylinder block. Then torque these bolts to 28 N·m (20 ft. lbs.).

(8) Install main bearing bedplate to engine block bolts (1 thru 10) and torque each bolt to 41 N·m (30

REMOVAL AND INSTALLATION (Continued)

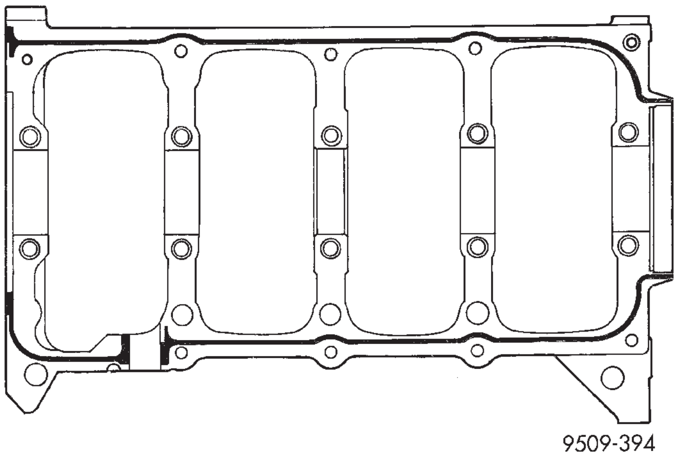


Fig. 75 Main Bearing Caps/Bedplate Sealing

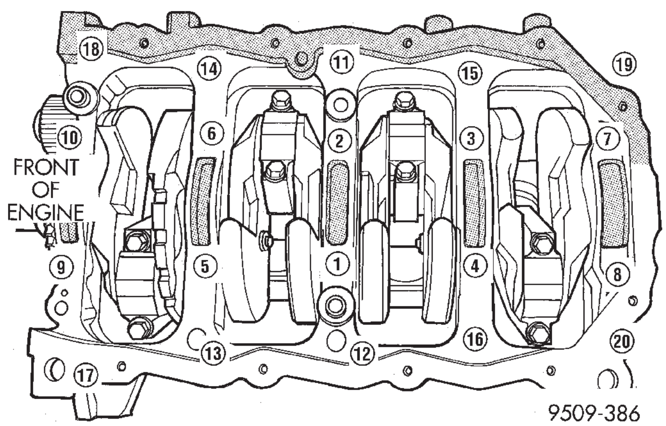


Fig. 76 Main Bearing Caps/Bedplate TorqueSequence

ft. lbs.) in sequence, then in sequence tighten bolts an additional 1/4 turn (Fig. 76).

(9) Install main bearing bedplate to engine block bolts (11 thru 20), and torque each bolt to 28 N·m (20 ft. lbs.) in sequence shown in (Fig. 76).

(10) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

OIL FILTER

CAUTION: When servicing the oil filter avoid deforming the filter can by installing the remove/install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

(1) Turn counterclockwise to remove.

(2) To install, lubricate new filter gasket. Check filter mounting surface. The surface must be smooth, flat and free of debris or old pieces of rubber. Screw filter on until the gasket contacts base. Tighten to 21 N·m (15 ft. lbs.).

OIL PUMP

REMOVAL

(1) Disconnect negative battery cable.

(2) Remove Timing Belt. Refer to Timing Belt Removal in this section.

(3) Remove collar and Oil Pan. Refer to Oil Pan Removal in this section.

(4) Remove Crankshaft Sprocket using Special Tool 6793 and insert C-4685-C2 L (Fig. 77).

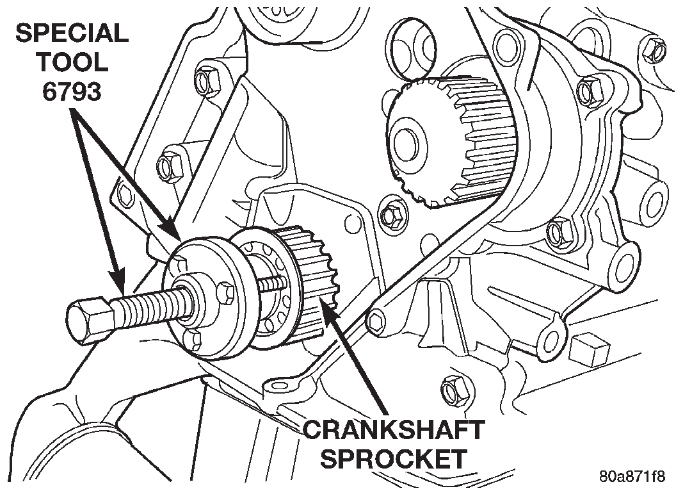


Fig. 77 Crankshaft Sprocket—Removal

(5) Remove oil pick-up tube.

(6) Remove oil pump, (Fig. 78) and front crankshaft seal.

INSTALLATION

(1) Make sure all surfaces are clean and free of oil and dirt.

(2) Apply Mopar Gasket Maker to oil pump as shown in (Fig. 79). Install oil ring into oil pump body discharge passage.

(3) Prime oil pump before installation.

(4) Align oil pump rotor flats with flats on crankshaft as you install the oil pump to the block.

NOTE: Front crankshaft seal MUST be out of pump to align, or damage may result.

(5) Install new front crankshaft seal using Special Tool 6780 (Fig. 80).

REMOVAL AND INSTALLATION (Continued)

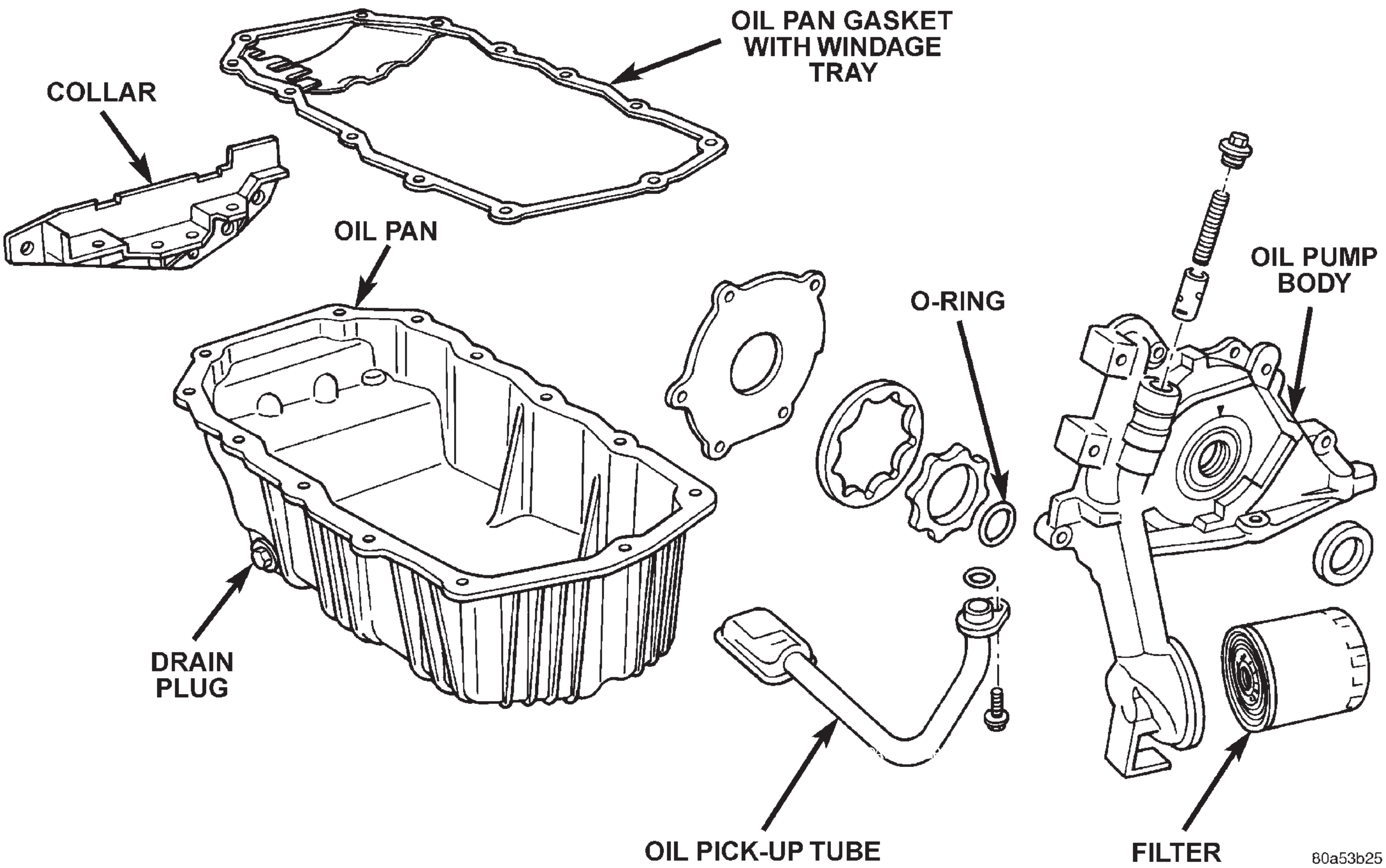


Fig. 78 Oil Pump and Pick-up Tube

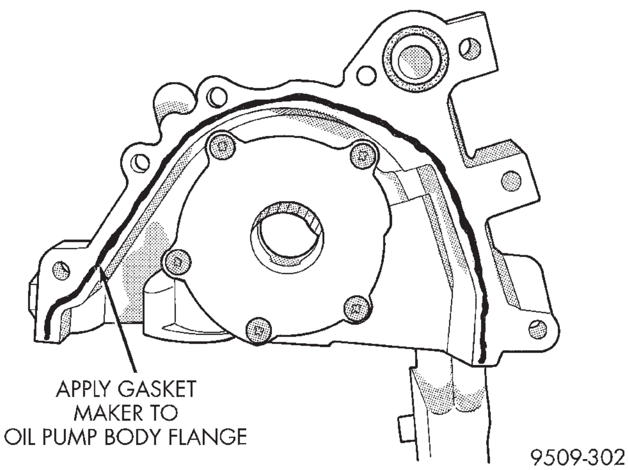


Fig. 79 Oil Pump Sealing

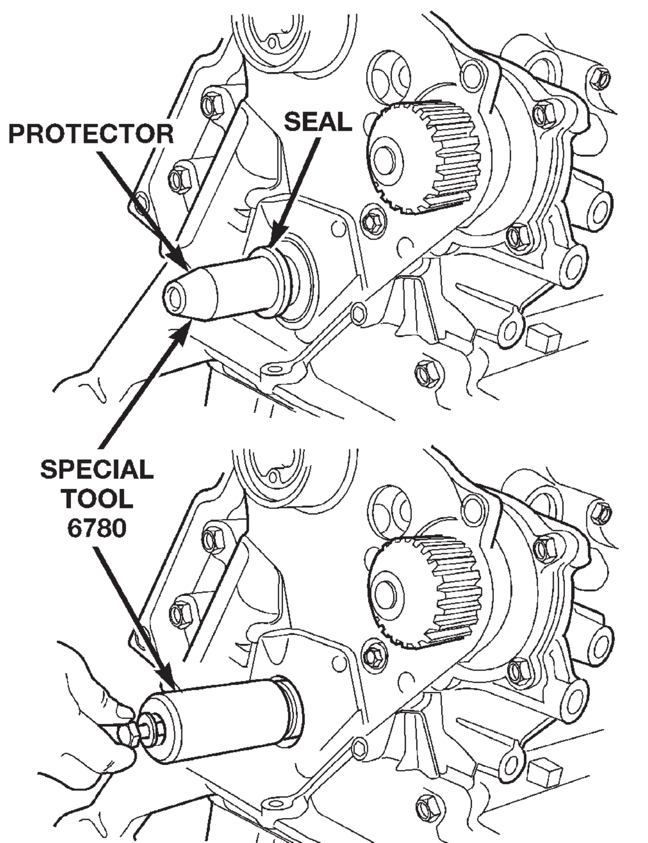


Fig. 80 Front Crankshaft Seal—Installation

REMOVAL AND INSTALLATION (Continued)

(6) Install crankshaft sprocket, using Special Tool 6792 (Fig. 81).

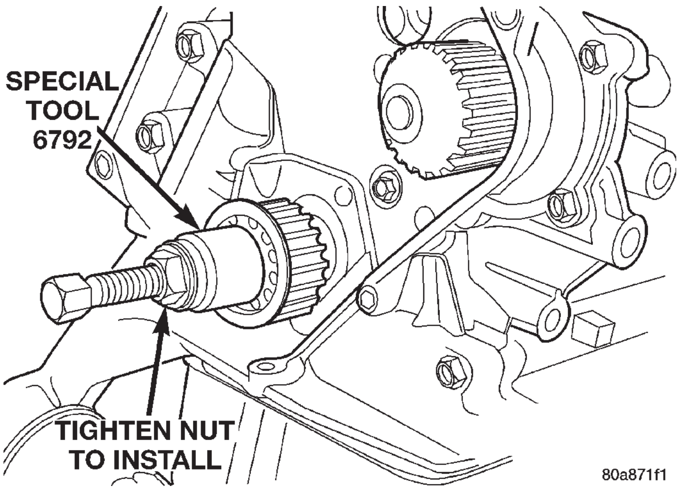


Fig. 81 Crankshaft Sprocket—Installation

(7) Install oil pump pick-up tube and oil pan.

CAUTION: Torque procedure for the collar must be followed or damage could occur to oil pan or collar.

(8) Install the 2 center collar to oil pan bolts. Torque to 3 N·m (30 in. lbs.)

(9) Install collar to transmission bolts and tighten to 108 N·m (80 ft. lbs.).

(10) Install the 2 remaining collar to pan bolts. Starting with the center bolts and working outward torque all 4 bolts to 34 N·m (250 in. lbs.).

(11) Install Timing Belt. Refer to Timing Belt Installation in this section.

PISTON AND CONNECTING ROD

REMOVAL

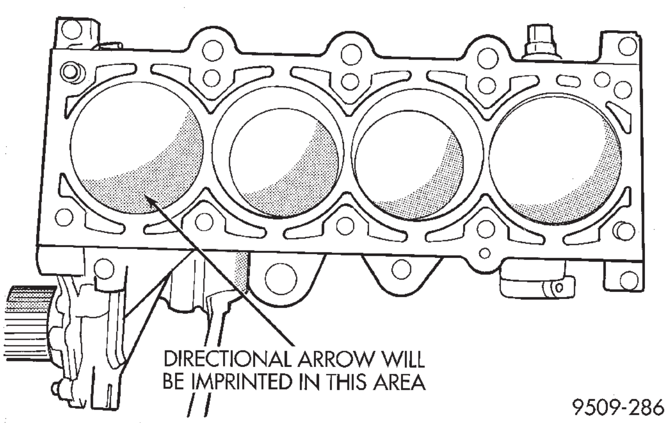


Fig. 82 Piston Markings

NOTE: Cylinder Head must be removed before Pistons and Rods. Refer to Cylinder Head Removal in this section.

(1) Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation**. Mark piston with matching cylinder number (Fig. 82).

(2) Remove oil pan. Scribe the cylinder number on the side of the rod and cap (Fig. 83) for identification.

(3) Pistons have a directional stamping in the front half of the piston facing towards the **front** of engine.

(4) Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centered in cylinder bore.

(5) Remove Balance Shaft Assembly. Refer to Balance Shaft Removal in this section.

(6) Remove connecting rod cap bolts. Push each piston and rod assembly out of cylinder bore.

NOTE: Be careful not to nick crankshaft journals.

(7) After removal, install bearing cap on the mating rod.

(8) Piston and Rods are serviced as an assembly.

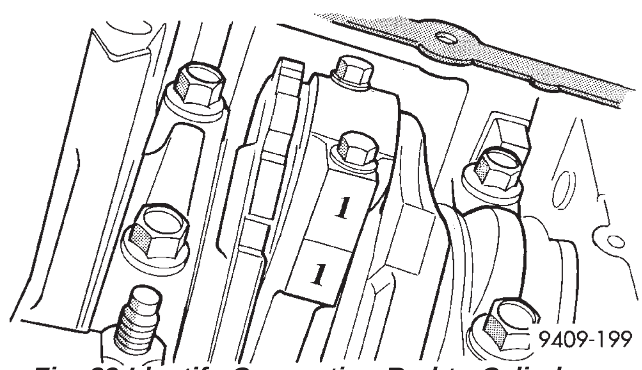


Fig. 83 Identify Connecting Rod to Cylinder

INSTALLATION

(1) Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.

(2) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in (Fig. 84). As viewed from top.

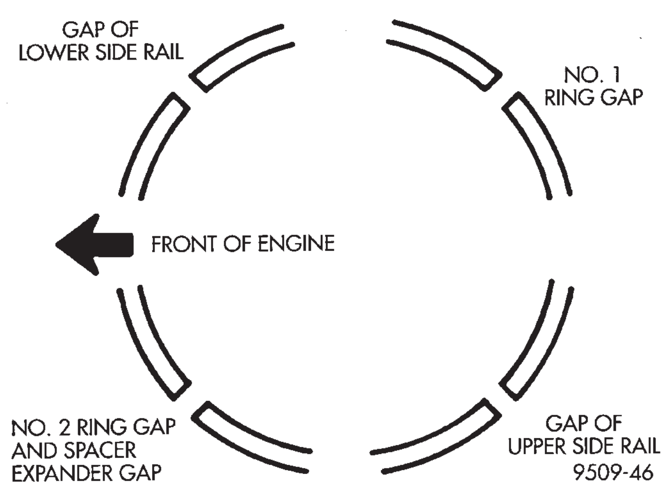


Fig. 84 Piston Ring End Gap Position

REMOVAL AND INSTALLATION (Continued)

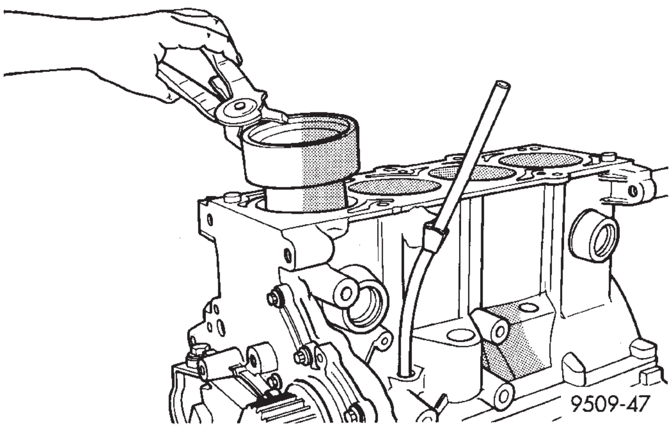


Fig. 85 Piston—Installation

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston (Fig. 85). **Be sure position of rings does not change during this operation** .

(4) The directional stamp on the piston should face toward the front of the engine (Fig. 82).

(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston assembly into cylinder bore and guide rod over the crankshaft journal.

(6) Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

NOTE: The rod bearing bolts should not be reused.

(7) Before installing the **NEW** bolts the threads should be coated with clean engine oil.

(8) Install each bolt finger tight than alternately torque each bolt to assemble the cap properly.

CAUTION: Do not use a torque wrench for second part of last step.

(9) Tighten the bolts to 27 N·m PLUS 1/4 turn (20 ft. lbs. PLUS 1/4 turn)

(10) Using a feeler gauge, check connecting rod side clearance (Fig. 86).

DISASSEMBLY AND ASSEMBLY

OIL PUMP

DISASSEMBLY

(1) To remove the relief valve, proceed as follows:

(a) Remove the threaded plug and gasket from the oil pump (Fig. 87).

(b) Remove spring and relief valve (Fig. 87)

(2) Remove oil pump cover screws, and lift off cover.

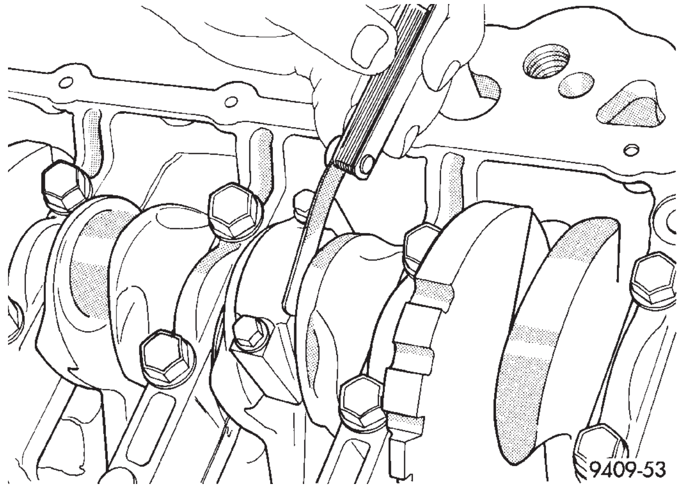


Fig. 86 Checking Connecting Rod Side Clearance

(3) Remove pump rotors.

(4) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

ASSEMBLY

(1) Assemble pump, using new parts as required. **Install the inner rotor with chamfer facing the cast iron oil pump cover.**

(2) Prime oil pump before installation by filling rotor cavity with engine oil.

(3) Install cover and tighten screws to 12 N·m (105 in. lbs.).

CAUTION: Oil pump pressure relief valve must be installed as shown in (Fig. 87) or serious damage may occur.

(4) Install relief valve, spring, gasket and cap as shown in (Fig. 87). Tighten cap to 41 N·m (30 ft. lbs.)

CLEANING AND INSPECTION

CYLINDER HEAD

CLEANING

Remove all gasket material from cylinder head and block. Be careful not to gouge or scratch the aluminum head sealing surface.

INSPECTION

(1) Cylinder head must be flat within 0.1 mm (0.004 inch) (Fig. 88).

(2) Inspect camshaft bearing journals for scoring.

VALVE GUIDES

(1) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(2) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bot-

CLEANING AND INSPECTION (Continued)

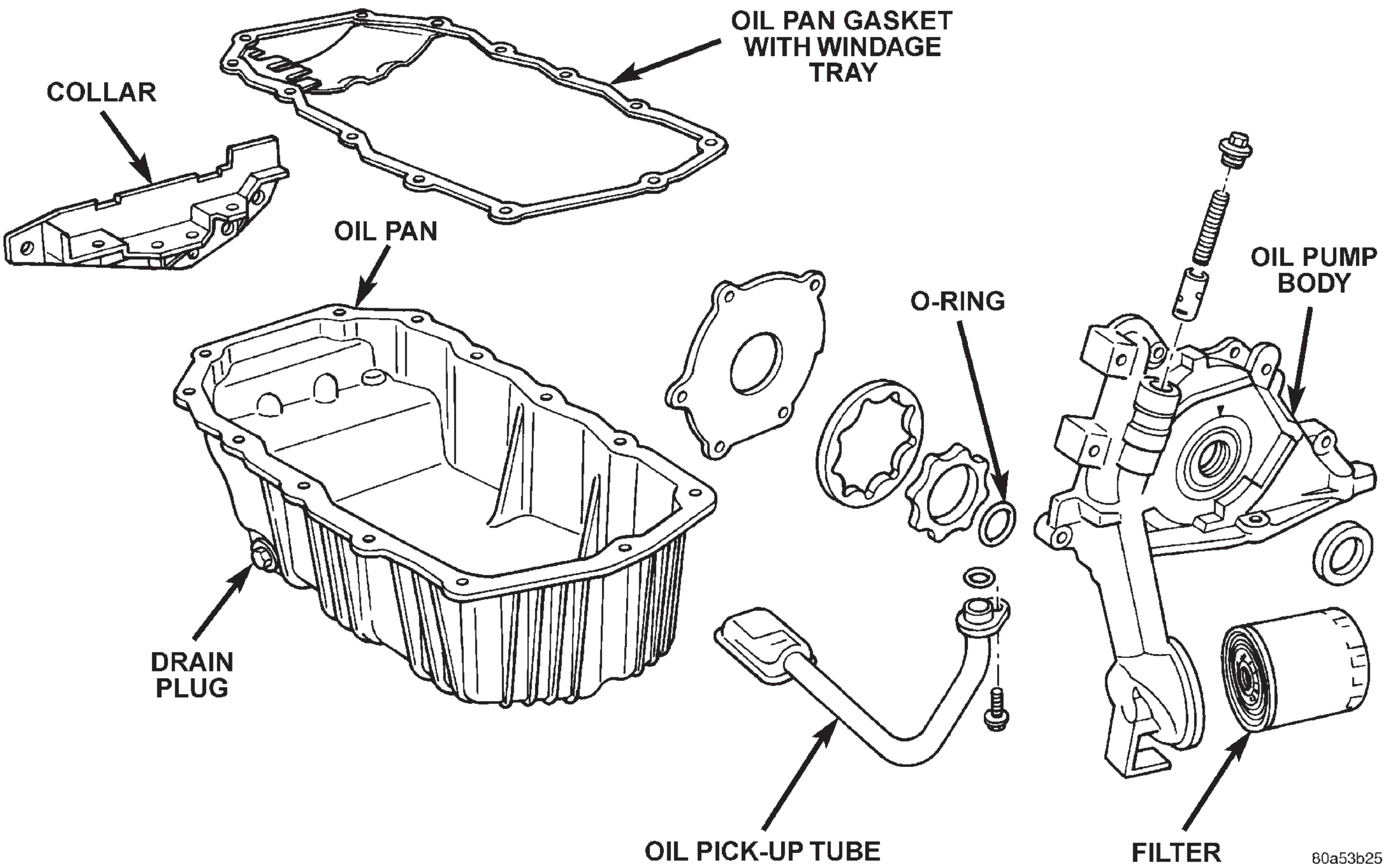


Fig. 87 Oil Pressure Relief Valve

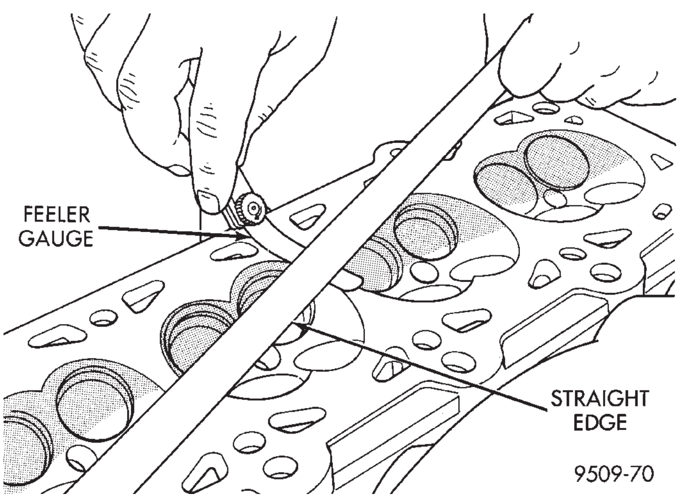


Fig. 88 Checking Cylinder Head Flatness

tom (Fig. 89). Refer to (Fig. 90) for specifications. Replace guides if they are not within specification.

(3) Check valve guide height (Fig. 91).

VALVE AND VALVE SPRING

VALVES

(1) Clean valves thoroughly and discard burned, warped and cracked valves.

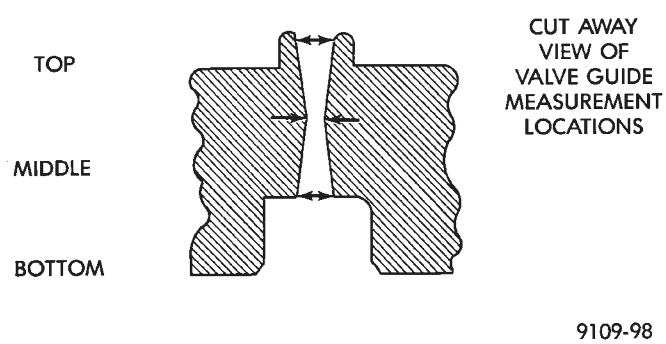


Fig. 89 Checking Wear on Valve Guide—Typical

Valve Guide Diameter	Intake Valve	Exhaust Valve
	5.975 - 6.000 mm (0.2352 - 0.2362 in.)	5.975 - 6.000 mm (0.2352 - 0.2362 in.)
Clearance	**New**	**Service Limit**
Intake	0.048 - 0.066 mm (0.0018 - 0.0025 in.)	0.25 mm (0.010 in.)
Exhaust	0.0736 - 0.094 mm (0.0029 - 0.0037 in.)	

9509-205

Fig. 90 Valve Guide Specifications

CLEANING AND INSPECTION (Continued)

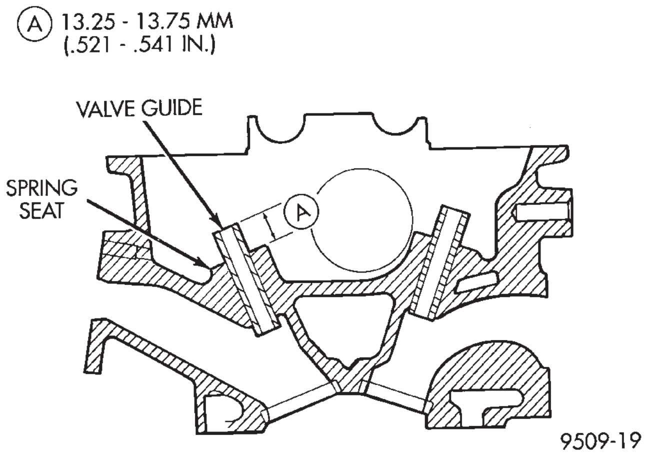


Fig. 91 Valve Guide Height

(2) Measure valve stems for wear. Measure stem about 60 mm beneath the valve lock grooves.

(3) If valve stems are worn more than 0.05 mm (.002 in.), replace valve.

VALVE SPRINGS

(1) Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:

- Valve Closed Nominal Tension— 76 ft. lbs. @ 38.0 mm (1.50 in.)
- Valve Open Nominal Tension— 136 ft. lbs. @ 29.75 mm (1.17 in.)

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

OIL PUMP

(1) Clean all parts thoroughly. Mating surface of the oil pump should be smooth (Fig. 92). Replace pump cover if scratched or grooved.

(2) Lay a straightedge across the pump cover surface (Fig. 93). If a .076 mm (.003 inch) feeler gauge can be inserted between cover and straight edge, cover should be replaced.

(3) Measure thickness and diameter of outer rotor. If outer rotor thickness measures 9.40 mm (0.370 inch.) or less (Fig. 94), or if the diameter is 79.95 mm (3.148 inches.) or less, replace outer rotor.

(4) If inner rotor measures 9.40 mm (.370 inch.) or less replace inner rotor (Fig. 95).

(5) Slide outer rotor into pump housing, press to one side with fingers and measure clearance between rotor and housing (Fig. 96). If measurement is 0.39 mm (0.015 inch.) or more, replace housing only if outer rotor is in specification.

(6) Install inner rotor into pump housing. If clearance between inner and outer rotors (Fig. 97) is .203 mm (.008 inch) or more, replace both rotors.

(7) Place a straightedge across the face of the pump housing, between bolt holes. If a feeler gauge of .102 mm (.004 inch) or more can be inserted between rotors and the straightedge, replace pump assembly (Fig. 98), **ONLY** if rotors are in specs.

(8) Inspect oil pressure relief valve plunger for scoring and free operation in its bore. Small marks may be removed with 400 grit wet or dry sandpaper.

(9) The relief valve spring has a free length of approximately 60.7 mm (2.39 inches) it should test between 18 and 19 pounds when compressed to 40.5 mm (1.60 inches). Replace spring that fails to meet specifications.

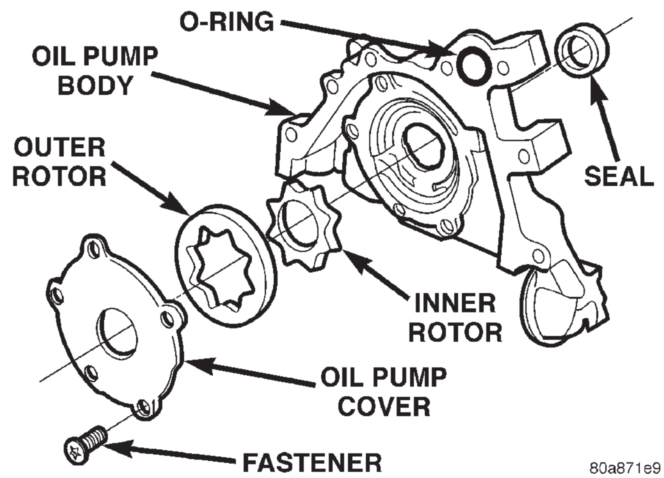


Fig. 92 Oil Pump

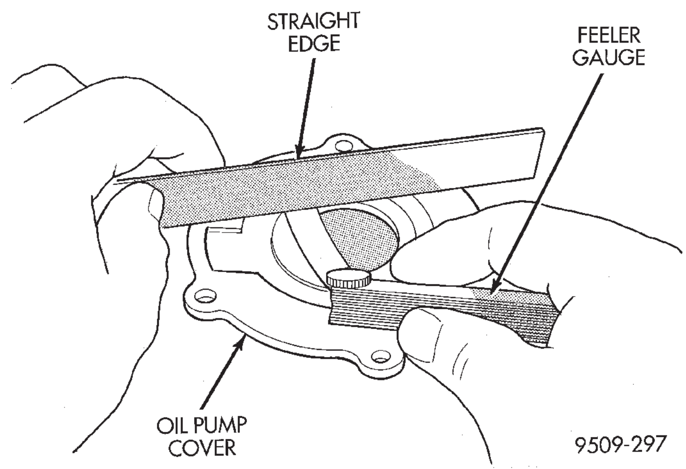


Fig. 93 Checking Oil Pump Cover Flatness

CLEANING AND INSPECTION (Continued)

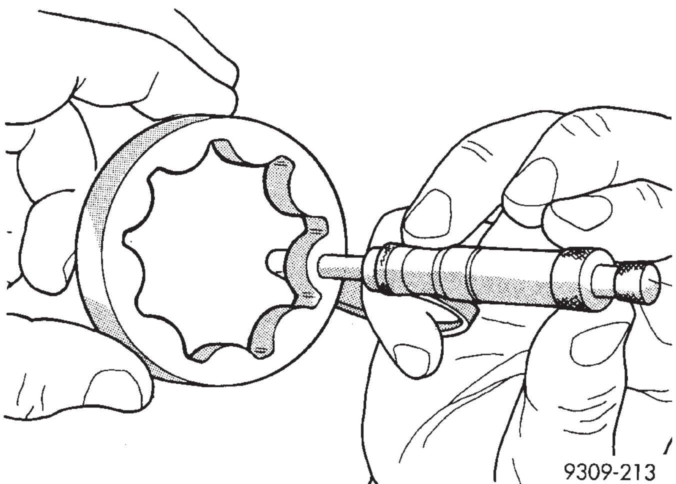


Fig. 94 Measuring Outer Rotor Thickness

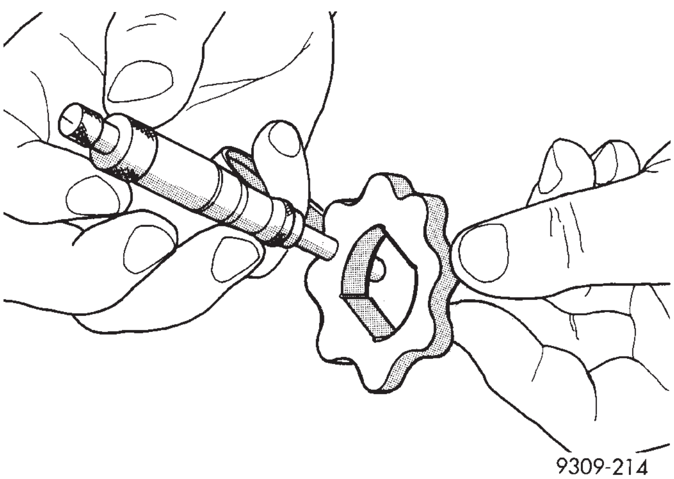


Fig. 95 Measuring Inner Rotor Thickness

(10) If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other reasons for oil pressure loss.

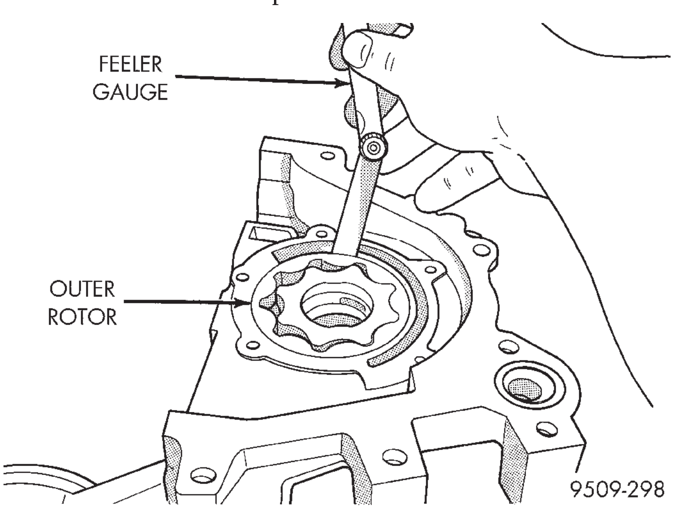


Fig. 96 Measuring Outer Rotor Clearance inHousing

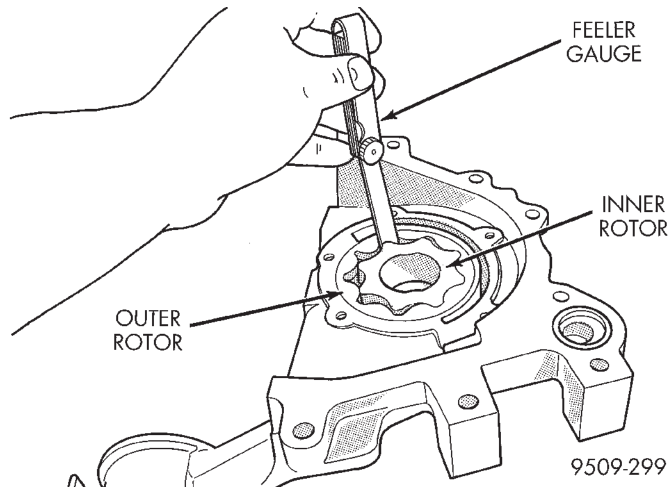


Fig. 97 Measuring Clearance Between Rotors

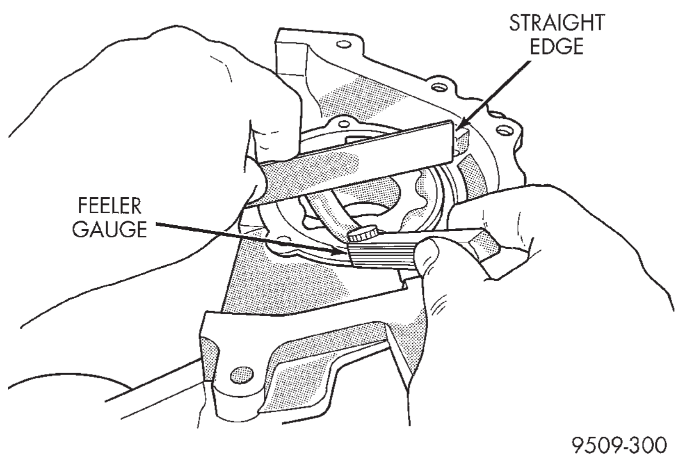


Fig. 98 MeasuringClearance Over Rotors

CRANKSHAFT

The crankshaft journals should be checked for excessive wear, taper and scoring (Fig. 99). Limits of taper or out of round on any crankshaft journals should be held to .025 mm (.001 inch). Journal grinding should not exceed .305 mm (.012 inch) under the standard journal diameter. DO NOT grind thrust faces of Number 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

CAUTION: With the nodular cast iron crankshafts used it is important that the final paper or cloth polish after any journal regrind be in the same direction as normal rotation in the engine.

CYLINDER BLOCK

(1) Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.

CLEANING AND INSPECTION (Continued)

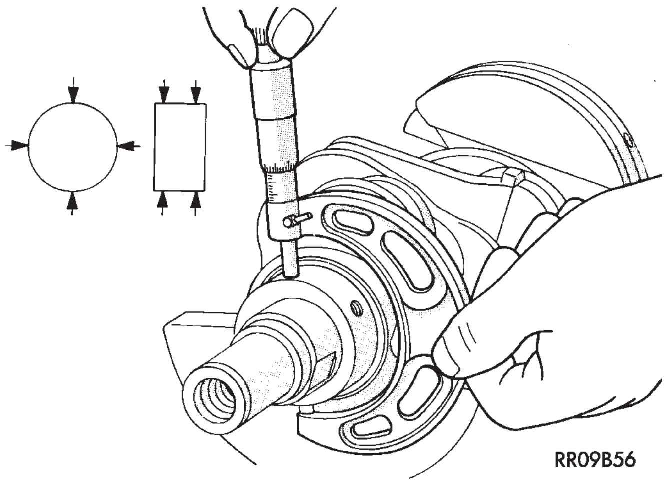


Fig. 99 Crankshaft Journal Measurements

(2) If new core plugs are installed, refer to Engine Core Plugs outlined in this section.

(3) Examine block and cylinder bores for cracks or fractures.

CYLINDER BORE INSPECTION

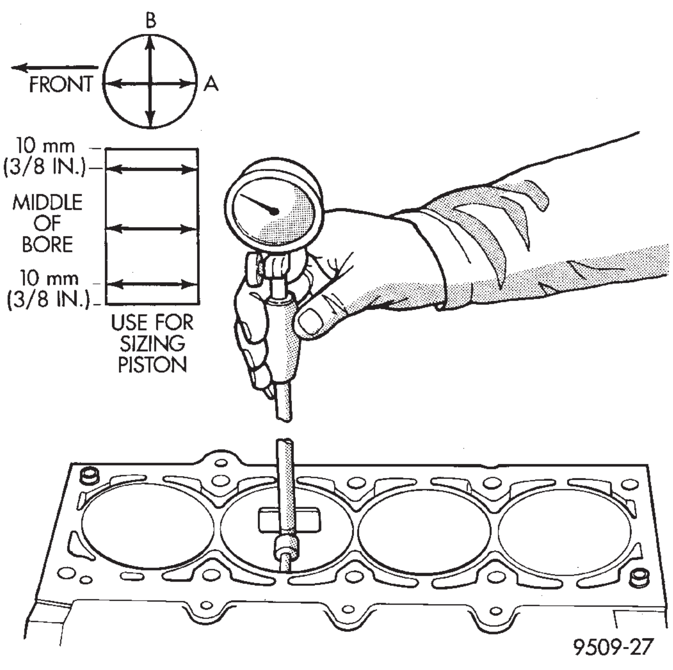


Fig. 100 Checking Cylinder Bore Size

The cylinder walls should be checked for out-of-round and taper with Tool C119 (Fig. 100). The cylinder bore out-of-round is 0.050 mm (.002 inch) maximum and cylinder bore taper is 0.051 mm (0.002 inch) maximum. If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

Measure the cylinder bore at three levels in directions A and B (Fig. 100). Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. Refer to (Fig. 101) for specifications.

Standard Bore	Maximum Out-of-Round	Maximum Taper
87.5 mm (3.445 in.)	0.051 mm (0.002 in.)	0.051 mm (0.002 in.)
Standard Piston Size		
87.450 - 87.468 mm (3.4434 - 3.4441 in.)		
Piston to Bore Clearance: 0.024 - 0.057 mm (.0009 to .0022 in.)		
Measurements taken at Piston Size location.		
		9509-208

Fig. 101 Cylinder Bore and Piston Specifications

CAMSHAFT FOLLOWER

Inspect the cam follower assembly for wear or damage (Fig. 102). Replace as necessary.

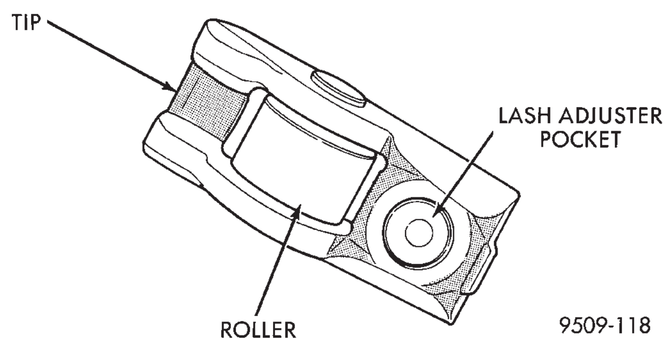


Fig. 102 Cam Follower Assembly

ADJUSTMENTS

ENGINE SUPPORT ADJUSTMENT

The right and left support assemblies are slotted to allow for right/left drive train adjustment in relation to drive shaft assembly length.

Check and reposition right and left engine support assemblies as required. Adjust drive train position, if required, for the following conditions:

- Drive shaft distress: See Group 2, Suspension and Driveshaft.
- Any front end structural damage (after repair).
- Support Assembly replacement.

ENGINE SUPPORT ADJUSTMENT

(1) Remove the load on the engine motor mounts by carefully supporting the engine and transmission assembly with a floor jack.

(2) Loosen the right engine support assembly vertical fasteners.

(3) Loosen the left engine support assembly vertical bolts.

ADJUSTMENTS (Continued)

(4) Pry the engine right or left as required to achieve the proper drive shaft assembly length. Refer to Group 2, Suspension and Driveshaft for driveshaft identification and related assembly length measuring.

(5) Tighten right engine support assembly vertical bolts to 61 N·m (45 ft. lbs.). and tighten left engine support assembly bolts to 61 N·m (45 ft. lbs.).

(6) Recheck drive shaft length.

SPECIFICATIONS

ENGINE 2.4L

Type . . . . In-Line OHV, DOHC
Number of Cylinder 4
Bore . . . . 87.5 mm (3.445 in.)
Stroke . . . . 101 mm (3.976 in.)
Compression Ratio 9.4:1
Displacement . . . . . . 2.4 Liters (148 Cubic Inches)
Firing Order 1, 3, 4, 2
Compression Pressure . . . . 1172-1551 kPa (170-225 psi)
Maximum Variation Between Cylinder . . . . . 25 %
Lubrication . . . Pressure Feed-Full Flow Filtration (Direct Crankshaft Driven Pump)
Engine Oil Capacity . . . . With Oil Filter 4.25 Liters (4.5 Qts.)
Engine Oil Capacity . . . . Without Oil Filter 3.8 Liters (4.0 Qts.)

Cylinder Block

Cylinder Bore Diameter . . . 87.4924 - 87.5076 mm (3.4446 - 3.4452 in.)
Out-of-Round (Max.) . . . . 0.051 mm (0.002 in.)
Taper (Max.) . . . . 0.051 mm (0.002 in.)

Pistons

Clearance at 14 mm (9/16 in.) From Bottom of Skirt . . . . . . 0.024 - 0.057 mm (0.0009 - 0.0022 in.)
Weight . . . . . . 332 - 346 grams (11.85 - 12.20 oz.)
Top Land Clearance (Diametrical) . . . . 0.614 - 0.664 mm (0.024 - 0.026 in.)
Piston Length . . . . 60.30 mm (2.374 in.)

Piston Ring Groove Depth

No. 1 . . . . 4.640 - 4.784 mm (0.182 - 0.188 in.)
No. 2 . . . . 4.575 - 4.719 mm (0.180 - 0.185 in.)
No.3 . . . . 4.097 - 4.236 mm (0.161 - 0.166 in.)

Piston Pins

Clearance in Piston . . . . 0.005 - 0.018 mm
In Rod (Interference) . . . . 0.018 - 0.043 mm (0.0007 - 0.0017 in.)
Diameter . 21.998-22.003 mm (0.8660 - 0.8662 in.)
End Play . . . . None
Length . . . . . 72.75 - 73.25 mm (2.864 - 2.883 in.)

Piston Ring Gap

Top Compression Ring . . . . 0.25 - 0.51 mm (0.0098 - 0.020 in.)
2nd Compression Ring . . . . 0.23 - 0.48 mm (0.009 - 0.018 in.)
Oil Control (Steel Rails) . . . . 0.25 - 0.64 mm (0.0098 - 0.025 in.)

Piston Ring Side Clearance

Top and Second Compression Rings . . . . 0.030 - 0.080 mm (0.0011 - 0.0031 in.)
Oil Ring (Pack) . . . . 0.012 - 0.178 mm (0.0004 - 0.0070 in.)

Piston Ring Width

Compression Rings . . . . 1.47 - 1.50 mm (0.057 - 0.059 in.)
Oil Ring (Pack) . . . . 2.72 - 2.88 mm (0.107 - 0.1133 in.)

Connecting Rod

Bearing Clearance . . . . 0.025 - 0.071 mm (0.0009 - 0.0027 in.)
Piston Pin Bore Diameter . . . . . 20.96 - 20.98 mm (0.8252 - 0.8260 in.)
Large End Bore Diameter . . . 53.007 - 52.993 mm (2.0868 - 2.0863)
Side Clearance . . . . 0.013 - 0.0150 mm (0.0051 - 0.0150 in.)
Total Weight (Less Bearing) . . . . 565.8 grams (19.96 oz.)

Crankshaft

Connecting Rod Journal Diameter . . . . 49.984 - 50.000 mm (1.967 - 1.9685 in.)
Out-of-Round (Max.) . . . . . 0.0035 mm (0.0001 in.)
Taper (Max.) . . . . 0.0038 mm (0.0001 in.)
Main Bearing Diametrical Clearance No. 1 - 5 . . . . 0.018 - 0.058 mm (0.0007 - 0.0023 in.)
End Play . . . . 0.09 - 0.24 mm (0.0035 - 0.0094 in.)

Main Bearing Journals

Diameter . . . . 59.992 - 60.008 mm (2.361 - 2.3625 in.)
Out-of-Round (Max.) . . . . . 0.0035 mm (0.0001 in.)
Taper (Max.) . . . . 0.0038 (0.0001 in.)

Hydraulic Lash Adjusters

Body Diameter . . . . 15.901 - 15.913 mm (0.626 - 0.6264 in.)
Plunger Travel Minimum (Dry) . . . . 3.0 mm (0.118 in.)

SPECIFICATIONS (Continued)

Camshaft

Bearing Bore Diameter No. 1-6	26.020 - 26.041 mm (1.024 - 1.025 in.)
Diametrical Bearing Clearance	0.069 - 0.071 mm (0.0027 - 0.003 in.)
End Play	0.050 - 0.170 mm (0.0019 - 0.0066 in.)
Bearing Journal Diameter No. 1-6	25.951 - 25.970 mm (1.021 - 1.022 in.)
Lift (Zero Lash) Intake	8.25 mm (0.324 in.)
Exhaust	6.52 mm (0.256 in.)

Valve Timing

Intake Valve Closes (ABDC)	51°
Opens (BTDC)	5°
Duration	236°
Exhaust Valve Closes (ATDC)	10°
Opens (BBDC)	50°
Duration	240°
Valve Overlap	15°

Cylinder Head

Material	Cast Aluminum
Gasket Thickness (Compressed)	1.15 mm (0.045 in.)
Valve Seat Angle	45°
Runout (Max.)	0.050 mm (0.002 in.)
Width (Finish) Intake and Exhaust	0.9 -1.3 mm (0.035 - 0.051 in.)
Guide Bore Diameter (Std)	11.0 - 11.02 mm (0.4330 - 0.4338 in.)
Finished Guide Bore ID	5.975 - 6.000 mm (0.235 - 0.236 in.)

Valves

Face Angle Intake and Exhaust	45 - 44½ °
Head Diameter Intake	34.67 - 34.93 mm (1.364 - 1.375 in.)
Exhaust	30.37 - 30.63 mm (1.195 - 1.205 in.)
Length (Overall) Intake	112.76 - 113.32 mm (4.439 - 4.461 in.)
Exhaust	109.59 -110.09 mm (4.314 - 4.334 in.)
Stem Diameter Intake	5.934 - 5.952 mm (0.233 - 0.234 in.)
Exhaust	5.906 - 5.924 mm (0.233 - 0.233 in.)
Valve Margin Intake	1.285 - 1.615 mm (0.050 - 0.063 in.)
Exhaust	0.985 - 1.315 mm (0.038 - 0.051 in.)
Valve Stem Tip Height Intake	48.04 mm (1.891 in.)
Exhaust	47.99 mm (1.889 in.)
Stem Diameter Intake	5.934 - 5.952 mm (0.234 - 0.234 in.)
Exhaust	5.906 - 5.924 mm (0.233 - 0.233 in.)
Stem-to-Guide Clearance Intake	0.048 - 0.066 mm (0.0018 - 0.0025 in.)
Exhaust	0.0736 - 0.094 mm (0.0029 - 0.0037 in.)
Max. Allowable Intake and Exhaust	0.025 mm (0.010 in.)

Valve Springs

Free Length (Approx.)	48.4 mm (1.905 in.)
Spring Tension (Valve Closed)	338 N ± 20 N @ 38.0 mm (75.98 lbs. ± 4.5 lbs. @ 1.496 in.)
Spring Tension (Valve Open)	607 N ± 30 N @ 29.75 mm (136 lbs. ± 7 lbs. @ 1.172 in.)
Number of Coils	7.82
Wire Diameter	3.86 mm (0.151 in.)
Installed Spring Height	38.00 mm (1.496 in.)

Oil Pump

Clearance over Rotors (Max.)	0.10 mm (0.004 in.)
Cover Out-of-Flat (Max.)	0.025 mm (0.001 in.)
Inner Rotor Thickness (Min.)	9.40 mm (0.370 in.)
Outer Rotor Clearance (Max.)	0.39 mm (0.015 in.)
Diameter (Min.)	79.95 mm (3.148 in.)
Thickness (Min.)	9.40 mm (0.370 in.)
Tip Clearance between Rotors (Max.)	0.20 mm (0.008 in.)

Oil Pressure

At Curb Idle Speed*	25 kPa (4 psi)
At 3000 rpm	170 — 550 kPa (25 — 80 psi)

SPECIFICATIONS (Continued)

TORQUE CHART 2.4L

DESCRIPTION . . . . TORQUE

Balance Shaft Carrier to Block
Bolts . . . . 54 N·m (40 ft. lbs.)

Balance Shaft Gear Cover
Double Ended Fastener . . . . . . 12 N·m (105 in. lbs.)

Balance Shaft Sprockets
Bolts . . . . 28 N·m (250 in. lbs.)

Balance Shaft Chain Tensioner
Bolts . . . . 12 N·m (105 in. lbs.)

Balance Shaft Carrier Cover
Fasteners . . . . 12 N·m (105 in. lbs.)

Camshaft Sensor Pick Up
Bolts . . . . 27 N·m (20 ft. lbs.)

Timing Belt Cover
Outer to Inner Attaching
Bolts M6 . . . . 4.5 N·m (40 in. lbs.)
Inner Cover to Head/Oil Pump
Bolts M6 . . . . 12 N·m (105 in. lbs.)

Camshaft Sprocket
Bolt . . . . 101 N·m (75 ft. lbs.)

Connecting Rod Cap
Bolts . . . . 27 N·m (20 ft. lbs.) Plus 1/4 Turn

Crankshaft Main Bearing Cap/Bedplate
M8 Bedplate Bolts . . . . 34 N·m (250 in. lbs.)
Main Cap Bolts M11 . . . . 41 N·m (30 ft. lbs.) Plus 1/4 Turn

Crankshaft Damper
Bolt . . . . 135 N·m (100 ft. lbs.)

Cylinder Head
Bolts . . . . Refer To Cylinder Head Installation

Cylinder Head Cover
Bolts . . . . 12 N·m (105 in. lbs.)

Engine Mount Bracket
Bolts . . . . 41 N·m (30 ft. lbs.)

Exhaust Manifold to Cylinder Head
Bolts . . . . 23 N·m (200 in. lbs.)

DESCRIPTION . . . . TORQUE

Exhaust Manifold Heat Shield
Bolts . . . . 12 N·m (105 in. lbs.)

Front Torque Bracket—2.0/2.4L Engine
Bolts . . . . 33 N·m (24 ft. lbs.)

Front Torque Bracket Strut—2.0/2.4L Engine
Long Bolts . . . . 110 N·m (80 ft. lbs.)
Short Bolt . . . . 61 N·m (45 ft. lbs.)

Intake Manifold
Bolts . . . . 27 N·m (20 ft. lbs.)

Oil Filter
Filter . . . . 20 N·m (15 ft. lbs.)

Oil Pan
Bolts . . . . 12 N·m (105 in. lbs.)
Drain Plug . . . . 27 N·m (20 ft. lbs.)

Oil Pan Collar
Collar to Pan Bolts . . . . 34 N·m (250 in. lbs.)
Collar to Transmission
Bolts . . . . 108 N·m (80 ft. lbs.)

Oil Pump Attaching
Bolts . . . . 28 N·m (250 in. lbs.)
Oil Pump Cover Fastener . . . 12 N·m (105 in. lbs.)
Oil Pump Pick-up Tube Bolt . 28 N·m (250 in. lbs.)
Oil Pump Relief Valve Cap . . . 41 N·m (30 ft. lbs.)

Rear Torque Bracket
Bolts . . . . 110 N·m (80 ft. lbs.)

Spark Plugs
Plugs . . . . 28 N·m (20 ft. lbs.)

Support Module—Front and Rear
Thru Bolt . . . . 61 N·m (45 ft. lbs.)

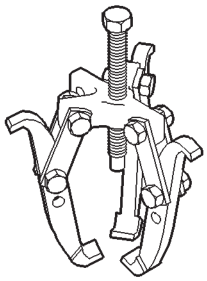
Thermostat Housing
Bolts . . . . 23 N·m (200 in lbs.)

Timing Belt Tensioner
Center Bolt . . . . 28 N·m (252 in. lbs.)

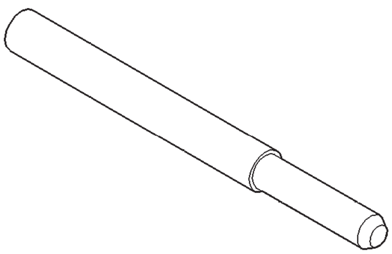
Water Pump Mounting
Bolts . . . . 12 N·m (105 in. lbs.)

SPECIAL TOOLS

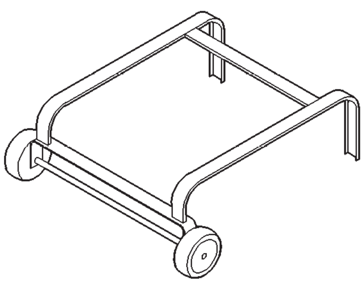
ENGINE 2.4L



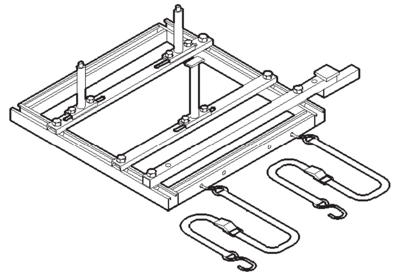
Puller 1026



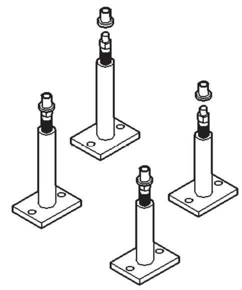
Crankshaft Damper Removal Insert6827-A



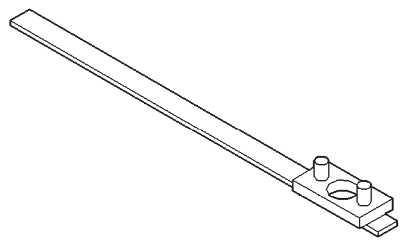
Dolly 6135



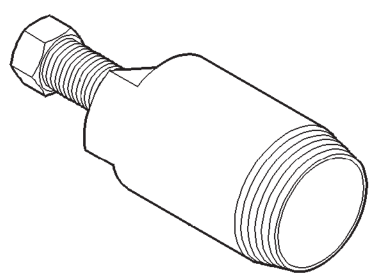
Cradle 6710



Post Kit Engine Cradle 6848

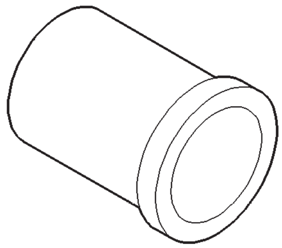


Camshaft Sprocket Remover C-4687

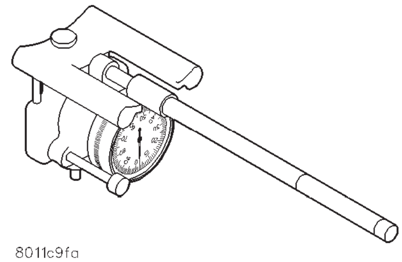


Camshaft Seal Remover C-4679-A

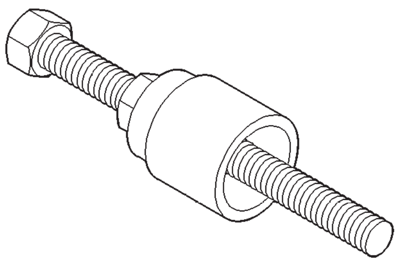
SPECIAL TOOLS (Continued)



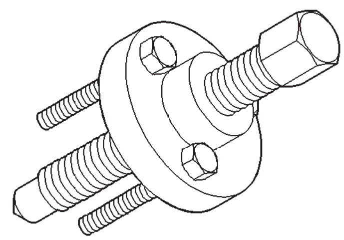
Camshaft Seal Installer MD-998306



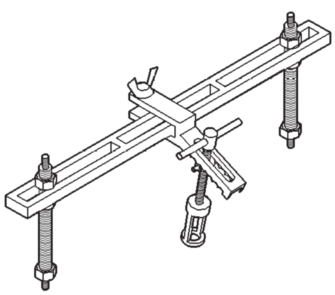
Cylinder Bore Gage C-119



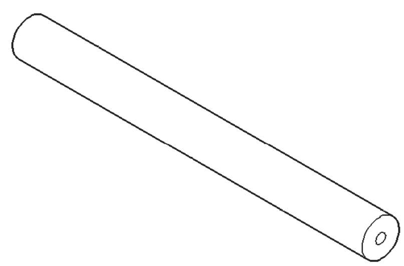
Crankshaft Damper Installer 6792



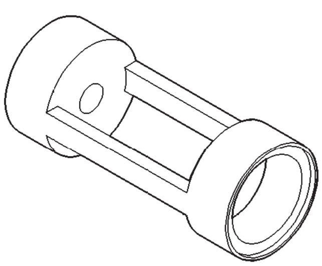
Crankshaft Sprocket Remover 6793



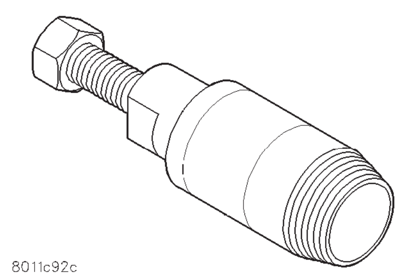
Valve Spring Compressor MD-998772-A



Crankshaft Sprocket Remover InsertC-4685-C2

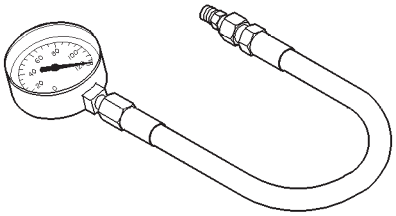


Valve Spring Compressor Adapter 6779

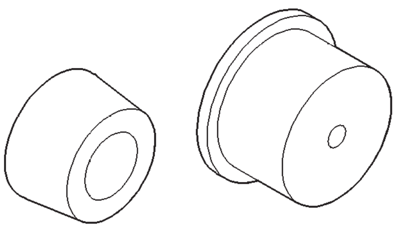


Crankshaft Seal Remover 6771

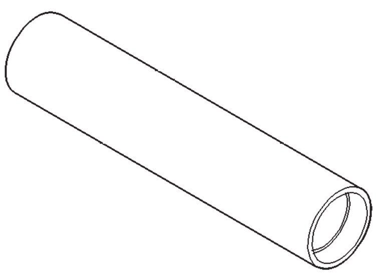
SPECIAL TOOLS (Continued)



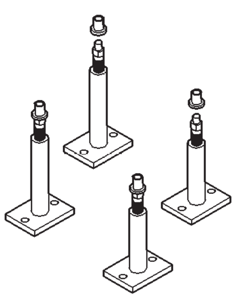
Oil Pressure Gage C-3292



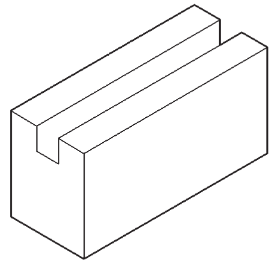
Rear Crankshaft Seal Guide and Installer6926-1 and 6926-2



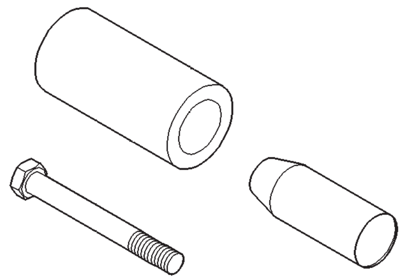
Balance Shaft Sprocket Installer6052



Post Kit Engine Cradle 6848



Post Adapter 8130



Front Crankshaft Oil Seal Installer6780

2.5L ENGINE

INDEX

DESCRIPTION AND OPERATION

ENGINE IDENTIFICATION

The engine identification number is located on the rear of the cylinder block just below the cylinder head (Fig. 1).

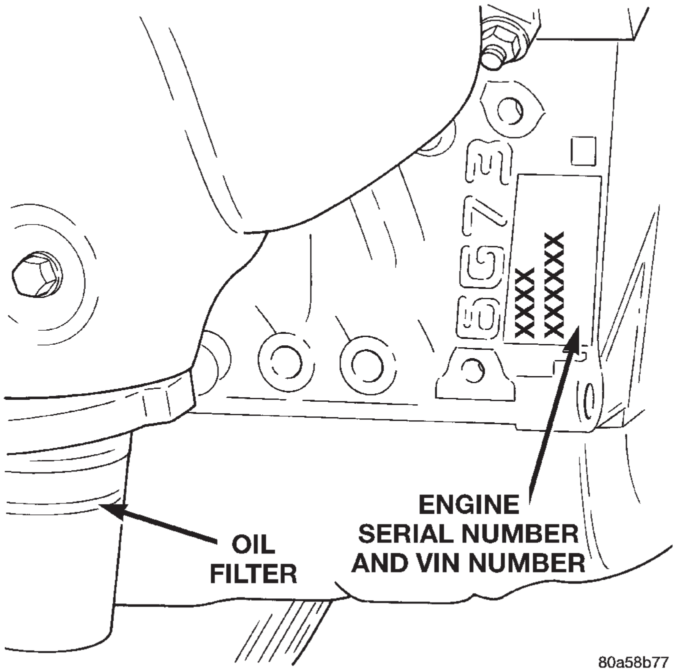
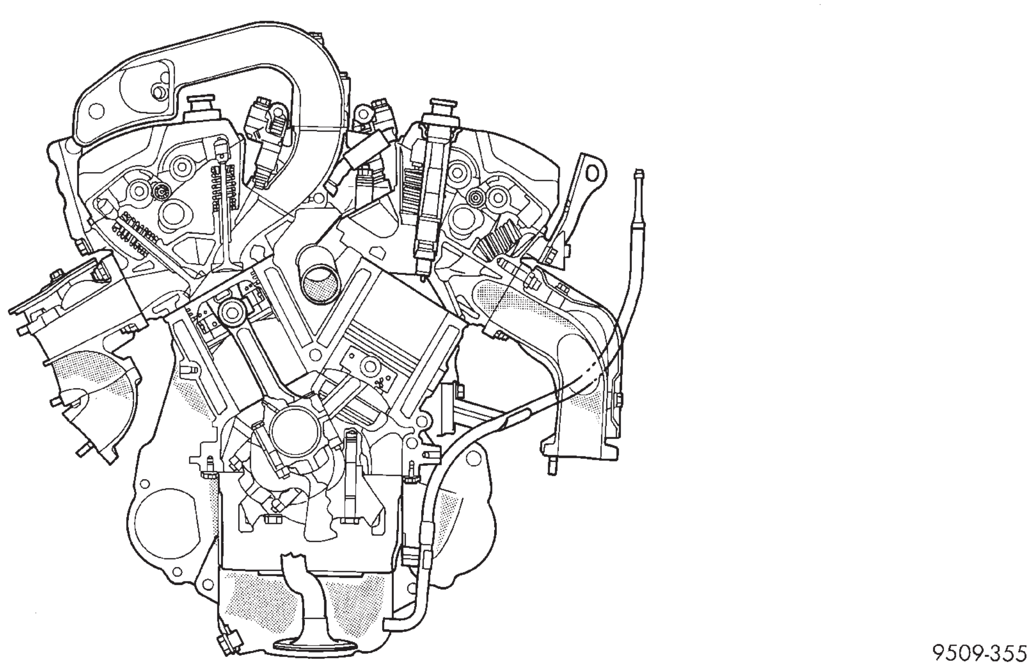


Fig. 1 Engine Identification

ENGINE—2.5L



DESCRIPTION AND OPERATION (Continued)

GENERAL SPECIFICATION

2.5L V-6 ENGINE

Type . . . . 60°V SOHC (Per Bank)
Bore . . . . 83.5 mm (3.29 Inch)
Stroke . . . . 76.0 mm (2.992 Inch)
Compression Ratio 9.4:1
Displacement . . . . 2.5 Liters (152 Cubic Inch)
Firing Order 1–2–3–4–5–6
Lubrication . . . . Pressure Feed-Full Flow Filtration (Direct Crankshaft Driven Pump)
Engine Oil Capacity . . . . 4.25 Liter (4.5 Qts.) Including Oil Filter, 3.8 Liter (4.0 Qts.) Without Filter.
Cooling System . . . Liquid Cooled-Forced Circulation (Pump-Timing Belt Driven)
Cylinder Block . . . . Cast Iron
Crankshaft . . . . Cast (Nodular Cast Iron)
Cylinder Head . . . . Aluminum Alloy
Connecting Rods . . . . Forged Steel
Pistons . . . . Aluminum Alloy (w/Strut)

ENGINE LUBRICATION SYSTEM

The lubrication system is a full flow filtration pressure feed type. Oil, stored in the oil pan, is taken in and discharged by a trochoid type oil pump directly coupled to the crankshaft and its pressure is regulated by a relief valve. The oil is fed through an oil filter and to the crankshaft journals from the oil gallery in the cylinder block. This gallery also feeds oil under pressure to the cylinder heads and camshaft journals. It then flows from the cylinder head passages to the rocker shafts to the rocker arm pivots and auto lash adjusters (Fig. 2).

ENGINE COMPONENTS

BLOCK

The cylinder block is a partial open deck design to improve cooling and weight reduction. High rigidity is provided with ribs cast in the outer wall, and a monoblock or beam type main bearing cap system. This single unit four bearing cap is designed to control vibration of the cylinder block partition walls.

CRANKSHAFT

The crankshaft is made of nodular cast iron and has six individual throws with five counter weights, it is supported by four main bearings with number three being the thrust bearing. The six separate connecting rod throws pins reduce torque fluctuations while a dynamic damper is used to control torsional vibration of the crankshaft. Rubber lipped seals are used at front and rear. The front seal is retained in

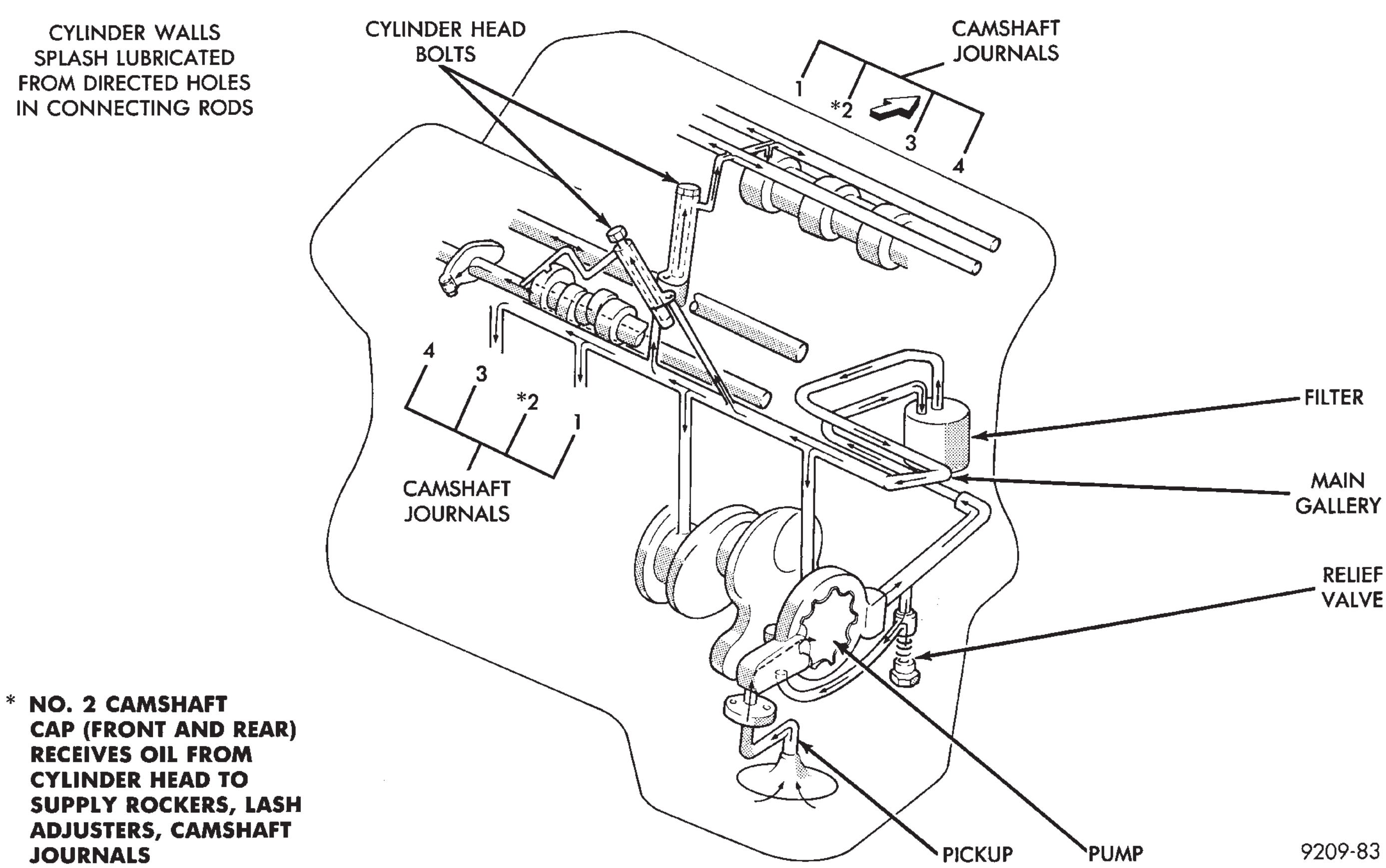


Fig. 2 Engine Oiling

DESCRIPTION AND OPERATION (Continued)

the oil pump case and the rear is retained in a die-cast aluminum block-mounted housing.

PISTONS

Are aluminum alloy with cast in steel struts at the pin bosses for autothermic control. The piston head is designed with valve recesses to provide for valve clearance. The piston rings consist of a chrome-plated, barrel faced design for the top ring, the second ring is a cast iron tapered face design and the oil ring is a chrome faced three piece design. Piston pins are press-fitted into place, to join the pistons to the forged steel connecting rods. The large end of the connecting rod has a oil jet hole for lubrication of the thrust side of the cylinder.

CYLINDER HEAD

The aluminum alloy cylinder heads feature a pent-roof design with four valves per cylinder. Valve guides are made of cast iron alloy and seat inserts are made of sintered alloy iron, these are pressed into the head. To improve combustion efficiency the chambers have a compact pent-roof design with a squish area. The cylinder heads are common to either cylinder bank.

CAMSHAFTS

Two overhead camshafts provide valve actuation, one left (radiator side of cylinder bank) and one right. The distributor is directly driven by the right camshaft. Both camshafts are supported by four bearing journals intregal with the head. A flange at the rear of the camshaft acts as a thrust collar. Right and Left camshaft driving sprockets are interchangeable. The sprockets and the engine water pump are driven by the timing belt.

ROCKER ARM SHAFTS

The shafts are retained by retaining caps and bolts. Four shafts are used, one for each intake and exhaust rocker arm assembly on each cylinder head. The hollow shafts provide a duct for lubricating oil flow from the cylinder head to the valve mechanisms. Rocker shaft springs are use on the intake shafts ONLY to obtain the proper clearance between the intake rocker arms and the spark plug tubes.

ROCKER ARMS

Are of light weight die-cast with roller type follower operating against the camshaft. The valve actuating end of the rocker arms are machined for hydraulic lash adjusters, eliminating the need for periodic valve lash adjustment.

VALVES

Four valves per cylinder are actuated by die-cast aluminum roller rocker arms and hydraulic lash adjusters assemblies which pivot on rocker arm shafts. All valves have 6 mm diameter chrome plated valve stems. The valve train has 33 mm (1.299 inch) diameter intake valves and 29 mm (1.141 inch) diameter exhaust valves. The valves have a carbo-nitriding finish for long life. Fluorcarbon valve stem seals are used on both valves. Stamped steel valve spring seat, Valve springs, spring retainers, and locks are conventional.

INTAKE MANIFOLD

This system is composed of a upper plenum (surge tank) and manifold. This aluminum alloy manifold has long runners to improve inertia. The plenum chamber (surge tank) absorbs air pulsations created during the suction phase of each cylinder. The lower intake manifold is machined for six injectors and fuel rail mounting.

EXHAUST MANIFOLDS

Both manifolds are made of cast nodular graphite iron for heat resistance. Exhaust gasses from the left cylinder bank, leave the left manifold through a stainless steel pipe and bellows routed under the engine to the right side manifold. The collected exhaust from both manifolds are combined, and exit to the exhaust pipe through a flex-joint.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

Check oil pressure using gauge at oil pressure switch location. Oil pressure should be 41 kPa (6 psi.) at idle or 241 to 517 kPa (35 to 75 psi.) at 3000 RPM.

(1) Remove pressure sending unit and install oil pressure gauge.

CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM.

(2) Warm engine at high idle until thermostat opens.

SERVICE PROCEDURES

BORING CYLINDER

Examine cylinder walls for scuffs, scoring and measure cylinder bore for out-of-round or taper. If defective, bore cylinder to oversize. Measure at points shown in (Fig. 3).

Four oversize pistons are available (0.25mm (.010 inch) 0.50mm (.020 inch) 0.75mm (.030 inch) and 1.0mm (.039 inch). Determine oversize piston on basis of largest cylinder bore.

SERVICE PROCEDURES (Continued)

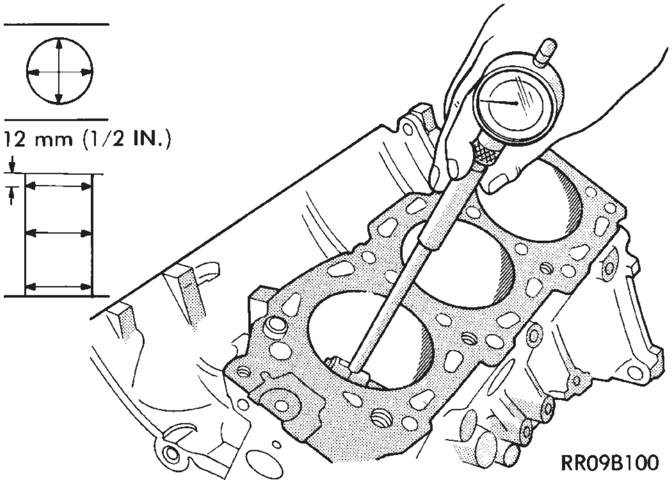


Fig. 3 Measure Cylinder Bore

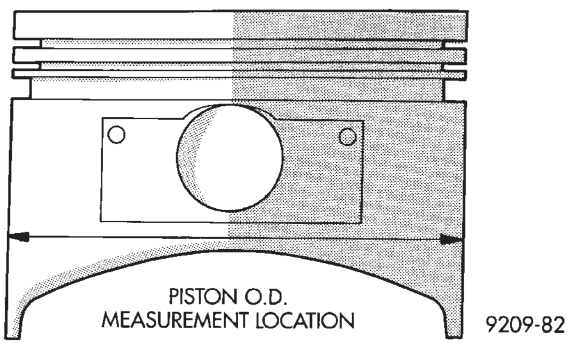


Fig. 4 Measure Piston

(1) Bore to specified clearance between the piston O.D. and cylinder. The measuring point of the piston O.D. is shown in (Fig. 4).

(2) Based on measured piston O.D., calculate boring finish dimension. Boring finish dimension equals piston O.D. plus 0.03 to 0.05 mm (.0012 to .002 inch) (clearance between piston O.D. and cylinder) minus 0.02 mm which is the boring margin.

(3) Bore all cylinders to calculated boring finish dimension. Then bore the final finish dimension (piston O.D. plus cylinder clearance).

(4) Check clearance between piston and cylinder, clearance should be 0.02 to 0.04 mm (0.0008 to 0.0016 inch).

FITTING PISTONS

Measure approximately 2mm (.080 inch) above the bottom of the piston skirt and across the thrust face (Fig. 5). See Boring Cylinder Block.

FITTING PISTON RINGS

(1) Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 16mm (0.63 in.) from bottom of

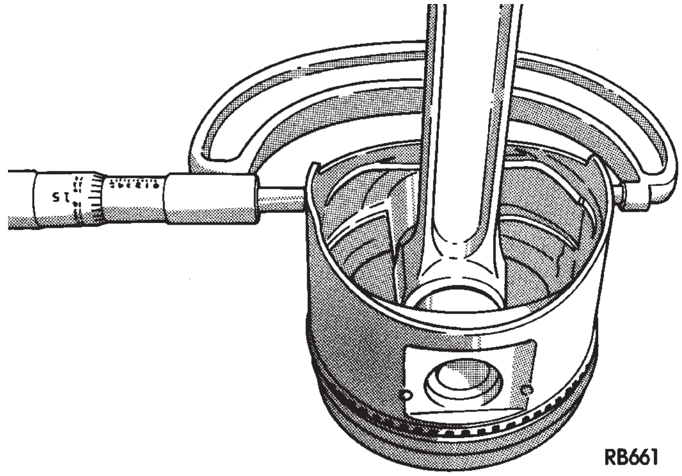


Fig. 5 Measuring Piston for Clearance andWear

cylinder bore. Check gap with feeler gauge (Fig. 6). Refer to (Fig. 7) for specification.

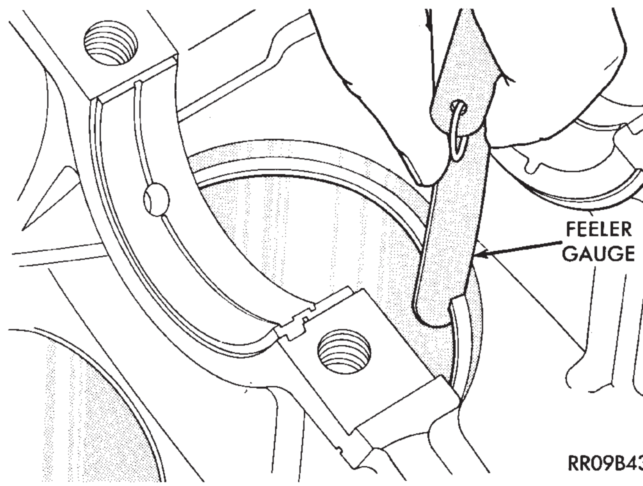


Fig. 6 Check Gap on Piston Rings

RING POSITION	RING GAP	WEAR LIMIT
UPPER RING	0.25 TO 0.40 mm (.010 TO .016 in.)	0.8 mm (.031 in.)
INTERMEDIATE RING	0.40 TO 0.55 mm (.016 TO .022 in.)	0.8 mm (.031 in.)
OIL CONTROL RING	0.15 TO 0.50 mm (.006 TO .019 in.)	1.0 mm (.039 in.)
RING POSITION	**GROOVE CLEARANCE**	**MAXIMUM CLEARANCE**
UPPER RING	0.03 TO 0.07 mm (.0012 TO .0028 in.)	.10 mm (.004 in.)
INTERMEDIATE RING	0.02 TO 0.06 mm (.0007 TO .0024 in.)	.10 mm (.004 in.)
OIL CONTROL RING-THREE PIECE. OIL RING SIDE RAILS MUST BE FREE TO ROTATE AFTER ASSEMBLY.		

9509-388

Fig. 7 Piston Ring Specifications

(2) Check piston ring to groove clearance (Fig. 8); Refer to Piston Ring Specification Chart (Fig. 7).

SERVICE PROCEDURES (Continued)

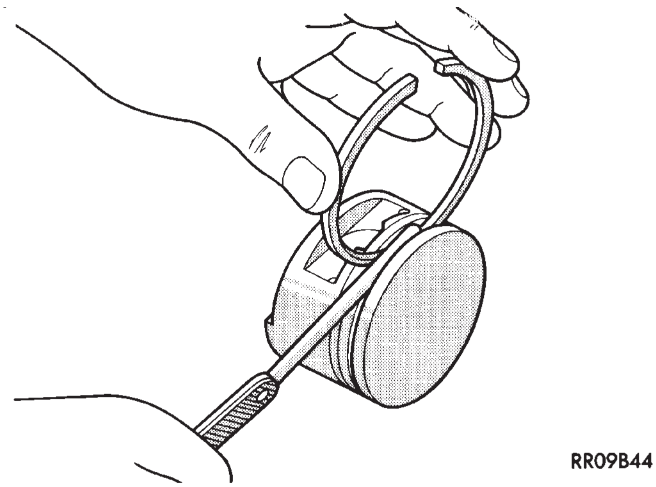


Fig. 8 Piston Ring Groove Clearance

PISTON RINGS

(1) The No. 1 and No. 2 piston rings have a different cross section. Install rings with manufacturers mark and size mark facing up, to the top of the piston (Fig. 9).

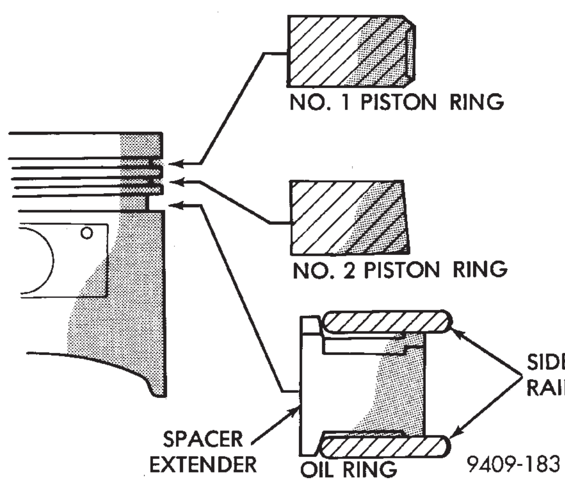


Fig. 9 Piston Ring—Installation

CAUTION: Install piston rings in the following order:

(2) Oil ring expander.
(3) Upper oil ring side rail.
(4) Lower oil ring side rail.
(5) No. 2 Intermediate piston ring.
(6) No. 1 Upper piston ring.

(7) Install the side rail by placing one end between the piston ring groove and the expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do Not use a piston ring expander** (Fig. 10).

(8) Install upper side rail first and then the lower side rail.

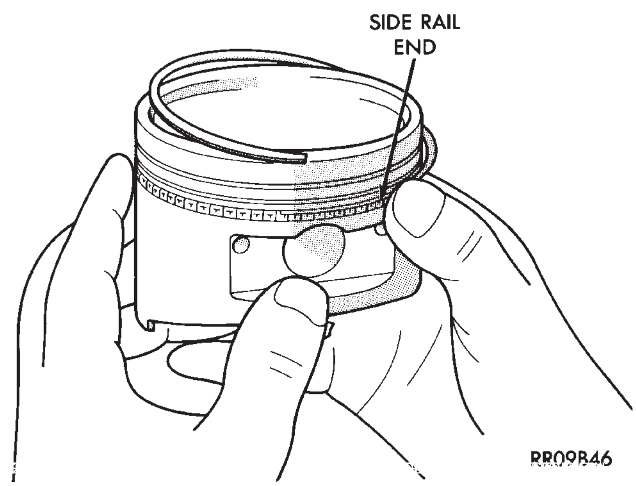


Fig. 10 Side Rail—Installation

(9) Install No. 2 piston ring and then No. 1 piston ring (Fig. 11).

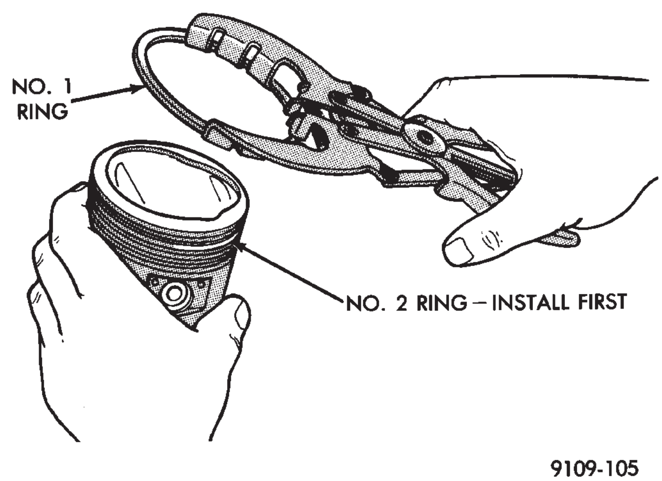


Fig. 11 Upper and Intermediate Rings—Installation

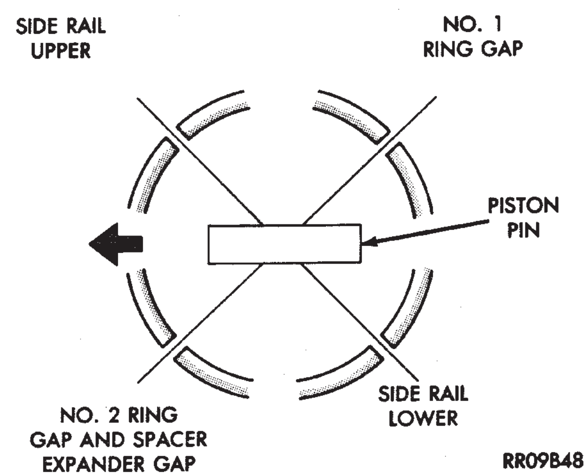


Fig. 12 Piston Ring End Gap Location

(10) Position piston ring end gaps as shown in (Fig. 12).

SERVICE PROCEDURES (Continued)

(11) Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction.

CONNECTING ROD CLEARANCE

(1) Follow the procedures outlined in the Standard Service Procedures Section for Measuring Main Bearing and Connecting Rod Bearing Clearances. (Fig. 13). Refer to (Fig. 15) for specifications.

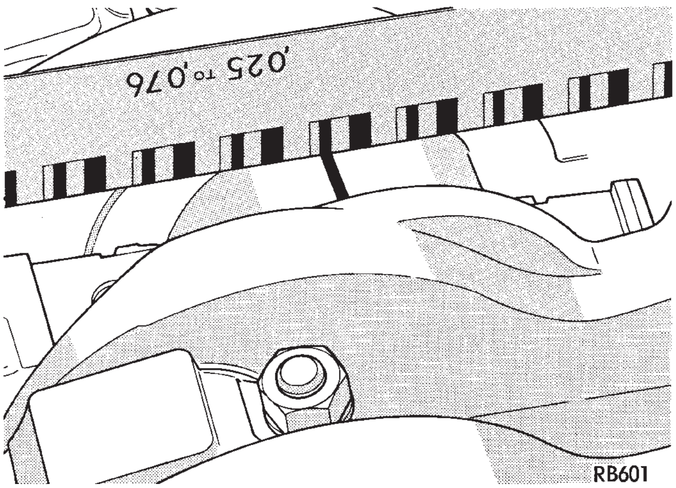


Fig. 13 Checking Connecting Rod Bearing Clearance

(2) Tighten nuts to 52 N·m (38 ft. lbs.).

(3) Remove connecting rod cap and measure Plastigage (Fig. 13).

CAUTION: Do not rotate crankshaft or the Plastigage may be smeared.

CONNECTING ROD SIDE CLEARANCE

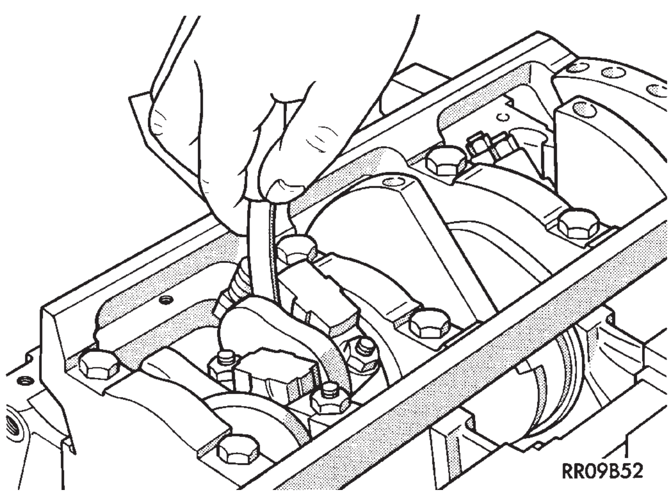


Fig. 14 Checking Connecting Rod Side Clearance

Using a feeler gauge, check connecting rod side clearance (Fig. 14). Refer to (Fig. 15) for specifications.

CONNECTING ROD BEARING OIL CLEARANCE	
NEW PART:	.020 TO .067 mm (.0008 TO .0028 in.)
CONNECTING ROD SIDE CLEARANCE	
NEW PART:	0.10 TO 0.25 mm (.004 TO .010 in.)
WEAR LIMIT:	0.4 mm (.015 in.)

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Fig. 15 Connecting Rod Clearance Specifications

FITTING MAIN BEARINGS

MAIN BEARING JOURNAL MEASUREMENT

Measure the journal outside diameter (Fig. 16). If the clearance exceeds the specifications limit (Fig. 17). Replace the main bearing(s) and if necessary replace the crankshaft.

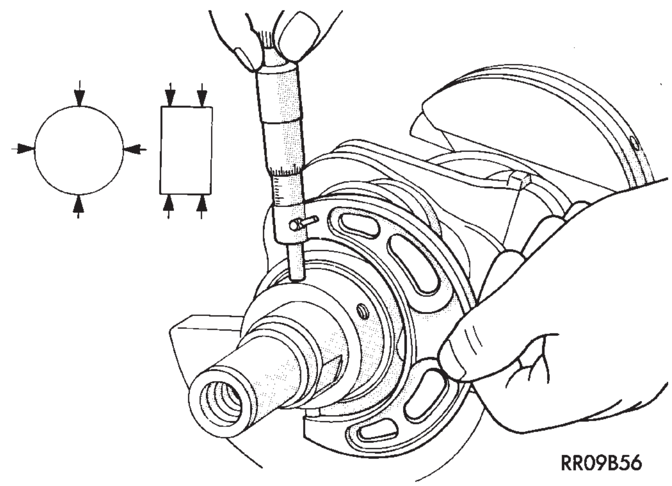


Fig. 16 Measure Crankshaft Journal O.D.

CRANKSHAFT END-PLAY		
NEW PART: .05 TO 0.25 mm		(.002 TO .0010 in.)
WEAR LIMIT: 0.30 mm		(.012 in.)
MAIN BEARING OIL CLEARANCE		
NEW PART: .020 TO .048 mm		(.0008 TO .0018 in.)
WEAR LIMIT: .10 mm		(.0039 in.)
CRANKSHAFT JOURNAL SIZES		
CRANKSHAFT MAIN BEARING JOURNAL		
	ALL	DIAMETER
	STANDARD	59.980 mm (2.361 in.)
CRANKSHAFT CONNECTING ROD JOURNAL		
	ALL	DIAMETER
	STANDARD	50.00 mm (1.968 in.)

9109-39

Fig. 17 Crankshaft Clearance Specifications

SERVICE PROCEDURES (Continued)

PLASTIGAGE MEASUREMENT

(1) Remove oil from journal and bearing shell.

(2) Install crankshaft.

(3) Cut plastigage to same length as width of the bearing and place it in parallel with the journal axis (Fig. 18).

(4) Install the main bearing cap carefully and tighten the bolts to specified torque.

CAUTION: Do not rotate crankshaft or the plastigage will be smeared.

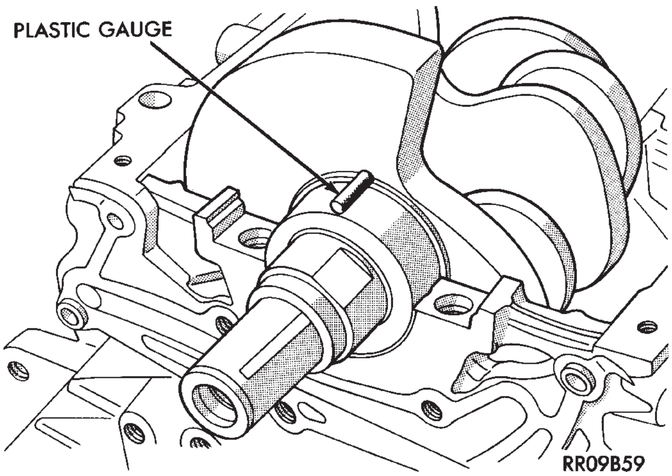


Fig. 18 Measure Oil Clearance with Plastigage

(5) Carefully remove the bearing cap and measure the width of the plastigage at the widest part using the scale on the plastigage package (Fig. 19). Refer to specifications (Fig. 17) for proper clearance. Also see Measuring Main and Connecting Rod Bearing Clearances in Standard Service Procedures.

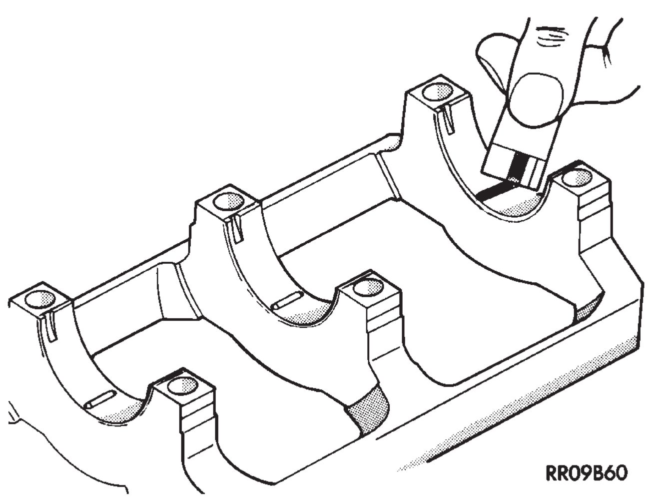


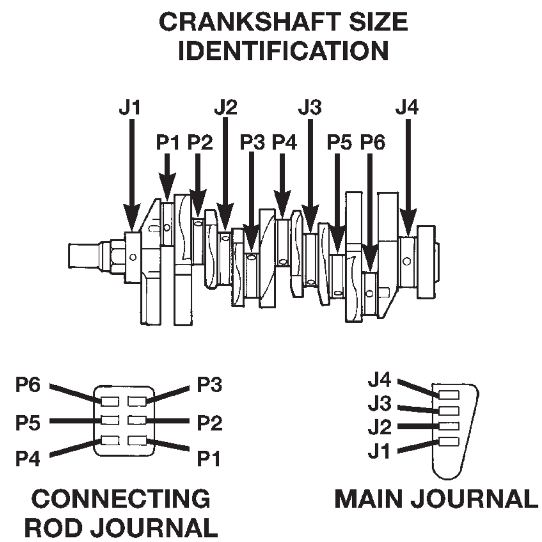
Fig. 19 Measuring Clearance

CRANKSHAFT BEARING INSTALLATION

When the bearings need replacing, select and install the proper bearing by the following procedure.

(1) Measure the crankshaft journal diameter and confirm its classification from the following (Fig. 20). In the case of a bearing supplied as a service part, its identification color is painted at the position show in (Fig. 21).

NOTE: Service Replacement parts have identification marks, but factory-assembled parts have no identification marks. Service crankshaft identification may have marks or paint at counterweights (Fig. 20).



MAIN JOURNAL

SIZE	NEW	CURRENT
59.543 to 59.695 mm (2.344 to 2.350 in.)	2	WHITE ENAMEL
59.695 to 59.848 mm (2.350 to 2.356 in.)	1	NONE
59.848 to 60.000 mm (2.356 to 2.362 in.)	0	YELLOW ENAMEL

CONNECTING ROD JOURNAL

SIZE	NEW	CURRENT
49.492 to 49.619 mm (1.949 to 1.954 in.)	III	WHITE ENAMEL
49.619 to 49.873 mm (1.954 to 1.964 in.)	II	NONE
49.873 to 50.000 mm (1.964 to 1.969 in.)	I	YELLOW ENAMEL

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Fig. 20 Crankshaft Size Identification

SERVICE PROCEDURES (Continued)

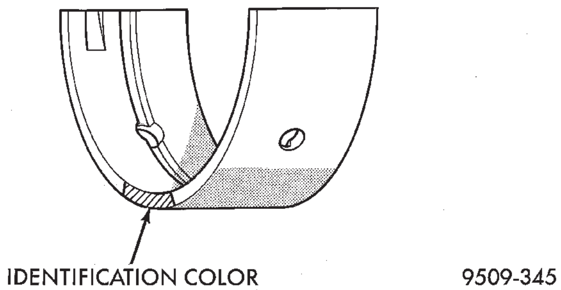


Fig. 21 Bearing Identification

CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine, locating probe on nose of crankshaft (Fig. 22).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

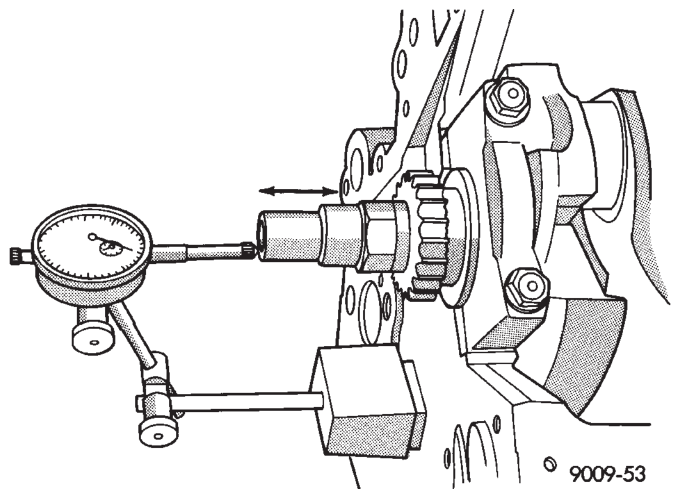


Fig. 22 Crankshaft End Play—Typical

(4) Move crankshaft all the way to the front and read the dial indicator. Refer to (Fig. 23) for specification.

CRANKSHAFT END-PLAY	
NEW PART: .05 TO 0.25 mm	(.002 TO .0010 in.)
WEAR LIMIT: 0.30 mm	(.012 in.)
MAIN BEARING OIL CLEARANCE	
NEW PART: .020 TO .048 mm	(.0008 TO .0018 in.)
WEAR LIMIT: .10 mm	(.0039 in.)
CRANKSHAFT JOURNAL SIZES	
CRANKSHAFT MAIN BEARING JOURNAL	
ALL	DIAMETER
STANDARD	59.980 mm (2.361 in.)
CRANKSHAFT CONNECTING ROD JOURNAL	
ALL	DIAMETER
STANDARD	50.00 mm (1.968 in.)

9109-39

Fig. 23 Crankshaft Specifications

CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft without rocker arm assemblies.

(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 24).

(4) Move camshaft as far forward as it will go.

(5) End play travel: 0.1 - 0.2 mm (0.004 - 0.008 in.). Max. Travel: 0.4 mm (0.016 in.)

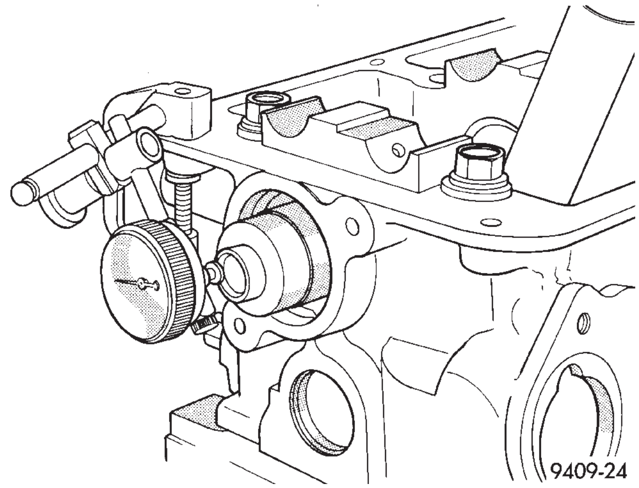


Fig. 24 Camshaft End Play

REMOVAL AND INSTALLATION

ENGINE SUPPORT MODULE (FRONT AND REAR MOUNTS)

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove thru bolt at rear mount and remove bolts attaching module to crossmember.

(3) Remove upper attaching bolt from rear support strut bracket (Fig. 25).

(4) Remove front attaching bolts from support module to lower radiator support.

(5) Support cooling module.

(6) Remove lower radiator support bolts, and remove support.

(7) Remove thru bolt at front mount and remove support module.

INSTALLATION

(1) Install thru bolt at front mount. Do not tighten at this time.

(2) Install lower radiator support.

(3) Install attaching bolts from support module to lower radiator support.

(4) Install upper bolt at rear support strut bracket.

(5) Install thru bolt at rear mount see (Fig. 26) tighten to 61 N·m (45 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

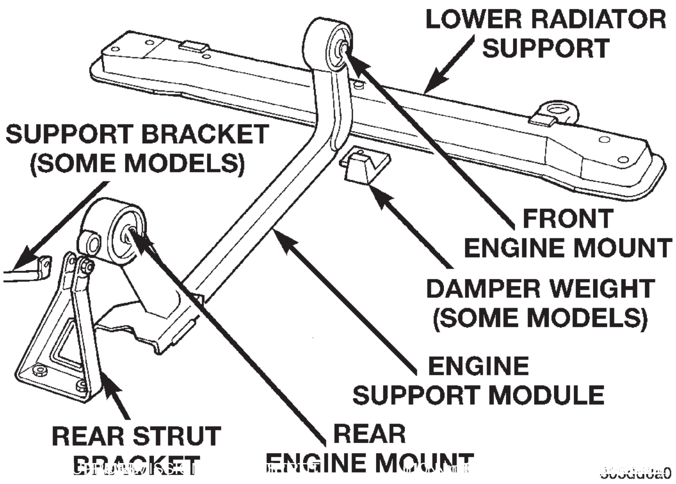


Fig. 25 Engine Support Module

(6) Tighten thru bolt at front mount see (Fig. 27) tighten to 61 N·m (45 ft. lbs.).

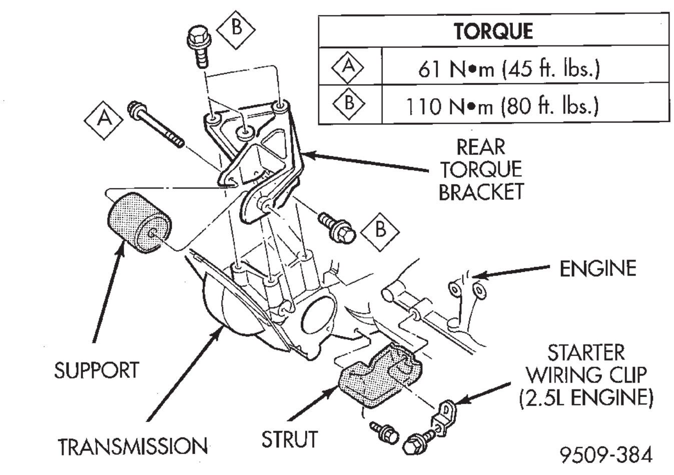


Fig. 26 Engine Mounting—Rear 2.4 and2.5L

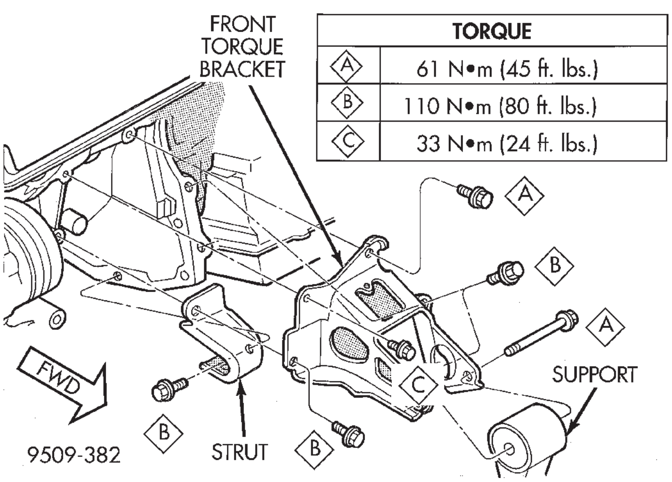


Fig. 27 Engine Mounting—Front 2.5L

ENGINE MOUNT—RIGHT/ENGINE SUPPORT BRACKET

NOTE: The right side engine mount is a Hydro-Mount and may show surface cracks this will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

(1) Raise vehicle on a hoist and remove inner splash. Remove the right engine support assembly vertical fasteners from frame rail (Fig. 28).

(2) Lower vehicle. Remove the load on the engine motor mounts by carefully supporting the engine assembly with a floor jack.

(3) Remove the three bolts attaching the engine support assembly to the engine bracket.

(4) Move the air conditioning dryer aside.

(5) Remove coolant recovery system tank. Refer to Group 7, Cooling System for procedure.

(6) Remove right engine support.

(7) Remove the three bolts attaching the engine support bracket to the cylinder block.

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section.

(8) Reverse removal procedure for installation. Refer to (Fig. 28) for bolt tightening specifications.

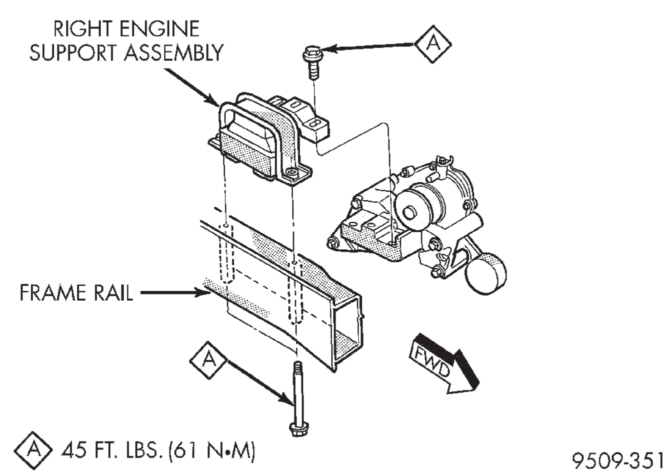


Fig. 28 Engine Mounting—Right Side2.5L

LEFT SIDE MOUNT

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section.

The left side engine mount is a Hydro-Mount and may show surface cracks this will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

REMOVAL AND INSTALLATION (Continued)

(1) Support the transmission with a transmission jack.

(2) Remove the three vertical bolts, from the mount to the transmission.

(3) Remove the transmission mount fasteners and remove mount.

(4) Reverse removal procedure for installation. Refer to (Fig. 29) for bolt tightening specifications.

(5) Engine support assemblies adjustment, Refer to Engine Support Assembly Adjustment of this section.

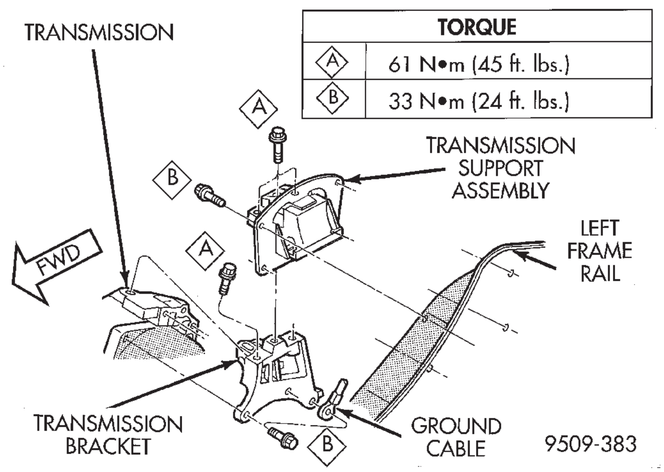


Fig. 29 Left Side Mount—Typical

ENGINE ASSEMBLY

REMOVAL

(1) Perform fuel pressure release procedure. Refer to Group 14, Fuel System for procedure. Remove fuel line to fuel rail.

(2) Disconnect battery and set Power Control Module (PCM) aside.

(3) Drain cooling system. Refer to Group 7, Cooling System for procedure.

(4) Remove upper radiator hose, radiator and fan module. Refer to Group 7, Cooling System for procedure.

(5) Remove lower radiator hose.

(6) Disconnect automatic transmission cooler lines and plug, if equipped.

(7) Disconnect transmission shift linkage.

(8) Disconnect throttle body linkage.

(9) Disconnect engine wiring harness.

(10) Disconnect heater hoses.

(11) Discharge Air Conditioning System. Refer to Group 24, Air Conditioning for procedure.

(12) Hoist vehicle and remove right inner splash shield.

(13) Remove accessory drive belts. Refer to Group 7, Cooling System for procedure.

(14) Remove axle shafts. Refer to Group 2, Suspension and Driveshaft for procedure.

(15) Disconnect exhaust pipe from manifold.

(16) Remove front and rear engine mount brackets from the body.

(17) Lower vehicle. Remove air cleaner assembly.

(18) Remove power steering pump and reservoir, Set them aside.

(19) Remove A/C compressor.

(20) Remove ground straps to body.

(21) Mount the bracket (Special Tool 6973) to the right side of the cylinder block (Fig. 30). Align the front adjustable post with the hole in the bracket.

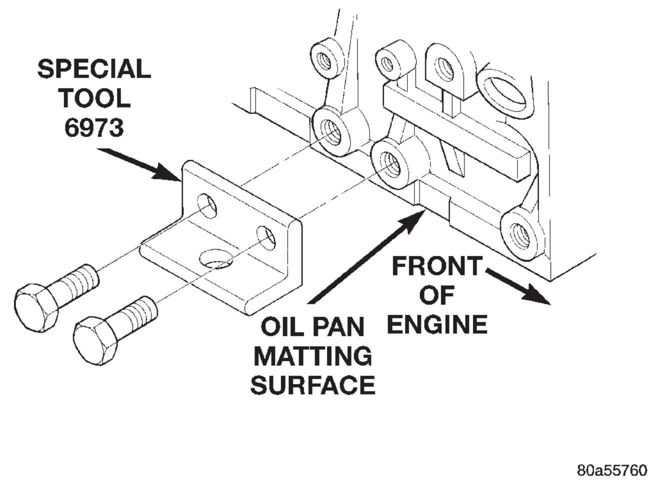


Fig. 30 Bracket for Cradle Post Support

(22) Raise vehicle enough to allow engine dolly and cradle Special Tools 6135 and 6710 to be installed under vehicle (Fig. 31).

(23) Loosen cradle engine mounts to allow movement for positioning onto engine locating holes on the engine bedplate. Lower vehicle and position cradle mounts until the engine is resting on mounts. Tighten mounts to cradle frame. This will keep mounts from moving when removing or installing engine and transmission.

(24) Lower vehicle so weight of the engine and transmission ONLY is on the cradle.

(25) Remove engine and transmission mount bolts.

(26) Raise vehicle slowly. It may be necessary to move the engine/transmission assembly on the cradle to allow for removal around body flanges.

INSTALLATION

(1) Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine and transmission.

(2) Align engine and transmission mounts to attaching points. Install mounting bolts at the right engine and left transmission mounts. Refer to procedures outlined in this section.

REMOVAL AND INSTALLATION (Continued)

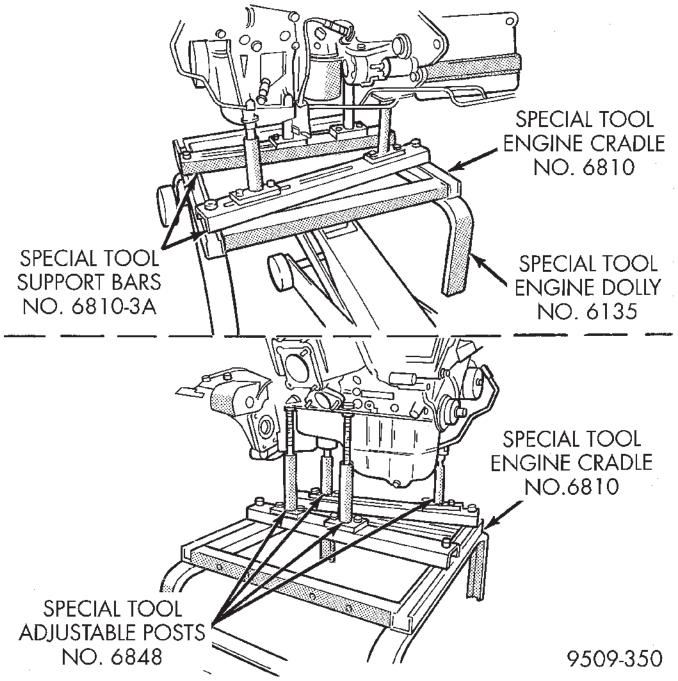


Fig. 31 Positioning Engine Cradle SupportPost Mounts

(3) Slowly raise vehicle enough to remove the engine dolly and cradle Special Tools 6135 and 6710.

(4) Install axle shafts. Refer to Group 2, Suspension and Driveshaft for procedure.

(5) Install transmission and engine braces and splash shields.

(6) Connect exhaust system to manifold. Refer to Group 11, Exhaust System and Intake Manifold for procedure and torque specifications.

(7) Install power steering pump and reservoir. Refer to Group 7, Cooling System Accessory Drive Section for belt tension adjustment.

(8) Install A/C compressor and hoses. Refer to Group 24, Heater and Air Conditioning for procedure.

(9) Install accessory drive belts. Refer to Group 7, Cooling System Accessory Drive Section for belt tension adjustment.

(10) Install front and rear engine mounts. Refer to this section for procedure.

(11) Install inner splash shield. Install wheels and tires.

(12) Connect automatic transmission cooler lines, shifter and kickdown linkage. Refer to Group 21, Transmission for procedures.

(13) Connect fuel line and heater hoses.

(14) Install ground straps. Connect engine and throttle body connections and harnesses. Refer to Group 8, Electrical for procedure.

(15) Connect throttle body linkage. Refer to Group 14, Fuel System for procedure.

(16) Install radiator and shroud assembly. Install radiator hoses. Fill cooling system. See Group 7, Cooling System for filling procedure.

(17) Connect battery and set Power Control Module (PCM) into place.

(18) Install air cleaner and hoses.

(19) Install oil filter. Fill engine crankcase with proper oil to correct level.

(20) Start engine and run until operating temperature is reached.

(21) Adjust transmission linkage, if necessary.

REMOVAL AND INSTALLATION (Continued)

CYLINDER HEAD COVER

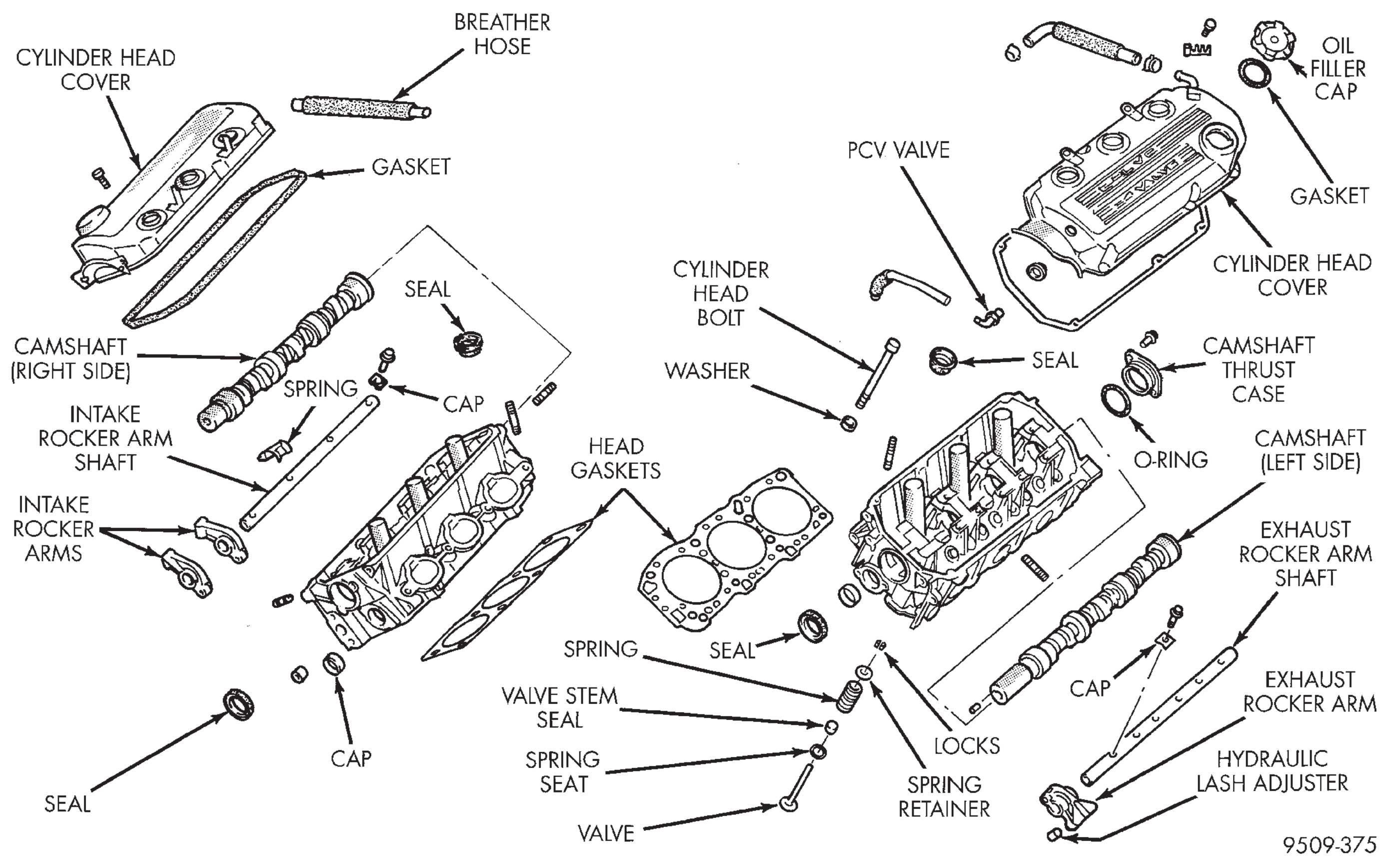


Fig. 32 Cylinder Head Components

REMOVAL

(1) Remove air intake plenum. Refer to Group 11, Exhaust and Intake Manifolds for procedure.

(2) Cover lower intake manifold with a suitable cover during service.

(3) Disconnect and relocate spark plug wires.

(4) Remove cylinder head cover screws and remove cover (Fig. 32).

INSTALLATION

NOTE: Before installation, clean cylinder head and cover mating surfaces. Make certain the rails are flat.

(1) Clean cylinder head and cover mating surfaces. Install new gasket.

(2) Install cover and tighten cover bolt washer and gasket assembly to 10 N·m (88 in. lbs.).

SPARK PLUG TUBE SEALS

The spark plug tube seals are located on the end of each tube (Fig. 33). These seals slide onto each tube to seal the cylinder head cover to spark plug tube. If these seals show signs of hardness and/or cracks they should be replaced.

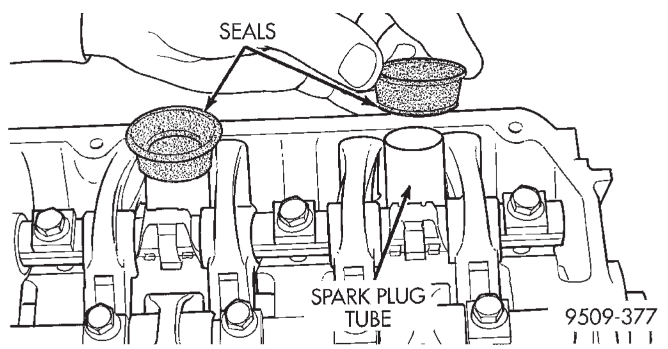


Fig. 33 Spark Plug Tube Seal

CYLINDER HEAD

REMOVAL

(1) Refer to Timing Belt removal outlined in this section for disassembly, and remove camshaft sprockets.

(2) Remove rocker arm assemblies. Refer to procedure outline in this section.

REMOVAL AND INSTALLATION (Continued)

(3) Remove upper intake manifold assembly. Refer to Group 11, Intake and Exhaust Manifolds for procedure.

(4) Remove distributor.

(5) Remove exhaust manifolds and cross over Refer to Group 11, Intake and Exhaust Manifolds for procedure.

(6) Remove cylinder head bolts and remove cylinder head.

INSTALLATION

(1) Clean surfaces of head and block, install head gasket over locating dowels.

(2) Install head on locating dowels.

(3) Install 10mm allen hex head bolts with washers.

(4) Tighten bolts in the order shown in (Fig. 34). When tightening the cylinder head bolts, tighten gradually, working in two or three steps and finally tighten to specified torque of 108 N·m (80 ft. lbs.).

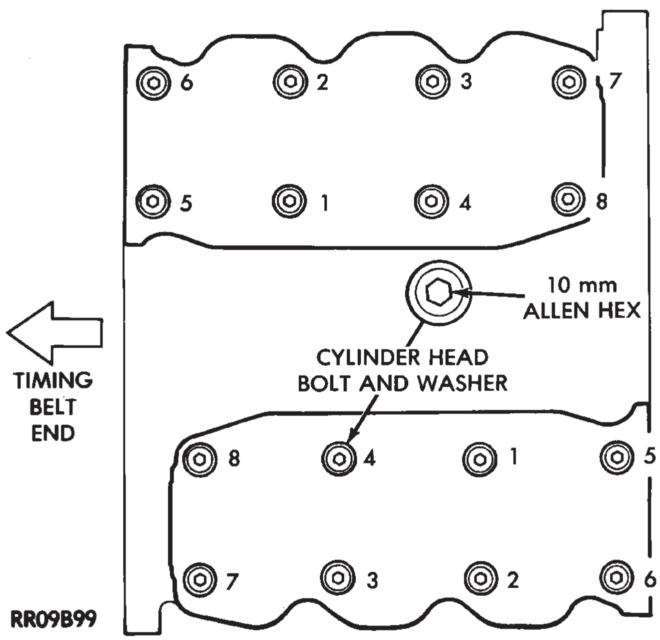


Fig. 34 Cylinder Head Bolt Tightening Sequence

ROCKER ARM AND HYDRAULIC ADJUSTER

REMOVAL

(1) Remove cylinder head cover using procedure outlined in this section.

(2) Identify the rocker arm shaft assemblies before removal.

(3) Install auto lash adjuster retainers, Special Tool MD-998443 onto rocker arms (Fig. 35). These retainers hold the lash adjusters into position when the rocker arms are serviced.

(4) Loosen the attaching fasteners. Remove rocker arm shaft assemblies from cylinder head.

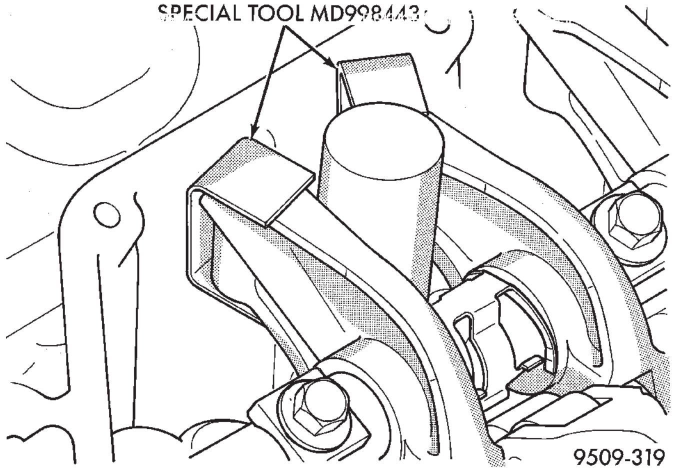


Fig. 35 Auto Lash Adjuster Retainers

(5) Mark rocker arm/hydraulic lash adjuster assemblies for reassembly in their original position. Remove rocker arm/hydraulic lash adjuster assembly. Lash adjusters are serviced as an assembly with the rocker arm (Fig. 36).

NOTE: The automatic lash adjusters are precision units installed in machined openings in the valve actuating ends of the rocker arms. Do not disassemble the auto lash adjuster.

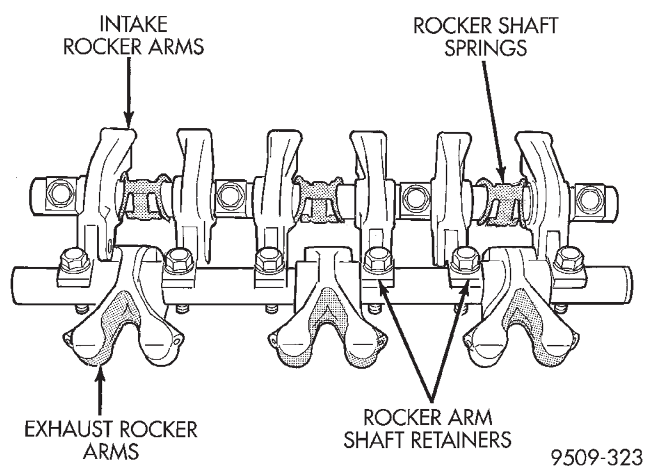


Fig. 36 Rocker Arm Shafts

INSTALLATION

(1) Install rocker arm and shafts with the FLAT on the shafts facing the timing belt side of the right cylinder head (Fig. 37). For the left cylinder head, install rocker arm and shafts with the FLAT on the shafts facing the transmission side of the engine. Install the retainers and spring clips in their original positions on the exhaust and intake shafts (Fig. 36).

(2) Tighten bolts to 31 N·m (276 in. lbs.) in sequence shown in (Fig. 38).

(3) Remove auto lash adjuster retainers Special Tool MD-998443 from rocker arms.

REMOVAL AND INSTALLATION (Continued)

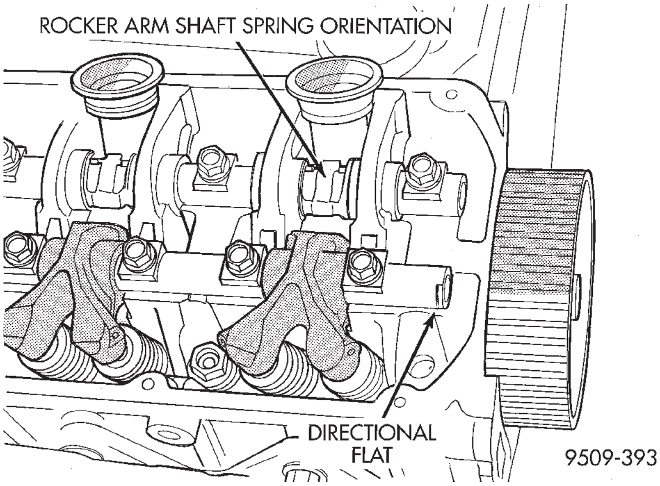


Fig. 37 Rocker Arm Shaft Flat

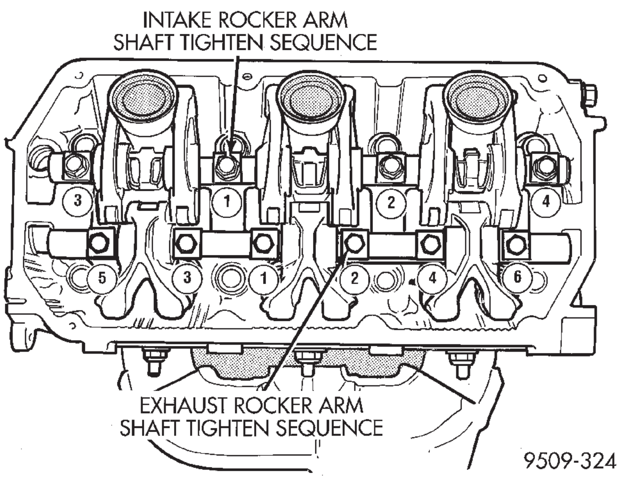


Fig. 38 Rocker Arm Shaft Tightening Sequence

CAMSHAFT

REMOVAL

NOTE: Cylinder Head Must Be Removed

(1) Remove the cylinder head covers.

(2) Install auto lash adjuster retainers Special Tool MD-998443 (Fig. 39). These retainers hold the lash adjuster into position when the rocker arms are serviced.

(3) Mark rocker arm shaft assemblies for installation.

(4) Remove rocker arm shaft bolts. Refer to procedure outlined in this section.

(5) Remove the timing belt and camshaft sprocket. Refer to timing belt and sprocket removal outlined in this section.

(6) Remove cylinder head retaining bolts. Remove cylinder head from vehicle.

(7) Remove thrust case from left head assembly and remove camshaft from the rear of the head.

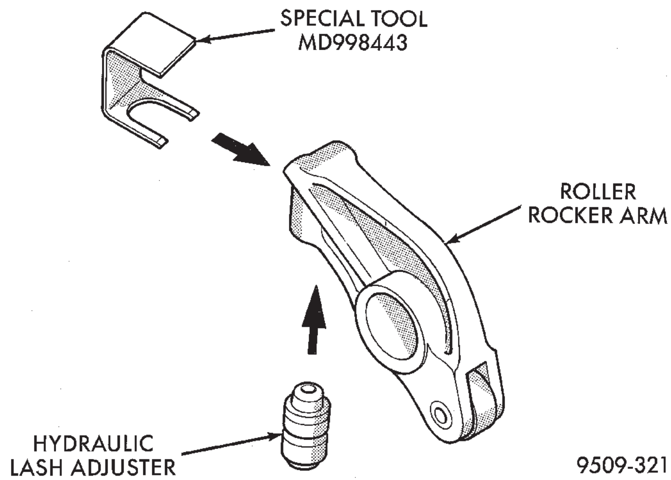


Fig. 39 Retainer Auto Lash Adjuster

(8) Remove distributor from right head assembly and remove camshaft from the rear of the head.

INSTALLATION

(1) Lubricate camshaft journals. Install camshaft into the cylinder head carefully.

(2) Install thrust case and tighten fasteners to 13 N·m (108 in. lbs.).

(3) Install camshaft seal. Camshaft must be installed before the camshaft seal is installed. Refer to procedure outlined in this section.

(4) Install camshaft sprocket and tighten to 88 N·m (65 ft. lbs.).

(5) Install timing belt. (Refer to procedure outlined in this section).

(6) Install rocker arm assemblies in correct order as removed. Tighten the rocker arm assemblies in sequence shown in (Fig. 40) to 31 N·m (276 in. lbs.).

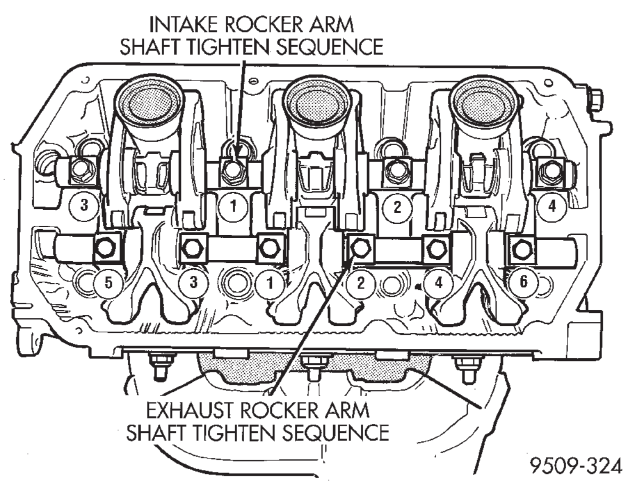


Fig. 40 Rocker Arm Shaft Tightening Sequence

CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft without rocker arm assemblies.

REMOVAL AND INSTALLATION (Continued)

(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 41).

(4) Move camshaft as far forward as it will go.

(5) End play travel: 0.1 - 0.2 mm (0.004 - 0.008 inch.). Max. Travel: 0.4 mm (0.016 in.)

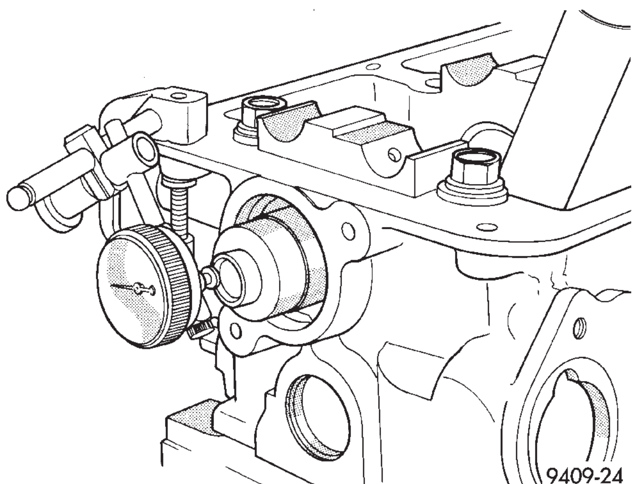


Fig. 41 Camshaft End Play

VALVE SPRINGS AND SEALS IN VEHICLE

REMOVAL

(1) Remove rocker arm shafts assemblies as previously outlined in this section.

(2) Rotate crankshaft until piston is at TDC on compression.

(3) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.

(4) Use Special Tool MD-998772A with Mounting Post 6886, Forcing Screw Arm 6887, Forcing Screw 6765 and adapter 6865 (Fig. 42) to compress valve springs and remove valve locks.

(5) Remove valve spring.

(6) Remove valve stem seal by using a valve stem seal tool.

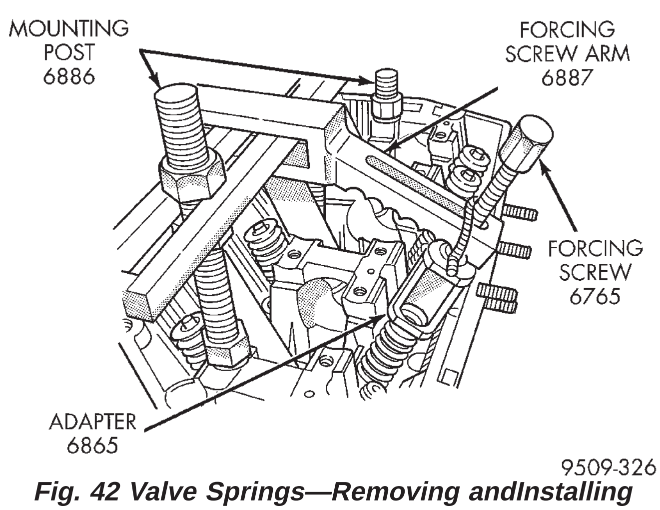


Fig. 42 Valve Springs—Removing andInstalling

INSTALLATION

(1) Install valve seal (Fig. 43) as outlined in valve installation outlined in this section.

(2) Use Special Tool MD-998772A with Mounting Post 6886, Forcing Screw Arm 6887, Forcing Screw 6765 and adapter 6865 (Fig. 42) to compress valve springs only enough to install locks. Correct alignment of tool is necessary to avoid nicking valve stems (air pressure required), piston at TDC.

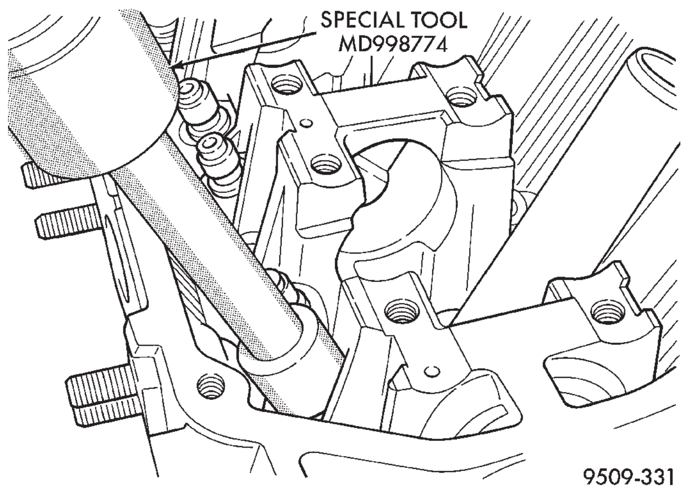


Fig. 43 Valve Stem Seals—Installed

(3) Install rocker arm and lash adjuster assemblies as previously outlined in this section.

(4) Install cylinder head cover as previously outlined in this section.

VALVE AND VALVE SEALS—HEAD OFF

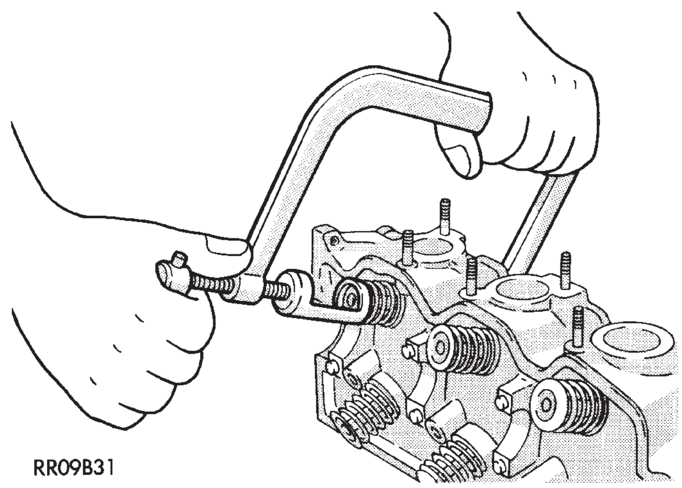


Fig. 44 Valves Removal—Typical

(1) With valve spring compressor Special Tool C-3422B with adapter 6526 or equivalent, remove spring retainer locks, retainer, valve spring, and valve (Fig. 44).

REMOVAL AND INSTALLATION (Continued)

(2) Remove valve stem seals with suitable tool (Fig. 45). Do not reuse valve stem seals.

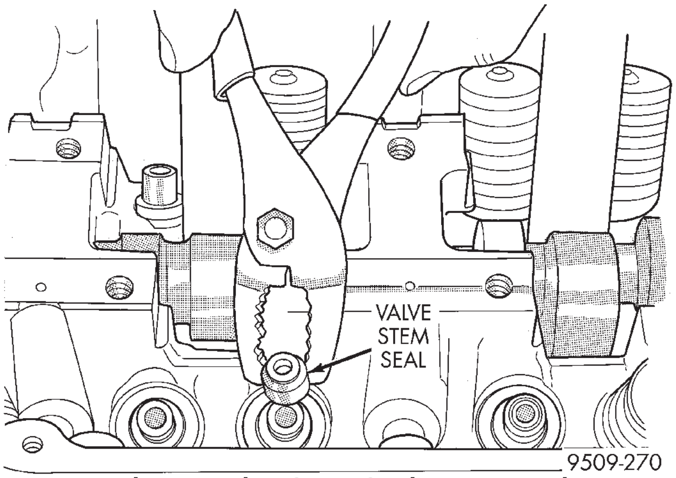


Fig. 45 Valve Stem Seals—Removal

INSTALLATION

(1) Coat valve stems with clean engine oil and insert in cylinder head.

(2) Install valve spring seat.

(3) Install the silver valve seal onto the intake valve guide and the black seal onto the exhaust value guide (Fig. 46). Using Special Tool MD-998774 install seal by tapping lightly until seal is in place (Fig. 47).

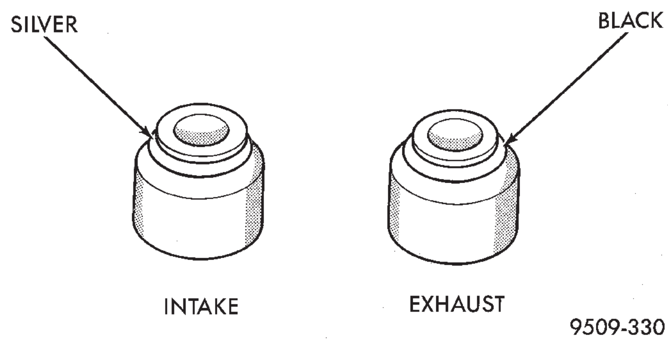


Fig. 46 Valve Stem Seals Identification

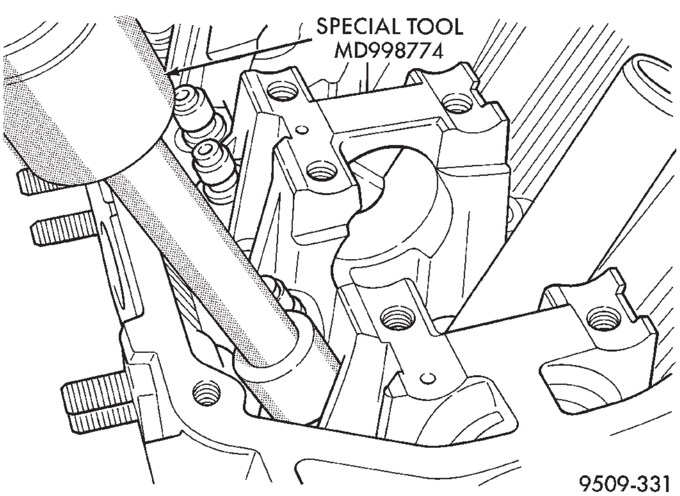


Fig. 47 Valve Stem Seals—Installed

(4) Install valve spring with the enamelled ends facing the rocker arms (Fig. 48). Install valve springs and retainers. Compress valve springs only enough to install locks, taking care not to misalign the direction of compression. Nicked valve stems may result from misalignment of the valve spring compressor.

CAUTION: When depressing the valve spring retainers with valve spring compressor the locks can become dislocated. Check to make sure both locks are in their correct location after removing tool.

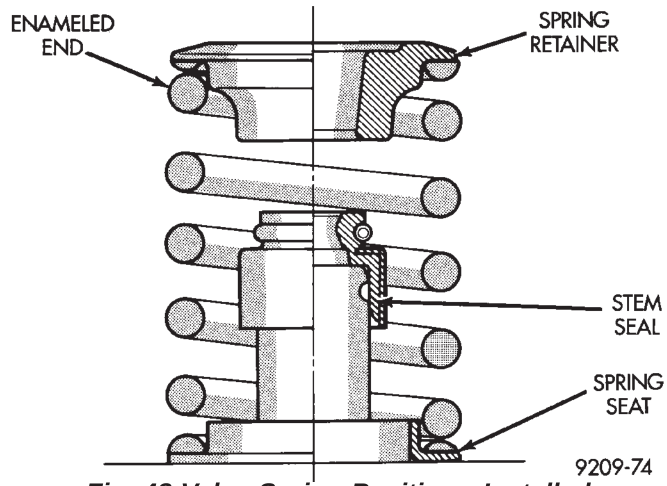


Fig. 48 Valve Spring Position—Installed

CRANKSHAFT DAMPER

(1) Remove drive belt splash shield (Fig. 49).

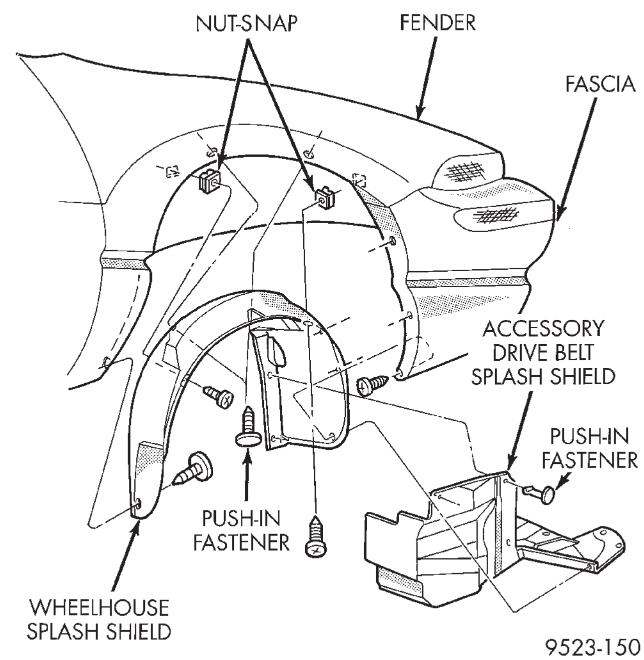


Fig. 49 Drive Belt Splash Shield

(2) Remove accessory drive belts. Refer to Group 7, Cooling System for procedure.

REMOVAL AND INSTALLATION (Continued)

(3) Remove crankshaft center bolt (Fig. 50) and remove crankshaft damper.

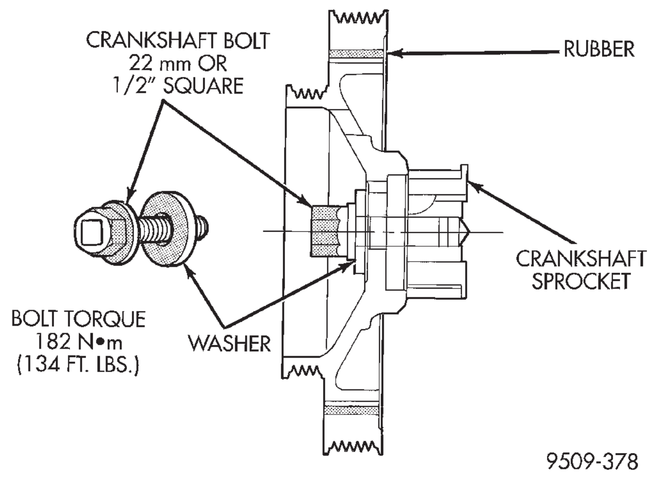


Fig. 50 Crankshaft Damper

(4) Reverse Procedure for Installation. See (Fig. 50) for crankshaft bolt torque.

TIMING BELT COVERS

REMOVAL

(1) Remove right inner slash shield. Refer to Group 23, Body for procedure.

(2) Remove the accessory drive belts. Refer to Group 7, Cooling System in for service procedure.

(3) Remove right engine mount. Refer to Engine Mounts in this section for procedure.

(4) Remove crankshaft damper. Refer to Crankshaft Damper Removal in this section.

NOTE: To remove engine mount bracket the lower timing belt cover must be removed first.

(5) Remove the engine mount bracket (Fig. 51).

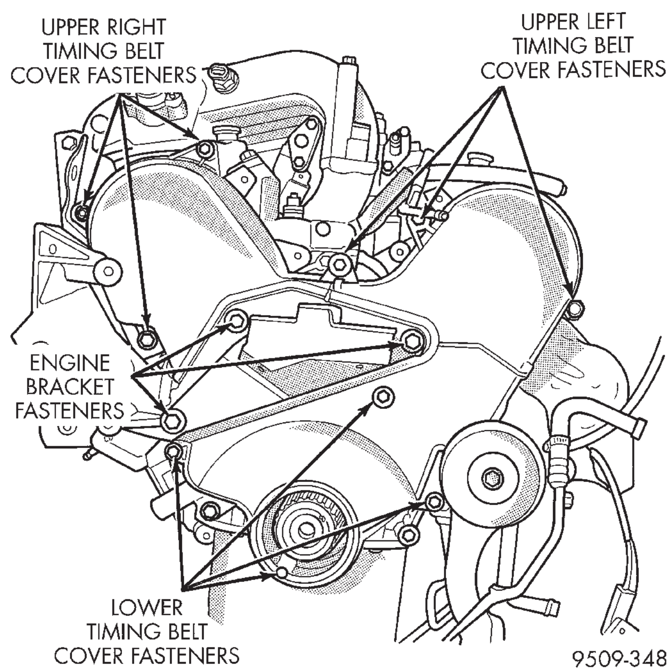


Fig. 51 Timing Belt Covers

(6) Remove the timing belt covers (Fig. 51). Remove covers in this order:

a. The upper left cover.

b. The lower cover.

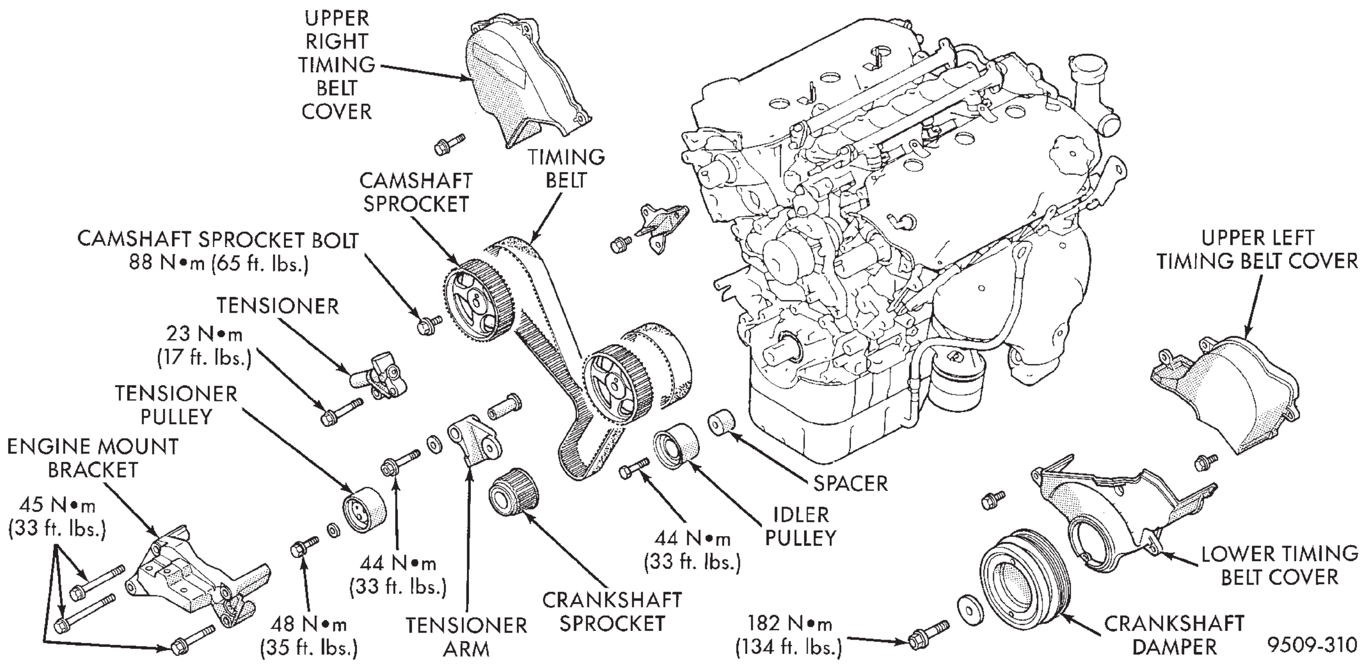
c. The upper right cover.

NOTE: To remove right/rear timing belt cover, the power steering pump bracket must be removed.

(7) To install reverse previous procedures.

REMOVAL AND INSTALLATION (Continued)

TIMING BELT



Timing Belt System

TIMING BELT— REMOVAL

(1) Mark belt running direction for installation (Fig. 52).

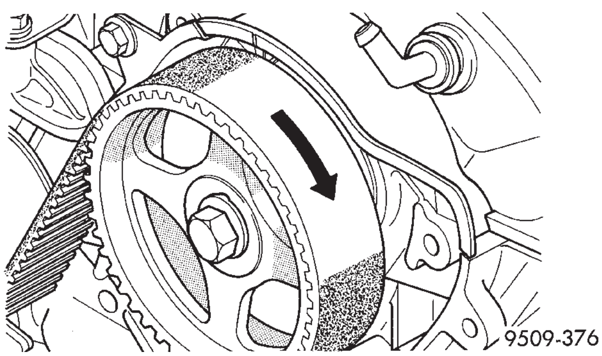


Fig. 52 Mark Direction of Timing Belt

(2) Loosen timing belt auto tensioner bolts (Fig. 53) and remove timing belt.

CAMSHAFT AND CRANKSHAFT TIMING PROCEDURE

TIMING BELT TENSIONER

(1) When tensioner is removed from the engine it is necessary to compress the plunger into the tensioner body.

(2) Place the tensioner into a vise and slowly compress the plunger (Fig. 54).

CAUTION: Index the tensioner in the vise the same way it is installed on the engine. This is to ensure proper pin orientation when tensioner is installed on the engine.

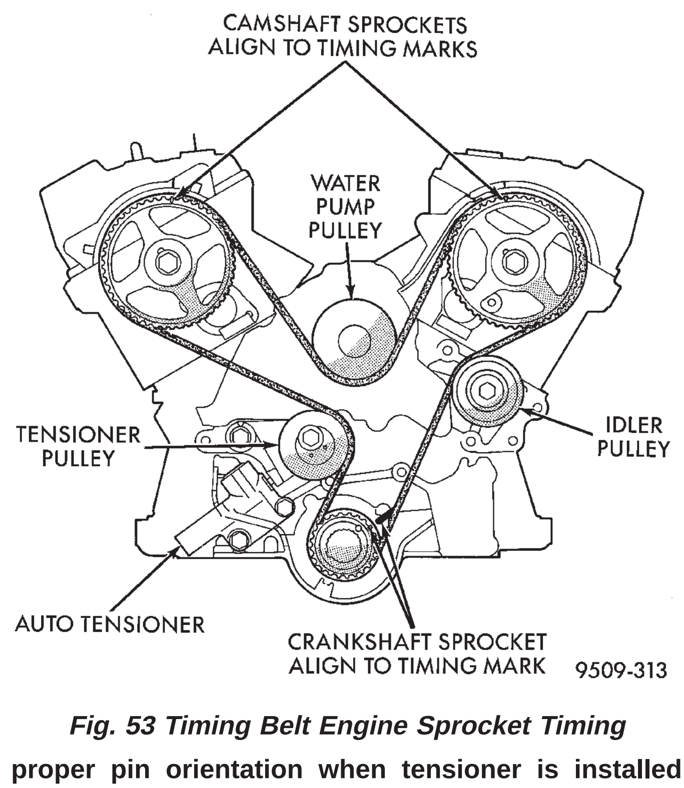


Fig. 53 Timing Belt Engine Sprocket Timing

(3) Compress plunger into the tensioner body. Install a pin through the body to retain the plunger.

REMOVAL AND INSTALLATION (Continued)

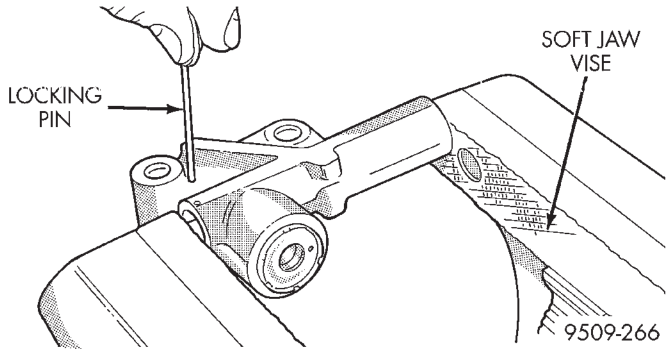


Fig. 54 Compressing Timing Belt Tensioner

TIMING BELT—INSTALLATION

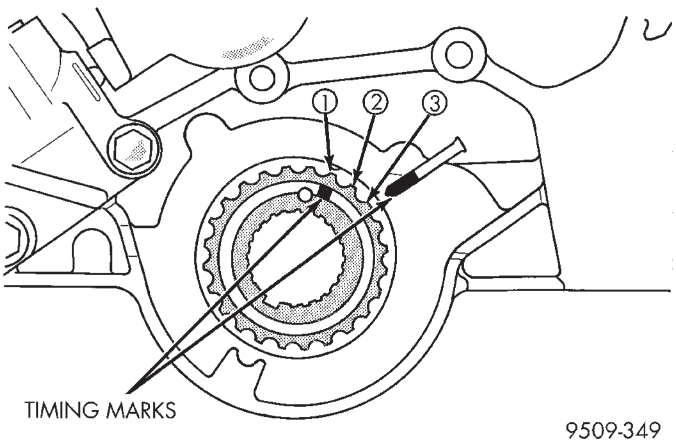


Fig. 55 Crankshaft Sprocket Timing

(1) Set crankshaft sprocket to TDC by aligning the sprocket with the mark on the oil pump housing, then back off to 3 notches before TDC (Fig. 55).

(2) Set camshaft sprockets to the aligning marks on the sprockets with the marks on the rear timing belt cover (Fig. 56).

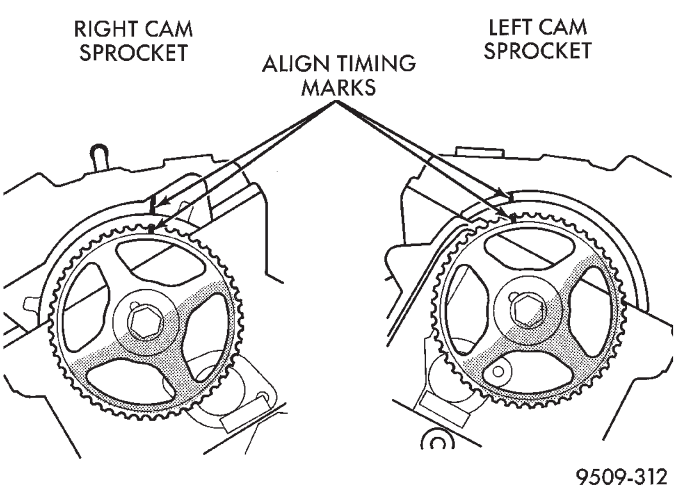


Fig. 56 Camshaft Sprocket Timing

(3) Install timing belt on rear camshaft sprocket first and install a binder clip on the belt and sprocket so the belt will not slip out of position. Keeping the belt taught, install under the water pump pulley and then around the front camshaft sprocket. Install an additional binder clip on the front sprocket and belt.

(4) Rotate the crankshaft to TDC (Fig. 57). Continue routing the belt by the idler pulley and around the crankshaft sprocket to the tensioner pulley.

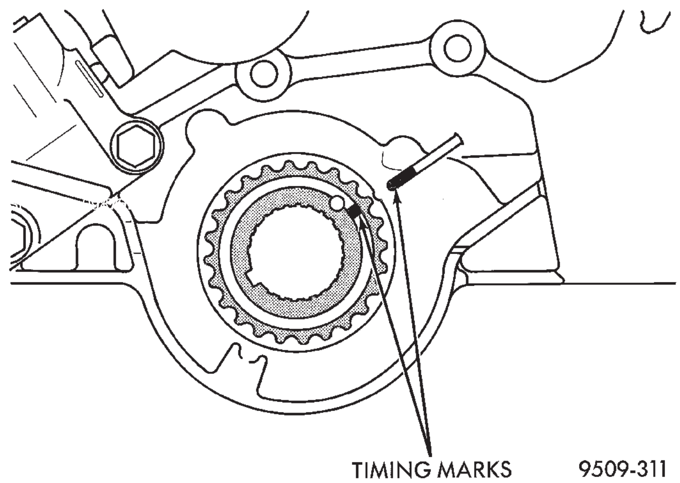


Fig. 57 Adjusting Crankshaft Sprocket forTiming Belt

(5) Apply rotating force to the crankshaft sprocket in the clockwise direction, to tension belt, check that all timing marks are aligned.

(6) Using Special Tool MD 998767 and a torque wrench on the tensioner pulley. Apply 4.4 N·m (38.9 in. lbs.) of torque to tensioner (Fig. 58). Tighten tensioner pulley bolt to 48 N·n (35 ft. lbs.).

(7) With torque being applied to the tensioner pulley install the tensioner to the tensioner pulley bracket and tighten fasteners to 23 N·m (205 in. lbs.).

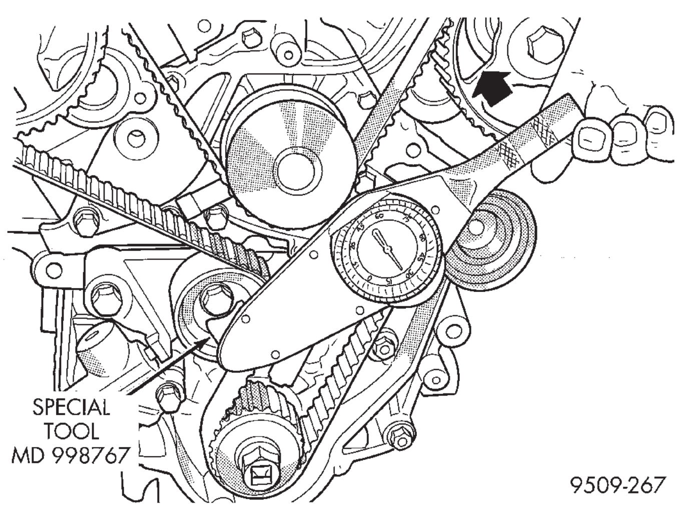


Fig. 58 Adjusting Drive Belt Tension

REMOVAL AND INSTALLATION (Continued)

(8) Pull tensioner plunger pin.

(9) Rotate crankshaft 2 revolutions in a clockwise direction ONLY and check the alignment of the timing marks (Fig. 53). Install tensioner pin into assembly. The pin should slide in and out without any resistance. If the pin does not slide freely, perform the procedure again.

(10) Install front half of timing cover and engine mount bracket (Fig. 51).

(11) Install right engine mount. Refer to procedure outlined in this section.

(12) Remove jack from under engine.

(13) Install crankshaft damper and crankshaft damper bolt and tighten to 182 N·m (134 ft. lbs.). Refer to procedure outline in this section.

(14) Install accessory drive belts. Refer to the Accessory Drive section located in Group 7 Cooling System, for the procedure.

(15) Raise vehicle on hoist and install right inner splash shield.

CAMSHAFT SPROCKETS

REMOVAL

(1) Hold camshaft sprocket with Special Tool 6847 loosen and remove bolt and washer (Fig. 59).

(2) Remove camshaft sprocket from camshaft.

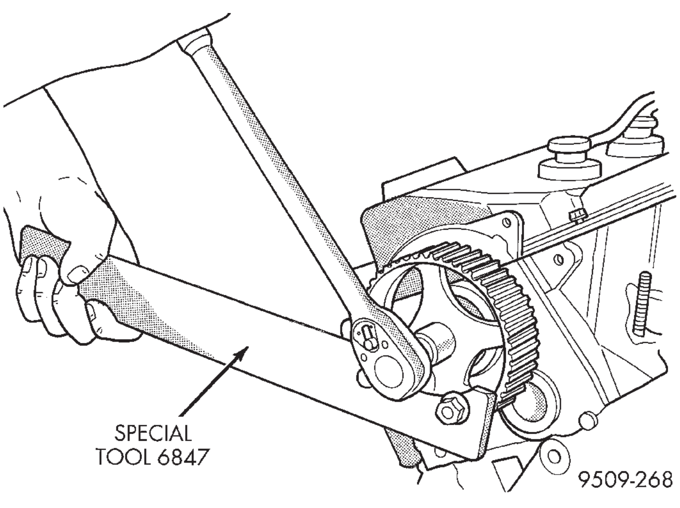


Fig. 59 Camshaft Sprockets—Removaland Installation

INSTALLATION

(1) Place camshaft sprocket on camshaft.

(2) Install bolt and washer to camshaft. Using Special Tool 6847 hold camshaft sprocket and torque bolt to 88 N·m (65 ft. lbs.) (Fig. 59).

CAMSHAFT OIL SEAL

(1) Apply light coat of engine oil to the camshaft oil seal lip.

(2) Install the oil seal using Special Tool MD998713 or 6863 camshaft oil seal installers (Fig. 60) and (Fig. 61).

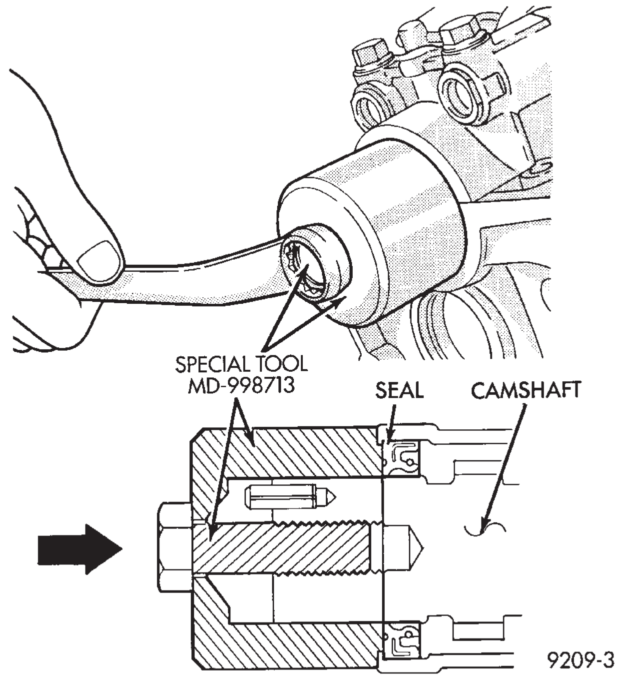


Fig. 60 Right Cylinder Head—InstallingCamshaft Oil Seal

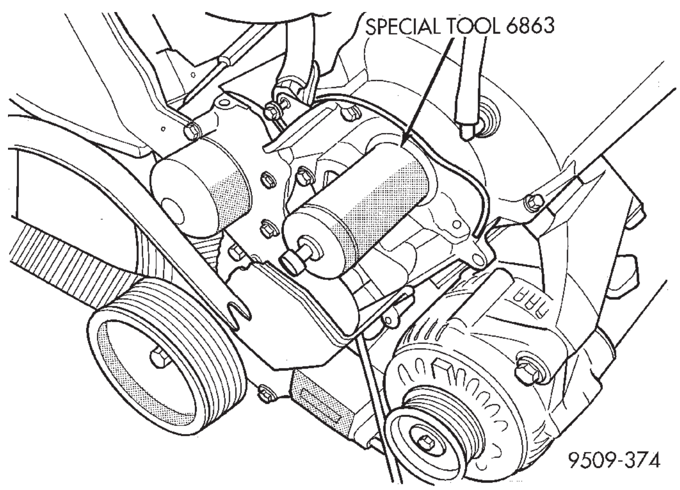


Fig. 61 Left Cylinder Head—InstallingCamshaft Oil Seal

REMOVAL AND INSTALLATION (Continued)

OIL PAN

REMOVAL

(1) Disconnect battery negative remote cable (Fig. 62).

(2) Remove oil drain plug and drain oil (Fig. 63).

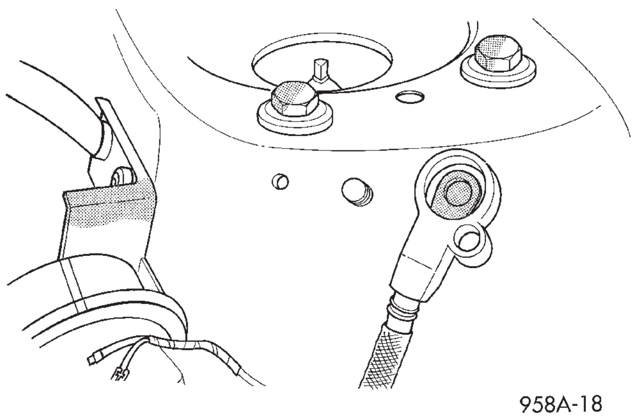


Fig. 62 Remote Battery CableNegative

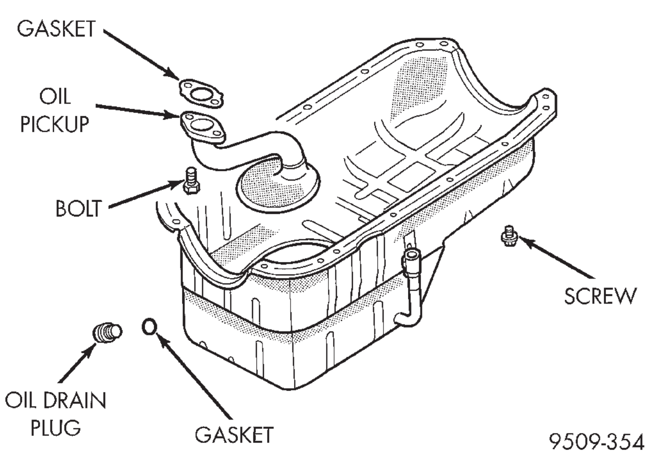


Fig. 63 Oil Pan

(3) Remove engine support module. Refer to procedure in this section.

(4) Remove dipstick tube.

(5) Remove starter motor. Refer to Group 8B, Battery/Starter/Generator Service for procedure.

(6) Remove engine to transaxle struts.

(7) Remove transaxle inspection cover.

(8) Remove oil pan.

INSTALLATION

NOTE: Oil pan to cylinder block sealing is provided with Mopar Silicone Rubber Adhesive Sealant or equivalent gasket material. See Form-In-Place Gaskets in Standard Service Procedures.

(1) Apply sealant as shown in (Fig. 64).

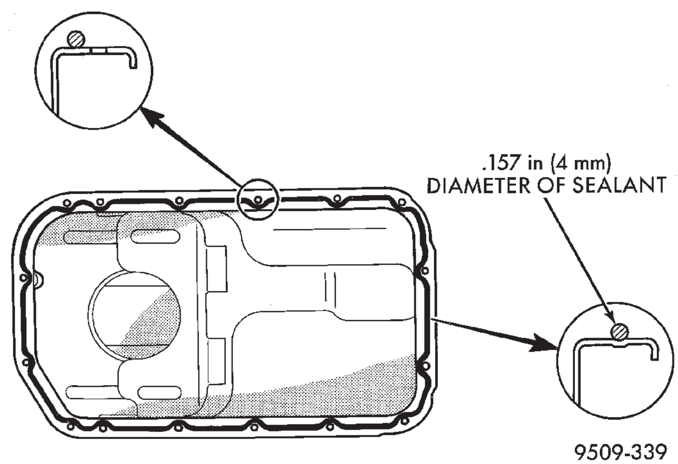


Fig. 64 Oil Pan Sealing

(2) Install pan and tighten screws to 6 N·m (50 in. lbs.).

(3) Reverse removal procedure for installation.

(4) Install correct amount of new oil.

REMOVAL AND INSTALLATION (Continued)

FRONT CRANKSHAFT OIL SEAL

REMOVAL

(1) Remove crankshaft damper. Refer to procedure in this section.

(2) Remove timing belt. Refer to procedure in this section.

(3) Remove crankshaft sprocket and key.

(4) Pry out the front seal with a flat tip screwdriver. Cover the end of the screwdriver with a shop towel.

CAUTION: Be careful not to nick or damage crankshaft flange surface or oil pump housing bore.

INSTALLATION

(1) Install front crankshaft seal into oil pump housing using Special Tool MD-998717 (Fig. 65).

(2) Reverse removal procedure for installation.

CRANKSHAFT

The crankshaft is supported in four main bearings. All upper bearing shells in the crankcase have oil grooves. All lower bearing shells in stalled in the monoblock main bearing cap are plain. Crankshaft end play is controlled by thrust washers on the number three main bearing journal.

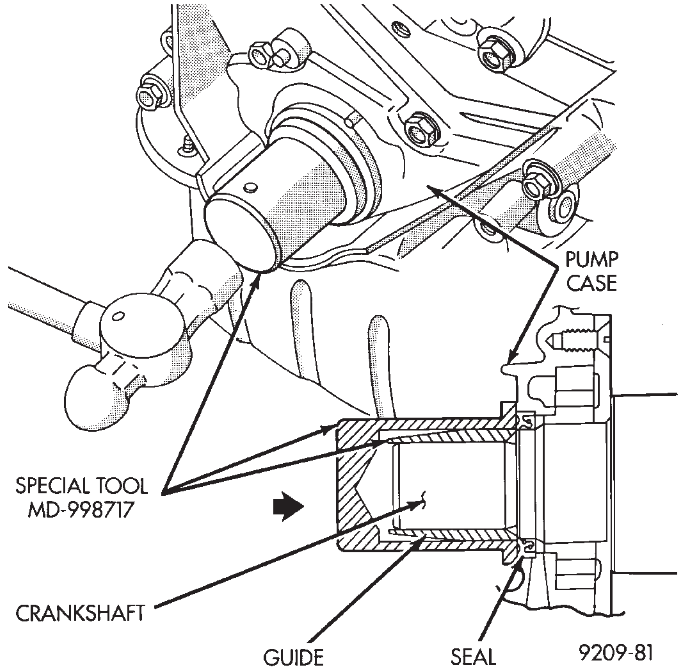


Fig. 65 Front Crankshaft Oil Seal

REMOVAL

(1) Remove front mounted oil pump assembly and gasket (Fig. 66) and (Fig. 67).

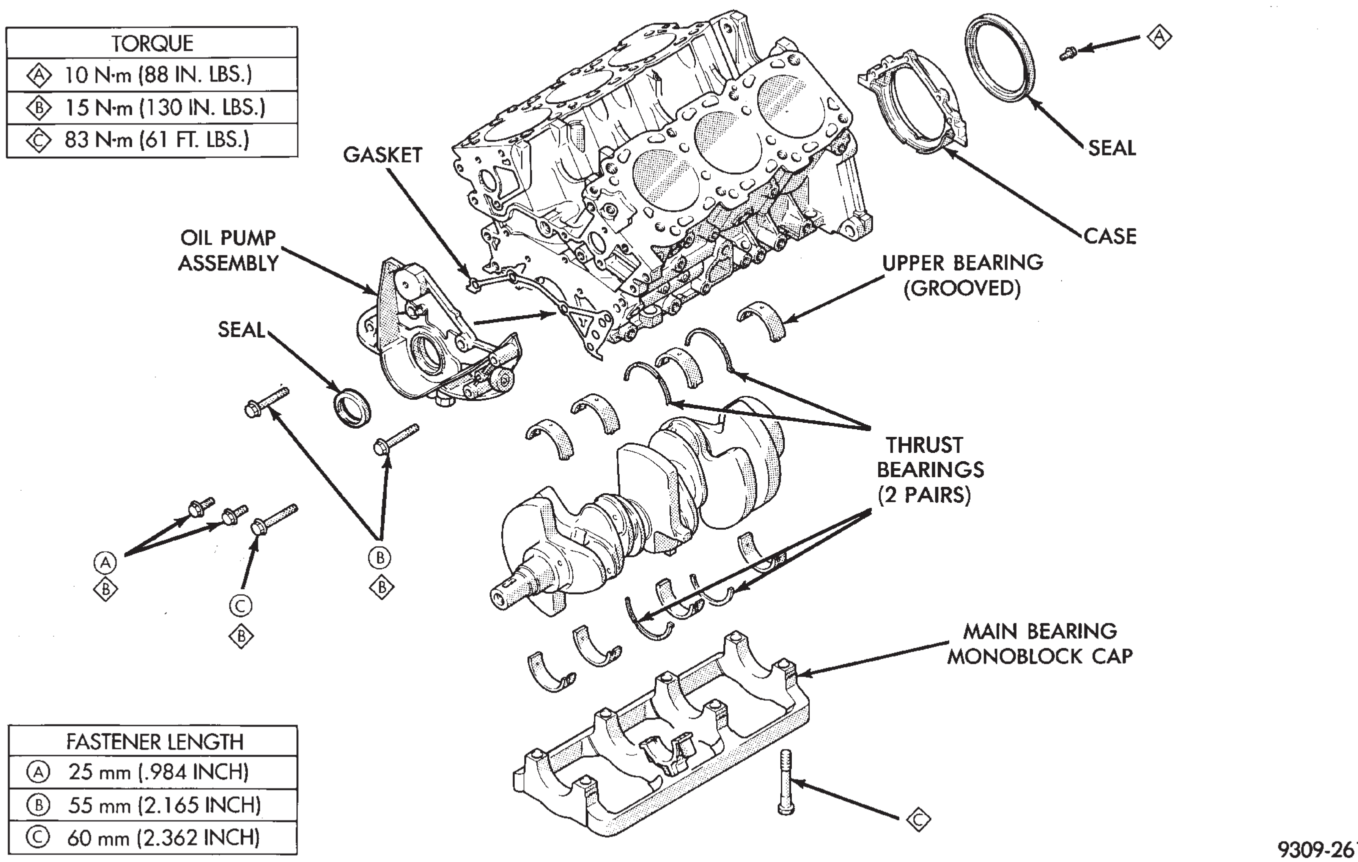


Fig. 66 Crankshaft and Cylinder Block

REMOVAL AND INSTALLATION (Continued)

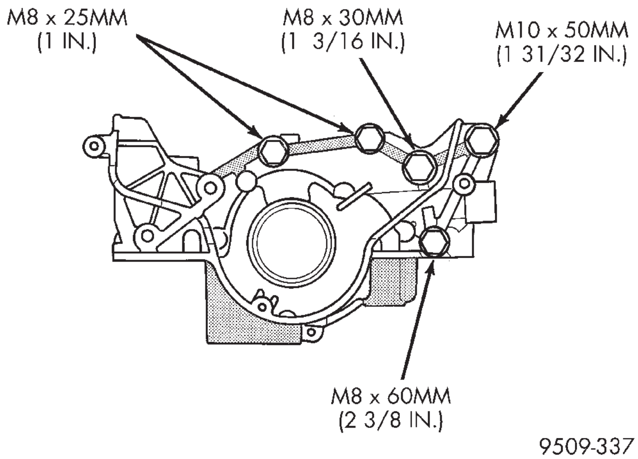


Fig. 67 Oil Pump

(2) Remove rear oil seal retainer and seal as assembly (Fig. 68).

(3) Release monoblock main bearing cap bolts evenly. Remove lower bearing shells and identify for reassembly.

(4) Lift out crankshaft and remove upper thrust washers from each side of number three main bearing in the crankcase (Fig. 66).

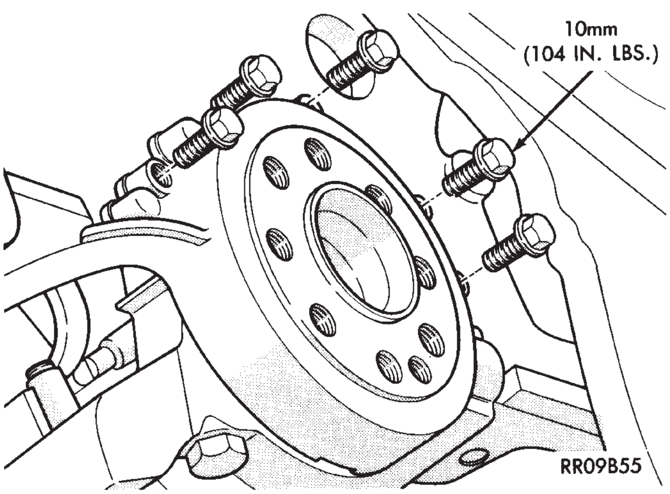


Fig. 68 Rear Seal Assembly

INSTALLATION

(1) Install upper main bearing shells making certain oil holes are in alignment, and bearing tabs seat in block tabs. All upper bearings have oil grooves (Fig. 69).

(2) **THRUST BEARINGS.** Crankshaft thrust bearings (washers) are installed at journal #3 separately from the radial bearings. Thrust bearings are different, one has end positioning tabs, while the other is plain. One **pair** of each thrust washers are installed into the block and one **pair** into the main bearing cap (Fig. 69).

(3) Apply a thin film of grease to plain side of thrust washers and position them on each side of number three main bearing. Grooved surface towards crankshaft.

(4) Oil the bearings and journals and install crankshaft.

(5) Install lower main bearing shells without oil grooves in monoblock cap.

(6) Install one pair of thrust washers in cap.

(7) Carefully install bearing cap with arrows (Fig. 70) toward timing belt end.

(8) Oil the bearing cap bolt threads, install and tighten bolts progressively in sequence shown in (Fig. 70) to 94 N·m (69 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

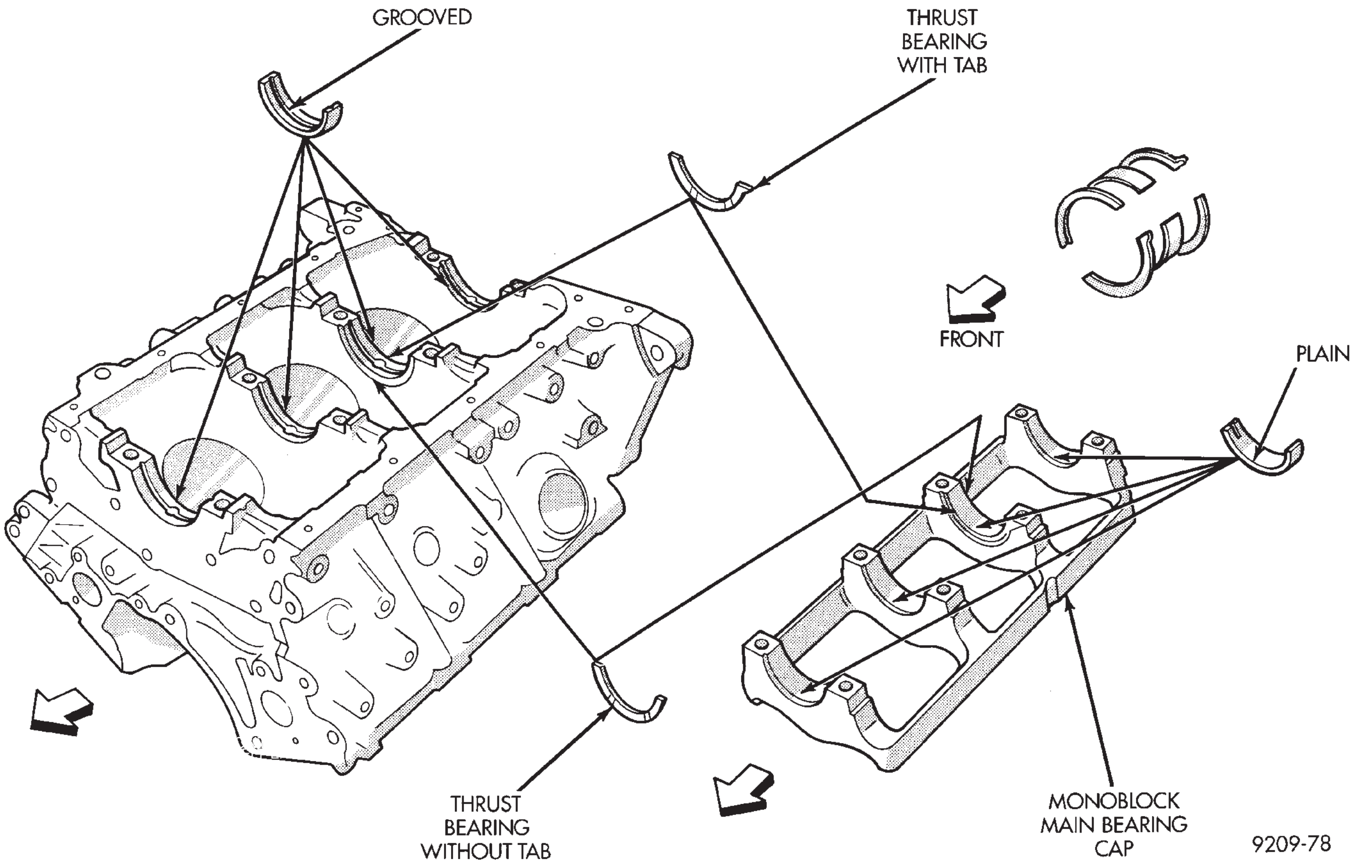


Fig. 69 Install Main Bearings

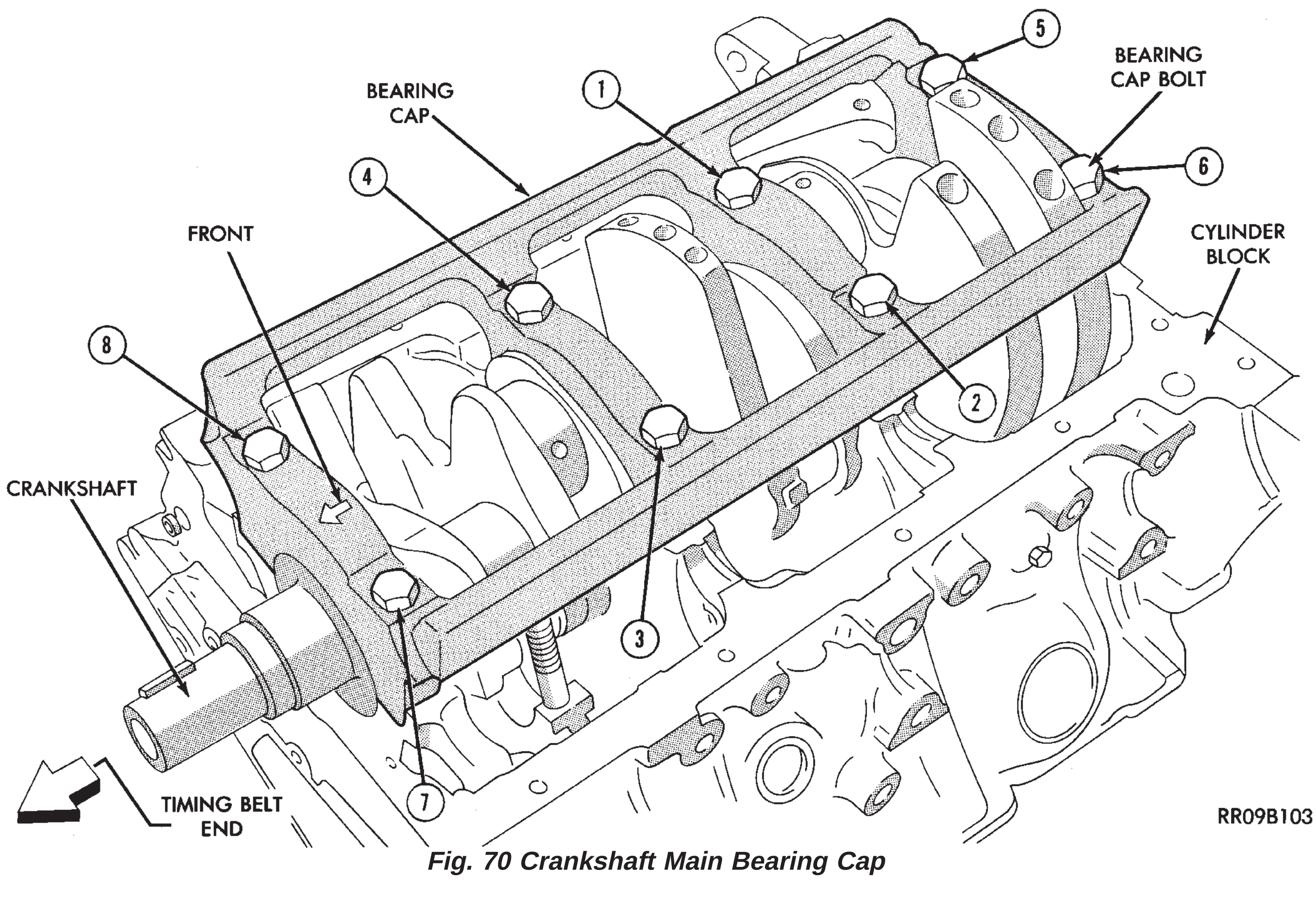


Fig. 70 Crankshaft Main Bearing Cap

REMOVAL AND INSTALLATION (Continued)

CHECKING CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine, locating probe on nose of crankshaft (Fig. 71).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

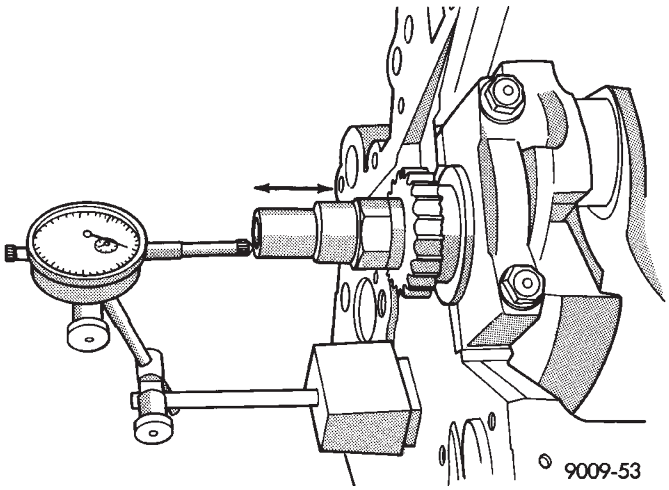


Fig. 71 Crankshaft End Play—Typical

(4) Move crankshaft all the way to the front and read the dial indicator. Refer to (Fig. 72) for specification.

CRANKSHAFT END-PLAY		
NEW PART:	.05 TO 0.25 mm	(.002 TO .0010 in.)
WEAR LIMIT:	0.30 mm	(.012 in.)
MAIN BEARING OIL CLEARANCE		
NEW PART:	.020 TO .048 mm	(.0008 TO .0018 in.)
WEAR LIMIT:	.10 mm	(.0039 in.)
CRANKSHAFT JOURNAL SIZES		
CRANKSHAFT MAIN BEARING JOURNAL		
ALL		DIAMETER
STANDARD		59.980 mm (2.361 in.)
CRANKSHAFT CONNECTING ROD JOURNAL		
ALL		DIAMETER
STANDARD		50.00 mm (1.968 in.)

9109-39

Fig. 72 Crankshaft Specifications

REAR CRANKSHAFT SEAL AND RETAINER

INSTALLATION

(1) Install rear crankshaft oil seal in housing with Special Tool MD998718 (Fig. 73).

(2) Apply (Mopar Silicone Rubber Adhesive Sealant or equivalent) to oil seal housing (Fig. 74) per procedure detailed in form-in-place gasket section in Standard Service Procedures.

(3) Apply light coating of engine oil to the entire circumference of oil seal lip.

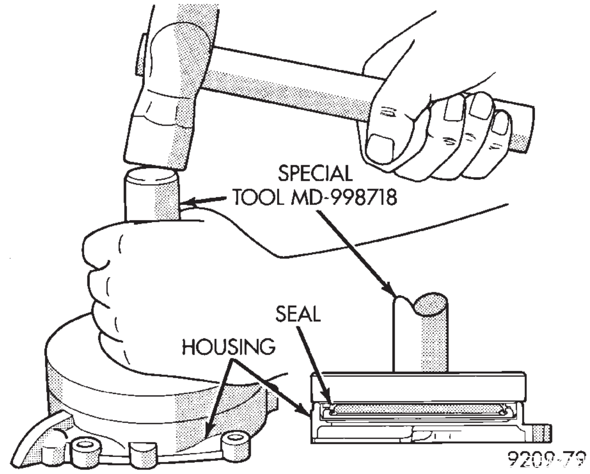


Fig. 73 Install Crankshaft Rear Oil Seal

(4) Install seal assembly on cylinder block and tighten bolts to 11 N·m (96 in. lbs.)

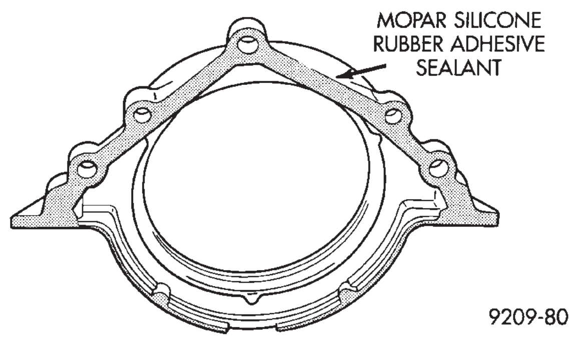


Fig. 74 Apply Sealant to Oil Seal Housing

OIL FILTER

CAUTION: When servicing the oil filter (Fig. 75) avoid deforming the filter can by installing the remove/install tool band strap against the can-to-base lockseam. The lockseam joining the can to the base is reinforced by the base plate.

(1) Turn counter clockwise to remove.

(2) To install, lubricate new filter gasket. Screw filter on until gasket contacts base. Tighten to 14 N·m (10 ft.lbs.).

OIL PUMP

REMOVAL

(1) Remove accessory drive belts. Refer to Group 7, Cooling System for procedure.

(2) Remove crankshaft damper. Refer to procedure in this section.

(3) Remove Timing Belt. Refer to procedure in this section.

(4) Remove bolts that attach oil pump to block (Fig. 76).

REMOVAL AND INSTALLATION (Continued)

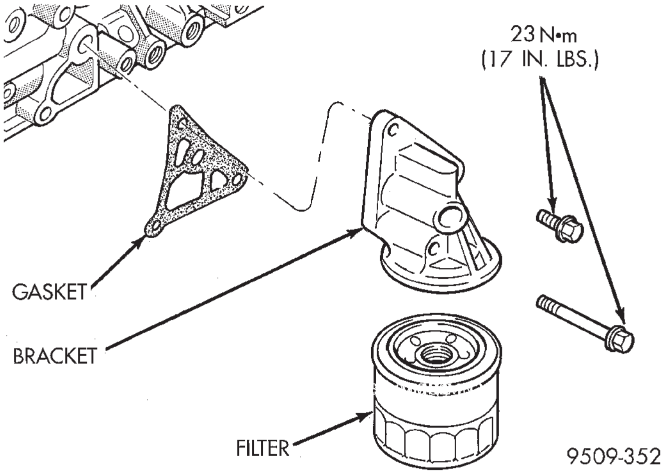


Fig. 75 Oil Filter and Bracket

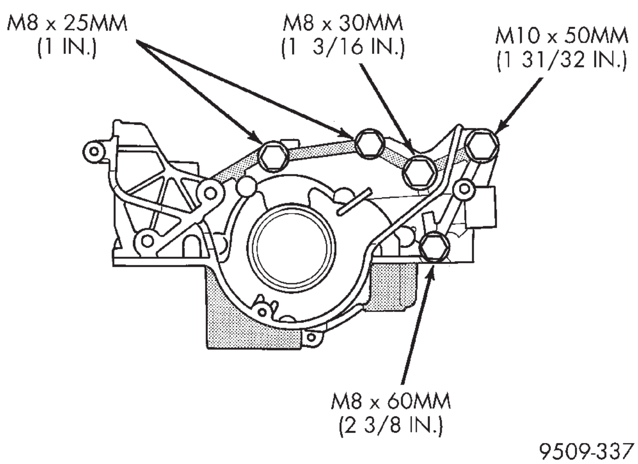


Fig. 76 Oil Pump Assembly

INSTALLATION

(1) Clean block and pump surfaces.

(2) Prime oil pump before installation by filling rotor cavity with clean engine oil.

(3) Apply mopar gasket maker to oil pump as shown in (Fig. 77). Install oil-ring into the counter bore on the oil pump body discharge passage.

(4) Install oil pump slowly onto crankshaft until seated to engine block. Tighten fasteners to M8 bolts 14 N·m (10 ft. lbs.) M10 bolts 41 N·m (30 ft. lbs.). See (Fig. 76) for bolt location and length.

PISTON AND CONNECTING ROD

REMOVAL

(1) Identify pistons with matching cylinder. **The pistons are not interchangeable from bank to bank** (Fig. 78). Pistons with the letter R and arrow toward the front of engine are to be installed in cylinders 1-3- 5. Pistons with the letter L and arrow toward the front of engine are to be installed in cylinders 2-4-6.

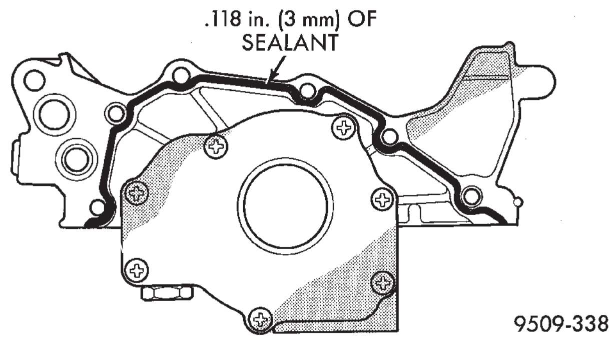


Fig. 77 Oil Pump Sealing

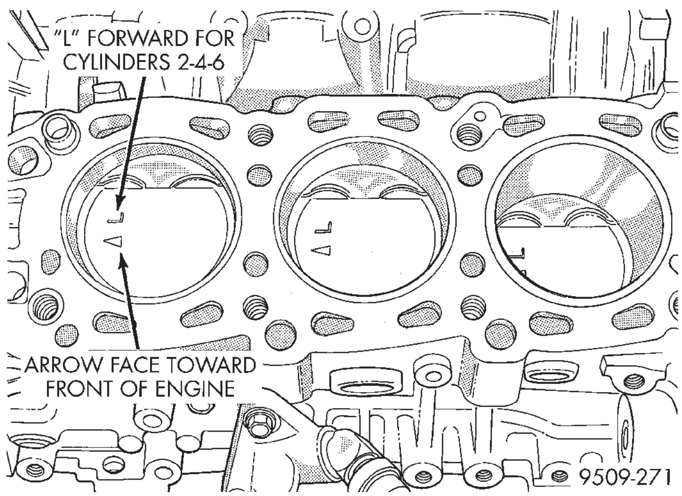


Fig. 78 Mark Pistons

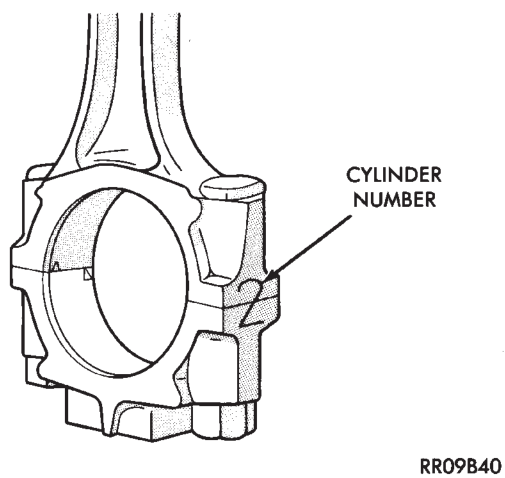


Fig. 79 Mark Matching Parts

(2) Mark connecting rod and cap with cylinder number (Fig. 79).

(3) Remove piston rings (Fig. 80).

INSTALLING PISTON RINGS

(1) The No. 1 and No. 2 piston rings have a different cross section. Install rings with manufacturers mark and size mark facing up, to the top of the piston (Fig. 81).

REMOVAL AND INSTALLATION (Continued)

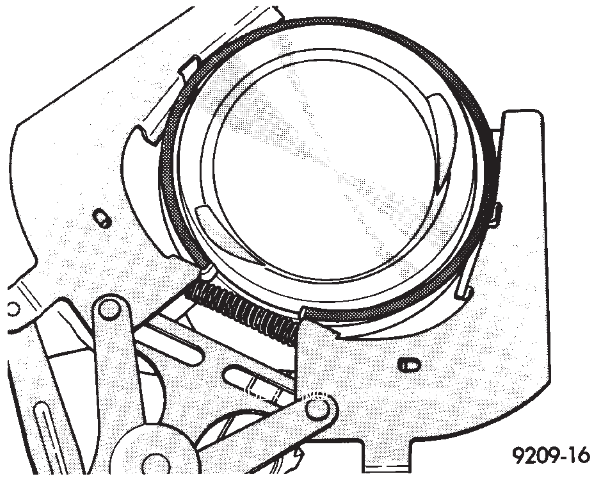


Fig. 80 Piston Ring—Removal

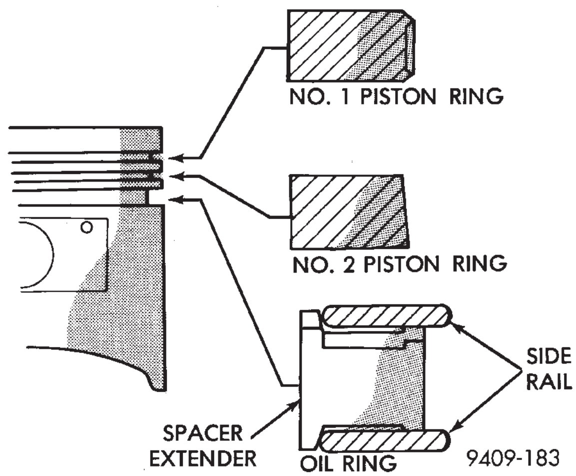


Fig. 81 Piston Ring—Installation

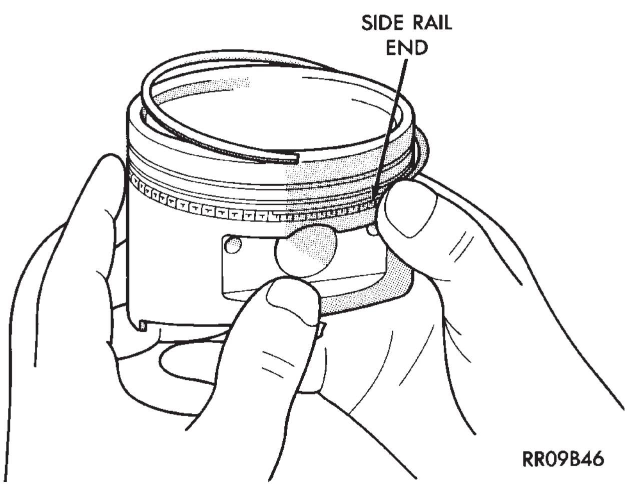


Fig. 82 Side Rail—Installation

CAUTION: Install piston rings in the following order:

(2) Oil ring expander.

(3) Upper oil ring side rail.

(4) Lower oil ring side rail.

(5) No. 2 Intermediate piston ring.

(6) No. 1 Upper piston ring.

(7) Install the side rail by placing one end between the piston ring groove and the expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do Not use a piston ring expander** (Fig. 82).

(8) Install upper side rail first and then the lower side rail.

(9) Install No. 2 piston ring and then No. 1 piston ring (Fig. 83).

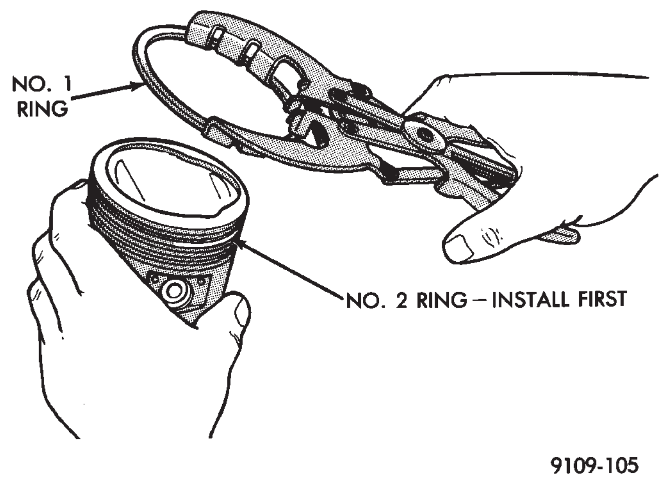


Fig. 83 Upper and Intermediate Ring—Installation

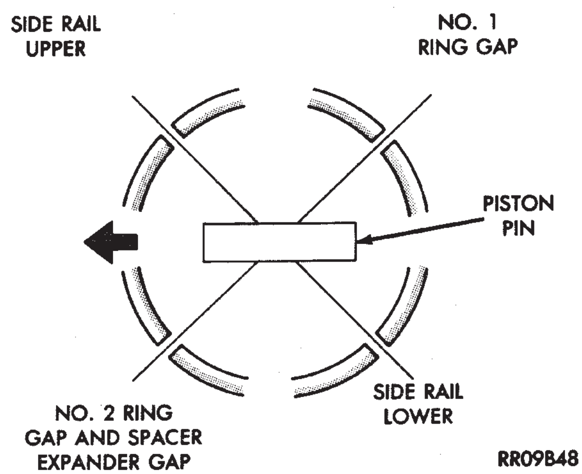


Fig. 84 Piston Ring End Gap Position

(10) Position piston ring end gaps as shown in (Fig. 84).

(11) Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction.

REMOVAL AND INSTALLATION (Continued)

INSTALLING PISTON AND CONNECTING ROD

(1) Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.

(2) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in (Fig. 84).

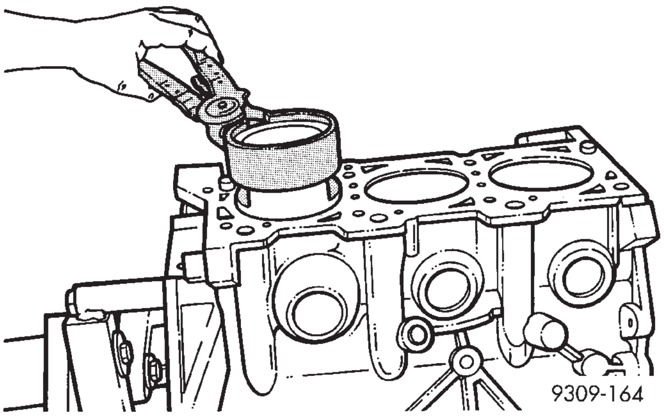


Fig. 85 Piston—Installation

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston and tighten. **Be sure position of rings does not change during this operation.**

(4) Install connecting rod bolt protectors on rod bolts.

(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal.

(6) Install the piston and connecting rod assembly with the directional letter is located on the top of the piston with the arrow facing toward the camshaft sprocket.

(7) Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal (Fig. 85).

(8) Install rod caps. Install nuts on cleaned and oiled rod bolts and tighten nuts to 51 N·m (37 ft. lb.).

CAUTION: Piston assemblies are not to be interchanged from bank to bank.

(9) Check alignment marks made during disassembly and that bearing position notches new or used are on the same side as shown in (Fig. 86).

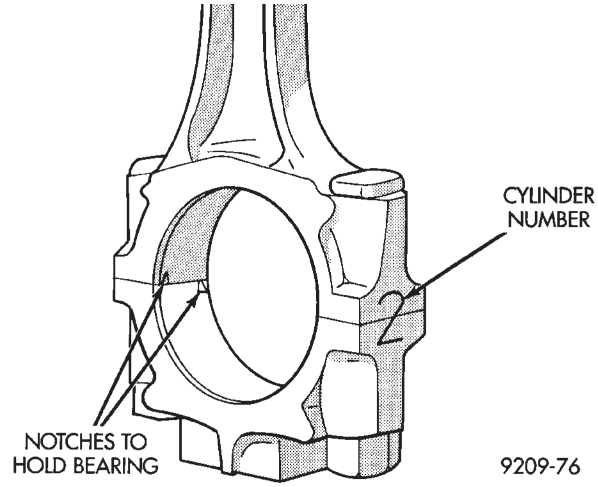


Fig. 86 Connecting Rod and Cap

DISASSEMBLY AND ASSEMBLY

OIL PUMP

(1) Assemble pump, using new parts as required with clean oil. Align marks on the inner and outer rotors when assembling (Fig. 87).

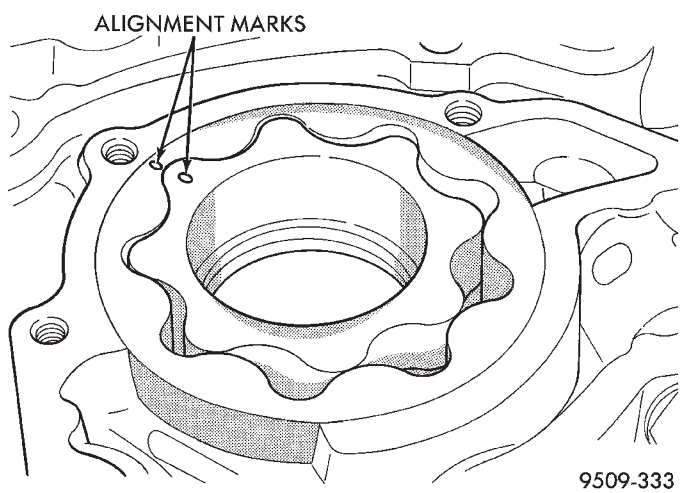


Fig. 87 Inner and Outer Rotor Alignment Marks

(2) Install cover and tighten screws to 10 N·m (85 in. lbs.).

(3) Install relief valve, spring, gasket and cap as shown in (Fig. 88). Tighten cap to 44 N·m (33 ft. lbs.)

ROCKER ARMS

(1) Identify the rocker arms and retainers for reassembly. Disassemble the rocker arm assemblies by removing the attaching bolts and spring clips from the shaft (Fig. 89).

(2) Slide the rocker arms off the shaft. Keep the spacers and rocker arms in the same location for reassembly.

DISASSEMBLY AND ASSEMBLY (Continued)

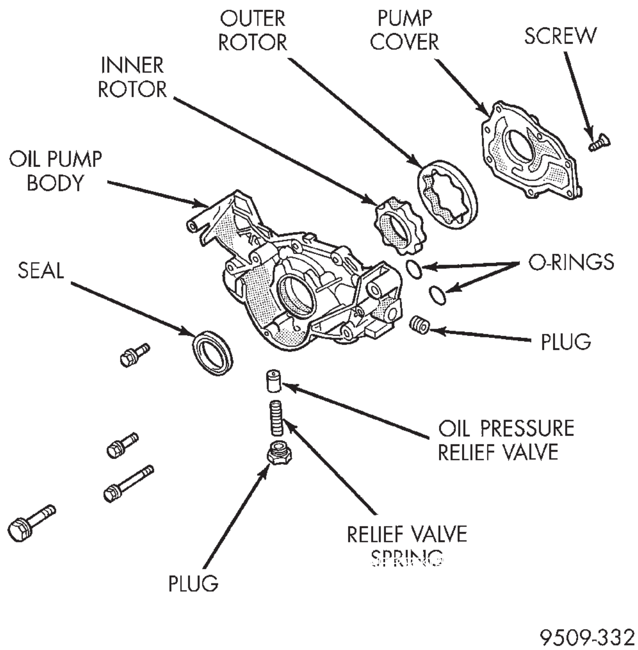


Fig. 88 Oil Pump

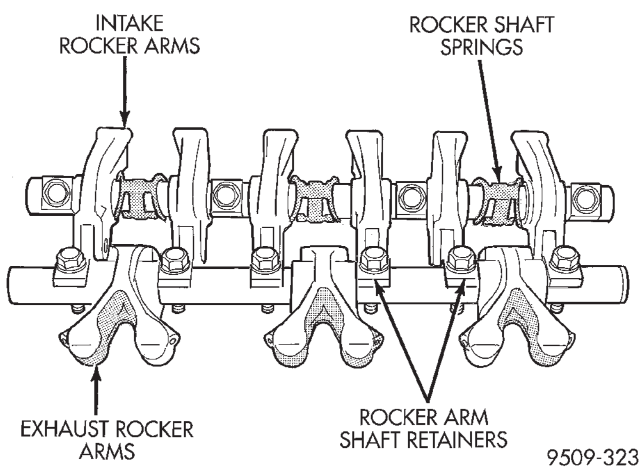


Fig. 89 Rocker Arm Shafts

INSPECTION

Inspect the rocker arm for scoring, wear of the roller or damage to the rocker arm (Fig. 90). Replace as necessary.

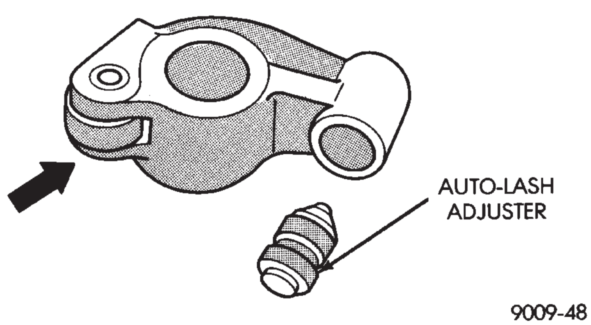


Fig. 90 Rocker Arm

ROCKER ARM SHAFTS

The rocker arm shafts is hollow and is used as a lubrication oil duct.

(1) Check the rocker arm mounting portion of the shafts for wear or damage. Replace if damaged or worn.

(2) Check oil holes for clogging with small wire, clean as required.

REASSEMBLY

Lubricate the rocker arms. Install onto shafts in their original position (Fig. 89).

CLEANING AND INSPECTION

CAMSHAFT INSPECTION

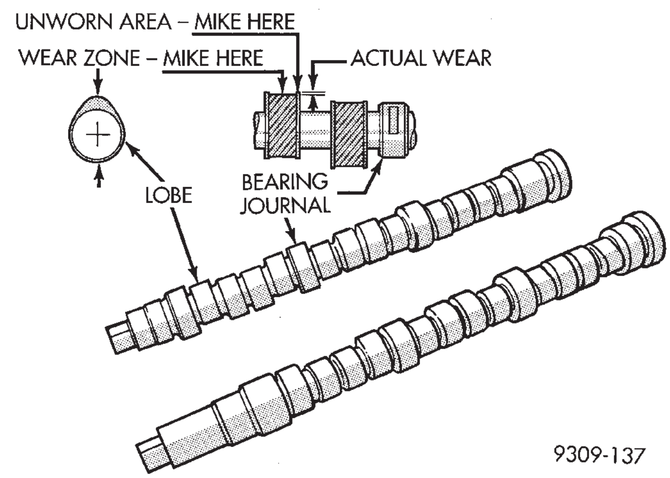


Fig. 91 Checking Camshafts for Wear

Check oil feed holes for blockage.

Inspect cylinder head journals for wear, Refer to **Cylinder Head Inspect** for Specifications.

Check camshaft bearing journals for scratches and worn areas (Fig. 91). If light scratches are present, they may be removed with 400 grit sand paper. If deep scratches are present, replace the camshaft and check the cylinder head for damage. Replace the cylinder head if worn or damaged. Check the lobes for pitting and wear. If the lobes show signs of wear, check the corresponding rocker arm roller for wear or damage. Replace rocker arm if worn or damaged. If lobes show signs of pitting on the nose, flank or base circle; replace the camshaft.

CYLINDER BORE AND BLOCK

(1) Measure the cylinder bore at three levels in directions A and B (Fig. 92). Top measurement should be 12 mm (.50 in.) down and bottom measurement should be 10 mm (.38 in.) up.

(2) Standard bore dimension: 83.50 - 83.53 mm (3.2874- 3.2886 in.)

CLEANING AND INSPECTION (Continued)

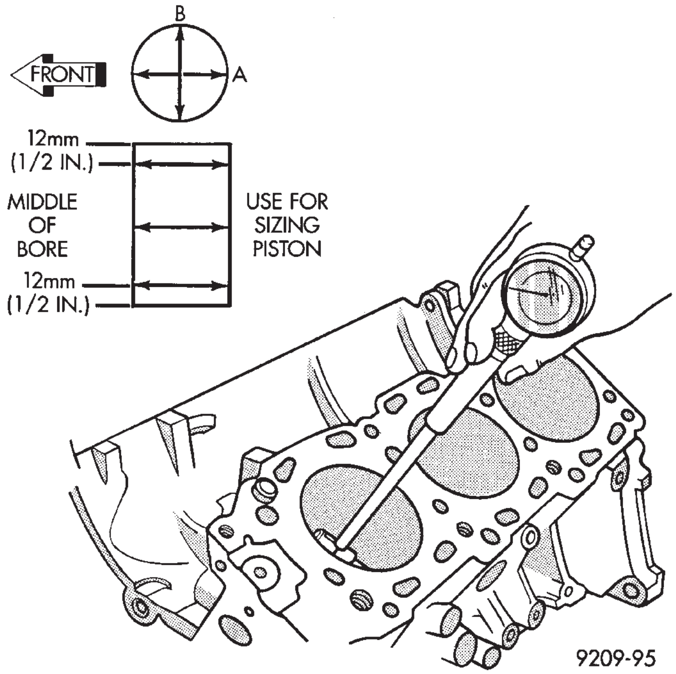


Fig. 92 Checking Cylinder Bore Size

(3) Maximum out-of-round or taper: 0.01 mm (.0004 in.)

CYLINDER BLOCK

Inspect cylinder block for scratches, cracks and rust or corrosion, and repair or replace as required.

(1) Clean cylinder block and check top surface for distortion with a straight edge and thickness gauge (Fig. 93).

(2) Top surface must be flat within:

- Standard Value: 0.05 mm (0.002 in.)
- Service Limit 0.1 mm (0.0039 in.)

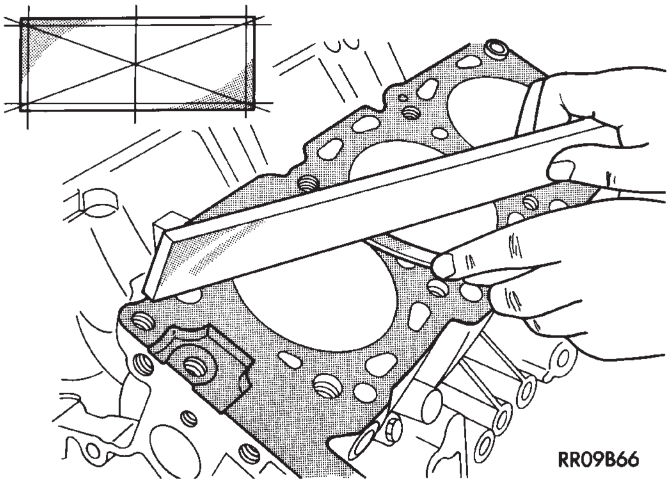


Fig. 93 Distortion Check

CYLINDER HEAD

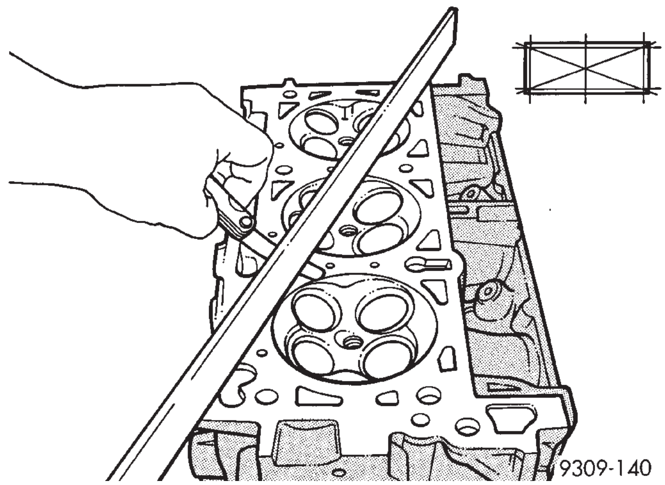


Fig. 94 Checking Cylinder Head Flatness

(1) Before cleaning, check for leaks, damage and cracks.

(2) Clean cylinder head and oil passages.

(3) Check cylinder head for flatness (Fig. 94).

(4) Cylinder head must be flat within;

- Standard dimension: less than 0.03mm (0.0012 inch)
- Service Limit: 0.2mm (.008 inch)
- Grinding Limit: Maximum of 0.2 mm (.008 inch) is permitted.

CAUTION: This is a combined total dimension of stock removal from cylinder head if any and block top surface is 0.2 mm (0.0079 in.).

VALVE GUIDES

(1) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(2) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (Fig. 95). Refer to (Fig. 96) for specifications. Replace guides if they are not within specification.

(3) Check valve guide height (Fig. 97).

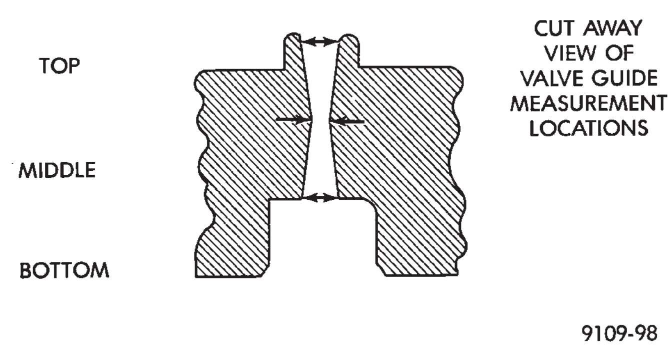


Fig. 95 Checking Wear on Valve Guide—Typical

CLEANING AND INSPECTION (Continued)

VALVE DIMENSIONS		
INTAKE VALVE		
STEM DIAMETER: 6.00 mm (.236 in.) FACE ANGLE: 45° VALVE MARGIN: 1.0 mm (.039 in.)		
EXHAUST VALVE		
STEM DIAMETER: 6.00 mm (.236 in.) FACE ANGLE: 45° VALVE MARGIN: 1.20 mm (.047 in.)		
VALVE GUIDE CLEARANCE	**NEW**	**SERVICE LIMIT**
INTAKE	0.02 TO 0.05 mm (.0008 TO .002 in.)	0.10 mm (.004 in.)
EXHAUST	0.04 TO 0.07 mm (.0016 TO .0028 in.)	0.15 mm (.006 in.)
VALVE SPRING SPECIFICATION		
FREE LENGTH	NEW	51.0 mm (2.01 in.)
	SERVICE LIMIT	50.0 mm (1.971 in.)
SQUARENESS	NEW	2° MAXIMUM
	SERVICE LIMIT	4° MAXIMUM
SPRING TENSION	INSTALLED HEIGHT	44.2 mm AT 267 N (1.74 in. 60 LBS.)

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Fig. 96 Valve Guide Specification

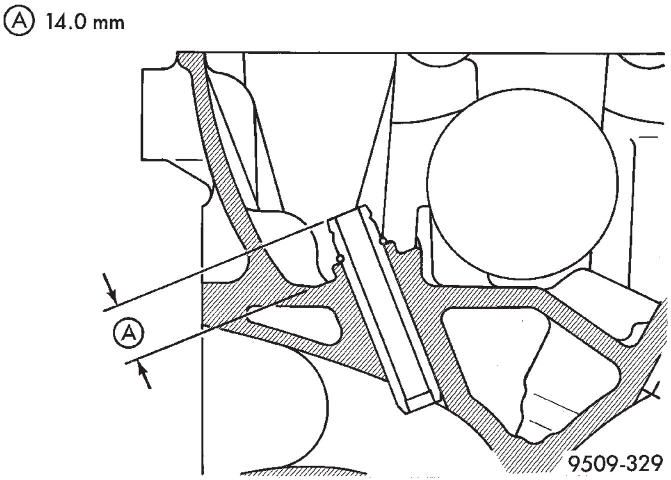

Fig. 97 Valve Guide Height

CYLINDER HEAD COVER

Before installation, clean cylinder head and cover mating surfaces. Make certain the rails are flat.

AUTO LASH ADJUSTER

The automatic lash adjusters are precision units installed in machined openings in the valve actuating ends of the rocker arms. Do not disassemble the auto lash adjuster.

ROCKER ARM

Inspect the rocker arm/hydraulic lash adjuster assembly for wear or damage (Fig. 98). Replace assembly as necessary.

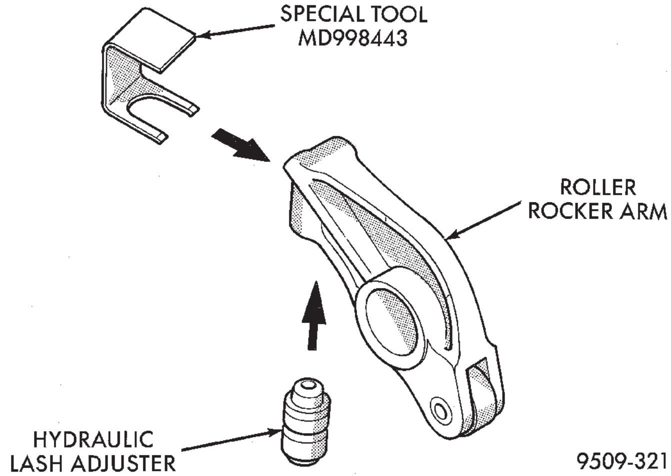

Fig. 98 Rocker Arm/Hydraulic Lash AdjusterAssemblies

OIL FILTER BRACKET

(1) Check the oil filter mounting surface. The surface must be smooth, flat and free of debris or old pieces of rubber (Fig. 99).

(2) Check bracket for cracks and oil leaks.

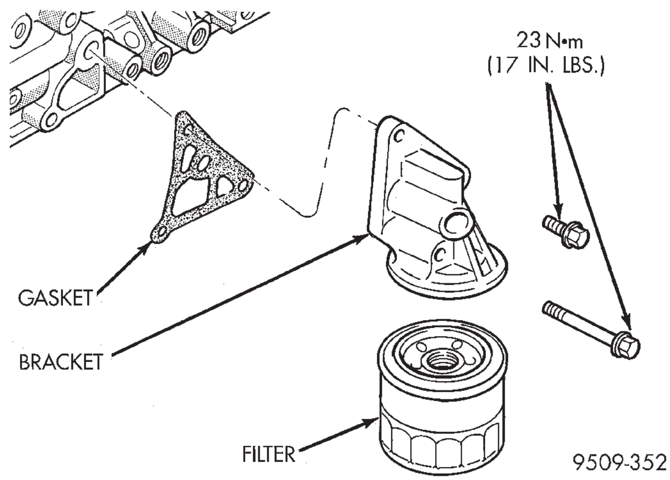

Fig. 99 Oil Filter and Bracket

CLEANING AND INSPECTION (Continued)

OIL PUMP

(1) Check oil pump case for damage and remove rear cover.

(2) Remove pump rotors and inspect case for excessive wear (Fig. 100).

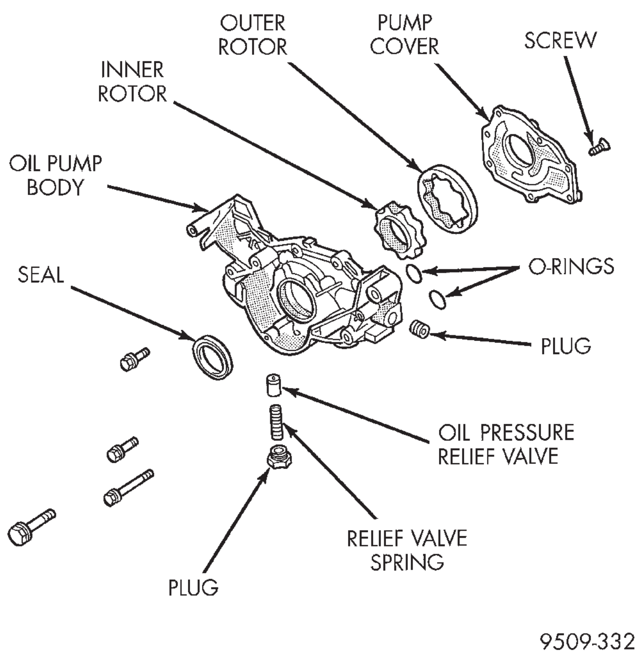

Fig. 100 Oil Pump Components

(3) Insert the rotor into the oil pump case (Fig. 101) and (Fig. 102) and measure clearance with a feeler gauge as indicated.

(4) Replace if out of limits.

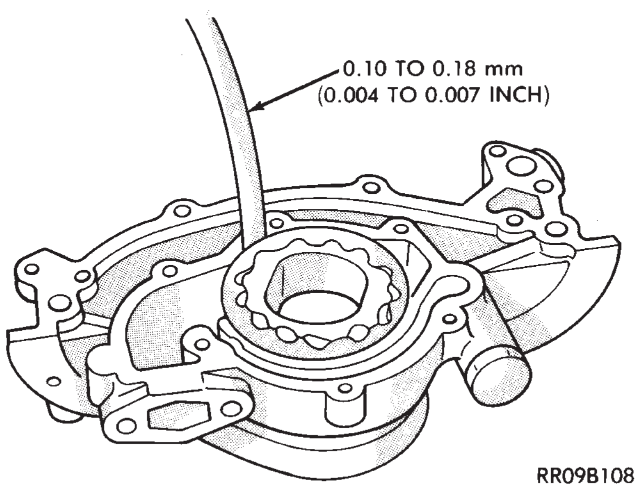

Fig. 101 Checking Clearance-Between OuterRotor and Case

OIL RELIEF PLUNGER

(1) Check that the oil relief plunger slides smoothly (Fig. 100).

(2) Check for broken relief spring.

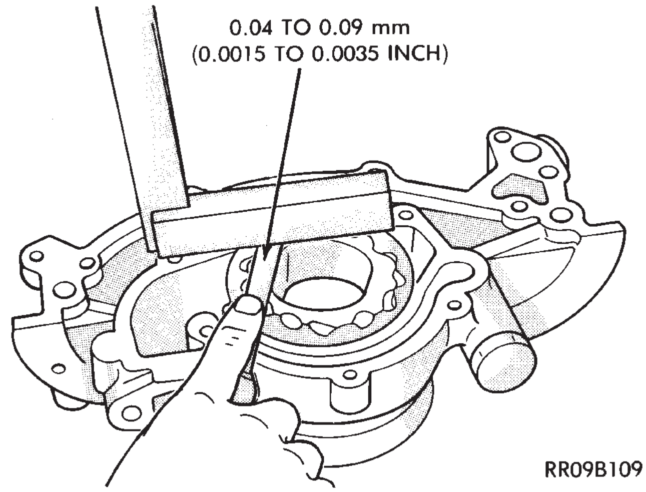

Fig. 102 Checking Rotor End Clearance

OIL PUMP ASSEMBLY

(1) Assemble pump, using new parts as required with clean oil. Align marks on the inner and outer rotors when assembling (Fig. 103).

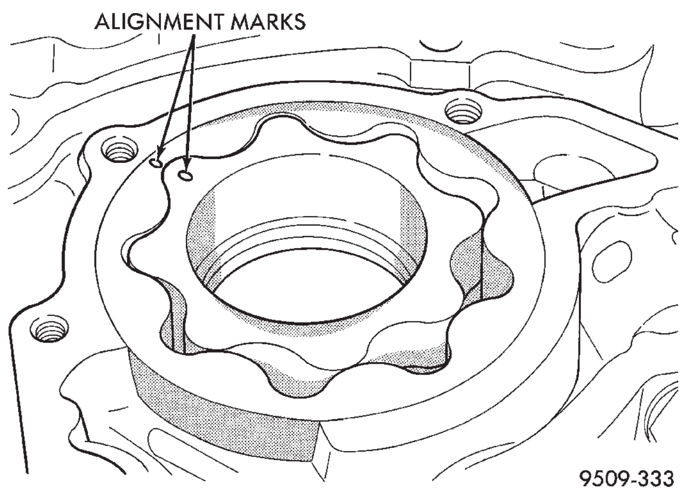

Fig. 103 Inner and Outer Rotor Alignment Marks

(2) Install cover and tighten screws to 12 N·m (105 in. lbs.)

(3) Install relief valve, spring, gasket and cap as shown in (Fig. 100). Tighten cap to 41 N·m (30 ft. lbs.)

TIMING BELT INSPECTION

(1) Remove the upper left timing belt cover (Fig. 104).

(2) Inspect both sides of the timing belt drive & back. Replace belt if any of the following conditions exist.

- Hardening of back rubber back side is glossy without resilience and leaves no indent when pressed with fingernail.
- Cracks on rubber back.
- Cracks or peeling of canvas.

CLEANING AND INSPECTION (Continued)

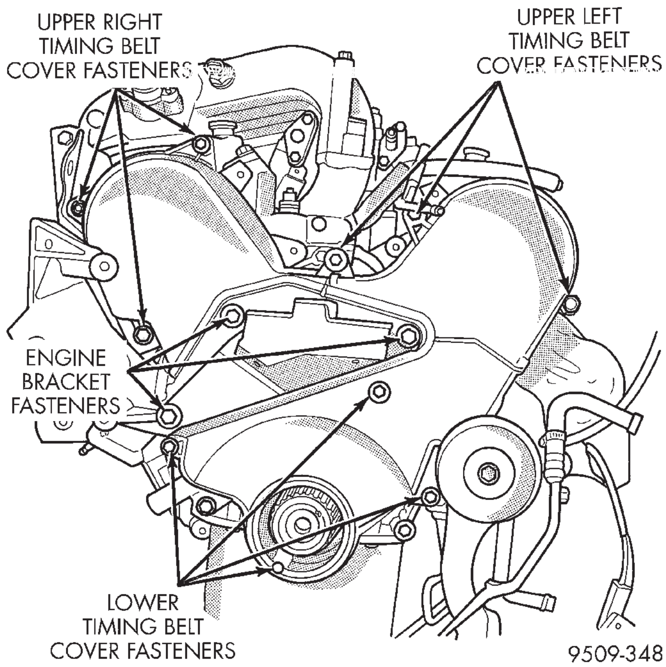

Fig. 104 Timing Belt Covers

- Cracks on rib root.
- Cracks on belt sides.
- Missing teeth.
- Abnormal wear of belt sides. The sides are normal if they are sharp as if cut by a knife (Fig. 105).

(3) If none of the above conditions are seen on the belt, the belt cover can be reinstalled.

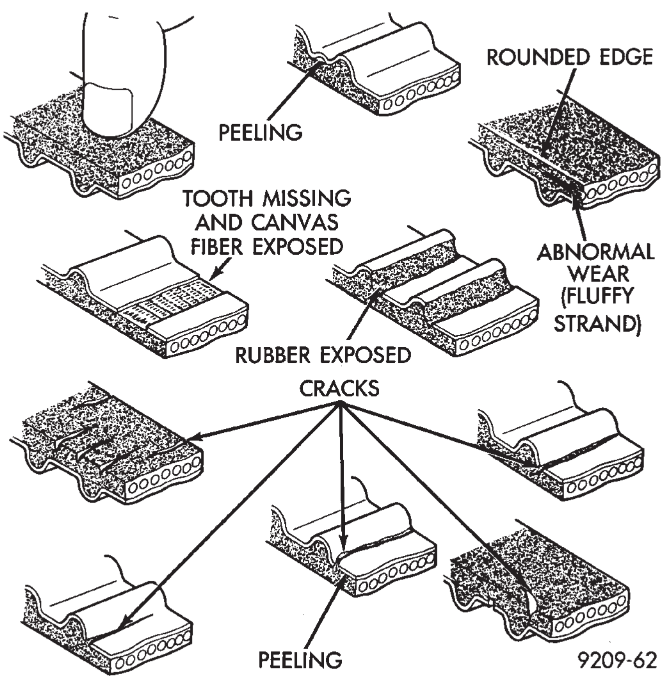

Fig. 105 Timing Belt Inspection

VALVES, SPRINGS, SEATS AND GUIDES

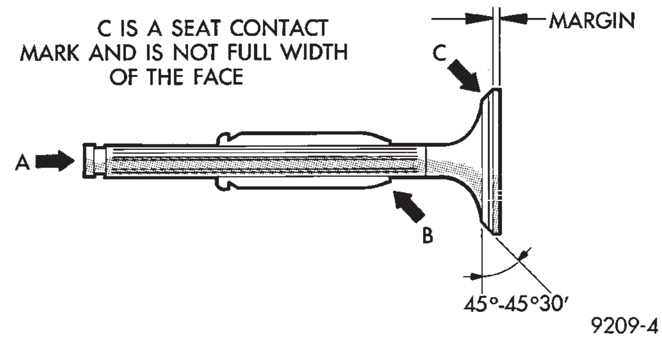

Fig. 106 Valve Inspection

(1) Check valve stem tip for pitting or depression at point A (Fig. 106).

(2) Check for wear and ridge wear at Point B.

(3) Measure the clearance between the valve guide and valve stem. If the service limit is exceeded, replace the valve guides, valves or both.

(4) Check for even contact (at face center) with valve seat, Point C.

(5) Check margin. Replace valve if margin is out of specification (Fig. 109).

(6) Check valve guide height (Fig. 107).

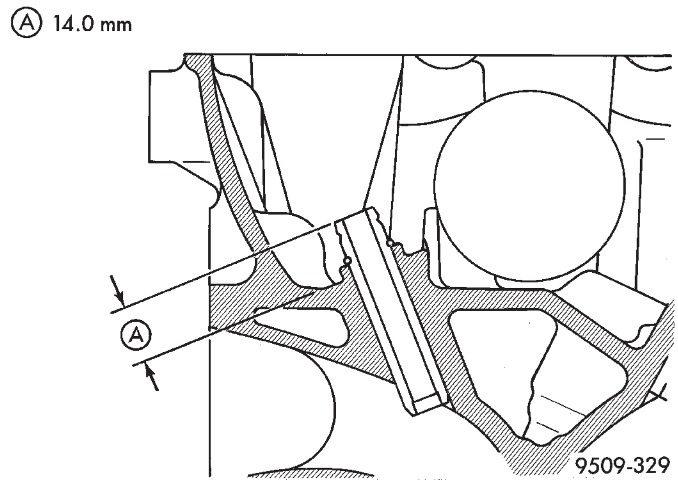

Fig. 107 Valve Guide Height

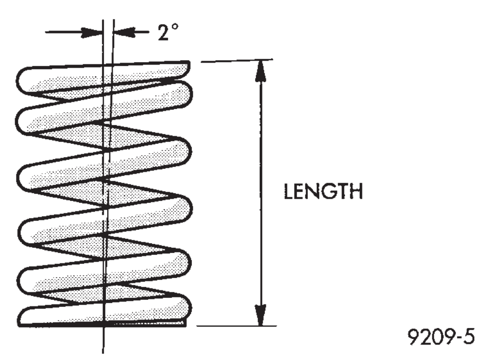

Fig. 108 Valve Spring

CLEANING AND INSPECTION (Continued)

(7) Measure valve stem to guide clearance. Refer to specification (Fig. 109).

(8) Measure Valve spring free length and if the spring is square (Fig. 108). Refer to (Fig. 109) for specifications.

VALVE DIMENSIONS		
INTAKE VALVE		
STEM DIAMETER: 6.00 mm (.236 in.) FACE ANGLE: 45° VALVE MARGIN: 1.0 mm (.039 in.)		
EXHAUST VALVE		
STEM DIAMETER: 6.00 mm (.236 in.) FACE ANGLE: 45° VALVE MARGIN: 1.20 mm (.047 in.)		
VALVE GUIDE CLEARANCE	**NEW**	**SERVICE LIMIT**
INTAKE	0.02 TO 0.05 mm (.0008 TO .002 in.)	0.10 mm (.004 in.)
EXHAUST	0.04 TO 0.07 mm (.0016 TO .0028 in.)	0.15 mm (.006 in.)
VALVE SPRING SPECIFICATION		
FREE LENGTH	NEW	51.0 mm (2.01 in.)
	SERVICE LIMIT	50.0 mm (1.971 in.)
SQUARENESS	NEW	2° MAXIMUM
	SERVICE LIMIT	4° MAXIMUM
SPRING TENSION	INSTALLED HEIGHT	44.2 mm AT 267 N (1.74 in. 60 LBS.)

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Fig. 109 Valve Specifications

VALVE SEAT INSPECTION

Inspect the valve seat with Prussian blue to determine where the valve contacts the seat. To do this, coat valve seat **LIGHTLY** with Prussian blue then set valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of valve face, contact is satisfactory. If the blue is transferred to top edge of the valve face, lower valve seat with a 15 degrees stone. If the blue is transferred to the bottom edge of valve face raise valve seat with a 65 degree stone (Fig. 110).

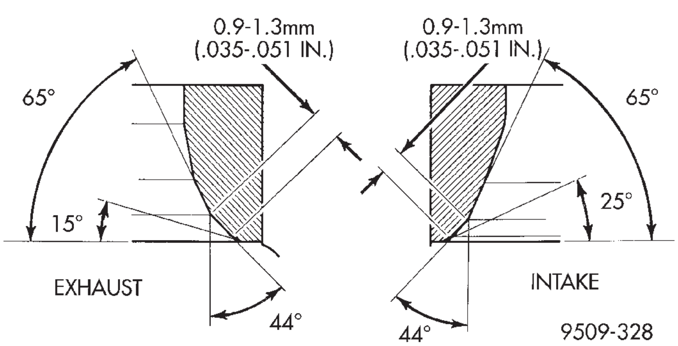


Fig. 110 Valve Seat Reconditioning

ADJUSTMENTS

ENGINE SUPPORT ADJUSTMENT

The right and left support assemblies are slotted to allow for right/left drive train adjustment in relation to drive shaft assembly length.

Check and reposition right and left engine support assemblies as required. Adjust drive train position, if required, for the following conditions:

- Drive shaft distress: See Group 2, Suspension and Driveshaft.
- Any front end structural damage (after repair).
- Support Assembly replacement.

ENGINE SUPPORT ADJUSTMENT

(1) Remove the load on the engine motor mounts by carefully supporting the engine and transmission assembly with a floor jack.

(2) Loosen the right engine support assembly vertical fasteners.

(3) Loosen the left engine support assembly vertical bolts.

(4) Pry the engine right or left as required to achieve the proper drive shaft assembly length. Refer to Group 2, Suspension and Driveshaft for driveshaft identification and related assembly length measuring.

(5) Tighten right engine support assembly vertical bolts to 61 N·m (45 ft. lbs.). and tighten left engine support assembly bolts to 61 N·m (45 ft. lbs.).

(6) Recheck drive shaft length.

SPECIFICATIONS

ENGINE 2.5L

DESCRIPTION	STANDARD DIMENSION AND SERVICE LIMIT
Valve Timing	
Intake—Open	19° BTDC
Intake—Close	45° ABDC
Exhaust—Open	49° BBDC
Exhaust—Close	15°ATDC
Compression Pressure	178 psi @ 250 RPM
Maximum Variation Between Cylinders	97 kPa (14 PSI)
Service Limit	25%
Valve Clearance—Hot Engine	Hydraulic Lash Adjuster
Cylinder Head	
Flatness of Gasket Surface	0.03 mm (0.0012 in.)
Service Limit	0.2mm (0.008 in.)
* Grinding Limit of Gasket Surface	0.2 mm (0.008 in.)
Manifold—Flatness	
Intake	0.10 mm (0.004 in.)
Service Limit	0.2 mm (0.008 in.)
Exhaust	0.15 mm (0.006 in.)
Service Limit	0.3 mm (0.12 in.)
Valves—Thickness of Valve Head (Margin)	
Intake	1.0 mm (0.039 in.)
Service Limit	0.5 mm (0.019 in.)
Exhaust	1.2 mm (0.047 in.)
Service Limit	0.7 mm (0.028 in.)
Valve Stem to Guide Clearance	
Intake	0.02 to 0.05 mm (0.0008 to 0.002 in.)
Service Limit	0.10 mm (0.004 in.)
Exhaust	0.04 to 0.07 mm (0.0016 to 0.0028 in.)
Service Limit	0.15 mm (0.006 in.)
Valve Face Angle	45° to 45-1/2°
Valve Stem Diameter Intake and Exhaust	6.0 mm (0.236 in.)

DESCRIPTION	STANDARD DIMENSION AND SERVICE LIMIT
Valve Guide	
Height	14.0 mm (0.551 in.)
O.D.	11.0 mm (0.443 in.)
I.D.	6.0 mm (0.236 in.)
Valve Seat	
Seat Surface Angle	44° to 44-1/2°
Contact Width	0.9 to 1.3 mm (0.035 to 0.051 in.)
Sinkage (Service Limit)	0.2 mm (0.078 in.)
Valve Spring	
Free Height	51.0 mm (2.01 in.)
Service Limit	50.0 mm (1.97 in.)
Loaded Height	44.2 mm at 267 N (1.74 in. at 60 lbs.)
Perpendicularity Intake and Exhaust	2° Maximum
Service Limit	4° Maximum

NOTE: * Includes/Combined With Cylinder Head and Block Top Surface Grinding

SPECIFICATIONS (Continued)

ENGINE SPECIFICATIONS (CONT.)

Description	Standard Dimension	Service Limit
Piston		
O.D.	83.5 mm (3.29 inches)	—
Piston to Cylinder Clearance	0.02 to 0.04 mm (0.0008 to 0.0016 inch)	—
Ring End Gap No. 1	0.25 to 0.40 mm (.010 to .016 inch)	0.8 mm (.031 inch)
No. 2	0.40 to 0.55 mm (.016 to .022 inch)	0.8 mm (.031 inch)
Oil	0.15 to 0.50 mm (.006 to .019 inch)	1.0 mm (.039 inch)
Ring Side Clearance No. 1	0.030 to 0.07 mm (.0012 to .0028 inch)	0.1 mm (.004 inch)
No. 2	(0.002 to 0.06 mm (.0007 to .0024 inch)	0.1 mm (.004 inch)
Connecting Rod		
Length — Center to Center	140.9 to 141.0 mm (5.547 to 5.551 inches)	—
Parallelism — Twist	0.05 mm (0.0019 inch)	—
Torsion	0.1 mm (0.0039 inch)	—
Big End Thrust Clearance	0.10 to 0.25 mm (0.004 to 0.010 inch)	0.4 mm (0.016 inch)
Crankshaft		
End Play	0.05 to 0.25 mm (0.002 to 0.010 inch)	0.4 mm (0.016 inch)
Main Journal Diameter	60.000 mm (2.362 inches)	—
Pin Diameter	50.000 mm (1.969 inches)	—
Bearing Surface Out-of-Round	0.03 mm Max. (0.001 inch) Max.	—
Bearing Surface Taper	0.005 mm Max. (0.0002 inch) Max.	—
Bearing Oil Clearance	0.02 to 0.04 mm (0.0008 to 0.0016 inch)	—
Undersize Service Bearing	0.25 to 0.50 - 0.75 mm (0.010 to 0.020 - 0.030 inch)	—
Cylinder Block		
I.D. (Bore)	83.50 to 83.53 mm (3.29 inches)	—
Flatness of Top Surface	0.05 mm (0.002 inch)	0.1 mm (0.004 inch)
Grinding Limit of Top Surface	0.2 mm* (0.008 inch)	0.2 mm* (0.008 inch)
* Includes/Combined With Cylinder Head Grinding		
Oil Pump		
Relief Valve Opening Pressure	5.0 to 6.0 kg/cm ^{2} (71.45 to 85.76 psi)	—
Outer Rotor to Case Clearance	0.10 to 0.18 mm (0.004 to 0.007 inch)	0.35 mm (0.0138 inch)
Rotor End Clearance	0.06 to 0.18 mm (0.0024 to 0.0071 inch)	0.09 mm (0.0035 inch)
Inner Rotor Pilot to Case Clearance	0.03 to 0.07 mm (0.001 to 0.0028 inch)	0.15 mm (0.006 inch)
Minimum Pressure, Engine Fully Warmed Up at Idle 3000 RPM	41 kPa (6 psi) 241-517 kPa (35-75 psi)	

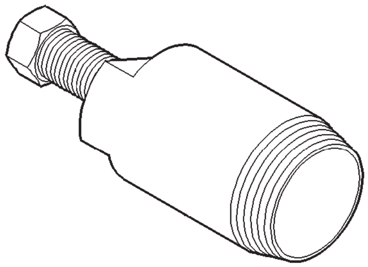
SPECIFICATIONS (Continued)

TORQUE CHART 2.5L

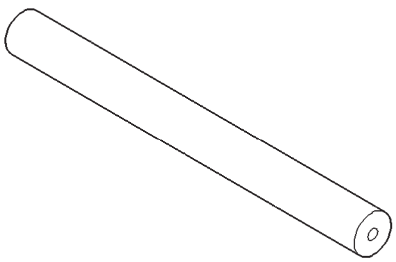
DESCRIPTION	TORQUE
Intake Manifold Plenum Bolt	18 N·m (13 ft. lbs.)
Intake Manifold Plenum Support Bolt M8	18 N·m (13 ft. lbs.)
M10	36 N·m (26 ft. lbs.)
Distributor Nut	13 N·m (9 ft. lbs.)
Spark Plug	25 N·m (18 ft. lbs.)
Crankshaft Bolt	182 N·m (134 ft. lbs.)
Engine Support Bracket Bolt	45 N·m (33 ft. lbs.)
Auto Tensioner Bolt	23 N·m (17 ft. lbs.)
Tensioner Pulley Bolt	48 N·m (35 ft. lbs.)
Tensioner Arm Assembly Bolt	44 N·m (33 ft. lbs.)
Idler Pulley Bolt	44 N·m (33 ft. lbs.)
Camshaft Sprocket Bolt	88 N·m (65 ft. lbs.)
Intake Manifold Nut	21 N·m (16 ft. lbs.)
Exhaust Manifold Nut	30 N·m (22 ft. lbs.)
Heater Pipe Assembly	19 N·m (13 ft. lbs.)
Thermostat Housing Bolt	19 N·m (13 ft. lbs.)
Water Inlet Pipe Bolt	14 N·m (10 ft. lbs.)
Water Pump Bolt	24 N·m (17 ft. lbs.)
Cylinder Head Cover Bolt	3.5 N·m (2.5 ft. lbs.)
Rocker Arm and Rocker Arm Shaft Bolt	31 N·m (23 ft. lbs.)
Thrust Case Bolt	13 N·m (9 ft. lbs.)
Cylinder Head and Valve Cylinder Head Bolt	108 N·m (80 ft. lbs.)
Oil Filter	14 N·m (10 ft. lbs.)
Oil Filter Bracket Bolt	23 N·m (17 ft. lbs.)
Drain Plug	40 N·m (29 ft. lbs.)
Oil Pan Bolt	6 N·m (4 ft. lbs.)
Oil Screen Bolt	19 N·m (13 ft. lbs.)
Plug	44 N·m (33 ft. lbs.)
Oil Pump Case Bolt M8	14 N·m (10 ft. lbs.)
M10	40 N·m (30 ft. lbs.)
Oil Pump Cover Bolt	10 N·m (7 ft. lbs.)
Connecting Rod Cap Nut	51 N·m (37 ft. lbs.)
Oil Seal Retainer Bolt	11 N·m (8 ft. lbs.)
Main Bearing Cap Bolt	94 N·m (69 ft. lbs.)

SPECIAL TOOLS

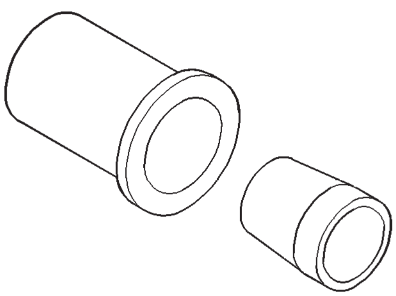
ENGINE 2.5L



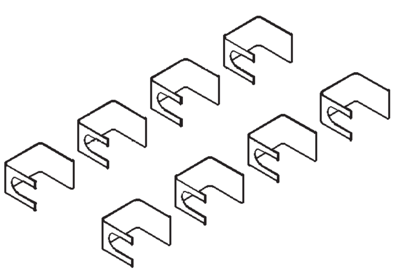
Remover C-4679-A



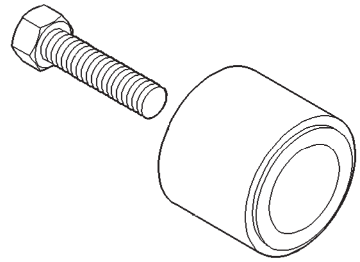
Insert C-4685-C2



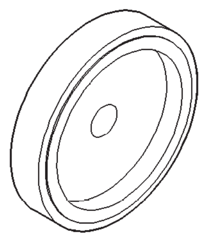
Installer MD-998717



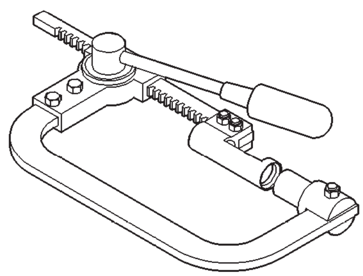
Holders MD-998443



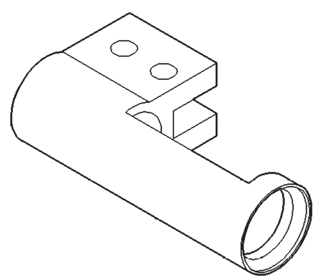
Installer MD-998713



Installer MD-998718

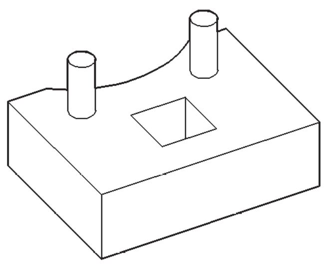


Compressor C-3422-B

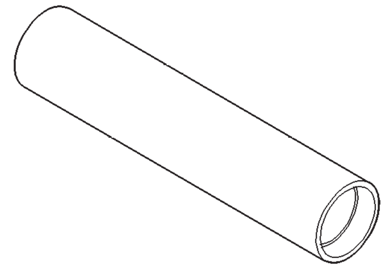


Adapter 6526

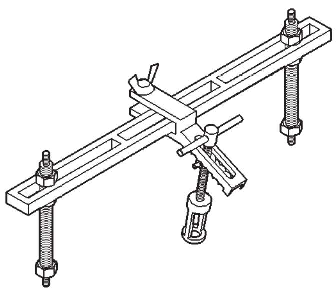
SPECIAL TOOLS (Continued)



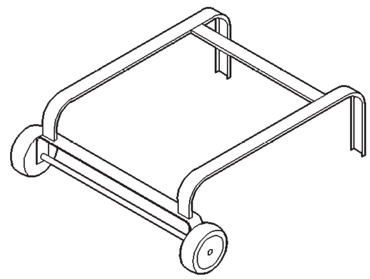
Wrench MD-998767



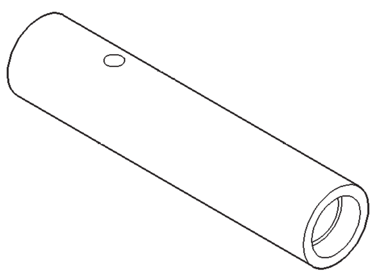
Installer 6052



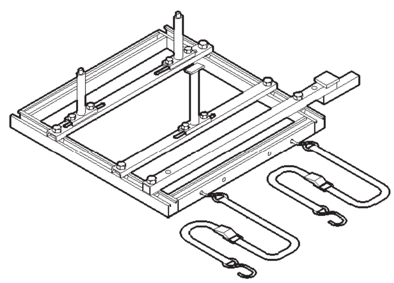
Compressor MD-998772-A



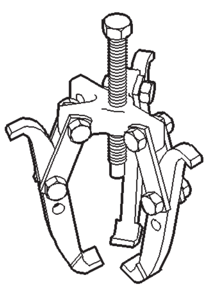
Dolly 6135



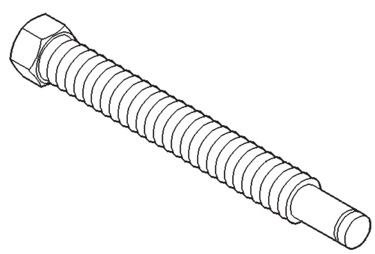
Installer MD-998774



Fixture Engine 6710

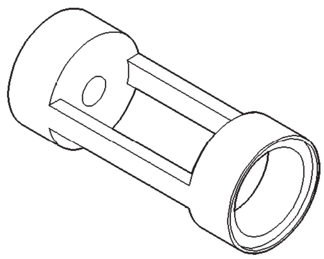


Puller 1026

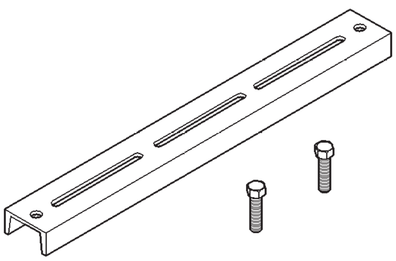


Screw 6765

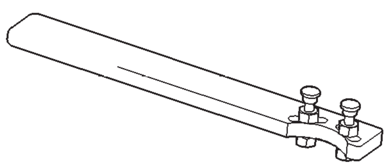
SPECIAL TOOLS (Continued)



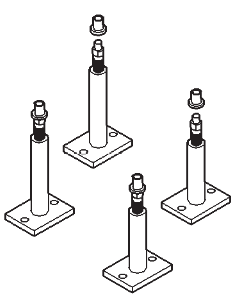
Adapter 6779



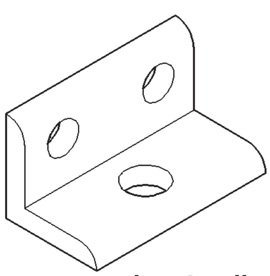
Support Bar Cradle 6710-3A



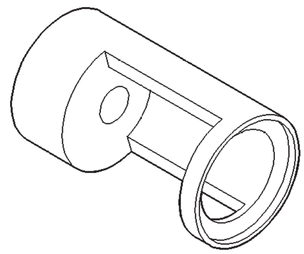
Holder 6847



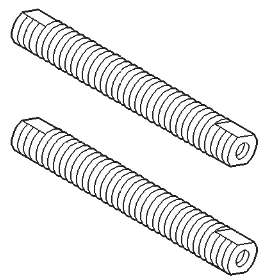
Engine Cradle Posts 6848



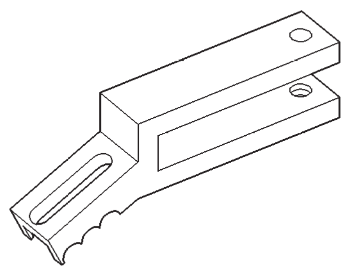
Bracket Cradle Post Support 6973



Adapter 6885



Posts 6886



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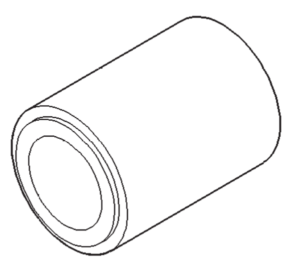


Camshaft Seal Installer 6863

EXHAUST SYSTEM AND INTAKE MANIFOLD

CONTENTS

GENERAL INFORMATION

EXHAUST SYSTEM

The exhaust system has a front mounted catalytic converter with flex-joint, center mounted resonator, and rear muffler (Fig. 1). Band clamps are used in two locations to connect system components (Fig. 2).

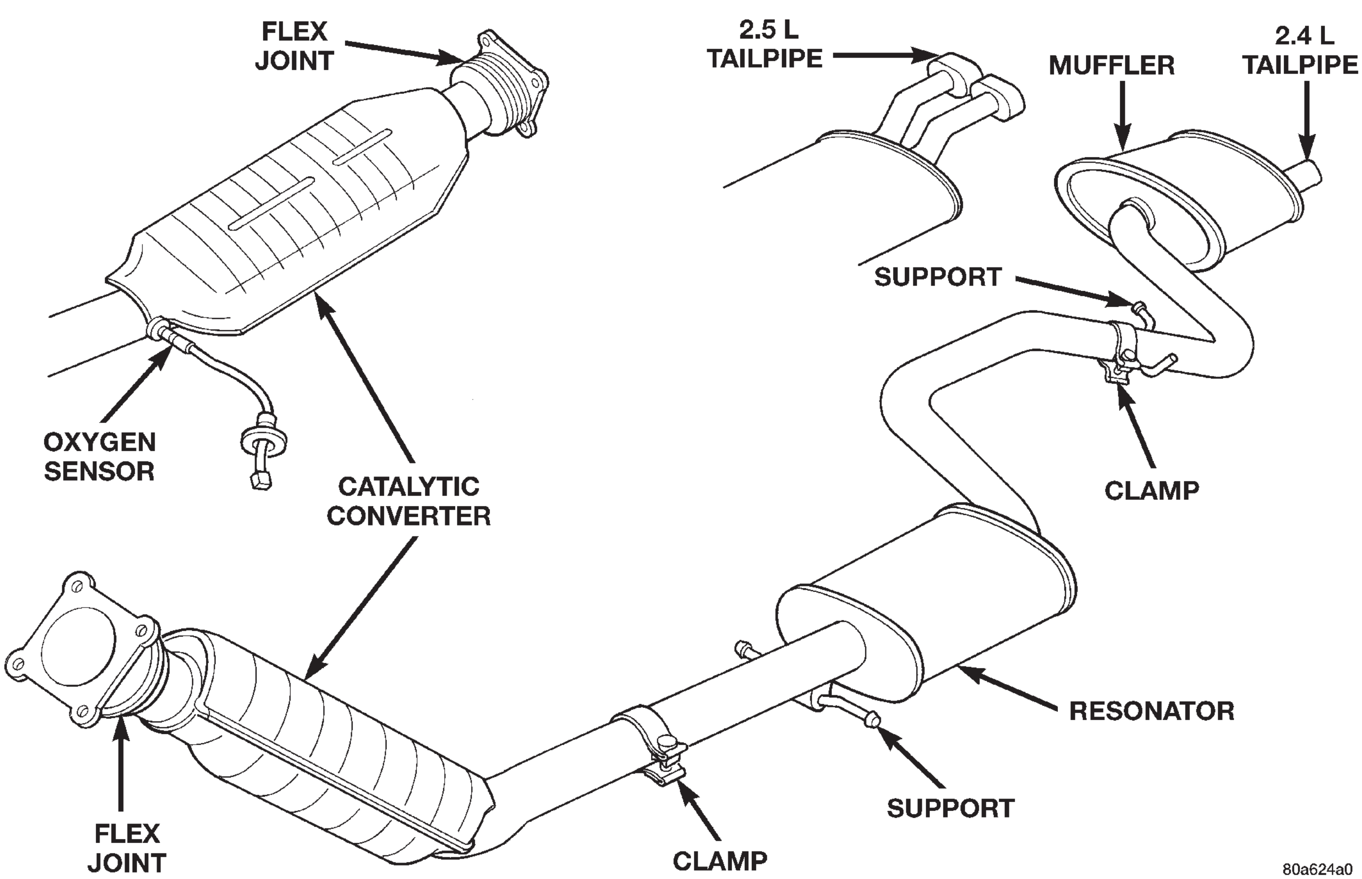


Fig. 1 Exhaust System—JX

GENERAL INFORMATION (Continued)

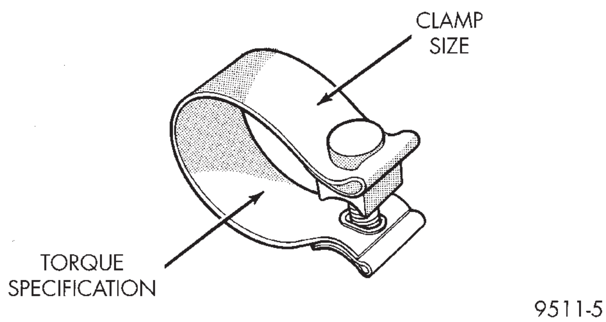


Fig. 2 Band Clamp

CATALYTIC CONVERTERS

There is no regularly scheduled maintenance on any Chrysler catalytic converter. If damaged, the converter must be replaced.

CAUTION: Due to exterior physical similarities of some catalytic converters with pipe assemblies, extreme care should be taken with replacement parts. There are internal converter differences required in some parts of the country (particularly California vehicles).

CATALYTIC CONVERTER

Models equipped with 2.5L engine have both oxygen sensor located in the converter (Fig. 3).

NOTE: 2.0L SOHC model is used only in Europe.

EXHAUST GAS RECIRCULATION (EGR)

To assist in the control of oxides of nitrogen (NOx) in engine exhaust, all engines are equipped with an exhaust gas recirculation system. The use of exhaust gas to dilute incoming air/fuel mixtures lowers peak flame temperatures during combustion, thus limiting the formation of NOx.

Exhaust gases are taken from opening in the exhaust manifold passage to the intake manifold. Refer to Section 25 for a complete description, Diagnosis and Service Procedures on the exhaust gas recirculation system and components.

HEAT SHIELD

Heat shields are needed to protect both the vehicle and the environment from the high temperatures developed near the catalytic converters (Fig. 4). All engines are equipped with a heat shield crimped on the top of the convertor.

Refer to Group 23, Body and Sheet Metal for service procedures. **Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shields on cars so equipped. Light over spray near the edges is permitted. Application of coating will greatly reduce the efficiency of the heat shields resulting in excessive floor pan temperatures and objectionable fumes.**

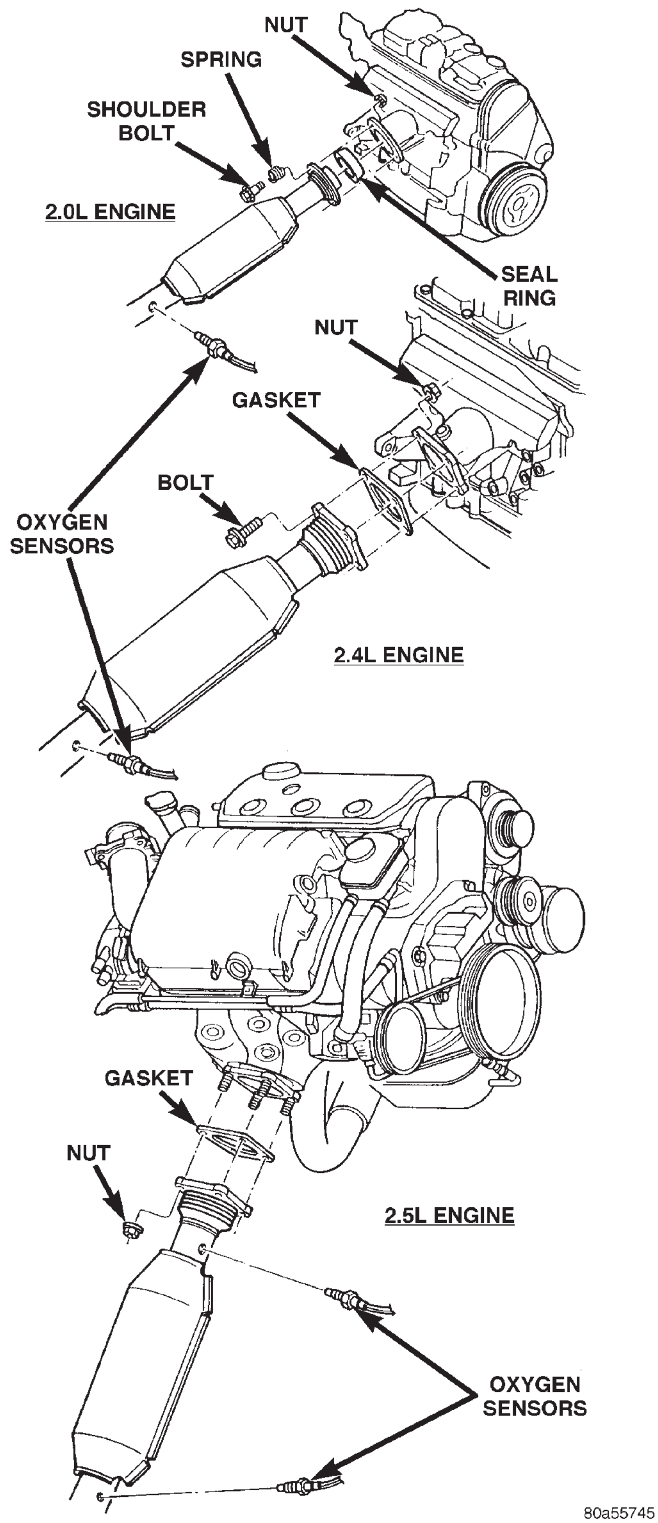


Fig. 3 Oxygen Sensor Location

The combustion reaction caused by the catalyst releases additional heat in the exhaust system. Caus-

GENERAL INFORMATION (Continued)

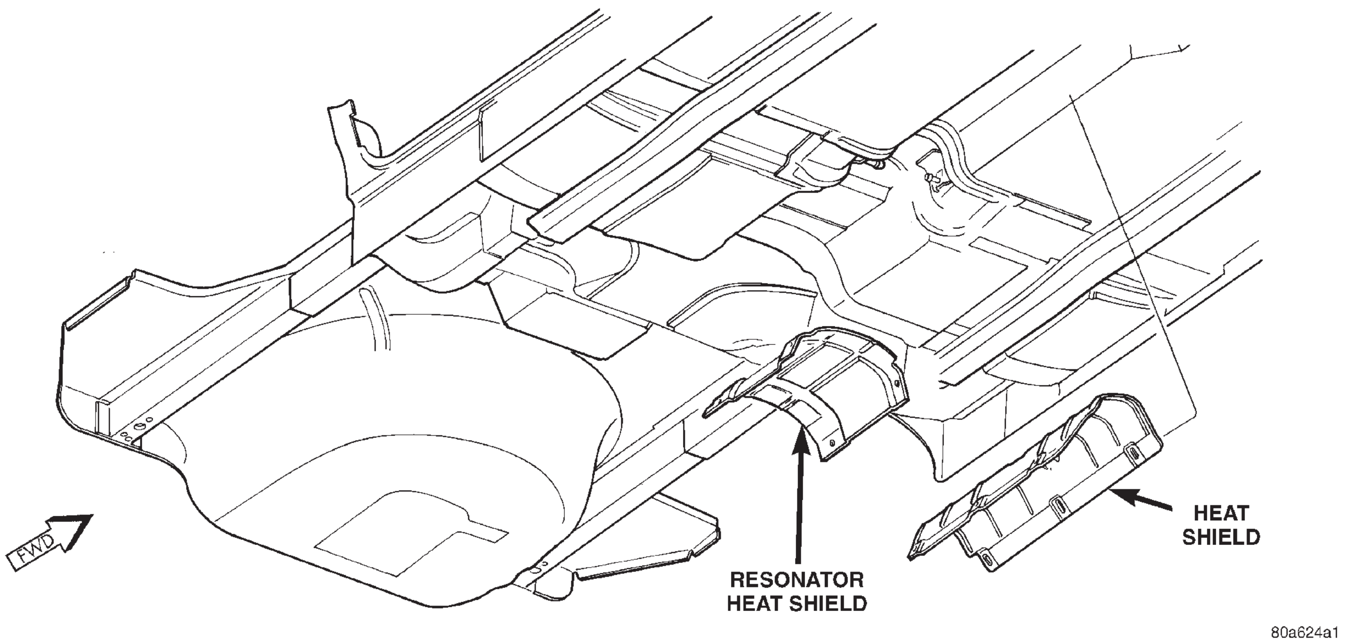


Fig. 4 Heat Shield—JX

ing temperature increases in the area of the catalytic convertor under severe operating conditions. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency. **Do not** remove spark plug wires from plugs or by any other means short out cylinders if exhaust system is equipped with catalytic converter. Failure of the catalytic converter can occur due to temperature increases caused by unburned fuel passing through the converter.

The use of the catalysts also involves some non-automotive problems. Unleaded gasoline must be used to avoid poisoning the catalyst core. Do not allow engine to operate at fast idle for extended periods (over 5 minutes). This condition may result in excessive exhaust system and floor pan temperatures.

GROUND STRAP

All vehicles are equipped with a ground strap on the exhaust system. The ground strap is attached from the rear muffler bracket to the body (Fig. 9). The ground strap is used to suppress radio frequency interference/static.

EXHAUST FLEX-JOINT COUPLING

A exhaust flex-joint coupling (Fig. 5) is used to secure the catalytic converter to the engine manifold. This joint actually moves back and forth as the engine moves, preventing breakage that could occur from the back-and-forth motion of a transverse mounted engine.

The exhaust flex-joint is welded to the catalytic converter.

CAUTION: When servicing, care must be exercised not to dent or bend the bellows of the flex-joint. Should this occur, the flex-joint will eventually fail and require the catalytic converter be replaced.

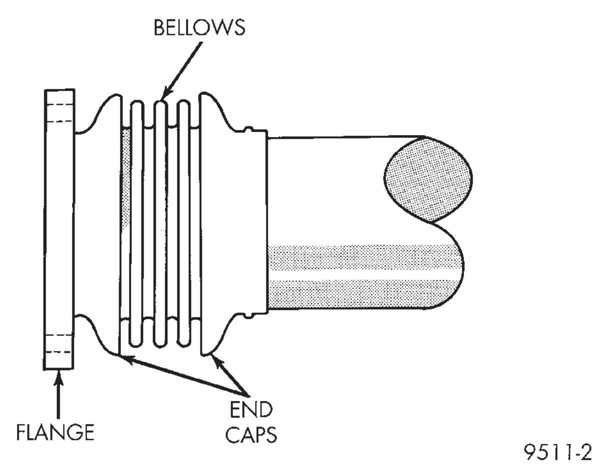


Fig. 5 Flex-Joint Coupling

DESCRIPTION AND OPERATION

INTAKE/EXHAUST MANIFOLD—2.4L ENGINE

The intake manifold is a tuned aluminum casting with individual primary runners leading from a plenum to the cylinders. The manifold is designed to boost torque which is desired for excellent engine response and usable power output.

The intake manifold is also cored with an EGR passage for balanced cylinder to cylinder EGR distribution.

The exhaust manifold is made of nodular cast iron for strength and high temperatures.

INTAKE/EXHAUST MANIFOLD—2.5L ENGINE

The intake system has a large air intake plenum of aluminum alloy and a cross type intake manifold (Fig. 6).

The exhaust manifolds are made of ductile cast iron with the front bank and rear bank independent of each other. The exhaust from the front bank exhaust manifold is fed through a exhaust crossover pipe to be combined with the rear bank exhaust at the exhaust outlet to the exhaust pipe.

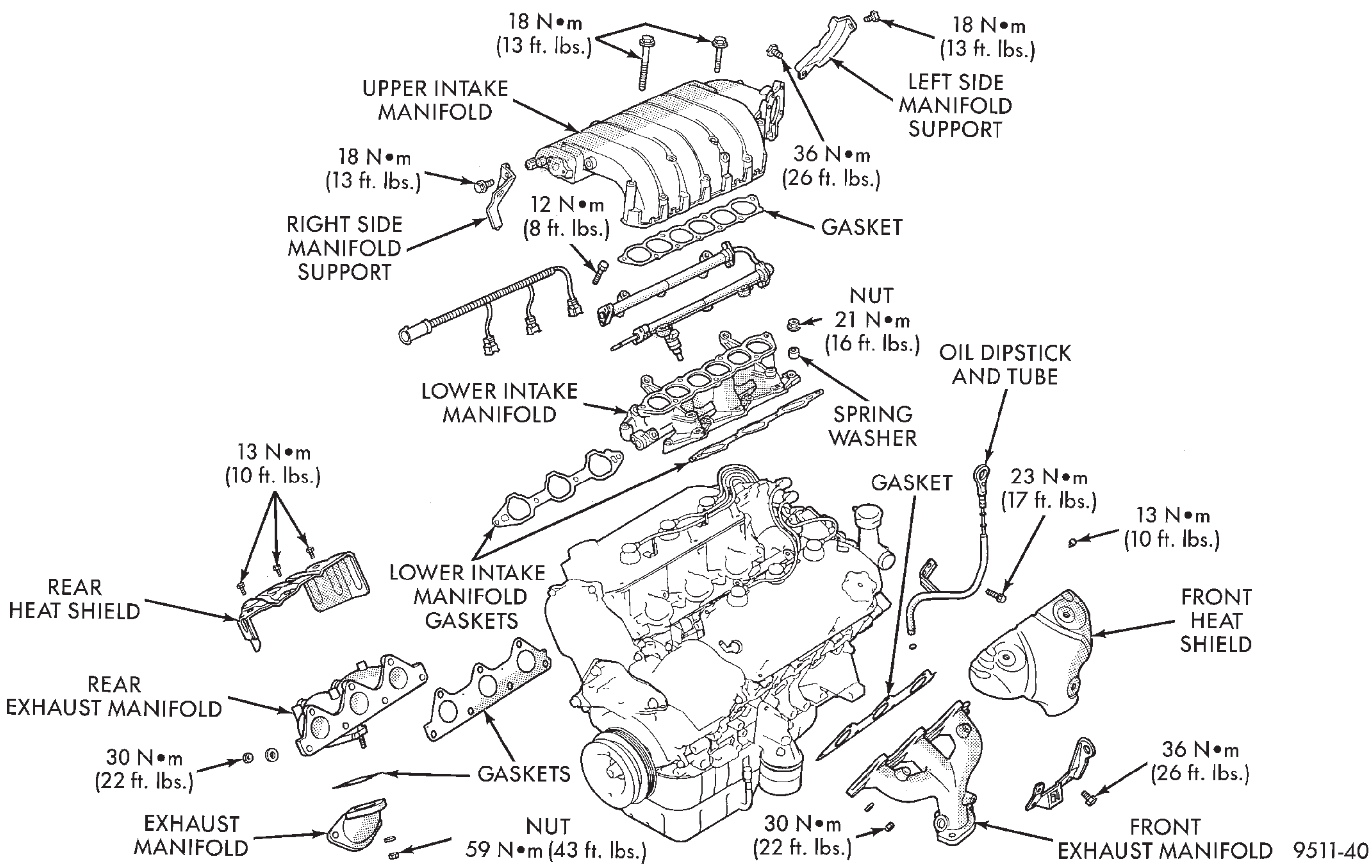


Fig. 6 Intake and Exhaust Manifolds—2.5L Engine

DIAGNOSIS AND TESTING

EXHAUST SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST NOISE (UNDER HOOD)	(a) Exhaust manifold cracked or broken (b) Manifold to cylinder head leak (c) EGR Valve to manifold gasket leakage (c) EGR Valve to EGR tube gasket leakage (c) EGR tube to manifold tube leakage (d) Exhaust flex-joint to manifold leak (e) Exhaust flex-joint (f) Pipe and shell noise from front exhaust pipe	(a) Replace manifold (b) Tighten manifold and/or replace gasket (c) Tighten fasteners or replace gasket (c) Tighten fasteners or replace gasket (c) tighten tube nut (d) Tighten joint and/or replace gasket (e) Replace catalytic converter assembly (f) Characteristic of single wall pipe
EXCESSIVE EXHAUST NOISE	(a) Leak at pipe joints (b) Burned or rusted out muffler assembly or exhaust pipe (c) Burned or rusted out resonator (d) Restriction in exhaust system (e) Converter material in muffler	(a) Tighten clamps at leaking joints. (b) Replace muffler resonator tailpipe assembly or exhaust pipe with catalytic (c) Replace muffler resonator tailpipe assembly (d) Remove restriction, if possible, or replace as necessary (e) Replace muffler and converter assemblies. Check fuel injection and ignition systems for proper operation.

REMOVAL AND INSTALLATION

EXHAUST PIPE AND MUFFLER

REMOVAL

(1) Raise vehicle on hoist and apply penetrating oil to clamp nuts of component being removed.

(2) Remove clamp and supports at muffler to resonator assembly (Fig. 7). Remove muffler from resonator pipe.

(3) Remove ground strap (Fig. 9).

(4) Remove clamp and supports at the resonator pipe to catalytic converter slip joint (Fig. 7). Separate at slip joint and remove the resonator assembly.

(5) Disconnect downstream heated oxygen sensor from the catalytic converter pipe (Fig. 8).

(6) Vehicle equipped with 2.5L engine disconnect upstream heated oxygen sensor.

(7) Remove catalytic converter to exhaust manifold attaching fasteners (Fig. 8). Remove catalytic converter from vehicle.

(8) Clean ends of pipes and/or muffler to assure mating of all parts. Discard broken or worn insulators, rusted clamps, supports and attaching parts.

NOTE: When replacement is required on any component of the exhaust system, it is most important that original equipment parts (or their equivalent) be used;

- To insure proper alignment with other parts in the system.
- Provide acceptable exhaust noise levels and does not change exhaust system back pressure that could affect emissions and performance.

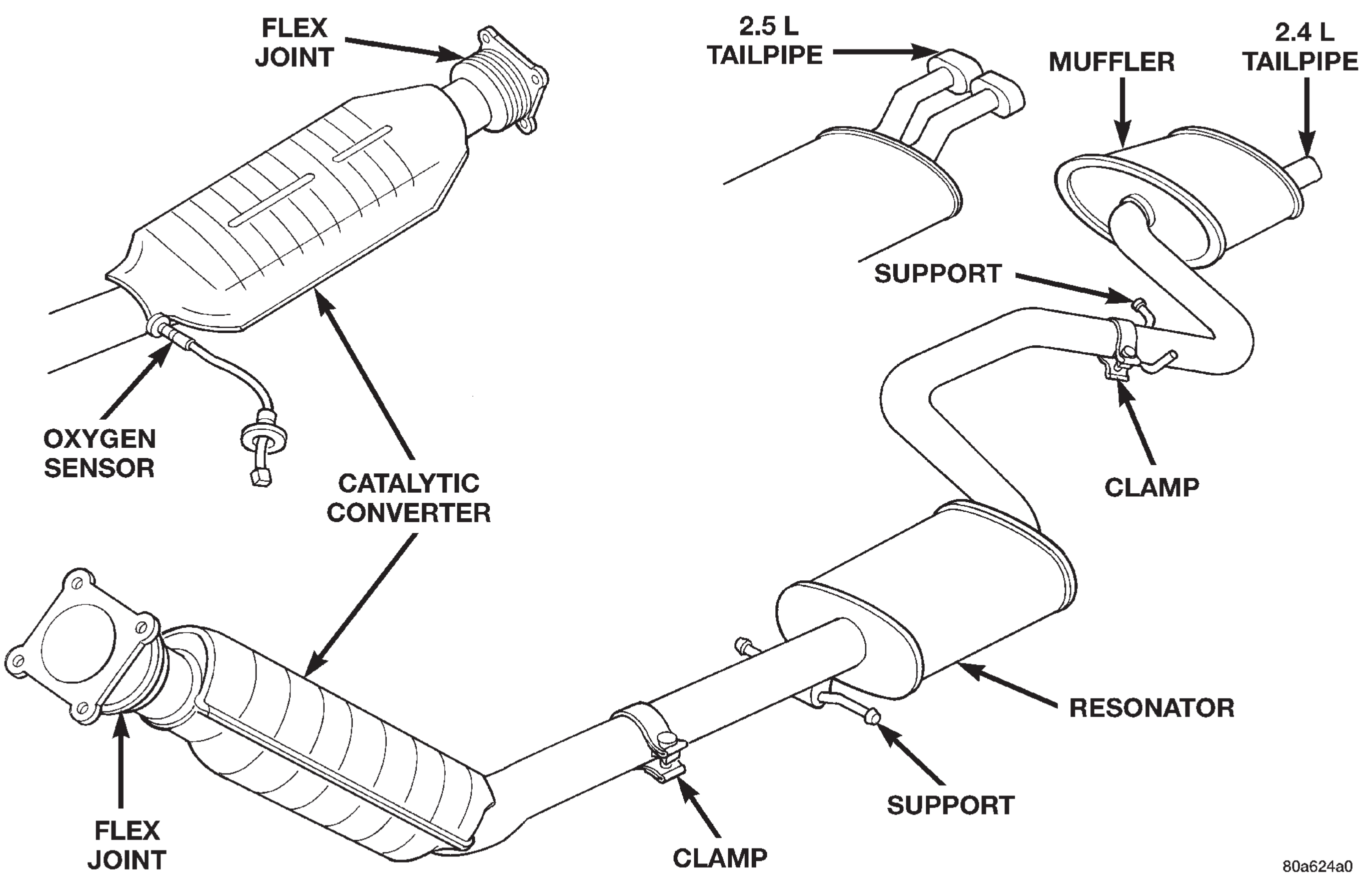


Fig. 7 Exhaust System Components

REMOVAL AND INSTALLATION (Continued)

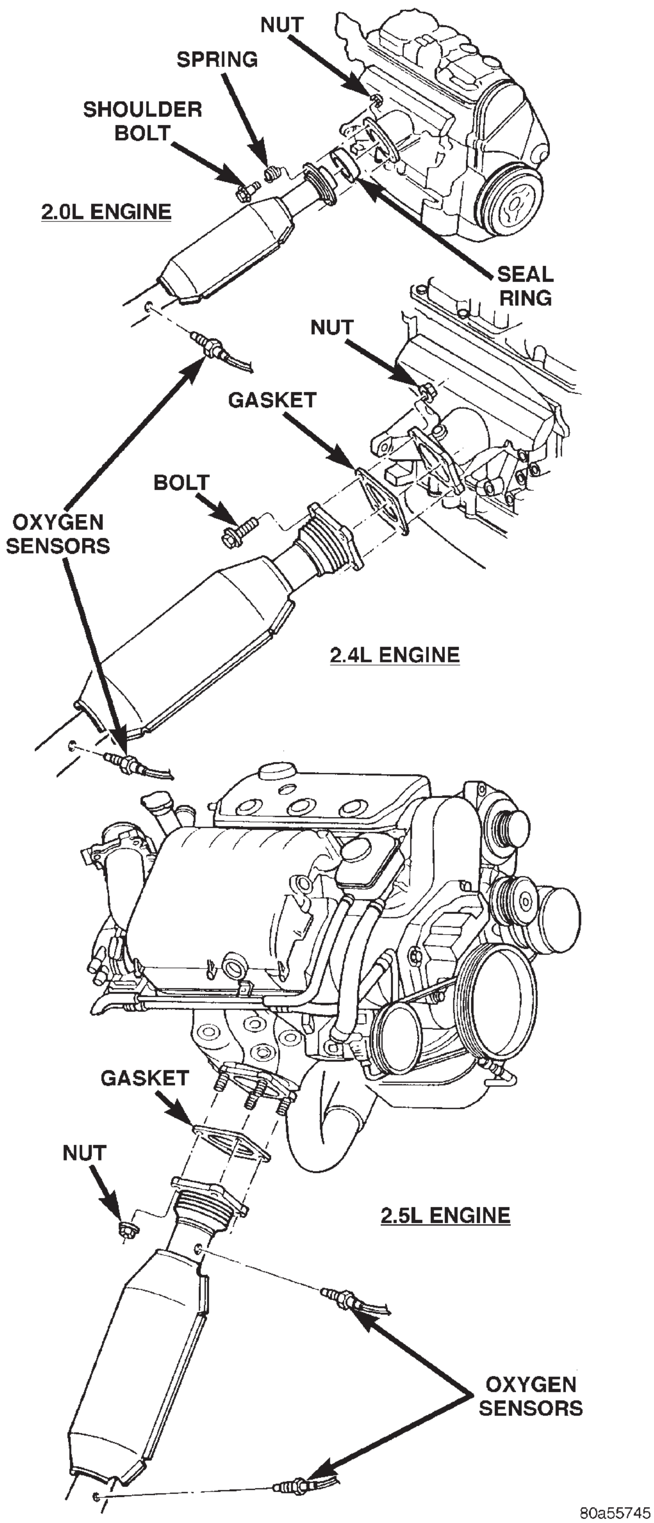


Fig. 8 Ball and Flex Joint Connections

INSTALLATION

When assembling exhaust system **do not** tighten clamps until components are aligned and supports have equal load on them (Fig. 9).

(1) Assemble catalytic convertor to exhaust manifold connection (Fig. 8).

(2) Assemble resonator pipe to catalytic convertor and attach to the supports on the underbody (Fig. 9).

(3) Install the muffler to resonator pipe and attach to the supports on the underbody (Fig. 9).

(4) Working from the front of system;

(5) Align and tighten the catalytic convertor to exhaust manifold fasteners (Fig. 8). On 2.0L engine torque shoulder bolts to 28 N·m (250 in. lbs.). On 2.4/2.5L engines torque fasteners to 32 N·m (24 ft. lbs.).

(6) Align each component to maintain position and proper clearance with underbody parts and that all supports have equal load on them. Tighten clamps to 80 N·m (60 ft. lbs.) (Fig. 10).

(7) Connect ground strap.

(8) Connect the downstream heated oxygen sensor.

(9) Connect the upstream heated oxygen sensor, on 2.5L engine.

INTAKE MANIFOLD—2.4L ENGINE

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

To release fuel pressure, refer to Group 14, Fuel System for procedure.

REMOVAL

(1) Perform fuel system pressure release procedure **before attempting any repairs.**

(2) Disconnect negative cable from auxiliary jumper terminal (Fig. 11).

(3) Remove Air Inlet Resonator. Refer to Group 14, Fuel System Air Inlet Resonator for procedure.

(4) Disconnect the fuel supply line quick connect at the fuel rail assembly. Refer to Group 14, Fuel System Quick Connect Fittings procedure.

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

(5) Remove fuel rail assembly attaching screws and remove fuel rail assembly from engine. Cover injector holes with suitable covering.

CAUTION: Do not set fuel injectors on their tips, damage may occur to the injectors

REMOVAL AND INSTALLATION (Continued)

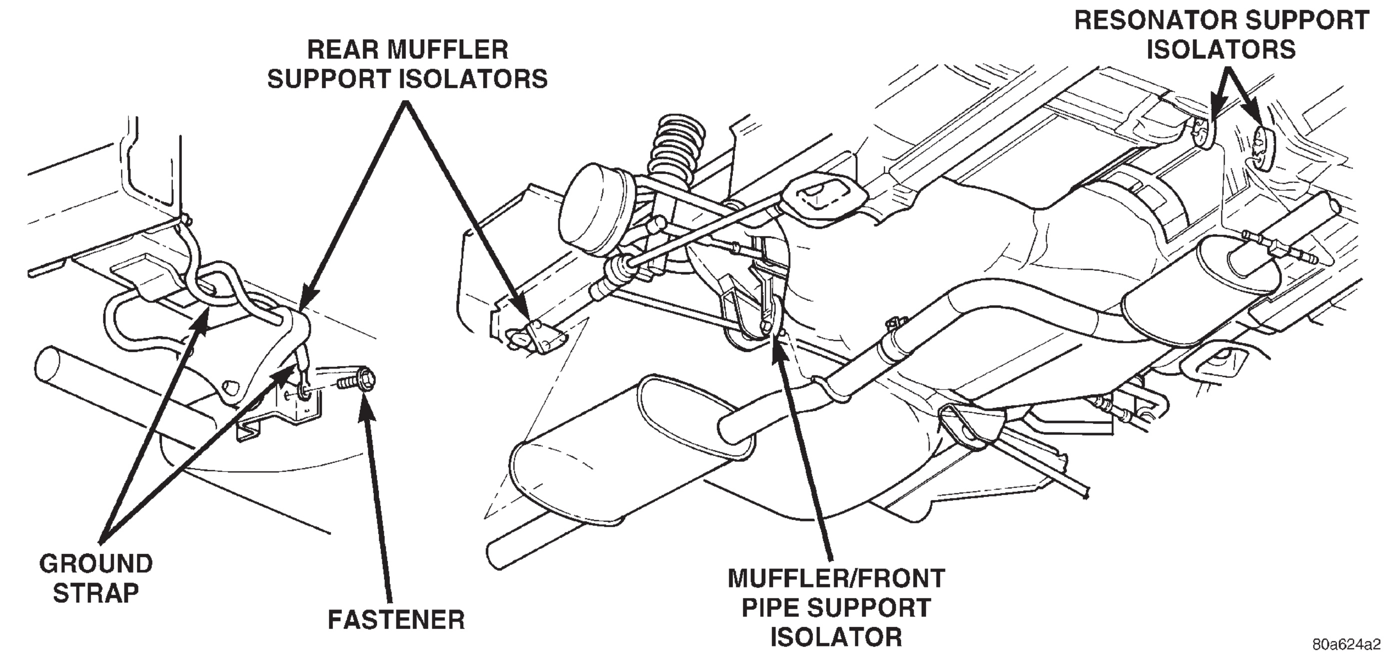


Fig. 9 Exhaust System Support Insulators—JX

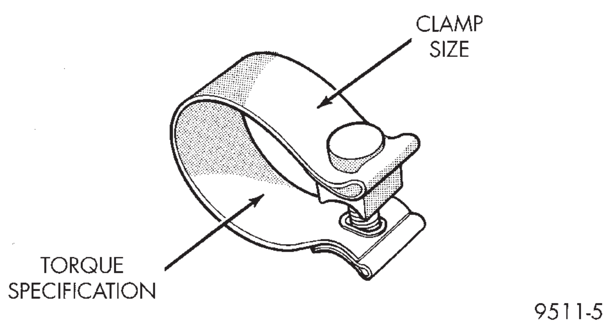


Fig. 10 Band Clamp

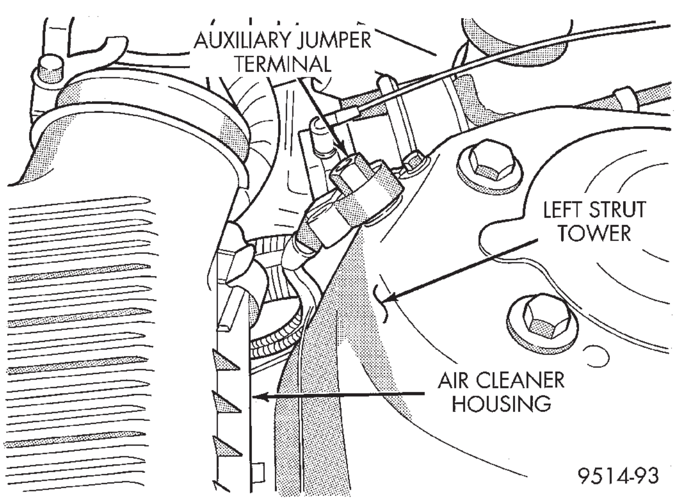


Fig. 11 Auxiliary Jumper Terminal

(6) Remove accelerator, kickdown and speed control cables from throttle lever and bracket. Refer to Group 14, Fuel System for procedures.

(7) Disconnect idle air control (IAC) motor and throttle position sensor (TPS) wiring connectors (Fig. 13).

(8) Disconnect intake air temperature sensor, leak detection pump and PCV hoses (Fig. 12).

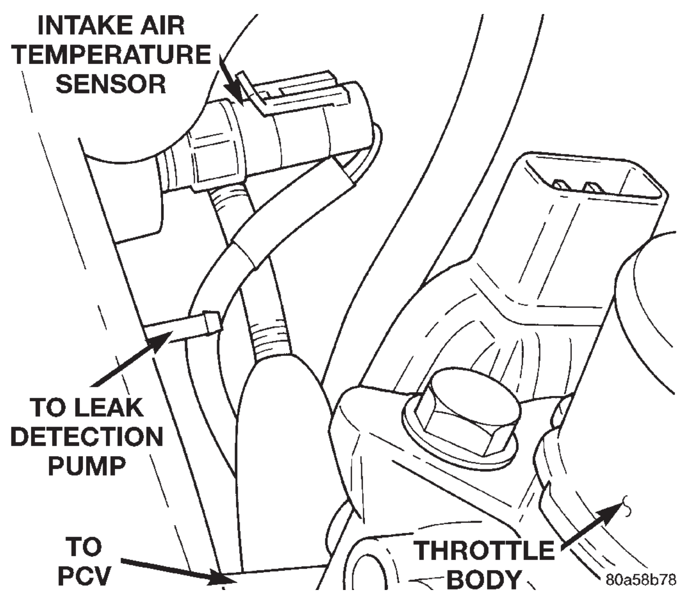


Fig. 12 Intake Air Temperature Sensor Leak Detection Pump and PCV Hoses

(9) Disconnect intake air temperature electrical connector. Disconnect leak detection pump and PCV hoses (Fig. 14)

(10) Remove transmission to throttle body support bracket fasteners at the throttle body and loosen the fastener at the transmission end.

REMOVAL AND INSTALLATION (Continued)

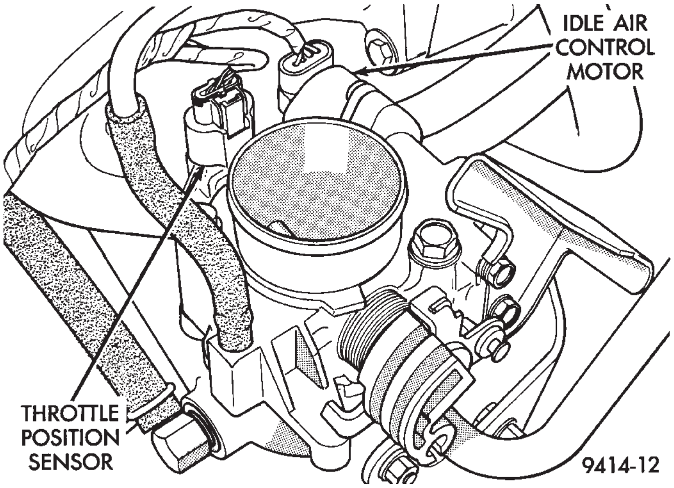


Fig. 13 Idle Air Control (IAC) Motor and Throttle Position Sensor (TPS) Wiring Connectors and Vacuum Hose Connection.

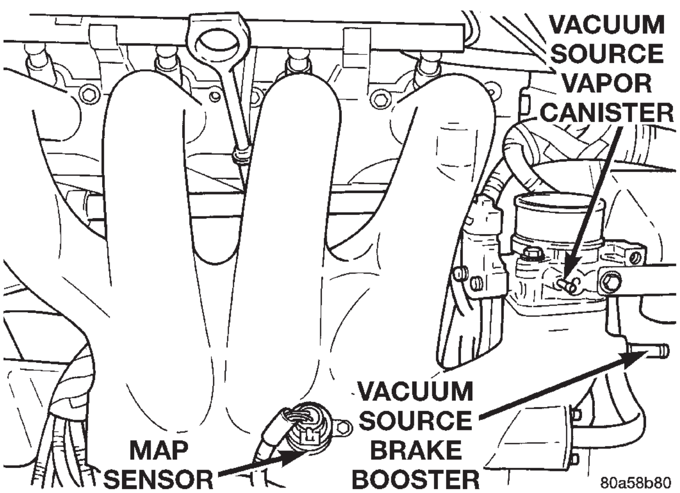


Fig. 14 Manifold Absolute Pressure (MAP) Vapor Canister and Brake Booster Hoses

(11) Remove EGR tube bolts at the valve and at the intake manifold (Fig. 15). Remove tube from engine.

(12) Remove the intake manifold support bracket.

(13) Remove intake manifold fasteners and washer assemblies. Remove intake manifold.

INSTALLATION

(1) Install new intake manifold gasket, and manifold onto cylinder head and tighten fasteners to 11.9 N·m (105 in. lbs.) in sequence shown in (Fig. 16).

(2) Remove covering from fuel injector holes and insure the holes are clean. Install fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).

(3) Connect PCV and brake booster hoses.

(4) Inspect quick connect fittings for damage, replace if necessary Refer to Group 14, Fuel System for procedure. Lube tube with clean 30w engine oil,

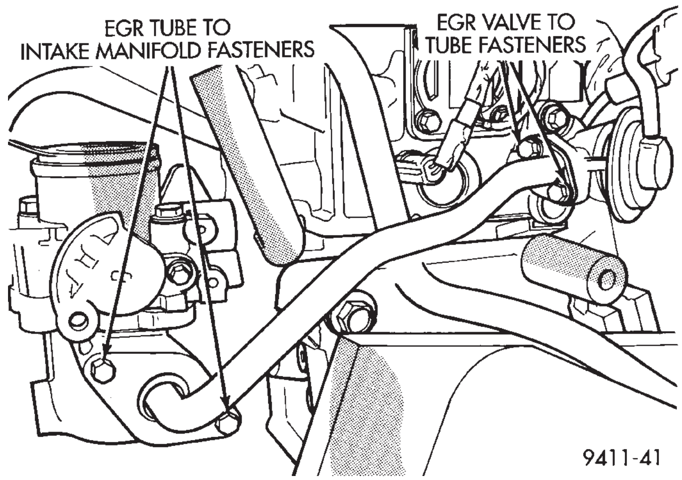


Fig. 15 Tube Assembly—Typical

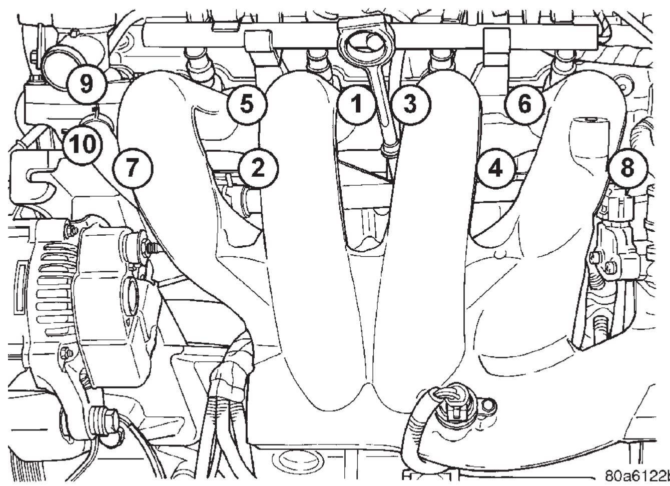


Fig. 16 Intake Manifold Tightening Sequence

Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.

(5) Install throttle body. Tighten fastener to 22 N·m (200 in. lbs.). Install transmission to throttle body support bracket and tighten to 11.9 N·m (105 in. lbs.) at the throttle body first. Next tighten the bracket at the transmission.

(6) Connect manifold absolute pressure (MAP) and intake air temperature sensor wiring connectors.

(7) Connect knock sensor electrical and starter relay connectors. Connect wiring harness to intake manifold tab.

(8) Connect Idle Air Control (IAC) motor and Throttle Position Sensor (TPS) wiring connectors.

(9) Connect vacuum hoses to throttle body.

(10) Install accelerator, kickdown and speed control cables to their bracket and connect them to the throttle lever. Refer to Group 14, Fuel System Throttle Body Installation procedure.

(11) Loosely assemble the EGR tube onto valve and intake manifold finger tight. Tighten tube fas-

REMOVAL AND INSTALLATION (Continued)

teners at the EGR valve first to 11 N·m (95 in. lbs.) then, tighten the intake manifold side fasteners to 11 N·m (95 in. lbs.).

(12) Connect negative cable from auxiliary jumper.

(13) With the DRB scan tool use ASD Fuel System Test to pressurize system to check for leaks.

CAUTION: When using the ASD Fuel System Test, the Auto Shutdown (ASD) relay will remain energized for 7 minutes or until the ignition switch is turned to the OFF position, or Stop All Test is selected.

EXHAUST MANIFOLD—2.4L ENGINE

REMOVAL

(1) Remove exhaust pipe from manifold. It may be necessary to remove the entire exhaust system. Refer to procedure outlined in this section.

(2) Remove exhaust manifold heat shield (Fig. 17).

(3) Remove 8 exhaust manifold retaining fasteners and remove exhaust manifold (Fig. 18).

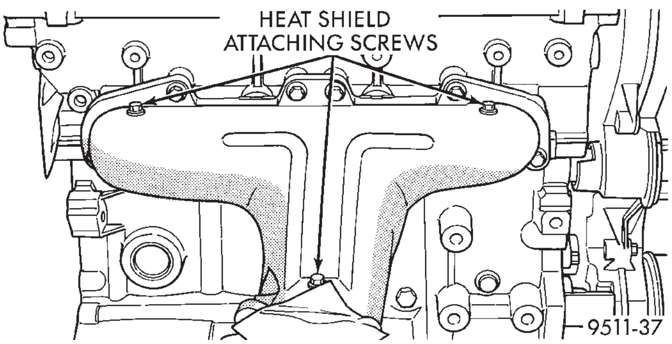


Fig. 17 Exhaust Manifold Heat Shield—2.4L Engine

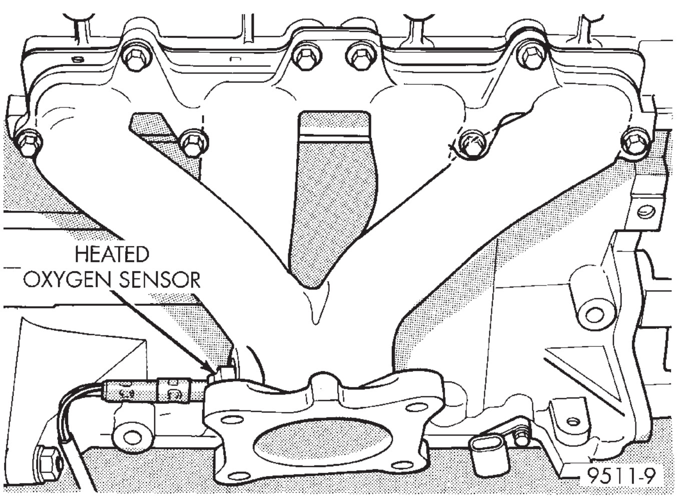


Fig. 18 Exhaust Manifold—2.4L Engine

INSTALLATION

(1) Install new manifold gasket. **DO NOT APPLY SEALER** .

(2) Set exhaust manifold in place. Tighten fasteners, starting at center and progressing outward in both directions to 23 N·m (200 in. lbs.) torque. Repeat this procedure until all fasteners are at specified torque.

(3) Install exhaust manifold heat shield.

(4) Attach exhaust pipe and tighten fasteners to 28 N·m (250 in. lbs.)

REMOVAL AND INSTALLATION (Continued)

INTAKE MANIFOLD/PLENUM—2.5L ENGINE

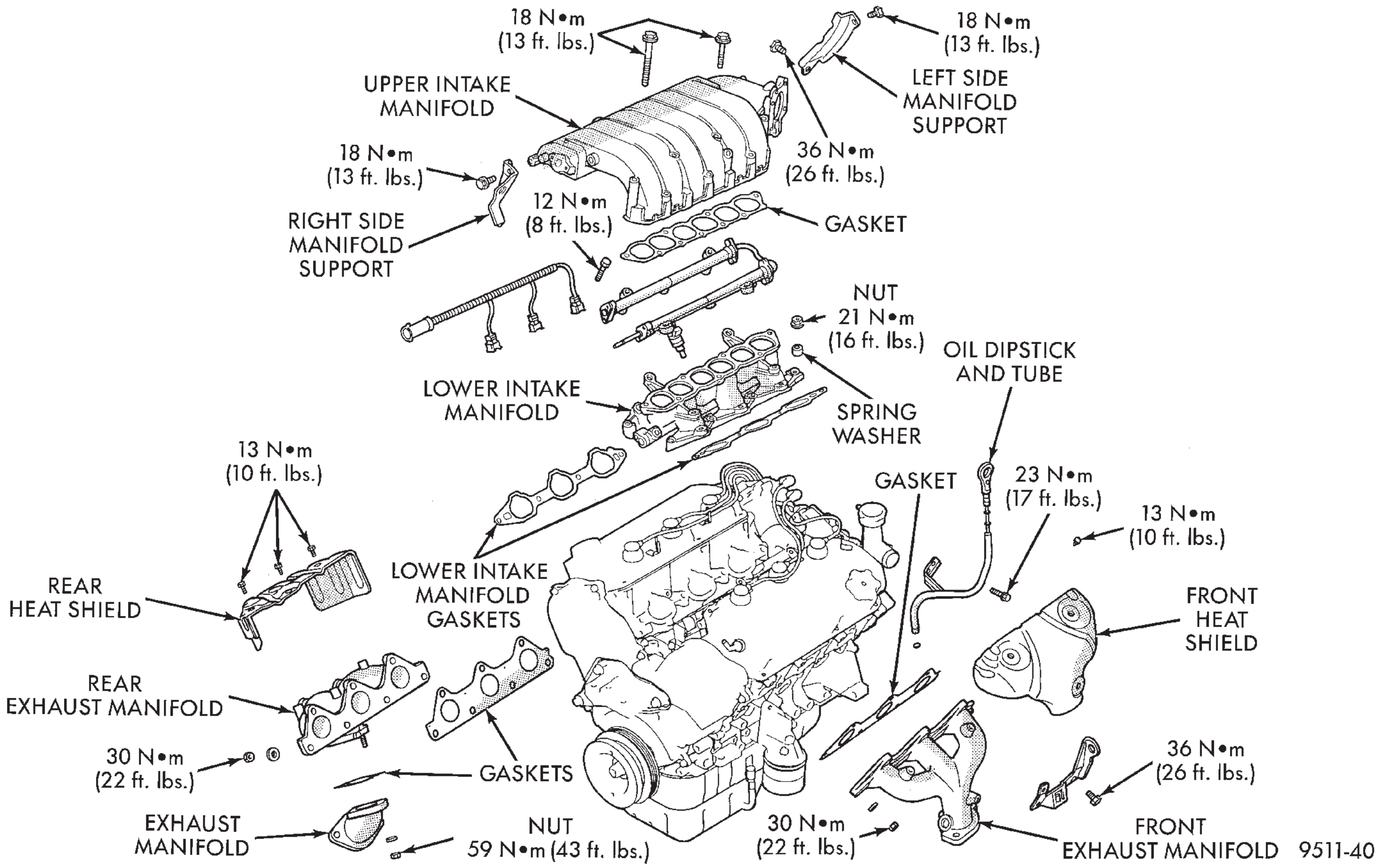


Fig. 19 Intake and Exhaust Manifolds—2.5L Engine

REMOVAL

(1) Disconnect negative cable from auxiliary jumper terminal (Fig. 20).

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

(2) Release fuel system pressure. Refer to Fuel System Pressure Release procedure in this section.

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

(3) Disconnect fuel supply tube from rail. Refer to Quick-Connect Fittings in the Fuel Delivery section of this group.

(4) Unplug connectors from MAP and intake air temperature sensors (Fig. 22).

(5) Remove plenum support bracket bolt located rearward of MAP sensor (Fig. 22).

(6) Remove bolt holding air inlet resonator to intake manifold (Fig. 21).

(7) Loosen throttle body air inlet hose clamp.

(8) Release snaps holding air cleaner housing cover to housing.

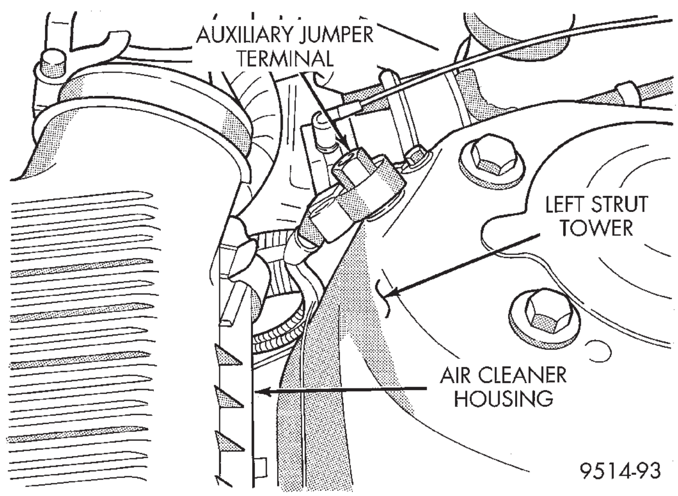


Fig. 20 Auxiliary Jumper Terminal

(9) Remove air cleaner cover and inlet hoses from engine.

(10) Unplug TPS and idle air control motor connectors (Fig. 23) and (Fig. 24).

(11) Squeeze retainer tab on throttle cable and slide cable out of bracket (Fig. 25).

REMOVAL AND INSTALLATION (Continued)

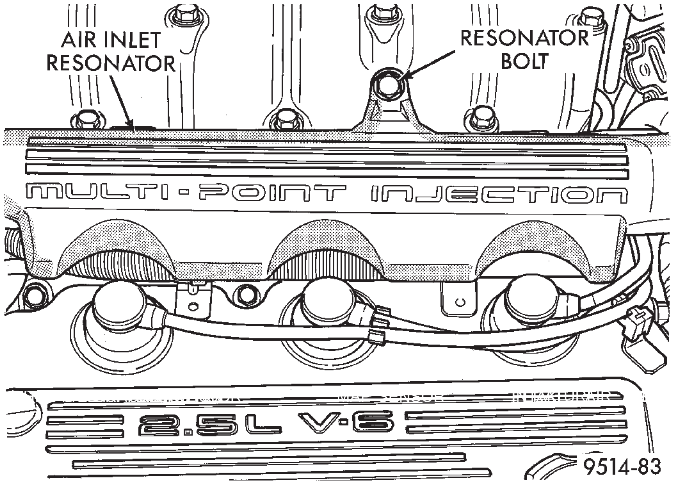


Fig. 21 Air Inlet Resonator

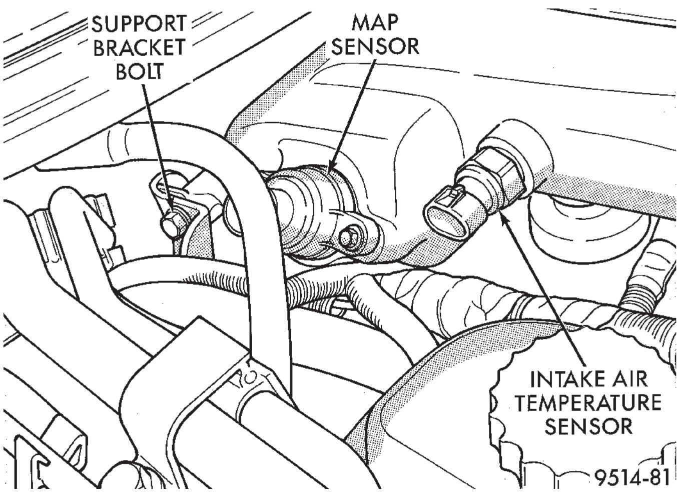


Fig. 22 Intake Manifold Sensors and Left Manifold Support Bolt

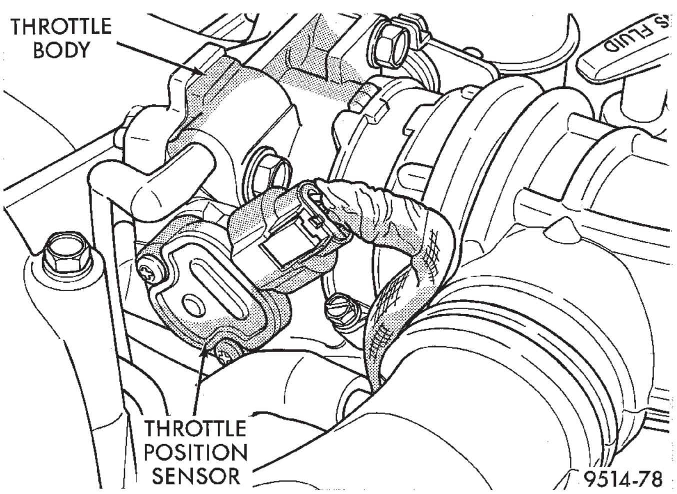


Fig. 23 Throttle Position Sensor

(12) Slide Speed control cable out of bracket, if equipped (Fig. 25).

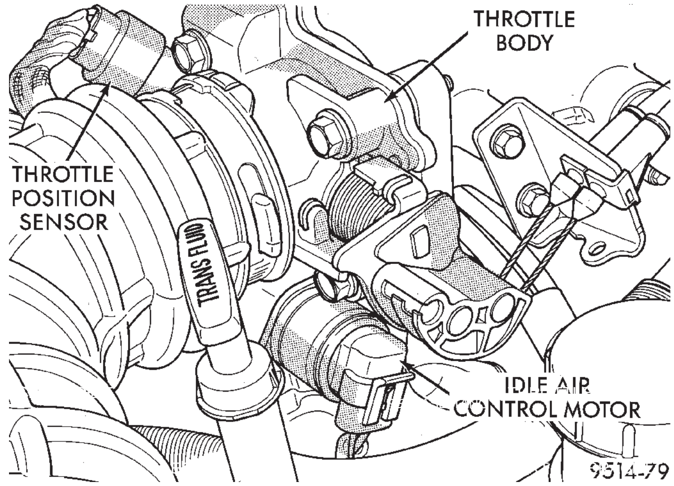


Fig. 24 Idle Air Control Motor

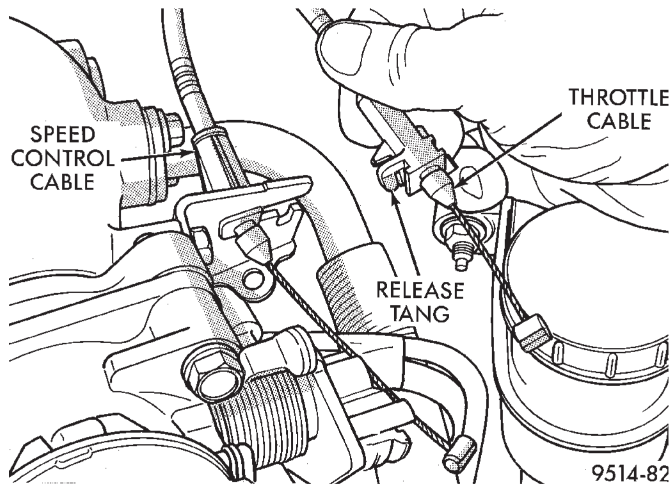


Fig. 25 Throttle Cable Attachment

(13) Remove EGR tube from intake manifold (Fig. 26).

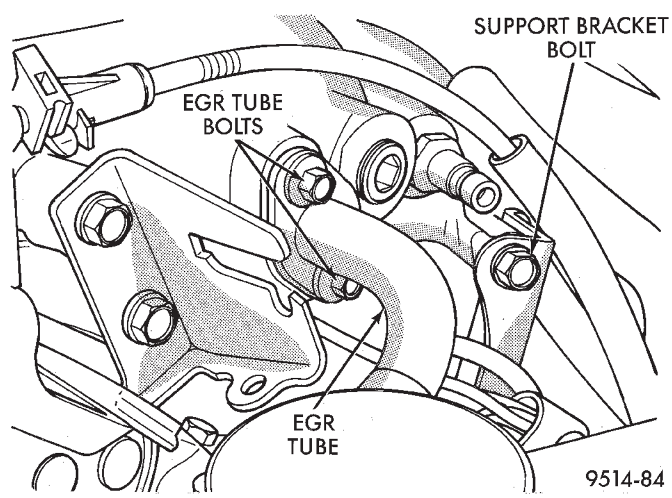


Fig. 26 EGR Tube and Right Manifold Support Bolt

(14) Remove plenum support bracket bolt located rearward of EGR tube (Fig. 26).

REMOVAL AND INSTALLATION (Continued)

(15) Remove 7 bolts holding upper intake plenum and remove plenum (Fig. 19).

(16) Disconnect electrical connectors from fuel injectors.

(17) Remove 4 bolts holding fuel rail (Fig. 27).

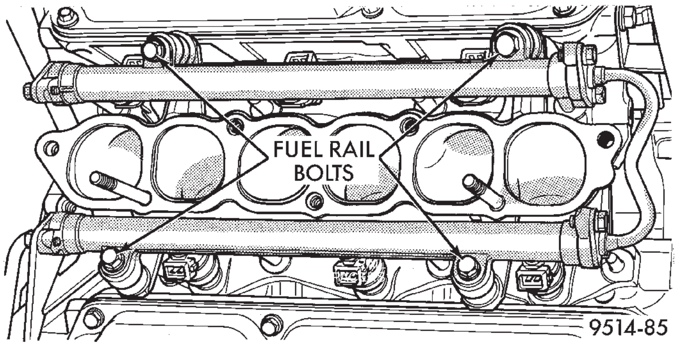


Fig. 27 Fuel Rail Attachment

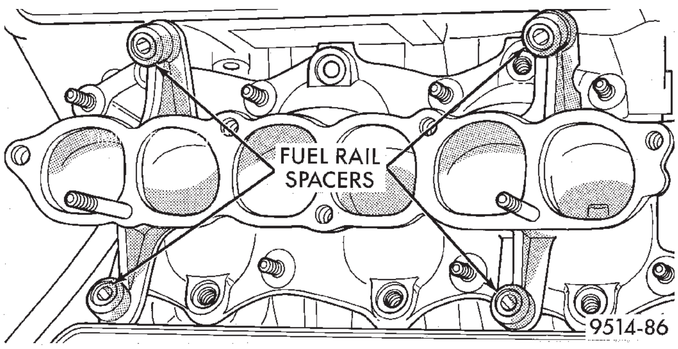


Fig. 28 Fuel Rail Spacers

(18) Lift fuel rail off engine. **There are spacers under each fuel rail bolt (Fig. 28).**

(19) Remove lower intake manifold attaching bolts. Remove intake manifold.

INSTALLATION

(1) Install intake manifold with new gaskets. Tighten in sequence shown in (Fig. 29) to 21 N·m (185 in. lbs.).

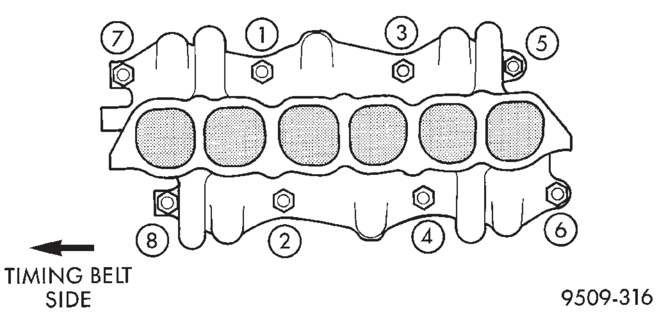


Fig. 29 Intake Manifold Tightening Sequence

(2) Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.

(3) Insert fuel injector nozzles into openings in intake manifold. Seat the injectors in place. Tighten fuel rail bolts to 12 N·m (8 ft. lbs.).

(4) Attach electrical connectors to fuel injectors.

(5) Connect fuel supply tube to fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.

(6) Install new gasket and position upper intake plenum. Tighten plenum bolts to 18 N·m (13 ft. lbs.) torque.

(7) Install bolts at plenum support brackets. Tighten bolts to 18 N·m (13 ft. lbs.).

(8) Install EGR tube to plenum. Tighten EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs) torque.

(9) Install throttle cables.

(10) Attach electrical connectors to sensors.

(11) Tighten air inlet tube clamps to 3 N·m ±1 (25 in. lbs. ±5).

(12) Connect negative terminal to auxiliary jumper terminal.

EXHAUST MANIFOLDS—2.5L ENGINE

REMOVAL

(1) Raise vehicle and disconnect exhaust pipe from rear (cowl side) exhaust manifold at flex-joint. It may be necessary to remove the entire exhaust system. Refer to procedure outlined in this section.

(2) Remove bolts attaching cross-under pipe to manifolds (Fig. 30). Remove assembly.

(3) Remove heat shield from rear exhaust manifold (Fig. 31).

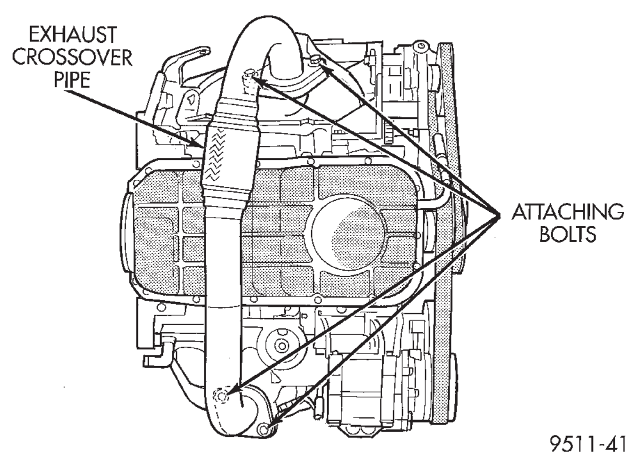


Fig. 30 Cross-Under Pipe Attaching Bolts

(4) Remove Power Steering pump bracket. Refer to Group 19 Steering for procedure.

(5) Remove nuts attaching rear manifold to cylinder head and remove manifold.

(6) Lower vehicle and remove screws attaching front heat shield to front manifold (Fig. 19).

REMOVAL AND INSTALLATION (Continued)

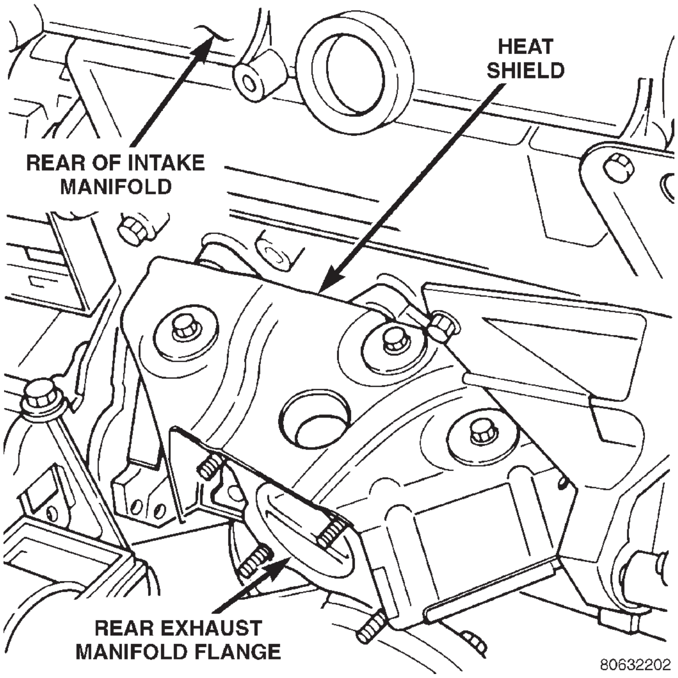


Fig. 31 Rear Exhaust Manifold—2.5L Engine

INSTALLATION

Install a new exhaust manifold gasket.

(1) Install the rear exhaust manifold and tighten attaching nuts to 30 N·m (22 ft. lbs.).

(2) Install rear exhaust manifold heat shield torque fastener to 13 N·m (115 in. lbs.).

(3) Install Power Steering Pump bracket to engine. Refer to Group 19 Steering for procedure.

(4) Attach the flex-joint exhaust manifold and tighten fasteners to 28 N·m (250 in. lbs.)

(5) Connect rear heated oxygen sensor lead.

(6) Attach cross-under pipe to exhaust manifold and tighten bolt to 31 N·m (275 in. lbs.)

(7) Install front exhaust manifold and attach exhaust cross-under pipe tighten fastener to 31 N·m (275 in. lbs.).

(8) Install front manifold heat shield and tighten attaching screws to 15 N·m (130 in. lbs.).

CLEANING AND INSPECTION

EXHAUST MANIFOLD INSPECTION—2.4L ENGINE

(1) Discard gasket and clean all gasket from surfaces of manifolds and cylinder head.

(2) Test manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (.006 in. per foot) of manifold length.

(3) Inspect manifolds for cracks or distortion. Replace manifold if necessary.

INTAKE MANIFOLD—2.5L ENGINE

(1) Discard gasket and clean all gasket surfaces of manifold to cylinder heads.

(2) Check upper and lower manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (.006 in. per foot) of manifold length.

(3) Inspect manifolds for cracks or distortion. Replace manifold if necessary.

EXHAUST MANIFOLD—2.5L ENGINE

Inspect exhaust manifolds for damage or cracks and check distortion of the cylinder head mounting surface and exhaust crossover mounting surface with a straightedge and thickness gauge.

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Band Clamp	
Fastener	80 N·m (60 ft. lbs.)
Body Heat Shields	
Fasteners	5 N·m (40 in. lbs.)
Cross-Under Pipe	
Fasteners	31 N·m (275 in. lbs.)
Exhaust Manifold-2.4L	
Fasteners	23 N·m (200 in. lbs.)
Exhaust Manifold-2.5L	
Fasteners	44 N·m (33 ft. lbs.)
Exhaust Manifold Flange-2.4L	
Fasteners	28 N·m (250 in. lbs.)
Exhaust Manifold Flange-2.5L	
Fasteners	32 N·m (24 ft. lbs.)
Exhaust Manifold Heat Shield-2.5L	
Bolts	13 N·m (115 in. lbs.)
Intake Manifold-2.4L	
Fasteners	23 N·m (200 in. lbs.)
Intake Manifold Lower-2.5L	
Fasteners	21 N·m (185 in. lbs.)
Intake Manifold Plenum Upper-2.5L	
Bolts	18 N·m (160 in. lbs.)

BUMPERS AND FRAME

CONTENTS

BUMPERS

INDEX

REMOVAL AND INSTALLATION

FRONT BUMPER FASCIA

It is not necessary to remove the headlamp assemblies to remove the front bumper fascia.

REMOVAL

(1) Release hood latch and open hood.
(2) Remove screws holding top of grille to headlamp adapter assembly (Fig. 1).
(3) Hoist and support vehicle on safety stands. Refer to Group 0, Lubrication and Maintenance, for proper hoisting and jacking procedures.
(4) Remove push-in fasteners holding fascia to underside of bumper reinforcement.
(5) Remove inner wheelhouse as necessary to access nuts holding fascia wings to fender.
(6) Remove nuts holding fascia wings to fender.
(7) Slide fascia forward and separate fascia from vehicle.
(8) Disengage fog lamp wire connectors from back of fog lamps, if so equipped.

INSTALLATION

(1) Ensure that energy management foam is properly installed in front fascia (Fig. 2).
(2) Engage fog lamp wire connectors to back of fog lamps, if so equipped.
(3) Position fascia on vehicle and slide rearward, being careful to ensure that the grille slides between hood latch handle and headlamp adapter assembly.
(4) Install nuts holding fascia wings to fender.
(5) Install inner wheelhouse.

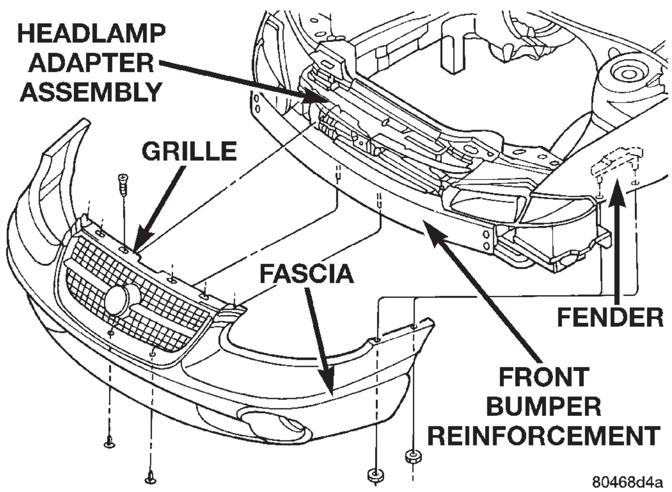


Fig. 1 Front Bumper Fascia

(6) Install push-in fasteners holding fascia to underside of bumper reinforcement.
(7) Install screws holding top of grille to headlamp adapter assembly.

HEADLAMP ADAPTER ASSEMBLY

REMOVAL

(1) Remove headlamp assemblies. Refer to Group 8L, Lamps, for proper procedure.
(2) Remove front fascia.
(3) Remove bolts holding headlamp adapter to radiator closure panel from headlamp cavities (Fig. 3).
(4) Remove bolts holding underside of adapter assembly to upper radiator crossmember.

REMOVAL AND INSTALLATION (Continued)

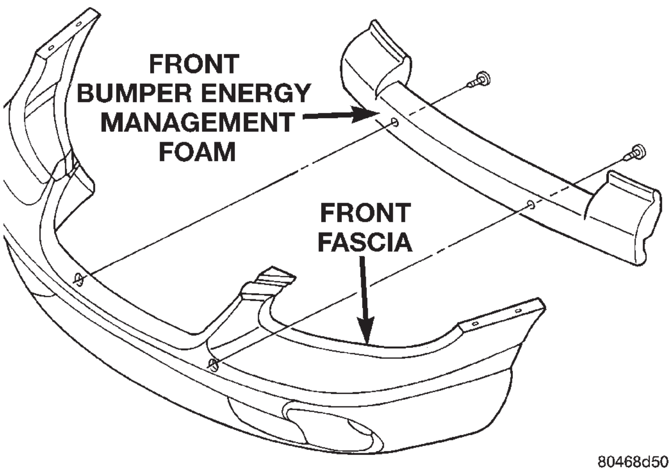


Fig. 2 Front Bumper Energy Management Foam

(5) Separate headlamp adapter assembly from vehicle.

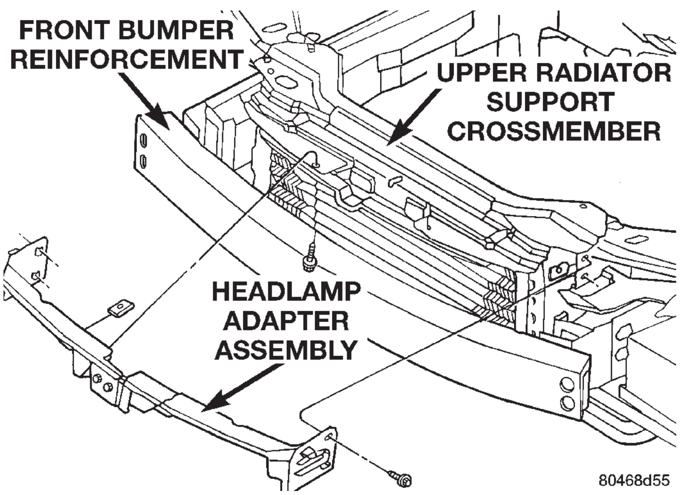


Fig. 3 Headlamp Adapter Assembly

INSTALLATION

(1) Position headlamp adapter assembly on vehicle.

(2) Loosely install bolts holding headlamp adapter to radiator closure panel from headlamp cavities.

(3) Loosely install bolts holding underside of adapter assembly to upper radiator crossmember.

(4) Tighten all bolts.

(5) Install front fascia.

(6) Install headlamp assemblies. Refer to Group 8L, Lamps, for proper procedures.

REAR BUMPER FASCIA

REMOVAL

(1) Release trunk latch and open trunk.

(2) Remove trunk lining as necessary to access nut holding rear fascia to rear closure panel.

(3) Remove screws holding fascia to rear closure panel and nuts securing to inner quarter panel (Fig. 4).

(4) Hoist and support vehicle on safety stands. Refer to Group 0, Lubrication and Maintenance, for proper procedure.

(5) Remove push-in fasteners holding bottom of fascia to rear bumper reinforcement.

(6) Disengage license plate lamp wire connector.

(7) Remove rear wheelhouse splash shields as necessary to access nuts holding fascia to quarter panels.

(8) Remove nuts holding rear fascia to quarter panels.

(9) Remove screw holding fascia to right rear quarter panel.

(10) Slide fascia rearward and separate from vehicle.

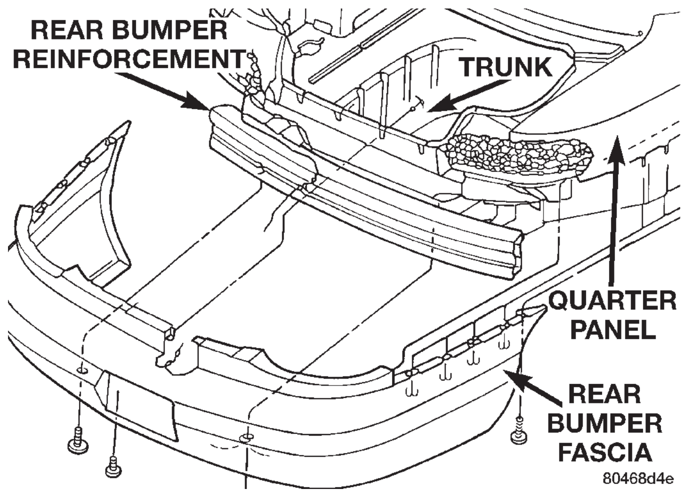


Fig. 4 Rear Bumper Fascia

INSTALLATION

(1) Ensure that the energy management foam is properly installed in rear fascia (Fig. 5).

(2) Position fascia on vehicle and slide forward to engage studs on quarter panel.

CAUTION: Ensure that license plate wire connector is properly routed through energy management foam and fascia.

(3) Install nuts, starting with rearward nut working forward, to hold rear fascia to quarter panels.

(4) Install screw holding rear fascia to right rear quarter panel.

NOTE: Hold fascia completely forward until first nut is secured.

(5) Install rear wheelhouse splash shields.

(6) Engage license plate lamp wire connector.

REMOVAL AND INSTALLATION (Continued)

(7) Install push-in fasteners holding rear fascia to rear bumper reinforcement.

(8) Install nuts holding rear fascia to inner quarter panel.

(9) Install screws holding rear fascia to closure panel.

(10) Install trunk lining.

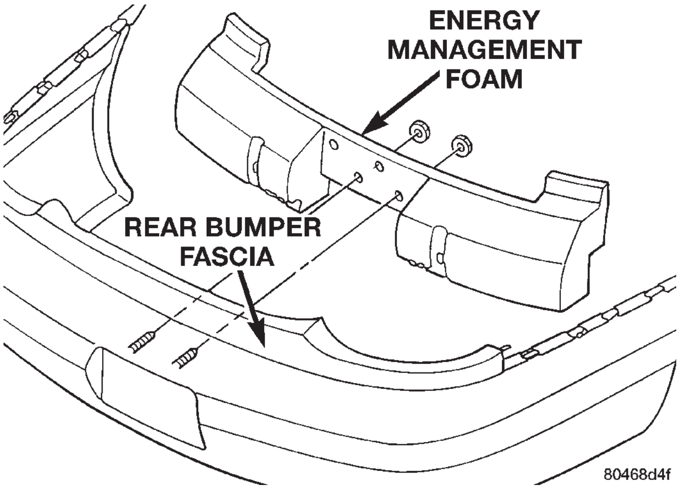


Fig. 5 Rear Bumper Energy Management Foam

REAR BUMPER REINFORCEMENT

REMOVAL

(1) Remove rear fascia.

(2) Support bumper reinforcement on a suitable lifting device.

(3) Mark position of nuts on frame rail to aid in installation.

(4) Remove nuts holding rear bumper reinforcement to frame rail (Fig. 6).

(5) Separate bumper reinforcement from vehicle.

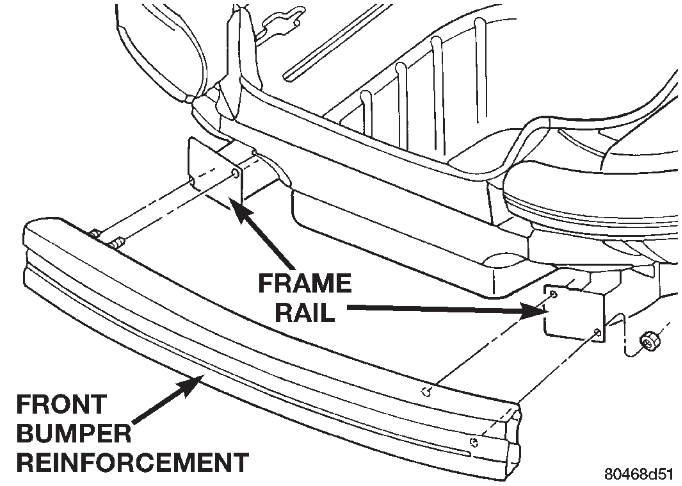


Fig. 6 Rear Bumper Reinforcement

INSTALLATION

(1) Position rear bumper reinforcement on vehicle.

(2) Install nuts holding bumper reinforcement to frame rail. Use previously made marks to properly position bumper reinforcement.

(3) Install rear fascia.

FRAME

INDEX

REMOVAL AND INSTALLATION

ENGINE SUPPORT MODULE

It is not necessary to support the engine during the following operation, unless the engine/transaxle side mounts or transaxle are to be removed. Refer to Group 9, Engine or Group 21, Transaxle, for proper methods of supporting the engine.

REMOVAL

(1) Hoist and support vehicle on safety stands. Refer to Group 0, Lubrication and Maintenance, for proper procedure.

(2) Remove bolt holding engine support to rear engine mount isolator (Fig. 1).

(3) Remove bolt holding engine support to front engine mount isolator.

(4) Place a suitable lifting device under engine support module.

(5) Remove bolts holding radiator support crossmember to bottom of radiator closure panel.

(6) Remove bolts holding engine support module to front suspension crossmember.

(7) Separate engine support module and radiator support crossmember from vehicle.

(8) Separate engine support module and radiator support crossmember.

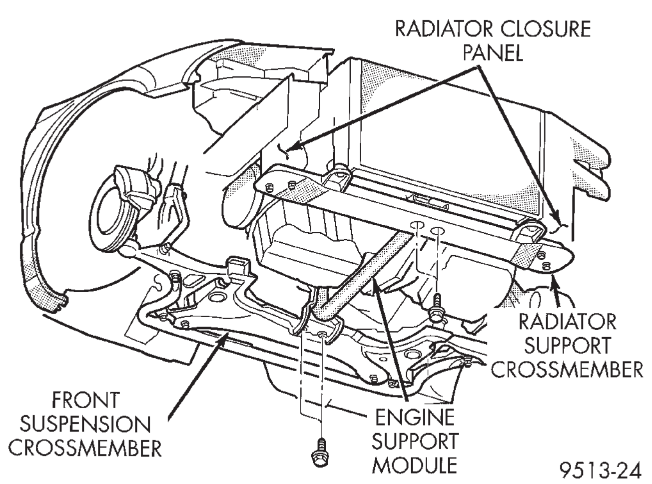


Fig. 1 Engine Support Module

INSTALLATION

(1) Install bolts holding engine support module to radiator support crossmember.

(2) Position engine support module and radiator support crossmember on vehicle.

(3) Install bolts holding engine support module to front suspension crossmember.

(4) Install bolts holding radiator support crossmember to radiator closure panel.

(5) Install bolt holding engine support module to front engine mount isolator.

(6) Install bolt holding engine support module to rear engine mount isolator

FRONT SUSPENSION CROSSMEMBER

REMOVAL

(1) Hoist and support vehicle on safety stands. Refer to Group 0, Lubrication and Maintenance, for proper procedure.

(2) Remove engine support module.

(3) Place a suitable lifting device under front suspension crossmember.

(4) Remove bolts holding suspension strut to the lower control arm. Refer to Group 2, Suspension, for proper procedure.

(5) Disengage lower ball joints from lower control arms. Refer to Group 2, Suspension, for proper procedure.

(6) Remove bolts holding front of suspension crossmember to frame rails under upper control arms.

(7) Loosen bolts holding rear of suspension crossmember to frame rail torque boxes.

(8) Allow the front of the suspension crossmember to swing away from the frame rails.

(9) Remove bolts holding steering gear to top of suspension crossmember (Fig. 2).

CAUTION: Do not allow steering gear to hang by the pressure or return hoses. Damage to hoses can result.

(10) Using mechanic's wire, tie steering gear to structure above.

(11) Raise crossmember back into position.

REMOVAL AND INSTALLATION (Continued)

(12) Remove bolts holding rear of crossmember to frame rail torque boxes.

(13) Lower front suspension crossmember away from bottom of vehicle.

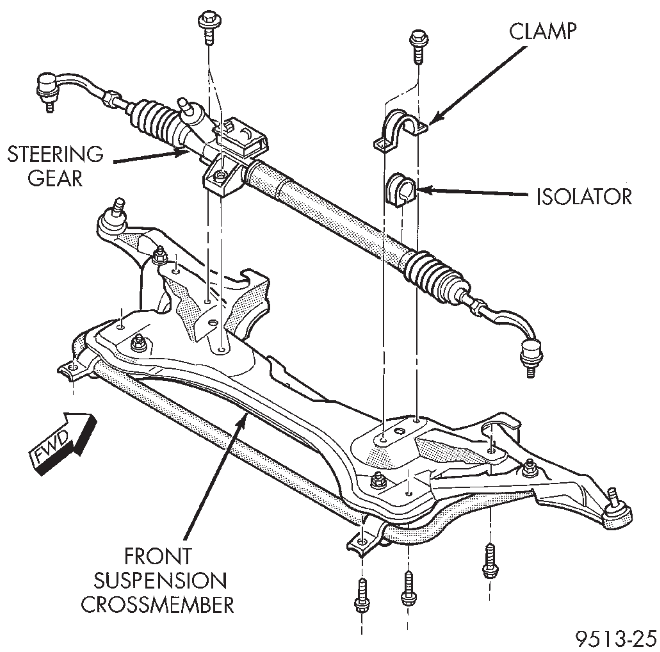


Fig. 2 Front Suspension Crossmember

INSTALLATION

(1) Raise front suspension crossmember into position on vehicle.

(2) Loosely install bolts holding rear of crossmember to frame rail torque boxes.

(3) Lower crossmember and install bolts holding steering gear to top of suspension crossmember.

(4) Raise crossmember into position.

(5) Tighten bolts holding rear of suspension crossmember to frame rail torque boxes.

(6) Install bolts holding front of suspension crossmember to frame rails under upper control arm.

(7) Engage lower ball joint to lower control arms. Refer to Group 2, Suspension, for proper procedure.

(8) Install bolts holding suspension strut to lower control arm. Refer to Group 2, Suspension, for proper procedure.

(9) Install engine support module.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Rear Bumper Reinforcement	
Attaching Nut	271 N·m (200 ft. lbs.)
Front Suspension Crossmember	
Attaching Bolt	115 N·m (85 ft. lbs.)
Radiator Support Crossmember	
Attaching Bolts	115 N·m (85 ft. lbs.)
Headlamp Adapter Assembly	
Attaching Bolts	34 N·m (25 ft. lbs.)
Engine Support Module:	
Bolts, Front–Module to Radiator Support Crossmember	34 N·m (25 ft. lbs.)
Bolts, Rear–Module to Radiator Support Crossmember	61 N·m (45 ft. lbs.)
Bolts, Rear–Module to Front Suspension Crossmember	61 N·m (45 ft. lbs.)
Bolts, Engine Isolator Through	61 N·m (45 ft. lbs.)

FRAME DIMENSIONS

Frame dimensions are listed in metric scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location.

SPECIFICATIONS (Continued)

VEHICLE PREPARATION

Position the vehicle on a level work surface. Using screw or bottle jacks, adjust the vehicle PLP heights to the specified dimension above a level work surface. Vertical dimensions can be taken from the work surface to the locations indicated were applicable (Fig. 3), (Fig. 4), (Fig. 5), (Fig. 6), (Fig. 7), (Fig. 8), (Fig. 9), (Fig. 10), and (Fig. 11)

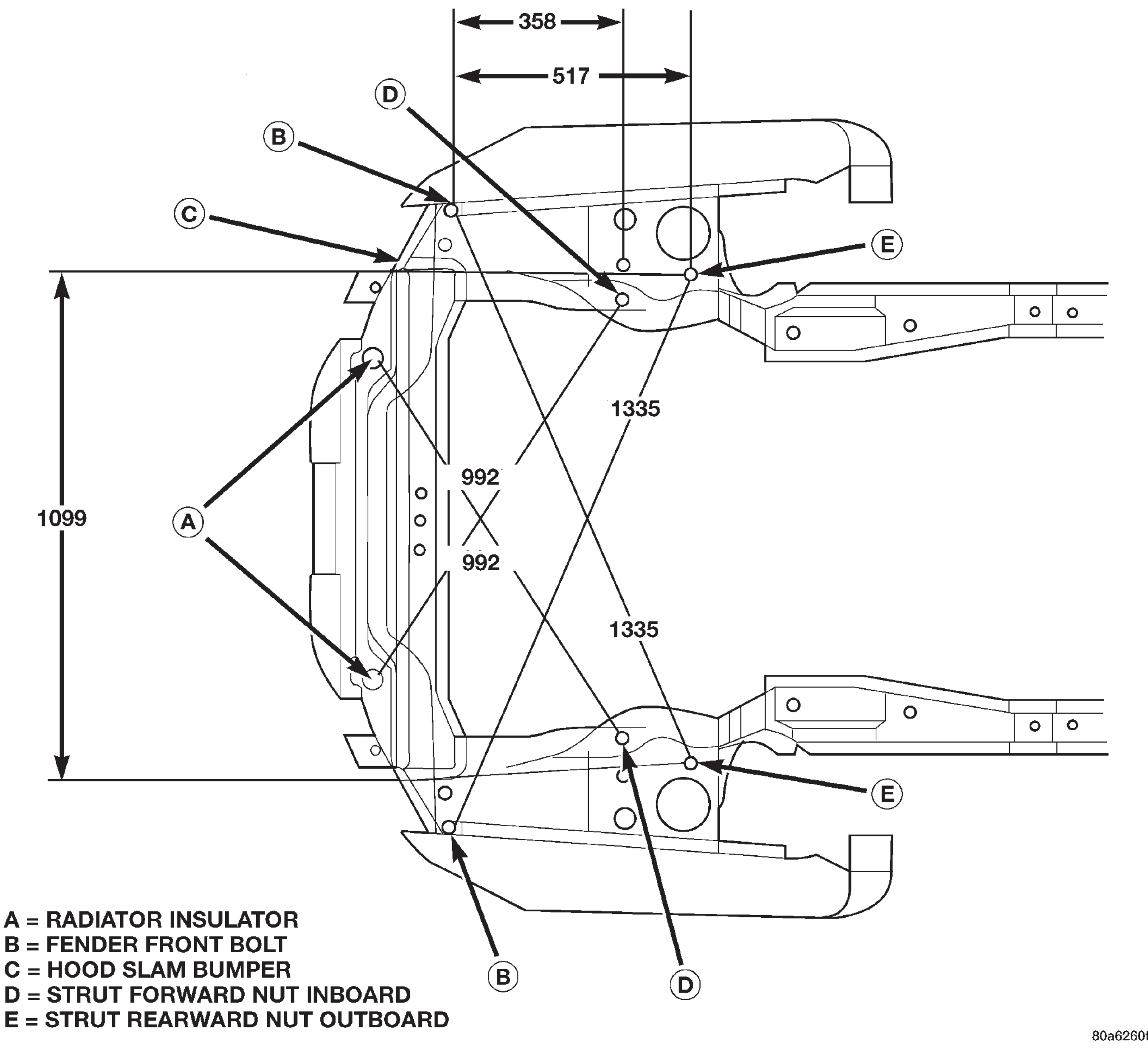


Fig. 3 Engine Compartment Top View

SPECIFICATIONS (Continued)

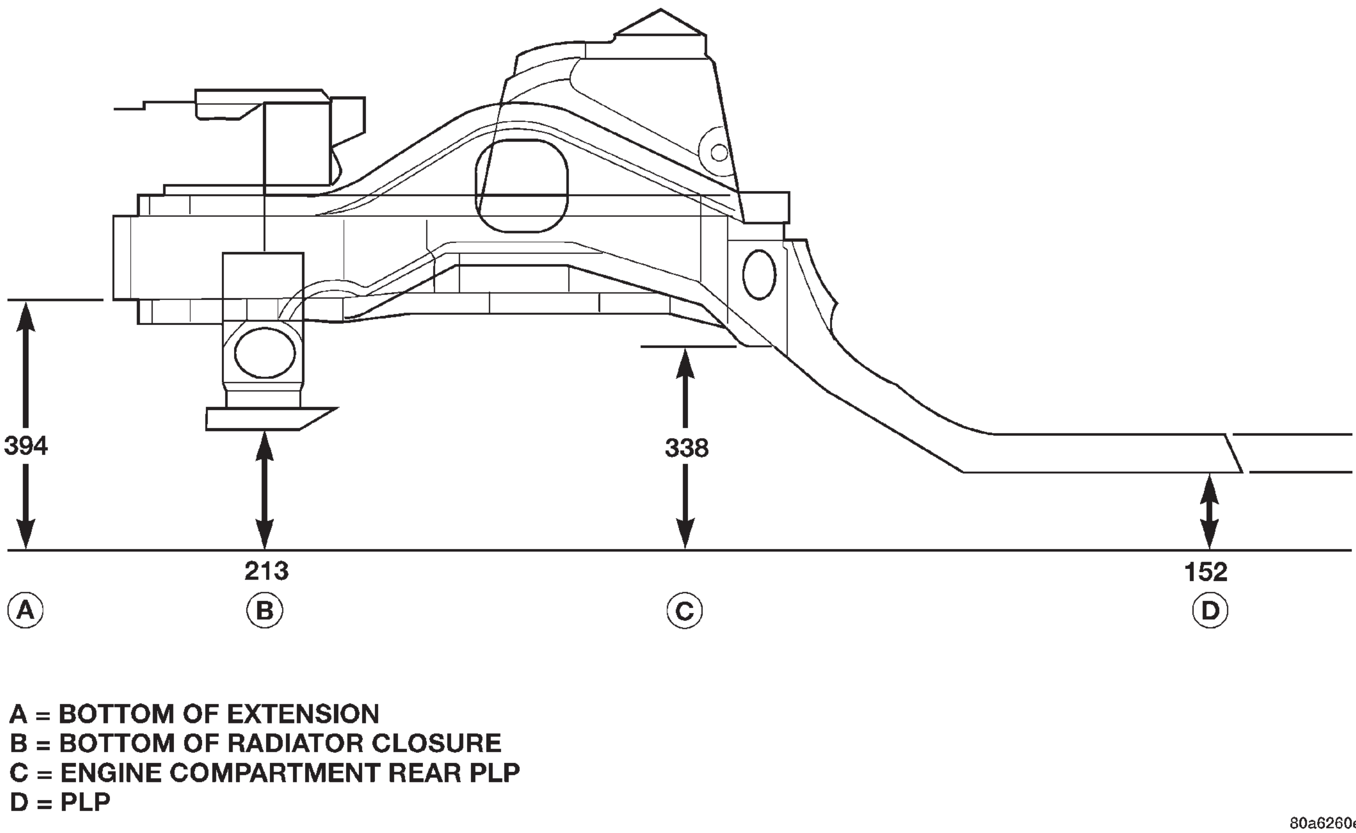


Fig. 4 Engine Compartment Side View

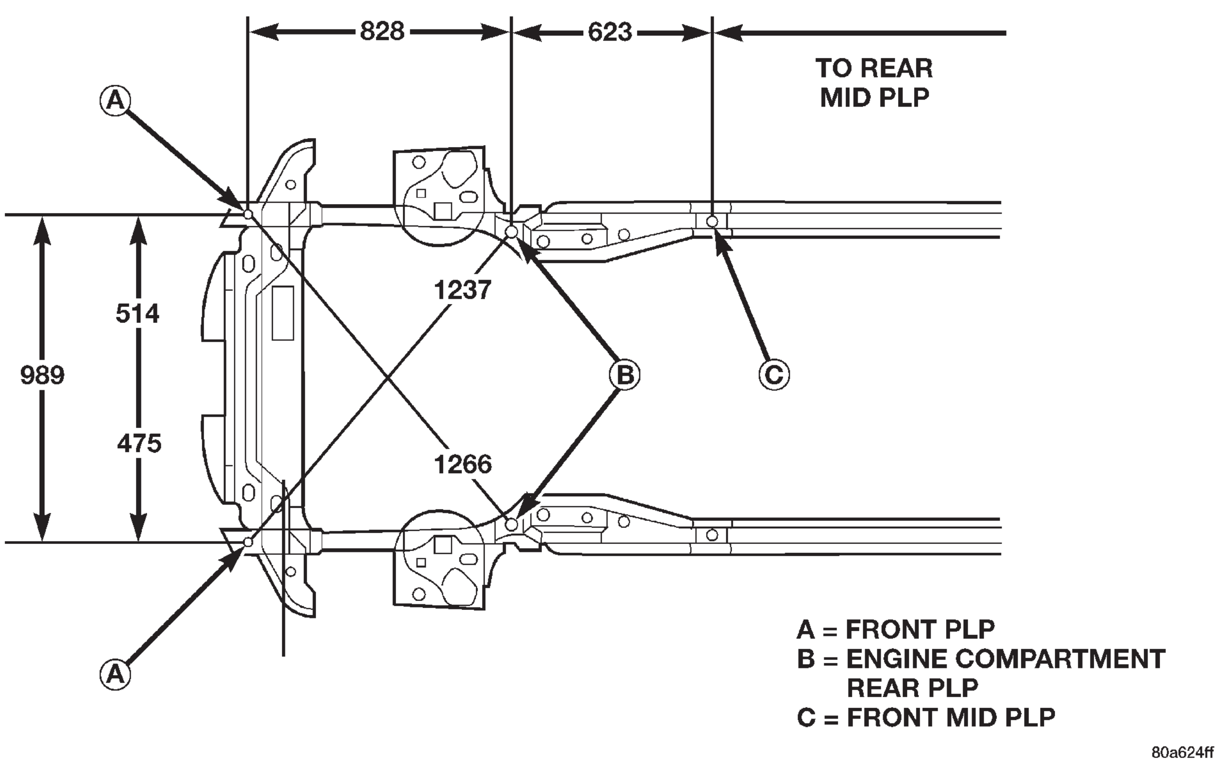


Fig. 5 Forward Frame Section Bottom View

SPECIFICATIONS (Continued)

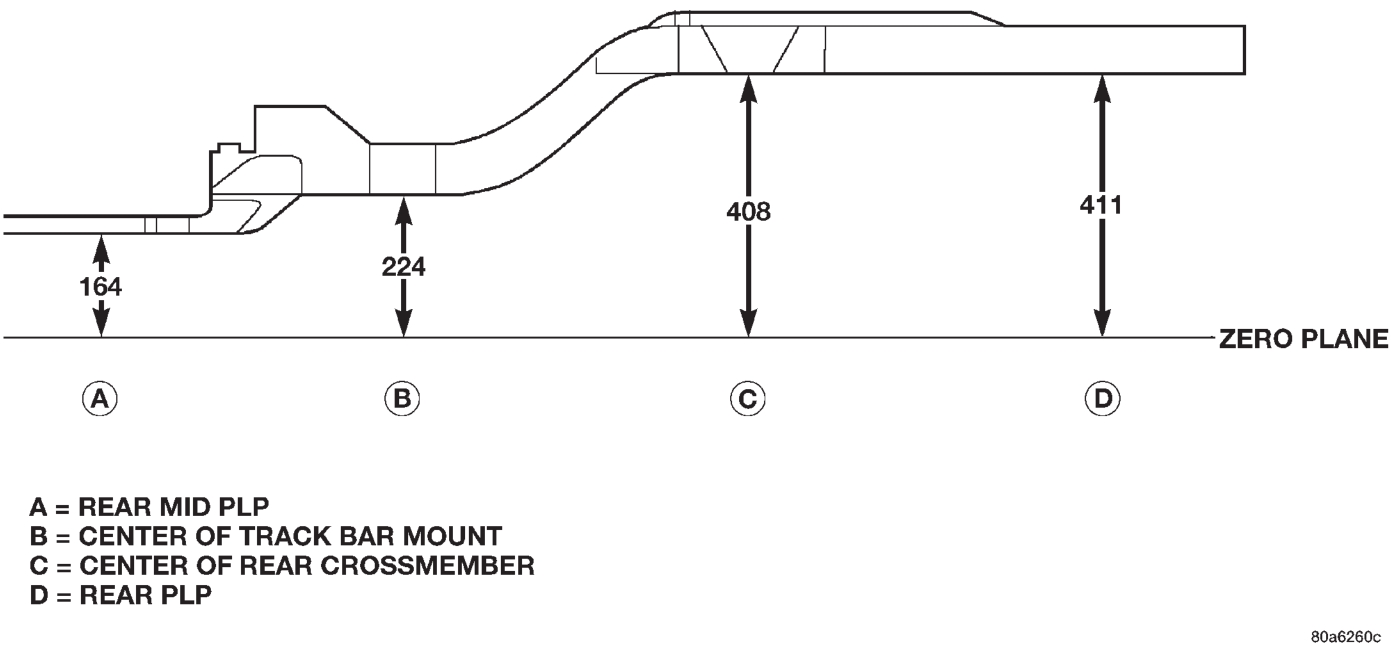


Fig. 6 Rear Frame Section Side View

SPECIFICATIONS (Continued)

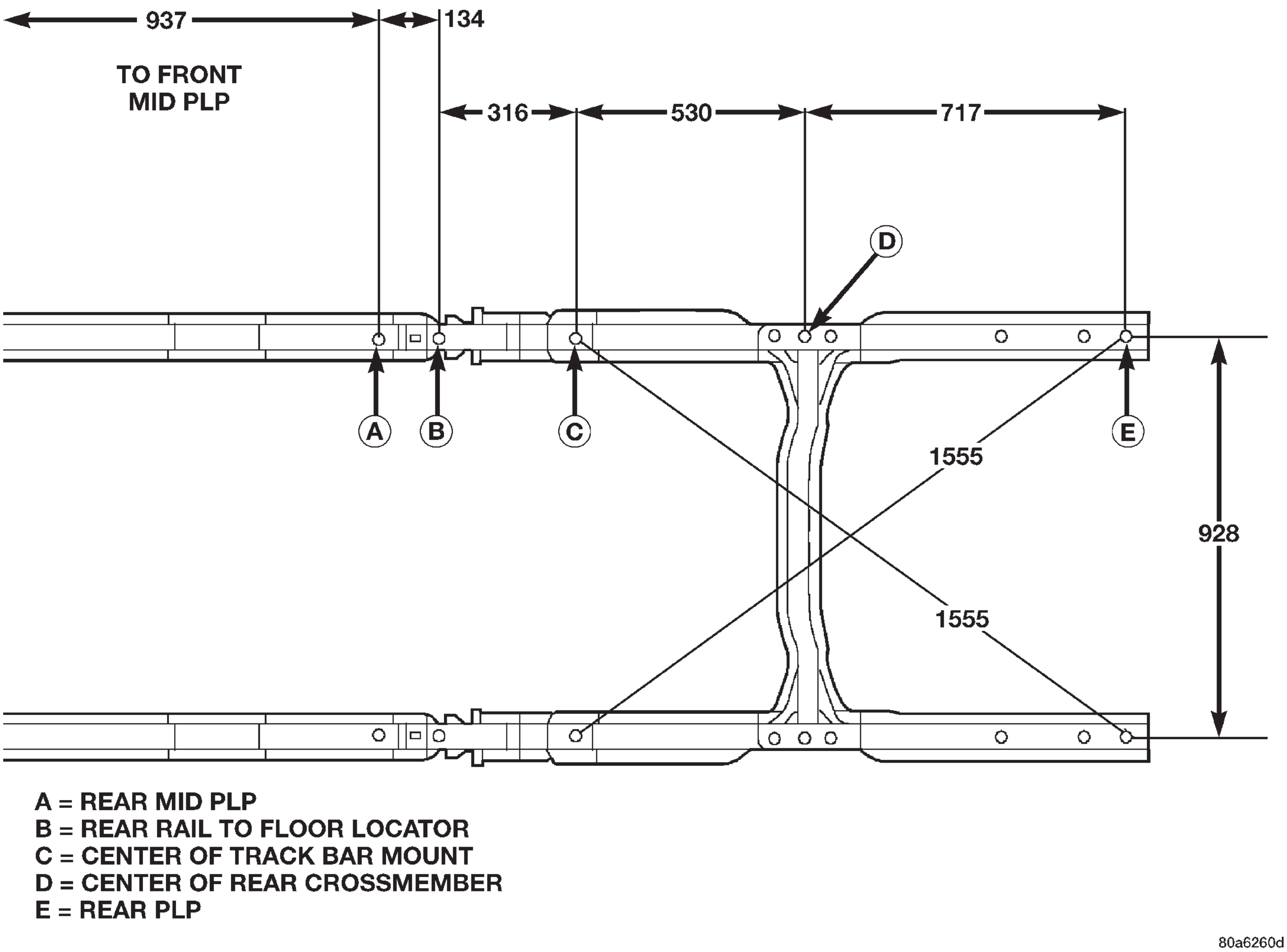


Fig. 7 Rear Frame Section Bottom View

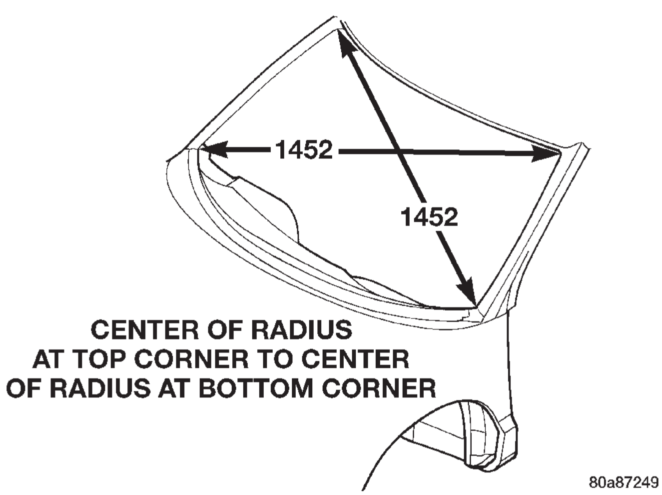


Fig. 8 Windshield Opening

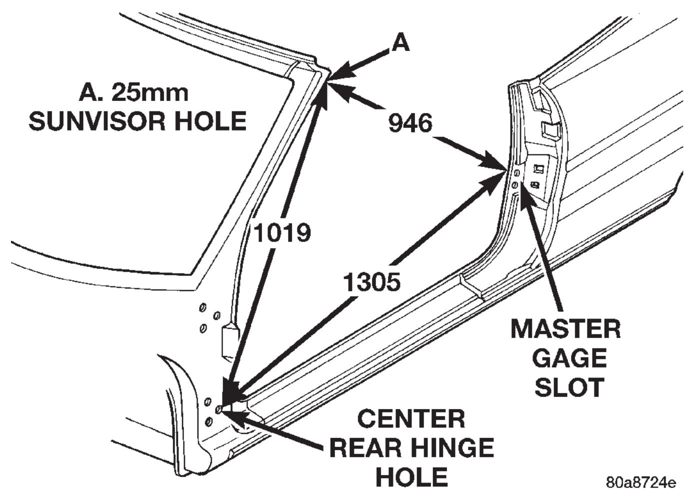
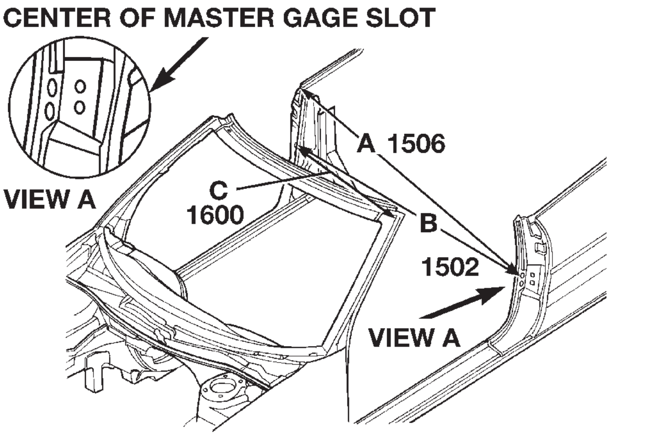


Fig. 9 Door Opening

SPECIFICATIONS (Continued)



A. DOOR OPENING PLP TO TOP CORNER OF OPPOSITE B-PILLAR.
B. DOOR OPENING PLP TO OPPOSITE DOOR OPENING PLP.
C. CENTER OF 25mm SUNVISOR HOLE TO OPPOSITE DOOR OPENING PLP.

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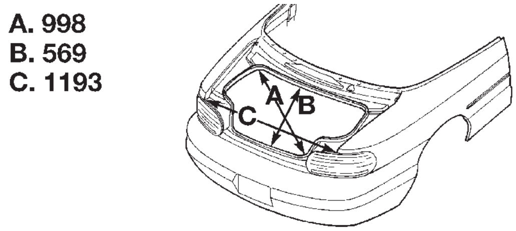
Fig. 10 Cross–Body Dimensions



A. CENTER OF DECK OPENING FRONT CORNER RADIUS TO REAR TAIL PANEL DECK OPENING RADIUS.
B. FRONT DECK OPENING WEATHERSTRIP FLANGE TO DECK OPENING TAIL PANEL WEATHERSTRIP FLANGE.
C. REAR OF QUARTER PANEL AT TAIL-LIGHT OPENING TO OPPOSITE POINT.

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Fig. 11 Trunk Opening

FUEL SYSTEM

CONTENTS

GENERAL INFORMATION

INDEX

GENERAL INFORMATION

INTRODUCTION

Throughout this group, references may be made to a particular vehicle by letter or number designation. A chart showing the breakdown of these designations is included in the Introduction Section at the front of this service manual.

The Evaporation Control System, is also considered part of the fuel system. The system reduces the emission of fuel vapor into the atmosphere.

The description and function of the Evaporation Control System is found in Group 25 of this manual.

FUEL REQUIREMENTS

Your vehicle was designed to meet all emission regulations and provide excellent fuel economy when using high quality unleaded gasoline.

Use unleaded gasolines having a minimum posted octane of 87.

If your vehicle develops occasional light spark knock (ping) at low engine speeds this is not harmful. However; continued heavy knock at high speeds can cause damage and should be reported to your dealer immediately. Engine damage as a result of heavy knock operation may not be covered by the new vehicle warranty.

In addition to using unleaded gasoline with the proper octane rating, those that contain detergents, corrosion and stability additives are recommended. Using gasolines that have these additives will help improve fuel economy, reduce emissions, and maintain vehicle performance.

Poor quality gasoline can cause problems such as hard starting, stalling, and stumble. If you experience these problems, try another brand of gasoline before considering service for the vehicle.

GASOLINE/OXYGENATE BLENDS

Some fuel suppliers blend unleaded gasoline with materials that contain oxygen such as alcohol, MTBE (Methyl Tertiary Butyl Ether) and ETBE (Ethyl Tertiary Butyl Ether). Oxygenates are required in some areas of the country during winter months to reduce carbon monoxide emissions. The type and amount of oxygenate used in the blend is important.

The following are generally used in gasoline blends:

Ethanol - (Ethyl or Grain Alcohol) properly blended, is used as a mixture of 10 percent ethanol and 90 percent gasoline. Gasoline blended with ethanol may be used in your vehicle.

MTBE/ETBE - Gasoline and MTBE (Methyl Tertiary Butyl Ether) blends are a mixture of unleaded gasoline and up to 15 percent MTBE. Gasoline and ETBE (Ethyl Tertiary Butyl Ether) are blends of gasoline and up to 17 percent ETBE. Gasoline blended with MTBE or ETBE may be used in your vehicle.

Methanol - Methanol (Methyl or Wood Alcohol) is used in a variety of concentrations blended with unleaded gasoline. You may encounter fuels containing 3 percent or more methanol along with other alcohols called cosolvents.

DO NOT USE GASOLINES CONTAINING METHANOL.

GENERAL INFORMATION (Continued)

Use of methanol/gasoline blends may result in starting and driveability problems and damage critical fuel system components.

Problems that are the result of using methanol/gasoline blends are not the responsibility of Chrysler Corporation and may not be covered by the vehicle warranty.

Reformulated Gasoline

Many areas of the country are requiring the use of cleaner-burning fuel referred to as **Reformulated Gasoline** . Reformulated gasolines are specially blended to reduce vehicle emissions and improve air quality.

Chrysler Corporation strongly supports the use of reformulated gasolines whenever available. Although your vehicle was designed to provide optimum performance and lowest emissions operating on high quality unleaded gasoline, it will perform equally well and produce even lower emissions when operating on reformulated gasoline.

Materials Added to Fuel

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain active solvents of similar ingredients that can be harmful to fuel system gasket and diaphragm materials.

FUEL DELIVERY SYSTEM

INDEX

DESCRIPTION AND OPERATION

FUEL DELIVERY SYSTEM

The front wheel drive car uses a plastic fuel tank located rear center of the vehicle.

The in-tank fuel pump module contains the fuel pump and pressure regulator. The pump is serviced as part of the fuel pump module. Refer to Fuel Pump Module.

The fuel delivery system contains a replaceable in-line filter. The filter attaches to the frame above the rear of the fuel tank. Refer to the Maintenance Schedules in the Introduction section of this manual for recommended fuel filter replacement intervals.

A returnless fuel system is used on all vehicles. Fuel is returned through the fuel pump module and back to the fuel tank. A separate fuel return line from the tank to the engine is no longer used.

Relieve fuel system pressure before servicing fuel system components. Refer to the Fuel System Pressure Release Procedure and follow all Cautions and Warnings. Most fuel system components attach to the fuel lines with quick connect fittings. Refer to Quick Connect Fittings in this section.

FUEL PUMP MODULE

The fuel pump module is installed in the top of the fuel tank (Fig. 1). The fuel pump module contains the following:

- Electric fuel pump
- Fuel pump reservoir
- Inlet strainer
- Fuel pressure regulator
- Fuel gauge sending unit
- Fuel supply line connection

The inlet strainer, fuel pressure regulator and fuel level sensor are the only serviceable items. If the fuel pump or electrical wiring harness requires service, replace the fuel pump module.

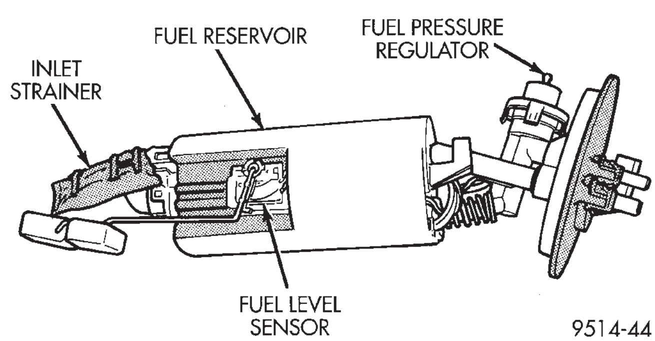


Fig. 1 Fuel Pump Module

DESCRIPTION AND OPERATION (Continued)

ELECTRIC FUEL PUMP

The electric fuel pump is located in and is part of the fuel pump module. It is a positive displacement, gerotor type, immersible pump with a permanent magnet electric motor. The pump draws fuel through a strainer and pushes it through the motor to the outlet. The pump contains one check valve. The check valve, in the pump outlet, maintains pump pressure during engine off conditions. The fuel pump relay provides voltage to the fuel pump.

The fuel pump has a maximum deadheaded pressure output of approximately 635 kPa (95 psi). The regulator adjusts fuel system pressure to approximately 338 kPa (49 psi).

FUEL PUMP ELECTRICAL CONTROL

Voltage to operate the electric pump is supplied through the fuel pump relay. For an electrical operational description of the fuel pump refer to fuel Pump Relay—PCM Output.

ELECTRICAL PUMP REPLACEMENT

The electric fuel pump is not serviceable. If the fuel pump or electrical wiring harness needs replacement, the complete fuel pump module must be replaced. Perform the Fuel System Pressure Release procedure before servicing the fuel pump.

FUEL LEVEL SENSOR

The level sensor is attached to the side of the fuel pump module. The level sensor consists of a float, an arm, and a variable resistor. As the fuel level increases, the float and arm move up. This decreases the sending unit resistance, causing the fuel gauge on the instrument panel to read full.

FUEL TANK

The fuel tanks of all Chrysler Motors built vehicles are equipped with fuel and vapor controls that allow the vehicle to pass a full 360° rollover without fuel leakage.

Front Wheel Drive fuel delivery systems contain a fuel tank rollover valve. The valve is mounted on top of the fuel tank. The valve functions as a tank pressure control valve while the vehicle is upright, but contains a check valve that prevents fuel from escaping from the fuel tank when the vehicle is turned over.

The fuel filler cap acts as a pressure/vacuum relief valve. When air pressure inside the fuel tank gets too high or too low, the fuel filler cap opens to relieve the difference in pressure.

An evaporation control system restricts fuel evaporation into the atmosphere and reduces unburned hydrocarbons. Vapors from the fuel tank are collected in a charcoal filled canister. The vapors are held in the canister until the engine is operating. When the engine is running, the vapors are drawn through the intake manifold into the combustion chambers.

FUEL INJECTORS

The fuel injectors are 12 ohm electrical solenoids (Fig. 2). The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a hollow cone. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber. The injectors are positioned in the intake manifold.

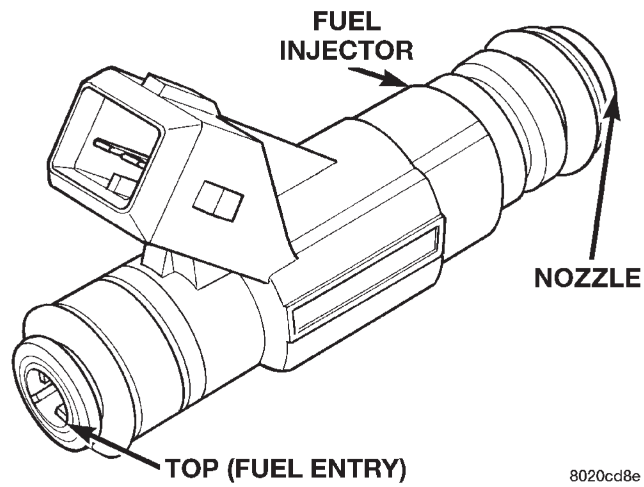


Fig. 2 Fuel Injector

The injectors are positioned in the intake manifold with the nozzle ends directly above the intake valve port (Fig. 3).

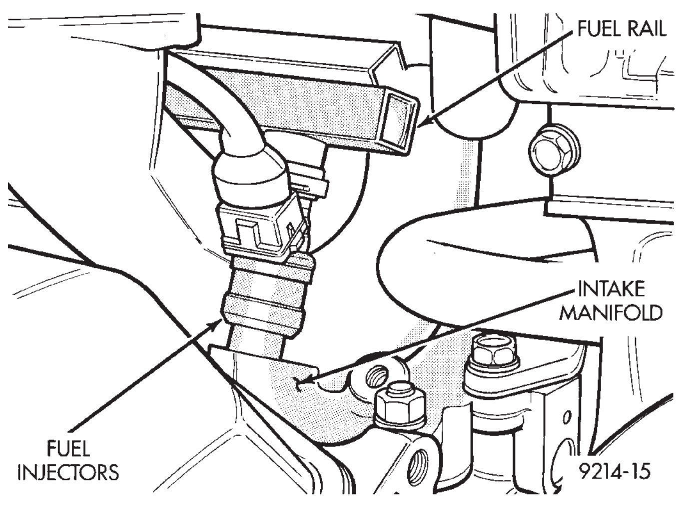


Fig. 3 Fuel Injector Location—Typical

FUEL PRESSURE REGULATOR

The fuel system uses a nonadjustable pressure regulator that maintains fuel system pressure at approximately 338 kPa (49 psi). The fuel pressure regulator contains a diaphragm, calibrated spring and a fuel return valve. The spring pushes down on

DESCRIPTION AND OPERATION (Continued)

the diaphragm and closes off the fuel return port. System fuel pressure reflects the amount of fuel pressure required to open the return port.

The pressure regulator is a mechanical device that is NOT controlled by the PCM or engine vacuum.

PRESSURE-VACUUM FILLER CAP

The loss of any fuel or vapor out of the filler tube neck is prevented by the use of a safety filler cap. The cap releases only under significant pressure 10.9 to 13.45 kPa (1.58 to 1.95 psi). The vacuum release for all gas caps is between .97 and 2.0 kPa (.14 and .29 psi). The cap must be replaced by a similar unit in order for the system to remain effective.

WARNING: REMOVE FUEL FILLER TUBE CAP TO RELIEVE TANK PRESSURE BEFORE REMOVING OR REPAIRING FUEL SYSTEM COMPONENTS.

Vehicle	Liters	U.S. Gallons
JX	60.0	16.0
Nominal refill capacities are shown. A variation may be observed from vehicle due to manufacturing tolerance and refill procedure.		

QUICK-CONNECT FITTINGS

Different types of quick-connect fittings are used to attach various fuel system components. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Refer to the Removal/Installation section for more information.

CAUTION: The interior components (o-rings, spacers) of quick-connect fitting are not serviced separately. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

Fuel tubes connect fuel system components with plastic quick-connect fuel fittings. The fitting contains non-serviceable O-ring seals (Fig. 4).

CAUTION: Quick-connect fittings are not serviced separately. Do not attempt to repair damaged quick-connect fittings or fuel tubes. Replace the complete fuel tube/quick-connect fitting assembly.

The quick-connect fitting consists of the O-rings, retainer and casing (Fig. 4). When the fuel tube enters the fitting, the retainer locks the shoulder of the nipple in place and the O-rings seal the tube.

ROLLOVER VALVES

All vehicles have 2 rollover valves on top of the fuel tank. The valves prevent fuel flow through the fuel tank vent valve hoses should the vehicle rollover.

The rollover valves on the fuel tank are not serviceable.

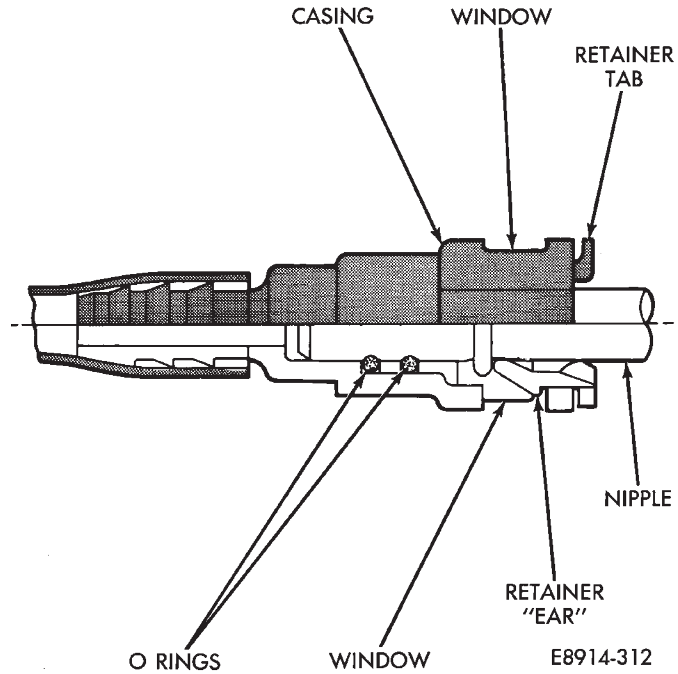


Fig. 4 Plastic Quick-Connect Fittings

DIAGNOSIS AND TESTING

FUEL PUMP PRESSURE TEST—2.4L ENGINES

The fuel system operates at approximately 338 kPa (48 psi). Check fuel system pressure at the test port on the fuel rail.

(1) Remove cap from fuel pressure test port on fuel rail.

(2) Connect Fuel Pressure Gauge C-4799B to test port (Fig. 5).

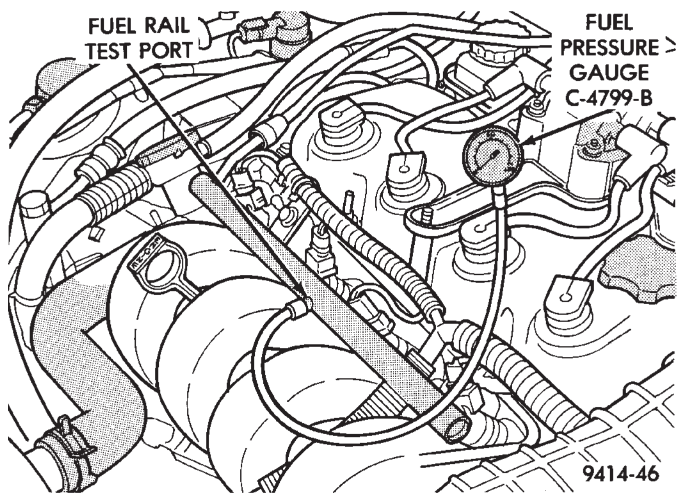


Fig. 5 Checking Fuel Pressure at Intake Manifold

CAUTION: When using the ASD Fuel System Test, the ASD relay and fuel pump relay remain energized for 7 minutes or until the test is stopped, or until the ignition switch is turned to the Off position.

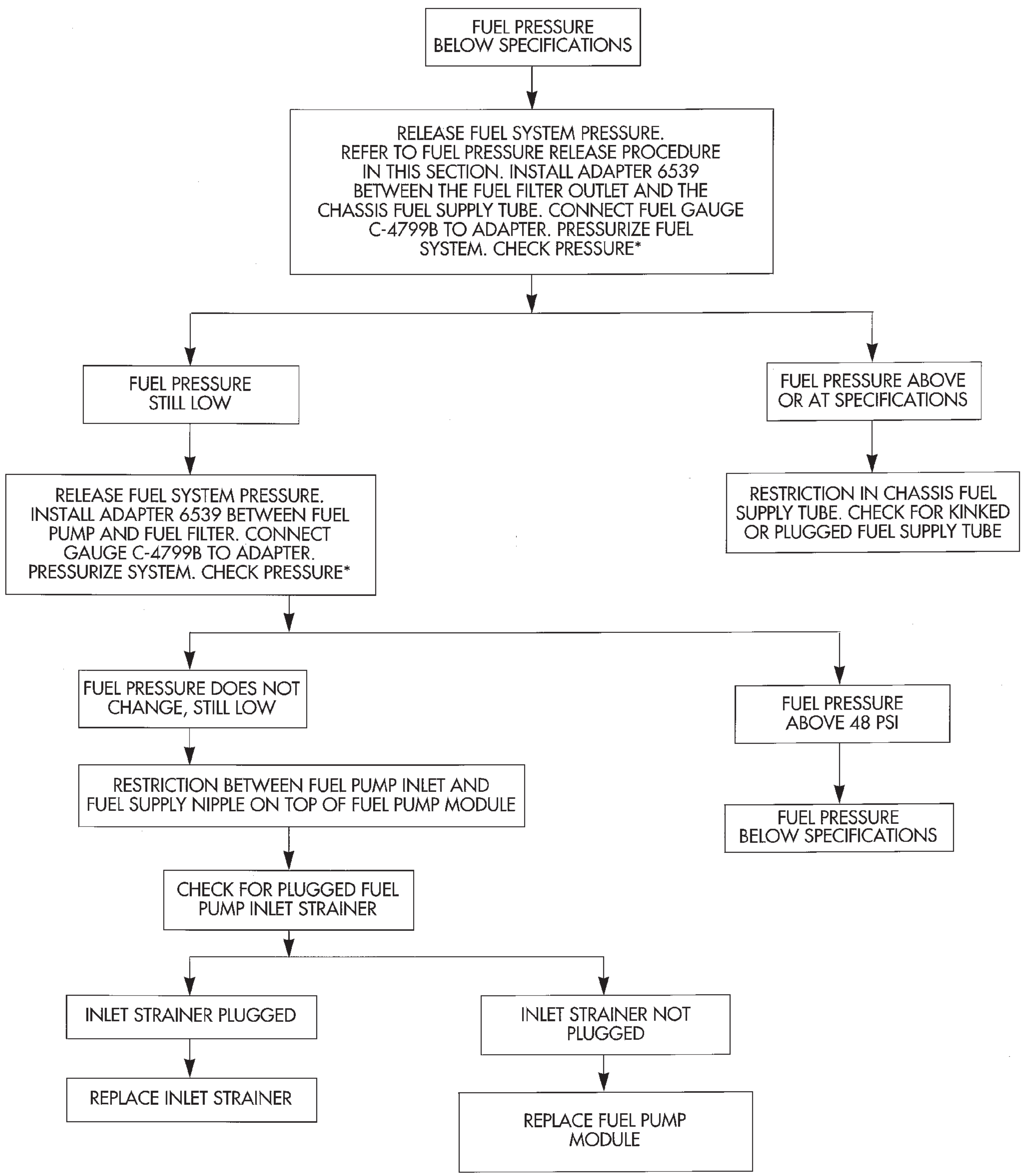
DIAGNOSIS AND TESTING (Continued)

(3) Place ignition key in the ON position. Using DRB scan tool, access ASD Fuel System Test. The ASD Fuel System Test will activate the fuel pump and pressurize the system.

- If the gauge reading equals 338 kPa (48 psi) further testing is not required. If pressure is not correct, record the pressure.
- If pressure is above specifications, check for a kinked or restricted fuel return tube (from filter to pump module). If the fuel return tube is not pinched or restricted, replace the fuel pressure regulator.
- If fuel pressure is below specifications, refer to the diagnosis chart for Fuel Pressure Below Specifications.

DIAGNOSIS AND TESTING (Continued)

FUEL PRESSURE BELOW SPECIFICATIONS



*Pressure gauge should rise rapidly. If pressure rises slowly, inlet strainer is plugged enough to cause drive ability problems.

9514-126

DIAGNOSIS AND TESTING (Continued)

FUEL PUMP PRESSURE TEST—2.5L ENGINE

WARNING: FUEL SYSTEM PRESSURE MUST BE RELEASED BEFORE A FUEL SYSTEM HOSE OR COMPONENT IS DISCONNECTED.

The fuel system operates at approximately 338 kPa (49±2 psi).

(1) Perform fuel system pressure release procedure.

(2) Remove fuel supply hose quick connector from the chassis line (at the engine). Refer to Quick Connect Fittings in this section.

(3) Connect Fuel Pressure Gauge C-4799 to Fuel Pressure Test Adapter 6539 (Fig. 6). Install the adapter between fuel supply hose and chassis fuel line assembly.

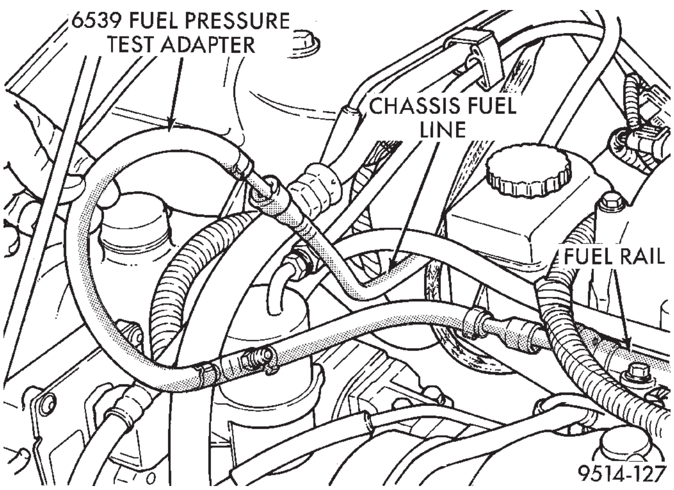


Fig. 6 Fuel Pressure Test Adapter

CAUTION: When using the ASD Fuel System Test, the ASD relay and fuel pump relay remain energized for 7 minutes or until the test is stopped, or until the ignition switch is turned to the Off position.

(4) Place the ignition key in the ON position. Using the DRB scan tool, access ASD Fuel System Test. The ASD Fuel System Test will activate the fuel pump and pressurize the system.

• If the gauge reading equals 338 kPa (49±2 psi) further testing is not required. If pressure is not correct, record the pressure.

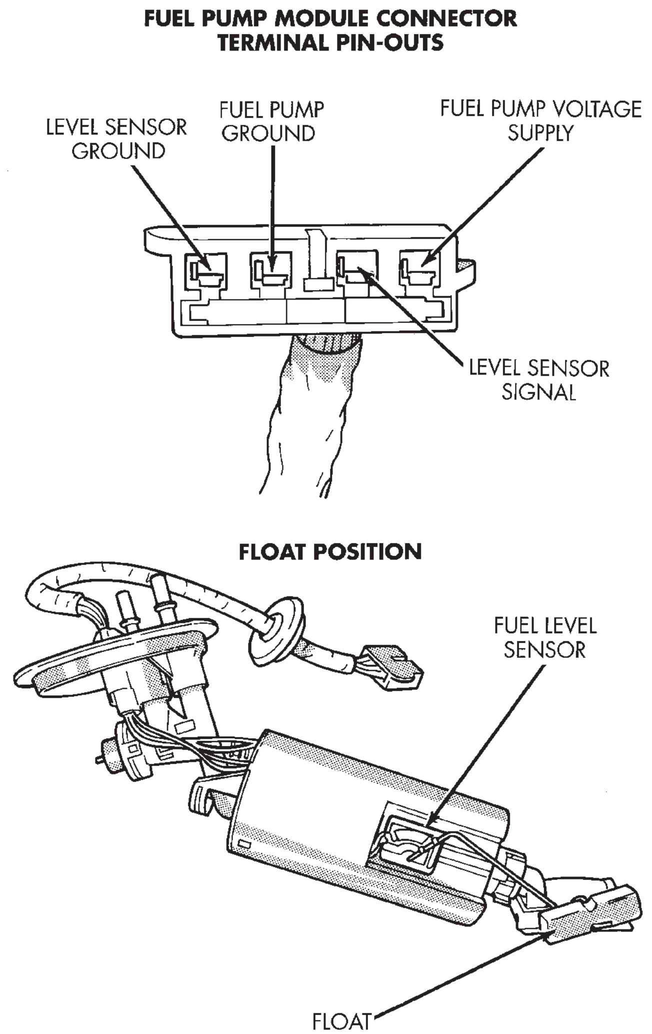
• If pressure is above specifications, check for a kinked or restricted fuel return tube (from filter to pump module). If the fuel return tube is not pinched or restricted, replace the fuel pressure regulator.

• If pressure is below specifications, refer to Fuel Pressure Below Specifications chart.

FUEL LEVEL SENSOR

This procedure tests the resistance of the level sensor itself. It does not test the level sensor circuit. Refer to Group 8W - Wiring Diagrams for circuit identification.

The level sensor is a variable resistor. Its resistance changes with the amount of fuel in the tank. The float arm attached to the sensor moves as the fuel level changes. To test the level sensor, connect an ohmmeter across the sensor signal and sensor ground terminals of the fuel pump module connector (Fig. 7). Move the float lever over the entire range to the positions shown in the resistance chart (Fig. 7). **Record the resistance at each end point. Replace the level sensor if the resistance is not within specifications, or an open circuit is noted during the entire range inspection.**



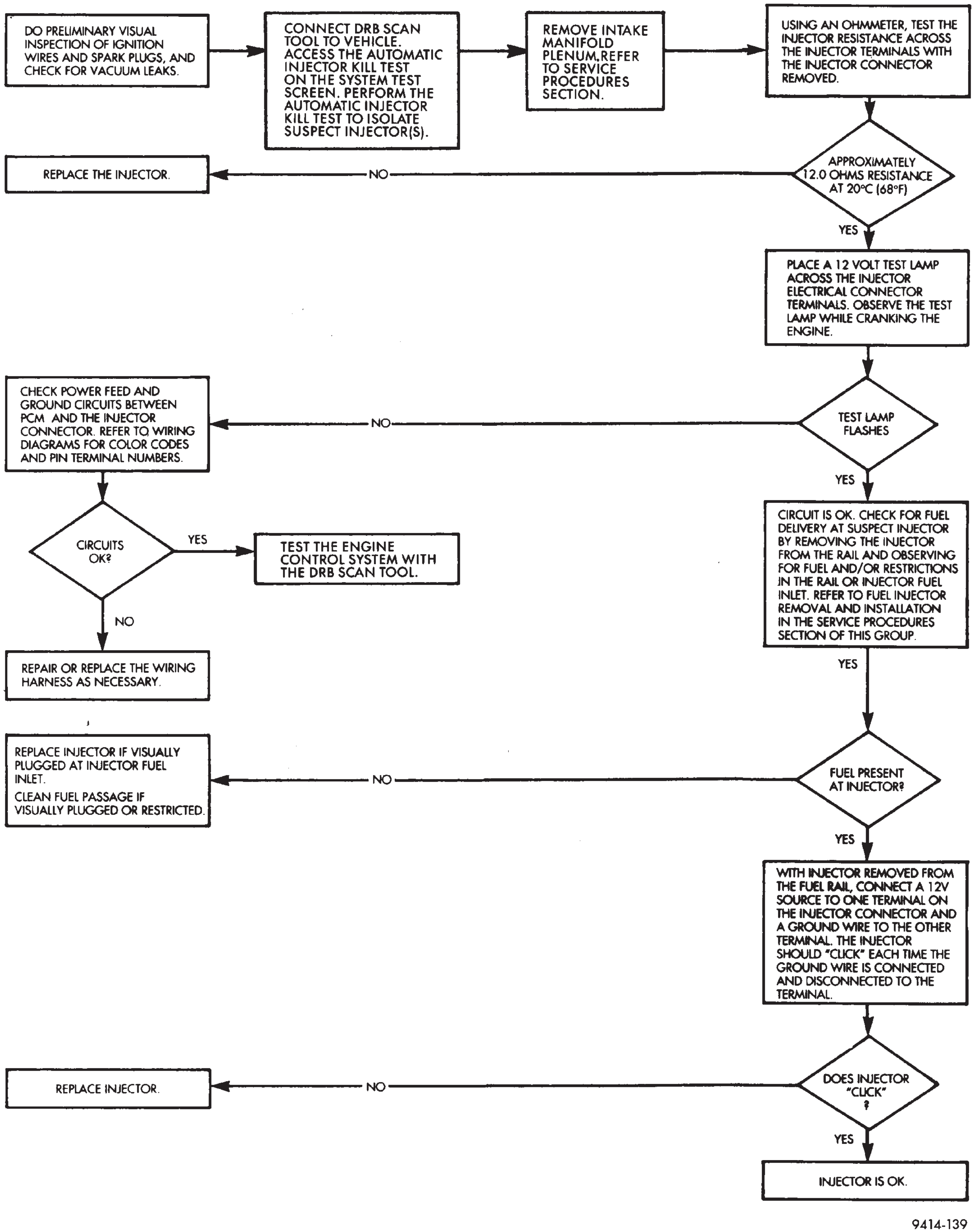
FLOAT POSITION (HEIGHT)	RESISTANCE
SENSOR FULL STOP	50 OHMS MINIMUM
SENSOR EMPTY STOP	1050 ± 10 OHMS

9514-120

Fig. 7 Level Sensor Diagnosis

FUEL INJECTORS

For fuel injector diagnosis, refer to the Fuel Injector Diagnosis charts. For poor fuel economy diagnosis or engine miss, also refer to Transmission Driveplate in this section.



FUEL INJECTOR DIAGNOSIS

SERVICE PROCEDURES

FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.4L

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

(1) Disconnect negative cable from auxiliary jumper terminal.
(2) Remove fuel filler cap.
(3) Remove protective cap from fuel pressure test port on fuel rail (Fig. 8).

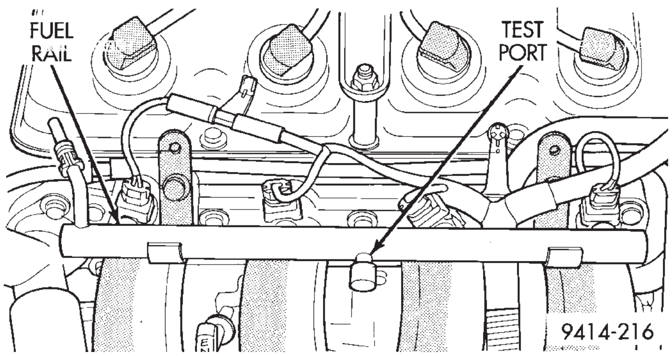


Fig. 8 Fuel Pressure Test Port—Typical

(4) Place open end of fuel pressure release hose, Special Tool number C-4799-1, into an approved gasoline container. Connect other end of hose C-4799-1 to fuel pressure test port (Fig. 9). Fuel pressure will bleed off through the hose into the gasoline container. Fuel gauge C-4799-A contains hose C-4799-1.

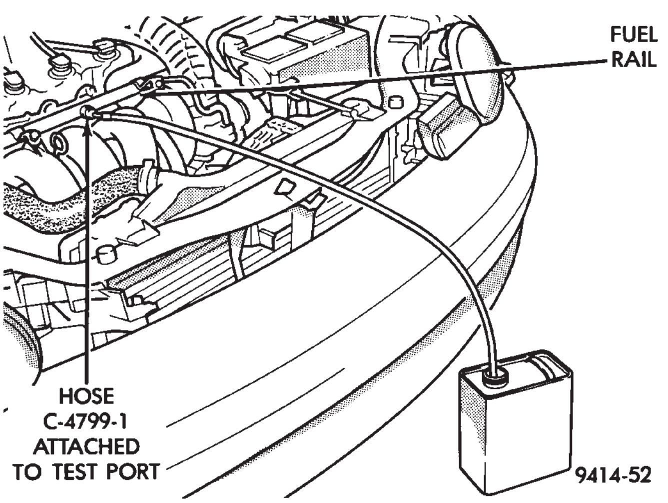


Fig. 9 Releasing Fuel Pressure

FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.5L

CAUTION: Do not attempt to start the engine for several minutes to avoid hydrostatic lock.

(1) Disconnect the fuel rail electrical harness from the engine harness. Refer to Group 8W, Wiring Diagrams.
(2) Connect one end of a jumper wire to the A142 circuit terminal of the fuel rail harness connector.
(3) Connect the other end of the jumper wire to a 12 volt power source.
(4) Connect one end of a jumper wire to a good ground source.
(5) Momentarily ground one of the injectors by connecting the other end of the jumper wire to an injector terminal in the harness connector. Repeat procedure for 2 to 3 injectors.

FUEL TANK DRAINING

(1) Remove fuel cap slowly to release tank pressure.
(2) With vehicle on a hoist, drain fuel from tank. Support fuel tank with a support such as a transmission jack stand.
(3) Position a fuel approved container, with a capacity of at least 16 gallons, under the drain plug located on the bottom left edge of the tank.
(4) Remove drain plug and allow fuel to drain (Fig. 10).

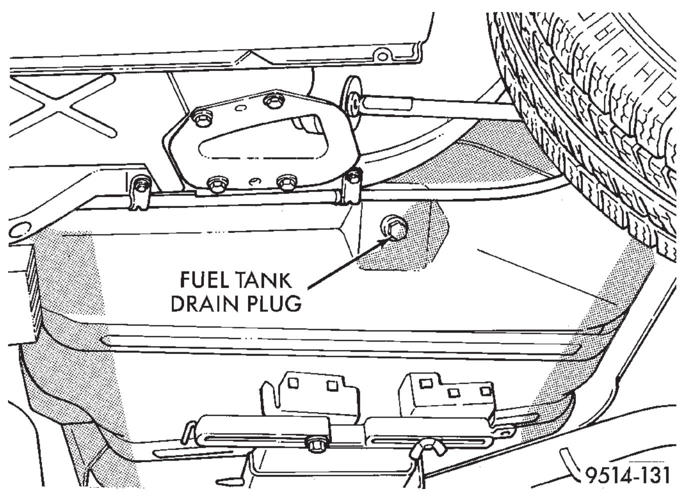


Fig. 10 Fuel Tank Drain Plug

WARNING: DRAIN PLUG MUST BE INSTALLED AT THIS TIME AS THERE WILL BE 1 TO 2 GALLONS OF FUEL LEFT IN THE TANK.

(5) When tank is no longer draining, install drain plug. Tighten plug to 32 in. lbs.

SERVICE PROCEDURES (Continued)

HOSES AND CLAMPS

Inspect all hose connections (clamps and quick connect fittings) for completeness and leaks. Replace cracked, scuffed, or swelled hoses. Replace hoses that rub against other vehicle components or show sign of wear.

Fuel injected vehicles use specially constructed hoses. When replacing hoses, only use hoses marked EFM/EFI.

When installing hoses, ensure that they are routed away from contact with other vehicle components that could rub against them and cause failure. Avoid contact with clamps or other components that cause abrasions or scuffing. Ensure that rubber hoses are properly routed and avoid heat sources.

The hose clamps have rolled edges to prevent the clamp from cutting into the hose. Only use clamps that are original equipment or equivalent. Other types of clamps may cut into the hoses and cause high pressure fuel leaks. Tighten hose clamps to 1 N·m (10 in. lbs.) torque.

QUICK-CONNECT FITTINGS

REMOVAL

When disconnecting a quick-connect fitting, the retainer will remain on the fuel tube nipple.

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE DISCONNECTING A QUICK-CONNECT FITTINGS. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE.

(1) Disconnect negative cable from battery.

(2) Perform Fuel Pressure Release Procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Squeeze retainer tabs together and pull fuel tube/quick-connect fitting assembly off of fuel tube nipple. The retainer will remain on fuel tube.

INSTALLATION

CAUTION: Never install a quick-connect fitting without the retainer being either on the fuel tube or already in the quick-connect fitting. In either case, ensure the retainer locks securely into the quick-connect fitting by firmly pulling on fuel tube and fitting to ensure it is secured.

(1) Using a clean lint free cloth, clean the fuel tube nipple and retainer.

(2) Prior to connecting the fitting to the fuel tube, coat the fuel tube nipple with clean 30 weight engine oil.

(3) Push the quick-connect fitting over the fuel tube until the **retainer seats and a click is heard.**

(4) The plastic quick-connect fitting has windows in the sides of the casing. When the fitting completely attaches to the fuel tube, the retainer locking ears and the fuel tube shoulder are visible in the windows. If they are not visible, the retainer was not properly installed (Fig. 11). **Do not rely upon the audible click to confirm a secure connection.**

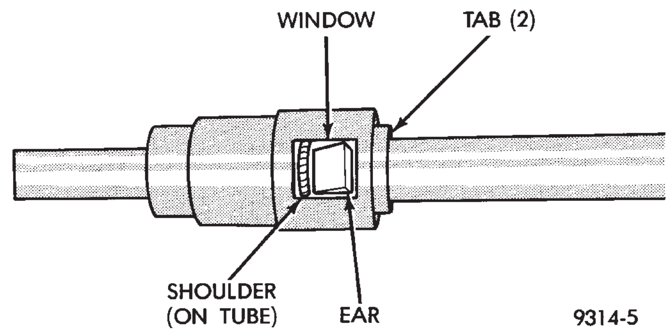


Fig. 11 Plastic Quick-Connect Fitting/Fuel Tube Connection

CAUTION: When using the ASD Fuel System Test, the Auto Shutdown (ASD) Relay remains energized for either 7 minutes, until the test is stopped, or until the ignition switch is turned to the Off position.

(5) Use the DRB scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

PLASTIC RETAINER RING TYPE FITTING

This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 12) usually black in color.

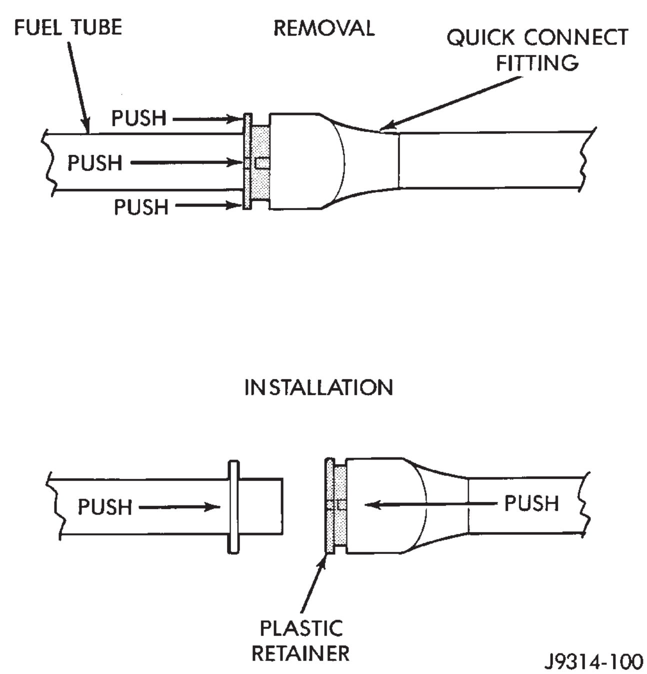


Fig. 12 Plastic Retainer Ring Type Fitting

SERVICE PROCEDURES (Continued)

CAUTION: The interior components (o-rings, spacers, retainers) of this type of quick-connect fitting are not serviced separately. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP.

DISCONNECTION/CONNECTION

(1) Disconnect negative battery cable from the battery.

(2) Perform the fuel pressure release procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Clean the fitting of any foreign material before disassembly.

(4) To release the fuel system component from the quick-connect fitting, firmly push the fitting towards the component being serviced while firmly pushing the plastic retainer ring into the fitting (Fig. 12). With the plastic ring depressed, pull the fitting from the component. **The plastic retainer ring must be pressed squarely into the fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on the shoulder of the plastic retainer ring to aid in disconnection.**

(5) After disconnection, the plastic retainer ring will remain with the quick-connect fitting connector body.

(6) Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

(7) Prior to connecting the quick-connect fitting to component being serviced, check condition of fitting and component. Clean the parts with a lint-free cloth. Lubricate them with clean engine oil.

(8) Insert the quick-connect fitting into the component being serviced until a click is felt.

(9) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(10) Connect negative battery cable to battery.

(11) Start engine and check for leaks.

REMOVAL AND INSTALLATION

AUTOMATIC SHUTDOWN RELAY

The relay is located in the Power Distribution Center (PDC) (Fig. 13). The PDC is located next to the battery in the engine compartment. For the location of the relay within the PDC, refer to the PDC cover for location. Check electrical terminals for corrosion and repair as necessary.

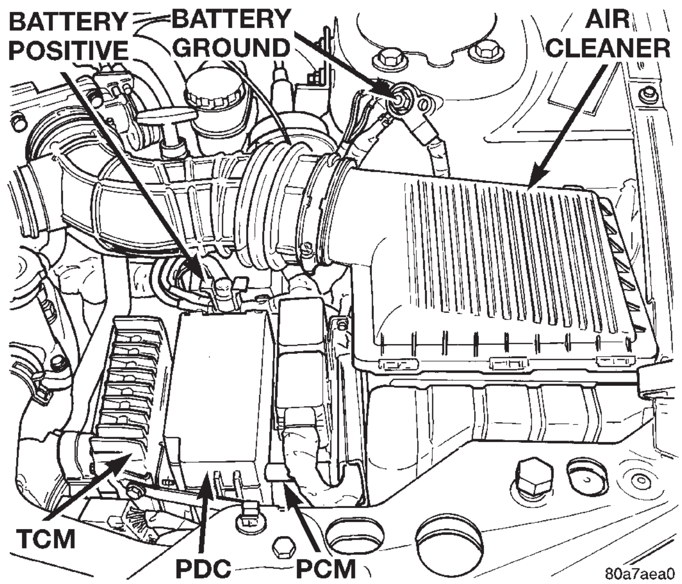


Fig. 13 Power Distribution Center (PDC)

FUEL PUMP RELAY

The fuel pump relay is located in the PDC. The inside top of the PDC cover has a label showing relay and fuse location.

FUEL PUMP MODULE

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

REMOVAL

(1) Remove fuel filler cap and perform Fuel System Pressure Release procedure. Refer to Fuel Delivery System in this Group.

(2) Disconnect negative cable from auxilary jumper terminal.

(3) Remove fuel tank. Refer to Fuel Tank in this group.

(4) Disconnect fuel filter lines from fuel pump module.

(5) Clean top of tank to remove loose dirt and debris.

REMOVAL AND INSTALLATION (Continued)

(6) Using Special Tool #6856 Fuel Pump Module Ring Spanner, remove locknut to release pump module (Fig. 14).

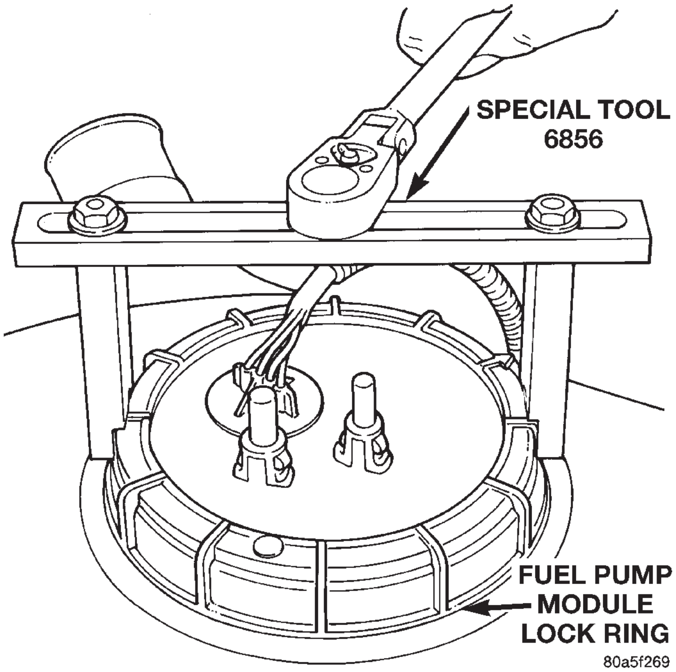


Fig. 14 Fuel Pump Module Locknut

WARNING: THE FUEL RESERVOIR OF THE FUEL PUMP MODULE DOES NOT EMPTY OUT WHEN THE TANK IS DRAINED. THE FUEL IN THE RESERVOIR MAY SPILL OUT WHEN THE MODULE IS REMOVED.

(7) Remove fuel pump module and O-ring from tank (Fig. 15). Discard O-ring.

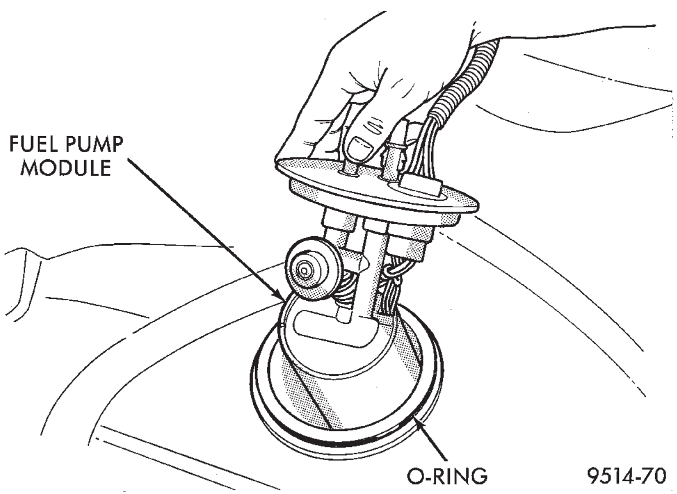


Fig. 15 Fuel Pump Module Removal

INSTALLATION

(1) Wipe seal area of tank clean. Place a new O-ring on the ledge between the tank threads and the pump module opening.

(2) Position fuel pump module in tank. Make sure the alignment tab on the underside of the pump module flange sits in the corresponding notch in the fuel tank.

CAUTION: Over tightening the pump lock ring may result in a leak.

(3) While holding the pump module in position, install locknut. Tighten locknut to 61 N·m (45 ft. lbs) torque using special tool #6856.

(4) Install fuel tank and fuel filter. Refer to Fuel Tank in this group.

(5) Fill fuel tank with clean fuel. Check for leaks.

(6) Install negative cable to auxiliary jumper terminal.

FUEL FILTER

The fuel filter mounts to the frame above the rear of the fuel tank. The inlet and outlet tubes are permanently attached to the filter.

REMOVAL

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE DISCONNECTING QUICK- CONNECT FITTINGS AT FUEL FILTER AND FUEL PUMP MODULE. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE

(1) Release fuel system pressure. Refer to Fuel Pressure Release Procedure in this section.

(2) From inside trunk, disconnect fuel pump module wiring jumper from main body harness. The 4 pin connector is located under the trunk mat on the left side of trunk near the base of the shock tower. Locate body grommet for jumper near base of rear seat. Push grommet out and feed jumper completely through hole in body.

(3) Remove fuel cap slowly to release tank pressure.

(4) With vehicle on a hoist, drain fuel from tank. Support fuel tank with a support such as a transmission jack stand.

(5) Position a fuel approved container, with a capacity of at least 16 gallons, under the drain plug located on the bottom left edge of the tank.

(6) Remove drain plug and allow fuel to drain.

WARNING: Drain plug must be installed at this time as there will be 1 to 2 gallons of fuel left in the tank.

(7) When tank is no longer draining, install drain plug. Tighten plug to 32 in. lbs.

(8) Remove driver's side fuel tank strap. Loosen, do not remove, passenger side fuel tank strap allowing fuel tank fill neck to touch rear suspension crossmember.

REMOVAL AND INSTALLATION (Continued)

WARNING: WRAP SHOP TOWELS AROUND HOSES TO CATCH ANY GASOLINE SPILLAGE.

(9) Disconnect fuel lines from fuel pump module (Fig. 16). These are quick connect fittings. Refer to Quick Connect Fittings in this section.

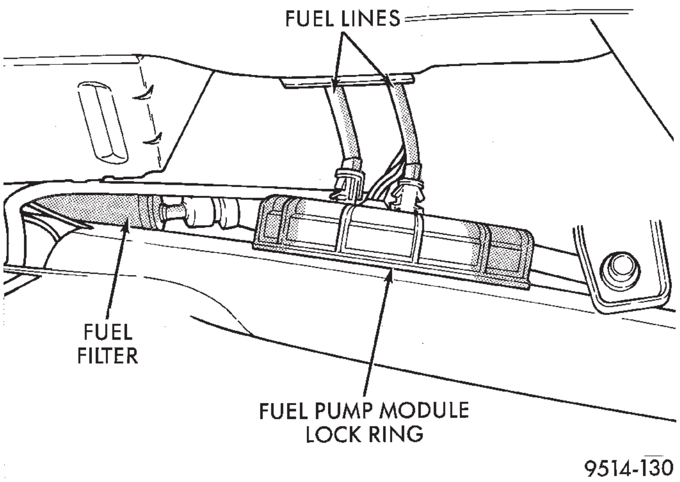


Fig. 16 Fuel Lines at Fuel Pump Module

(10) Disconnect fuel supply line from the fuel brake module.
(11) Remove fuel filter (Fig. 17).

INSTALLATION

The fuel supply (to filter) tube, return tube (to pump module) are permanently attached to the fuel filter. The ends of the fuel supply and return tubes have different size quick-connect fittings. The larger quick-connect fitting connects to the large nipple (supply side) on the fuel pump module. The smaller quick-connect fitting attaches to the small nipple (return side) on the fuel pump module.

(1) Apply a light coating of clean 30 weight engine oil to the fuel filter nipples. Install fuel tubes. Refer to Fuel Tubes and Quick-Connect Fittings in this section.

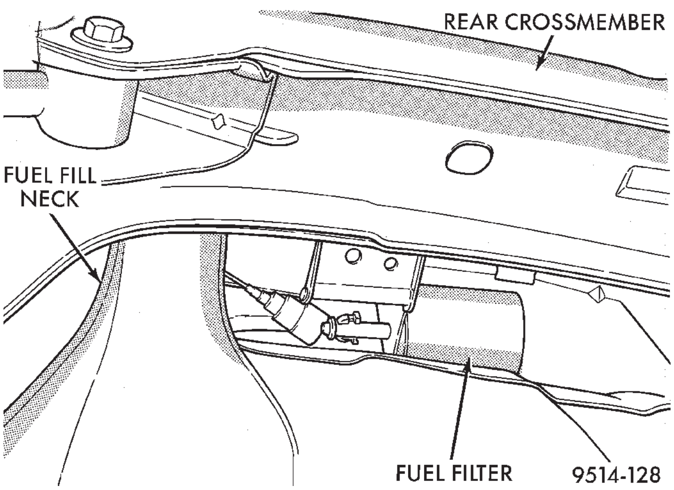


Fig. 17 Fuel Filter

(2) Install fuel tank, filter and tank straps, install the front bolts first and then the rear bolts. Torque tank strap bolts to 23 N·m (250. in. lbs.). **Make sure pump module harness grommet is installed in body as tank is raised into position.**
(3) Lower vehicle and connect pump module connector.
(4) Fill tank with fuel.
(5) Connect negative cable to auxiliary jumper terminal.

FUEL PRESSURE REGULATOR

The fuel pressure regulator is part of the fuel pump module (Fig. 18). Remove the fuel pump module from the fuel tank to access the fuel pressure regulator.

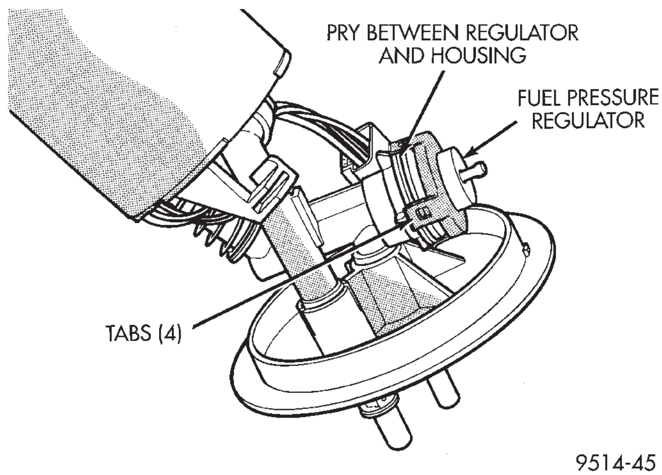


Fig. 18 Fuel Pressure Regulator

WARNING: FUEL SYSTEM PRESSURE MUST BE RELEASED BEFORE SERVICING ANY FUEL SYSTEM COMPONENT. PERFORM THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

REMOVAL

(1) Spread tangs on pressure regulator retainer (Fig. 18).
(2) Pry fuel pressure regulator out of housing.
(3) Ensure both upper and lower O-rings were removed with regulator.

INSTALLATION

(1) Lightly lubricate the O-rings with clean engine oil and place them into opening in pump module (Fig. 19).
(2) Push regulator into opening in pump module.
(3) Fold tangs on regulator retainer over tabs on housing.

REMOVAL AND INSTALLATION (Continued)

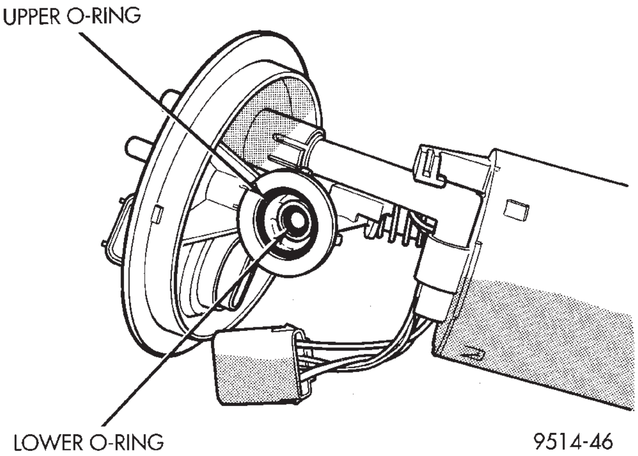


Fig. 19 Fuel Pressure Regulator O-rings

FUEL PUMP INLET STRAINER

REMOVAL

(1) Remove fuel pump module. Refer to Fuel Pump Module Removal in this section.

(2) Using a thin straight blade screwdriver, carefully pry back the locking tabs on fuel pump reservoir and remove the strainer (Fig. 20).

(3) Remove strainer O-ring from the fuel pump reservoir body.

(4) Remove any contaminants by washing the inside of the fuel tank.

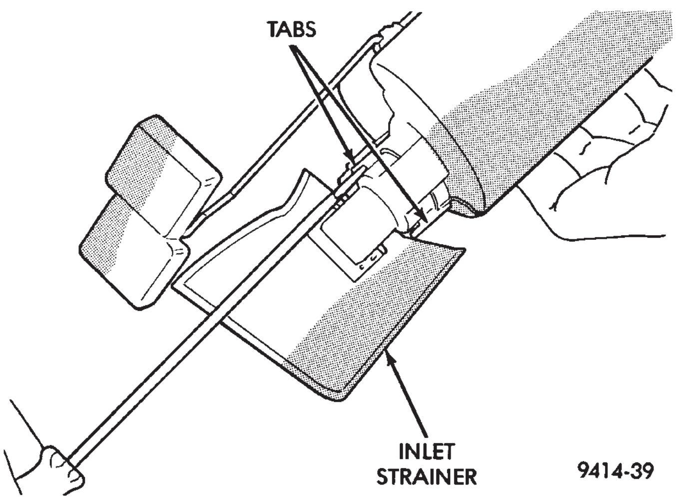


Fig. 20 Inlet Strainer Removal

INSTALLATION

(1) Lubricate the strainer O-ring with clean motor oil.

(2) Insert strainer O-ring into outlet of strainer so that it sits evenly on the step inside the outlet.

(3) Push strainer onto the inlet of the fuel pump reservoir body. Make sure the locking tabs on the reservoir body lock over the locking tangs on the strainer.

(4) Install fuel pump module. Refer to Fuel Pump Module Installation in this section.

FUEL LEVEL SENSOR

REMOVAL

Remove fuel pump module. Refer to Fuel Pump Module in this section.

(1) Depress retaining tab and remove the fuel pump/level sensor connector from the **BOTTOM** of the fuel pump module electrical connector (Fig. 21).

NOTE: The pump module harness on TOP of flange is not serviceable or removable.

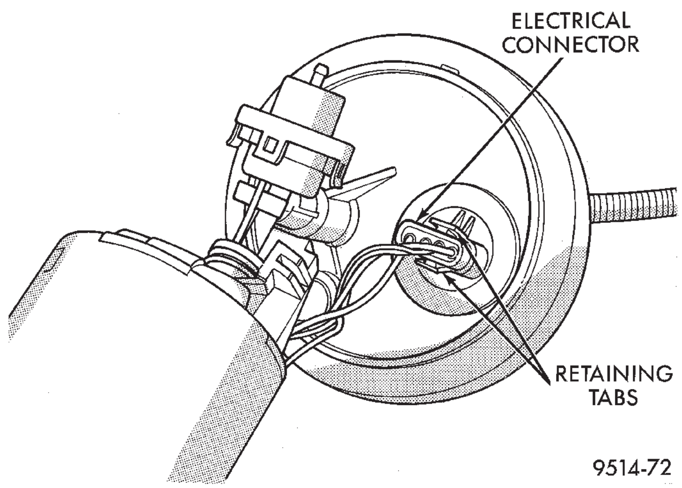


Fig. 21 Fuel Pump/Level Sensor Electrical Connector

(2) Using Special Tool C-4334 terminal remover or equivlant, remove terminals from level sensor connector (Fig. 22).

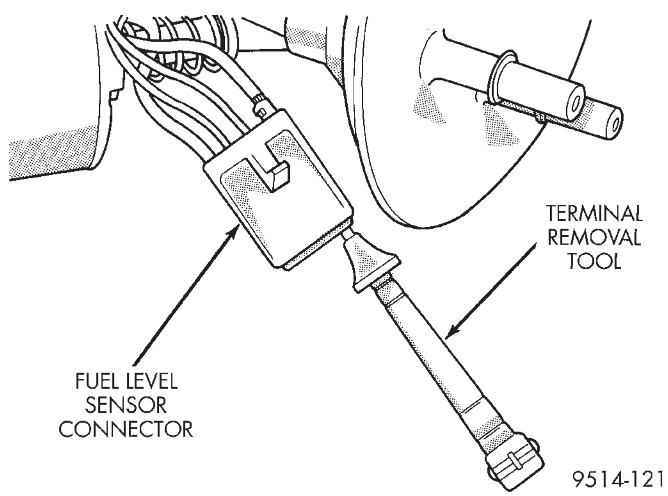


Fig. 22 Terminal Removal Tool

REMOVAL AND INSTALLATION (Continued)

(3) Insert a screwdriver between the fuel pump module and the top of the level sensor housing (Fig. 23). Push level sensor down slightly.

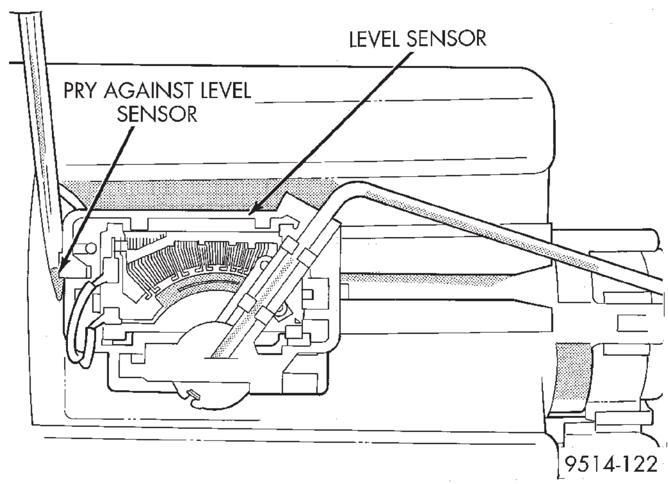


Fig. 23 Loosening Level Sensor

(4) Slide level sensor wires through opening fuel pump module (Fig. 24).

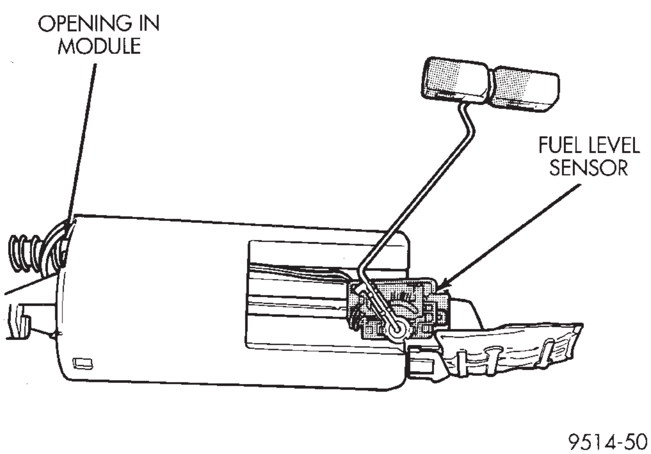


Fig. 24 Level Sensor Removal/Installation

(5) Slide level sensor out of channel in module.

INSTALLATION

(1) Insert level sensor wires into bottom of opening in module.

(2) Wrap wires into groove in back of level sensor (Fig. 25).

(3) While feeding wires into guide grooves, slide level sensor up into channel until it snaps into place (Fig. 26). Ensure tab at bottom of sensor locks in place.

(4) Install level sensor wires in connector. Push the wires up through the connector and then pull them down until they lock in place. Ensure signal and ground wires are installed in the correct position (Fig. 27).

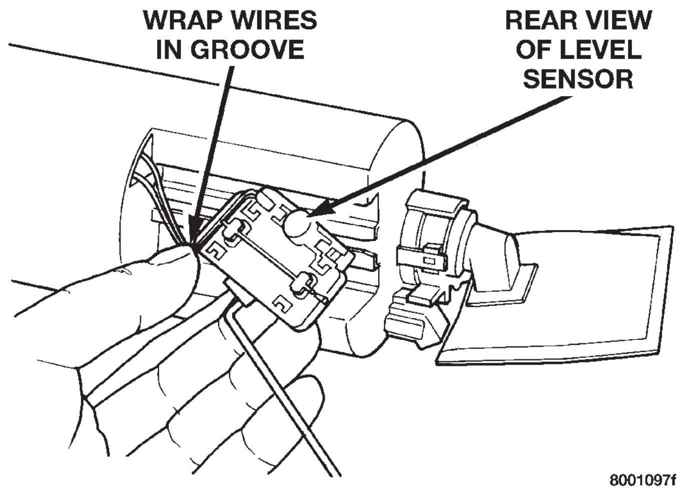


Fig. 25 Groove in Back Side of Level Sensor

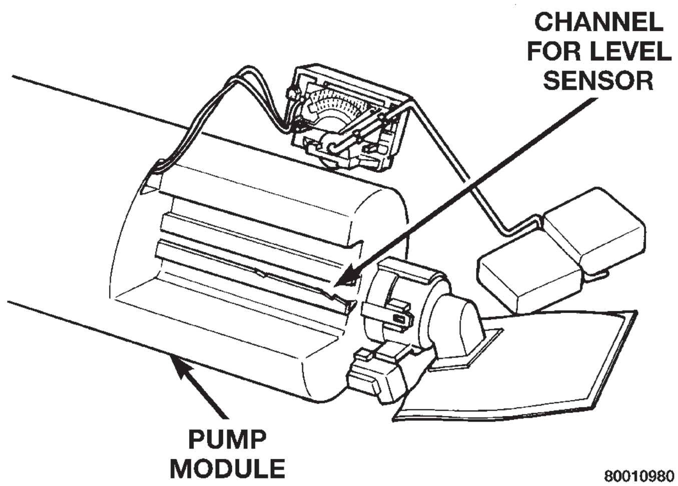


Fig. 26 Installation Channel

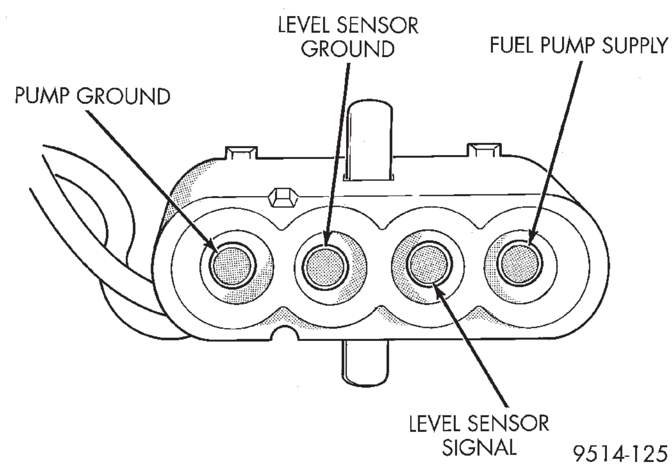


Fig. 27 Fuel/Pump/Level Sensor Electrical Connector

(5) Install locking wedge on connector.

(6) Push connector up into bottom of fuel pump module electrical connector.

REMOVAL AND INSTALLATION (Continued)

(7) Install fuel pump module. Refer to Fuel Pump Module in this section.

FUEL RAIL—2.4L

REMOVAL

(1) Disconnect negative cable from auxiliary jumper terminal.

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

(2) Release fuel system pressure. Refer to Fuel System Pressure Release procedure in this section.

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

(3) Disconnect fuel supply tube from rail. Refer to Quick-Connect Fittings in the Fuel Delivery section of this group.

(4) Disconnect electrical connectors from fuel injectors (Fig. 28).

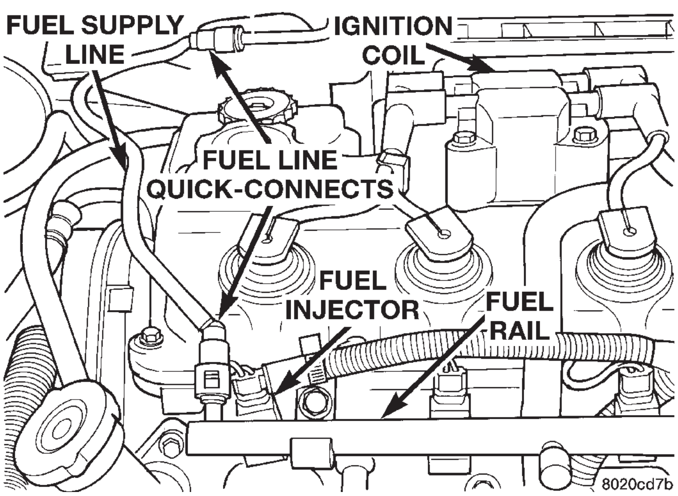


Fig. 28 Fuel Rail and Injectors

(5) Remove fuel rail mounting screws.

(6) Lift rail off of intake manifold. Cover the fuel injector openings in the intake manifold.

INSTALLATION

(1) Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.

(2) Insert fuel injector nozzles into openings in intake manifold. Seat the injectors in place. Tighten fuel rail mounting screws to 22.5 N·m ± 3 N·m (200±30 in. lbs.).

(3) Attach electrical connectors to fuel injectors.

(4) Connect fuel supply tube to fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.

(5) Connect negative cable to auxiliary jumper terminal.

FUEL RAIL—2.5L

REMOVAL

(1) Disconnect negative cable from auxiliary jumper terminal.

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

(2) Release fuel system pressure. Refer to Fuel System Pressure Release procedure in this section.

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

(3) Disconnect fuel supply tube from rail. Refer to Quick-Connect Fittings in the Fuel Delivery section of this group.

(4) Unplug connectors from MAP and intake air temperature sensors (Fig. 29).

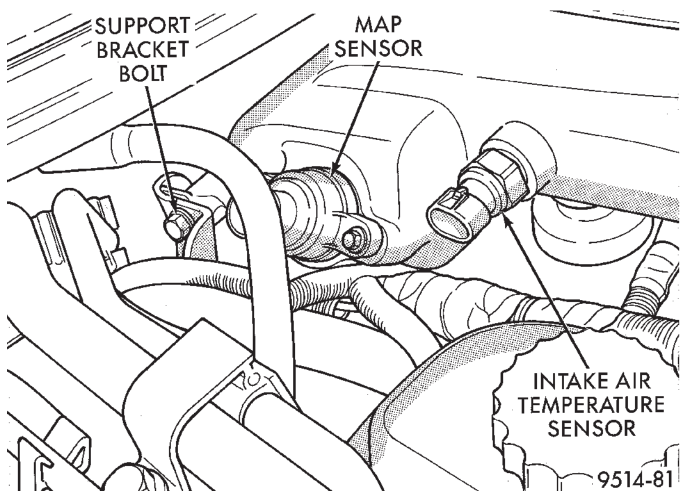


Fig. 29 Intake Manifold Plenum Sensors and Left Plenum Support Bolt

(5) Remove plenum support bracket bolt located rearward of MAP sensor (Fig. 29).

(6) Remove bolt holding air inlet resonator to intake plenum.

(7) Loosen throttle body air inlet hose clamp.

(8) Release snaps holding air cleaner housing cover to housing.

(9) Remove air cleaner cover and inlet hoses from engine.

REMOVAL AND INSTALLATION (Continued)

(10) Unplug TPS and idle air control motor connectors (Fig. 30) and (Fig. 31).

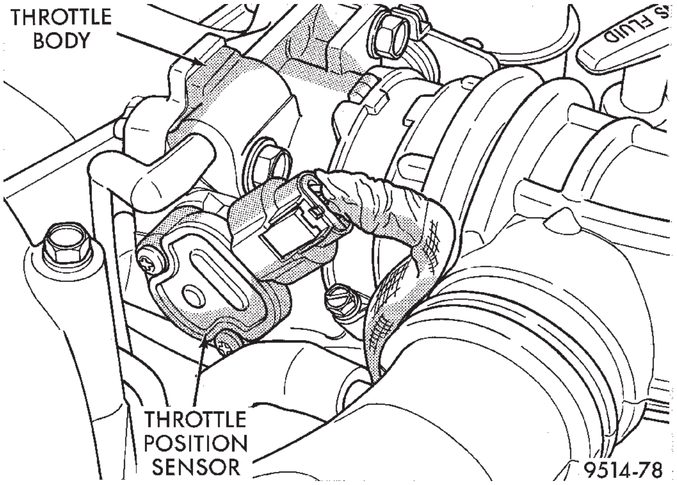


Fig. 30 Throttle Position Sensor

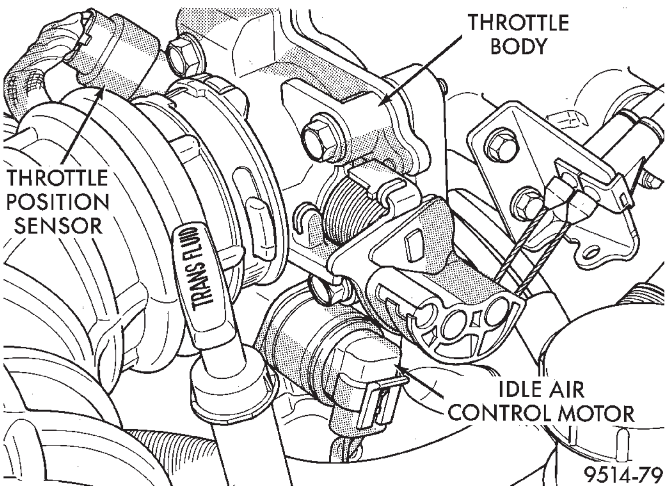


Fig. 31 Idle Air Control Motor

(11) Pry retainer tab back on throttle cable and slide cable out of bracket (Fig. 32).

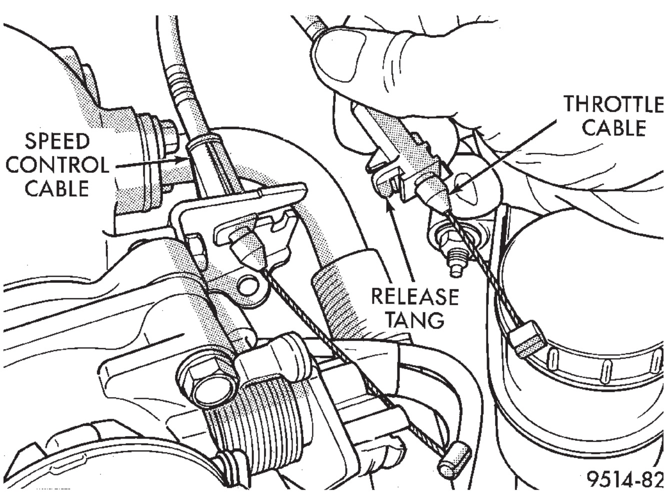


Fig. 32 Throttle Cable Attachment

(12) Slide Speed control cable out of bracket, if equipped (Fig. 32).

(13) Remove EGR tube from intake plenum (Fig. 33).

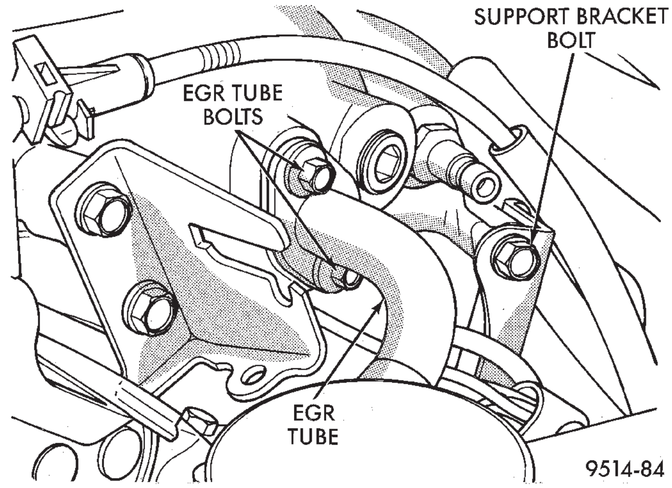


Fig. 33 Tube and Right Plenum Support Bolt

(14) Remove plenum support bracket bolt located rearward of EGR tube (Fig. 33).

(15) Remove 7 bolts holding upper intake plenum and remove plenum.

(16) Disconnect electrical connectors from fuel injectors.

(17) Remove 4 bolts holding fuel rail (Fig. 34).

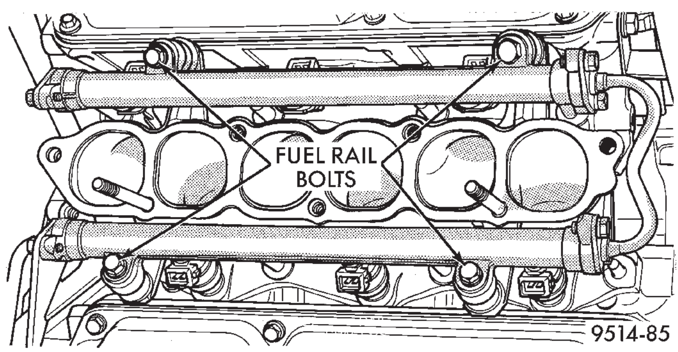


Fig. 34 Fuel Rail Attachment

(18) Lift fuel rail off engine. **There are spacers under each fuel rail bolt (Fig. 35).**

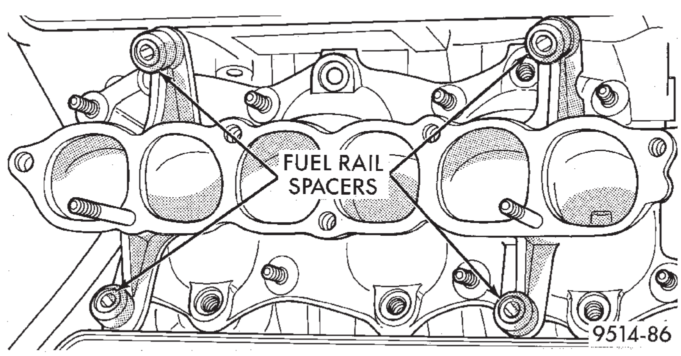


Fig. 35 Fuel Rail Spacers

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.

CAUTION: Make sure spacers are located under each fuel rail mounting position.

(2) Insert fuel injector nozzles into openings in intake manifold. Seat the injectors in place. Tighten fuel rail bolts to 12 N·m (8 ft. lbs.).

(3) Attach electrical connectors to fuel injectors.

(4) Connect fuel supply tube to fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.

(5) Install new gasket and position upper intake plenum. Tighten plenum bolts to 18 N·m (13 ft. lbs.) torque.

(6) Install bolts at plenum support brackets. Tighten bolts to 18 N·m (13 ft. lbs.).

(7) Install EGR tube to plenum. Tighten EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs) torque.

(8) Install throttle cables.

(9) Attach electical connectors to sensors.

(10) Tighten air inlet tube clamps to 3 N·m ±1 (25 in. lbs. ±5) torque.

(11) Connect negative terminal to auxillary jumper terminal.

FUEL INJECTORS

REMOVAL

(1) Remove fuel rail. Refer to appropriate Fuel Rail Removal in this section.

(2) Remove fuel injector clip (Fig. 36) or (Fig. 37).

(3) Pull injector out of fuel rail. Replace fuel injector O-rings.

INSTALLATION

(1) Reverse procedure for installation.

FUEL TANK

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

REMOVAL

(1) Release fuel system pressure. Refer to Fuel Pressure Release Procedure in this section.

(2) Disconnect negative cable from auxiliary jumper terminal.

(3) From inside trunk, disconnect pump wiring jumper from main body harness. The 4 pin connector is located under the trunk mat on the left side of trunk near the base of the shock tower. Locate body grommet for jumper near base of rear seat. Push grommet out and feed jumper completely through hole in body.

(4) Remove fuel cap slowly to release tank pressure.

(5) With vehicle on a hoist, drain fuel from tank. Support fuel tank with a support such as a transmission jack stand.

(6) Position a fuel approved container, with a capacity of at least 16 gallons, under the drain plug located on the bottom left edge of the tank.

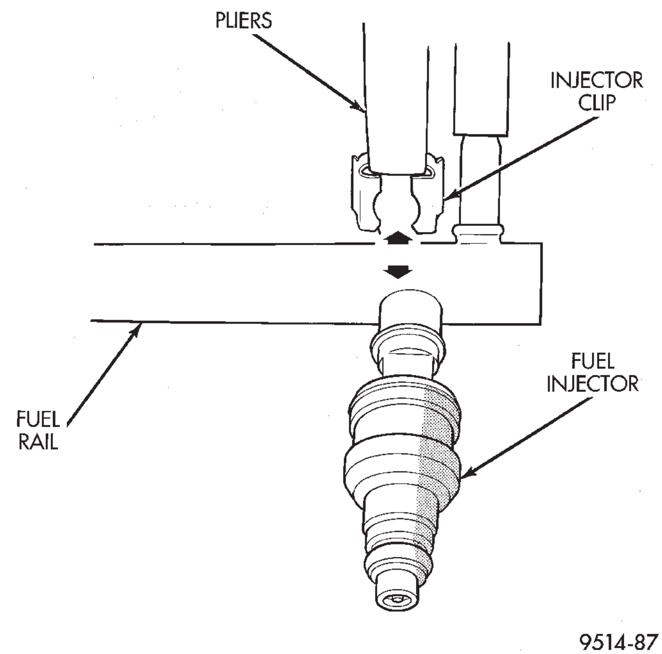


Fig. 36 Fuel Injector Clip—2.0/2.4L Engines

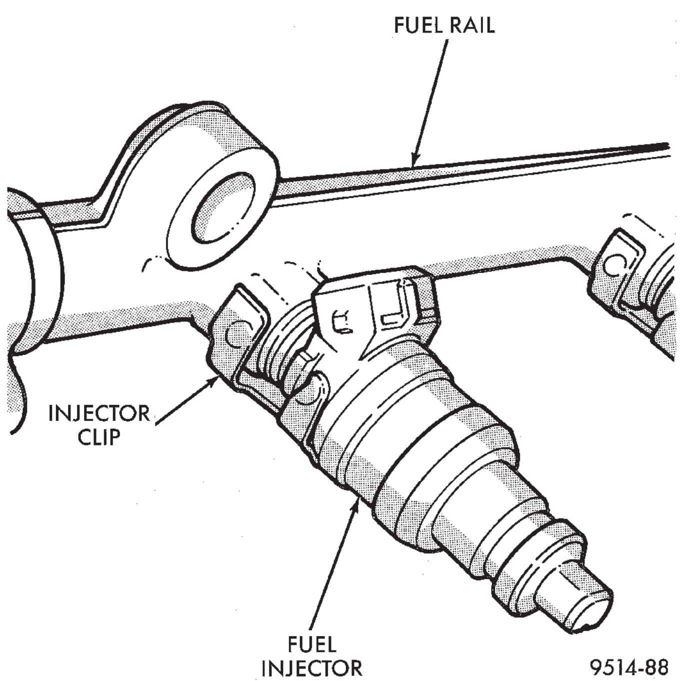


Fig. 37 Fuel Injector Clip—2.5L Engine

REMOVAL AND INSTALLATION (Continued)

(7) Remove drain plug and allow fuel to drain (Fig. 38).

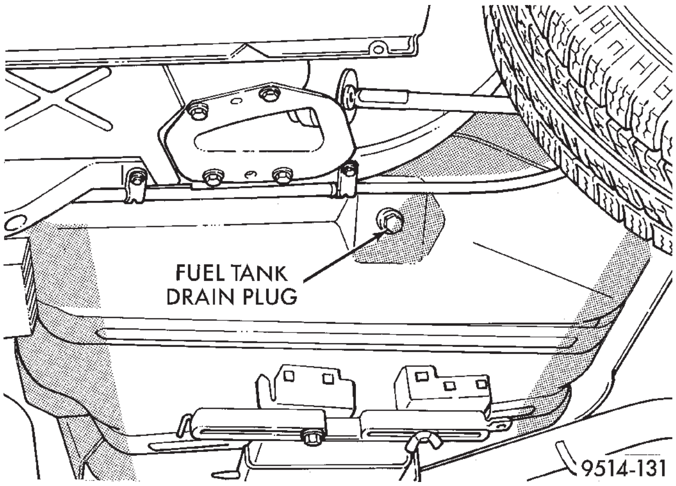


Fig. 38 Fuel Tank Drain Plug

WARNING: DRAIN PLUG MUST BE INSTALLED AT THIS TIME AS THERE WILL BE 1 TO 2 GALLONS OF FUEL LEFT IN THE TANK.

(8) When tank is no longer draining, install drain plug. Tighten plug to 32 in. lbs.

WARNING: There may be fuel in the fill tube. Remove hose carefully to reduce fuel splash.

(9) Disconnect fuel tank from rubber fill hose (Fig. 39).

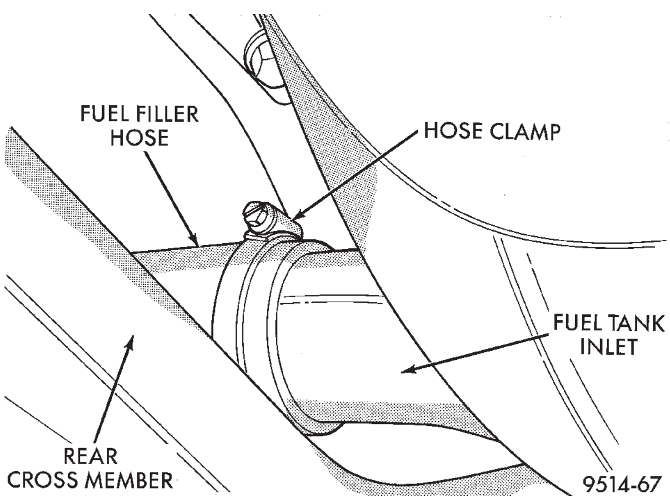


Fig. 39 Fuel Filler Hose Clamp

WARNING: WRAP SHOP TOWELS AROUND HOSES TO CATCH ANY GASOLINE SPILLAGE.

(10) Disconnect fuel lines from fuel pump module. These are quick connect fittings (Fig. 40).

(11) Disconnect vapor line from tank mounted roll-over valve. The valve is located at the rear of the tank and connects to the vapor line with a rubber hose.

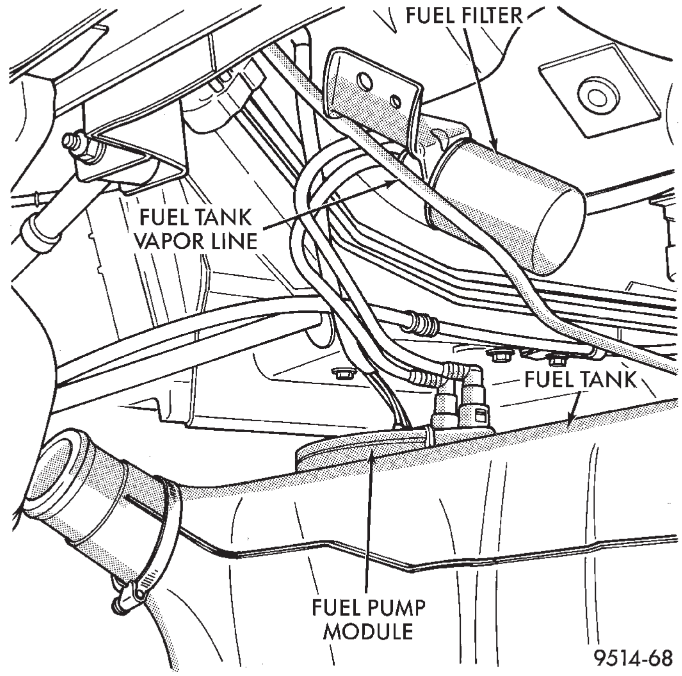


Fig. 40 Fuel Tank Removal

(12) Remove bolts and fuel tank straps.

(13) Remove tank from vehicle. Slide tank forward during removal to allow fill neck to clear suspension cross-member.

INSTALLATION

(1) Position fuel tank on transmission jack.

(2) Raise tank into position.

(3) Connect vapor line to rollover valve.

(4) Connect chassis fuel tube to fuel filter. Refer to Quick Connect Fittings in the Fuel Delivery section of this Group.

(5) Connect fuel fill tube to tank inlet. Tighten hose clamp to 3.5 N·m (31 in. lbs.) torque.

(6) Install pump module harness grommet into body.

(7) Position fuel filter and fuel tank straps. Install the front bolts first and then the rear bolts. Tighten fuel tank strap bolts to 23 N·m (250 in. lbs.) torque. Remove transmission jack. Ensure straps are not twisted or bent.

(8) Lower vehicle.

(9) Connect fuel pump module connector.

(10) Fill fuel tank, install filler cap, and connect battery cable.

CAUTION: When using the ASD Fuel System Test, the ASD relay remains energized for either 7 minutes, until the test is stopped, or until the ignition switch is turned to the Off position.

(11) Use the DRB scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

REMOVAL AND INSTALLATION (Continued)

FUEL FILLER NECK

REMOVAL

(1) Loosen fuel filler tube cap (Fig. 41).

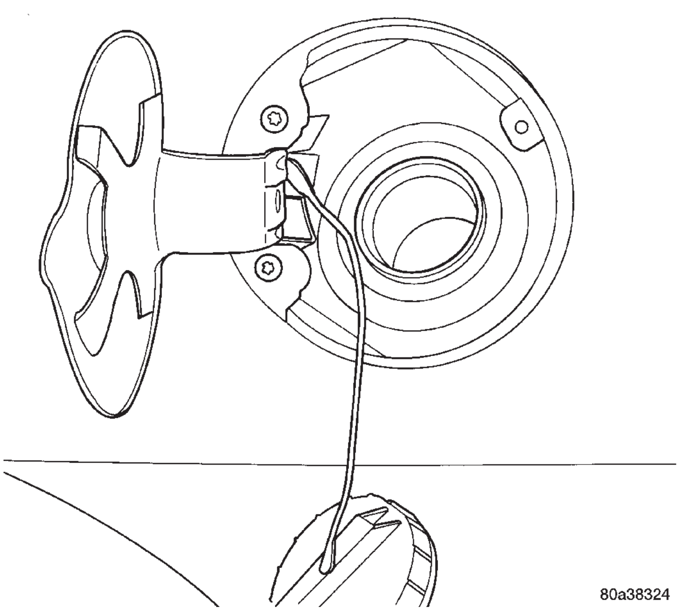


Fig. 41 Fuel Filler Cap

(2) Remove fuel filler neck from gromment in body housing (Fig. 42).

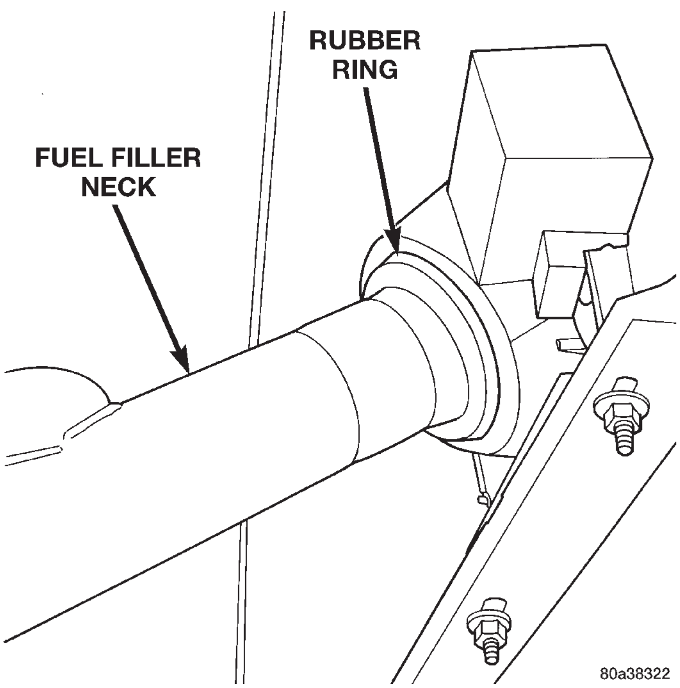


Fig. 42 Rubber Gromment and Body Housing

(3) Disconnect fuel filler ground strap from body.
(4) Disconnect fuel filler tube hose from fuel tank neck.
(5) Remove fuel filler tube assembly.

INSTALLATION

(1) Install rubber gromment in body housing (Fig. 43). Make sure chamfer is in the proper location (Fig. 44).

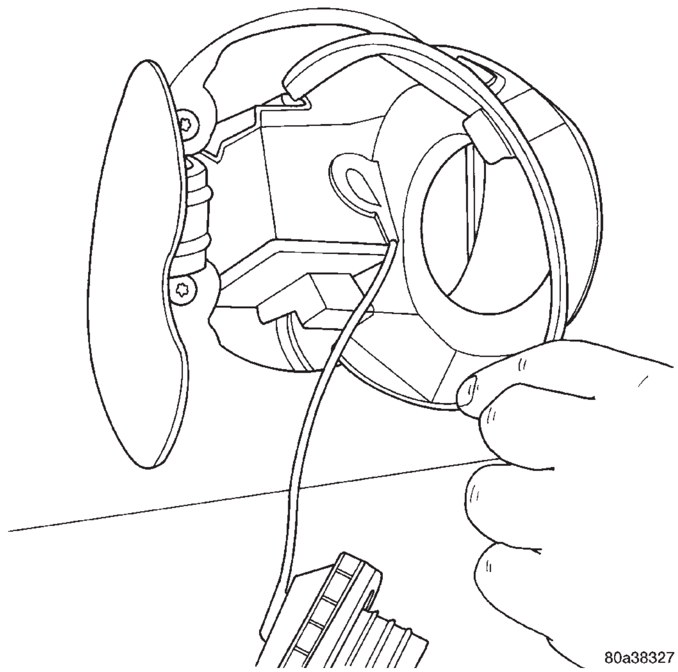


Fig. 43 Body Housing

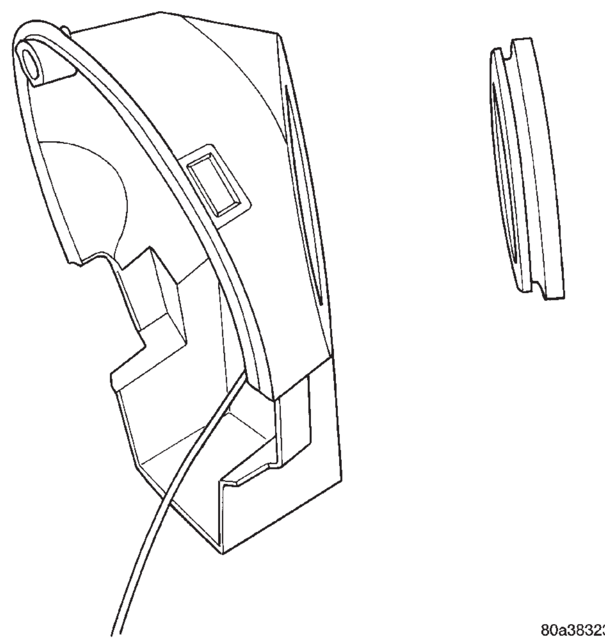


Fig. 44 Rubber Gromment

(2) Use a lubrication on fuel filler tube when inserting it in the rubber gromment.
(3) Install fuel tube onto the fuel tank neck.
(4) Tighten hose clamp to 3.5 N.m (31 in. lbs.).
(5) Install fuel filler ground strap on to body lip.

REMOVAL AND INSTALLATION (Continued)

ACCELERATOR PEDAL

REMOVAL

(1) Remove the throttle cable from the throttle body cam as described in Throttle Cable of this section.

(2) Reach behind the top of the pedal shaft and push the retainer toward rear of vehicle (Fig. 45). It may be necessary to squeeze retainer ears together on dash side of pedal shaft.

(3) Lift cable up through slot in top of pedal shaft.

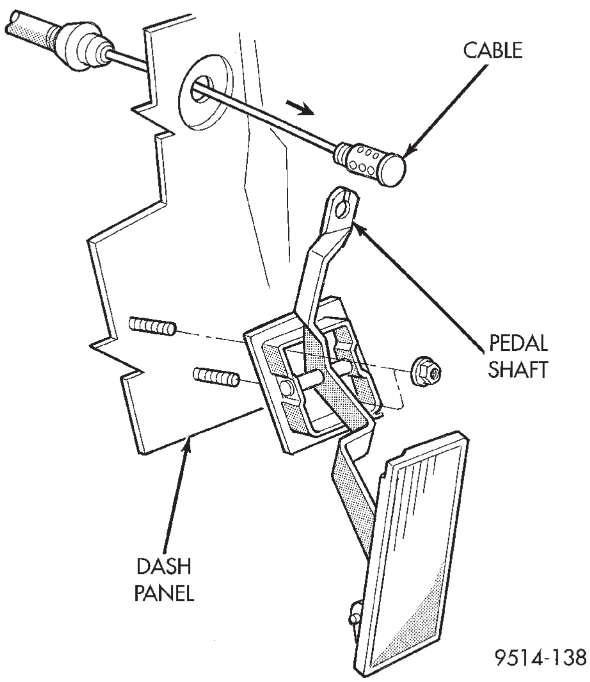


Fig. 45 Accelerator Pedal and Throttle Cable

(4) Remove nuts from accelerator pedal assembly studs. Remove assembly from vehicle.

INSTALLATION

(1) Position accelerator pedal assembly on dash panel. Install retaining nuts. Tighten retaining nuts to 12 N·m (105 in. lbs.) torque.

(2) Place cable through slot in top of pedal shaft.

(3) Step on pedal and retainer will snap into place.

(4) Hold the throttle body lever in the wide open position and install the throttle cable.

THROTTLE CABLE—2.4L

REMOVAL

(1) Working from the engine compartment, remove the throttle cable from the throttle body lever (Fig. 46) and (Fig. 47).

(2) Compress the retaining tabs on the cable and slide cable out of bracket (Fig. 47).

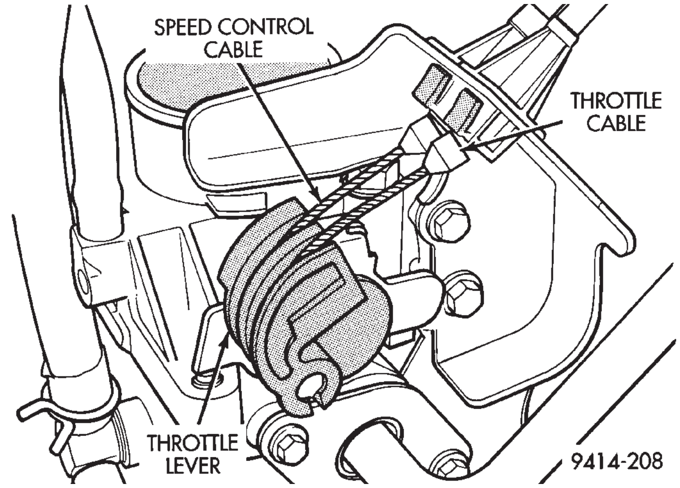


Fig. 46 Throttle Cable Attachment to Throttle Body

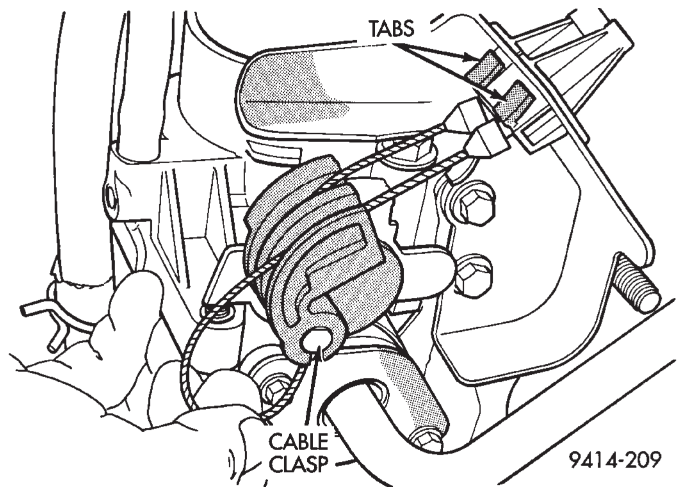


Fig. 47 Disconnecting Throttle Cable

(3) From inside vehicle, reach behind the top of the pedal shaft and push the retainer toward rear of vehicle. It may be necessary to squeeze retainer ears together on dash side of pedal shaft.

(4) Lift cable up through slot in top of pedal shaft.

(5) From the engine compartment, pull the throttle cable and grommet out of the dash panel.

INSTALLATION

(1) From the engine compartment, push the cable end fitting and grommet into the dash panel.

(2) Install cable housing (throttle body end) into the cable mounting bracket on the engine.

(3) Place cable through slot in top of pedal shaft.

(4) Step on pedal and retainer will snap into place.

(5) From the engine compartment, rotate the throttle lever forward to the wide open position and install cable clasp.

REMOVAL AND INSTALLATION (Continued)

THROTTLE CABLE—2.5L

REMOVAL

(1) Working from the engine compartment, remove throttle cable from the throttle body lever (Fig. 48).

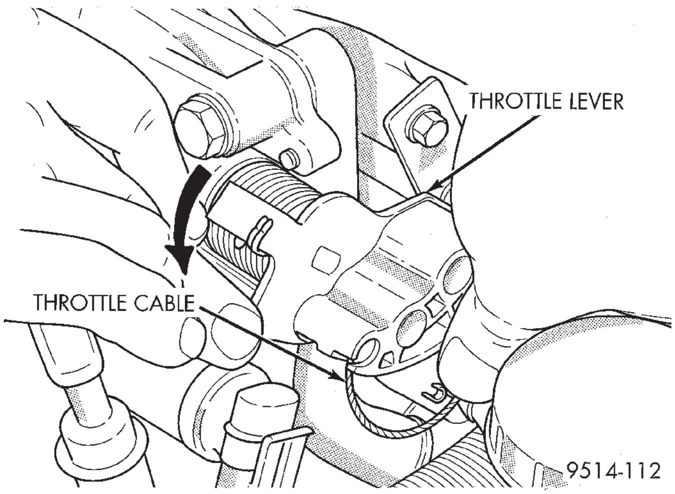


Fig. 48 Throttle Cable Attachment to Throttle Body

(2) Push release tang toward dash panel on throttle cable and slide cable out of bracket (Fig. 49).

(3) From inside the vehicle, reach behind the top of the pedal shaft and push the retainer toward rear of vehicle. It may be necessary to squeeze retainer ears together on dash side of pedal shaft.

(4) Lift cable up through slot in top of pedal shaft.

(5) From the engine compartment, pull the throttle cable and grommet out of the dash panel.

INSTALLATION

(1) From the engine compartment, push the cable end fitting and grommet into the dash panel.

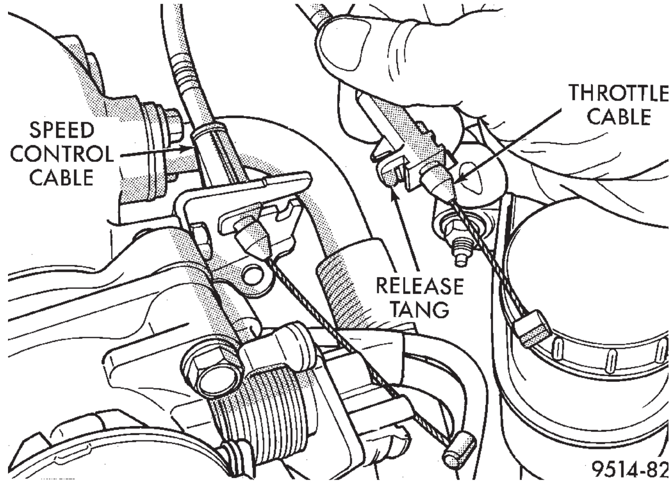


Fig. 49 Throttle Cable Attachment

(2) Install cable housing (throttle body end) into the cable mounting bracket on the engine.

(3) Place cable through slot in top of pedal shaft.

(4) Step on pedal and retainer will snap into place.

(5) From the engine compartment, rotate the throttle lever forward to the wide open position and install cable clasp.

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Accelerator Pedal to Dash Nuts	12 N·m (105 in. lbs.)
Fuel Filter Mounting Screw	12 N·m (110 in. lbs.)
Fuel Pump Module Locknut	61 N·m (45 ft. lbs.)
Fuel Tank strap Bolts	60 N·m (44 ft. lbs.)
Fuel Rail Bolts—2.0/2.4L	22.5 N·m (200 in. lbs.)
Fuel Rail Bolts—2.5L	12 N·m (106 in. lbs.)
Ignition Coil Mounting Bolts	12 N·m (105 in. lbs.)

FUEL INJECTION SYSTEM

INDEX

SPECIFICATIONS (Continued)

GENERAL INFORMATION

INTRODUCTION

All engines used in this section have a sequential Multi-Port Electronic Fuel Injection system. The MPI system is computer regulated and provides precise air/fuel ratios for all driving conditions. The Powertrain Control Module (PCM) operates the fuel injection system.

The PCM regulates:

- Ignition timing
- Air/fuel ratio
- Emission control devices
- Cooling fan
- Charging system
- Idle speed
- Vehicle speed control

Various sensors provide the inputs necessary for the PCM to correctly operate these systems. In addition to the sensors, various switches also provide inputs to the PCM.

All inputs to the PCM are converted into signals. The PCM can adapt its programming to meet changing operating conditions.

Fuel is injected into the intake port above the intake valve in precise metered amounts through electrically operated injectors. The PCM fires the injectors in a specific sequence. Under most operating conditions, the PCM maintains an air fuel ratio of 14.7 parts air to 1 part fuel by constantly adjusting injector pulse width. Injector pulse width is the length of time the injector is open.

The PCM adjusts injector pulse width by opening and closing the ground path to the injector. Engine RPM (speed) and manifold absolute pressure (air density) are the primary inputs that determine injector pulse width.

MODES OF OPERATION

As input signals to the PCM change, the PCM adjusts its response to output devices. For example, the PCM must calculate a different injector pulse width and ignition timing for idle than it does for Wide Open Throttle (WOT). There are several different modes of operation that determine how the PCM responds to the various input signals.

There are two different areas of operation, OPEN LOOP and CLOSED LOOP.

During OPEN LOOP modes the PCM receives input signals and responds according to preset PCM programming. Inputs from the upstream and downstream heated oxygen sensors are not monitored during OPEN LOOP modes, except for heated oxygen sensor diagnostics (they are checked for shorted conditions at all times).

During CLOSED LOOP modes the PCM monitors the inputs from the upstream and downstream heated oxygen sensors. The upstream heated oxygen sensor input tells the PCM if the calculated injector pulse width resulted in the ideal air-fuel ratio of 14.7 to one. By monitoring the exhaust oxygen content through the upstream heated oxygen sensor, the PCM can fine tune injector pulse width. Fine tuning injector pulse width allows the PCM to achieve optimum fuel economy combined with low emissions.

For the PCM to enter CLOSED LOOP operation, the following must occur:

(1) Engine coolant temperature must be over 35°F.

- If the coolant is over 35° the PCM will wait 44 seconds.
- If the coolant is over 50°F the PCM will wait 38 seconds.
- If the coolant is over 167°F the PCM will wait 11 seconds.

(2) For other temperatures the PCM will interpolate the correct waiting time.

(3) O2 sensor must read either greater than .745 volts or less than .1 volt.

(4) The multi-port fuel injection systems has the following modes of operation:

- Ignition switch ON (Zero RPM)
- Engine start-up
- Engine warm-up
- Cruise
- Idle
- Acceleration
- Deceleration
- Wide Open Throttle
- Ignition switch OFF

(5) The engine start-up (crank), engine warm-up, deceleration with fuel shutoff and wide open throttle modes are OPEN LOOP modes. Under most operating conditions, the acceleration, deceleration (with A/C on), idle and cruise modes, **with the engine at operating temperature** are CLOSED LOOP modes.

GENERAL INFORMATION (Continued)

IGNITION SWITCH ON (ZERO RPM) MODE

When the ignition switch activates the fuel injection system, the following actions occur:

- The PCM monitors the engine coolant temperature sensor and throttle position sensor input. The PCM determines basic fuel injector pulse width from this input.
- The PCM determines atmospheric air pressure from the MAP sensor input to modify injector pulse width.

When the key is in the ON position and the engine is not running (zero rpm), the Auto Shutdown (ASD) and fuel pump relays de-energize after approximately 1 second. Therefore, battery voltage is not supplied to the fuel pump, ignition coil, fuel injectors and heated oxygen sensors.

ENGINE START-UP MODE

This is an OPEN LOOP mode. If the vehicle is in park or neutral (automatic transaxles) or the clutch pedal is depressed (manual transaxles) the ignition switch energizes the starter relay. The following actions occur when the starter motor is engaged.

- If the PCM receives the camshaft position sensor and crankshaft position sensor signals, it energizes the Auto Shutdown (ASD) and fuel pump relays. If the PCM does not receive both signals within approximately one second, it will not energize the ASD relay and fuel pump relay. The ASD and fuel pump relays supply battery voltage to the fuel pump, fuel injectors, ignition coil and heated oxygen sensors.
- The PCM energizes all four injectors (on the 69° degree falling edge) for a calculated pulse width until it determines crankshaft position from the camshaft position sensor and crankshaft position sensor signals. The PCM determines crankshaft position within 1 engine revolution.
- After determining crankshaft position, the PCM begins energizing the injectors in sequence. It adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.
- When the engine idles within ±64 RPM of its target RPM, the PCM compares current MAP sensor value with the atmospheric pressure value received during the Ignition Switch On (zero RPM) mode. If the PCM does not detect a minimum difference between the two values, it sets a MAP diagnostic trouble code into memory.

Once the ASD and fuel pump relays have been energized, the PCM determines injector pulse width based on the following:

- Battery voltage
- Engine coolant temperature
- Engine RPM
- Intake air temperature (IAT)
- Throttle position
- The number of engine revolutions since cranking was initiated

During Start-up the PCM maintains ignition timing at 9° BTDC.

ENGINE WARM-UP MODE

This is an OPEN LOOP mode. The following inputs are received by the PCM:

- Engine coolant temperature
- Manifold Absolute Pressure (MAP)
- Intake air temperature (IAT)
- Crankshaft position (engine speed)
- Camshaft position
- Knock sensor
- Throttle position
- A/C switch
- Battery voltage
- Power steering pressure switch
- Vehicle speed
- Speed control
- Both O2 sensors
- All diagnostics

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts ignition timing and engine idle speed. Engine idle speed is adjusted through the idle air control motor.

CRUISE OR IDLE MODE

When the engine is at operating temperature this is a CLOSED LOOP mode. During cruising or idle the following inputs are received by the PCM:

- Intake air temperature
- Engine coolant temperature
- Manifold absolute pressure
- Crankshaft position (engine speed)
- Camshaft position
- Knock sensor
- Throttle position
- Exhaust gas oxygen content
- A/C control positions
- Power steering pressure switch
- Battery voltage
- Vehicle speed

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts engine idle speed and ignition timing. The PCM adjusts the air/fuel ratio according to the oxygen content in the exhaust gas (measured by the upstream and downstream heated oxygen sensor).

The PCM monitors for engine misfire. During active misfire and depending on the severity, the PCM either continuously illuminates or flashes the malfunction indicator lamp (Check Engine light on

GENERAL INFORMATION (Continued)

instrument panel). Also, the PCM stores an engine misfire DTC in memory.

The PCM performs several diagnostic routines. They include:

- Oxygen sensor monitor
- Downstream heated oxygen sensor diagnostics during open loop operation (except for shorted)
- Fuel system monitor
- EGR monitor
- Purge system monitor
- All inputs monitored for proper voltage range.
- All monitored components (refer to Group 25 for On-Board Diagnostics).

The PCM compares the upstream and downstream heated oxygen sensor inputs to measure catalytic convertor efficiency. If the catalyst efficiency drops below the minimum acceptable percentage, the PCM stores a diagnostic trouble code in memory.

During certain idle conditions, the PCM may enter a variable idle speed strategy. During variable idle speed strategy the PCM adjusts engine speed based on the following inputs.

- A/C sense
- Battery voltage
- Battery temperature
- Engine coolant temperature
- Engine run time
- Power steering pressure switch
- Vehicle mileage

ACCELERATION MODE

This is a CLOSED LOOP mode. The PCM recognizes an abrupt increase in Throttle Position sensor output voltage or MAP sensor output voltage as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased fuel demand.

DECELERATION MODE

This is a CLOSED LOOP mode. During deceleration the following inputs are received by the PCM:

- A/C pressure transducer
- A/C sense
- Battery voltage
- Intake air temperature
- Engine coolant temperature
- Crankshaft position (engine speed)
- Exhaust gas oxygen content (upstream heated oxygen sensor)
- Knock sensor
- Manifold absolute pressure
- Power steering pressure switch
- Throttle position
- IAC motor control changes in respones to MAP sensor feedback

The PCM may receive a closed throttle input from the Throttle Position Sensor (TPS) when it senses an abrupt decrease in manifold pressure. This indicates a hard deceleration. In response, the PCM may momentarily turn off the injectors. This helps improve fuel economy, emissions and engine braking.

If decel fuel shutoff is detected, downstream oxygen sensor diagnostics is performed.

WIDE-OPEN-THROTTLE MODE

This is an OPEN LOOP mode. During wide-open-throttle operation, the following inputs are received by the PCM:

- Intake air temperature
- Engine coolant temperature
- Engine speed
- Knock sensor
- Manifold absolute pressure
- Throttle position

When the PCM senses a wide-open-throttle condition through the Throttle Position Sensor (TPS) it de-energizes the A/C compressor clutch relay. This disables the air conditioning system.

The PCM does not monitor the heated oxygen sensor inputs during wide-open-throttle operation except for downstream heated oxygen sensor and both shorted diagnostics. The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel.

IGNITION SWITCH OFF MODE

When the operator turns the ignition switch to the OFF position, the following occurs:

- All outputs are turned off, unless 02 Heater Monitor test is being run. Refer to Group 25, On-Board Diagnostics.
- No inputs are monitored except for the heated oxygen sensors. The PCM monitors the heating elements in the oxygen sensors and then shuts down.

DESCRIPTION AND OPERATION

SYSTEM DIAGNOSIS

The PCM can test many of its own input and output circuits. If the PCM senses a fault in a major system, the PCM stores a Diagnostic Trouble Code (DTC) in memory.

Technicians can display stored DTC's by two different methods.

For DTC information, refer to Group 25, Emission Control Systems. See On-Board Diagnostics.

DESCRIPTION AND OPERATION (Continued)

POWER DISTRIBUTION CENTER

The Power Distribution Center (PDC) is located next to the battery (Fig. 1). The PDC contains the starter relay, radiator fan relay, A/C compressor clutch relay, auto shutdown relay, fuel pump relay and several fuses.

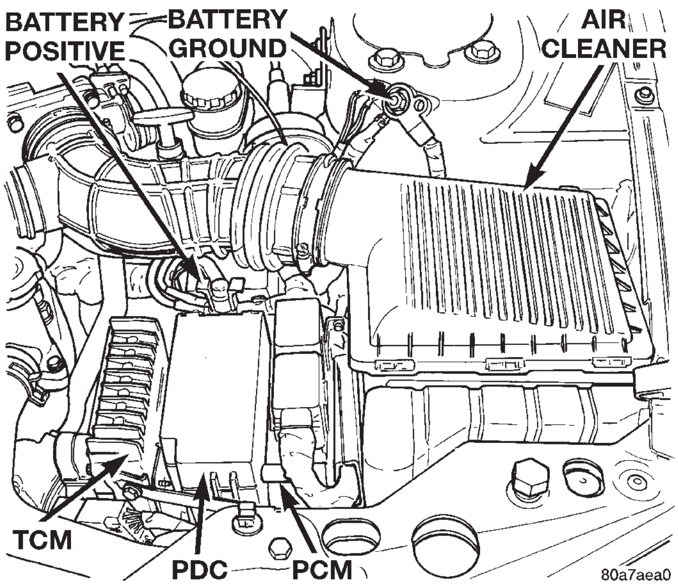


Fig. 1 Power Distribution Center and Powertrain Control Module

CCD BUS

Various modules exchange information through a communications port called the CCD Bus. The powertrain control module (PCM) transmits the Malfunction Indicator Lamp (Check Engine) On/Off signal and engine RPM on the CCD Bus. The PCM receives the Air Conditioning select input, transaxle gear position input and speed control engage inputs over the CCD Bus. The PCM also receives the air conditioning evaporator temperature signal from the CCD Bus.

The following components access or send information on the CCD Bus.

- Instrument Panel
- Body Control Module
- Air Bag System Diagnostic Module
- Full ATC Display Head
- ABS Module
- Transmission Control Module
- Powertrain Control Module
- Overhead Travel Module

POWERTRAIN CONTROL MODULE

The Powertrain Control Module (PCM) is a digital computer containing a microprocessor. The PCM receives input signals from various switches and sensors that are referred to as PCM Inputs. Based on these inputs, the PCM adjusts various engine and vehicle operations through devices that are referred to as PCM Outputs.

NOTE: PCM Inputs:

- Air Conditioning Controls
- Battery Voltage
- Battery Temperature Sensor
- Brake Switch
- Camshaft Position Sensor
- Crankshaft Position Sensor
- Engine Coolant Temperature Sensor
- Fuel Level Sensor
- Ignition Switch
- Intake Air Temperature Sensor
- Knock Sensor (2.0/2.4L only)
- Manifold Absolute Pressure (MAP) Sensor
- Oxygen Sensors
- Power Steering Pressure Switch
- SCI Receive
- Speed Control Switches
- Throttle Position Sensor
- Transmission Park/Neutral Switch (automatic transmission)
- Vehicle Speed Sensor

NOTE: PCM Outputs:

- Air Conditioning Clutch Relay
- Auto Shutdown (ASD) Relay
- Charging Indicator Lamp
- SCI Transmit
- Duty Cycle EVAP Canister Purge Solenoid
- EGR Solenoid
- Fuel Injectors
- Fuel Pump Relay
- Generator Field
- Idle Air Control Motor
- Ignition Coils
- Malfunction Indicator (Check Engine) Lamp
- Radiator Fan Relays
- Speed Control Solenoids

Based on inputs it receives, the PCM adjusts fuel injector pulse width, idle speed, ignition spark advance, ignition coil dwell and EVAP canister purge operation. The PCM regulates the cooling fan, air conditioning and speed control systems. The PCM changes generator charge rate by adjusting the generator field. The PCM also performs diagnostics.

The PCM adjusts injector pulse width (air-fuel ratio) based on the following inputs.

- Battery voltage
- Coolant temperature
- Exhaust gas content (oxygen sensor)
- Engine speed (crankshaft position sensor)
- Intake air temperature
- Manifold absolute pressure
- Throttle position

The PCM adjusts ignition timing based on the following inputs.

- Coolant temperature

DESCRIPTION AND OPERATION (Continued)

- Engine speed (crankshaft position sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position
- Transmission gear selection (park/neutral switch)
- Intake air temperature

The PCM also adjusts engine idle speed through the idle air control motor based on the following inputs.

- Air conditioning sense
- Battery voltage
- Battery temperature
- Brake switch
- Coolant temperature
- Engine speed (crankshaft position sensor)
- Engine run time
- Manifold absolute pressure
- Power steering pressure switch
- Throttle position
- Transmission gear selection (park/neutral switch)
- Vehicle distance (speed)

The Auto Shutdown (ASD) and fuel pump relays are located in the Power Distribution Center (PDC).

The camshaft position sensor (distributor pick-up signal 2.5L) and crankshaft position sensor signals are sent to the PCM. If the PCM does not receive the signal within approximately 1 second of engine cranking, it deactivates the ASD relay and fuel pump relay. When these relays are deactivated, power is shut off from the fuel injectors, ignition coils, oxygen sensor heating elements and fuel pump.

The PCM contains a voltage converter that changes battery voltage to a regulated 9 volts direct current to power the camshaft position sensor, crankshaft position sensor and vehicle speed sensor. The PCM also provides a 5 volt direct current supply for the manifold absolute pressure sensor and throttle position sensor.

AIR CONDITIONING PRESSURE TRANSDUCER—PCM INPUT

The Powertrain Control Module (PCM) monitors the A/C compressor discharge (high side) pressure through the air conditioning pressure transducer. The transducer supplies an input to the PCM. The PCM engages the A/C compressor clutch if pressure is sufficient for A/C system operation.

AUTOMATIC SHUTDOWN (ASD) SENSE—PCM INPUT

The ASD sense circuit informs the PCM when the ASD relay energizes. A 12 volt signal at this input indicates to the PCM that the ASD has been activated. This input is used only to sense that the ASD relay is energized.

When energized, the ASD relay supplies battery voltage to the fuel injectors, ignition coils and the heating element in each oxygen sensor. If the PCM does not receive 12 volts from this input after grounding the ASD relay, it sets a Diagnostic Trouble Code (DTC).

BATTERY VOLTAGE—PCM INPUT

The PCM monitors the battery voltage input to determine fuel injector pulse width and generator field control.

If battery voltage is low the PCM will increase injector pulse width (period of time that the injector is energized).

BATTERY TEMPERATURE SENSOR—PCM INPUT

The PCM uses the temperature of the battery area to control the charge rate. The signal is used to regulate the system voltage. The system voltage is higher at cold temperatures and is gradually reduced as temperature is increased.

BRAKE SWITCH—PCM INPUT

When the brake switch is activated, the PCM receives an input indicating that the brakes are being applied. After receiving this input the PCM maintains idle speed to a scheduled RPM through control of the idle air control motor. The brake switch is mounted on the brake pedal support bracket.

CAMSHAFT POSITION SENSOR—PCM INPUT

The PCM determines fuel injection synchronization and cylinder identification from inputs provided by the camshaft position sensor and crankshaft position sensor. From the two inputs, the PCM determines crankshaft position.

Refer to Group 8D - Camshaft Position Sensor for more information.

2.4L ENGINES

The camshaft position sensor attaches to the rear of the cylinder head (Fig. 2).

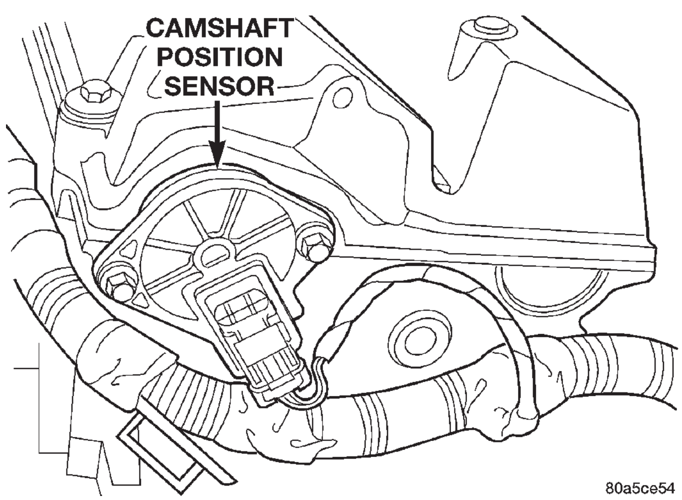


Fig. 2 Camshaft Position Sensor—2.4L

The sensor also acts as a thrust plate to control camshaft endplay.

DESCRIPTION AND OPERATION (Continued)

2.5L ENGINE

The 2.5L engine is equipped with a camshaft driven mechanical distributor. The distributor is also equipped with an internal camshaft position (fuel sync) sensor (Fig. 3).

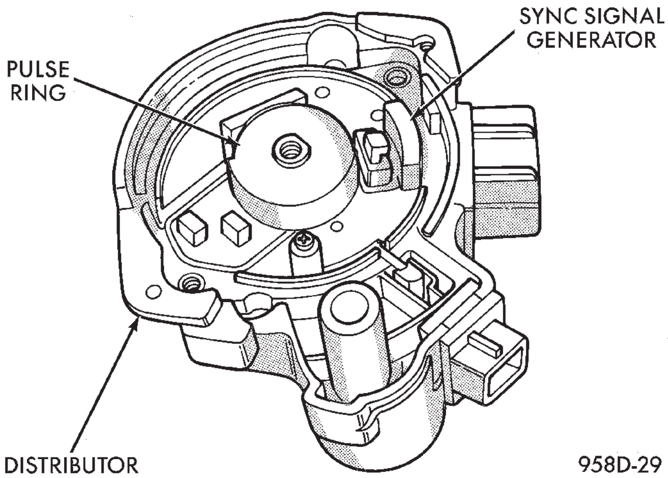


Fig. 3 Camshaft Position Sensor—2.5L

CRANKSHAFT POSITION SENSOR—PCM INPUT

The PCM determines what cylinder to fire from the crankshaft and camshaft position sensor input. It is also used to synchronize the fuel injectors with their respective cylinders.

Refer to Group 8D - Crankshaft Position Sensor for more information.

2.4L ENGINES

On 2.4L engines, the second crankshaft counterweight has two sets of four timing reference notches including a 60 degree signature notch (Fig. 4). From the crankshaft position sensor input the PCM determines engine speed and crankshaft angle (position).

The crankshaft position sensor mounts to the engine block behind the generator, just above the oil filter (Fig. 5).

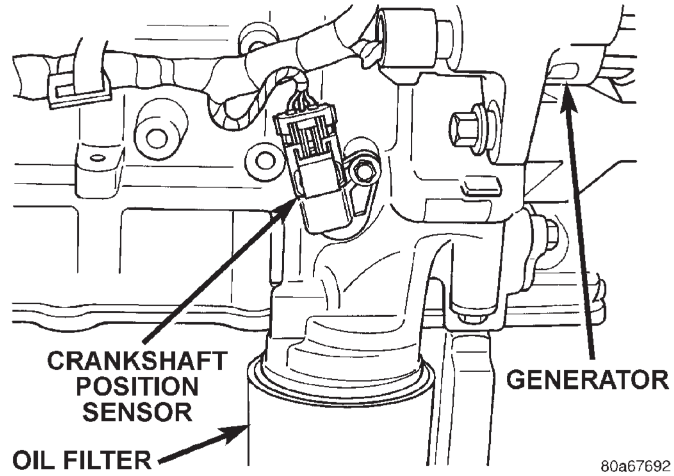


Fig. 5 Crankshaft Position Sensor—2.4L Engines

2.5L ENGINE

On a 2.5L engine, this sensor is a hall effect device that detects notches in the flexplate.

The sensor is located in the transaxle housing, above the vehicle speed sensor (Fig. 6).

ENGINE COOLANT TEMPERATURE SENSOR—PCM INPUT

The coolant temperature sensor has one element. The element supplies coolant temperature signal to the PCM. The PCM supplies coolant temperature information on the CCD Bus to the Body Control Module (BCM) for the instrument panel gauge cluster. The PCM determines engine coolant temperature from the coolant temperature sensor.

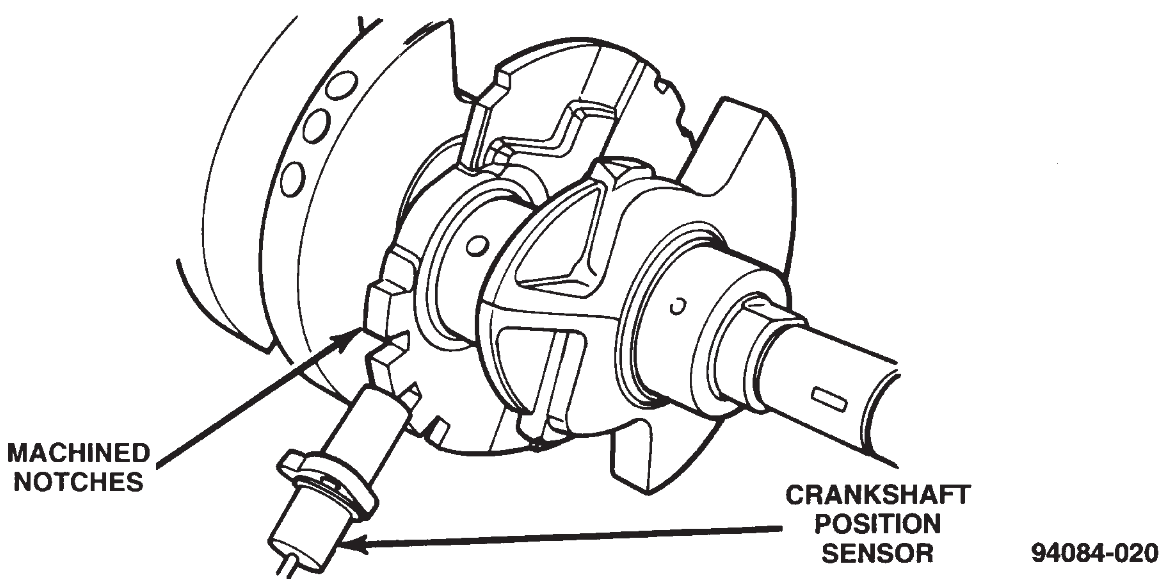


Fig. 4 Timing Reference Notches

DESCRIPTION AND OPERATION (Continued)

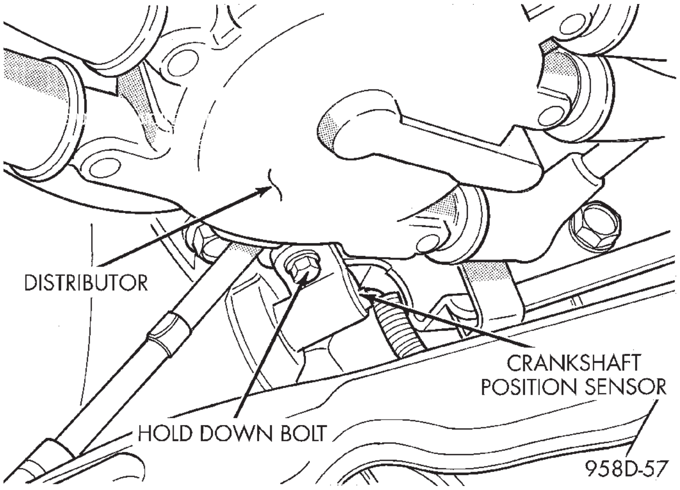


Fig. 6 Crankshaft Position Sensor—2.5L Engine

As coolant temperature varies, the coolant temperature sensor resistance changes resulting in a different current draw from the PCM.

When the engine is cold, the PCM will provide slightly richer air- fuel mixtures and higher idle speeds until normal operating temperatures are reached.

The coolant sensor threads into the front of the cylinder head 2.4L (Fig. 7); next to the coolant fill neck 2.5L (Fig. 8). New sensors have sealant applied to the threads.

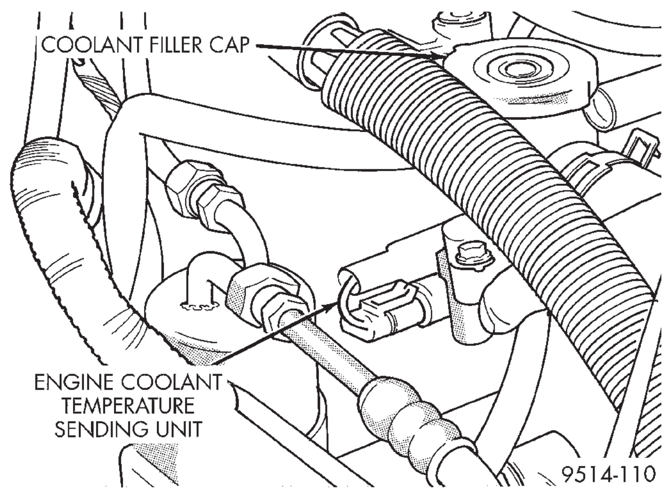


Fig. 7 Engine Coolant Temperature Sensor—2.4L

FUEL LEVEL SENSOR—PCM INPUT

The fuel level sensor (fuel gauge sending unit) sends a variable voltage to the PCM to indicate fuel level. The purpose of this feature is to prevent a false setting of misfire and fuel system monitor trouble codes if the fuel level is less than approximately 15 percent of its rated capacity.

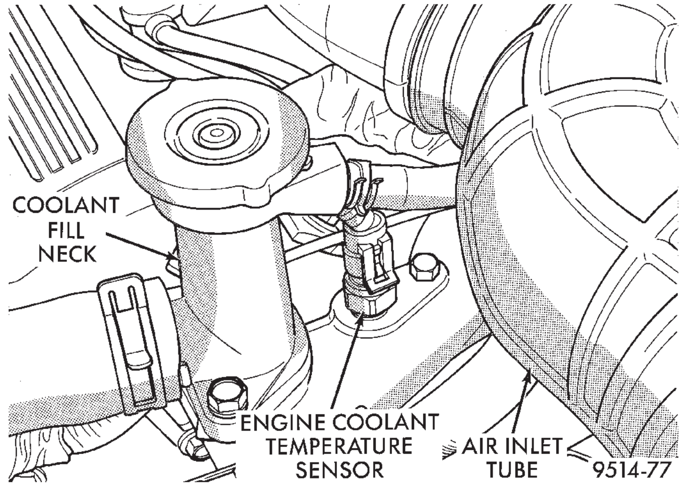


Fig. 8 Engine Coolant Temperature Sensor—2.5L

HEATED OXYGEN SENSORS—PCM INPUT

As vehicles accumulate mileage, the catalytic convertor deteriorates. The deterioration results in a less efficient catalyst. To monitor catalytic convertor deterioration, the fuel injection system uses two heated oxygen sensors. One sensor upstream of the catalytic convertor, one downstream of the convertor. The PCM compares the reading from the sensors to calculate the catalytic convertor oxygen storage capacity and converter efficiency. Also, the PCM uses the upstream heated oxygen sensor input when adjusting injector pulse width.

When the catalytic converter efficiency drops below emission standards, the PCM stores a diagnostic trouble code and illuminates the malfunction indicator lamp (MIL).

The automatic shutdown relay supplies battery voltage to both the upstream and downstream heated oxygen sensors. The oxygen sensors are equipped with a heating element. The heating elements reduce the time required for the sensors to reach operating temperature.

UPSTREAM OXYGEN SENSOR

The input from the upstream heated oxygen sensor tells the PCM the oxygen content of the exhaust gas. Based on this input, the PCM fine tunes the air-fuel ratio by adjusting injector pulse width.

The sensor input switches from 0 to 1 volt, depending upon the oxygen content of the exhaust gas in the exhaust manifold. When a large amount of oxygen is present (caused by a lean air-fuel mixture), the sensor produces voltage as low as 0.1 volt. When there is a lesser amount of oxygen present (rich air-fuel mixture) the sensor produces a voltage as high as 1.0 volt. By monitoring the oxygen content and converting it to electrical voltage, the sensor acts as a rich-lean switch.

DESCRIPTION AND OPERATION (Continued)

The heating element in the sensor provides heat to the sensor ceramic element. Heating the sensor allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

In Closed Loop, the PCM adjusts injector pulse width based on the upstream heated oxygen sensor input along with other inputs. In Open Loop, the PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

The upstream oxygen sensor threads into the outlet flange of the exhaust manifold (Fig. 9) or (Fig. 10).

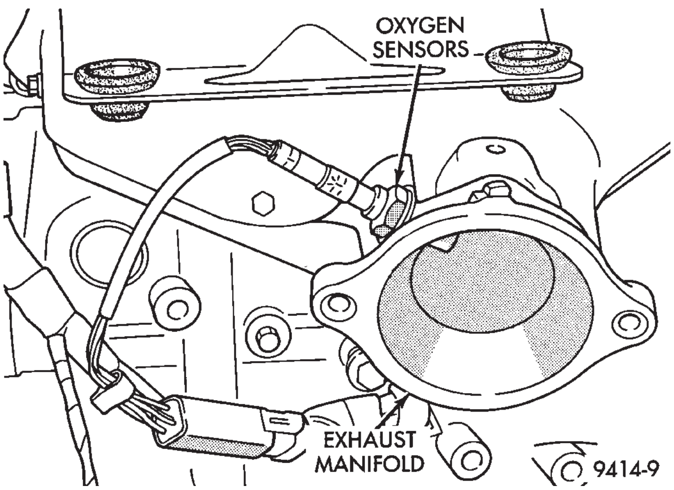


Fig. 9 Upstream Heated Oxygen Sensor—2.0/2.4L Engines

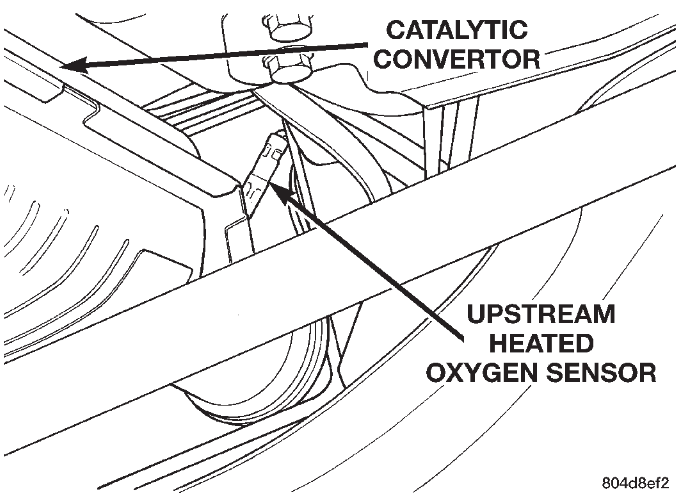


Fig. 10 Upstream Oxygen Sensor—2.5L

DOWNSTREAM OXYGEN SENSOR

The downstream heated oxygen sensor threads into the outlet pipe at the rear of the catalytic convertor (Fig. 11). The downstream heated oxygen sensor input is used to detect catalytic convertor deterioration. As the convertor deteriorates, the input from the downstream sensor begins to match the upstream sensor input except for a slight time delay. By comparing the downstream heated oxygen sensor input to the input from the upstream sensor, the PCM calculates catalytic convertor efficiency.

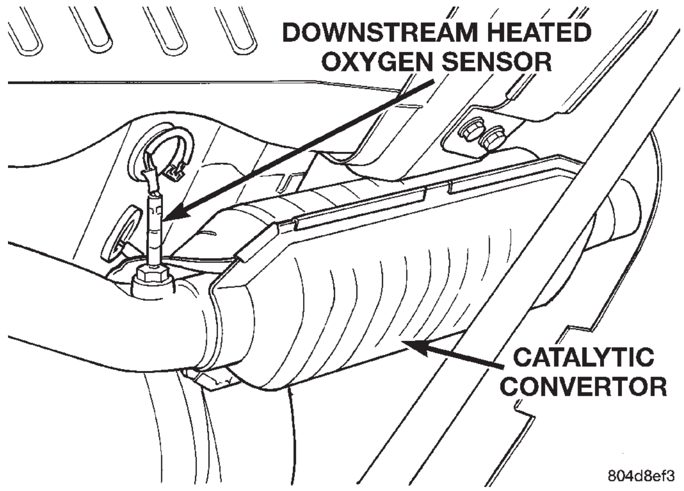


Fig. 11 Downstream Heated Oxygen Sensor

IGNITION SENSE—PCM INPUT

The ignition sense input informs the Powertrain Control Module (PCM) that the ignition switch is in the crank or run position.

INTAKE AIR TEMPERATURE SENSOR—PCM INPUT

The Intake Air Temperature (IAT) sensor measures the temperature of the intake air as it enters the engine. The sensor supplies one of the inputs the PCM uses to determine injector pulse width and spark advance.

The IAT sensor and Manifold Absolute Pressure (MAP) switch they are a combined sensor that attach to the intake manifold (Fig. 12).

The IAT sensor threads into the intake manifold (Fig. 13) or (Fig. 14).

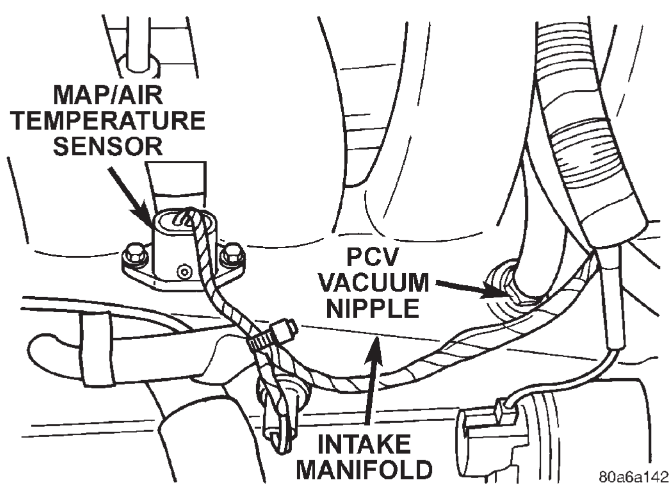


Fig. 12 Intake Air Temperature Sensor and MAP Sensor—2.0L

DESCRIPTION AND OPERATION (Continued)

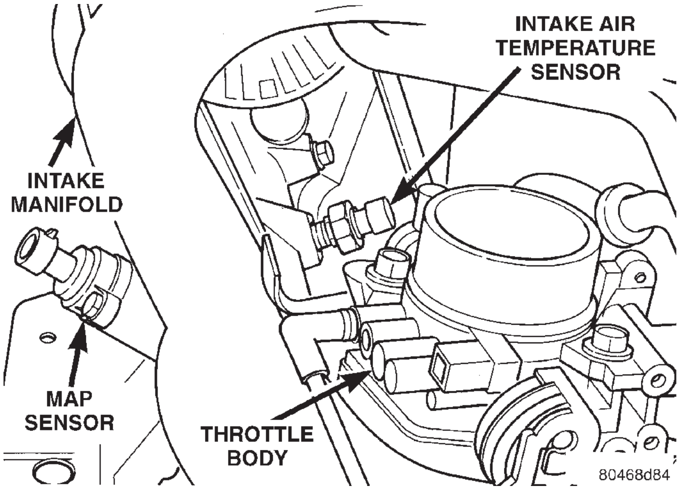


Fig. 13 Intake Air Temperature Sensor and MAP Sensor—2.4L

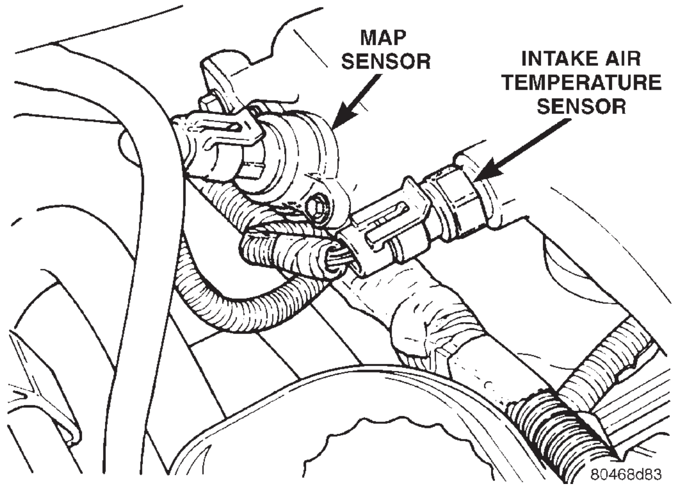


Fig. 14 Intake Air Temperature Sensor and MAP Sensor—2.5L

KNOCK SENSOR—PCM INPUT (2.0L/2.4L ENGINES)

The knock sensor threads into the side of the cylinder block in front of the starter (Fig. 15). When the knock sensor detects a knock in one of the cylinders, it sends an input signal to the PCM. In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which sends an input voltage (signal) to the PCM. As the intensity of the engine knock vibration increases, the knock sensor output voltage also increases.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT

The PCM supplies 5 volts direct current to the MAP sensor. The MAP sensor converts intake manifold pressure into voltage. The PCM monitors the MAP sensor output voltage. As vacuum increases,

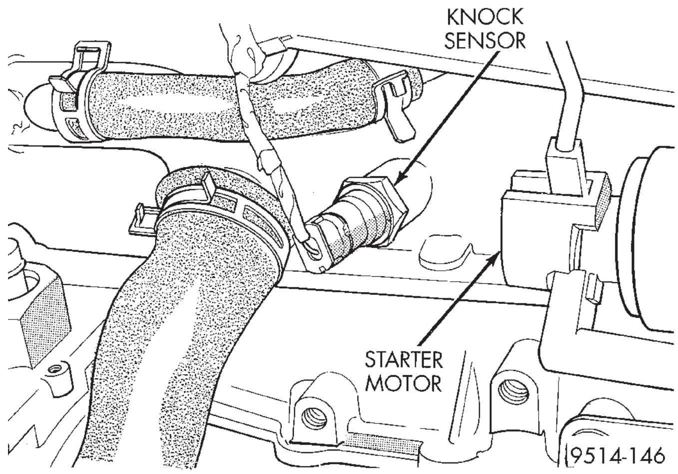


Fig. 15 Knock Sensor

MAP sensor voltage decreases proportionately. Also, as vacuum decreases, MAP sensor voltage increases proportionately.

At key on, before the engine is started, the PCM determines atmospheric air pressure from the MAP sensor voltage. While the engine operates, the PCM determines intake manifold pressure from the MAP sensor voltage. Based on MAP sensor voltage and inputs from other sensors, the PCM adjusts spark advance and the air/fuel mixture.

The MAP sensor mounts to the intake manifold.

POWER STEERING PRESSURE SWITCH—PCM INPUT

A pressure sensing switch is located on the power steering gear. The switch (Fig. 16) provides an input to the PCM during periods of high pump load and low engine RPM; such as during parking maneuvers.

When power steering pump pressure exceeds 4137 kPa (600 psi), the switch is open. The PCM increases idle air flow through the IAC motor to prevent engine stalling. When pump pressure is low, the switch is closed.

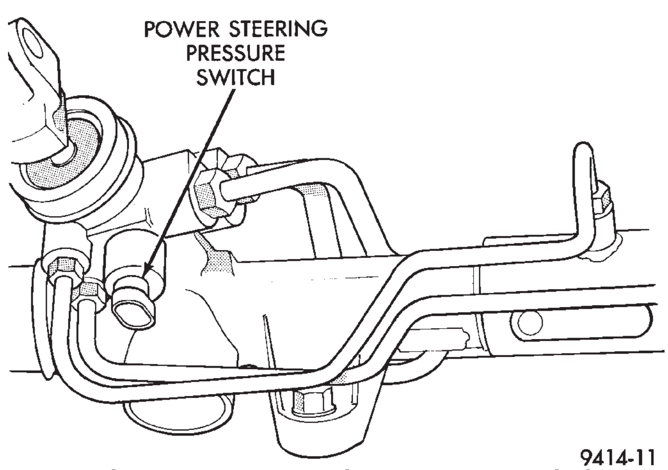


Fig. 16 Power Steering Pressure Switch

DESCRIPTION AND OPERATION (Continued)

SENSOR RETURN—PCM INPUT

The sensor return circuit provides a low electrical noise ground reference for all of the systems sensors. The sensor return circuit connects to internal ground circuits within the powertrain control module.

SPEED CONTROL—PCM INPUT

The speed control system provides five separate voltages (inputs) to the Powertrain Control Module (PCM). The voltages correspond to the ON/OFF, SET, RESUME and CANCEL.

The speed control ON voltage informs the PCM that the speed control system has been activated. The speed control SET voltage informs the PCM that a fixed vehicle speed has been selected. The speed control RESUME voltage indicates the previous fixed speed is requested. The speed control CANCEL voltage tells the PCM to deactivate but retain set speed in memory (same as depressing the brake pedal). The speed control OFF voltage tells the PCM that the speed control system has deactivated. Refer to Group 8H for more speed control information.

SCI RECEIVE—PCM INPUT

SCI Receive is the serial data communication receive circuit for the DRB scan tool. The Powertrain Control Module (PCM) receives data from the DRB through the SCI Receive circuit.

TRANSAXLE PARK/NEUTRAL SWITCH—PCM INPUT

The park/neutral switch is located on the transaxle housing (Fig. 17). It provides an input to the PCM indicating whether the automatic transaxle is in Park or Neutral. This input is used to determine idle speed (varying with gear selection) and ignition timing advance. The park neutral switch is sometimes referred to as the neutral safety switch.

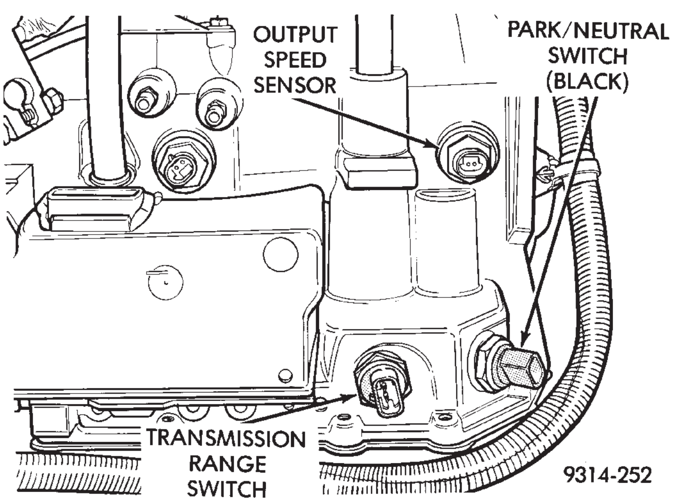


Fig. 17 Park Neutral Switch—4-Speed Electronic Automatic Transaxle—Typical

THROTTLE POSITION SENSOR—PCM INPUT

The throttle position sensor mounts to the side of the throttle body (Fig. 18) or (Fig. 19).

The Throttle Position Sensor (TPS) connects to the throttle blade shaft. The TPS is a variable resistor that provides the PCM with an input signal (voltage). The signal represents throttle blade position. As the position of the throttle blade changes, the resistance of the TPS changes.

The PCM supplies approximately 5 volts DC to the TPS. The TPS output voltage (input signal to the PCM) represents throttle blade position. The TPS output voltage to the PCM varies from approximately 0.5 volt at minimum throttle opening (idle) to a maximum of 3.7 volts at wide open throttle.

Along with inputs from other sensors, the PCM uses TPS input to determine current engine operating conditions. The PCM also adjusts fuel injector pulse width and ignition timing based on these inputs.

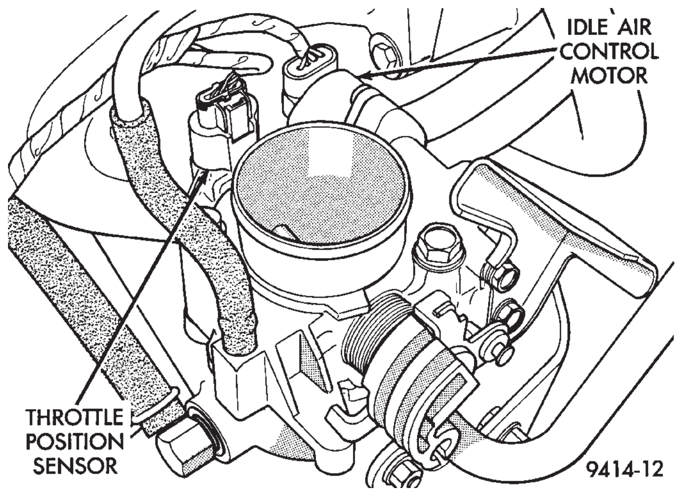


Fig. 18 Throttle Position Sensor—2.0/2.4L Engines

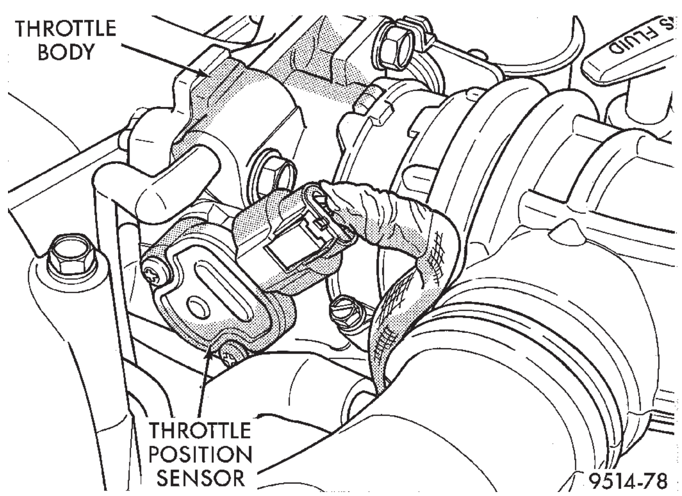


Fig. 19 Throttle Position Sensor—2.5L Engine

DESCRIPTION AND OPERATION (Continued)

VEHICLE SPEED AND DISTANCE—PCM INPUT

The transaxle output speed sensor supplies the vehicle speed and distance inputs to the PCM. The output speed sensor is located on the side of the transaxle (Fig. 17).

The speed and distance signals, along with a closed throttle signal from the TPS, determine if a closed throttle deceleration or normal idle condition (vehicle stopped) exists. Under deceleration conditions, the PCM adjusts the idle air control motor to maintain a desired MAP value. Under idle conditions, the PCM adjusts the idle air control motor to maintain a desired engine speed.

AIR CONDITIONING CLUTCH RELAY—PCM OUTPUT

The PCM controls the air conditioning clutch relay ground circuit. Buss bars in the Power Distribution Center (PDC) supply voltage to the solenoid side and power side of the relay. When the PCM receives an air conditioning input, it grounds the A/C compressor clutch relay and the radiator fan relay.

When the PCM senses low idle speeds or wide open throttle through the throttle position sensor, it removes the ground for the A/C compressor clutch relay. When the relay de-energizes, the contacts open preventing air conditioning clutch engagement. Also, if the PCM senses a part throttle launch condition, it disables the A/C compressor clutch for several seconds.

The air conditioning clutch relay is located in the PDC. The inside top of the PDC cover has a label showing relay and fuse location.

AUTOMATIC SHUTDOWN RELAY—PCM OUTPUT

The PCM operates the automatic shut down (ASD) relay and fuel pump relay through one ground path. The PCM operates them by switching the ground path for the solenoid side of the relays on and off. Both relays turn on and off at the same time.

The ASD relay connects battery voltage to the fuel injectors and ignition coil. The fuel pump relay connects battery voltage to the fuel pump.

A buss bar in the power distribution center (PDC) supplies voltage to the solenoid side and contact side of the relay. The ASD relay power circuit contains a 20 amp fuse between the buss bar in the PDC and the relay. The fuse also protects the power circuit for the fuel pump relay and pump. The fuse is located in the PDC. Refer to Group 8W, Wiring Diagrams for circuit information.

The PCM controls the relay by switching the ground path for the solenoid side of the relay on and off. The PCM turns the ground path off when the ignition switch is in the Off position unless the 02 Heater Monitor test is being run. Refer to Group 25, On-Board Diagnostics. When the ignition switch is in the On or Crank position, the PCM monitors the crankshaft position sensor and camshaft position sensor signals to determine engine speed and ignition timing (coil dwell). If the PCM does not receive the crankshaft position sensor and camshaft position sensor signals when the ignition switch is in the Run position, it will de-energize the ASD relay.

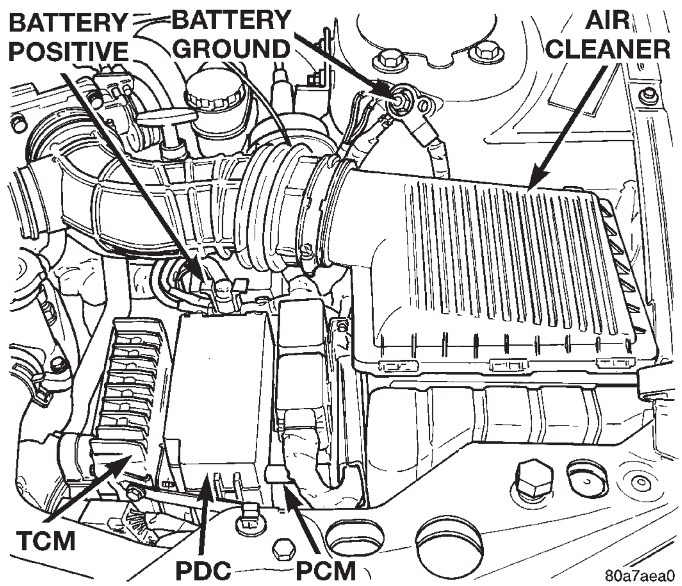


Fig. 20 Power Distribution Center (PDC)

The ASD relay and fuel pump relay are located in the power distribution center (PDC) near the battery (Fig. 20). The inside top of the PDC cover has a label showing relay and fuse location.

DUTY CYCLE EVAP PURGE SOLENOID—PCM OUTPUT

The duty cycle EVAP purge solenoid regulates the rate of vapor flow from the EVAP canister to the throttle body. The powertrain control module operates the solenoid.

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged.

The engine enters closed loop operation after it reaches a specified temperature and the programmed time delay ends. During closed loop operation, the PCM energizes and de-energizes the solenoid 5 to 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse width. Pulse width is the amount of time the solenoid is energized.

The solenoid attaches to a bracket near the front engine mount (Fig. 21). To operate correctly, the solenoid must be installed with the electrical connector on top.

DESCRIPTION AND OPERATION (Continued)

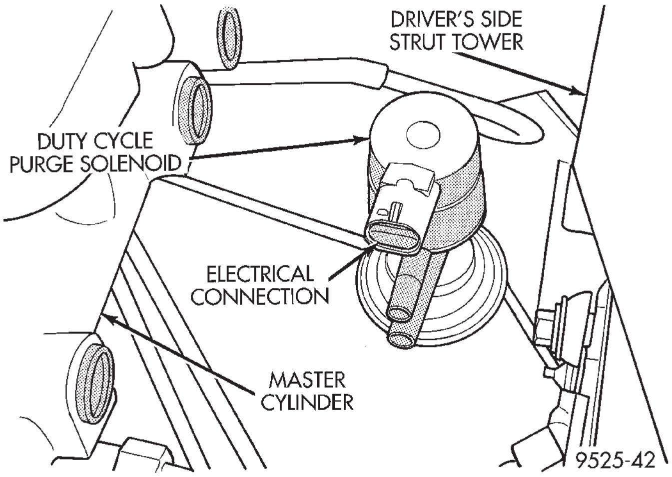


Fig. 21 Duty Cycle EVAP Purge Solenoid

ELECTRIC EGR TRANSDUCER—PCM OUTPUT—2.4/2.5L ENGINES

The Electric EGR Transducer contains an electrically operated solenoid and a back-pressure controlled vacuum transducer (Fig. 22). The PCM operates the solenoid based on inputs from the multiport fuel injection system. The solenoid/transducer and EGR valve are serviced as an assembly.

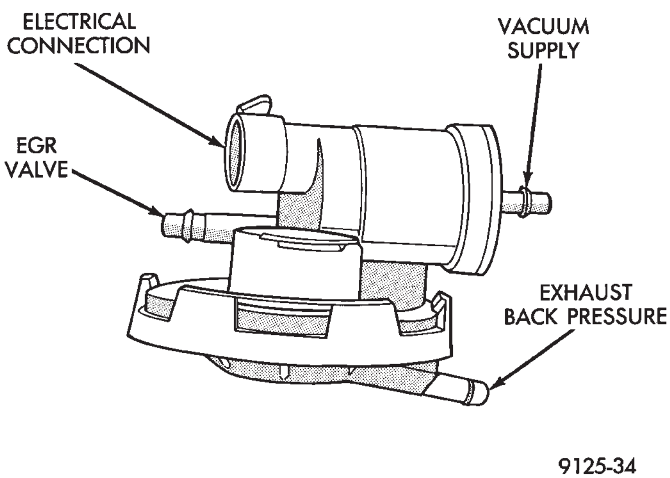


Fig. 22 Electronic EGR Transducer

When the PCM energizes the solenoid, vacuum does not reach the transducer. Vacuum flows to the transducer when the PCM de-energizes the solenoid.

When exhaust system back-pressure becomes high enough, it fully closes a bleed valve in the vacuum transducer. When the PCM de-energizes the solenoid and back-pressure closes the transducer bleed valve, vacuum flows through the transducer to operate the EGR valve.

De-energizing the solenoid, but not fully closing the transducer bleed hole (because of low back-pressure), varies the strength of the vacuum signal applied to the EGR valve. Varying the strength of the vacuum signal changes the amount of EGR supplied to the engine. This provides the correct amount of exhaust gas recirculation for different operating conditions.

The solenoid/transducer and EGR valve mount to the rear of the cylinder head (Fig. 23) or (Fig. 24).

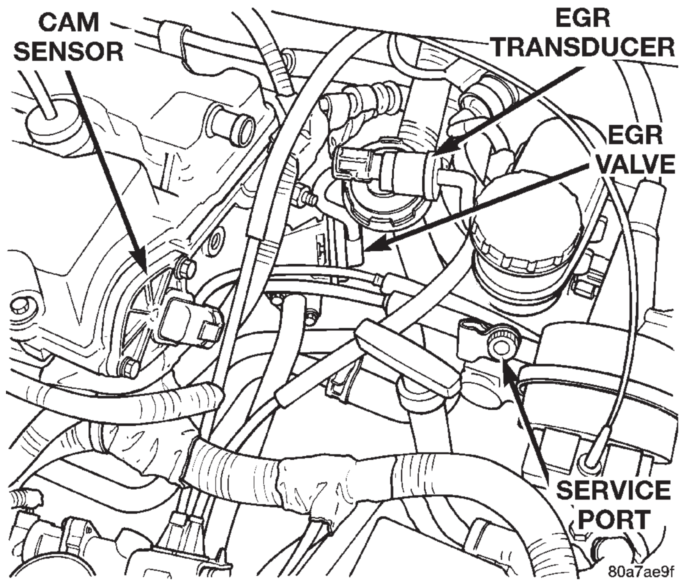


Fig. 23 Electric EGR Transducer—2.4L Engine

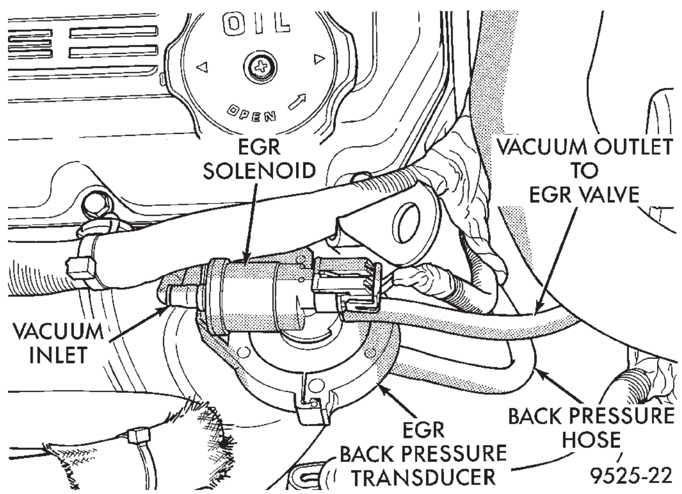


Fig. 24 EGR Control Valve—2.5L Engine

GENERATOR FIELD—PCM OUTPUT

The PCM regulates the charging system voltage within a range of 12.9 to 15.0 volts. Refer to Group 8A for Battery system information and 8C for charging system information.

DESCRIPTION AND OPERATION (Continued)

IDLE AIR CONTROL MOTOR—PCM OUTPUT

The Idle Air Control (IAC) motor is mounted on the throttle body. The PCM operates the idle air control motor (Fig. 25) or (Fig. 26). The PCM adjusts engine idle speed through the idle air control motor to compensate for engine load, coolant temperature or barometric pressure changes.

The throttle body has an air bypass passage that provides air for the engine during closed throttle idle. The idle air control motor pintle protrudes into the air bypass passage and regulates air flow through it.

The PCM adjusts engine idle speed by moving the IAC motor pintle in and out of the bypass passage. The adjustments are based on inputs the PCM receives. The inputs are from the throttle position sensor, crankshaft position sensor, coolant temperature sensor, MAP sensor, vehicle speed sensor and various switch operations (brake, park/neutral, air conditioning).

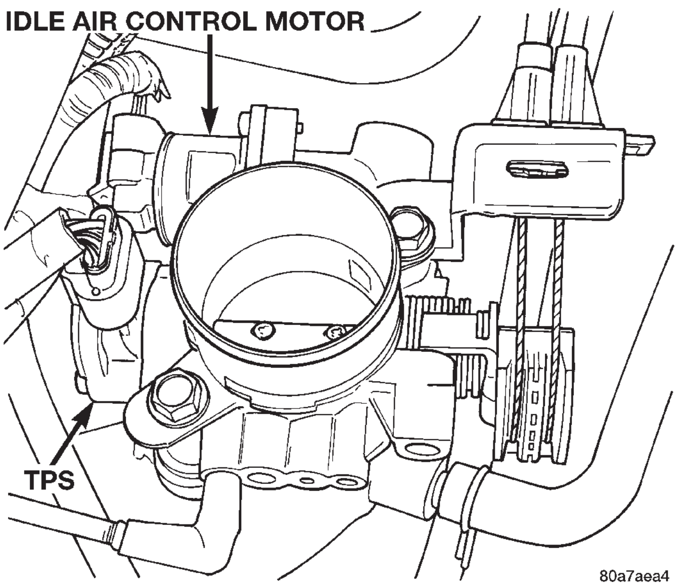


Fig. 25 Idle Air Control Motor Air Bypass Passage—2.4L

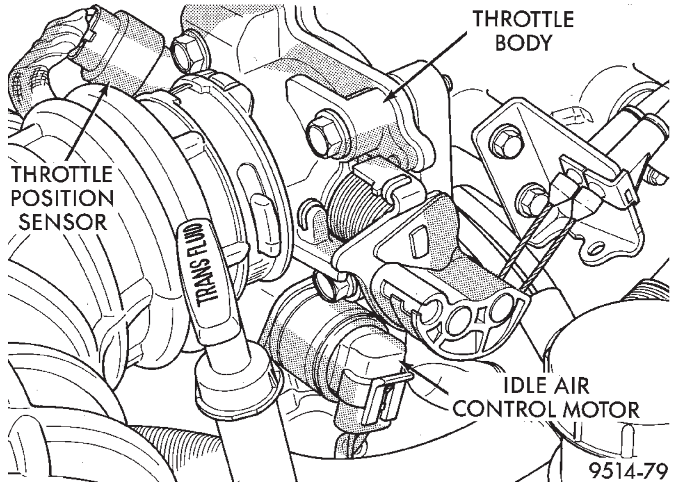


Fig. 26 Idle Air Control Motor Air Bypass Passage—2.5L

DATA LINK CONNECTOR

The data link connector (diagnostic connector) links the DRB scan tool with the Powertrain Control Module (PCM). Refer to On-Board Diagnostics in Group 25 - Emission Control Systems. The data link connector is located inside the vehicle, under the instrument panel, at the driver's kick panel (Fig. 27).

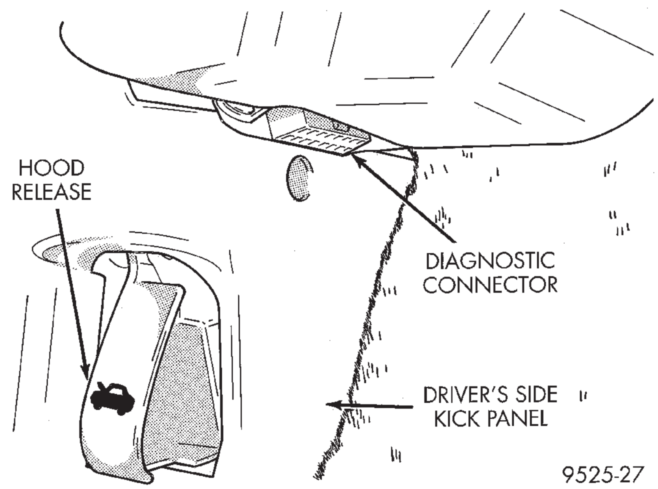


Fig. 27 Data Link (Diagnostic) Connector

FUEL INJECTORS—PCM OUTPUT

All engines use electrically operated top feed fuel injectors (Fig. 28). The Automatic Shutdown (ASD) relay supplies battery voltage to the fuel injectors. The PCM controls the ground path for each injector in sequence. By switching the ground paths on and off, the PCM fine-tunes injector pulse width. Injector pulse width refers to the amount of time an injector operates.

The PCM determines injector synchronization from the camshaft position sensor and crankshaft position sensor inputs. The PCM grounds the ASD and fuel pump relays after receiving the camshaft position sensor and crankshaft position sensor inputs.

DESCRIPTION AND OPERATION (Continued)

The PCM energizes the injectors in a sequential order during all engine operating conditions except start-up. For the first injector pulse width during start-up, all injectors are energized at the same time. Once the PCM determines crankshaft position, it begins energizing the injectors in sequence.

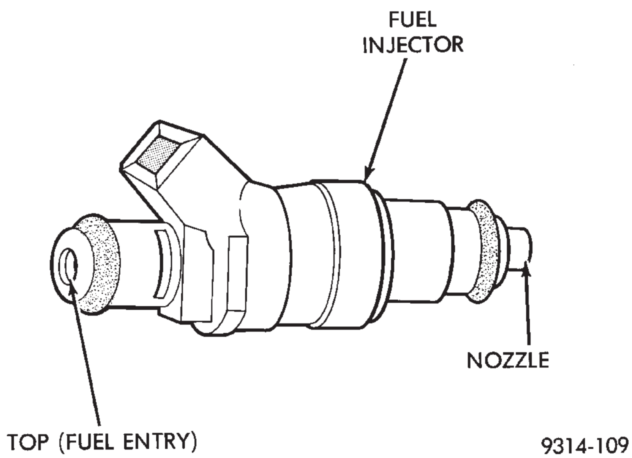


Fig. 28 Fuel Injector

IGNITION COIL—PCM OUTPUT

The coil assembly consists of independent coils molded together (Fig. 29) or (Fig. 30). The coil assembly is mounted on the intake manifold. High tension leads route to each cylinder from the coil. The coil fires two spark plugs every power stroke. One plug is the cylinder under compression, the other cylinder fires on the exhaust stroke. The PCM determines which of the coils to charge and fire at the correct time.

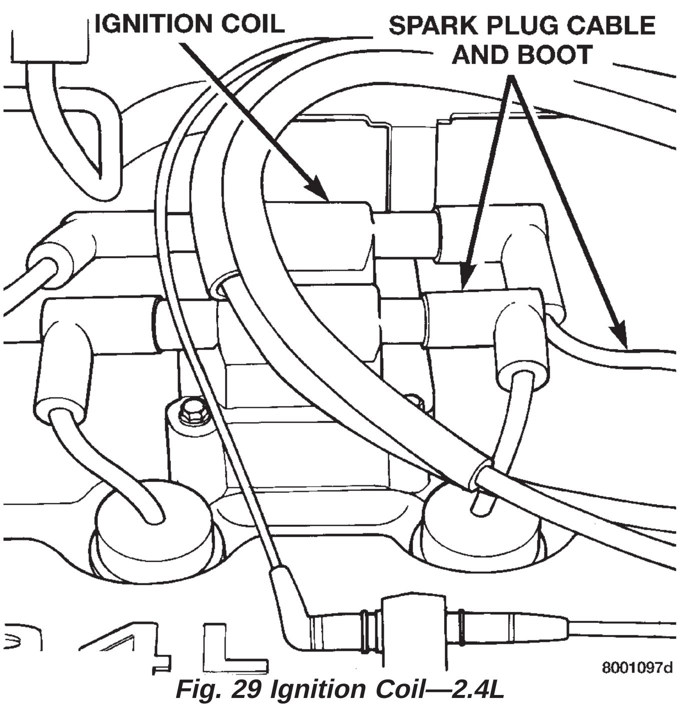


Fig. 29 Ignition Coil—2.4L

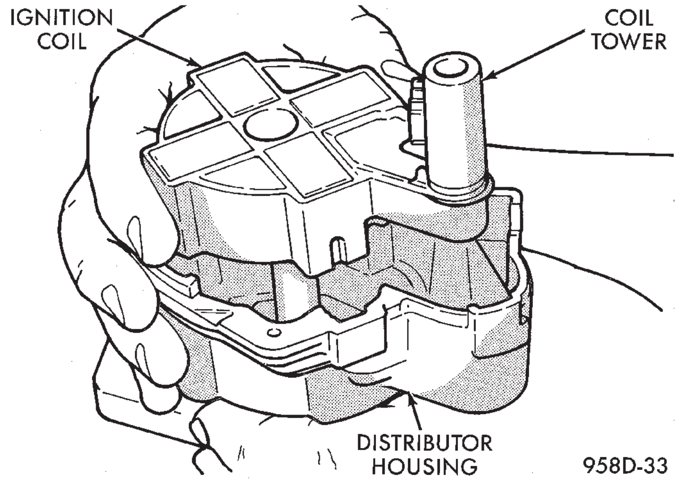


Fig. 30 Ignition Coil—2.5L

The Automatic Shutdown (ASD) relay provides battery voltage to the ignition coil. The PCM provides a ground contact (circuit) for energizing the coil. When the PCM breaks the contact, the energy in the coil primary transfers to the secondary causing the spark. The PCM will de-energize the ASD relay if it does not receive the crankshaft position sensor and camshaft position sensor inputs. Refer to Automatic Shutdown (ASD) Relay—PCM Output in this section for relay operation.

MALFUNCTION INDICATOR (CHECK ENGINE) LAMP—PCM OUTPUT

The PCM supplies the malfunction indicator (check engine) lamp on/off signal to the instrument panel through the CCD Bus. The CCD Bus is a communications port. Various modules use the CCD Bus to exchange information.

The Check Engine lamp comes on each time the ignition key is turned ON and stays on for 3 seconds as a bulb test.

The Malfunction Indicator Lamp (MIL) stays on continuously, when the PCM has entered a Limp-In mode or identified a failed emission component. During Limp-in Mode, the PCM attempts to keep the system operational. The MIL signals the need for immediate service. In limp-in mode, the PCM compensates for the failure of certain components that send incorrect signals. The PCM substitutes for the incorrect signals with inputs from other sensors.

If the PCM detects active engine misfire severe enough to cause catalyst damage, it flashes the MIL. At the same time the PCM also sets a Diagnostic Trouble Code (DTC).

For signals that can trigger the MIL (Check Engine Lamp) refer to Group 25, On-Board Dianostics.

The MIL can also display diagnostic trouble codes. Cycle the ignition switch on, off, on, off, on, within 5 seconds and any diagnostic trouble codes stored in

DESCRIPTION AND OPERATION (Continued)

the PCM will be displayed. Refer to On-Board Diagnostics in Group 25, Emission Control Systems Diagnostic Trouble Code Descriptions.

RADIATOR FAN RELAYS—PCM OUTPUT

The PCM energizes the radiator fans through either the low or high speed radiator fan relay. The PCM controls the ground circuit for the solenoid side of the relay. Power for both relay solenoids is supplied through a 10 amp fuse in the PDC. Power for both relay contacts is supplied power through a 40 amp fuse in the PDC. Refer to Group 8W - Wiring Diagrams for circuit information.

The PCM monitors the A/C compressor discharge (high side) pressure through the air conditioning pressure transducer. Depending on engine coolant temperature and A/C system high side pressure, both fans operate at either low or high speed.

The radiator fan relays are located in the PDC. The inside top of the PDC cover has a label showing relay and fuse location.

SPEED CONTROL RELAY—PCM OUTPUT

When the operator engages the speed control PCM receives a input from the speed control On switch. In response to the input, the PCM grounds the coil side of the speed control relay. The ignition switch supplies power to the coil and contact sides of the relay. When energized, the speed control relay supplies battery voltage to the speed control vacuum and vent servos. Refer to Group 8H for speed control information.

SPEED CONTROL SERVOS—PCM OUTPUT

The PCM operates the speed control vacuum and vent servos. The PCM supplies a ground for both servos. The speed control relay supplies, also operated by the PCM, supplies battery voltage to the servos. When the PCM supplies a ground to the vacuum servo, the speed control system opens the throttle plate to obtain or maintain the selected road speed. When the PCM supplies a ground to the vent servo, the speed control system releases the throttle plate. The PCM balances the two servos to maintain the set speed. Refer to Group 8H for speed control information.

TACHOMETER—PCM OUTPUT

The tachometer receives its information across the CCD Bus from the Body Control Module (BCM). Information on engine RPM is transmitted from the Powertrain Control Module (PCM) across the CCD Bus to the BCM. The BCM calculates the position of the tachometer pointer based on the input from the PCM and adjusts the position of the gauge pointer to the necessary position. This signal is sent over the CCD Bus to the instrument cluster.

5 VOLT SUPPLY—PCM OUTPUT

The PCM supplies 5 volts to the following sensors:

- A/C pressure transducer
- Engine coolant temperature sensor
- Manifold absolute pressure sensor
- Throttle position sensor

8-VOLT SUPPLY—PCM OUTPUT

The PCM supplies 8 volts to the crankshaft position sensor, camshaft position sensor.

THROTTLE BODY

The throttle body mounts to the intake manifold. The throttle position sensor and idle air control motor attach to the throttle body (Fig. 31) or (Fig. 32).

At above idle conditions, air flow through the throttle body is controlled by a cable operated throttle blade. During closed throttle idle conditions, the idle air control motor controls air flow. Refer to Idle Air Control Motor in this section.

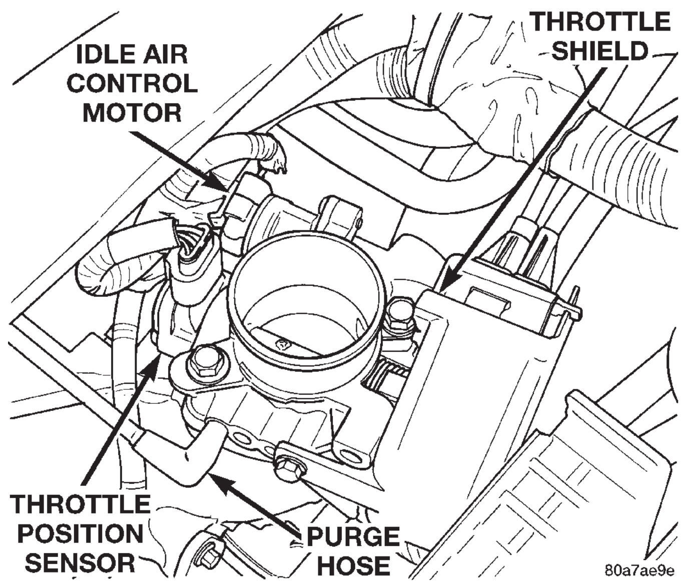


Fig. 31 Throttle Body—2.4L Engines

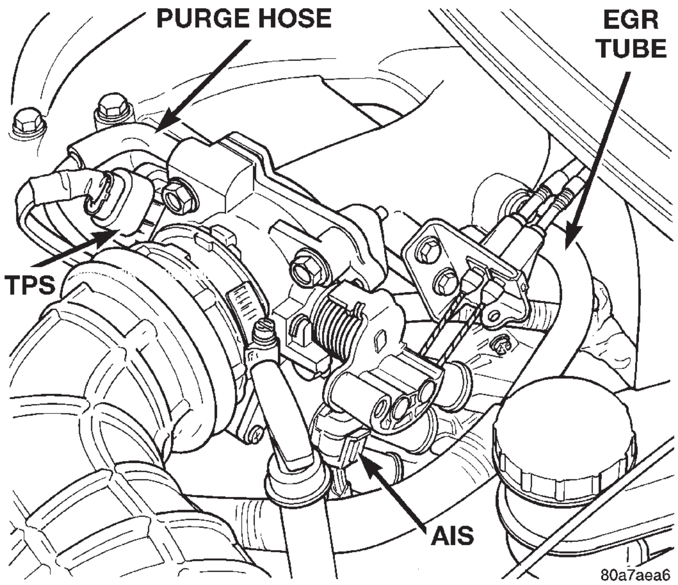


Fig. 32 Throttle Body—2.5L Engine

DIAGNOSIS AND TESTING

VISUAL INSPECTION

Before diagnosing or servicing the fuel injection system, perform a visual inspection for loose, disconnected, or misrouted wires and hoses. A thorough visual inspection that includes the following checks saves unnecessary test and diagnostic time.

(1) Inspect remote battery cable connections. Be sure they are clean and tight. Clean corroded terminals (Fig. 33).

(2) Verify that the PCM's 2 40-way connectors are fully inserted into their sockets on the PCM (Fig. 33).

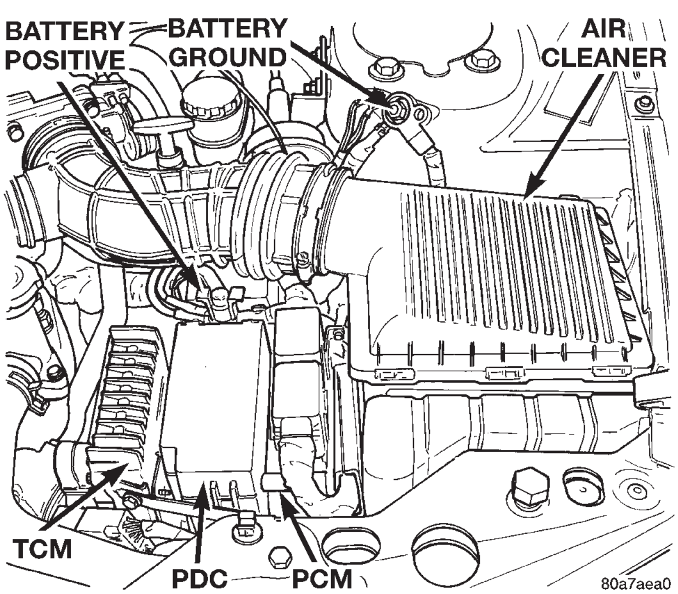


Fig. 33 Remote Battery Terminals and PCM Connectors

(3) Open the Power Distribution Center (PDC). Check for blown fuses. Ensure the relays and fuses are fully seated in the PDC (Fig. 33). A label on the underside of the PDC cover shows the locations of each relay and fuse.

(4) Inspect accelerator cable, and cruise control cable (if equipped) connections. Check their connections to the throttle arm of the throttle body for any binding or restrictions.

(5) Check the electrical connections at the idle air control motor and throttle position sensor (Fig. 34) 0r (Fig. 35).

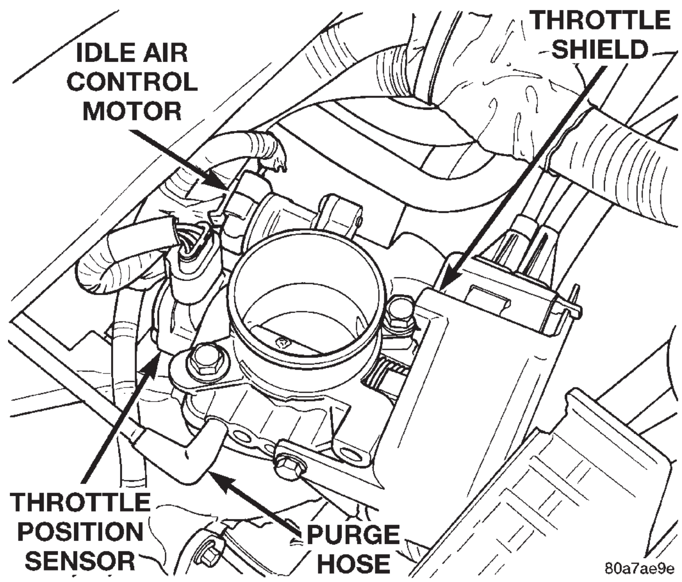


Fig. 34 Idle Air Control Motor and Throttle Position Sensor—2.4L Engine

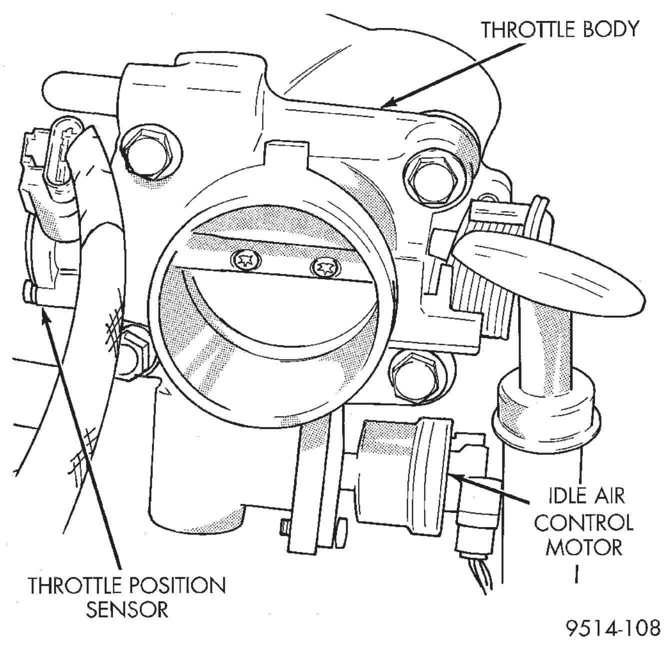


Fig. 35 Idle Air Control Motor and Throttle Position Sensor—2.5L Engine

DIAGNOSIS AND TESTING (Continued)

(6) Check hose connections between the PCV valve, vacuum port-intake manifold (Fig. 36) or (Fig. 37).

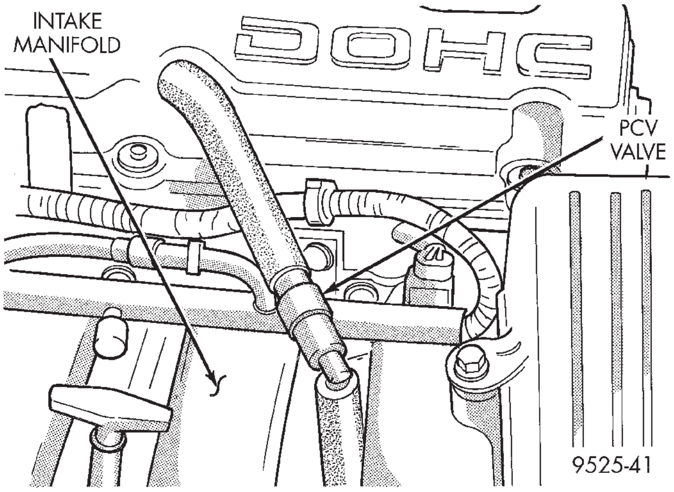


Fig. 36 PCV Valve—2.4L Engine

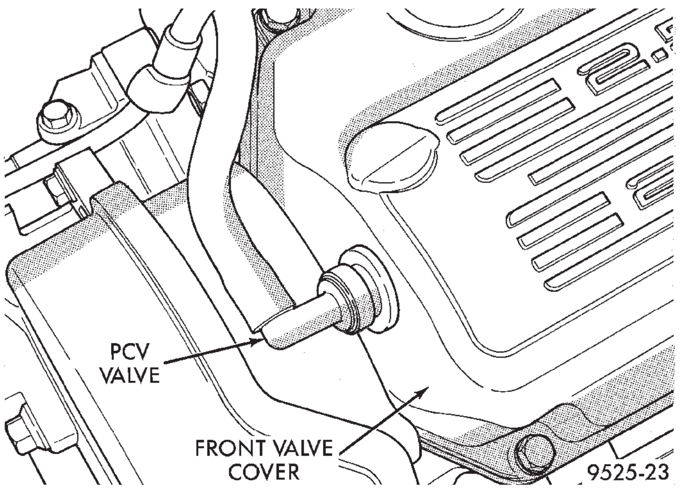


Fig. 37 PCV Valve—2.5L Engine

(7) Inspect the electrical connections at the intake air temperature sensor and the MAP sensor (Fig. 38) or (Fig. 39).

(8) Inspect the fuel injector electrical connections (Fig. 40). Use the DRB Scan Tool to verify connection on a 2.5L engine.

2.4L

(a) Inspect the ignition coil electrical connector. Ensure the spark plug insulators are firmly seated over the spark plugs (Fig. 41).

2.5L

(b) Inspect distributor connectors (Fig. 42) and spark plug cables at distributor.

(9) Inspect the electrical and hose connections at the duty cycle purge solenoid (Fig. 43).

(10) Check electrical connection to the radiator fan.

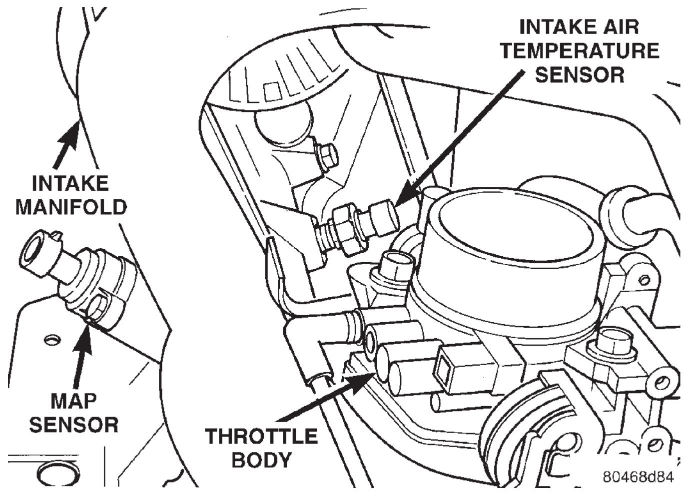


Fig. 38 MAP Sensor and Intake Air Temperature Sensor—2.4L Engine

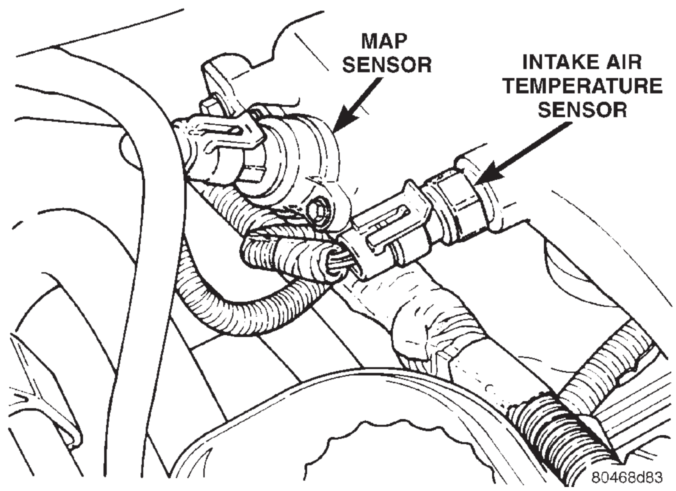


Fig. 39 MAP Sensor and Intake Air Temperature Sensor—2.5L Engine

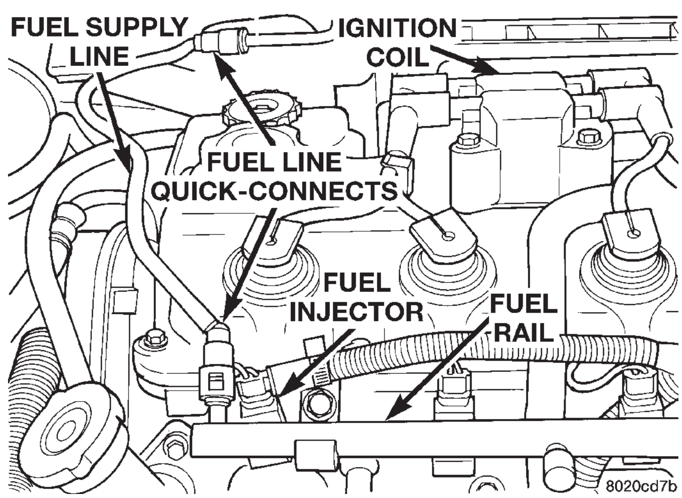


Fig. 40 Fuel Injectors—2.4L Engines

DIAGNOSIS AND TESTING (Continued)

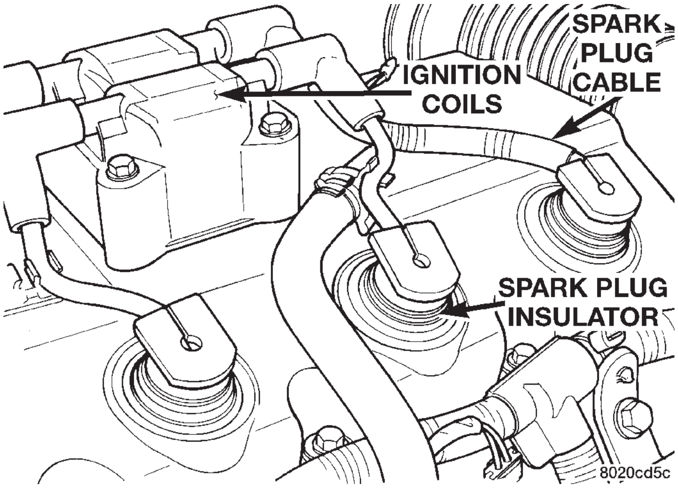


Fig. 41 Ignition Coil and Spark Plugs

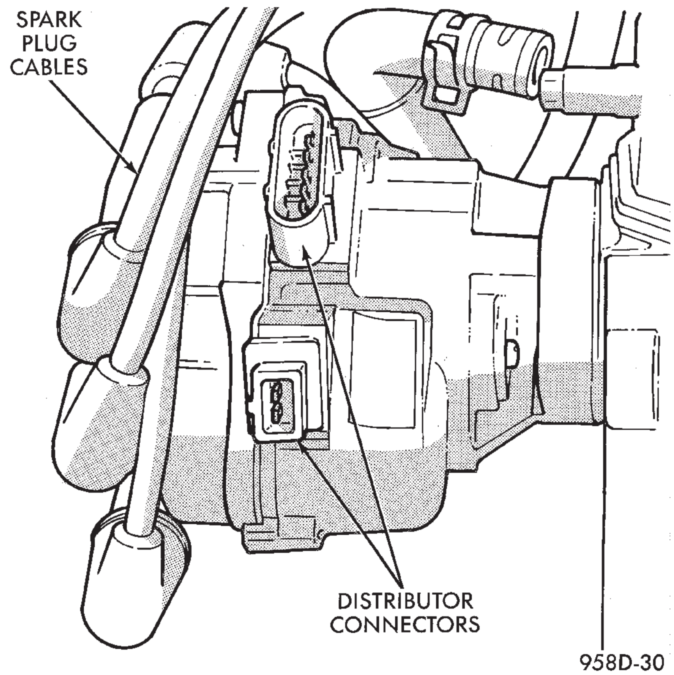


Fig. 42 Distributor Electrical Connectors-Viewed From Rear of Distributor

(11) Inspect system body grounds for loose or dirty connections. Refer to Group 8 - Wiring for ground locations.

(12) Inspect air cleaner filter element. Replace as necessary. Check air induction system for restrictions.

(13) Check electrical connection at the knock sensor (Fig. 44), 2.4L engines only.

(14) Check electrical connections at the camshaft position sensor (Fig. 45).

(15) Check electrical connections at the engine coolant temperature sensor (Fig. 46) or (Fig. 47).

(16) Check electrical connector at Electronic EGR Transducer. Inspect vacuum and back pressure hoses at the solenoid and transducer for leaks (Fig. 48) or (Fig. 49).

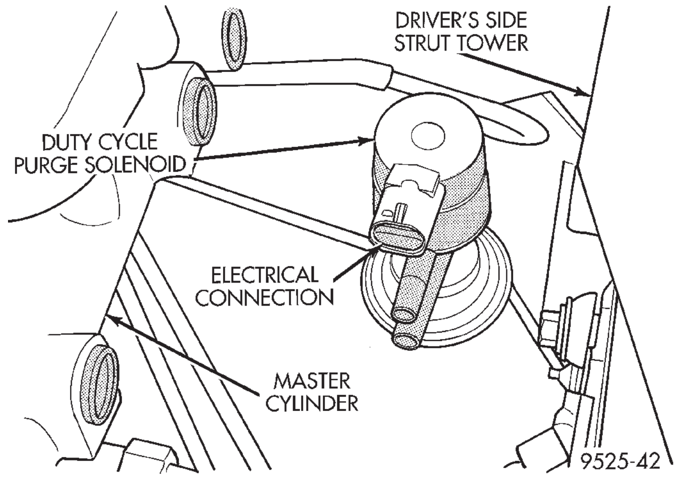


Fig. 43 Duty Cycle EVAP Purge Solenoid

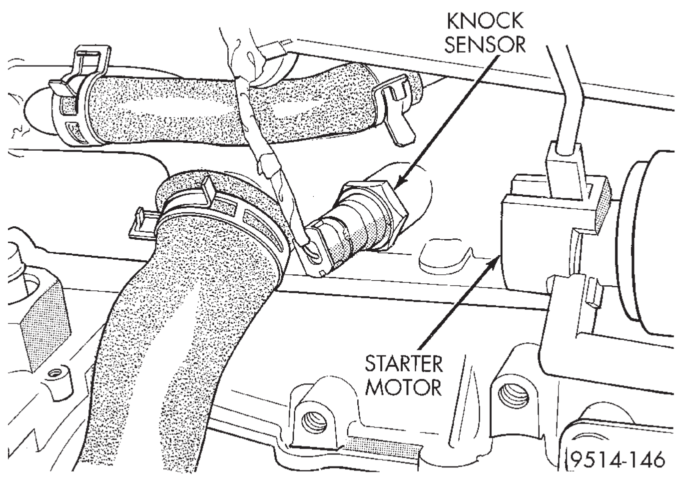


Fig. 44 Knock Sensor—2.4L

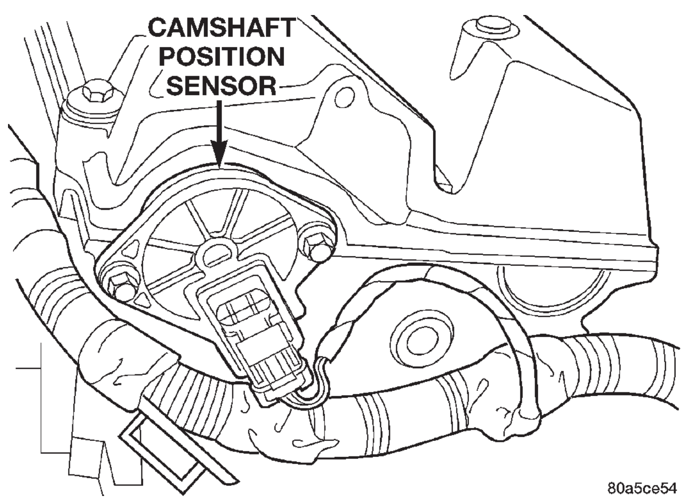


Fig. 45 Camshaft Position Sensor—2.4L Engine

(17) Inspect electrical connections at the generator. Check the generator belt for glazing or damage.

(18) Inspect electrical connector at the crankshaft position sensor (Fig. 50) or (Fig. 51).

DIAGNOSIS AND TESTING (Continued)

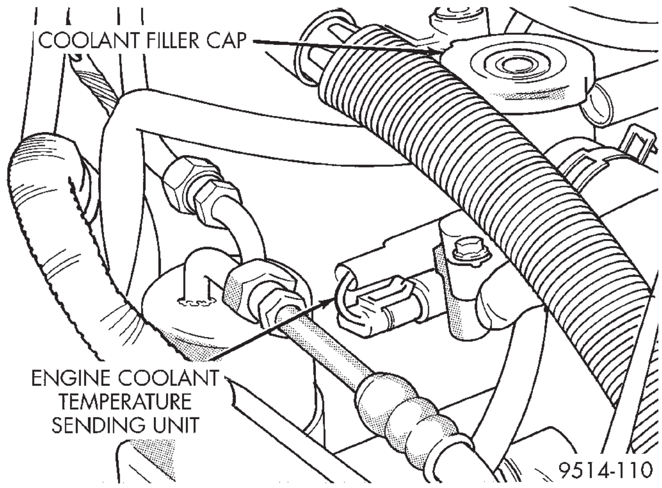


Fig. 46 Engine Coolant Temperature Sensor—2.4L Engine

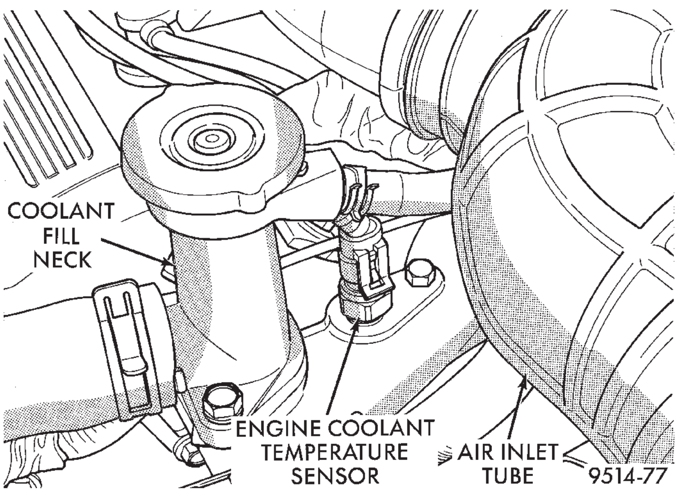


Fig. 47 Engine Coolant Temperature Sensor—2.5L Engine

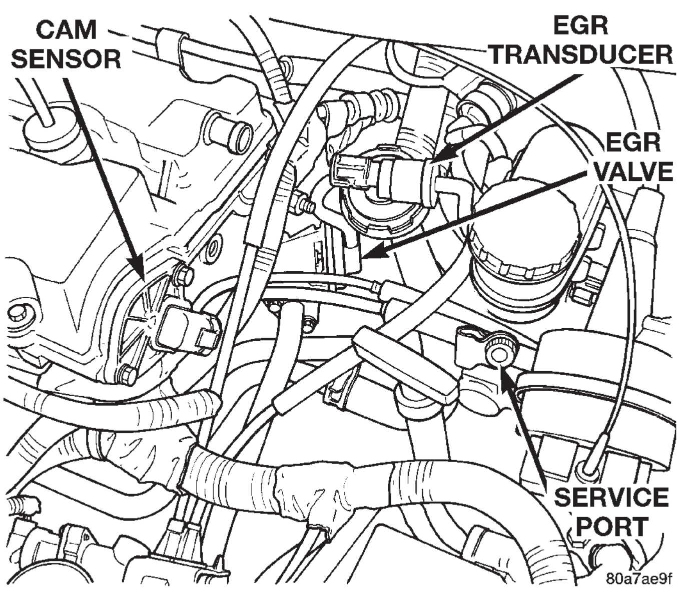


Fig. 48 Electronic EGR Transducer—2.4L Engine

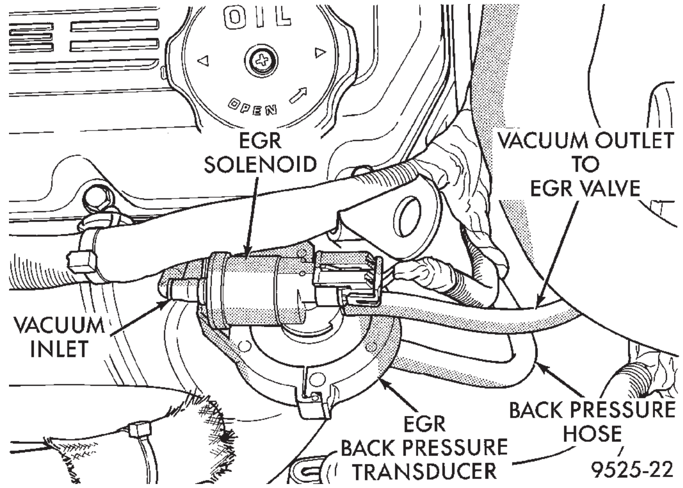


Fig. 49 Electronic EGR Transducer—2.5L Engine

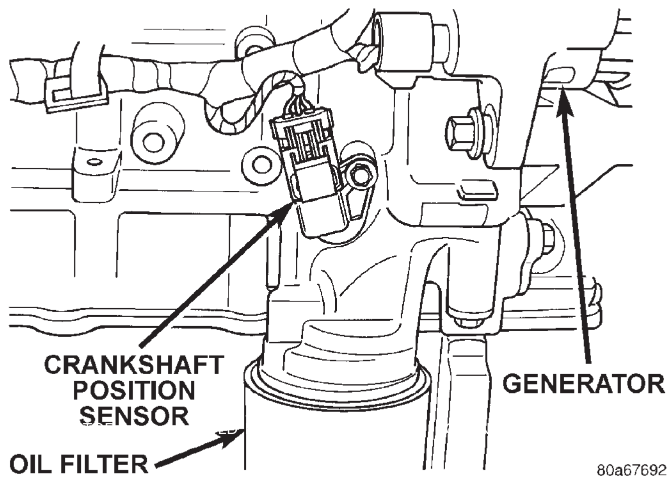


Fig. 50 Crankshaft Position Sensor—2.4L Engines-Typical

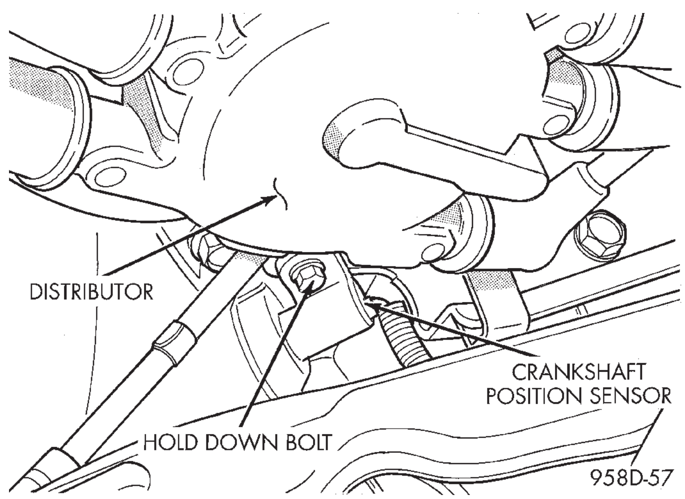


Fig. 51 Crankshaft Position Sensor—2.5L Engine

DIAGNOSIS AND TESTING (Continued)

(19) Check electrical connection at the vehicle speed sensor (Fig. 52).

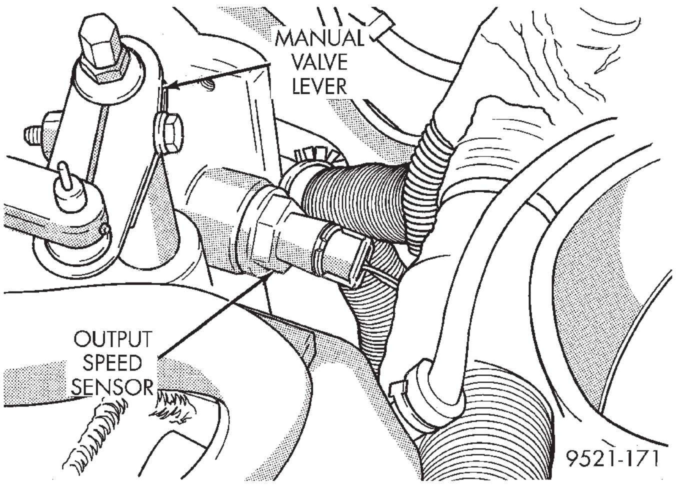


Fig. 52 Output Speed Sensor—Automatic Transmission

(20) Check electrical connection at the power steering pressure switch on the power steering gear housing (Fig. 53).

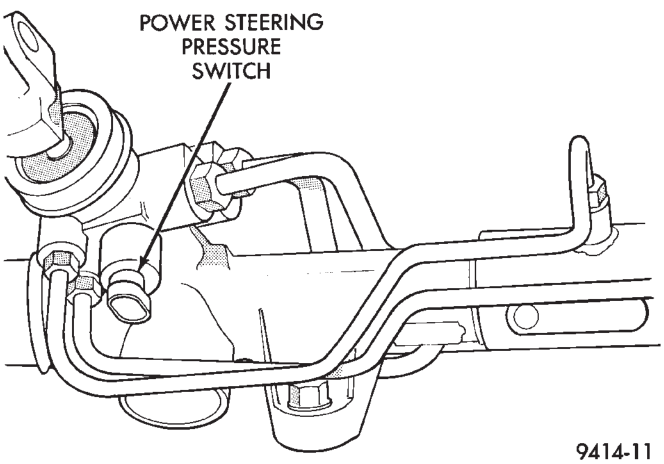


Fig. 53 Power Steering Pressure Switch

(21) On vehicles with automatic transaxles, check the electrical connections at the Transmission Range Sensor (TRS).

(22) Inspect the electrical connections at the upstream and downstream heated oxygen sensors (Fig. 54), or (Fig. 55), and (Fig. 56).

(23) Inspect the fuel pump module electrical connection in the trunk for corrosion or damage (Fig. 57).

(24) Inspect the connections to the speed control servo, if equipped. Refer to Group 8H, Vehicle Speed Control.

ASD AND FUEL PUMP RELAYS

The following description of operation and tests apply only to the Automatic Shutdown (ASD) and fuel pump relays . The terminals on the bottom of each relay are numbered (Fig. 58).

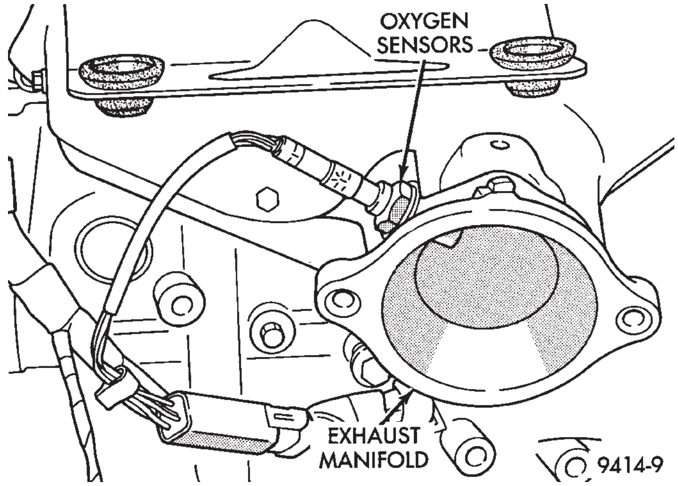


Fig. 54 Upstream Heated Oxygen Sensor—2.4L Engines

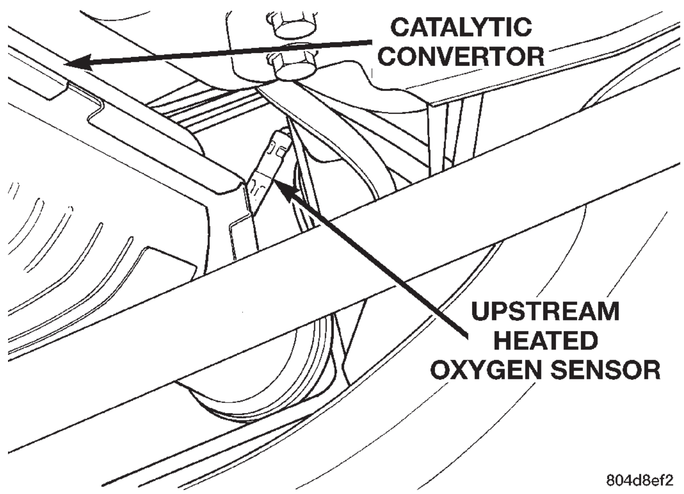


Fig. 55 Upstream Heated Oxygen Sensor—2.5L Engine

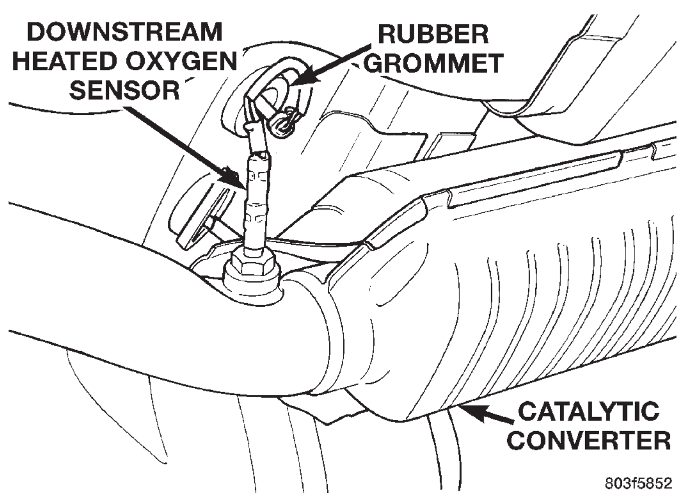


Fig. 56 Rear Heated Oxygen Sensor

DIAGNOSIS AND TESTING (Continued)

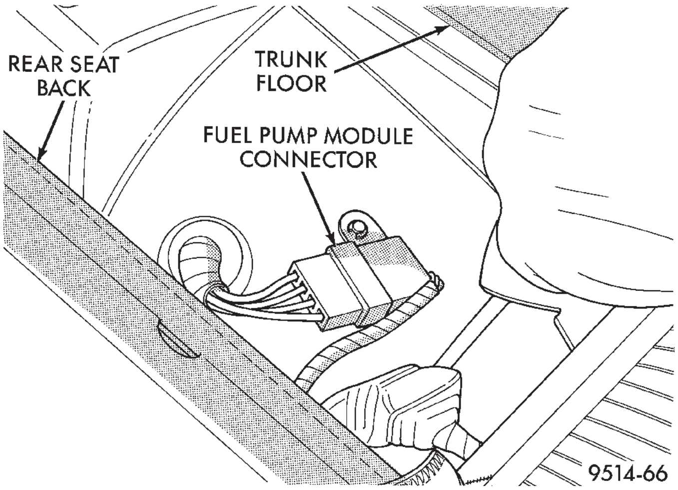
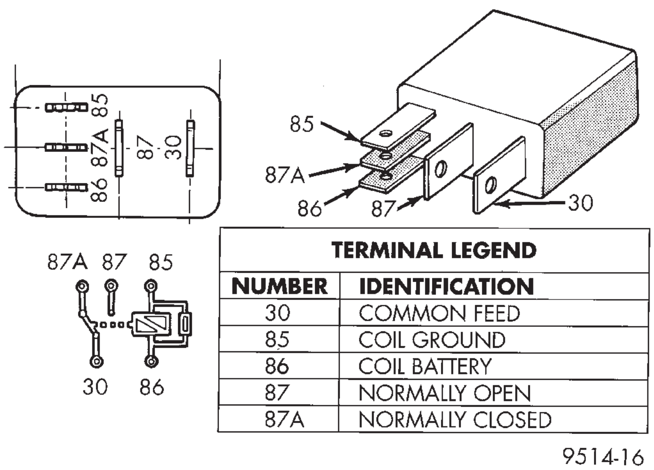


Fig. 57 Fuel Pump Module Electrical Connector



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 58 ASD and Fuel Pump Relay Terminals

OPERATION

• Terminal number 30 is connected to battery voltage. For both the ASD and fuel pump relays, terminal 30 is connected to battery voltage at all times.

• The PCM grounds the coil side of the relay through terminal number 85.

• Terminal number 86 supplies voltage to the coil side of the relay.

• When the PCM de-energizes the ASD and fuel pump relays, terminal number 87A connects to terminal 30. This is the Off position. In the off position, voltage is not supplied to the rest of the circuit. Terminal 87A is the center terminal on the relay.

• When the PCM energizes the ASD and fuel pump relays, terminal 87 connects to terminal 30. This is the On position. Terminal 87 supplies voltage to the rest of the circuit.

TESTING

The following procedure applies to the ASD and fuel pump relays.

(1) Remove relay from connector before testing.

(2) With the relay removed from the vehicle, use an ohmmeter to check the resistance between terminals 85 and 86. The resistance should be between 75 ±5 ohms.

(3) Connect the ohmmeter between terminals 30 and 87A. The ohmmeter should show continuity between terminals 30 and 87A.

(4) Connect the ohmmeter between terminals 87 and 30. The ohmmeter should not show continuity at this time.

(5) Connect one end of a jumper wire (16 gauge or smaller) to relay terminal 85. Connect the other end of the jumper wire to the ground side of a 12 volt power source.

(6) Connect one end of another jumper wire (16 gauge or smaller) to the power side of the 12 volt power source. **Do not attach the other end of the jumper wire to the relay at this time.**

WARNING: DO NOT ALLOW OHMMETER TO CONTACT TERMINALS 85 OR 86 DURING THIS TEST.

(7) Attach the other end of the jumper wire to relay terminal 86. This activates the relay. The ohmmeter should now show continuity between relay terminals 87 and 30. The ohmmeter should not show continuity between relay terminals 87A and 30.

(8) Disconnect jumper wires.

(9) Replace the relay if it did not pass the continuity and resistance tests. If the relay passed the tests, it operates properly. Check the remainder of the ASD and fuel pump relay circuits. Refer to group 8W, Wiring Diagrams.

CAMSHAFT AND CRANKSHAFT POSITION SENSOR

Refer to Group 8D, Ignition for Diagnosis and Testing of Camshaft and Crankshaft Sensors.

ENGINE COOLANT TEMPERATURE SENSOR

To perform a complete test of this sensor and its circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the sensor only, refer to the following:

(1) With the key off, disconnect wire harness connector from coolant temperature sensor.

(2) Connect one lead of a high input impedance (digital) volt- ohmmeter to one terminal of sensor.

(3) Connect the other ohmmeter lead to remaining terminal of sensor. The ohmmeter should read as follows:

• Engine/Sensor at normal operating temperature around 200°F should read approximately 700 to 1,000 ohms.

• Engine/Sensor at room temperature around 70°F ohmmeter should read approximately 7,000 to 13,000 ohms.

(4) Test the resistance of the wire harness between the PCM connector terminal 26 and the sensor harness connector. Also check for continuity between

DIAGNOSIS AND TESTING (Continued)

connector terminal 43 and the sensor harness connector. Refer to Group 8W, Wiring diagrams for circuit information. If the resistance is greater than 1 ohm, repair the wire harness as necessary.

HEATED OXYGEN SENSOR

Use an ohmmeter to test the heating element of the oxygen sensors. Disconnect the electrical connector from each oxygen sensor. The white wires in the sensor connector are the power and ground circuits for the heater. Connect the ohmmeter test leads to terminals of the white wires in the heated oxygen sensor connector. Replace the heated oxygen sensor if the resistance is not between 4 and 7 ohms.

IDLE AIR CONTROL (IAC) MOTOR TEST

To preform a complete test of IAC motor and its circuitry, refer to DRB scan tool and the appropriate Powertrain Diagnostics Procedures manual.

KNOCK SENSOR

The knock sensor can be tested with a digital voltmeter. Sensor output should be between 80 mV and 4 volts with the engine running between 576 and 2208 rpm. If the output falls outside of this range a DTC will be set.

MANIFOLD ABSOLUTE PRESSURE SENSOR

To perform a complete test of the MAP sensor and its circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the MAP sensor only, refer to the following:

(1) Test the MAP sensor output voltage at the MAP sensor connector between terminals 1 and 3 (Fig. 33). With the ignition switch ON and the engine not running, output voltage should be 4 to 5 volts. The voltage should drop to 1.5 to 2.1 volts with a hot, neutral idle speed condition. If OK, go to next step. If not OK, go to step 3.

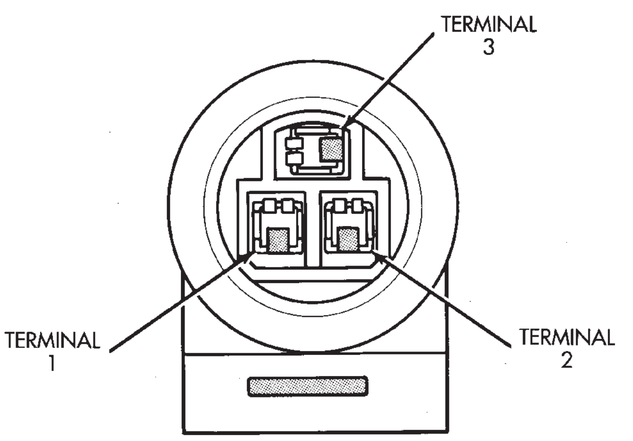


Fig. 59 MAP Sensor Connector

(2) Test PCM terminal 29 for the same voltage described in the previous step to verify wire harness condition. Repair as required.

(3) Test the MAP sensor ground circuit at sensor connector terminal 1 and PCM terminal 51. If OK, go to next step. If not OK, repair as required.

(4) Test MAP sensor supply voltage between sensor connector terminals 2 and 1 with the key ON. The voltage should be approximately 5 volts (±.5V). Five volts (±.5V) should also be at terminal 43 of the PCM. If OK, replace MAP sensor. If not OK, repair or replace the wire harness as required.

THROTTLE POSITION SENSOR

To perform a complete test of the this sensor and its circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the throttle position sensor only, refer to the following:

The Throttle Position Sensor (TPS) can be tested with a digital voltmeter. The center terminal of the sensor is the output terminal.

With the ignition switch in the ON position, check the output voltage at the center terminal wire of the connector. Check the output voltage at idle and at wide-open-throttle (WOT). At idle, TPS output voltage should be greater than 0.6 volts. At wide open throttle, TPS output voltage should be less than 4.5 volts. The output voltage should gradually increase as the throttle plate moves slowly from idle to WOT.

Check for spread terminals at the sensor and PCM connections before replacing the TPS.

THROTTLE BODY MINIMUM AIR FLOW

(1) Turn ignition key to Off.

(2) Disconnect the PCV valve hose from the intake manifold nipple. Cap the PCV vacuum nipple.

(3) Disconnect purge hose from the nipple on the throttle body (Fig. 60) or (Fig. 61).

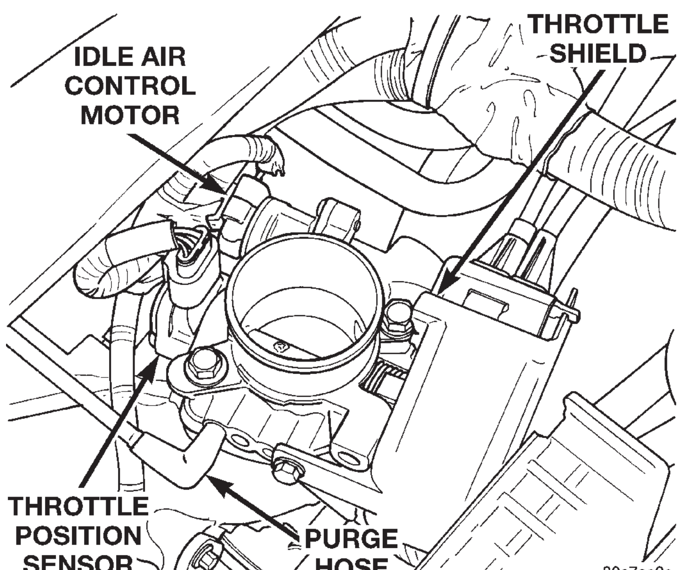


Fig. 60 Purge Hose—2.4L Engines

DIAGNOSIS AND TESTING (Continued)

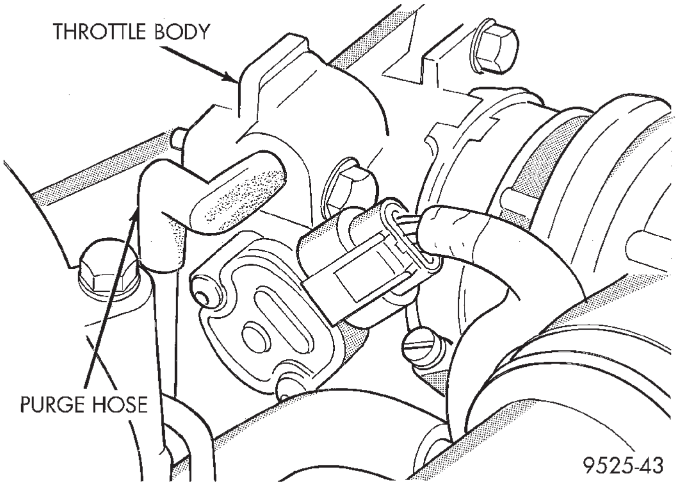


Fig. 61 Purge Hose—2.5L Engine

(4) Use a piece of hose to attach Air Metering Orifice 6457 (0.125 in. orifice) to the purge nipple on the throttle body (Fig. 62).

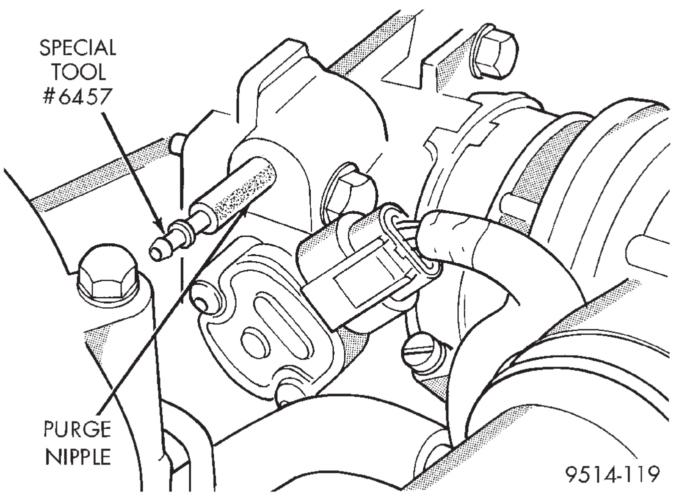


Fig. 62 Orifice 6457 Attached to Purge Nipple—2.5L Engine

(5) Ensure that all accessories are off.

(6) Connect the DRB scan tool to the data link connector inside the passenger compartment.

(7) Run engine in Park or Neutral until the cooling fan has cycled on and off at least once (180°F).

(8) Using the DRB scan tool, access Minimum Airflow Idle Speed.

(9) The following will then occur:

- Idle air control motor will fully close
- Idle spark advance will become fixed
- PCM will go open loop enriched
- DRB scan tool displays engine RPM

(10) If idle RPM is within the range shown in the Idle Specification chart, throttle body minimum airflow is set correctly.

(11) If idle RPM is above specifications, use the DRB scan tool to check idle air control motor operation. If idle air control motor is OK, replace throttle body. If idle air flow is below specification, shut off the engine and clean the throttle body as follows:

Odometer Reading	IDLE RPM
Below 1000 Miles	550 - 1300 RPM
Above 1000 Miles	600 - 1300 RPM

9414-225

2.4L Minimum Air Flow Idle Specifications

Odometer Reading	IDLE RPM
Below 1000 Miles	450 - 1100 RPM
Above 1000 Miles	500 - 1100 RPM

FJ9514-107

2.5L Minimum Air Flow Idle Specifications

WARNING: CLEAN THROTTLE BODY IN A WELL VENTILATED AREA. WEAR RUBBER OR BUTYL GLOVES, DO NOT LET MOPAR PARTS CLEANER COME IN CONTACT WITH EYES OR SKIN. AVOID INGESTING THE CLEANER. WASH THOROUGHLY AFTER USING CLEANER.

(a) Remove the throttle body from engine.

(b) While holding the throttle open, spray the entire throttle body bore and the manifold side of the throttle plate with Mopar Parts Cleaner. **Only use Mopar Parts Cleaner to clean the throttle body.**

(c) Using a soft scuff pad, clean the top and bottom of throttle body bore and the edges and manifold side of the throttle blade. **The edges of the throttle blade and portions of the throttle bore that are closest to the throttle blade when is closed, must be free of deposits.**

(d) Use compressed air to dry the throttle body.

(e) Inspect throttle body for foreign material.

(f) Install throttle body on manifold.

(g) Repeat steps 1 through 10. If the minimum air flow is still not within specifications, the problem is not caused by the throttle body.

(12) Shut off engine.

(13) Remove Air Metering Orifice 6457. Install purge hose.

(14) Remove cap from PCV valve. Connect hose to PCV valve.

(15) Remove DRB scan tool.

VEHICLE SPEED SENSOR

To perform a complete test of the sensor and its circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures Manual.

SERVICE PROCEDURES

CLEANING COKED THROTTLE BODIES

Coked throttle bodies will cause low idle speed and poor idle quality. Also, if the vehicle has low idle and the idle air control motor operates normally, clean the throttle body before checking throttle body minimum air flow. Refer to the General Diagnosis Section of this group for the Throttle Body Minimum Air Flow procedure.

(1) Remove the throttle body from engine.

WARNING: CLEAN THROTTLE BODY IN A WELL VENTILATED AREA. WEAR RUBBER OR BUTYL GLOVES, DO NOT LET MOPAR PARTS CLEANER COME IN CONTACT WITH EYES OR SKIN. AVOID INGESTING THE CLEANER. WASH THOROUGHLY AFTER USING CLEANER.

(2) While holding the throttle open, spray the entire throttle body bore and the manifold side of the throttle plate with Mopar Parts Cleaner. **Only use Mopar Parts Cleaner to clean the throttle body.**

(3) Using a soft scuff pad, clean the top and bottom of throttle body bore and the edges and manifold side of the throttle blade. **The edges of the throttle blade and portions of the throttle bore that are closest to the throttle blade when it is closed, must be free of deposits.**

(4) Use compressed air to dry the throttle bodies.

(5) Inspect throttle body for foreign material.

(6) Install throttle body on manifold.

REMOVAL AND INSTALLATION

THROTTLE BODY—2.4L ENGINES

REMOVAL

(1) Remove air inlet resonator as described in this section.

(2) Remove throttle shield (Fig. 63).

(3) Remove throttle cable from the throttle body lever (Fig. 64) and (Fig. 65).

(4) Compress the retaining tabs on the cable and slide cable out of bracket.

(5) If equipped with speed control, remove speed control cable from throttle lever by sliding clasp out hole used for throttle cable.

(6) Remove EVAP purge hose from nipple on throttle body.

(7) Remove 2 screws holding cable mounting bracket and support bracket.

(8) Remove throttle body mounting bolts.

(9) Lift throttle body far enough to remove connectors from the throttle position sensor and idle air control motor. Remove throttle body.

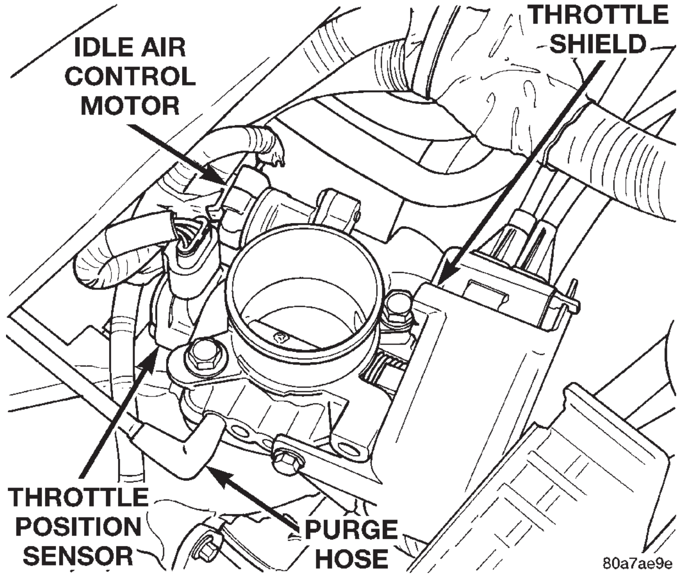


Fig. 63 Throttle Body—2.4L

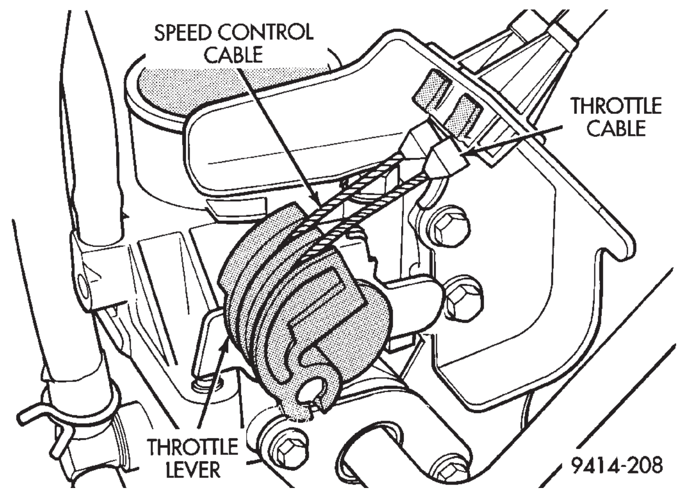


Fig. 64 Throttle Cable Attachment to Throttle Body

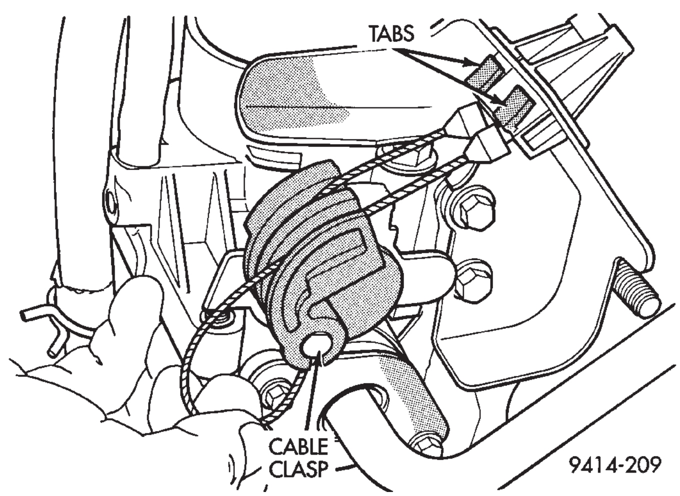


Fig. 65 Disconnecting Throttle Cable

(10) Remove paper gasket from intake manifold.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Attach electrical connectors to idle air control motor and throttle position sensor.

(2) Install paper gasket.

(3) Position throttle body on intake and install mounting bolts. Do Not tighten bolts at this time.

(4) Install throttle cable bracket. Do Not tighten bolts at this time.

(5) Tighten throttle body bolts to 22.5 ±3 N·m (200 ±25 in. lbs.) torque.

(6) Tighten throttle cable bracket bolts to 11.75 ±2.25 N·m (105 ±20 in. lbs.) torque.

(7) Install EVAP purge hose to throttle body nipple.

(8) Install cable housing(s) retainer tabs into bracket.

(9) Install throttle body cables by rotating the throttle lever forward to the wide open position.

(10) Install throttle shield and tighten bolt to 4.5 N·m (40 in. lbs.).

(11) Install air inlet resonator as described in this section.

THROTTLE BODY—2.5L ENGINE

REMOVAL

(1) Remove air tube from throttle body.

(2) Remove throttle cable from the throttle body lever (Fig. 66).

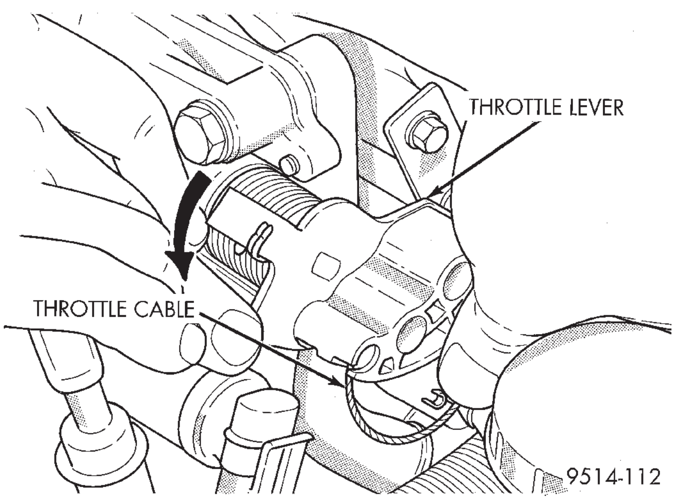


Fig. 66 Throttle Cable Attachment to Throttle Body

(3) Push release tang toward dash panel on throttle cable and slide cable out of bracket (Fig. 67).

(4) Slide speed control cable out of bracket, if equipped (Fig. 67).

(5) Remove EVAP purge hose from nipple on throttle body.

(6) Remove connectors from throttle position sensor and idle air control motor.

(7) Remove bolts holding throttle body to intake manifold. Remove throttle body.

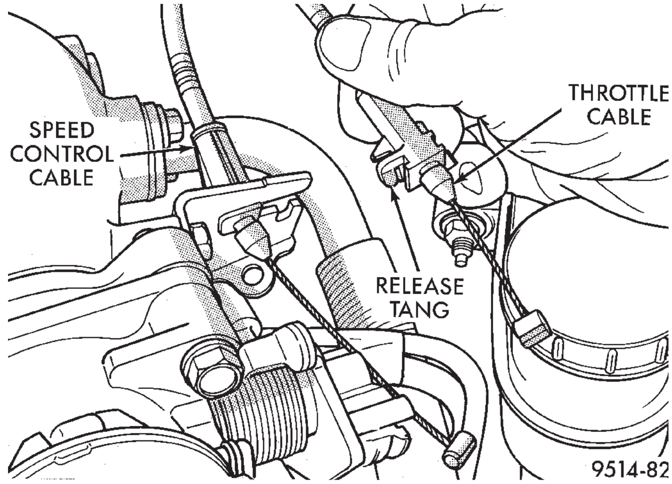


Fig. 67 Throttle Cable Attachment

INSTALLATION

(1) Attach electrical connectors to idle air control motor and throttle position sensor.

(2) Install new gasket.

(3) Position throttle body on intake and install mounting bolts. Tighten bolts to 28.25 N·m (250 in. lbs.).

(4) Install speed control cable (if equipped) and throttle cable into throttle lever.

(5) Install cables into cable bracket.

(6) Install air inlet tube. Tighten clamps to 3±.5 N·m (25±5 in. lbs.) torque.

THROTTLE POSITION SENSOR (TPS)—2.4L

The throttle position sensor attaches to the side of the throttle body (Fig. 68).

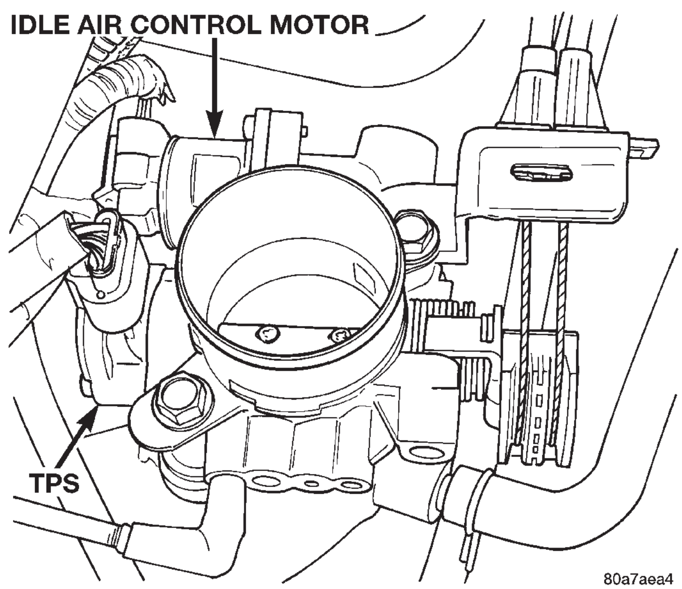


Fig. 68 Throttle Position Sensor and Idle Air Control Motor

REMOVAL

(1) Disconnect EVAP purge hose from throttle body.

REMOVAL AND INSTALLATION (Continued)

(2) Remove throttle body. Refer to Throttle Body in this section.

(3) Disconnect electrical connector from idle air control motor and throttle position sensor.

(4) Remove throttle position sensor mounting screws.

(5) Remove throttle position sensor.

INSTALLATION

(1) The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 69). The socket has two tabs inside it. The throttle shaft rests against the tabs. When indexed correctly, the TPS can rotate clockwise a few degrees to line up the mounting screw holes with the screw holes in the throttle body. The TPS has slight tension when rotated into position. If it is difficult to rotate the TPS into position, install the sensor with the throttle shaft on the other side of the tabs in the socket. Tighten mounting screws to 2 N·m (17 in. lbs.) torque.

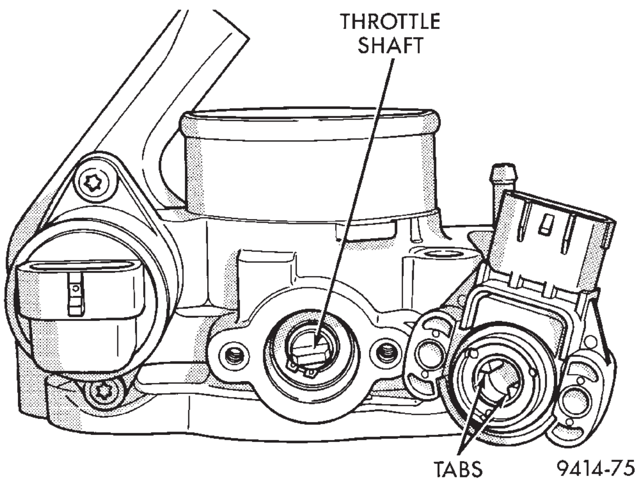


Fig. 69 Throttle Position Sensor Installation

(2) After installing the TPS, the throttle plate should be closed. If the throttle plate is open, install the sensor on the other side of the tabs in the socket.

(3) Install throttle body. Refer to Throttle Body in this section.

(4) Attach electrical connectors to idle air control motor and throttle position sensor.

(5) Install EVAP purge hose to throttle body nipple.

THROTTLE POSITION SENSOR (TPS)—2.5L

The TPS attaches to the side of the throttle body (Fig. 70).

REMOVAL

(1) Disconnect EVAP purge hose from throttle body.

(2) Disconnect electrical connector from idle air control motor and TPS.

(3) Remove throttle body. Refer to Throttle Body in this section.

(4) Remove TPS mounting screws.

(5) Remove throttle position sensor.

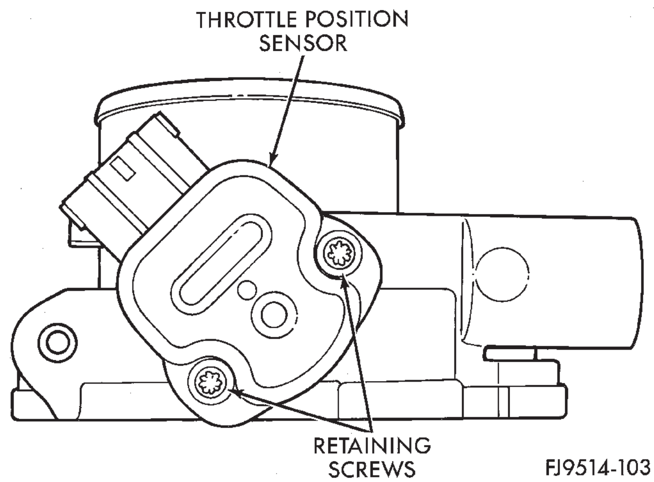


Fig. 70 Throttle Position Sensor—2.5L Engine

INSTALLATION

(1) The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 71). The socket has two tabs inside it. The throttle shaft rests against the tabs. When indexed correctly, the TPS can rotate clockwise a few degrees to line up the mounting screw holes with the screw holes in the throttle body. The TPS has slight tension when rotated into position. If it is difficult to rotate the TPS into position, install the sensor with the throttle shaft on the other side of the tabs in the socket. Tighten mounting screws to 2 N·m (17 in. lbs.) torque.

(2) After installing the TPS, the throttle plate should be closed. If the throttle plate is open, install the sensor on the other side of the tabs in the socket.

(3) Install throttle body to intake manifold. Refer to throttle body in this section.

(4) Attach electrical connectors to idle air control motor and throttle position sensor.

(5) Install EVAP purge hose to throttle body nipple.

IDLE AIR CONTROL MOTOR—2.0/2.4/2.5L

The idle air control motor attaches to the side of the throttle body (Fig. 72) or (Fig. 73) or (Fig. 74).

REMOVAL

(1) Disconnect EVAP purge hose from throttle body.

(2) Remove throttle body. Refer to Throttle Body in this section.

(3) Disconnect electrical connector from idle air control motor and throttle position sensor.

(4) Remove idle air control motor mounting screws.

(5) Remove idle air control motor. Ensure O-ring is removed with the motor.

REMOVAL AND INSTALLATION (Continued)

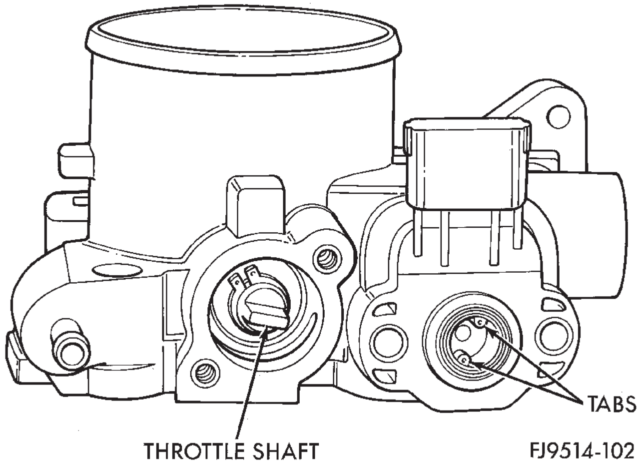


Fig. 71 Indexing Throttle Position Sensor—2.5L Engine

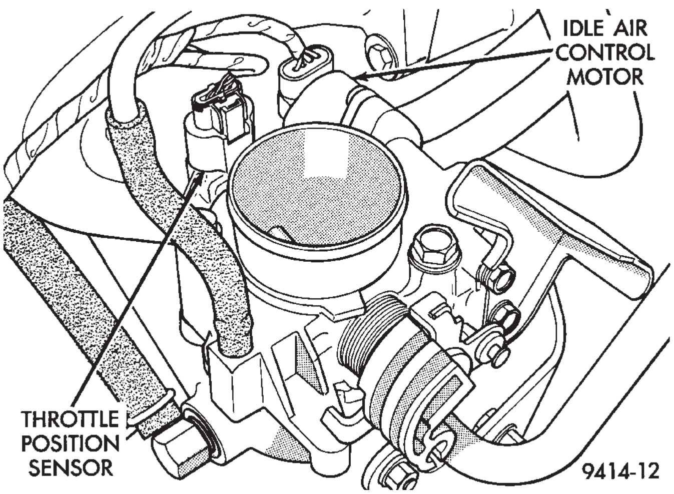


Fig. 72 Throttle Position Sensor and Idle Air Control Motor—2.0L

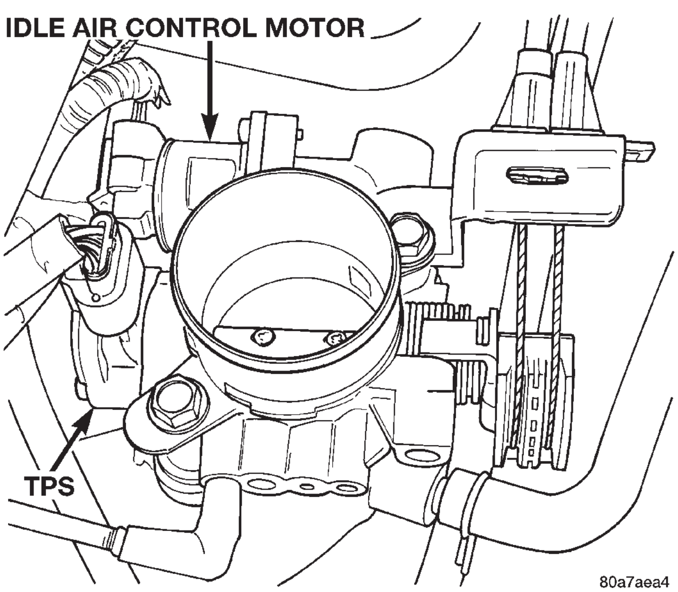


Fig. 73 Throttle Position Sensor and Idle Air Control Motor—2.4L

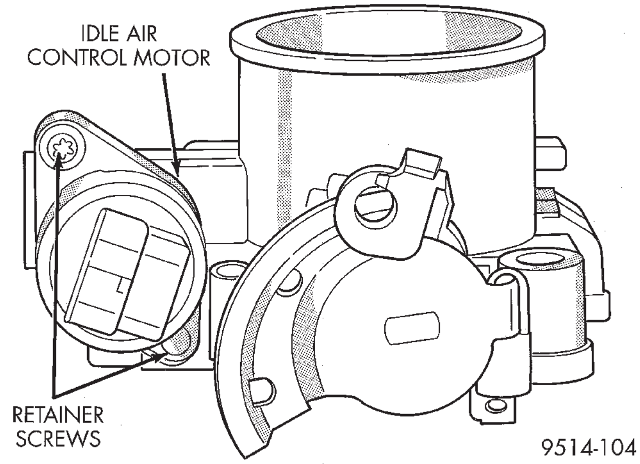


Fig. 74 Throttle Position Sensor and Idle Air Control Motor—2.5L

INSTALLATION

(1) The new idle air control motor has a new O-ring installed on it. If pintle measures more than 1 inch (25 mm) it must be retracted. Use the DRB AIS Motor Open/Close Test to retract the pintle (battery must be connected.)

(2) Carefully place idle air control motor into throttle body.

(3) Install mounting screws. Tighten screws to 3 N·m (25 in. lbs.) torque.

(4) Install throttle body. Refer to Throttle Body in this section.

(5) Attach electrical connectors to idle air control motor and throttle position sensor.

(6) Install EVAP purge hose to throttle body nipple.

INTAKE AIR TEMPERATURE SENSOR—2.4L

The intake air temperature sensor threads into the intake manifold plenum (Fig. 75).

REMOVAL

(1) Remove air inlet resonator.

(2) Reaching through intake manifold from throttle body end, disconnect sensor connector.

(3) Remove sensor.

INSTALLATION

(1) Install sensor. Tighten sensor to 28 N·m (20 ft. lbs.) torque.

(2) Attach electrical connector to sensor.

(3) Install air inlet resonator.

INTAKE AIR TEMPERATURE SENSOR—2.5L

The intake air temperature sensor threads into the intake manifold plenum (Fig. 76).

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Disconnect electrical connector from sensor.
(2) Remove sensor.

INSTALLATION

(1) Install sensor. Tighten sensor to 28 N·m (20 ft. lbs.) torque.
(2) Attach electrical connector to sensor.

DUTY CYCLE EVAP PURGE SOLENOID

REMOVAL

(1) If equipped with speed control, remove speed control servo and bracket. **Cover the ends of the speed control servo studs to allow easier service of the purge solenoid.**
(2) Disconnect electrical connector from solenoid.
(3) Disconnect vacuum tubes from solenoid.
(4) Remove solenoid from bracket by pulling up on solenoid.

INSTALLATION

NOTE: To eliminate a chance of transmitting noises into the body, make sure the hood release cable is installed in all of its clamps. Make sure the solenoid is not touching a brake line.

The top of the solenoid has TOP printed on it. The solenoid will not operate unless it is installed correctly.
(1) Install solenoid on bracket.
(2) Connect vacuum tube to solenoid.
(3) Connect electrical connector to solenoid.
(4) Install speed control servo and bracket. Tighten nuts to 9 N·m (80 in. lbs.).

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

2.4L

The MAP sensor attaches to the intake manifold plenum (Fig. 75).

2.5L

The MAP sensor attaches to the intake manifold plenum (Fig. 76).

REMOVAL

(1) Disconnect electrical connector from MAP sensor.
(2) Remove sensor mounting screws.
(3) Remove sensor.

INSTALLATION

(1) Insert sensor into intake manifold while making sure not to damage O-ring seal.
(2) Tighten mounting screws to:

2.4L

(3) 2 N·m (20 in. lbs.) torque.

2.5L

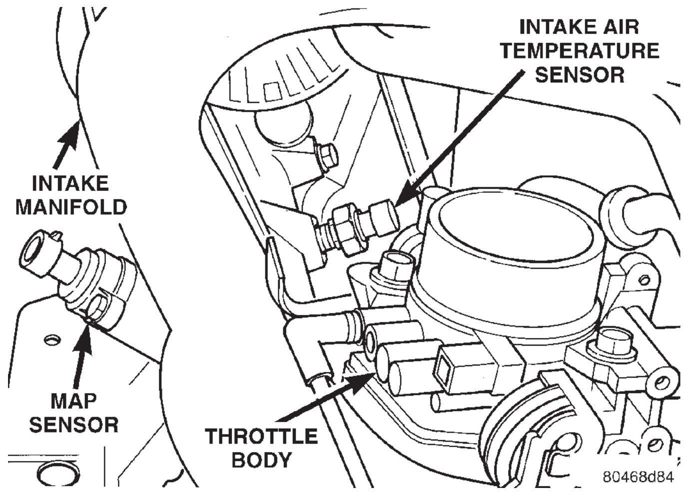


Fig. 75 Intake Air Temperature Sensor and MAP Sensor—2.4L

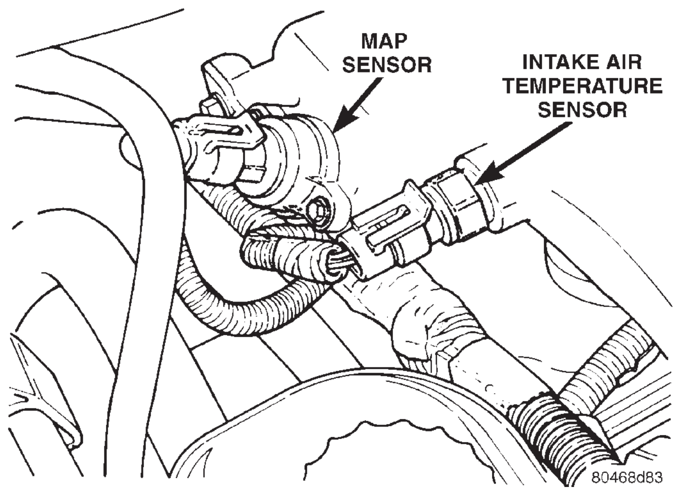


Fig. 76 Intake Air Temperature Sensor and MAP Sensor—2.5L

(4) 3.4 N·m (30 in. lbs) torque.
(5) Attach electrical connector to sensor.

POWERTRAIN CONTROL MODULE SERVICE

The PCM attaches to a bracket between the air cleaner housing and Power Distribution Center (PDC).

REMOVAL

(1) Disconnect negative cable from auxiliary jumper terminal (Fig. 77).
(2) Disconnect both 40-way connectors from PCM.
(3) Remove screws attaching PCM to bracket (Fig. 78).
(4) Lift PCM up to remove it from vehicle.

INSTALLATION

(1) Install PCM. Tighten mounting screws.
(2) Attach both 40-way connectors to PCM.

REMOVAL AND INSTALLATION (Continued)

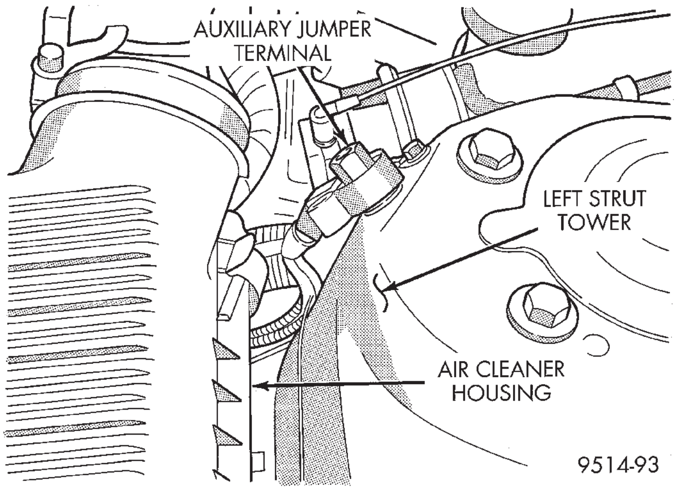


Fig. 77 Auxiliary Jumper Terminal

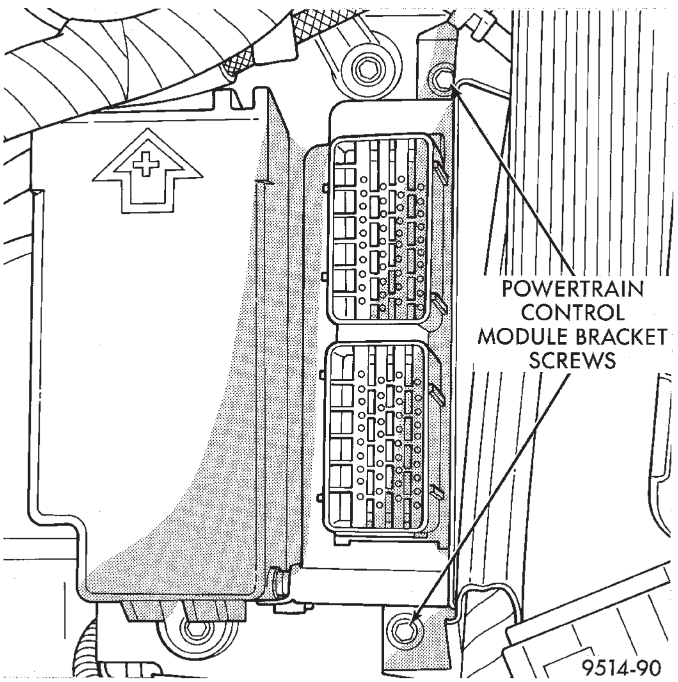


Fig. 78 PCM Bracket Screws

(3) Connect negative cable to auxiliary jumper terminal.

CRANKSHAFT POSITION SENSOR

For removal/installation procedures refer to group 8D - Ignition System, Service Procedures.

CAMSHAFT POSITION SENSOR

For removal/installation procedures refer to group 8D - Ignition System, Service Procedures.

UPSTREAM HEATED OXYGEN SENSOR—2.0/2.4L

REMOVAL

(1) Raise and support vehicle.

(2) Disconnect electrical connector from sensor.

(3) Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 79).

INSTALLATION

(1) After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite® 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect elecrtical connector to sensor.

(3) Lower vehicle.

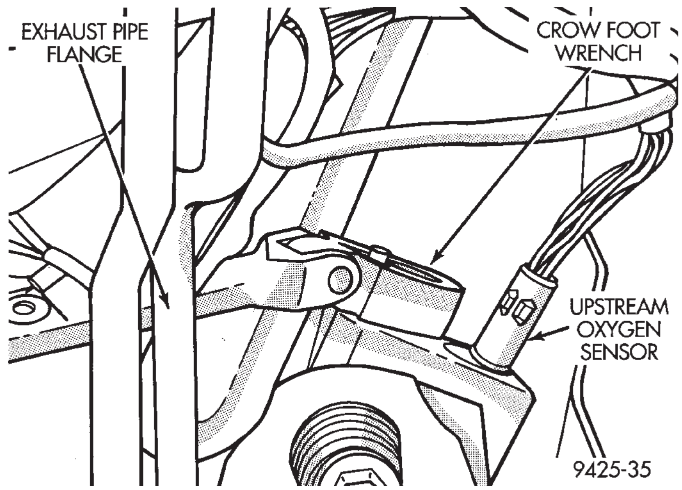


Fig. 79 Upstream Heated Oxygen Sensor Removal/ Installation

UPSTREAM HEATED OXYGEN SENSOR—2.5L

REMOVAL

(1) Raise and support vehicle.

(2) Disconnect electrical connector from sensor.

(3) Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 80).

INSTALLATION

(1) After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite® 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect elecrtical connector to sensor.

(3) Lower vehicle.

DOWNSTREAM HEATED OXYGEN SENSOR—2.0/2.4L

The downstream heated oxygen sensor threads into the exhaust pipe behind the catalytic convertor.

REMOVAL AND INSTALLATION (Continued)

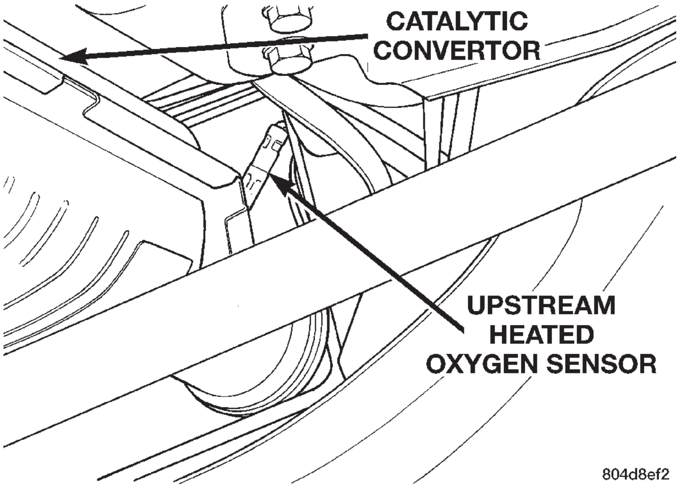


Fig. 80 Upstream Heated Oxygen Sensor Removal/ Installation

REMOVAL

(1) Raise vehicle.

(2) Disconnect electrical connector from sensor.

(3) Disconnect sensor electrical harness from clips along body.

(4) Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 81).

INSTALLATION

(1) After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite® 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect sensor electrical harness to clips along body.

(3) Connect electrical connector to sensor.

(4) Lower vehicle.

AIR INLET RESONATOR

2.0L

REMOVAL

(1) Remove 2 bolts holding air inlet resonator to intake manifold (Fig. 82).

(2) Loosen screw holding resonator to throttle body (Fig. 83).

(3) Loosen clamp holding resonator to air inlet tube. Remove resonator.

INSTALLATION

(1) Install air inlet resonator to throttle body.

(2) Install air inlet tube to resonator.

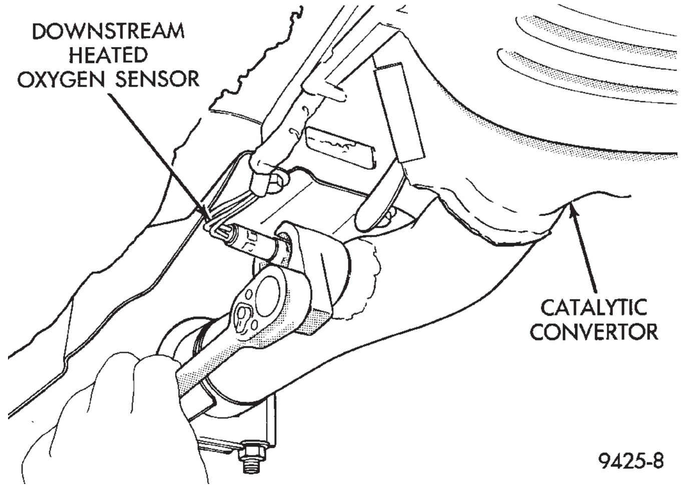


Fig. 81 Downstream Heated Oxygen Sensor Removal/Installation

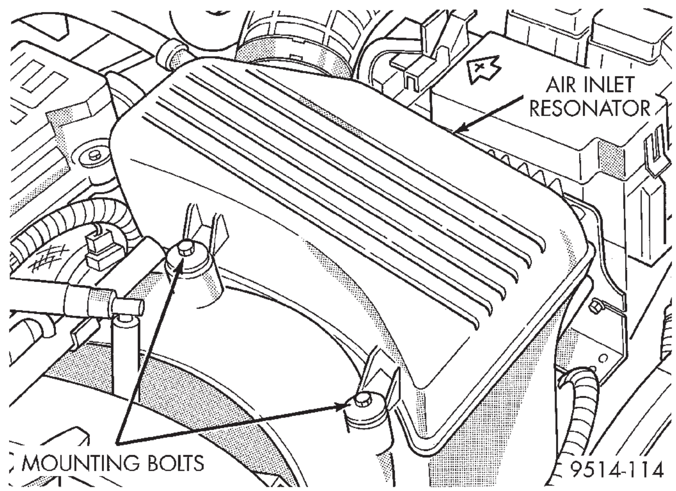


Fig. 82 Air Inlet Resonator

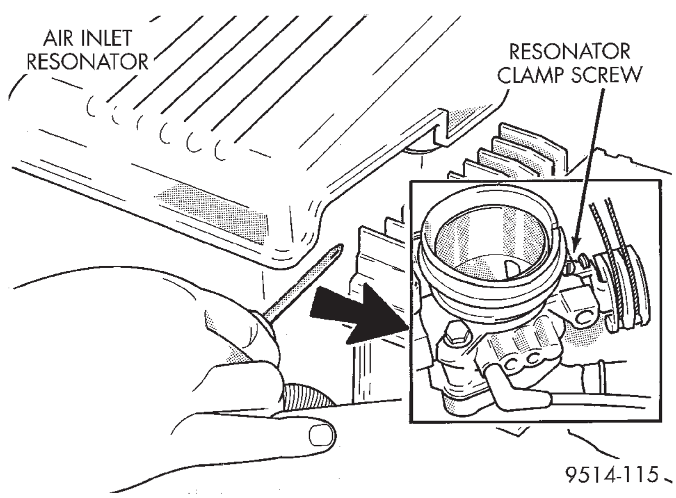


Fig. 83 Air Inlet Resonator Attachment to Throttle Body

(3) Tighten clamps to 3±.5 N·m (25±5 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

2.4L

REMOVAL

(1) Loosen screw holding resonator to throttle body (Fig. 83).

(2) Loosen clamp holding resonator to air inlet tube. Remove resonator.

INSTALLATION

(1) Install air inlet resonator to throttle body.

(2) Install air inlet tube to resonator.

(3) Tighten clamps to 3±.5 N·m (25±5 in. lbs.) torque.

2.5L

REMOVAL

(1) Remove bolt holding resonator to intake manifold (Fig. 84).

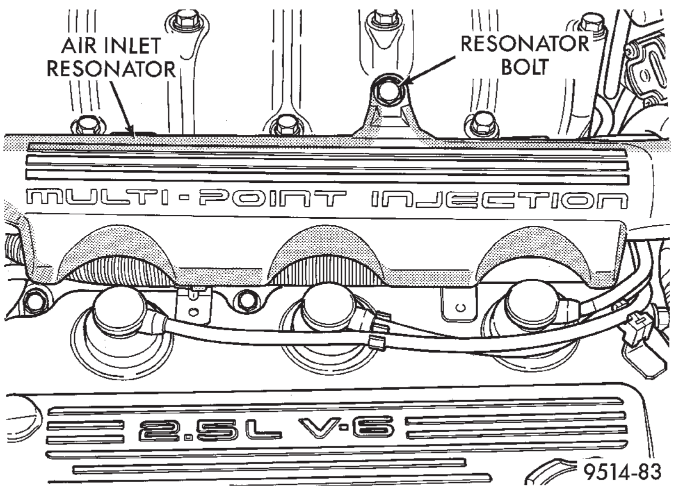


Fig. 84 Air Inlet Resonator

(2) Loosen clamp holding resonator to air inlet tube. Remove resonator.

INSTALLATION

(1) Install air inlet tube to resonator.

(2) Tighten clamp to 3±.5 N·m (25±5 in. lbs.) torque.

(3) Install bolt holding resonator to intake manifold. Tighten to 5±.5 N·m (45±5 in. lbs.) torque.

AIR CLEANER

The air cleaner housing attaches to the inner fender in front of the driver's side strut tower (Fig. 85). An ambient air duct supplies underhood air for the engine.

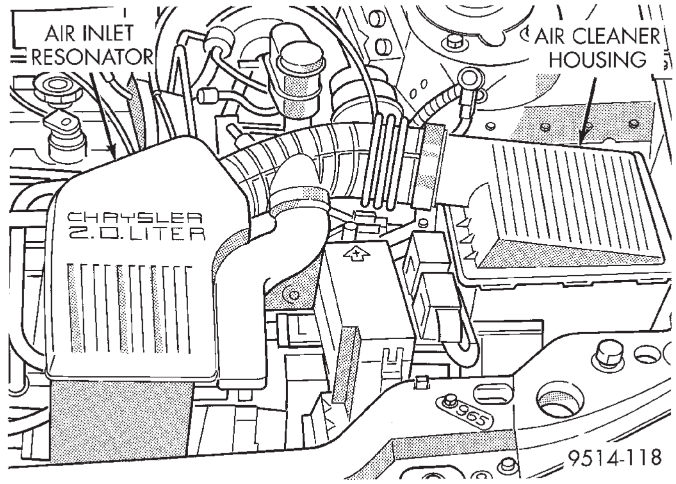


Fig. 85 Air Inlet System

FILTER ELEMENT REPLACEMENT

REMOVAL

(1) Unfasten clasps on rear of air cleaner housing cover. Lift cover off air cleaner housing (Fig. 86).

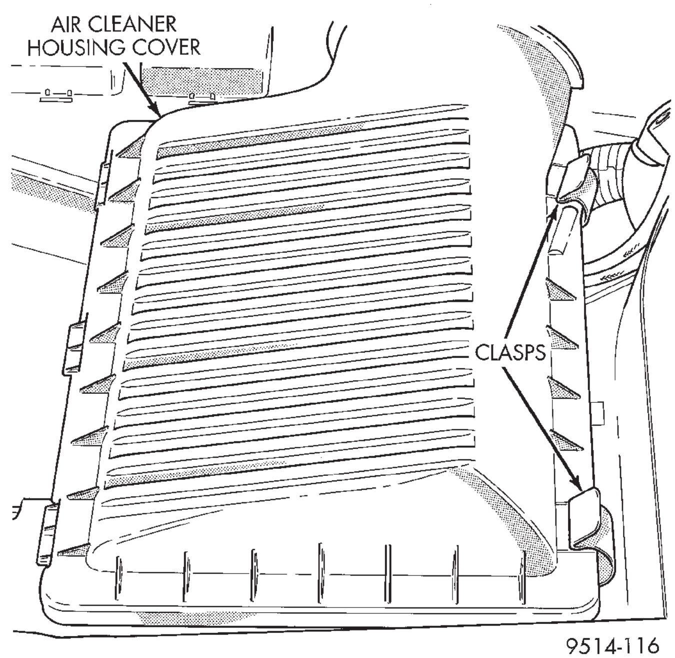


Fig. 86 Air Cleaner Cover Clasps

(2) Remove filter element (Fig. 87).

(3) If necessary, clean the inside of the air cleaner housing.

INSTALLATION

(1) Install new filter element.

(2) Place cover over air cleaner housing. Snap clasps in place.

REMOVAL AND INSTALLATION (Continued)

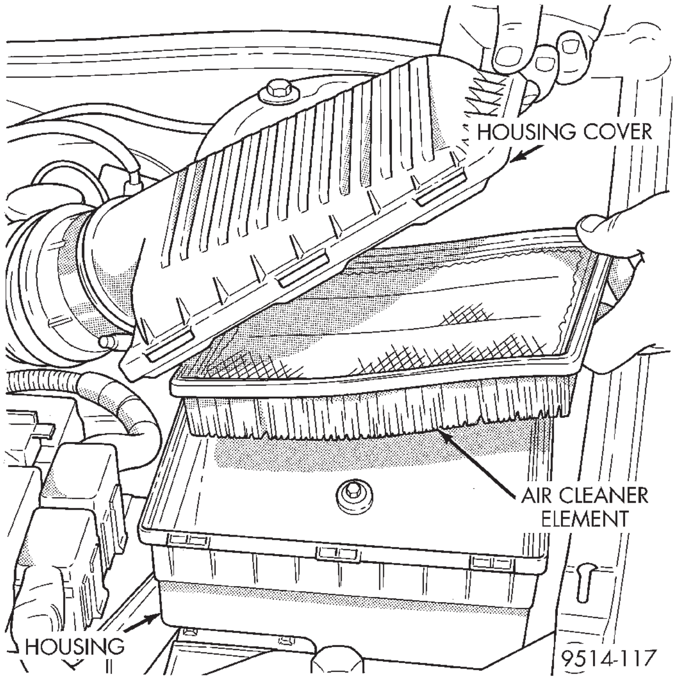


Fig. 87 Air Cleaner Housing and Element

ENGINE COOLANT TEMPERATURE SENSOR

2.4L

The engine coolant temperature sensor threads into the front of the cylinder head (Fig. 88).

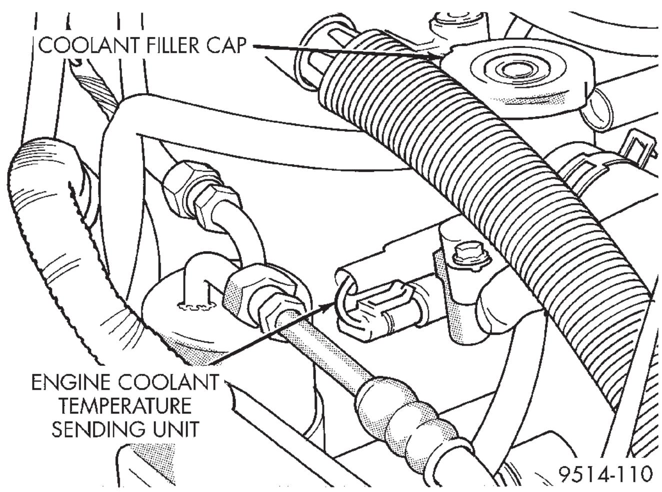


Fig. 88 Engine Coolant Temperature Sensor—2.4L Engine

2.5L

The engine coolant temperature sensor is located next to the fill neck (Fig. 89).

REMOVAL

(1) With the engine cold, drain coolant until level drops below sensor level. Refer to Group 7, Cooling System.

(2) Disconnect coolant sensor electrical connector.

(3) Remove coolant sensor.

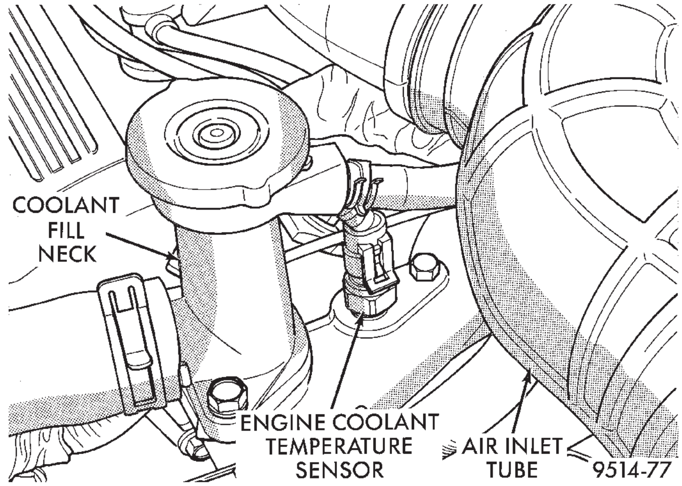


Fig. 89 Engine Coolant Temperature Sensor—2.5L Engine

INSTALLATION

(1) Install coolant sensor. Tighten sensor to:

2.4L

(2) 27 N·m (20 ft. lbs.) torque.

2.5L

(3) 7 N·m (60 in. lbs.) torque.

(4) Attach electrical connector to sensor.

(5) Fill cooling system. Refer to Group 7, Cooling System.

VEHICLE SPEED SENSOR

The vehicle speed sensor is located in the transmission extension housing (Fig. 90).

REMOVAL

(1) Disconnect electrical connector from sensor.

(2) Remove the sensor mounting bolt.

(3) Lift the sensor out of the transaxle extension housing. Ensure the O-ring was removed with the sensor.

INSTALLATION

The speed sensor gear meshes with a gear on the output shaft.

(1) With O-ring in place, install sensor.

(2) Install mounting bolt.

(3) Connect electrical connector to sensor.

KNOCK SENSOR

For removal/installation procedures refer to Group 8D- Ignition System, Service Procedures.

SPECIFICATIONS

VECI LABEL

If anything differs between the specifications found on the Vehicle Emission Control Information (VECI) label and the following specifications, use specifica-

SPECIFICATIONS (Continued)

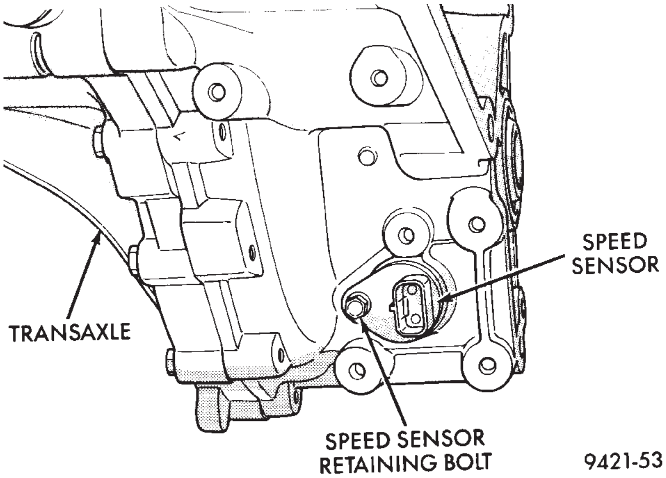


Fig. 90 Vehicle Speed Sensor

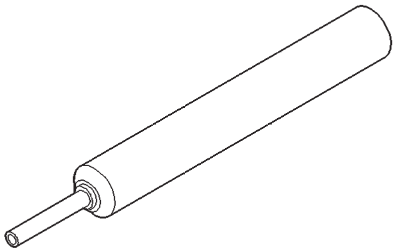
tions on VECI label. The VECI label is located in the engine compartment.

TORQUE

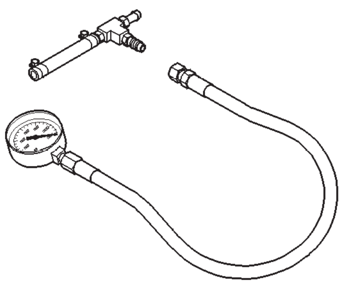
DESCRIPTION	TORQUE
Camshaft Position Semsor	12 N·m (105 in. lbs.)
Crankshaft Position Sensor	12 N·m (105 in. lbs.)
Engine Coolant Temperature Sensor	28 N·m (20 ft. lbs.)
IAC Motor-To-Throttle Body Bolts	3 N·m (25 in. lbs.)
MAP Sensor Mounting Screws	3 N·m (25 in. lbs.)
Oxygen Sensor	28 N·m (20 ft. lbs.)
Powertrain Control Module (PCM) Mounting Screws	4 N·m (35 in. lbs.)
Throttle Body Mounting Bolts	26 N·m (19 ft. lbs.)
Throttle Position Sensor	3 N·m (25 in. lbs.)
Throttle Shield Bolt	4.5 N·m (40 in. lbs.)

SPECIAL TOOLS

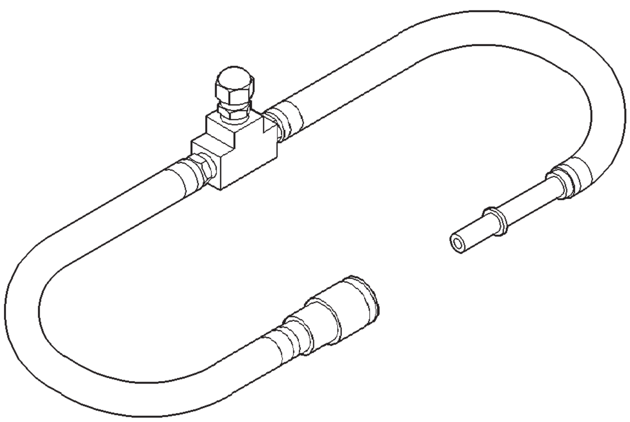
FUEL



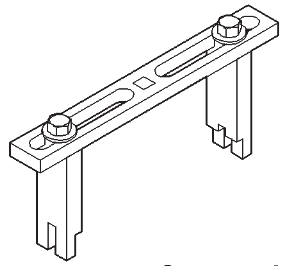
Extractor C–4334



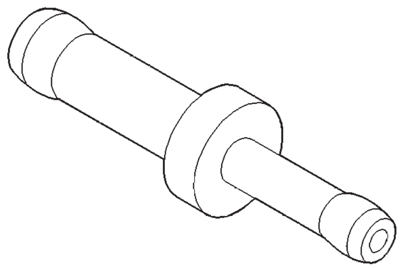
Pressure Gauge Assembly C–4799–B



Fuel Pressure Test Adapter 6539

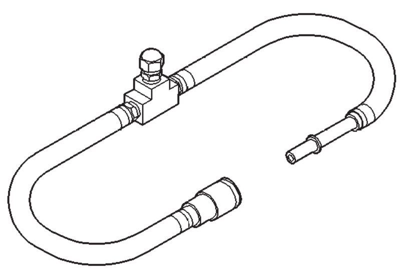


Spanner Wrench 6856



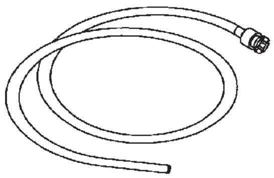
Metering Orifice

Fuel Line Tool



Fuel Line Adapter

SPECIAL TOOLS (Continued)



Fuel Line Adapter 1/4

STEERING

CONTENTS

GENERAL INFORMATION

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GENERAL INFORMATION

STEERING SYSTEM AND COMPONENT DESCRIPTION

This vehicle is equipped with a speed-sensitive variable-assist power steering system as standard equipment on all models.

The power steering system consists of these six major components. Power Steering Pump, Power Steering Gear, Power Steering Reservoir, Power Steering Supply and Pressure Hoses, and Power Steering Fluid Return Hose. Turning of the steering wheel is converted into linear travel through the meshing of the helical pinion teeth with the rack teeth. Power assist steering is provided by an open center, rotary type control valve. It is used to direct oil from the power steering pump to either side of the integral steering rack piston.

Road feel is controlled by the diameter of a torsion bar which initially steers the vehicle. As steering effort increases as in a turn, the torsion bar twists, causing relative rotary motion between the rotary valve body and valve spool. This movement directs oil behind the integral rack piston, which in turn, builds up hydraulic pressure and assists in the turning effort.

DIAGNOSIS AND TESTING

STEERING DIAGNOSIS CHARTS

STEERING NOISE

There is some noise in all power steering systems. One of the most common is a hissing sound evident at standstill parking. Hiss is a very high frequency noise similar to that experienced while slowly closing a water tap. The noise is present in every valve and results from high velocity fluid passing over the edges of the valve orifice. There is no relationship between this noise and the performance of the vehicles steering system. Hiss may be expected when the steering wheel is at the end of its travel or slowly turning when the vehicle is at a standstill.

CONDITION	POSSIBLE CAUSES	CORRECTION
Objectionable Hiss Or Whistle	1. Damaged or mispositioned steering column coupler to dash panel seal. 2. Noisy valve in power steering gear.	1. Check for proper seal between steering column coupler and dash seal. 2. Replace steering gear assembly.
Rattle Or Clunk	1. Steering gear loose on front suspension crossmember. 2. Front suspension crossmember to frame bolts or studs loose. 3. Tie rod is loose (outer or inner). 4. Loose lower control arm to front suspension crossmember bolts. 5. Loose upper control arm/ shock absorber mounting bracket to body attaching bolts. 6. Power steering fluid pressure hose touching the body of the vehicle. 7. Noise internal to power steering gear. 8. Damaged front suspension crossmember.	1. Check steering gear to front suspension crossmember mounting bolts. Tighten to specified torque if found to be loose. 2. Tighten the front suspension crossmember attaching bolts or studs to the specified torque. 3. Check tie rod pivot points for wear. Replace worn/loose parts as required. 4. Tighten control arm mounting bolts to the specified torques. 5. Check mounting bracket to body attaching bolts for looseness. If required tighten to the specified torques. 6. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing. 7. Replace steering gear assembly. 8. Replace front suspension crossmember.
Chirp or squeal (in the area of the power steering pump). Particularly noticeable at full wheel travel and during standstill parking.	1. Loose power steering pump drive belt.	1. Adjust power steering pump drive belt to specified tension.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Power steering pump growl results from the development of high pressure fluid flow. Normally this noise should not be high enough to be objectionable. Abnormal situations, such as a low oil level causing aeration or hose touching the vehicle body, can create a noise level that could bring complaints.		
Whine Or Growl (Pump Noise)	**1. Low fluid level.**	**1. Fill power steering fluid reservoir to proper level and perform leakage diagnosis. (Recheck fluid level after power steering fluid is free of air.)**
	2. Power steering hose touching vehicle body or frame.	**2. Reposition power steering hose. Replace hose if tube ends are bent.**
	3. Extreme wear of power steering pump internal parts.	**3. Replace power steering pump and flush system.**
Sucking Air Sound	**1. Loose clamp on power steering fluid low pressure hose.**	**1. Tighten or replace hose clamp.**
	2. Missing O-Ring on power steering pressure hose connection.	**2. Inspect connection and replace O-Ring as required.**
	3. Low power steering fluid level	**3. Fill power steering fluid reservoir to proper level and perform leakage diagnosis.**
	4. Air leak between power steering fluid reservoir and power steering pump.	**4. Inspect and/or replace power steering fluid reservoir or supply hose as required.**
SQUEAK OR RUBBING SOUND	**1. Sound coming from steering column.**	**1.Check for squeak in steering column. Inspect for contact between shroud, intermediate shaft, column, and steering wheel. Realign if necessary.**
		2. Check for lack or grease on steering column dash panel to lower coupler seal.
	2. Sound internal to steering gear.	**1. Replace steering gear assembly.**
SCRUBBING OR KNOCKING SOUND	**1. Incorrect tire size.**	**1. Verify that tire size on vehicle is the same as originally supplied.**
	2. Check clearance between tires and other vehicle components, through the full travel of the suspension.	2. Correct as necessary.
	3. Check for interference between steering gear and other components.	3.Correct as necessary.
	4.Incorrect steering gear supplied.	4. Replace steering gear with correct steering gear for specific vehicle.

DIAGNOSIS AND TESTING (Continued)

BINDING STICKING SEIZED

CONDITION	POSSIBLE CAUSES	CORRECTION
CATCHES, STICKS IN CERTAIN POSITIONS OR IS DIFFICULT TO TURN.	1. Low power steering fluid level.	1. Fill power steering fluid reservoir to specified level and perform leakage diagnosis.
	2. Tires not inflated to specified pressure.	2. Inflate tires to the specified pressure.
	3. Lack of lubrication in front suspension upper or lower control arm ball joints.	3. Lubricate ball joints if ball joints are not a lubricated for life type ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	4. Worn upper or lower ball joint.	4. Replace the upper or lower control arm.
	5. Lack of lubrication in front suspension outer tie rod ends.	5. Lubricate tie rod ends if they are not a lubricated for life type. If tie rod end is a lubricated for life type, replace tie rod end.
	6. Loose power steering pump drive belt.	6. Tighten the power steering pump drive belt to the specified tension. See accessory drive in service manual.
	7. Faulty power steering pump flow control. (Verify cause using Power Steering Pump Test Procedure.)	7. Replace power steering pump.
	8. Excessive friction in steering column or intermediate shaft.	8. Correct condition. (See Steering Column Service Procedure)
	9. Steering column coupler binding.	9. Realign the steering column to eliminate the binding condition.
	10. Binding upper or lower ball joint.	10. Replace the upper or the lower control arm as required.
	11. Excessive friction in steering gear.	11. Replace steering gear assembly.

SHAKE SHUDDER VIBRATION

CONDITION	POSSIBLE CAUSES	CORRECTION
VIBRATION OF THE STEERING WHEEL AND/OR DASH DURING DRY PARK OR LOW SPEED STEERING MANEUVERS.	1. Air in the fluid of the power steering system.	1. Steering shudder can be expected in new vehicles and vehicles with recent steering system repairs. Shudder should improve after the vehicle has been driven several weeks.
	2. Tires not properly inflated.	2. Inflate tires to the specified pressure.
	3. Excessive engine vibration.	3. Ensure that the engine is running properly.
	4. Loose tie rod end.	4. Check the inner to outer tie rod jam nut for looseness. If loose tighten to the specified torque. Inspect inner tie rod for looseness at steering gear. Inspect outer tie rod ball for excessive wear/looseness. If inner tie rod is loose replace steering gear, if outer tie has excessive wear replace tie rod end.
	5.Overcharged air conditioning system.	5.Check air conditioning pump head pressure. (See Air Conditioning Refrigerant System Diagnosis)

DIAGNOSIS AND TESTING (Continued)

LOW ASSIST, NO ASSIST, HARD STEERING

CONDITION	POSSIBLE CAUSES	CORRECTION
STIFF, HARD TO TURN, SURGES, MOMENTARY INCREASE IN EFFORT WHEN TURNING.	1. Tires not properly inflated.	1. Inflate tires to specified pressure.
	2. Low power steering fluid level.	2. Add power steering fluid as required to power steering fluid reservoir to obtain proper level. Perform leakage diagnosis on power steering system.
	3. Loose power steering pump drive belt.	3. Tighten the power steering pump drive belt to the specified tension. If drive belt is defective, replace and correctly tension.
	4. Lack of lubrication in control arm ball joints.	4. Lubricate ball joints if ball joints are not a lubricated for life type ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	5. Worn upper or lower ball joint.	5. Replace the upper and/or lower control arm.
	6. Low power steering pump pressure. (Verify using Power Steering System Test Procedure)	6. Verify cause using the Power Steering System Test Procedure. Replace the power steering pump if necessary.
	7. High internal leak in steering gear assembly.	7. Check steering system using the Power Steering System Test Procedure. If steering gear is defective replace steering gear.

POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSES	CORRECTION
STEERING WHEEL DOES NOT RETURN TO CENTER POSITION.	1. Tires not inflated to specified pressure.	1. Inflate tires to specified pressure.
	2. Improper front wheel alignment.	2. Check and adjust as necessary.
	3. Steering column U-joints misaligned.	3. Realign steering column U-joints.
	4. Mispositioned dash cover.	4. Reposition dash cover.
		To evaluate items 6 and 7, disconnect the intermediate shaft. Turn the steering wheel and feel or listen for internal rubbing in steering column.
	5. Steering wheel rubbing.	5. Adjust steering column shrouds to eliminate rubbing condition.
	6. Damaged, mis-positioned or un-lubricated steering column coupler to dash seal.	6. Determine condition which exists and correct.
	7. Tight shaft bearing in steering column assembly.	7. Replace the steering column assembly.
	8. Excessive friction in steering column coupler.	8. Replace steering column coupler.
	9. Excessive friction in steering gear.	9. Replace steering gear.

DIAGNOSIS AND TESTING (Continued)

LOOSE STEERING

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE STEERING WHEEL KICKBACK OR TOO MUCH STEERING WHEEL FREE PLAY.	1. Air in the fluid of the power steering system.	1. Fill power steering fluid reservoir to the specified level. Perform procedure to bleed the air out of the power steering system. Perform leakage diagnosis.
	2. Steering gear loose on front suspension crossmember.	2. Check steering gear to front suspension crossmember mounting bolt torque. Tighten to specified torque if found to be loose.
	3. Worn, broken or loose steering column to steering gear coupler.	3. Check for worn universal joint, broken isolator or loose fasteners.
	4. Free play in steering column.	4.Check components of the steering system and repair or replace as required.
	5. Loose front suspension control arm ball joints.	5. Check and or replace the ball joint or control arm as required.
	6. Loose steering knuckle to upper or lower ball joint stud attaching nut.	6. Check attaching nuts and tighten if required to specified torque.
	7. Front wheel bearings loose or worn.	7. Tighten hub nut to specified torque or replace with new parts as necessary.
	8. Loose outer tie rod ends.	8. Check free play of outer tie rod ends and replace if required.
	9. Loose inner tie rod ends.	9. Replace steering gear assembly.
	10 Defective steering gear rotary valve.	10. Replace steering gear assembly.

VEHICLE LEADS TO THE SIDE

CONDITION	POSSIBLE CAUSES	CORRECTION
STEERING WHEEL DOES NOT WANT RETURN TO CENTER POSITION.	1. Radial tire lead.	1.Rotate tires as recommended in the Tire And Wheel Group of this service manual.
	2. Front suspension misaligned.	2. Align the front suspension as required. Refer to the Wheel Alignment Procedure in the Suspension Group of this service manual for the required wheel alignment procedure.
	3. Wheel braking.	3. Check for dragging brakes. Refer to the procedures in the Brake Group of this service manual.
	4. Unbalanced steering gear valve. (If this is the cause, the steering efforts will be very light in direction of lead and heavier in the opposite direction.	4. Replace steering gear.
STEERING WHEEL HAS FORE AND AFT LOOSENESS.	1. Steering wheel to steering column shaft retaining nut not properly tightened and torqued.	1. Tighten the retaining nut to its specified torque specification.
	2. Steering column lower bearing spring retainer slipped on steering column shaft.	2. Replace steering column.

DIAGNOSIS AND TESTING (Continued)

POWER STEERING FLUID LEAK

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW FLUID LEVEL WITH: NO VISIBLE SIGNS OF A LEAK ON THE STEERING GEAR, POWER STEERING PUMP, FLOOR OR ANYWHERE ELSE.	1. Overfilled power steering pump fluid reservoir.	1. Adjust the power steering fluid fill to the correct level.
LOW FLUID LEVEL WITH: VISIBLE LEAK ON STEERING GEAR, POWER STEERING PUMP, FLOOR OR ANYWHERE ELSE.	2. Power steering hose connections at the power steering pump or steering gear.	2. Check for loose fittings and if found, tighten the fitting to its specified torque. If fittings are tight examine the fittings for damaged or missing O-ring seals and replace as required.
	3. Power steering pump or power steering gear leaking.	3. Identify the location of the leak and repair or replace the component as required. Refer to Power Steering Pump and/or Power Steering Gear in this group of the service manual for required procedures.

FOAMY OR MILKY POWER STEERING FLUID

CONDITION	POSSIBLE CAUSES	CORRECTION
AERATION AND OVERFLOW OF FLUID.	1. Air leaks.	1. Check for air leaking into the power steering system as described under Sucking Air Diagnosis and correct condition.
	2. Low fluid level.	2. Extremely cold temperatures may cause power steering fluid aeration if the power steering fluid is low. Add power steering fluid as required to bring level up to specification.
	3. Cracked power steering pump housing.	3. Remove power steering pump from vehicle and inspect the power steering pump housing for cracks. If a defect in the housing is found, replace the power steering pump.
	4. Water contamination.	4. Drain the power steering fluid from the system if there is evidence of contamination. Then refill the system with fresh clean power steering fluid.

POWER STEERING PUMP

INDEX

DESCRIPTION AND OPERATION

POWER STEERING PUMP OPERATION

On all vehicles equipped with power steering, the hydraulic pressure for operation of the power steering gear is provided by a belt driven power steering pump (Fig. 1). The TTA power steering pump used on this vehicle is a droop flow rate and constant displacement, vane type pump.

In the event of a power steering pump drive belt failure, manual steering control of the vehicle can still be maintained. However, under these conditions, steering effort will be significantly increased.

All vehicles use a remote mounted reservoir for the power steering fluid. The power steering fluid remote reservoir on the 2.4 ltr. engine is mounted to the rear of the cylinder head on the passenger side of the vehicle. The power steering fluid remote reservoir on the 2.5 ltr. engine is mounted to the front side of the engine between the cylinder heads.

The service procedures for the TTA power steering pump are limited to the areas and components listed below. **No repair procedures are to be done on internal components of the TTA power steering pumps.**

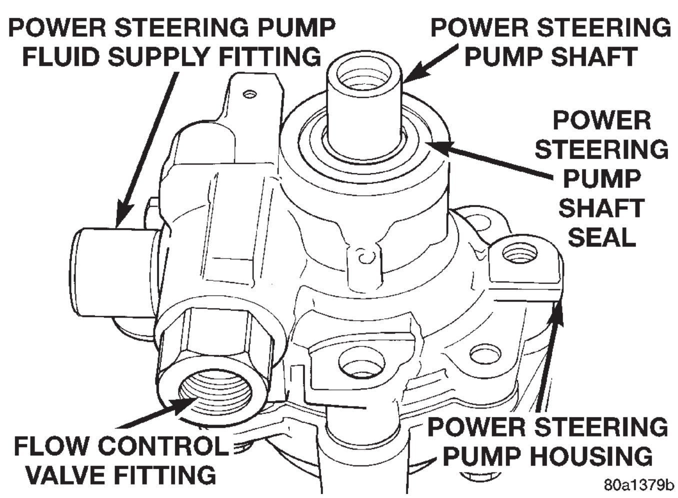


Fig. 1 Power Steering Pump Assembly

- Repair of power steering fluid leaks from areas of the power steering pump sealed by O-rings is allowed (See Pump Leak Diagnosis). However power steering pump shaft seal leakage will require replacement of the pump.
- Power steering fluid reservoirs, related components and attaching hardware.

DESCRIPTION AND OPERATION (Continued)

• Power steering fluid reservoir filler cap/dipstick assemblies.

Because of unique shaft bearings, flow control levels or pump displacements, power steering pumps may be used only on specific vehicle applications. Be sure that all power steering pumps are only replaced with a pump that is the correct replacement for that specific application.

Hydraulic pressure is provided for operation of the power steering gear by the belt driven power steering pump. It is a constant displacement, vane type pump. The power steering pump is connected to the steering gear by a power steering fluid pressure hose, return hose and the remote power steering fluid reservoir.

Rectangular pumping vanes in the shaft driven rotor, move power steering fluid from the intake to the cam ring pressure cavities of the power steering pump. As the rotor begins to turn, centrifugal force throws the vanes against the inside surface of the cam ring to pickup residual oil. This oil is then forced into the high pressure area. As more oil is picked up by the vanes, the additional oil is forced into the cavities of the thrust plate through two crossover holes in the cam ring and pressure plate. The crossover holes empty into the high pressure area between the pressure plate and the housing end cover.

As the high pressure area is filled, oil flows under the vanes in the rotor slots, forcing the vanes to follow the inside surface of the cam ring. As the vanes reach the restricted area of the cam ring, oil is forced out from between the vanes. When excess oil flow is generated during high-speed operation, a regulated amount of oil returns to the pump intake side through a flow control valve. The flow control valve reduces the power required to drive the pump and holds down temperature build-up.

When steering conditions exceed maximum pressure requirements, such as when the wheels are turned against the stops. The pressure built up in the steering gear exerts pressure on the spring end of the flow control valve. The high pressure lifts the relief valve ball from its seat and allows oil to flow through a trigger orifice located in the outlet fitting. This reduces pressure on the spring end of the flow control valve which then opens and allows the oil to return to the intake side of the pump. This action limits maximum pressure output of the pump to a safe level.

Under normal power steering pump operating conditions, pressure requirements of the pump are below maximum, causing the pressure relief valve to remain closed.

POWER STEERING FLUID PRESSURE SWITCH

On all vehicles, a power steering pressure switch (Fig. 2) is used to improve the vehicle's idle quality. The pressure switch improves vehicle idle quality, by maintaining required engine idle speed when necessary, due to increased pressure in the power steering system. This increased pressure will slow down the power steering pump which will decrease engine idle speed.

The pressure switch functions by signaling the power train control module, that the power steering system is putting additional load on the engine. This type of condition exists when turning the front tires of the vehicle when the vehicle is stationary and the engine is at idle speed. When this condition is sensed by the power train control module, through a signal from the power steering pressure switch, engine idle speed will be maintained. The maintained engine idle speed compensates for the additional load, thus maintaining the required engine idle speed and idle quality.

The power steering pressure switch is mounted directly to the power steering gear on vehicle's requiring its use (Fig. 2).

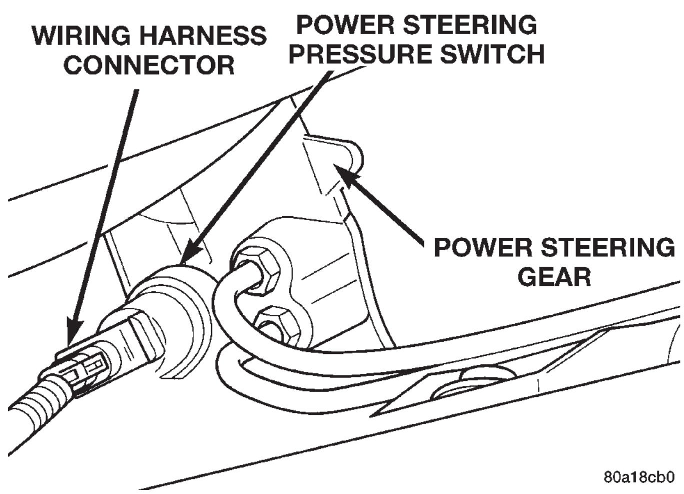


Fig. 2 Power Steering Pressure Switch Location On Steering Gear

DIAGNOSIS AND TESTING

POWER STEERING PUMP FLOW RATE AND PRESSURE TEST

The following procedure is to be used to test the operation of the power steering system on this vehicle. This test will provide the flow rate of the power steering pump along with the maximum relief pressure. This test is to be performed any time a power steering system problem is present to determine if the power steering pump or power steering gear is not functioning properly. The following pressure and

DIAGNOSIS AND TESTING (Continued)

flow test is performed using Pressure/Flow Tester, Special Tool 6815 (Fig. 3).

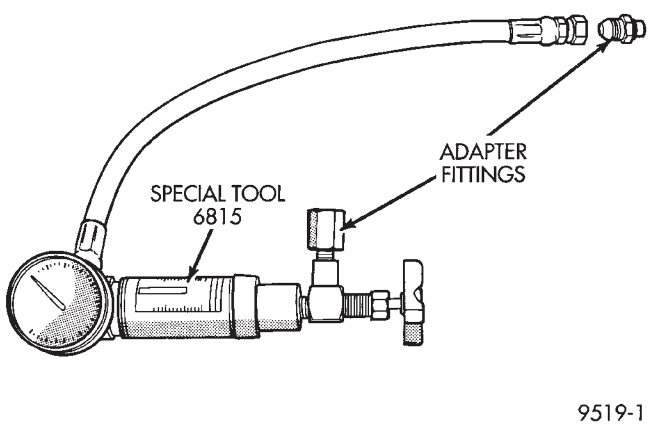


Fig. 3 Power Steering Pump Flow/Pressure Tester

POWER STEERING PUMP FLOW AND PRESSURE TEST PROCEDURE

(1) Check power steering pump drive belt tension and adjust as necessary.

(2) Disconnect power steering fluid pressure hose (Fig. 4), at power steering pump. Use a container for dripping fluid.

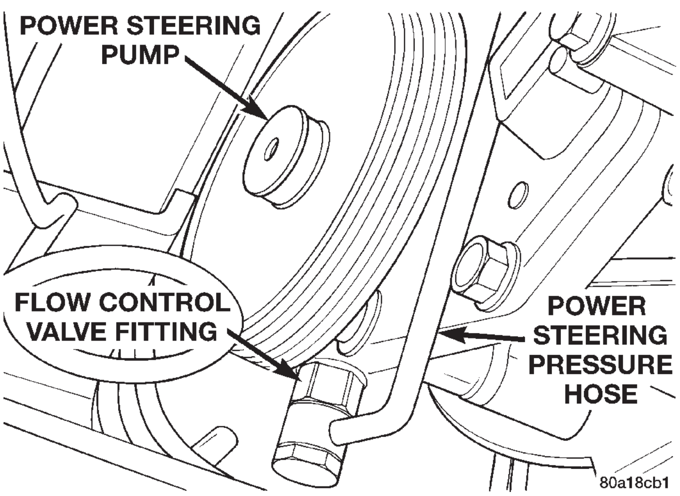


Fig. 4 Power Steering Pump Pressure Hose

(3) Connect the inlet hose on the Pressure Gauge, Special Tool 6815 using required adapter, Special Tool 6972 to the pressure fitting on the power steering pump. Connect the pressure hose which was removed from the power steering pump, using required adapter fitting, to the outlet port of Pressure Gauge, Special Tool 6815. **Pressure Gauge, Special Tool 6815 is to be installed in series with power steering pressure hose, between power steering pump and steering gear. It must also be installed so it is in correct direction of the fluid flow.**

(4) Completely open valve on Special Tool 6815.

(5) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test and get air out of fluid. Then shut off engine.

(6) Check power steering fluid level, and add fluid as necessary. Start engine again and let idle.

(7) Pressure gauge should read below 862 kPa (125 psi). If above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi). The flow meter reading should be between 4.9 and 5.3 liters per minute (1.3 and 1.4 GPM).

CAUTION: The following test procedure involves testing power steering pump maximum pressure output and flow control valve operation. Do not leave valve closed for more than 5 seconds as the pump could be damaged.

(8) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

NOTE: Power steering pump maximum relief pressure is 8240 to 8920 kPa (1195 to 1293 psi.).

- If power steering pump pressures are above specifications, but not within 345 kPa (50 psi) of each other, then replace power steering pump.
- If pressures are within 345 kPa (50 psi) of each other but below specifications, then replace power steering pump.

CAUTION: Do not force the pump to operate against the stops for more than 5 seconds at a time because pump damage will result.

(9) Open test valve. Turn steering wheel to the extreme left and right positions until against the stops, recording the highest indicated pressure at each position. Compare pressure gauge readings to power steering pump specifications. If the highest output pressures are not the same against either stop, the steering gear is leaking internally and must be replaced.

SERVICE PROCEDURES

POWER STEERING SYSTEM FLUID LEVEL CHECK

WARNING: FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING PARTS. DO NOT USE AUTOMATIC TRANSMISSION FLUID IN THE POWER STEERING SYSTEM. DO NOT OVERFILL THE POWER STEERING SYSTEM.

SERVICE PROCEDURES (Continued)

Wipe reservoir filler cap free of dirt. Then check fluid level. The dipstick should indicate COLD when fluid is at normal ambient temperature, approximately 21°C to 27°C (70°F to 80°F). In all pumps add fluid as necessary, use only **Mopar Power Steering Fluid, or equivalent. DO NOT USE ANY TYPE OF AUTOMATIC TRANSMISSION FLUID.**

POWER STEERING PUMP INITIAL OPERATION

CAUTION: The fluid level should be checked with engine off to prevent injury from moving components. Use only Mopar® Power Steering Fluid. Do not use automatic transmission fluid. Do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **FULL COLD** when the fluid is at normal temperature of approximately 21°C to 27°C (70°F to 80°F).

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two (2) minutes.

(2) Start the engine and let run for a few seconds. Then turn the engine off.

(3) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(4) Raise the front wheels off the ground.

(5) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops.

(6) Add power steering fluid if necessary.

(7) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(8) Stop the engine. Check the fluid level and refill as required.

(9) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

POWER STEERING PUMP FLOW CONTROL VALVE O-RING SEAL

DISASSEMBLE

The power steering pump does not require removal from the engine for removal and replacement of the flow control valve fitting O-Ring.

(1) Remove the power steering fluid pressure hose from power steering pump pressure fitting (Fig. 5).

(2) Remove the power steering pump discharge/flow control valve fitting (Fig. 6) from the power steering pump housing. **Use care to prevent the flow control valve and the spring from sliding out of the discharge/flow control valve fitting.**

(3) Remove and discard O-ring seal from fitting.

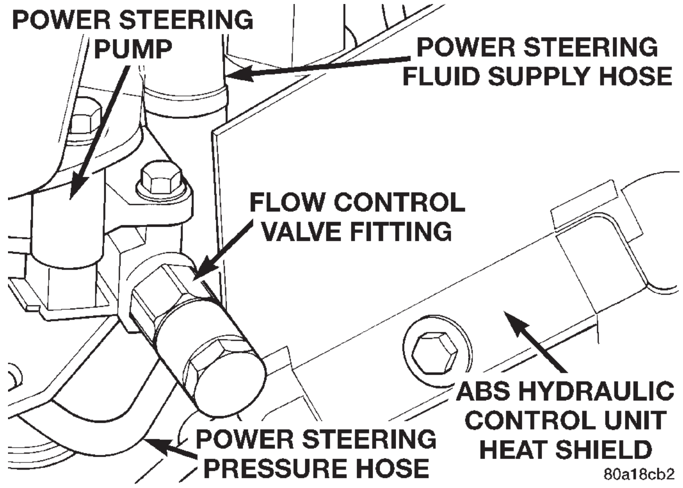


Fig. 5 Power Steering Pump Pressure Hose

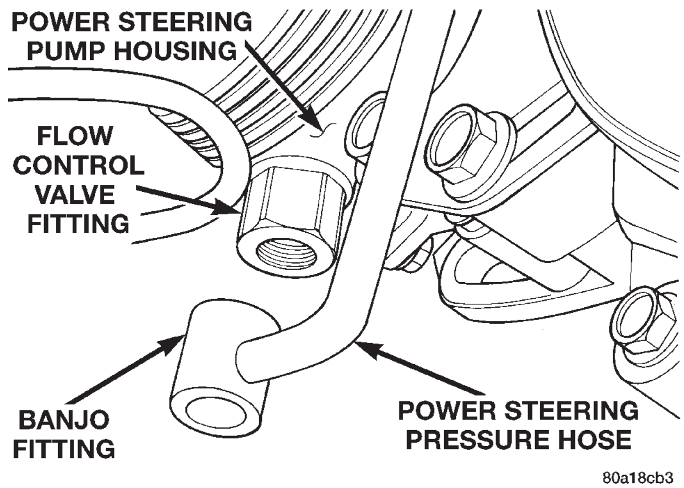


Fig. 6 Pump Discharge And Flow Control Valve Fitting

ASSEMBLE

(1) If necessary, clean and install flow control valve and spring in pump housing bore.

(2) Install new O-ring seal on fitting.

(3) Install the discharge/flow control valve fitting (Fig. 6) into the power steering pump. Tighten the discharge/flow control valve to a torque of 75 N·m (55 ft. lbs.)

(4) Install power steering fluid pressure hose on flow control valve fitting (Fig. 5). Tighten the banjo bolt to a torque of 34 N·m (25 ft. lbs.).

POWER STEERING PUMP SUCTION PORT FITTING

The power steering pump will require removal from the engine for removal and replacement of the suction port O-Ring seal. Refer to Power Steering Pump Service in this group of the service manual for the required removal and replacement procedure for the power steering pump.

SERVICE PROCEDURES (Continued)

DISASSEMBLE

(1) Remove power steering fluid supply hose from power steering pump suction port fitting.

(2) Remove bolt attaching the power steering pump suction port fitting (Fig. 7) to the power steering pump.

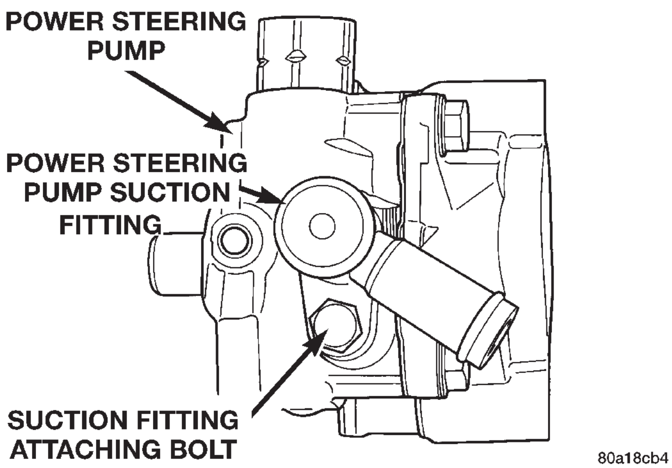


Fig. 7 Power Steering Pump Suction Fitting

(3) Remove the suction port fitting (Fig. 7) from the power steering pump.

(4) Remove and discard O-ring seal from suction port fitting.

ASSEMBLE

(1) Install new O-ring seal on suction fitting.

(2) Install suction port fitting in power steering pump. Install and securely tighten the suction port fitting attaching bolt (Fig. 7).

(3) Install power steering fluid supply hose on suction port fitting, being sure hose clamp is installed on hose past upset bead on suction port fitting.

REMOVAL AND INSTALLATION

POWER STEERING FLUID PRESSURE SWITCH

REMOVE

(1) Disconnect negative battery cable from the negative post of the battery. Be sure cable is isolated from negative post on battery.

(2) Raise vehicle.

(3) Locate power steering pressure switch (Fig. 8) on the back side of the power steering gear.

(4) Remove the vehicle's wiring harness connector (Fig. 8) from the power steering pressure switch.

(5) Using a crow foot and a long extension, remove the power steering pressure switch, from the power steering gear.

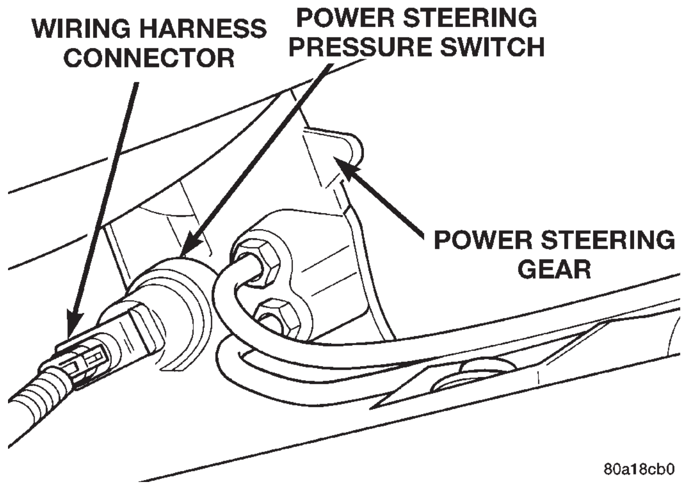


Fig. 8 Power Steering Pressure Switch Location On Steering Gear

INSTALL

CAUTION: When tightening the power steering pressure switch after installation in steering gear, do not exceed the torque specification shown in step 1 below. Over-tightening may result in stripping the threads out of the pressure switch port on the steering gear.

(1) Install power steering pressure switch into power steering gear by hand until fully seated. Then using a crow foot and extension, tighten power steering pressure switch to a torque of 16 N·m (12 ft. lbs.).

(2) Install vehicle wiring harness connector onto power steering pressure switch. Be sure latch on wiring harness connector is fully engaged with locking tab on power steering pressure switch.

CAUTION: Do not use automatic transmission fluid in power steering system. Only use Mopar®, Power Steering Fluid, or equivalent.

(3) Fill power steering reservoir to correct fluid level.

(4) Connect negative cable back on negative post of battery.

(5) Start engine and turn steering wheel several times from stop to stop to bleed air from fluid in system. Stop engine, check fluid level, and inspect system for leaks. See Checking Fluid Level.

POWER STEERING FLUID PRESSURE HOSE

Service all power steering hoses with the vehicle raised on a hoist. Cap all open ends of hoses, power steering pump fittings and steering gear ports to prevent the entry of foreign material into the components.

REMOVAL AND INSTALLATION (Continued)

WARNING: POWER STEERING OIL, ENGINE PARTS AND EXHAUST SYSTEM MAY BE EXTREMELY HOT IF ENGINE HAS BEEN RUNNING. DO NOT START ENGINE WITH ANY LOOSE OR DISCONNECTED HOSES. DO NOT ALLOW HOSES TO TOUCH HOT EXHAUST MANIFOLD OR CATALYST.

REMOVE

NOTE: To service the power steering pressure hose on this vehicle, the front suspension crossmember and steering gear will need to be lowered away from the body of the vehicle. This is required for access to the power steering hose connections on the side of the steering gear. Refer to the steering gear service procedure in this group of the service manual for the required procedure for removal of the front suspension crossmember.

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication And Maintenance section in this manual, for the required lifting procedure to be used for this vehicle.

CAUTION: When lowering the front suspension crossmember, its installed position on the vehicle's body must be marked on the crossmember before it is lowered. Use the procedure for the removal and replacement of the steering gear that is in this group of the service manual for the required procedure to locate and lower the crossmember.

(2) Lower the front suspension crossmember far enough to gain access to the high and low pressure ports on the steering gear.

(3) Disconnect the power steering pressure hose (Fig. 9) at the power steering gear. Drain power steering fluid from power steering pump and hose through open end of hose.

(4) **If the vehicle is equipped with a 2.4 liter engine,** remove the power steering pressure hose routing bracket from the power steering return hose bracket on rear of engine (Fig. 10). Then remove the nut attaching the power steering pressure hose routing bracket to the stud on the side of cylinder head (Fig. 11).

(5) **If vehicle is equipped with a 2.5 liter engine,** remove the 2 routing brackets (Fig. 12) attaching the power steering return hose to the power steering pressure hose routing brackets. Then remove the 2 bolts attaching the power steering pressure hose routing brackets to the cylinder head (Fig. 12).

(6) **If the vehicle is equipped with a 2.4 liter engine,** remove the tie-strap (Fig. 10) holding the power steering fluid supply hose to the power steering pressure hose.

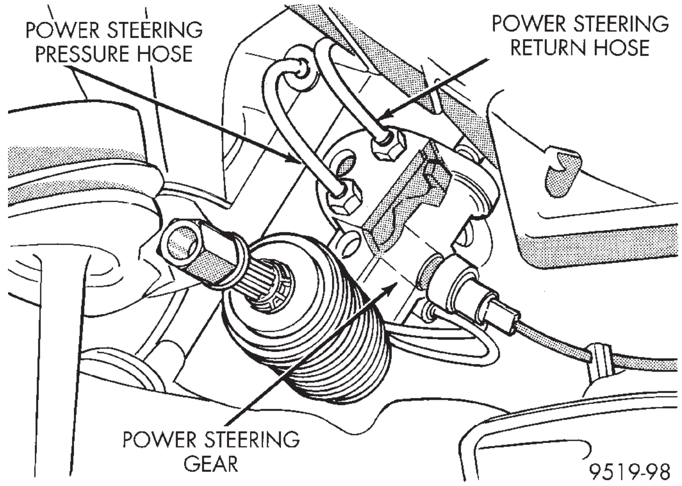


Fig. 9 Power Steering Hose Connections At Steering Gear

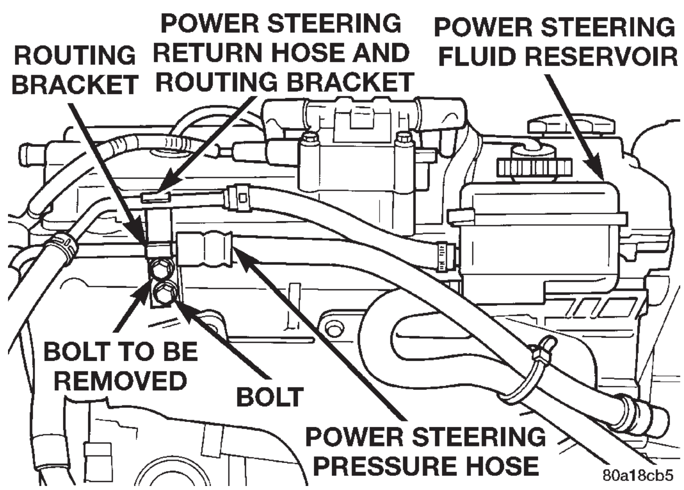


Fig. 10 2.4 Liter Power Steering Hose Routing

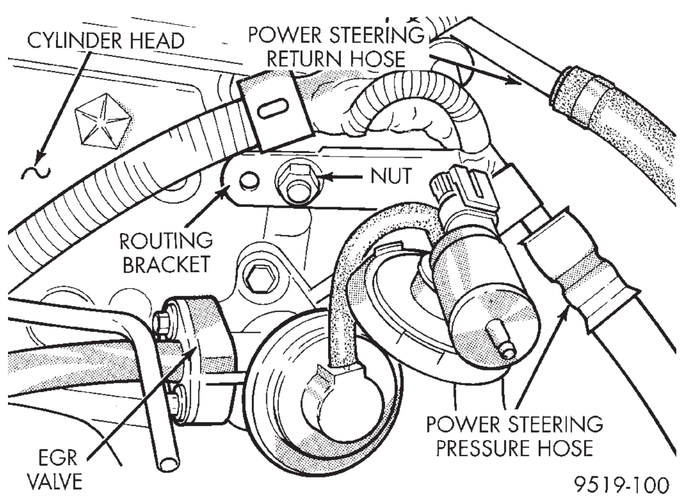


Fig. 11 Power Steering Hose Bracket Attachment To Cylinder Head

REMOVAL AND INSTALLATION (Continued)

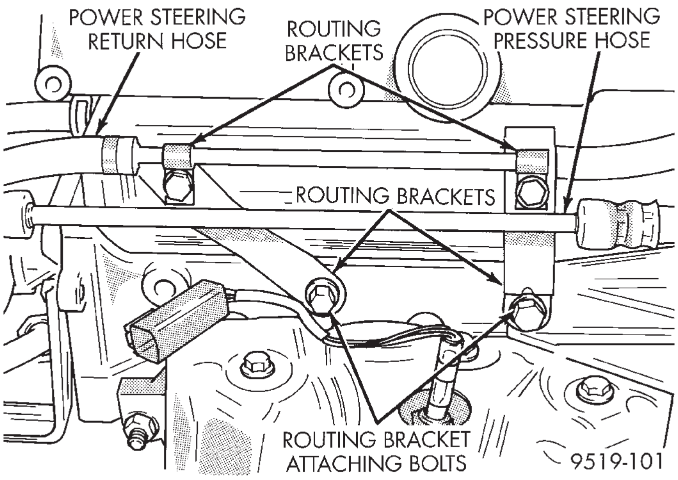


Fig. 12 2.5 Liter Power Steering Hose Routing

(7) Remove the power steering pressure hose from the pressure fitting on power steering pump (Fig. 13).

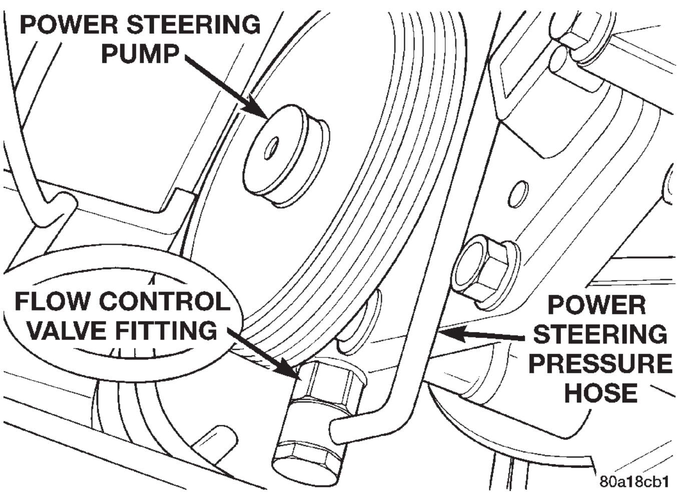


Fig. 13 Power Steering Pump Pressure Fitting

(8) Power steering fluid pressure hose is removed from the vehicle from the bottom rear of engine compartment.

(9) Discard all used O-rings located at ends of power steering pressure hose fittings.

INSTALL

(1) Install power steering pressure hose in vehicle from bottom of engine compartment using the reverse order of removal.

(2) Using a lint free towel, wipe clean all open power steering hose ends and the power steering pump and steering gear ports.

CAUTION: The Banjo fitting O-ring is a special O-ring for this application, do not replace this O-ring with a standard O-ring of this required size.

(3) Install a new O-ring on the end of the power steering pressure hose banjo fitting (Fig. 14).

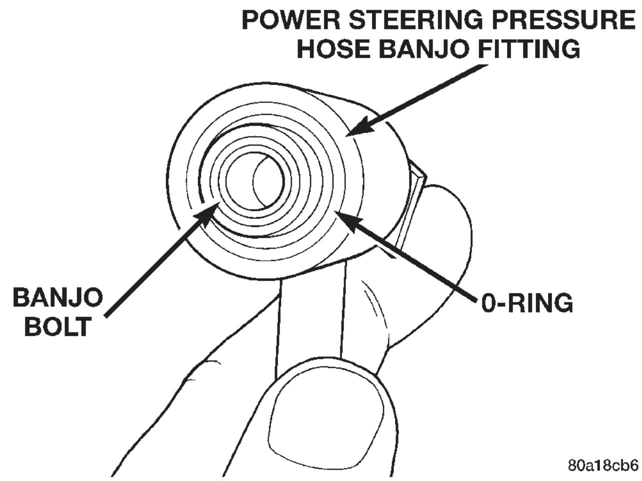


Fig. 14 O-Ring Installed In Banjo Fitting

(4) Install a new O-Ring (Fig. 15) on the Banjo Bolt of the power steering pressure hose Banjo fitting.

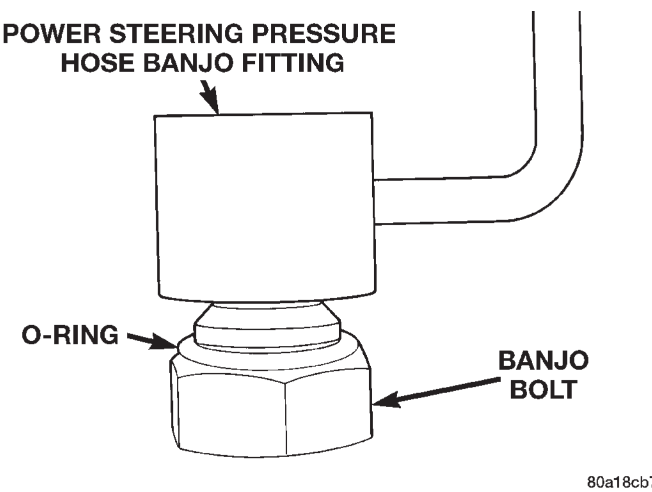


Fig. 15 O-Ring Installed On Banjo Fitting Bolt

(5) Lubricate both O-rings using fresh clean power steering fluid.

(6) Install the Banjo Bolt into the power steering pressure hose banjo fitting (Fig. 15)

(7) Attach the power steering pressure hose to the outlet fitting on the power steering pump (Fig. 13). **Do not tighten the pressure fitting banjo bolt at this time.**

CAUTION: Hoses must remain away from exhaust system, vehicle components and unfriendly surfaces causing possible damage to power steering hoses.

(8) Correctly route power steering pressure hose avoiding tight bends or kinking of the hose. Install

REMOVAL AND INSTALLATION (Continued)

power steering pressure hose routing brackets and attaching bolts on engine (Fig. 12), (Fig. 11) and (Fig. 10).

(9) Route power steering pressure hose to pressure port on power steering gear. Install power steering pressure hose, on steering gear and loosely install tube nut into steering gear. Then using a crow foot, (Fig. 16) tighten the power steering pressure hose tube nut to a torque of 31 N·m (275 in. lbs.).

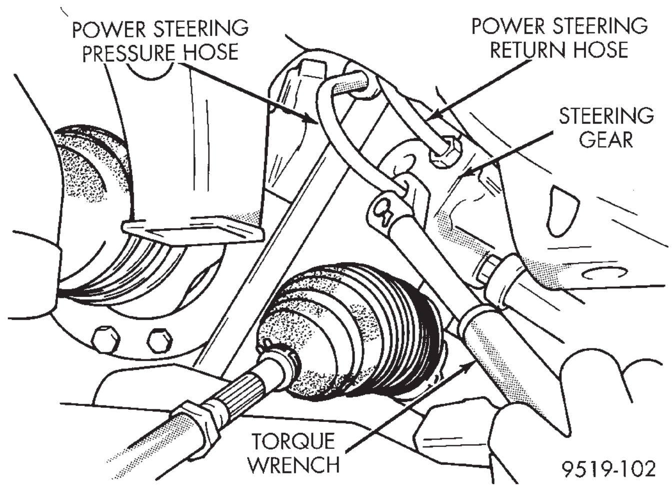


Fig. 16 Power Steering Pressure Hose Tube Nut

(10) Correctly position the power steering pressure hose banjo fitting at the power steering pump so the power steering pressure hose is not touching any components or the body. While holding the banjo fitting from rotating, tighten the Banjo Bolt (Fig. 13) to a torque of 34 N·m (25 ft. lbs.).

CAUTION: When installing the front suspension crossmember, it must be installed back in the same location on the vehicle's body as when it was originally installed when the vehicle was built. Use procedure for installing the steering gear that is in this group of the service manual for the required procedure to install and locate crossmember.

(11) Raise the front suspension crossmember and steering gear back up into the vehicle. Refer to the steering gear service procedure in this group of the service manual for the required procedure to install the front suspension crossmember.

CAUTION: If the vehicle is equipped with a 2.4 liter engine, the tie strap must be installed on the power steering pressure hose and supply hose to ensure proper routing of the hoses.

(12) Install the tie-strap (Fig. 10) holding the power steering fluid supply hose to the power steering pressure hose.

(13) Lower vehicle.

(14) Start the engine and let run for a few seconds. then turn the engine off.

(15) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(16) Raise front wheels of vehicle off the ground.

(17) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops. Then turn the engine off.

(18) Add power steering fluid if necessary.

(19) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(20) Stop the engine. Check the fluid level and refill as required.

(21) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(22) After hose is installed, check for leaks at all hose connections.

POWER STEERING FLUID RETURN HOSE

Service all power steering hoses with the vehicle raised on a hoist. Cap all open ends of hoses, power steering pump fittings and steering gear ports to prevent the entry of foreign material into the components.

WARNING: POWER STEERING OIL, ENGINE PARTS AND EXHAUST SYSTEM MAY BE EXTREMELY HOT IF ENGINE HAS BEEN RUNNING. DO NOT START ENGINE WITH ANY LOOSE OR DISCONNECTED HOSES. DO NOT ALLOW HOSES TO TOUCH HOT EXHAUST MANIFOLD OR CATALYST.

REMOVE

NOTE: To remove the power steering return hose on this vehicle, the front suspension crossmember and steering gear will need to be lowered away from the body of the vehicle. This is required for access to the power steering hose connections on the side of the steering gear. Refer to the steering gear service procedure in this group of the service manual for the required procedure to remove the front suspension crossmember.

(1) Siphon all power steering fluid from the power steering fluid reservoir.

CAUTION: Care must be used when removing power steering fluid return hose from power steering fluid reservoir. If excessive force is used when trying to remove hose from nipple on power steering fluid reservoir, nipple can break off of the reservoir.

REMOVAL AND INSTALLATION (Continued)

(2) Remove power steering fluid return hose from nipple on power steering fluid reservoir (Fig. 17) and (Fig. 18).

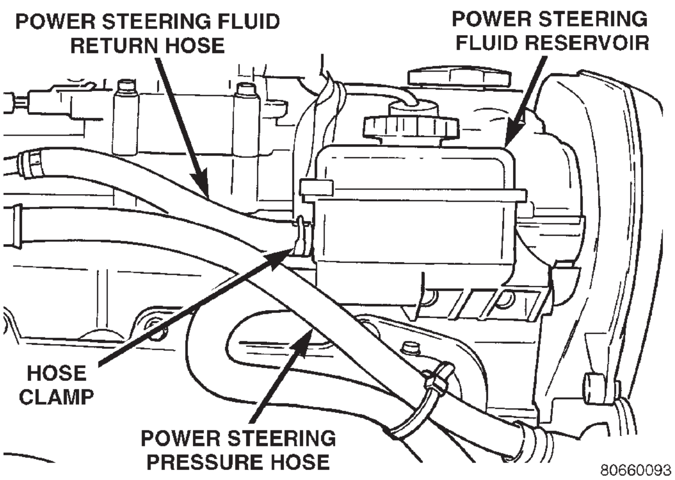


Fig. 17 Power Steering Fluid Return Hose At Reservoir 2.4 Liter

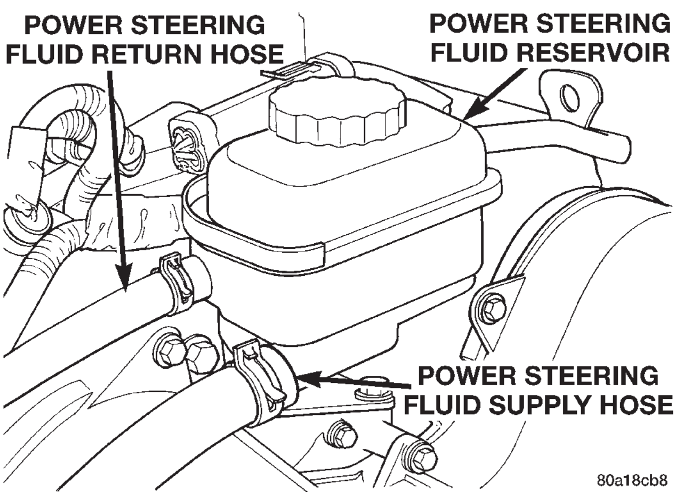


Fig. 18 Power Steering Fluid Return Hose At Reservoir 2.5 Liter

(3) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication And Maintenance section in this manual, for the required lifting procedure to be used for this vehicle.

CAUTION: When lowering the front suspension crossmember, its installed position on the vehicle's body must be marked on the crossmember before it is lowered. Use procedure for the removal and replacement of the steering gear that is in this group of the service manual for the required procedure to locate and lower crossmember.

(4) Lower the front suspension crossmember far enough to gain access to the high and low pressure ports on the steering gear.

(5) Disconnect power steering fluid return hose at power steering cooler line (Fig. 19). Drain power steering fluid from hose.

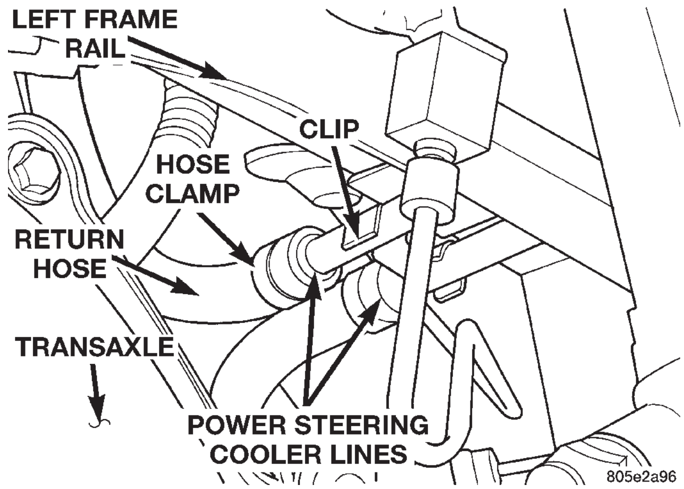


Fig. 19 Power Steering Hose Connections At Cooler Lines

(6) **If vehicle is equipped with a 2.4 liter engine,** remove power steering pressure hose routing bracket from the power steering return hose routing bracket on rear of engine (Fig. 20). Then remove the bolt (Fig. 20) attaching the power steering pressure hose routing bracket to the cylinder head.

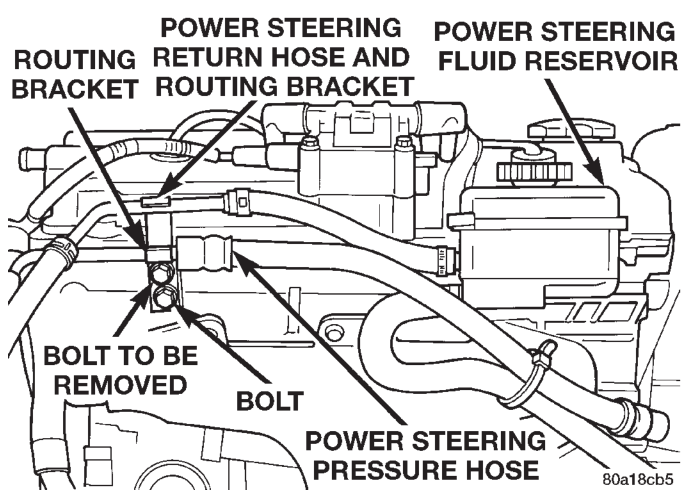


Fig. 20 2.4 Liter Power Steering Hose Routing

(7) **If vehicle is equipped with a 2.5 liter engine,** remove the 2 routing brackets (Fig. 21) attaching the power steering return hose to the power steering pressure hose routing brackets.

(8) Remove the power steering return hose from the vehicle. The power steering return hose is removed from the bottom of the engine compartment.

INSTALL

(1) Install power steering return hose on vehicle. Power steering return hose is installed from the bot-

REMOVAL AND INSTALLATION (Continued)

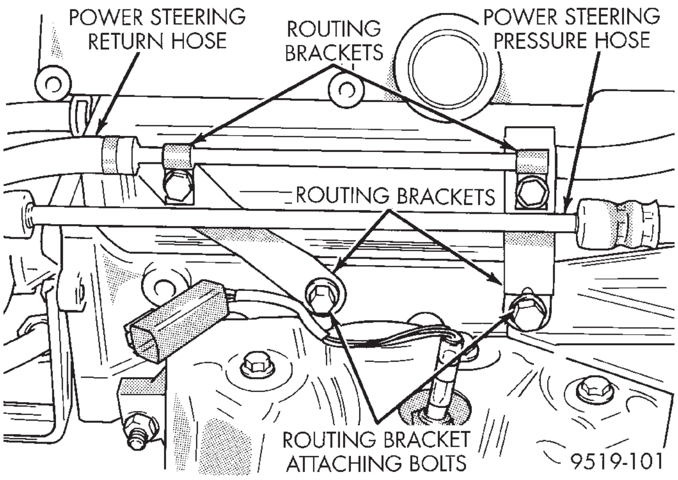


Fig. 21 2.5 Liter Power Steering Hose Routing

tom of the vehicles engine compartment using the reverse steps of removal..

(2) Using a lint free towel, wipe clean all open power steering hose ends, and the power steering gear port.

(3) Install a new O-ring on the power steering return hose to steering gear fitting.

(4) Lubricate O-ring using fresh clean power steering fluid.

(5) Install the power steering return hose, on the cooler lines (Fig. 19).

CAUTION: Hoses must remain away from exhaust system, vehicle components and unfriendly surfaces causing possible damage to power steering hoses.

(6) Correctly route power steering return hose up to the power steering fluid reservoir, avoiding tight bends or kinking of the hose.

(7) **If vehicle is equipped with a 2.4 liter engine,** install power steering return hose routing bracket on rear of cylinder head (Fig. 20) and securely tighten bolt. Then install the power steering pressure hose routing bracket on the return hose routing bracket (Fig. 20) and securely tighten attaching bolt.

(8) **If vehicle is equipped with a 2.5 liter engine,** install the 2 routing brackets (Fig. 21) attaching the power steering return hose to the power steering pressure hose routing brackets.

CAUTION: When installing the front suspension crossmember, it must be installed back in the same location on the vehicle's body as when it was originally installed when the vehicle was built. Use procedure for installing the steering gear that is in this group of the service manual for the required procedure to install and locate crossmember.

(9) Raise the front suspension crossmember and steering gear back up into the vehicle. Refer to the steering gear service procedure in this group of the service manual for the required procedure to install the front suspension crossmember.

(10) Lower vehicle.

CAUTION: Care must be used when installing power steering fluid return hose on power steering fluid reservoir. If excessive force is used when trying to install hose on nipple of power steering fluid reservoir, nipple can be broken off the reservoir.

(11) Install power steering return hose on power steering fluid reservoir fitting. Install hose clamp on power steering return hose at power steering fluid reservoir (Fig. 17) and (Fig. 18). **Be sure hose clamp is installed on return hose past upset bead on power steering fluid reservoir.**

(12) Start the engine and let run for a few seconds. Then turn the engine off.

(13) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(14) Raise front wheels of vehicle off the ground.

(15) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops. Then turn the engine off.

(16) Add power steering fluid if necessary.

(17) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(18) Stop the engine. Check the fluid level and refill as required.

(19) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(20) After hose is installed, check for leaks at all hose connections.

POWER STEERING FLUID SUPPLY HOSE–RESERVOIR TO POWER STEERING PUMP 2.4L ENGINE

REMOVE

(1) Using a siphon pump, remove as much power steering fluid as possible from the remote power steering fluid reservoir.

CAUTION: Care must be used when removing the power steering fluid supply hose from power steering fluid reservoir. If excessive force is used when trying to remove hose from nipple on power steering fluid reservoir, nipple can break off of the reservoir.

REMOVAL AND INSTALLATION (Continued)

(2) Remove the tie-strap (Fig. 22) holding the power steering fluid supply hose to the power steering pressure hose.

(3) Remove hose clamp, attaching power steering fluid supply hose to power steering fluid reservoir (Fig. 22). Then remove power steering fluid supply hose from power steering fluid reservoir.

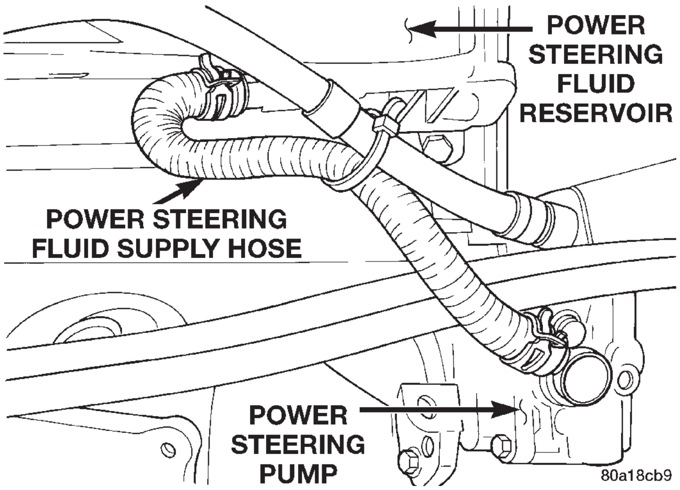


Fig. 22 Power Steering Fluid Supply Hose

(4) Remove hose clamp, attaching the power steering fluid supply hose to the power steering pump. Then remove power steering fluid supply hose from power steering pump fitting.

(5) Remove power steering fluid supply hose from engine.

INSTALL

(1) Install power steering fluid supply hose back on engine making sure it is correctly routed.

CAUTION: Care must be used when installing power steering fluid supply hose on power steering fluid reservoir. If excessive force is used when trying to install hose on nipple of power steering fluid reservoir, nipple can be broken off the reservoir.

(2) Install power steering fluid supply hose on power steering fluid reservoir fitting. Install hose clamp on power steering fluid supply hose at power steering fluid reservoir (Fig. 22). **Be sure hose clamp is installed on supply hose past upset bead on power steering fluid reservoir.**

(3) Install power steering fluid supply hose on power steering pump fitting. Install hose clamp on power steering fluid supply hose at power steering pump fitting (Fig. 22). **Be sure hose clamp is installed on power steering fluid supply hose past upset bead on power steering pump fitting.**

CAUTION: The tie strap must be installed on the power steering pressure hose and supply hose to ensure proper routing of the hoses.

(4) Install the tie-strap (Fig. 22) holding the power steering fluid supply hose to the power steering pressure hose.

CAUTION: Do not use automatic transmission fluid in power steering system. Only use Mopar®, Power Steering Fluid, or equivalent.

(5) Fill power steering fluid reservoir.

(6) Start the engine and let run for a few seconds. Then turn the engine off.

(7) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(8) Raise front wheels of vehicle off the ground.

(9) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops. Then turn the engine off.

(10) Add power steering fluid if necessary.

(11) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(12) Stop the engine. Check the fluid level and refill as required.

(13) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(14) After hose is installed, check for leaks at all hose connections.

POWER STEERING FLUID SUPPLY HOSE–RESERVOIR TO POWER STEERING PUMP 2.5L ENGINE

REMOVE

(1) Using a siphon pump, remove as much power steering fluid as possible from the remote power steering fluid reservoir.

CAUTION: Care must be used when removing the power steering fluid supply hose from power steering fluid reservoir. If excessive force is used when trying to remove hose from nipple on power steering fluid reservoir, nipple can break off of the reservoir.

(2) Remove hose clamp, attaching power steering fluid supply hose to the power steering fluid reservoir. Then remove power steering fluid supply hose from power steering fluid reservoir (Fig. 23).

(3) Raise vehicle.

(4) Remove hose clamp, attaching power steering fluid supply hose to power steering pump. Then

REMOVAL AND INSTALLATION (Continued)

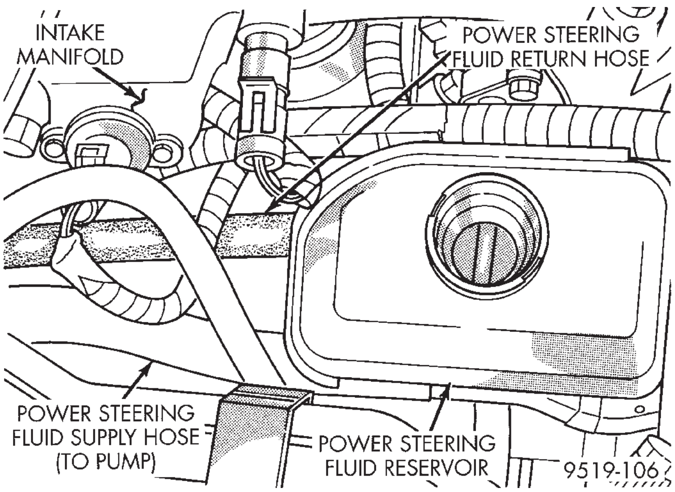


Fig. 23 Power Steering Fluid Supply Hose At Reservoir

remove power steering fluid supply hose from fitting on power steering pump (Fig. 24).

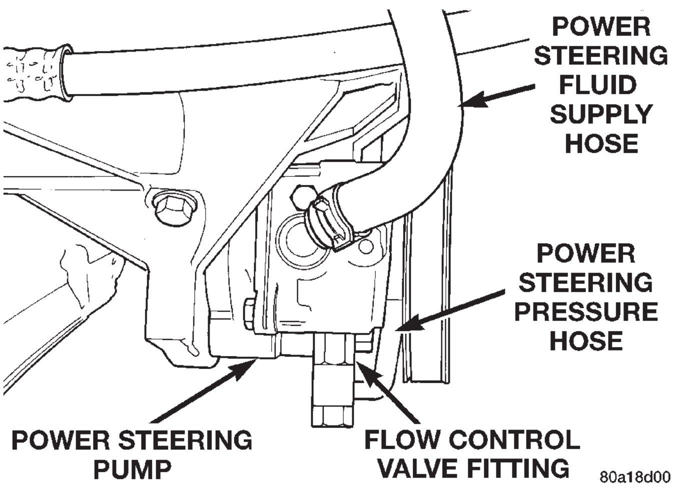


Fig. 24 Fluid Supply Hose At Power Steering Pump

INSTALL

(1) Install power steering fluid supply hose on power steering pump fitting, making sure it is correctly routed up to the power steering fluid reservoir. Install hose clamp on power steering fluid supply hose at power steering pump fitting (Fig. 24). **Be sure hose clamp is installed on power steering fluid supply hose past upset bead on power steering pump fitting.**

(2) Lower vehicle.

CAUTION: Care must be used when installing power steering fluid supply hose on power steering fluid reservoir. If excessive force is used when trying to install hose on nipple of power steering fluid reservoir, nipple can be broken off the reservoir.

(3) Install power steering fluid supply hose on power steering fluid reservoir fitting (Fig. 23). Install hose clamp on power steering fluid supply hose at power steering fluid reservoir. **Be sure hose clamp is installed on supply hose past the upset bead on power steering fluid reservoir.**

CAUTION: Do not use automatic transmission fluid in power steering system. Only use Mopar®, Power Steering Fluid, or equivalent.

(4) Fill power steering fluid reservoir.

(5) Start the engine and let run for a few seconds. Then turn the engine off.

(6) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(7) Raise front wheels of vehicle off the ground.

(8) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops. Then turn the engine off.

(9) Add power steering fluid if necessary.

(10) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(11) Stop the engine. Check the fluid level and refill as required.

(12) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(13) After hose is installed, check for leaks at all hose connections.

POWER STEERING PUMP 2.4 LTR ENGINE

WARNING: POWER STEERING OIL, ENGINE COMPONENTS AND EXHAUST SYSTEM MAY BE EXTREMELY HOT IF ENGINE HAS BEEN RUNNING. DO NOT START ENGINE WITH ANY LOOSE OR DISCONNECTED HOSES, OR ALLOW HOSES TO TOUCH HOT EXHAUST MANIFOLD OR CATALYST.

REMOVE

(1) Remove battery cable from (-) negative post on battery and isolate cable.

(2) Siphon as much power steering fluid as possible out of the remote power steering fluid reservoir.

(3) Raise vehicle.

(4) Remove right front tire from vehicle.

(5) Remove accessory drive splash shield (Fig. 25) from the right front wheel well.

(6) Remove the power steering fluid pressure hose from the pressure fitting on power steering pump (Fig. 26). Let remaining power steering fluid drain out of the power steering fluid supply hose, power steering pump and power steering fluid pressure hose. **After power steering fluid has drained out of pump and hose, install a cap on the power**

REMOVAL AND INSTALLATION (Continued)

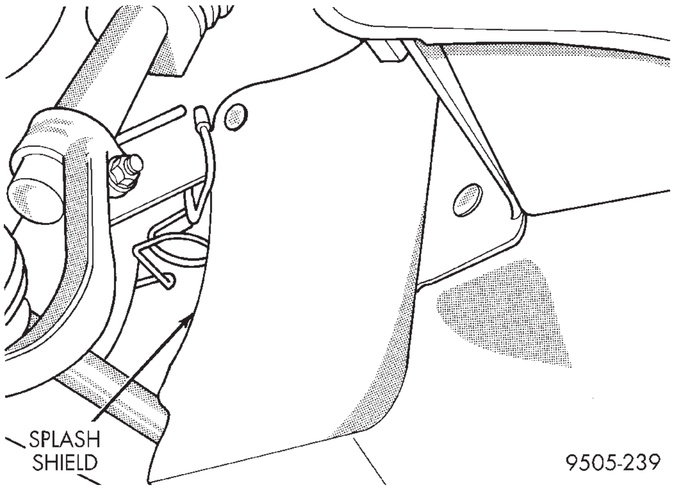


Fig. 25 Accessory Drive Splash Shield

steering pressure hose and a plug in the power steering pump pressure fitting.

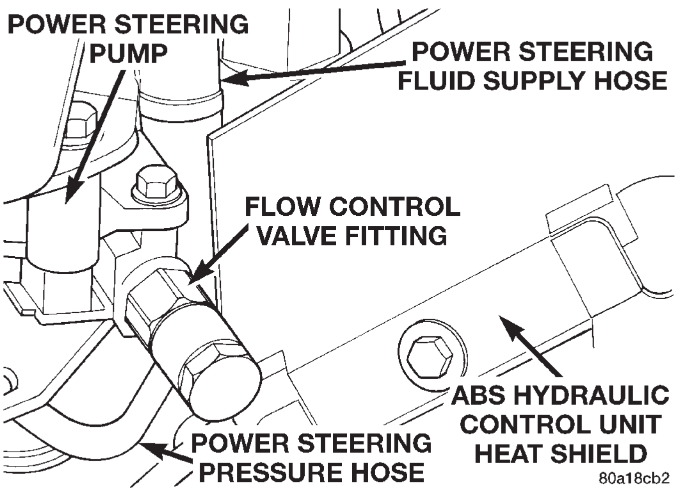


Fig. 26 Power Steering Fluid Pressure Hose Attachment To Pump

(7) Remove hose clamp, attaching power steering fluid supply hose to the power steering pump suction fitting (Fig. 26). Then remove power steering fluid supply hose from fitting. **Install a cap on suction fitting of power steering pump.**

(8) Remove bolt at adjustment slot, (Fig. 27) attaching front power steering pump mounting bracket to cast aluminum accessory drive bracket on engine.

(9) Remove bolt (Fig. 28) attaching the back of the power steering pump to the cast aluminum mounting bracket.

(10) Remove the antilock brakes hydraulic control unit heat shield (Fig. 26) from the hydraulic control unit mounting bracket.

(11) Remove retainer for wheel speed sensor cable grommet (Fig. 29) from right inner fender.

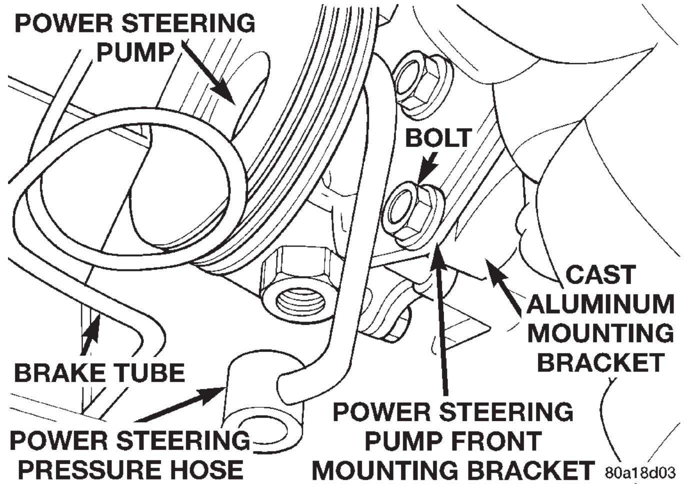


Fig. 27 Power Steering Pump Front Bracket Attachment

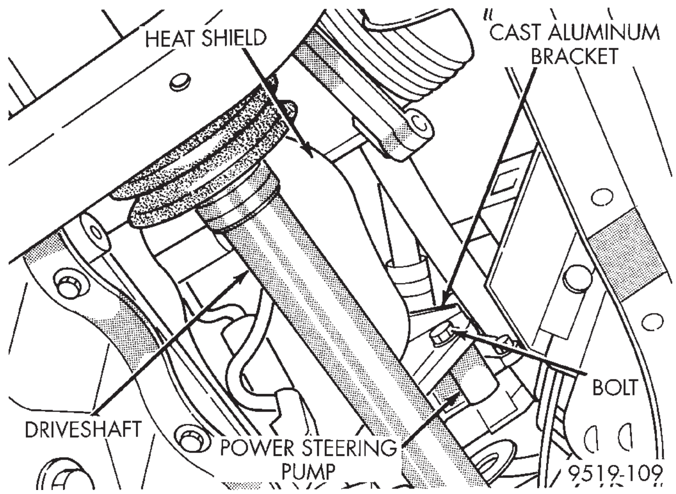


Fig. 28 Power Steering Pump Attachment To Rear Mounting Bracket

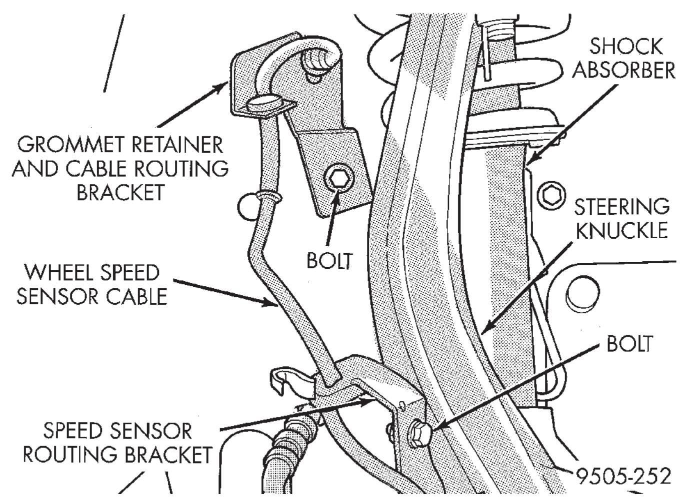


Fig. 29 Wheel Speed Sensor Cable Grommet Retainer

REMOVAL AND INSTALLATION (Continued)

(12) Remove the speed sensor cable sealing grommet from inner fender (Fig. 30). Then disconnect the wheel speed sensor cable from the vehicle wiring harness (Fig. 30). Push vehicle wiring harness back through hole in inner fender and unclip wiring harness trough from frame rail.

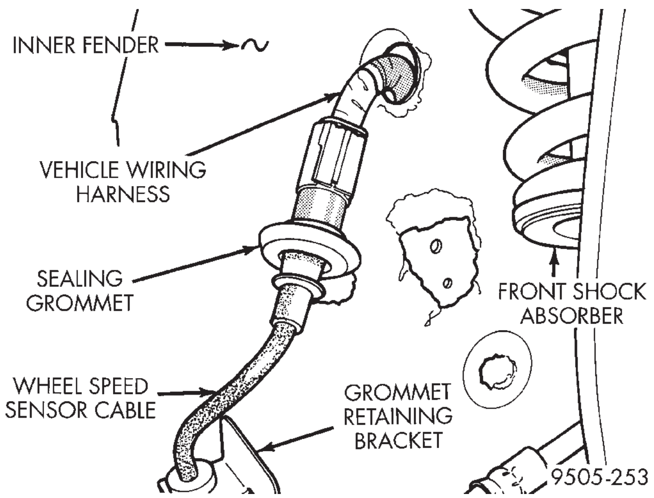


Fig. 30 Wheel Speed Sensor Cable Connection To Vehicle Wiring Harness

(13) Remove bolt attaching top of power steering pump front bracket to the cast aluminum mounting bracket. Access to the top bolt is through the wheel speed sensor cable routing hole (Fig. 31). To access the bolt use a long extension and a 15 mm flex socket.

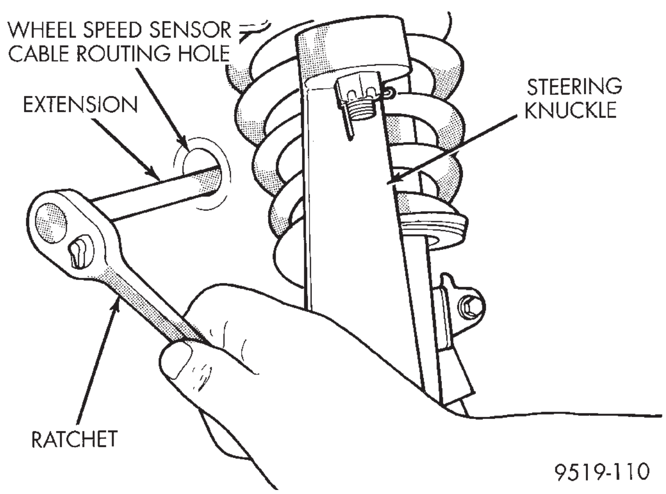


Fig. 31 Access To Top Mounting Bolt For Power Steering Pump

(14) Remove power steering pump drive belt from power steering pump pulley.

(15) Remove power steering pump and front mounting bracket as an assembly from the engine and vehicle. Pump and mounting bracket is removable by bringing it out through area between rear of engine, driveshaft and front suspension crossmember.

(16) Transfer required parts from removed power steering pump, to replacement power steering pump.

INSTALL

(1) Install power steering pump and mounting bracket as an assembly back in vehicle, using reverse order of removal.

(2) Install power steering pump and front bracket on the cast aluminum accessory drive engine bracket (Fig. 27). Then loosely install the bolt at adjusting slot (Fig. 27) mounting pump bracket to accessory drive bracket.

(3) Loosely install the bolt mounting the power steering pump to its rear mounting bracket (Fig. 28).

(4) Loosely install bolt attaching top of power steering pump front bracket to the cast aluminum accessory drive bracket. Access to install the bolt is through the wheel speed sensor cable routing hole (Fig. 31).

(5) Using a lint free towel, wipe clean all open power steering hose ends, and power steering pump fittings.

(6) Install a new O-ring on the end of power steering pressure hose banjo fitting (Fig. 32).

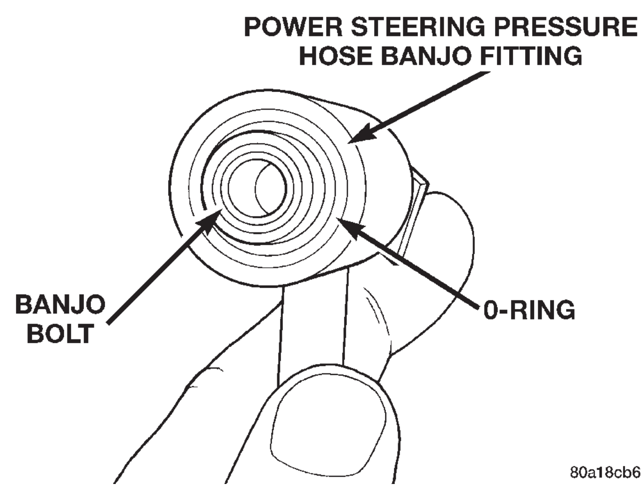


Fig. 32 O-Ring Installed On Power Steering Hose Banjo Fitting

(7) Install a new O-ring on the Banjo Fitting Bolt for the power steering pressure hose Banjo Fitting (Fig. 33)

(8) Lubricate both O-rings using fresh clean power steering fluid.

NOTE: Pressure hose must be installed between the front bracket of the power steering pump and power steering pump pulley.

(9) Install the power steering pressure hose on the power steering pump pressure fitting, and loosely install the Banjo Fitting bolt.

REMOVAL AND INSTALLATION (Continued)

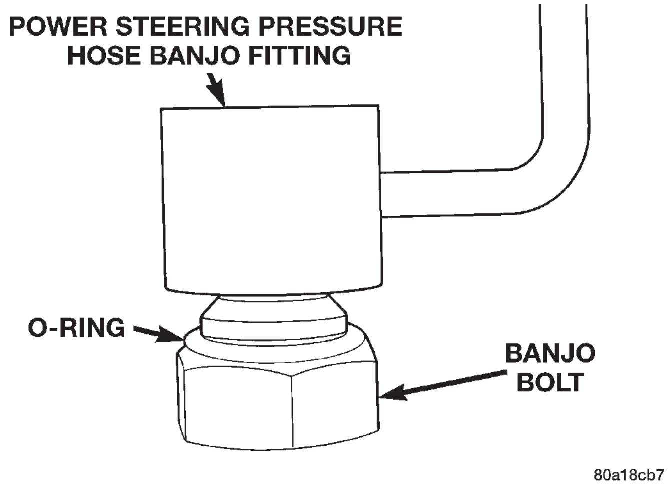


Fig. 33 O-Ring Installed On Banjo Fitting Bolt

(10) Install power steering pump drive belt on power steering pump pulley.

(11) Install a 1/2 in. breaker bar in the square adjusting hole in the front power steering pump mounting bracket (Fig. 34). Then using breaker bar rotate power steering pump to obtain the correct drive belt tension. See Accessory Drive Belts in Group 7 Cooling System of this service manual for the correct drive belt tension specification. When correct drive belt tension is obtained first tighten the bottom 2 adjusting slot bolts at the power steering pump cast mounting bracket to a torque of 54 N·m (40 ft. lbs.). Then tighten the power steering pump mounting bracket top pivot bolt to a torque of 54 N·m (40 ft. lbs.). Access to tighten and torque the bolt is through the wheel speed sensor cable routing hole (Fig. 31).

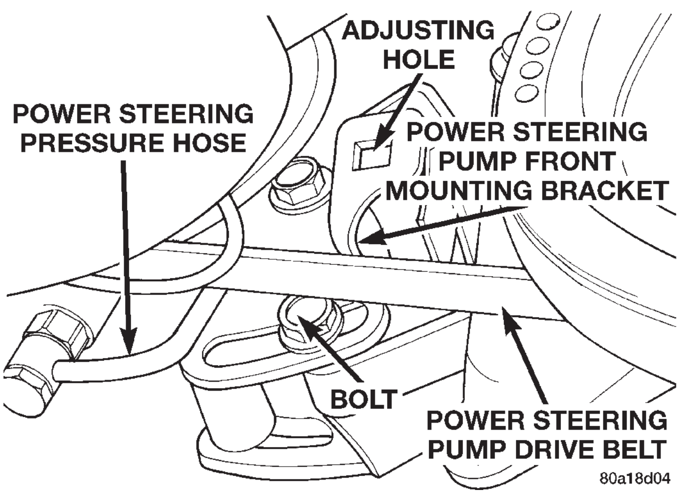


Fig. 34 Power Steering Pump Front Mounting Bracket Adjusting Hole

(12) Install power steering supply hose on power steering pump suction fitting. Install hose clamp on hose, being sure hose clamp is installed on hose past upset bead on power steering pump tube.

(13) Position power steering pressure hose on power steering pump, so hose is not contacting the pulley of power steering pump or the drive belt. Then tighten the Banjo Bolt to a torque of 34 N·m (25 ft. lbs.).

(14) Install heat shield on hydraulic control unit for the antilock brake system (Fig. 26).

(15) Clip the vehicle wiring harness back on the right frame rail. Then route the wiring harness connector for the wheel speed sensor cable through routing hole in inner fender. Connect vehicle wiring harness to wheel speed sensor cable (Fig. 30).

(16) On a vehicle equipped with antilock brakes, install wheel speed sensor cable sealing grommet in routing hole. Install retainer for wheel speed sensor cable grommet (Fig. 30) on right inner fender.

(17) Install accessory drive slash shield in right front inner fender.

(18) Install tire back on vehicle. Tighten the wheel lug nuts in proper sequence until all lug nuts are torqued to half specification. Then repeat tightening sequence to full specified torque of 135 N·m (100 ft. lbs.).

(19) Lower vehicle.

CAUTION: Do not use automatic transmission fluid in power steering system. Only use Mopar®, Power Steering Fluid, or equivalent.

(20) Fill power steering reservoir to correct fluid level.

(21) Connect negative cable back on negative post of battery.

(22) Start the engine and let run for a few seconds. Then turn the engine off.

(23) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(24) Raise front wheels of vehicle off the ground.

(25) Start engine, then slowly turn steering wheel right and left several times until lightly contacting the wheel stops. Then turn the engine off.

(26) Add power steering fluid if necessary.

(27) Lower the vehicle. Start engine again and turn the steering wheel slowly from lock to lock.

(28) Stop the engine. Check the fluid level and refill as required.

(29) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(30) After power steering pump is installed, check for leaks at all hose connections and power steering pump fittings.

REMOVAL AND INSTALLATION (Continued)

POWER STEERING PUMP 2.5 L ENGINE

WARNING: POWER STEERING OIL, ENGINE COMPONENTS AND EXHAUST SYSTEM MAY BE EXTREMELY HOT IF ENGINE HAS BEEN RUNNING. DO NOT START ENGINE WITH ANY LOOSE OR DISCONNECTED HOSES, OR ALLOW HOSES TO TOUCH HOT EXHAUST MANIFOLD OR CATALYST.

REMOVE

(1) Remove battery cable from (-) negative post on battery and isolate cable.

(2) Siphon as much power steering fluid as possible out of the remote power steering fluid reservoir.

(3) Remove the power steering fluid supply hose from the power steering fluid reservoir. Fluid supply hose will be removed with the power steering pump.

(4) Raise vehicle.

(5) Remove right front tire from vehicle.

(6) Remove accessory drive splash shield (Fig. 35) from the right front wheel well.

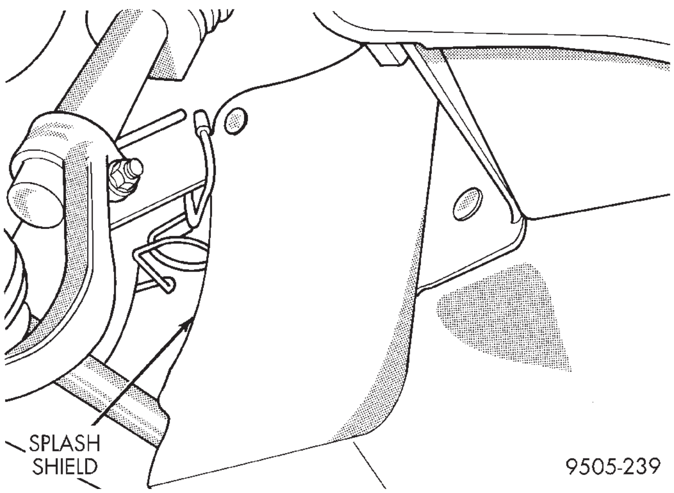


Fig. 35 Accessory Drive Splash Shield

(7) Remove the power steering fluid pressure hose from pressure fitting on power steering pump (Fig. 36). Let remaining power steering fluid drain out of the power steering fluid supply hose, power steering pump and power steering fluid pressure hose. **After power steering fluid has drained out of pump and hose, install a cap on the power steering pressure hose and a plug in the power steering pump pressure fitting.**

(8) Remove the antilock brakes hydraulic control unit heat shield (Fig. 37) from the hydraulic control unit mounting bracket.

(9) Remove bolt at adjusting slot in accessory drive mounting bracket, (Fig. 38) attaching back of power steering pump to the bracket.

(10) Remove bolt at adjustment slot, (Fig. 39) attaching the power steering pump front mounting bracket to cast aluminum accessory drive bracket on engine. Then remove bolt (Fig. 39) at top of power

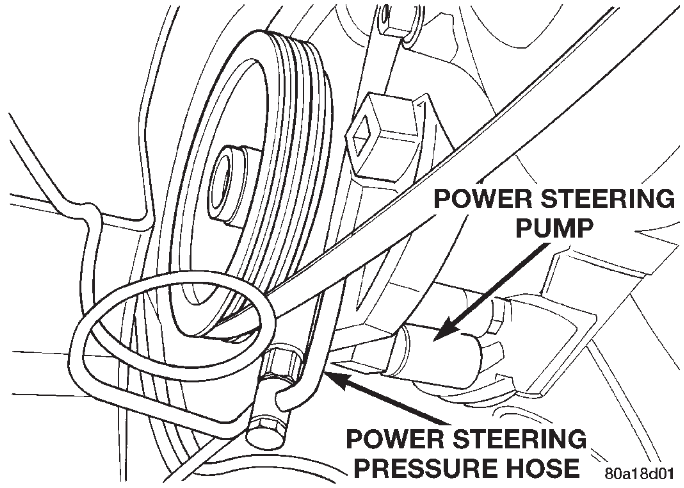


Fig. 36 Power Steering Fluid Pressure Hose Attachment To Pump

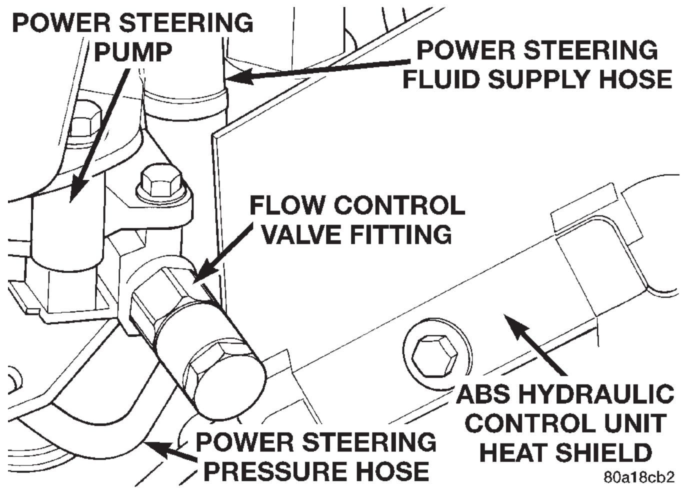


Fig. 37 Hydraulic Control Unit Heat Shield

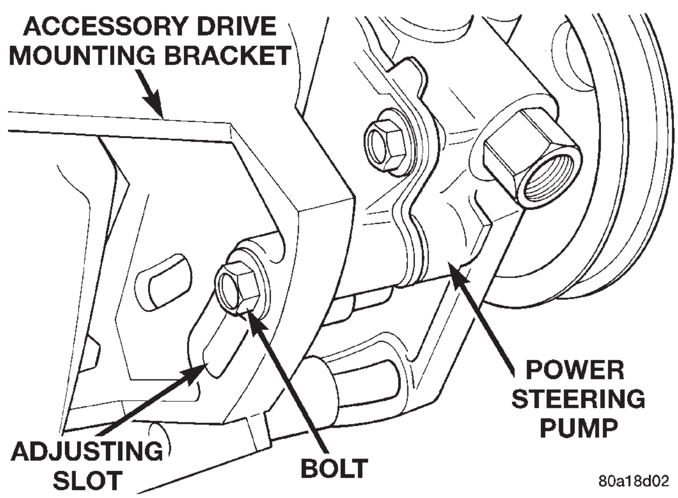


Fig. 38 Power Steering Pump Rear Mounting Bolt

REMOVAL AND INSTALLATION (Continued)

steering front mounting bracket, attaching it to the accessory drive bracket.

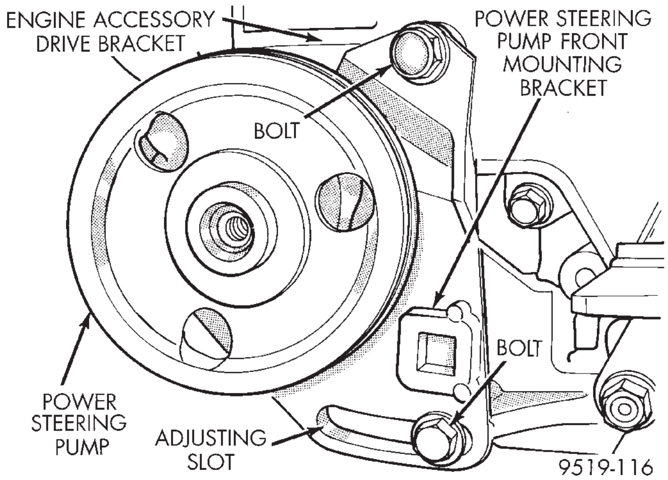


Fig. 39 Power Steering Pump Front Bracket Attachment

(11) Remove the power steering pump drive belt from power steering pump pulley.

(12) Remove power steering pump, fluid supply hose and front mounting bracket as an assembly from the engine and vehicle. Pump, fluid supply hose and mounting bracket is removable by bringing it out through area between rear of engine, driveshaft and front suspension crossmember.

(13) Transfer required parts from removed power steering pump, to replacement power steering pump.

INSTALL

(1) Install power steering pump, mounting bracket and fluid supply hose as an assembly back in vehicle, using reverse order of removal. **Be sure power steering fluid supply hose is correctly routed up to the power steering fluid reservoir when installing power steering pump.**

(2) Install power steering pump and front bracket on the cast aluminum accessory drive engine bracket (Fig. 39). Then loosely install bolt at adjusting slot and top of power steering pump front bracket (Fig. 39) mounting pump bracket to accessory drive bracket.

(3) Loosely install the bolt mounting power steering pump to its rear mounting bracket (Fig. 38).

(4) Using a lint free towel, wipe clean all open power steering hose ends, and power steering pump fittings.

(5) Install a new O-ring on the end of the power steering pressure hose bajo fitting (Fig. 40).

(6) Install a new O-ring on the power steering pressure hose banjo fitting bolt (Fig. 41).

(7) Lubricate both O-rings using fresh clean power steering fluid.

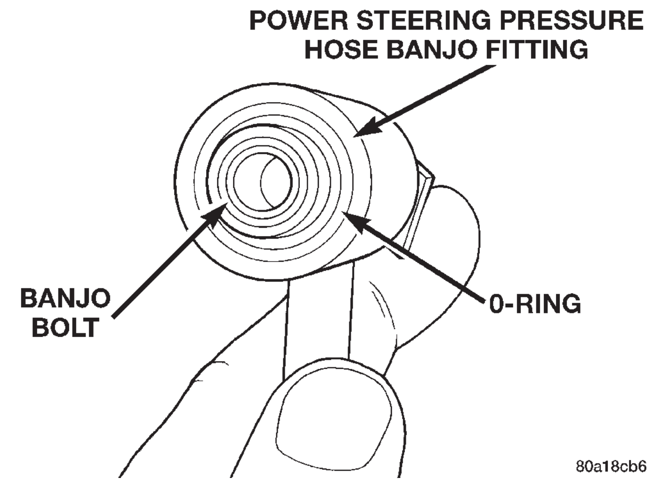


Fig. 40 O-Ring Installed On Power Steering Hose Banjo Fitting

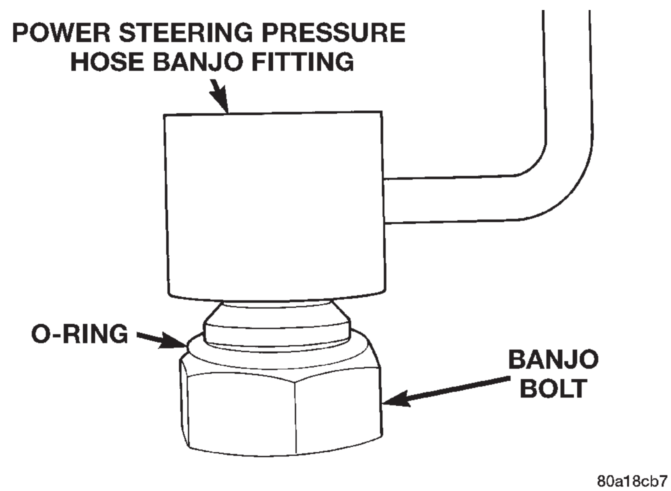


Fig. 41 O-Ring Installed On Banjo Fitting Bolt

NOTE: When installing the pressure hose it must be installed between the front bracket of the power steering pump and power steering pump pulley.

(8) Install the power steering pressure hose on the power steering pump pressure fitting and, loosely install the Banjo Bolt.

(9) Install power steering pump drive belt on power steering pump pulley.

(10) Install a 1/2 in. breaker bar in the square adjusting hole in the front power steering pump mounting bracket (Fig. 42) Then rotate pump to obtain the correct drive belt tension. See Accessory Drive Belts in Group 7 Cooling System of this service manual for the correct drive belt tension specification. When correct drive belt tension is obtained first tighten the bottom 2 adjusting slot bolts at the power steering pump cast mounting bracket to a torque of 54 N·m (40 ft. lbs.). Then tighten the power steering pump mounting bracket top pivot bolt to a torque of 54 N·m (40 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

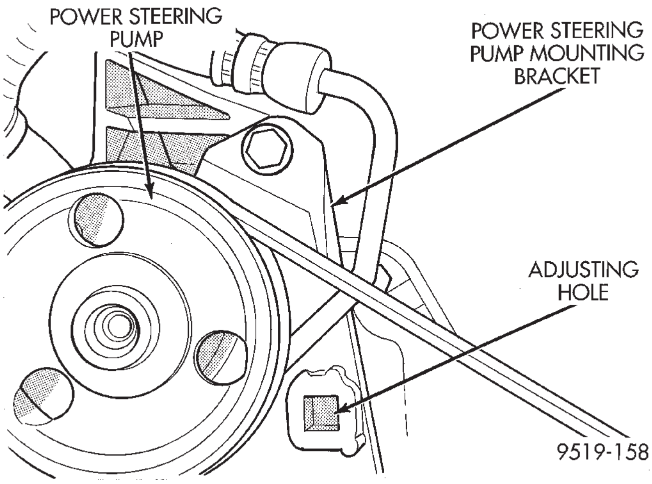


Fig. 42 Power Steering Pump Front Mounting Bracket Adjusting Hole

(11) Position power steering pressure hose in outlet fitting of power steering pump, so hose is not contacting the pulley of power steering pump drive belt (Fig. 36). Then tighten the Banjo Bolt to a torque of 34 N·m (25 ft. lbs.).

(12) Install heat shield on hydraulic control unit for the antilock brake system (Fig. 37).

(13) Install accessory drive splash shield in right front inner fender (Fig. 35).

(14) Install tire back on vehicle. Tighten the wheel lug nuts in proper sequence until all lug nuts are torqued to half specification. Then repeat tightening sequence to full specified torque of 129 N·m (95 ft. lbs.).

(15) Lower vehicle.

CAUTION: Do not use automatic transmission fluid in power steering system. Only use Mopar®, Power Steering Fluid, or equivalent.

(16) Install power steering fluid supply hose on power steering fluid reservoir fitting. Install hose clamp on hose, being sure hose clamp is installed on hose past upset bead on power steering fluid reservoir.

(17) Fill power steering reservoir to correct fluid level.

(18) Connect negative cable back on negative post of battery.

(19) Start the engine and let run for a few seconds. Then turn the engine off.

(20) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(21) Raise front wheels of vehicle off the ground.

(22) Start engine, then slowly turn steering wheel right and left several times until lightly contacting the wheel stops. Then turn the engine off.

(23) Add power steering fluid if necessary.

(24) Lower the vehicle. Start engine again and turn the steering wheel slowly from lock to lock.

(25) Stop the engine. Check the fluid level and refill as required.

(26) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

(27) After power steering pump is installed, check for leaks at all hose connections and power steering pump fittings.

POWER STEERING OIL COOLER

REMOVE

(1) Raise vehicle using a frame contact type hoist or supported as required using jack stands. See Hoisting in the Lubrication And Maintenance group of this service manual for the required hoisting or jacking procedure to be used for this vehicle.

(2) Remove the hose clamps (Fig. 43) from the power steering fluid hoses. Drain power steering fluid from the hoses and the power steering fluid cooler.

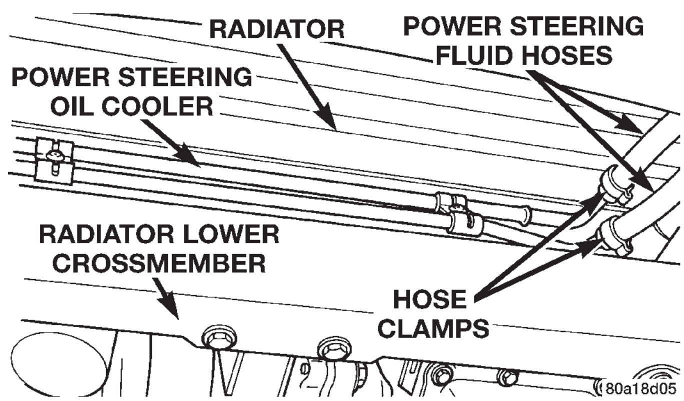


Fig. 43 Hose Clamps At Power Steering Fluid Cooler

(3) Remove the 2 bolts (Fig. 44) attaching the power steering fluid cooler to the radiatior lower crossmember (Fig. 44).

(4) Remove the power steering fluid cooler and mounting brackets as an assembly (Fig. 43) from the radiator lower crossmember. It is removed by rolling the bottom of the power steering fluid cooler and mounting brackets upward removing the tabs on the brackets from the radiator lower crossmember

INSTALL

(1) Install tabs on mounting brackets into the holes in the radiator lower crossmember. Then rotate cooler upward into position on crossmember.

REMOVAL AND INSTALLATION (Continued)

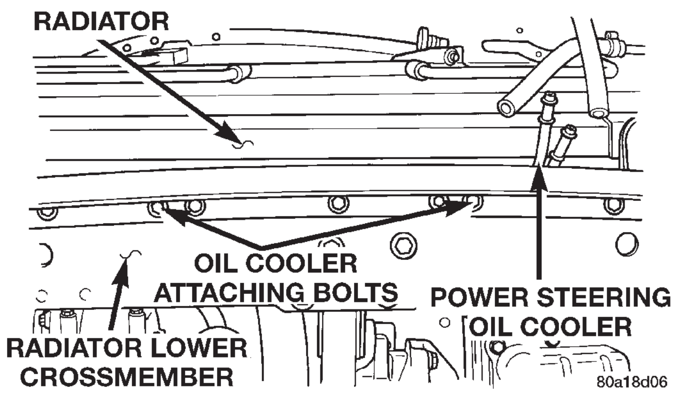


Fig. 44 Power Steering Fluid Cooler Attachment

(2) Install the 2 bolts (Fig. 44) attaching the power steering fluid cooler to the radiator lower crossmember. Tighten the attaching bolt to a torque of 7 N·m (60 in. lbs.)

CAUTION: Only the original equipment crimp style clamp can be used when installing the power steering fluid hoses on the power steering oil cooler. Use of a different style clamp may not provide proper retention of the hose to the power steering oil cooler. Refer to the Mopar Parts Catalog for the required replacement hose clamp.

(3) Install the hose clamps on the power steering fluid hoses.

(4) Install power steering fluid hoses on the power steering fluid cooler. (Fig. 43). **Be sure hose clamps are installed on hose past the upset bead on the power steering oil cooler.**

(5) Using Crimper, Hose Clamp, Special Tool C-4124 properly crimp the clamps on the power steering fluid hoses at the power steering oil cooler.

(6) Lower the vehicle to a point where front tires are just off the ground.

(7) Start the engine and let run for a few seconds. Then turn the engine off.

(8) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(9) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops.

(10) Add power steering fluid if necessary.

(11) Stop the engine. Check the fluid level and refill as required.

(12) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

POWER STEERING FLUID COOLER LINES

REMOVE

(1) Remove the intermediate steering shaft coupler (Fig. 45) from the steering gear shaft.

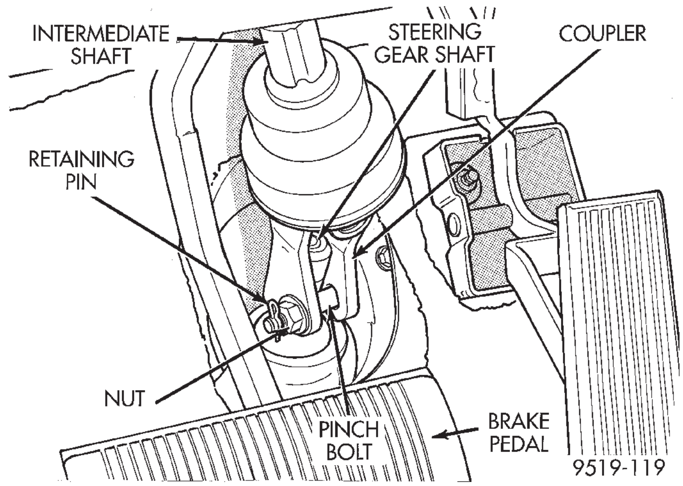


Fig. 45 Intermediate Shaft Coupler Attachment To Steering Gear

(2) Siphon as much power steering fluid as possible from the power steering fluid reservoir.

(3) Raise the vehicle using a frame contact type hoist or supported as required using jack stands. See Hoisting in the Lubrication and Maintenance group of this service manual for the required hoisting or jacking procedure to be used for this vehicle.

(4) Remove the left front wheel/tire.

(5) Remove the front fascia and the grill as an assembly from the vehicle. Refer to Front Bumper/ Fascia in Group 13 of this service manual for the proper procedure.

(6) Remove the hose clamps (Fig. 46) from the power steering fluid hoses. Drain power steering fluid from the hoses and the power steering fluid cooler.

(7) Remove the bracket attaching the power steering fluid cooler lines to the left front frame rail (Fig. 47).

(8) Lower the front suspension crossmember. Refer to the steering gear service procedures in this group of the service manual for the required procedure for the removal of the front suspension crossmember.

(9) Remove the clip (Fig. 48) holding the power steering fluid cooler lines together.

(10) Remove the hose clamp (Fig. 48) attaching the power steering fluid return hose from the engine, (Fig. 48) to the power steering fluid cooler lines.

(11) Remove the power steering fluid return hose (Fig. 49) from the power steering gear.

(12) Remove the power steering fluid cooler lines from the routing clip on the left front frame rail (Fig. 47).

REMOVAL AND INSTALLATION (Continued)

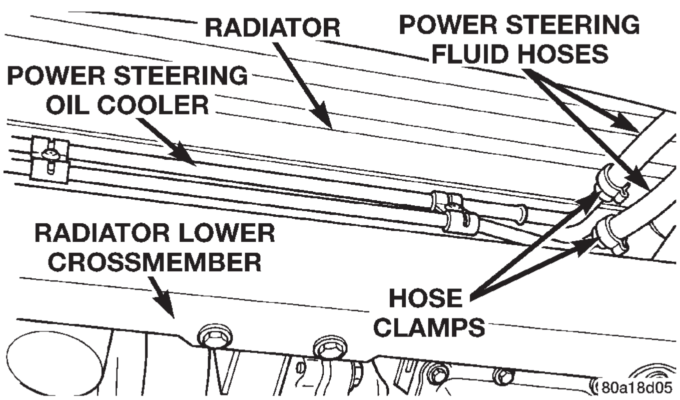


Fig. 46 Hose Clamps At Power Steering Fluid Cooler

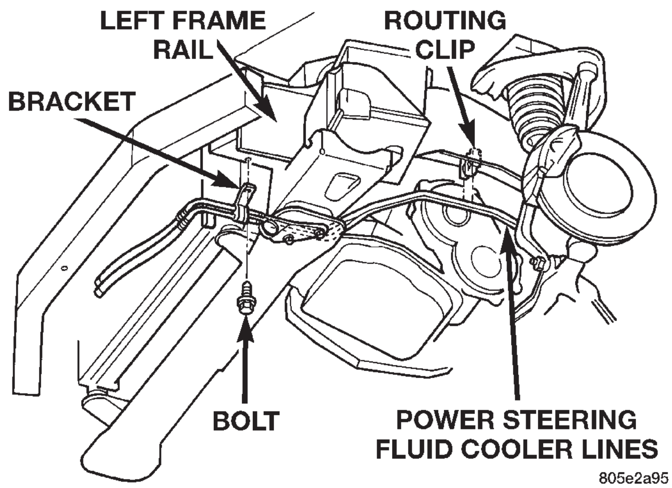


Fig. 47 Power Steering Cooler Line Attachment

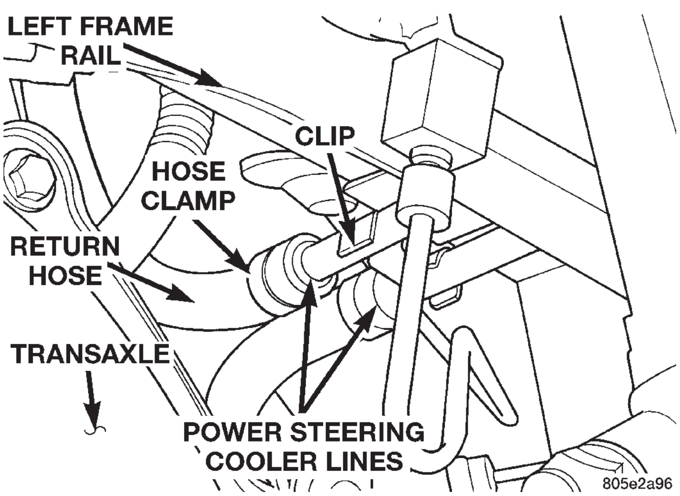


Fig. 48 Power Steering Cooler Line Clip

(13) Separate the power steering cooler line assembly into 2 separate pieces.

(14) Remove each cooler line separately from the vehicle. The cooler lines are removed out through the front of the vehicle in the area between the radiator and the closure panel.

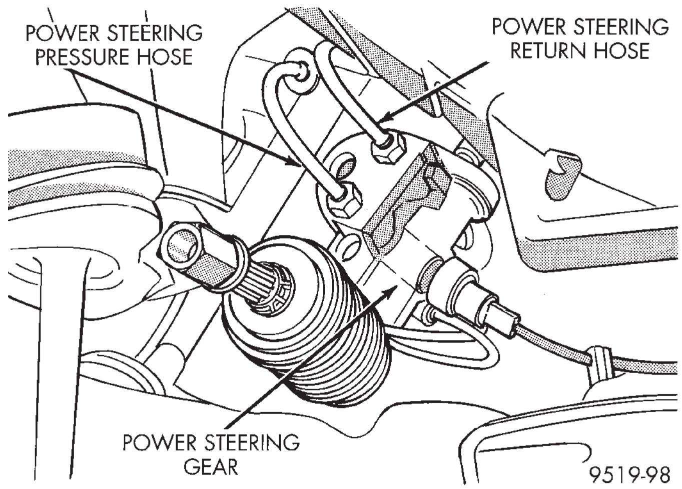


Fig. 49 Power Steering Hose Connections At Steering Gear

INSTALL

(1) Install the cooler lines individually using the reverse procedure of their removal.

(2) Install the cooler lines in the routing clip on the left frame rail

CAUTION: Only the original equipment crimp style clamp can be used when installing the power steering fluid hoses. Use of a different style clamp may not provide proper retention of the hose to the power steering oil cooler. Refer to the Mopar Parts Catalog for the required replacement hose clamp.

(3) Install the hose clamps on the power steering fluid hoses.

(4) Install the power steering fluid return hose coming from the engine on the power steering cooler line (Fig. 48). **Be sure hose clamp is installed on hose past the upset bead on the power steering cooler line.**

(5) Using Crimper, Hose Clamp, Special Tool C-4124 properly crimp the clamps on the power steering fluid hoses at the power steering oil cooler line.

(6) Install the power steering fluid return hose on the steering gear. Then using a crow foot and torque wrench (Fig. 50) tighten the tube nut to a torque of 31 N·m (275 in. lbs.).

(7) Install the clip (Fig. 48) holding the 2 power steering fluid cooler lines together.

(8) Install the front suspension crossmember. Refer to the steering gear service procedures in this group of the service manual for the required procedure for the installation of the front suspension crossmember.

(9) Install the left front wheel/tire.

REMOVAL AND INSTALLATION (Continued)

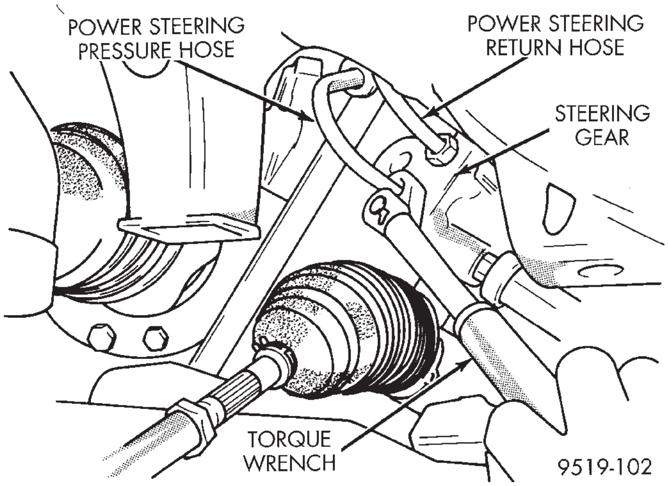


Fig. 50 Torquing Power Steering Fluid Hose Tube Nuts

(10) Install the bracket attaching the power steering cooler lines to the left frame rail (Fig. 47). Install bracket attaching bolt and tighten to a torque of 7 N·m (60 in. lbs.).

(11) (Fig. 47).

CAUTION: Only the original equipment crimp style clamp can be used when installing the power steering fluid hoses on the power steering oil cooler. Use of a different style clamp may not provide proper retention of the hose to the power steering oil cooler. Refer to the Mopar Parts Catalog for the required replacement hose clamp.

(12) Install the hose clamps on the power steering fluid hoses.

(13) Install power steering fluid hoses on the power steering fluid cooler. (Fig. 46). **Be sure hose clamps are installed on hose past the upset bead on the power steering oil cooler.**

(14) Using Crimper, Hose Clamp, Special Tool C-4124 properly crimp the clamps on the power steering fluid hoses at the power steering oil cooler.

(15) Install the front fascia and grill on the vehicle. Refer to Front Bumper/Fascia in Group 13 of this service manual for the proper procedure.

(16) Lower the vehicle to a point where front tires are just off the ground.

(17) Connect the steering column intermediate shaft on the shaft of the steering gear (Fig. 45). Install the coupler retaining pinch bolt and tighten to a torque of 27 N·m (240 in. lbs.). **Be sure to install the coupler retaining pinch bolt retention pin (Fig. 45).**

(18) Start the engine and let run for a few seconds. Then turn the engine off.

(19) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(20) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops.

(21) Add power steering fluid if necessary.

(22) Stop the engine. Check the fluid level and refill as required.

(23) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

POWER STEERING SYSTEM FLUID RESERVOIR

REMOVE

(1) Using a siphon pump, remove as much power steering fluid as possible from the power steering fluid reservoir.

(2) Raise vehicle.

(3) Remove hose clamp attaching power steering fluid supply hose to fitting on power steering pump. Let power steering fluid drain from supply hose and power steering fluid reservoir, until reservoir is empty.

(4) Lower vehicle.

CAUTION: Care must be used when removing and installing power steering fluid hoses on the power steering fluid reservoir. If excessive force is used when trying to remove or install hoses on nipples of power steering fluid reservoir, nipples can be broken off the reservoir.

(5) Remove power steering fluid return and supply hose, from power steering fluid reservoir.

(6) Remove bolts attaching power steering fluid reservoir to engine (Fig. 51) or (Fig. 52).

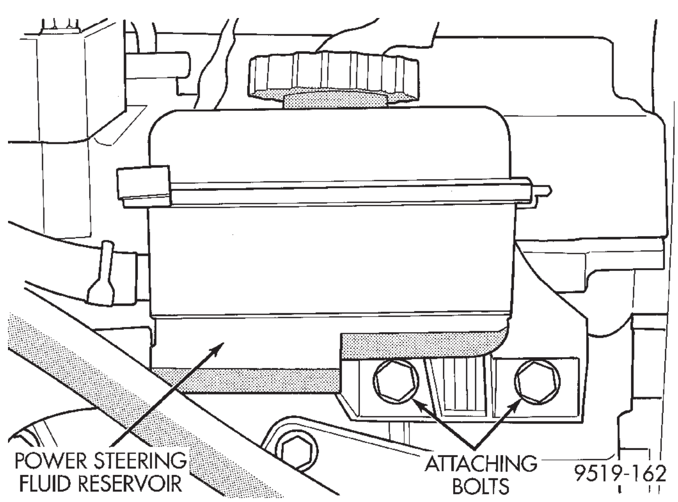


Fig. 51 Power Steering Fluid Reservoir Mounting 2.4 Ltr. Engine

REMOVAL AND INSTALLATION (Continued)

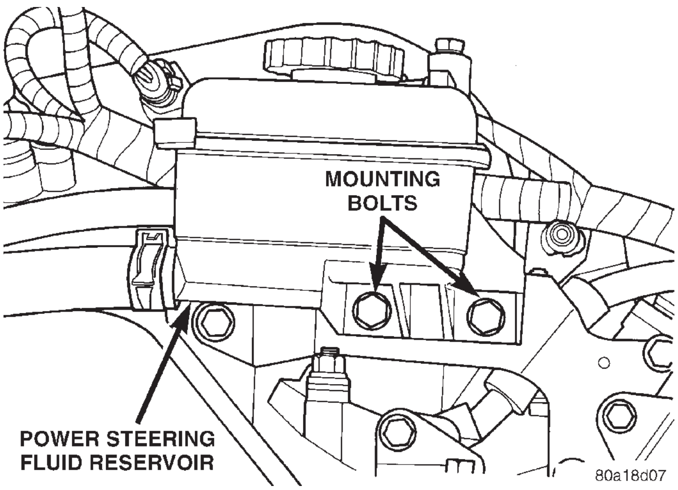


Fig. 52 Power Steering Fluid Reservoir Mounting 2.5 Liter Engine

(7) Remove power steering fluid reservoir from vehicle.

INSTALL

(1) Install power steering fluid reservoir on cylinder head. Install and securely tighten the power steering fluid reservoir attaching bolts (Fig. 51) or (Fig. 52).

(2) Install power steering fluid return and supply hose, on power steering fluid reservoir fittings. **Be sure both hose clamps are installed on hose past upset bead on power steering reservoir fittings.**

(3) Raise vehicle.

(4) Install power steering supply hose, on suction fitting of the power steering pump. **Be sure hose clamp is installed on hose past upset bead on power steering gear steel tube.**

(5) Fill power steering pump fluid reservoir to the proper level.

(6) Start the engine and let run for a few seconds. Then turn the engine off.

(7) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(8) Raise front wheels of vehicle off the ground.

(9) Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops. Then turn the engine off.

(10) Add power steering fluid if necessary.

(11) Lower the vehicle and turn the steering wheel slowly from lock to lock.

(12) Stop the engine. Check the fluid level and refill as required.

(13) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

DISASSEMBLY AND ASSEMBLY

POWER STEERING PUMP DRIVE PULLEY

The power steering pump must be removed from the vehicle for removal of the power steering pump pulley. Refer to Power Steering Pump Removal in the Power Steering Pump Service Procedures section in this group of the service manual.

DISASSEMBLE

(1) Remove power steering pump from engine. Refer to Power Steering Pump Removal in the Power Steering Pump Service Procedures section in this group of the service manual for required procedure.

CAUTION: Do not hammer on power steering pump pulley or shaft to remove power steering pump pulley. This will damage the pulley and the power steering pump.

(2) Mount Puller, Special Tool C-4333 or C-4068 on power steering pump pulley. Mount power steering pump and puller in a vise (Fig. 53) to keep shaft of power steering pump from turning when removing pulley.

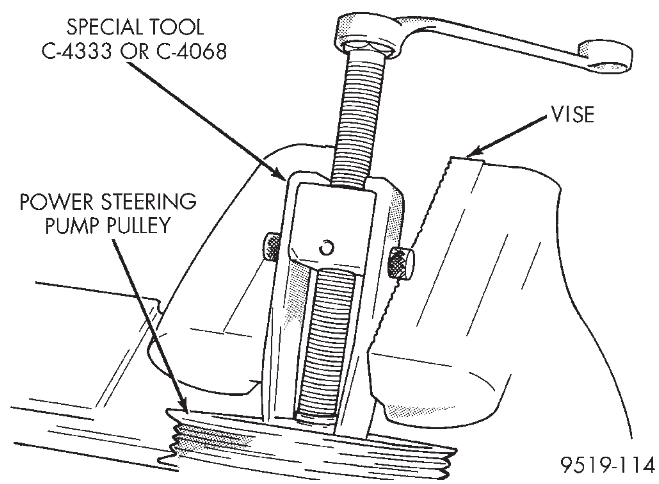


Fig. 53 Removing Pulley From Power Steering Pump Shaft

(3) Remove the drive pulley from the shaft of the power steering pump.

(4) Replace power steering pump pulley if bent, cracked, or loose.

ASSEMBLE

CAUTION: Do not hammer on power steering pump pulley or shaft to remove power steering pump pulley. This will damage the pulley and the power steering pump.

DISASSEMBLY AND ASSEMBLY (Continued)

(1) Mount power steering pump in a vise using the power steering pump mounting bracket.

(2) Place power steering pump pulley squarely on end of power steering pump shaft (Fig. 54).

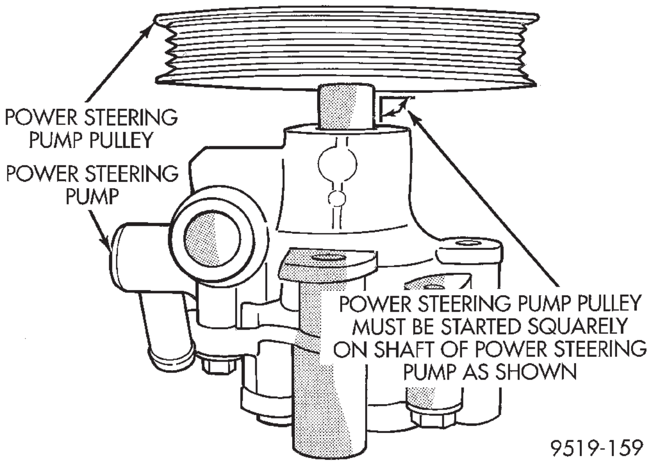


Fig. 54 Pulley Positioned On Shaft Of Power Steering Pump

(3) Place Installation Spacer, Special Tool 6936, (Fig. 55) on top of the power steering pump pulley.

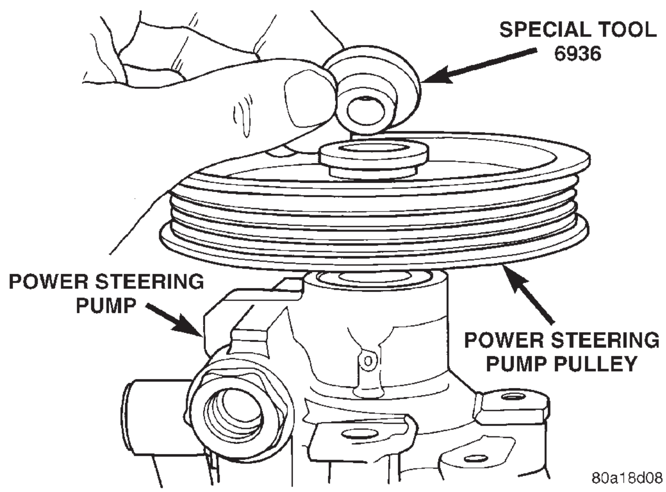


Fig. 55 Special Tool 6936 Correctly Installed On Power Steering Pump Pulley

(4) Mount Installer, Special Tool C-4063 in internal threads of the power steering pump shaft and against Special Tool 6936 on power steering pump pulley (Fig. 56).

(5) Ensuring that special tool and pulley remain aligned with pump shaft, force pulley onto power steering pump shaft until Special Tool 6936 is against the end of the power steering pump shaft. **When Special Tool 6936 is against the shaft of the power steering pump Special Tool C-4063 will no longer be able to be turned.**

(6) Remove Installer, Special Tool C-4063 from power steering pump.

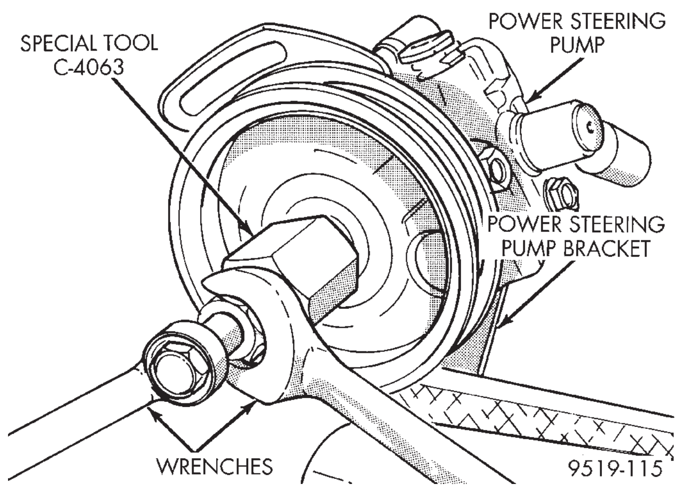


Fig. 56 Installing Pulley On Shaft Of Power Steering Pump

(7) Install power steering pump and mounting bracket back on engine. Refer to Power Steering Pump Installation in the Power Steering Pump Service Procedures section in this group of the service manual for required procedure.

POWER STEERING PUMP MOUNTING BRACKET

DISASSEMBLE

(1) Remove power steering pump from engine. Refer to Power Steering Pump Removal in the Power Steering Pump Service Procedures section in this group of the service manual for required procedure.

CAUTION: Do not hammer on power steering pump pulley or shaft to remove power steering pump pulley. This will damage the pulley and the power steering pump.

(2) Mount Puller, Special Tool C-4333 or C-4068 on power steering pump pulley. Mount power steering pump and puller in a vise (Fig. 57) to keep shaft of power steering pump from turning when removing pulley.

(3) Remove the drive pulley from the shaft of the power steering pump.

(4) Remove bolts attaching power steering pump to mounting bracket.

(5) Remove power steering pump from mounting bracket.

ASSEMBLE

(1) Install power steering pump on mounting bracket. Install the power steering pump to mounting bracket attaching bolts. Torque the mounting bolts to 54 N·m (40 ft. lbs).

DISASSEMBLY AND ASSEMBLY (Continued)

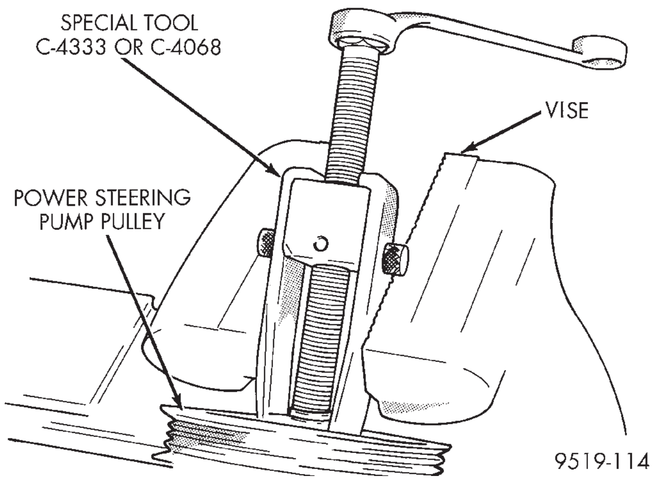


Fig. 57 Removing Pulley From Power Steering Pump Shaft

CAUTION: Do not hammer on power steering pump pulley or shaft to remove power steering pump pulley. This will damage the pulley and the power steering pump.

(2) Place power steering pump pulley squarely on end of power steering pump shaft (Fig. 58).

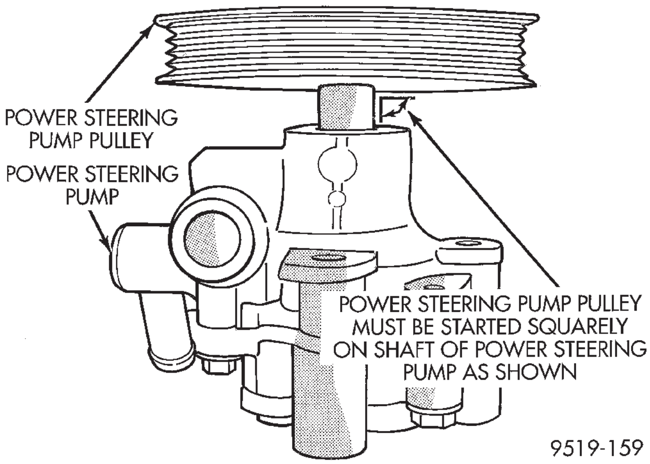


Fig. 58 Pulley Positioned On Shaft Of Power Steering Pump

(3) Place Installation Spacer, Special Tool 6936 on top of the power steering pump pulley (Fig. 59).

(4) Mount Installer, Special Tool C-4063 in internal threads of the power steering pump shaft and against Special Tool 6936 on power steering pump pulley (Fig. 60).

(5) Ensuring that special tool and pulley remain aligned with pump shaft, force pulley onto power steering pump shaft until Special Tool 6936 is against the end of the shaft. **When Special Tool 6936 is against the shaft of the power steering pump, Special Tool C-4063 will no longer be able to be turned.**

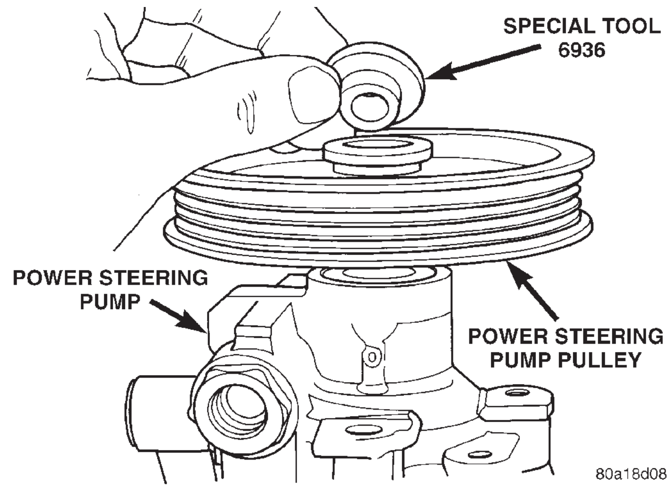


Fig. 59 Spacer Correctly Installed On Power Steering Pump Pulley

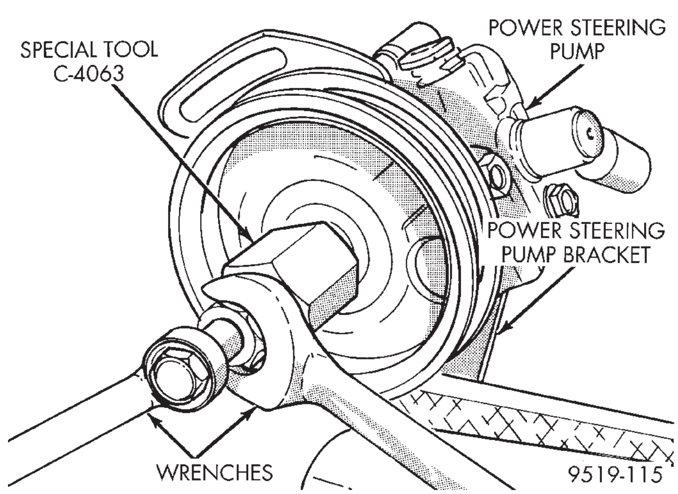


Fig. 60 Installing Pulley On Shaft Of Power Steering Pump

(6) Remove Installer, Special Tool C-4063 from power steering pump.

(7) Install power steering pump and bracket assembly back on engine. Refer to Power Steering Pump Installation in the Power Steering Pump Service Procedures section in this group of the service manual for required procedure.

SPECIFICATIONS

POWER STEERING PUMP FLOW SPECIFICATIONS

Flow At 1500 RPM And Minimum
Pressure . . . . 5.7 to 7.6 Liters/Min
(1.5 to 2.0 GPM)
Control Valve Pressure Relief . . . . 8240 to 8920 kPa
(1195 to 1293 psi)

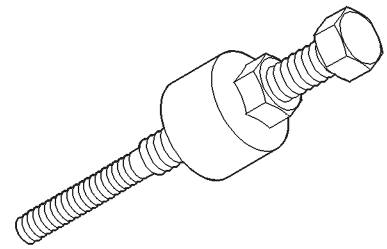
SPECIFICATIONS (Continued)

POWER STEERING PUMP FASTENER TORQUE SPECIFICATIONS

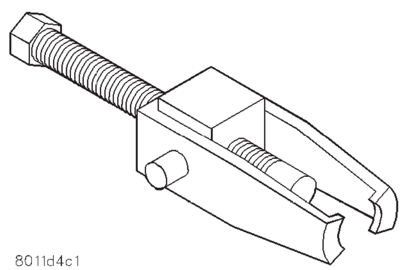
DESCRIPTION	TORQUE
POWER STEERING PUMP:	
Discharge Fitting	75 N·m (55 ft. lbs.)
To Rear Bracket Mounting Bolts	54 N·m (40 ft. lbs.)
To Front Bracket Mounting Bolts	54 N·m (40 ft. lbs.)
Bracket To Engine Mounting Bolts	54 N·m (40 ft. lbs.)
POWER STEERING FLUID HOSES:	
Hose Tube Nuts	31 N·m (275 in. lbs.)
Pressure Hose Banjo Bolt	34 N·m (25 ft. lbs.)
Return Hose Bracket To Head 2.4L	28 N·m (21 ft. lbs.)
Pressure Hose To Return Hose Bracket	9 N·m (75 in. lbs.)
Pressure Hose To Cylinder Head 2.5L	54 N·m (40 ft. lbs.)
Return Hose To Pressure Hose Bracket 2.5L	9 N·m (75 in. lbs.)
POWER STEERING FLUID RESERVOIR:	
Reservoir To Mounting Bracket Or Engine	28 N·m (21 ft. lbs.)
Reservoir Bracket To Engine	28 N·m (21 ft. lbs.)

SPECIAL TOOLS

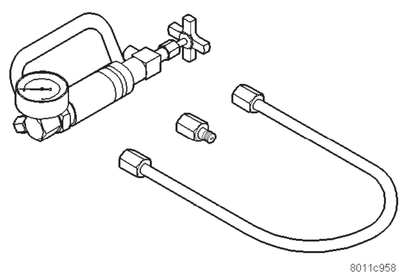
POWER STEERING PUMP



Installer C-4063B



Puller C-4333



P/S System Analyzer 6815

POWER STEERING GEAR

INDEX

DESCRIPTION AND OPERATION

POWER STEERING GEAR

The power steering system consists of these six major components. Power Steering Pump, Power Steering Gear, (Fig. 1) Power Steering Reservoir, Power Steering Supply and Pressure Hoses, and Power Steering Fluid Return Hose. Turning of the steering wheel is converted into linear travel through the meshing of the helical pinion teeth with the rack teeth. Power assist steering is provided by an open center, rotary type control valve which directs oil from the pump to either side of the integral rack piston.

Road feel is controlled by the diameter of a torsion bar which initially steers the vehicle. This movement directs oil behind the integral rack piston, which, in turn, builds up hydraulic pressure and assists in the turning effort.

The drive tangs on the pinion of the power steering pump mate loosely with a stub shaft. This is to permit manual steering control to be maintained if the drive belt on the power steering pump should break. However, under these conditions, steering effort will be increased.

DIAGNOSIS AND TESTING

POWER STEERING PUMP FLOW RATE AND PRESSURE TEST

The following procedure is to be used to test the operation of the power steering system on this vehicle. This test will provide the flow rate of the power steering pump along with the maximum relief pressure. This test is to be performed any time a power steering system problem is present to determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Pressure/Flow Tester, Special Tool 6815 (Fig. 3).

POWER STEERING PUMP FLOW AND PRESSURE TEST PROCEDURE

(1) Check power steering pump drive belt tension and adjust as necessary.

(2) Disconnect power steering fluid pressure hose (Fig. 4), at power steering pump. Use a container for dripping fluid.

(3) Connect the inlet hose on the Pressure Gauge, Special Tool 6815 using required adapter, Special Tool 6972 to the pressure fitting on the power steering pump. Connect the pressure hose which was removed from the power steering pump, using required adapter fitting, to the outlet port of Pressure Gauge, Special Tool 6815. **Pressure Gauge, Special Tool 6815 is to be installed in series with power steering pressure hose, between power steering pump and steering gear. It must also be installed so it is in correct direction of the fluid flow.**

(4) Completely open valve on Special Tool 6815.

(5) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test and get air out of fluid. Then shut off engine.

(6) Check power steering fluid level, and add fluid as necessary. Start engine again and let idle.

(7) Pressure gauge should read below 862 kPa (125 psi). If above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi). The flow meter reading should be between 4.9 and 5.3 liters per minute (1.3 and 1.4 GPM).

DIAGNOSIS AND TESTING (Continued)

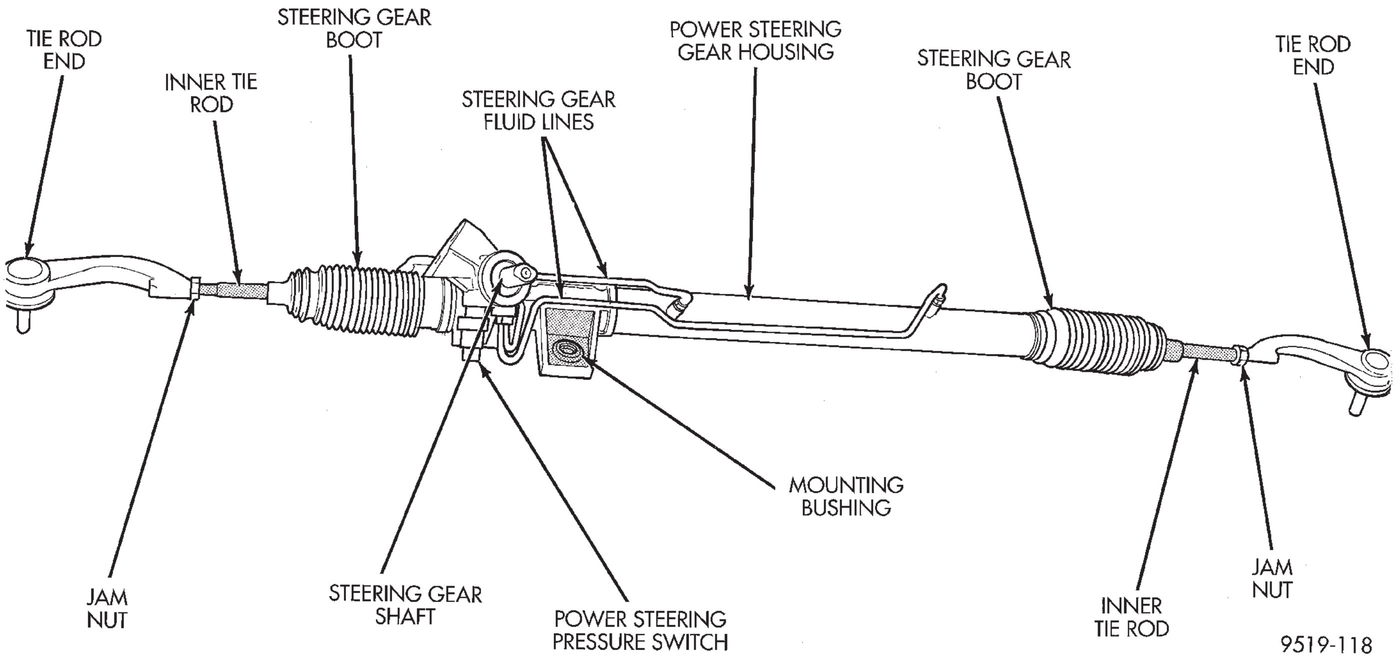


Fig. 1 Power Steering Gear Assembly

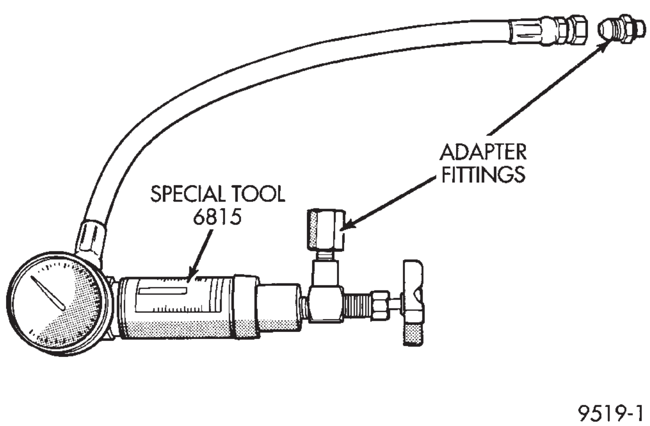


Fig. 2 Power Steering Pump Flow/Pressure Tester

CAUTION: The following test procedure involves testing power steering pump maximum pressure output and flow control valve operation. Do not leave valve closed for more than 5 seconds as the pump could be damaged.

(8) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

NOTE: Power steering pump maximum relief pressure is 8240 to 8920 kPa (1195 to 1293 psi.).

• If power steering pump pressures are above specifications, but not within 345 kPa (50 psi) of each other, then replace power steering pump.

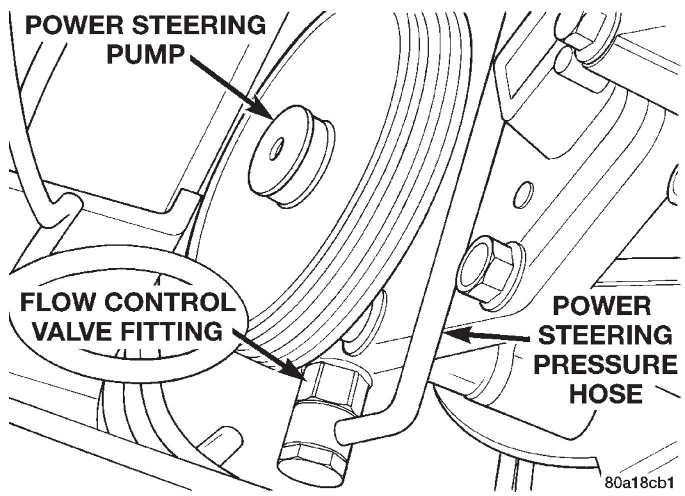


Fig. 3 Power Steering Pump Pressure Hose

• If pressures are within 345 kPa (50 psi) of each other but below specifications, then replace power steering pump.

CAUTION: Do not force the pump to operate against the stops for more than 5 seconds at a time because pump damage will result.

(9) Open test valve. Turn steering wheel to the extreme left and right positions until against the stops, recording the highest indicated pressure at each position. Compare pressure gauge readings to power steering pump specifications. If the highest output pressures are not the same against either stop, the steering gear is leaking internally and must be replaced.

REMOVAL AND INSTALLATION

POWER STEERING GEAR ASSEMBLY

REMOVE

(1) Remove remote ground cable (Fig. 4) from ground stud on shock tower. Then correctly isolate ground cable from vehicle by installing isolator on stud (Fig. 5).

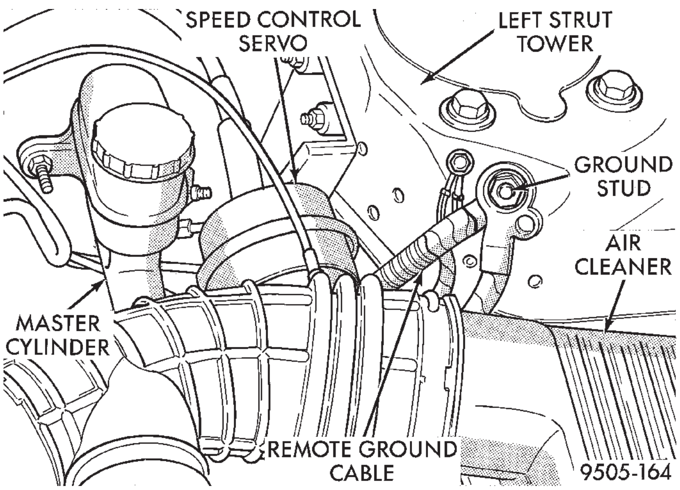


Fig. 4 Remote Ground Cable At Shock Tower

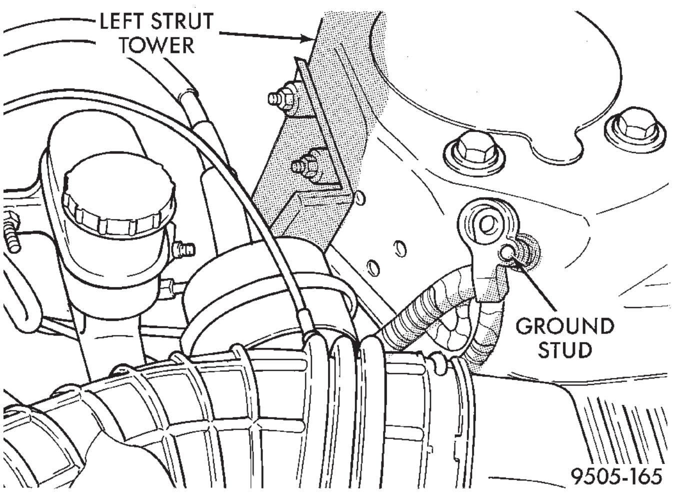


Fig. 5 Correctly Isolated Remote Ground Cable

(2) Siphon as much power steering fluid as possible from the remote power steering fluid reservoir.

(3) From interior of vehicle, remove the retaining pin from the intermediate shaft coupler pinch bolt (Fig. 6). Then remove the pinch bolt (Fig. 6) from the intermediate shaft coupler and the separate intermediate shaft coupler, from steering gear shaft.

(4) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

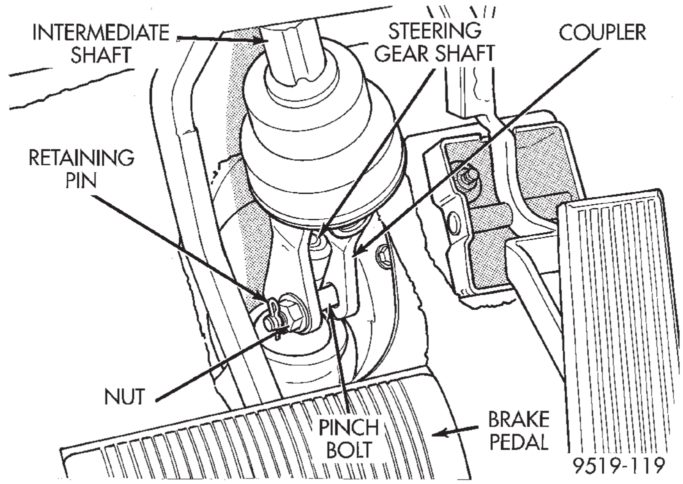


Fig. 6 Intermediate Shaft Coupler To Steering Gear Attachment

(5) Remove both front wheel and tire assemblies from the vehicle.

(6) Remove nuts attaching both outer tie rod ends to the steering knuckles (Fig. 7). **Nuts are to be removed from tie rod ends using the following procedure, hold tie rod end stud with an 11/32 socket, while loosening and removing nut with wrench (Fig. 7).**

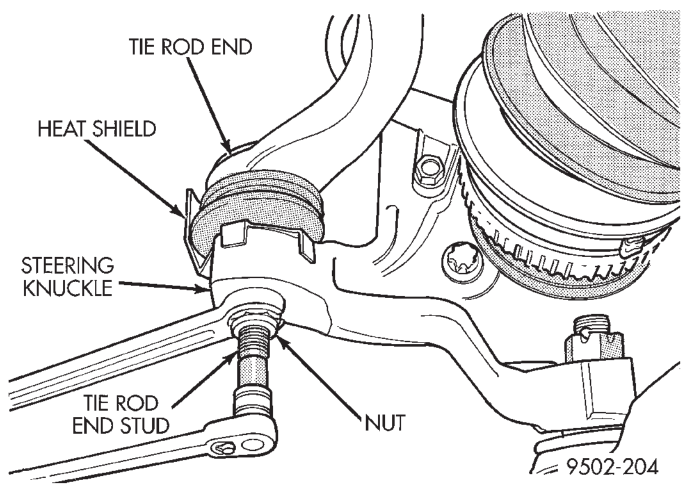


Fig. 7 Removing Tie Rod End Nut

(7) Remove both tie rod end studs, from the steering knuckles, using Remover, Special Tool MB-991113 (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

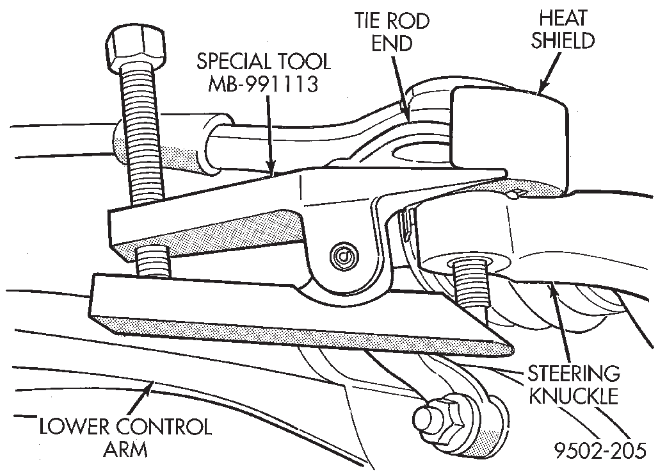


Fig. 8 Tie Rod End Removal From Steering Knuckle

CAUTION: This vehicles is designed and assembled using NET BUILD front suspension alignment settings. This means that front suspension alignment settings are determined as the vehicle is designed by the location of front suspension components in relation to the vehicle body. This process is carried out when building the vehicle, by accurately locating the front suspension crossmember to master gage holes located in the underbody of the vehicle. With this method of designing and building a vehicle, it is no longer necessary or possible to adjust a vehicles front suspension alignment settings. Consequently, whenever the front suspension crossmember is removed from a vehicle, it MUST be replaced in the same location on the body of the vehicle it was removed from. Front suspension Toe settings though are still adjustable by the outer tie rod ends.

CAUTION: Before removing the front suspension crossmember from the vehicle, locating marks for the front suspension crossmember MUST be scribed on the front suspension crossmember and body of vehicle. This must be done so front suspension crossmember can be located against body of vehicle, in the same location when it is installed back in vehicle. If location of front suspension crossmember to body of vehicle is not maintained when vehicle is assembled, NET BUILD front suspension alignment settings will not be obtained. This may lead to handling and or tire wear problems.

NOTE: Use the following procedure to mark the side to side and front to back installed location of the front suspension crossmember to the body of the vehicle.

(8) Using an awl, scribe a line on the body (Fig. 9) and (Fig. 10) marking the front to back installed location where the front suspension crossmember is mounted against the body of the vehicle. The line should be scribed at both the front and back of where the crossmember is mounted to the vehicle and on each side of the vehicle. In (Fig. 9) and (Fig. 10) the left side of the vehicle is shown.

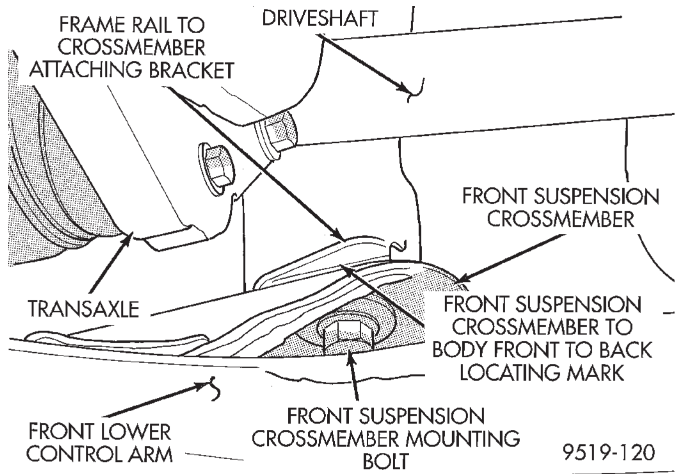


Fig. 9 Front Suspension Crossmember Front To Back Locating Mark (Left Side Front)

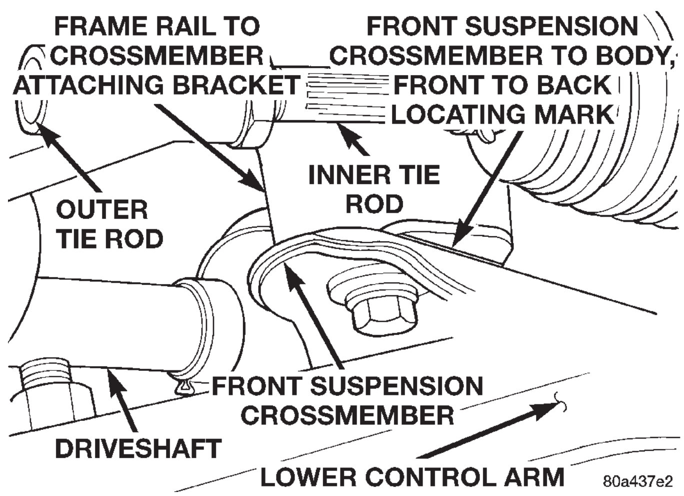


Fig. 10 Front Suspension Crossmember Front To Back Locating Mark (Left Side Rear)

(9) Using an awl, scribe a line on the front suspension crossmember (Fig. 11) marking the side to side installed location where front suspension crossmember is mounted against the body of the vehicle. The line should be scribed at the side of the frame rail bracket (Fig. 11) where the crossmember is mounted to the vehicle. The locating mark is to be marked the same on each side of the vehicle. In (Fig. 11) the left side of the vehicle is shown.

(10) Remove the stabilizer bar bushing clamp to body attaching bolts only (Fig. 12). The sway bar

REMOVAL AND INSTALLATION (Continued)

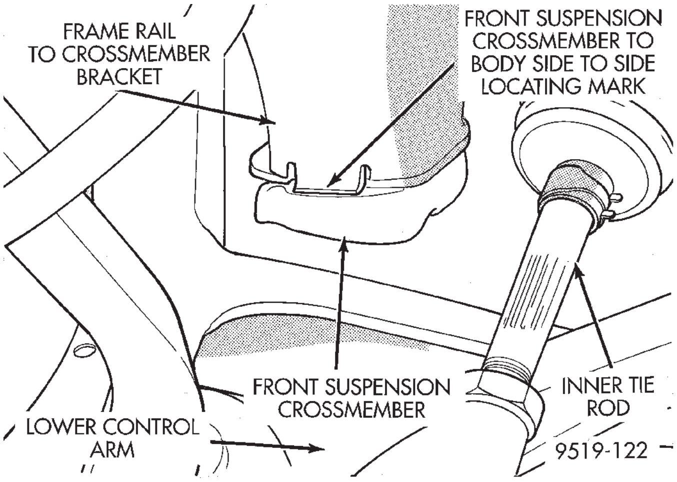


Fig. 11 Front Suspension Crossmember Side To Side Locating Mark

bushing clamp to front suspension crossmember bolts (Fig. 12) do not need to be removed

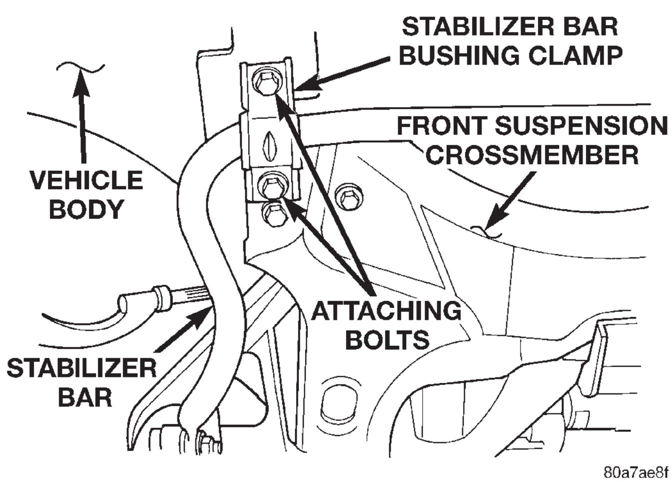


Fig. 12 Stabilizer Bar Bushing Clamp Attaching Bolts

(11) **If vehicle is equipped with antilock brakes, the hydraulic control unit can not hang from the brake tubes when lowering front suspension crossmember. Using wire, tie the antilock brakes hydraulic control unit to the body and engine so the wire will support it when the crossmember is lowered.**

(12) If vehicle is equipped with antilock brakes, remove the 3 bolts attaching the antilock brakes hydraulic control unit to the front suspension crossmember.

(13) Remove the bolts attaching the shock absorber clevis to the left and right lower control arms (Fig. 13).

(14) Remove the 2 bolts attaching the under engine support bracket (Fig. 14) to the front edge of the front suspension crossmember.

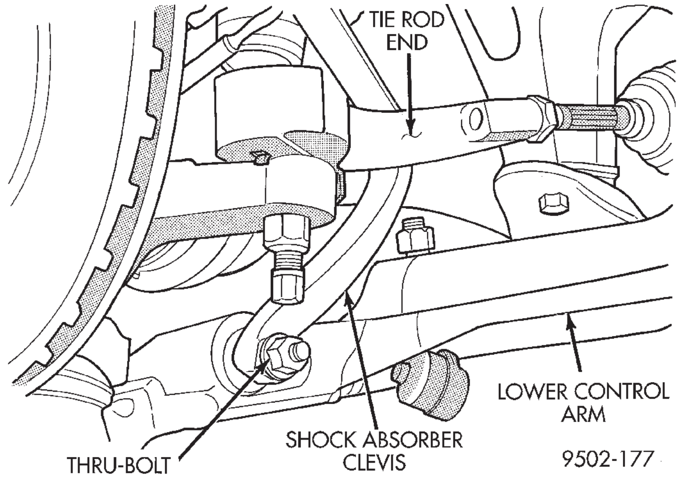


Fig. 13 Shock Clevis To Lower Control Arm Bolts

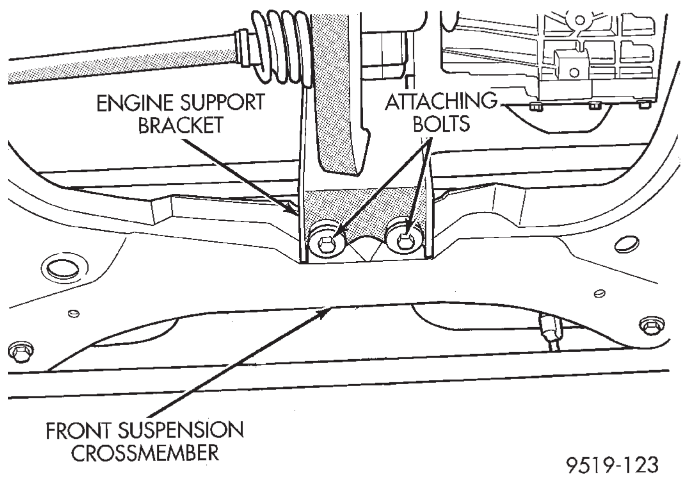


Fig. 14 Engine Support Bracket To Crossmember Attaching Bolts

(15) Remove the 2 attaching bolts from the rear support bracket (Fig. 15) at the rear of the front suspension crossmember.

(16) Remove bolt (Fig. 16) attaching engine support bracket to the transaxle mounting bracket.

(17) Position a transmission jack under the center of the front suspension crossmember. Transmission jack is used to lower, support and raise front suspension crossmember when removing steering gear assembly.

(18) From each side of the vehicle, remove the 2 bolts attaching the front and rear of the front suspension crossmember to the frame rails of vehicle (Fig. 17).

(19) Using transmission jack, lower front suspension crossmember enough to allow steering gear to be removed from crossmember. **When lowering front suspension crossmember, do not let crossmember hang from lower control arms, weight of crossmember must be supported by the transmission jack.**

REMOVAL AND INSTALLATION (Continued)

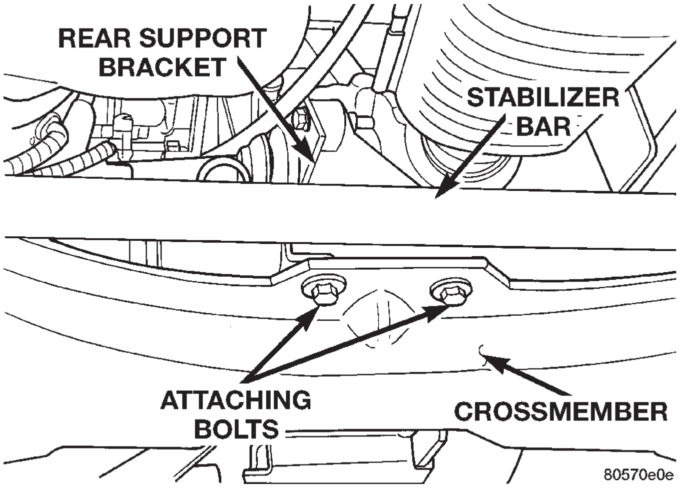


Fig. 15 Rear Support Bracket Attachment To Crossmember

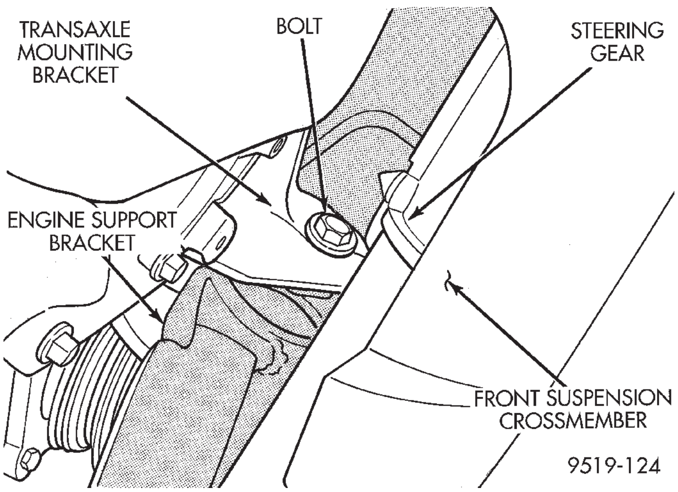


Fig. 16 Engine Support Bracket To Transaxle Bracket Bolt

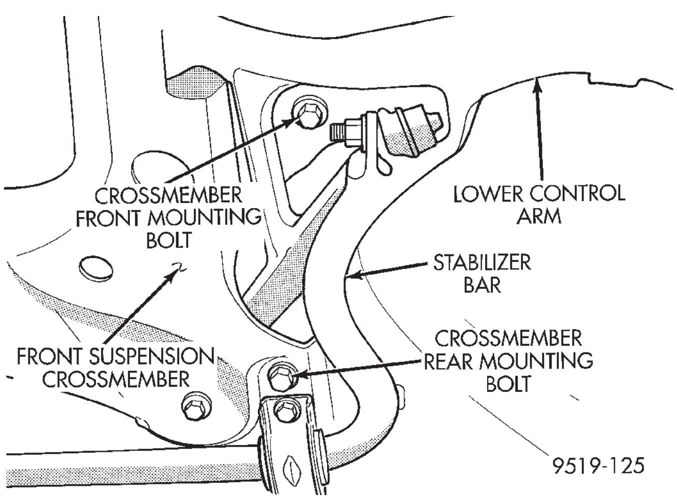


Fig. 17 Crossmember To Body Attaching Bolts

(20) Remove power steering fluid, pressure and return hoses from the power steering gear assembly (Fig. 18).

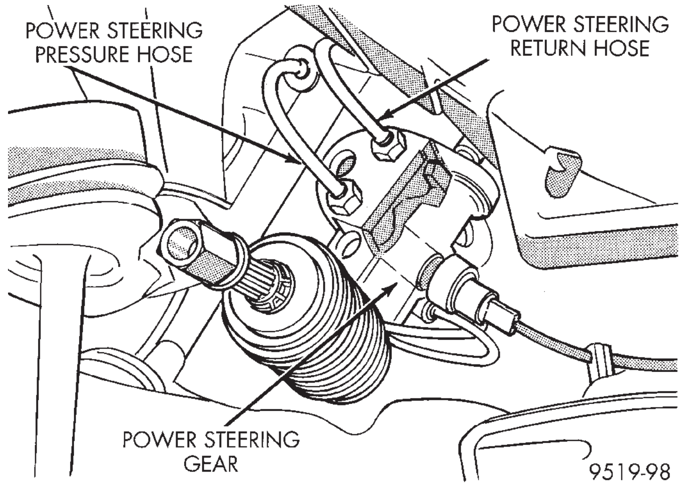


Fig. 18 Power Steering Pressure And Return Hose At Steering Gear

(21) Remove wiring harness connector, (Fig. 18) from the power steering fluid pressure switch.

(22) Remove the 2 bolts, at the isolators (Fig. 19) and (Fig. 20) attaching the steering gear assembly to front suspension crossmember. Then remove the 2 bolts attaching the steering gear saddle bracket (Fig. 21) to the front suspension crossmember. Remove the steering gear assembly from the front suspension crossmember.

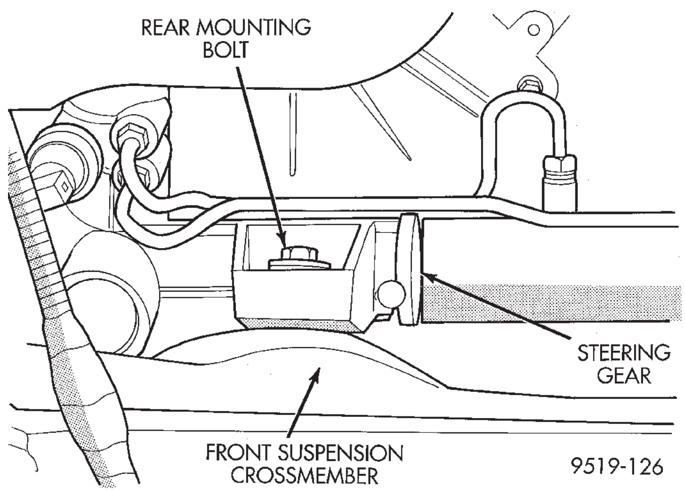


Fig. 19 Steering Gear Rear Mounting Isolator Bolt

(23) Transfer required parts from removed steering gear assembly to the replacement steering gear, if a new steering gear is being installed.

INSTALL

(1) Install steering gear assembly on front suspension crossmember. Install the 2 long steering gear assembly to front crossmember mounting bolts (Fig.

REMOVAL AND INSTALLATION (Continued)

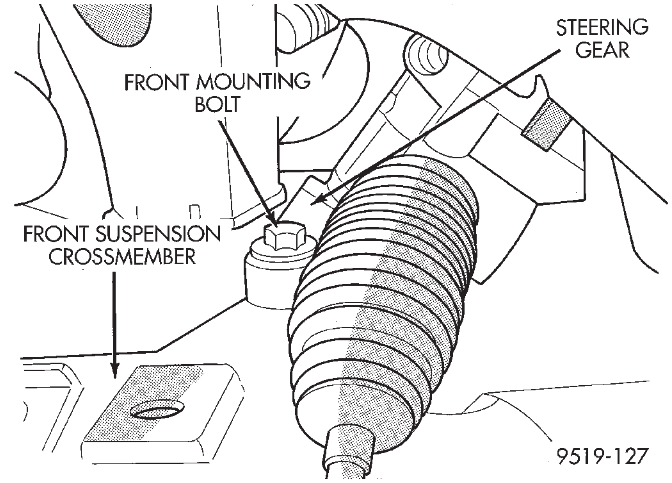


Fig. 20 Steering Gear Front Mounting Bolt

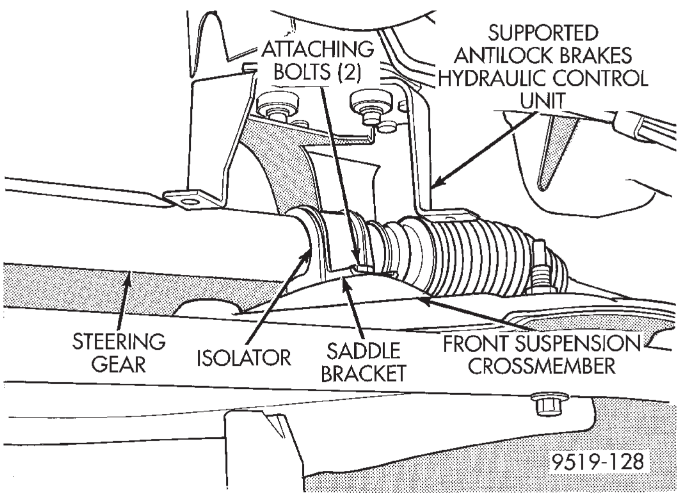


Fig. 21 Steering Gear Saddle Bracket Mounting Bolts

19) and (Fig. 20) into the mounting isolators. Then install the 2 short bolts (Fig. 21) into the saddle bracket. Tighten the 4 steering gear mounting bolts to a torque of 68 N·m (50 ft. lbs.).

(2) Install the power steering fluid pressure and return lines on the ports of the power steering gear (Fig. 18). Tighten power steering fluid pressure and return lines to steering gear tube nuts (Fig. 18) to a torque of 31 N·m (275 in. lbs.).

(3) Using transmission jack, raise front suspension crossmember and steering gear against body of vehicle. Start the 2 rear bolts (Fig. 17) into tapping plates, attaching front suspension crossmember to body of vehicle. Then install the 2 front bolts, (Fig. 17) attaching front suspension crossmember to frame rails of vehicle. Tighten the 4 mounting bolts evenly, until front suspension crossmember is against body of vehicle at the 4 mounting points. Then torque the 4 mounting bolts to 2 N·m (20 in. lbs.) to hold front suspension crossmember in position.

CAUTION: When front suspension crossmember is installed back in vehicle, crossmember MUST be aligned with positioning marks previously scribed into body of vehicle. This MUST be done to maintain NET BUILD front suspension alignment settings.

(4) Using a soft face hammer, tap front suspension crossmember into position, until it is aligned with the previously scribed positioning marks on body of vehicle (Fig. 9), (Fig. 10) and (Fig. 11). When front suspension crossmember is correctly positioned, torque the 2 rear crossmember mounting bolts to 163 N·m (120 ft. lbs.). Then torque the 2 front crossmember to frame rail attaching bolts to 163 N·m (120 ft. lbs.).

(5) Install the engine support bracket on the front of the front suspension crossmember (Fig. 14). Install the 2 support bracket to suspension crossmember attaching bolts and tighten to a torque of 75 N·m (55 ft. lbs.).

(6) Install bolt (Fig. 16) attaching engine support bracket to transaxle mounting bracket. Tighten bolt to a torque of 75 N·m (55 ft. lbs.).

(7) Install the 2 bolts attaching the rear support bracket, for the under engine support bracket (Fig. 15), to the rear of the front suspension crossmember. Tighten bolts to a torque of 75 N·m (55 ft. lbs.).

(8) Install vehicle wiring harness connector (Fig. 18) onto power steering fluid pressure switch on steering gear assembly. **Be sure locking tab on wiring harness connector is securely latched to pressure switch.**

(9) Install the antilock brakes hydraulic control unit mounting bracket on the front suspension crossmember. Install the 3 mounting bracket to crossmember attaching bolts and tighten to a torque of 28 N·m (250 in. lbs.).

(10) Loosely install the 2 shock absorber clevis to lower control arm attaching nuts and bolts (Fig. 13).

(11) Install tie rod seal boot heat shield (Fig. 8) on tie rod end.

(12) Install tie rod end into steering knuckle. Start tie rod end to steering knuckle attaching nut onto stud of tie rod end. While holding stud of tie rod end stationary, tighten tie rod end to steering knuckle attaching nut (Fig. 8). Then using a crowfoot and 11/32 socket, torque tie rod end attaching nut to 61 N·m (45 ft. lbs.) (Fig. 22).

(13) Install the 2 stabilizer bar bushing clamp to body attaching bolts (Fig. 12) and securely tighten.

CAUTION: When supporting lower control arm with jack stand, do not position jack stand under the ball joint cap on the lower control arm. Position in area of lower control arm shown in (Fig. 23).

REMOVAL AND INSTALLATION (Continued)

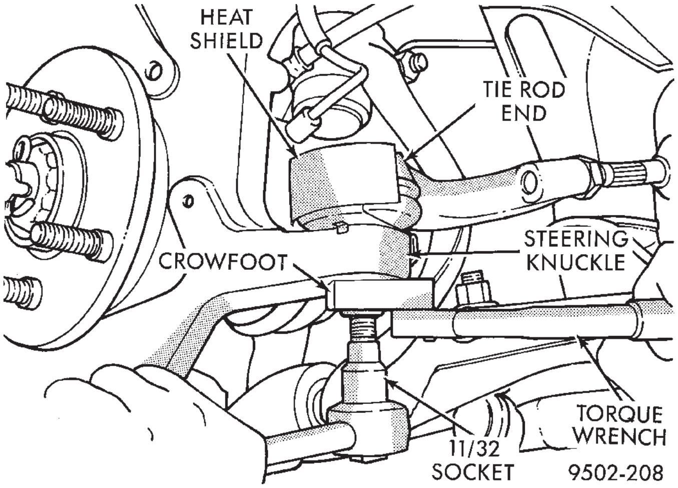


Fig. 22 Torquing Tie Rod End Attaching Nut

(14) Lower vehicle to the ground with a jack stand positioned under the lower control arm (Fig. 23). Continue to lower vehicle so the total weight of the vehicle is supported by the jack stand and lower control arm.

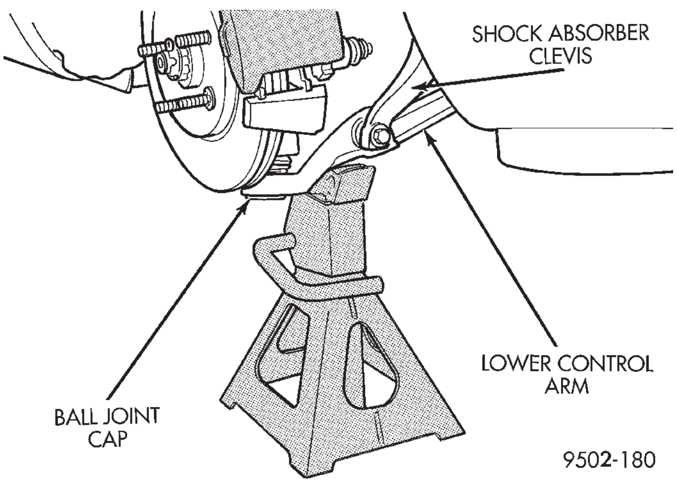


Fig. 23 Lower Control Arm Correctly Supported By Jack Stand

(15) Tighten the shock absorber clevis to lower control arm bushing thru-bolt (Fig. 13) to a torque of 92 N·m (68 ft. lbs.).

(16) Install the wheel and tire assemblies back on vehicle. Tighten the wheel nuts in proper sequence to a torque of 129 N·m (95 ft. lbs.) torque.

CAUTION: Before connecting steering column intermediate shaft coupler onto steering gear shaft, front wheels must be pointed straight ahead and steering wheel must be in center position.

(17) From interior of vehicle, reconnect the steering column intermediate shaft coupler on the steering gear shaft (Fig. 6). Install steering gear coupler retaining pinch bolt and torque to 27 N·m (240 in. lbs.). **Be sure to install the upper to lower steering coupler retaining bolt, retention pin.**

CAUTION: Do not use automatic transmission fluid.

(18) Fill power steering pump fluid reservoir to the (Full-Cold) proper level.

(19) Start the engine and let run for a few seconds. Then turn the engine off.

(20) Add fluid if necessary.

(21) Raise front wheels of vehicle off the ground.

(22) Start engine and turn steering wheel several times from stop to stop to bleed air from fluid in system. Stop engine, check fluid level, and inspect system for leaks. **Fill pump reservoir to correct level with Mopar®, Power Steering Fluid, or equivalent.** See Checking Fluid Level.

(23) Lower front wheels of vehicle back on the ground.

CAUTION: During this procedure do not allow the steering gear inner tie rod boots to become twisted. (See Wheel Alignment in the suspension section of this service manual).

(24) Check front alignment and adjust the front Toe setting on the vehicle. Refer to the Toe Setting Procedure in Front Suspension Service Procedures in this group of the service manual. Refer to the Specifications Section at the end of this group for the desired front Toe specification.

(25) Tighten tie rod jam nut to 74 N·m (55 ft.lbs.) torque.

(26) Adjust steering gear to tie rod boots at tie rods.

DISASSEMBLY AND ASSEMBLY

STEERING GEAR MOUNTING BOLT ISOLATOR

The removal and installation of the mounting bolt isolator must be performed with the steering gear assembly removed from the vehicle.

The steering gear mounting bolt isolators (Fig. 24) are a serviceable component of the steering gear assembly. Both isolator bushing are serviced using the same procedure listed below but only the rear mounting bushing is shown.

DISASSEMBLY

(1) Using a screwdriver, pry the sleeve out of the mounting bolt isolator (Fig. 24).

(2) Pry the mounting bolt isolator bushing from the steering gear mounting bracket.

DISASSEMBLY AND ASSEMBLY (Continued)

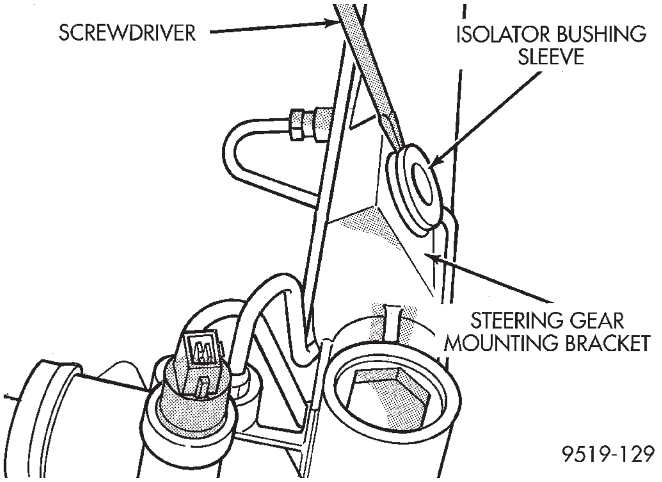


Fig. 24 Mounting Bolt Isolator Sleeve Removal

ASSEMBLY

(1) Lubricate replacement mounting bolt isolator bushing using Mopar, Silicone Spray Lube or an equivalent.

(2) Install the mounting bolt isolator bushing into the steering gear mounting bracket from the bottom side of the bracket (Fig. 25).

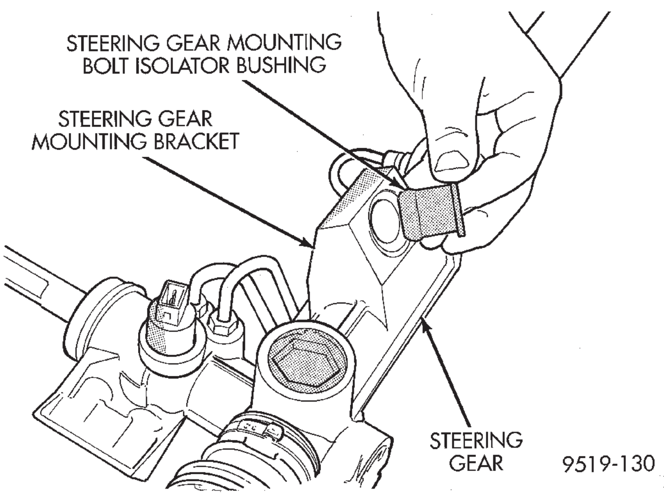


Fig. 25 Installing Mounting Bolt Isolator Bushing

(3) Install mounting bolt isolator bushing sleeve into isolator bushing by pressing the sleeve into the bushing by hand (Fig. 26).

INNER TIE ROD BOOT

NOTE: The replacement of the inner tie rod to steering gear boot must be performed with the steering gear removed from the vehicle.

DISASSEMBLE

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this service manual for the required lifting procedure to be used for this vehicle.

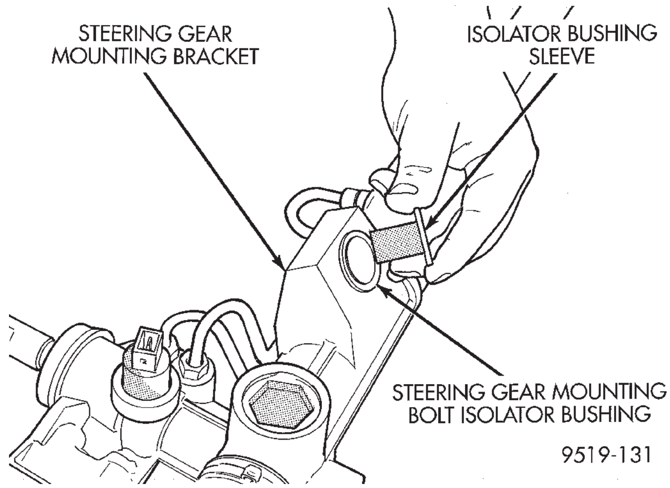


Fig. 26 Mounting Bolt Isolator Sleeve Installation

(2) Remove the front wheels and tires from the vehicle.

(3) Remove the steering gear from the vehicle. Refer to Power Steering Gear in the Removal And Installation Section in this group of the service manual for the required procedure.

(4) Securely mount the steering gear in a vise or other appropriate holding fixture.

(5) Loosen the inner to outer tie rod jam nut (Fig. 27). Remove the outer tie rod from inner tie rod.

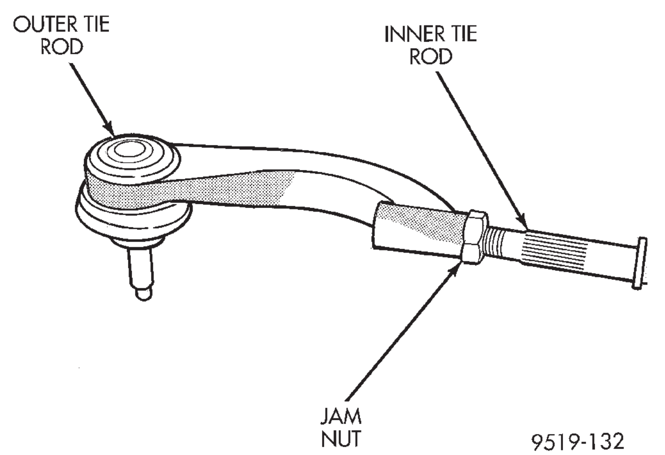


Fig. 27 Inner To Outer Tie Rod Jam Nut

(6) Remove jam nut (Fig. 27) from inner tie rod.

(7) Using pliers expand tie rod boot clamp, (Fig. 28) and remove from tie rod boot.

(8) Remove the tie rod boot to steering gear clamp (Fig. 29).

NOTE: After removing inner boot clamps. Use a very small screwdriver to lift boot from its retaining groove in steering gear. Then the boot can be removed from steering gear.

DISASSEMBLY AND ASSEMBLY (Continued)

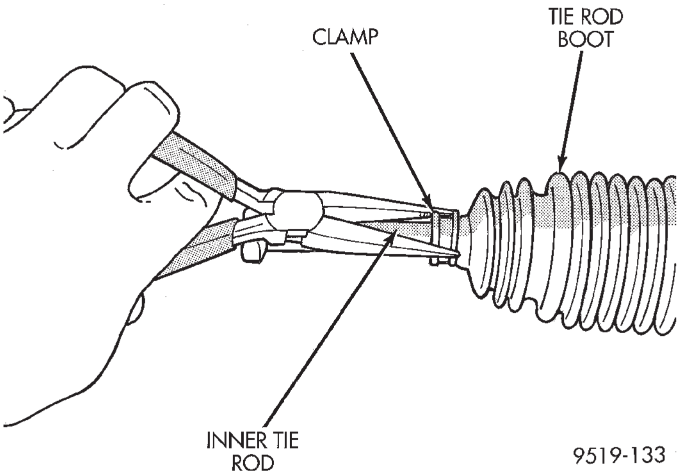


Fig. 28 Tie Rod Boot Clamp Removal

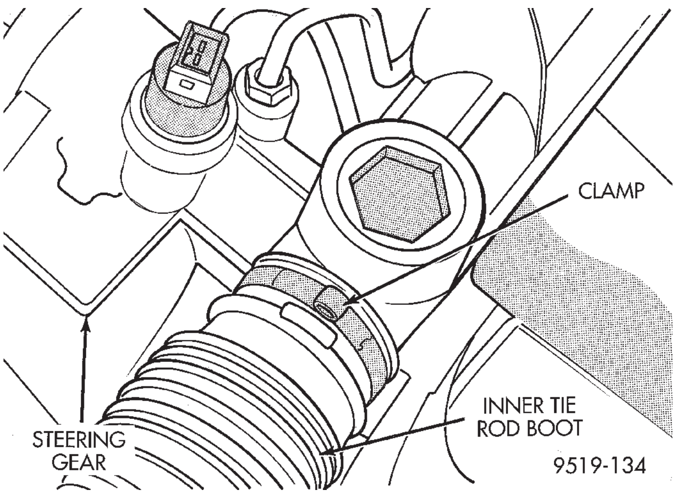


Fig. 29 Tie Rod Boot To Steering Gear Clamp

ASSEMBLE

(1) Install tie rod boot to steering gear clamp on tie rod boot. Then install tie rod boot on inner tie rod.

(2) Crimp inner tie rod boot to steering gear clamp on tie rod boot using Crimper, Special Tool, C4975-A (Fig. 30). When installing clamp, Special Tool C4975-A must have bottom bolt tightened until their is no gap between the 2 bars of the tool (Fig. 30).

(3) Lubricate inner tie rod boot groove with silicone type lubricant, then install tie rod boot to inner tie rod clamp (Fig. 28). (Clamp will have to be loosened for toe adjustment.)

(4) Install inner to outer tie rod jam nut on inner tie rod (Fig. 27).

(5) Install outer tie rod on inner tie rod. Do not tighten jam nut.

(6) Install steering gear assembly back in the vehicle. Refer to Power Steering Gear in the Removal And Installation Section in this group of the service manual for the required procedure.

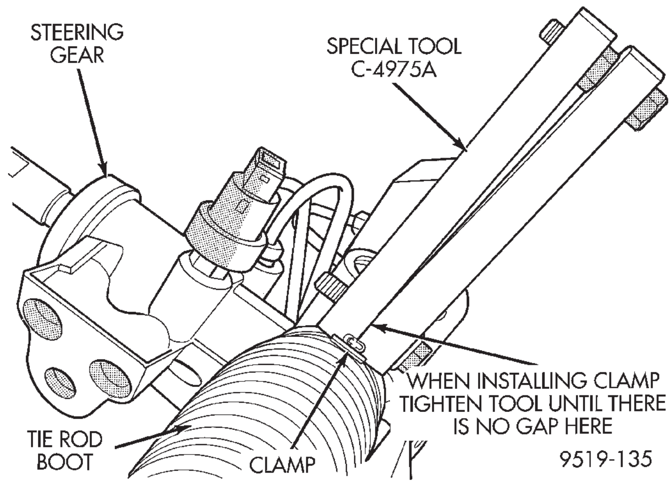


Fig. 30 Installing Tie Rod Boot To Steering Gear Clamp

CAUTION: During this procedure do not allow the steering gear boot to become twisted. (See Wheel Alignment in the suspension section of this service manual).

(7) Make toe adjustment by turning inner tie rod.

(8) Tighten the inner to outer tie rod jam nut to 75 N·m (55 ft. lbs.) torque. Lubricate tie rod boot groove with silicone type lubricant, before installing outer boot clamp, making sure boot is not twisted.

OUTER TIE ROD END

DISASSEMBLE

(1) Loosen inner tie rod to outer tie rod jam nut (Fig. 31).

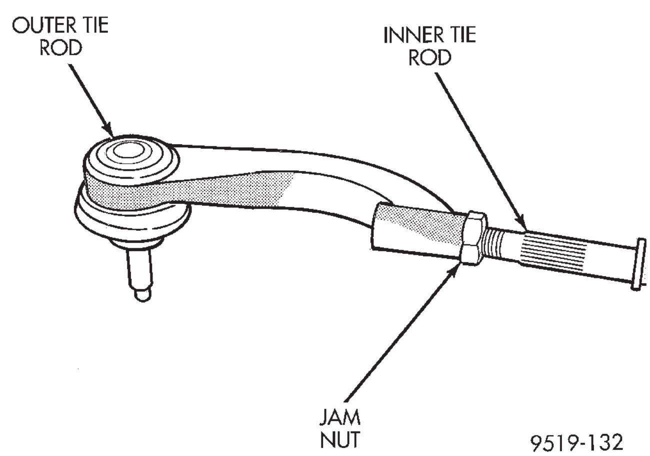


Fig. 31 Inner To Outer Tie Rod Jam Nut

(2) Remove nut attaching outer tie rod end to steering knuckle (Fig. 32). **Nut is to be removed from tie rod end using the following procedure, hold tie rod end stud with a 11/32 socket while loosening and removing nut with wrench.**

DISASSEMBLY AND ASSEMBLY (Continued)

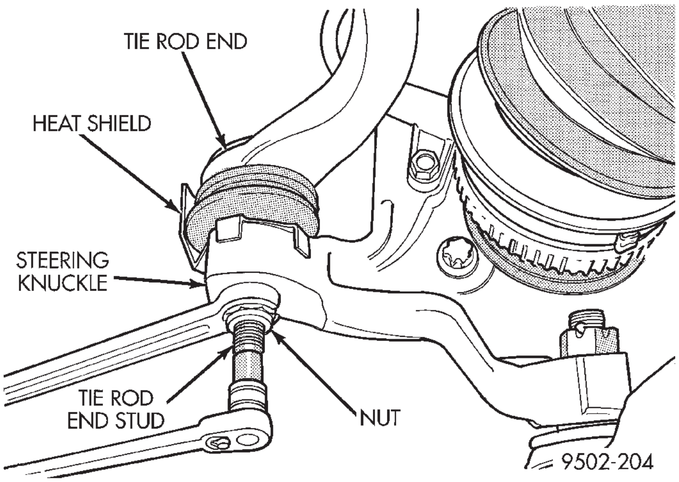


Fig. 32 Removing Tie Rod End Nut

(3) Remove tie rod end stud, from steering knuckle, using Remover, Special Tool MB-991113 (Fig. 33).

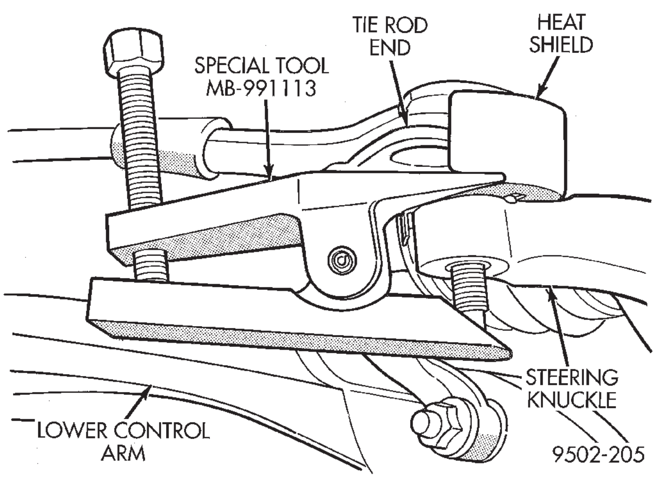


Fig. 33 Tie Rod End Removal From Steering Knuckle

(4) Remove outer tie rod end from inner tie rod by un-threading it from the inner tie rod.

ASSEMBLE

(1) Install outer tie rod onto inner tie rod. **Make sure jam nut is on inner tie rod.**

(2) Do not tighten jam nut.

(3) Install tie rod end seal boot heat shield (Fig. 32) on the tie rod end.

(4) Install tie rod end into the steering knuckle. Start tie rod end to steering knuckle attaching nut onto stud of tie rod end. While holding stud of tie rod end stationary, tighten tie rod end to steering knuckle attaching nut (Fig. 32). Then using a crow-foot and 11/32 socket, (Fig. 34) torque tie rod end attaching nut to 61 N·m (45 ft. lbs.).

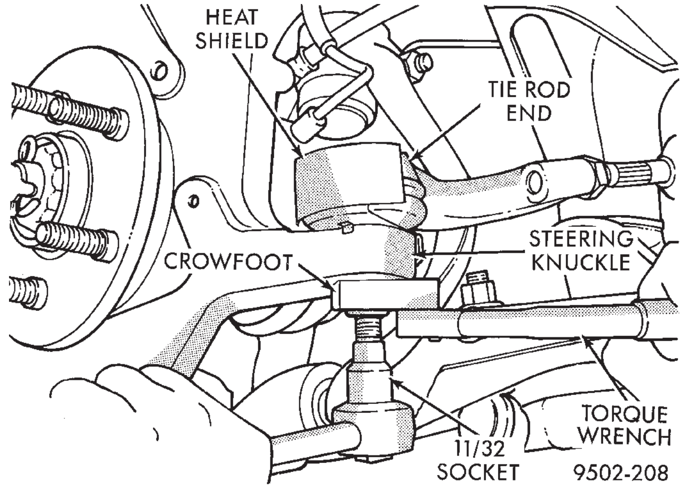


Fig. 34 Torquing Tie Rod End Attaching Nut

CAUTION: During this procedure do not allow the steering gear boot to become twisted. (See Wheel Alignment in the suspension section of this service manual).

(5) Adjust the front Toe setting on the vehicle. Refer to the Toe Setting Procedure in Front Suspension Service Procedures in this group of the service manual. Refer to the Specifications Section at the end of this group for the desired front Toe specification.

(6) Tighten tie rod jam nut (Fig. 31) to 75 N·m (55 ft. lbs.) torque.

(7) Adjust the steering gear to inner tie rod boots at inner tie rod if they became twisted during Toe adjustment.

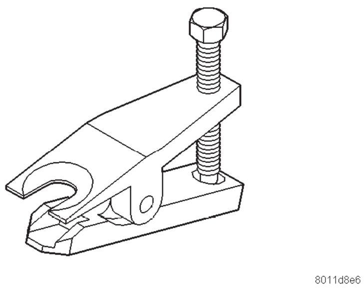
SPECIFICATIONS

STEERING GEAR FASTENER TORQUE SPECIFICATIONS

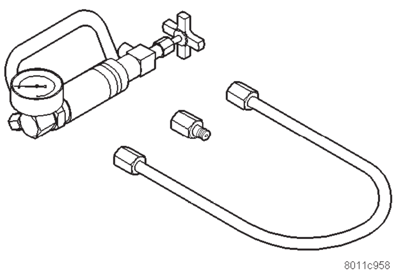
DESCRIPTION	TORQUE
STEERING GEAR:	
To Crossmember Bolts	68 N·m (50 ft. lbs.)
Tie Rod To Steering Knuckle Nut	61 N·m (45 ft. lbs.)
Outer To Inner Tie Rod Jam Nut	75 N·m (55 ft. lbs.)
Power Steering Hose Tube Nuts	31 N·m (275 in. lbs.)

SPECIAL TOOLS

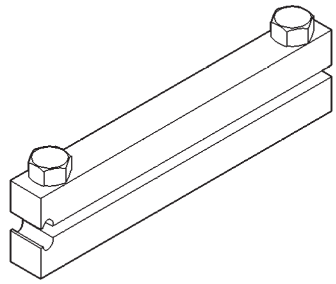
POWER STEERING GEAR



Remover Tie Rod End MB–990635



P/S System Analyzer 6815



Installer Boot Clamp C-4975A

STEERING COLUMN

INDEX

DESCRIPTION AND OPERATION

STEERING COLUMN ASSEMBLY

The steering column used in this vehicle (Fig. 1) has been designed to be serviced only as a complete assembly if a component of the steering column is determined to be defective. The replaceable components of the steering column assembly, are the key cylinder, ignition switch, multi-function switch, clock spring, speed control switches, halo lamp, trim shrouds, driver air bag and steering wheel. These replaceable components of the steering column, can be serviced without requiring removal of the steering column from the vehicle.

DIAGNOSIS AND TESTING

STEERING COLUMN

For diagnosis of conditions relating to the steering column, refer to the steering system diagnosis charts, in the diagnosis and testing section at the beginning of this group.

STEERING GEAR TO STEERING COLUMN INTERMEDIATE COUPLER

The steering column coupler **MUST** be inspected whenever a vehicle is involved in an impact or whenever any of the following conditions exist.

(1) The steering column coupler must be inspected whenever a vehicle is involved in a collision which deploys the air bag, regardless of the extent of damage done to the vehicle.

(2) If a vehicle is involved in an impact of the vehicles front suspension or under carriage, which results in any type of damage to the front suspension crossmember.

(3) Under any conditions which result in the steering column assembly or steering column shaft receiving a force great enough to move the steering column or shaft forward of rearward in a vehicle.

STEERING COLUMN SHAFT FLEX COUPLER

If the steering column shaft flex coupler is diagnosed to be defective due to any of the following conditions: seized bearing, loose bearing stake or a bearing not fully seated in the yoke of the coupler assembly, the coupler can be serviced as a separate component of the steering column assembly.

The steering column assembly needs to be removed from the vehicle for replacement of the steering column shaft flex coupler assembly.

SERVICE PROCEDURES

STEERING COLUMN SERVICE PROCEDURE WARNINGS

WARNING: BEFORE BEGINNING ANY SERVICE PROCEDURES THAT INVOLVES REMOVING THE AIR BAG. REMOVE AND ISOLATE THE NEGATIVE (-) BATTERY CABLE (GROUND) FROM THE VEHICLE BATTERY. THIS IS THE ONLY SURE WAY TO DISABLE THE AIR BAG SYSTEM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIR BAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

SERVICE PROCEDURES (Continued)

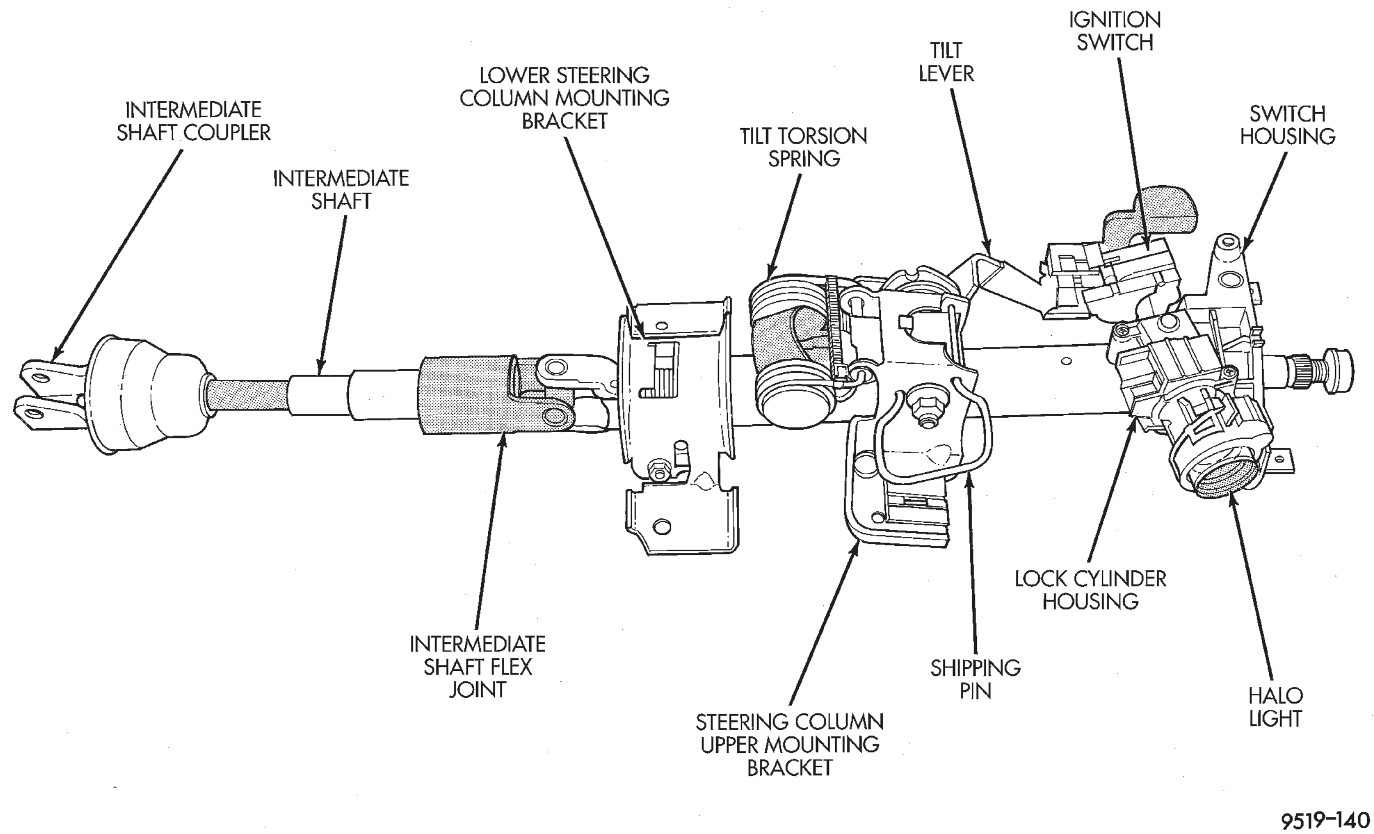


Fig. 1 Tilt Steering Column Assembly

WARNING: THE AIR BAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIR BAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIR BAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIR BAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIR BAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS. BEFORE SERVICING A STEERING COLUMN EQUIPPED WITH AN AIR BAG, REFER TO GROUP 8M, ELECTRICAL FOR PROPER AND SAFE SERVICE PROCEDURES.

NOTE: Safety goggles should be worn at all times when working on steering columns.

CAUTION: Disconnect negative (ground) cable from the battery, before servicing any column component.

CAUTION: Do not attempt to remove the pivot pins to disassemble the tilting mechanism. Damage will occur.

REMOVAL AND INSTALLATION

STEERING COLUMN ASSEMBLY

WARNING: SAFETY GOGGLES SHOULD BE WORN AT ALL TIMES WHEN WORKING ON STEERING COLUMNS.

REMOVE

(1) Remove remote ground cable (Fig. 2) from ground stud on shock tower. Then correctly isolate ground cable from vehicle by installing isolator on stud (Fig. 3).

(2) **Wait for a minimum of 2 minutes before starting to remove airbag from steering wheel.**

REMOVAL AND INSTALLATION (Continued)

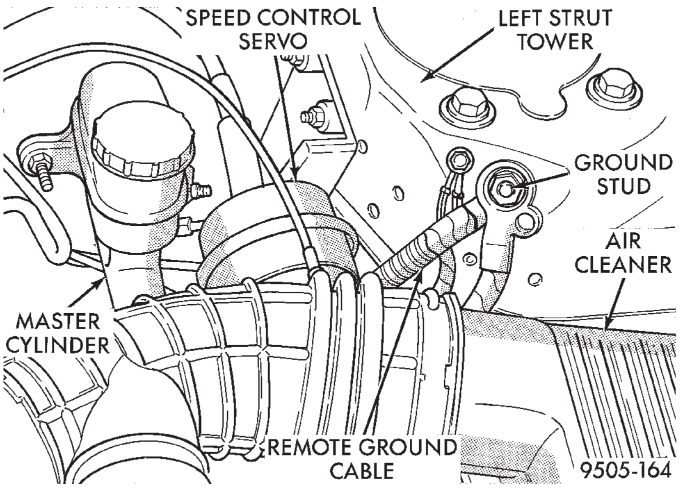


Fig. 2 Remote Ground Cable At Shock Tower

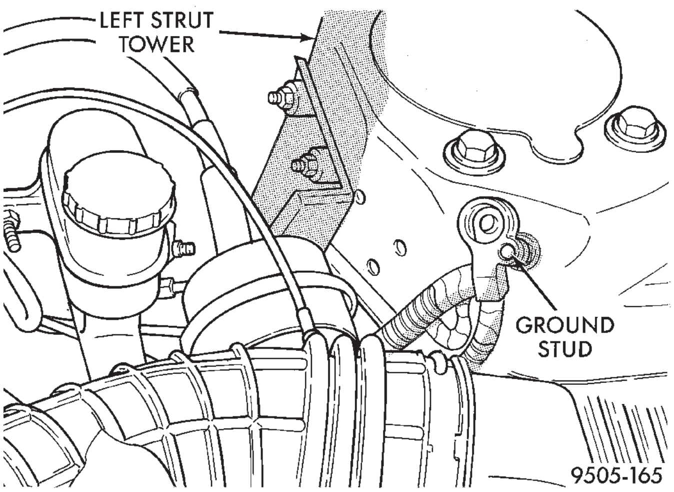


Fig. 3 Correctly Isolated Remote Ground Cable

This will allow the airbag system capacitor to de-energize.

(3) Before beginning removal of steering column assembly from vehicle, be sure front wheels of vehicle are in the **straight ahead** position.

(4) Remove fuse panel cover from left end of instrument panel (Fig. 4). Then remove the screw behind fuse panel cover, attaching the instrument panel top cover (Fig. 4).

NOTE: When removing the center bezel, only use a soft tool such as a trim stick (Fig. 5) to pry the center bezel from the dash panel. Use of a hard tool will damage dash panel.

(5) Remove center bezel surrounding radio and climate control panel from top cover of dash panel (Fig. 5).

(6) Remove the 3 screws attaching the top cover to the dash panel (Fig. 6).

(7) Remove the top cover from the dash panel. Removal of the top cover is required to gain access to

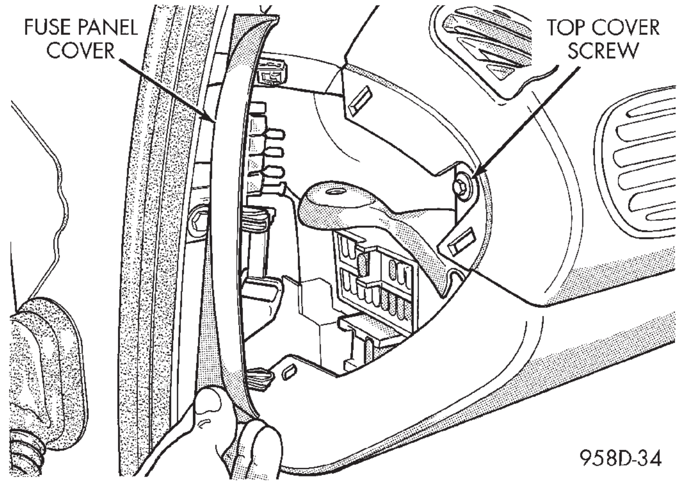


Fig. 4 Instrument Panel Top Cover Attaching Screw

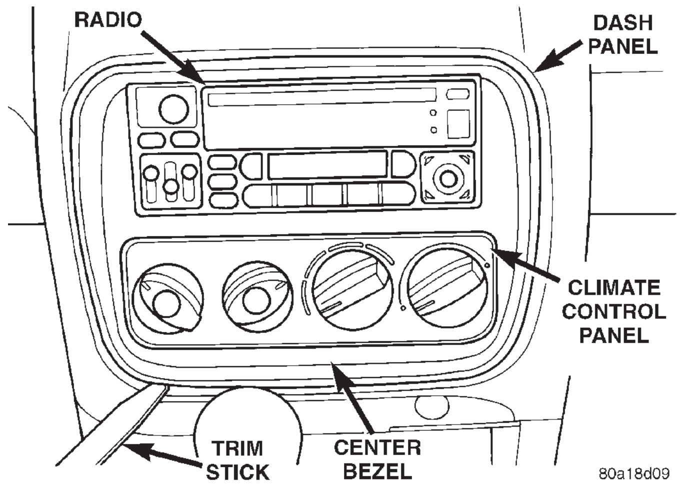


Fig. 5 Center Bezel

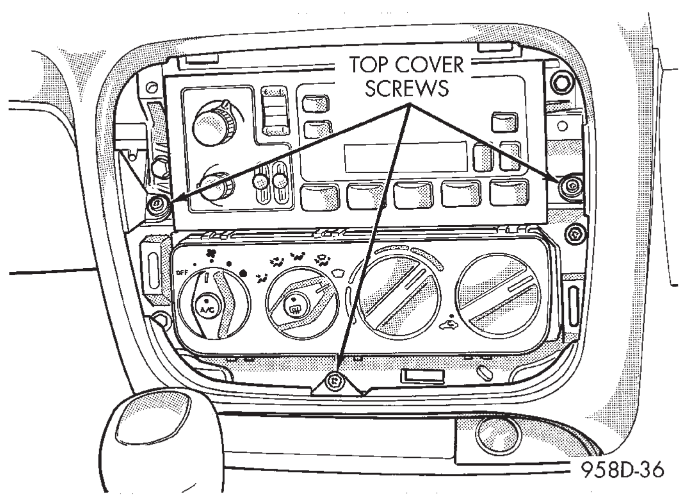


Fig. 6 Instrument Panel Top Cover Attaching Screws

the screws (Fig. 7) attaching the top of the knee bolster to the dash panel.

(8) Remove screws attaching the knee bolster to the instrument panel (Fig. 7).

REMOVAL AND INSTALLATION (Continued)

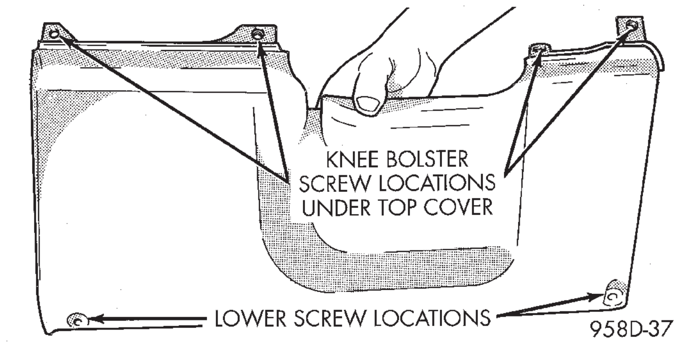


Fig. 7 Knee Bolster Attaching Screw Locations

WARNING: WHEN AN UNDEPLOYED AIRBAG ASSEMBLY IS TO BE REMOVED FROM THE STEERING WHEEL, DISCONNECT BATTERY GROUND CABLE AND ISOLATE. ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR TWO MINUTES, THEN BEGIN AIRBAG REMOVAL.

(9) Remove the speed control switches (Fig. 8) from the steering wheel. The speed control switches are mounted to the steering wheel using 2 mounting screws in the side of each speed control switch (Fig. 8).

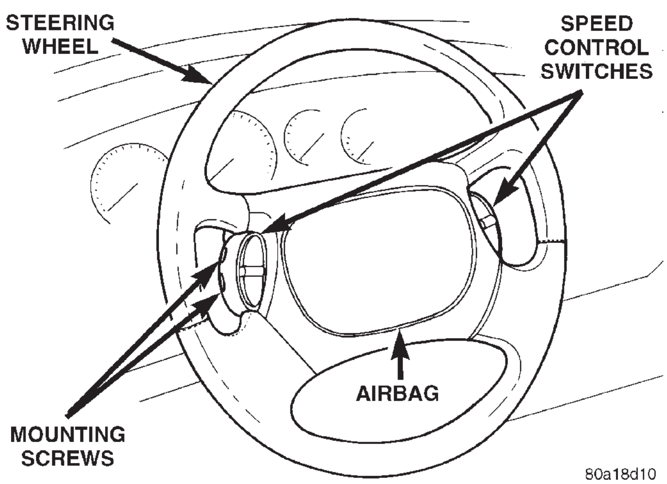


Fig. 8 Speed Control Switches

(10) Remove both speed control switches from the wiring harness in the steering wheel.

WARNING: WHEN HANDLING AN UNDEPLOYED AIRBAG MODULE DURING SERVICING OF THE STEERING COLUMN THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED. AT NO TIME SHOULD ANY SOURCE OF ELECTRICITY BE PERMITTED NEAR THE INFLATOR ON THE BACK OF THE AIRBAG MODULE. WHEN CARRYING A LIVE MODULE, THE TRIM COVER SHOULD BE POINTED AWAY FROM THE BODY TO MINIMIZE INJURY IF MODULE ACCIDENTLY DEPLOYS. IF AIRBAG MODULE IS PLACED ON A BENCH OR OTHER SURFACE, PLASTIC COVER SHOULD BE FACE UP TO MINIMIZE MOVEMENT IN CASE OF ACCIDENTAL DEPLOYMENT.

(11) Remove the 2 bolts, 1 on each side of the steering wheel, attaching the airbag module to the steering wheel (Fig. 9).

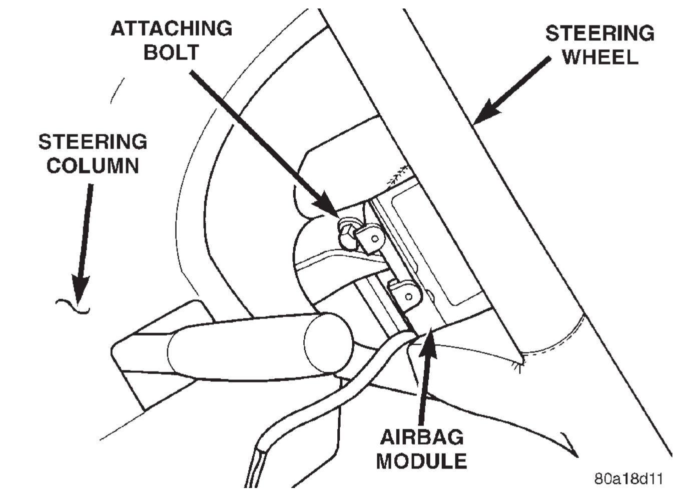


Fig. 9 Airbag Module Attaching Bolts

(12) Remove the airbag module from the center of the steering wheel.

(13) Remove the locking tab from clockspring airbag electrical lead connector (Fig. 10). Locking tab is removed by pulling it straight out of the airbag connector. **Do not twist the locking tab when removing it from the connector.**

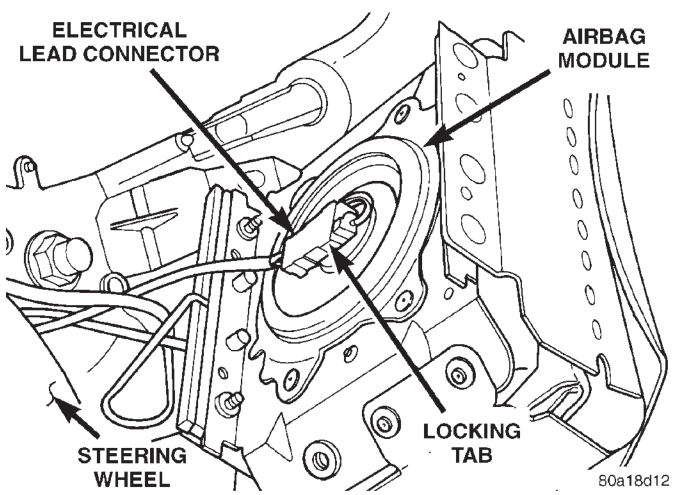


Fig. 10 Airbag Module Electrical Lead Locking Tab

(14) Disconnect the electrical connector (Fig. 11) from the back of the airbag module. Connector is removed by pulling it straight out of the airbag module. **Do not twist the connector when removing it from the airbag.**

REMOVAL AND INSTALLATION (Continued)

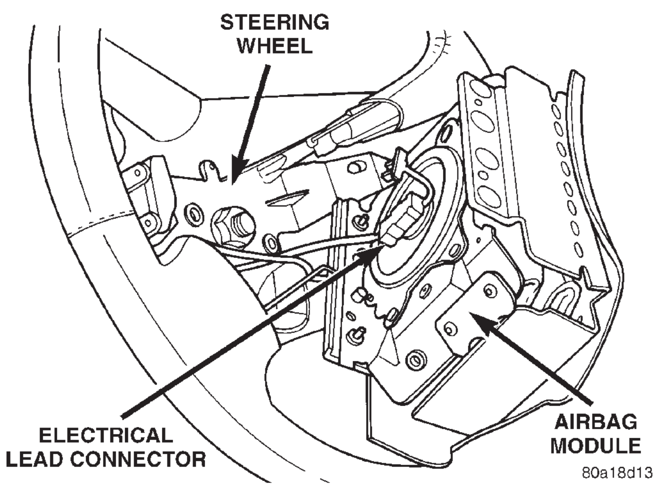


Fig. 11 Airbag Module Electrical Lead Connector

(15) Remove the wiring lead for the horn switch in the airbag module (Fig. 12) from the wiring lead coming from the clockspring.

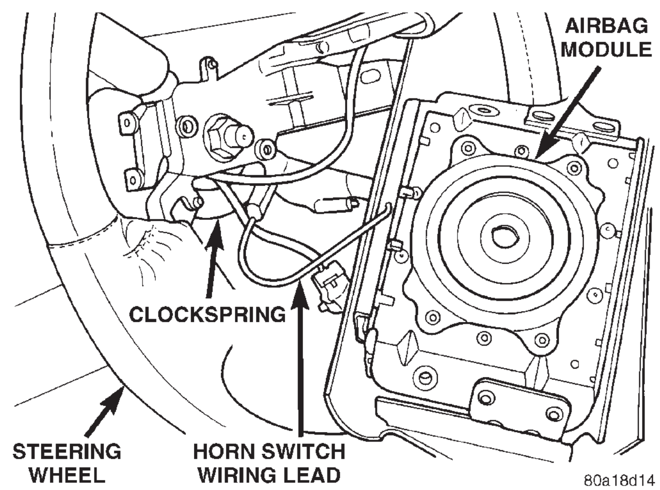


Fig. 12 Horn Switch Wiring Lead

(16) Turn the lock cylinder to the **off** position and remove the key from the lock cylinder.

(17) Turn the steering wheel to the left 1/2 a turn (180°) (Fig. 13) until the steering column lock is engaged.

(18) Remove the steering wheel attaching nut (Fig. 13) from the steering column shaft.

CAUTION: When installing Puller, Special Tool C-3428-B on steering wheel be sure puller bolts are fully seated in threaded puller holes on steering wheel. If bolts are not fully seated in threaded holes, threads may be stripped out when puller is tightened to remove steering wheel.

(19) Install Puller, Snap-On CJ2001P or an equivalent on steering wheel (Fig. 14).

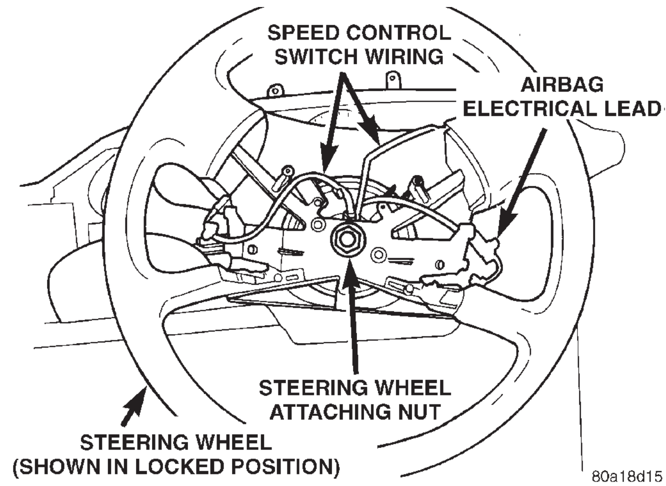


Fig. 13 Steering Wheel Attaching Nut

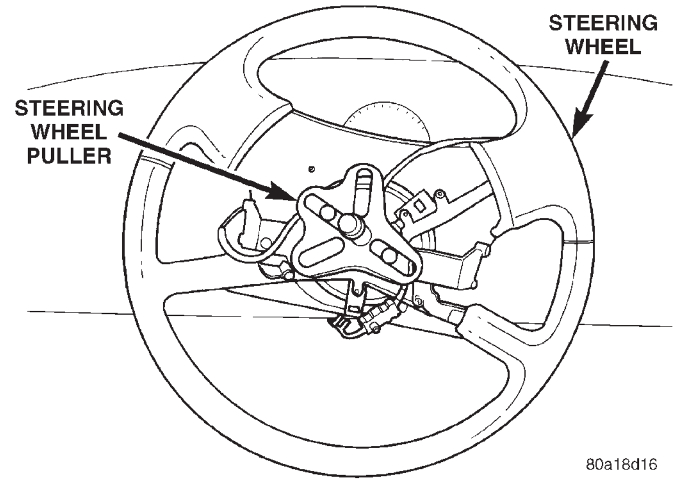


Fig. 14 Puller Installed On Steering Wheel

CAUTION: Do not bump or hammer on steering wheel or steering column shaft when removing steering wheel from steering column.

CAUTION: Do not bump or hammer on steering wheel or steering column shaft when removing steering wheel from steering column.

(20) Remove steering wheel assembly from steering column shaft using Puller, Snap-On CJ2001P or an equivalent.

(21) Remove the 2 screws attaching the upper and lower shrouds to the steering column (Fig. 15). First remove upper shroud from steering column, then release tilt lever and tilt steering column to its highest point. Then remove lower shroud from steering column.

(22) Remove the 2 wiring harness connectors from the clockspring (Fig. 16). Then remove wiring harness connector from lock housing halo light (Fig. 16).

REMOVAL AND INSTALLATION (Continued)

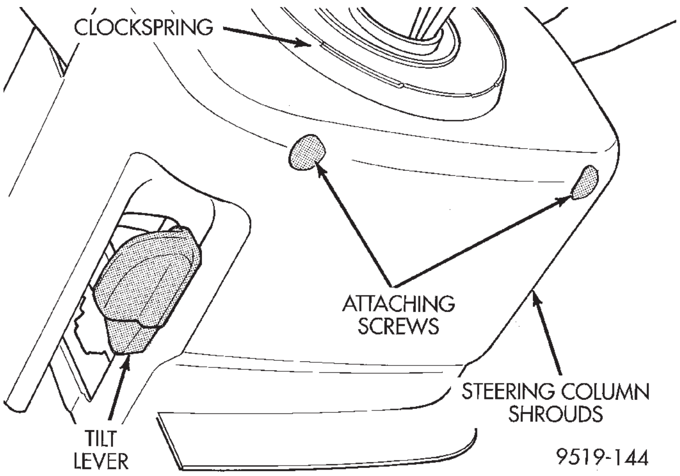


Fig. 15 Steering Column Shroud Attaching Screws

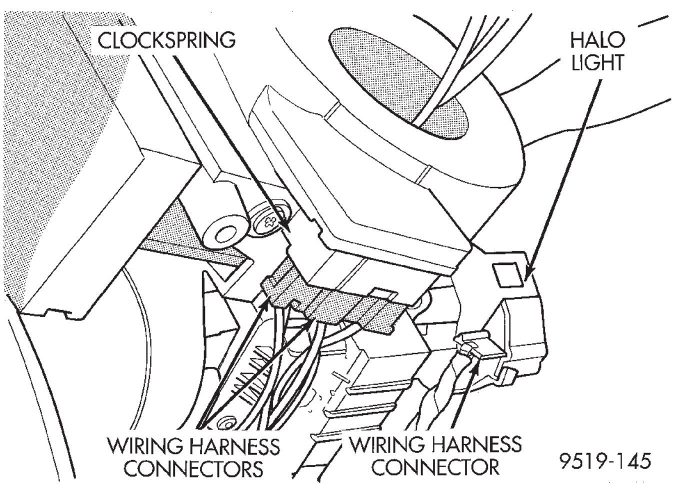


Fig. 16 Wiring Harness Connection To Clock Spring And Halo Light

(23) Remove the multi and 2 wire wiring harness connectors from the back of the ignition switch (Fig. 17). Then remove the 2 wiring harness connector from the multi function switch (Fig. 17) and (Fig. 18).

(24) Depress the locking tab on the shifter/ignition interlock cable (Fig. 19) and remove the cable from the key lock housing.

(25) Remove routing clip holding wiring harness to jacket of steering column.

(26) Remove retaining pin in steering column coupler pinch bolt (Fig. 20). Loosen the upper to lower steering coupler pinch bolt retaining nut and remove pinch bolt from steering coupler (Fig. 20). **Pinch bolt nut is caged to coupler and is not removable.** Then separate steering coupler from steering gear.

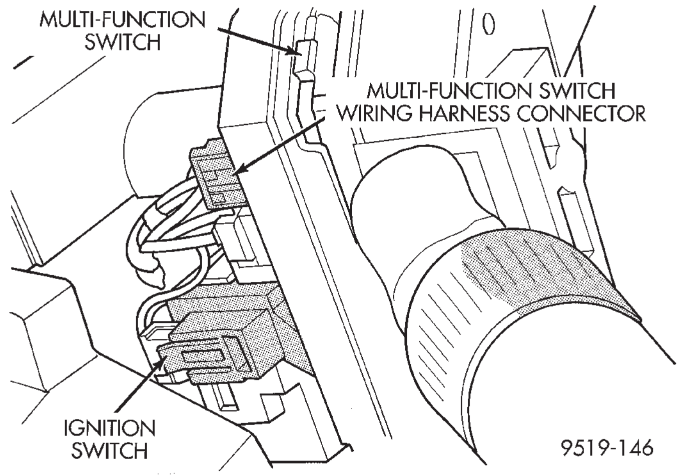


Fig. 17 Wiring Harness Connections To Ignition And Multi-Function Switch

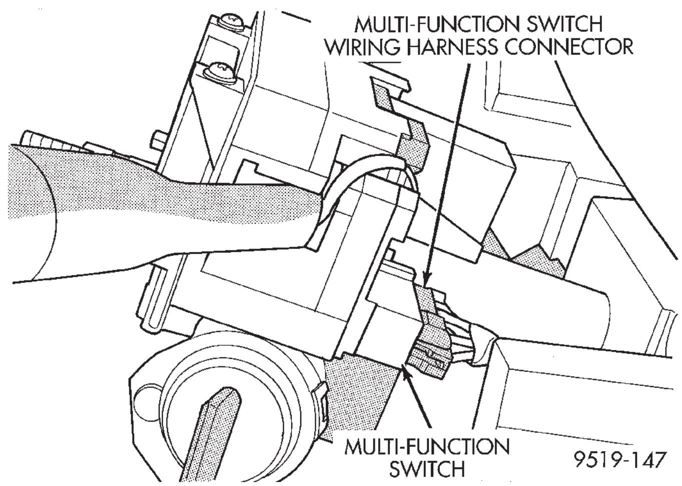


Fig. 18 Wiring Harness Connection To Multi-Function Switch

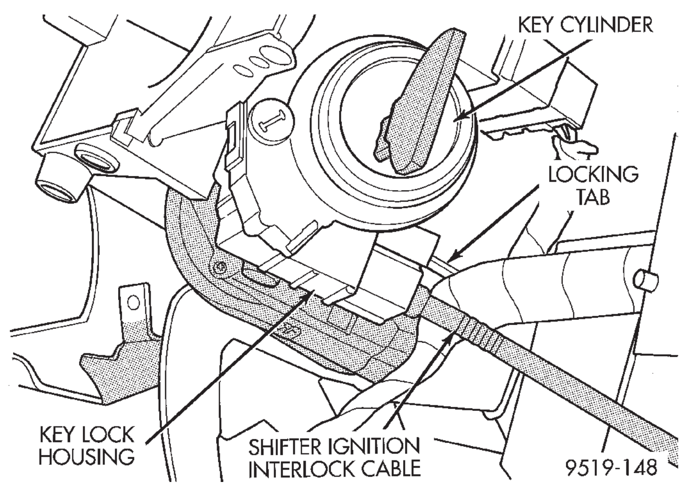


Fig. 19 Shifter/Ignition Cable At Lock Cylinder Housing

REMOVAL AND INSTALLATION (Continued)

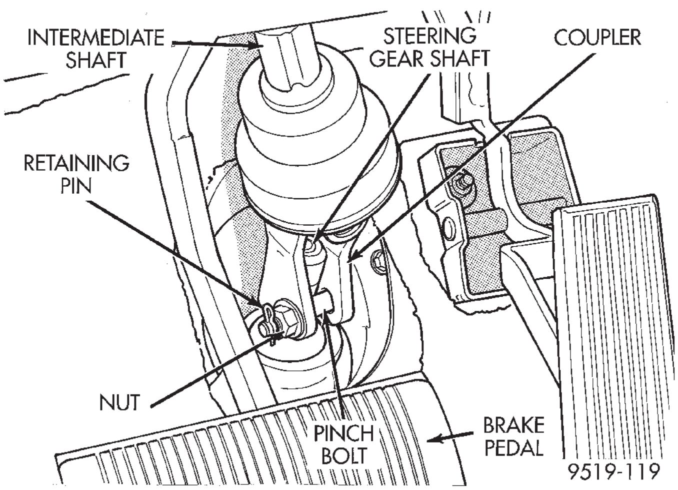


Fig. 20 Intermediate Shaft Coupler To Steering Gear Shaft

CAUTION: Before loosening the upper and lower steering column mounting bracket attaching nuts, the following procedure to lock upper steering column mounting bracket from moving must be done. If upper steering column mounting bracket is not locked in its proper position before loosening the mounting nuts, the tilt steering column will not operate correctly when installed back in car. This is due to the alignment of the upper mounting bracket assembly slipping when the mounting bolts are loosened.

(27) Place steering column so it is positioned in the middle of its tilt range. Place the steering column assembly tilt lever in its fully locked position. Then insert a 5/32 inch drill bit in each locking pin hole on the upper steering column mounting bracket (Fig. 21).

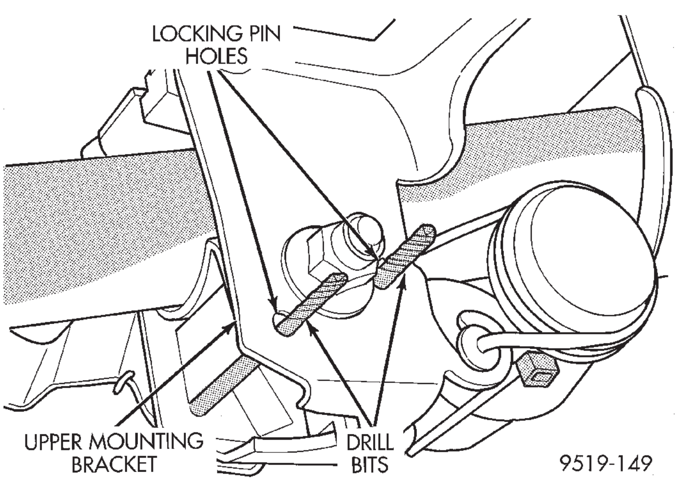


Fig. 21 Locking Pins Installed In Steering Column Bracket

(28) Remove the 2 upper steering column assembly mounting bracket to support bracket nuts. Then remove the 2 lower steering column assembly mounting bracket to support bracket nuts (Fig. 22).

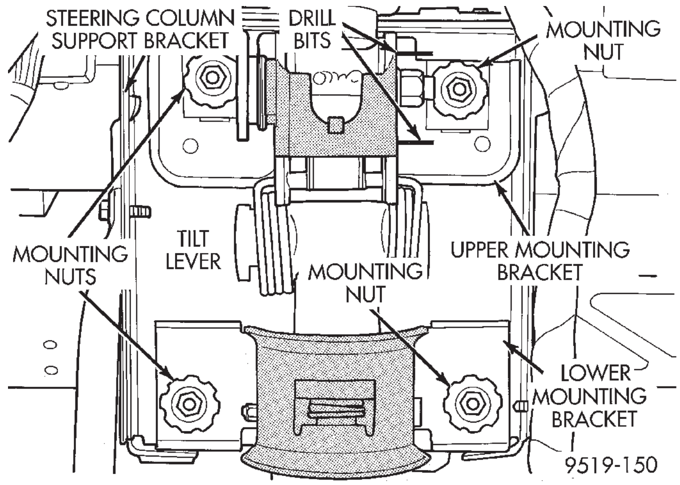


Fig. 22 Steering Column Upper And Lower Mounting Bracket Nuts

(29) Remove steering column assembly from vehicle through the drivers door of the passenger compartment. Use care to avoid damaging the paint or interior trim.

INSTALL

(1) Install steering column on the studs in the steering column support bracket. Loosely install the 4 steering column assembly attaching nuts.

(2) Tighten the 2 lower steering column assembly mounting nuts (Fig. 22) to hold the steering column in place. Be sure both breakaway capsules are still fully seated in the slots of the upper steering column mounting bracket and the mounting studs are centered for and aft in the plastic capsules (Fig. 23). Then equally tighten both steering column upper mounting nuts, (Fig. 22) until upper steering column mounting bracket is seated against support bracket. Tighten the 4 steering column bracket to support bracket nuts to 12 N·m (105 in. lbs.).

CAUTION: Be sure drill bits are removed from steering column upper mounting bracket.

(3) Remove the 2 drill bits (Fig. 21) from the steering column upper mounting bracket. **If a new steering column is being installed in the vehicle, remove the shipping (grenade) pin from steering column upper mounting bracket.**

(4) Assemble the lower intermediate shaft coupler to the steering gear input shaft. Tighten the coupler pinch bolt nut to a torque of 27 N·m (240 in. lbs.). **Be sure to install steering coupler pinch bolt retaining pin (Fig. 20).**

(5) Install the shifter/ignition interlock cable (Fig. 19) in the lock cylinder housing.

REMOVAL AND INSTALLATION (Continued)

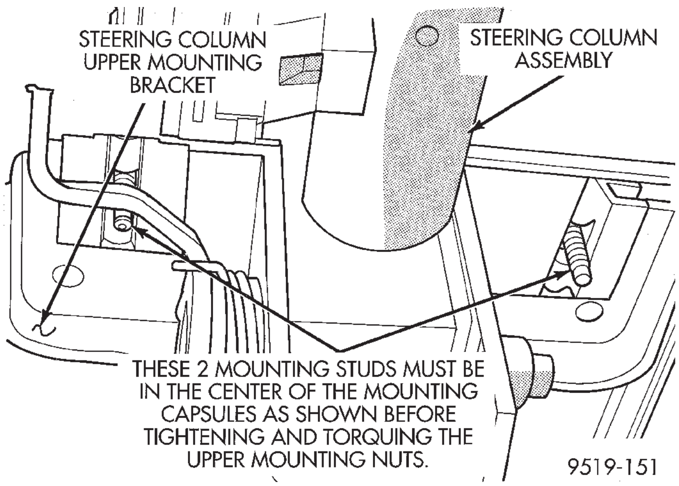


Fig. 23 Mounting Studs Correctly Positioned In Plastic Capsules

(6) Route wiring harness on steering column and install routing clip in bottom of steering column jacket.

(7) Install multi and 2 wire wiring harness connectors on the back of the ignition switch (Fig. 17). Then install the 2 wiring harness connectors on the multi function switch (Fig. 17) and (Fig. 18).

(8) Install clockspring on switch housing. Install the 2 wiring harness connectors on the clockspring (Fig. 16). Then install wiring harness connector on lock housing halo light (Fig. 16).

(9) Install the upper and lower steering column shrouds onto the lock housing of the steering column assembly. Install and securely tighten the 2 upper to lower steering column shroud to lock housing attaching screws (Fig. 15).

CAUTION: Clockspring centering procedure MUST be performed prior to installing steering wheel assembly. If clockspring is not centered it may be overextended, causing clockspring assembly to become inoperative. The yellow centering indicator must be present in the centering window of the clockspring and the arrow on the clockspring rotor must be pointing at the centering window.

(10) Center the clock spring using the following procedure.

- Depress the 2 plastic locking pins to disengage clockspring locking mechanism.
- Keeping locking mechanism disengaged, rotate the clockspring rotor in the CLOCKWISE DIRECTION to the end of the travel. Do not apply excessive torque.
- From the end of clockwise travel, slowly rotate the rotor in the counterclockwise direction until yellow appears in the centering window of clockspring. When yellow appears in the centering window the arrow on the clockspring rotor will be pointing at yellow window on clock spring.
- Engage the clockspring locking mechanism.

CAUTION: Do not install steering wheel onto shaft of steering column assembly by driving it onto the shaft. Pull steering wheel down onto steering column shaft using ONLY the steering wheel retaining nut.

(11) Feed clockspring wiring leads through hole in steering wheel (Fig. 13). Position steering wheel on shaft of steering column assembly, making sure to fit flats on hub of steering wheel with formations on inside of clockspring.

(12) Install steering wheel to steering column shaft retaining nut and tighten until steering wheel is fully installed on shaft. Tighten steering wheel retaining nut to a torque of 61 N·m (45 ft. lbs.).

(13) Turn the key cylinder to the unlock position, unlocking the steering column shaft.

(14) Correctly route the speed control switch wiring leads from the clockspring to the speed control switch openings in steering wheel.

(15) Connect the horn switch wiring lead from the clockspring to the airbag module horn switch wiring lead (Fig. 12)

(16) Install the airbag electrical lead into connector on back of airbag module (Fig. 11). Insert locking tab into back of airbag connector (Fig. 10). **Be sure electrical connector from clockspring is securely latched into airbag module connector.**

CAUTION: The fasteners, screws, and bolts, originally used for the airbag components are specifically designed for the airbag system. They must never be replaced with any substitutes. Anytime a new fastener is needed, replace only with correct fasteners provided in service packages or fasteners listed in the parts book.

(17) Install airbag module into center of steering wheel. Install **only the 2 original or correct replacement** airbag module attaching bolts (Fig. 9). Torque the 2 airbag module attaching bolts to 10 N·m (90 in. lbs.).

(18) Connect the clockspring electrical leads to the speed control switches. Install the speed control switches in the steering wheel. Install and securely tighten screws attaching the speed control switches to the steering wheel (Fig. 8).

(19) Install lower instrument panel knee bolster onto the lower instrument panel. Install and securely tighten the knee bolster to instrument panel attaching screws (Fig. 7).

(20) Install the instrument panel top cover.

REMOVAL AND INSTALLATION (Continued)

(21) Install screw behind fuse panel cover holding dash panel top cover (Fig. 4). Install fuse panel cover on left end of dash panel.

(22) Install the 3 screws holding dash panel top cover to the center dash panel (Fig. 6).

(23) Install center bezel surrounding radio and climate control panel from top cover of instrument panel (Fig. 24).

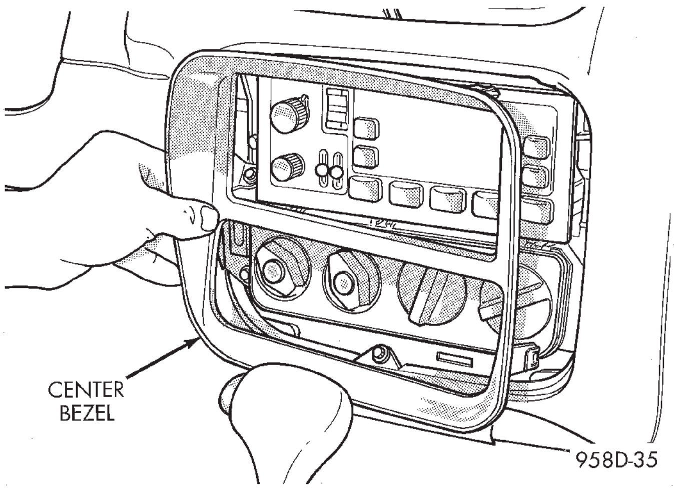


Fig. 24 Installing Center Bezel

CAUTION: When reconnecting battery on a vehicle that has had the airbag module removed, ensure no occupants are in the vehicle and the following procedure is used.

(24) Reconnecting of the battery negative cable is to be done using the steps in the procedure listed below.

- Remove forward console or cover as necessary.
- Connect DRB scan tool to ASDM diagnostic 6-way connector, located at right side of the ASDM module.
- Turn ignition key to ON position. Exit vehicle with the DRB scan tool. Install the latest version of the proper diagnostic cartridge into the DRB scan tool.
- Ensuring that their are no occupants in the vehicle, connect negative cable to negative post of the battery.
- Using the DRB scan tool read and record active fault codes. Also read and record any stored fault codes. Refer to the Passive Restraint Diagnostic Test Manual if any faults are found.
- Erase stored faults if there are no active fault codes. If problems remain, fault codes will not erase.
- From the passenger side of the vehicle, turn ignition key to OFF and then ON observing instrument cluster airbag lamp. It should go on for six to eight seconds, then go out. This will indicate that the airbag system is functioning normally.

(25) **If airbag warning lamp fails to light, blinks on and off or goes on and stays on, there is an airbag system malfunction.** Refer to the Passive Restraint Diagnostic Test Manual to diagnose the system malfunction.

(26) Test the operation of the horn, lights and any other functions that are steering column operated. If applicable reset the radio and the clock.

(27) Road test vehicle to ensure proper operation of the steering system and the speed control system.

STEERING COLUMN SHAFT FLEX COUPLER

If lower steering column shaft coupler is diagnosed to be defective by showing any of the following conditions (seized bearing, loose bearing stake or a bearing not fully seated in yoke) the intermediate shaft can be serviced as a separate component of the steering column assembly.

The steering column assembly will need to be removed from the interior of the vehicle to allow for replacement of the steering column shaft coupler assembly.

REMOVE

(1) Remove steering column assembly from vehicle. Refer to the Steering Column Removal Section in this group of the service manual for the required removal procedure.

(2) Install Puller, Special Tool 6831-A through center of roll pin in flex joint and install knurled nut (Fig. 25).

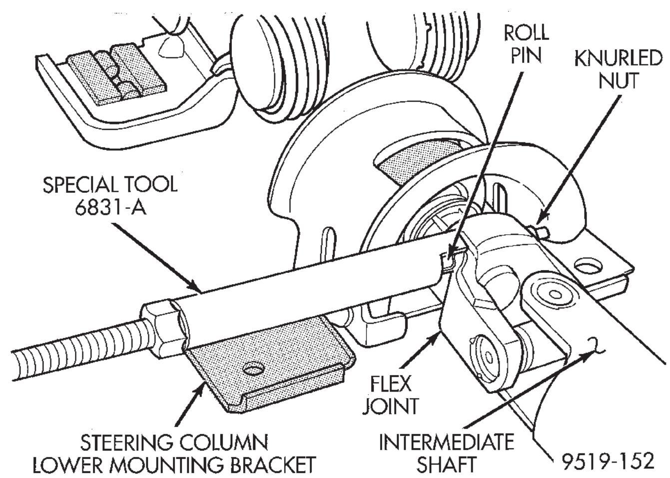


Fig. 25 Removing Roll Pin From Flex Joint

(3) While holding hex on end threaded rod, tighten the nut on threaded rod of Puller, Special Tool 6831-A. This will pull the roll pin out of the flex joint.

(4) Using a screwdriver inserted between the flex joint and the steering column lower mounting bracket (Fig. 26) pry flex joint off steering column shaft.

REMOVAL AND INSTALLATION (Continued)

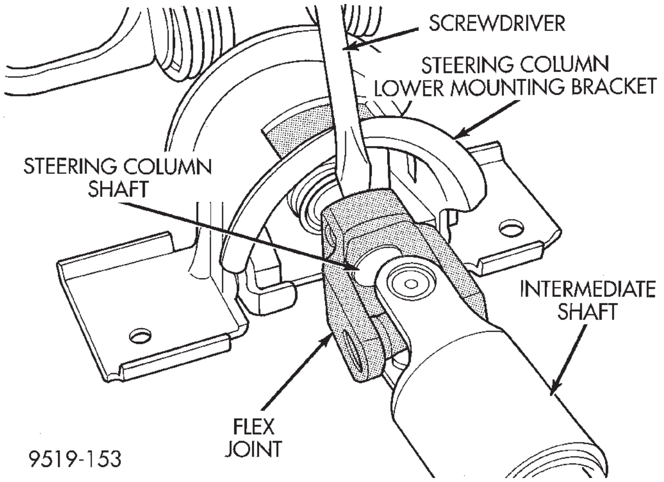


Fig. 26 Removing Flex Joint From Steering Column Shaft

INSTALL

(1) Start roll pin into flex joint prior to installing flex joint on steering column shaft. Install roll pin into flex joint just far enough to square roll pin to hole in flex joint. If roll pin is installed too far, flex joint will not slid onto steering column shaft.

(2) Install steering coupler on steering shaft until correctly positioned to allow spring pin to be installed in coupler.

(3) Install Puller, Special Tool 6831-A through center of roll pin and install knurled nut (Fig. 27).

(4) Using Puller, Special Tool, 6831-A, (Fig. 27) install roll pin into the coupler until spring pin is fully installed through both sides of the coupler assembly.

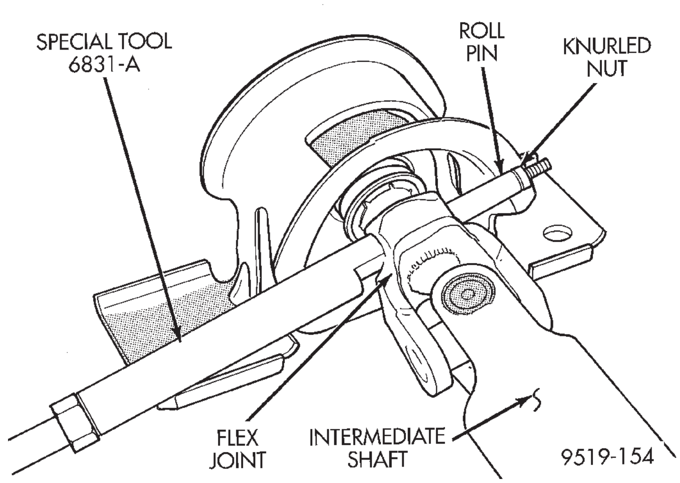


Fig. 27 Tool Set-Up For Installing Flex Joint Roll Pin

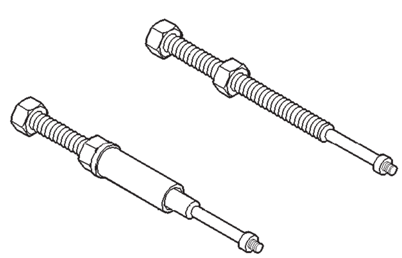
SPECIFICATIONS

STEERING COLUMN FASTENER TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
STEERING WHEEL:	
Retaining Nut	61 N·m (45 ft. lbs.)
STEERING COLUMN ASSEMBLY:	
Mounting Bracket Attaching Nuts	12 N·m (105 in. lbs.)
Flex Coupler Pinch Bolt	27 N·m (240 in. lbs.)
Airbag Module Attaching Nuts	10 N·m (90 in. lbs.)

SPECIAL TOOLS

STEERING COLUMN



Remover / Installer Steering Shaft Roll Pin 6831A

TRANSAXLE

CONTENTS

GENERAL INFORMATION

41TE FOUR SPEED AUTOMATIC TRANSAXLE

The 41TE four-speed FWD transaxle uses fully-adaptive controls. Adaptive controls are those which perform their functions based on real-time feedback sensor information. The transaxle uses hydraulically applied clutches to shift a planetary gear train.

TRANSAXLE IDENTIFICATION

The 41TE transaxle identification code is printed on a label. The label is located on the transaxle case up on the bellhousing (Fig. 1).

GENERAL INFORMATION (Continued)

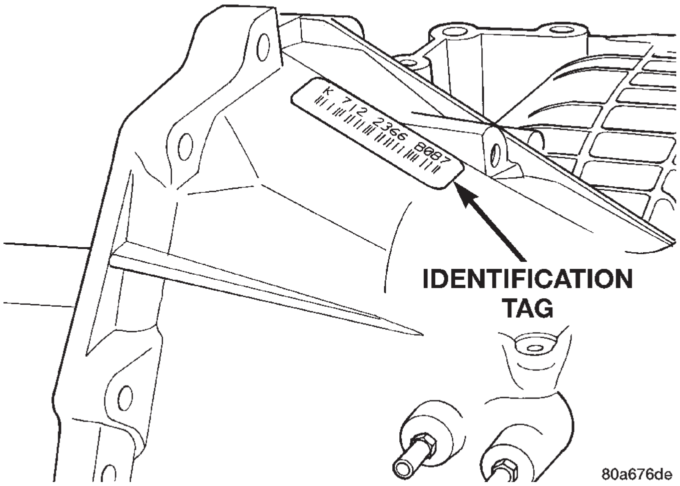


Fig. 1 Identification Tag Location

OPERATION

The gear ratios for the 41TE transaxle are as follows:

1st	2.84
2nd	1.57
3rd	1.00
OD	0.69
Reverse	2.21

Final Drive Ratio is dependent on which engine option is selected.

2.0 Liter	4.08 FDR
2.4 Liter	3.91 FDR
2.5 Liter	3.91 FDR

The torque converter clutch is available in 2nd, direct, or overdrive gear. The shift lever is conventional with six positions: P, R, N, OD, 3, and L available. When OD is selected the transaxle shifts through all four speeds with torque converter clutch available in overdrive. This position is recommended for most driving. The 3 position is tailored for use in hilly, mountainous driving or trailer towing. When 3 is selected, the transmission uses only 1st, 2nd, and direct gears with 2nd-direct shift delayed to 40 mph or greater. When operating in 3 or L positions torque converter clutch application occurs in direct gear. This improves transmission cooling under heavy loads. If high transmission oil or engine coolant temperature occurs, the torque converter clutch will also engage in 2nd gear. The L position provides maximum engine braking for descending steep grades. Unlike most current transaxles, upshifts are provided to 2nd or direct gear at peak engine speeds if the accelerator is depressed. This provides engine over-speed protection and maximum performance.

FLUID LEVEL AND CONDITION

NOTE: The transmission and differential sump have a common oil sump with an opening between the two.

The torque converter fills in both the (P) Park and (N) Neutral positions. Place the selector lever in (P) Park to check the fluid level. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground. This will assure complete oil level stabilization between differential and transmission.** The fluid should be at normal operating temperature (approximately 82 C. or 180 F.). The fluid level is correct if it is in the **HOT** region (cross-hatched area) on the oil level indicator.

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transaxle has too much fluid, the gears churn up foam and cause the same conditions which occur with a low fluid level.

In either case, the air bubbles can cause overheating, fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

Along with fluid level, it is important to check the condition of the fluid. When the fluid smells burned, and is contaminated with metal or friction material particles, a complete transaxle overhaul is needed. Be sure to examine the fluid on the dipstick closely. If there is any doubt about its condition, drain out a sample for a double check.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

SELECTION OF LUBRICANT

It is important that the proper lubricant be used in the 41TE transaxle. MOPAR® ATF PLUS (Automatic Transmission Fluid—type 7176) should be used to aid in assuring optimum transmission performance. Fluids of the type labeled DEXRON III Automatic Transmission Fluid are **not recommended** . DEXRON III can be used only if the recommended fluid is not available. If more than a small amount of DEXRON III is used shudder or shift quality problems may result. It is important that the transmission fluid be maintained at the prescribed level using the recommended fluids.

GENERAL INFORMATION (Continued)

SPECIAL ADDITIVES

Chrysler Corporation does not recommend the addition of any fluids to the transaxle, other than the fluid listed above. An exception to this policy is the use of special dyes to aid in detecting fluid leaks. The use of transmission sealers should be avoided, since they may adversely affect seals.

DESCRIPTION AND OPERATION

CLUTCH AND GEAR

The transaxle consists of:

- Three multiple disc input clutches
- Two multiple disc grounded clutches
- Four hydraulic accumulators
- Two planetary gear sets

This provides four forward ratios and a reverse ratio. The clutch-apply pistons were designed with centrifugally balanced oil cavities so that quick response and good control can be achieved at any speed. A push/pull piston is incorporated for two of the three input clutches.

CAUTION: Some clutch packs appear similar, but they are not the same. Do not interchange clutch components, as they might fail.

HYDRAULICS

The hydraulics of the transaxle provide:

- Manual shift lever select function
- Main line pressure regulation
- Torque converter and cooler flow control

Oil flow to the friction elements is controlled directly by four solenoid valves. The hydraulics also include a unique logic- controlled solenoid torque converter clutch control valve. This valve locks out the 1st gear reaction element with the application of 2nd, direct, or overdrive gear elements. It also redirects the 1st gear solenoid output so that it can control torque converter clutch operation. To regain access to 1st gear, a sequence of commands must be used to move the solenoid switch valve. This precludes any application of the 1st gear reaction element with other elements applied. It also allows one solenoid to control two friction elements.

Small, high-rate accumulators are provided in each controlled friction element circuit. These serve to absorb the pressure responses, and allow the controls to read and respond to changes that are occurring.

SOLENOIDS

The solenoid valves perform most control functions, these valves must be extremely durable and tolerant of dirt. For that reason hardened-steel poppet and ball valves are used. These are free from any close operating clearances. The solenoids operate the valves directly without any intermediate element. Direct operation means that these units must have very high output. They must close against the sizeable flow areas and high line pressures. Fast response is also required to meet the control requirements.

Two of the solenoids are normally-venting and two are normally-applying; this was done to provide a default mode of operation. With no electrical power, the transmission provides 2nd gear in (OD), (3), or (L) shift lever positions. All other transmission lever positions will operate normally. The choice of 2nd gear was made to provide adequate breakaway performance while still accommodating highway speeds.

SENSORS

There are three pressure switches to identify solenoid application. There are two speed sensors to read input (torque converter turbine) and output (parking sprag) speeds. There is a transmission range sensor to indicate the manual shift lever position. Also there is a transmission temperature sensor that is part of the transmission range sensor. The transmission temperature sensor measures the fluid temperature at the tranmission sump. The pressure switches are incorporated in an assembly with the solenoids. Engine speed, throttle position, temperature, etc., are also observed. Some of these signals are read directly from the engine control sensors; others are read from a multiplex circuit with the powertrain control module.

ELECTRONICS

The 41TE Transmission Control Module (TCM) is located underhood in a potted, die-cast aluminum housing. The module used is a new controller called EATX III. The TCM has a sealed, 60-way connector.

TORQUE CONVERTER CLUTCH CONTROL (TCC)

The EMCC logic enables torque converter clutch to partially engage between 23 to 47 miles per hour. Full engagement occurs at about 50 miles per hour. This feature is on all vehicles equipped with the 41TE transaxle.

ADAPTIVE CONTROLS

These controls function by reading the input and output speeds over 140 times a second and responding to each new reading. This provides the precise and sophisticated friction element control needed to make smooth clutch-to-clutch shifts for all gear changes. The use of overrunning clutches or other shift quality aids are not required. As with most automatic transaxles, all shifts involve releasing one element and applying a different element. In simpli-

DESCRIPTION AND OPERATION (Continued)

fied terms, the upshift logic allows the releasing element to slip backwards slightly. This ensures that it does not have excess capacity. The apply element is filled until it begins to make the speed change to the higher gear. The apply pressure is then controlled to maintain the desired rate of speed change. This continues until the shift is made. The key to providing excellent shift quality is precision. For example, the release element for upshifts is allowed to slip backwards slightly. The amount of that slip is typically less than a total of 20 degrees. To achieve that precision, the TCM learns the traits of the transaxle that it is controlling. It learns the release rate of the releasing element and the apply time of the applying element. It also learns the rate at which the apply element builds pressure sufficient to begin making the speed change. This method achieves more precision than would be possible with exacting tolerances. It can also adapt to any changes that occur with age or environment.

For kickdown shifts, the control logic allows the releasing element to slip. Then controls the rate at which the input (and engine) accelerate. When the lower gear speed is achieved, the releasing element reapplies to maintain that speed until the apply element is filled. This provides quick response since the engine begins to accelerate immediately. This also provides a smooth torque exchange since the release element can control the rate of torque increase. This control can make any powertrain feel more responsive without increasing harshness.

Adaptive controls respond to input speed changes. They compensate for changes in engine or friction element torque and provide good, consistent shift quality for the life of the transaxle.

TORQUE MANAGEMENT

Most 41TE transaxles utilize torque management. Torque management is a unique function of the Powertrain Control Module (PCM). The PCM receives output signals from the Transmission Control Module (TCM) and many various engine sensors. The PCM evaluates these signals and decides if it is necessary to decrease the output of the engine's torque. This reduction in torque does not interfere with the normal operation of the vehicle. This reduction in torque will prolong the life of the drivetrain components. Torque reduction is not noticeable in normal driving functions. The torque reduction function shuts off above 16 MPH.

ON-BOARD DIAGNOSTICS

This vehicle utilizes a diagnostic system called OBDII. The powertrain control module communicates with the Transmission Control Module. Whenever the transaxle sets a fault in the Transmission Control Module (dependent on which fault is set), the powertrain control module will turn on a MIL (Malfunction Indicator Lamp) on the instrument cluster. By reading the code in the powertrain control module it will tell you where the fault occurred. If the fault occurred in the transaxle, the controller will read a **CODE 45.** For further information regarding OBDII, refer to Group 25, Emission Systems.

These controls provide comprehensive, on-board transaxle diagnostics. The information available can aid in transaxle diagnosis. For example, apply element buildup rate indicates solenoid performance. Also included are self diagnostic functions. Self diagnostics allow the technician to test the condition of the electronic controls. The Transmission Control Module continuously monitors its critical functions. It also records any malfunctions, and the number of engine starts since the last malfunction. This allows the technician to use the information in the event of a customer complaint.

TRANSMISSION CONTROL MODULE

Do not interchange Transmission Control Modules with previous year transmission control modules. If a same year TCM is being used from a different vehicle, the following procedures must be performed:

- Quick Learn Procedure
- Torque Converter Clutch Break-in Procedure
- Electronic Pinion Factor Procedure

The Transmission Control Module is located on the right inner fender panel, in the engine compartment. It is held in place by four mounting screws.

NOTE: If the Transmission Control Module has been replaced, the following procedures must be performed:

- Quick Learn Procedure: This procedure will allow the transmission control module to learn the characteristics of the vehicle.
- Electronic Pinion Factor Procedure: This procedure will reprogram the TCM to compensate for different tire sizes and final drive ratios.
- Converter Clutch Break-In Procedure: This procedure will reset the torque converter clutch status.

SHIFTER/IGNITION INTERLOCK

The Shifter/Ignition Interlock, is a mechanically cable operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch. The interlock system locks the floor mounted shift lever into the PARK position whenever the ignition switch is in the LOCK or ACCESSORY position. When the key is in the OFF or RUN position the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to

DESCRIPTION AND OPERATION (Continued)

LOCK or ACCESSORY position, unless shifter is in the PARK position.

GEARSHIFT AND PARKING LOCK CONTROLS

The transaxle is controlled by a lever type gearshift incorporated within the floor shift mechanism. The standard gearshift control has six selector lever positions: P (park), R (reverse), N (neutral), and D (drive), and L (low). The parking lock is applied by moving the selector lever past a gate to the P position. **Do not apply the parking lock until the vehicle has stopped; otherwise, a severe ratchet noise will occur.**

TRANSMISSION RANGE SENSOR

All vehicles are equipped with a transmission range sensor that is located on top of the valve body. This sensor replaces the gear position switch and the transmission range switch. This sensor will allow for accurate transmission gear position measurement. This sensor is similar to the MVLPS that is currently on the 42LE transaxle.

To service the transmission range sensor (TRS), you must remove the valve body. For repair procedures, refer to the Removal and Installation section within this group.

TRANSMISSION TEMPERATURE SENSOR

Located within the Transmission Range Sensor is a transmission temperature sensor. This sensor is used to measure the transmission fluid sump temperature. The transmission temperature sensor is serviced with the TRS as a unit.

AUTOSTICK

OPERATION

Autostick is a driver–interactive transaxle feature that offers manual gear shifting capability. When the shifter is moved into the Autostick position, the transaxle remains in whatever gear it was using before Autostick was activated. Moving the shifter to the left (towards the driver) causes a downshift and moving to the right (towards the passenger) causes an upshift. The instrument cluster will illuminate the selected gear. The vehicle can be launched in 1st, 2nd, or 3rd gear while in the Autostick mode. The speed control is operable in 3rd and 4th gear Autostick mode. Speed control will be deactivated if the transaxle is shifted to 2nd gear. Shifting into OD position cancels the Autostick mode, and the transaxle resumes the OD shift schedule.

AUTOMATIC OVERRIDES

For safety, durability, and driveability, some shifts are executed automatically or prevented.

AUTOMATIC SHIFTS WILL OCCUR UNDER THE FOLLOWING CONDITIONS

TYPE OF SHIFT	APPROXIMATE SPEED
4-3 coast downshift	13 mph
3-2 coast downshift	9 mph
2-1 coast downshift	5 mph
1-2 upshift	6300 engine rpm
2-3 upshift	6300 engine rpm
4-3 kickdown shift	13-47 mph w/sufficient throttle

MANUAL SHIFTS ARE NOT PERMITTED UNDER THE FOLLOWING CONDITIONS

TYPE OF SHIFT	APPROXIMATE SPEED
3-4 upshift	Below 15 mph
3-2 downshift	Above 74 mph @ closed throttle or 70 mph otherwise
2-1 downshift	Above 41 mph @ closed throttle or 38 mph otherwise

SHIFT POSITION INDICATOR

The shifter position indicator is located in the instrument cluster. The shifter position indicator outlines with a box the gear position the transaxle manual valve lever is in.

The transmission range sensor (located on the valvebody) sends a signal to the TCM on the position of the transaxle manual valve lever. The TCM receives the switch signal and processes the data. The TCM sends the Shift Lever Position (SLP) information to the BCM via the CCD bus. The BCM then outlines the appropriate shifter position indicator in the instrument cluster.

To replace the shifter position indicator, refer to Group 8E, Instrument Panel And Gauges.

DIAGNOSIS AND TESTING

41TE TRANSAXLE GENERAL DIAGNOSIS

CAUTION: Before attempting any repair on a 41TE four speed automatic transaxle, check for Diagnostic Trouble Codes with the DRB scan tool. Always use the Powertrain Diagnostic Test Procedure Manual.

Transaxle malfunctions may be caused by these general conditions:

- Poor engine performance

DIAGNOSIS AND TESTING (Continued)

- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or that more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

ROAD TEST

Prior to performing a road test, check the fluid level.

During the road test, the transaxle should be operated in each position to check for slipping and any variation in shifting. During test drive the transmission sump temperature should be monitored for normal values. Sump temperatures in excess of 230°F should prompt a thorough oil level and cooling systems check. RPM monitors should also be watched for lock-up and gear shifting.

If vehicle operates properly at high speeds, but has poor acceleration, the converter's overrunning clutch may be slipping. If acceleration is normal, but high throttle opening is needed for high speeds, the clutch may have seized. Both of these stator defects require replacement of the torque converter.

The clutch that is slipping can be determined by checking for a DTC code 50–54 and noting the transaxle operation in all selector positions. Then comparing which internal units are applied in those positions. The **Elements in Use Chart** provides a basis for road test analysis.

The process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. Road test analysis can usually diagnose slipping units. However, the actual cause of the malfunction may not be detected. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

HYDRAULIC PRESSURE TESTS

Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transaxle problems.

Before performing pressure tests, be certain that fluid level and condition, and shift cable adjustments have been checked and approved. Fluid must be at operating temperature (150 to 200 degrees F.).

Install an engine tachometer, raise vehicle on hoist which allows front wheels to turn, and position tachometer so it can be read.

Attach 150 psi gauges to ports required for test being conducted. A 300 psi gauge (C-3293) is required for reverse pressure test.

Test port locations are shown in (Fig. 3).

TEST ONE-SELECTOR IN LOW 1st GEAR

(1) Attach pressure gauge to the low/reverse clutch tap.

(2) Move selector lever to the (L) position.

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed to 20 mph.

(4) Low/reverse clutch pressure should read 115 to 145 psi.

(5) This test checks pump output, pressure regulation and condition of the low/reverse clutch hydraulic circuit and shift schedule.

TEST TWO-SELECTOR IN DRIVE 2nd GEAR

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

(1) Attach gauge to the underdrive clutch tap.

(2) Move selector lever to the 3 position.

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph.

(4) In second gear the underdrive clutch pressure should read 110 to 145 psi.

TEST 2A–SELECTOR IN OD

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

(1) Attach gauge to the UD clutch tap.

(2) Move selector lever to the OD position.

(3) Allow wheels to rotate freely and increase throttle opening to achieve an indicated speed of 40 mph.

(4) Underdrive clutch pressure should read below 5 psi. If not, than either the solenoid assembly or TCM is at fault.

TEST THREE-OVERDRIVE CLUTCH CHECK

(1) Attach gauge to the overdrive clutch tap.

(2) Move selector lever to the (Circle D) position.

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 20 mph.

(4) Overdrive clutch pressure should read 74 to 95 psi.

(5) Move selector lever to the (3) position and increase indicated vehicle speed to 30 mph.

(6) The vehicle should be in second gear and overdrive clutch pressure should be less than 5 psi.

DIAGNOSIS AND TESTING (Continued)

Shift Lever Position	Start Safety	Park Sprag	CLUTCHES				
			Underdrive	Overdrive	Reverse	2/4	Low/ Reverse
P — PARK	X	X					X
R — REVERSE							X
N — NEUTRAL	X						X
OD — OVERDRIVE First—			X				X
Second			X			X	
Direct			X	X			
Overdrive				X		X	
3 — DRIVE GEAR* First			X				X
Second			X			X	
Direct			X	X			
L — LOW* First			X				X
Second			X			X	
Direct			X	X			

*Vehicle upshift and downshift speeds are increased when in these selector positions.

Fig. 2 ELEMENTS IN USE AT EACH POSITION OF THE SELECTOR LEVER

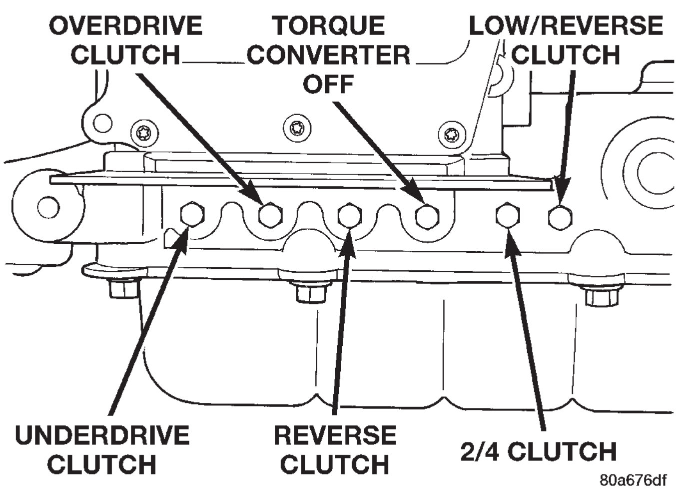


Fig. 3 Pressure Taps

(7) This test checks the overdrive clutch hydraulic circuit as well as the shift schedule.

TEST FOUR-SELECTOR IN CIRCLE DRIVE, OVERDRIVE GEAR

(1) Attach gauge to the 2/4 clutch tap.
(2) Move selector lever to the (Circle D) position.
(3) Allow vehicle front wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph.
(4) The 2/4 clutch pressure should read 75 to 95 psi.
(5) This test checks the 2/4 clutch hydraulic circuit.

TEST FIVE-SELECTOR IN CIRCLE DRIVE, OVERDRIVE

(1) Attach gauge to the torque converter clutch off pressure tap.
(2) Move selector lever to the (Circle D) position.
(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph.

CAUTION: Both wheels must turn at the same speed.

(4) Torque converter clutch off pressure should be less than 5 psi.
(5) This test checks the torque converter clutch hydraulic circuit.

TEST SIX-SELECTOR IN REVERSE

(1) Attach gauge to the reverse and LR clutch tap.
(2) Move selector lever to the reverse position.
(3) Read reverse clutch pressure with output stationary (foot on brake) and throttle opened to achieve 1500 rpm.

DIAGNOSIS AND TESTING (Continued)

(4) Reverse and LR clutch pressure should read 165 to 235 psi.

(5) This test checks the reverse clutch hydraulic circuit.

TEST RESULT INDICATIONS

(1) If proper line pressure is found in any one test, the pump and pressure regulator are working properly.

(2) Low pressure in all positions indicates a defective pump, a clogged filter, or a stuck pressure regulator valve.

(3) Clutch circuit leaks are indicated if pressures do not fall within the specified pressure range.

(4) If the overdrive clutch pressure is greater than 5 psi in Step 4 of Test Three, a worn reaction shaft seal ring or a defective solenoid assembly is indicated.

(5) If the underdrive clutch pressure is greater than 5 psi in Step 4 of Test 2A, a defective solenoid assembly or TCM is the cause.

CLUTCH AIR PRESSURE TESTS

Inoperative clutches can be located using a series of tests by substituting air pressure for fluid pressure (Fig. 5) (Fig. 6). The clutches may be tested by applying air pressure to their respective passages. The valve body must be removed and Tool 6056 installed. To make air pressure tests, proceed as follows:

NOTE: The compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.

Remove oil pan and valve body. See Valve body removal.

OVERDRIVE CLUTCH

Apply air pressure to the overdrive clutch apply passage and watch for the push/pull piston to move forward. The piston should return to its starting position when the air pressure is removed.

REVERSE CLUTCH

Apply air pressure to the reverse clutch apply passage and watch for the push/pull piston to move rearward. The piston should return to its starting position when the air pressure is removed.

2/4 CLUTCH

Apply air pressure to the feed hole located on the 2/4 clutch retainer. Look in the area where the 2/4 piston contacts the first separator plate and watch carefully for the 2/4 piston to move rearward. The piston should return to its original position after the air pressure is removed.

LOW/REVERSE CLUTCH

Apply air pressure to the low/reverse clutch feed hole (rear of case, between 2 bolt holes). Then, look in the area where the low/reverse piston contacts the first separator plate. Watch carefully for the piston to move forward. The piston should return to its original position after the air pressure is removed.

UNDERDRIVE CLUTCH

Because this clutch piston cannot be seen, its operation is checked by function. Air pressure is applied to the low/reverse and the 2/4 clutches. This locks the output shaft. Use a piece of rubber hose wrapped around the input shaft and a pair of clamp-on pliers to turn the input shaft. Next apply air pressure to the underdrive clutch. The input shaft should not rotate with hand torque. Release the air pressure and confirm that the input shaft will rotate.

FLUID LEAKAGE-TORQUE CONVERTER HOUSING AREA

(1) Check for source of leakage.

(2) Fluid leakage at or around the torque converter area may originate from an engine oil leak. The area should be examined closely. Factory fill fluid is red and, therefore, can be distinguished from engine oil.

(3) Prior to removing the transaxle, perform the following checks:

(4) When leakage is determined to originate from the transaxle, check fluid level prior to removal of the transaxle and torque converter.

(5) High oil level can result in oil leakage out the vent in the manual shaft. If the fluid level is high, adjust to proper level.

(6) After performing this operation, inspect for leakage. If a leak persists, perform the following operation on the vehicle. This will determine if the torque converter or transaxle is leaking.

TORQUE CONVERTER LEAKAGE

Possible sources of torque converter leakage are:

- Torque converter weld leaks at the outside (peripheral) weld.
- Torque converter hub weld.

NOTE: Hub weld is inside and not visible. Do not attempt to repair. Replace torque converter.

NOTE: If the torque converter must be replaced, refer to Torque Converter Clutch Break-in Procedure in this section. This procedure will reset the transmission control module break-in status. Failure to perform this procedure may cause transaxle shutter.

DIAGNOSIS AND TESTING (Continued)

ALL PRESSURE SPECIFICATIONS ARE PSI

(on hoist, with front wheels free to turn)

Gear Selector Position	Actual Gear	PRESSURE TAPS Under-Drive Clutch	Over-Drive Clutch	Reverse Clutch	Torque Converter Clutch Off	2/4 Clutch	Low/ Reverse Clutch
PARK * 0 mph	PARK	0-2	0-5	0-2	60-110	0-2	115-145
REVERSE * 0 mph	REVERSE	0-2	0-7	165-235	50-100	0-2	165-235
NEUTRAL * 0 mph	NEUTRAL	0-2	0-5	0-2	60-110	0-2	115-145
L # 20 mph	FIRST	110-145	0-5	0-2	60-110	0-2	115-145
3 # 30 mph	SECOND	110-145	0-5	0-2	60-110	115-145	0-2
3 # 45 mph	DIRECT	75-95	75-95	0-2	60-90	0-2	0-2
OD # 30 mph	OVERDRIVE	0-2	75-95	0-2	60-90	75-95	0-2
OD # 50 mph	OVERDRIVE WITH TCC	0-2	75-95	0-2	0-5	75-95	0-2

***Engine speed at 1500 rpm**
#CAUTION: Both front wheels must be turning at same speed.

9321-200

Fig. 4 PRESSURE CHECK SPECIFICATIONS

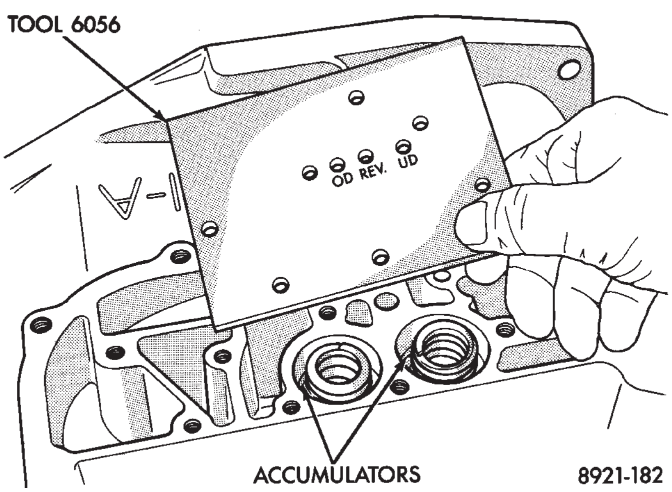


Fig. 5 Air Pressure Test Plate

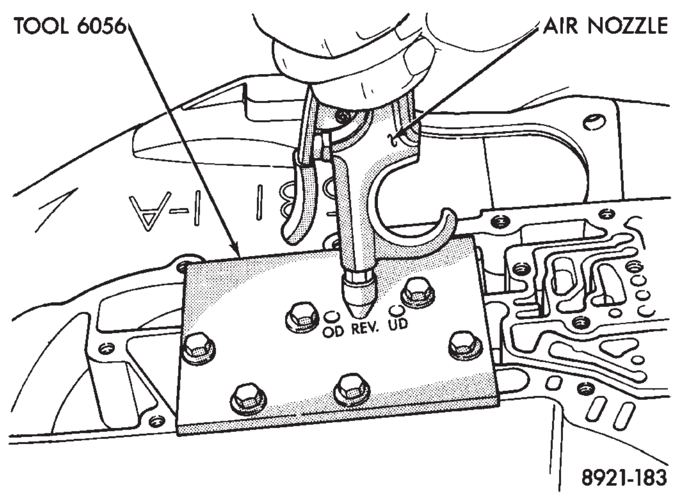


Fig. 6 Testing Reverse Clutch

INTERLOCK SYSTEM OPERATION CHECK

(1) Place shifter in PARK, the Ignition switch should rotate freely from OFF to LOCK position. When the shifter is moved to the DRIVE position the ignition switch should not rotate from OFF to LOCK.

(2) Moving the shifter out of PARK should only be possible when the ignition switch is in the OFF or RUN position. Movement of the shifter from the PARK position should not be possible, when the ignition switch is in the LOCK or ACCESSORY position.

(3) If the Interlock System, operates in any way other than as described above, repair of the Interlock System is required. See Adjustment and Repair procedures, in this section for the required procedures.

SHIFT POSITION INDICATOR

The transmission range sensor (on the valve body) sends a signal to the TCM on the position of the

DIAGNOSIS AND TESTING (Continued)

transaxle manual valve lever. The TCM receives the switch signal and processes the data. The TCM sends the Shift Lever Position (SLP) information to the BCM via the CCD bus. The BCM then outlines the appropriate shifter position indicator in the instrument cluster.

If a problem arises with the shifter position indicator, consult the following chart for diagnostic information. If the malfunction cannot be corrected using the chart, consult the proper diagnostic manual.

To replace the shifter position indicator, refer to Group 8E, Instrument Panel And Gauges.

CONDITION	POSSIBLE CAUSE
ALL PRNO3L DISPLAY LIGHTS "ON" IN P&N GEAR POSITIONS	Check wiring and connectors
	Faulty trans. range sensor
	Faulty manual lever
ALL DISPLAY LIGHTS "ON" IN ALL GEAR POSITIONS	Check wiring & connectors
	Faulty trans. range sensor
	Faulty manual lever
	CCD communication malfunction
ALL DISPLAY LIGHTS "OFF"	Normal transient condition between P&R and R&N gear positions
	Check shift lever linkage
	Body controller malfunction
	Check wiring and connectors
	Faulty cluster
ALL DISPLAY LIGHTS "OFF" ACCOMPANIED BY A "NO BUS" MESSAGE	CCD communication malfunction
DISPLAY LIGHTS OUT OF SEQUENCE WITH SHIFT LEVER	Check wiring and connectors
	Faulty trans. range sensor
	Faulty manual lever
	CCD communication malfunction

AUTOSTICK

The autostick feature will be deactivated if one of the following conditions or Trouble Codes occur:

- DIAGNOSTIC TROUBLE CODE 28–PRNDL Error–usually accompanied by all PRNDL lights turning on in Park and Neutral. This will result in if three such errors are detected after any one "key–on".
- DIAGNOSTIC TROUBLE CODE 70–Autostick Switch Error
- DIAGNOSTIC TROUBLE CODE 71–High Powertrain Temperature–(Transmission oil temperature >280° F) or (Engine coolant temperature >255° F).

Autostick will be reactivated when the condition that caused deactivation no longer exists (The Diagnostic Trouble Codes may remain in memory up to 75 starts after the fault was initially set). The following conditions must be met to reactivate Autostick after a high temperature fault:

- Acceptable Powertrain Temperature=(Transmission Oil Temperature <265° F) and (Engine Coolant Temperature <240° F).

SERVICE PROCEDURES

FLUID AND FILTER CHANGE

When the factory fill fluid is changed, only fluids labeled MOPAR® ATF PLUS (Automatic Transmission fluid) Type 7176 should be used. A filter change should be made at the time of the oil change. Also the magnet (on the inside of the oil pan) should be cleaned with a clean, dry cloth.

If the transaxle is disassembled for any reason, the fluid and filter should be changed.

FLUID DRAIN, REFILL AND LEVEL CHECK

DRAIN AND REFILL

(1) Raise vehicle on a hoist (See Group 0, Lubrication). Place a drain container with a large opening, under transaxle oil pan.

(2) Loosen pan bolts and tap the pan at one corner to break it loose allowing fluid to drain, then remove the oil pan.

(3) Install a new filter and O-ring on bottom of the valve body.

(4) Clean the oil pan and magnet. Reinstall pan using new MOPAR® RTV sealant. Tighten oil pan bolts to 19 N·m (165 in. lbs.).

(5) Pour four quarts of MOPAR® ATF PLUS (Automatic Transmission Fluid) Type 7176 through the fill tube.

(6) Start engine and allow to idle for at least one minute. Then, with parking and service brakes applied, move selector lever momentarily to each position, ending in the park or neutral position.

SERVICE PROCEDURES (Continued)

(7) Add sufficient fluid to bring level to 1/8 inch below the ADD mark.

CAUTION: Do not overfill transaxle. Do not add oil if level is between: Lower holes for warm oil (100°F). Upper holes for hot oil (180°F).

(8) Recheck fluid level after transaxle is at normal operating temperature. The level should be in the HOT region (Fig. 7).

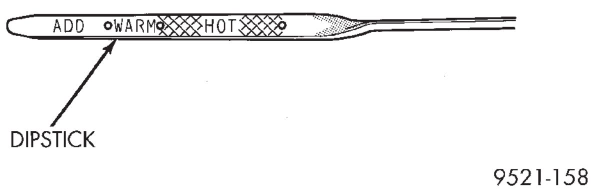


Fig. 7 Oil Level Indicator

(9) To prevent dirt from entering transaxle, make certain that dipstick is seated into the dipstick fill tube (Fig. 8).

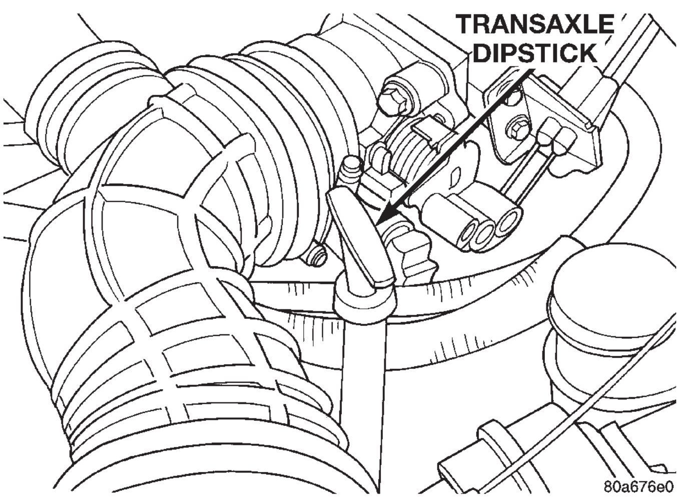


Fig. 8 Oil Level Indicator Location

FLUID LEVEL CHECK

NOTE: Engine and Transaxle should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.
(2) Hook up DRBIII scan tool and select transmission.
(3) Select sensors.
(4) Read the transmission temperature value.
(5) Compare the fluid temperature value with the chart.
(6) Adjust transmission fluid level shown on the dipstick according to the chart.
(7) Check transmission for leaks.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transaxle case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

FLUSHING COOLERS AND TUBES

When a transaxle failure has contaminated the fluid, the oil cooler(s) must be flushed. The cooler bypass valve in the transaxle must be replaced also. The torque converter must also be replaced with an exchange unit. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transaxle.

There are two different procedures for flushing coolers and lines. The recommended procedure is to use Tool 6906 Cooler Flusher. The other procedure is to use a hand suction gun and mineral spirits.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.

KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.

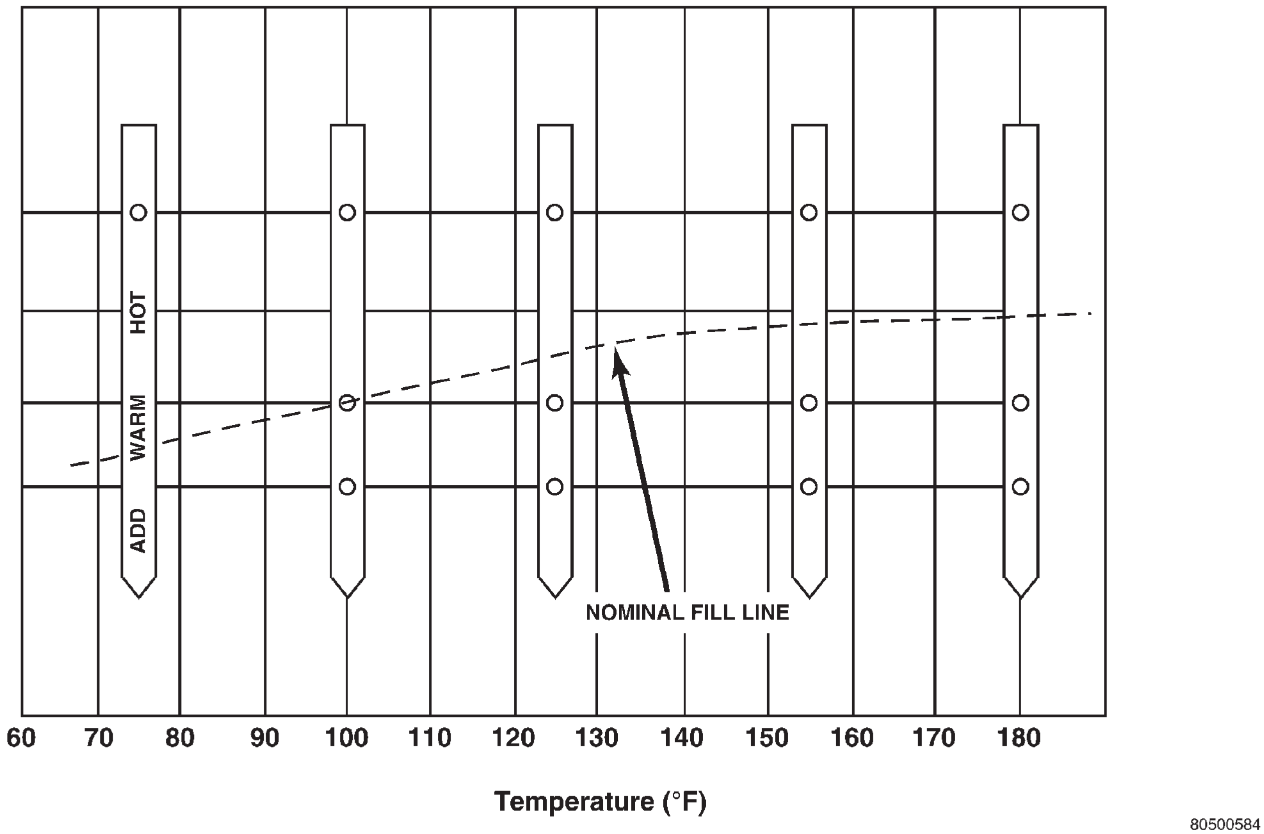
KEEP THE AREA WELL VENTILATED.

DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

COOLER FLUSH USING TOOL 6906

(1) Remove cover plate filler plug on Tool 6906. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.
(2) Reinstall filler plug on Tool 6906.

SERVICE PROCEDURES (Continued)



Transmission Fluid Temperature Chart

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission (Fig. 9).

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Turn pump ON for two to three minutes to flush cooler(s) and lines. Monitor pressure readings and clear return lines. Pressure readings should stabilize below 20 psi. for vehicles equipped with a single cooler and 30 psi. for vehicles equipped with dual coolers. If flow is intermittent or exceeds these pressures, replace cooler.

(8) Turn pump OFF.

(9) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(10) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(11) Place CLEAR suction line into a one quart container of Mopar® type 7176 automatic transmission fluid.

(12) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(13) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

COOLER FLUSH USING SUCTION GUN AND MINERAL SPIRITS

(1) Disconnect the cooler lines at the transmission.

(2) Using a hand suction gun filled with mineral spirits, reverse flush the cooler. Force mineral spirits into the **From Cooler** line of the cooler (Fig. 9) and catch the exiting spirits from the **To Cooler** line. Observe for the presence of debris in the exiting fluid. Continue until fluid exiting is clear and free from debris.

(3) Using compressed air (under 40 psi.) in intermittent spurts, blow any remaining mineral spirits from the cooler, again in the reverse direction.

(4) Pump one (1) quart of automatic transmission fluid through the cooler before reconnecting.

SERVICE PROCEDURES (Continued)

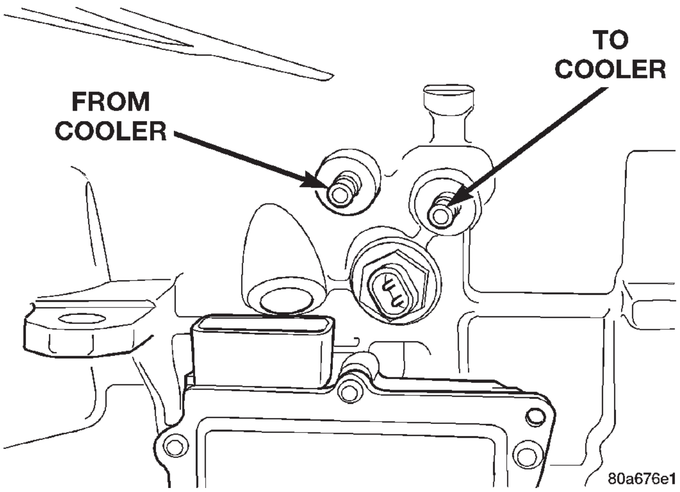


Fig. 9 Cooler Line Location

(5) If at any stage of the cleaning process, the cooler does not freely pass fluid, the cooler must be replaced.

OIL COOLER FLOW CHECK

After the new or repaired transmission has been installed, fill to the proper level with Mopar ATF Plus (Type 7176) automatic transmission fluid. The flow should be checked using the following procedure:

(1) Disconnect the **From cooler** line at the transmission and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed** , with the shift selector in neutral.

(3) If fluid flow is intermittent or it takes more than 20 seconds to collect one quart of ATF, replace the cooler.

(4) If flow is found to be within acceptable limits, reconnect the cooler line. Then fill transmission to the proper level, using the approved type of automatic transmission fluid.

TRANSAXLE QUICK LEARN PROCEDURE

The quick learn procedure requires the use of the DRB scan tool and the DRB scan tool cartridge.

This program allows the electronic transaxle system to recalibrate itself. This will provide the best possible transaxle operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transaxle Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, follow the instructions from the DRB scan tool.

PINION FACTOR PROCEDURE

The vehicle speed readings for the speedometer are taken from the output speed sensor. The TCM must be calibrated to the different combinations of equipment available. A procedure has been developed called Pinion Factor. It allows the technician to set the Transmission Control Module initial setting so that the speedometer readings will be correct.

Failure to perform this procedure will cause a No Speedometer Operation condition.

This procedure must be performed if the Transmission Control Module has been replaced.

To properly read or reset the Pinion Factor, it is necessary to use a DRB scan tool. Perform the following steps with the DRB scan tool to read or reset the Pinion Factor:

(1) Plug the DRB scan tool into the blue CCD Bus connector. The connector is located under the instrument panel on the drivers side of the vehicle.

(2) Insert the DRB scan tool cartridge into the DRB scan tool.

(3) The red and green lights on the DRB scan tool will light up and then begin flashing. Wait until the lights stop flashing before continuing with this procedure.

(4) Press the number 4 key (Select System) on the DRB scan tool key pad. Item number 4 will not appear on the DRB scan tool screen unless you scroll down. It is not necessary to scroll down to be able to choose item 4.

(5) Press the number 2 on the DRB scan tool key pad (Transmission).

(6) Press the number 1 on the DRB scan tool key pad. Wait for the DRB scan tool to perform the following three tests before continuing.

- Bus Test
- Initialize
- Transmission Control Module Part Number

(7) Press the number 5 on the DRB scan tool key pad (Adjustments).

(8) Press the number 2 on the DRB scan tool key pad (Pinion Factor). Then follow the instructions on the DRB scan tool screen.

REMOVAL AND INSTALLATION

GEARSHIFT CABLE

REMOVAL

(1) Disconnect battery negative cable at left strut tower.

(2) Remove air cleaner assembly.

REMOVAL AND INSTALLATION (Continued)

(3) Remove battery positive cable.

(4) Remove Transmission Control Module (TCM) connector. Remove TCM.

(5) Pull Power Distribution Center (PDC) up and out of the way.

(6) Using a pry tool, pry up on cable at manual valve lever and remove cable from lever.

(7) Remove the screw from the cable bracket at the transaxle.

(8) Remove the gearshift knob set screw and knob.

(9) Remove the rear half of the floor console. Refer to Group 23, Body.

(10) Remove the front half of the floor console. Refer to Group 23, Body.

(11) Using a flat blade pry tool, remove the shifter cable core end from the shift lever pin.

(12) Using a flat blade pry tool, pry the cable conduit clip up from the shifter bracket. Pull up on the cable conduit and remove from bracket.

(13) Hoist vehicle. Refer to Group 0, Lubrication and Maintenance.

(14) Remove the cable grommet from the floor pan area.

(15) Carefully remove the cable from the underbody by unfolding the cable retainer clip as you go along.

INSTALLATION

(1) To install gearshift cable, reverse removal procedure. refer to Gearshift Cable Adjustment for adjustment procedure.

GEARSHIFT MECHANISM

REMOVAL

(1) Disconnect battery and isolate cable.

(2) Remove the gearshift knob set screw and knob.

(3) Remove console assembly. Refer to Group 23, Body.

(4) Using a flat blade pry tool, remove the shifter cable end from the gearshift pin.

(5) Pry the cable retaining clip up and off of the gearshift mechanism. Remove the gearshift cable from the gearshift mechanism.

(6) Pry up the adjuster lock on the shifter/ignition interlock cable. Unsnap the shifter/ignition interlock cable end fitting from the groove in the gearshift mechanism. Remove the cable core end from the plastic cam of the shifter mechanism.

(7) Remove the nuts at the base of the gearshift mechanism (Fig. 10). Remove the shifter mechanism.

INSTALLATION

(1) For installation, reverse removal steps. Tighten the nuts at the base of the gearshift mechanism to 17 N·m (150 in. lbs.). Refer to Cable Adjustment for proper cable adjustment procedures.

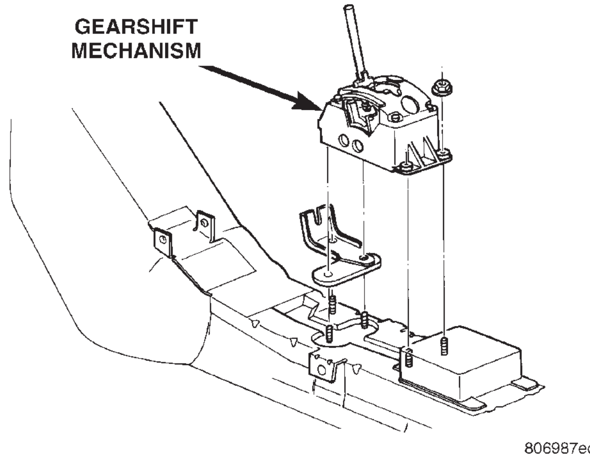


Fig. 10 Gearshift Mechanism

AUTOSTICK

The autostick switch mechanism is incorporated into the gearshift mechanism. If the switch needs to be replaced, the gearshift mechanism must be replaced. To replace the autostick switch, refer to Gearshift Mechanism Replacement in this section.

SHIFTER IGNITION INTERLOCK CABLE

REMOVAL

(1) Disconnect and isolate, the battery negative (-) cable at the left side strut tower.

(2) Remove the gearshift knob set screw and knob.

(3) Remove console assembly. Refer to Group 23, Body.

(4) Unsnap the shifter/ignition interlock cable end fitting from the groove in the gearshift mechanism (Fig. 11).

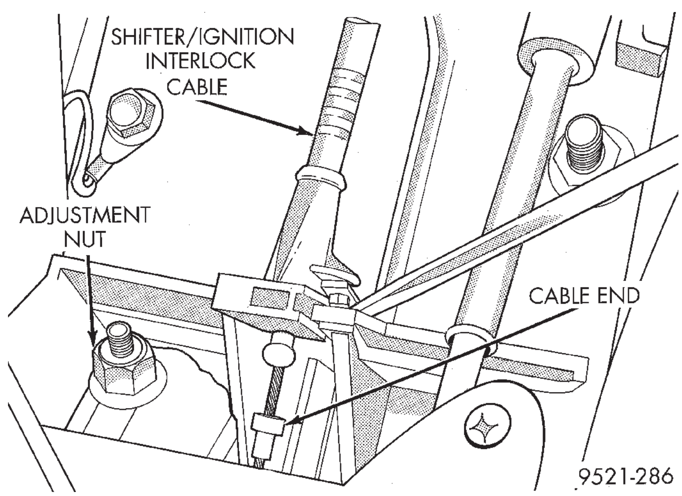


Fig. 11 Shifter/Ignition Interlock Cable

(5) Remove the cable core end from the plastic cam of the shifter mechanism.

REMOVAL AND INSTALLATION (Continued)

(6) Pull cable up and out of the gearshift mechanism.

(7) Remove fuse panel cover from left end of instrument panel. Remove screw holding end of instrument panel top cover (Fig. 12).

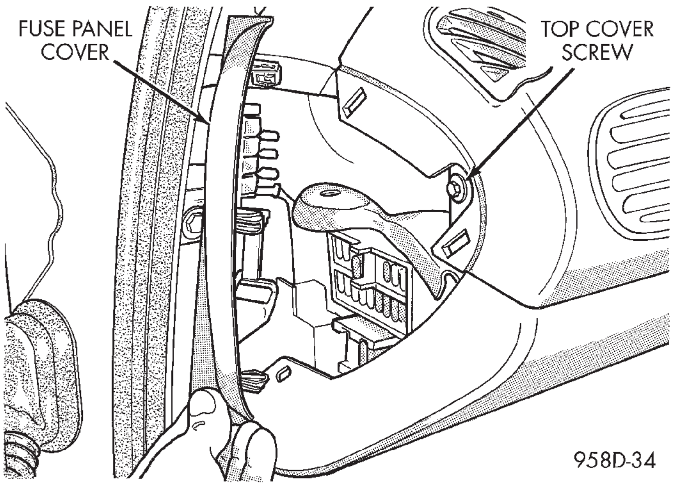


Fig. 12 Instrument Panel Top Cover–Left Side

(8) Pull center bezel off (Fig. 13).

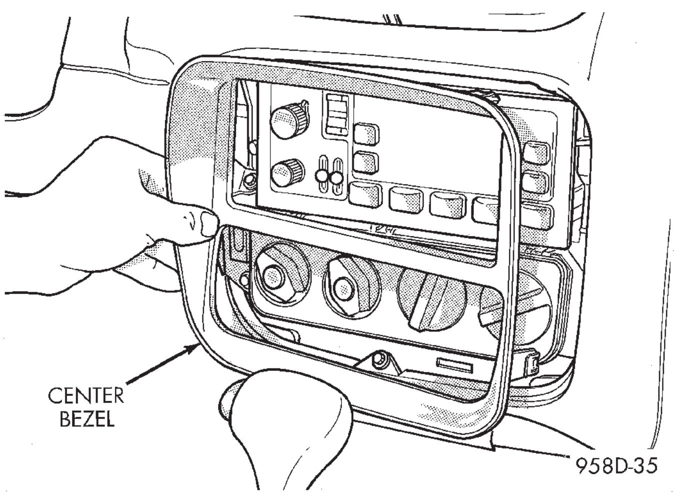


Fig. 13 Center Bezel

(9) Remove screws holding instrument panel top cover to center of instrument panel (Fig. 14).

(10) Pull instrument panel top cover up enough to gain access to knee bolster screws (Fig. 15).

(11) Remove lower knee bolster screws and knee bolster.

(12) Remove screws from lower steering column shroud (Fig. 16).

(13) Pull lower shroud to clear ignition cylinder (Fig. 17).

(14) Hold tilt wheel lever down and slide lower shroud forward to remove it from column (Fig. 18).

(15) Tilt wheel to full down position and remove upper steering column shroud.

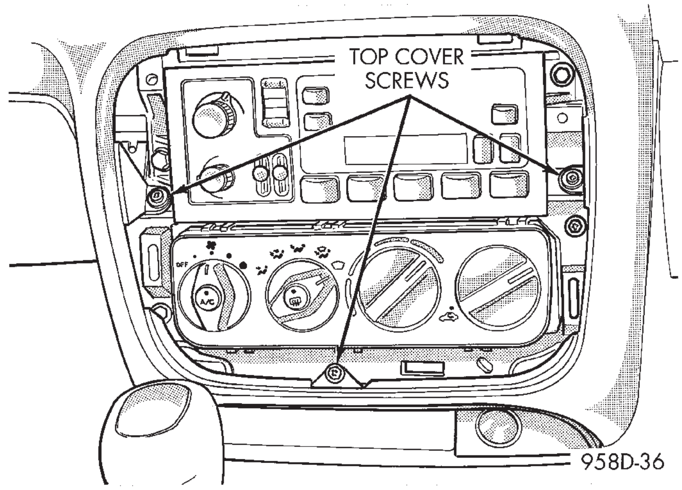


Fig. 14 Instrument Panel Top Cover–Center

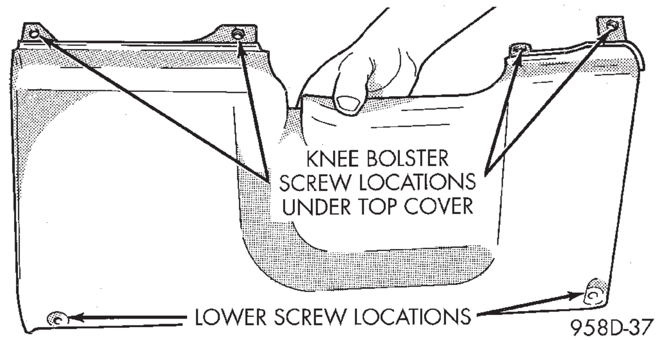


Fig. 15 Knee Bolster Attaching Points

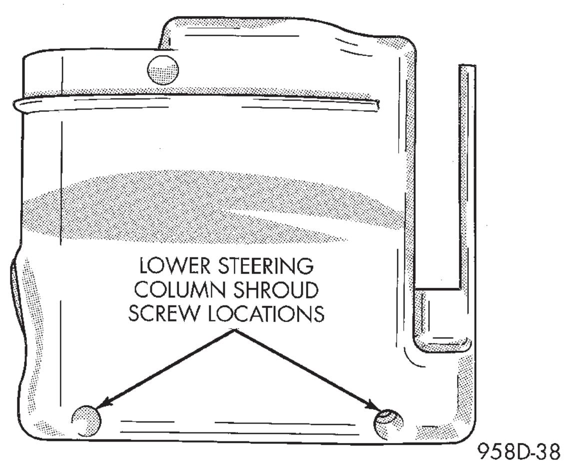


Fig. 16 Lower Steering Column Shroud Screw Locations

(16) Verify vehicle ignition is on. Grasp the interlock cable clip and connector. Remove the cable from the interlock housing (Fig. 19).

(17) Unclip the cable retaining clip located along the cable housing.

REMOVAL AND INSTALLATION (Continued)

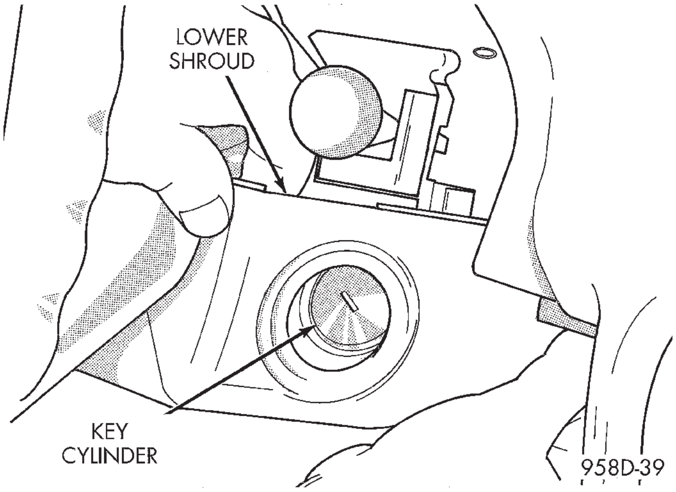


Fig. 17 Remove Lower Shroud From Ignition Cylinder

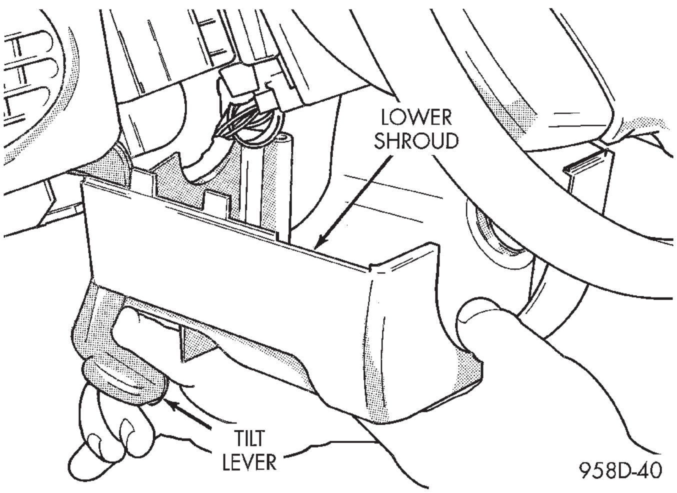


Fig. 18 Lower Shroud Removal

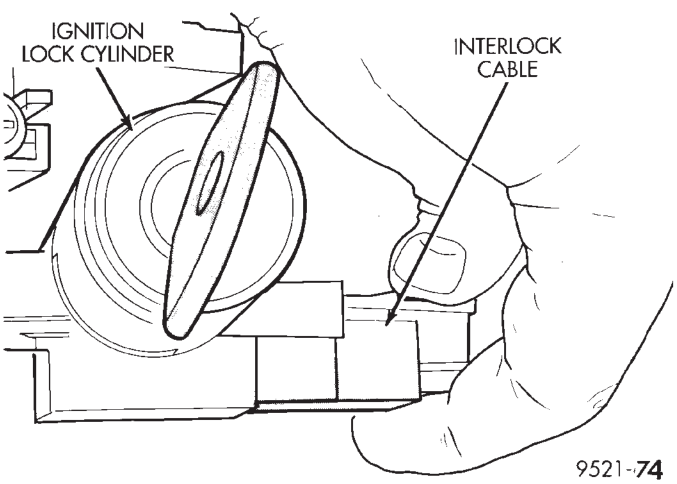


Fig. 19 Interlock Cable and Connector

(18) Remove interlock cable from underside of instrument panel.

INSTALLATION

CAUTION: When installing interlock cable assembly, care must be taken not to bend exposed cable wire and slug at shifter end of cable.

(1) Route interlock cable into lower dash panel.

(2) Turn the ignition switch to the RUN position.

(3) Install the interlock cable into the interlock housing at the steering column (Fig. 20). Verify the cable snaps into the housing.

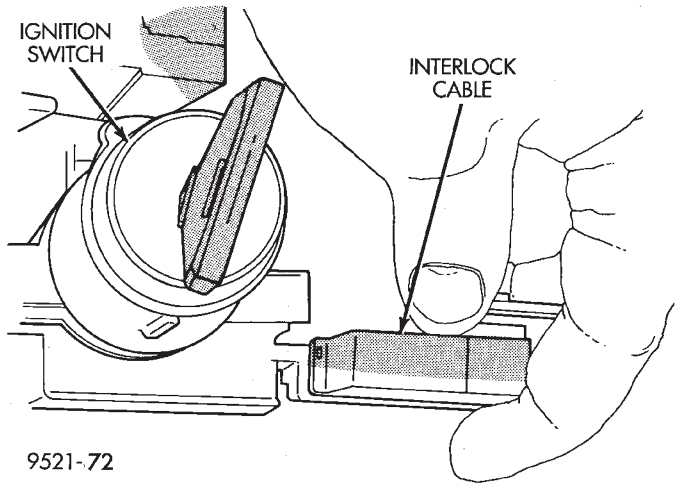


Fig. 20 Interlock Cable At Housing

(4) Install interlock cable into routing clip located along cable housing.

(5) Route interlock cable to the console.

(6) Install the cable core end to the plastic cam of the shifter mechanism. Snap the shifter/ignition interlock cable end fitting into the groove in the gearshift mechanism.

(7) Adjust the Shifter/Ignition Interlock System. See Interlock System Adjustment, in this section of service manual.

(8) Perform the Shifter/Ignition Interlock System operation check, as described in the beginning of this section.

(9) Install console assembly. Refer to Group 23, Body.

(10) Install the gearshift knob set screw and knob.

(11) Tilt wheel to full down position and install upper steering column shroud.

(12) Hold tilt wheel lever down and slide lower shroud in at column.

(13) Install screws at lower steering column shroud.

(14) Install lower knee bolster screws and knee bolster.

(15) Install screws holding instrument panel top cover to center of instrument panel.

(16) Install center bezel.

REMOVAL AND INSTALLATION (Continued)

(17) Install screw holding end of instrument panel top cover. Install fuse panel cover from left end of instrument panel.

(18) Reconnect the battery negative (-) cable to the vehicle battery.

INTERLOCK MECHANISM

REMOVAL

(1) Remove the lower column covers, knee bolster and shrouds. Refer to Interlock Cable Replacement.

(2) Grasp the interlock cable and connector firmly. Remove the interlock cable.

(3) Remove the two interlock mechanism to steering column attaching screws (Fig. 21). Remove the interlock housing.

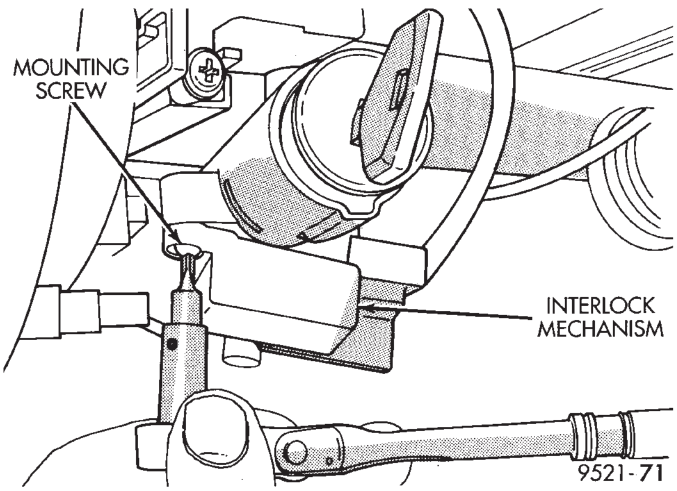


Fig. 21 Interlock Mechanism

INSTALLATION

(1) Position the interlock housing at steering column. Install the two interlock mechanism to steering column attaching screws. Torque screws to 3 N·m (21 in. lbs.).

(2) Snap the interlock cable into the housing.

(3) Install the lower column covers, shrouds and knee bolster. Refer to Interlock Cable Replacement.

MANUAL VALVE LEVER (SHIFT LEVER)

REMOVAL

(1) Remove shift cable from lever.

(2) Loosen the lever mounting bolt. Do not remove bolt (not necessary).

(3) Pull up on lever and remove.

INSTALLATION

(1) For installation, reverse removal procedure.

SOLENOID ASSEMBLY-REPLACE

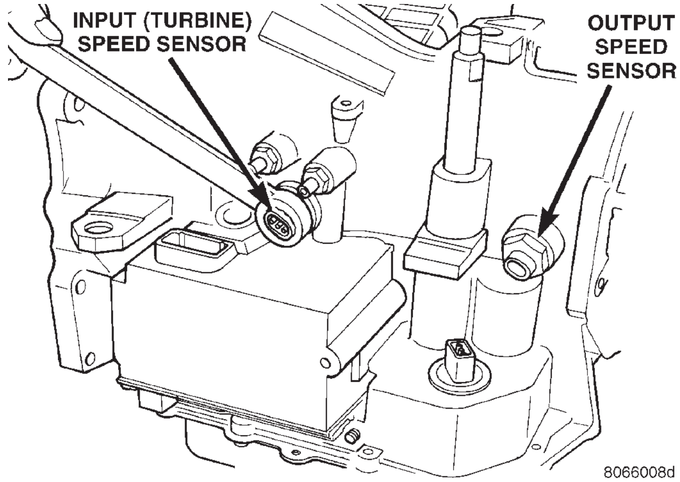


Fig. 22 Input Speed Sensor

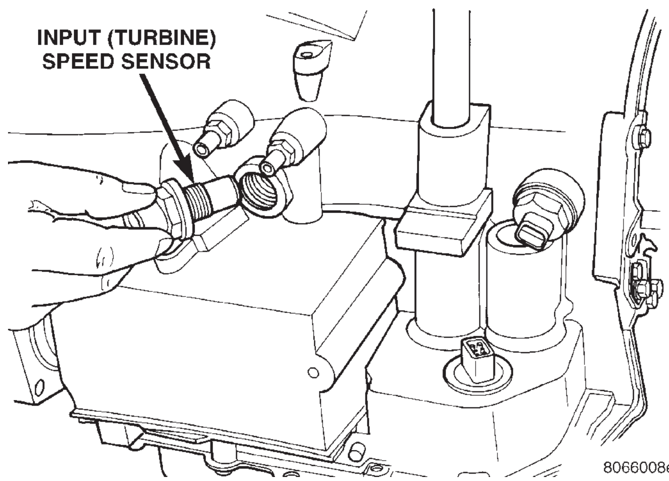


Fig. 23 Input Speed Sensor Removed

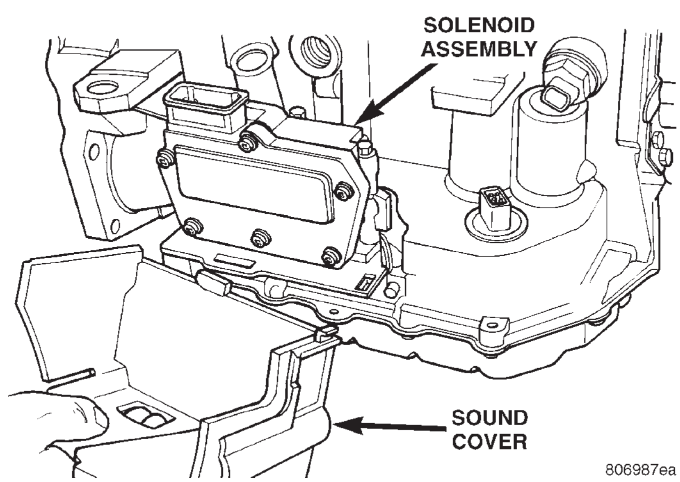


Fig. 24 Sound Cover

REMOVAL AND INSTALLATION (Continued)

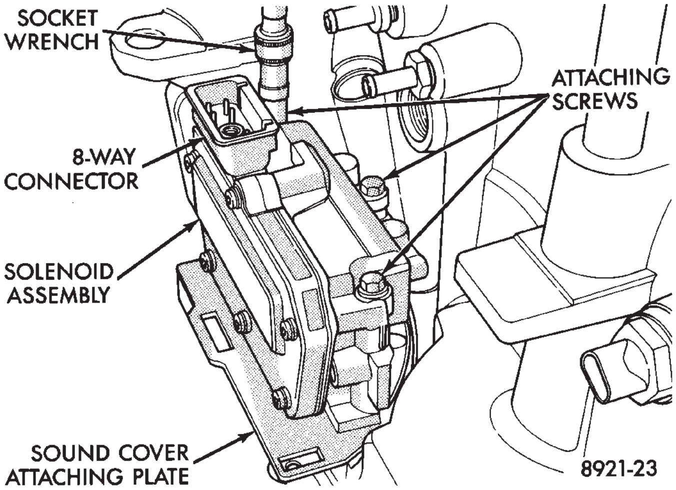


Fig. 25 Attaching Screws

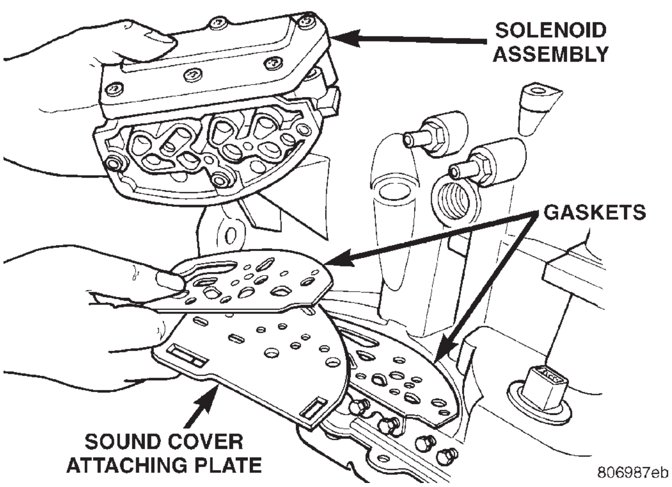


Fig. 26 Solenoid Assembly

TRANSMISSION RANGE SENSOR

The transmission range sensor is located within the transaxle. To remove the TRS the transaxle oil pan and valve body must be removed.

REMOVAL

(1) Disconnect battery negative cable.

(2) Remove engine air cleaner and tube.

(3) Remove gearshift cable.

(4) Remove manual valve lever.

(5) Disconnect transmission range sensor connector.

(6) Hoist vehicle.

(7) Carefully remove transaxle oil pan and drain fluid.

(8) Remove transaxle oil filter. Let transaxle oil drain fully.

(9) Remove valve body retaining bolts.

(10) Extract park rod from guide bracket and remove valve body from transaxle.

(11) Place valve body on workbench (Fig. 27).

(12) Remove TRS retaining screw (Fig. 28).

(13) Remove manual shaft seal (Fig. 29).

(14) Slide Transmission Range Sensor up the manual shaft and remove (Fig. 30).

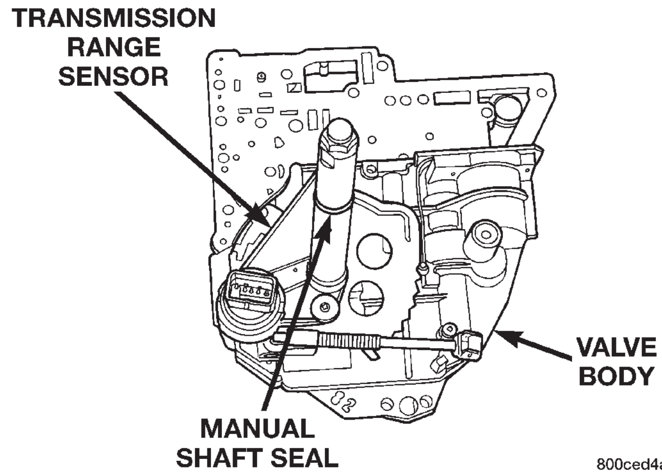


Fig. 27 Valve Body W/TRS

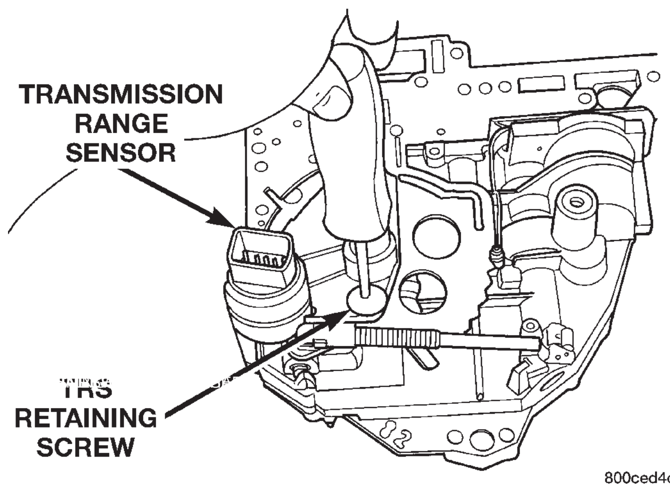


Fig. 28 Remove Retaining Screw

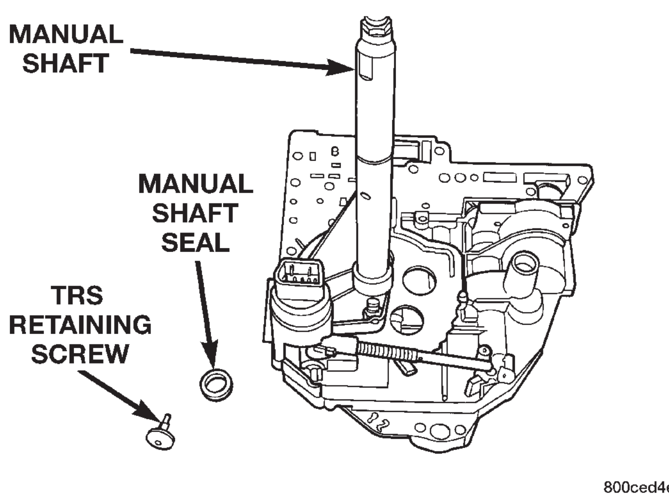


Fig. 29 Remove Manual Shaft Seal

REMOVAL AND INSTALLATION (Continued)

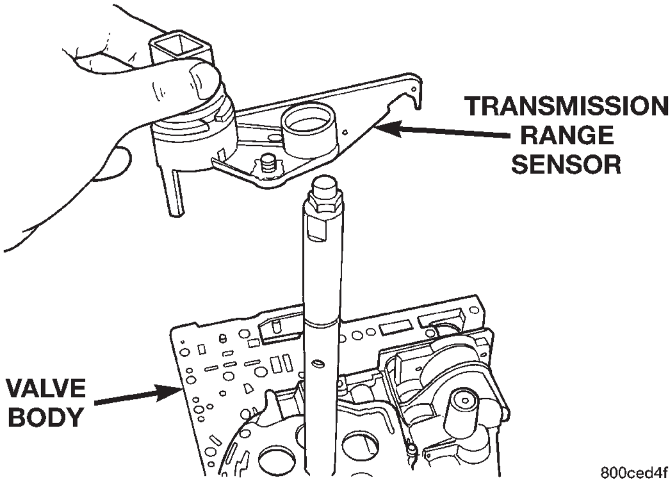


Fig. 30 Remove Transmission Range Sensor

INSTALLATION

(1) For installation, reverse removal procedure. Tighten TRS retaining screw to 5 N·m (45 in. lbs.) Reseal transaxle oil pan using RTV.

SPEED SENSOR-INPUT

CAUTION: When disconnecting speed sensor connector, be sure that the weather seal does not fall off or remain in old sensor.

The input speed sensor is located to the left of the manual shift lever (Fig. 31).

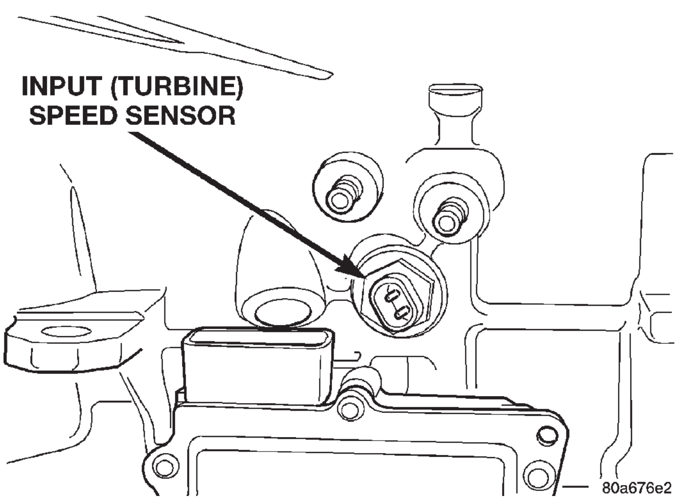


Fig. 31 Input (Turbine) Speed Sensor

SPEED SENSOR-OUTPUT

CAUTION: When disconnecting speed sensor connector, be sure that the weather seal does not fall off or remain in old sensor.

The output speed sensor is located to the right of the manual shift lever (Fig. 32).

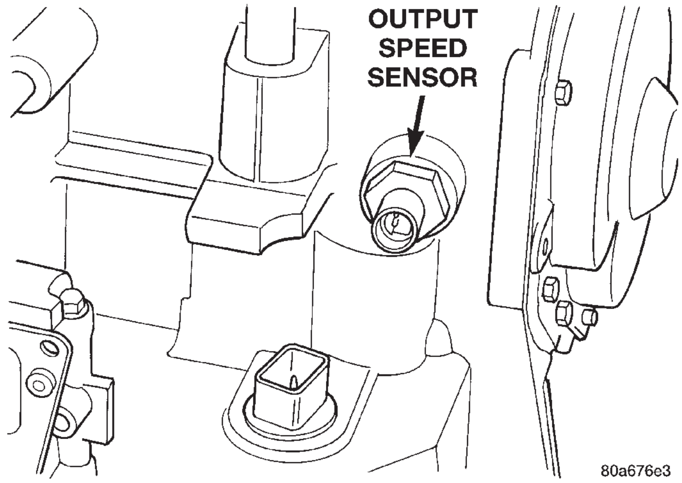


Fig. 32 Output Speed Sensor

TRANSMISSION CONTROL MODULE

Do not interchange transmission control modules with previous year transmission control modules. If a same year TCM is being used from a different vehicle, the following procedures must be performed:

- Quick Learn Procedure
- Torque Converter Clutch Break-in Procedure
- Electronic Pinion Procedure

The transmission control module is next to the battery on the left side of vehicle, in the engine compartment. It is held in place by three mounting screws.

NOTE: If the transmission control module has been replaced, the following procedures must be performed:

- Quick Learn Procedure: This procedure will allow the transmission control module to learn the characteristics of the vehicle.
- Electronic Pinion Factor Procedure: This procedure will reprogram the TCM to compensate for different tire sizes and final drive ratios.
- Converter Clutch Break-In Procedure: This procedure will reset the torque converter clutch status.

2.4 LITER ENGINE

REMOVAL

(1) Disconnect battery negative cable at the left strut tower.
(2) Remove air cleaner clamps and air cleaner.
(3) Remove TCM 60 way connector.
(4) Remove three mounting screws.
(5) Remove TCM (Fig. 33).

INSTALLATION

(1) For installation, reverse removal procedure.

REMOVAL AND INSTALLATION (Continued)

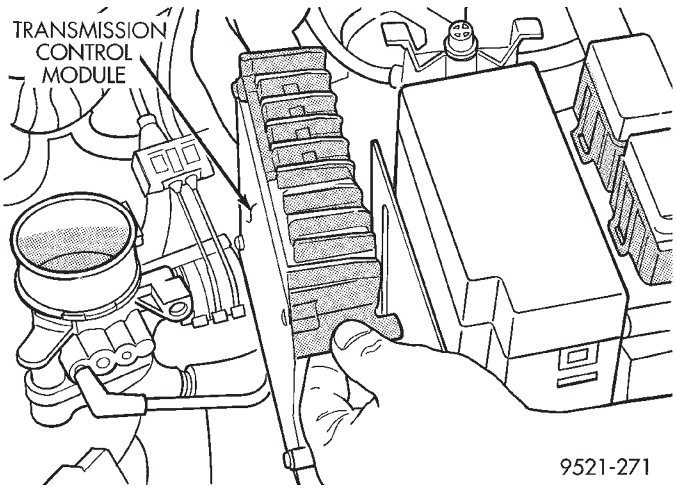


Fig. 33 Transmission Control Module

2.5 LITER ENGINE

REMOVAL

(1) Disconnect battery negative cable at the left strut tower.
(2) Remove TCM 60 way connector.
(3) Remove three mounting screws.
(4) Remove TCM.

INSTALLATION

(1) For installation, reverse removal procedure.

VALVE BODY

REMOVAL

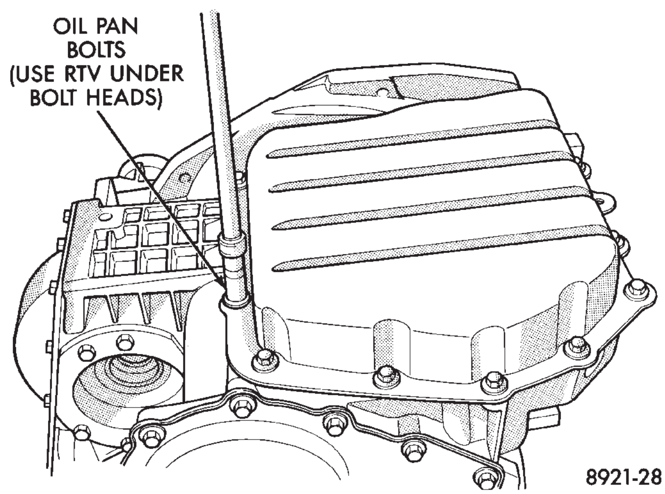


Fig. 34 Oil Pan Bolts

INSTALLATION

To install valve body, reverse removal procedure

CAUTION: The valve body manual shaft pilot may distort and bind the manual valve if the valve body is mishandled or dropped.

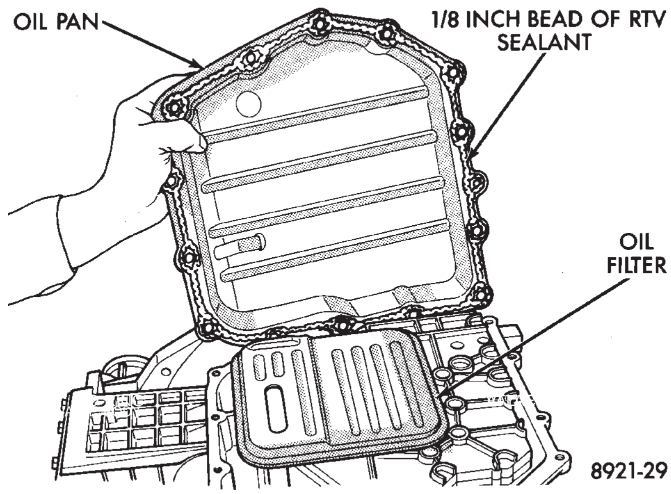


Fig. 35 Oil Pan

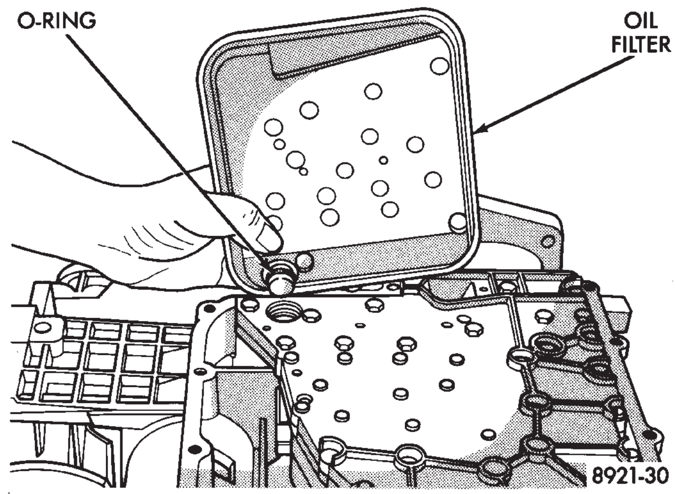


Fig. 36 Oil Filter

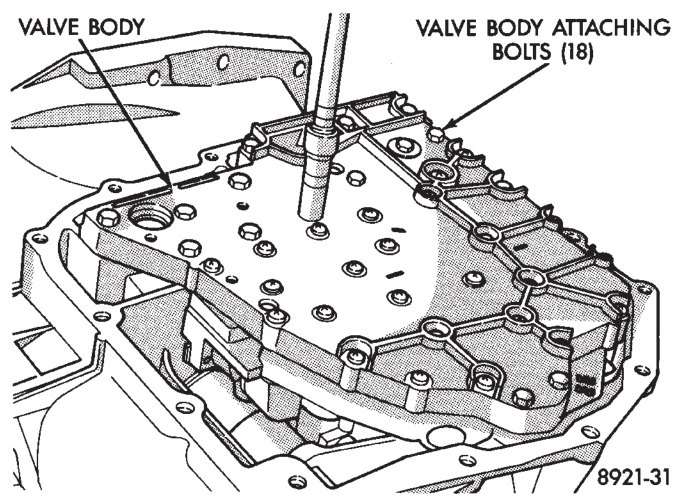


Fig. 37 Valve Body Attaching Bolts

When installing valve body assembly onto transaxle, observe (Fig. 38). Guide park rod rollers into

REMOVAL AND INSTALLATION (Continued)

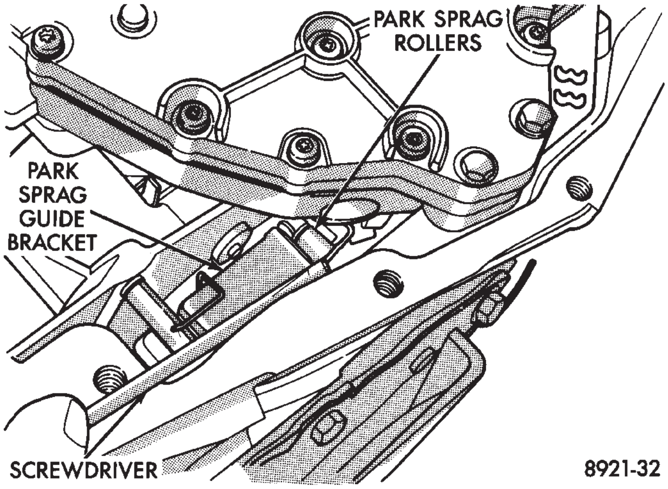


Fig. 38 Push Park Rod Rollers from Guide Bracket

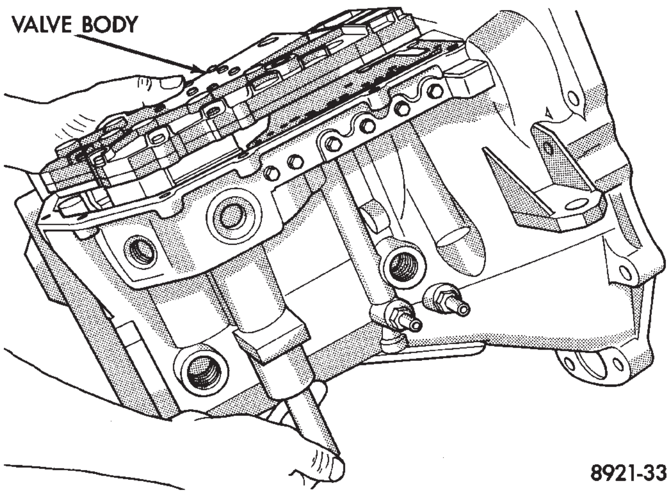


Fig. 39 Remove Valve Body

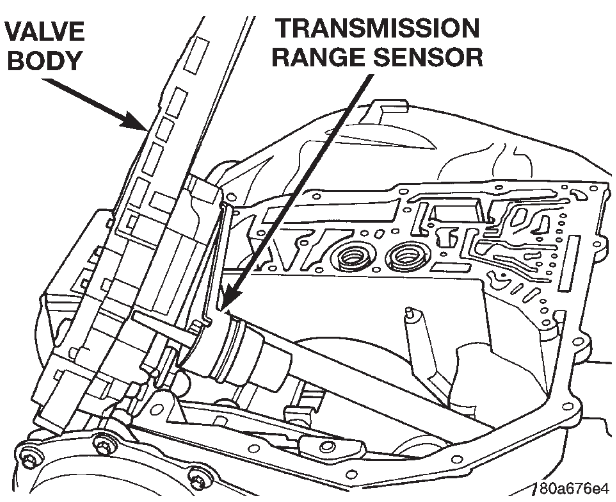


Fig. 40 Valve Body Removed

guide bracket, while shifting manual lever assembly out of the installation position.

TRANSAXLE

REMOVAL

Transaxle removal does NOT require engine removal.

The transaxle and torque converter must be removed as an assembly; otherwise, the torque converter drive plate, pump bushing or oil seal may be damaged. The drive plate will not support a load; therefore, none of the weight of the transaxle should be allowed to rest on the drive plate during removal.

(1) Disconnect battery negative cable at left strut tower (Fig. 41).

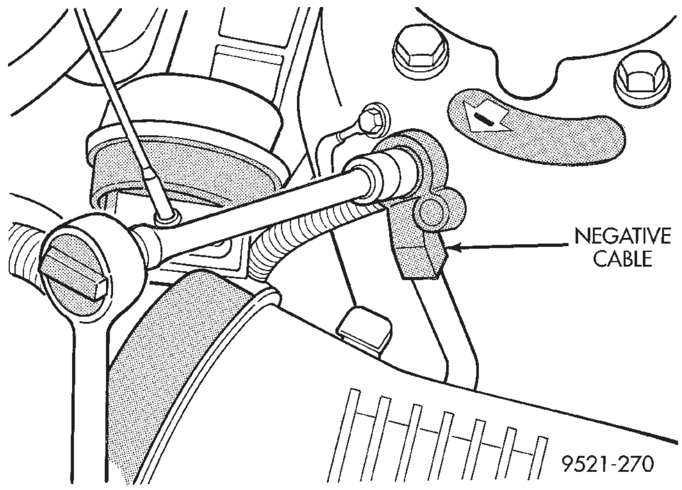


Fig. 41 Negative Cable

(2) Remove air cleaner duct.

(3) Remove transmission control module (TCM) and wiring (Fig. 42).

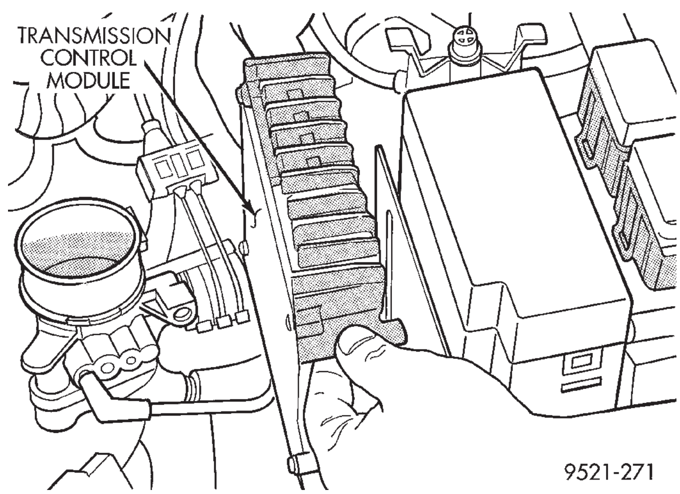


Fig. 42 Transmission Control Module

REMOVAL AND INSTALLATION (Continued)

(4) Remove solenoid pack connector (Fig. 43).

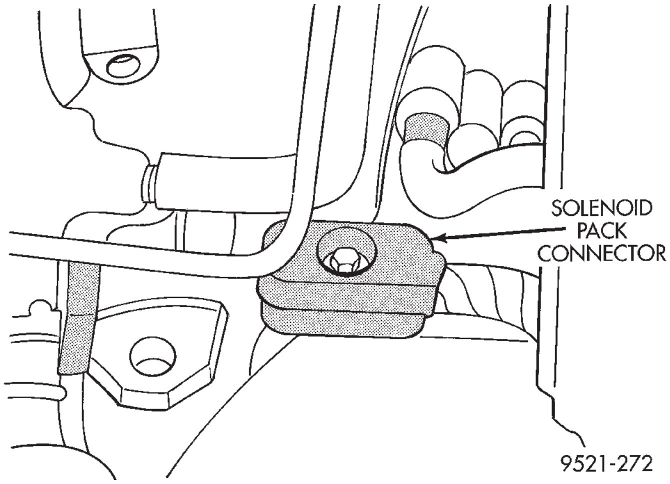


Fig. 43 Solenoid Pack Connector

(5) Remove dipstick tube.
(6) Remove transaxle cooler lines (Fig. 44).

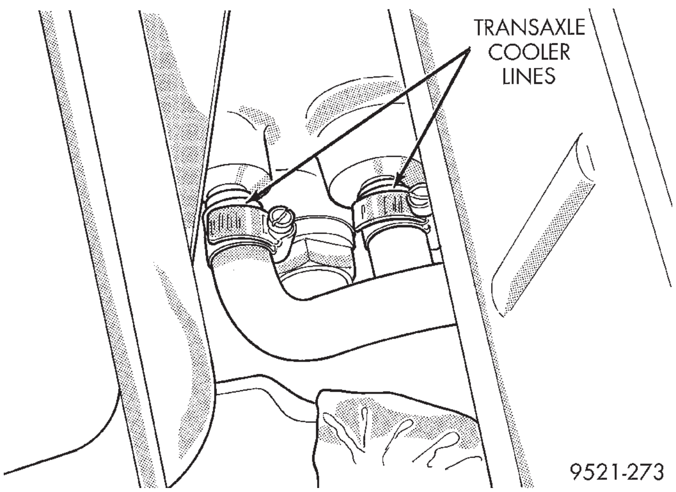


Fig. 44 Transaxle Cooler Lines

(7) Remove shift cable at lever and at clamp on transaxle (Fig. 45) (Fig. 46).

(8) Install engine support fixture and support engine (Fig. 47).

(9) Remove left upper transaxle mount top bolts (Fig. 48).

(10) Raise vehicle. Remove front wheels. Refer to Group 2, Suspension to remove wheel hub nuts and both drive shafts.

(11) Remove left and right side lower splash shields (Fig. 49).

CAUTION: The exhaust flex joint must be disconnected from the exhaust manifold anytime the engine is lowered. If the engine is lowered while the flex pipe is attached, damage will occur.

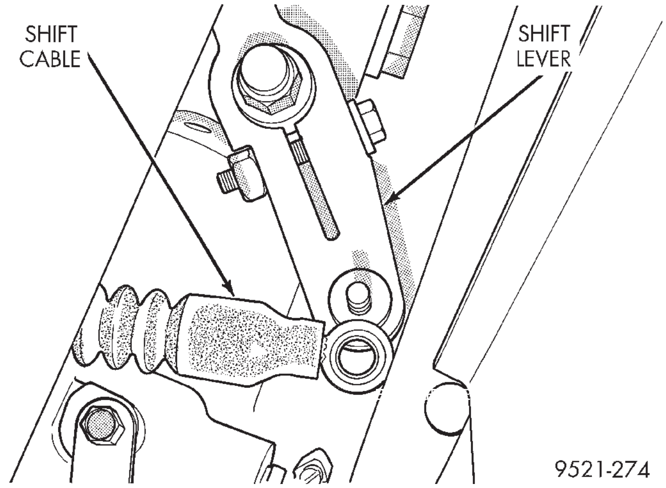


Fig. 45 Shift Cable at Lever

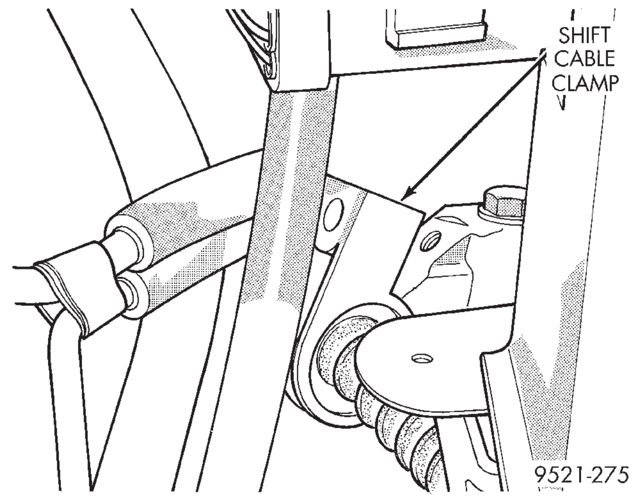


Fig. 46 Shift Cable Clamp

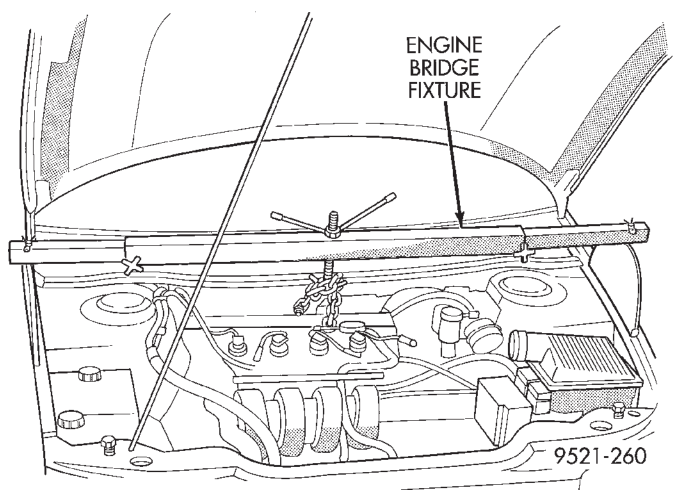


Fig. 47 Engine Support Fixture (Typical)

(12) Remove bolts securing exhaust flex joint to exhaust manifold. Disconnect exhaust pipe from manifold.

REMOVAL AND INSTALLATION (Continued)

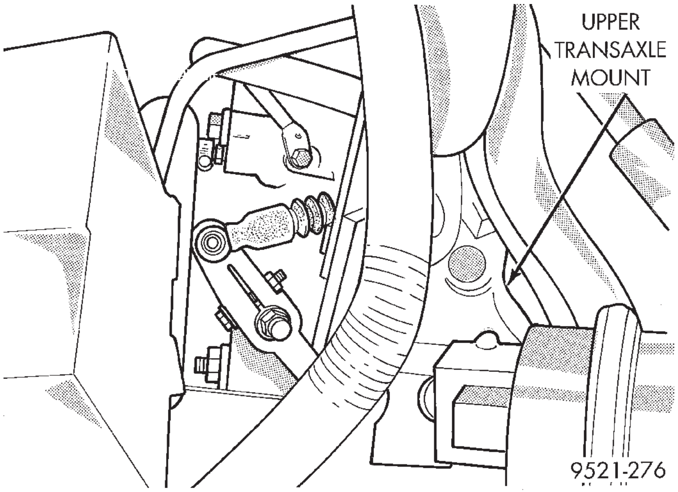


Fig. 48 Upper Transaxle Mount

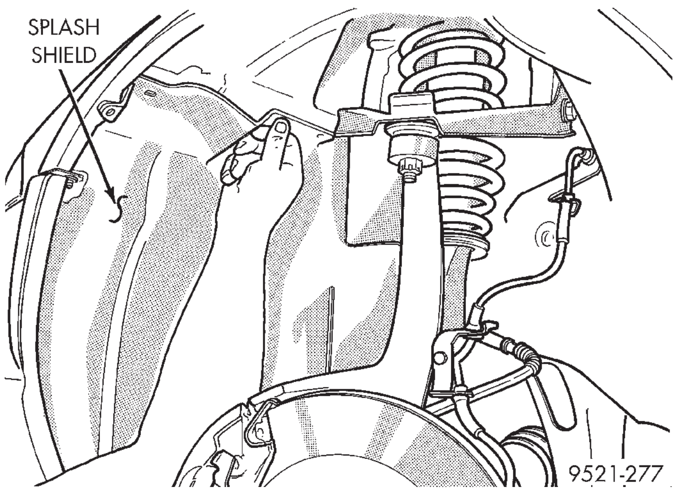


Fig. 49 Lower Splash Shields

(13) Remove remaining left upper mount bolts (Fig. 50).

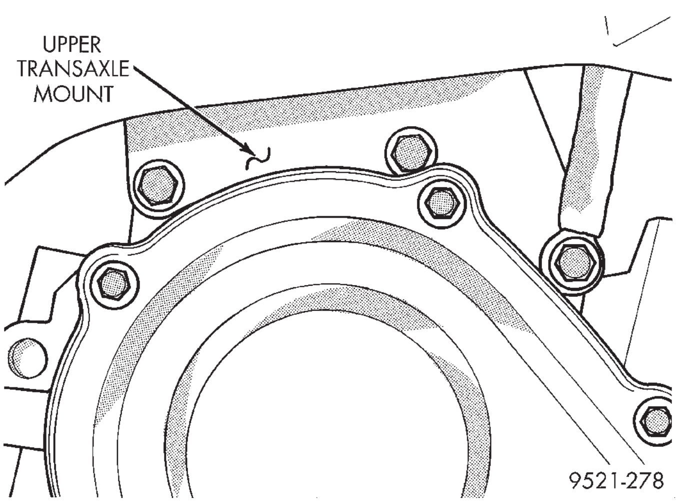


Fig. 50 Left Mount Bolts

(14) Remove engine oil filter.

(15) Remove starter and wiring (Fig. 51).

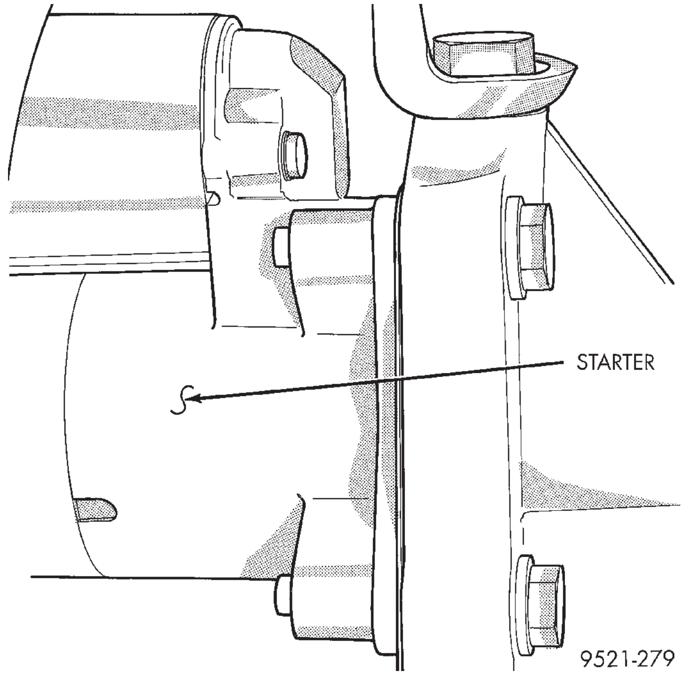


Fig. 51 Starter

(16) Remove front motor mount bracket.

(17) Remove rear mount bracket through-bolt.

(18) Remove center member bolts.

(19) Remove rear mount bracket bolts, and remove rear mount bracket.

(20) Remove radiator lower crossmember.

(21) Remove lateral bending strut brackets (front and rear).

NOTE: The 2.4 liter engine has an oil pan collar bracket attached to the transaxle bell housing. Refer to Group 9–Engine, for the proper Removal and Installation procedure.

(22) Remove flex plate cover.

(23) Rotate engine clockwise to line up converter bolts (Fig. 52). Remove converter bolts (Fig. 53). Mark converter for reassembly ease .

(24) Remove crank position sensor (if equipped).

(25) Remove transaxle wiring.

(26) Loosen right side steering gear bolts. Loosen right side K-frame bolts.

(27) Remove left side steering gear bolts. Remove left side K-frame bolts (Fig. 54).

(28) Remove sway bar mounts (Fig. 55).

(29) Position transmission jack under transaxle and support with safety chain (Fig. 56).

(30) Remove upper and lower transaxle bell housing bolts.

(31) Move K-frame rearward and carefully lower the transaxle assembly from vehicle.

REMOVAL AND INSTALLATION (Continued)

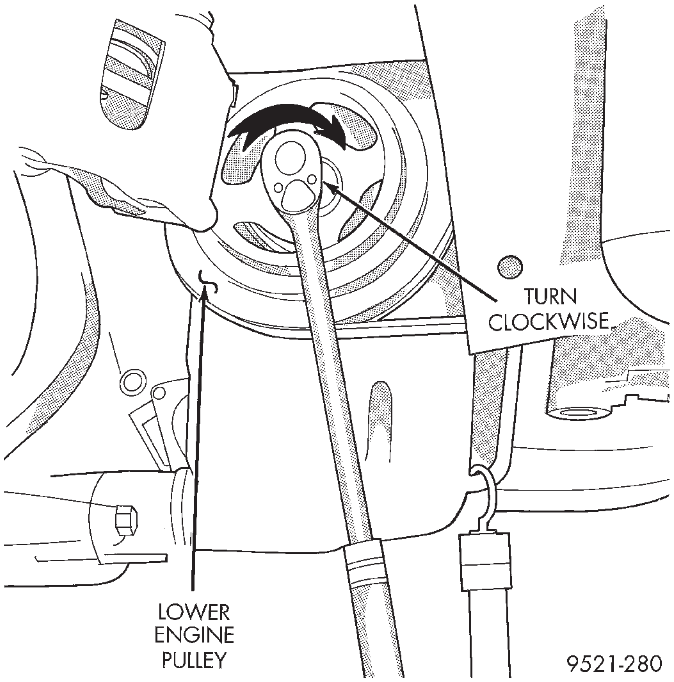


Fig. 52 Rotate Engine Clockwise

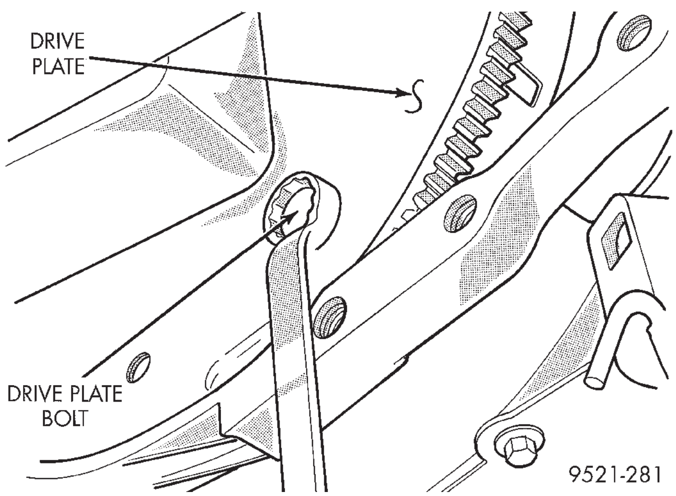


Fig. 53 Converter Bolts

INSTALLATION

(1) For installation of transaxle, reverse the above procedure.

NOTE: If the torque converter has been replaced, refer to Torque Converter Clutch Break-in Procedure in this section. This procedure will reset the transmission control module break-in status. Failure to perform this procedure may cause transaxle shutter.

(2) Check and/or adjust gear shift cable.

(3) Refill transaxle with MOPAR® ATF PLUS (Automatic Transmission Fluid) Type 7176.

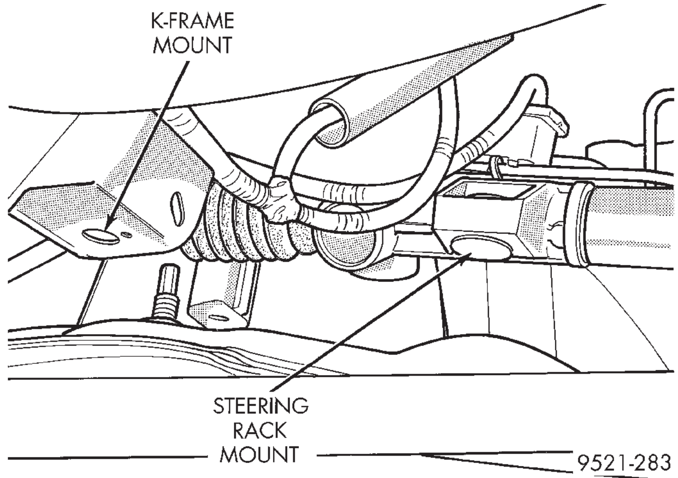


Fig. 54 Steering Gear and K-frame Bolts

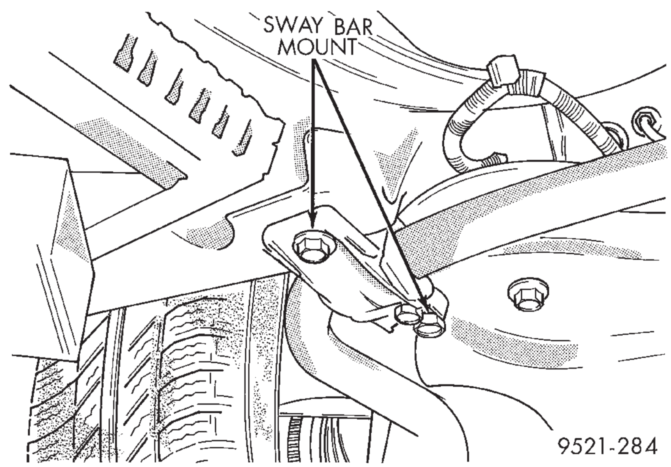


Fig. 55 Sway Bar Mounts

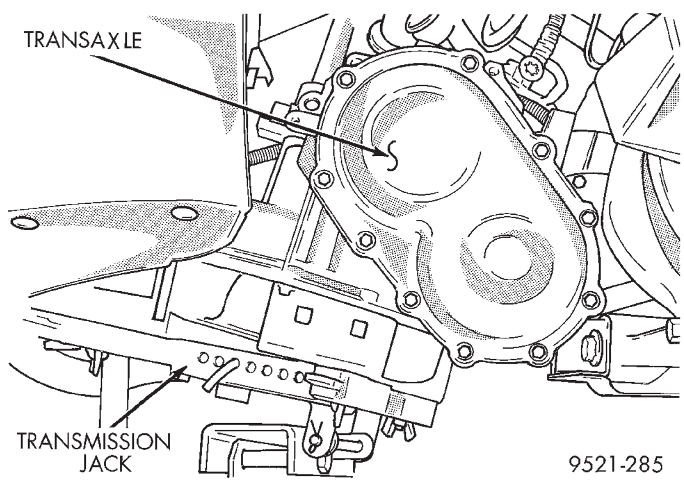


Fig. 56 Transmission Jack

REMOVAL AND INSTALLATION (Continued)

OIL PUMP SEAL

REMOVAL

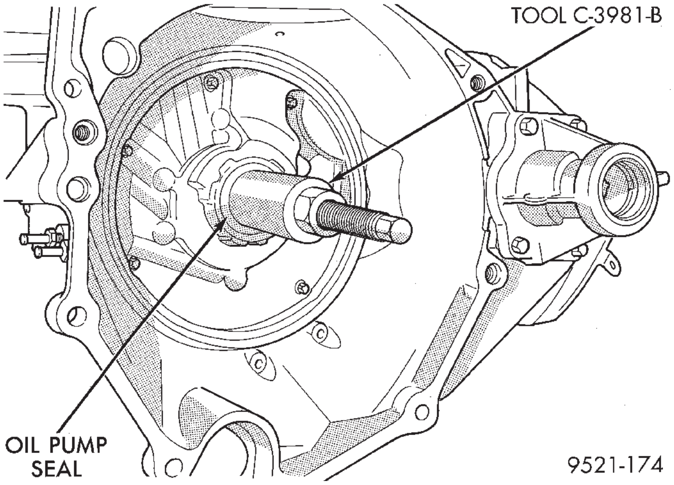


Fig. 57 Remove Oil Pump Seal

INSTALLATION

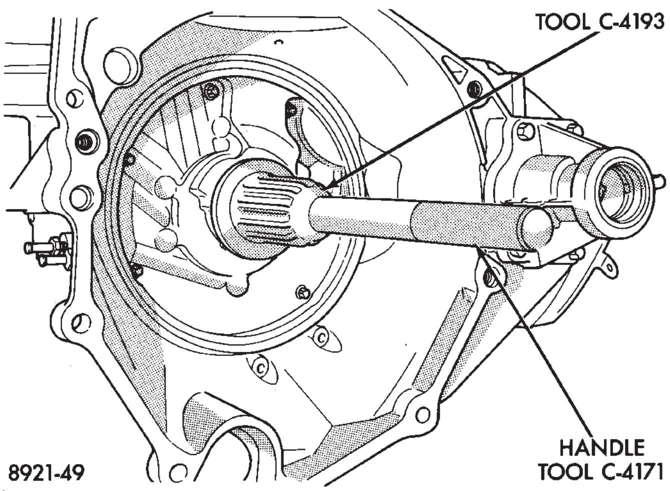


Fig. 58 Install Oil Pump Seal

DISASSEMBLY AND ASSEMBLY

VALVE BODY RECONDITION

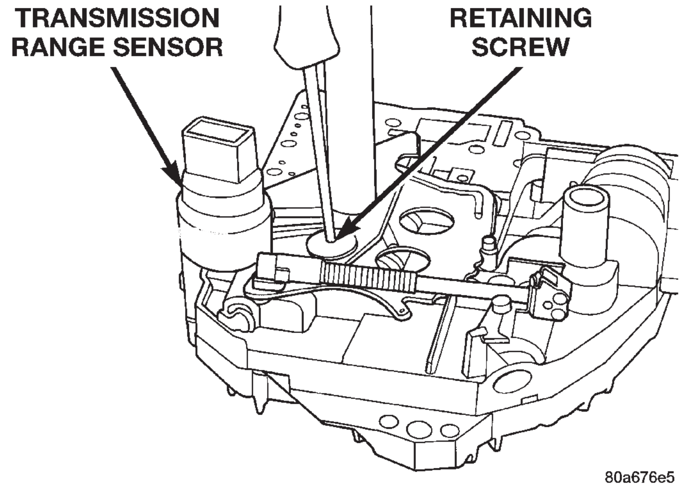


Fig. 59 Transmission Range Sensor Screw

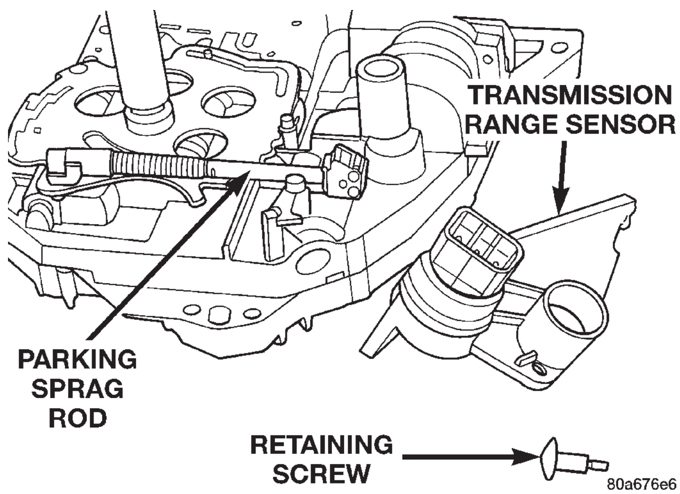


Fig. 60 Transmission Range Sensor Removed

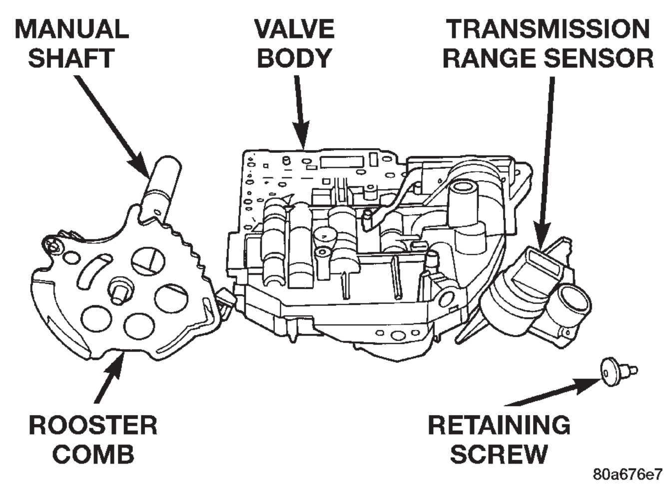


Fig. 61 Manual Shaft and Rooster Comb

DISASSEMBLY AND ASSEMBLY (Continued)

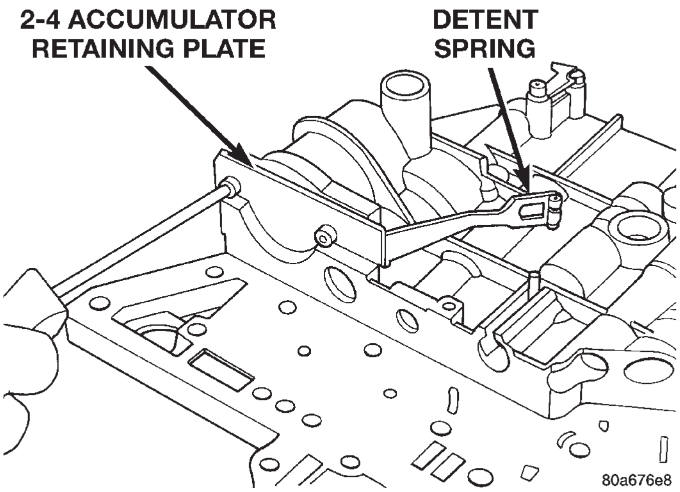


Fig. 62 2-4 Accumulator Plate

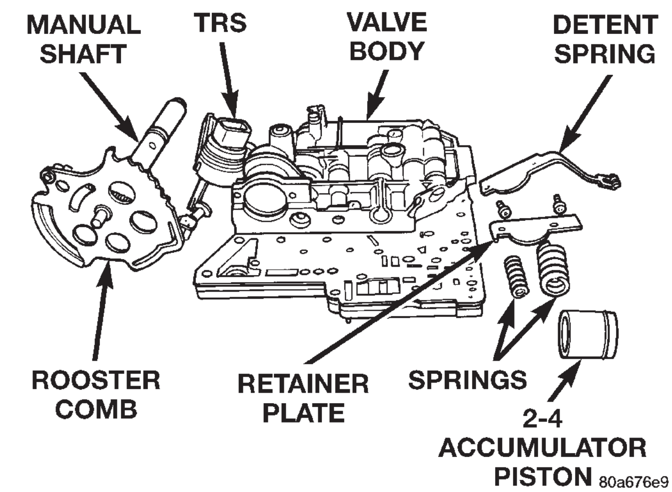


Fig. 63 TRS, Manual Shaft, and 2-4 Accumulator

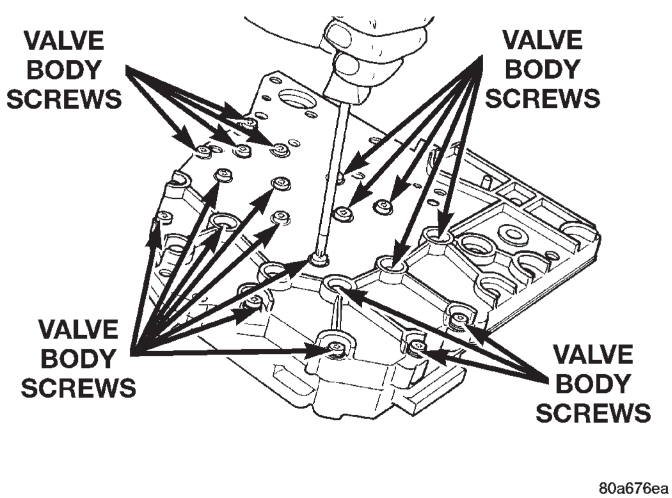


Fig. 64 Valve Body Screws

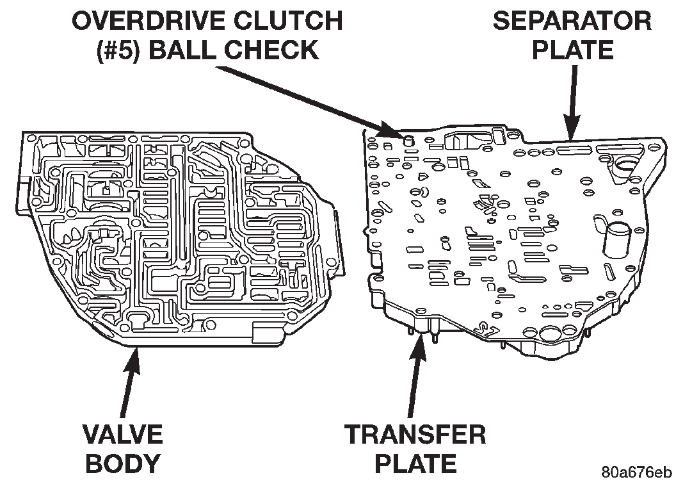


Fig. 65 Valve Body and Transfer Plate

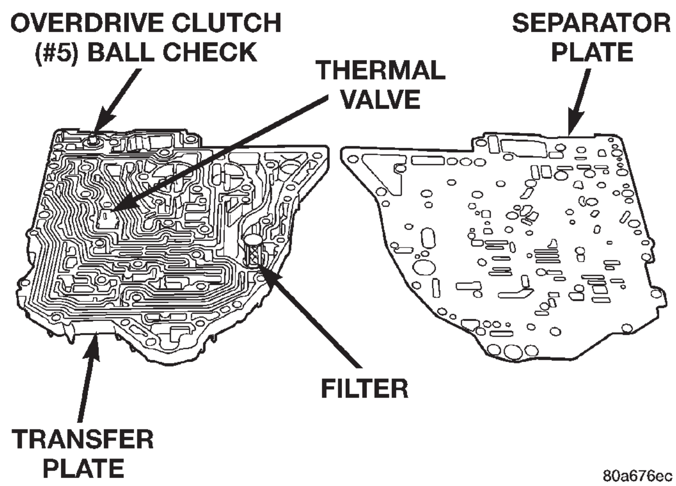


Fig. 66 Transfer Plate and Separator Plate

DISASSEMBLY AND ASSEMBLY (Continued)

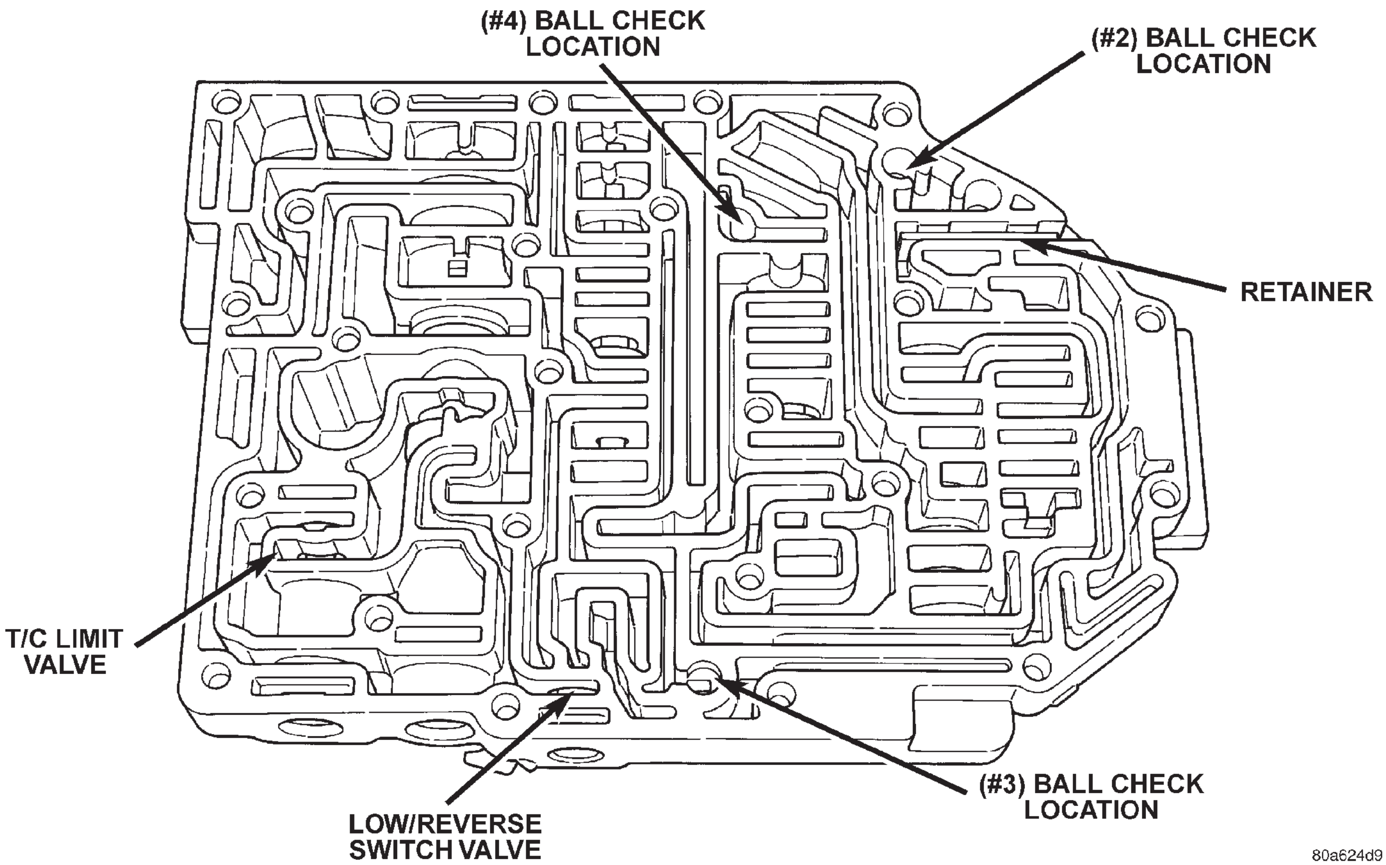


Fig. 67 Ball Check Location

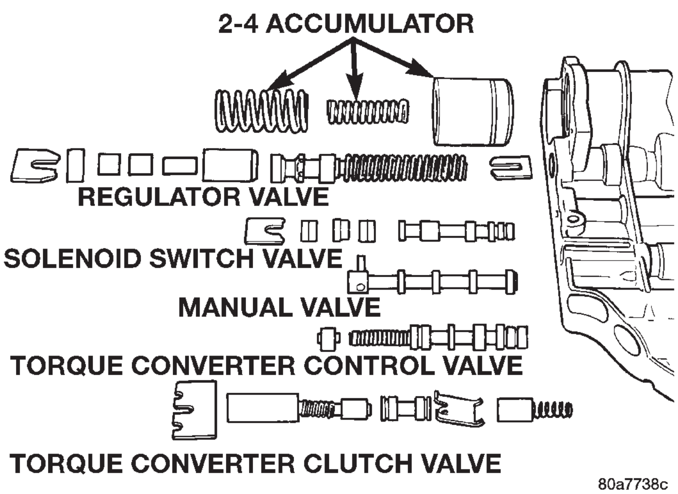


Fig. 68 Springs and Valves Location

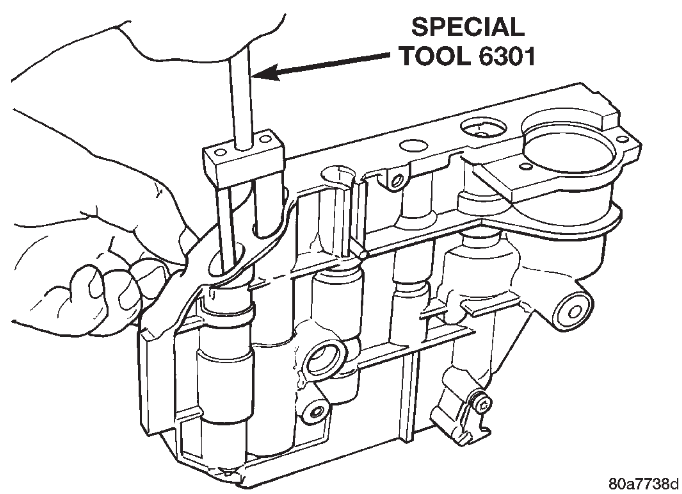


Fig. 69 Remove or Install Dual Retainer Plate

DISASSEMBLY AND ASSEMBLY (Continued)

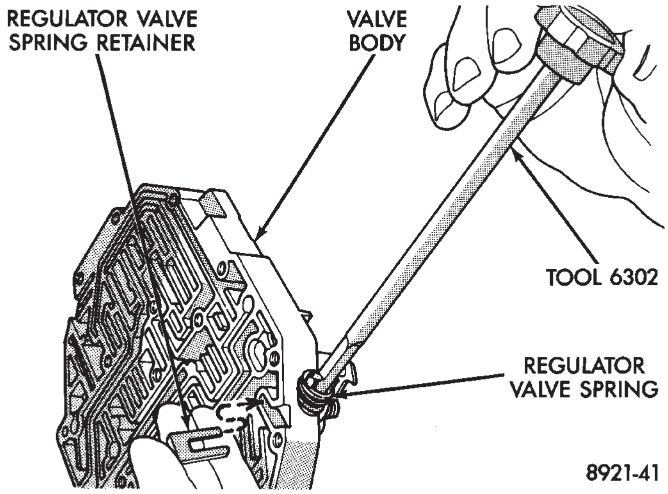


Fig. 70 Remove or Install Retainer Plate

TRANSAXLE RECONDITION

NOTE: Tag all clutch pack assemblies, as they are removed, for reassembly identification.

CAUTION: Do not intermix clutch discs or plates as the unit might then fail.

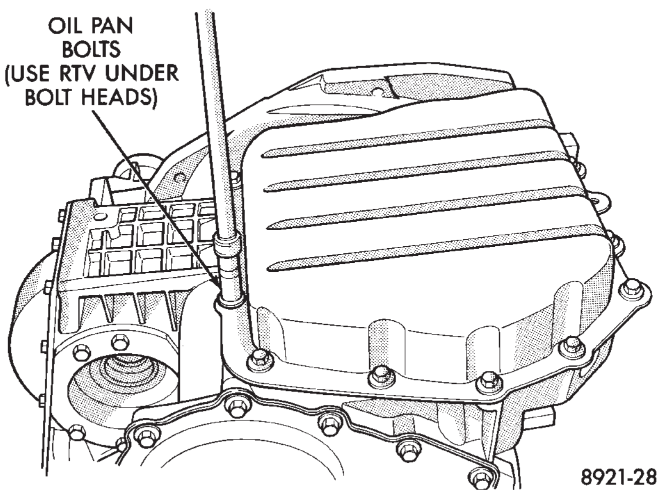


Fig. 71 Oil Pan Bolts

Measuring input shaft end play before disassembly will usually indicate when a #4 thrust plate change is required. The #4 thrust plate is located behind the overdrive clutch hub.

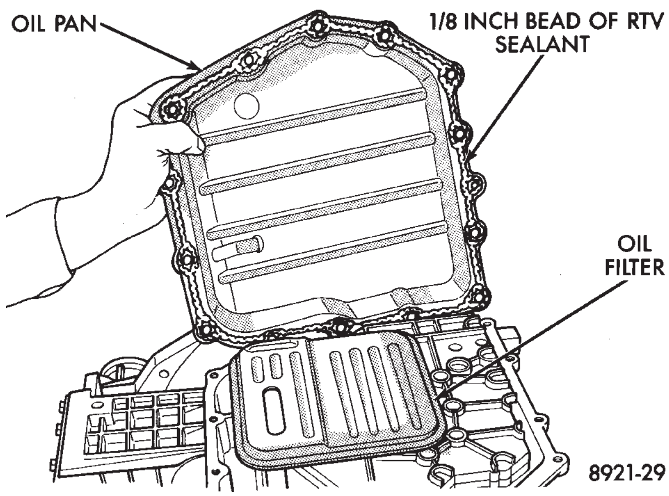


Fig. 72 Oil Pan

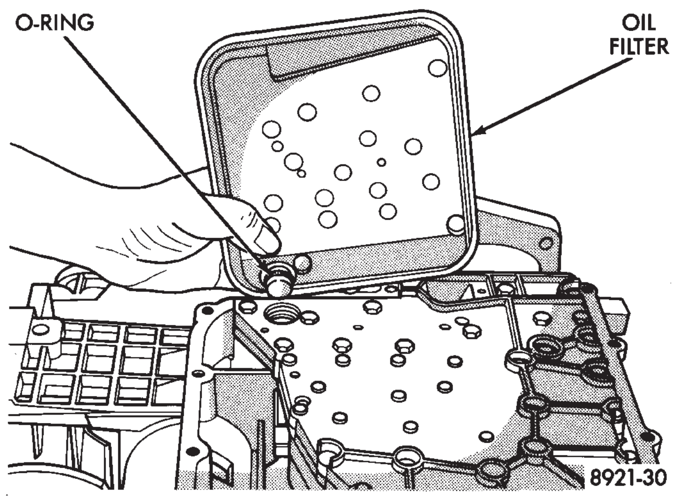


Fig. 73 Oil Filter

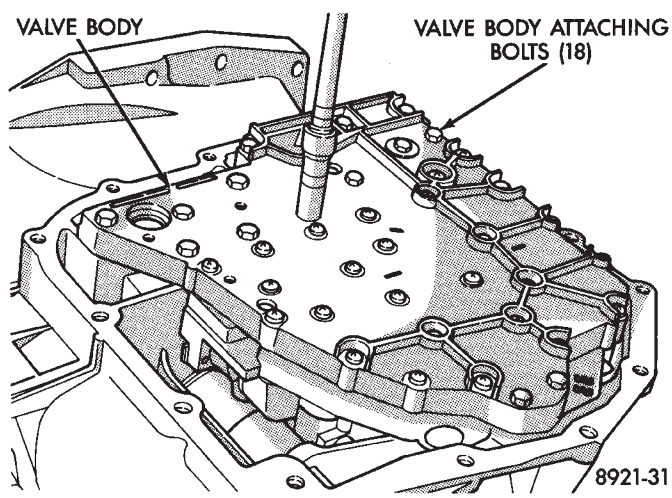


Fig. 74 Valve Body Attaching Bolts

DISASSEMBLY AND ASSEMBLY (Continued)

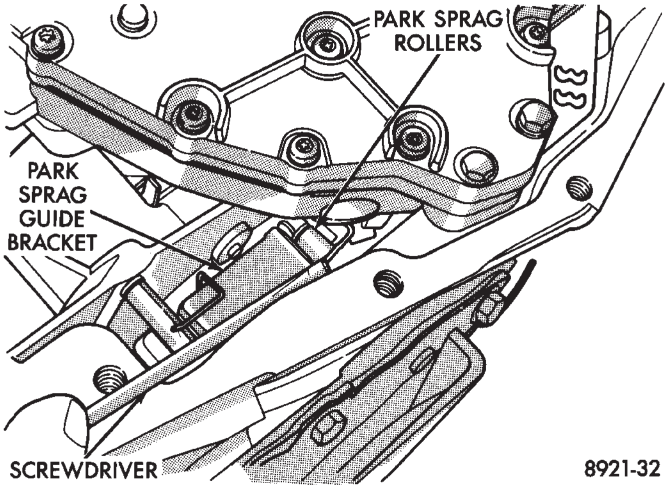


Fig. 75 Push Park Rod Rollers from Guide Bracket

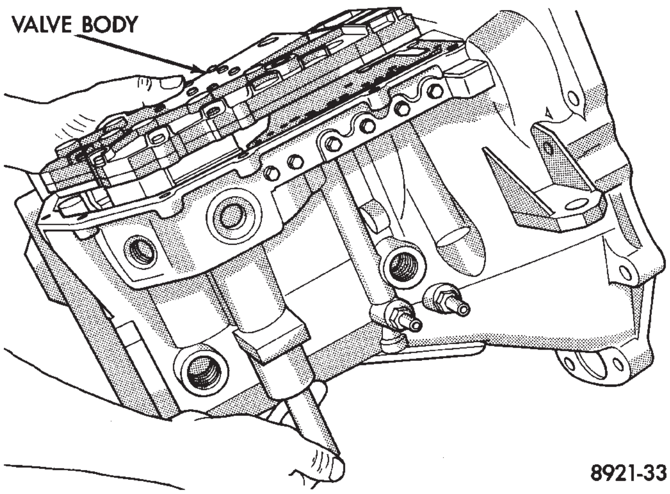


Fig. 76 Remove Valve Body

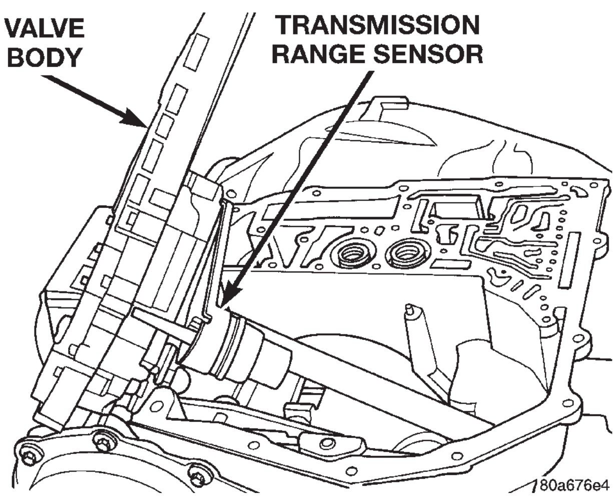


Fig. 77 Valve Body Removed

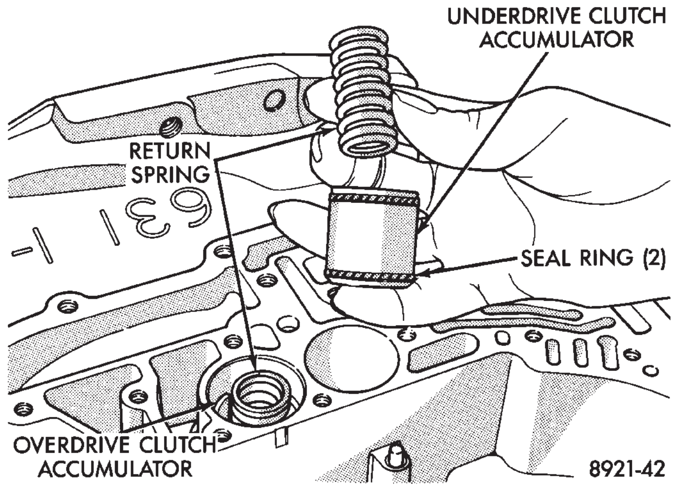


Fig. 78 Accumulators

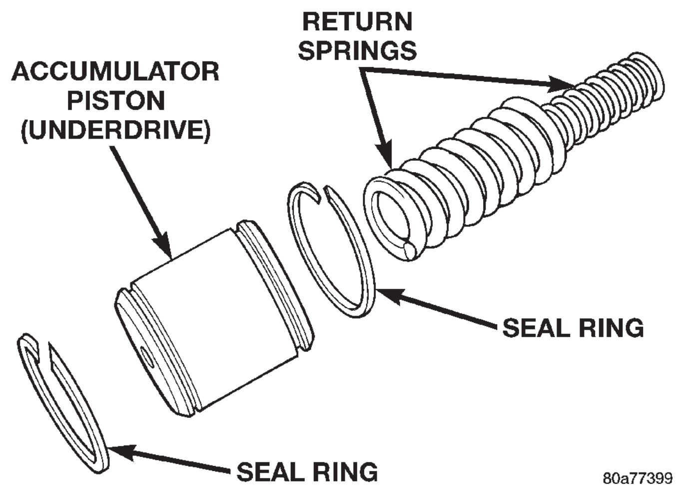


Fig. 79 Accumulator (Underdrive)

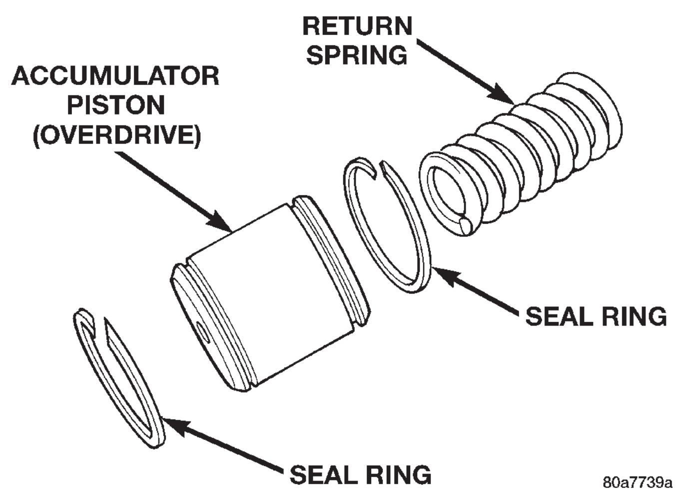


Fig. 80 Accumulator (Overdrive)

DISASSEMBLY AND ASSEMBLY (Continued)

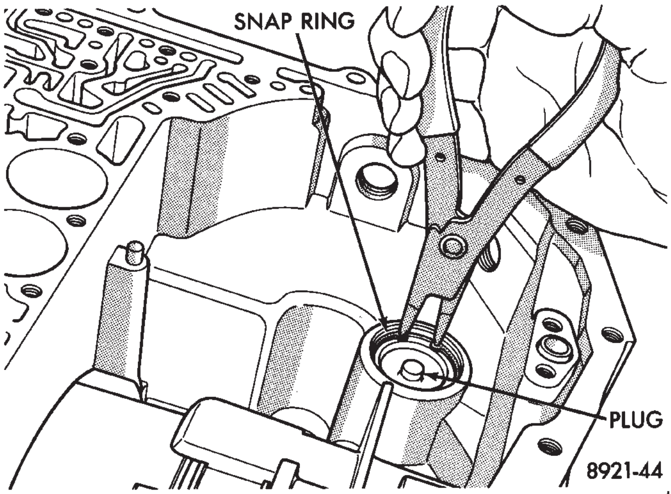


Fig. 81 Low/Reverse Accumulator Snap Ring

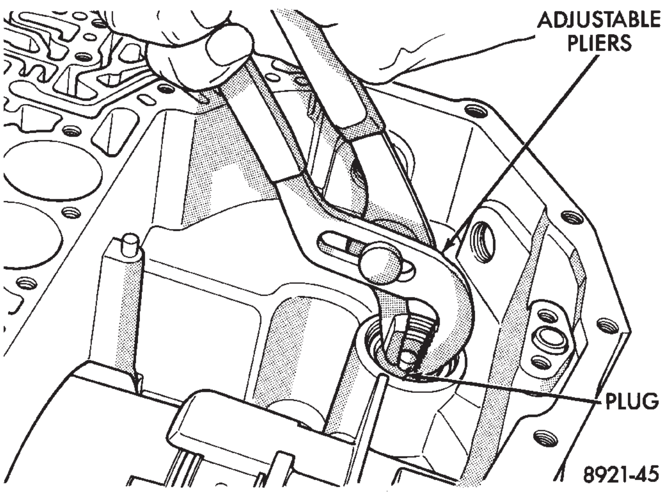


Fig. 82 Low/Reverse Accumulator Plug (Cover)

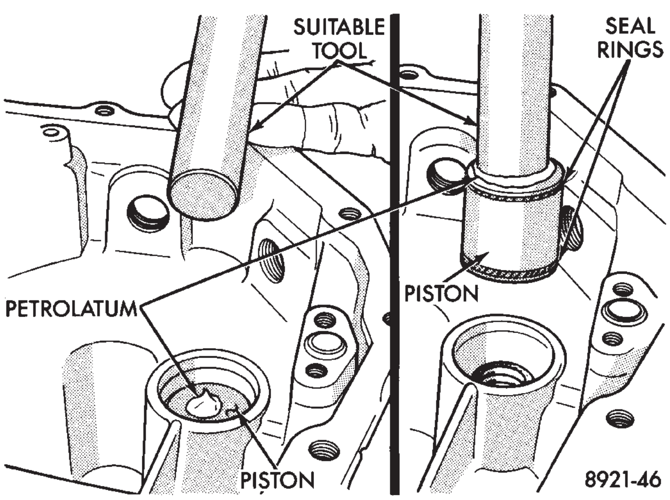


Fig. 83 Low/Reverse Accumulator Piston

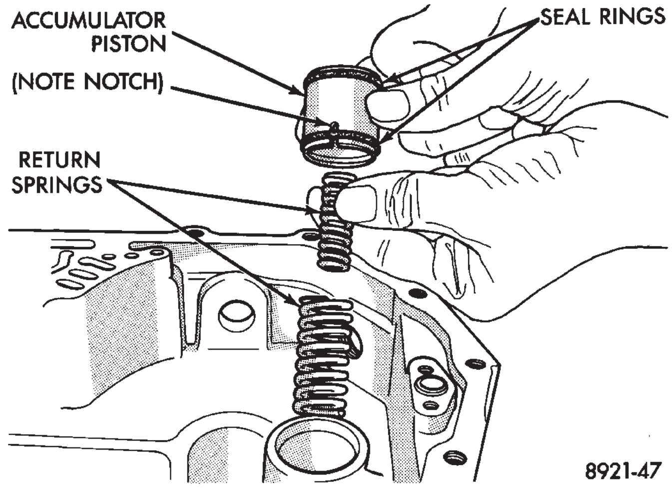


Fig. 84 Low/Reverse Accumulator

Attach a dial indicator to transaxle bell housing with its plunger seated against end of input shaft (Fig. 85).

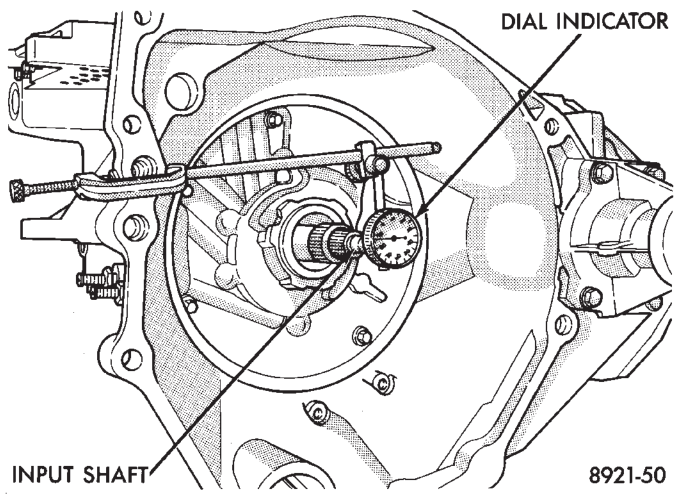


Fig. 85 Measure Input Shaft End Play

Move input shaft in and out to obtain end play reading. End play specifications are .13 to .64 mm (.005 to .025 inch).

DISASSEMBLY AND ASSEMBLY (Continued)

Record indicator reading for reference when reassembling the transaxle.

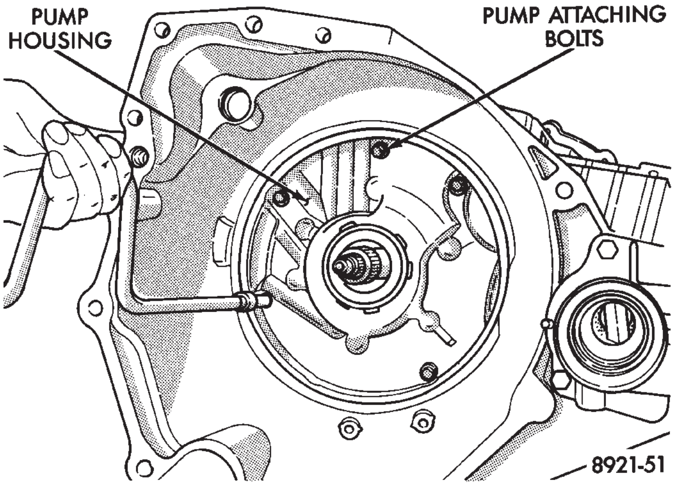


Fig. 86 Pump Attaching Bolts

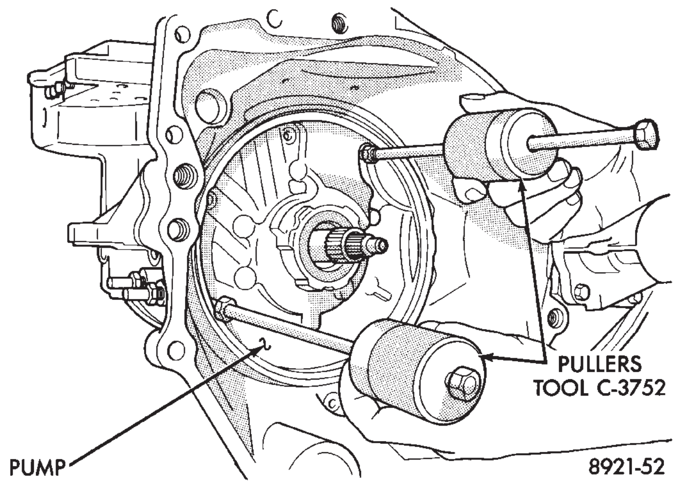


Fig. 87 Install Tool C-3752

CAUTION: Be sure input speed sensor is removed before removing oil pump.

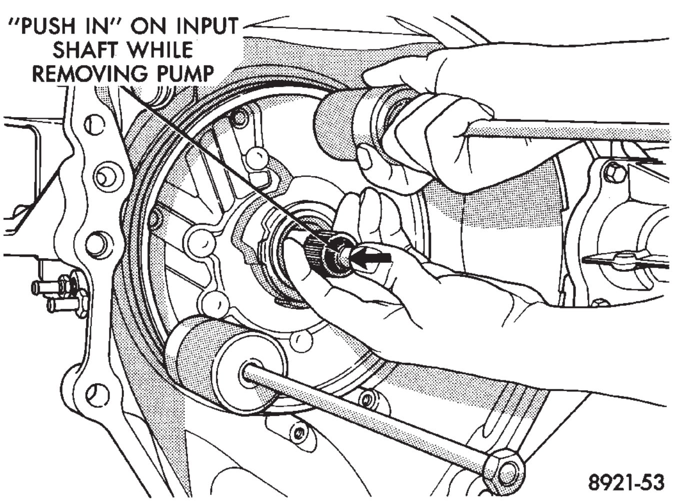


Fig. 88 Remove Oil Pump

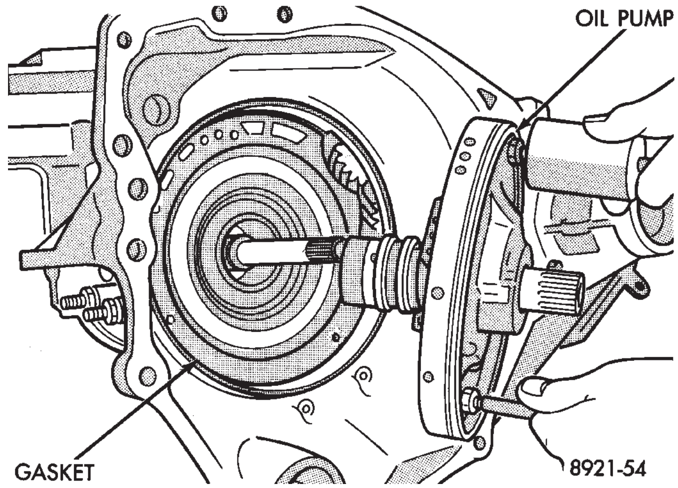


Fig. 89 Oil Pump Removed

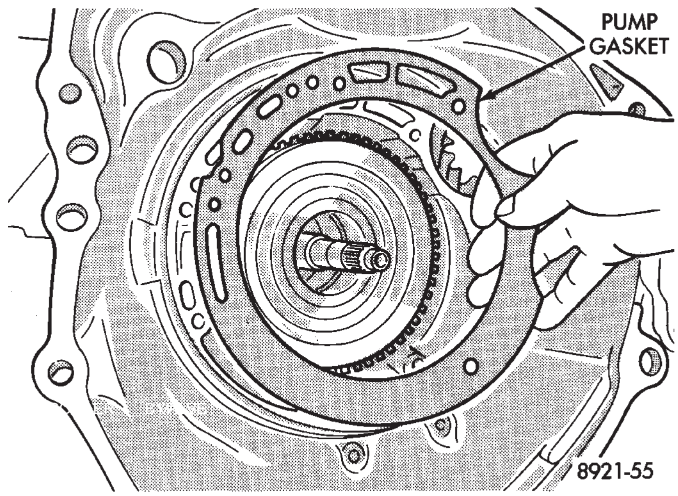


Fig. 90 Oil Pump Gasket

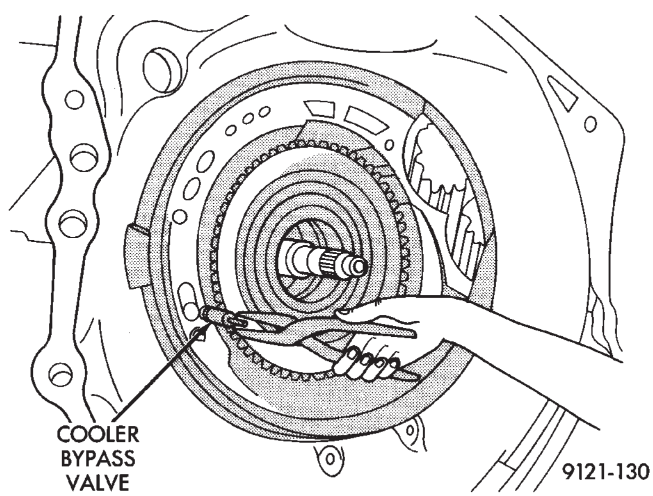


Fig. 91 Remove Bypass Valve

DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: The cooler bypass valve must be replaced if a transaxle failure has occurred. Do not reuse old valve or attempt to clean old valve. When installing bypass valve, insert with O-ring end towards rear of case.

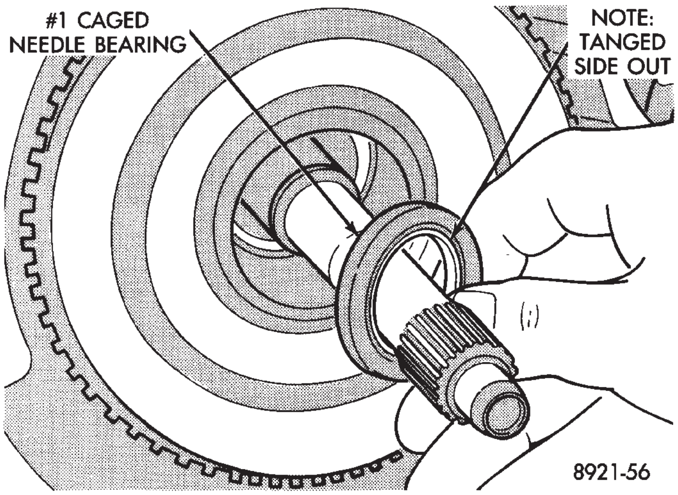


Fig. 92 Caged Needle Bearing

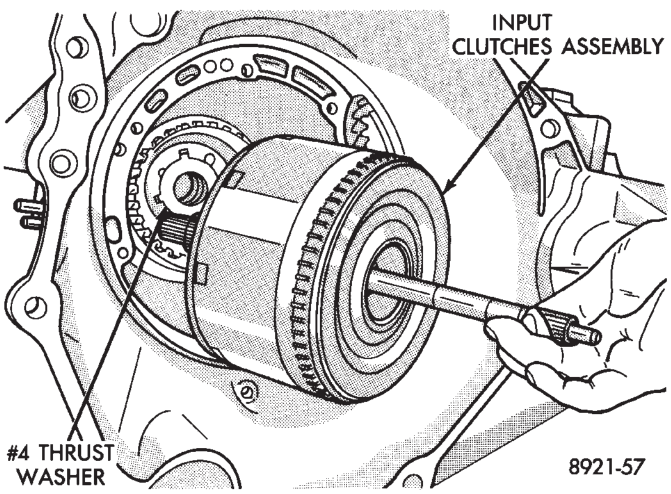


Fig. 93 Input Clutches Assembly

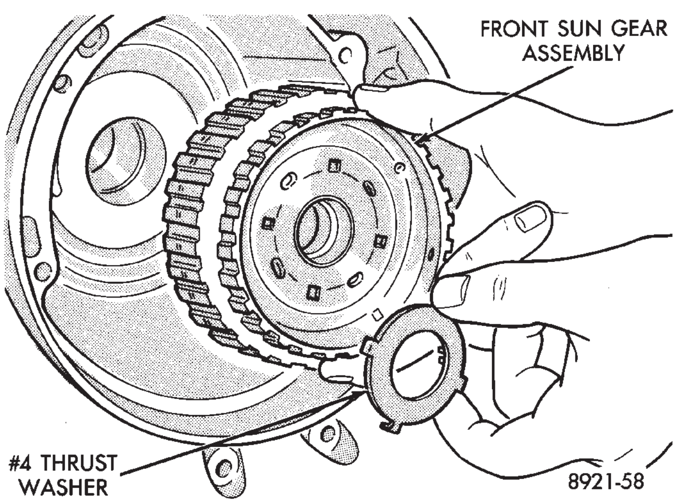


Fig. 94 Front Sun Gear Assembly

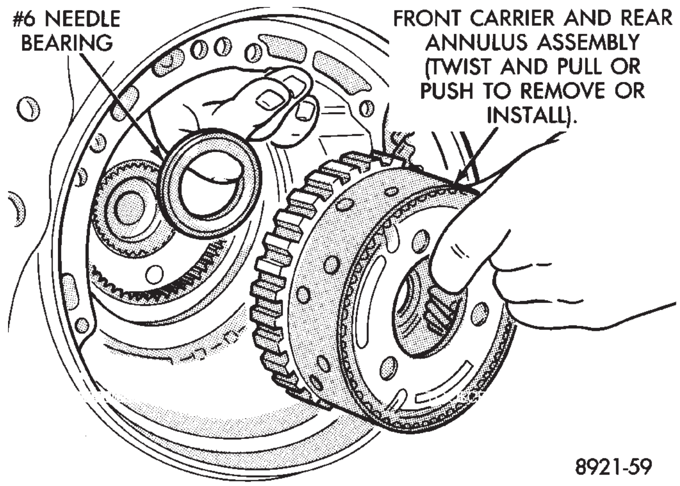


Fig. 95 Front Carrier and Rear Annulus Assembly

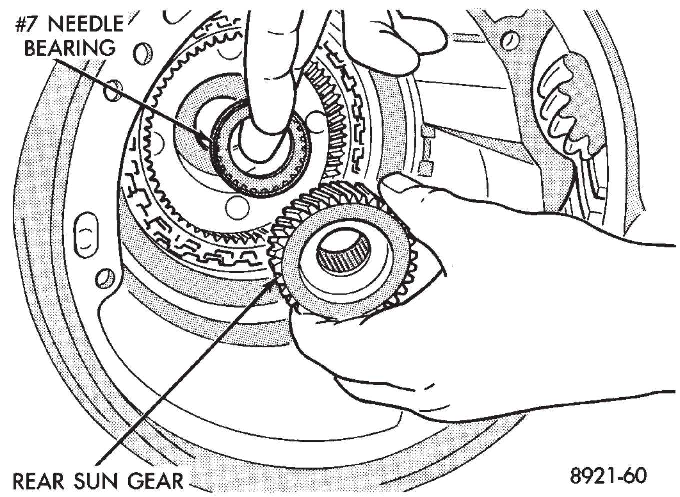


Fig. 96 Rear Sun Gear

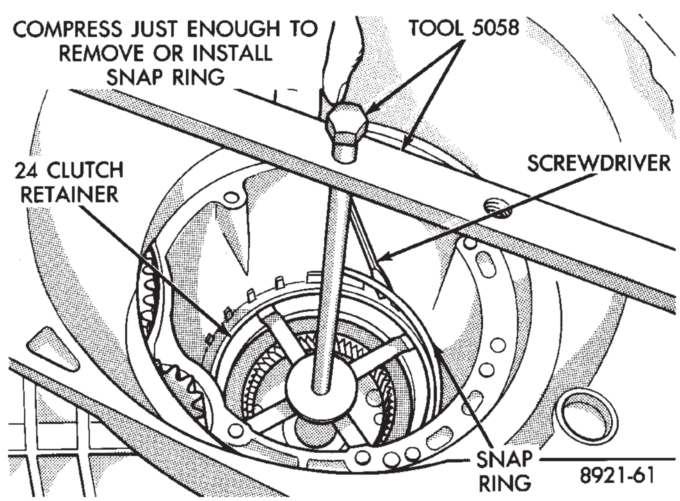


Fig. 97 2/4 Clutch Retainer Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

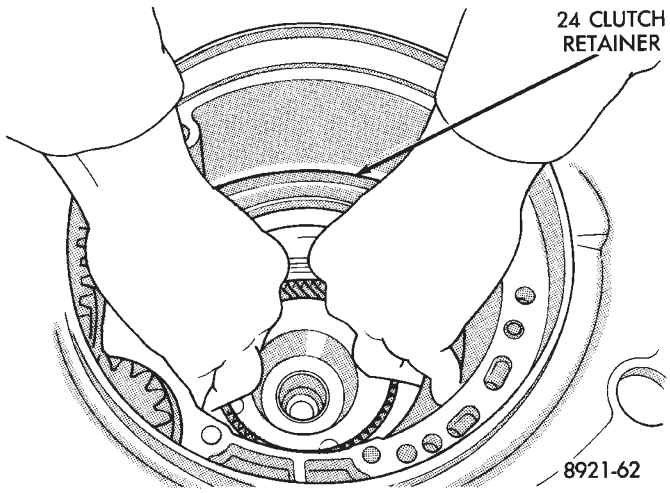


Fig. 98 Remove 2/4 Clutch Retainer

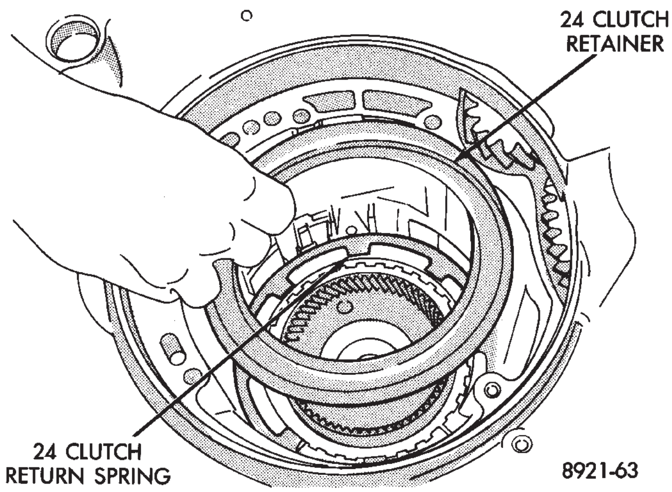


Fig. 99 2/4 Clutch Retainer

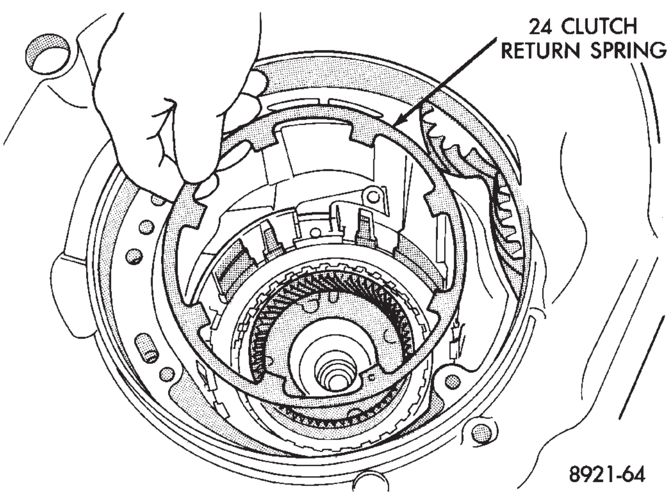


Fig. 100 2/4 Clutch Return Spring

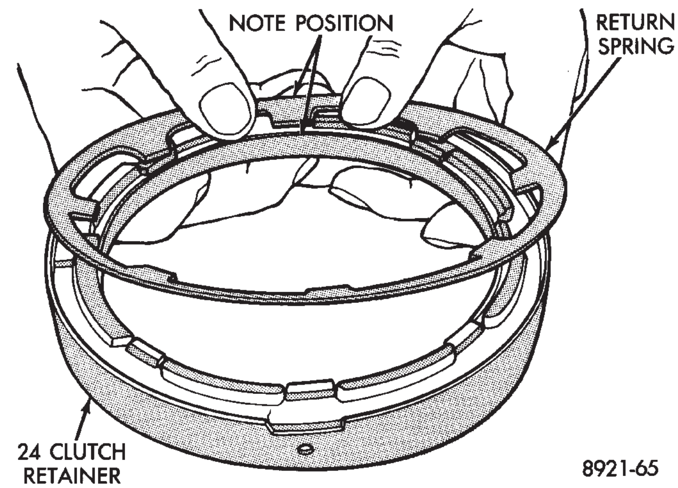


Fig. 101 2/4 Retainer and Spring Indexed

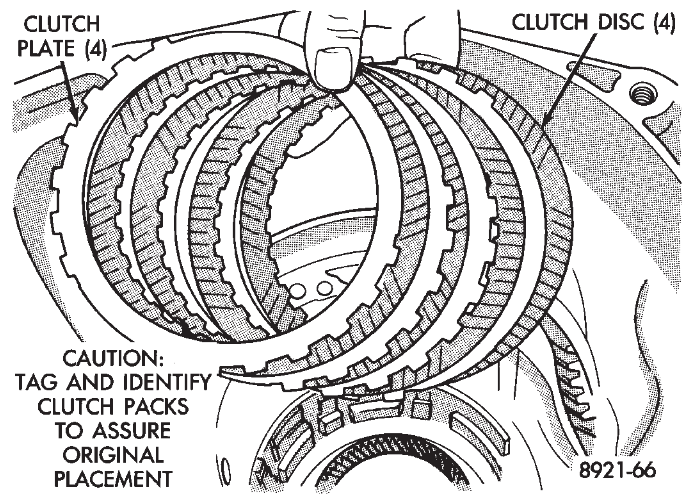


Fig. 102 2/4 Clutch Pack

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: Tag 2/4 clutch pack for reassembly identification.

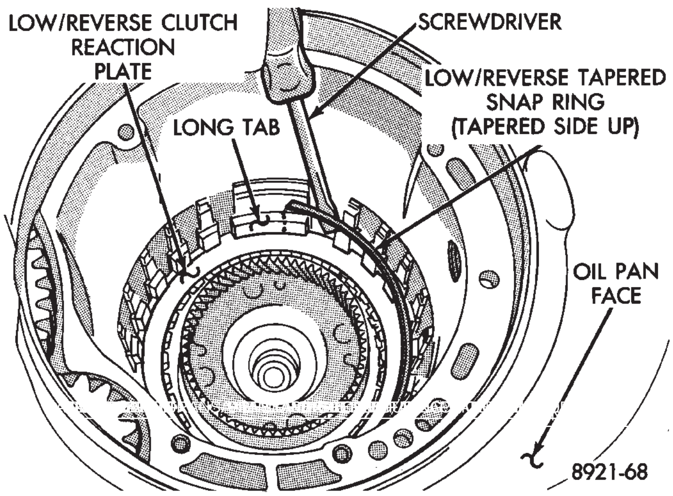


Fig. 103 Tapered Snap Ring

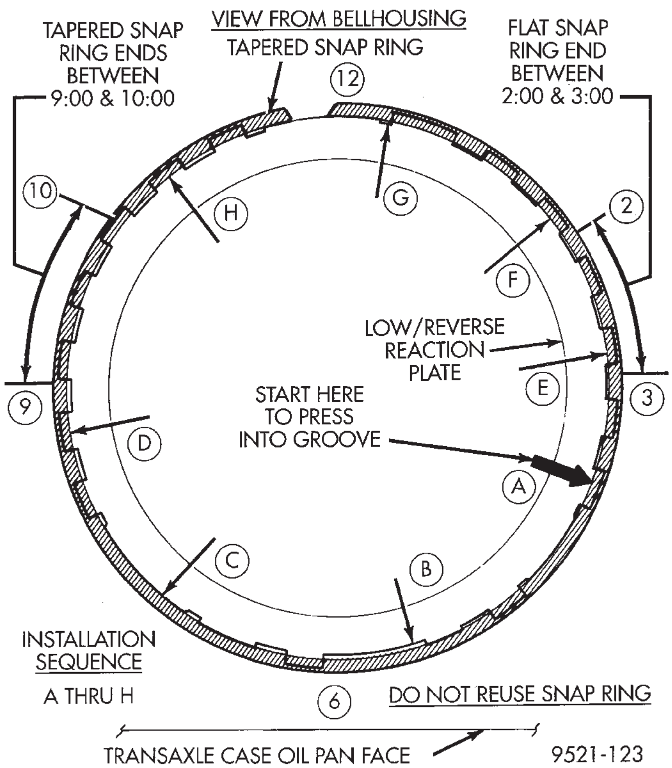


Fig. 104 Tapered Snap Ring Instructions

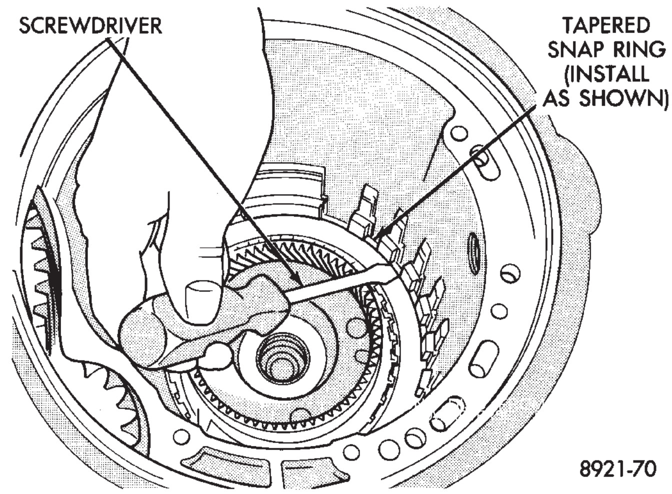


Fig. 105 Snap Ring Installed

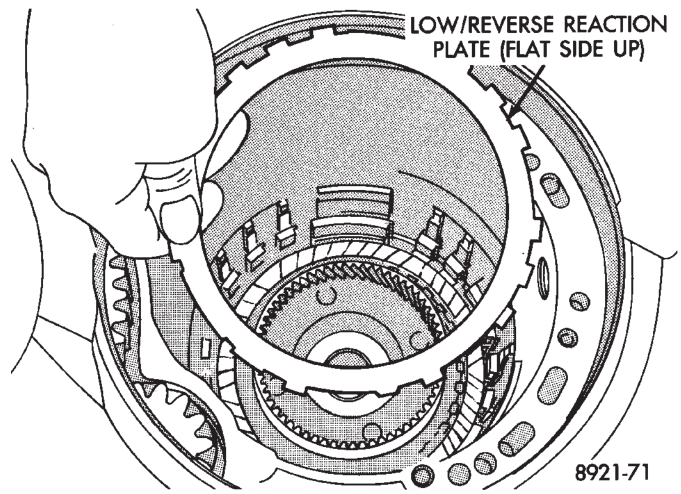


Fig. 106 Low/Reverse Reaction Plate

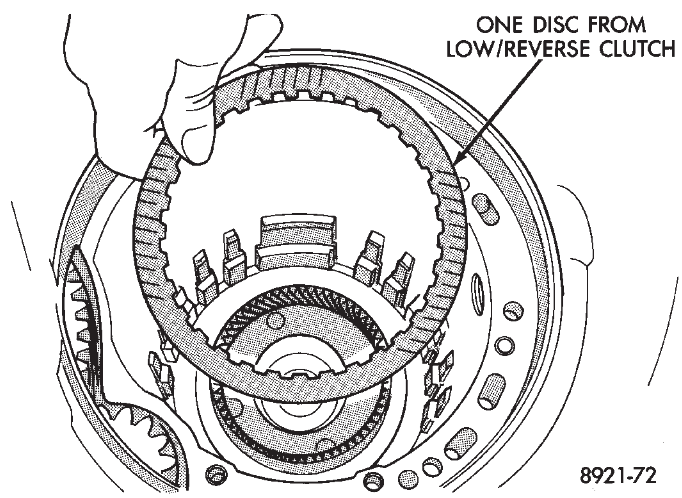


Fig. 107 Remove One Disc

DISASSEMBLY AND ASSEMBLY (Continued)

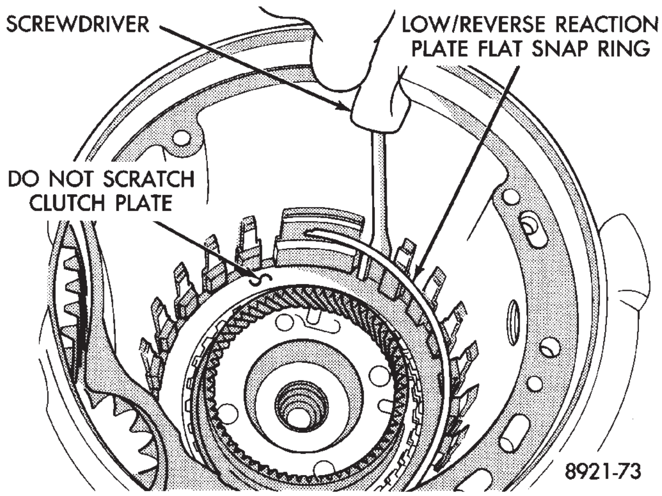


Fig. 108 Low/Reverse Reaction Plate Snap Ring

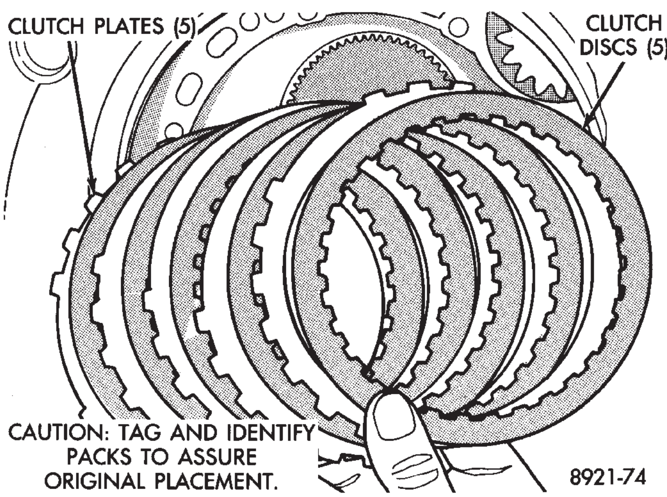


Fig. 109 Low/Reverse Clutch Pack

NOTE: Tag low/reverse clutch pack for reassembly identification.

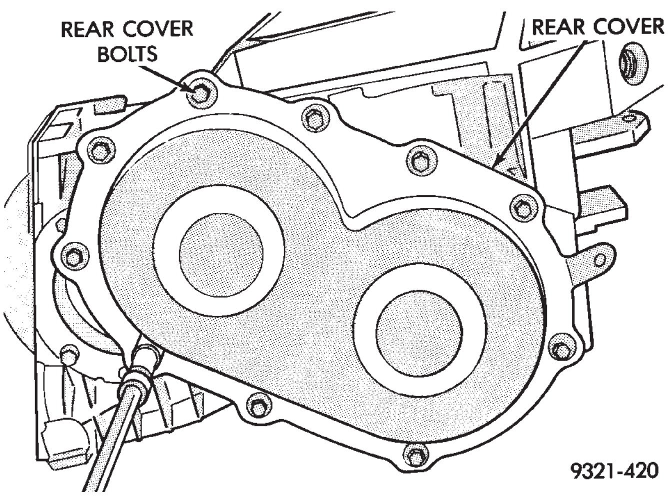


Fig. 110 Rear Cover Bolts

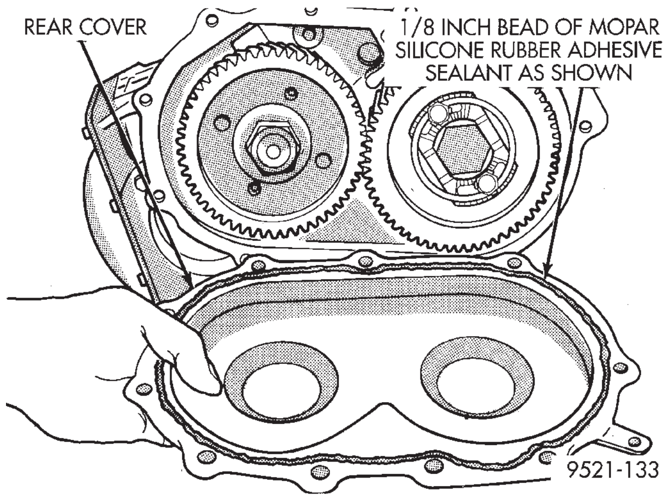


Fig. 111 Rear Cover

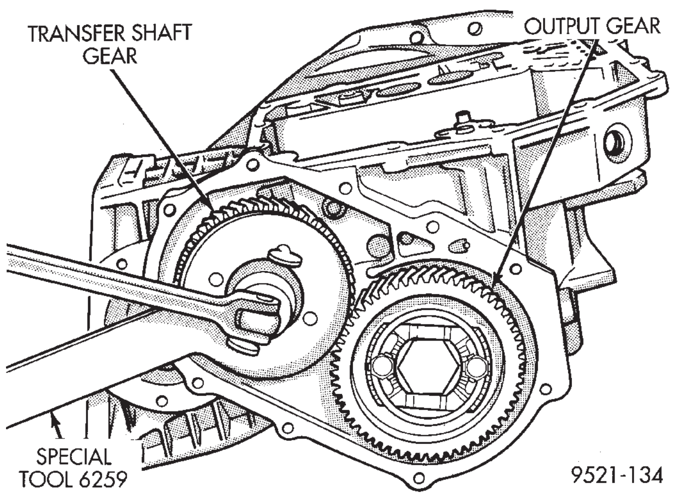


Fig. 112 Remove Transfer Shaft Gear Nut

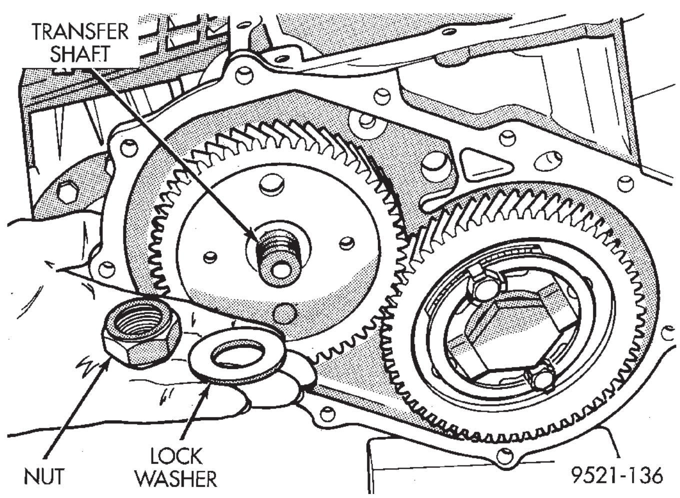


Fig. 113 Transfer Shaft Gear Nut and Washer

DISASSEMBLY AND ASSEMBLY (Continued)

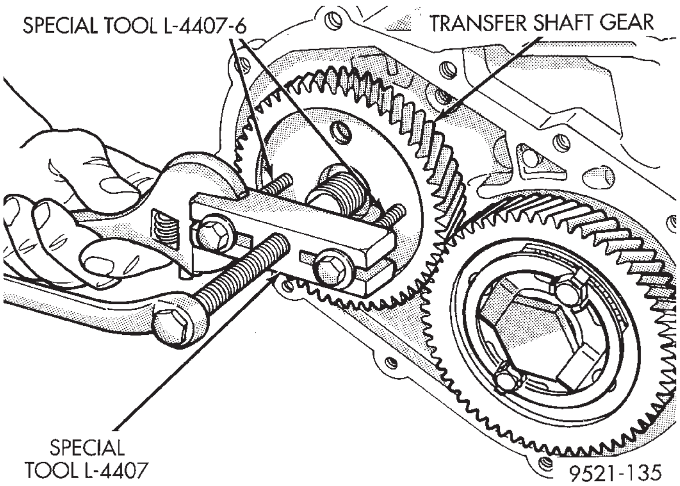


Fig. 114 Remove Transfer Shaft Gear

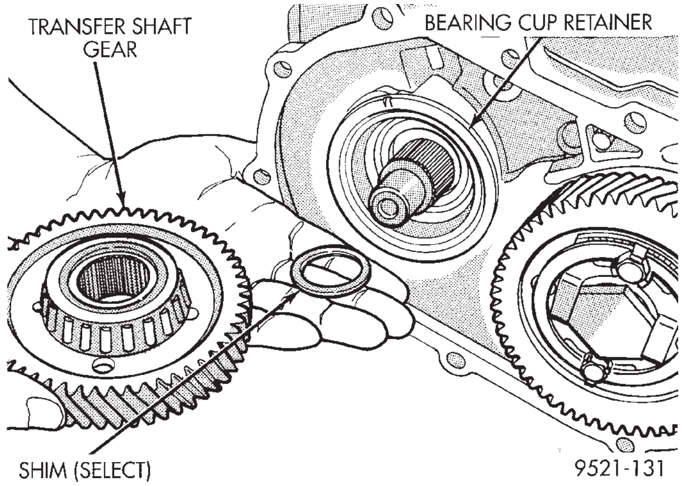


Fig. 117 Transfer Shaft Gear and (Select) Shim

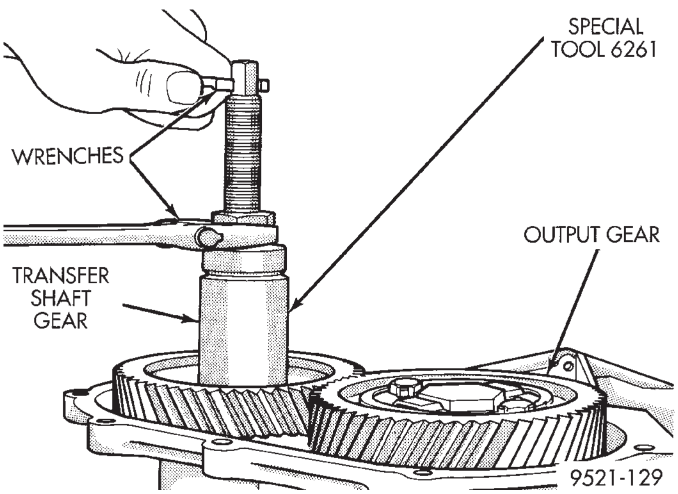


Fig. 115 Install Transfer Shaft Gear

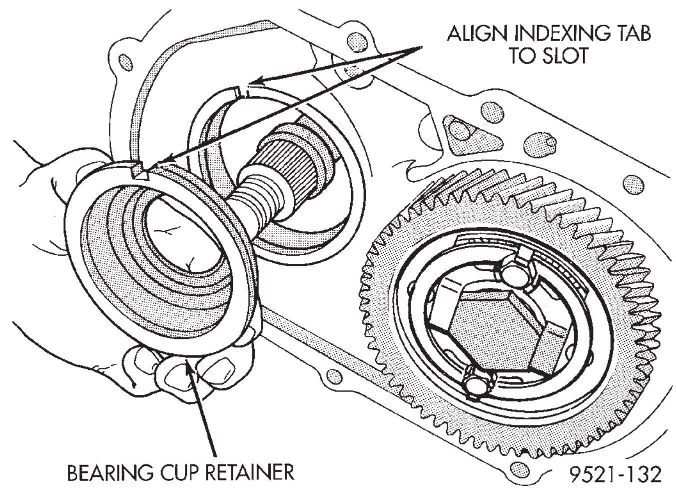


Fig. 118 Bearing Cup Retainer

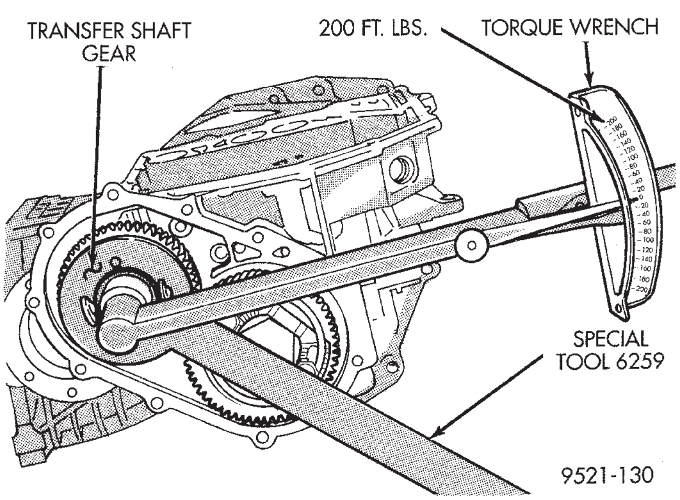


Fig. 116 Tighten Nut to 271 N·m (200 Ft. lbs.)

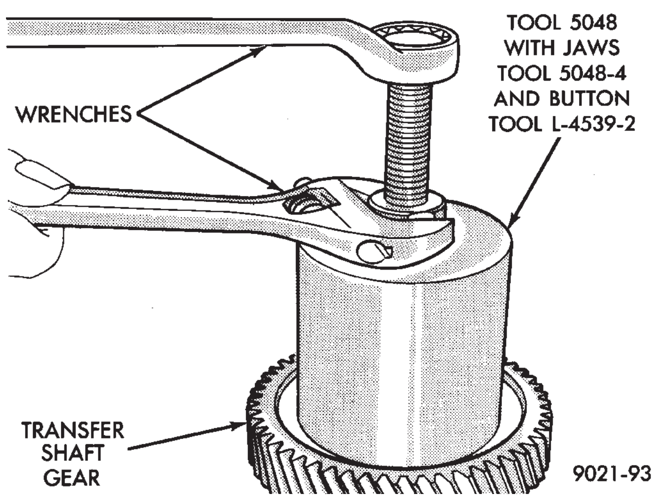


Fig. 119 Remove Transfer Shaft Bearing Cone

DISASSEMBLY AND ASSEMBLY (Continued)

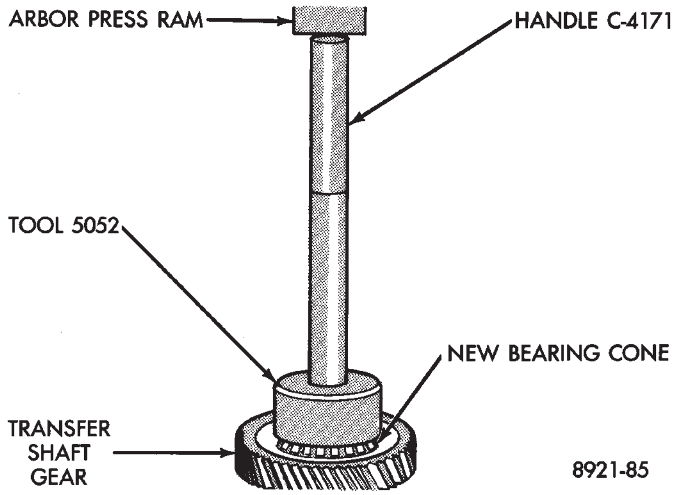


Fig. 120 Install Transfer Shaft Bearing Cone

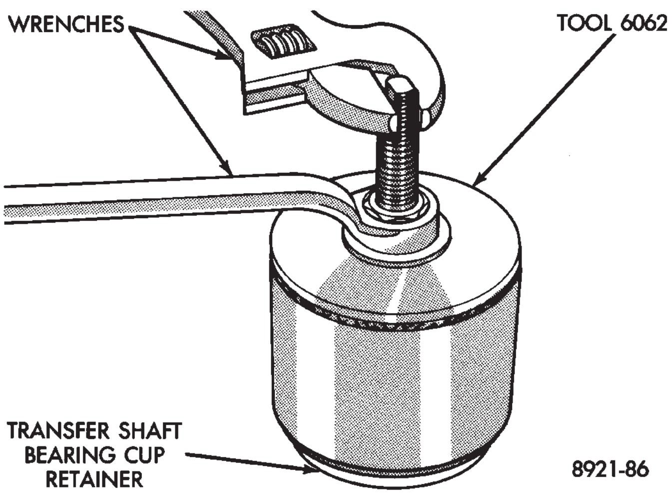


Fig. 121 Remove Transfer Shaft Bearing Cup

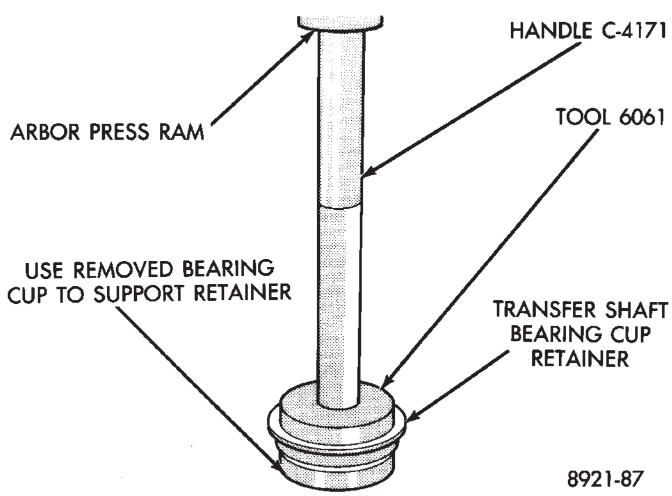


Fig. 122 Install New Bearing Cup

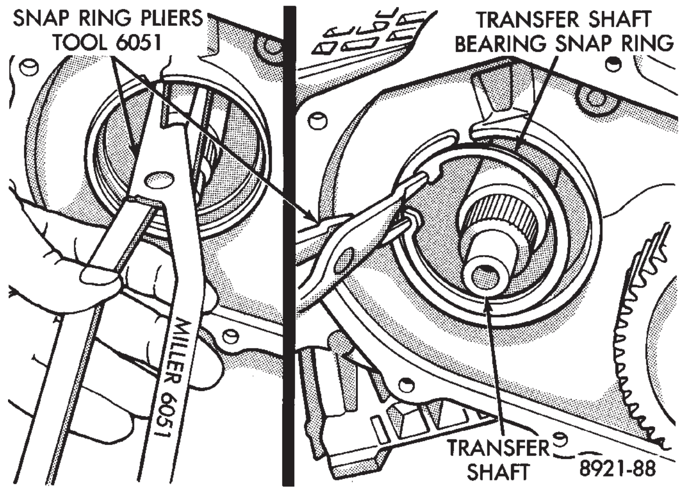


Fig. 123 Transfer Shaft Bearing Snap Ring

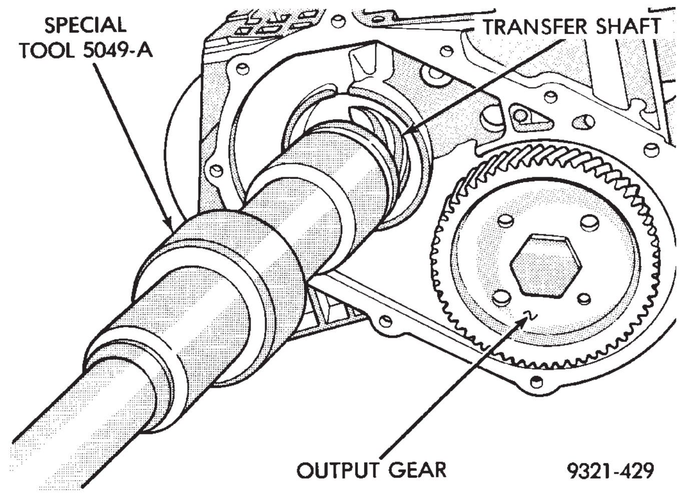


Fig. 124 Transfer Shaft

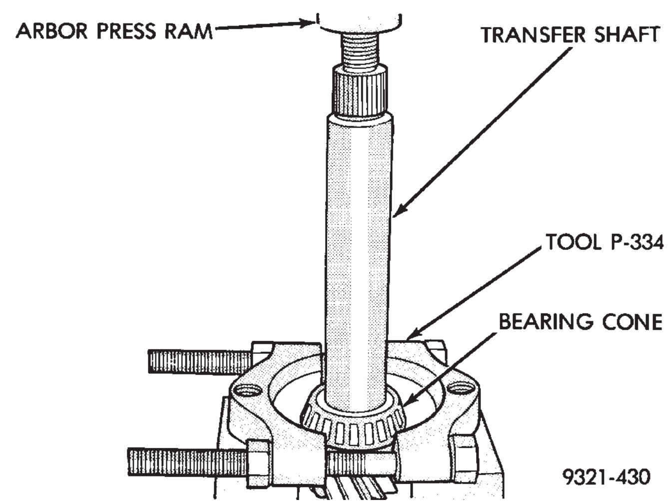


Fig. 125 Remove Transfer Shaft Bearing Cone

DISASSEMBLY AND ASSEMBLY (Continued)

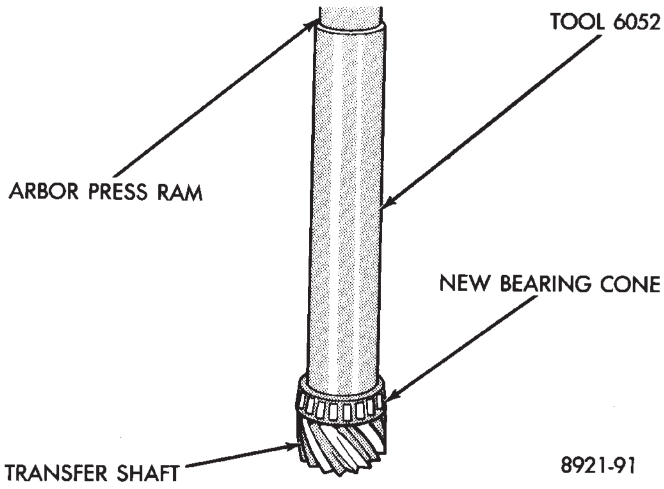


Fig. 126 Install Bearing Cone

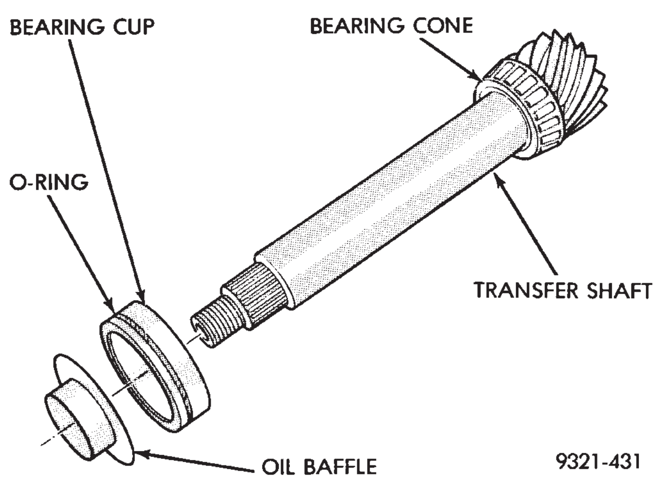


Fig. 127 Bearing Cup Removed

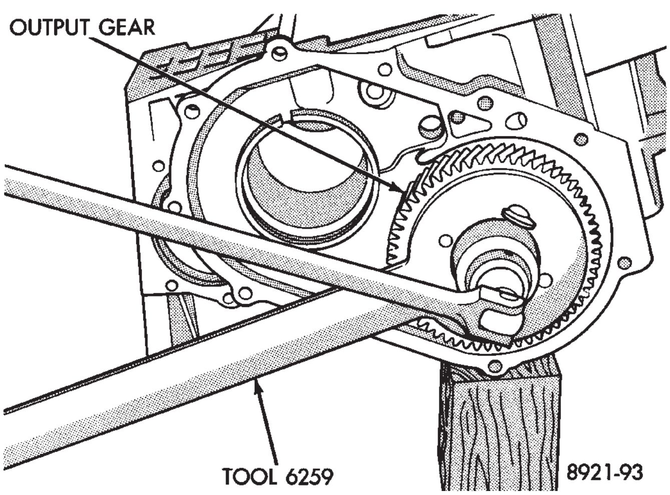


Fig. 128 Remove Output Gear Bolt

All transaxles utilize a stirrup and retaining strap that is attached to the output gear. The stirrup prevents the output gear retaining bolt from turning and backing out of the rear carrier. The strap is used to hold the stirrup to the output gear and prevent the stirrup retaining bolts from backing out.

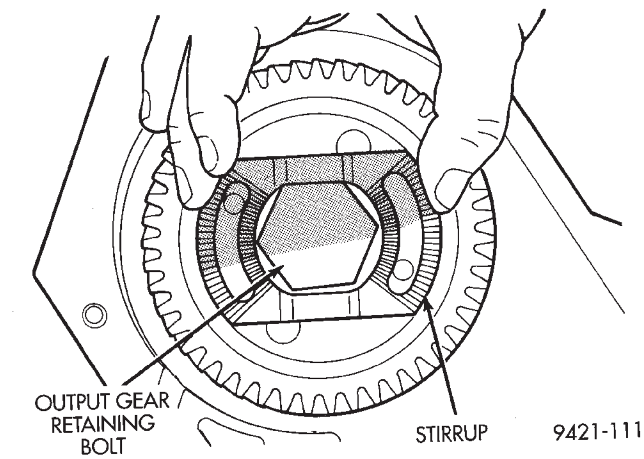


Fig. 129 Output Gear Retaining Bolt Stirrup (Serration Side Out)

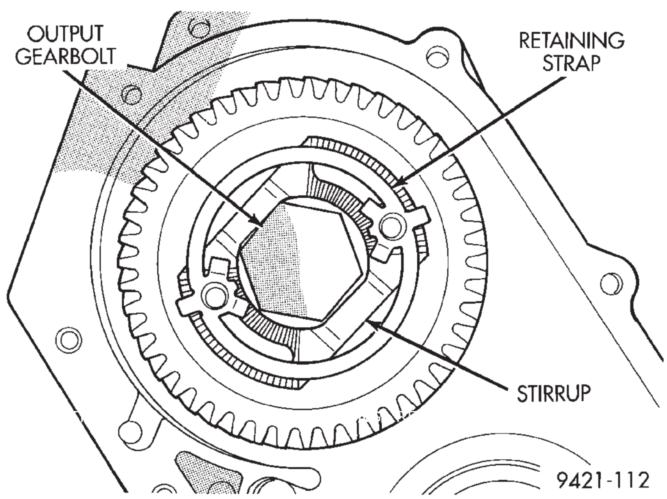


Fig. 130 Stirrup Strap (Align Strap Holes With Tapped Gear Holes)

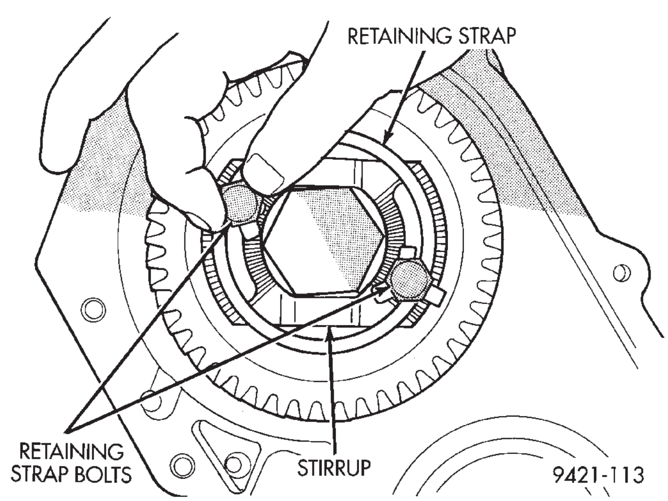


Fig. 131 Install Strap Bolts

DISASSEMBLY AND ASSEMBLY (Continued)

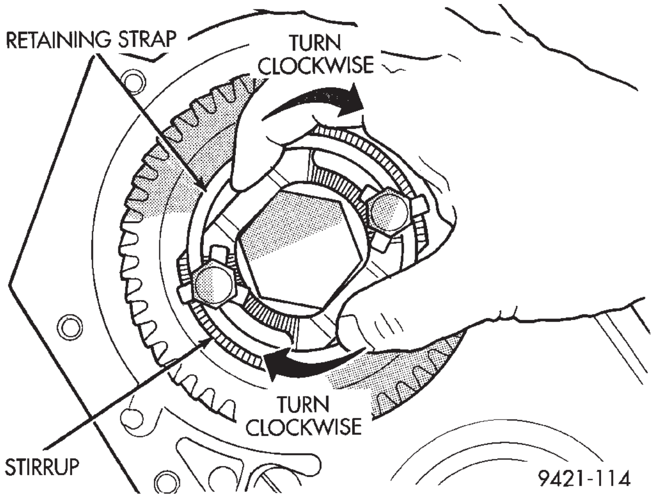


Fig. 132 Turn Stirrup Clockwise Against Flats Of Output Gear Retaining Bolt

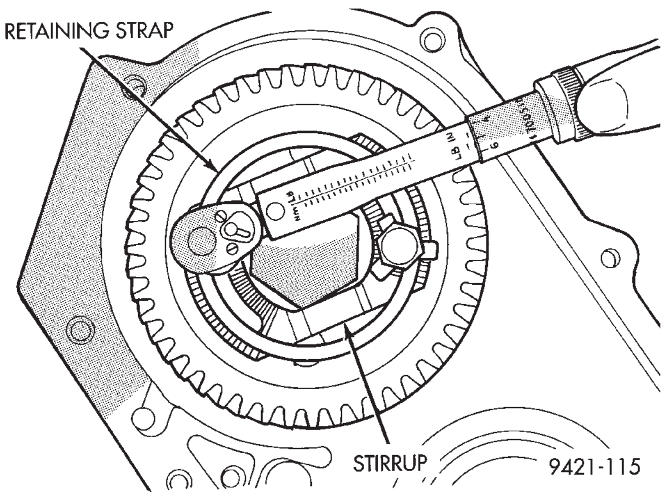


Fig. 133 Tighten Stirrup Strap Bolts To 23 N·m (200 in. lbs.)

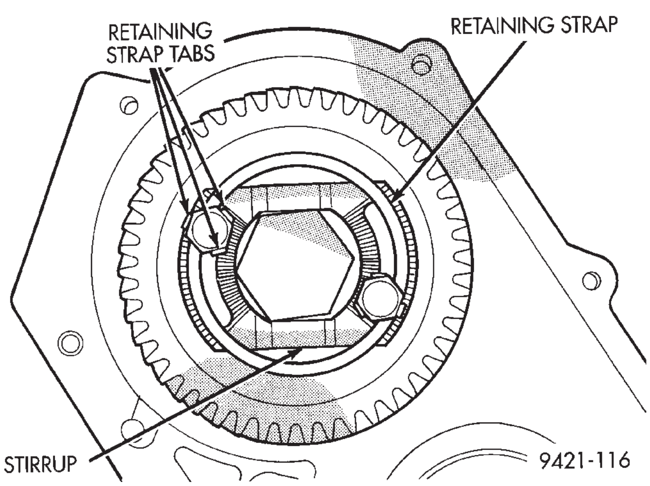


Fig. 134 Bend Tabs On Strap Up Against Flats Of Bolts

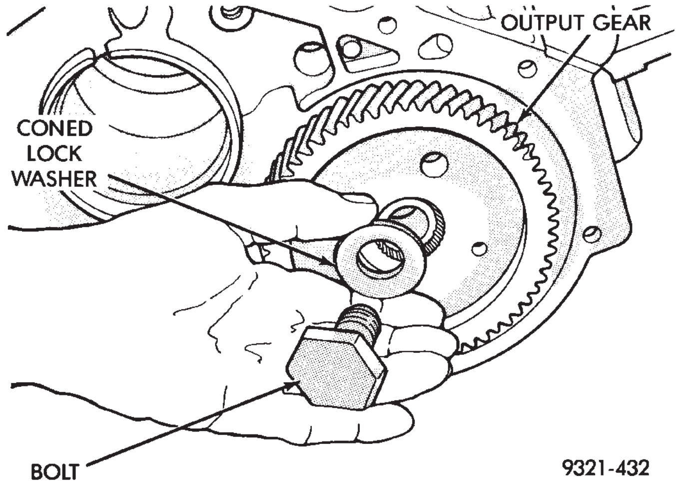


Fig. 135 Output Gear Bolt and Washer

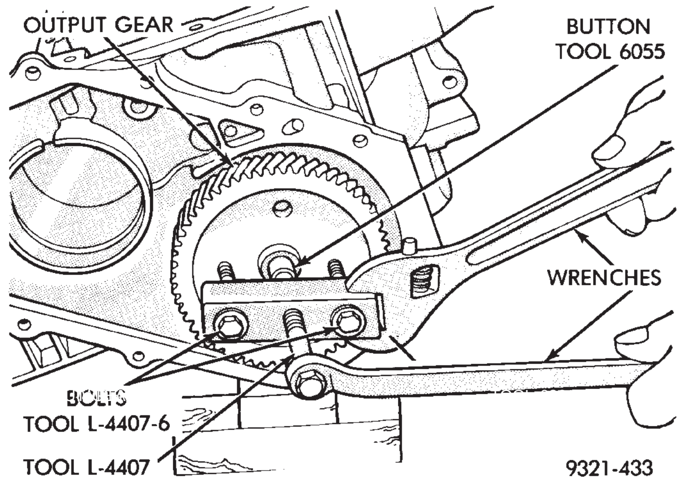


Fig. 136 Remove Output Gear

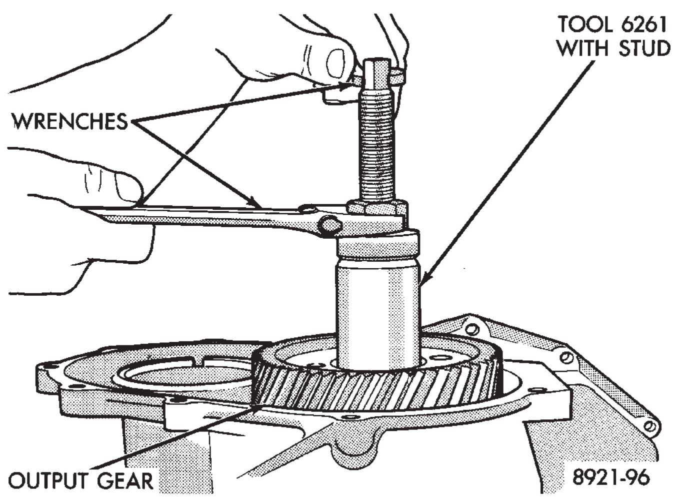


Fig. 137 Install Output Gear

DISASSEMBLY AND ASSEMBLY (Continued)

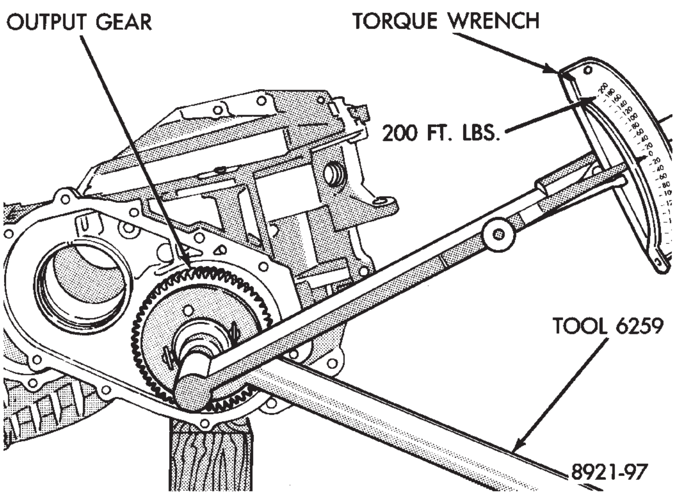


Fig. 138 Tighten Output Gear to 271 N·m (200 ft. lbs.)

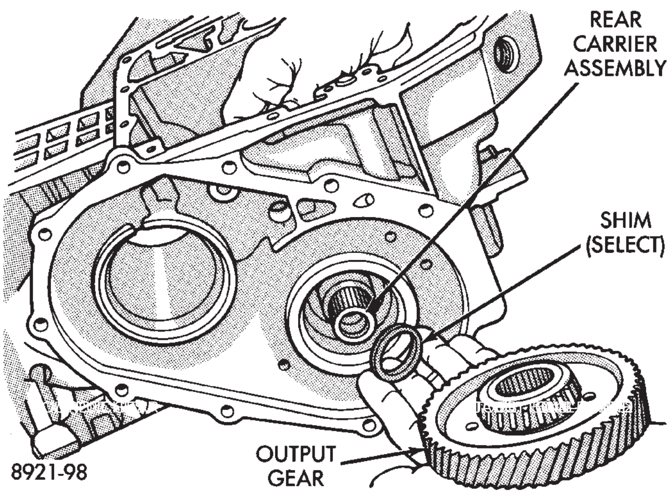


Fig. 139 Output Gear and (Select) Shim

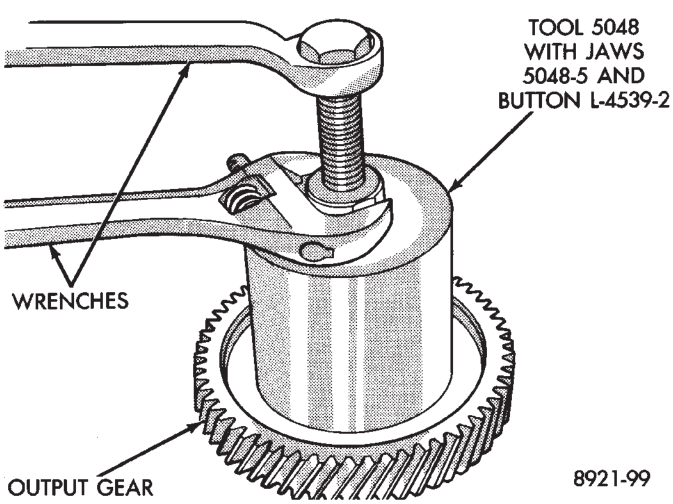


Fig. 140 Remove Bearing Cone

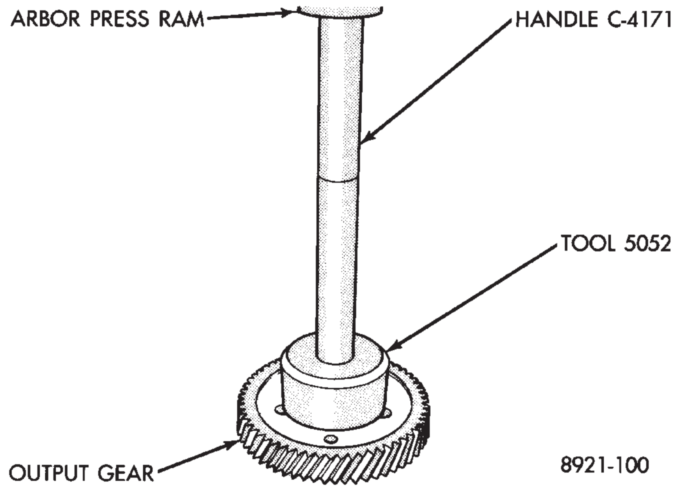


Fig. 141 Install New Bearing Cone

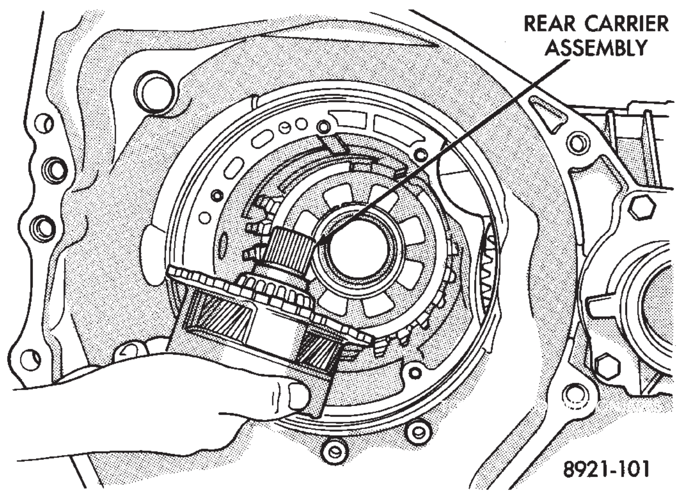


Fig. 142 Rear Carrier Assembly

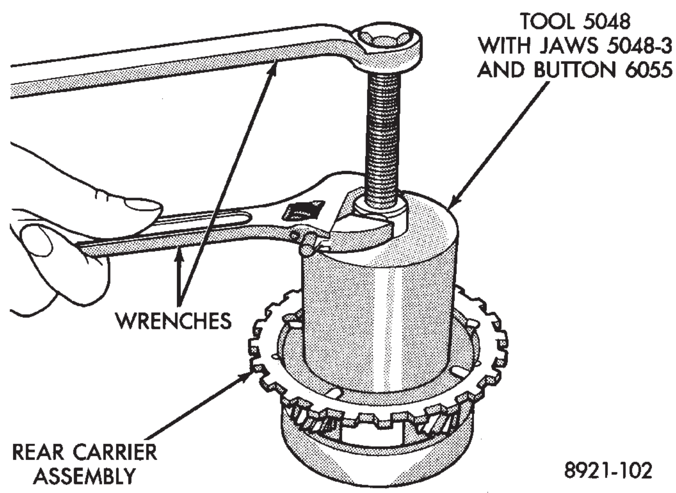


Fig. 143 Remove Rear Carrier Bearing Cone

DISASSEMBLY AND ASSEMBLY (Continued)

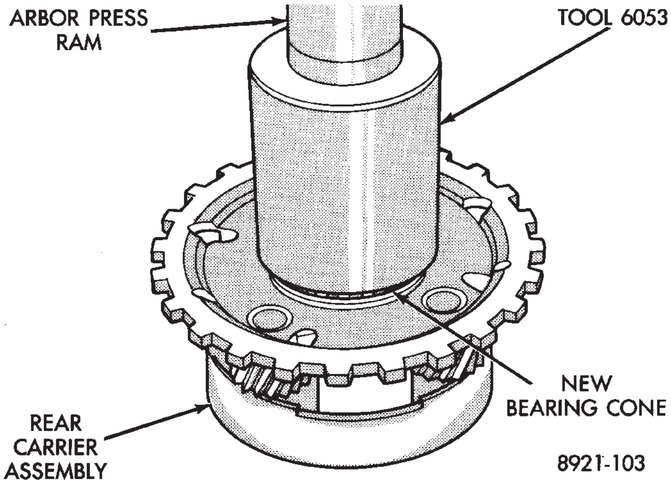


Fig. 144 Install Rear Carrier Bearing Cone

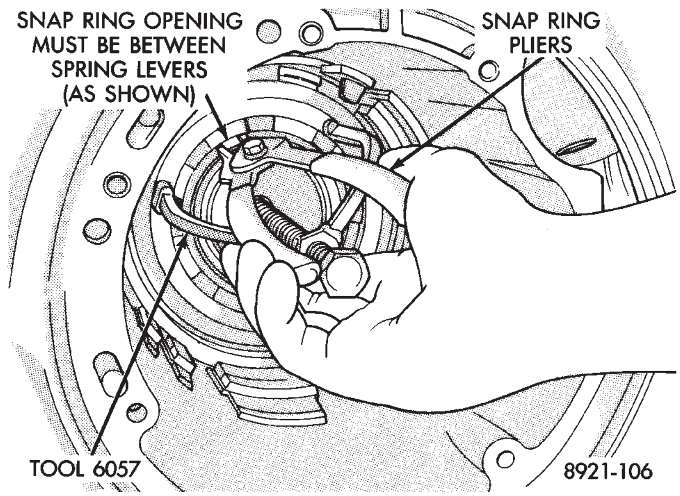


Fig. 147 Remove or Install Snap Ring

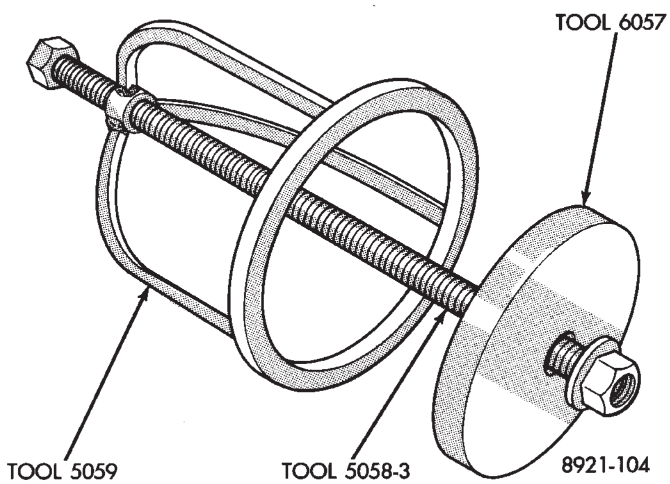


Fig. 145 Low/Reverse Spring Compressor Tool

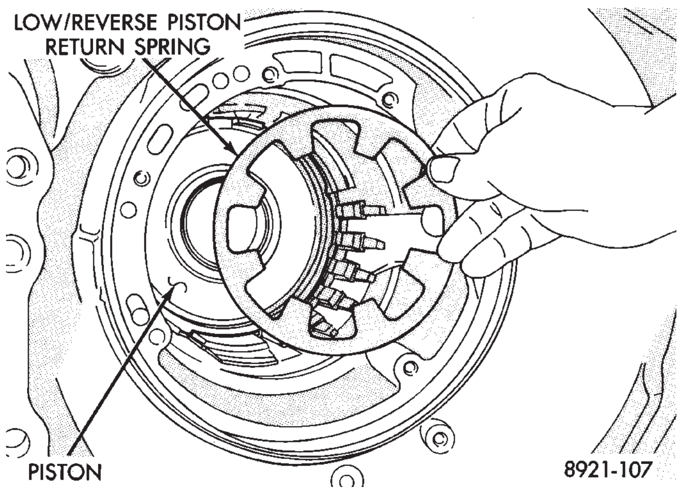


Fig. 148 Low/Reverse Piston Return Spring

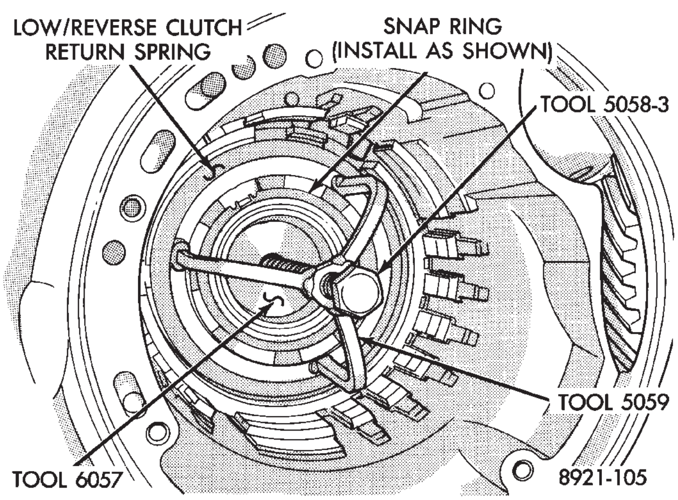


Fig. 146 Compressor Tool in Use

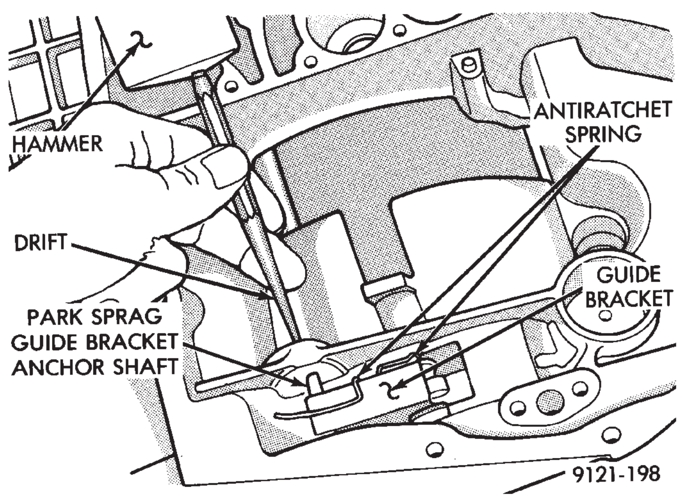


Fig. 149 Drive Out Anchor Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: When installing, be sure guide bracket and split sleeve touch the rear of the transaxle case.

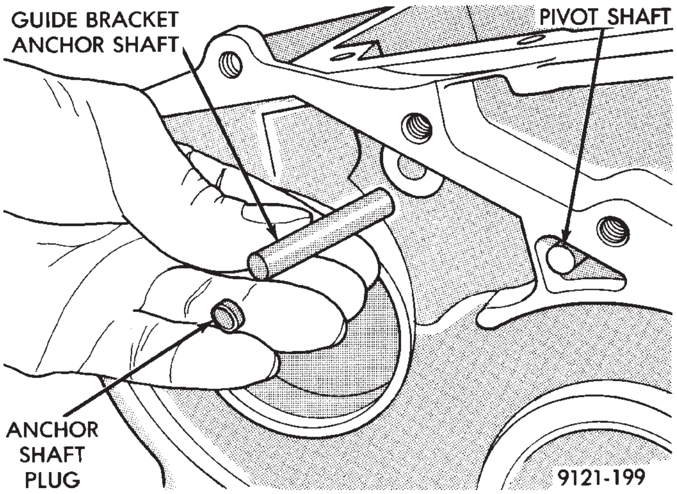


Fig. 150 Anchor Shaft and Plug

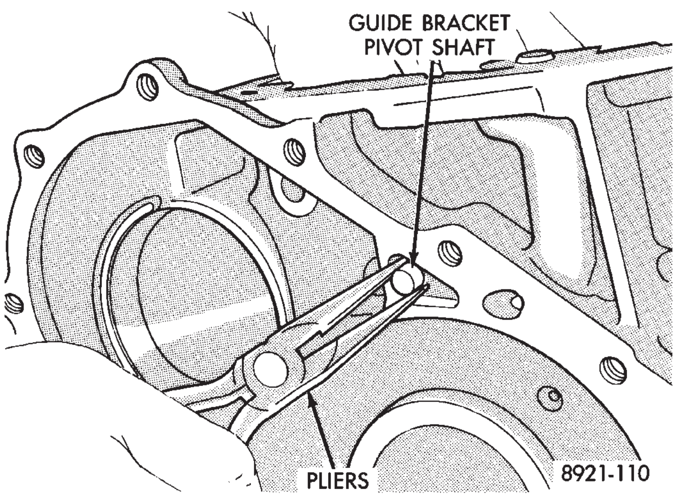


Fig. 151 Guide Bracket Pivot Shaft

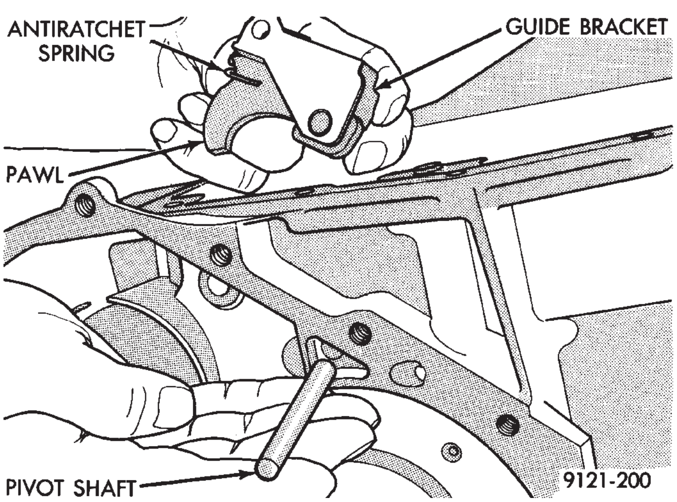


Fig. 152 Pivot Shaft and Guide Bracket

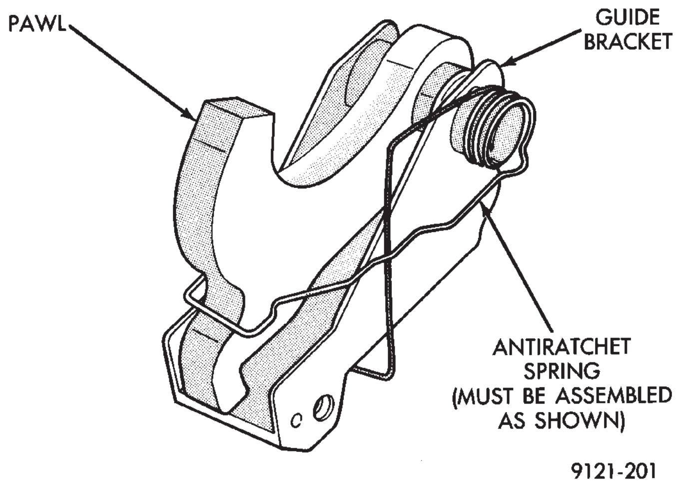


Fig. 153 Guide Bracket Assembled

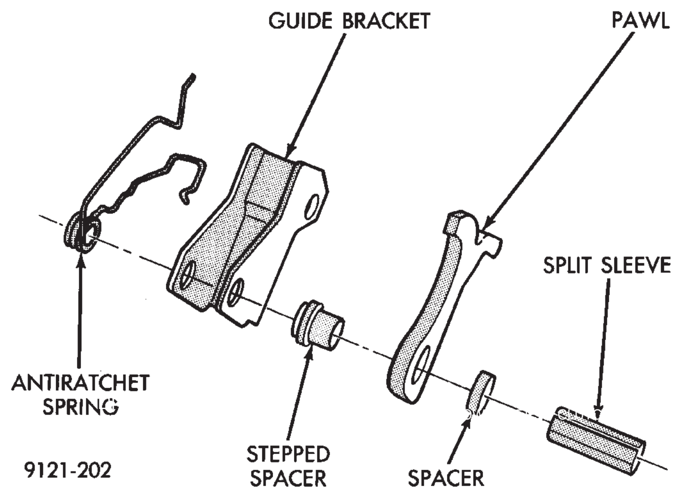


Fig. 154 Guide Bracket Disassembled

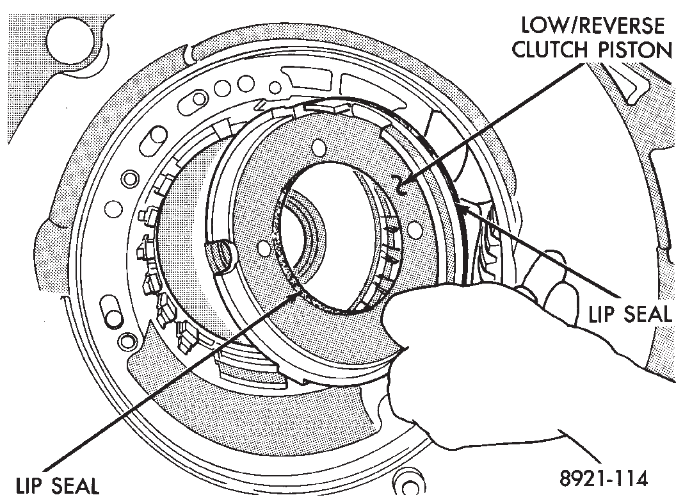


Fig. 155 Low/Reverse Clutch Piston

DISASSEMBLY AND ASSEMBLY (Continued)

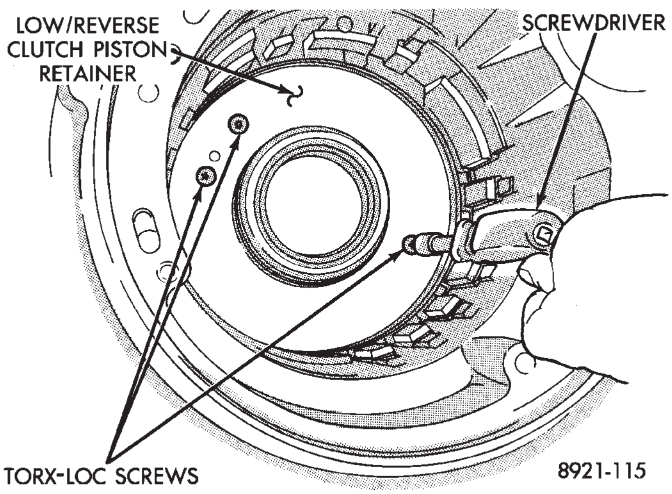


Fig. 156 Piston Retainer Attaching Screws

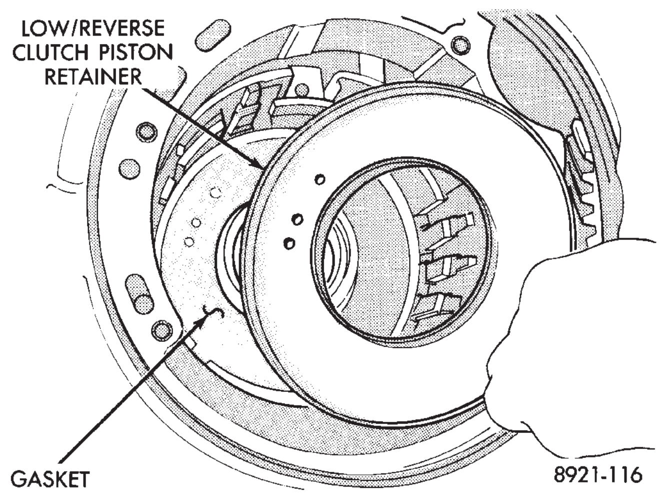


Fig. 157 Piston Retainer

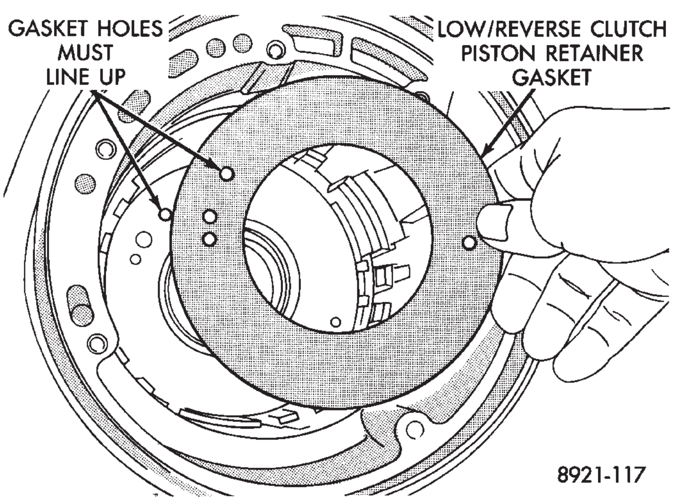


Fig. 158 Piston Retainer Gasket

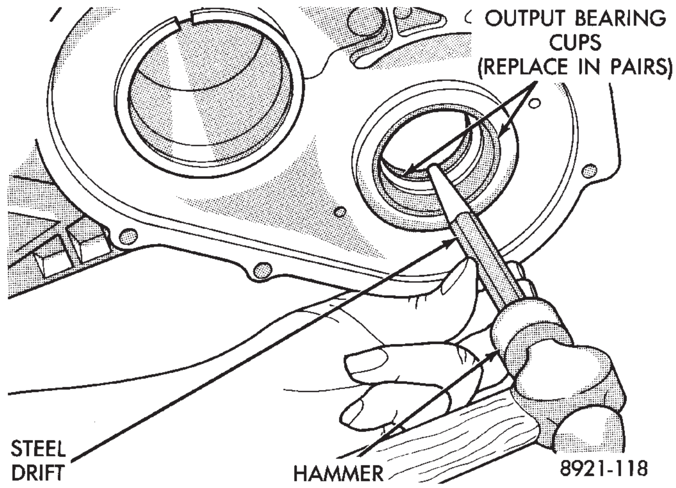


Fig. 159 Remove Output Bearing Inner Cup

CAUTION: Drift bearing cup all the way around.

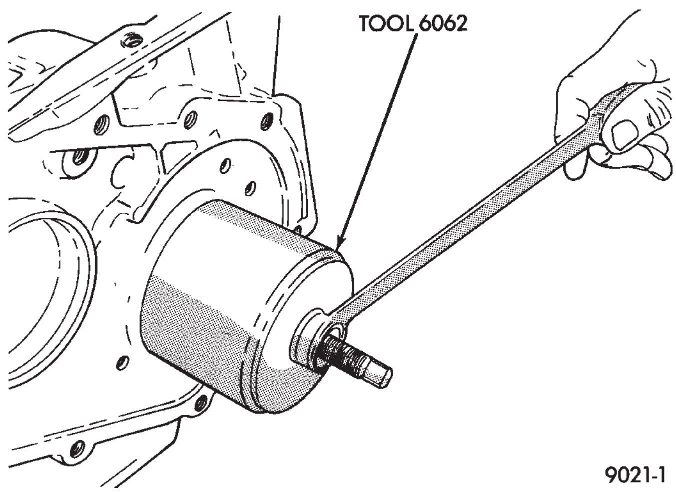


Fig. 160 Remove Output Bearing Outer Cup

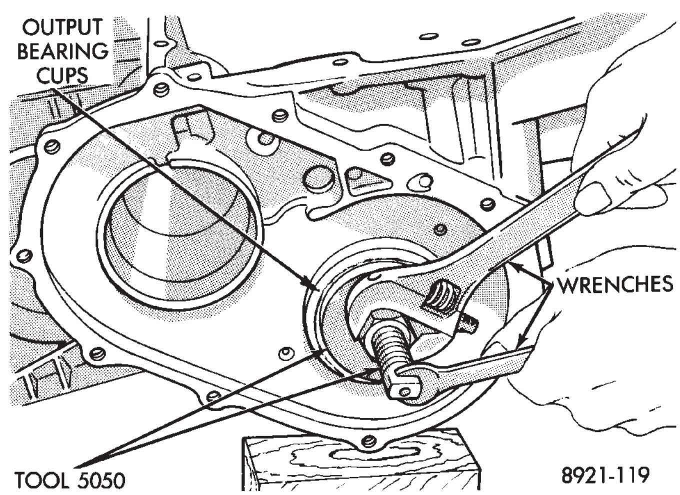


Fig. 161 Install Both Output Bearing Cups

DISASSEMBLY AND ASSEMBLY (Continued)

To assemble, reverse the above procedure. Be sure to check both grounded clutch clearances. Before installing the input clutches retainer, follow the instructions in **Determining No. 4 Thrust Plate Thickness**.

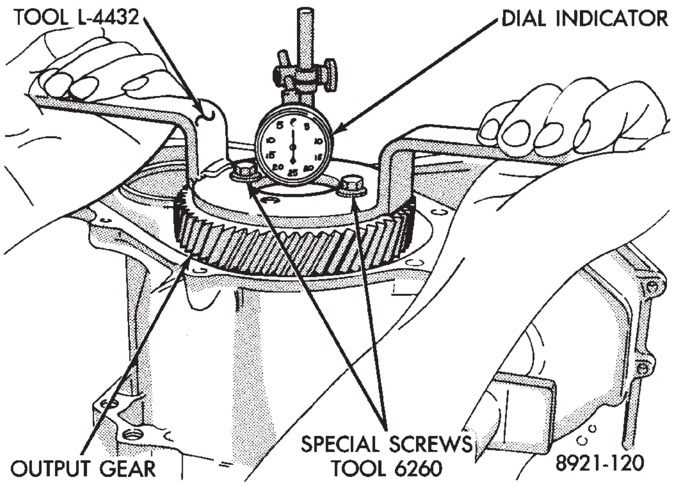


Fig. 162 Checking Output Gear Bearings End Play

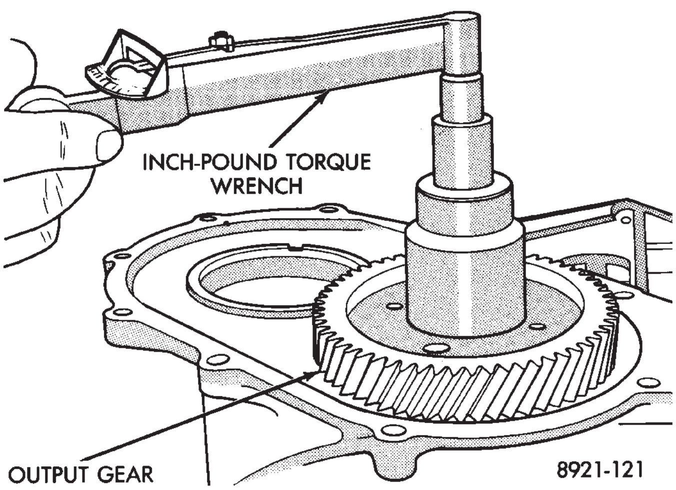


Fig. 163 Checking Output Gear Bearings Turning Torque

Press down clutch pack with finger and zero dial indicator. **Low/Reverse clutch pack clearance is 1.04 to 1.65mm (.042 to .065 inch).**

Select the proper low/reverse reaction plate to achieve specifications:

Press down clutch pack with finger and zero dial indicator. **The 2/4 clutch pack clearance is 0.76 to 2.64mm (.030 to .104 inch).** If not within specifications, the clutch is not assembled properly. **There is no adjustment for the 2/4 clutch clearance.**

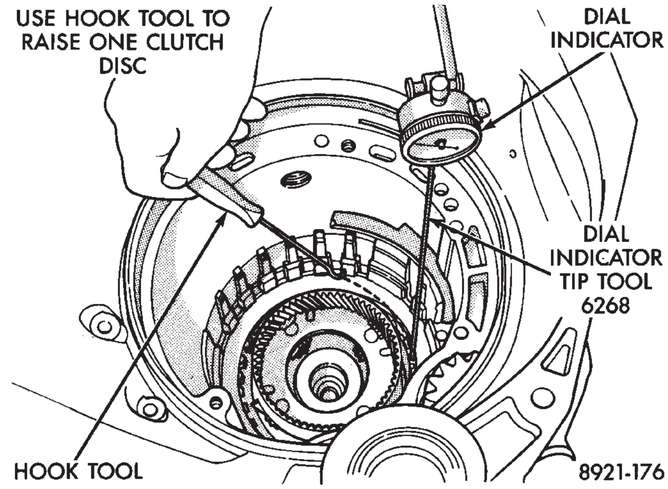


Fig. 164 Check Low/Reverse Clutch Clearance

THICKNESS
6.92 mm (.273 in.)
6.66 mm (.262 in.)
6.40 mm (.252 in.)
6.14 mm (.242 in.)
5.88 mm (.232 in.)
5.62 mm (.221 in.)
5.36 mm (.211 in.)

9121-4

LOW/REVERSE REACTION PLATE CHART

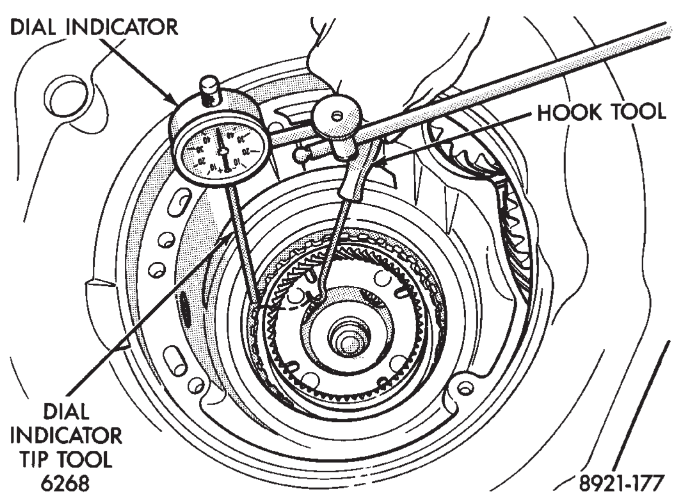


Fig. 165 Check 2/4 Clutch Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

DETERMINING No. 4 THRUST PLATE THICKNESS—INPUT SHAFT END PLAY

To determine the proper thickness of the No. 4 thrust plate, select the thinnest No. 4 thrust plate. Using petrolatum (Fig. 166) to hold thrust plate in position, install input clutch assembly. Be sure the input clutch assembly is completely seated (Fig. 167).

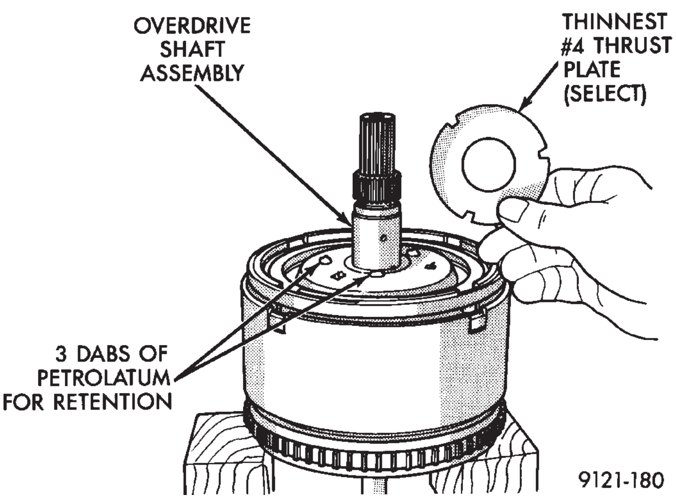


Fig. 166 Select Thinnest No. 4 Thrust Plate

CAUTION: If view through input speed sensor hole

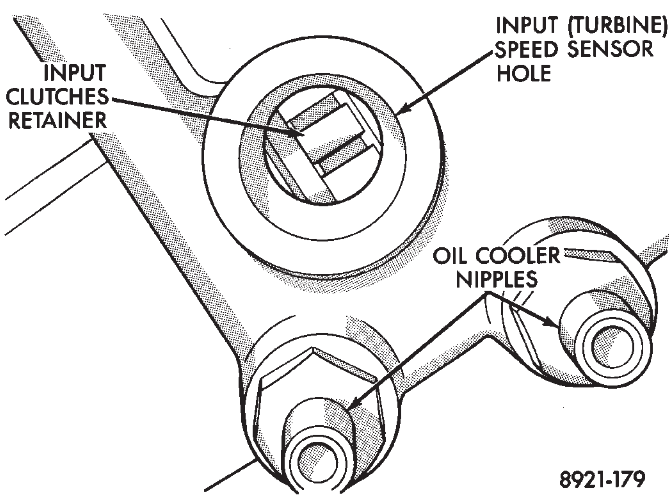


Fig. 167 View Through Input Speed Sensor Hole

is not as shown above, the input clutches assembly is not seated properly.

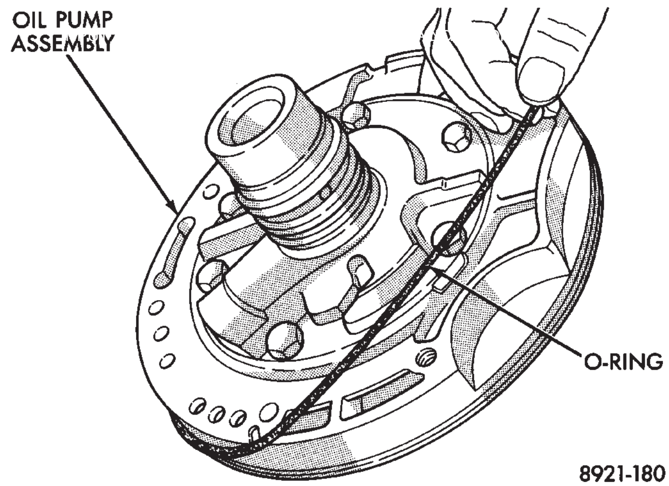


Fig. 168 Remove Oil Pump O-Ring

Remove the oil pump O-ring. You will be able to install and remove the oil pump and gasket very easily to select the proper No. 4 thrust plate.

CAUTION: Be sure to reinstall O-ring on oil pump after selecting the proper No. 4 thrust plate.

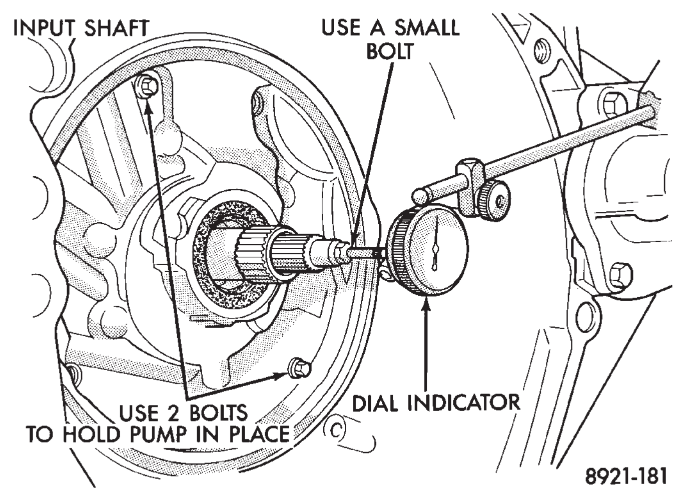


Fig. 169 Measure Input Shaft End Play

NOTE: Input shaft end play must be .005 to .025 inch.

For example, if end play reading is .055 inch, select No. 4 Thrust Plate which is .071 to .074 thick. This should provide an input shaft end play reading of yes

DISASSEMBLY AND ASSEMBLY (Continued)

See chart below to select the proper No. 4 thrust plate.

SHIM THICKNESS mm	inch
.81 - 1.03	.032 - .040
1.03 - 1.25	.040 - .049
1.25 - 1.47	.049 - .058
1.47 - 1.69	.058 - .066
1.69 - 1.91	.066 - .075
1.91- 2.13	.075 - .084
2.13 - 2.35	.084 - .092
2.35 - 2.57	.092 - .101
2.57 - 2.79	.101 - .109
2.79 - 3.01	.109 - .118
3.01 - 3.23	.118 - .131
3.23 - 3.45	.131 - .136

9221-127

No. 4 THRUST PLATE CHART

INPUT CLUTCHES-RECONDITION

DISASSEMBLY

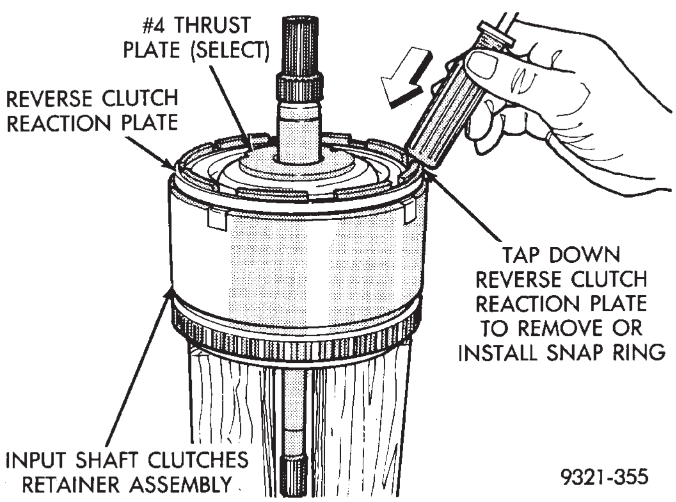


Fig. 170 Tapping Reaction Plate

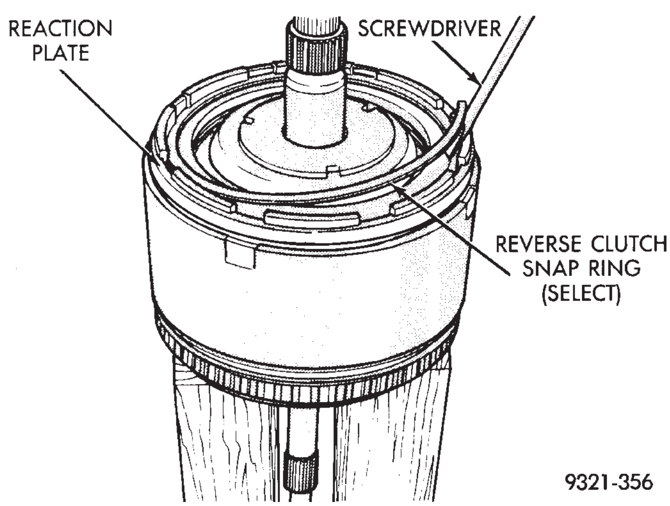


Fig. 171 Reverse Clutch Snap Ring

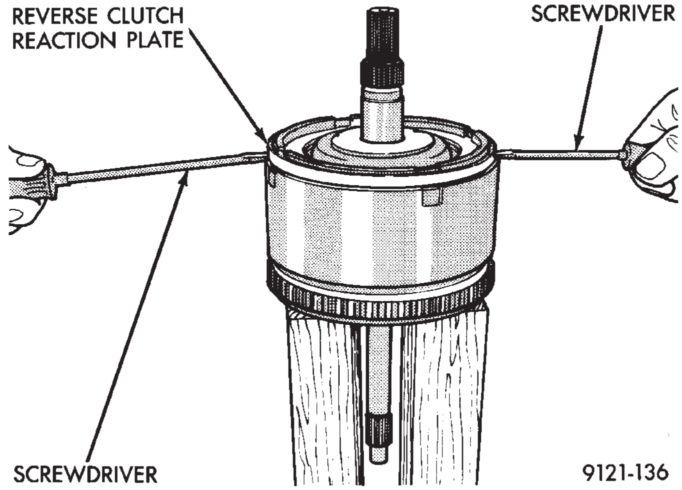


Fig. 172 Pry Reverse Clutch Reaction Plate

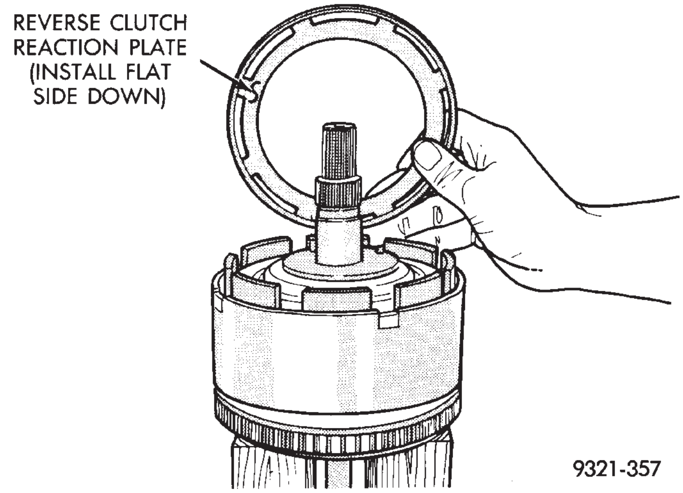


Fig. 173 Reverse Clutch Reaction Plate

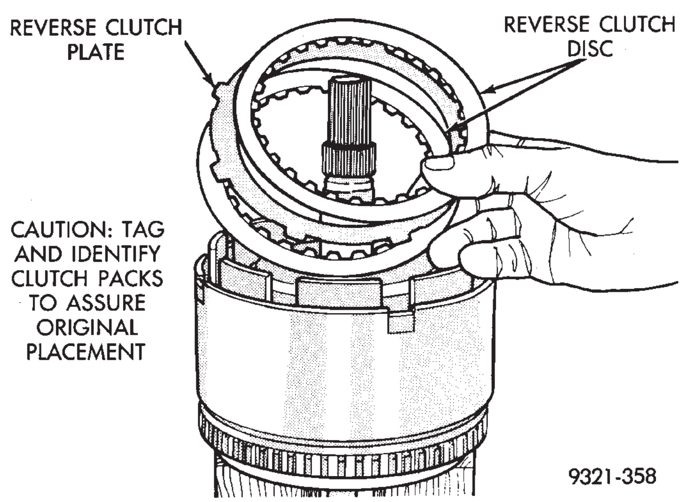


Fig. 174 Reverse Clutch Pack

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: Tag reverse clutch pack for reassembly identification.

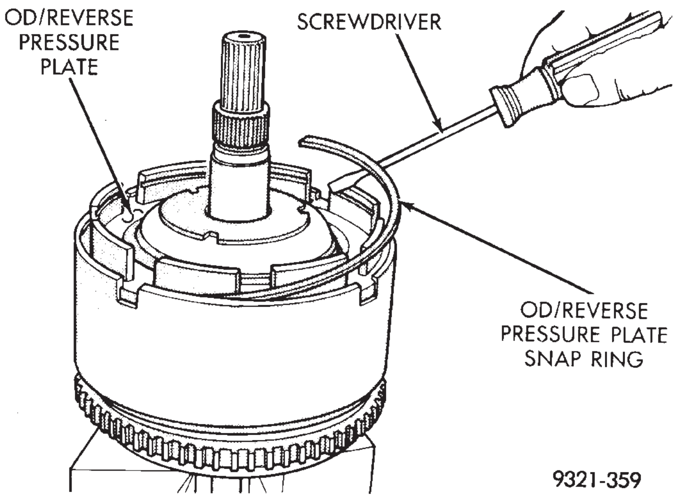


Fig. 175 OD/Reverse Pressure Plate Snap Ring

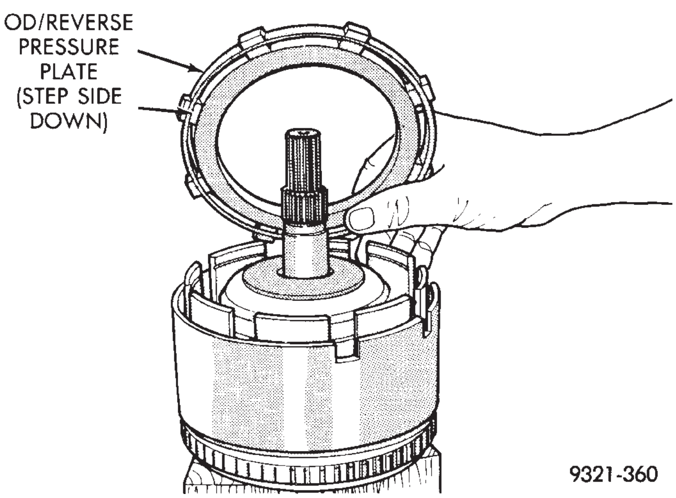


Fig. 176 OD/Reverse Pressure Plate

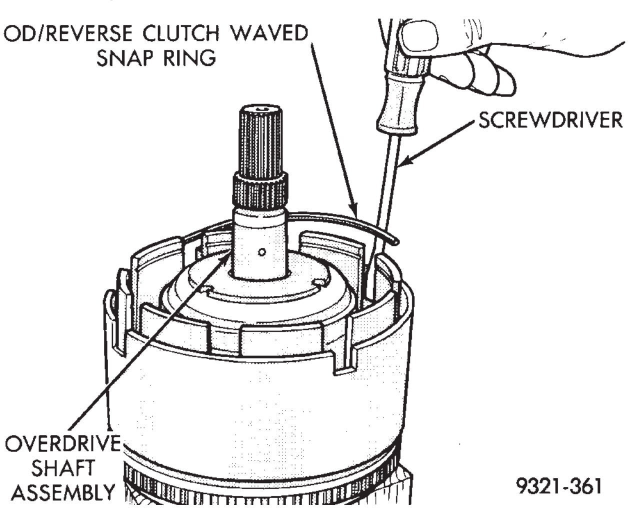


Fig. 177 Waved Snap Ring

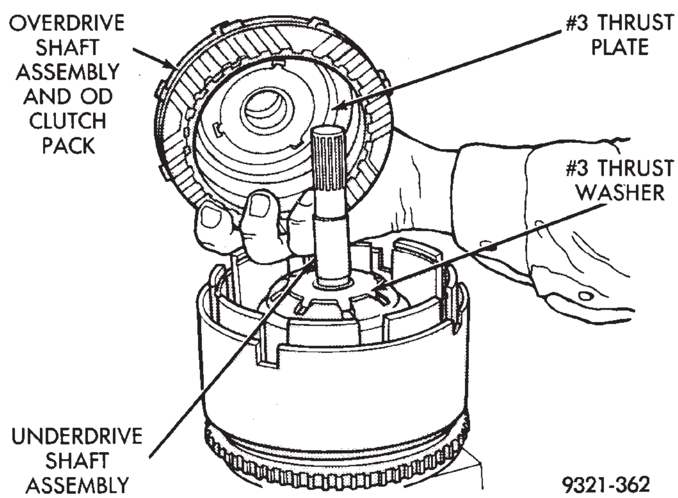


Fig. 178 Remove OD Clutch Pack

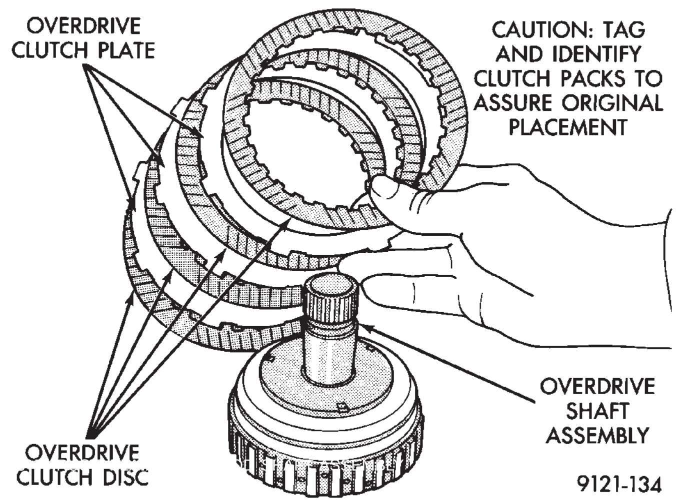


Fig. 179 Overdrive Clutch Pack

NOTE: Tag overdrive clutch pack for reassembly identification.

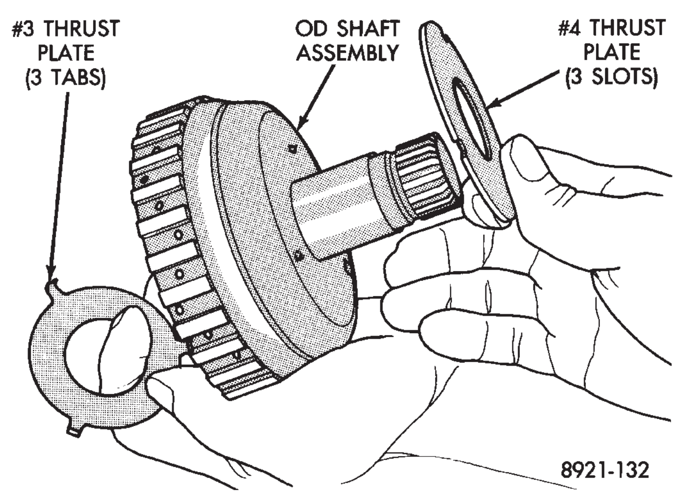


Fig. 180 Overdrive Shaft Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

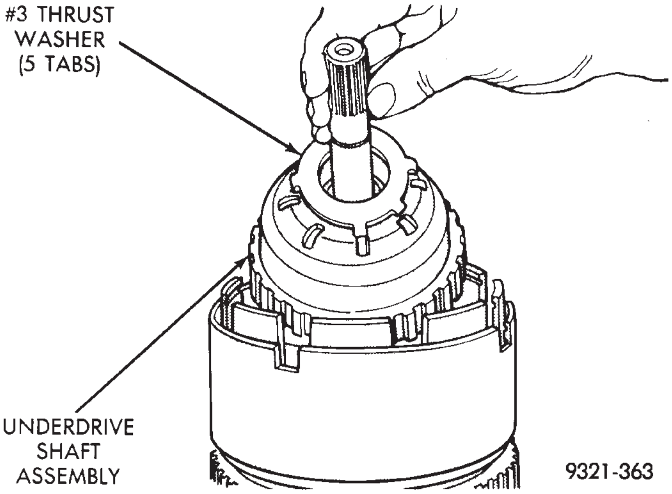


Fig. 181 Underdrive Shaft Assembly

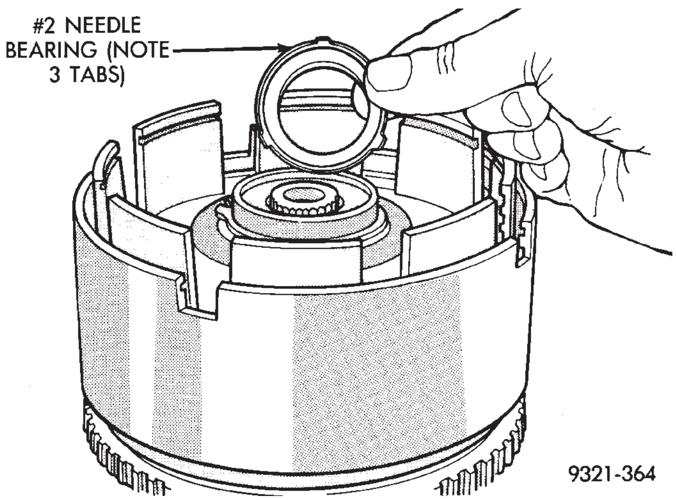


Fig. 182 No. 2 Needle Bearing

NOTE: The OD/UD Reaction Plate, Snap Rings, and Input Clutches Retainer is not interchangeable with previous year 41TE components. The snap rings are thicker and the position of the ring lands have changed.

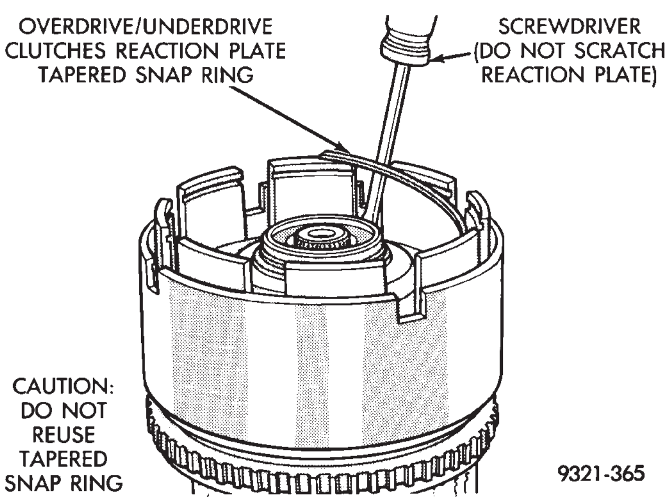


Fig. 183 OD/UD Reaction Plate Tapered Snap Ring

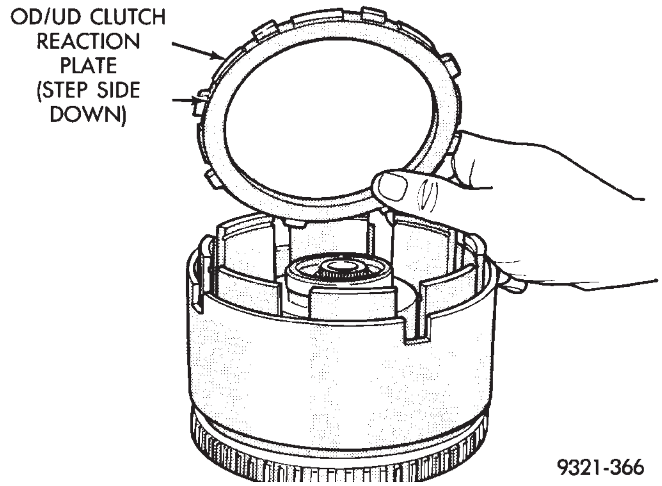


Fig. 184 OD/UD Reaction Plate

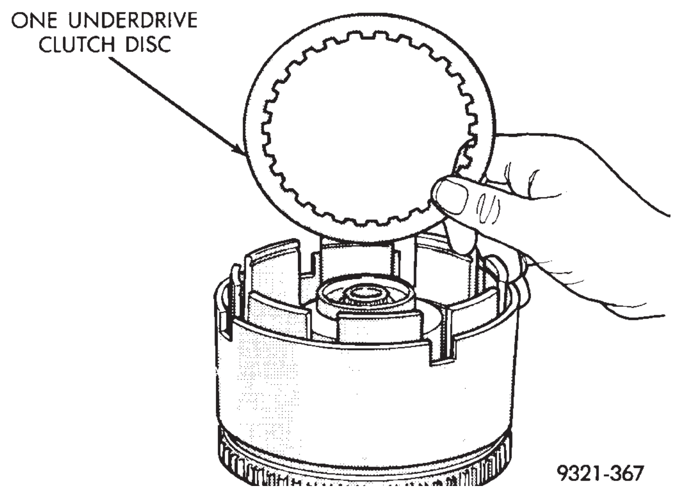


Fig. 185 Remove One UD Clutch Disc

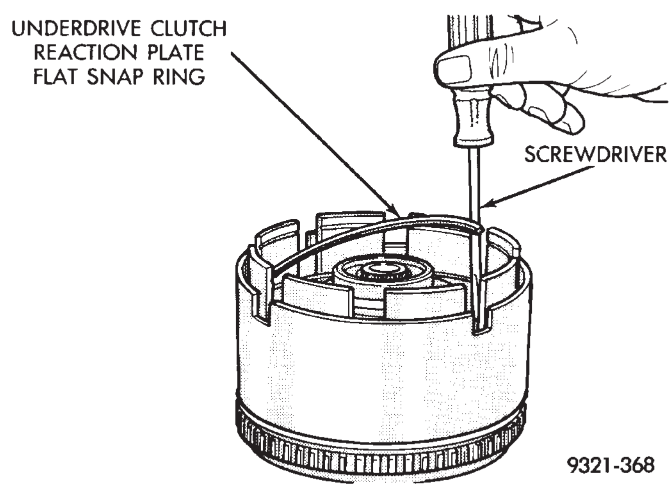


Fig. 186 UD Clutch Flat Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

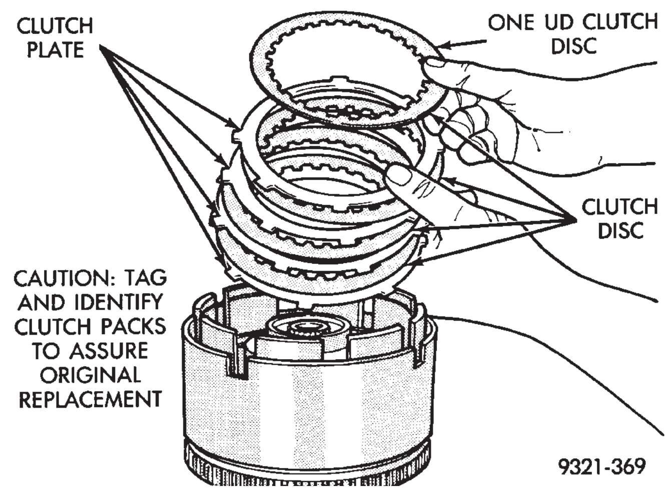


Fig. 187 Underdrive Clutch Pack

NOTE: Tag underdrive clutch pack for reassembly identification.

CAUTION: Compress return spring just enough to remove or install snap ring.

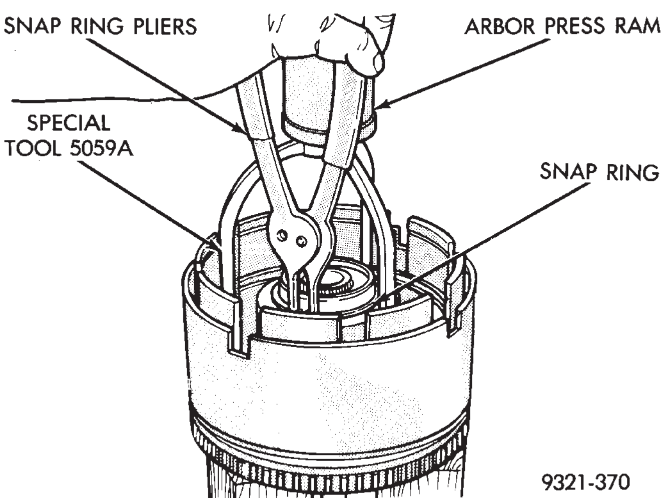


Fig. 188 UD Spring Retainer Snap Ring

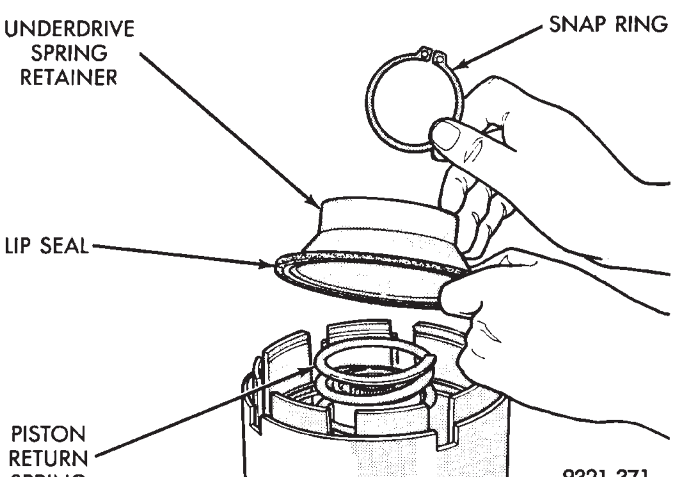


Fig. 189 UD Return Spring and Retainer

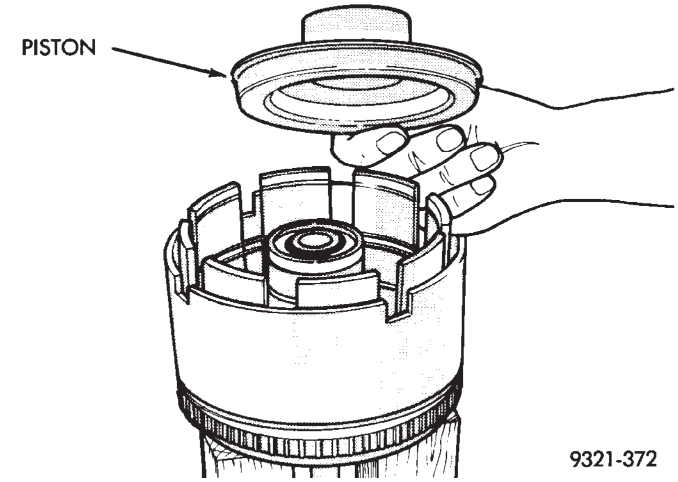


Fig. 190 Underdrive Clutch Piston

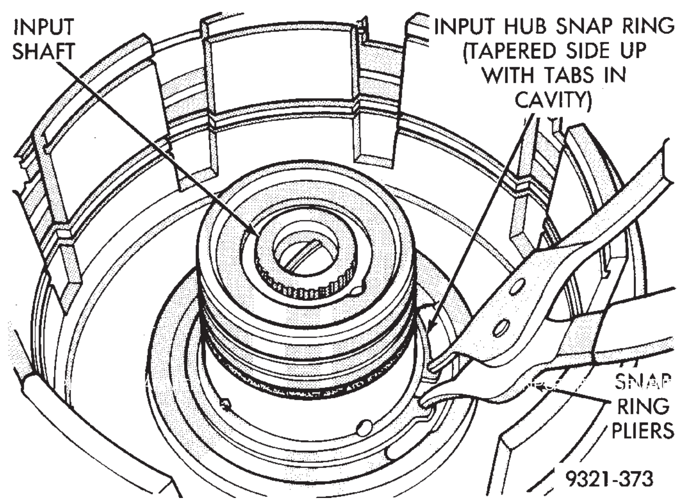


Fig. 191 Input Hub Tapered Snap Ring

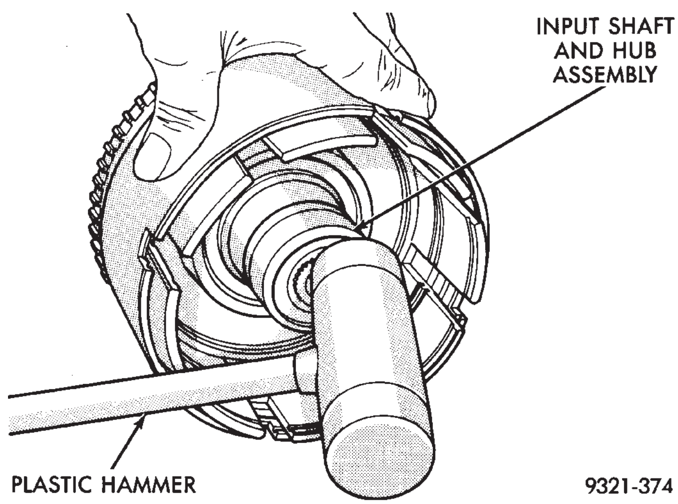


Fig. 192 Tap on Input Hub

DISASSEMBLY AND ASSEMBLY (Continued)

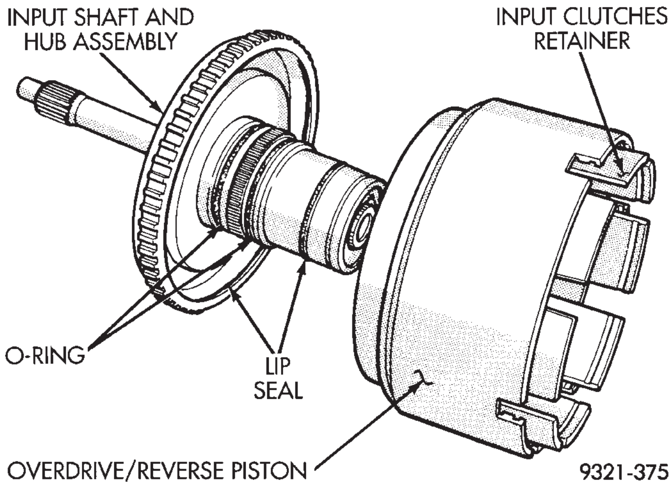


Fig. 193 Input Hub Removed

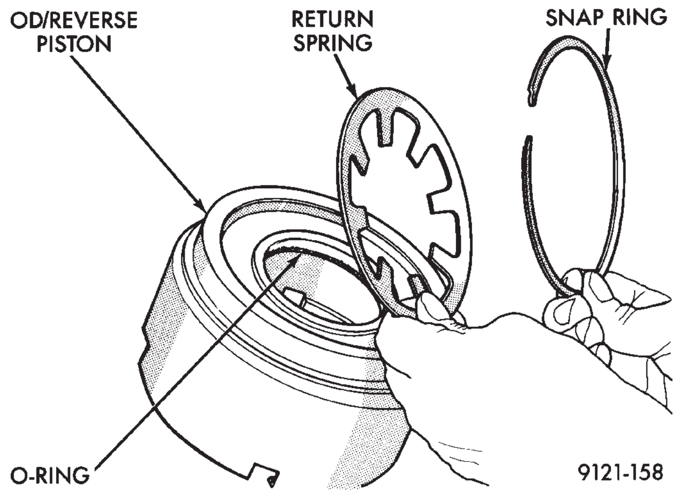


Fig. 196 Snap Ring and Return Spring

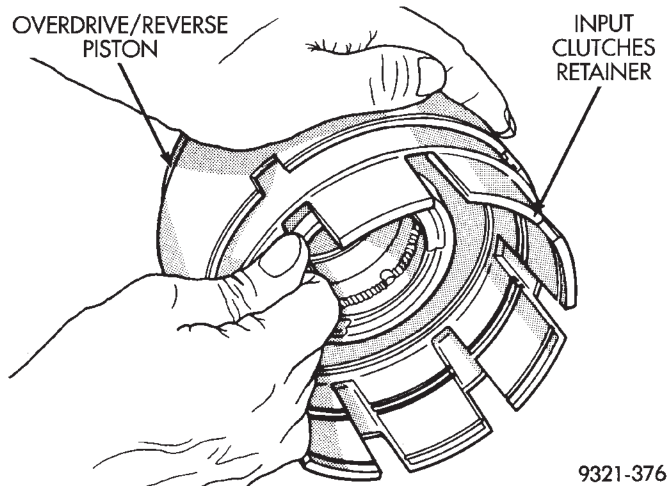


Fig. 194 Pull Retainer from Piston

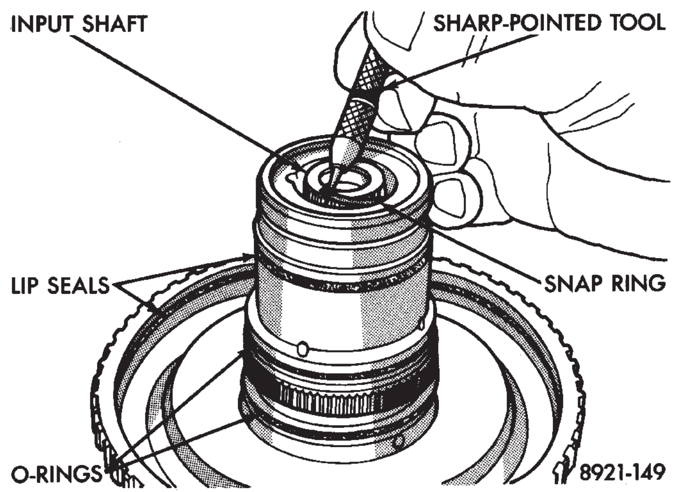


Fig. 197 Remove Input Shaft Snap Ring

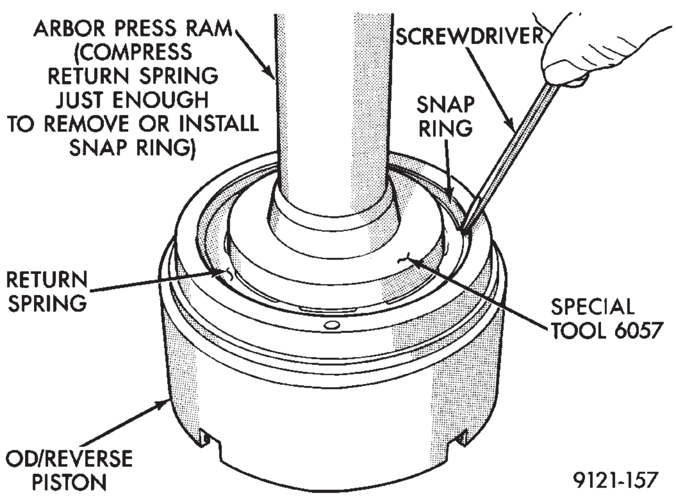


Fig. 195 Install Snap Ring

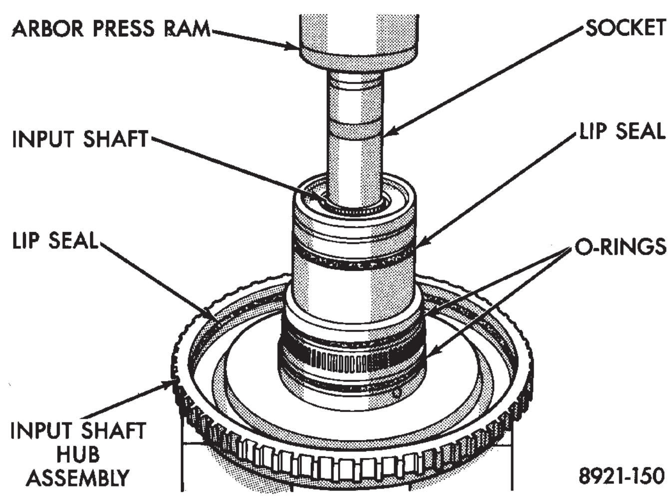


Fig. 198 Remove Input Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

Use petrolatum on all seals to ease assembly of components.

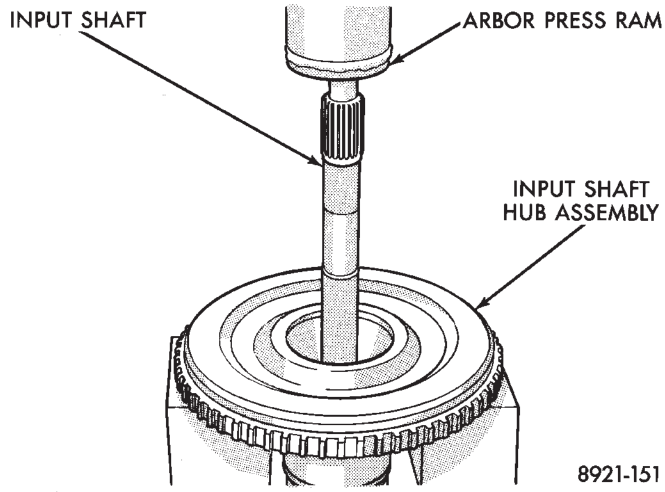


Fig. 199 Install Input Shaft

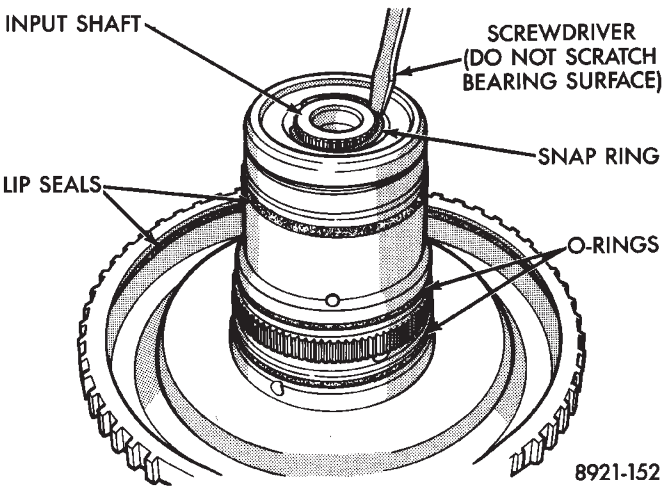


Fig. 200 Install Input Shaft Snap Ring

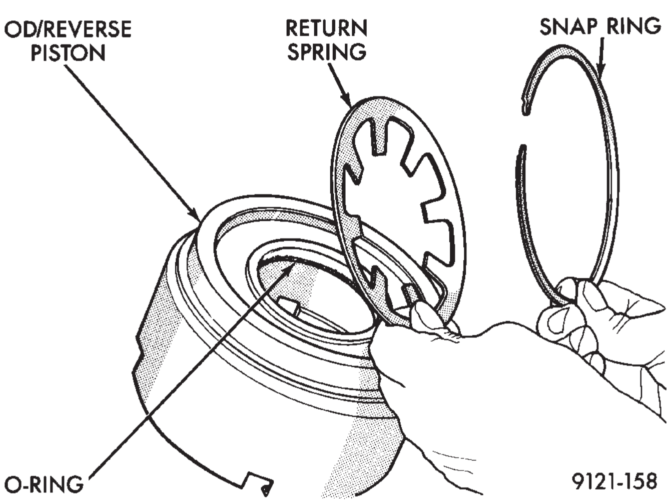


Fig. 201 Return Spring and Snap Ring

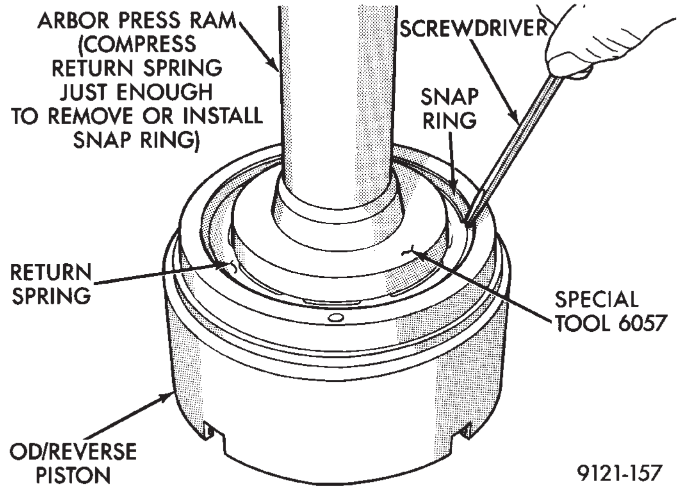


Fig. 202 Install Snap Ring

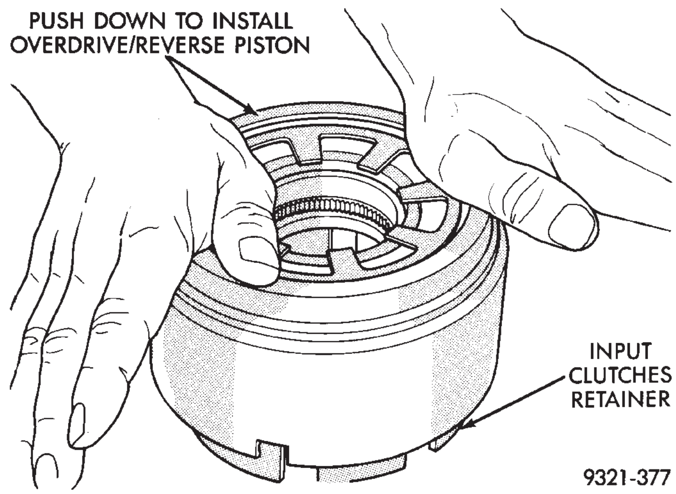


Fig. 203 Install OD/Reverse Piston

NOTE: The OD/UD Reaction Plate, Snap Rings, and Input Clutches Retainer is not interchangeable with previous year 41TE components. The snap rings are thicker and the position of the ring lands have changed.

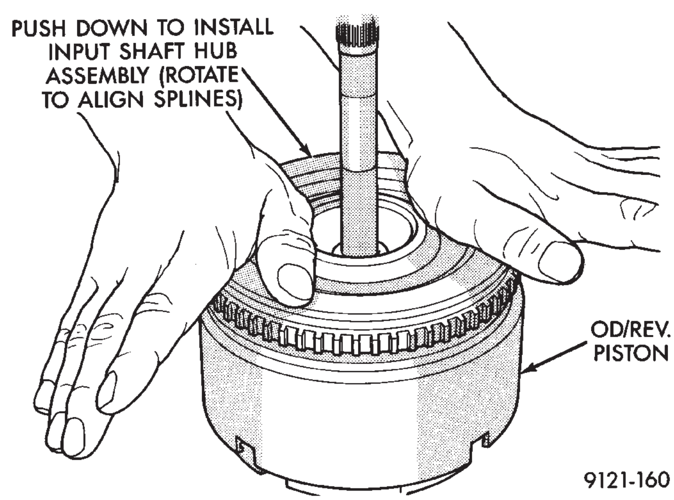


Fig. 204 Install Input Shaft Hub Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

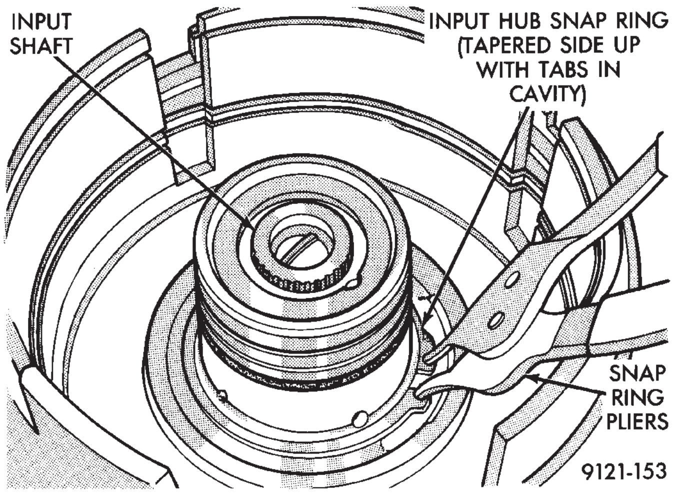


Fig. 205 Input Hub Tapered Snap Ring

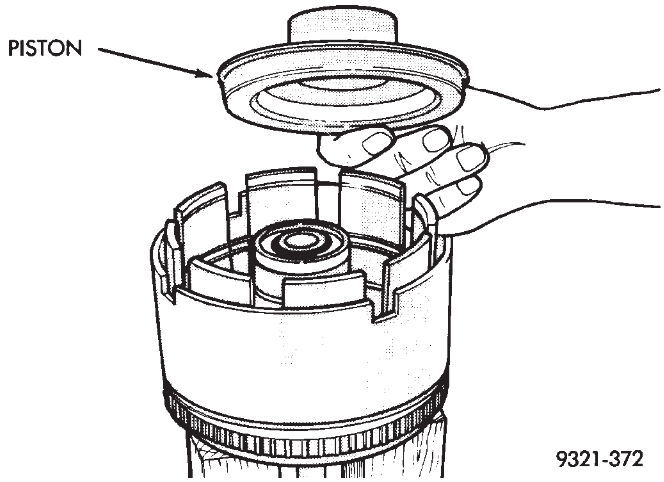


Fig. 206 Underdrive Clutch Piston

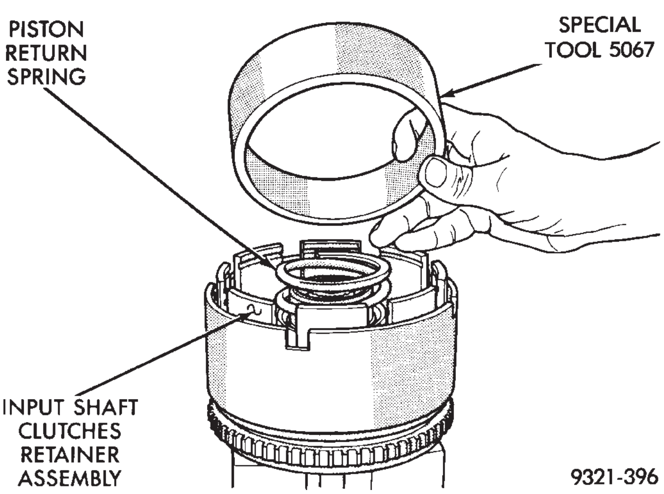


Fig. 207 Seal Compressor Special Tool 5067

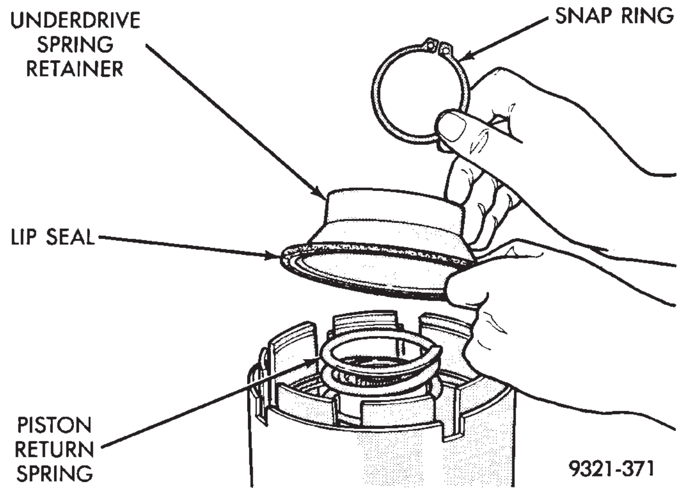


Fig. 208 UD Return Spring and Retainer

CAUTION: Compress return spring just enough to remove or install snap ring.

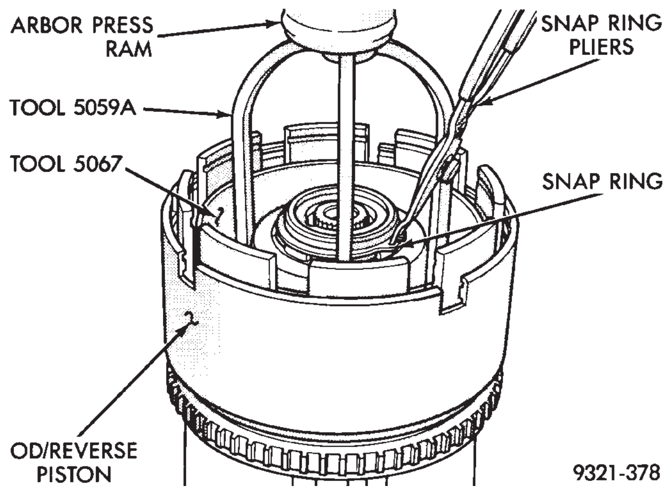


Fig. 209 Install UD Spring Retainer and Snap Ring

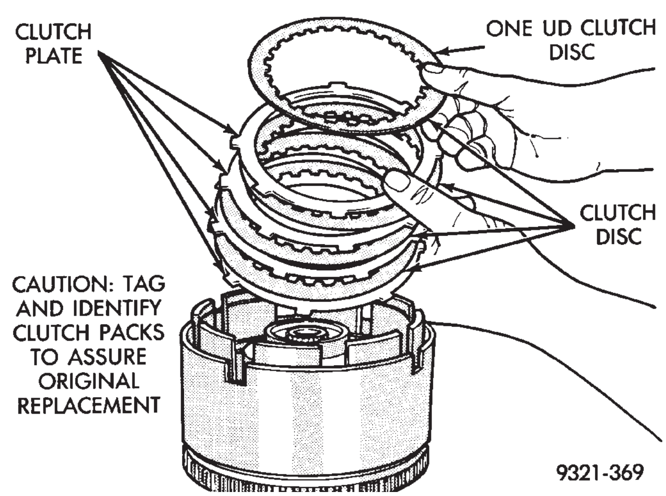


Fig. 210 Underdrive Clutch Pack

DISASSEMBLY AND ASSEMBLY (Continued)

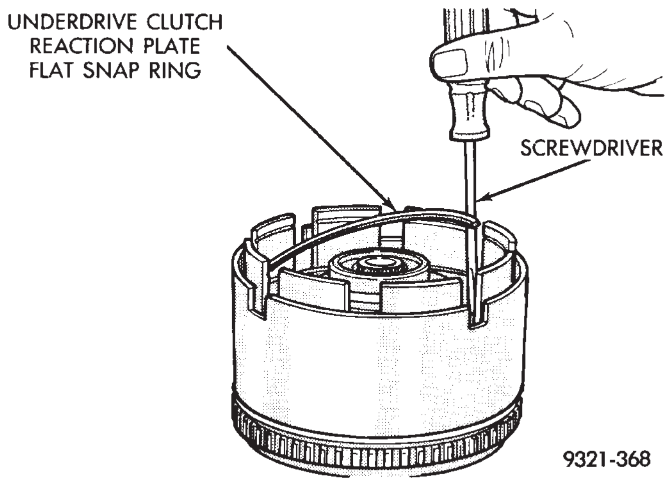


Fig. 211 UD Clutch Flat Snap Ring

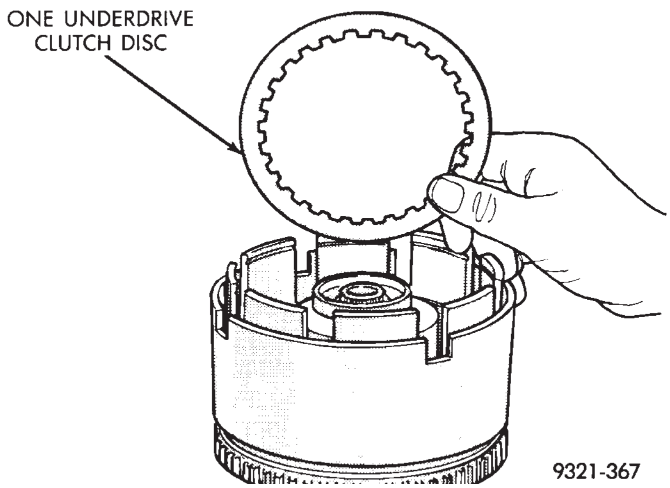


Fig. 212 Install Last UD Clutch Disc

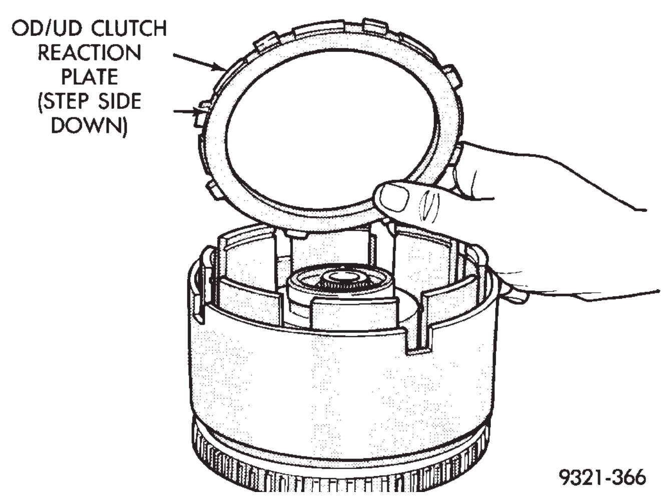


Fig. 213 OD/UD Reaction Plate

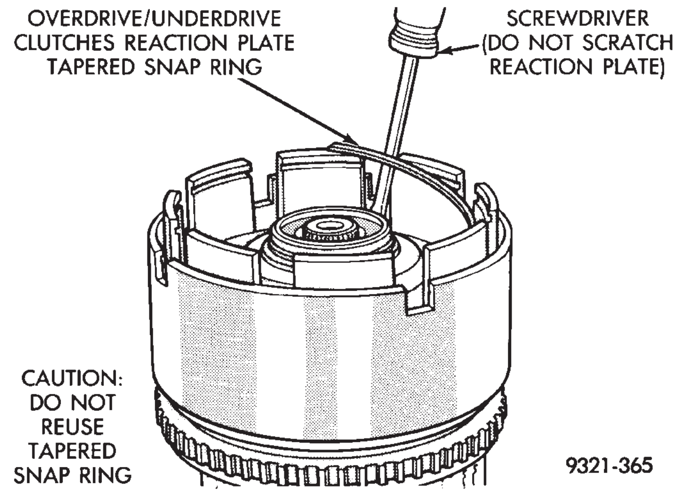


Fig. 214 Tapered Snap Ring

NOTE: Snap ring ends must be located within one finger of the input clutch hub. Be sure that snap ring is fully seated, by pushing with screwdriver, into snap ring groove all the way around.

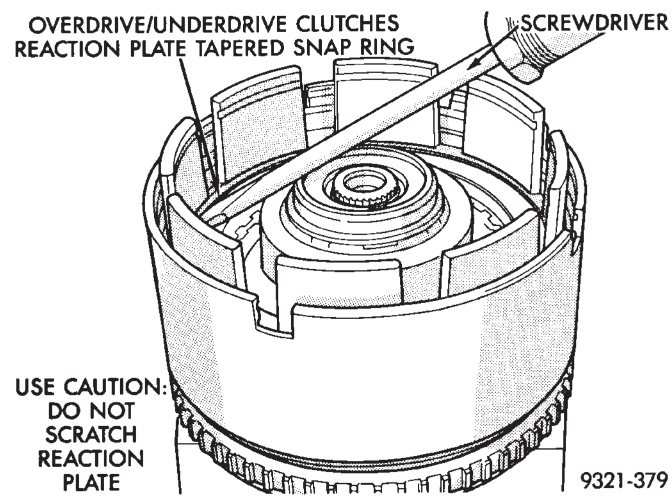


Fig. 215 Seating Tapered Snap Ring

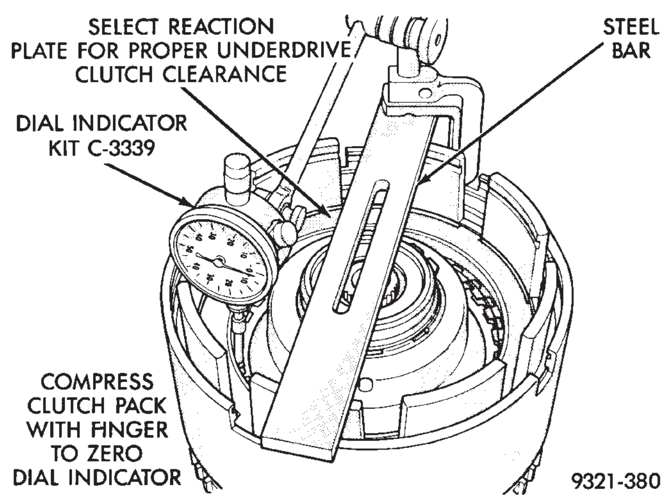


Fig. 216 Set Up Dial Indicator for Clutch Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

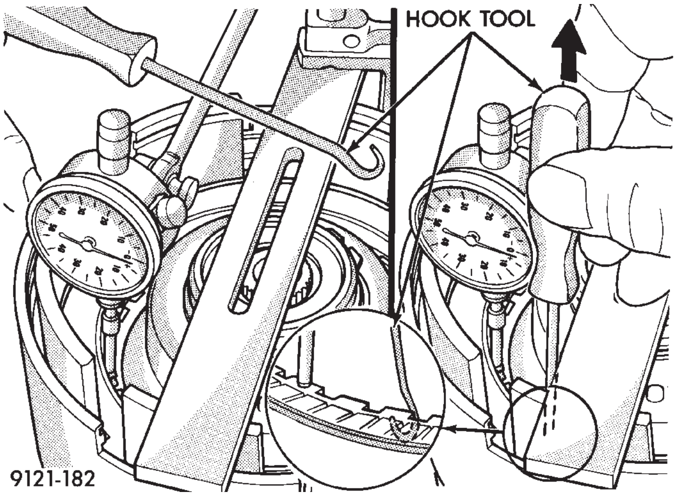


Fig. 217 Use Hook Tool to Raise One Clutch Disc

Underdrive clutch pack clearance must be 0.91 to 1.47 mm (.036 to .058 inch). Select the proper reaction plate to achieve specifications:

THICKNESS
6.99 mm (.275 in.)
6.50 mm (.256 in.)
6.01 mm (.237 in.)
5.52 mm (.217 in.)

9121-5

UNDERDRIVE REACTION PLATE CHART

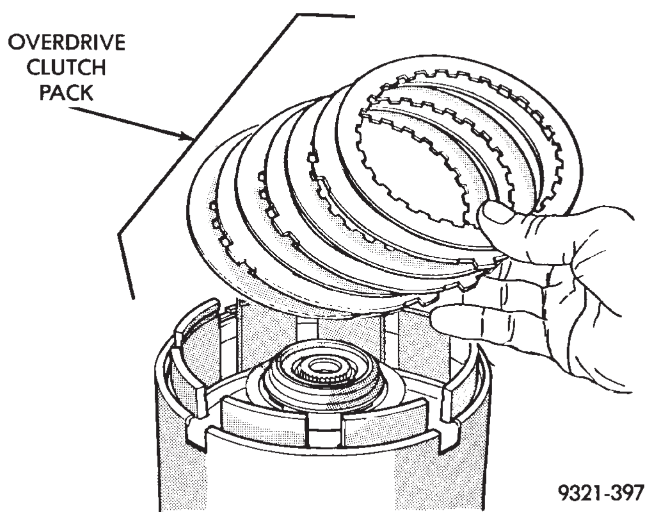


Fig. 218 Install OD Clutch Pack

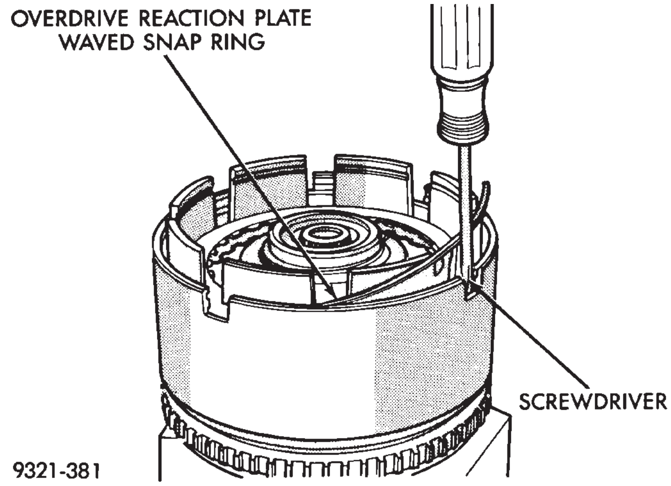


Fig. 219 Install Waved Snap Ring

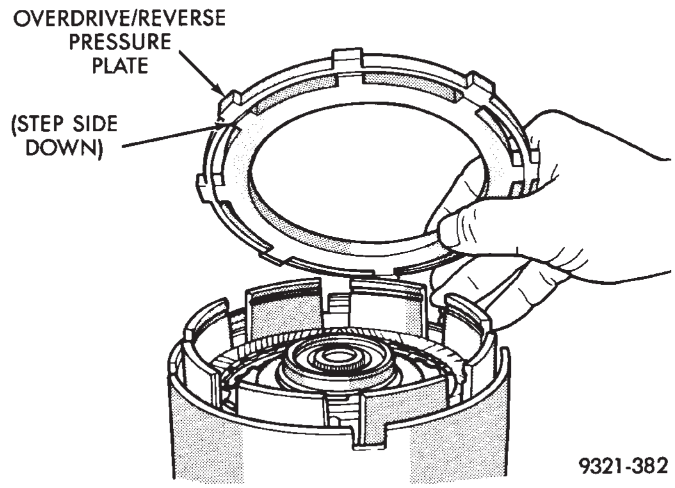


Fig. 220 OD/Reverse Pressure Plate

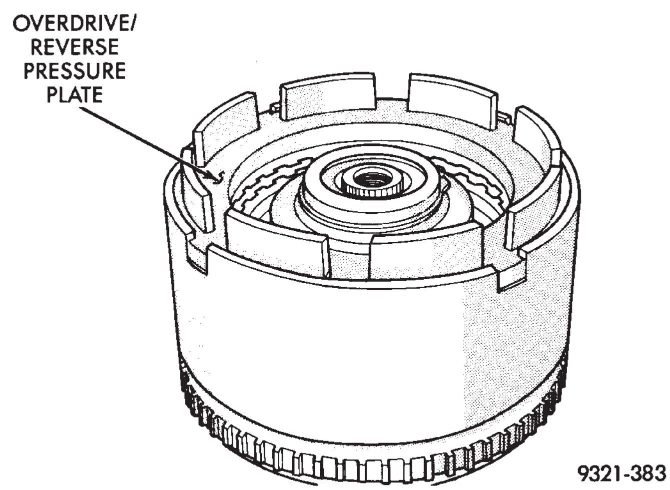


Fig. 221 Pressure Plate Installed

DISASSEMBLY AND ASSEMBLY (Continued)

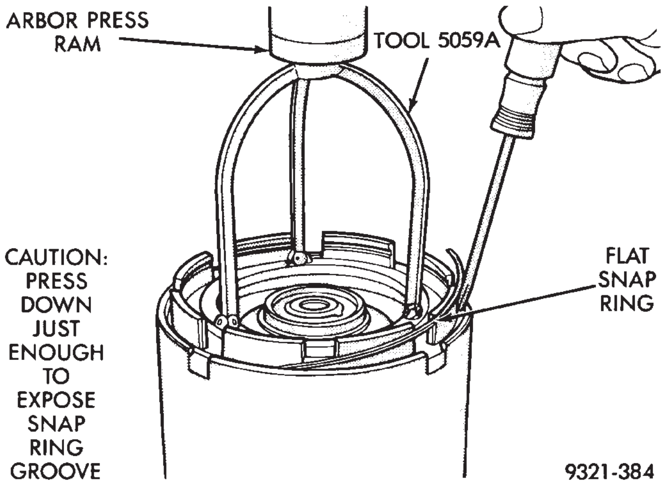


Fig. 222 Install Flat Snap Ring

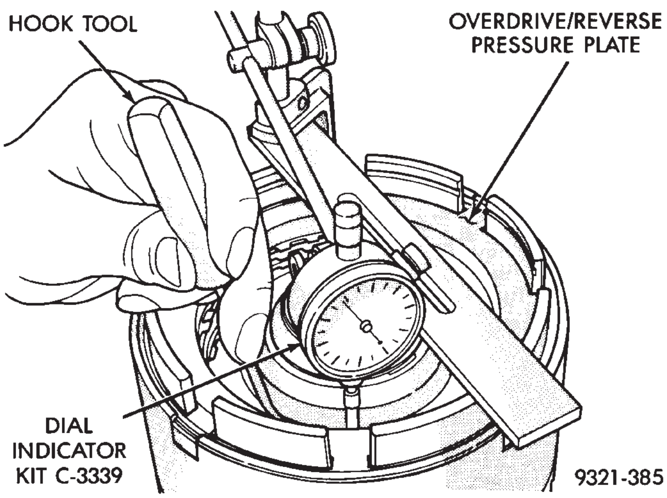


Fig. 223 Check OD Clutch Pack Clearance

The overdrive (OD) clutch pack clearance is 1.07 to 2.44 mm (.042 to .096 inch). If not within specifications, the clutch is not assembled properly. There is no adjustment for the OD clutch clearance.

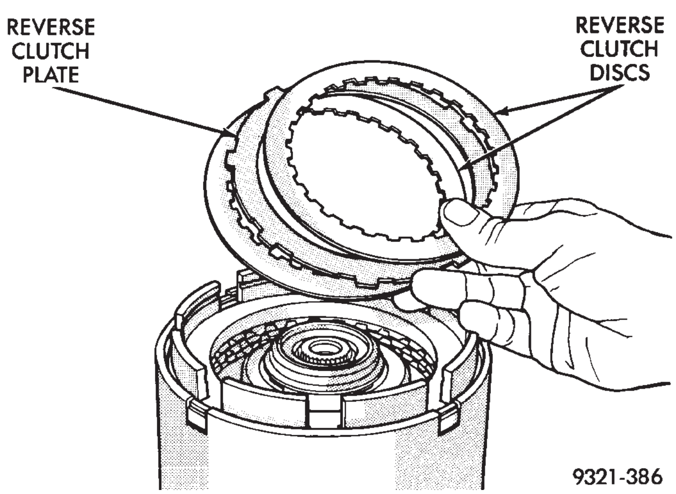


Fig. 224 Install Reverse Clutch Pack

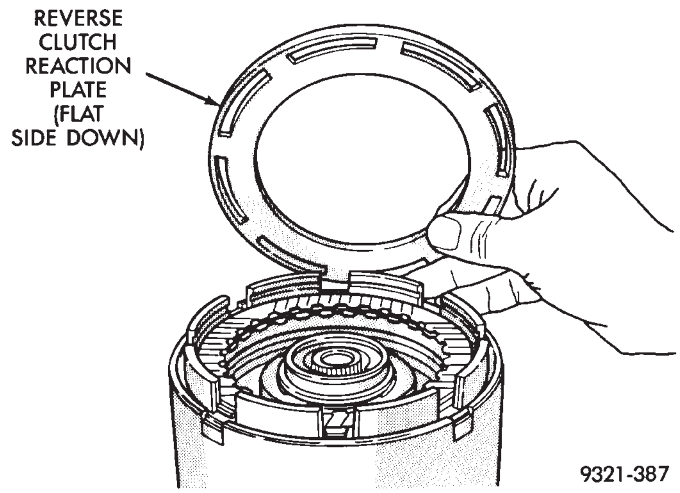


Fig. 225 Install Reaction Plate

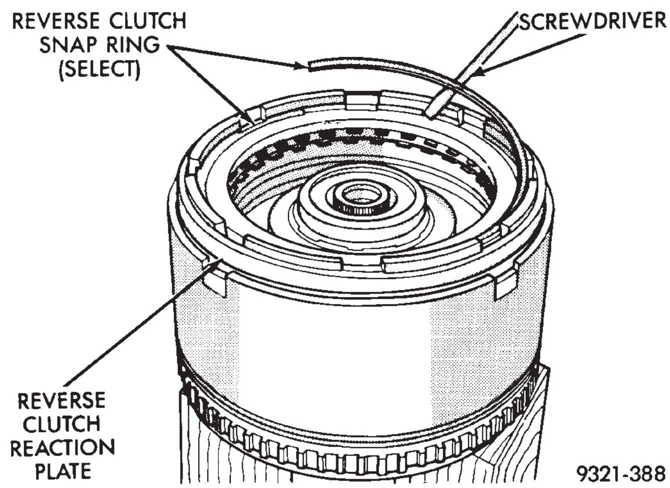


Fig. 226 Install Reverse Clutch Snap Ring

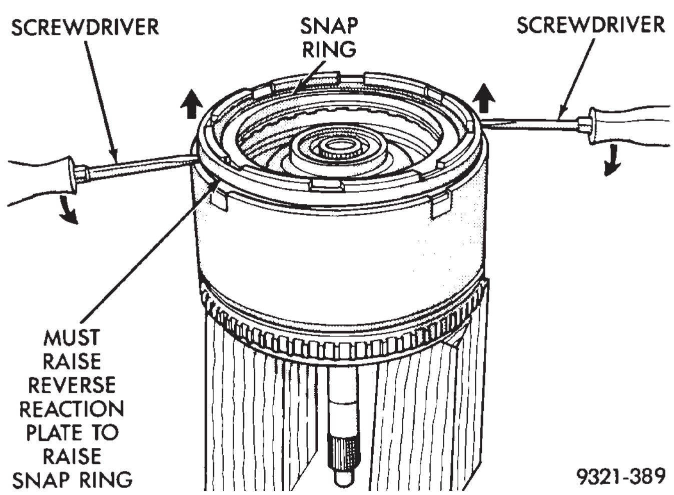


Fig. 227 Seating Snap Ring to Determine Reverse Clutch Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

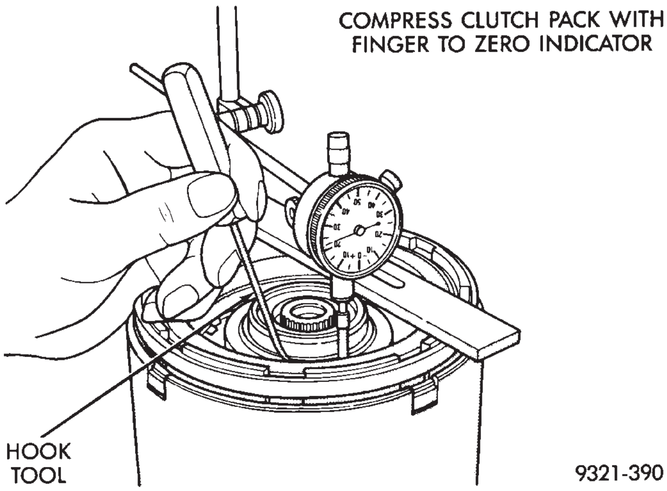


Fig. 228 Check Reverse Clutch Pack Clearance

The reverse clutch pack clearance is 0.76 to 1.24 mm (.030 to .049 inch). Select the proper reverse clutch snap ring to achieve specifications:

THICKNESS
1.56 mm (.061 in.)
1.80 mm (.071 in.)
2.05 mm (.081 in.)
2.30 mm (.090 in.)

9121-6

REVERSE CLUTCH SNAP RING CHART

All clutch clearances in the input clutch retainer have now been checked and approved.

To complete the assembly of the input clutch retainer, the reverse clutch and the overdrive clutch must be removed from the retainer.

CAUTION: Do not intermix clutch parts. Keep in exact same order.

Now proceed with the next phase of the assembly:

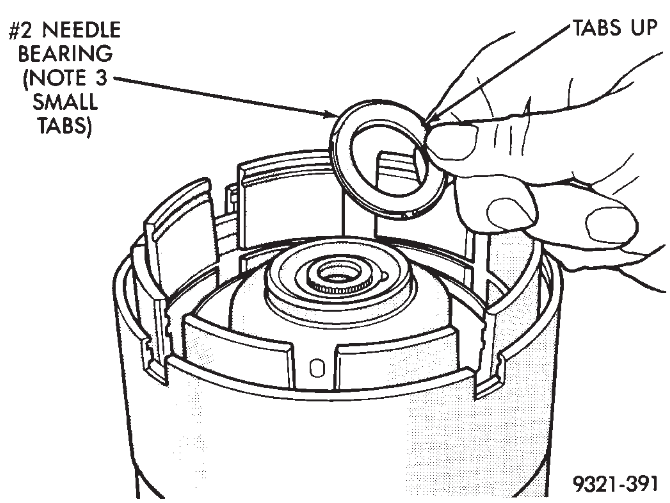


Fig. 229 Install No. 2 Needle Bearing

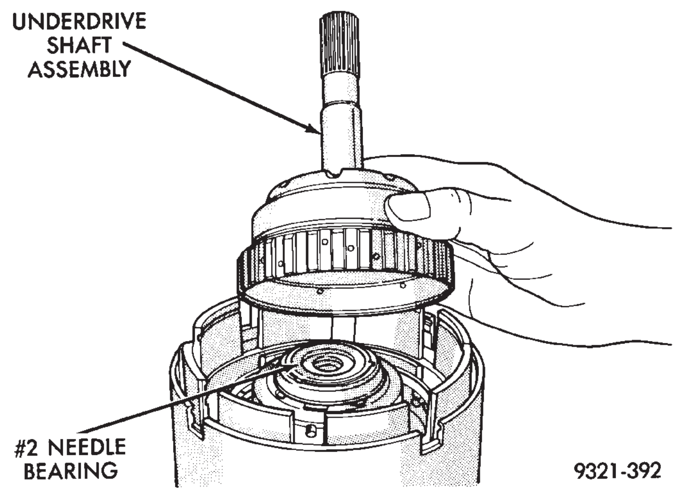


Fig. 230 Install Underdrive Shaft Assembly

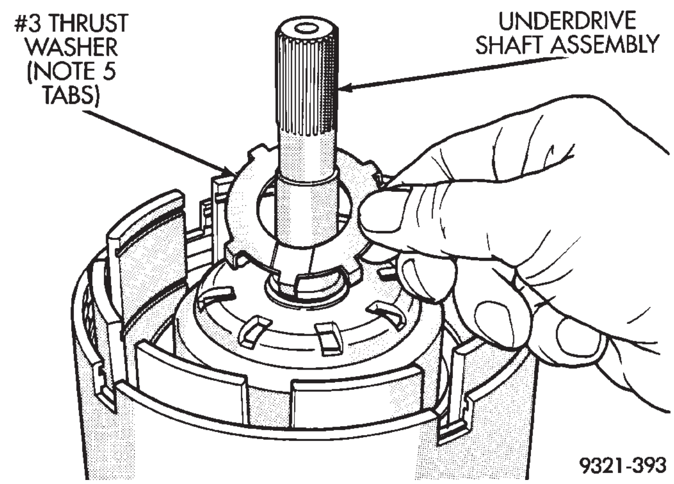


Fig. 231 Install No. 3 Thrust Washer

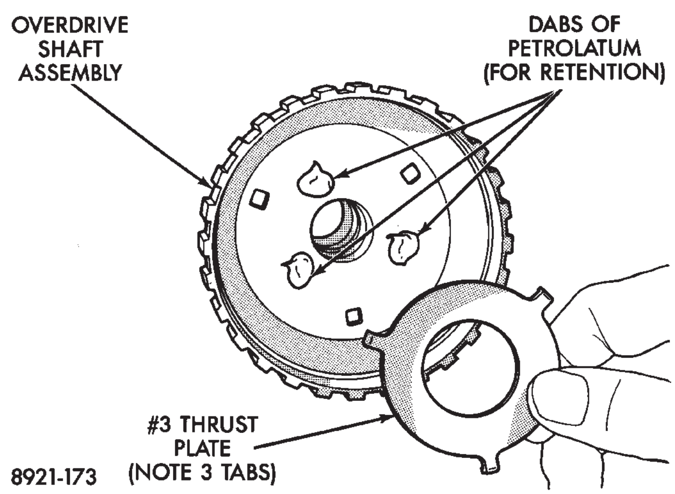


Fig. 232 Install No. 3 Thrust Plate

DISASSEMBLY AND ASSEMBLY (Continued)

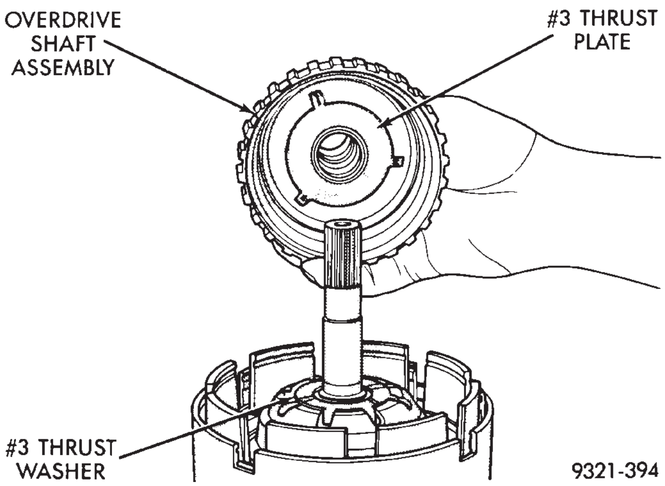


Fig. 233 Install Overdrive Shaft Assembly

Reinstall overdrive clutch and reverse clutch as shown. **Rechecking these clutch clearances is not necessary, as they were set and approved previously.**

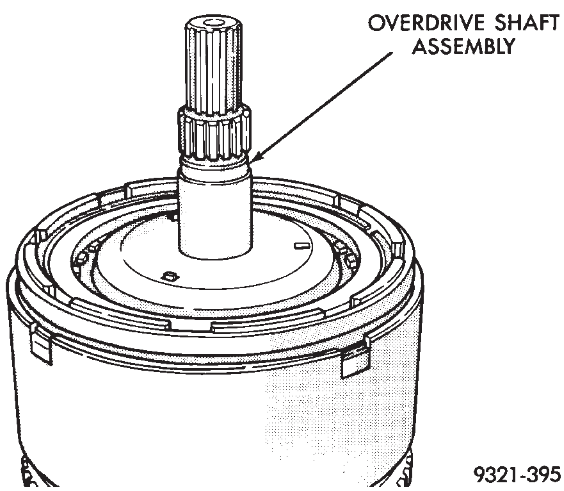


Fig. 234 Input Clutch Assembly

DIFFERENTIAL REPAIR

The transfer shaft should be removed for differential repair and bearing turning torque checking.

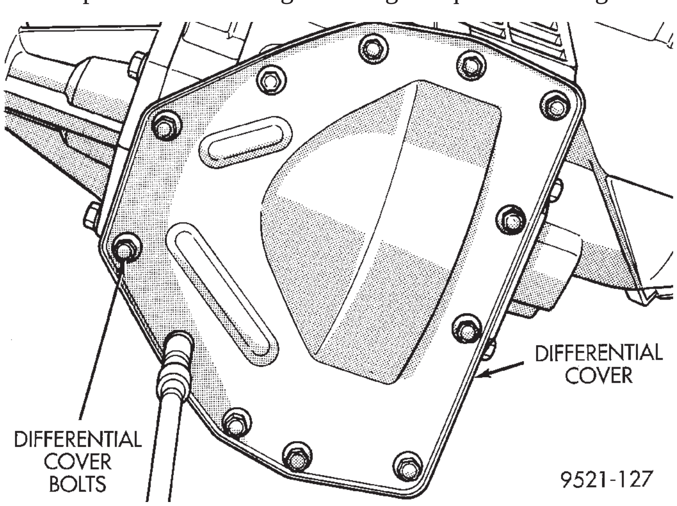


Fig. 235 Differential Cover Bolts

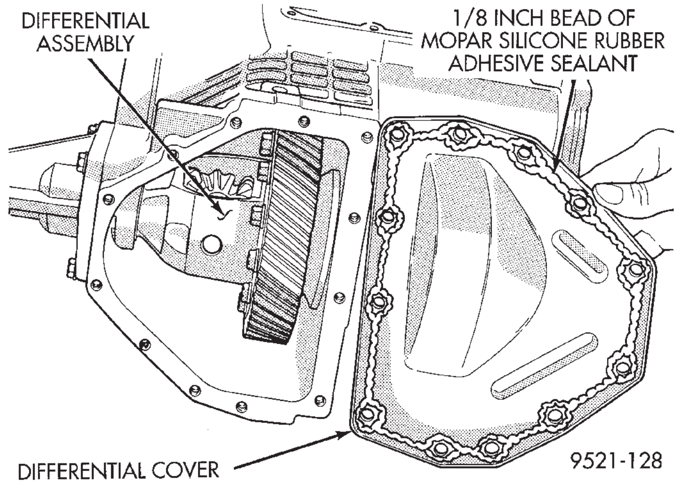


Fig. 236 Remove or Install Differential Cover

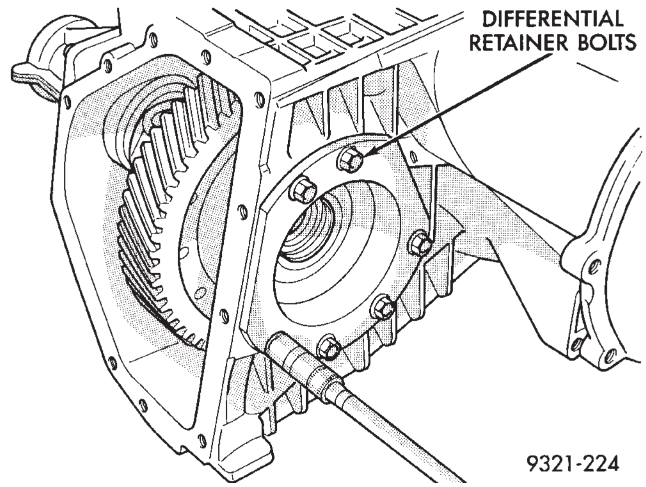


Fig. 237 Differential Retainer Bolts

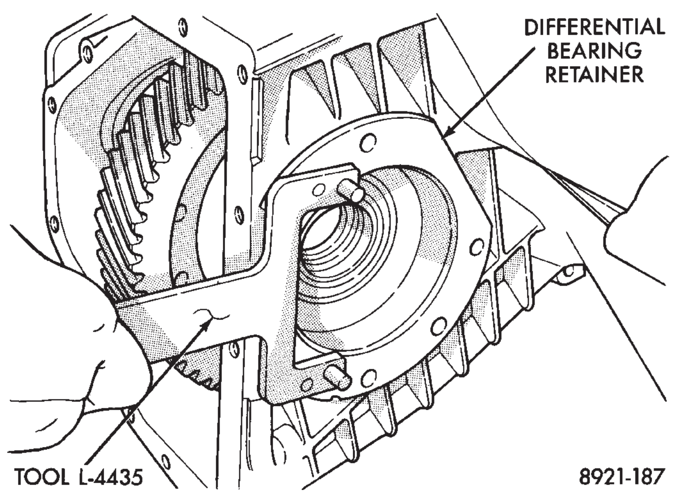


Fig. 238 Remove or Install Bearing Retainer

Remove adapter plate/seal housing on the right side of the transaxle.

DISASSEMBLY AND ASSEMBLY (Continued)

WARNING: HOLD ONTO DIFFERENTIAL ASSEMBLY TO PREVENT IT FROM ROLLING OUT OF HOUSING.

Use Mopar® Silicone Rubber Adhesive Sealant, or equivalent, when installing adapter plate.

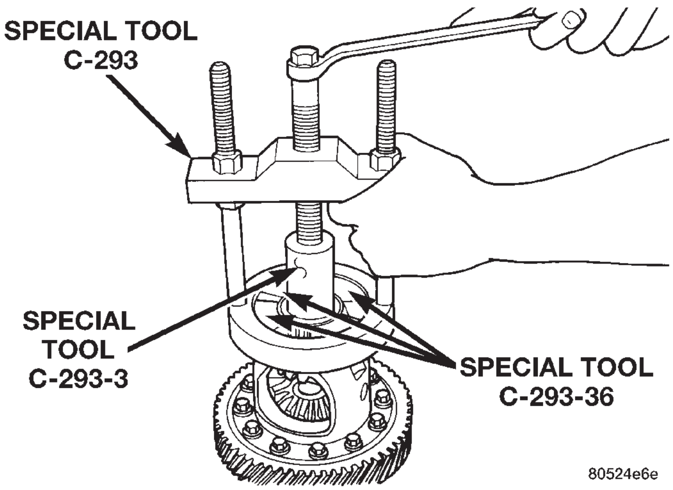


Fig. 239 Remove Differential Bearing Cone (Adapter Plate Side)

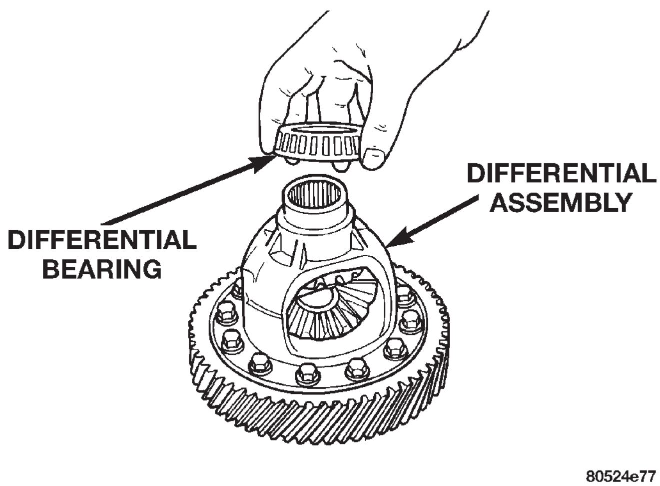


Fig. 240 Position Bearing Cone Onto Differential

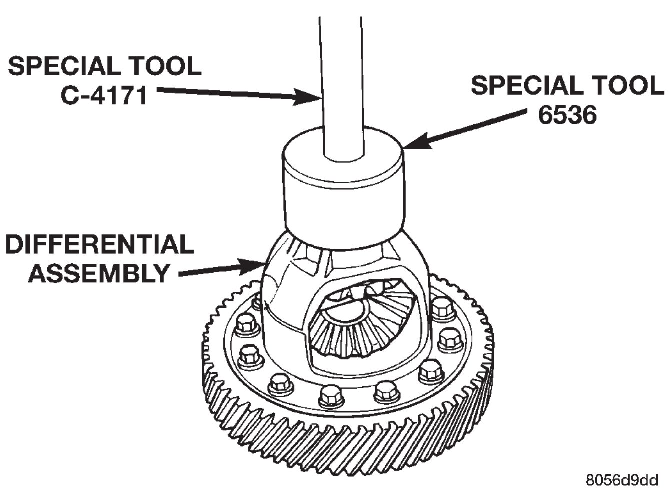


Fig. 241 Install Differential Bearing Cone

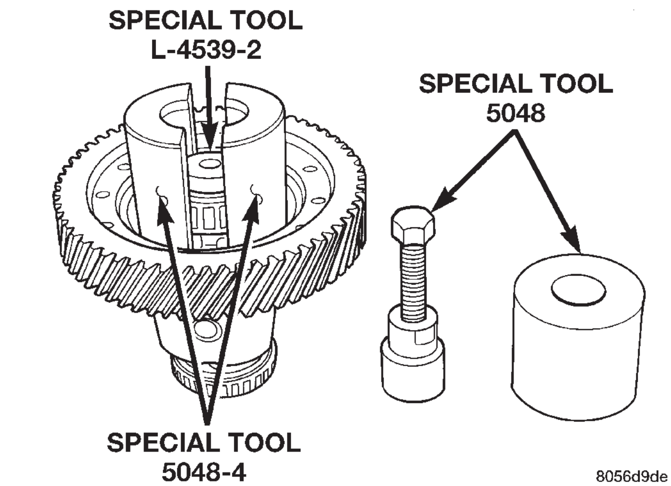


Fig. 242 Position Button and Collets Onto Differential and Bearing (Ring Gear Side)

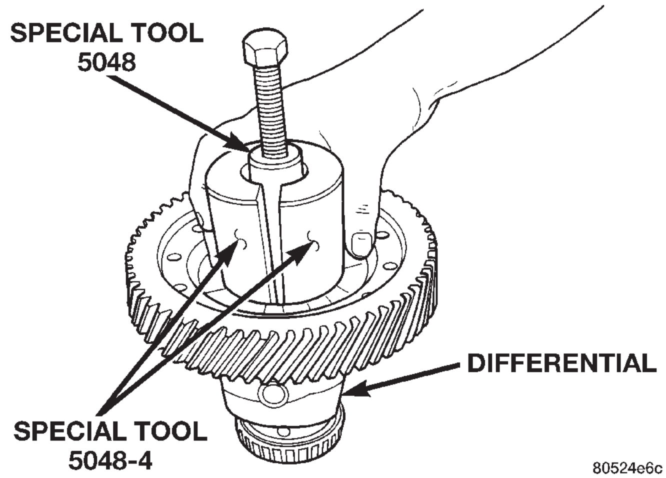


Fig. 243 Position Tool 5048 Over Button and Collets at Differential Bearing (Ring Gear Side)

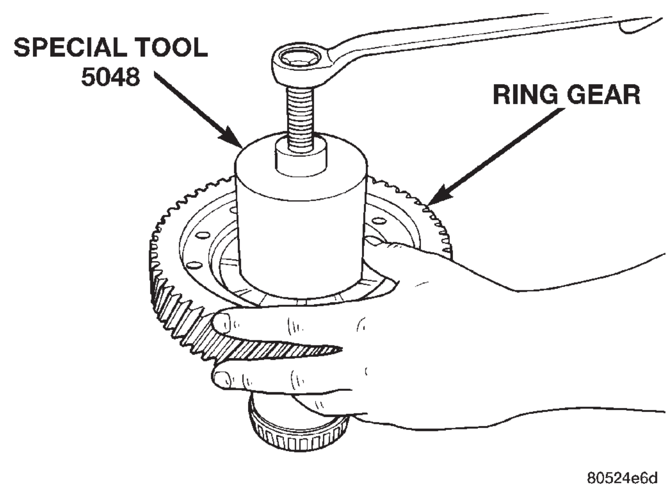


Fig. 244 Remove Differential Bearing Cone (Ring Gear Side)

To install the differential bearing cup and cone on the ring gear side, use Special Tool 5052, and Special Tool C-4171.

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: The differential is serviced as an assembly. The only parts that are serviceable within the differential are the differential bearing cups and cones. If any other part fails within the differential, you must replace the differential assembly along with the transfer shaft.

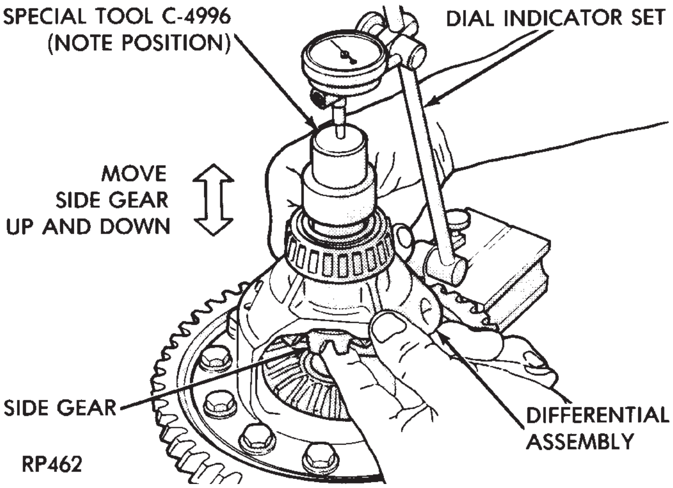


Fig. 245 Checking Side Gear End Play

CAUTION: Side gear end play must be BETWEEN 0.001 to 0.013 inch.

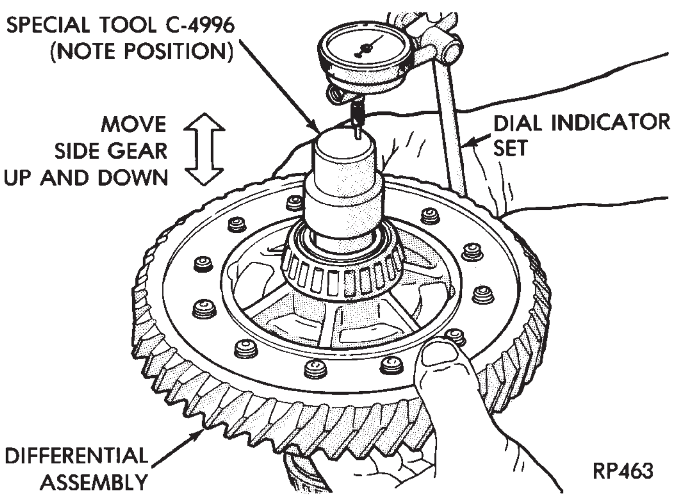


Fig. 246 Checking Side Gear End Play (Typical)

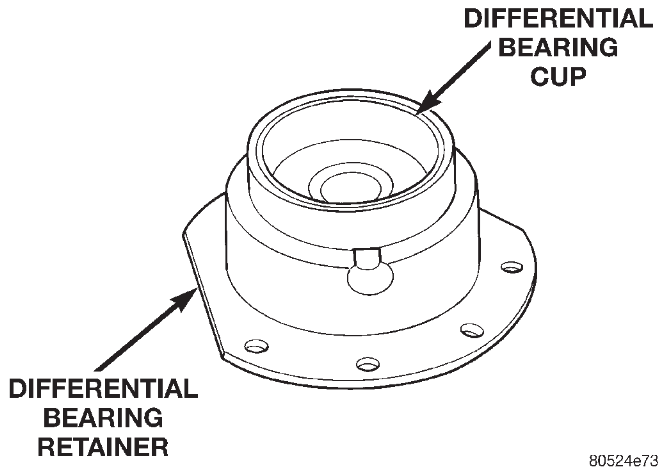


Fig. 247 Differential Bearing Retainer

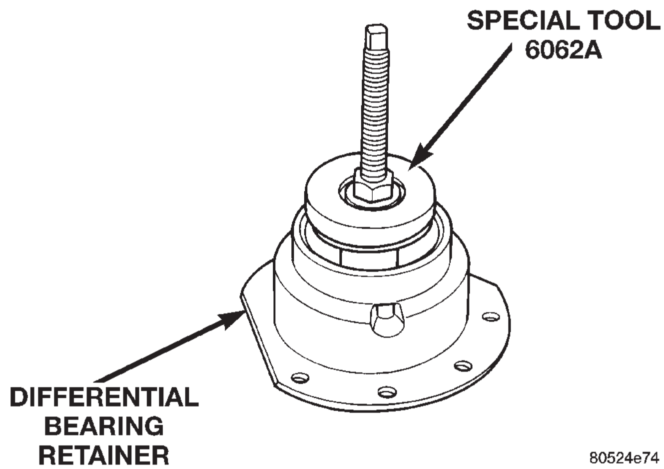


Fig. 248 Position Bearing Cup Remover Tool in Retainer

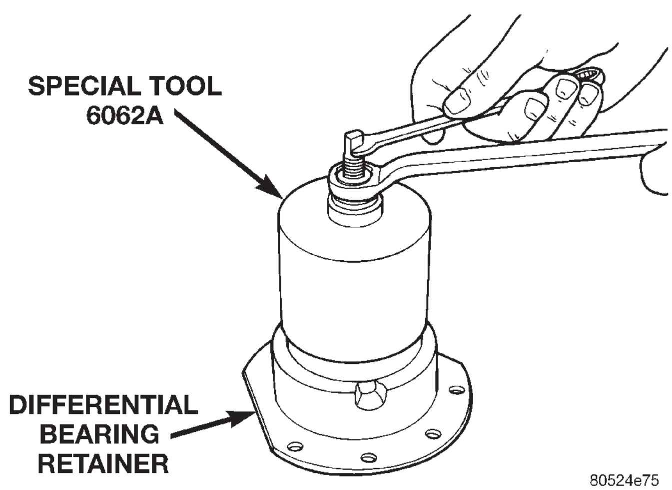


Fig. 249 Remove Bearing Cup

DISASSEMBLY AND ASSEMBLY (Continued)

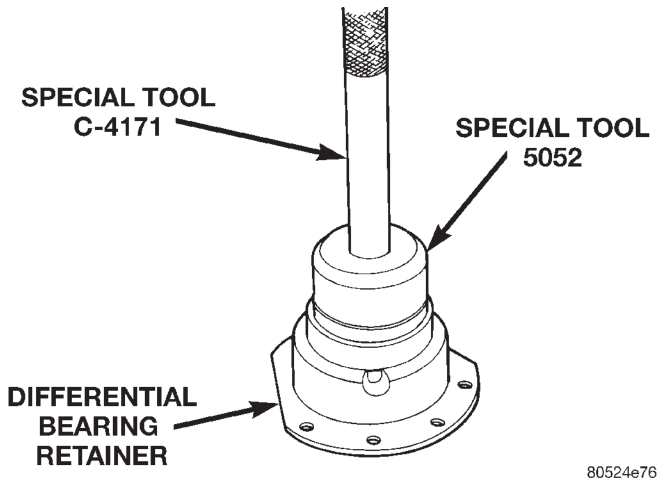


Fig. 250 Install Bearing Cup

To remove the differential bearing cup from the adapter side, use Special Tool 6062A, Remover. To install the differential bearing cup on the adapter side, use Special Tool 6536, Driver and Special Tool C-4171, Handle.

DETERMINING SHIM THICKNESS

Shim thickness need be determined only if any of the following parts are replaced:

- Transaxle case
- Differential carrier
- Differential bearing retainer
- Extension housing
- Differential bearing cups and cones

Refer to Bearing Adjustment Procedure in rear of this section to determine proper shim thickness.

NOTE: Use Mopar® Silicone Rubber Adhesive Sealant, or equivalent, on retainer to seal retainer to case.

CLEANING AND INSPECTION

CLEANING VALVE BODY

Prior to removing any transaxle parts, plug all openings and clean unit, preferably by steam. Cleanliness through entire disassembly and assembly cannot be overemphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe parts with shop towels.** All mating surfaces in the transaxles are accurately machined; therefore, careful handling of all parts must be exercised to avoid nicks or burrs.

NOTE: Tag all springs, as they are removed, for reassembly identification.

ADJUSTMENTS

GEARSHIFT LINKAGE ADJUSTMENT

Normal operation of the Park/Neutral Position Switch provides a quick check to confirm proper linkage adjustment.

Move the selector level slowly forward until it clicks into the (P) Park position. The starter should operate.

After checking the (P) position, move selector slowly toward the (N) Neutral position until lever is in the (N) position. If the starter will also operate at this point the gearshift linkage is properly adjusted. If the starter fails to operate in either position, linkage adjustment is required.

ADJUSTMENT

(1) Set parking brake.

(2) Remove the gearshift knob set screw and knob.

(3) Remove gearshift selector bezel and lamp wiring.

(4) Install the gearshift knob set screw and knob.

(5) Place gearshift lever in the (P) (PARK) position.

(6) Loosen the gearshift cable adjuster nut at the shifter assembly.

(7) Move the gearshift lever on the transaxle to the park position.

(8) Verify the shift lever and transaxle are in park position. Tighten the gearshift cable adjuster nut at the shifter assembly. The gearshift linkage should now be properly adjusted.

(9) Check adjustment as follows:

- Detent position for neutral and drive should be within limits of hand lever gate stops.
- Key start must occur only when shift lever is in park or neutral positions.

AUTOSTICK

The autostick switch is serviced as an assembly with the gearshift mechanism. The switch is not adjustable. If a problem occurs with the switch, refer to the Diagnosis and Testing section.

INTERLOCK SYSTEM ADJUSTMENT

If ignition switch cannot be turned to the LOCK position, with shifter in PARK, an adjustment of the Interlock System may be required. To adjust Shifter/Ignition Interlock System, follow procedure listed below.

(1) Disconnect and isolate, the battery negative (-) cable from the vehicle battery.

(2) Remove the gearshift knob set screw and knob.

(3) Remove console assembly. Refer to Group 23, Body.

ADJUSTMENTS (Continued)

(4) Loosen the adjustment nut on the interlock lever (Fig. 251).

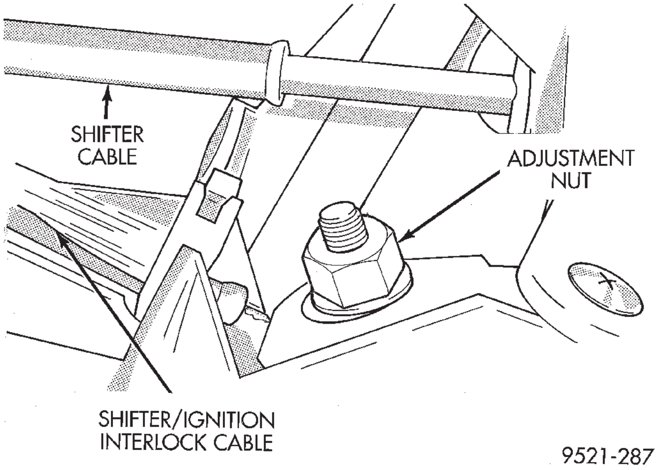


Fig. 251 Interlock Cable Adjuster Nut

(5) Move ignition key to the RUN position.

(6) Remove the interlock cable from the shifter housing (Fig. 252). Slide the cable out of the groove in the interlock lever.

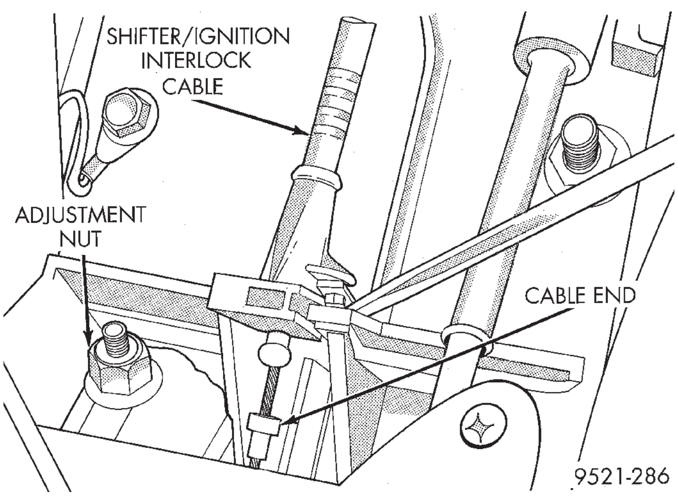


Fig. 252 Interlock Cable

(7) Inspect the interlock cable:

• With the lock cylinder in OFF (lock) position and the ignition key removed, the cable core wire should not move when pulled. If the cable core wire moves, the cable is improperly installed or kinked.

• With the ignition key in the RUN position, the cable core wire should slide freely when pulled. Also, the cable should return to the bottomed out position when released. If the cable core wire does not move in the RUN position, the cable is improperly installed or kinked.

(8) Put the shifter in the PARK position.

(9) Slide the interlock cable core wire into the groove on the adjustment lever. Ensure the cable end seats in the groove.

(10) Slip the cable into the housing until it snaps in place.

(11) Ensure the shift lever remains in PARK. Remove the ignition key from the lock cylinder (switch in OFF position).

(12) When the adjustment nut on the interlock lever is loosened, the cable indexes itself to the correct position.

(13) Loosen the adjustment nut. Allow the cable to adjust itself to the correct position. Tighten the adjustment nut.

(14) Check the interlock adjustment:

• With the ignition key in the OFF (lock) position, the shifter should be locked in the PARK position. If not, re-adjust the interlock and tighten the adjustment nut.

• **Without starting the engine,** place the ignition switch in the run position. Move the shifter to the reverse position. You should not be able to remove the ignition key from the lock cylinder. If the key can be removed at this point, re- adjust the interlock and tighten the adjustment nut.

• Place the shifter in the PARK position. Turn the ignition key to the OFF (lock) position. You should be able to remove the ignition key from the lock cylinder. If not, re-adjust the interlock and tighten the adjustment nut.

(15) Install the bezel on the shifter console.

(16) Install shifter handle.

BEARING ADJUSTMENT PROCEDURE

GENERAL RULES ON SERVICING BEARINGS

(1) Take extreme care when removing and installing bearing cups and cones. **Use only an arbor press for installation,** as a hammer may not properly align the bearing cup or cone. Burrs or nicks on the bearing seat will give a false end play reading, while gauging for proper shims. Improperly seated bearing cup and cones are subject to low-mileage failure.

(2) Bearing cups and cones should be replaced if they show signs of pitting or heat distress.

(3) If distress is seen on either the cup or bearing rollers, both cup and cone must be replaced.

NOTE: Bearing end play and drag torque specifications must be maintained to avoid premature bearing failures.

(4) Used (original) bearing may lose up to 50 percent of the original drag torque after break-in.

NOTE: All bearing adjustments must be made with no other component interference or gear intermesh, except the transfer gear bearing.

(5) Oil all bearings before checking turning torque.

ADJUSTMENTS (Continued)

OUTPUT GEAR BEARING

With output gear removed:

(1) Install a 4.50 mm (0.177 inch) gauging shim on the rear carrier assembly hub, using grease to hold the shim in place.

(2) Install output gear and bearing assembly. Torque to 271 N·m (200 ft. lbs.).

(3) To measure bearing end play:

- Attach Tool L-4432 to the gear.
- Push and pull the gear while rotating back and forth to insure seating of the bearing rollers.
- Using a dial indicator, mounted to the transaxle case, measure output gear end play.

(4) Once bearing end play has been determined, refer to the output gear bearing shim chart for the required shim.

(5) Use Tool 6259 to remove the retaining bolt and washer. To remove the output gear, use Tool L-4407.

(6) Remove the gauging shim and install the proper shim. Use grease to hold the shim in place. Install the output gear and bearing assembly.

CAUTION: Always use new retaining bolt, old retaining bolt may not be reused.

(7) Install the new retaining bolt and washer. Tighten to 271 N·m (200 ft. lbs.).

(8) Using an inch-pound torque wrench, check the turning torque. **The torque should be between 3 and 8 inch-pounds.**

(9) If the turning torque is too high, install a .04 mm (.0016 inch) thicker shim. If the turning torque is too low, install a .04 mm (.0016 inch) thinner shim. Repeat until the proper turning torque is 3 to 8 inch pounds.

End Play (with 4.50 mm gauging shim installed)		Required Shim	End Play (with 4.50 mm gauging shim installed)		Required Shim
mm	inch	mm	mm	inch	mm
.05	.002	4.42	.53	.021	3.94
.08	.003	4.38	.56	.022	3.90
.10	.004	4.38	.58	.023	3.90
.13	.005	4.34	.61	.024	3.86
.15	.006	4.30	.64	.025	3.82
.18	.007	4.30	.66	.026	3.82
.20	.008	4.26	.69	.027	3.78
.23	.009	4.22	.71	.028	3.74
.25	.010	4.22	.74	.029	3.74
.28	.011	4.18	.76	.030	3.70
.30	.012	4.14	.79	.031	3.66
.33	.013	4.14	.81	.032	3.66
.36	.014	4.10	.84	.033	3.62
.38	.015	4.10	.86	.034	3.62
.41	.016	4.06	.89	.035	3.58
.43	.017	4.02	.91	.036	3.54
.46	0.18	4.02	.94	.037	3.54
.48	.019	3.98	.97	.038	3.50
.51	.020	3.94			

Average conversion .04 mm =.0016 inch 9121-255

Fig. 253 Output Gear Bearing Shim Chart

DIFFERENTIAL BEARING

(1) Position the transaxle assembly vertically on the support stand, differential bearing retainer side up.

(2) Install Tool L-4436A into the differential and onto the pinion mate shaft.

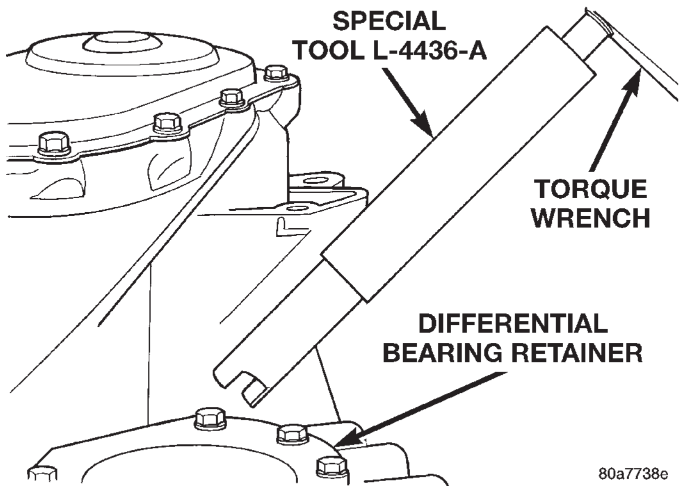


Fig. 254 Tool L-4436 and Torque Wrench

(3) Rotate the differential at least one full revolution to ensure the tapered roller bearings are fully seated.

(4) Using Tool L-4436A and an inch-pound torque wrench, check the turning torque of the differential. **The turning torque should be between 5 and 18 inch-pounds.**

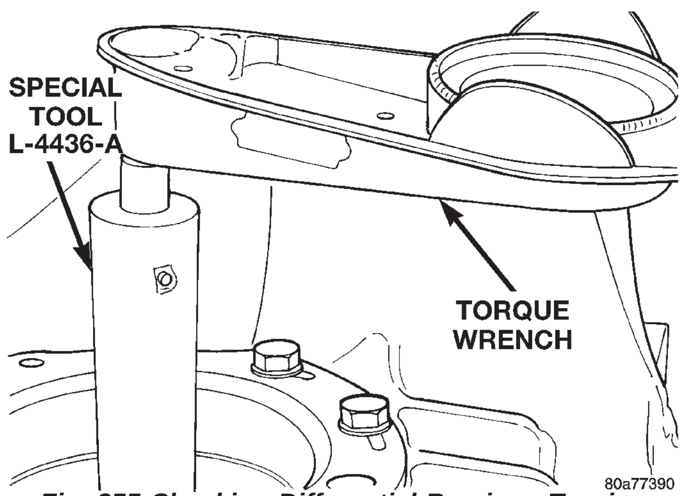


Fig. 255 Checking Differential Bearings Turning Torque

(5) If the turning torque is within specifications, remove tools. Setup is complete.

(6) If turning torque is not within specifications proceed with the following steps.

(a) Remove differential bearing retainer from the transaxle case.

(b) Remove the bearing cup from the differential bearing retainer using Tool 6062A.

ADJUSTMENTS (Continued)

(c) Remove the existing shim from under the cup.

(d) Measure the existing shim.

NOTE: If the turning torque was too high when measured, install a .05 mm (.002 inch) thinner shim. If the turning torque is was too low, install a .05 mm (.002 inch) thicker shim. Repeat until 5 to 18 inch-pounds turning torque is obtained.

Oil Baffle is not required when making shim selection.

(e) Install the proper shim under the bearing cup. Make sure the oil baffle is installed properly in the bearing retainer, below the bearing shim and cup.

(f) Install the differential bearing retainer using Tool 5052 and C-4171. Seal the retainer to the housing with MOPAR® Adhesive Sealant and torque bolts to 28 N·m (250 in. lbs.).

(7) Using Tool L-4436A and an inch-pound torque wrench, recheck the turning torque of the differential. **The turning torque should be between 5 and 18 inch-pounds.**

DIFFERENTIAL BEARING SHIM CHART

HIM	THICKNESS
MM	INCH
.980	0.0386
1.02	0.0402
1.06	0.0418
1.10	0.0434
1.14	0.0449
1.18	0.0465
1.22	0.0481
1.26	0.0497
1.30	0.0512
1.34	0.0528
1.38	0.0544
1.42	0.0560
1.46	0.0575
1.50	0.0591
1.54	0.0607
1.58	0.0623
1.62	0.0638
1.66	0.0654
1.70	0.0670
2.02	0.0796
2.06	0.0812

ADJUSTMENTS (Continued)

TRANSFER SHAFT BEARING

(1) Use Tool 6259 to remove the retaining nut and washer. Remove the transfer shaft gear using Tool L-4407.

(2) Install a 4.66 mm (.184 inch) gauging shim on the transfer shaft.

(3) Install transfer shaft gear and bearing assembly and torque the nut to 271 N·m (200 ft. lbs.).

(4) To measure bearing end play:

- Attach Tool L-4432 to the transfer gear.
- Mount a steel ball with grease into the end of the transfer shaft.
- Push and pull the gear while rotating back and forth to insure seating of the bearing rollers.
- Using a dial indicator, measure transfer shaft end play.

(5) Refer to the Transfer Bearing Shim Chart for the required shim combination to obtain the proper bearing setting.

(6) Use Tool 6259 to remove the retaining nut and washer. Remove the transfer shaft gear using Tool L-4407.

(7) Remove the gauging shim and install the correct shim. Install the transfer gear and bearing assembly.

CAUTION: Original retaining nut may not be reused. Always use a new retaining nut when reassembling.

(8) Install the new retaining nut and washer and torque to 271 N·m (200 ft. lbs.). **Measure transfer shaft end play, end play should be .05 to .10 mm (.002 to .004 inch).**

(9) Measure bearing end play as outlined in Step (4). End play should be between .05 mm and .10 mm (.002 to .004 inch).

NOTE: If end play is too high, install a .04 mm (.0016 inch) thinner shim. If end play is too low, install a .04 mm (.0016 inch) thicker shim combination. Repeat until .05 to .10 mm (.002 to .004 inch) end play is obtained.

End Play (with 4.66 mm gauging shim installed)		Required Shim	End Play (with 4.66 mm gauging shim installed)		Required Shim
mm	inch	mm	mm	inch	mm
.05	.002	4.66	.79	.031	3.90
.08	.003	4.62	.81	.032	3.90
.10	.004	4.58	.84	.033	3.86
.13	.005	4.58	.86	.034	3.82
.15	.006	4.54	.89	.035	3.82
.18	.007	4.50	.91	.036	3.78
.20	.008	4.50	.94	.037	3.74
.23	.009	4.46	.97	.038	3.74
.25	.010	4.46	.99	.039	3.70
.28	.011	4.42	1.02	.040	3.66
.30	.012	4.38	1.04	.041	3.66
.33	.013	4.38	1.07	.042	3.62
.36	.014	4.34	1.08	.043	3.62
.38	.015	4.30	1.12	.044	3.58
.41	.016	4.30	1.14	.045	3.54
.43	.017	4.26	1.17	.046	3.54
.46	.018	4.22	1.19	.047	3.50
.48	.019	4.22	1.22	.048	3.46
.50	.020	4.18	1.24	.049	3.46
.53	.021	4.18	1.27	.050	3.42
.56	.022	4.14	1.30	.051	3.38
.58	.023	4.10	1.32	.052	3.38
.61	.024	4.10	1.35	.053	3.34
.64	.025	4.06	1.37	.054	3.34
.66	.026	4.02	1.40	.055	3.30
.69	.027	4.02	1.42	.056	3.26
.71	.028	3.98	1.45	.057	3.26
.74	.029	3.94	1.47	.058	3.22
.76	.030	3.94			

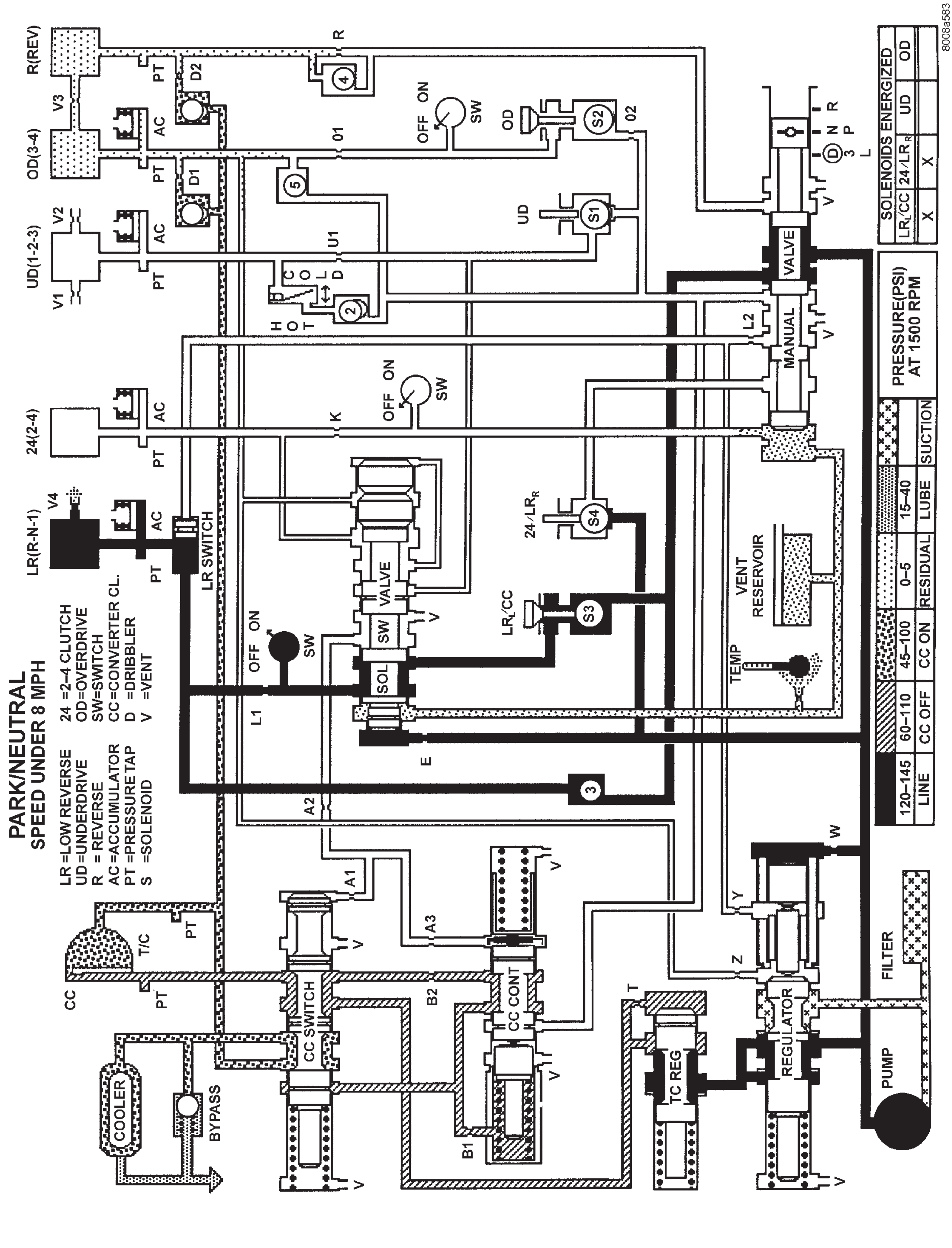
9121-2

Fig. 256 Transfer Bearing Shim Chart

SCHEMATICS AND DIAGRAMS

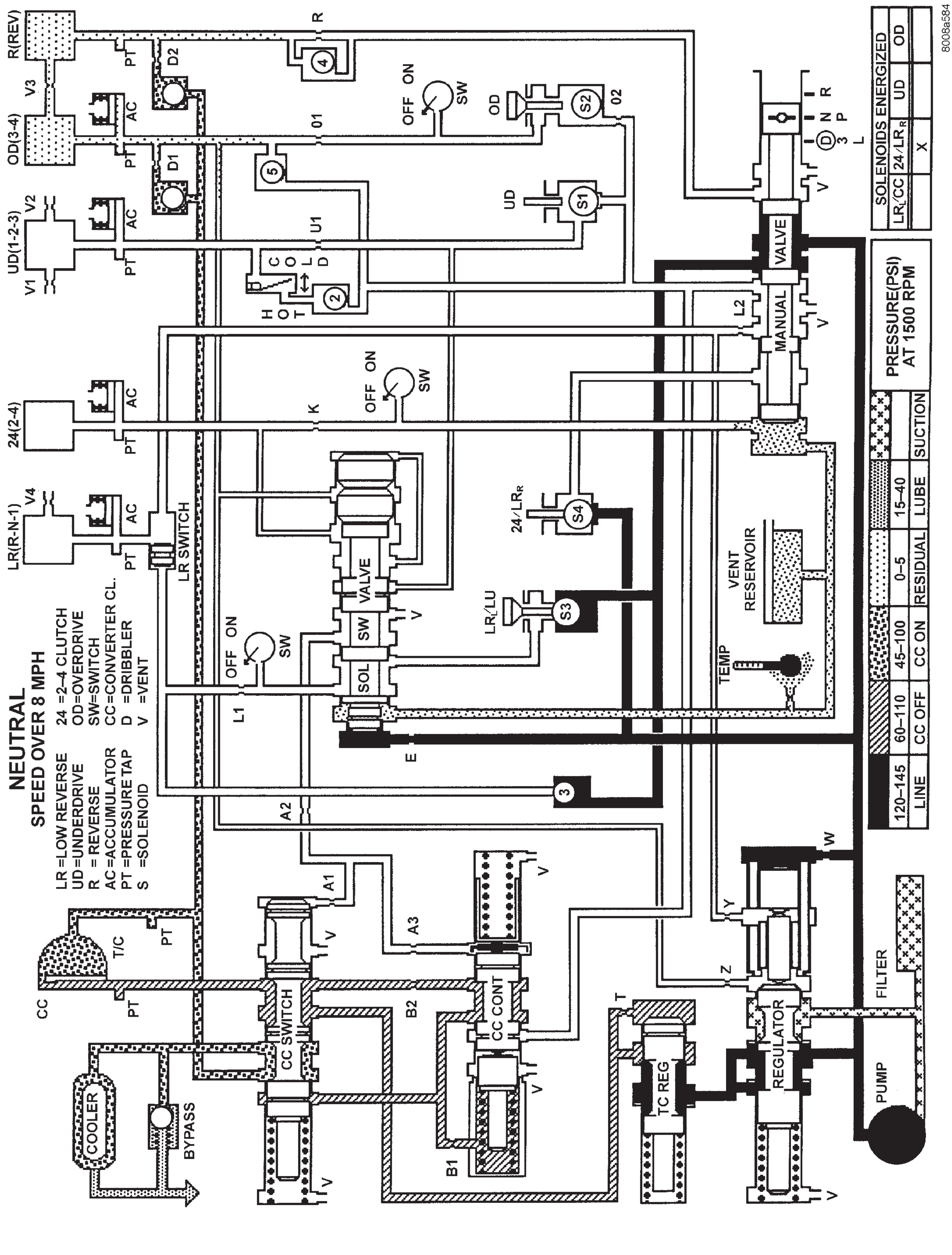
41TE TRANSAXLE HYDRAULIC SCHEMATICS

SCHEMATICS AND DIAGRAMS (Continued)



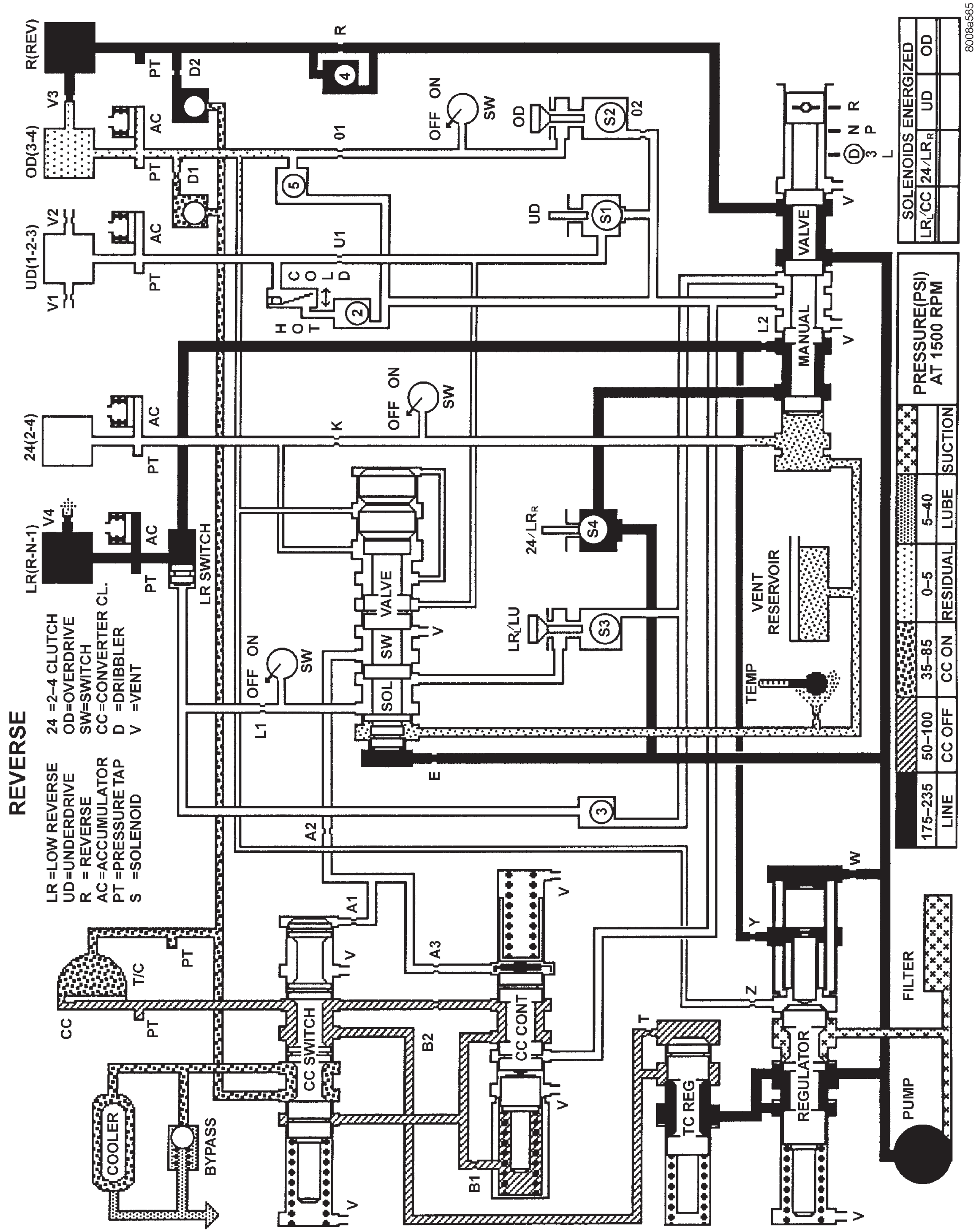
41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

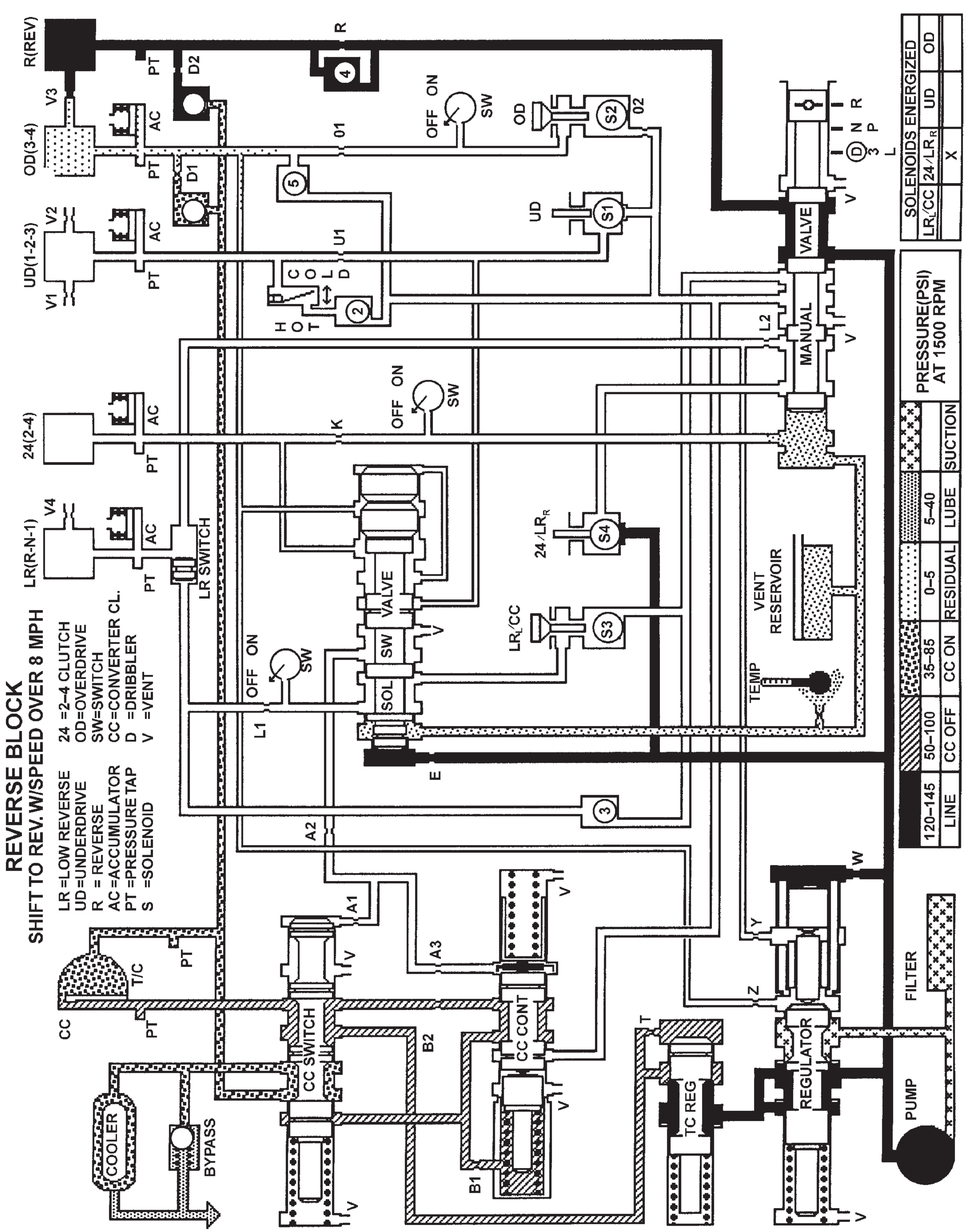


41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

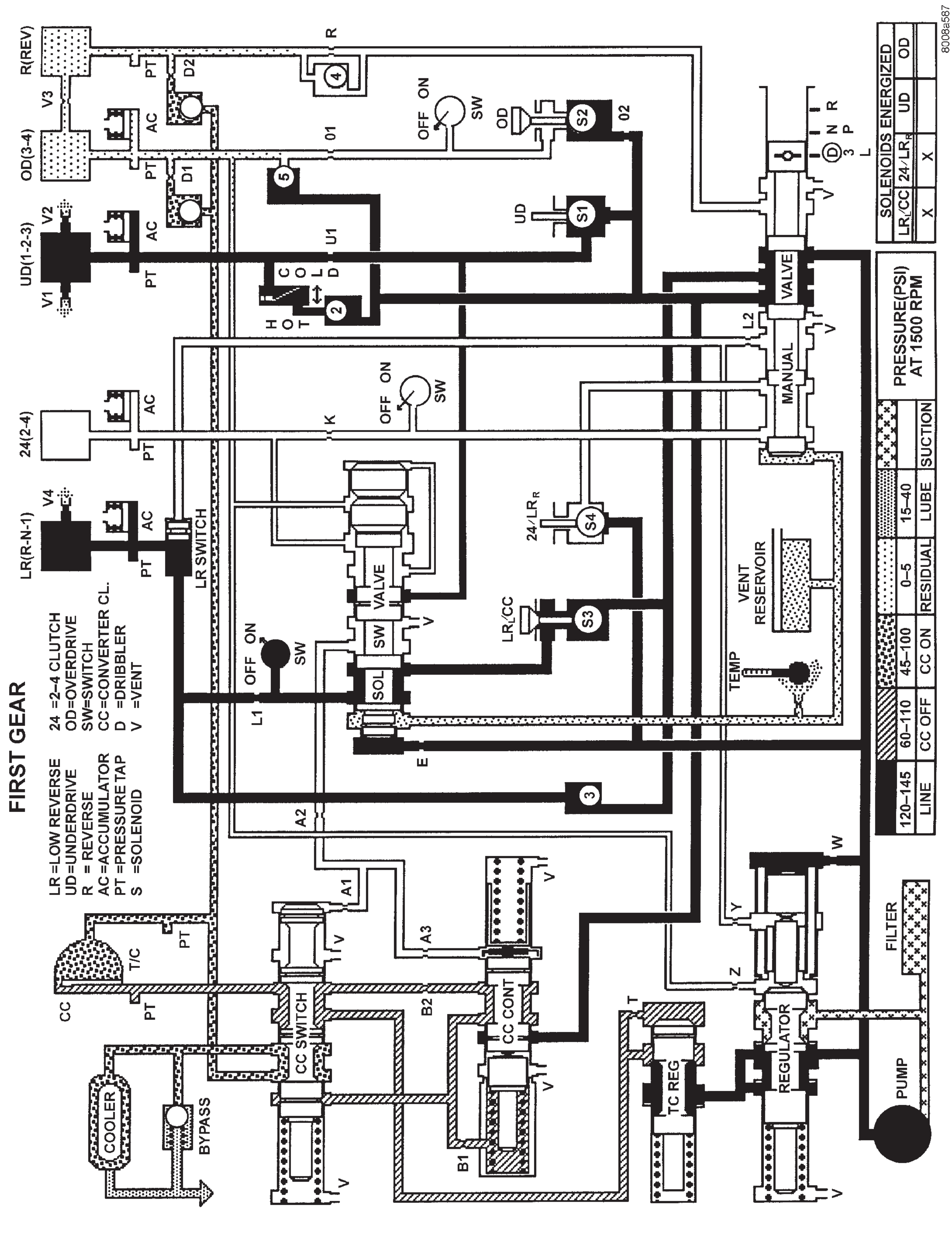


SCHEMATICS AND DIAGRAMS (Continued)



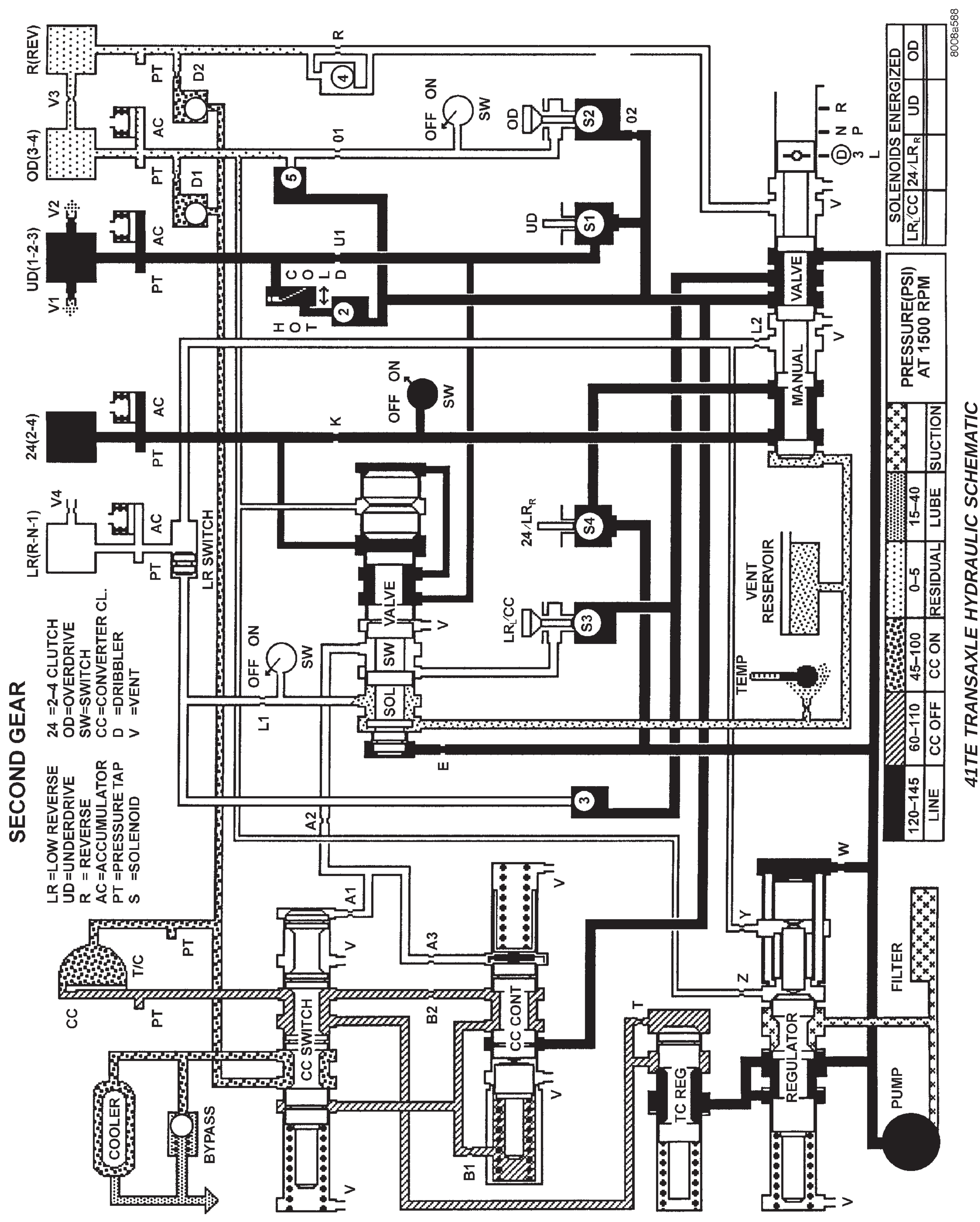
41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)



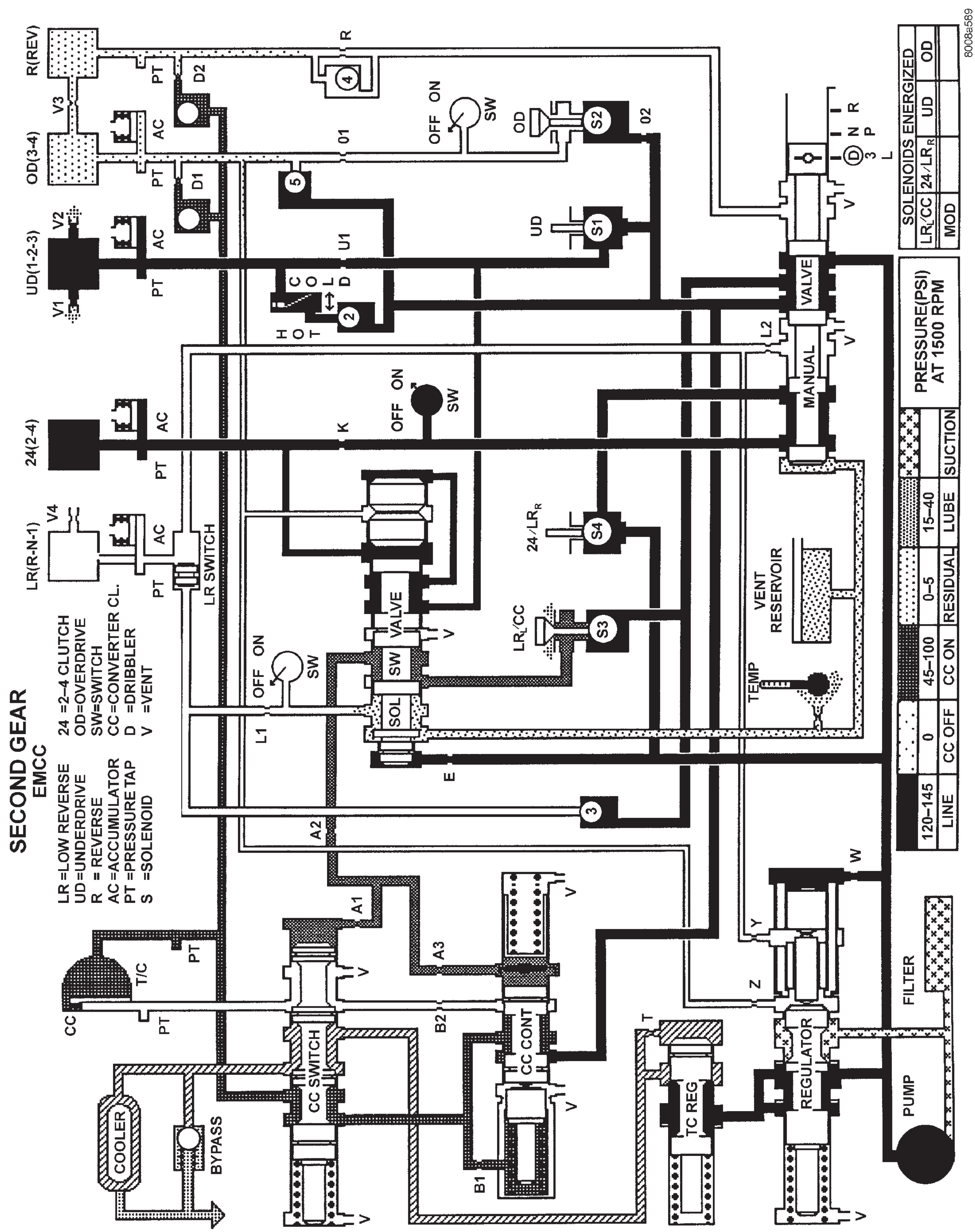
41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

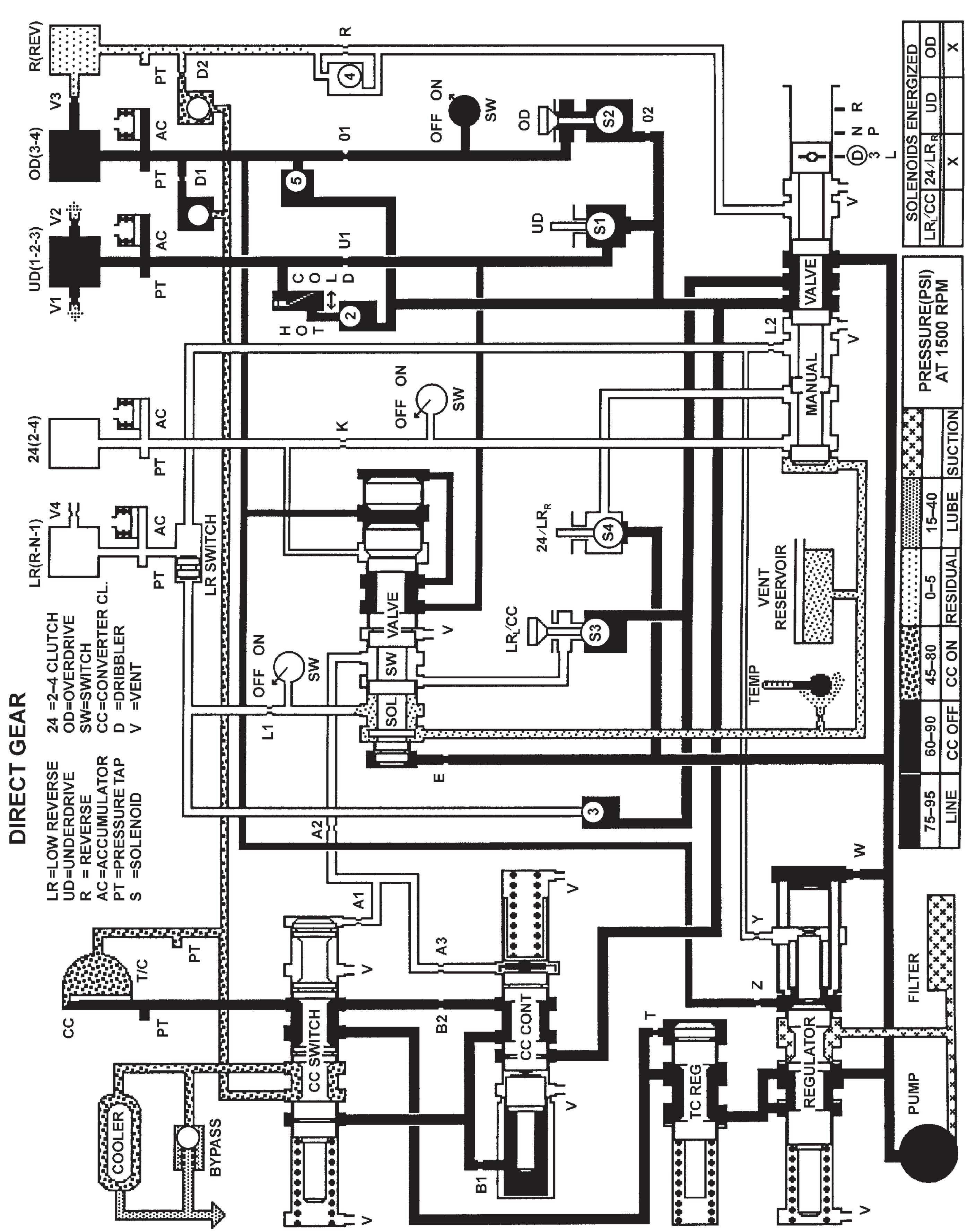


41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

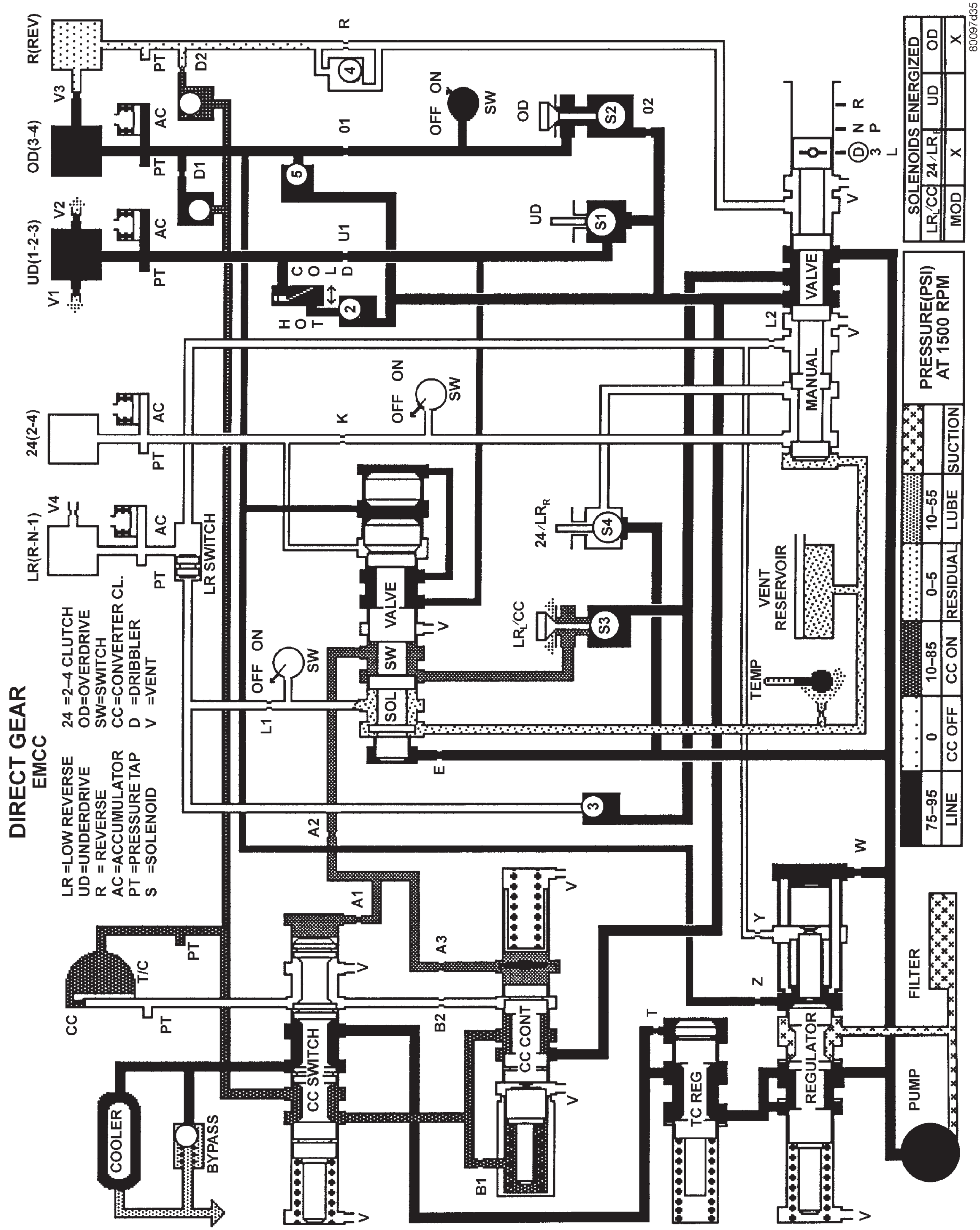


SCHEMATICS AND DIAGRAMS (Continued)



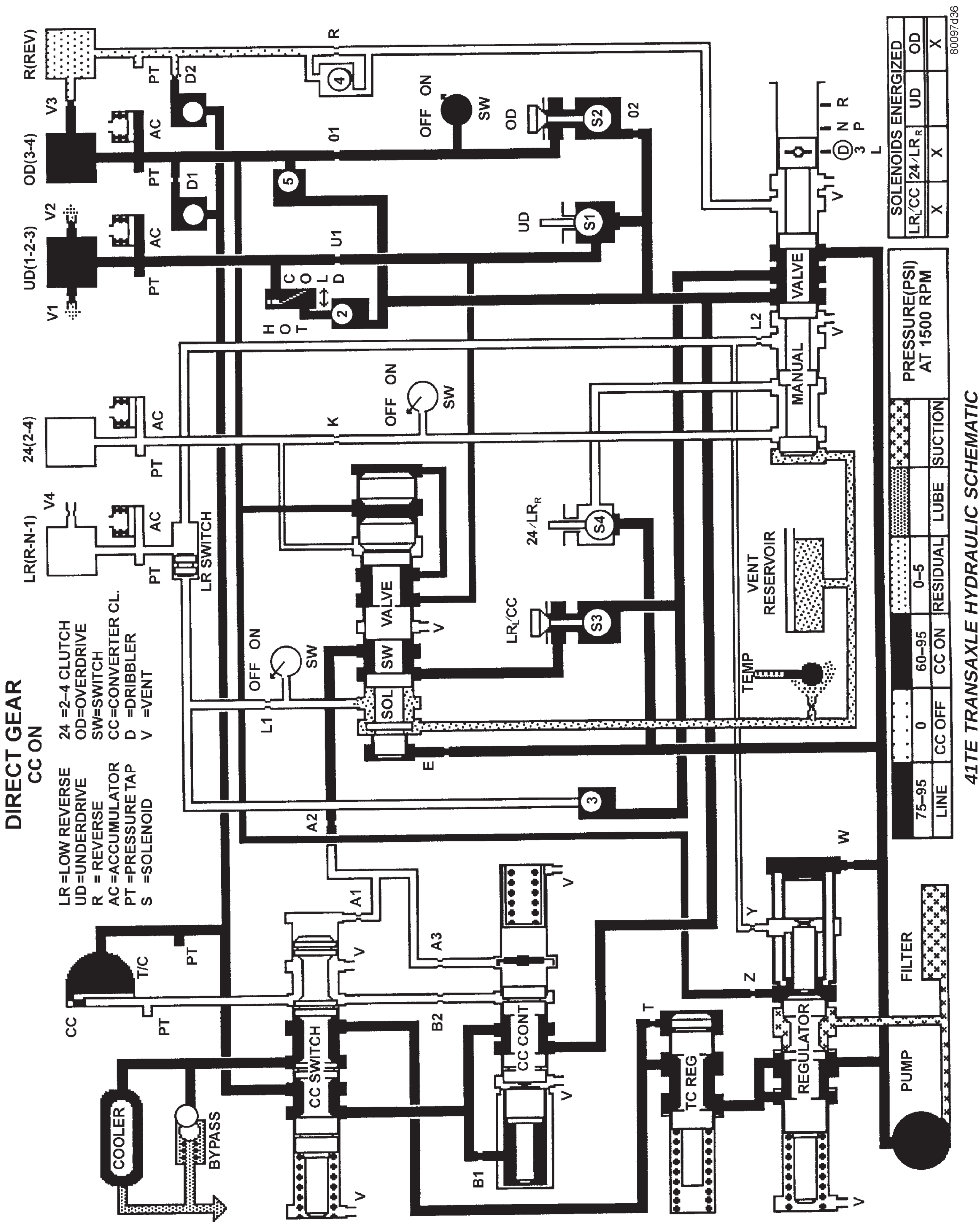
41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

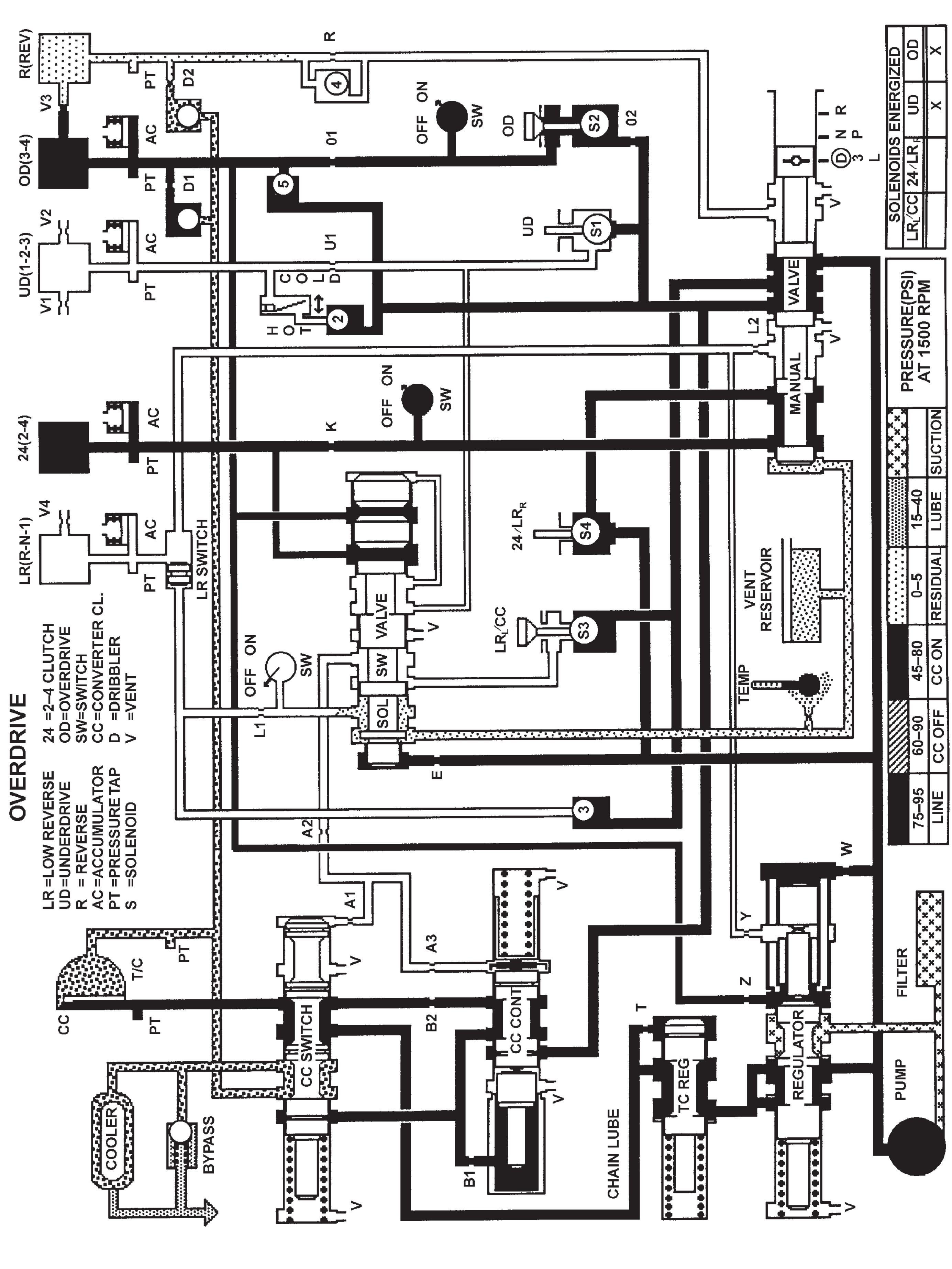


41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)

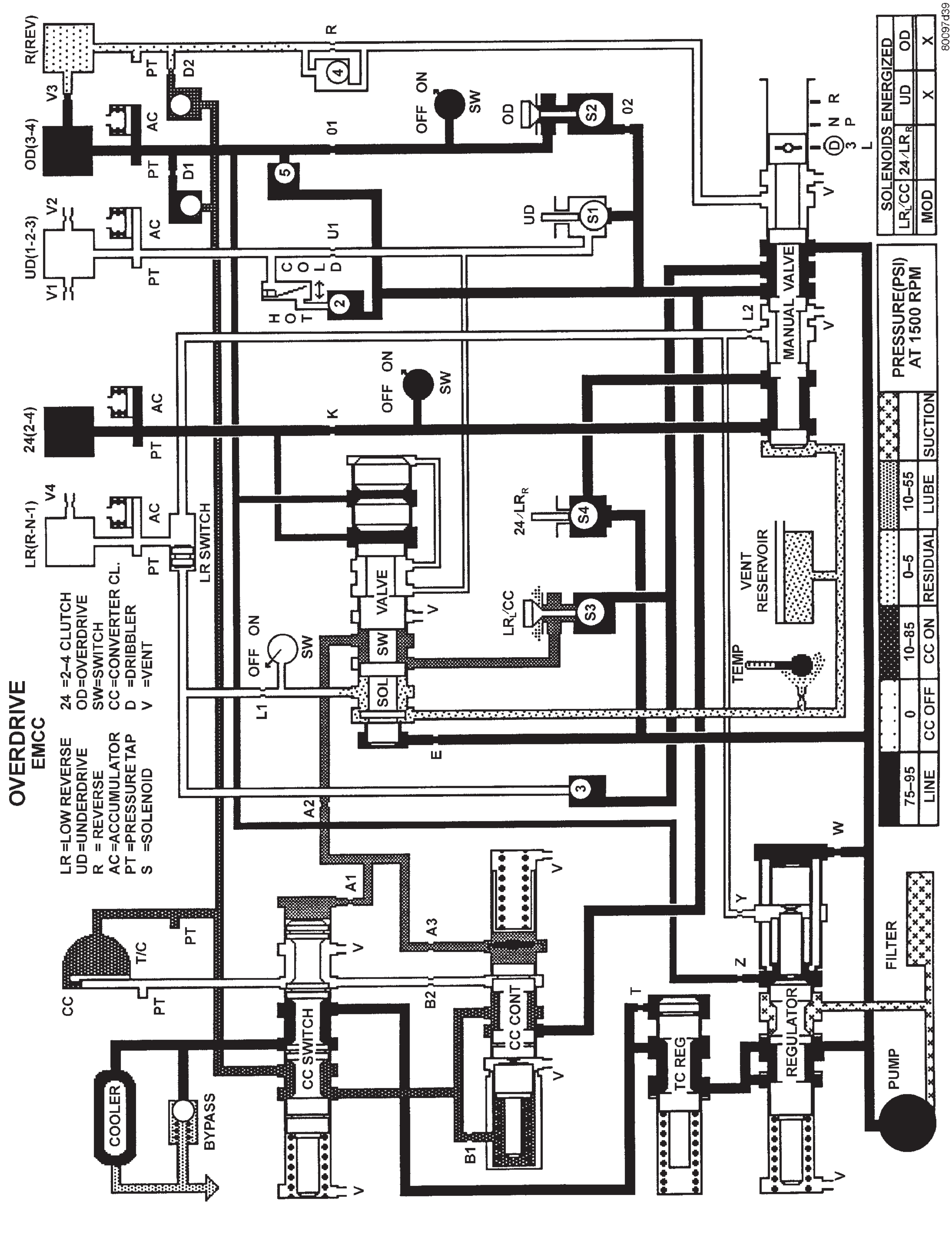


SCHEMATICS AND DIAGRAMS (Continued)



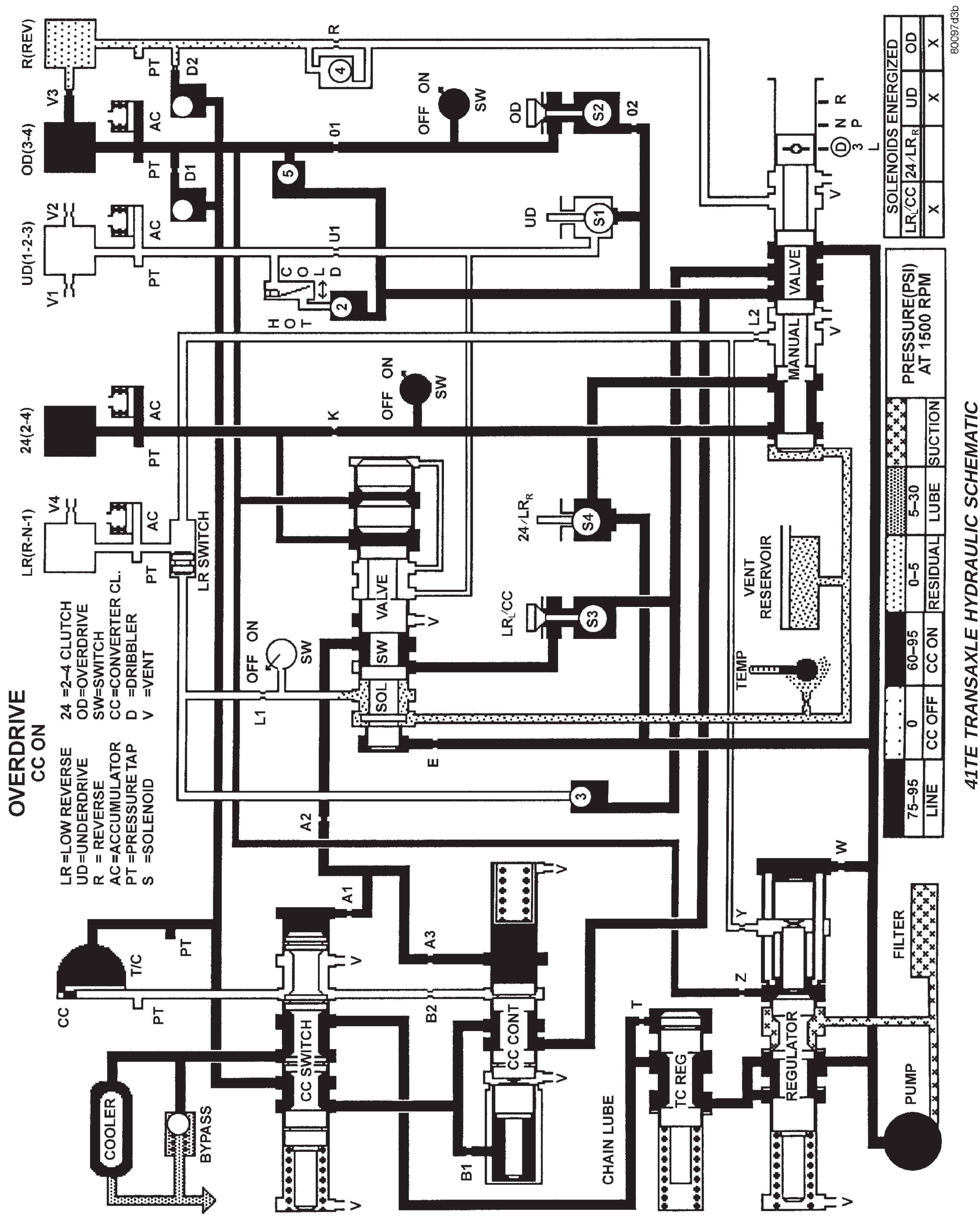
41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)



41TE TRANSAXLE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)



SPECIFICATIONS

41TE AUTOMATIC TRANSAXLE

Type . . . . .Fully-adaptive, elecronically-controlled, four-speed automatic with torque converter and integral differential
Torque Converter Diameter . . . . .241 millimeters (9.48 inches)
Oil Capacity - Transaxle and Torque Converter . . . . .MOPAR ATF Type 7176 (or DEXRON II)
Cooling Method. . . . . .Water heat exhanger and/or air-to-oil heat enchanger
Lubrication . . . . .Pump (internal-external gear type)
Gear Ratios:
Transmission portion:
First .2.84
Second 1.57
Direct 1.00
Overdrive 0.69
Reverse 2.21
Final Drive Ratio:. . . . . .2.5 - 3.91 FDR, 2.4 - 3.91 FDR

Pump Clearances:	**Millimeter**	**Inch**
Outer Gear to Pocket.	.045-.141	.0018-.0056
Outer Gear Side Clearance	.020-.046	.0008-.0018
Inner Gear Side Clearance	.020-.046	.0008-.0018
Tapered Roller Bearing Settings:	**Millimeter**	**Inch**
Output Gear	.02-.05 Preload	.0008-.002 Preload
Transfer Shaft	.05-.10 End Play	.002-.004 End Play
Differential.	.15-.29 Preload	.006-.012 Preload
Clutch Clearances:	**Millimeter**	**Inch**
Underdrive Clutch	.091 to 1.47	.036 to .058
Overdrive Clutch	1.07 to 2.44	.042 to .096
Reverse Clutch	0.76 to 1.24	.030 to .049
2.4 Clutch	0.76 to 2.64	.030 to .104
Low/Reverse Clutch	1.04 to 1.65	.042 to .065

41TE AUTOMATIC TRANSAXLE

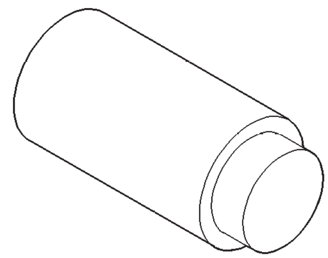
SPECIFICATIONS (Continued)

41TE TORQUE SPECIFICATIONS

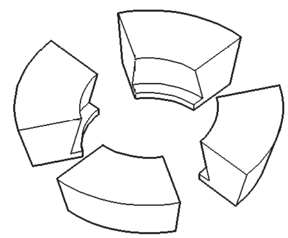
DESCRIPTION	TORQUE
Brake Rotor Dust Shield	20 N·m (180 in. lbs.)
Cooler Line Fittings	12 N·m (105 in. lbs.)
Differential Cover	19 N·m (165 in. lbs.)
Differential Ring Gear	95 N·m (70 ft. lbs.)
Differential Bearing Ret.	28 N·m (21 ft. lbs.)
Driveplate To Crank. Bolts	95 N·m (70 ft. lbs.)
Driveplate To Torque Conv.	75 N·m (55 ft. lbs.)
Eight Way Solenoid Conn.	4 N·m (35 in. lbs.)
Extension Housing	28 N·m (21 ft. lbs.)
Input Speed Sensor	27 N·m (20 ft. lbs.)
L/R Clutch Retainer	5 N·m (45 in. lbs.)
Oil Pan To Trans. Case	19 N·m (165 in. lbs.)
Output Gear Bolt	271 N·m (200 ft. lbs.)
Output Gear Stirrup Ret.	23 N·m (17 ft. lbs.)
Output Speed Sensor	27 N·m (20 ft. lbs.)
Pressure Taps	5 N·m (45 in. lbs.)
Pump To Case Bolts	22 N·m (16 ft. lbs.)
Reaction Shaft Bolts	22 N·m (16 ft. lbs.)
Rear End Cover	19 N·m (14 ft. lbs.)
Sixty-Way Connector	4 N·m (35 in. lbs.)
Solenoid Assembly To Case	12 N·m (105 in. lbs.)
Transmission Range Sensor	5 N·m (45 in. lbs.)
Transfer Gear Nut	271 N·m (200 ft. lbs.)
Valve Body To Case Bolts	12 N·m (105 in. lbs.)
Valve Body Bolts	5 N·m (45 in. lbs.)
Vent Assembly	12 N·m (105 in. lbs.)

SPECIAL TOOLS

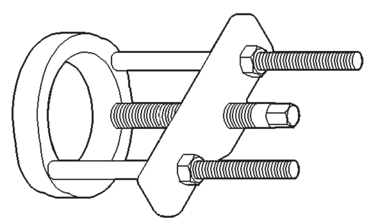
41TE AUTOMATIC TRANSAXLE



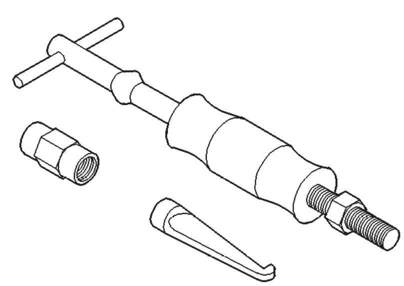
Puller Press Extension C-293-3



Adapter Blocks C-293–36

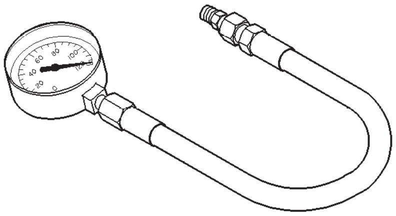


Puller Press C-293–PA

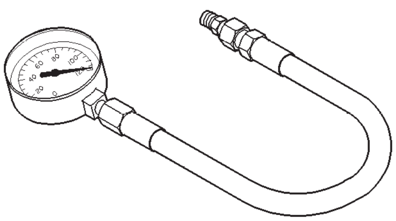


Slide Hammer C-637

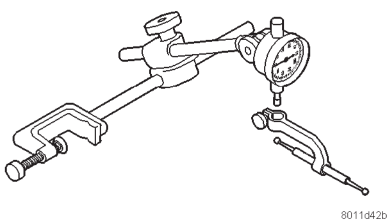
SPECIAL TOOLS (Continued)



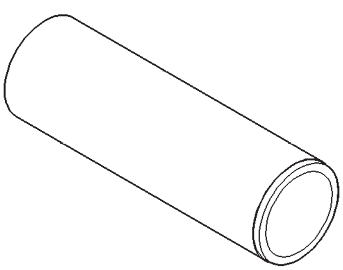
Pressure Gauge (Low) C-3292



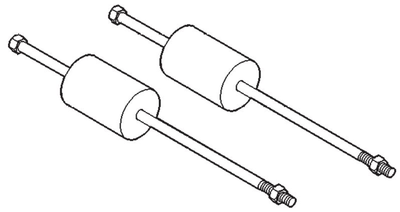
Pressure Gauge (High) C-3293SP



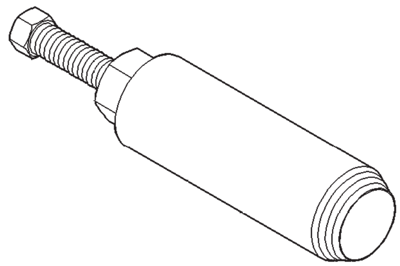
Dial Indicator C-3339



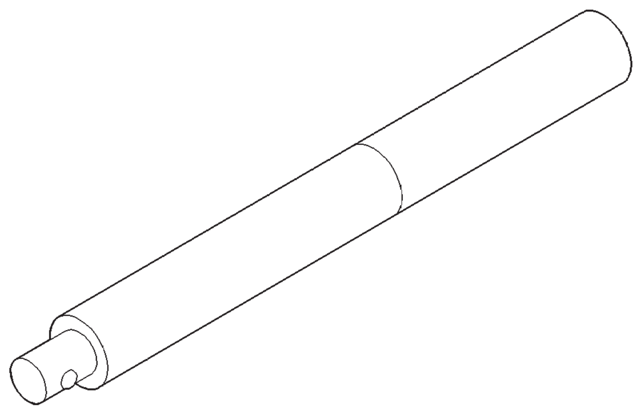
Sleeve C-3717



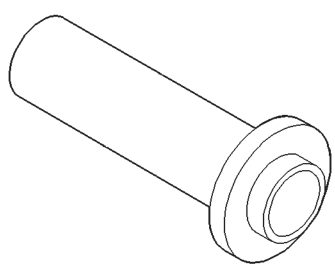
Oil Pump Puller C-3752



Seal Puller C-3981B

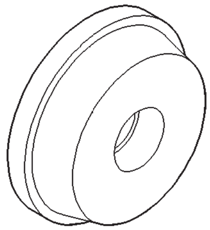


Universal Handle C-4171

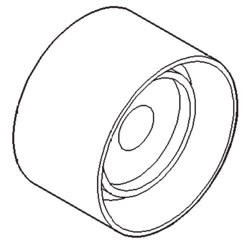


Seal Installer C-4193A

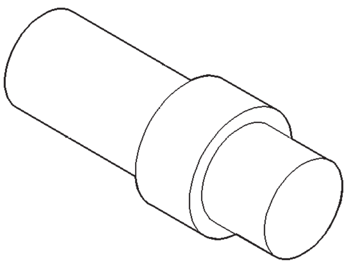
SPECIAL TOOLS (Continued)



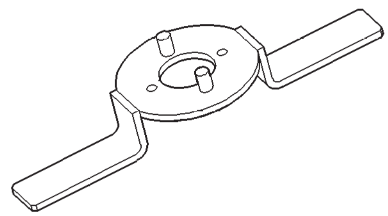
Installer C-4628



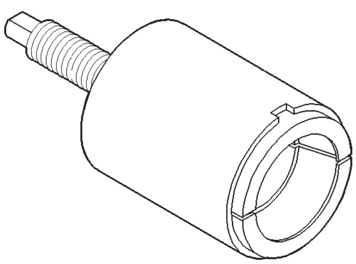
Bearing Installer L-4410



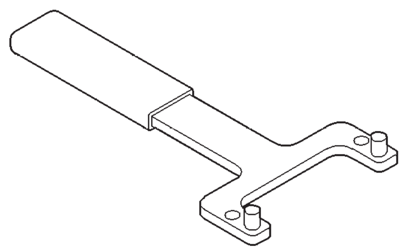
Adapter C-4996



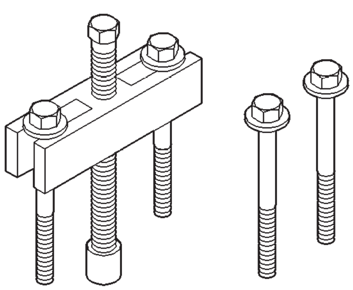
Gear Checking Plate L-4432



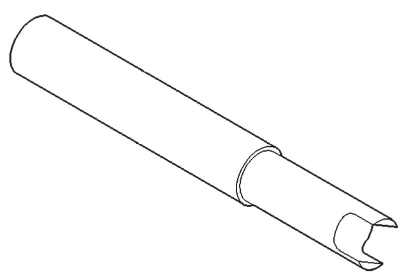
Remover Kit L-4406



Bearing Puller L-4435

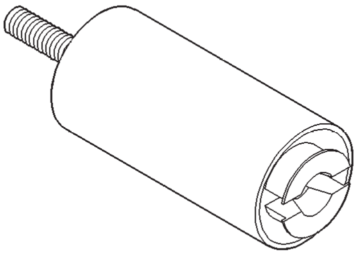


Gear Puller L-4407A

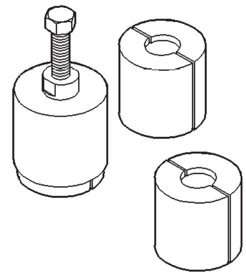


Differential Tool L-4436A

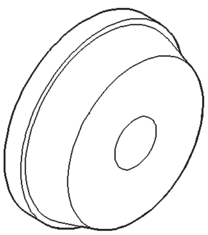
SPECIAL TOOLS (Continued)



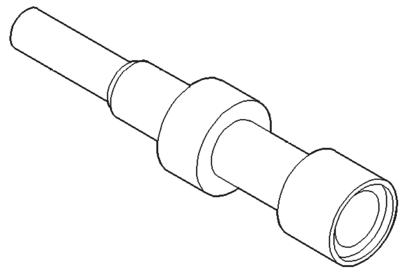
Special Jaw Set L-4518



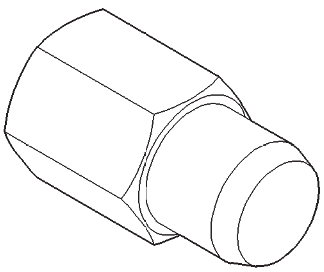
Puller Set 5048



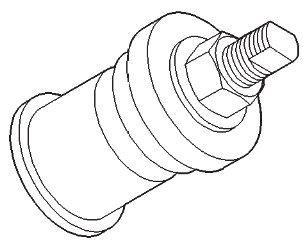
Installer L-4520



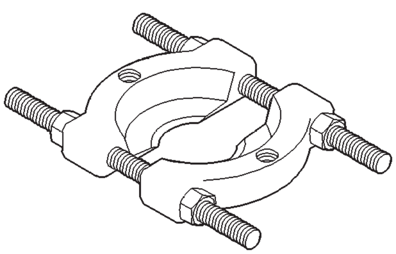
Remover/Installer 5049-A



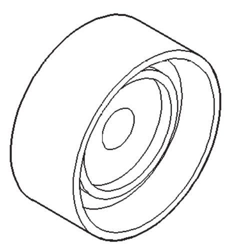
Adapter MD-998343



Installer 5050A

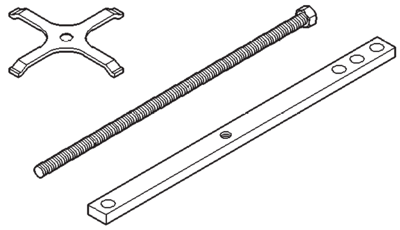


Bearing Splitter P-334

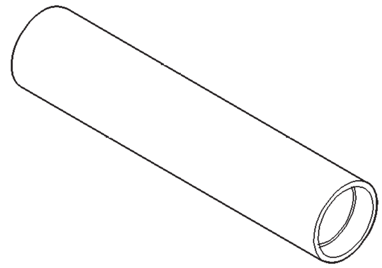


Installer 5052

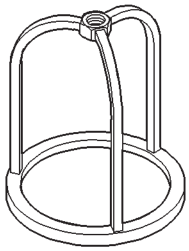
SPECIAL TOOLS (Continued)



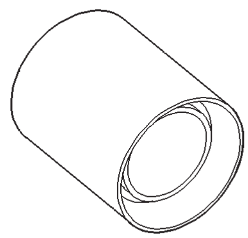
Compressor 5058A



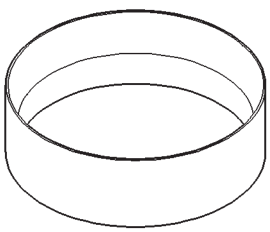
Installer 6052



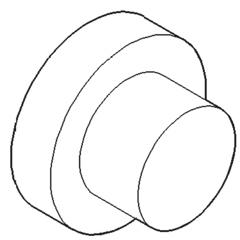
Compressor 5059-A



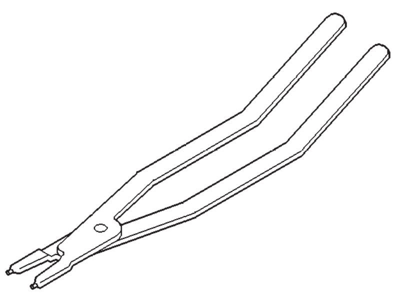
Installer 6053



Installer 5067



Button 6055



Pliers 6051

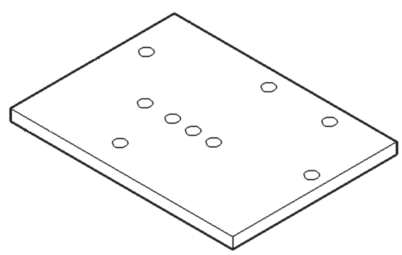
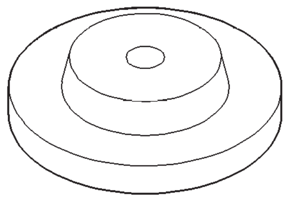
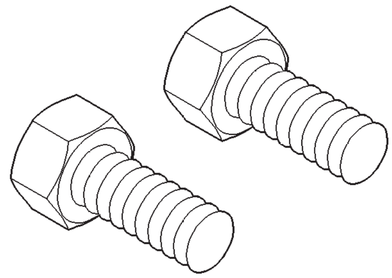


Plate 6056

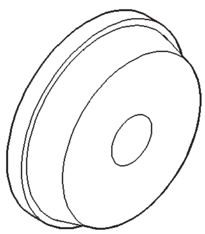
SPECIAL TOOLS (Continued)



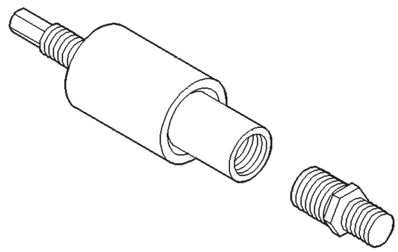
Disk 6057



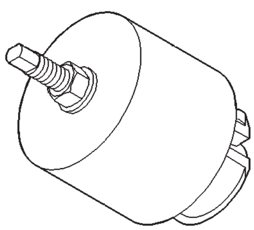
Bolt 6260



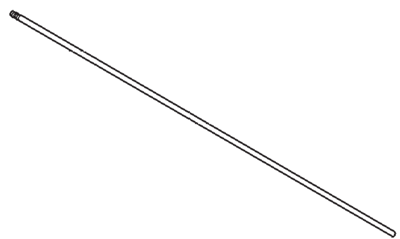
Installer 6061



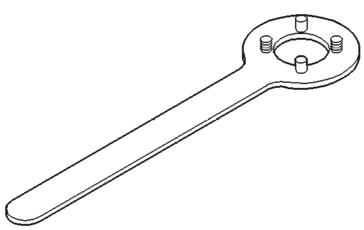
Installer 6261



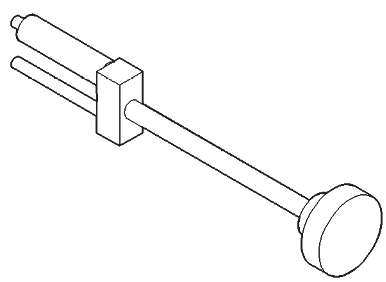
Bearing Cup Remover 6062-A



Tip 6268

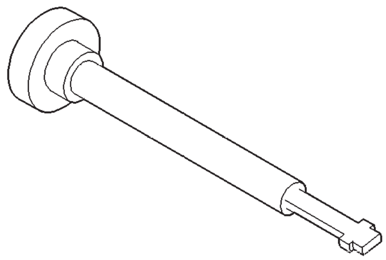


Holder 6259

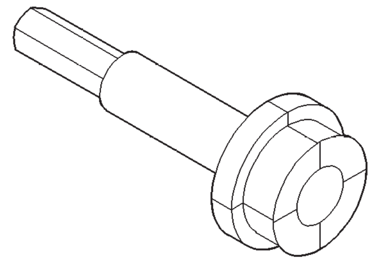


Remover/Installer 6301

SPECIAL TOOLS (Continued)



Remover/Installer 6302



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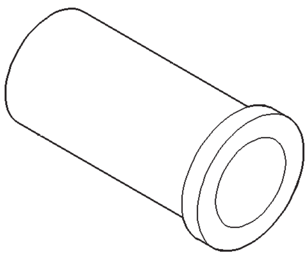

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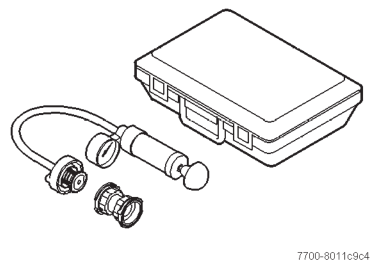
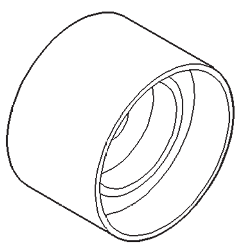
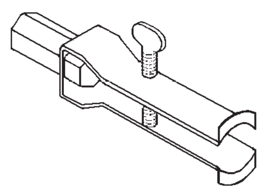


Cooling System Tester 7700



Installer 6536-A



Seal Remover 7794-a

TIRES AND WHEELS

CONTENTS

TIRES

INDEX

DESCRIPTION AND OPERATION

TIRE INFORMATION

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles

Radial ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation. This will help to achieve a greater tread-life potential.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 1).

Performance tires will have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. The letter **S** indicates that the tire is speed rated up to 112 mph.

- **Q** up to 100 mph
- **T** up to 118 mph
- **U** up to 124 mph
- **H** up to 130 mph
- **V** up to 149 mph
- **Z** more than 149 mph (consult the tire manufacturer for the specific speed rating)

An All Season type tire will have either **M + S, M & S or M–S** (indicating mud and snow traction) imprinted on the side wall.

TIRE CHAINS

This vehicle was not designed to allow the use of snow chains on the tires. If snow chains are installed on the tires, there may not be sufficient clearance under all driving conditions. This may cause damage

DESCRIPTION AND OPERATION (Continued)

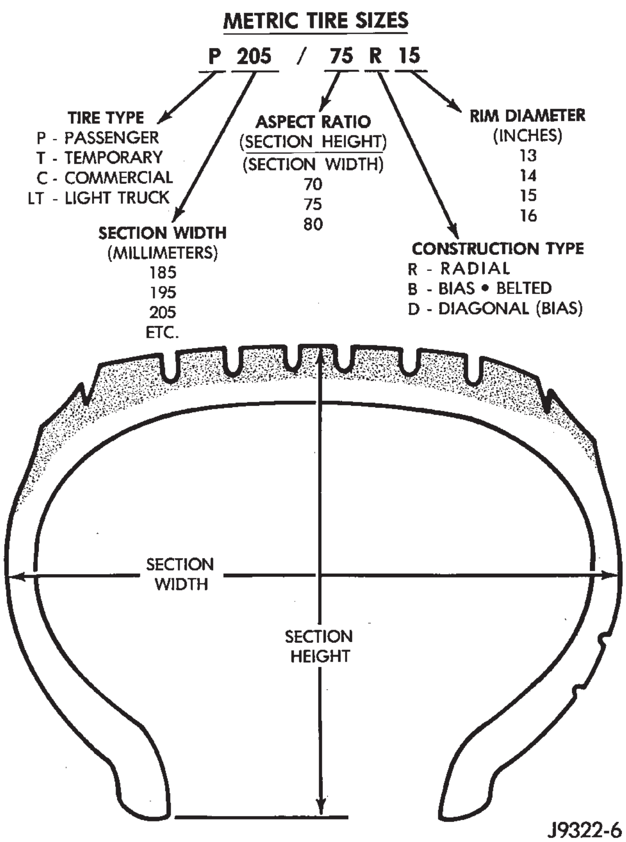


Fig. 1 Tire Identification

to the body and/or suspension components of the vehicle.

RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life, ride quality and decrease rolling resistance.

Radial-ply tires must always be used in sets of four and under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

It is recommended that tires from different manufactures NOT be mixed. The proper tire pressure should be maintained on all four tires. For proper tire pressure refer to the Tire Inflation Pressure Chart provided with the vehicle.

SPARE TIRE (TEMPORARY)

The temporary spare tire is designed for emergency use only. The original tire should be repaired and reinstalled at the first opportunity, or a new tire purchased. Do not exceed speeds of 50 MPH. Refer to Owner's Manual for complete details.

TIRE INFLATION PRESSURES

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING. THE TIRE CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

Under inflation causes rapid shoulder wear of the tire tread and tire flexing. This can result in failure of the tire. (Fig. 2).

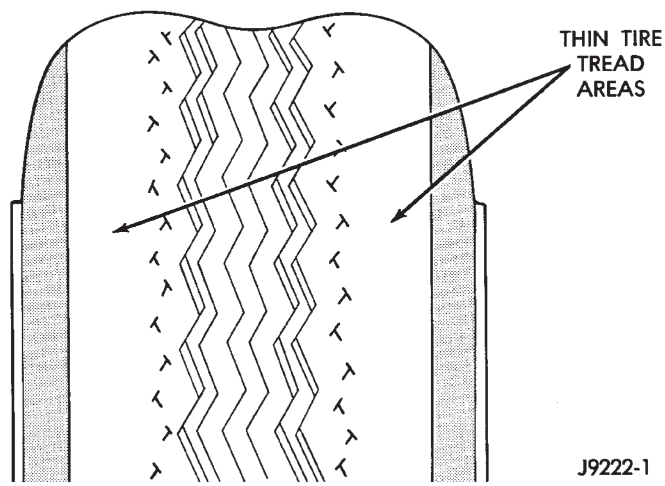


Fig. 2 Under Inflation Wear

Over inflation causes rapid center wear and loss of the tire's ability to cushion shocks (Fig. 3).

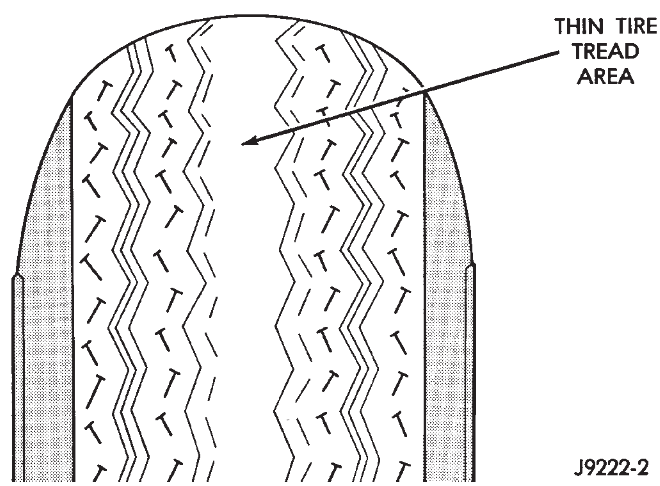


Fig. 3 Over Inflation Wear

Improper inflation can cause:

- Uneven wear patterns

DESCRIPTION AND OPERATION (Continued)

- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift.

Proper tire air inflation pressure specifications can be found on the Vehicle Tire Placard provided with the vehicle. See owner's manual.

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once per month. Check tire pressure more frequently when the weather temperature varies widely. Tire pressure will decrease when the outdoor temperature drops.

Tire inflation pressures specified on the placard are always cold inflation pressure. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours, or the vehicle is driven less than one mile after being inoperative for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. Do not reduce this normal pressure build-up.

TIRE PRESSURE FOR HIGH—SPEED OPERATION

Chrysler Corporation advocates driving at safe speeds within posted speed limits. Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. For speeds up to and including 75 mph (120 km/h), tires must be inflated to the pressures shown on the tire placard. For continuous speeds in excess of 75 mph (120 km/h), tires must be inflated to the maximum pressure specified on the tire sidewall.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

For emergency vehicles that are driven at speeds over 90 mph (144 km/h), special high-speed tires must be used. Consult tire manufacturer for correct inflation pressure recommendations.

REPLACEMENT TIRES

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is recommend that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires not listed in the specification charts may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

DIAGNOSIS AND TESTING

PRESSURE GAUGES

A high-quality air-pressure gauge is recommended to check tire pressure. After checking with the gauge, replace valve caps and finger tighten.

TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band.

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs (Fig. 4).

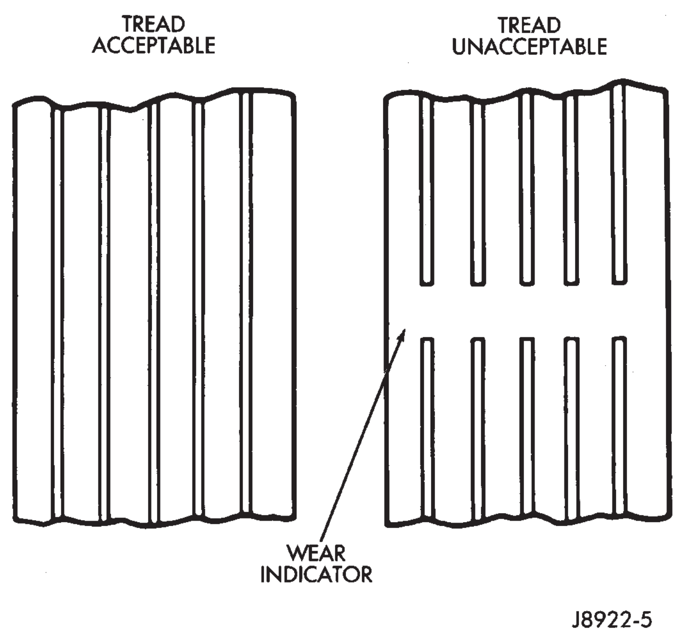


Fig. 4 Tread Wear Indicators

TIRE WEAR PATTERNS

Under inflation results in faster wear on shoulders of tire. Over inflation causes faster wear at center of tread.

DIAGNOSIS AND TESTING (Continued)

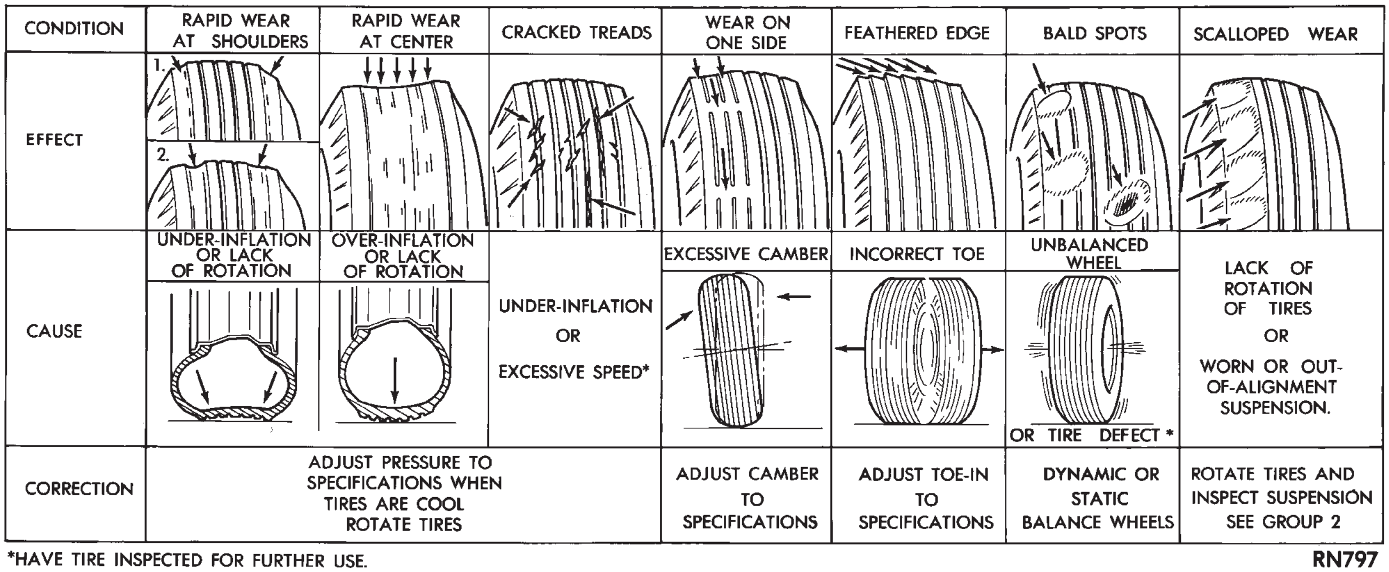


Fig. 5 Tire Wear Patterns

Excessive camber causes the tire to run at an angle to the road. One side of tread is worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges of the tire, from dragging of tire. There is a feathered effect across the tread (Fig. 5).

TIRE NOISE OR VIBRATION

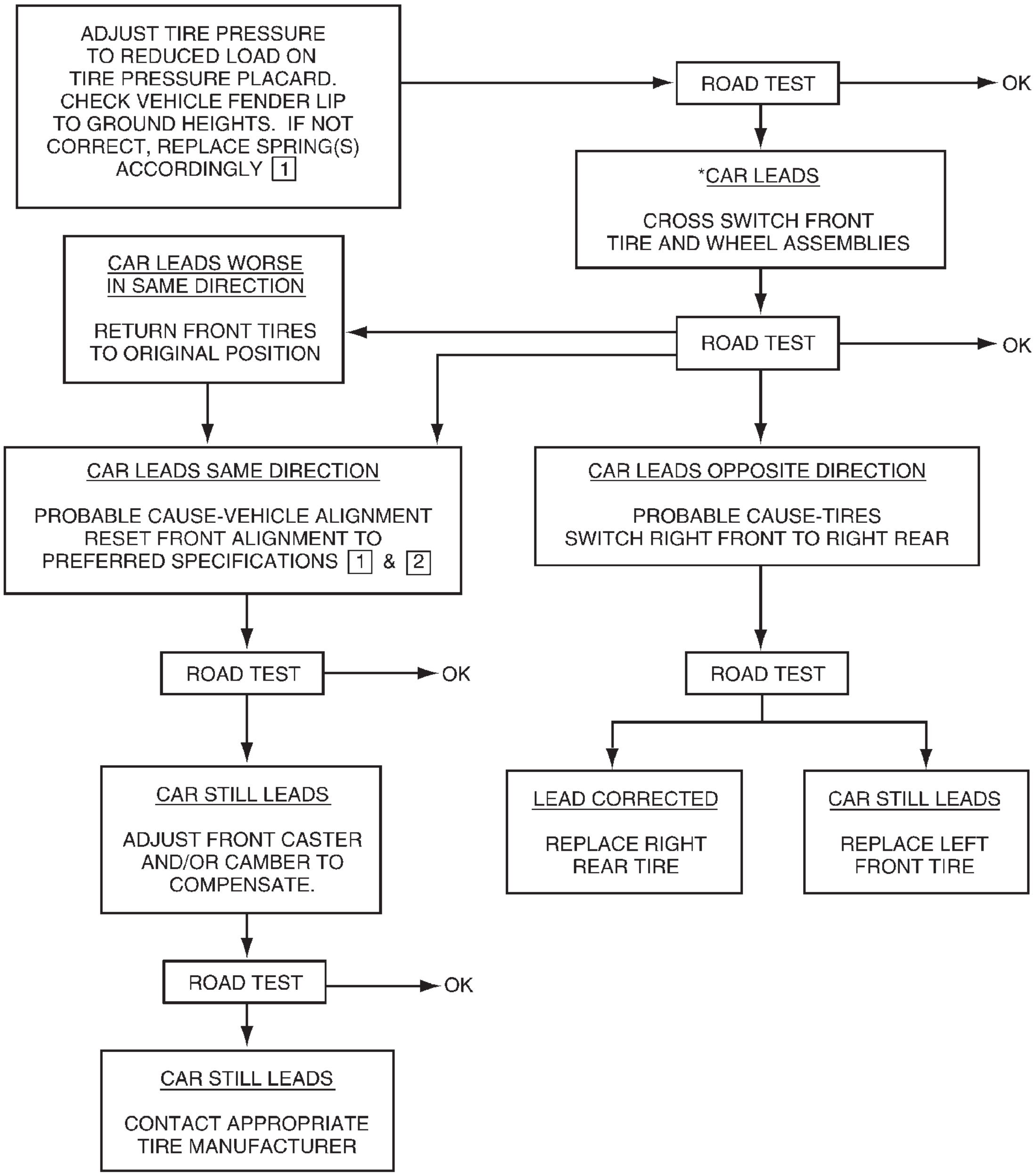
Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying speeds. Note the effect of acceleration and deceleration on noise level. Differential and exhaust noises will change in intensity as speed varies, while tire noise will usually remain constant.

LEAD CORRECTION CHART

Use the following chart to correct a vehicle leading or drifting problem.

LEAD CORRECTION CHART



*NOTE: VERIFY THAT LEAD IS NOT RELATED TO STEERING WHEEL NOT CENTERED

1 SEE ALIGNMENT SECTION IN GROUP 2 SUSPENSION OF THIS SERVICE MANUAL FOR THE SERVICE AND PREFERRED ALIGNMENT SPECIFICATIONS AND THE VEHICLE FENDER LIP TO GROUND HEIGHTS.

2 REMOVE FRONT SHOCK/SPRING/UPPER CONTROL ARM ASSEMBLY PER INSTRUCTIONS IN <u>FRONT SUSPENSION</u> SECTION. REMOVE BOTH BRACKET TO BODY PLASTIC LOCATOR PINS FROM UPPER SHOCK MOUNT BRACKET. INSTALL SHOCK/SPRING/UPPER CONTROL ARM ASSEMBLY INTO VEHICLE POSITIONING LEFT, RIGHT, OR BOTH UPPER SHOCK MOUNT BRACKETS TO BODY, BY USING THE AVAILABLE CLEARANCE BETWEEN THE BOLT AND SHOCK TOWER HOLES, SUCH THAT:

1) CROSS CAR CASTER MEASUREMENT IS MORE <u>POSITIVE</u> IN THE DIRECTION THE VEHICLE LEADS;

AND/OR,

2) CROSS CAR CAMBER MEASUREMENT IS MORE <u>NEGATIVE</u> IN THE DIRECTION THE VEHICLE LEADS.

FOR EITHER OF THE ABOVE CONDITIONS, VEHICLE ALIGNMENT MUST BE AT LEAST WITHIN THE SPECIFIED ACCEPTABLE RANGE.

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SERVICE PROCEDURES

TIRE AND WHEEL ROTATION

NON-DIRECTIONAL TREAD PATTERN TIRES

Tires on the front and rear axles operate at different loads and perform different functions. For these reasons, they wear at unequal rates, and tend to develop irregular wear patterns. These effects can be reduced by timely rotation of tires. The benefits of rotation are especially worthwhile. Rotation will increase tread life, help to maintain mud, snow, and wet traction levels, and contribute to a smooth, quiet ride.

The suggested rotation method is the forward-cross tire rotation method (Fig. 6). This method takes advantage of current tire industry practice which allows rotation of radial-ply tires. Other rotation methods may be used, but may not have all the benefits of the recommended method.

NOTE: Only the 4 tire rotation method may be used if the vehicle is equipped with a low mileage or temporary spare tire.

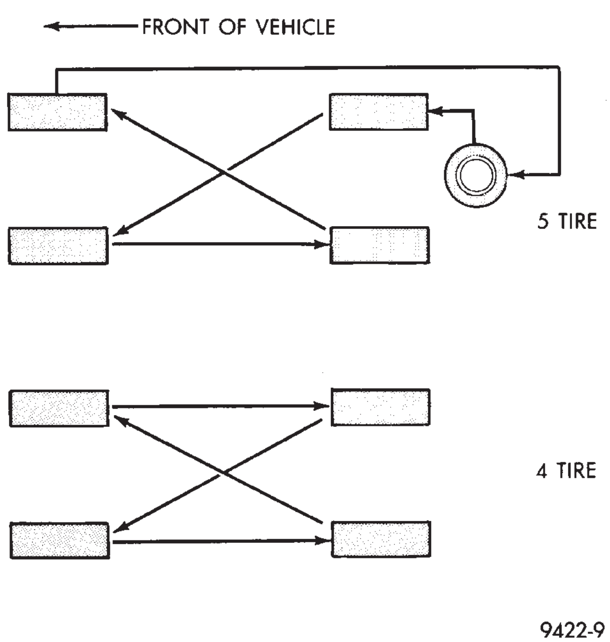

Fig. 6 Forward-Cross Tire Rotation Method

DIRECTIONAL TREAD PATTERN TIRES

Some vehicles are fitted with special high-performance tires having a directional tread pattern. These tires are designed to improve traction on wet pavement. To obtain the full benefits of this design, the tires must be installed so that they rotate in the correct direction. This is indicated by arrows on the tire sidewalls.

When wheels and tires are being installed, extra care is needed to ensure that this direction of rotation is maintained.

Refer to Owner's Manual for rotation schedule.

REPAIRING TIRE LEAKS

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 7). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before dismounting tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and progressively tighten all 5 wheel nuts to a torque of 135 N·m (100 ft. lbs.).

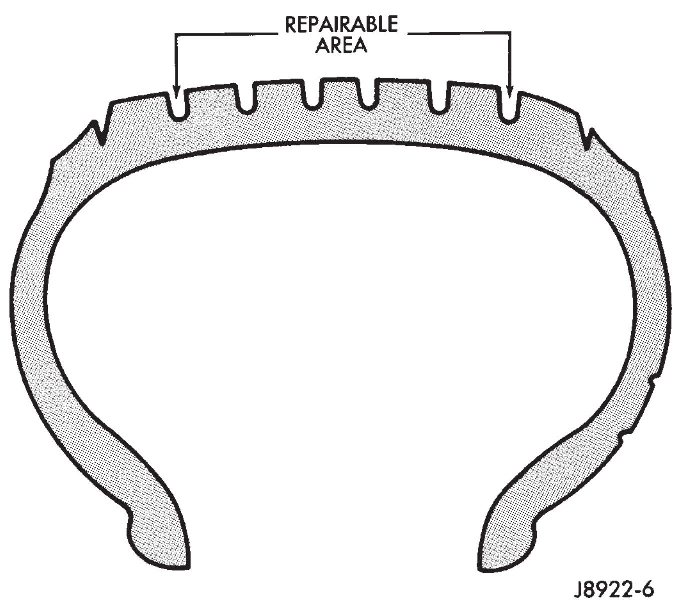

Fig. 7 Tire Repair Area

TIRE AND WHEEL MATCH MOUNTING

Wheels and tires are match mounted at the factory. This means that the high spot of the tire is matched to the low spot on the wheel rim. This technique is used to reduce run-out in the wheel/tire assembly. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the rim is identified with a label on the outside of the rim and a dot or line on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot or line on the inside of the rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve

SERVICE PROCEDURES (Continued)

stem location. This reference will ensure that it is remounted in the original position on the wheel.

(1) Measure the total indicator runout on the center of the tire tread rib. Record the indicator reading. Mark the tire to indicate the high spot. Place a mark on the tire at the valve stem location (Fig. 8).

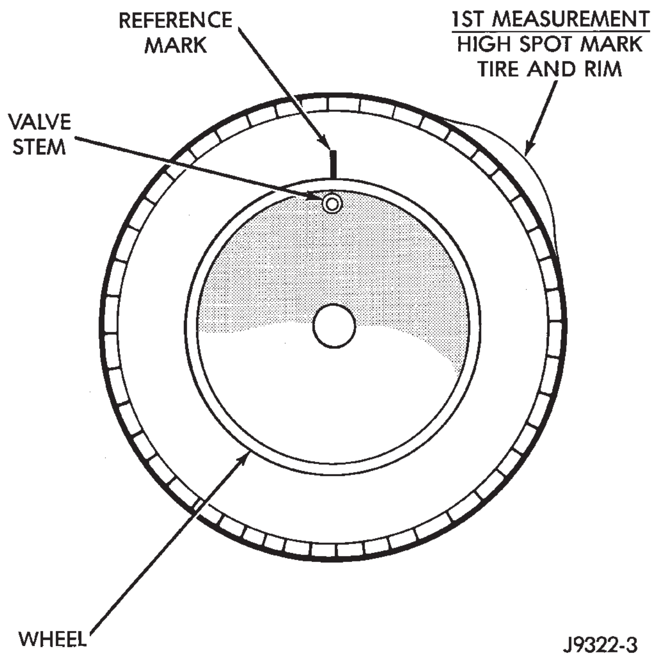

Fig. 8 First Measurement On Tire

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 9).

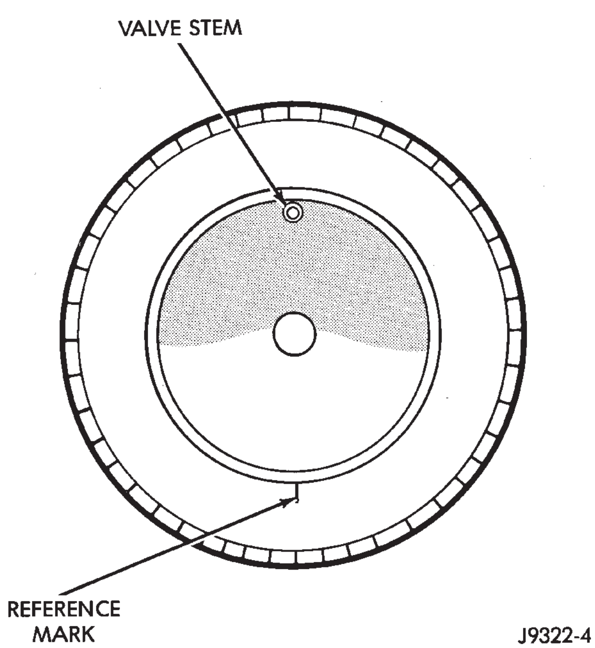

Fig. 9 Remount Tire 180 Degrees

(3) Measure the total indicator runout again. Mark the tire to indicate the high spot.

(4) If runout is still excessive, the following procedures must be done.

- If the high spot is within 102 mm (4.0 in.) of the first spot and is still excessive, replace the tire.
- If the high spot is within 102 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications. Refer to Wheel and Tire Runout.
- If the high spot is NOT within 102 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 10). This procedure will normally reduce the runout to an acceptable amount.

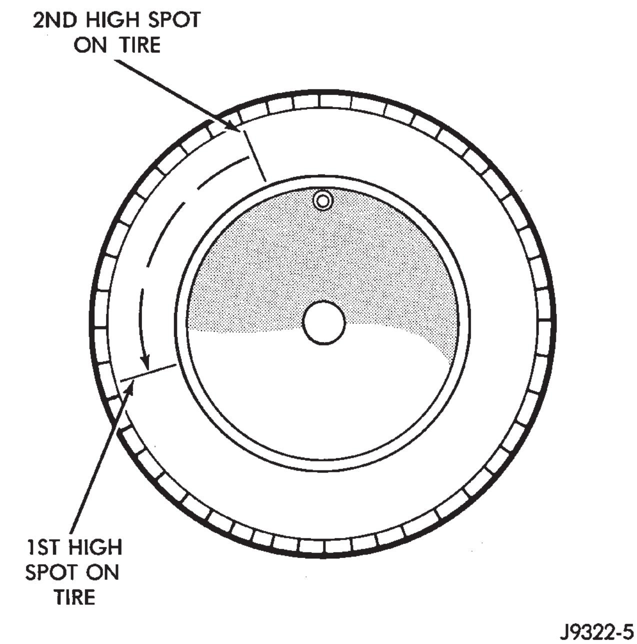

Fig. 10 Remount Tire 90 Degrees In Direction of Arrow

CLEANING AND INSPECTION

CLEANING OF TIRES

Remove protective coating on tires before delivery of vehicle. The coating could cause deterioration of tires.

Remove protective coating by:

- Applying warm water
- Letting it soak one minute
- Scrubbing the coating away with a soft bristle brush.
- Steam cleaning may also be used for cleaning.
- DO NOT use gasoline or wire brush for cleaning.
- DO NOT use mineral oil or an oil-based solvent.

SPECIFICATIONS

TIRE SPECIFICATIONS

The following guide should help you understand the tire designations:	
P	Passenger car tire (or “T” for temporary-use tire).
185	Nominal width of tire in millimeters.
70	Tire height-to-width ratio.
R	Radial-ply tire (or “D” for bias-ply tire).
14	Nominal rim diameter in inches.
Do not install smaller than minimum size tires shown on the tire inflation placard on the vehicle.	

WHEELS

INDEX

DESCRIPTION AND OPERATION

WHEEL INFORMATION

Original equipment wheels are designed for proper operation at all loads up to the specified maximum vehicle capacity.

All models use steel or aluminum drop center wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 1).

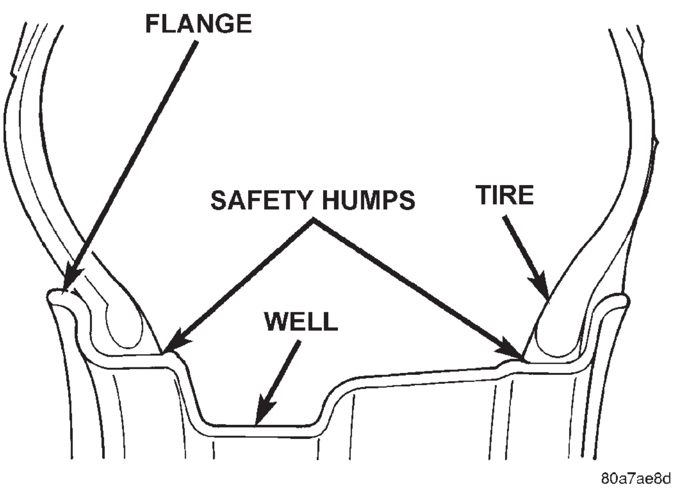

Fig. 1 Safety Rim

Initial inflation of the tires forces the bead over these raised sections. In case of air loss the raised sections hold the tire in position on the wheel until the vehicle can be brought to a safe stop.

Cast aluminum wheels require special balance weights to fit on the thicker flange of the rim and special wheel clamps for the alignment equipment.

The wheel studs and nuts are designed for the specific wheel applications used on a vehicle and must be replaced with equivalent parts.

Do not use replacement parts of lesser quality or of a substitute design from the original equipment part.

All aluminum and steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels, including the spare.

Vehicles that are equipped with bolt-on wheel covers use large nose wheel nuts. The wheel nuts used on a vehicle equipped with bolt-on wheel covers are externally threaded so that the wheel covers can be attached to the wheel nuts.

Before installing a wheel, remove any buildup of corrosion on the wheel mounting surface.

WARNING: INSTALLING WHEELS WITHOUT GOOD METAL-TO-METAL CONTACT COULD CAUSE LOOSENING OF WHEEL LUG NUTS. THIS COULD ADVERSELY AFFECT THE SAFETY AND HANDLING OF YOUR VEHICLE.

WHEEL COVER (LOCK-ON)

For the 1997 model year, this vehicle uses a lock-on type wheel cover (Fig. 2).

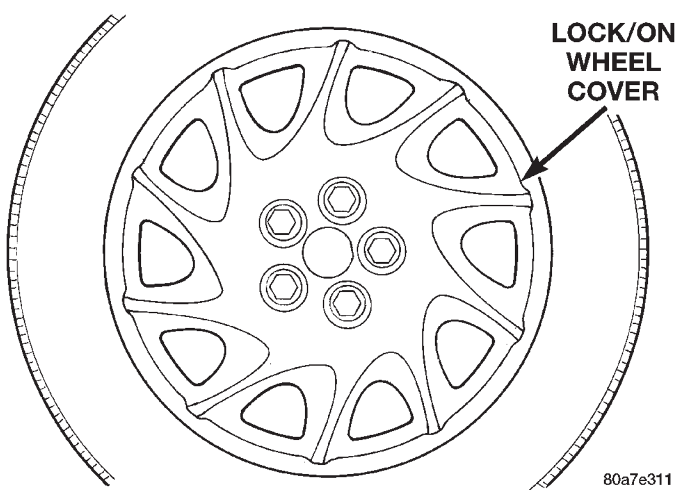

Fig. 2 Lock-On Wheel Cover

DESCRIPTION AND OPERATION (Continued)

The wheel cover is locked to the wheel using the 5 nuts located in the wheel cover (Fig. 2). The nuts in the wheel cover, thread onto a special externally threaded wheel nut (Fig. 3). This is the method used to retain the wheel cover to the wheel.

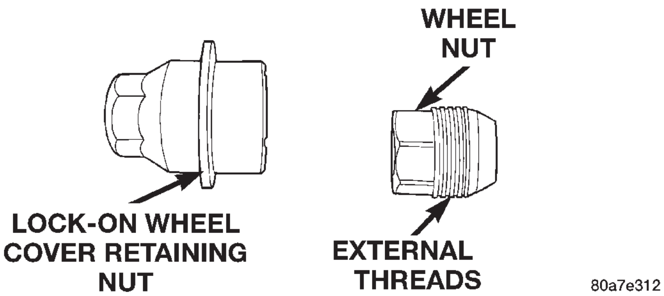

Fig. 3 Wheel Nut And Wheel Cover Retaining Nut

The wheel cover retaining nut (Fig. 3) is retained in the wheel cover and will stay on the wheel cover when un-threaded from the wheel nut. If required, the retaining nut for the lock-on wheel cover can be removed from the wheel cover and replaced as a separate part of the lock-on wheel cover.

The lock-on wheel cover can not be removed from the wheel until all 5 of wheel cover retaining nuts (Fig. 2) are un-threaded from the wheel nuts. Then the lock-on wheel cover can be removed by hand from the wheel.

DIAGNOSIS AND TESTING

WHEEL INSPECTION

Wheels must be replaced if they:
- Have excessive run out
- Are bent or dented
- Leak air
- Have damaged wheel lug holes

Wheel repairs employing hammering, heating, welding or repairing leaks are not allowed.

Original equipment replacement wheels are available through the dealer. When obtaining replacement wheels from any other source, they must be equivalent in load carrying capacity. The wheel features (diameter, width, offset, brake clearance, and mounting configuration) must match the original equipment wheels.

WARNING: FAILURE TO USE ORIGINAL EQUIPMENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF YOUR VEHICLE.

WARNING: REPLACEMENT WITH USED WHEELS IS NOT RECOMMENDED. THE SERVICE HISTORY OF THE RIM MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

TIRE AND WHEEL RUNOUT

NOTE: Runout should always be measured off the vehicle and on a suitable balance machine.

Radial run out is the difference between the high and low points on the outer edge of the tire or wheel.

Lateral run out is the total side–to–side wobble of the tire or wheel.

Radial run out of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral run out of more than 2.0 mm (.080 inch) measured at the side of the tire as close to the tread as possible may cause the vehicle to shake.

Sometimes radial run out can be reduced by relocating the wheel and tire on the wheel studs (See Method 1). If this does not reduce run out to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

METHOD 1 (RELOCATE WHEEL ON HUB)

Check accuracy of the wheel mounting surface; adjust wheel bearings.

Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

Verify all wheel nuts are properly torqued (Fig. 4).

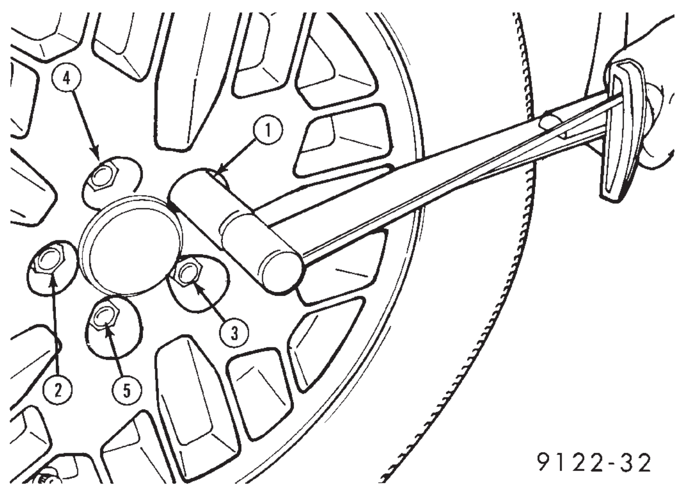

Fig. 4 Tightening Wheel Nuts

Use run out gauge D-128-TR to determine run out (Fig. 5).

Relocate the wheel on the mounting studs, two studs over from the original position.

Retighten wheel nuts until all are properly torqued. This will prevent brake distortion.

Check radial run out. If still excessive, mark tire sidewall, wheel, and stud at point of maximum run out (Fig. 6) and proceed to Method 2.

DIAGNOSIS AND TESTING (Continued)

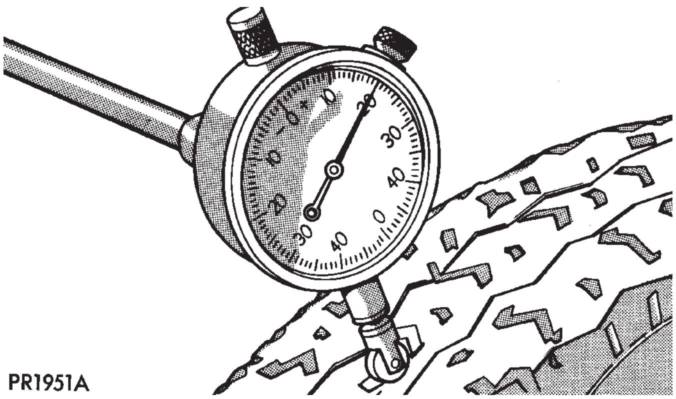

Fig. 5 Run Out Gauge

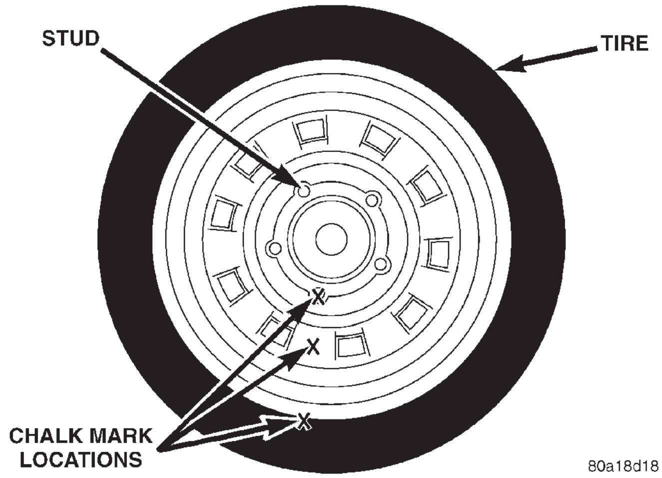

Fig. 6 Chalk Marking On Wheel, Tire And Stud

METHOD 2 (RELOCATE TIRE ON WHEEL)

Rotating tire on wheel is particularly effective when there is run out in both tire and wheel.

Remove tire from wheel and remount wheel on hub in former position.

Check wheel radial run out (Fig. 7). It should be no more than 0.762 mm (0.030 inch).

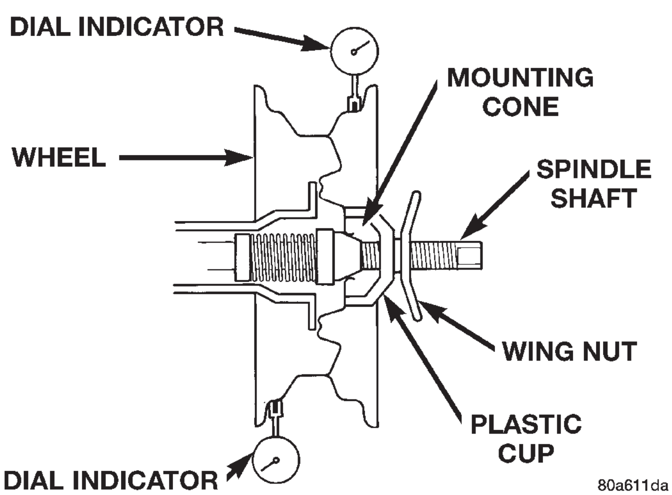

Fig. 7 Checking Wheel Radial Run Out

Check wheel lateral run out (Fig. 8). It should be no more than 0.762 mm (0.030 inch).

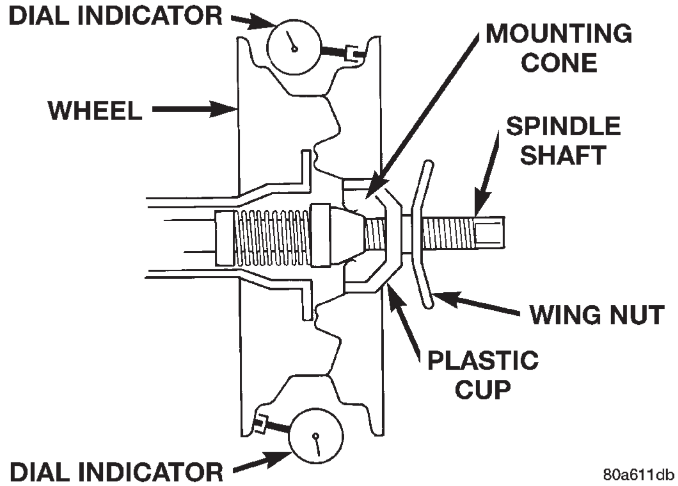

Fig. 8 Checking Wheel Lateral Run Out

If the point of greatest wheel radial run out is near the original chalk mark, remount the tire on the rim 180 degrees from its original position. Recheck the run out. If this does not reduce the run out to an acceptable level, replace the wheel and/or the tire.

SERVICE PROCEDURES

TIRE AND WHEEL BALANCE

Balancing need is indicated by vibration of seats, floor pan, or steering wheel. The vibration will be noticed mostly when driving over 90 km/h (55 mph) on a smooth road.

It is recommended that a two plane dynamic balancer be used when a wheel and tire assembly require balancing. Static should be used only when a two plane balancer is not available.

Off-vehicle tire and wheel balancing is recommended to be used on this vehicle.

NOTE: If on vehicle equipment is being used to balance the tire /wheel assemblies, remove the opposite tire/wheel from the vehicle.

For static balancing, find the location of heavy spot on tire/wheel causing the imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 9).

For dynamic balancing, the balancing equipment is designed to indicate the location and amount of weight to be applied to both the inner and outer rim flanges (Fig. 10)

REMOVAL AND INSTALLATION (Continued)

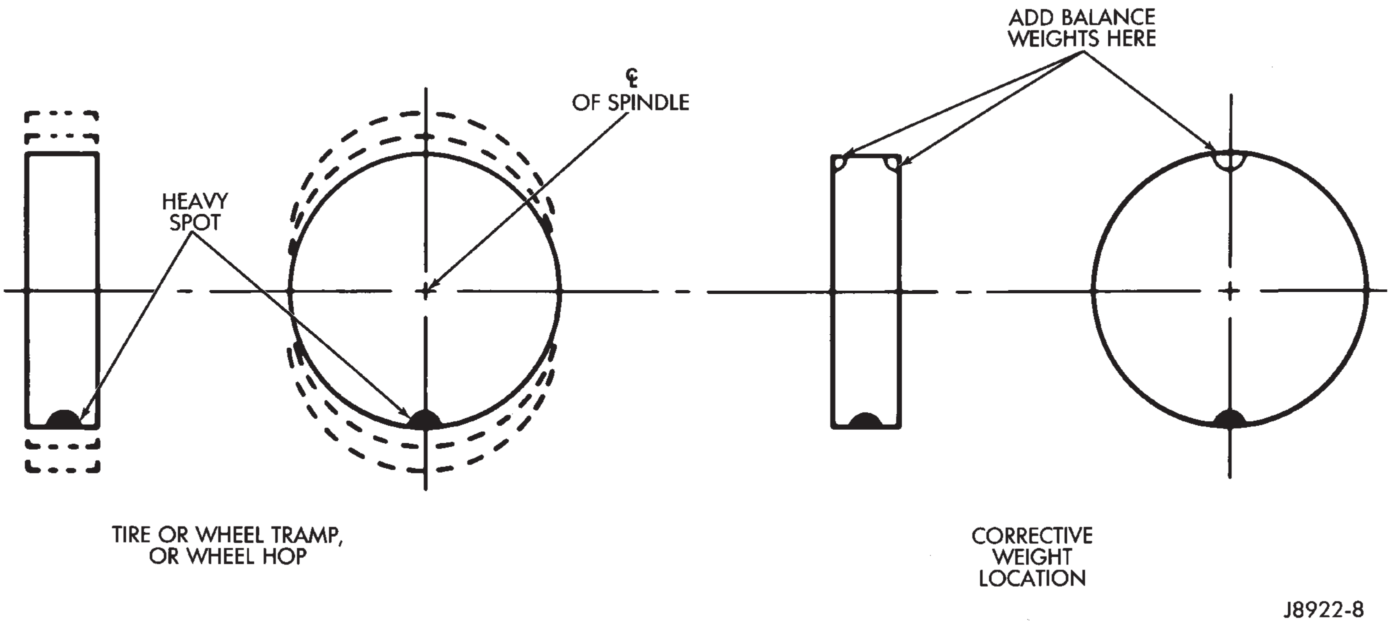

Fig. 9 Static Unbalance & Balance

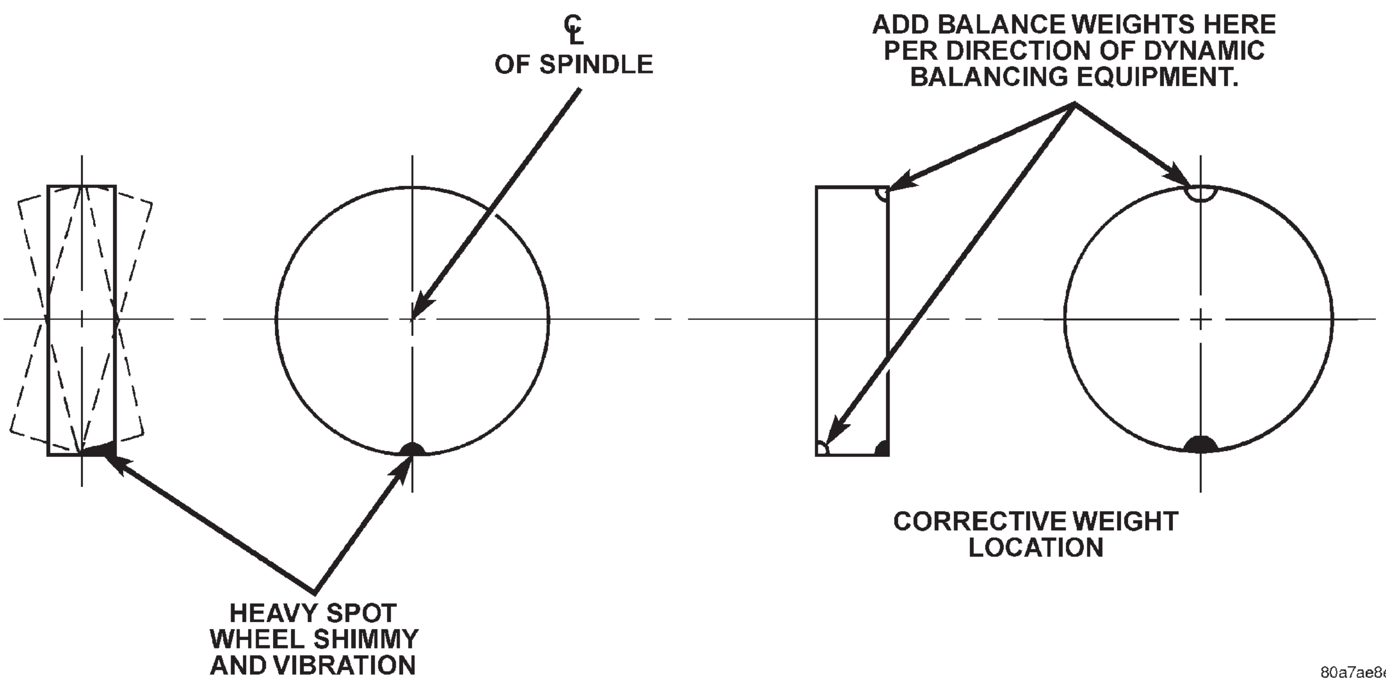

Fig. 10 Dynamic Unbalance & Balance

REMOVAL AND INSTALLATION

WHEEL COVER (LOCK-ON)

REMOVE

NOTE: When unthreading the wheel cover retaining nuts (Fig. 11) from the wheel nuts it is recommended that a hand wrench be used and not an impact wrench. Use of an impact wrench could result in damage to the lock-on wheel cover retaining nuts.

(1) Un-thread the 5 nuts (Fig. 11) attaching the wheel cover to the wheel nuts.

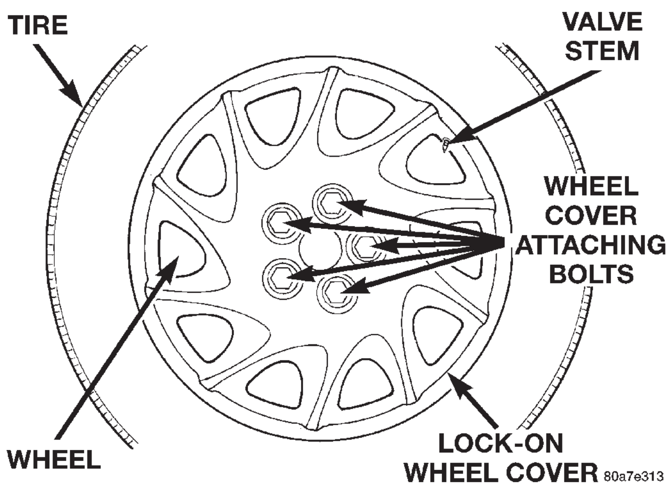

Fig. 11 Wheel Cover Attaching Nuts

(2) Grasp the wheel cover and pull straight outward from the wheel. This will remove the wheel cover from the wheel.

INSTALL

(1) Align the valve notch in the wheel cover with the valve stem on the wheel (Fig. 11). Align the wheel cover retaining nuts with the externally threaded wheel nuts.

(2) By hand, start to thread all 5 of the wheel cover retaining nuts onto the externally threaded wheel nuts.

NOTE: When tightening the wheel cover retaining nuts it is recommended that a hand wrench be used and not an impact wrench. Use of an impact wrench could result in damage to the lock-on wheel cover retaining nuts.

(3) Tighten each of the wheel cover retaining nuts. If the retaining nut "jumps" a thread (slips), which is an override feature of the retaining nut, retighten the retaining nut to a point just prior to this occurring. To avoid rattling of the wheel cover be sure all five retaining nuts are correctly tightened.

WHEEL AND TIRE

CAST ALUMINUM WHEEL

To install the wheel, first position it properly on the mounting surface using the hub pilot as a guide. All wheel nuts should be lightly tightened before progressively tightening them in the proper sequence (Fig. 12). Then tighten wheel nuts in the proper sequence to a torque of 135 N·m (100 ft. lbs.). Never use oil or grease on studs or nuts.

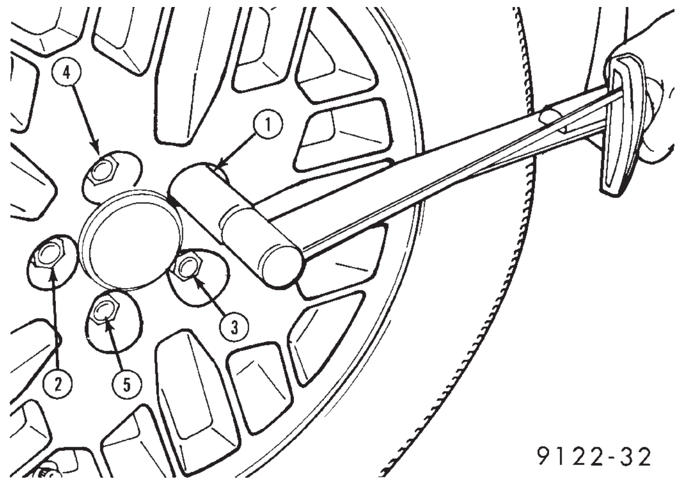

Fig. 12 Tightening Wheel Nuts

STEEL WHEEL

REMOVE

CAUTION: When removing the wheel cover, do not attempt pry the wheel cover off the wheel. This can result in damage to the wheel cover. The wheel cover is removed by un-threading the wheel cover retaining nuts and pulling it off the wheel by hand.

NOTE: When unthreading the wheel cover retaining nuts (Fig. 13) from the wheel nuts it is recommended that a hand wrench be used and not an impact wrench. Use of an impact wrench could result in damage to the lock-on wheel cover retaining nuts.

(1) Un-thread the 5 nuts (Fig. 13) attaching the wheel cover to the wheel nuts.

(2) Grasp the wheel cover and pull straight outward. This will remove the wheel cover from the wheel.

(3) Remove the wheel nuts (Fig. 14) from the studs.

(4) Remove the wheel and tire from the hub.

REMOVAL AND INSTALLATION (Continued)

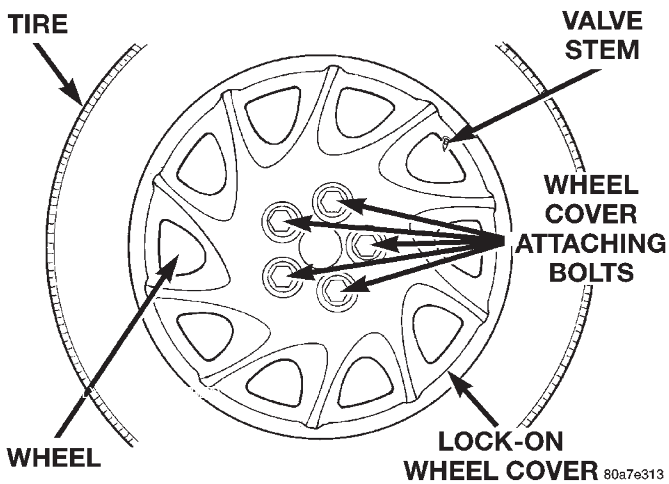

Fig. 13 Wheel Cover Locking Nuts

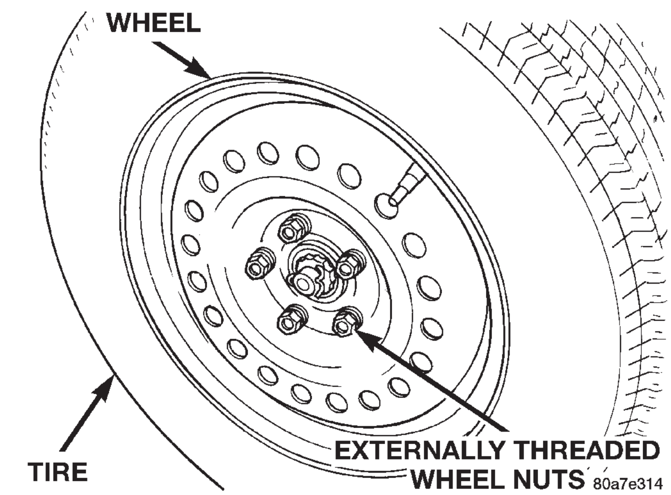

Fig. 14 Wheel Nuts

INSTALL

(1) To install the wheel, first position it properly on the studs and hub mounting surface using the hub pilot as a guide. Install and **lightly tighten** the wheel nuts in the proper sequence (Fig. 15).

CAUTION: When installing the wheel/tire never use oil or grease on studs or nuts.

(2) Progressively tighten the 5 wheel nuts in the proper sequence (Fig. 15) until tightened to half of the specified torque. Then tighten the wheel nuts in the proper sequence to a torque of 135 N·m (100 ft. lbs.).

(3) Align the valve notch in the wheel cover with the valve stem on the wheel (Fig. 13). Align the wheel cover retaining nuts with the externally threaded wheel nuts.

(4) By hand, start to thread all 5 of the wheel cover retaining nuts onto the externally threaded wheel nuts.

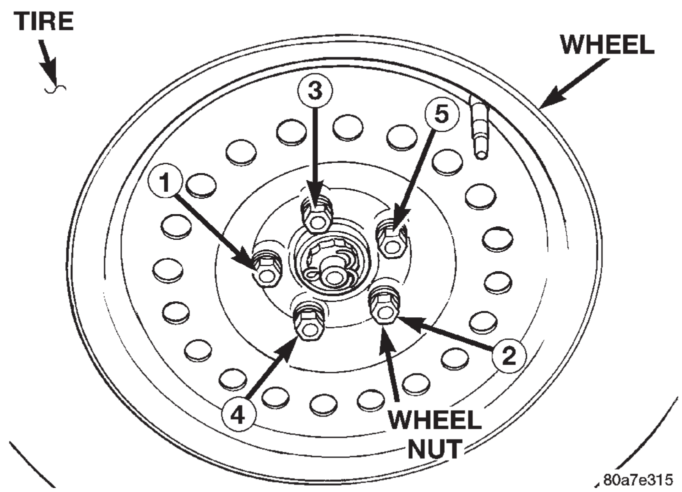

Fig. 15 Wheel Nut Tightening Sequence

NOTE: When tightening the wheel cover retaining nuts it is recommended that a hand wrench be used and not an impact wrench. Use of an impact wrench could result in damage to the lock-on wheel cover retaining nuts.

(5) Tighten each of the wheel cover retaining nuts. If the retaining nut “jumps” a thread (slips), which is an override feature of the retaining nut, retighten the retaining nut to a point just prior to this occurring. To avoid rattling of the wheel cover be sure all five retaining nuts are correctly tightened.

WHEEL COVER RETAINING NUT

If a retaining nut for the lock-on wheel is damaged, it can be replaced as a separate part of the wheel cover. Use the following procedure for replacing a wheel cover retaining nut.

REMOVE

(1) If required, remove the wheel cover from the wheel. Refer to Wheel Cover Lock-On in the Removal And Installation Section in this group of the service manual for the procedure.

NOTE: The retaining nut flange can not be forced past the large retaining tab. When removing retaining nut from wheel cover, the flange on the retaining nut must be forced past the 2 small retaining tabs on wheel cover.

(2) From the back side of the wheel cover, push outward and tilt the retaining nut sideways forcing the flange on the retaining nut past the 2 small retaining tabs in the retaining nut hole of the wheel cover (Fig. 16).

(3) When flange on retaining nut is past the 2 retaining tabs on the wheel cover, remove retaining nut from wheel cover by pushing or pulling from hole in wheel cover.

REMOVAL AND INSTALLATION (Continued)

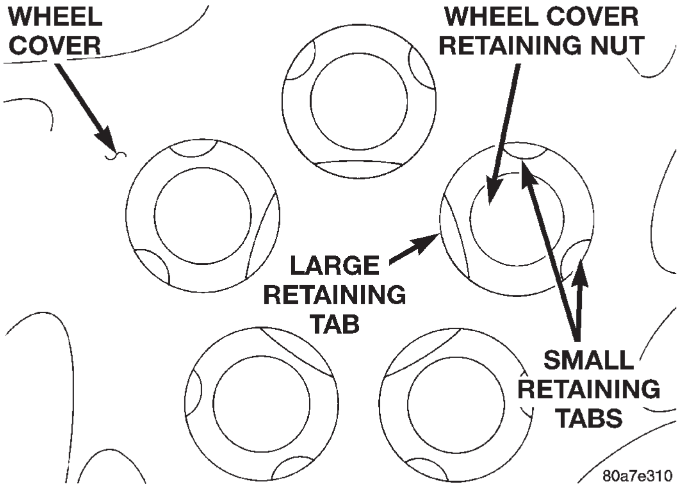

Fig. 16 Wheel Cover Retaining Nut Retention

INSTALL

(1) Install retaining nut in hole of wheel cover with retaining nut flange positioned under the large retaining flange (Fig. 16).

(2) Push on hex of retaining nut forcing the retaining nut flange past the 2 small retaining tabs in wheel cover.

SPECIFICATIONS

WHEEL SPECIFICATIONS

Wheel:

Mounting Stud Size . . . . M12 x 1.5mm
Mounting Stud Lug Nut Hex Size 19mm
Mounting Lug Nut Tightening
Torque . . . . 135 N·m (100 ft. lbs.)

BODY

CONTENTS

GENERAL SERVICE INFORMATION

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GENERAL INFORMATION

VEHICLE IDENTIFICATION

Throughout this group, references to the Chrysler Corporation vehicle family identification code are used when describing a procedure that is unique to that vehicle. Refer to Introduction Group of this manual for detailed information on vehicle identification. If a procedure is common to all vehicles covered in this manual, no reference will be made to a vehicle family code.

SAFETY PRECAUTIONS AND WARNINGS

WARNING: EYE PROTECTION SHOULD BE USED WHEN SERVICING GLASS COMPONENTS. PERSONAL INJURY CAN RESULT.

USE A OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL– BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

DO NOT STAND UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.

CAUTION: When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.

Always have a fire extinguisher ready for use when welding.

Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.

Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.

Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.

Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.

Chrysler Corporation uses many different types of push-in fasteners to secure the interior and exterior trim to the body. Most of these fasteners can be reused to assemble the trim during various repair procedures. At times, a push-in fastener cannot be removed without damaging the fastener or the component it is holding. If it is not possible to remove a fastener without damaging a component or body, cut or break the fastener and use a new one when installing the component. Never pry or pound on a plastic or pressed-board trim component. Using a suitable fork-type prying device, pry the fastener from the retaining hole behind the component being removed. When installing, verify fastener alignment with the retaining hole by hand. Push directly on or over the fastener until it seats. Apply a low-force pull to the panel to verify that it is secure.

When it is necessary to remove components to service another, it should not be necessary to apply excessive force or bend a component to remove it. Before damaging a trim component, verify hidden fasteners or captured edges holding the component in place.

PAINT

INDEX

GENERAL INFORMATION

PAINT CODE

A paint code is provided on the body code plate located in the engine compartment. Refer to the Introduction section at the front of this manual for body code plate description. The paint and trim codes are also included on the Vehicle Safety Label located on the driver's door end frame.

BASE COAT/CLEAR COAT FINISH

On most vehicles a two-part paint application (base coat/clear coat) is used. Color paint that is applied to primer is called base coat. The clear coat protects the base coat from ultraviolet light and provides a durable high-gloss finish.

WET SANDING, BUFFING, AND POLISHING

Minor acid etching, orange peel, or smudging in clear coat or single-stage finishes can be reduced with light wet sanding, hand buffing, and polishing. **If the finish has been wet sanded in the past, it cannot be repeated. Wet sanding operation should be performed by a trained automotive paint technician.**

CAUTION: Do not remove clear coat finish, if equipped. Base coat paint must retain clear coat for durability.

PAINTED SURFACE TOUCH-UP

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use Mopar® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat. Refer to Introduction group of this manual for Body Code Plate information.

TOUCH-UP PROCEDURE

(1) Scrape loose paint and corrosion from inside scratch or chip.

(2) Clean affected area with Mopar® Tar/Road Oil Remover, and allow to dry.

(3) Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the defect without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.

(4) Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.

(5) On vehicles without clear coat, the touch-up color can be lightly wet sanded (1500 grit) and polished with rubbing compound.

(6) On vehicles with clear coat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

GENERAL INFORMATION (Continued)

AFTERMARKET PAINT REPAIR PRODUCTS

1997 EXTERIOR COLORS

EXTERIOR COLOR	CHRY CODE	PPG	BASF	DUPONT	S–W ACME M-S	AKZ0/NOBEL SIKKENS
Candy Apple Red Met. Tint C/C	RH2	4974 5025	26098	B9616	51063 51064	CHA95:RH2
Deep Amethyst Pearl Coat	TCN	5246	27038	B9736	52566	CHA97:TCN
Lt. Gold Pearl-Coat	SYL	83539	26097	B9618	51076	CHA96:SYL
Forest Green Pearl-Coat	SG8	47439	26078	B9609	5106	CHA95:SG8
Med. Fern Green Pearl-Coat	RJP	47320	25040	B9524	50270	CHA95:RJP
Lt. Iris Pearl-Coat	PC5	4788	24078	B9455	48782	CHA94:PC5
Black Clear-Coat	DX8	9700	15214	99	34858 90-5950	CHA85:DX8
Bright White Clear-Coat	GW7	4037	18238	B8833	37298	CHA88:GW7

1997 MOLDING COLORS

MOLDING COLOR	CHRY CODE	PPG	BASF	DUPONT	S-W ACME M-S	AKZO/NOBEL SIKKENS
Candy Apple Red	RH2	4974 5025	26098	B9616	51063 51064	CHA95:RH2
Lt. Gold	SYL	83539	26097	B9618	51076	CHA96:SYL
Orchid	RMK	74085	25038	B9522	50272	CHA95:RMK
Medium Fern	RJP	47320	25040	B9524	50270	CHA95:RJP
Forest Green	SG8	47439	26078	B9609	5106	CHA95:SG8
Lt. Iris	PC5	4788	24078	B9455	48782	CHAPC5M
Black	DX8	9700	15214	F0204	34858 90-5950	CHADX8M
Bright White	GW7	4037	18238	B8833	37298	CHAGW7M

1997 INTERIOR COLORS

INTERIOR COLOR	CHRY CODE	PPG	BASF	DUPONT	S-W ACME M-S
Mist Gray	C3	35799 2-1576	25065	C9507	50508
Silver Fern	JK	35798 2-1577	25066	C9509	50510
Camel	K5	27731 2-1584	26120	C9603	51541

STATIONARY GLASS

INDEX

DESCRIPTION AND OPERATION

SAFETY PRECAUTIONS

WARNING: DO NOT OPERATE THE VEHICLE WITHIN 24 HOURS OF WINDSHIELD INSTALLATION. IT TAKES AT LEAST 24 HOURS FOR URETHANE ADHESIVE TO CURE. IF IT IS NOT CURED, THE WINDSHIELD MAY NOT PERFORM PROPERLY IN AN ACCIDENT.

URETHANE ADHESIVES ARE APPLIED AS A SYSTEM. USE GLASS CLEANER, GLASS PREP SOLVENT, GLASS PRIMER, PVC (VINYL) PRIMER AND PINCHWELD (FENCE) PRIMER PROVIDED BY THE ADHESIVE MANUFACTURER. IF NOT, STRUCTURAL INTEGRITY COULD BE COMPROMISED.

BE SURE TO REFER TO THE URETHANE MANUFACTURER'S DIRECTIONS FOR CURING TIME SPECIFICATIONS, AND DO NOT USE ADHESIVE AFTER ITS EXPIRATION DATE.

VAPORS THAT ARE EMITTED FROM THE URETHANE ADHESIVE OR PRIMER COULD CAUSE PERSONAL INJURY. USE THEM IN A WELL-VENTILATED AREA.

SKIN CONTACT WITH URETHANE ADHESIVE SHOULD BE AVOIDED. PERSONAL INJURY MAY RESULT.

ALWAYS WEAR EYE AND HAND PROTECTION WHEN WORKING WITH GLASS.

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

It is difficult to salvage a windshield during the removal operation. The windshield is part of the structural support for the roof. The urethane bonding used to secure the windshield to the fence is difficult to cut or clean from any surface. If the moldings are set in urethane, it would also be unlikely they could be salvaged. Before removing the windshield, check the availability of the windshield and moldings from the parts supplier.

REMOVAL AND INSTALLATION

WINDSHIELD

The urethane adhesive holding the windshield to the opening pinch weld (fence) can be cut using a sharp cold knife from the exterior of the vehicle. Using the cold knife method is effective if the windshield is already broken. If the glass must be salvaged, cutting the urethane adhesive from the interior of the vehicle using a reciprocating or oscillating power knife is recommended.

RECOMMENDED TOOLS AND ADHESIVE

POWER KNIFE

- Fein® Power Cut-out Knife
- Equalizer® Magnum, Interior Auto Glass Cut Out Knife

ADHESIVE, PRIMER AND CLEANER

Mopar® Windshield Glass Polyurethane package or equivalent must be used in order to ensure that the vehicle will conform to the FMVSS 212 windshield retention standard and the FMVSS 216 roof crush standard.

WINDSHIELD REMOVAL—EXTERIOR METHOD

(1) Open convertible top.
(2) Remove header/A-pilllar weatherstrip from weatherstrip retainers.
(3) Remove A-pillar weatherstrip retainer and molding.
(4) Remove header weatherstrip/molding.
(5) Remove windshield wiper arms.
(6) Remove cowl cover.
(7) Place protective covers over instrument panel and hood.
(8) Using a sharp cold knife, cut urethane adhesive holding the windshield to the A-pillars, header and cowl pinch weld fences (Fig. 1). A power cutting device can be used if available.
(9) Separate windshield from vehicle.

WINDSHIELD REMOVAL—INTERIOR METHOD

(1) Remove cowl cover.
(2) Open convertible top.

REMOVAL AND INSTALLATION (Continued)

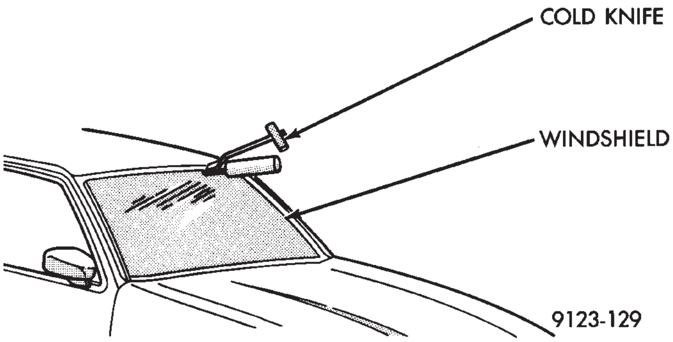

Fig. 1 Cut Urethane Around Windshield

(3) Remove header/A-pillar weatherstrip from weatherstrip retainers.

(4) Remove A-pillar weatherstrip retainer and molding.

(5) Remove header weatherstrip/molding.

(6) Remove header panel trim cover.

(7) Remove header panel weatherstrip from channel.

(8) Remove instrument panel top cover. Refer to Group 8E, Instrument Panel.

(9) Remove A-pillar trim covers.

(10) Place protective covers over instrument panel and hood.

(11) Using a reciprocating or oscillating power knife, cut urethane adhesive holding the windshield to the A-pillars, roof header and cowl pinch weld fences. Refer to instructions provided with the equipment being used.

(12) Separate windshield from vehicle.

WINDSHIELD INSTALLATION

CAUTION: Open the left front door glass before installing windshield to avoid pressurizing the passenger compartment. If a door is slammed before urethane bonding is cured, water leaks can result.

Allow the urethane at least 24 hours to cure before returning the vehicle to use.

To avoid stressing the replacement windshield, the urethane bonding material on the windshield fence should be smooth and consistent to the shape of the replacement windshield. The support spacers should be cleaned and properly installed on weld studs or repair screws at bottom of windshield opening.

NOTE: The JX uses adjustable support spacers. Once the support spacers are set, use care not to move them.

(1) Place replacement windshield into windshield opening and position glass in the center of the opening against the support spacers.

(2) Verify the glass lays evenly against the pinch weld fence at the sides, top and bottom of the replacement windshield. If not, the pinch weld fence must be formed to the shape of the new glass.

(3) Measure the distance from the center of the dowel pin hole to the top edge of the windshield.

(4) Move the support spacers as necessary so that the distance from the center of the dowel pin hole to the top of the windshield is 91.61 mm. (3.61 in.).

(5) Place a piece of tape over the ratcheting portion of the support spacer to prevent them from moving.

(6) Repeat Step 3 through Step 5 for the opposite side of the windshield.

(7) Mark the glass at the support spacers with a grease pencil or pieces of masking tape and ink pen to use as a reference for installation (Fig. 2).

(8) Remove replacement windshield from windshield opening.

(9) Position the windshield inside up on a suitable work surface with two padded, wood 10 cm by 10 cm by 50 cm (4 in. by 4 in. by 20 in.) blocks, placed parallel 75 cm (2.5 ft.) apart (Fig. 3).

WARNING: DO NOT USE SOLVENT BASED GLASS CLEANER TO CLEAN WINDSHIELD BEFORE APPLYING GLASS PREP AND PRIMER. POOR ADHESION CAN RESULT.

(10) Clean inside of windshield with ammonia based glass cleaner and lint-free cloth.

(11) Apply molding to perimeter of windshield.

(12) Apply Glass Prep adhesion promoter 25 mm (1 in.) wide around perimeter of windshield and wipe with clean/dry lint-free cloth until no streaks are visible.

(13) Apply Glass Primer 25 mm (1 in.) wide around perimeter of windshield. Allow at least three minutes drying time.

(14) Using a razor knife, remove as much original urethane as possible. Do not damage paint on windshield fence.

(15) Apply pinch weld primer 15 mm (.75 in.) wide around the windshield fence. Allow at least three minutes drying time.

(16) If a low viscosity urethane adhesive is used, install compression spacers on the fence around the windshield opening at original locations (Fig. 4).

(17) Apply a 10 mm (0.4 in.) bead of urethane on centerline of windshield fence.

(18) With the aid of a helper, position the windshield over the windshield opening. Align the reference marks at the bottom of the windshield to the support spacers.

(19) Slowly lower windshield glass to windshield opening fence. Guide the molding into proper position

REMOVAL AND INSTALLATION (Continued)

as necessary. Push windshield inward until molding is flush to roof line and A-pillars (Fig. 5).

(20) Clean access urethane from exterior with Mopar® Super Kleen or equivalent.

(21) Apply 150 mm (6 in.) lengths of 50 mm (2 in.) masking tape spaced 250 mm (10 in.) apart to hold molding in place until urethane cures.

(22) Install cowl cover and wipers.

(23) Install inside rear view mirror.

(24) After urethane has cured, remove tape strips and water test windshield to verify repair.

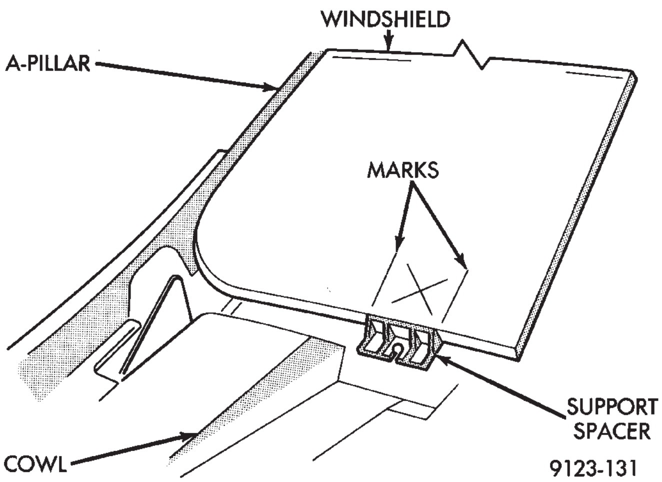

Fig. 2 Center Windshield and Mark at Support Spacers

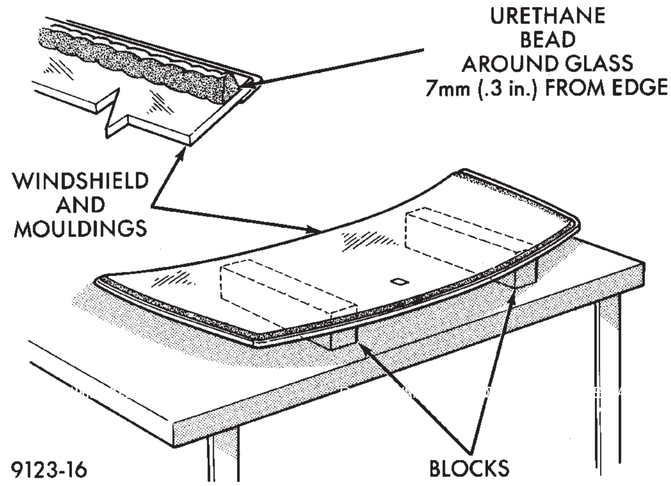

Fig. 3 Work Surface Set up and Molding Installation

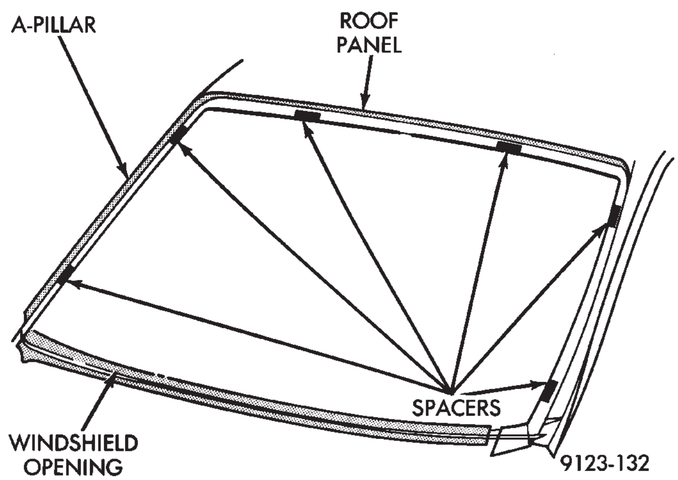

Fig. 4 Position Urethane Compression Spacers—Typical

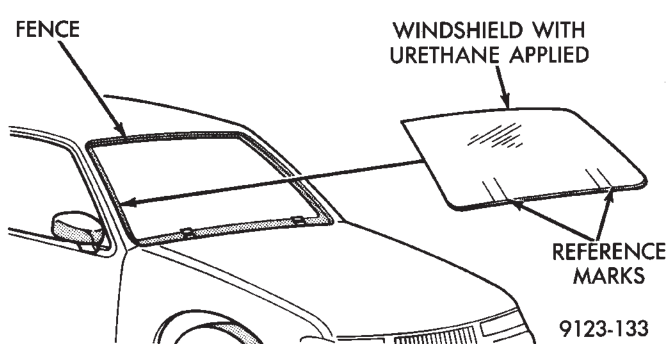

Fig. 5 Lower Windshield Into Position

SEATS

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REMOVAL AND INSTALLATION

FRONT AND REAR SEAT DIAGRAMS

Refer to (Fig. 1) and (Fig. 2) for more information while servicing the front or rear seat.

REMOVAL AND INSTALLATION (Continued)

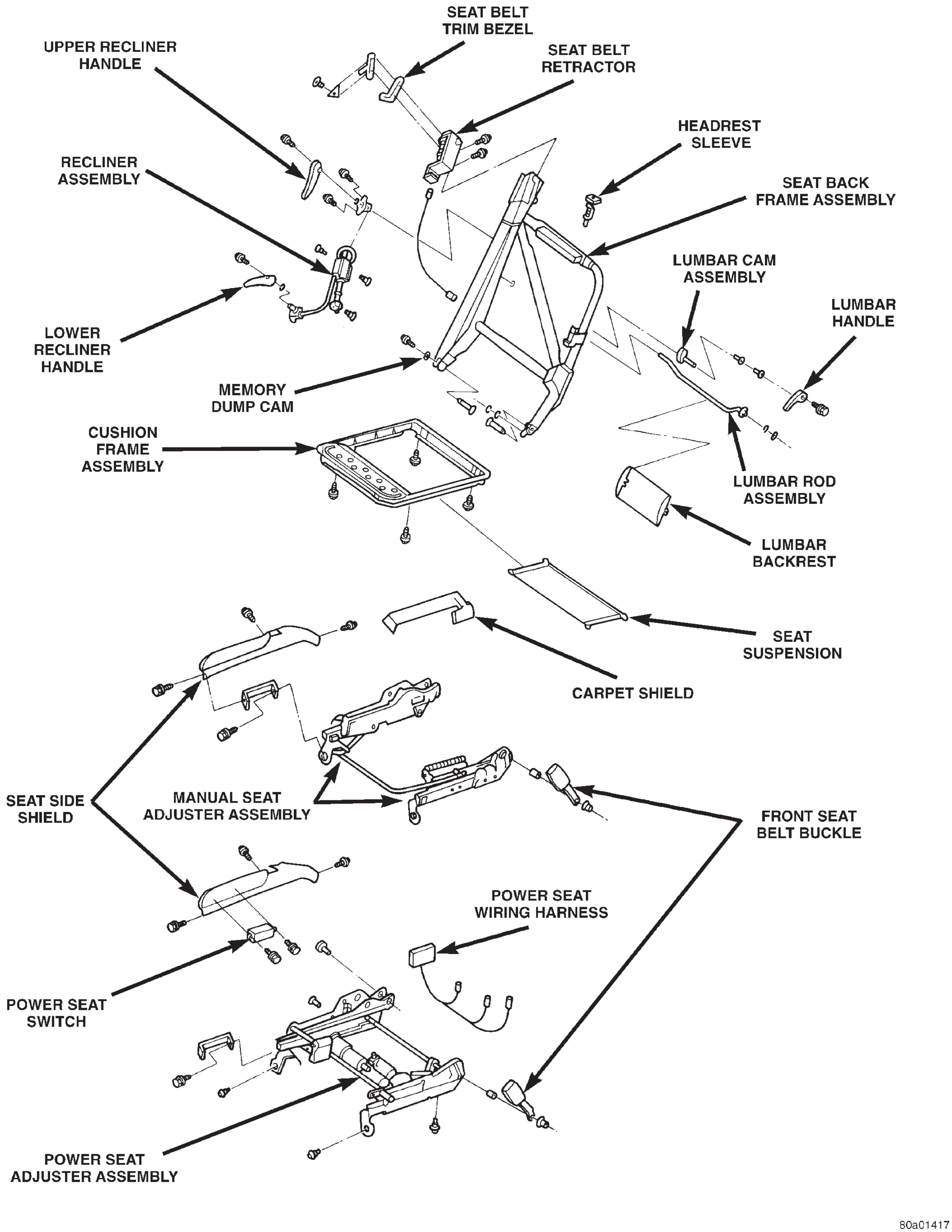


Fig. 1 Front Seat Exploded Diagram

REMOVAL AND INSTALLATION (Continued)

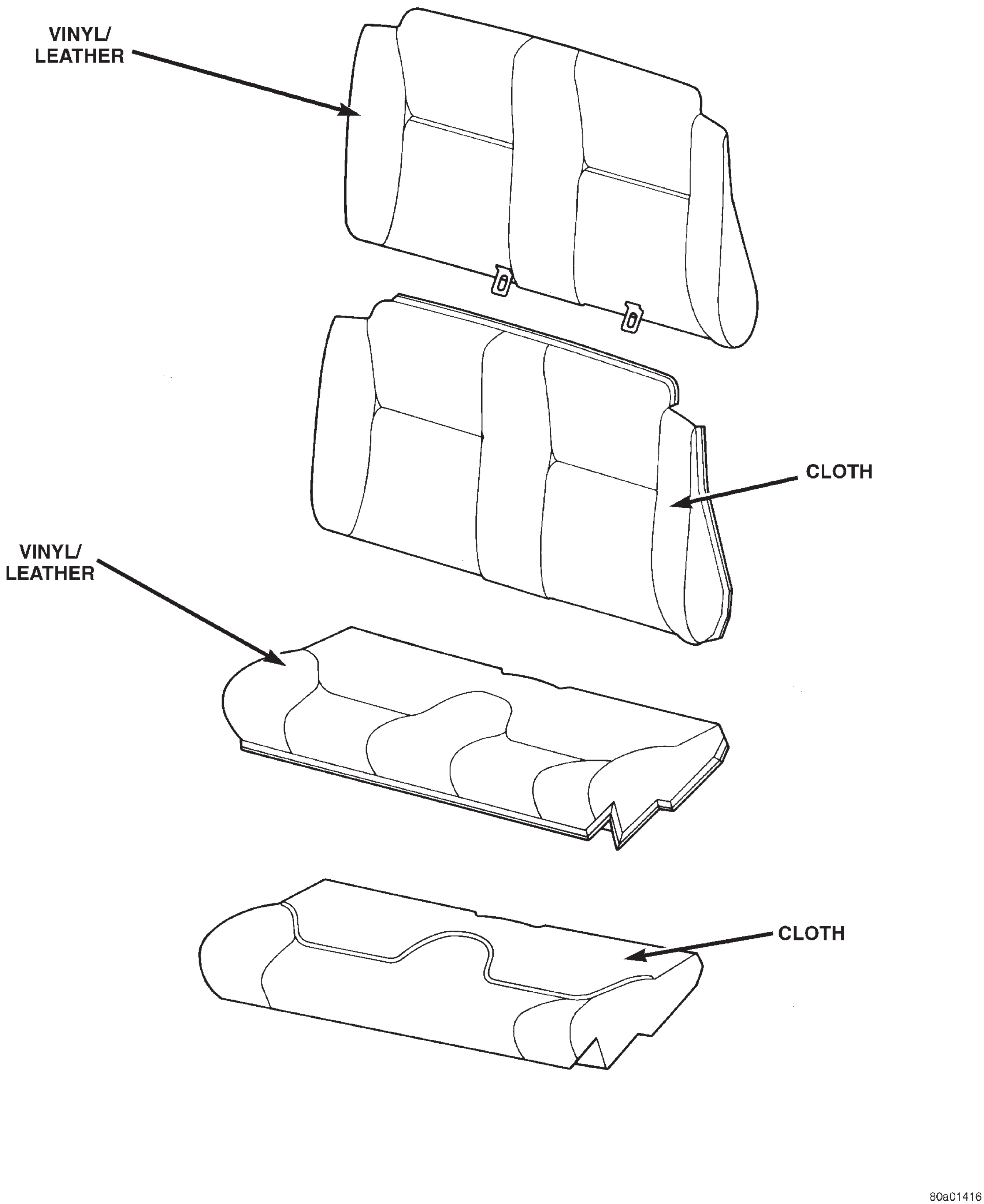


Fig. 2 Rear Seat Covers

REMOVAL AND INSTALLATION (Continued)

FRONT SEAT SIDE SHIELD

REMOVAL

(1) Remove lower recliner handle.

(2) Remove screws holding seat side shield to seat frame.

(3) Remove screws holding power seat switch to side shield, if so equipped.

(4) Separate side shield from vehicle (Fig. 3).

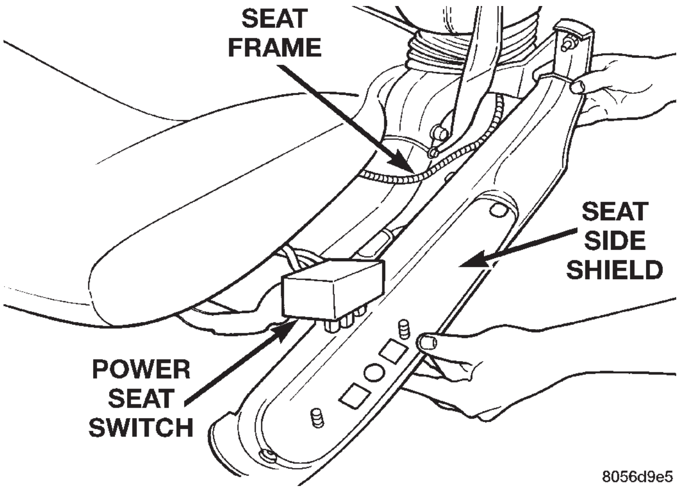


Fig. 3 Front Seat Side Shield

INSTALLATION

(1) Position side shield near seat.

(2) Install screws holding power seat switch to side shield, if so equipped.

(3) Install screws holding side shield to seat frame.

(4) Install lower recliner handle.

FRONT SEAT CUSHION ASSEMBLY

REMOVAL

(1) Remove seat from vehicle. Refer to procedures found in this section.

(2) Invert seat on a suitable work surface.

(3) Remove fasteners holding seat cushion assembly to seat adjusters (Fig. 4).

(4) Separate seat cushion assembly from seat adjusters.

INSTALLATION

(1) Position seat cushion assembly on seat adjusters.

(2) Install fasteners holding seat cushion assembly to seat adjusters.

(3) Install seat in vehicle. Refer to procedures found in this section.

FRONT SEAT CUSHION COVER

REMOVAL

(1) Remove seat cushion assembly.

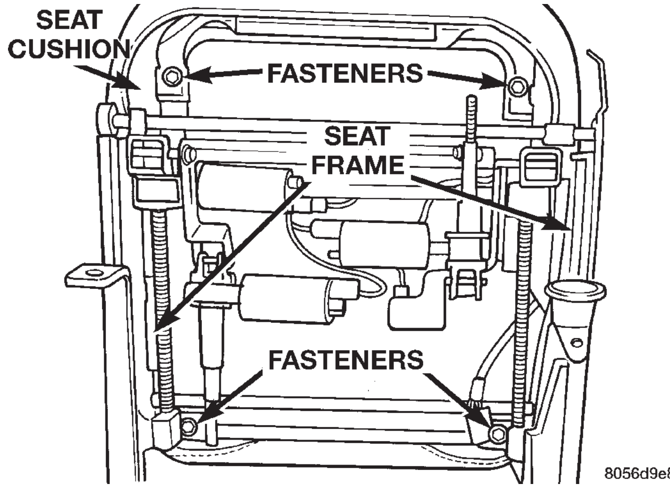


Fig. 4 Front Seat Cushion

(2) Disengage seat cushion cover retainer channels from seat cushion frame.

(3) Peel seat cushion cover back from seat cushion foam to access hog rings holding seat cushion cover to seat cushion foam.

(4) Remove hog rings holding seat cushion cover to seat cushion foam.

(5) Separate seat cushion cover from seat cushion foam.

INSTALLATION

(1) Position seat cushion foam to seat cushion frame.

(2) Wrap fabric flap on bottom of cushion foam behind and under rear rail of cushion frame. Pull fabric tight.

(3) Install hog rings to hold fabric flap to seat cushion frame.

(4) Position seat cushion cover to seat cushion foam.

(5) Align horizontal seat cushion cover seam center notch with center hog ring location in seat cushion foam.

(6) Install hog rings to hold horizontal seam wire to wire in seat cushion foam at each hog ring location provided. Begin at center hog ring location and work outward.

(7) Install hog rings to hold vertical seam wires to wires in seat cushion foam at each hog ring location provided, if seat has vertical seams.

(8) Pull cushion cover down over seat cushion foam and frame.

(9) Engage seat cushion cover retainer channels to seat frame.

(10) Install seat cushion assembly.

REMOVAL AND INSTALLATION (Continued)

FRONT SEAT BACK

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate procedure found in this section.

(2) Remove seat side shield.

(3) Remove wire connector for seat belt retractor by separating wire connector from push-in fastener located on bracket under seat cushion.

(4) Mark location of wiring tie strap holding retractor wiring harness to recliner cable.

(5) Remove wiring tie strap.

NOTE: The torque prevailing nuts used to secure the lower seat belt anchor and seat belt buckle are not re-usable. Verify availability prior to proceeding.

(6) Remove nut holding lower seat belt anchor to seat frame (Fig. 5).

(7) Remove nut and washer holding seat belt buckle to seat frame.

(8) Separate seat belt buckle from seat frame.

(9) Remove recliner cable eyelet clip (Fig. 5).

(10) Remove recliner cable from arm on seat adjuster and feed cable back through hole in seat adjuster.

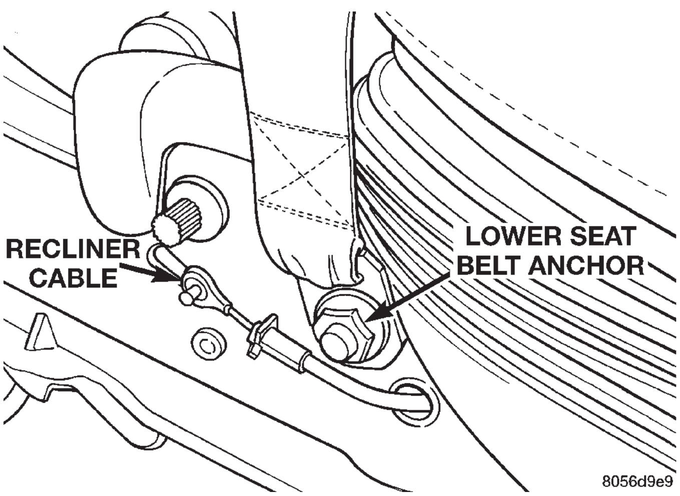


Fig. 5 Lower Seat Belt Anchor And Recliner Cable

WARNING: Do not pull on upper recliner handle or recliner cable end at any point during the following steps. The recliner lead screw is spring loaded and will eject if either the handle or cable is pulled before the lead screw is removed.

(11) Remove seat cushion assembly.

(12) Remove E-clip and washer from easy-entry rod at inboard side of seat, passenger side only.

(13) Separate rod from seat back.

(14) Remove pivot bolts holding seat back to seat frame.

(15) Remove bolt holding recliner lead screw to seat frame.

(16) Separate seat back from seat frame.

(17) Unscrew lead screw from recliner mechanism (Fig. 6).

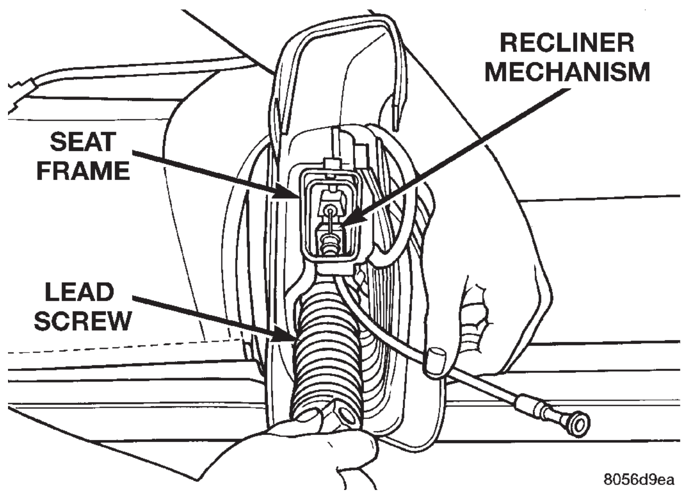


Fig. 6 Recliner Lead Screw

INSTALLATION

(1) Screw recliner lead screw into recliner mechanism. (Fig. 6).

WARNING: Do not pull on upper recliner handle or recliner cable end at any point during the following steps. The recliner lead screw is spring loaded and will eject if either the handle or cable is pulled.

(2) Position seat back to seat frame.

(3) Install bolt holding recliner lead screw to seat frame. Torque to 45.3 N·M (33.3 ft. lbs.).

(4) Install pivot bolts holding seat back to seat frame. Torque to 45.3 N·M (33.3 ft. lbs.).

(5) Attach easy-entry rod to seat back, passenger side only.

(6) Install easy-entry washer and E-clip, passenger side only.

(7) Install seat cushion.

(8) Feed recliner cable through hole in seat adjuster and engage cable eyelet to arm on seat adjuster.

(9) Install new recliner cable eyelet clip to arm on seat frame (Fig. 5).

(10) Position seat belt buckle washer to bolt on side of seat adjuster.

(11) Position seat belt buckle to bolt on side of seat adjuster and install nut.

(12) Install new nut to hold seat belt buckle to seat adjuster.

(13) Position lower seat belt anchor to bolt on seat adjuster.

(14) Verify that seat belt is routed such that it will not be twisted when engaged to the seat belt buckle.

(15) Install new nut holding lower seat belt anchor to seat frame (Fig. 5).

REMOVAL AND INSTALLATION (Continued)

NOTE: The torque specification for the lower seat belt anchor and seat belt buckle nuts are 45.3 N·M (33.3 ft. lbs.).

NOTE: Verify that a minimum of three threads extend beyond the lower seat belt anchor nut and that the lower seat belt anchor swivels freely. If both conditions are not found, remove nut, retorque bolt, and while preventing bolt from turning, retorque nut.

(16) Install wire connector for seat belt retractor to bracket located under seat cushion.

(17) Install wiring tie strap holding retractor wiring harness to recliner cable. Ensure that the wiring tie strap is placed at the original location by using the previously made marks.

(18) Install seat side shield. Verify that side and rear screws go through the rubber bellows.

(19) Install seat to vehicle. Refer to procedures found in this section.

FRONT SEAT BACK COVER

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate procedure found in this section.

(2) Remove seat side shield.

NOTE: The torque prevailing nut used to secure the lower seat belt anchor is not re-usable. Verify availability prior to proceeding.

(3) Remove nut holding lower seat belt anchor to seat frame (Fig. 5).

(4) Remove upper recliner handle and lumber adjustment handle, if so equipped.

(5) Remove headrest (Fig. 7).

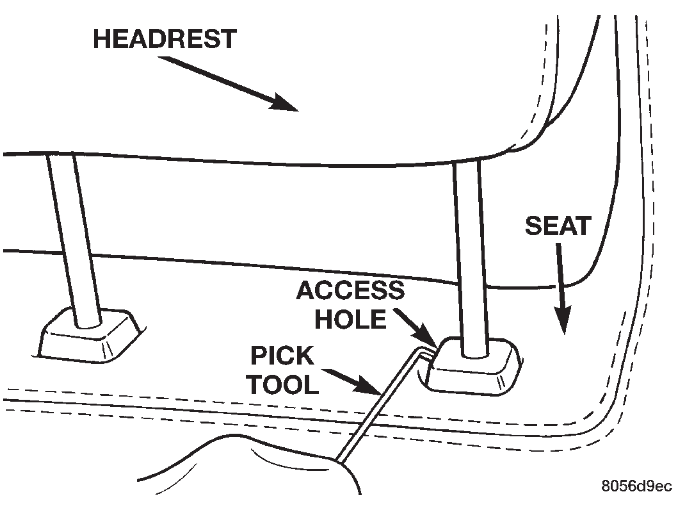


Fig. 7 Headrest Removal

(6) Separate plastic retainer strip at bottom of seat back (Fig. 8).

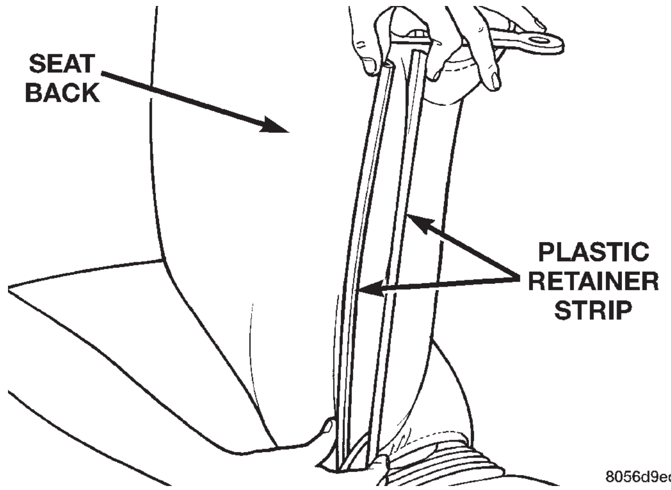


Fig. 8 Seat Cover Retainer Strip

(7) Remove hog rings holding seat cover seam cords to wires in seat back foam (Fig. 9).

(8) Pull seat cover upward to mid point position.

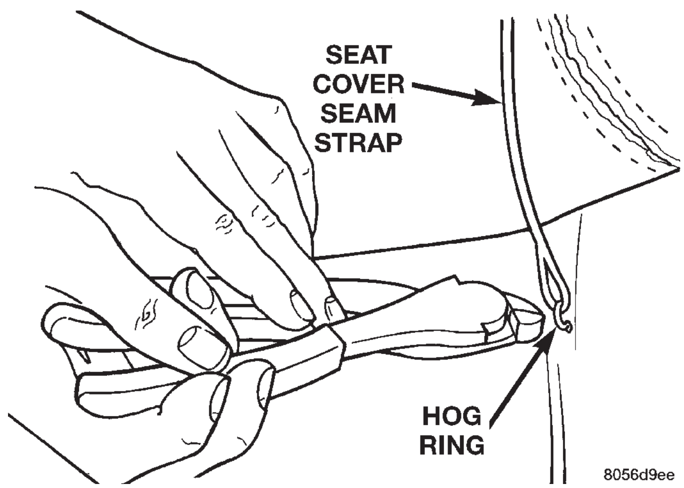


Fig. 9 Hog Rings

(9) Remove hog rings holding the top of the seat cover seam cords to wires in seat back foam.

(10) Remove hog rings holding seat back cover seam wire to wire in seat back foam.

(11) If vehicle is equipped with cloth seats;

(a) Pull seat back cover upward to access upper seat back cover seam wire.

(b) Remove hog rings holding seat back cover seam wire to wire in seat back foam.

(12) Remove bezel around seat belt webbing at seat belt retractor flag.

(13) Disengage clips holding seat cover to seat belt retractor cover.

REMOVAL AND INSTALLATION (Continued)

(14) Remove headrest guides (Fig. 10).

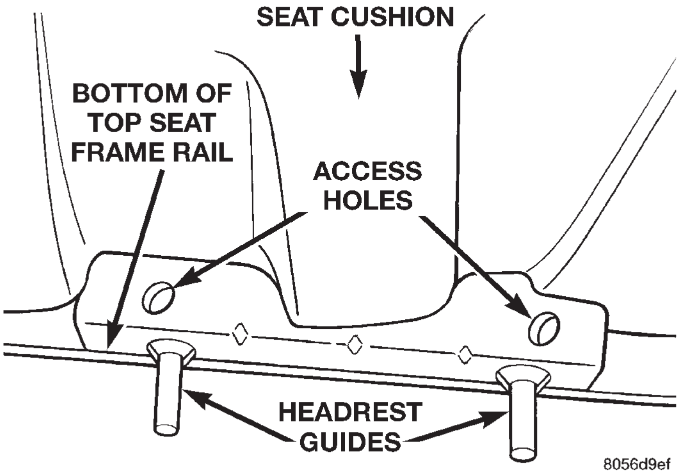


Fig. 10 Headrest Guides

(15) Feed seat belt bezel and seat belt through seat cover while pulling cover from seat back foam.

(16) Separate seat back cover from seat back foam and frame.

INSTALLATION

(1) Position seat back foam to seat back frame.

(2) Install hog rings to hold seat back foam to seat back frame.

(3) Position seat cover on seat back foam and seat frame.

(4) Feed seat belt bezel and seat belt through hole in seat cover.

(5) Pull seat cover downward to first horizontal trench in seat back foam.

(6) Align seat cover horizontal seam center notch to center hog ring location.

(7) Install hog rings, center first, to hold seat back cover seam wire to wire in seat back foam.

(8) If vehicle is equipped with cloth seats;

(a) Pull seat back cover downward to second horizontal trench in seat back foam.

(b) Align seat cover horizontal seam center notch to center hog ring location.

(c) Install hog rings, center first, to hold seat back cover seam wire to wire in seat back foam.

(9) Install hog rings at hog ring location in vertical foam trenches to attach the cover seam cords to the wires in the foam. If vehicle is equipped with cloth seats, attach the lower ends of horse shoe shaped wire with the same hog rings.

(10) Engage clips holding seat cover to seat belt retractor cover.

(11) Install headrest guides.

(12) Install headrest.

(13) Install hog rings to hold seat cover seam cords to wires in seat back foam.

(14) Pull seat cover down fully over seat back foam.

(15) Install hog rings above bead in seat cover seam cord to hold cords to hog ring location at bottom of vertical foam trench.

(16) Connect seat cover retainer strips at bottom of seat back.

(17) Slide long snaps on outboard portion of seat belt bezel inside seat back cover and seat belt retractor cover.

(18) Using a suitable hook style tool inserted through opening in seat belt bezel, support the inside of the seat belt retractor cover while snapping the inboard portion of the bezel into the cover.

(19) Install upper recliner handle and lumbar adjustment handle, if so equipped.

(20) Attach lower seat belt anchor to bolt on seat adjuster.

(21) Verify that seat belt is routed such that it will not be twisted when engaged to the seat belt buckle.

(22) Install new nut holding lower seat belt anchor to seat frame (Fig. 5).

NOTE: The torque specification for the lower seat belt anchor nut is 45.3 N·M (33.3 ft. lbs.).

(23) Verify that a minimum of three threads extend beyond the lower seat belt anchor nut and that the lower seat belt anchor swivels freely. If both conditions are not found, check that the bolt is fully engaged to the seat adjuster.

(24) Install seat to vehicle. Refer to appropriate procedure in this section.

SEAT RECLINER

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate procedure found in this section.

(2) Remove seat back from lower seat frame.

(3) Unscrew recliner lead screw.

(4) Remove seat back cover until the screws holding the upper recliner handle mechanism to the seat back frame can be accessed.

(5) Remove rubber bellows covering lower part of seat back frame.

(6) Remove screws holding upper recliner handle mechanism to seat frame.

(7) Push upper recliner mechanism into seat frame with handle shaft facing the front of the seat frame.

NOTE: Do not re–use bolts holding recliner housing to seat frame. Verify availability prior to proceeding.

(8) Remove bolts holding recliner housing to seat frame.

REMOVAL AND INSTALLATION (Continued)

(9) Pull recliner housing and upper recliner handle mechanism downward and out through bottom of seat frame.

INSTALLATION

(1) Feed upper recliner mechanism and then recliner housing into the seat back frame with handle shaft facing the front of the seat frame.

(2) Install new bolts to hold seat recliner housing to seat frame. Tighten to 34 N·M (300 in. lbs.).

(3) Pull upper recliner handle mechanism through hole in seat frame.

(4) Install screws holding upper recliner handle mechanism to seat frame.

(5) Install rubber bellows covering lower part of seat back frame.

(6) Install seat back cover.

(7) Install recliner spring bracket, spring, and lead screw.

(8) Install seat back to lower seat frame.

(9) Install seat into vehicle. Refer to procedures found in this section.

POWER SEAT ADJUSTER

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate procedure in this section.

(2) Remove front seat back.

(3) Separate power seat switch and harness from seat adjuster.

INSTALLATION

(1) Install power seat switch and harness to seat adjuster.

(2) Install front seat back.

(3) Install seat in vehicle. Refer to appropriate procedure in this section.

MANUAL SEAT ADJUSTERS

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate procedure in this section.

(2) Remove front seat back.

(3) Remove towel bar spring.

(4) Remove push-nuts holding towel bar to seat adjusters.

(5) Separate towel bar from seat adjuster.

(6) Remove seat adjusters.

INSTALLATION

(1) Position seat adjusters for reassembly.

(2) Install towel bar to seat adjusters.

(3) Install new push nuts to hold towel bar to seat adjusters.

(4) Install towel bar spring.

(5) Install front seat back.

(6) Install seat in vehicle. Refer to appropriate procedure in this section.

REAR SEAT CUSHION COVER

REMOVAL

(1) Remove rear seat cushion from vehicle. Refer to procedures found in this section.

(2) Place seat cushion on a suitable work surface in inverted position.

(3) Remove hog rings around perimeter of seat cushion holding seat cushion cover to seat cushion frame.

(4) Pull seat cover from seat cushion frame and seat cushion foam.

(5) Remove hog rings holding seat cover seam wires to seat foam wires.

(6) Separate seat cover from seat frame and seat cushion foam.

INSTALLATION

(1) Position seat cushion cover to seat cushion frame and seat cushion foam.

(2) If vehicle is equipped with cloth seats;

(a) Align notch in center of seat cushion cover seam to center hog ring locator.

(b) Install a hog ring at each hog ring location to hold seat cushion cover seam wires to wires in seat cushion foam. Begin at center location and work outward.

(3) If vehicle is equipped with leather/vinyl seats;

(a) Align notch in center of inboard vertical cover seam with center hog ring locator.

(b) Install a hog ring at each hog ring location, beginning at center location, to hold seat cushion cover seam wire to wire in seat cushion foam.

(c) Repeat above steps for opposite inboard vertical seam, both outboard vertical seams, and for the horizontal seams.

(4) Pull seat cover over seat cushion frame and seat cushion foam.

(5) Install hog rings at hog ring locators around perimeter of seat cushion foam holding seat cushion cover to seat cushion frame.

(6) Install rear seat cushion to vehicle. Refer to procedures found in this section.

REAR SEAT BACK COVER

REMOVAL

(1) Remove rear seat back from vehicle. Refer to procedures found in this section.

(2) Place seat back on a suitable work surface in inverted position.

(3) Remove hog rings around perimeter of seat back holding seat back cover to seat back frame.

REMOVAL AND INSTALLATION (Continued)

(4) Pull seat cover from seat back frame and seat back foam.

(5) Remove any hog rings holding seat cover seam wires to seat foam wires.

(6) Separate seat cover from seat frame and seat back foam.

INSTALLATION

(1) Position seat cover to seat back frame and seat back foam.

(2) Align notch in center of seat back cover vertical seam to center hog ring locator.

(3) Install a hog ring at each hog ring location, center first, to hold seat back cover seam to wires in seat back foam.

(4) Repeat the above steps for the opposite inboard vertical seam, both outboard vertical seams, and the lower horizontal seam.

(5) If vehicle is equipped with cloth seats;

(a) Install hog rings at each hog ring locator, center first, to attach ends of vertical portions of U-shaped wires to vertical foam wires.

(b) Align notch in center of upper horizontal seat cover seam to center hog ring location.

(c) Install a hog ring at each hog ring locator to hold upper horizontal seam wire to wire in seat back foam.

(6) Install hog rings holding seat cover seam wires to seat frame.

(7) Pull seat cover over seat back frame and seat back foam.

(8) Install hog rings at hog ring locators around perimeter of seat back cushion holding seat cover to seat back frame.

(9) Install rear seat back to vehicle. Refer to procedures found in this section.

CONVERTIBLE TOP

INDEX

DIAGNOSIS AND TESTING

HYDRAULIC SYSTEMS

The power convertible top hydraulic system consists of;
- Two hydraulic cylinders
- Hydraulic lines
- Electric hydraulic pump and reservoir
- Dual relays

HYDRAULIC SYSTEM TESTS

NOTE: The convertible top will raise slowly or make abnormal noise if the hydraulic fluid level is low.

(1) Remove rear seat cushion and back.
(2) With the top up and latched, remove the reservoir fill plug.
(3) Visually inspect fluid level. If low, inspect for leak in hydraulic system.
(4) Fill reservoir with Dextron II automatic transmission fluid to the bottom of the fill hole.
(5) Repair or replace components, as necessary.
(6) Replace fill plug and lower top.
(7) Raise top and verify fluid level.

REMOVAL AND INSTALLATION

FOLDING TOP COVER

REMOVAL

(1) Release folding top latches and allow top cover to relax.
(2) Remove tack strip trim panel.
(3) Remove headlining.
(4) Remove all convertible top storage area sections.
(5) Remove nuts holding tack strip to deck panel.
(6) Separate tack strip from deck panel.

CAUTION: Cover all painted and upholstered surfaces to avoid damage while performing the following operations.

(7) Reposition tack strip above rear deck and quarter panels.
(8) Using a grease pencil, mark location of outer top cover on rear tack strip to aid installation.
(9) Remove staples holding top cover to rear tack strip.
(10) Fold rear of top cover, tack strips and rear window up and over the third (rear) roof bow.
(11) Remove screws holding roof rail tension cable springs to rear rail behind quarter glass opening.
(12) Pull side rail rear weatherstrips from weatherstrip retainer channels.
(13) Remove screws holding rear weatherstrip retainer channels to convertible top mechanism.
(14) Separate rear weatherstrip retainer channels from vehicle.
(15) Separate top cover listing from adhesive on roof rail.
(16) Raise folding top to the mid point.
(17) Remove screws holding convertible top header feature strip to header panel.
(18) Mark location of top cover on top header.
(19) Remove staples holding top cover to header.
(20) Remove screws in end of roof bow.
(21) Slide convertible top plastic retainer strips from channels in roof bows.
(22) Close folding top, do not latch.
(23) Slide tension cable out of cable pocket.
(24) Disengage roof rail tension cables from header.
(25) Separate top cover from vehicle.

INSTALLATION

(1) Position convertible top cover on vehicle.
(2) Slide tension cable through cable pocket.

REMOVAL AND INSTALLATION (Continued)

(3) Install rubber plugs holding roof rail tension cable ends into key-hole slots in roof rails.
(4) Install roof bows to convertible top mechanism.
(5) Snap convertible top plastic retainer strips into channels in roof bows, starting at rear bow and working forward.
(6) Install screws at ends of roof bows.
(7) Raise convertible top to mid point.
(8) Align top cover to mark made previously on header.
(9) Install staples to hold top cover to header.
(10) Install screws holding convertible top header feature strip to header panel.
(11) Install screws holding roof rail tension cable springs to roof rear roof rail behind quarter glass opening.
(12) Align mark made on rear of top cover and rear window to tack strip.
(13) Install staples holding rear of top cover and rear window to tack strip.
(14) Position tack strip to rear deck panel.
(15) Install nuts holding tack strip to rear deck panel.
(16) Install headlining.
(17) Install all convertible top storage area sections.
(18) Install tack strip trim panel.
(19) Lower quarter glass.
(20) Lower and secure convertible top.
(21) Apply suitable adhesive to side rail rear section to attach top cover listing.
(22) Pull top cover listing taunt and secure to adhesive on rear side rail.
(23) Install side rail rear weatherstrip retainer channels.
(24) Install side rail rear weatherstrips.
(25) Verify fit and operation. Adjust as necessary.

BACKLITE

REMOVAL

(1) Release folding top latches and allow top cover to relax.
(2) Lift shower curtain and remove push in nuts holding curtain to the studs.

CAUTION: Take precautions not to tear curtain on the boot shelf during removal.

(3) Disengage the headliner at the rear sail panels.
(4) Disengage wire connectors from terminals on heated rear window.
(5) Pull wire harness from sleeves at each side of the rear window.
(6) Remove nuts holding beltline tack strips to vehicle.

NOTE: Support top 12” above windshield header.

(7) Remove the 5 piece beltline tack strips and save plastic centering bushings for reinstallation.

NOTE: Be sure to note the locations of the plastic centering bushings for installation.

(8) Disengage elastic strap from the third roof bow, if equipped.
(9) Remove antenna mast.
(10) Place protective padding over the entire rear deck area to protect paint. Move tack strips to top of deck opening onto protective padding.
(11) Mark the outer sail panels along the top edges and down the seams between the outer and second tack strips from the outside of top (Fig. 1).

NOTE: Reference marks will be used to reinstall the new backlite assembly.

(12) Remove sail panel springs on both sides at the front corners of the cover assembly (Fig. 2).
(13) Remove all staples from the cover assembly.

CAUTION: Be careful not to tear or damage the cover assembly.

(14) Fold the cover assembly up over the top.
(15) Remove tape and foam at the end of the third roof bow, save if reusable.
(16) Remove the rearmost stop screw on the number three bow, either driver’s or passenger’s side (Fig. 3).
(17) Slide the old backlite assembly off the number three bow .

INSTALLATION

NOTE: To support the new backlite assembly for stapling purposes, remove the new backlite from packaging and place shipping box across the top opening, resting on the backseat and decklid.

(1) Remove the boot shelf and two sail springs from the old backlite assembly and install onto the new backlite assembly.
(2) Place backlite locking strip on third bow.
(3) Insert the locking strip into the channel of the number three roof bow. A rubber mallet may be required to set locking strip into channel (Fig. 4).

CAUTION: Do not slide or pull the locking strip onto the number three bow.

NOTE: To ensure backlite is snapped into number three bow, flip assembly onto top to inspect snap in feature.

REMOVAL AND INSTALLATION (Continued)

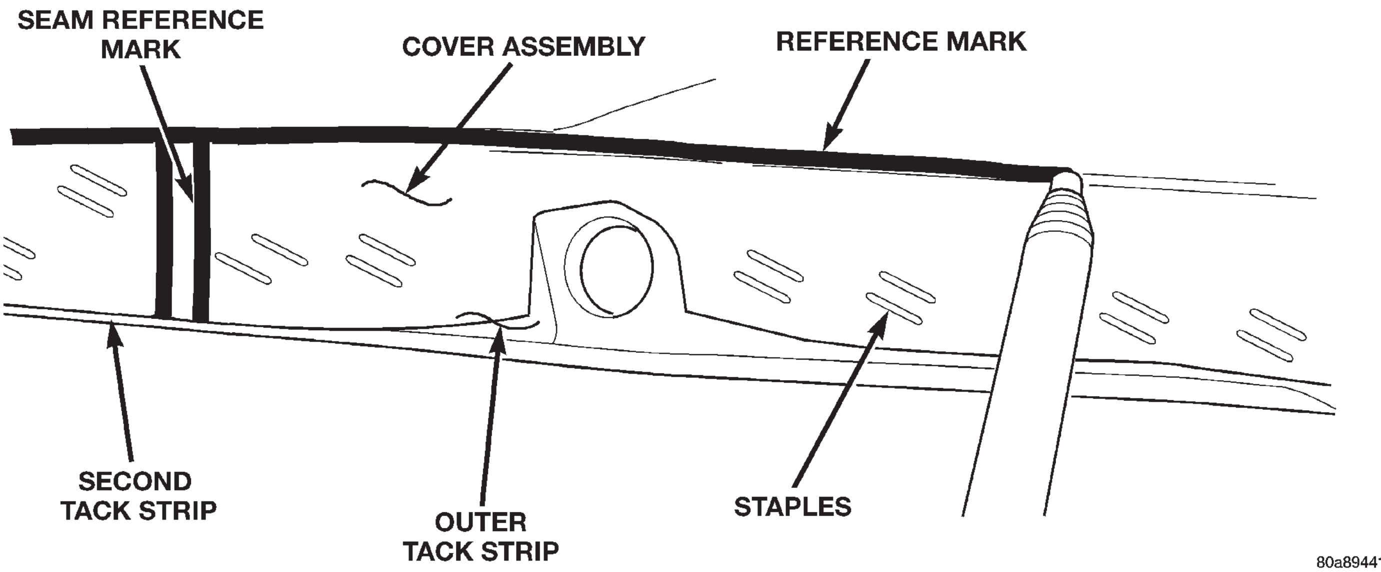


Fig. 1 Sail Panel Reference Marks

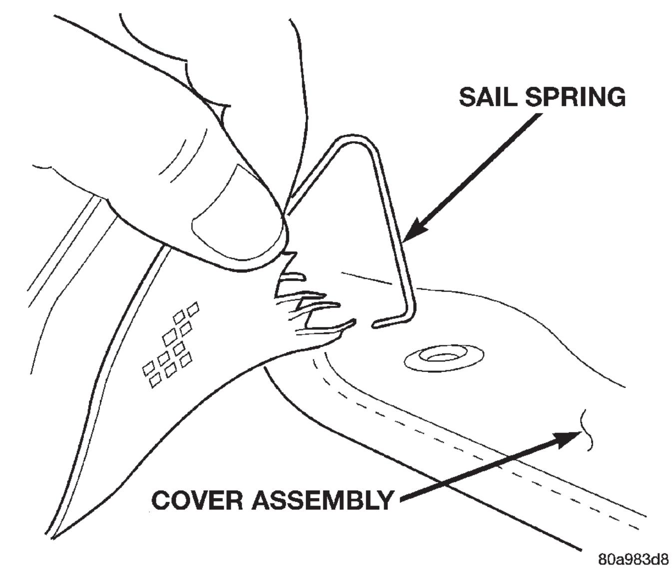


Fig. 2 Sail Springs

(4) Install existing or new foam on the end of the bow using 1" black tape to secure foam to bow.

(5) Install the rearmost stop screw on the number three bow.

(6) Starting from the right side of the vehicle, locate the front edge of the cover assembly to the tacking strip (use measurements from Removal step #11) and pull cover down until marking is one eighth of an inch below the top edge of the tacking strips.

NOTE: 1/8" measurement should be constant when restapling the cover assembly to prevent wrinkles.

(7) Continue to staple right hand cover assembly to tacking strips. Work from the outboard to center line of the vehicle.

(8) Repeat step #6 for left side of the vehicle.

(9) Install sail panel springs to front of cover assembly.

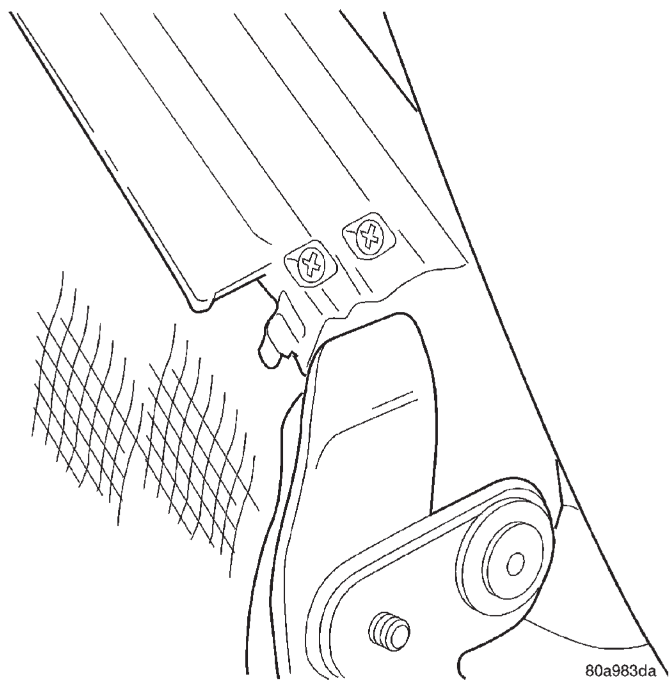


Fig. 3 Backlite Rear Stop Screw

(10) Install antenna mast.

(11) Engage backlite elastic strap to number three roof bow.

(12) Install plastic centering bushings to the beltline tack strips.

(13) Using the nuts, install the beltline tacking strips, starting with the center tack strip and working outboard.

(14) Feed heated rear window wire harness thru sleeves at each side of the backlite.

(15) Engage heated rear window wire connectors to terminals.

(16) Engage the headliner at the rear sail panel.

(17) Install shower curtain with push on nuts.

REMOVAL AND INSTALLATION (Continued)

CAUTION: Make sure top well is not trapped under the tack strips.

(18) Latch top and inspect for wrinkles.

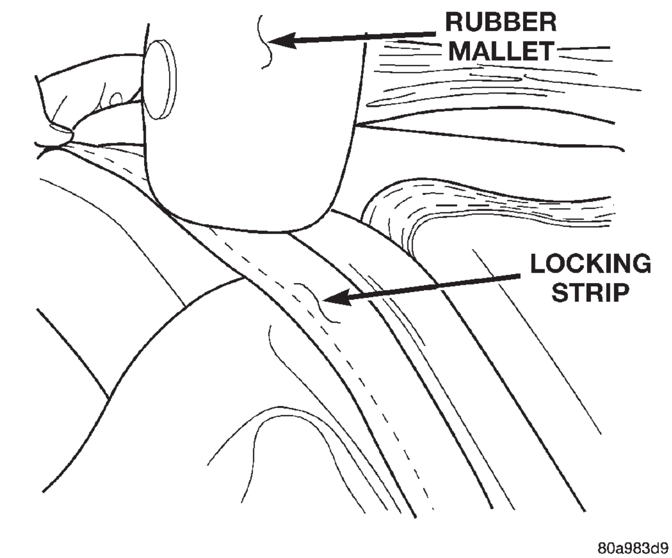


Fig. 4 Backlite Locking Strip

HYDRAULIC PUMP ASSEMBLY

REMOVAL

(1) Disconnect battery negative cable.
(2) Remove rear seat cushion and rear seat back.
(3) Disconnect pump wire connector and ground connection (Fig. 5).
(4) Disconnect hydraulic lines from pump.
(5) Remove motor pump assembly from vehicle. The rubber mounts are pressed and locked into the mounting bracket. Pull up on motor assembly to remove.

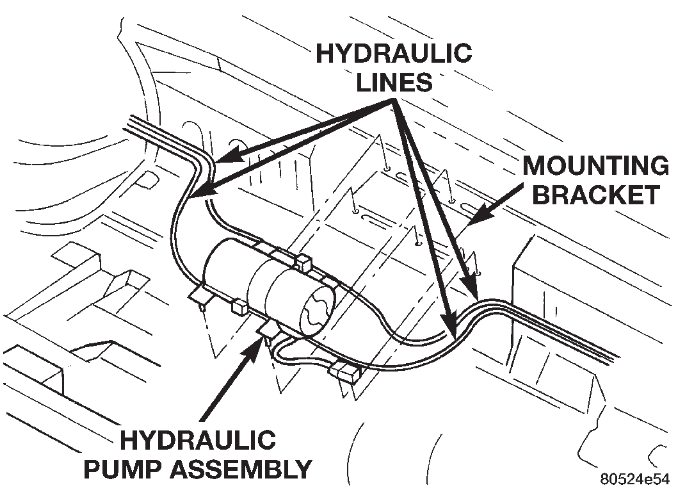


Fig. 5 Hydraulic Pump Assembly

INSTALLATION

(1) Position hydraulic motor in vehicle.
(2) Press hydraulic motor into mounts.
(3) Connect hydraulic lines to pump.
(4) Connect pump wire connector and ground connection.
(5) Connect battery negative cable.
(6) Fill and verify operation of hydraulic pump.
(7) Install rear seat cushion and rear seat back.

HYDRAULIC CYLINDER

REMOVAL

(1) Disconnect battery negative cable.
(2) Remove rear seat cushion and rear seat back.
(3) Remove quarter trim panel.
(4) Remove cylinder mounting bracket and nut (Fig. 6).
(5) Remove pivot bolt holding cylinder shaft to top linkage.
(6) Disconnect hydraulic lines from the cylinder.
(7) Remove cylinder from vehicle.

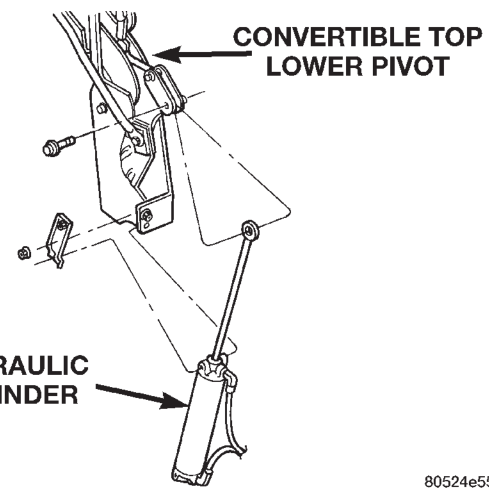


Fig. 6 Hydraulic Cylinder

INSTALLATION

Reverse the preceding operation. Fill hydraulic system and check for proper operation.

HYDRAULIC LINES

REMOVAL

(1) Remove rear seat cushion and rear seat back.
(2) Remove both quarter trim panels.
(3) Disconnect hydraulic line from hydraulic cylinders.
(4) Disconnect hydraulic line from hydraulic pump.
(5) Separate hydraulic line from vehicle.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position hydraulic line to vehicle.
(2) Connect hydraulic line to hydraulic pump.
(3) Connect hydraulic line to hydraulic cylinders.
(4) Fill hydraulic system. Check for leaks and proper operation.
(5) Install quarter trim panels
(6) Install rear seat cushion and rear seat back.

ADJUSTMENTS

CONVERTIBLE TOP ADJUSTMENTS

Refer to (Fig. 7) to determine which adjustment is required. Refer to the appropriate procedure for more information.

DOWEL PIN ADJUSTMENTS

(1) Loosen dowel pins (Fig. 8).
(2) Position dowel pins to the center of the receiver holes in the windshield header.
(3) Tighten dowel pins and verify adjustment.

NOTE: Refer to Cam Adjustment or Balance Link Adjustment paragraphs of this section to adjust forward or rearward position of the top header.

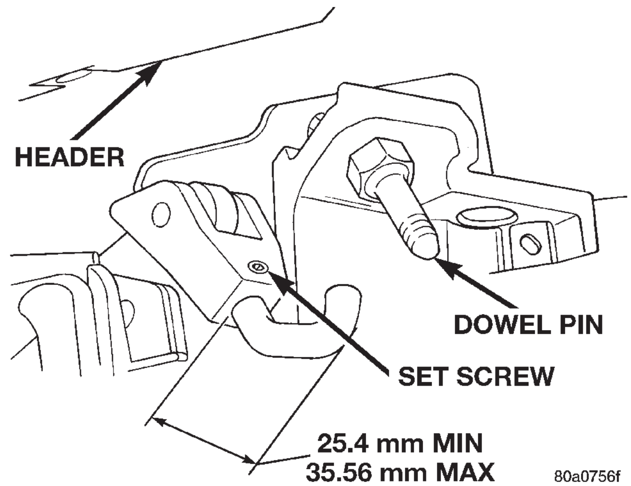


Fig. 8 Roof Latch and Guide Dowel Pin

LATCH HOOK ADJUSTMENT

If the convertible top latching effort is excessive, it can be reduced by lengthening the latch hook (Fig. 8). The top header weatherstrip requires enough compression to prevent air and water leaks. Adjust latch hook to achieve reasonable latching effort and proper sealing.

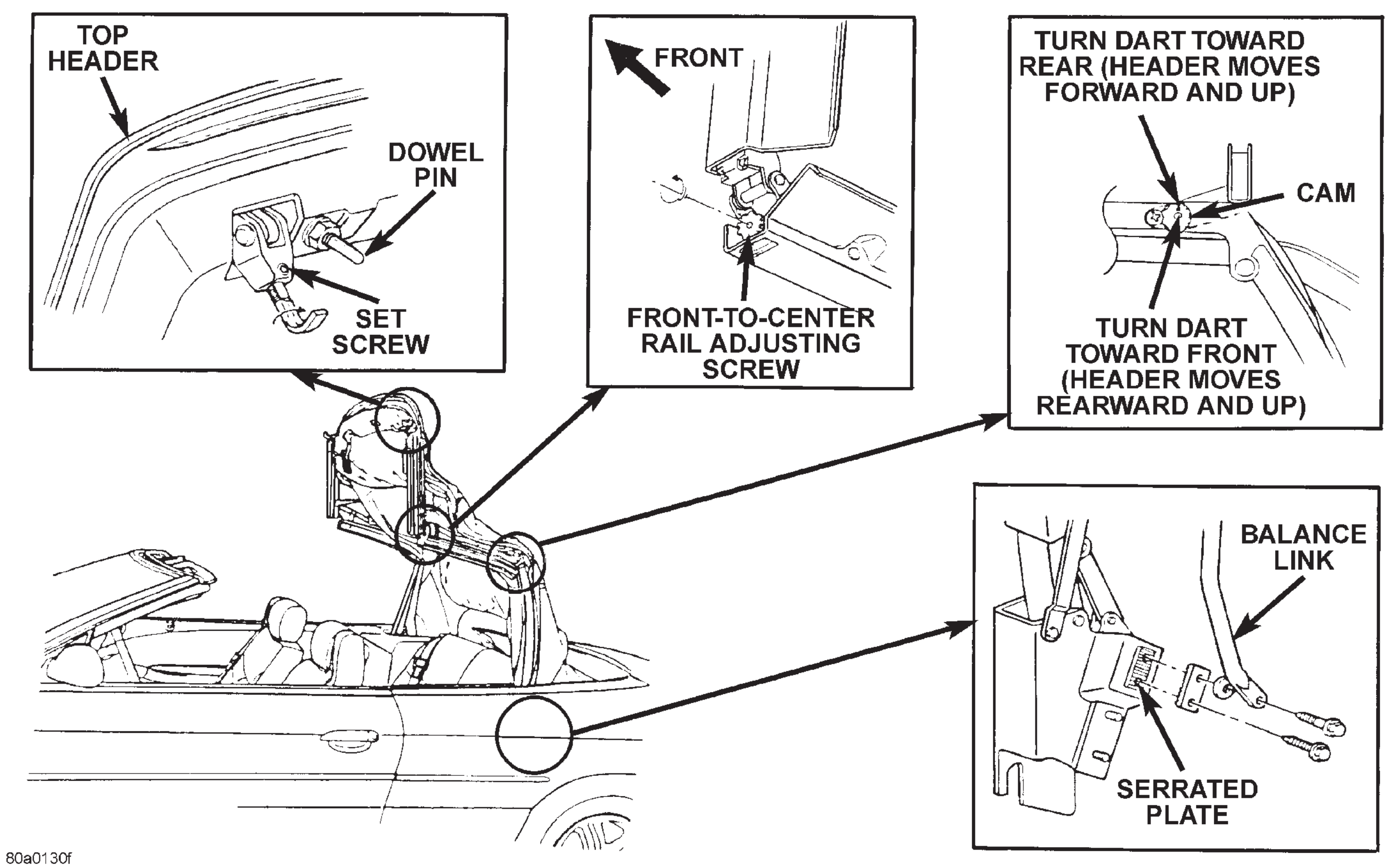


Fig. 7 Adjustment Locations

ADJUSTMENTS (Continued)

FRONT TO CENTER RAIL ADJUSTMENT

To align the roof rail weatherstrips to the door and quarter glass contact, adjust the front to center rail adjusting screw (Fig. 9). To decrease pressure on door glass turn adjuster inward. To increase pressure on door glass turn adjuster outward.

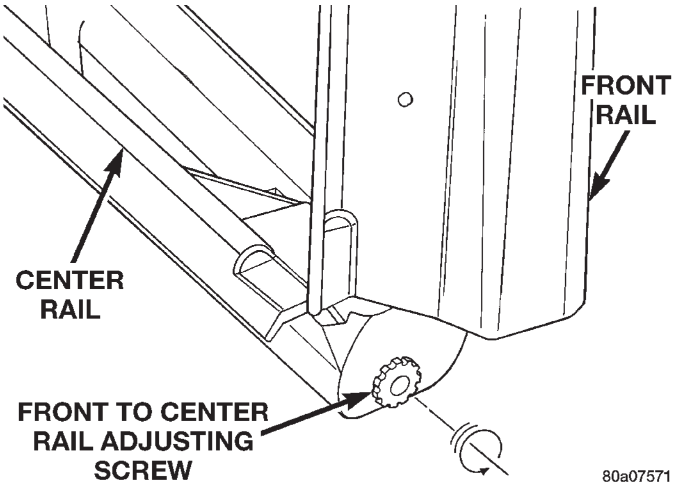


Fig. 9 Roof Rail Adjustment

TOP FRAME CAM ADJUSTMENT

The top frame cam changes forward or rearward position of the top header in relation to the windshield header. The cam turns inside the rear side rail and thrust link (Fig. 10). It may be necessary to lengthen the balance links 1 or 2 serrations after a cam adjustment. The position of the cam high side determines the angle between the center and rear side rails. When the high side is fully forward, the angle is at a minimum, and when turned rearward, the angle is increased. An increased angle increases the forward movement of the top. The cam high side is indicated by a arrow on the cam threaded end.

TO ADJUST CAM SETTING

(1) Lower top to half down position to remove all possible strain from the cam.

(2) Remove torx head screw.

(3) Using appropriate torx bit, rotate cam as necessary and secure set screw.

BALANCE LINK ADJUSTMENT

WARNING: DO NOT PLACE HANDS OVER GAPS IN MOVABLE CONVERTIBLE TOP COMPONENTS DURING SERVICING. PERSONAL INJURY CAN RESULT.

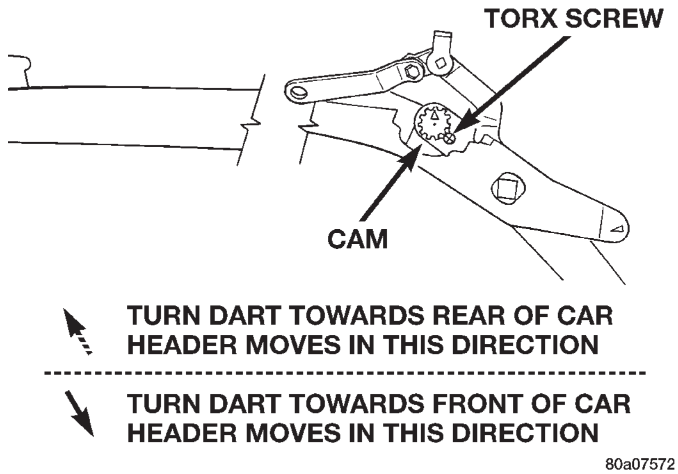


Fig. 10 Cam Assembly

(1) Remove convertible top head lining as necessary to gain access to adjusters.

(2) With the top latched in up position, loosen both bolts just enough to permit moving link up or down (Fig. 11).

(3) Push upward in the area of the front to center rail joint. Push rails up by hand as far as possible.

(4) With the balance link adjusting bolts loosened, allow the balance link to seek proper position

(5) Tighten bolts while rail is held in position.

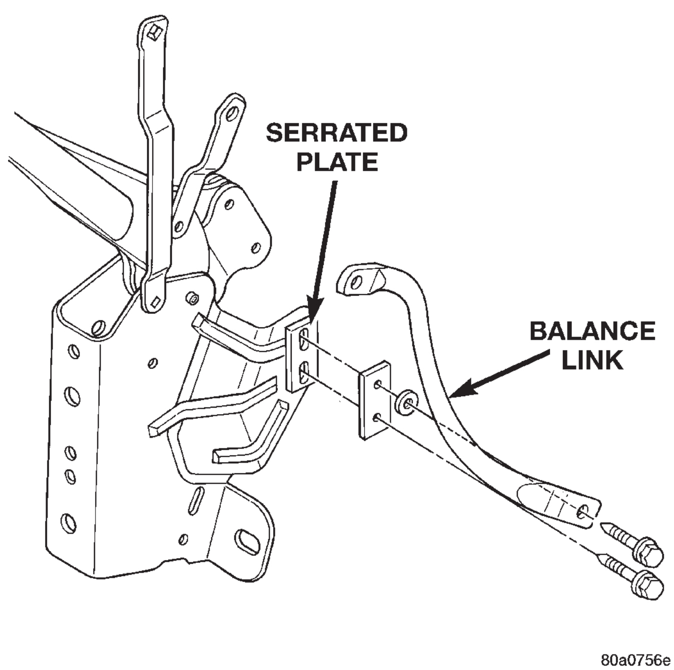


Fig. 11 Balance Link Adjustment

BODY COMPONENTS

INDEX

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water-test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations refer to Group 0, Lubrication and Maintenance, General Information section.

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

DIAGNOSIS AND TESTING (Continued)

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high crosswinds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

Wind noise can also be caused by improperly fitted exterior moldings or body ornamentation. Loose moldings can flutter, creating a buzzing or chattering noise. An open cavity or protruding edge can create a whistling or howling noise. Inspect the exterior of the vehicle to verify that these conditions do not exist.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

(1) Drive the vehicle to verify the general location of the wind noise.

(2) Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

UNIVERSAL TRANSMITTER

NOTE: The universal transmitter is disabled when the vehicle theft security system (VTSS) is activated.

Universal Transmitter will operate most:

- Garage door opener
- Gate opener
- Home/Office lighting and/or security system(s)

The transmitter is powered by the M1 circuit that supplies voltage to the driver side visor/vanity lamp.

TRAINING THE UNIVERSAL TRANSMITTER

To train the transmitter refer to the Owner's Manual.

TESTING TRANSMITTER

(1) Check for battery voltage at the Universal Transmitter by pressing a button and seeing if a red lamp comes on. If OK, go to Step 6. If not OK, go to Step 2.

(2) Check if visor/vanity lamp lights. If lamp lights, replace visor. If lamp does not light go to Step 3.

(3) Check fuse. If OK, go to Step 4. If not OK, repair as necessary.

(4) Remove visor and test M1 wire for battery voltage at the visor connector. If voltage is OK, go to Step 5. If no voltage repair wire as necessary. Refer to Group 8W, Wiring Diagrams for proper terminals.

(5) Test Z1 wire for ground at the visor connector. If ground is OK, replace visor. If no ground repair wire as necessary.

(6) Check the instructions in the Owner's Manual and retrain the transmitter. If the transmitter can not be trained replace visor.

REMOVAL AND INSTALLATION

GRILLE

REMOVAL

(1) Release hood latch and open hood.

(2) Remove screws attaching grille to headlamp adapter assembly (Fig. 1).

(3) Pull forward on grille slightly and remove clips holding grille to fascia.

(4) Separate grille from vehicle.

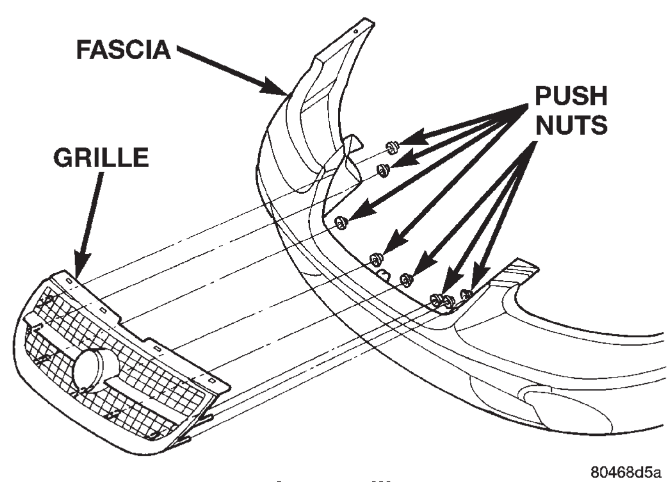


Fig. 1 Grille

INSTALLATION

(1) Position grille on vehicle.

(2) Install clips holding grille to fascia.

(3) Install screws holding grille to headlamp adapter assembly.

REMOVAL AND INSTALLATION (Continued)

HOOD LATCH

REMOVAL

(1) Release hood latch and open hood.
(2) Support hood on prop rod.
(3) Remove nuts holding hood latch to upper radiator support crossmember (Fig. 2).
(4) Separate hood latch from vehicle.
(5) Disengage remote release cable from hood latch (Fig. 3).

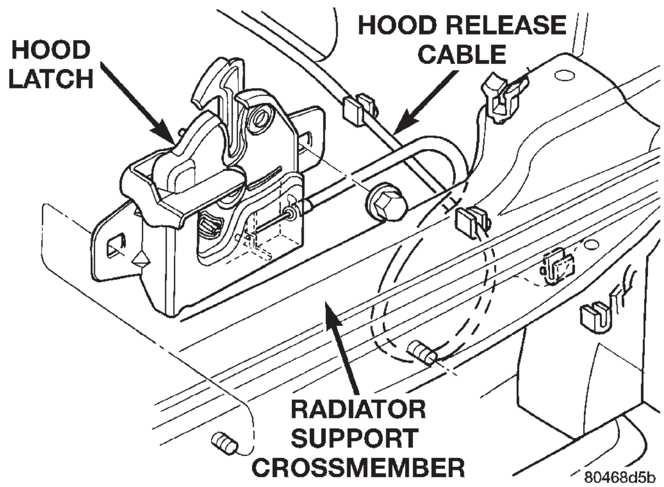


Fig. 2 Hood Latch

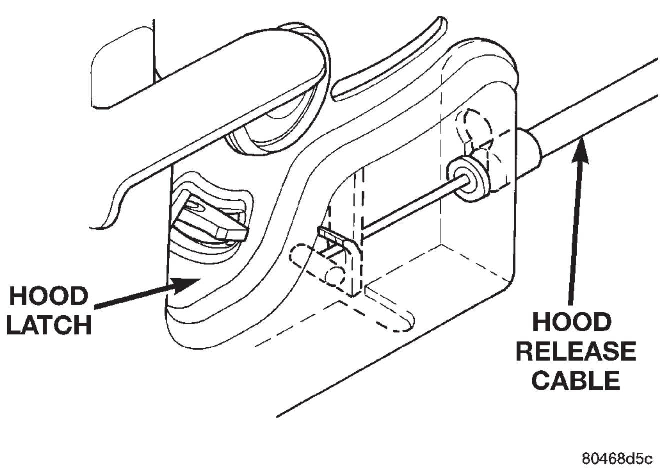


Fig. 3 Hood Latch Release Cable

INSTALLATION

(1) Engage remote release cable into hood latch (Fig. 3).
(2) Position hood latch on vehicle.
(3) Install nuts holding hood latch onto upper radiator support crossmember.
(4) Verify operation. Adjust as necessary.

HOOD LATCH RELEASE CABLE

REMOVAL

(1) Remove hood latch.
(2) Remove left front cowl trim panel.
(3) Remove screws holding hood release handle to inner cowl panel (Fig. 4).
(4) Release clips holding hood release cable to left inner frame rail (Fig. 5).
(5) Disengage rubber grommet at lower dash panel.
(6) Disengage push–in fastener holding hood release cable to dash panel.
(7) Separate hood release cable from vehicle.

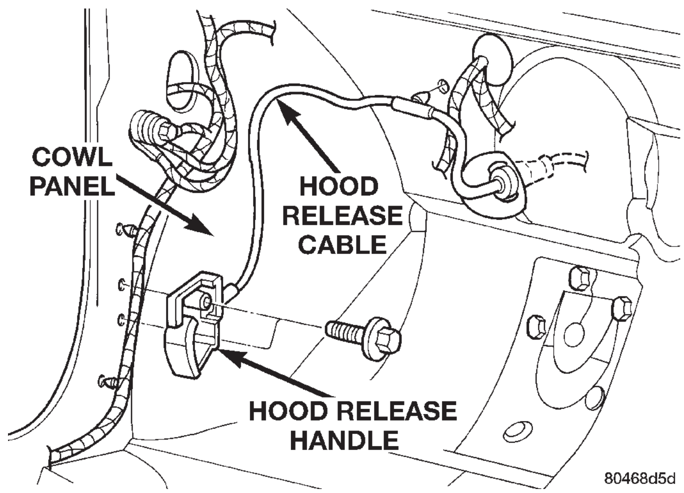


Fig. 4 Hood Release Cable Handle

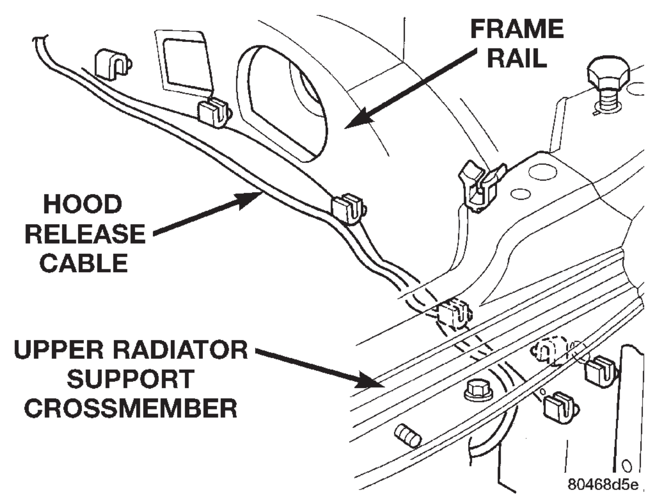


Fig. 5 Hood Release Cable Routing

INSTALLATION

(1) Route hood release cable through hole in lower dash panel and along inner frame rail.

REMOVAL AND INSTALLATION (Continued)

(2) Engage rubber grommet to lower dash panel.
(3) Engage push–in fastener holding hood release cable to lower dash panel.
(4) Install screws holding hood release cable handle to inner cowl panel.
(5) Install left front cowl trim panel.
(6) Engage hood release cable into clips along inner frame rail (Fig. 5).
(7) Install hood latch.

HOOD

REMOVAL

(1) Open hood.
(2) Disengage under hood lamp wire connector from engine compartment wire harness.
(3) Mark outline of hinges on inside of hood to aid installation.
(4) Remove the top bolts holding hood to hinge and loosen the bottom bolts until they can be removed by hand.
(5) With assistance from a helper at the opposite side of the vehicle to support the hood, remove bottom bolts holding hood to hinge.
(6) Separate the hood from the vehicle.

INSTALLATION

(1) With assistance from a helper, place hood in position on vehicle.
(2) Install bottom bolts to hold hood to hinge finger tight.
(3) Install top bolts to hold hood to hinge finger tight.
(4) Position bolts at outline marks and tighten bolts. The hood should be aligned to 4 mm (0.160 in.) gap to the front fenders and flush across the top surfaces along fenders.
(5) Engage under hood lamp wire connector to engine compartment wire harness.
(6) Verify hood latch operation and alignment. Adjust as necessary.

HOOD HINGE

REMOVAL

(1) Support hood on the side that requires hinge replacement.
(2) Mark all bolt and hinge attachment locations with a grease pencil or other suitable device to aid installation.
(3) Remove cowl cover.
(4) Remove bolts holding hood to hinge.
(5) Remove bolts holding hood hinge to front fender flange and separate hinge from vehicle.

INSTALLATION

(1) If necessary, paint new hinge before installation.
(2) Place hinge in position on vehicle.
(3) Install bolts to hold hood hinge to front fender flange.
(4) Install bolts to hold hood to hinge.
(5) Align all marks and secure bolts. The hood should be aligned to 4 mm (0.160 in.) gap to the front fenders and flush across the top surfaces along fenders. Shims can be added or removed under hood hinge to achieve proper hood height.
(6) Install cowl cover.
(7) Verify hood latch operation. Adjust as necessary.

HOOD PROP-ROD

REMOVAL

(1) Release hood latch and open hood.

CAUTION: Do place prop-rod or substitute against outer hood panel, damage to exterior finish will result.

(2) Using a length of wooden dowel rod, prop hood open.
(3) Disengage prop-rod from retainer holding prop-rod to radiator closure panel (Fig. 6).
(4) Separate prop-rod from vehicle.

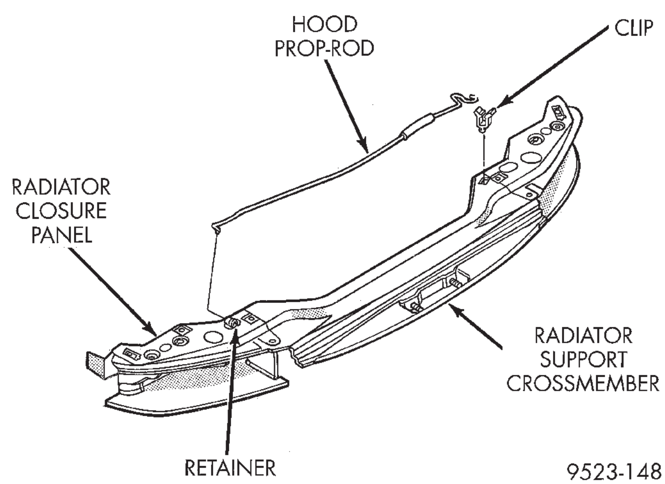


Fig. 6 Hood Prop Rod

INSTALLATION

Reverse the preceding operation.

HOOD ADJUSTER BUMPER

REMOVAL

(1) Release hood latch and open hood.
(2) Rotate hood adjuster bumper counterclockwise.

REMOVAL AND INSTALLATION (Continued)

(3) Separate hood adjuster bumper from radiator closure panel (Fig. 7).

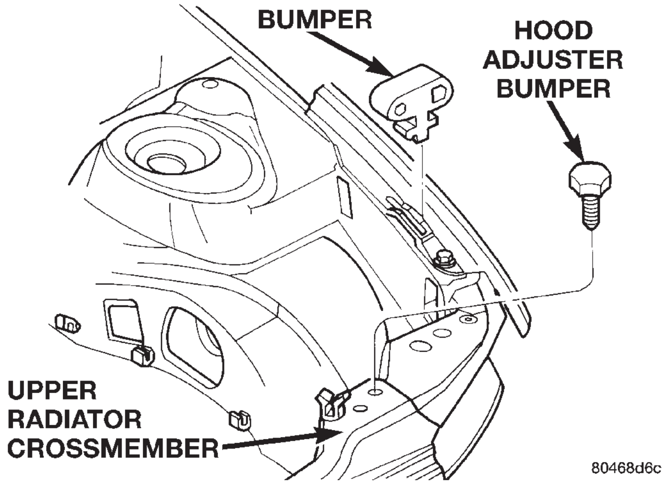


Fig. 7 Hood Adjuster Bumper

INSTALLATION

Reverse the preceding operation. Adjust hood adjuster bumper to achieve a hood height that is flush across the gaps to the fenders.

RADIATOR SUPPORT CROSSMEMBER

REMOVAL

(1) Release hood latch and open hood.

(2) Remove push-in fasteners holding fascia/grille to radiator support crossmember.

(3) Remove bolts holding support braces to bottom of radiator support crossmember.

(4) Remove bolts holding crossmember to radiator closure panel.

(5) Remove nuts holding hood latch to radiator support crossmember.

(6) Separate radiator support crossmember from vehicle.

INSTALLATION

Reverse the preceding operation.

COWL COVER

REMOVAL

(1) Release hood latch and open hood.

(2) Remove windshield wiper arms. Refer to Group 8K, Windshield Wipers and Washers.

(3) Remove screws holding cowl cover to cowl (Fig. 8).

(4) Remove clips holding cowl cover to cowl plenum under hood to cowl bulb seal.

(5) Separate cowl cover from vehicle.

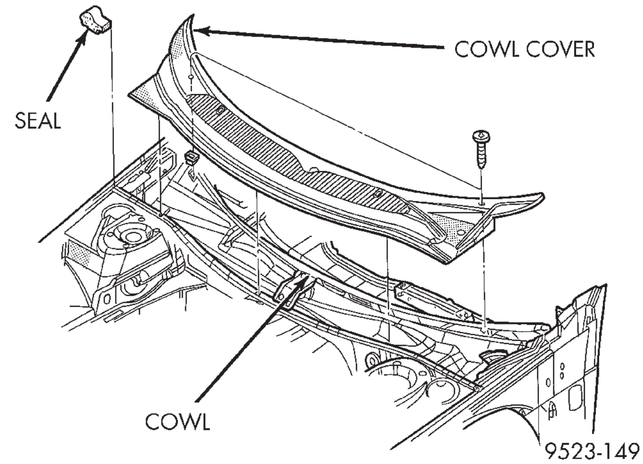


Fig. 8 Cowl Cover

INSTALLATION

(1) Position cowl cover to vehicle.

(2) Install clips holding cowl cover to cowl plenum under hood to cowl bulb seal.

(3) Install screws holding cowl cover to cowl.

(4) Install windshield wiper arms. Refer to Group 8K, Windshield Wipers and Washers.

BATTERY SPLASH SHIELD

REMOVAL

(1) Remove screws holding battery splash shield to front bumper fascia (Fig. 9).

(2) Rotate half turn retainers holding battery splash shield to wheelhouse splash shield counter-clockwise.

(3) Separate battery splash shield from wheel-house splash shield.

(4) Separate battery splash shield from vehicle.

INSTALLATION

Reverse the preceding operation.

LEFT FRONT WHEELHOUSE SPLASH SHIELD

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Remove left front wheel. Refer to Group 22, Wheels and Tires, for proper procedures.

(3) Remove battery splash shield.

(4) Remove screws holding wheelhouse splash shield to front fender lip (Fig. 9).

(5) Remove push-in fastener holding wheelhouse splash shield to fender at the rocker panel.

(6) Remove push-in fasteners holding wheelhouse splash shield to fender support.

(7) Separate wheelhouse splash shield from vehicle.

REMOVAL AND INSTALLATION (Continued)

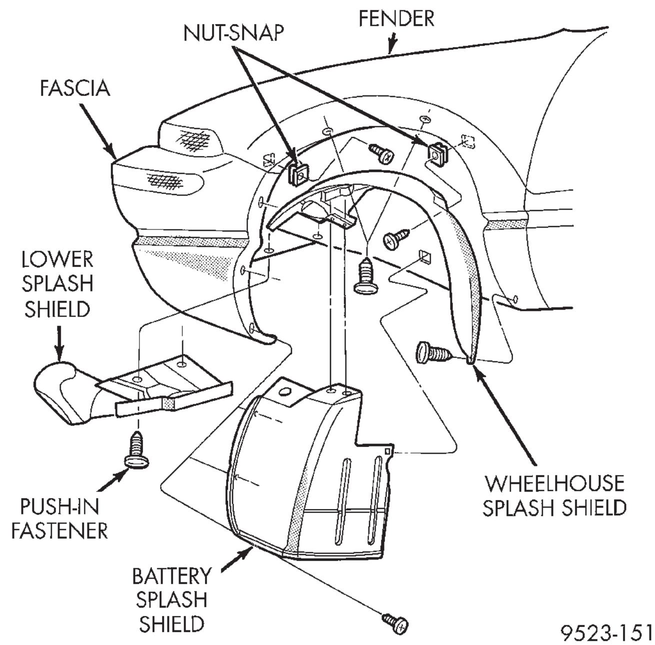


Fig. 9 Left Front Wheelhouse Splash Shield

INSTALLATION

Reverse the preceding operation.

ACCESSORY DRIVE BELT SPLASH SHIELD

REMOVAL

(1) Remove screw holding accessory drive belt splash shield to front fender (Fig. 10).

(2) Remove push-in fasteners holding accessory drive belt splash shield to frame rail.

(3) Separate accessory drive belt splash shield from vehicle.

INSTALLATION

Reverse the preceding operation.

RIGHT FRONT WHEELHOUSE SPLASH SHIELD

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Remove right front wheel.

(3) Remove screws holding wheelhouse splash shield to front fender lip (Fig. 10).

(4) Remove screws holding wheelhouse splash shield to front bumper fascia.

(5) Remove push-in fastener holding wheelhouse splash shield to fender at rocker panel.

(6) Remove push-in fasteners holding wheelhouse splash shield to fender support.

(7) Separate wheelhouse splash shield from vehicle.

INSTALLATION

Reverse the preceding operation.

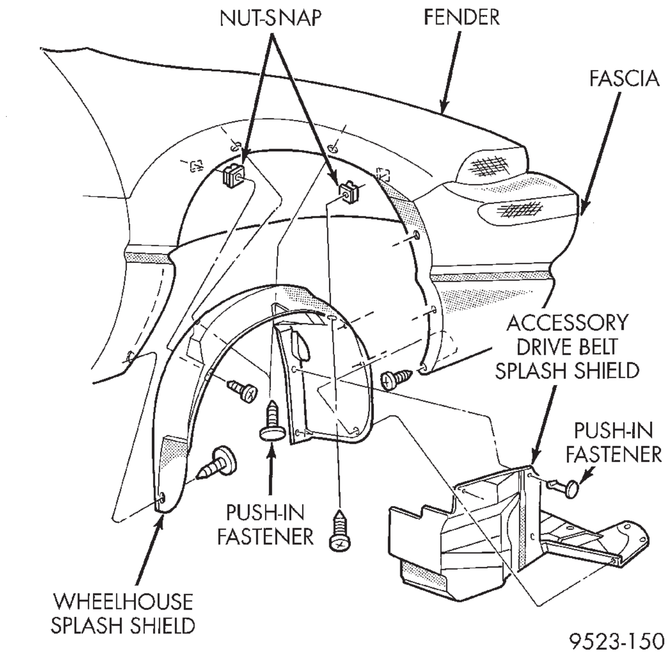


Fig. 10 Right Front Wheelhouse Splash Shield

DOOR

REMOVAL

NOTE: The retaining clips used on the door hinge pins are not to be re-used. Verify availability prior to proceeding.

(1) Open and support door on a suitable lifting device.

(2) Disengage wire connector at hinge pillar.

(3) Remove bolts holding door check strap to hinge pillar.

(4) Remove clip holding hinge pin in lower door hinge.

(5) Remove pin from lower hinge (Fig. 11).

(6) Remove clip holding hinge pin in upper hinge.

(7) Remove pin from upper hinge (Fig. 11).

(8) Separate door from vehicle.

INSTALLATION

(1) Apply Mopar® Multimileage Grease to inside of door hinge bushings.

(2) Position door on vehicle and install pin in upper hinge. Align knurling on hinge pin with the grooves in the door hinge prior to driving in the hinge pin.

(3) Install pin in lower hinge.

NOTE: Verify that head of each hinge pin is fully seated into door hinge.

(4) Install new clip holding hinge pin in upper hinge.

REMOVAL AND INSTALLATION (Continued)

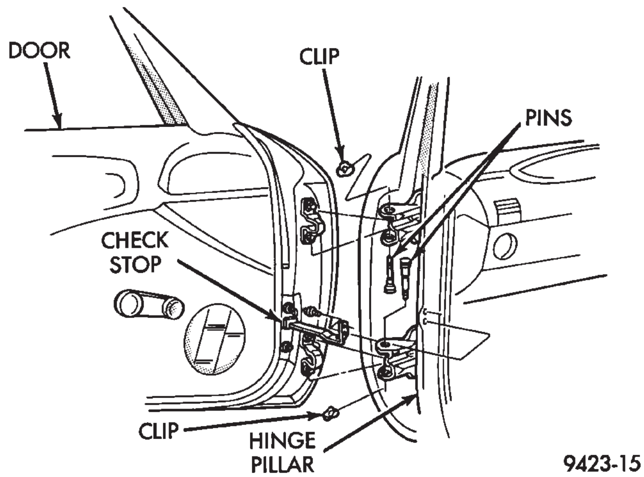


Fig. 11 Door—Typical

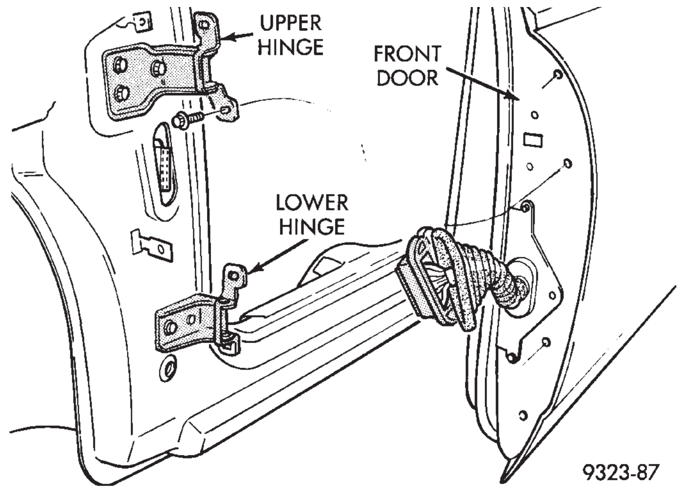


Fig. 12 Door and Hinge—Typical

(5) Install new clip holding pin in lower hinge.
(6) Install bolts holding door check strap to hinge pillar.
(7) Engage wire connector at hinge pillar.

DOOR HINGE

NOTE: If both hinges on one door are to be replaced, remove and install one hinge completely prior to beginning the second hinge.

REMOVAL

(1) Open and support door on a suitable lifting device.
(2) Remove bolts holding door check strap to lower A–pillar for greater access, if necessary.
(3) Mark position of hinge on both the door end frame and lower A–pillar to ease installation.
(4) Remove bolts holding hinge to door end frame (Fig. 12).
(5) Remove bolts holding hinge to lower A–pillar.
(6) Separate door hinge from vehicle.

INSTALLATION

CAUTION: When installing a new hinge, make sure that the head of each hinge pin is fully seated into the door hinge. Also, remove the plastic shipping clip and replace it with the correct metal retaining clip once the hinge pin is seated.

(1) If necessary, paint new door hinge prior to installation.
(2) Position door hinge on vehicle.
(3) Loosely install bolts holding hinge to lower A–pillar.
(4) Loosely install bolts holding hinge to door end frame.
(5) Align hinge to marks made previously and tighten all bolts.
(6) Install bolts holding door check strap to lower A–pillar, if removed previously.
(7) Verify door fit and operation. Adjust door hinge for proper door alignment, if necessary.

DOOR GLASS

REMOVAL

(1) Remove door trim panel and watershield.
(2) Remove inner door belt weatherstrip.
(3) Loosen inner belt stabilizer (Fig. 13).
(4) Remove door speaker, if so equipped.
(5) Lower door glass to access glass attachment bolts.
(6) Remove bolts holding regulator lift channel to door glass (Fig. 14).
(7) Remove bolts holding rear guide plate to door glass (Fig. 15).
(8) Separate rear guide plate from door glass.
(9) Lift door glass upward and out of opening at top of door (Fig. 16).

INSTALLATION

(1) Carefully lower door glass through opening in top of door. Verify that the front edge of the glass is in the mirror flag glass channel.
(2) Position rear guide plate onto door glass and install bolts.
(3) Install nuts holding regulator lift channel to door glass.
(4) Tighten all door glass fasteners.
(5) Install door speaker, if so equipped.
(6) Tighten window inner belt stabilizer.
(7) Install inner door belt weatherstrip.
(8) Install door trim panel and watershield.

REMOVAL AND INSTALLATION (Continued)

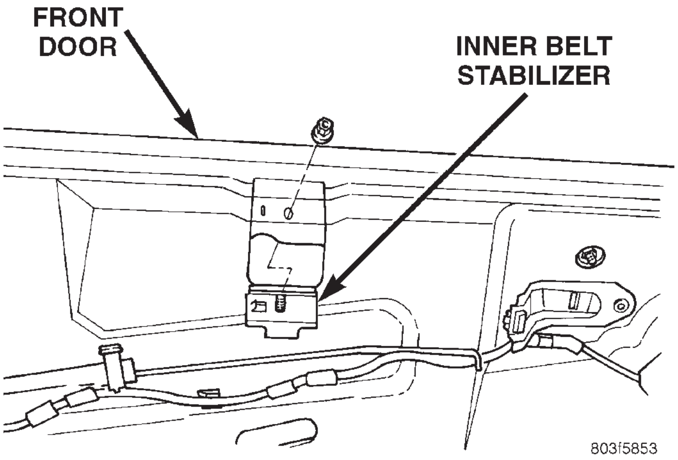


Fig. 13 Inner Belt Stabilizer

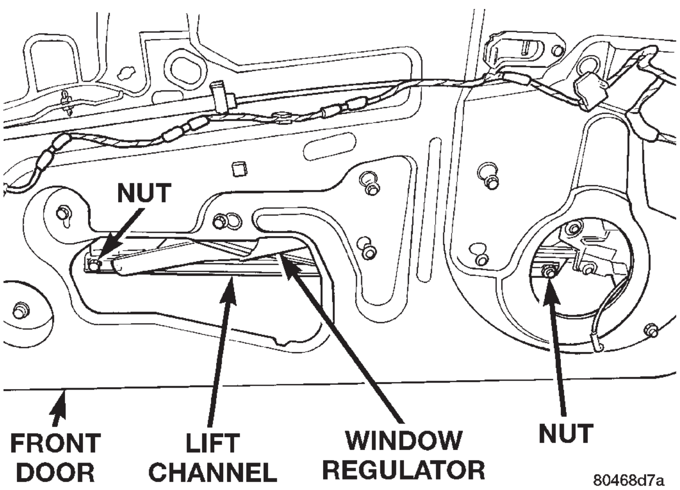


Fig. 14 Regulator Lift Channel

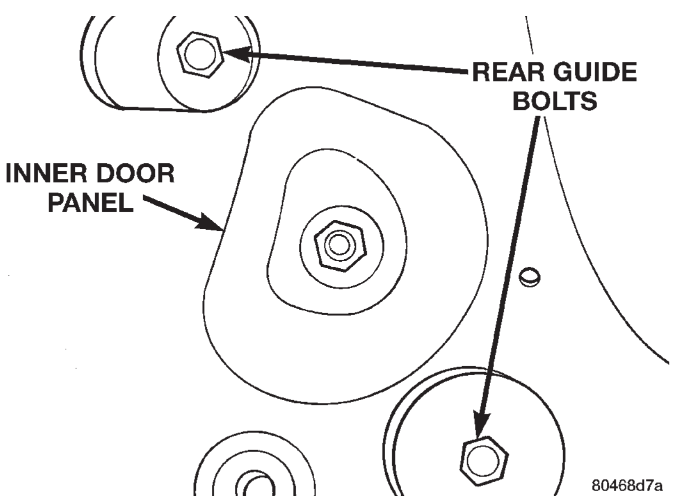


Fig. 15 Rear Guide Bolts

WINDOW REGULATOR

NOTE: For power window motor service procedures, refer to Group 8S, Power Windows.

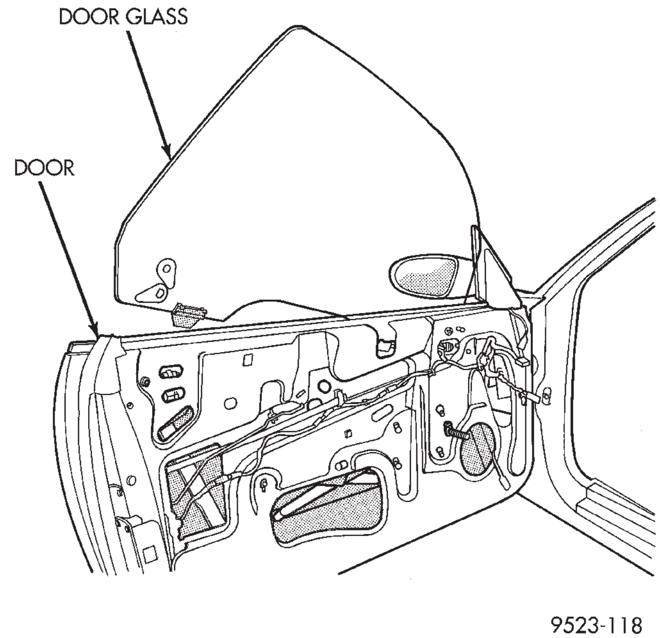


Fig. 16 Door Glass—Typical

REMOVAL

(1) Remove door trim panel and water shield.

(2) Disconnect wire connector to power window motor.

(3) Remove nuts holding regulator lift channel to door glass (Fig. 17).

(4) Secure door glass in upward position.

(5) Mark position of rear bolt of roller channel to inner door panel to aid in installation.

(6) Remove bolt holding rear of roller channel to door panel.

(7) Loosen bolt holding front of roller channel to door panel.

(8) Separate roller channel from door panel (Fig. 18).

(9) Loosen bolts holding window regulator to inner door panel reinforcement.

(10) Separate bolt heads from key-hole slots in inner door panel.

(11) Remove window regulator through large hole in inner door panel (Fig. 19).

(12) Remove power window motor from regulator. Refer to Group 8S, Power Windows, for motor procedure.

INSTALLATION

(1) Install power window motor on regulator. Refer to group 8S, Power Windows, for motor procedures.

(2) Move window regulator into position in door and engage bolt heads into key-hole slots in inner door panel reinforcement and tighten bolts.

(3) Install roller channel to door panel.

REMOVAL AND INSTALLATION (Continued)

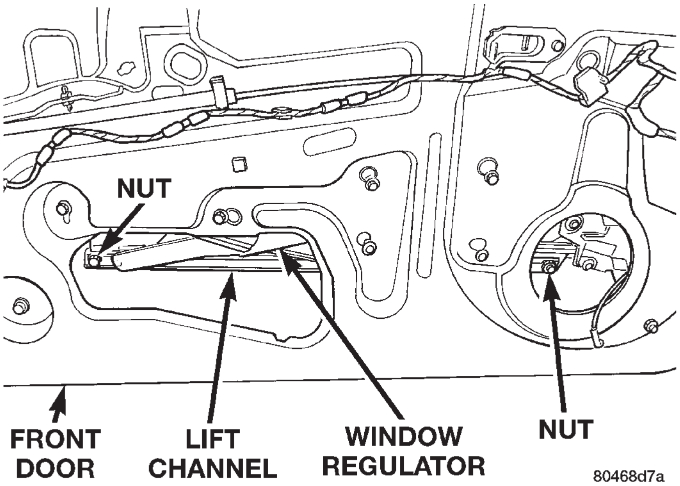


Fig. 17 Regulator Lift Channel

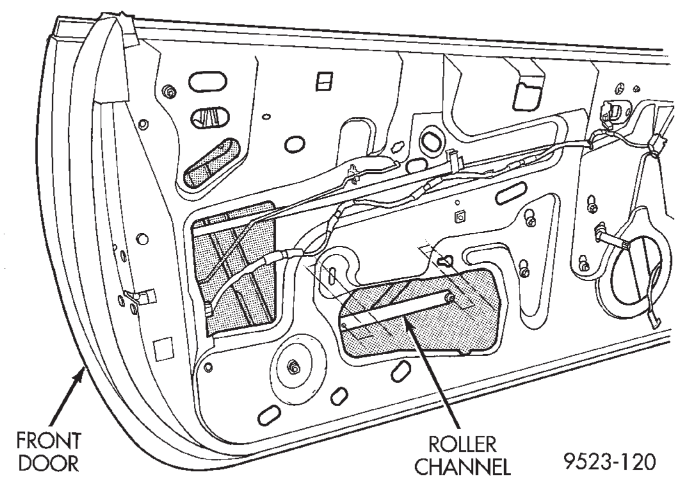


Fig. 18 Roller Channel

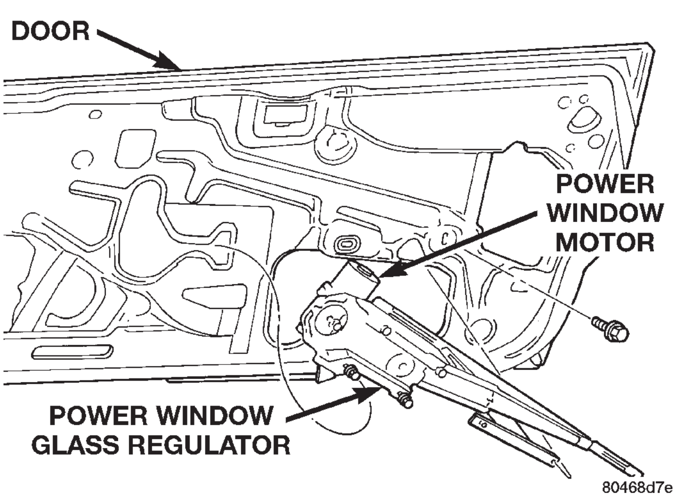


Fig. 19 Power Window Regulator

(4) Install bolt at rear of roller channel. Make sure that bolt is aligned to mark on inner door panel made previously.

(5) Tighten front and rear bolts of roller channel.

(6) Install nuts holding regulator lift channel to door glass.

(7) Verify glass fit and operation. Adjust door glass, if necessary.

(8) Connect wire connector to power window motor.

(9) Install door trim panel and water shield.

WINDOW INNER BELT STABILIZER

REMOVAL

(1) Remove door trim panel.

(2) Remove nut holding inner belt stabilizer to door panel.

(3) Separate inner belt stabilizer from door. (Fig. 20)

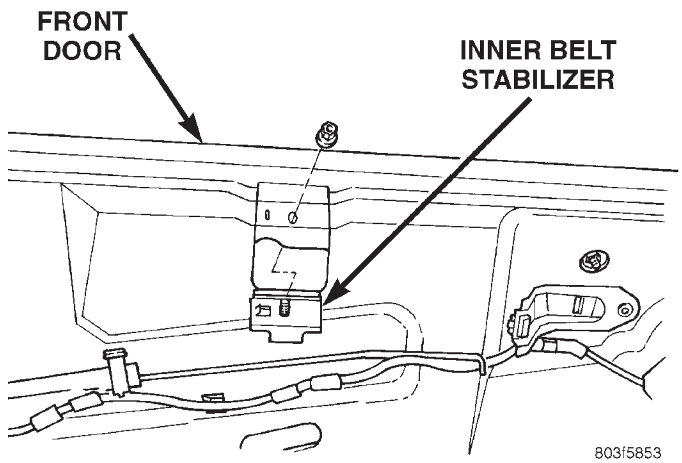


Fig. 20 Inner Belt Stabilizer

INSTALLATION

Reverse the preceding operation. Adjust inner belt stabilizer against glass with enough tension to allow free up and down movement.

REAR VERTICAL GUIDE BAR

REMOVAL

(1) Remove door trim panel and watershield.

(2) Remove nut holding top of guide bar to inner door panel.

(3) Using a suitable allen-wrench, hold jack screw stationary while removing nut holding bottom of guide bar to inner door panel.

(4) Separate guide bar from vehicle and remove through access hole in inner door panel (Fig. 21).

INSTALLATION

(1) If a new guide bar is being installed, preset bottom jack screw using old guide bar as a reference.

(2) Position rear guide bar on vehicle.

(3) Using a suitable allen-wrench, hold jack screw stationary while installing nut holding bottom of guide bar to inner door panel.

REMOVAL AND INSTALLATION (Continued)

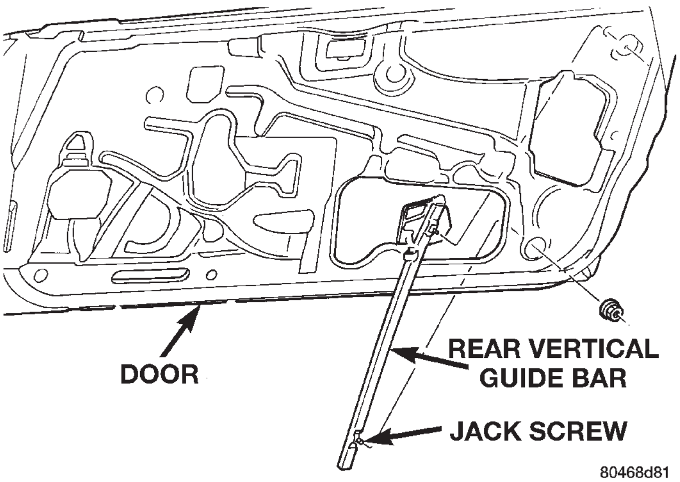


Fig. 21 Rear Vertical Guide Bar

(4) Install nut holding top of rear guide bar to inner door panel.

(5) Verify glass fit and operation. Adjust door glass as necessary.

(6) Install door trim panel and watershield.

DOOR TRIM PANEL

REMOVAL

(1) Roll door glass down.

(2) Disengage clips holding speaker grille to door trim panel.

(3) Remove screws holding door trim panel to door (Fig. 22).

(4) Disengage clips holding perimeter of trim panel to door (Fig. 23).

(5) Lift trim panel upward and disengage trim panel from upper retainer channel.

(6) Tilt trim panel away from door.

(7) Disengage clip holding latch linkage to back of inside door handle.

(8) Disconnect electrical connectors as necessary.

(9) Separate door trim panel from door.

INSTALLATION

(1) Position door trim panel next to door.

(2) Connect electrical connectors as necessary.

(3) Engage clip holding latch linkage to inside door handle.

(4) Position door trim panel on door and engage trim panel to upper retainer channel.

(5) Engage clips holding perimeter of trim panel to door.

(6) Install screws holding trim panel to door.

(7) Engage clips holding speaker grille to door trim panel.

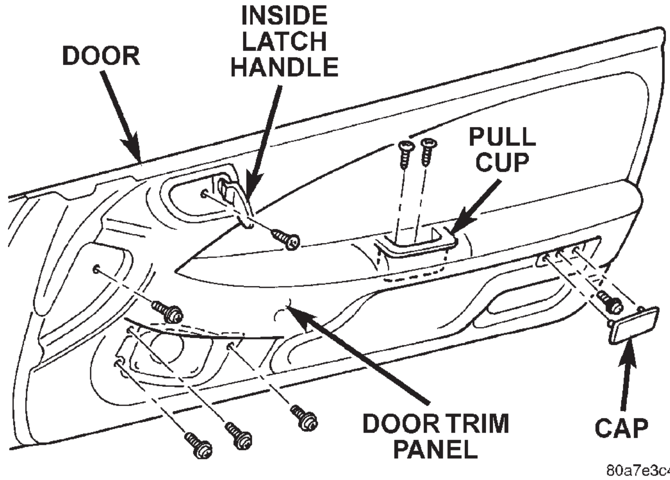


Fig. 22 Door Trim Panel Screws

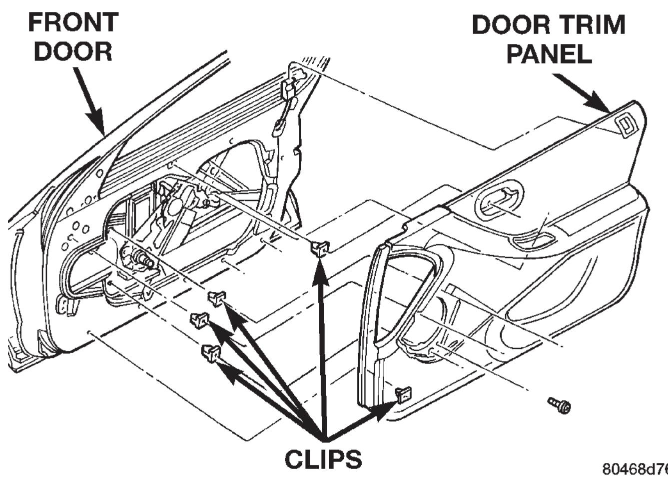


Fig. 23 Door Trim Panel Clips

DOOR WATERSHIELD

REMOVAL

(1) Remove door trim panel.

(2) Remove door speaker, if equipped.

(3) Remove door trim pull cup mount bracket.

(4) Disengage clip holding lock linkage to lock button bell crank.

(5) Peel watershield away from adhesive around perimeter of inner door panel (Fig. 24).

INSTALLATION

(1) Insure that enough adhesive remains to securely retain the watershield. Replace as necessary.

(2) Place the watershield into position and press securely to adhesive making sure to properly route wiring and linkages.

(3) Engage clip holding lock linkage to lock button bell-crank.

(4) Install door trim pull cup mount bracket.

(5) Install door speaker, if equipped.

(6) Install door trim panel.

REMOVAL AND INSTALLATION (Continued)

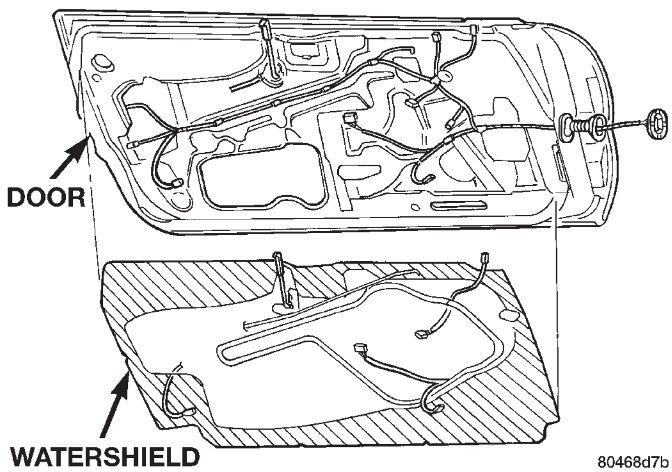


Fig. 24 Door Watershield

LOCK BUTTON BELL-CRANK

REMOVAL

(1) Remove door trim panel.

(2) Disengage clip holding lock linkage to bell-crank.

(3) Rotate bell-crank until retaining ears align with slots in door panel.

(4) Separate bell-crank from door (Fig. 25).

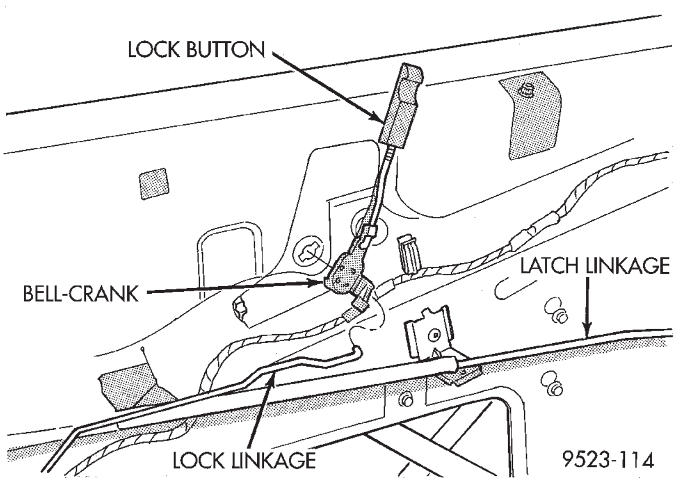


Fig. 25 Lock Button Bell-Crank—Typical

INSTALLATION

Reverse the preceding operation.

SIDE VIEW MIRROR

REMOVAL

(1) Remove side view mirror cover (Fig. 26).

(2) If vehicle is equipped with power mirrors, remove the door trim panel.

(3) Disengage power window mirror motor wire connector, if so equipped.

(4) Disengage wire harness grommet from mirror flag, if so equipped.

(5) Remove nuts holding side view mirror to mirror flag (Fig. 27).

(6) Separate side view mirror from vehicle.

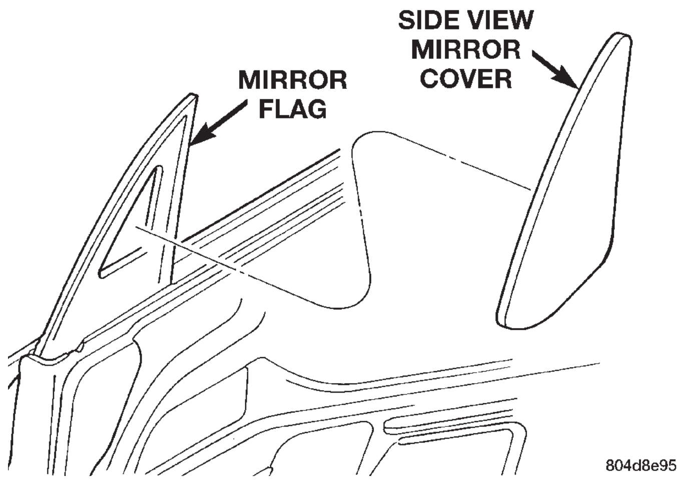


Fig. 26 Side View Mirror Cover

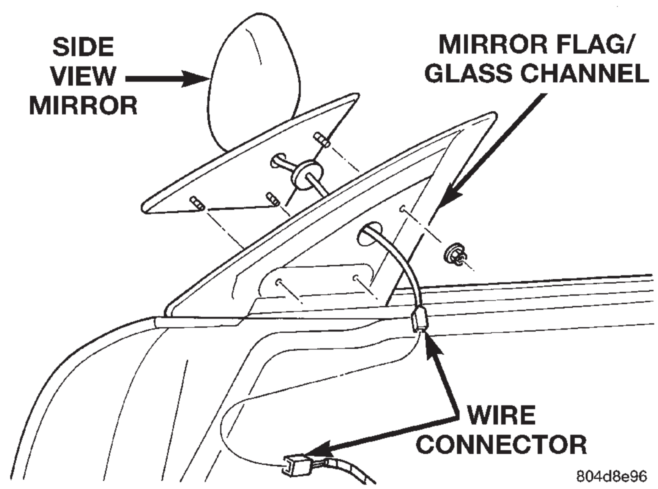


Fig. 27 Side View Mirror

INSTALLATION

(1) Feed power mirror wire harness through hole in mirror flag and seat grommet. Do not pull on wire harness to seat grommet.

(2) Position side view mirror to vehicle.

(3) Install nuts holding side view mirror to mirror flag.

(4) Engage push–in fastener holding power mirror wire connector to inner door panel, if so equipped.

(5) Engage power mirror motor wire connector, if so equipped.

(6) Install side view mirror cover.

REMOVAL AND INSTALLATION (Continued)

SIDE VIEW MIRROR FLAG/DOOR GLASS CHANNEL

REMOVAL

(1) Remove side view mirror.

(2) Remove door trim panel.

(3) Remove door glass.

(4) Remove door outer belt weatherstrip.

(5) Remove screws holding mirror flag/door glass channel to outer door panel (Fig. 28).

(6) Remove nut holding top of mirror flag/door glass channel to inner door panel.

(7) Using a suitable allen-wrench, hold jack screw stationary while removing nut holding bottom of mirror flag/door glass channel to inner door panel.

(8) Separate from vehicle and remove through opening in top of door.

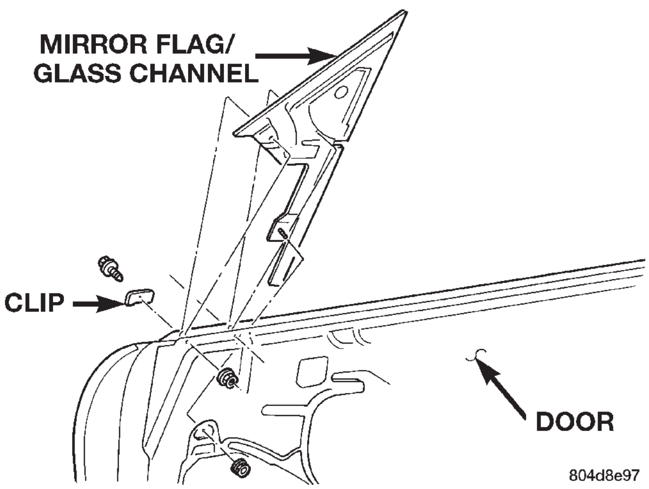


Fig. 28 Side View Mirror Flag/Door Glass Channel

INSTALLATION

(1) If installing a new mirror flag/door glass channel, preset jack–screw using old flag/channel as a reference.

(2) Position mirror flag/door glass channel on vehicle.

(3) Using a suitable allen-wrench, hold jack screw stationary while installing nut holding bottom of mirror flag/door glass channel to inner door panel.

(4) Install nut holding top of mirror flag/door glass channel to inner door panel.

(5) Install screws holding mirror flag/door glass channel to outer door panel.

(6) Install door outer belt weatherstrip.

(7) Install door glass.

(8) Install side view mirror.

(9) Verify glass fit and operation. Adjust door glass as necessary.

(10) Install door trim panel.

DOOR CHECK STRAP

REMOVAL

(1) Remove door trim panel.

(2) Remove watershield as necessary to gain access.

(3) Remove bolts holding check strap to lower A–pillar.

(4) Remove bolts holding check strap to door end frame (Fig. 29).

(5) Separate door check strap from vehicle.

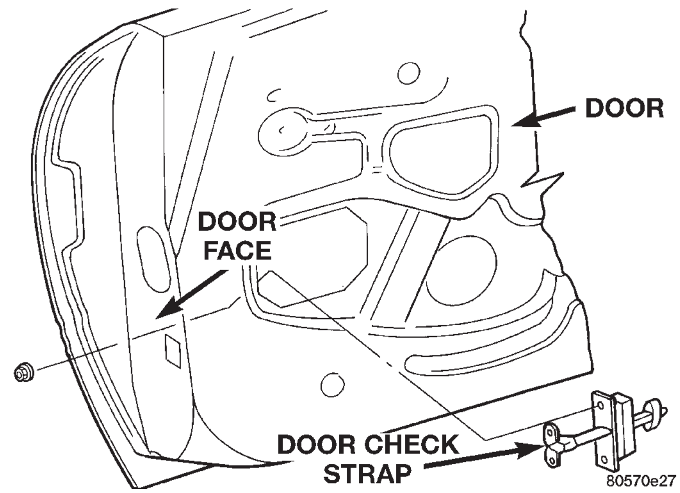


Fig. 29 Door Check Strap

INSTALLATION

(1) Position door check strap on vehicle.

(2) Install bolts holding check strap to door end frame.

(3) Install bolts holding check strap to lower A-pillar.

(4) Install watershield.

(5) Install door trim panel.

DOOR LATCH

REMOVAL

(1) Remove door trim panel and watershield.

(2) Raise door glass.

(3) Disconnect lock rod from lock button bellcrank.

(4) Disengage lock and latch rods from clips on inner door panel (Fig. 30).

(5) Disconnect lock and latch rods from outside door handle and key cylinder at door latch (Fig. 31).

(6) Disengage wire connector from power door lock motor.

(7) Remove screws holding door latch to door end frame (Fig. 32).

(8) Separate door latch from vehicle.

REMOVAL AND INSTALLATION (Continued)

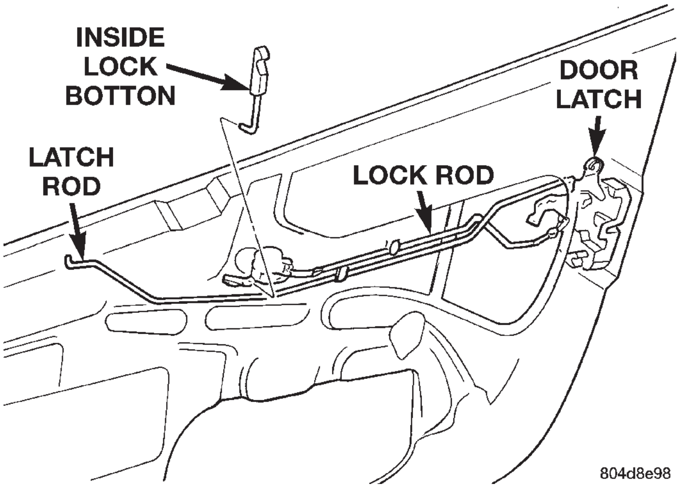


Fig. 30 Latch and Lock Rod Clips

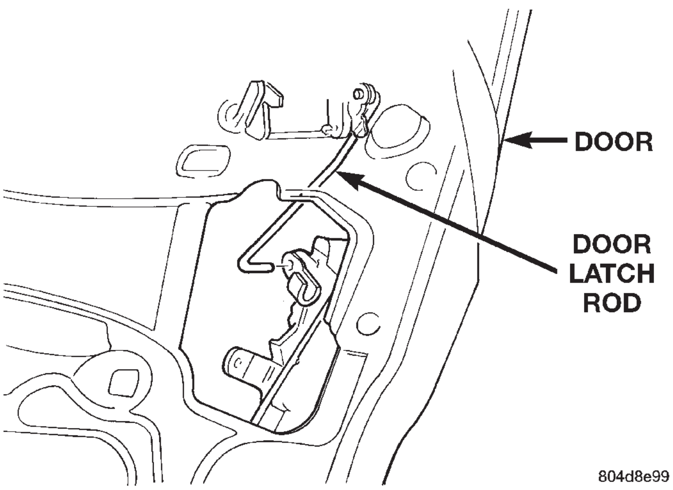


Fig. 31 Lock and Latch Rods At Door Latch

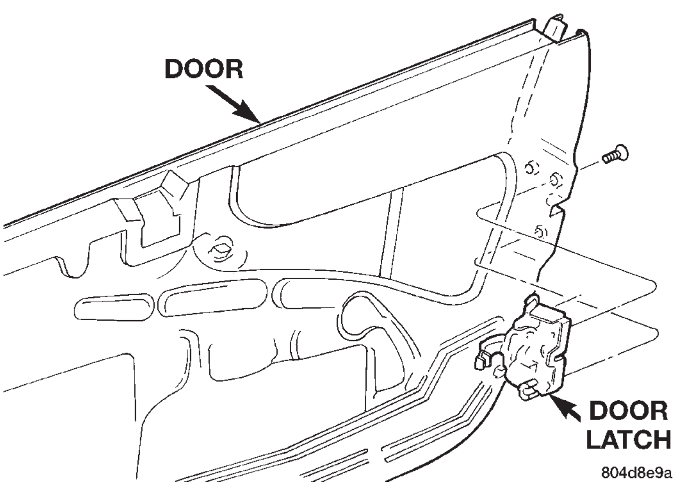


Fig. 32 Door Latch

INSTALLATION

CAUTION: Do not close door before adjusting the door latch. Door may fail to re–open.

(1) Position door latch on vehicle.
(2) Install screws holding door latch to door end frame.
(3) Engage wire connector to power door lock motor.
(4) Connect lock and latch rods from outside door handle and key cylinder at door latch.
(5) Engage lock and latch rods to clips on inner door panel.
(6) Connect lock rod from lock button bellcrank.
(7) Adjust door latch.
(8) Verify operation of door latch. Readjust if necessary.
(9) Install door trim panel and watershield.

DOOR LOCK CYLINDER

REMOVAL

(1) Remove outside door handle.
(2) Remove clip holding lock cylinder to outside door panel (Fig. 33).
(3) Disengage clip holding link to key cylinder.
(4) Separate lock cylinder from outer door panel.

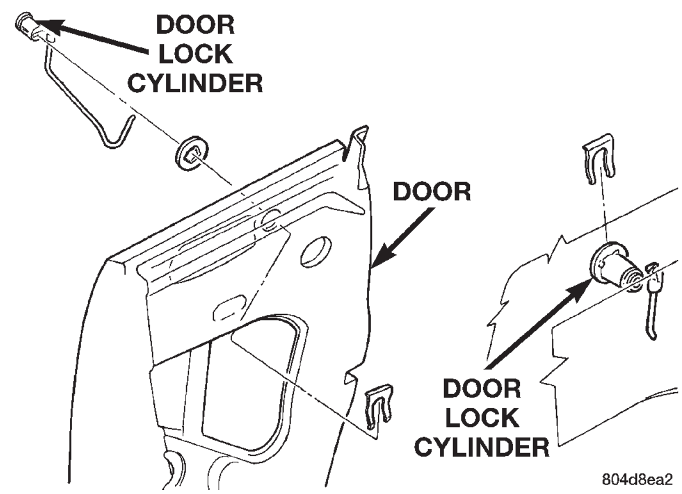


Fig. 33 Door Lock Cylinder

INSTALLATION

(1) Position lock cylinder and gasket in door outer panel.
(2) Install clip holding lock cylinder to outside door panel.
(3) Engage link to key cylinder.
(4) Install outside door handle.

DOOR LATCH STRIKER

REMOVAL

(1) Mark outline of door latch striker on B–pillar to aid in installation.
(2) Remove screws holding door latch striker to B–pillar (Fig. 34).
(3) Separate latch striker from vehicle.

REMOVAL AND INSTALLATION (Continued)

NOTE: Be sure to check for any shims between door latch striker and B–pillar. If any shims are found, they must be re-installed with the new door latch striker to maintain proper door operation.

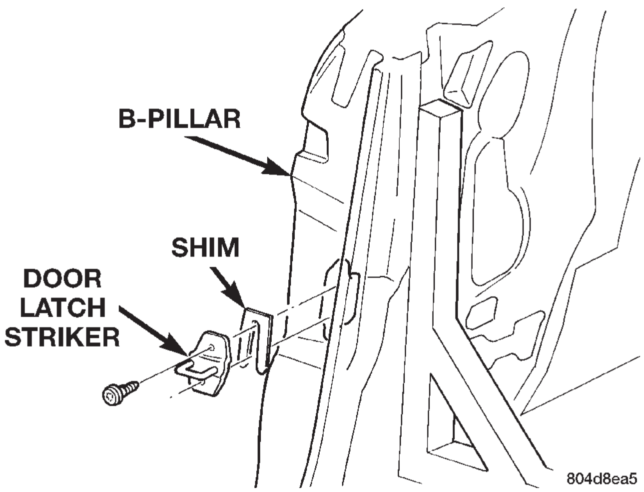


Fig. 34 Door Latch Striker

INSTALLATION

(1) Position door latch striker and any shims on vehicle.

(2) Loosely install screws holding latch striker to B–pillar.

(3) Align latch striker to marks on B–pillar made previously.

(4) Tighten all fasteners.

(5) Verify door fit and operation. Adjust door latch striker as necessary.

OUTSIDE DOOR HANDLE

REMOVAL

(1) Remove door trim panel.

(2) Raise door glass.

(3) Remove watershield as necessary to gain access.

(4) Disconnect latch rod at door latch.

(5) Remove nuts holding door handle to outer door panel (Fig. 35).

(6) Separate outside door handle from door.

INSTALLATION

(1) Position outside door handle on door.

(2) Install nuts holding door handle to outer door panel.

(3) Connect latch rod at door latch.

(4) Install watershield.

(5) Install door trim panel.

(6) Verify door handle operation. Adjust door latch as necessary.

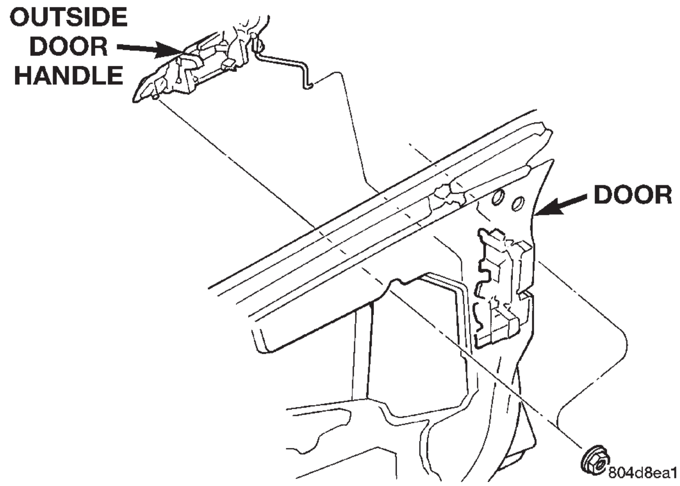


Fig. 35 Outside Door Handle

DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove door trim panel.

(2) Pull upward on rear edge of inner belt weatherstrip (Fig. 36).

(3) Separate weatherstrip from vehicle.

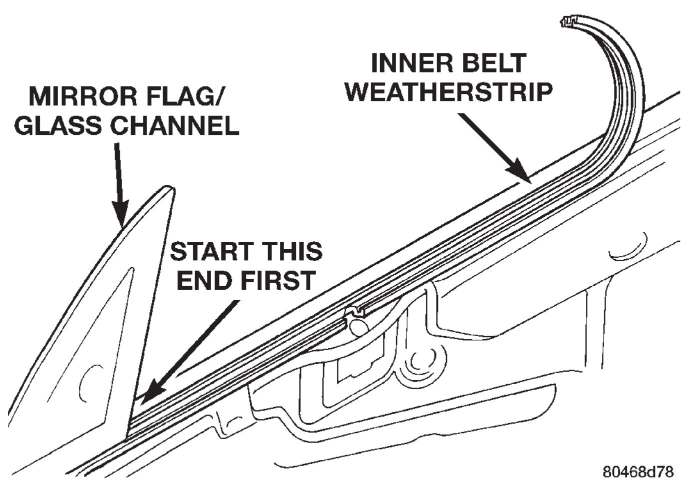


Fig. 36 Door Inner Belt Weatherstrip

INSTALLATION

(1) Start leading edge of weatherstrip on vehicle.

(2) Press the leading edge of the weatherstrip forward until edge is tight to the mirror flag.

(3) Press weatherstrip into position on door panel.

(4) Install door trim panel.

OUTER DOOR BELT WEATHERSTRIP

REMOVAL

(1) Remove door glass.

(2) Remove screws holding outer belt weatherstrip to outer door panel (Fig. 37).

REMOVAL AND INSTALLATION (Continued)

(3) Separate outer belt weatherstrip from the vehicle.

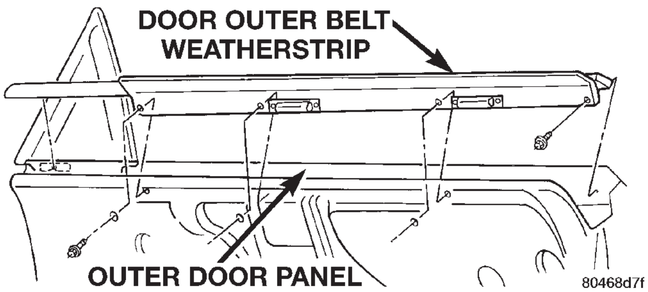


Fig. 37 Door Outer Belt Weatherstrip

INSTALLATION

(1) Position outer belt weatherstrip on vehicle.
(2) Install screws to hold outer weatherstrip to outer door panel.
(3) Install door glass.

A–PILLAR WEATHERSTRIP RETAINER AND MOLDING

REMOVAL

(1) Partially raise convertible top.
(2) Remove header and A–pillar weatherstrip as necessary to gain access.
(3) Remove screws holding A–pillar weatherstrip retainer to A–pillar (Fig. 38).
(4) Separate retainer from vehicle.
(5) Remove screws holding A-pillar molding to A-pillar.
(6) Separate A-pillar molding from vehicle.

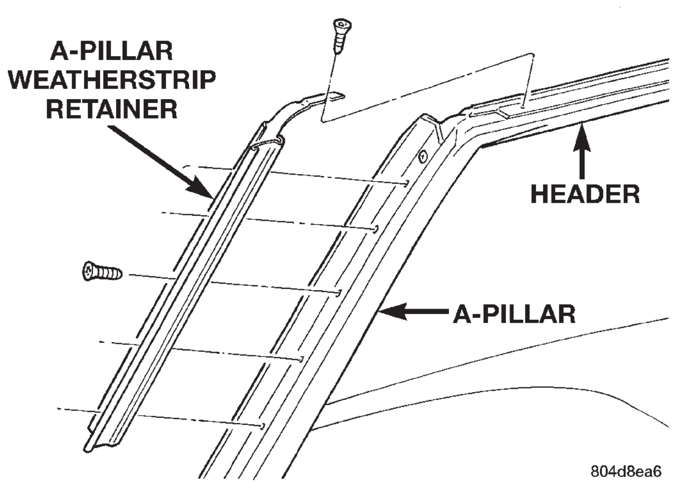


Fig. 38 A–Pillar Weatherstrip Retainer

INSTALLATION

(1) Clean A–pillar of any seal material residue.
(2) Position A-pillar molding to vehicle.
(3) Install screws to hold A-pillar molding to A-pillar.
(4) Position A–pillar weatherstrip retainer on A–pillar.
(5) Install screws holding retainer to A–pillar. Install middle screw first and then work outward.
(6) Install header and A–pillar weatherstrip.
(7) Lower and secure convertible top.

HEADER WEATHERSTRIP RETAINER/MOLDING

REMOVAL

(1) Partially raise convertible top.
(2) Remove header and A–pillar weatherstrip as necessary to gain access.
(3) Remove screws holding A–pillar weatherstrip retainer to header weatherstrip retainer.
(4) Remove screws holding header weatherstrip retainer to header panel (Fig. 39).
(5) Separate retainer from vehicle.

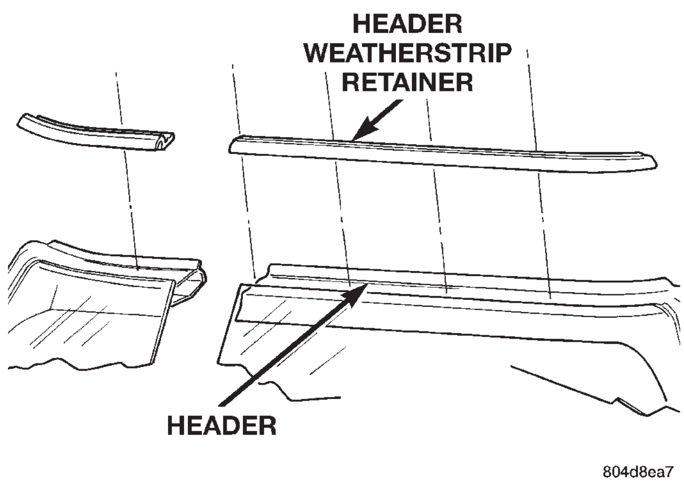


Fig. 39 Header Weatherstrip Retainer

INSTALLATION

(1) Clean any residual seal material from header panel.
(2) Position header weatherstrip retainer on vehicle.
(3) Install screws holding retainer to header panel. Install center screw first and then work outward.
(4) Install screws holding A–pillar weatherstrip retainer to header retainer.
(5) Install header and A–pillar weatherstrip.
(6) Lower and secure convertible top.

HEADER/A–PILLAR WEATHERSTRIP

REMOVAL

(1) Partially raise convertible top.
(2) Remove inside rear view mirror.
(3) Remove sun visors.
(4) Remove header trim panel.
(5) Remove both door sill trim panels.

REMOVAL AND INSTALLATION (Continued)

(6) Remove nuts holding header and A–pillar weatherstrip at upper corners of windshield (Fig. 40).

(7) Remove push–in fasteners at lower corners of windshield holding weatherstrip to A–pillar.

(8) Separate header and A–pillar weatherstrip from vehicle.

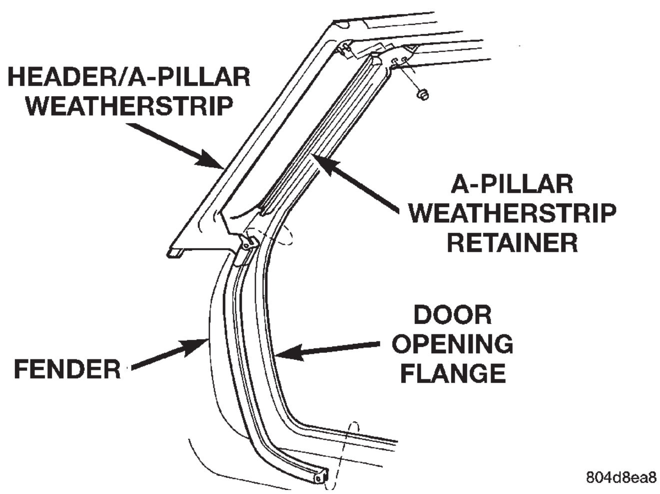


Fig. 40 Header/A–Pillar Weatherstrip

INSTALLATION

CAUTION: Ensure that the butyl patch and butyl rope at each corner of the windshield is present and in good condition (Fig. 41). The butyl is critical for the water management system. Replace as necessary.

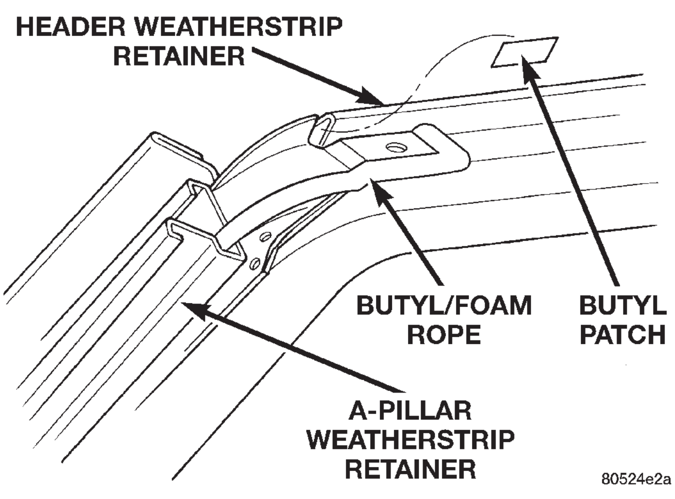


Fig. 41 Butyl Patch and Rope

(1) Position header and A–pillar weatherstrip on vehicle.

(2) Secure weatherstrip into retainers at header and A–pillar.

(3) Install nuts at upper corners of windshield.

(4) Install push–in fasteners at lower corners of windshield.

(5) Install door sill trim panels.

(6) Install header trim panel.

(7) Install sun visors.

(8) Install inside rear view mirror.

(9) Lower and secure convertible top.

QUARTER PANEL WEATHERSTRIP

REMOVAL

(1) Remove door sill trim panel.

(2) Remove push–in fasteners holding weatherstrip to B–pillar.

(3) Remove weatherstrip from door opening flange.

(4) Separate quarter panel weatherstrip from vehicle (Fig. 42).

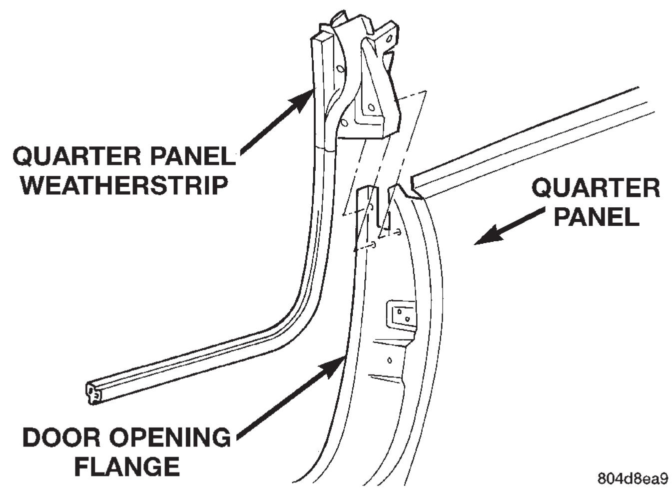


Fig. 42 Quarter Panel Weatherstrip

INSTALLATION

(1) Position panel weatherstrip onto vehicle.

(2) Install weatherstrip to door opening flange.

(3) Install push–in fasteners holding weatherstrip to B–pillar.

(4) Install door sill trim panel.

SIDE RAIL WEATHERSTRIPS

FRONT

REMOVAL

(1) Partially raise convertible top.

(2) Using a trim stick, special tool C–4755, separate one end of weatherstrip from retainer channel.

(3) Separate weatherstrip from vehicle (Fig. 43).

INSTALLATION

(1) Position weatherstrip on vehicle.

(2) Push weatherstrip into retainer channel, aligning embossment on backside of weatherstrip to corner of retainer.

(3) Lower convertible top.

REMOVAL AND INSTALLATION (Continued)

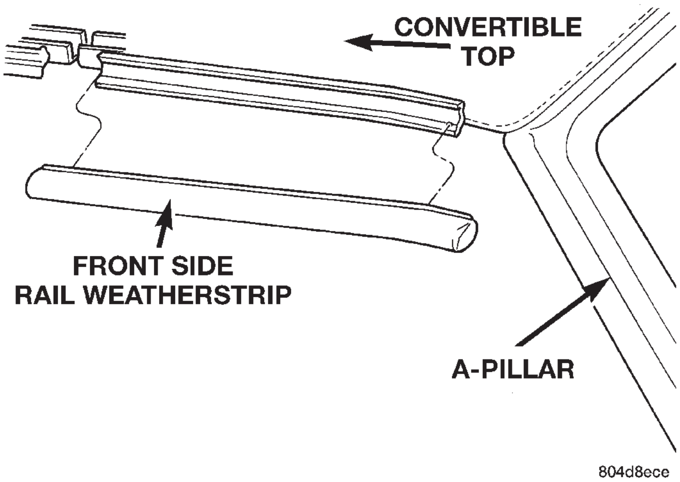


Fig. 43 Front Side Rail Weatherstrip

(4) Adjust position of weatherstrip so that weatherstrip is butted tightly against A–pillar seal and center side rail weatherstrip.

(5) Secure convertible top.

CENTER

REMOVAL

(1) Partially raise convertible top.

(2) Using a trim stick, special tool C–4755, separate one end of weatherstrip from retainer channel.

(3) Separate weatherstrip from vehicle (Fig. 44).

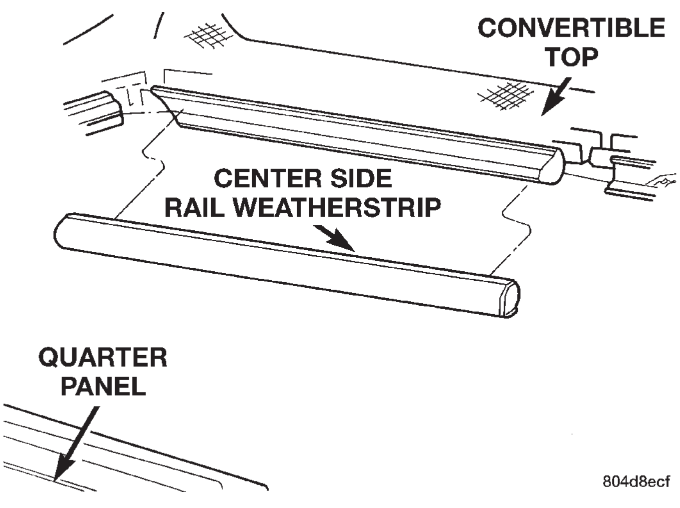


Fig. 44 Center Side Rail Weatherstrip

INSTALLATION

(1) Position weatherstrip on vehicle.

(2) Push weatherstrip into retainer channel, aligning embossment on backside of weatherstrip to corner of retainer.

(3) Lower convertible top.

(4) Adjust position of weatherstrip so that weatherstrip is butted tightly against front and rear side rail weatherstrips.

(5) Secure convertible top.

REAR

REMOVAL

(1) Partially raise convertible top.

(2) Using a trim stick, special tool C–4755, separate one end of weatherstrip from retainer channel.

(3) Separate weatherstrip from vehicle (Fig. 45).

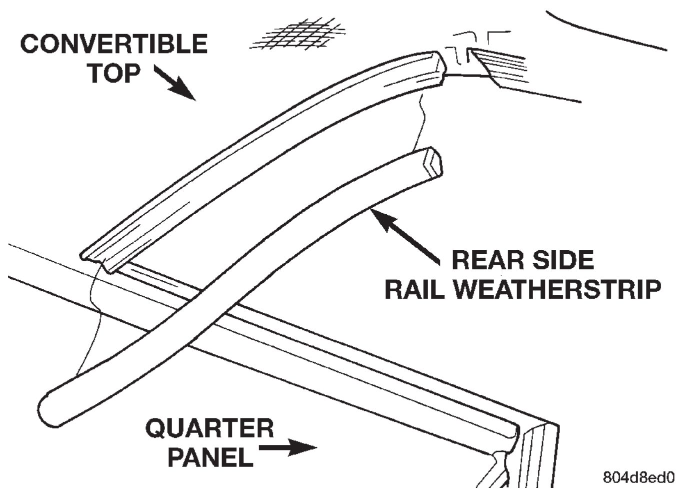


Fig. 45 Rear Side Rail Weatherstrip

INSTALLATION

(1) Position weatherstrip on vehicle.

(2) Push weatherstrip into retainer channel, aligning embossment on backside of weatherstrip to corner of retainer.

(3) Lower convertible top.

(4) Adjust position of weatherstrip so that weatherstrip is butted tightly against quarter panel and center side rail weatherstrip.

(5) Secure convertible top.

SUN VISOR

REMOVAL

(1) Disengage sun visor from sun visor support.

(2) Remove screws holding sun visor to header panel.

(3) Disconnect lighted vanity mirror and universal garage door opener wiring, if so equipped.

(4) Separate sun visor from vehicle (Fig. 46).

INSTALLATION

(1) Position sun visor to vehicle.

(2) Connect lighted vanity mirror and universal garage door opener wiring, if so equipped.

(3) Install screws holding sun visor to header panel.

(4) Engage sun visor to sun visor support

REMOVAL AND INSTALLATION (Continued)

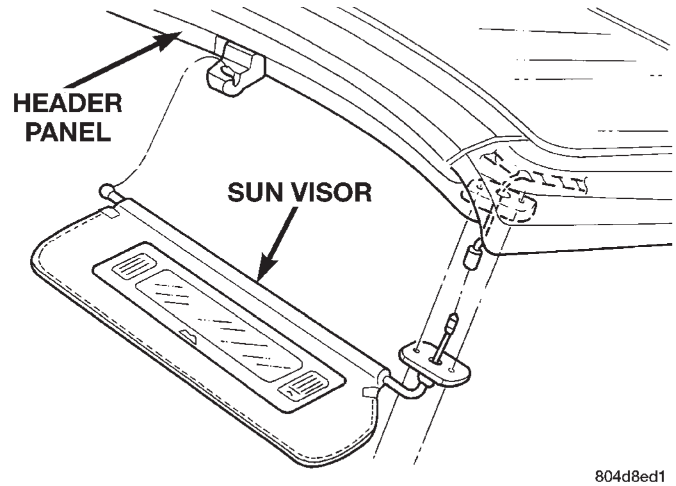


Fig. 46 Sun Visor

INSIDE REAR VIEW MIRROR

REMOVAL

(1) Remove screws holding inside rear view mirror to header panel.

(2) Disconnect wire connector to rear view mirror, if so equipped.

(3) Separate rear view mirror from vehicle (Fig. 47)

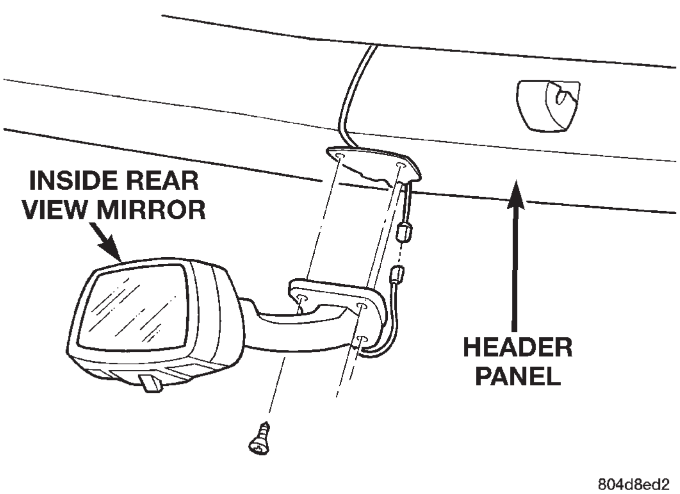


Fig. 47 Inside Rear View Mirror

INSTALLATION

(1) Position inside rear view mirror to vehicle.

(2) Connect wire connector to rear view mirror, if so equipped.

(3) Install screws holding rear view mirror to header panel.

A–PILLAR TRIM PANEL

REMOVAL

(1) Disengage clips holding A–pillar trim panel to A–pillar.

(2) Separate trim panel from vehicle (Fig. 48).

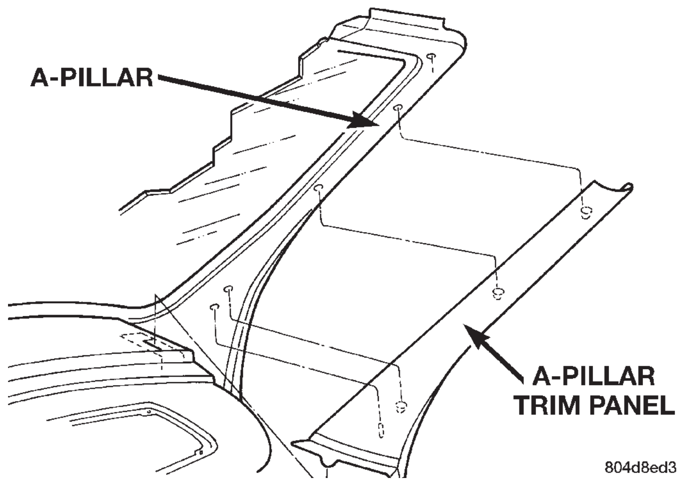


Fig. 48 A–Pillar Trim Panel

INSTALLATION

(1) Position trim panel near A–pillar.

(2) Align locating pins on back side of trim panel to holes in A–pillar.

(3) Press clips on A–pillar trim panel into slots in A–pillar.

HEADER TRIM PANEL—RIGHT OR LEFT

REMOVAL

(1) Remove sun visor.

(2) Remove inside rear view mirror, right side only.

(3) Disengage clip holding header trim panel to header panel.

(4) Separate header trim panel from vehicle (Fig. 49).

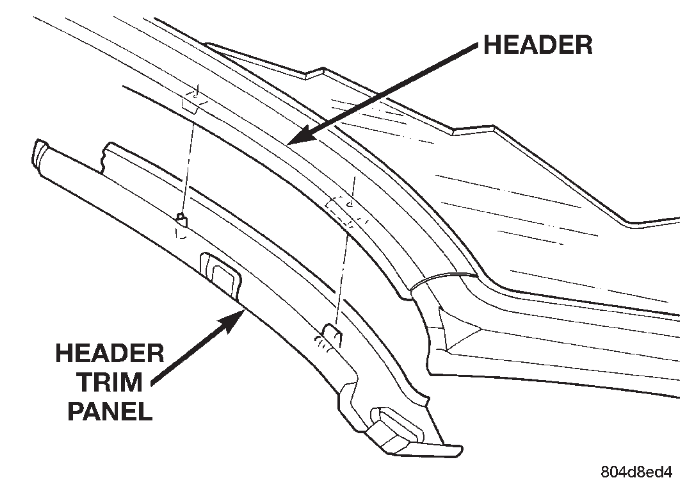


Fig. 49 Header Trim Panel

INSTALLATION

(1) Position header trim panel on vehicle.

(2) Align locating pins on back side of trim panel to holes in header panel.

REMOVAL AND INSTALLATION (Continued)

(3) Engage clip on trim panel to slots in header panel.
(4) Install inside rear view mirror.
(5) Install sun visor.

DOOR OPENING TRIM WELT

REMOVAL

(1) Using trim stick, special tool C–4755, remove one end of door opening trim welt from door opening flange.
(2) Separate welt from vehicle (Fig. 50).

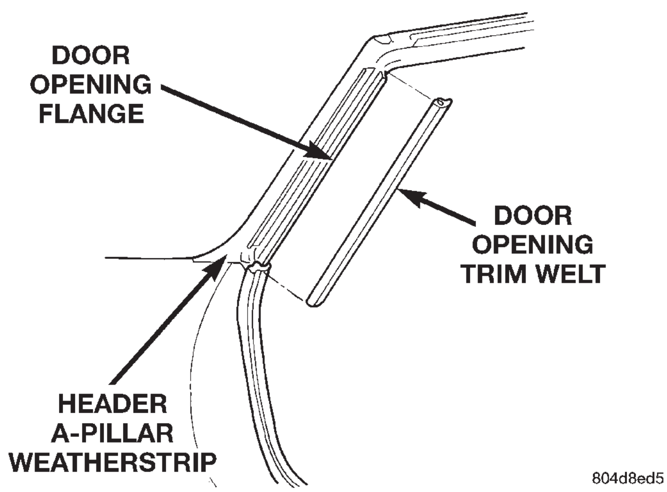


Fig. 50 Door Opening Trim Welt

INSTALLATION

(1) Position door opening trim welt on vehicle.
(2) Butt end of welt to edge of header/A–pillar weatherstrip.
(3) Push door opening welt onto door opening flange.

COWL TRIM PANEL

REMOVAL

(1) Remove door sill trim panel.
(2) Remove screws holding cowl trim panel to inner cowl panel.
(3) Separate cowl trim panel from vehicle (Fig. 51).

INSTALLATION

(1) Position cowl trim panel to vehicle.
(2) Install screws holding cowl trim panel to inner cowl panel.
(3) Install door sill trim panel.

DOOR SILL TRIM PANEL

REMOVAL

(1) Using a fork–type prying tool, disengage clips holding door sill trim panel to door sill (Fig. 52).

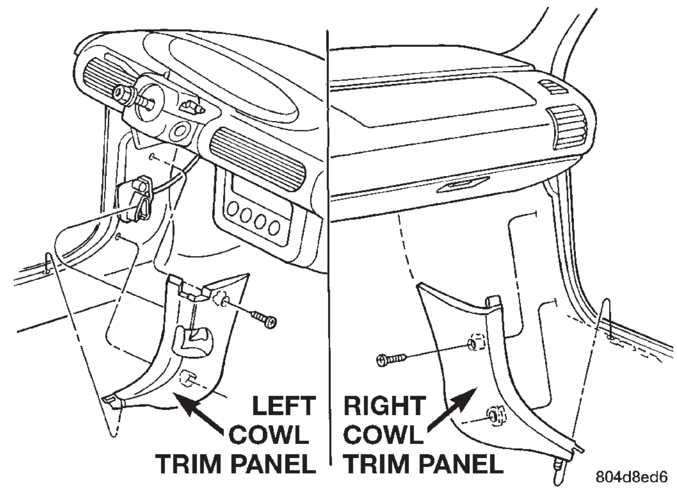


Fig. 51 Cowl Trim Panel

(2) Starting at one end of sill trim panel, pull upward on sill trim panel in order to disengage clips holding sill trim panel to door opening flange.
(3) Separate door sill trim panel from vehicle.

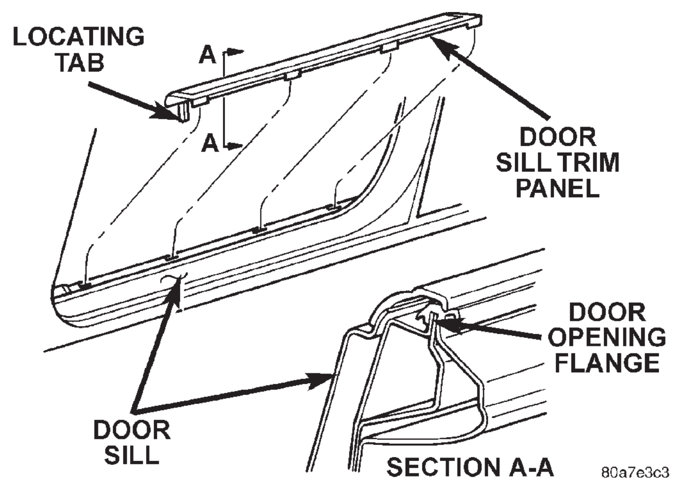


Fig. 52 Door Sill Trim Panel

INSTALLATION

(1) Position door sill trim panel on vehicle.
(2) Align locating rib to net against cowl trim panel.
(3) Engage clips on sill trim panel to door opening flange.

NOTE: Check that header/A–pillar and quarter panel weatherstrips are properly positioned. Incorrect positioning will interfere with clip engagement to door opening flange and damage door sill trim panel.

(4) Engage clips holding sill trim panel to door sill.

REMOVAL AND INSTALLATION (Continued)

MANUAL FRONT SEAT

REMOVAL

(1) Position seat in full rearward position.

(2) Remove front inboard and outboard bolts holding seat to floor pan crossmember (Fig. 53).

(3) Move seat to full forward position.

(4) Remove rear inboard bolt holding seat to floor pan.

(5) Remove rear outboard bolts holding seat to side sill pylon.

(6) Tilt seat forward and disconnect wire connector to seat belt retractor.

(7) Separate seat from vehicle.

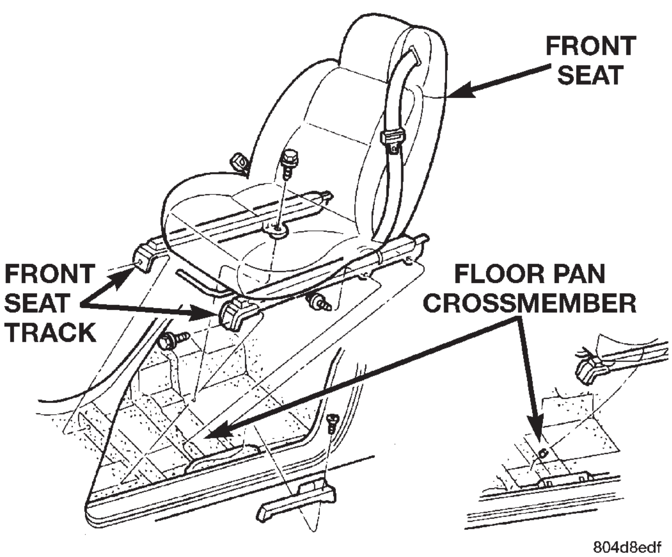


Fig. 53 Front Seat

INSTALLATION

CAUTION: It is important that the following steps be done correctly to insure that the seat tracks are properly timed prior to securing the seats to the vehicle.

(1) Adjust seat back to vertical position using either recliner handle.

NOTE: Do not grab either recliner handle or towel bar when handling seat. The seat tracks are spring loaded and will release.

(2) Turn seat on its side with the bottom of the seat facing so that the seat tracks can be seen.

(3) Securely grasp the spring loaded track and while lifting the towel bar, allow the seat track to move to the full rearward position. The seat track is in the full rearward position if the first and last latch pins are engaged into the seat track.

(4) Position the other seat track in the full rearward position. The first and last latch pins should also be engaged.

(5) Return seat to upright position.

(6) Position seat in vehicle.

(7) Tilt seat forward and connect wire connector to seat belt retractor.

(8) Push downward on seat cushion to ensure that the front mounting brackets are fully seated to floor pan crossmember.

(9) Install and tighten rear outboard bolt holding seat to side sill pylon.

(10) Install and tighten forward rear outboard bolt holding seat to side sill pylon.

(11) Install and tighten rear inboard bolt holding seat to floor pan.

(12) Move seat to full rearward position. Push rearward slightly on seat to ensure that the adjuster latches are engaged on both seat tracks.

(13) Install and tighten front inboard bolt holding seat to floor pan crossmember.

(14) Install and tighten front outboard bolt holding seat to floor pan crossmember.

NOTE: Torque specification for all seat retaining bolts is 61 N·m (45 ft. lbs.).

POWER FRONT SEAT

REMOVAL

(1) Position seat in full rearward position.

(2) Remove front inboard and outboard bolts holding seat to floor pan crossmember (Fig. 53).

(3) Move seat to full forward position.

(4) Remove rear inboard bolt holding seat to floor pan.

(5) Remove rear outboard bolts holding seat to side sill pylon.

(6) Tilt seat forward and disconnect wire connector to seat belt retractor and power seat mechanism.

(7) Separate seat from vehicle.

INSTALLATION

(1) Adjust seat back to vertical position using either recliner handle.

(2) Position seat in vehicle.

(3) Tilt seat forward and connect wire connector to seat belt retractor and power seat mechanism.

(4) Push downward on seat cushion to ensure that the front mounting brackets are fully seated to floor pan crossmember.

(5) Use power seat switch to move seat to full forward position.

(6) Install and tighten rear outboard bolt holding seat to side sill pylon.

REMOVAL AND INSTALLATION (Continued)

(7) Install and tighten center outboard bolt holding seat to side sill pylon.

(8) Install and tighten rear inboard bolt holding seat to floor pan.

(9) Use power seat switch to move seat to full rearward position.

(10) Install and tighten front inboard bolt holding seat to floor pan crossmember.

(11) Install and tighten front outboard bolt holding seat to floor pan crossmember.

NOTE: Torque specification for all seat retaining bolts is 61 N·m (45 ft. lbs.).

FRONT SEAT BELT AND RETRACTOR

REMOVAL

(1) Remove seat from vehicle. Refer to appropriate seat procedure.

(2) Remove seat side shield. Refer to procedure found in this section.

NOTE: The torque prevailing nut used to secure the lower seat belt anchor is not re-usable. Verify availability prior to proceeding.

(3) Remove nut holding lower seat belt anchor to seat frame (Fig. 5).

(4) Remove seat back cover to gain access to seat belt retractor. Refer to procedure found in this section.

(5) Remove seat belt retractor cover (Fig. 54).

(6) Remove and discard bolts holding seat belt retractor to seat frame.

CAUTION: Do not re-use the bolts holding the seat belt retractor to the seat frame.

(7) Separate seat belt retractor from seat frame.

(8) Disengage wire connector from seat belt retractor.

INSTALLATION

(1) Position seat belt retractor to seat frame.

(2) Engage wire connector to seat belt retractor.

(3) Install new bolts to hold seat belt retractor to seat frame.

NOTE: The torque specification on the retractor bolts is 16.2 N·M (12 ft. lbs.).

(4) Install seat belt retractor cover (Fig. 54).

(5) Install seat cover. Refer to procedure found in this section.

(6) Attach lower seat belt anchor to bolt on seat adjuster.

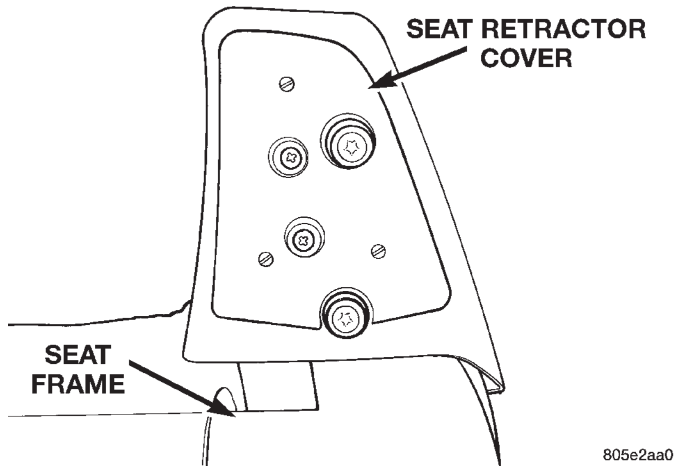


Fig. 54 Seat Belt Retractor Cover

(7) Verify that seat belt is routed such that it will not be twisted when engaged to the seat belt buckle.

(8) Install new nut holding lower seat belt anchor to seat frame (Fig. 5).

NOTE: The torque specification for the lower seat belt anchor nut is 45.3 N·M (33.3 ft. lbs.).

(9) Verify that a minimum of three threads extend beyond the lower seat belt anchor nut and that the lower seat belt anchor swivels freely. If both conditions are not found, check that the bolt is fully engaged to the seat adjuster.

(10) Install seat side shield.

(11) Install seat in vehicle. Refer to appropriate seat procedure.

CAUTION: Failure to follow proper installation procedure may result in the seat track latch pins not being synchronized.

FRONT SEAT BELT BUCKLE

REMOVAL

NOTE: The torque prevailing nut holding the front seat belt buckle to the seat adjuster is not re-usable. Verify availability prior to proceeding.

(1) Remove nut holding seat belt buckle to seat adjuster. Discard nut.

(2) Separate seat belt buckle from seat.

INSTALLATION

(1) Verify that the black spacer washer is properly installed over the shoulder of the weld nut on the seat adjuster.

(2) Install seat belt buckle to bolt on seat adjuster.

REMOVAL AND INSTALLATION (Continued)

(3) Verify that the seat belt buckle is sitting on the shoulder of the weld nut on the seat adjuster.

(4) Install nut to hold seat belt buckle to seat adjuster.

NOTE: The torque specification for the seat belt buckle nut is 45 N·M (33 ft. lbs.).

(5) Verify that a minimum of three threads extend beyond the seat belt buckle nut. If not, check that the bolt is fully engaged to the seat adjuster.

FLOOR CONSOLE

REMOVAL

(1) Raise parking brake lever as high as possible.

(2) Move transmission shifter to neutral position.

(3) Loosen set screw on front of shifter knob and remove shift lever knob.

(4) Remove plastic plunger rod from shifter lever.

(5) Remove lighted PRNDL letter bezel.

(6) Disconnect PRNDL bezel wire connector at the shifter mechanism.

(7) Remove screws, next to floor shifter and in console storage compartment, holding floor console to brackets on floor pan.

(8) Disconnect wire connector for floor console accessories at floor pan.

(9) Separate console from vehicle.

NOTE: The grip portion of the parking brake lever will only fit through the wider lower portion of the slot in the floor console.

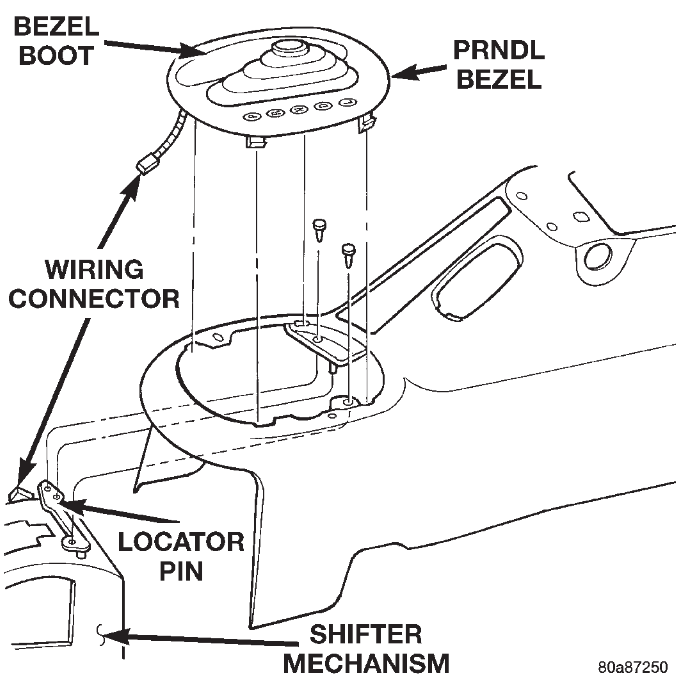


Fig. 55 PRNDL Bezel

INSTALLATION

(1) Position console in vehicle.

(2) Connect wire connector for floor console accessories at floor pan.

(3) Verify that the rear locator pin on the bottom of the storage bin is engaged to the slot in the body bracket and the front pin is engaged to the shift mechanism (Fig. 55).

(4) Install screws, next to floor shifter and in console storage compartment, holding floor console to brackets on floor pan.

(5) Connect PRNDL bezel wire connector on shifter mechanism.

(6) Install lighted PRNDL letter bezel.

(7) Install plastic plunger rod to shifter lever.

(8) Install shift lever knob and tighten set screw on front of shifter knob.

FORWARD INSTRUMENT PANEL CONSOLE

REMOVAL

(1) Remove floor console.

(2) Remove instrument panel cluster hood. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(3) Remove instrument panel center bezel. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(4) Remove left knee bolster. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(5) Release glove box door catches and allow to hang downward.

(6) Remove screws holding storage bin to forward IP console (Fig. 56).

(7) Remove storage bin from forward IP console.

(8) Remove screws holding forward IP console to shifter mounting bracket.

(9) Remove screws holding forward IP console to instrument panel at sides of storage bin area.

(10) Remove screws holding forward IP console to instrument panel support braces.

(11) Separate forward IP console from vehicle.

INSTALLATION

(1) Position forward IP console to vehicle.

(2) Install screws holding forward IP console to instrument panel support braces.

(3) Install screws holding forward IP console to instrument panel at sides of storage bin area.

(4) Install screws holding forward IP console to shifter mounting bracket.

(5) Install storage bin from forward IP console.

(6) Install screws holding storage bin to forward IP console.

(7) Release glove box door catches and allow to hang downward.

REMOVAL AND INSTALLATION (Continued)

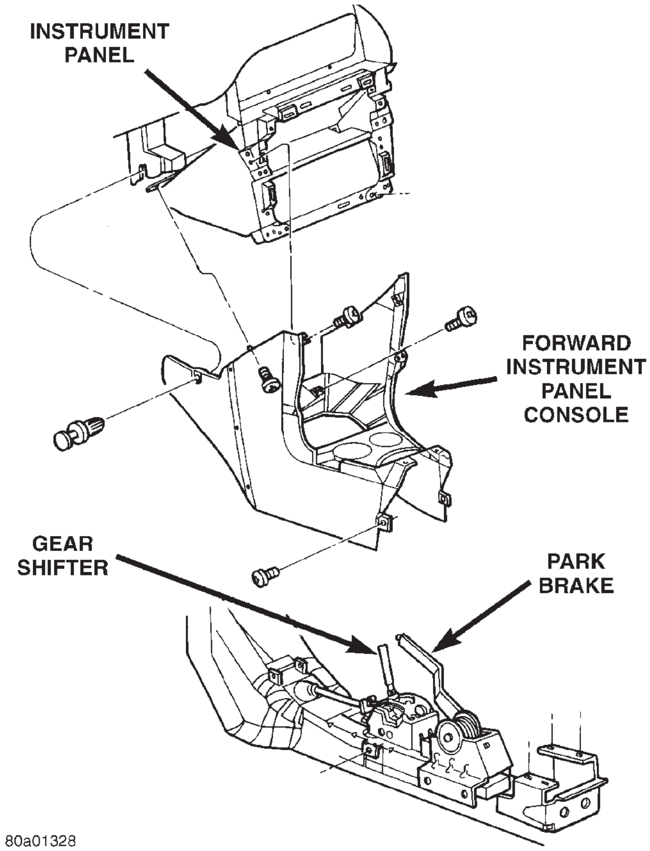


Fig. 56 Forward Instrument Panel Console

(8) Install left knee bolster. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(9) Install instrument panel center bezel. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(10) Install instrument panel cluster hood. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(11) Install floor console.

REAR SEAT CUSHION

NOTE: Special care should be taken when removing rear seat cushion to prevent damage to the cushion frame. Remove cushion at attachment areas, not at wing area.

REMOVAL

(1) Push firmly rearward and upward at one attachment point and disengage wire loops from retainers in floor pan (Fig. 57).

(2) Repeat for other attachment point.

(3) Separate rear seat cushion from vehicle.

INSTALLATION

(1) Position rear seat cushion in vehicle.

(2) Place inner seat belts on top of seat cushion.

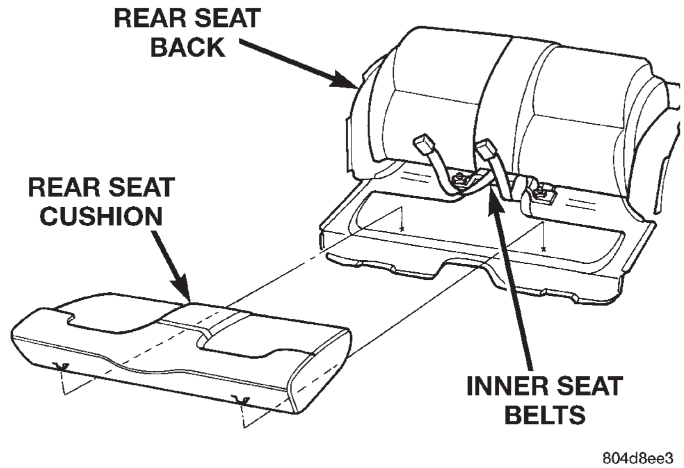


Fig. 57 Rear Seat Cushion

(3) Push seat cushion rearward and align wire loops to retainers in floor pan.

(4) Push rear seat cushion firmly downward and engage wire loops to retainers in floor pan.

REAR SEAT BACK

REMOVAL

(1) Remove rear seat cushion.

(2) Remove rear inner seat belt assembly (Fig. 58).

(3) Pull bottom of rear seat back forward until seat back brackets clear studs on floor pan (Fig. 59).

(4) Push upward on rear seat back and disengage hooks holding seat back to rear seat back support.

(5) Separate rear seat back from vehicle.

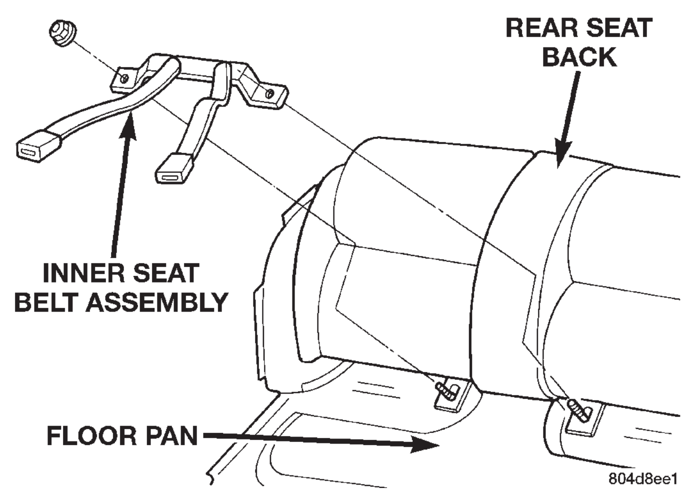


Fig. 58 Rear Inner Seat Belt Assembly

INSTALLATION

(1) Position rear seat back in vehicle.

(2) Tilt rear seat back rearward and raise seat back above retaining brackets on rear seat back support.

REMOVAL AND INSTALLATION (Continued)

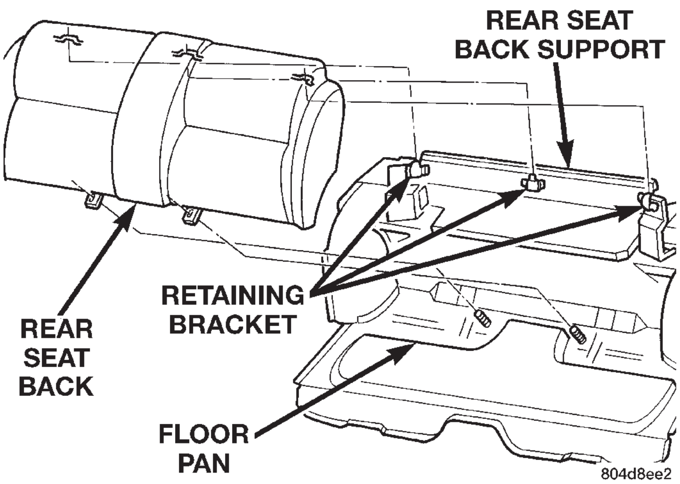


Fig. 59 Rear Seat Back

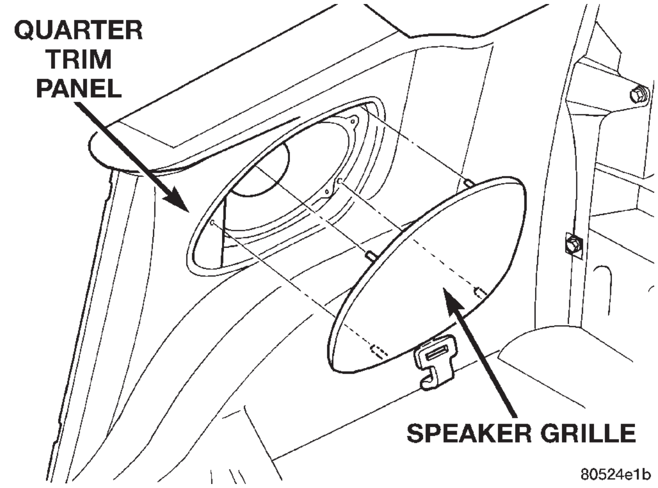


Fig. 60 Speaker Grille

(3) Lower rear seat back until center loop begins to engage.

(4) Lower rear seat back and push rearward on outboard corners of seat back to engage outboard hooks to brackets on rear seat back support.

(5) Push downward on rear seat back until all hooks are fully engaged into retaining brackets.

(6) Install rear inner seat belt assembly.

(7) Install rear seat cushion.

NOTE: Torque specification for rear inner seat belt assembly is 40 N·m (350 in. lbs.).

QUARTER TRIM PANEL

REMOVAL

(1) Lower convertible top.

(2) Remove rear seat cushion and rear seat back.

(3) Remove door sill trim panel.

(4) Remove push-in fastener holding quarter trim panel to door sill panel.

(5) Remove speaker grille (Fig. 60).

(6) Remove vertical screws and inboard velcro screw holding quarter trim panel to inner quarter panel (Fig. 61).

(7) Remove screws holding quarter trim panel to inner quarter panel through the speaker opening.

(8) Remove screws holding quarter trim panel to inner quarter panel at rear of trim panel.

(9) Remove push–in fasteners holding quarter trim panel to inner quarter panel at front of trim panel.

(10) Pull trim panel from inner quarter panel and disconnect speaker wiring connector.

(11) Separate quarter trim panel from vehicle.

INSTALLATION

(1) Position quarter trim panel on vehicle.

(2) Connect speaker wiring connector.

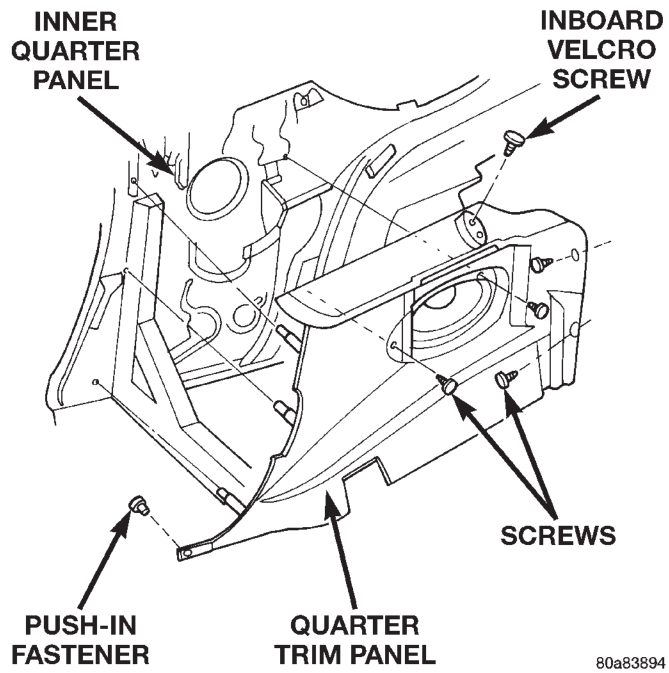


Fig. 61 Quarter Trim Panel

(3) Install push–in fasteners holding quarter trim panel to inner quarter panel at front of trim panel.

(4) Install screws holding quarter trim panel to inner quarter panel through the speaker opening.

(5) Install vertical screws and inboard velcro screw holding quarter trim panel to inner quarter panel.

(6) Install screws holding quarter trim panel to inner quarter panel at rear of trim panel.

(7) Install push-in fastener holding quarter trim panel to door sill panel.

(8) Install door sill trim panel.

(9) Install speaker grille.

(10) Install rear seat cushion and rear seat back.

REMOVAL AND INSTALLATION (Continued)

REAR OUTER SEAT BELT AND RETRACTOR

REMOVAL

(1) Remove rear seat cushion.

(2) Remove rear seat back.

(3) Remove quarter trim panel.

(4) Remove bolt holding seat belt anchor to floor pan (Fig. 62).

(5) Remove bolt holding seat belt retractor to rear seat support assembly.

(6) Separate seat belt and retractor assembly from vehicle.

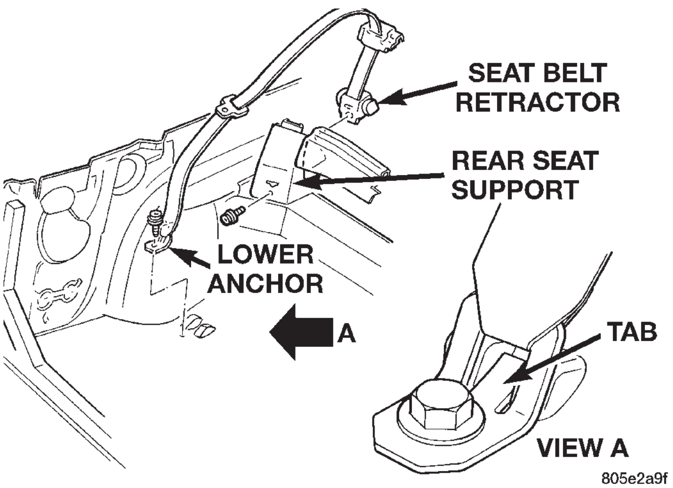


Fig. 62 Rear Outer Seat Belt And Retractor

INSTALLATION

(1) Position seat belt and retractor assembly to rear seat support assembly.

(2) Engage hook on seat belt retractor to slot in rear seat support assembly.

(3) Install bolt holding seat belt retractor to rear seat support assembly.

(4) Route seat belt through channel and snap bezel onto top of channel.

(5) Install bolt holding seat belt anchor to floor pan.

(6) Verify that seat belt is not twisted when engaged to seat belt buckle and that the tab on the lower seat belt anchor is between the formations on the floor pan (Fig. 62).

(7) Install quarter trim panel.

(8) Install rear seat back.

(9) Install rear seat cushion.

NOTE: Torque for both seat belt fasteners is 40 N·M (350 in. lbs.)

REAR INNER SEAT BELT ASSEMBLY

REMOVAL

(1) Remove rear seat cushion.

(2) Remove nuts holding seat belt assembly to floor pan.

(3) Remove rear inner seat belt assembly (Fig. 63).

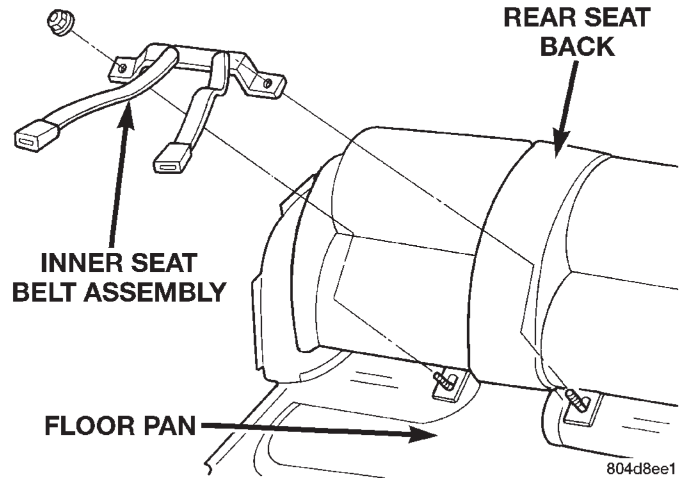


Fig. 63 Rear Inner Seat Belt Assembly

INSTALLATION

(1) Position rear inner seat belt assembly onto studs on floor pan.

(2) Install nuts holding seat belt assembly to floor pan.

(3) Install rear seat cushion.

NOTE: Torque specification for rear inner seat belt assembly is 40 N·m (350 in. lbs.).

QUARTER GLASS

NOTE: No access is provided to glass fasteners except if glass is in the full up position. If this position can not be achieved, remove the quarter window module. Refer to quarter window module procedure in this section.

REMOVAL

(1) Raise glass to full up position.

(2) Remove quarter trim panel.

(3) Partially lower convertible top.

(4) Remove fasteners attaching glass to lift channel of quarter window module (Fig. 64).

(5) Loosen latch plate hook nut.

(6) Separate glass from vehicle.

INSTALLATION

(1) Position glass in vehicle.

(2) Loosely install fasteners holding glass to lift channel of quarter window module.

(3) Lower and secure convertible top.

(4) Tighten latch plate hook nut.

(5) Adjust quarter glass as necessary. Refer to quarter glass adjustment procedure in this section.

REMOVAL AND INSTALLATION (Continued)

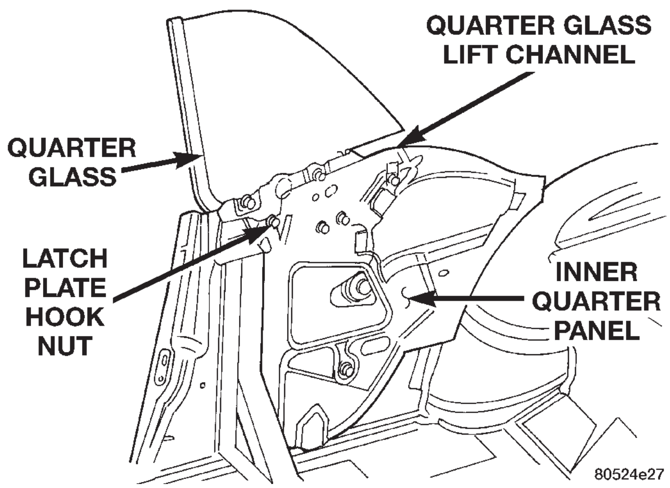


Fig. 64 Quarter Glass

(6) Install quarter trim panel.

QUARTER WINDOW MODULE

REMOVAL

(1) Raise quarter glass to full up position, if possible, to aid in removal.

(2) Remove quarter trim panel.

(3) Partially lower convertible top.

(4) Disconnect wire connector to power window motor.

(5) Remove fasteners holding quarter window module to inner quarter panel (Fig. 65).

(6) Lift quarter window module upward and out opening at top of quarter panel.

(7) Separate quarter glass from quarter window module (Fig. 66).

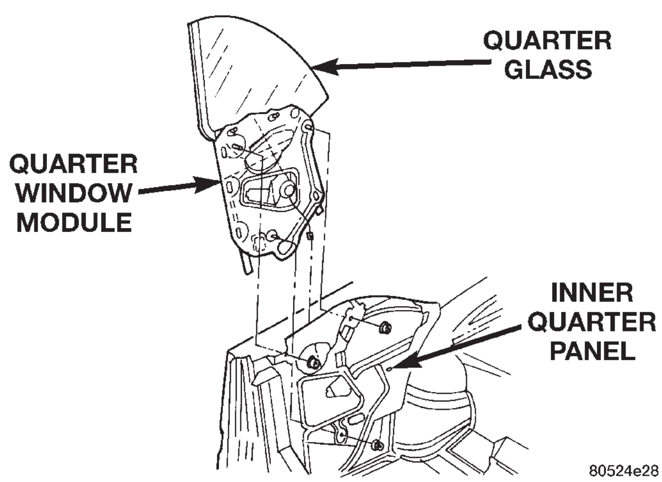


Fig. 65 Quarter Window Module

INSTALLATION

(1) Lower quarter window module into position through opening in top of quarter panel.

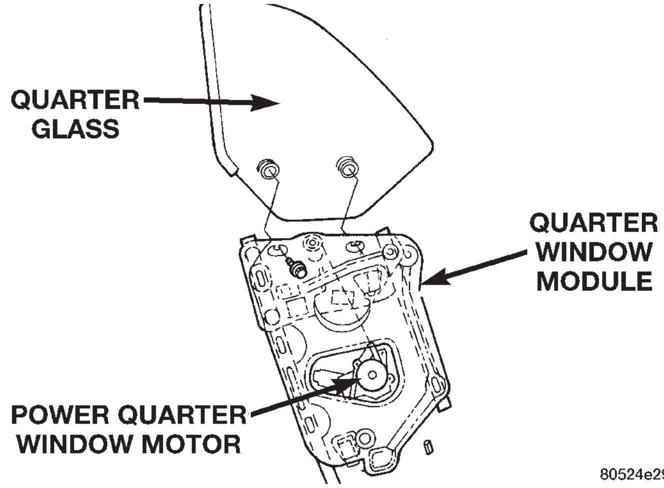


Fig. 66 Quarter Glass

(2) Install fasteners holding quarter window module to inner quarter panel.

(3) Connect wire connector to power window motor.

(4) Raise glass lift channel to full up position.

(5) Position quarter glass on quarter window module.

(6) Loosely install fasteners holding quarter glass to quarter window module.

(7) Lower and secure convertible top.

(8) Adjust quarter glass as necessary. Refer to quarter glass adjustment procedure in this section.

(9) Install quarter trim panel.

CARPET

REMOVAL

(1) Lower convertible top to full down position.

(2) Remove front seats.

(3) Remove rear seat cushion.

(4) Remove floor console and forward instrument panel console.

(5) Remove door sill trim panels.

(6) Remove cowl trim panels.

(7) Remove quarter trim panels.

(8) Remove amplifier on passenger side of floor pan, if so equipped.

(9) Remove wiring troughs holding carpet at outboard ends of rear seat crossmember.

(10) Remove push–in fasteners from rear of carpet holding carpet to rear seat crossmember (Fig. 67).

(11) Remove plastic sill retainers from metal clips along door sill panel.

(12) Separate carpet from vehicle (Fig. 67).

INSTALLATION

(1) Position carpet in vehicle.

(2) Install push–in fasteners from rear of carpet holding carpet to rear seat crossmember.

REMOVAL AND INSTALLATION (Continued)

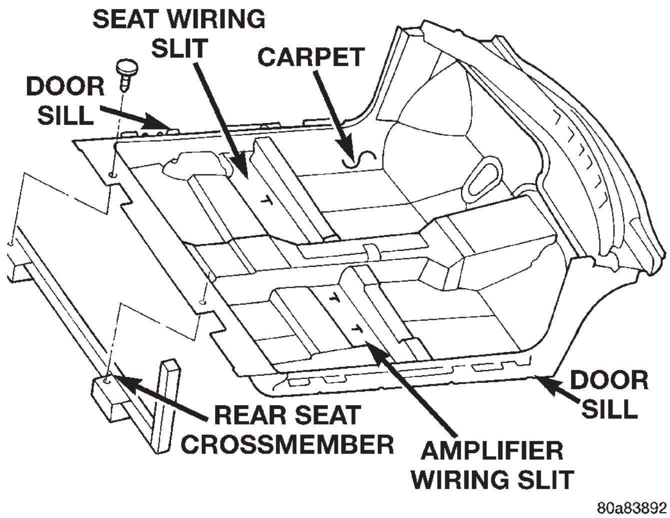


Fig. 67 Carpet Fasteners

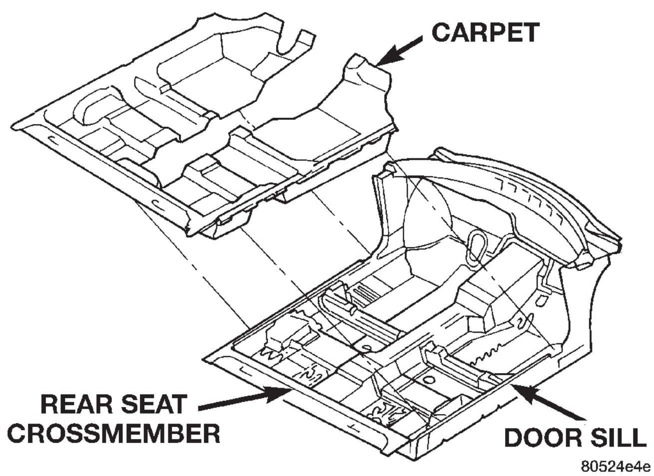


Fig. 68 Carpet

(3) Feed wiring connectors for the seats and amplifier, if equipped, through slits in carpet.
(4) Install plastic sill retainers in metal clips along door sill panel.
(5) Install wiring troughs holding carpet at outboard ends of rear seat crossmember.
(6) Install amplifier on passenger side of floor pan, if so equipped.
(7) Install quarter trim panels.
(8) Install cowl trim panels.
(9) Install door sill trim panels.
(10) Install floor console and forward instrument panel console.
(11) Install rear seat cushion.
(12) Install front seats.
(13) Raise and secure convertible top.

QUARTER PANEL OUTER BELT WEATHERSTRIP/ MOLDING

REMOVAL

(1) Lower convertible top to midway position.
(2) Lower quarter glass to full down position.
(3) Remove quarter trim panel.
(4) Remove screws holding quarter panel outer belt weatherstrip/molding to outer quarter panel.
(5) Loosen appropriate side of upper deck molding.
(6) Pull upward at one end of outer belt weatherstrip to separate from vehicle.
(7) Separate outer belt weatherstrip from vehicle.

INSTALLATION

(1) Position quarter panel outer belt weatherstrip/ molding on vehicle.
(2) Push outer belt weatherstrip/molding downward until weatherstrip/molding is fully seated.
(3) Install screws holding outer belt weather-strip to outer quarter panel.
(4) Tighten fasteners for upper belt molding.
(5) Install quarter trim panel.
(6) Raise and secure convertible top.

UPPER DECK MOLDING

REMOVAL

(1) Lower convertible top to midway position.
(2) Remove screws holding upper deck molding to rear deck panel above convertible top rear attachment.
(3) Open trunk.
(4) Remove screws holding upper deck molding to rear deck panel inside trunk water trough.
(5) Disconnect wire connector for CHMSL.
(6) Separate upper deck molding from vehicle.

INSTALLATION

(1) Position upper deck molding on vehicle.
(2) Connect wire connector for CHMSL.
(3) Install screws holding upper deck molding to rear deck panel inside trunk water trough.
(4) Install screws holding upper deck molding to rear deck panel above convertible top rear attachment.
(5) Raise and secure convertible top.

FOLDING TOP HEADLINING

REMOVAL

(1) Raise convertible top to midway position.
(2) Remove convertible top header trim panel.
(3) Remove screws holding headlining to convertible top header panel.

REMOVAL AND INSTALLATION (Continued)

(4) Remove push–in fasteners holding headlining to convertible top mechanism rearward of quarter window.
(5) Remove tack strip trim panel.
(6) Remove shock cords along both sides of headlining.
(7) Remove roof bows from convertible top mechanism.
(8) Slide roof bows from convertible top cover and headlining.
(9) Remove nuts holding headlining straps to tack strip.
(10) Disengage hook and loop fasteners holding headlining above rear window.
(11) Separate headlining from vehicle.

INSTALLATION

(1) Position headlining from vehicle.
(2) Engage hook and loop fasteners holding headlining above rear window.
(3) Install nuts holding headlining straps to tack strip.
(4) Install roof bows from convertible top mechanism.
(5) Snap plastic retainer strips on headlining and convertible top cover into channels on roof bows, working from rear bow forward.
(6) Install shock cords along both sides of headlining.
(7) Install tack strip trim panel.
(8) Install push–in fasteners holding headlining to convertible top mechanism rearward of quarter window.
(9) Install screws holding headlining to convertible top header panel.
(10) Install convertible top header trim panel.
(11) Lower and secure convertible top.

CONVERTIBLE TOP STORAGE

RIGHT OR LEFT

REMOVAL

(1) Raise and secure convertible top.
(2) Lift tack strip trim panel as necessary to access slots in convertible top storage area.
(3) Remove push in fastener in rear of side piece.
(4) Disengage slots in right/left convertible top storage area from studs along jackscrew (Fig. 69).
(5) Separate right/left storage area from vehicle.

INSTALLATION

(1) Position right/left convertible top storage area in vehicle.
(2) Engage slot in right/left storage area to studs along tack strip
(3) Install tack strip trim piece.
(4) Install push in fasteners to hold center and side storage areas below seat belt bezel.
(5) Install push in fastener in rear of side piece.

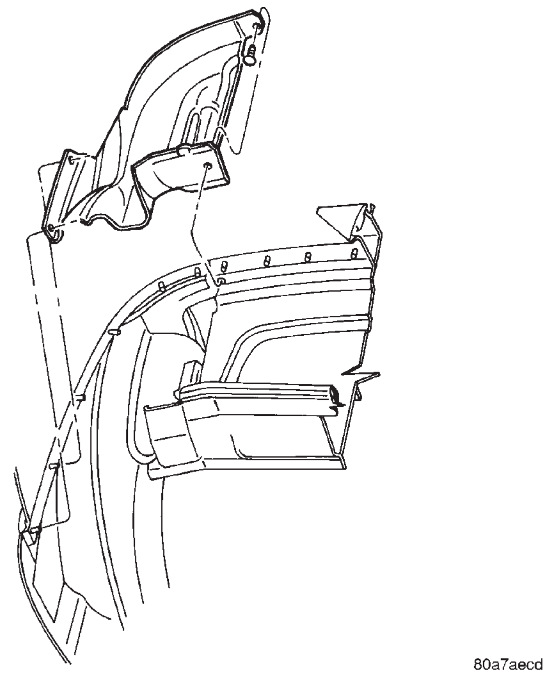


Fig. 69 Right/Left Convertible Top Storage

(6)
(7)

CENTER

REMOVAL

(1) Raise and secure convertible top.
(2) Remove tack strip trim panel as necessary.
(3) Remove right and left convertible top storage area sections.
(4) Remove push–in fasteners holding center convertible top storage section to rear of storage area (Fig. 70).
(5) Remove push in fasteners holding center and side storage areas below seat belt bezel.
(6) Pull rear of center storage area upward and disengage front of center storage area from beauty bar.
(7) Separate center storage area from vehicle.

INSTALLATION

(1) Position center convertible top storage area in vehicle.
(2) Engage front of center storage area under beauty bar and push rear of center storage area downward into position.
(3) Install push–in fasteners holding center convertible top storage section to rear of storage area.
(4) Install push in fasteners to hold center and side storage areas below seat belt bezel.
(5) Install right and left convertible top storage area sections.
(6) Install tack strip trim panel.

REMOVAL AND INSTALLATION (Continued)

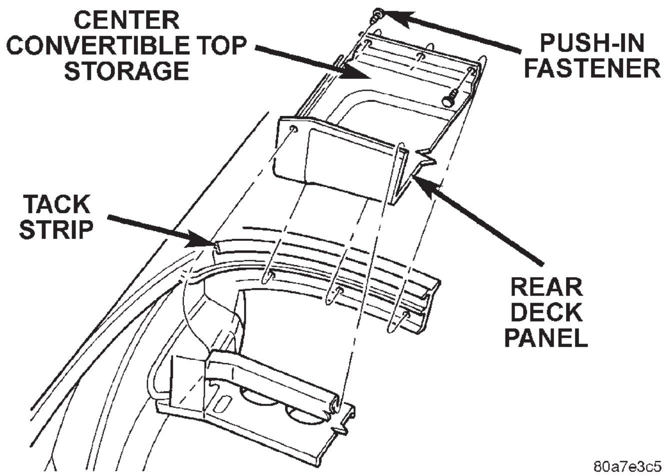


Fig. 70 Center Convertible Top Storage

TRUNK LID

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Mark outline of hinge on trunk lid to aid in installation (Fig. 71).

(3) Disconnect all wire connectors from trunk latch and disengage wire harness from trunk lid.

(4) Place suitable padding between trunk lid and deck panel to protect paint finish.

(5) With aid of a helper, remove bolts holding trunk lid to trunk hinge.

(6) Separate trunk lid from vehicle.

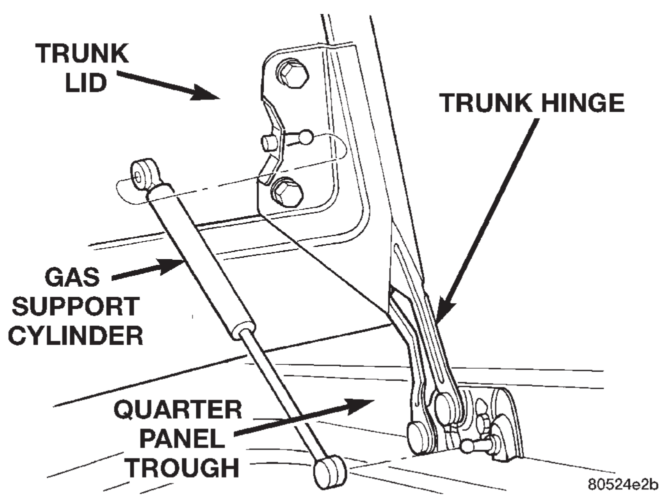


Fig. 71 Trunk Hinge And Gas Support Cylinder

INSTALLATION

(1) Position trunk lid on vehicle.

(2) With aid of a helper, loosely install bolts holding trunk lid to trunk hinge.

(3) Align marks made on trunk lid previously to trunk hinge and tighten bolts holding trunk lid to trunk hinge.

(4) Connect all wire connectors to trunk latch and install wire harness to trunk lid.

(5) Verify fit of trunk lid to deck panel. Adjust as necessary.

TRUNK HINGE AND GAS SUPPORT CYLINDER

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Mark outline of trunk hinge on trunk lid and quarter panel trough to aid in installation.

(3) Place suitable padding to cover deck panel in order to protect paint finish.

(4) Using a suitable wooden dowel or other prop rod, support trunk lid.

(5) Pull out caps at each end of gas support cylinder.

(6) Disengage gas support cylinder from trunk hinge by prying cylinder from ball stud on hinge (Fig. 71).

(7) With aid of a helper, remove bolts holding trunk hinge to trunk lid.

(8) Remove bolts holding trunk hinge to quarter panel.

(9) Separate trunk hinge from vehicle.

INSTALLATION

(1) Position trunk hinge to vehicle.

(2) Loosely install bolts holding trunk hinge to quarter panel.

(3) Loosely install bolts holding trunk hinge to trunk lid.

(4) Align trunk hinge to marks made previously and tighten all fasteners.

(5) Install gas support cylinder to trunk hinge.

(6) Install caps at each end of gas support cylinder.

(7) Verify fit of trunk lid to deck panel. Adjust as necessary.

TRUNK LATCH STRIKER

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Mark outline of trunk latch striker on rear closure panel to aid in installation.

(3) Remove bolts holding trunk latch striker to rear closure panel (Fig. 72).

(4) Separate striker from vehicle.

INSTALLATION

(1) Position striker in vehicle.

(2) Loosely install bolts holding trunk latch striker to rear closure panel.

(3) Align trunk latch striker to marks made previously on rear closure panel and tighten bolts.

(4) Verify fit of trunk lid to deck panel and operation of trunk latch. Adjust as necessary.

REMOVAL AND INSTALLATION (Continued)

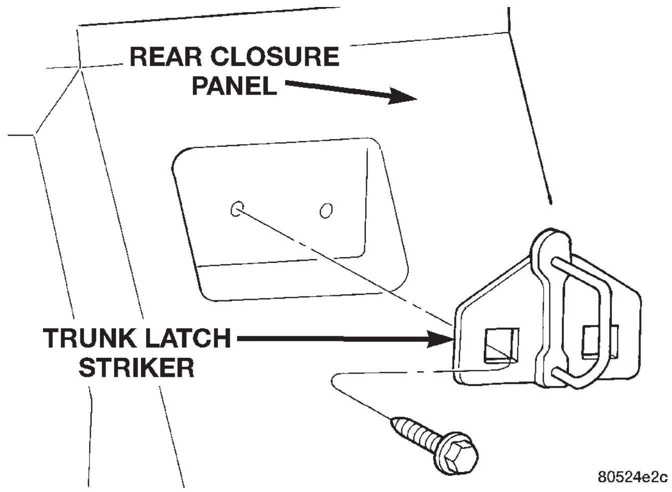


Fig. 72 Trunk Latch Striker

TRUNK LATCH

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Mark outline of trunk latch on trunk lid to aid in installation.

(3) Disconnect wire connectors to remote release solenoid, if so equipped (Fig. 73).

(4) Remove bolts holding trunk latch to trunk lid.

(5) Separate trunk latch from vehicle.

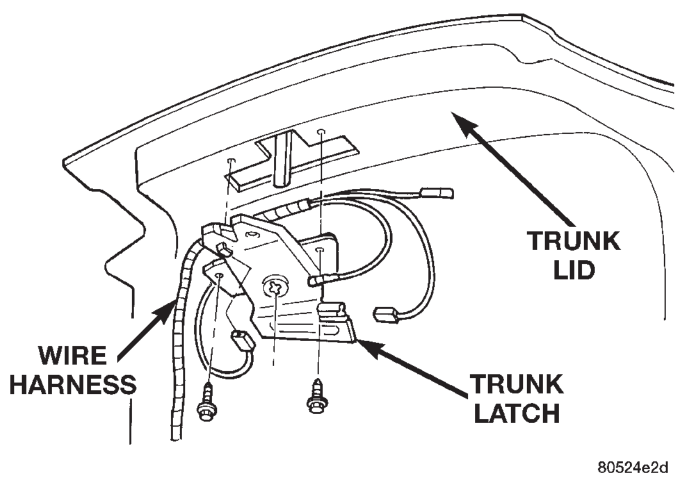


Fig. 73 Trunk Latch

INSTALLATION

(1) Position trunk latch on vehicle.

(2) Loosely install bolts holding trunk latch to trunk lid.

(3) Align trunk latch to marks made previously on trunk lid and tighten bolts.

(4) Connect wire connectors to remote release solenoid, if so equipped.

(5) Verify fit of trunk lid to deck panel and trunk latch operation. Adjust as necessary

TRUNK LOCK CYLINDER

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Remove trunk latch.

(3) Remove clip holding trunk lock cylinder to security alarm switch, if so equipped (Fig. 74).

(4) Remove security alarm switch, if so equipped.

(5) Remove clip holding trunk lock cylinder to trunk lid.

(6) Separate trunk lock cylinder from vehicle.

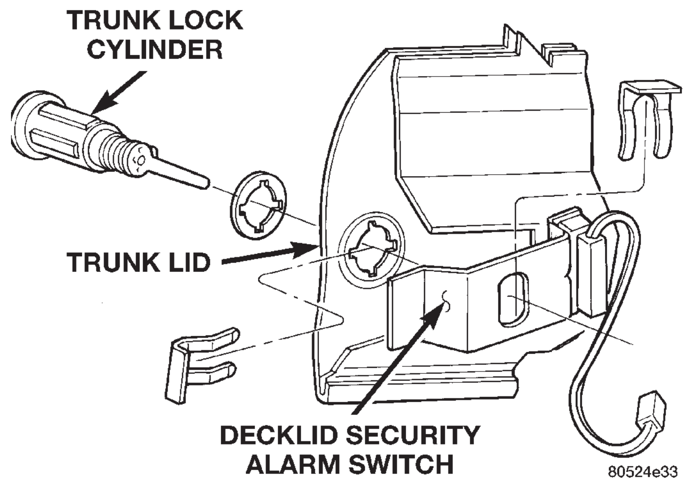


Fig. 74 Trunk Lock Cylinder

INSTALLATION

(1) Position trunk lock cylinder on vehicle

(2) Install clip holding trunk lock cylinder to trunk lid.

(3) Install security alarm switch, if so equipped.

(4) Install clip holding trunk lock cylinder to security alarm switch, if so equipped.

(5) Install trunk latch.

TRUNK OPENING WEATHERSTRIP

REMOVAL

(1) Release trunk latch and open trunk lid.

(2) Pull trunk opening weatherstrip from trunk opening flange (Fig. 75).

(3) Separate trunk opening weatherstrip from vehicle.

INSTALLATION

(1) Position trunk opening weatherstrip on vehicle.

(2) Starting with one end of trunk opening weatherstrip over trunk latch striker, push weatherstrip onto trunk opening flange.

(3) Verify that the ends of the trunk opening weatherstrip meet above the trunk latch striker.

(4) Verify trunk lid operation and sealing.

REMOVAL AND INSTALLATION (Continued)

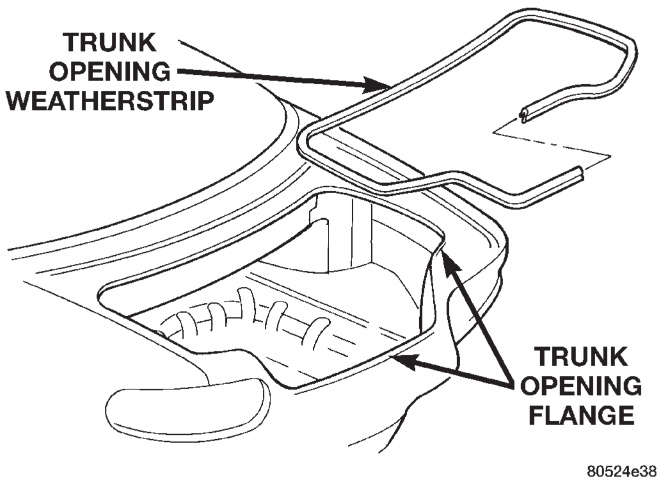


Fig. 75 Trunk Opening Weatherstrip

BODY SIDE MOLDING

REMOVAL

(1) Warm the affected body side molding and body metal to approximately 38°C (100°F) using a suitable heat lamp or heat gun.

(2) Pull body side molding from vehicle (Fig. 76).

(3) Remove adhesive tape residue from surface of vehicle.

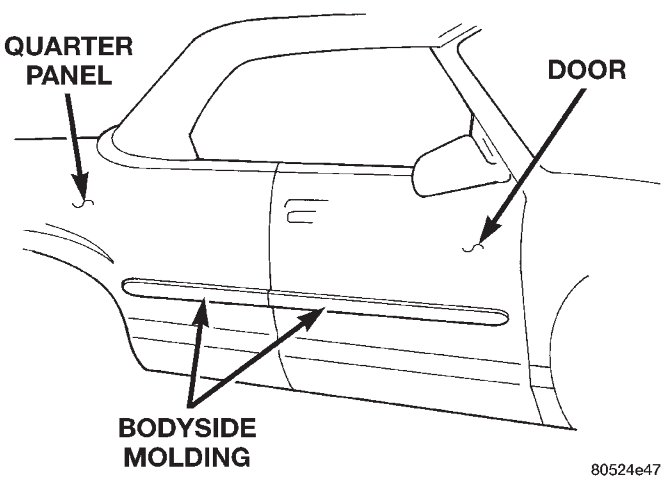


Fig. 76 Body Side Molding

INSTALLATION

(1) If molding is to be reused, remove tape residue from molding. Clean back of molding with Mopar® Super Kleen solvent or equivalent. Wipe molding dry with lint free cloth. Apply new body side molding (two sided adhesive) tape to back of molding.

(2) Clean body surface with Mopar® Super Kleen solvent or equivalent. Wipe surface dry with a lint free cloth.

(3) Apply a length of masking tape on the body parallel to the top edge of the molding to use as a guide, if necessary.

(4) Remove protective cover from tape on back of molding. Apply molding to body below the masking tape guide.

(5) Remove masking tape guide. Heat body metal and body side molding to approximately 38°C (100°F) using a suitable heat lamp or heat gun.

(6) Firmly press body side molding to body surface to insure adhesion.

ADJUSTMENTS

FRONT DOOR GLASS ADJUSTMENT

NOTE: Verify that the door is properly adjusted to the body prior to adjusting the door glass.

NOTE: Lower quarter glass to the full down position while making door glass adjustments, unless otherwise instructed.

UP-STOP ADJUSTMENTS

(1) Remove door trim panel.

(2) Remove water shield as necessary to gain access to adjuster.

(3) Loosen up-stop nut (Fig. 78) and bolt (Fig. 79).

(4) Remove weatherstrip from location to be adjusted.

NOTE: Remove only one weatherstrip section at a time or the glass to weatherstrip retainer measurements will not be accurate.

(5) Close door and raise door glass.

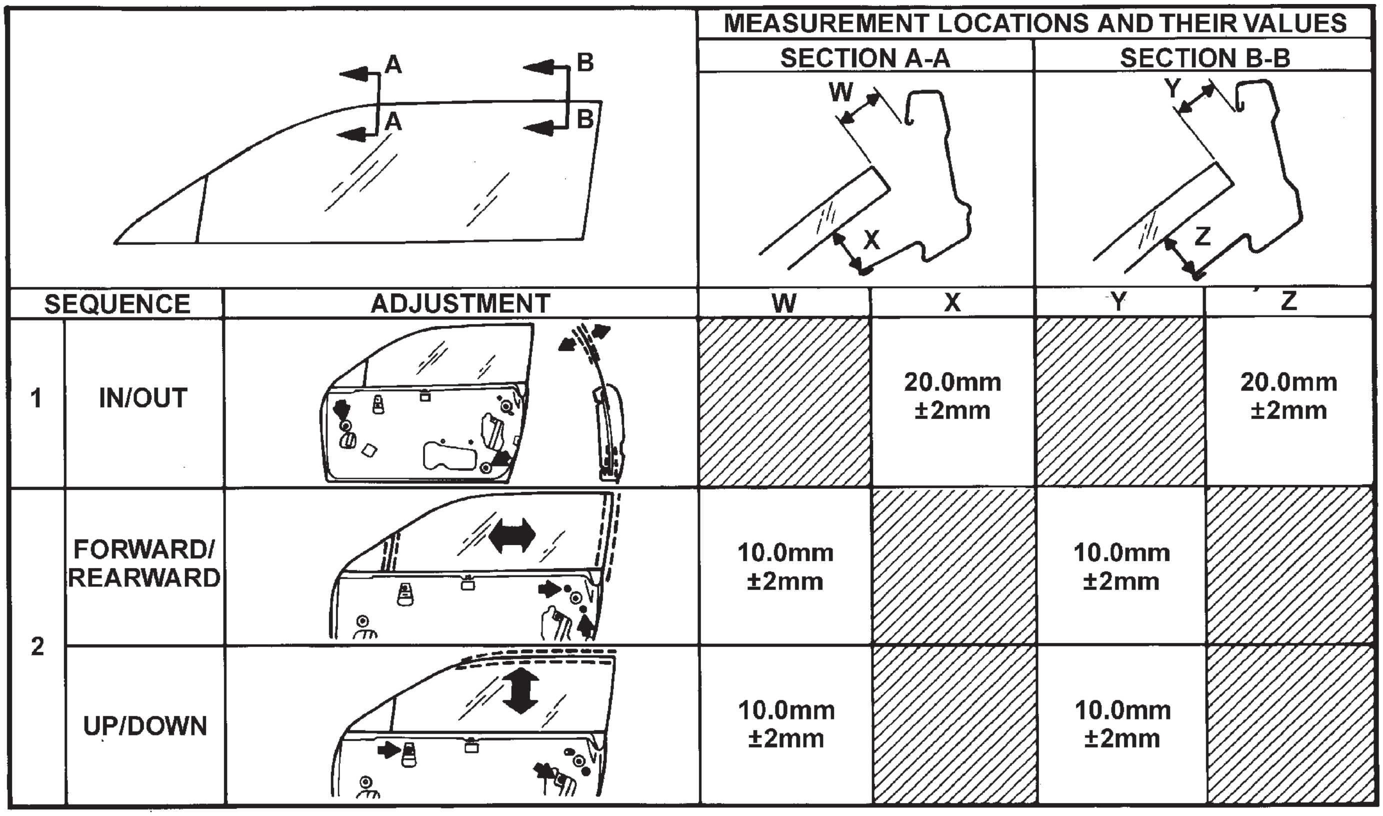
(6) Slide up-stop to achieve proper glass to weatherstrip retainer gap (Fig. 77).

(7) Tighten all fasteners.

(8) Verify that forward up–stop fully contacts hook on glass. Adjust contact bolt on forward up–stop as necessary.

ADJUSTMENTS (Continued)

ADJUSTMENT SPECIFICATIONS



SEQUENCE		ADJUSTMENT	W	X	Y	Z
1	IN/OUT			20.0mm ±2mm		20.0mm ±2mm
2	FORWARD/ REARWARD		10.0mm ±2mm		10.0mm ±2mm	
	UP/DOWN		10.0mm ±2mm		10.0mm ±2mm	

NOTE: Forward / Rearward and Up/Down adjustment are to be made at the same time.

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Fig. 77

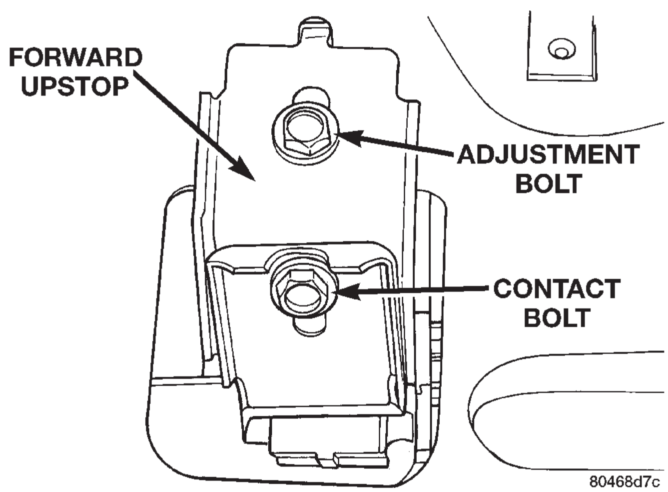


Fig. 78 Forward Up–Stop Adjustment

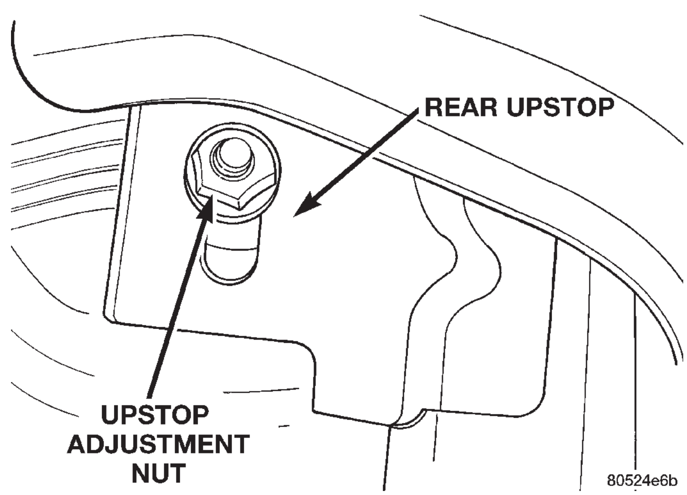


Fig. 79 Rear Up–Stop Adjustment

TOP OF GLASS—INBOARD/OUTBOARD ADJUSTMENTS

(1) Remove door trim panel.

(2) Remove water shield as necessary to gain access to adjusters.

(3) Using a suitable wrench, loosen the lower jack-screw jam-nuts (Fig. 80).

(4) Remove weatherstrip from side rail weather-strip retainer at point to be adjusted.

(5) Close door and raise glass.

(6) Using a suitable allen-wrench, rotate jack-screws to achieve the proper gap between the door glass weatherstrip retainer strip (Fig. 77).

ADJUSTMENTS (Continued)

NOTE: Remove only one weatherstrip section at a time or the glass to weatherstrip retainer measurements will not be accurate.

(7) Verify that the top edge of the door glass is beneath the lip of the weatherstrip.

(8) Tighten all fasteners.

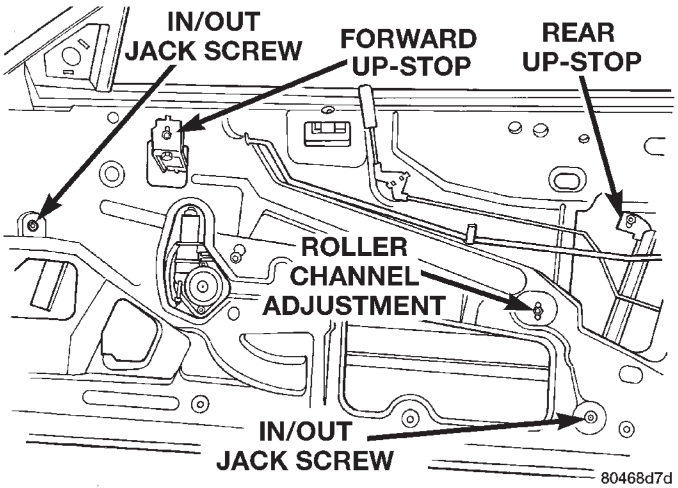


Fig. 80 Inboard/Outboard Glass Adjustment

GLASS—FRONT/REAR ADJUSTMENT

(1) Remove door trim panel and water shield.

(2) Lower door glass to gain access to glass attachments.

(3) Loosen three glass attachment bolts.

(4) Raise door glass and position correctly (Fig. 77) and (Fig. 81).

(5) Tighten the two accessible glass fasteners in the full up position.

(6) Lower door glass and tighten the remaining glass fastener.

(7) Raise glass to top of travel and verify positioning (Fig. 77) and (Fig. 81).

(8) To verify proper fit of the door glass to the header/A-pillar weatherstrip,

(a) Lower door glass slightly.

(b) Place a paper strip between the glass and weatherstrip near mirror flag and another near the front upper corner of the door glass.

(c) Raise glass to full up position.

(d) Pull the strip from between the door glass and the weatherstrip. There should be slight tension on the paper.

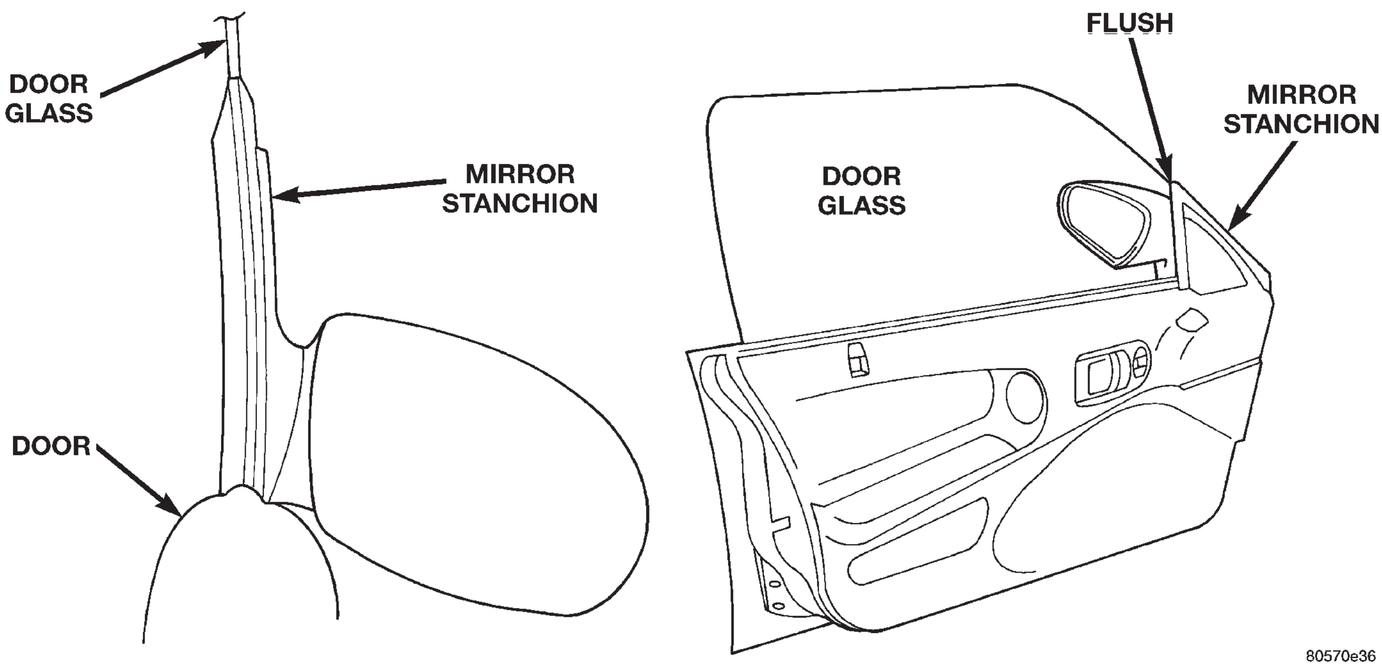


Fig. 81 Front/Rear Glass Position

ADJUSTMENTS (Continued)

DOOR GLASS ALIGNMENT VERIFICATION

NOTE: Door Glass Alignment Verification procedure must be done whenever the door glass is adjusted and after all adjustments are made.

(1) Raise quarter glass to full up position.
(2) Close door and cycle door glass between full up and full down positions.
(3) Verify that door glass operates smoothly and maintains correct alignment to convertible top and quarter glass.
(4) Verify that quarter glass weatherstrip fully contacts door glass.
(5) Verify that no scissoring of the door glass and weatherstrip occurs.
(6) If any of the above conditions are found,
(a) Adjust quarter glass. Refer to Quarter Glass Adjustment procedures found in this section.
(b) Re–adjust the door glass as necessary to cure the condition.

QUARTER GLASS ADJUSTMENT

NOTE: The door glass must be properly adjusted prior to performing any quarter glass adjustments.

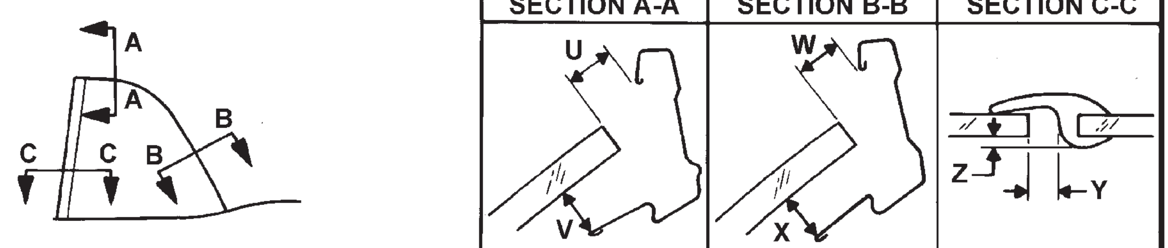
UP-STOP ADJUSTMENTS

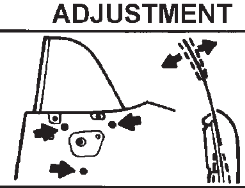
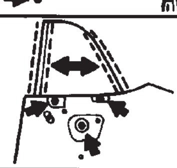
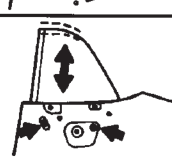
(1) Remove quarter trim panel.
(2) Remove center and rear side rail weatherstrips from side rail weatherstrip retainer channels.
(3) Loosen up-stop nuts.
(4) Raise quarter glass.
(5) Slide up-stop to achieve proper glass to weatherstrip retainer gap (Fig. 82).
(6) Tighten all fasteners.
(7) Install center and rear side rail weatherstrips to side rail weatherstrip retainer channels.
(8) Cycle quarter glass between full up and full down positions. Verify operation and re-adjust as necessary.
(9) Verify that the top edge of the door glass is beneath the lip of the weatherstrip.
(10) Install quarter trim panel.

TOP OF GLASS—INBOARD/OUTBOARD ADJUSTMENTS

(1) Remove quarter trim panel.
(2) Remove center and rear side rail weatherstrips from side rail weatherstrip retainer channels.
(3) Using a suitable wrench, loosen the lower jackscrew jam-nuts.
(4) Raise quarter glass.

ADJUSTMENT SPECIFICATIONS



SEQUENCE		ADJUSTMENT	MEASUREMENT LOCATIONS AND THEIR VALUES					
			SECTION A-A		SECTION B-B		SECTION C-C	
			U	V	W	X	Y	Z
1	IN/OUT			20.0mm ±2mm		20.0mm ±2mm		2.0mm ±1mm
2	FORWARD/ REARWARD		10.0mm ±2mm		10.0mm ±3mm		6.0mm ±1mm	
	UP/DOWN		10.0mm ±2mm		10.0mm ±3mm			

NOTE: Forward / Rearward and Up/Down adjustment are to be made at the same time.

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Fig. 82

ADJUSTMENTS (Continued)

(5) Using a suitable allen-wrench, rotate jack-screws to achieve the proper gap between the door glass weatherstrip retainer channel (Fig. 82).

(6) Verify that the quarter glass maintains even contact with the outer belt weatherstrip.

(7) Install center and rear side rail weatherstrips to side rail weatherstrip retainer channels.

(8) Cycle quarter glass between full up and full down positions. Verify operation and re-adjust as necessary.

(9) Tighten all fasteners.

(10) Verify that the top edge of the door glass is beneath the lip of the weatherstrip with glass in the full up position.

(11) Install quarter trim panel.

GLASS—FRONT/REAR ADJUSTMENT

(1) Remove quarter trim panel.

(2) Remove center and rear side rail weatherstrips from side rail weatherstrip retainer channels.

(3) Loosen glass attachment bolts.

(4) Raise quarter glass and position correctly (Fig. 82).

(5) Tighten all fasteners.

(6) Install center and rear side rail weatherstrips to side rail weatherstrip retainer channels.

(7) Cycle quarter glass between full up and full down positions. Verify operation and re-adjust as necessary.

(8) Install quarter trim panel.

QUARTER GLASS ALIGNMENT VERIFICATION

(1) Raise door glass to full up position.

(2) Cycle quarter glass between full up and full down positions.

(3) Verify that quarter glass operates smoothly and maintains correct alignment to convertible top and door glass.

(4) Verify that quarter glass weatherstrip fully contacts door glass.

(5) Verify that no scissoring of the door glass and weatherstrip occurs.

(6) If any of the above conditions are found,

(a) Re-adjust quarter glass.

(b) Adjust the door glass as necessary to cure the condition.

DOOR LATCH ADJUSTMENT

(1) Insert a suitable allen–wrench through elongated slot in door end frame and loosen bolt 1/2 to one full turn (Fig. 83).

(2) Cycle outside door handle twice.

(3) Tighten adjusting screw to 30 in. lbs.

(4) Verify latch operation.

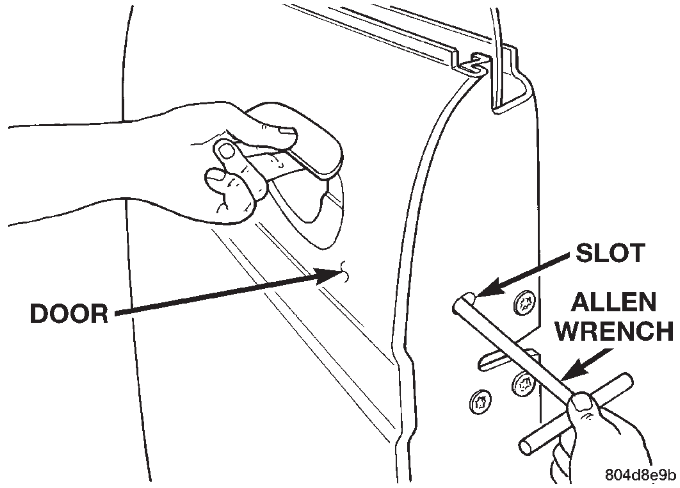


Fig. 83 Door Latch Adjustment

SPECIFICATIONS

BODY LUBRICATION SPECIFICATIONS

LUBRICATION REQUIREMENTS

Body mechanisms and linkages should be inspected, cleaned, and lubricated, as required, to maintain ease of operation and to provide protection against rust and wear. When performing other underhood services, the hood latch release mechanism and safety catch should be inspected, cleaned, and lubricated. During the winter season, external door lock cylinders should be lubricated to assure proper operation when exposed to water and ice.

Prior to the application of any lubricant, the parts concerned should be wiped clean to remove dust and grit. If necessary, a suitable solvent can be used to clean the item to be lubricated. After lubricating a component, any excess oil or grease should be removed.

LUBRICANT APPLICATION

DOOR LOCK CYLINDERS

(1) Apply a small amount of lubricant directly into the lock cylinder.

(2) Apply a small amount of lubricant to the key.

(3) Insert key into lock cylinder and cycle the mechanism from the locked to the unlocked position.

NOTE: Do not add more lubricant.

(4) Cycle the lock cylinder mechanism several times to allow the lubricant to flow throughout the cylinder.

(5) Wipe all lubricant from exterior of lock cylinder and key.

ALL OTHER BODY MECHANISMS

(1) Clean component as described above.

(2) Apply specified lubricant to all pivoting and sliding contact areas of component.

SPECIFICATIONS (Continued)

LUBRICANT USAGE

ENGINE OIL

- Hood Hinges—Pivot Points
- Trunk Lid Hinges

MOPAR® SPRAY WHITE LUBE OR EQUIVALENT

- Door Check Straps
- Trunk Lid Prop Pivots
- Ash Receiver
- Parking Brake Mechanism
- Sliding Seat Tracks
- Trunk Latch

MOPAR® MULTI–PURPOSE GREASE OR EQUIVALENT

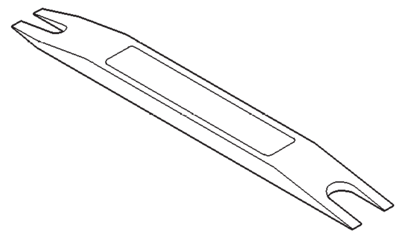
- All Other Hood Mechanisms
- Door Hinges—Hinge Pin and Pivot Contact Areas

MOPAR® LOCK CYLINDER LUBRICANT OR EQUIVALENT

- Door Lock Cylinders
- Trunk Lock Cylinder

SPECIAL TOOLS

BODY



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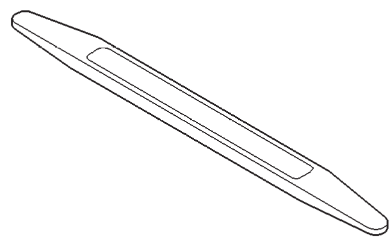

STICK, TRIM C4755

HEATING AND AIR CONDITIONING

CONTENTS

GENERAL INFORMATION

INTRODUCTION

The heater/air conditioning systems share many of the same components. This group will deal with both systems together when component function is common, and separately when they are not.

For proper operation of the instrument panel controls, refer to the Owner's Manual provided with the vehicle.

All vehicles are equipped with a common Heater-A/C unit housing assembly.

GENERAL INFORMATION (Continued)

SAFETY PRECAUTIONS AND WARNINGS

WARNING: WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM EYE CONTACT WITH REFRIGERANT. IF EYE CONTACT IS MADE, SEEK MEDICAL ATTENTION IMMEDIATELY.

DO NOT EXPOSE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC TYPE LEAK DETECTOR IS RECOMMENDED.

LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.

THE EVAPORATION RATE OF REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH REFRIGERANT. R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR.

SOME MIXTURES OF AIR and R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. SEEK MEDICAL ATTENTION IMMEDIATELY IF SWALLOWED OR INHALED. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN AND PETS.

DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT RUNNING TEMPERATURE. PERSONAL INJURY CAN RESULT.

CAUTION: The engine cooling system is designed to develop internal pressure of 97 to 123 kPa (14 to 18 psi). Allow the vehicle to cool a minimum of 15 minutes before opening the cooling system. Refer to Group 7, Cooling System.

DESCRIPTION AND OPERATION

AIR CONDITIONING COMPONENTS

A/C PRESSURE TRANSDUCER

The switch is located on the discharge line near the compressor. The pressure transducer functions as the refrigerant system pressure sensor. It supports the condenser/radiator fans and compressor functions.

CLUTCH, PULLEY AND COIL

They are mounted on the compressor providing a way to drive the compressor. The compressor clutch and coil are the only serviced parts on the compressor. When the compressor is not in operation, the pulley free wheels on the clutch hub bearing. When the coil is energized the clutch plate is magnetically engaged with the pulley and turns the compressor shaft.

COMPRESSOR

The compressor compresses the low pressure refrigerant vapor from the evaporator into a high pressure, high temperature vapor. The Scroll TRS-90 Compressor is used on all models. The system uses polyalkylene glycol synthetic wax-free refrigerant oil SP-15 PAG.

CONDENSER

It is located in front of the engine cooling radiator. Its function is to cool the hot high pressure refrigerant gas. This causes it to condense into a high pressure liquid refrigerant.

EVAPORATOR COIL

The coil removes heat and dehumidifies the air before it enters the vehicle. The coil is located in the A/C housing.

EVAPORATOR PROBE

The evaporator temperature probe prevents condensate water on the evaporator coil from freezing and obstructing A/C system air flow. It does this by cycling the compressor clutch on and off. The switch is attached to the evaporator coil with the sensing probe inserted into the coil fins.

EXPANSION VALVE:

The valve is used to meter refrigerant into the evaporator in accordance with cooling requirements. The valve is located in front of the evaporator coil.

HIGH PRESSURE RELIEF VALVE

The valve is located at the rear of the compressor. The valve is used to prevent excessive high system pressure. The valve vents the system when a pressure of 3445-4135 kPa (500-600 psi) and above is reached. This prevents damage to the compressor and other system components. The valve closes with a minimum pressure of 2756 kPa (400 psi).

DESCRIPTION AND OPERATION (Continued)

FILTER/DRIER

The drier is used to remove any traces of moisture from the refrigerant system. The filter is used to separate any foreign particles.

REFRIGERANT LINES

The lines are used to carry the refrigerant between the various system components.

SERVICE GAUGE PORT

The high pressure gauge port is located on the compressor discharge line. The low pressure gauge port is located on the suction line.

THERMAL LIMITER SWITCH

The switch is used to measure compressor surface temperature. If compressor surface temperature is excessive the switch will cut battery feed voltage to the compressor clutch. The switch will then reset once compressor surface temperature returns to normal.

A/C PRESSURE TRANSDUCER

The A/C Pressure Transducer functions as the refrigerant system pressure sensor. It supports the condenser/radiator fans and compressor functions. The pressure transducer is screwed attached to a valve on the discharge line near the compressor.

A/C REFRIGERANT LINES

The air conditioning lines used on this vehicle are made from reinforced rubber with a nylon liner on the inner walls. The ends of the A/C lines are made with light weight aluminum fittings or quick connects.

The A/C lines use special connectors called quick connects. There are four quick connects in the system. Two are located at the condenser and the other two are located at the expansion valve. Each quick connector has a clip installed on it.

CAUTION: Never attempt to remove a clip or disconnect a quick connect without reclaiming all refrigerant from the air conditioning system. The system must be empty.

All quick connects use two O-rings to seal the connection. The O-rings are made from a special type of rubber that is not affected by R-134a refrigerant. O-ring replacement is required whenever lines are removed and installed. Use only O-rings specified for this vehicle. Failure to use the correct type of O-ring will cause the connection to leak within a short period of time.

When it is necessary to open the refrigeration system, have everything needed to service the system ready. The system should not be left open any longer than necessary. Cap or plug all lines and fittings as soon as they are opened. This will prevent the entrance of dirt and moisture into the system. All new lines and components should be capped or sealed until they are ready to be used.

WARNING: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO DISCHARGE R-134a SYSTEM. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR/R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

COMPRESSOR

The TRS90 is a fixed displacement type compressor (Fig. 1).

CAUTION: Cleanliness is extremely important. Clean the surfaces around the suction and discharge ports of the compressor before opening the system. If compressor is removed from vehicle, apply tape to the opened ports to prevent any contamination.

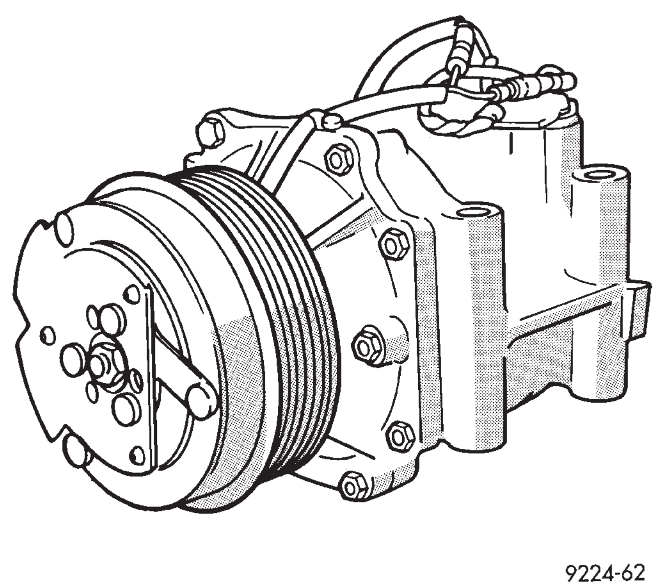

Fig. 1 TRS90 Compressor

DESCRIPTION AND OPERATION (Continued)

COMPRESSOR CLUTCH/COIL ASSEMBLY

The clutch assembly consists of a stationary electromagnetic coil, hub bearing pulley assembly, and clutch plate.

The electromagnetic coil and pulley are retained on the compressor with snap rings. The clutch plate is mounted on the compressor shaft and secured with a nut.

When the compressor is not operating, the pulley free wheels on the hub bearing which is part of the pulley. When the coil is energized the plate is magnetically engaged with the pulley and turns the compressor shaft.

ENGINE COOLING SYSTEM REQUIREMENTS

To maintain ample temperature levels from the heating-A/C system, the cooling system must be in proper working order. Refer to Group 0, Lubrication and Maintenance or Group 7, Cooling System of this manual.

The use of a bug screen is not recommended. Any obstructions forward of the condenser can reduce the effectiveness of the air conditioning system.

EVAPORATOR PROBE

The evaporator probe is a temperature sensing element located at the coldest point on the face of the evaporator. Output from the probe is sampled by the Body Control Module (BCM). It is used to switch the A/C compressor clutch OFF before evaporator freeze up occurs. The clutch is switched OFF when the probe temperature reaches 0.94°C. (33.7°F.). It is allowed to switch ON when the probe temperature reaches 2.05°C. (35.7°F.).

The evaporator probe is located on the lower right side of the evaporator housing.

EXPANSION VALVE

The expansion valve is located on the engine side of the dash panel, near the right shock tower.

The expansion valve can fail in three different positions (open, closed or restricted).

In an Open Position: this will result in a noisy compressor or no cooling. The cause can be a broken spring, broken ball or excessive moisture in the A/C system. If the spring or ball are found to be defective, replace the expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant.

In a Closed Position: There will be low suction pressure and no cooling. This may be caused by a failed power dome or excessive moisture in the A/C system. If the power dome on the expansion valve is found to be defective replace the expansion valve. If excessive moisture is found recycle the refrigerant.

A Restricted Orifice: There will be low suction pressure and no cooling. This may be caused by debris in the refrigerant system. If debris is believed to be the cause, recycle the refrigerant and replace the expansion valve and receiver/drier.

HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The refrigerant oil will absorb moisture readily out of the air. This moisture will convert into acids within a closed system.

CAUTION: The system must be completely empty before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been emptied. If any pressure is noticed as a fitting is loosened, retighten fitting and evacuate the system again.

A good rule for the flexible hose lines is to keep the radius of all bends at least 10 times the diameter of the hose. Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 3 inches (80 mm) from the exhaust manifold. Inspect all flexible hose lines to make sure they are in good condition and properly routed.

The use of correct wrenches when making connections is very important. Improper wrenches or improper use of wrenches can damage the fittings.

The internal parts of the A/C system will remain stable as long as moisture-free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability. This may cause operational troubles or even serious damage if present in more than very small quantities.

When opening a refrigeration system, have everything you will need to repair the system ready. This will minimize the amount of time the system must be opened. Cap or plug all lines and fittings as soon as they are opened. This will help prevent the entrance of dirt and moisture. All new lines and components should be capped or sealed until they are ready to be used.

All tools, including the refrigerant dispensing manifold, the manifold gauge set, and test hoses should be kept clean and dry.

THERMAL LIMITER SWITCH

The switch is used to measure compressor surface temperature. If compressor surface temperature is excessive the switch will cut battery feed voltage to

DESCRIPTION AND OPERATION (Continued)

the compressor clutch. The switch will then reset once compressor surface temperature returns to normal.

SYSTEM AIRFLOW

The system draws outside air through the cowl opening at the base of the windshield. Then it goes into the plenum chamber above the Heater A/C unit housing and passes through the evaporator. At this point airflow can be directed either through or around the heater core. This is done by adjusting the blend-air door with the TEMP control on the control head. After the air passes the blend air door, the air flow is then directed from the PANEL, BI-LEVEL (panel and floor), and FLOOR - DEFROST outlets. Air flow velocity can be adjusted with the blower speed selector switch on the control head.

Ambient air intake can be shut off by closing the recirculating air door. This will recirculate the air that is already inside the vehicle. This is done by rotating the RECIRC. knob on the control head. Rotating the MODE control knob to the Defrost/Floor or Defrost setting on the control head will engage the compressor. This will send refrigerant through the evaporator, and remove heat and humidity from the air before it goes through the heater core. The compressor can also be engaged by depressing the A/C button on the control head.

DIAGNOSIS AND TESTING

A/C PERFORMANCE TEST

The air conditioning system is designed to remove heat and humidity from the air entering the passenger compartment. The evaporator, located in the heater A/C unit, is cooled to temperatures near the freezing point. As warm damp air passes over the fins in the evaporator, moisture in the air condenses to water, dehumidifying the air. Condensation on the evaporator fins reduces the evaporators ability to absorb heat. During periods of high heat and humidity, an air conditioning system will be less effective. With the control module set to RECIRC, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, A/C performance levels rise.

PERFORMANCE TEST PROCEDURE

Review Safety Precautions and Warnings in this group before proceeding with this procedure. Air temperature in test room and on vehicle must be 21° C (70°F) minimum for this test.

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

(1) Connect a tachometer and manifold gauge set. Attach a thermal couple to the evaporator line.

(2) Set control to A/C, RECIRC, and PANEL, temperature lever on full cool and blower on high.

(3) Start engine and hold at 1000 rpm with A/C clutch engaged.

(4) Engine should be warmed up with doors and windows closed.

(5) Insert a thermometer in the left center A/C outlet and operate the engine for five minutes. The A/C clutch may cycle depending on ambient conditions.

(6) With the A/C clutch engaged, compare the discharge air temperature to the evaporator line temperature. The discharge air temperature should be within –12°C (10°F).

(7) If the discharge air temperature fails to meet the specifications. Refer to the System Charge Level.

COMPRESSOR CLUTCH COIL

(1) Verify battery state of charge.

(2) Connect an ammeter (0-10 ampere scale) in series with the clutch coil terminal. Use a volt meter (0-20 volt scale) with clip leads measuring voltage across the battery and A/C clutch.

(3) With A/C control in A/C mode and blower at low speed, start the engine and run at normal idle.

(4) The A/C clutch should engage immediately and the clutch voltage should be within 2 volts of the battery voltage. If the A/C clutch does not engage, test the fusible link.

(5) The A/C clutch coil is acceptable if the current draw is 2.0 to 4.15 amperes at 11.5 to 12.5 volts at clutch coil. This is with the work area temperature at 21°C (70°F). If voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until voltage reads below 12.5 volts.

(6) If coil current reads zero, the coil is open and should be replaced. If the ammeter reading is 5 amperes or more, the coil is shorted and should be replaced. If the coil voltage is not within two volts of the battery voltage, test clutch coil feed circuit for excessive voltage drop.

COMPRESSOR NOISE TEST

When investigating an air conditioning related noise, you must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature, or any other special condition.

Noises that develop during air conditioning operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brack-

DIAGNOSIS AND TESTING (Continued)

ets, or a loose clutch assembly. Improper drive belt tension can cause a misleading noise when compressor is engaged. The noise may not occur when compressor is disengaged.

Drive belt(s) are speed sensitive. At different engine speeds and depending upon belt tension, belt(s) can develop noises that are mistaken for a compressor noise.

(1) Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. Listen to compressor clutch while engaged and disengaged.

(2) To duplicate high-ambient condition (high-head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn’t exceed 2070 kPa (300 psi).

(3) Tighten ALL compressor mounting bolts, clutch mounting bolt, clutch coil mounting screws

(4) Check refrigerant hoses for rubbing or interference which can cause unusual noises.

(5) Check refrigerant charge (refer to Charging the System).

(6) Check compressor noise as in Step 1.

(7) If noise still exists, loosen compressor mounting bolts and torque. Repeat Step 1.

(8) If noise continues, replace compressor and repeat Step 1.

CONTROL MODULE

The control switch and timer circuit may be tested in the vehicle with or without scan tool (DRB).

TESTING WITH SCAN TOOL

If using the scan tool, refer to the proper Body Diagnostic Procedures Manual.

TESTING WITHOUT SCAN TOOL

(1) Remove the control switch from console and disconnect control switch (Fig. 2).

(2) Using a ohmmeter, check leads between Pins 5 and 8 of the 8-Way connector. Turn the control module to each position shown on chart below. The resistance reading should be within the specifications shown. If not OK, replace the control module. If OK, check:

- Blown fuse
- Cut wire
- Poor ground
- Poor connection
- Defective BCM
- Bulkhead connector inoperative

Refer to Group 8W, Wiring Diagrams.

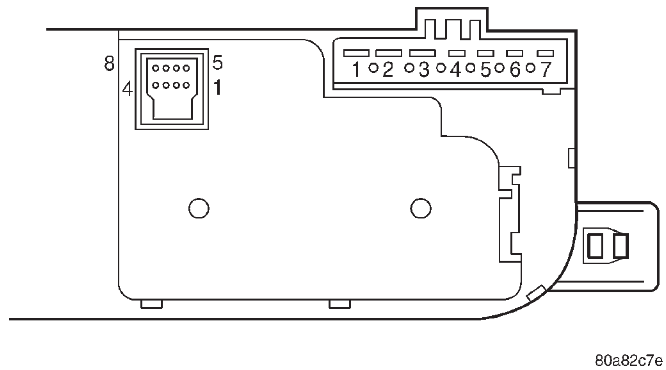

Fig. 2 HVAC Control Module Connectors

CONTROL MODULE TEST	
SWITCH POSITION	OHM RANGE
Panel	828 to 856 ohms
Bi-Level	1.279 to 1.315 K ohns
Floor	2.302 to 2.358 K ohms
Mix	5.202 to 5.318 K ohms
Defrost	99.5 to 101.5 K ohms

HEATER PERFORMANCE TEST

PRE-DIAGNOSTIC PREPARATIONS

Review Safety Precautions and Warnings in this group before performing the following procedures.

Check the coolant level, drive belt tension, vacuum line connections, radiator air flow and fan operation. Start engine and allow to warm up to normal temperature.

WARNING: DO NOT REMOVE RADIATOR CAP WHEN ENGINE IS HOT, PERSONAL INJURY CAN RESULT.

If vehicle has been run recently, wait 15 minutes before removing cap. Place a rag over the cap and turn it to the first safety stop. Allow pressure to escape through the overflow tube. When the system stabilizes, remove the cap completely.

MAXIMUM HEATER OUTPUT: TEST AND ACTION

Engine coolant is provided to the heater system by two 16 mm (5/8 inch inside diameter) heater hoses. With engine idling at normal running temperature, set the control to maximum heat, floor, and high blower setting. Using a test thermometer, check the air temperature coming from the floor outlets, refer to Temperature Reference chart.

If the floor outlet air temperature is insufficient, refer to Group 7, Cooling Systems for specifications. Both heater hoses should be HOT to the touch (coolant return hose should be slightly cooler than the

DIAGNOSIS AND TESTING (Continued)

TEMPERATURE REFERENCE CHART

AMBIENT	TEMP.	MINIMUM FLOOR	OUTLET TEMP.
CELSIUS	FAHRENHEIT	CELSIUS	FAHRENHEIT
15.5°	60°	62.2°	144°
21.1°	70°	63.8°	147°
26.6°	80°	65.5°	150°
32.2°	90°	67.2°	153°

supply hose). If coolant return hose is much cooler than the supply hose, locate and repair engine coolant flow obstruction in heater system.

POSSIBLE LOCATIONS OR CAUSE OF OBSTRUCTED COOLANT FLOW

(1) Pinched or kinked heater hoses.

(2) Improper heater hose routing.

(3) Plugged heater hoses or supply and return ports at cooling system connections, refer to Group 7, Cooling System.

(4) Plugged heater core.

(5) Air locked heater core.

(6) If coolant flow is verified and outlet temperature is insufficient, a mechanical problem may exist.

POSSIBLE LOCATION OR CAUSE OF INSUFFICIENT HEAT

(1) Obstructed cowl air intake.

(2) Obstructed heater system outlets.

(3) Blend-air door not functioning properly.

TEMPERATURE CONTROL

If temperature cannot be adjusted with the TEMP lever on the control panel, the following could require service:

(1) Blend-air door binding.

(2) Faulty blend-air door motor.

(3) Improper engine coolant temperature.

(4) Faulty Instrument Panel Control.

SYSTEM OIL LEVEL

It is important to have the correct amount of lubricant in the A/C system to ensure proper lubrication of the compressor. Too little lubricant will result in damage to the compressor. Too much lubricant will reduce the cooling capacity of the system and consequently result in higher discharge air temperatures.

The lubricant used in the compressor is polyalkalene glycol PAG lubricant. Only refrigerant lubricant approved for use with R-134a should be used to service the system. Do not use any other lubricant. The lubricant container should be kept tightly capped until it is ready for use. Refrigerant lubricant will quickly absorb any moisture it comes in contact with.

It is not necessary to check or add lubricant unless it has been lost. Lubricant loss at the leak point will be evident by the presence of a wet, shiny surface around the leak.

REFRIGERANT OIL LEVEL CHECK

When an air conditioning system is first assembled, all components (except the compressor) are refrigerant oil free. After the system has been charged with (R-134a) refrigerant and operated, the oil in the compressor is dispersed through the lines and components. The evaporator, condenser, and receiver/drier will retain a significant amount of oil. Refer to the A/C Component Refrigerant Oil Capacities chart below. When a component is replaced, the specified amount of refrigerant oil must be added. When the compressor is replaced, the amount of oil that is retained in the rest of the system must be drained from the replacement compressor. When a line or component has ruptured and oil has escaped, the compressor should be removed and drained. The receiver/drier must be replaced along with the ruptured part. The oil capacity of the system, minus the amount of oil still in the remaining components, can be measured and poured into the suction port of the compressor.

Example: On an A/C system the evaporator retains 60 ml. (2 oz.). The condenser retains 30 ml. (1 oz.) of oil, and system capacity may be 150 ml. (5.00 oz.) of oil.

150 ml. minus 90 ml. equals 60 ml. (2.00 oz.).

A/C COMPONENT REFRIGERANT OIL CAPACITIES		
COMPONENT NAME	ml.	oz.
Total Air Conditioning System	150 ml.	5.00 oz.
Condenser	30 ml.	1.00 oz.
Evaporator	59 ml.	2.00 oz.
Filter/Drier	30 ml.	1.00 oz.
Line Blown	44 ml.	1.50 oz.

CAUTION: The refrigerant oil used in a R-134a A/C system is unique. Use only oils which were designed to work with R-134a refrigerant. The oil designated for this vehicle is SP15 PAG (polyalkalene glycol).

VERIFY REFRIGERANT LUBRICANT LEVEL

(1) Discharge refrigerant system using a recycling/reclaiming equipment if a charge is present.

(2) Disconnect refrigerant lines from A/C compressor. Cap the open lines to prevent moisture from entering system.

(3) Remove compressor from vehicle.

(4) From suction and discharge ports on top of compressor, drain lubricant from compressor.

(5) Add system capacity minus the capacity of components that have not been replaced. Refer to the

DIAGNOSIS AND TESTING (Continued)

A/C Component Refrigerant Oil Capacities chart above. Add lubricant through the suction and discharge ports on compressor. This is not to exceed 150 ml. (5.00 oz.) in total.

(6) Install compressor and connect refrigerant lines. Then evacuate and charge refrigerant system.

(7) Most reclaim/recycling equipment will measure the lubricant being removed. This is the amount of lubricant to be added back to the system. If a new compressor is being installed, drain lubricant from old compressor, measure the amount drained and discard old lubricant. Drain the lubricant from the new compressor into a clean container. Return the amount of lubricant measured from the old compressor, plus the amount reclaimed from the system back into the new compressor.

THERMAL LIMITER SWITCH

(1) Unplug Thermal Limiter wiring connector.

(2) With an ohmmeter check for continuity between the two terminals. If no continuity is present replace switch.

(3) The Thermal Limiter is calibrated to open and close at:

- Open circuit (no continuity) at 122 to 128°C (252 to 262°F)
- Close circuit (continuity) at 106 to 116°C (225 to 235°F)

There is no serviceability of the thermal limiter switch. If the thermal limiter switch fails, the compressor must be replaced. To replace the compressor, refer to Compressor Removal and Installation in this section.

SERVICE PROCEDURES

EVACUATING REFRIGERANT SYSTEM

NOTE: Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the compressor.

If a compressor designed to use R-134a refrigerant is left open to the atmosphere for an extended period of time. It is recommended that the refrigerant oil be drained and replaced with new oil or a new compressor be used. This will eliminate the possibility of contaminating the refrigerant system.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Moisture will boil at near room temperature when exposed to vacuum. To evacuate the refrigerant system:

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection. If connection is still difficult to make refer to TSB #24-02-93.

(1) Connect a suitable charging station, refrigerant recovery machine, and a manifold gauge set with vacuum pump (Fig. 3).

(2) Open suction and discharge valves and start vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge, to eliminate all moisture in system. When suction gauge reads -88 kPa (-26 in. Hg) vacuum or greater for 45 minutes, close all valves and turn off vacuum pump. If the system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.

(3) Close all valves. Turn off and disconnect the vacuum pump.

(4) The refrigerant system is prepared to be charged with refrigerant.

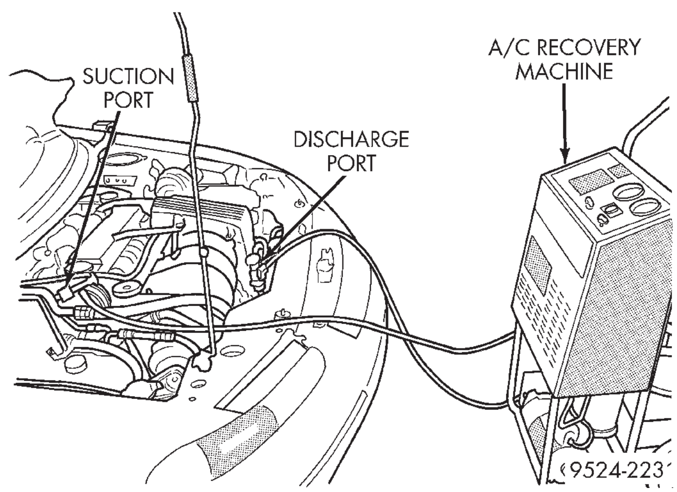

Fig. 3 Refrigerant Recovery Machine Hookup

R-134a REFRIGERANT

This vehicle uses a new type of refrigerant called R-134a. It is a non-toxic, non-flammable, clear colorless liquefied gas.

R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. Even a small amount of R-12 in a R-134a system could cause compressor failure, refrigerant oil sludging or poor performance. **Never add R-12 to a system**

SERVICE PROCEDURES (Continued)

designed to use R-134a. System failure will occur.

Both of the service ports to charge the air conditioning system are located on the hoses (Fig. 4). New design of service ports have been used to ensure that the system is not accidentally filled with the wrong refrigerant (R-12).

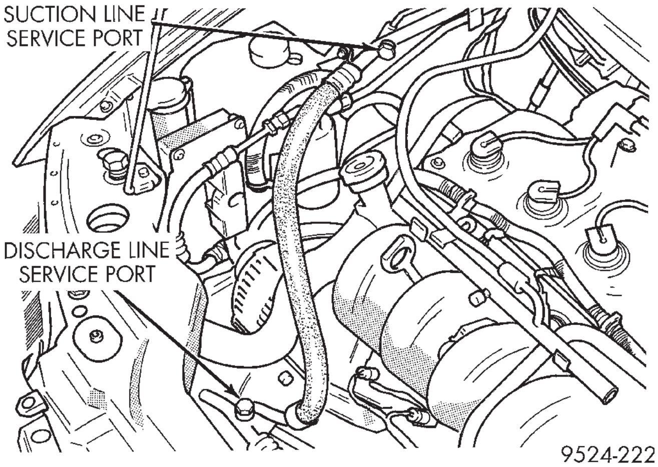

Fig. 4 A/C Service Ports

When servicing a system, it is required that an air conditioning charging recovery/recycling machine be used (Fig. 5). Contact an automotive service equipment supplier for proper equipment. Refer to the operating instructions provided with the equipment for proper operation.

A manifold gauge set (Fig. 6) must also be used in conjunction with the charging and/or recovery/recycling device. Only use gauges that have not been used for R-12. The service hoses on the gauge set should have manual (turn wheel) or automatic back flow valves at the service port connector ends. This will prevent refrigerant R-134a from being released into the atmosphere.

R-134a refrigerant requires a special type of compressor oil. When adding oil, make sure that it is designed to be used in a R-134a system. Refer to the label under the hood for proper oil and refrigerant charge levels (Fig. 7).

Due to the different characteristics of R-134a it requires all new service procedures.

WARNING: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO RECLAIM R-134a SYSTEMS. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME

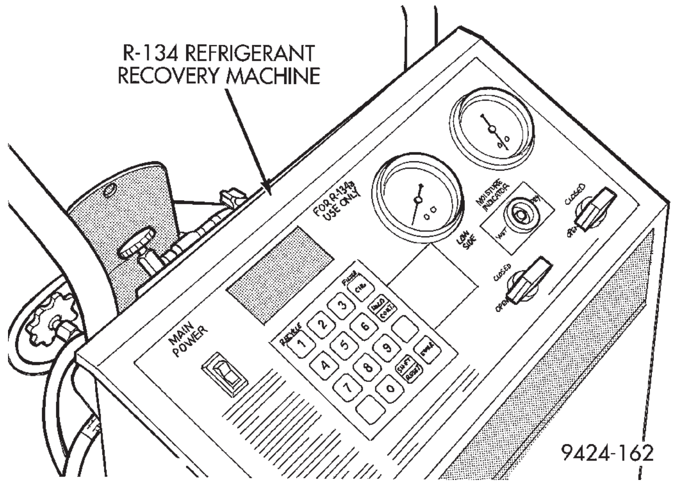

Fig. 5 Refrigerant Recovery/Recycling Station - Typical

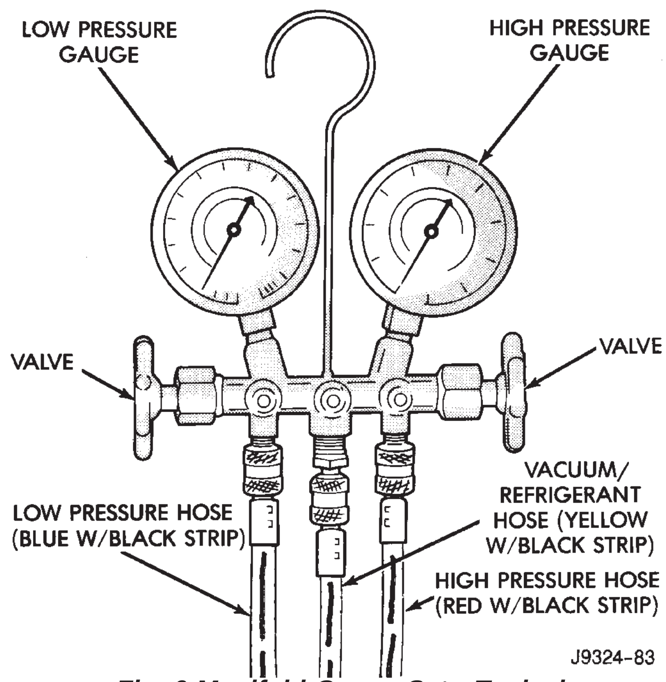

Fig. 6 Manifold Gauge Set - Typical

Fig. 7 Underhood Label

MIXTURES OF AIR and R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

SERVICE PROCEDURES (Continued)

The use of R-134a will have a positive environmental impact due to it's zero ozone depletion and low global warming impact.

SYSTEM CHARGE LEVEL

TO CHECK OR FILL SYSTEM

The procedure below should be used to check and/or fill the refrigerant charge in the air conditioning system.

NOTE: The air conditioning system in this vehicle holds 0.794 Kg. (28 oz. or 1.75 lbs.) of R-134a refrigerant.

This procedure can be performed two different ways:

- With a scan tool (DRB) and a thermocouple. Use the scan tool (DRB) diagnostic topic: Partial Charge Test.
- Using a manifold gauge set, a thermocouple and the Charge Determination Graph. It is recommended to use the gauges or reclaim/recycle equipment.

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(1) Establish your preferred method of measuring compressor discharge pressure. Use a manifold gauge set or a scan tool.

(2) Attach a clamp-on thermocouple (P.S.E. 66-324-0014 or 80PK-1A) or equivalent to the liquid line. It must be placed as close to the condenser outlet as possible to observe liquid line temperature. Refer to “Thermocouple Probe” in this section for more information on probe.

(3) The vehicle must be in the following modes:

- Transaxle in Park
- Engine Idling at 700 rpm
- A/C Controls Set to Outside Air
- Panel Mode
- Full Cool
- High Blower
- A/C Button in the ON position
- Vehicle Windows Open.

(4) Operate system for a couple of minutes to allow the system to stabilize.

(5) Set system pressure to about 1793 kPa (260 psi) by blocking off the airflow to the front grill area. This will maintain a constant pressure and stop the cooling fans from alternating between high and low speeds.

(6) Observe Discharge pressure and Liquid line temperature. Using the Charge Determination Graph determine where the system is currently operating (Fig. 8). If the system is in the undercharged region, ADD 0.057 Kg. (2 oz.) to the system and recheck readings. If the system is in the overcharged region, RECLAIM 0.057 Kg. (2 oz.) from the system and recheck readings. Continue this process until the system readings are in the proper charge area on the Charge Determination Chart.

(7) The scan tool procedure does not require the Charge Determination Graph. The correct liquid line temperature range is calculated by the scan tool automatically.

SYSTEM LEAK CHECKING

WARNING: R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. MIXTURE OF AIR and R-134a CAN BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO DISCHARGE R-134a SYSTEM. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

If the A/C system is not cooling properly, determine if the refrigerant system is fully charged with R-134a. This is accomplished by performing a system Charge Level-Check or Fill. If while performing this test A/C liquid line pressure is less than 345 kPa (50 psi) proceed to Empty Refrigerant System Leak Test. If liquid line pressure is greater than 345 kPa (50 psi) proceed to low refrigerant level leak test. If the refrigerant system is empty or low in refrigerant charge, a leak at any line fitting or component seal is likely. A review of the fittings, lines and components for oily residue is an indication of the leak location. To detect a leak in the refrigerant system, perform one of the following procedures as indicated by the symptoms.

SERVICE PROCEDURES (Continued)

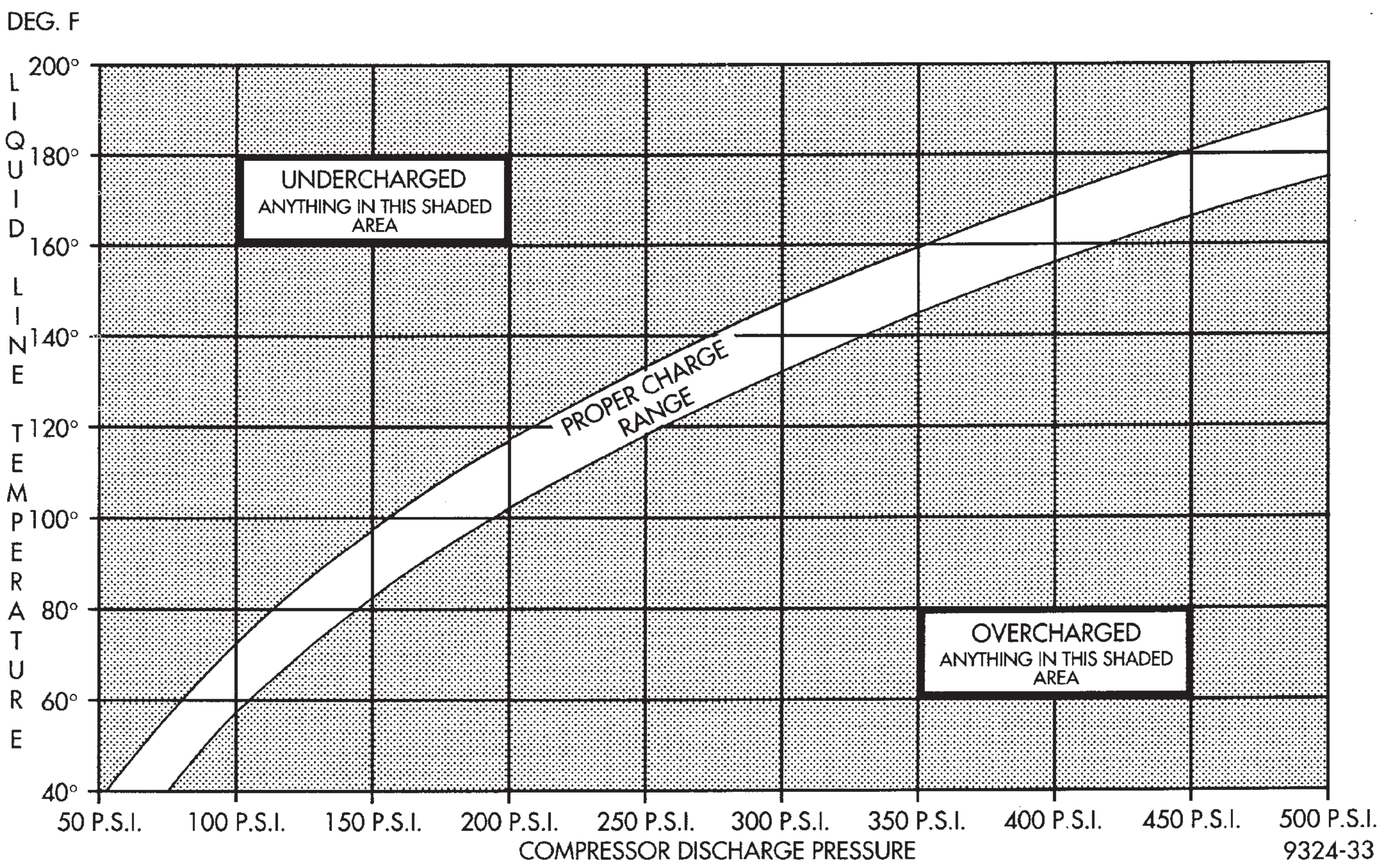


Fig. 8 Charge Determination Graph

EMPTY REFRIGERANT SYSTEM LEAK TEST

(1) Evacuate the refrigerant system to the lowest degree of vacuum possible (approx. 28 in Hg.). Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed with this procedure.

(2) Prepare a .284 Kg. (10 oz.) refrigerant charge to be injected into the system.

(3) Connect and dispense .284 Kg. (10 oz.) of refrigerant into the evacuated refrigerant system.

(4) Proceed to Step 2 of Low Refrigerant Level Leak Test.

LOW REFRIGERANT LEVEL LEAK TEST

(1) Determine if there is any (R-134a) refrigerant in the system.

(2) Position the vehicle in a wind free work area. This will aid in detecting small leaks.

(3) Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run for five minutes with the system set to the following:

- Transaxle in Park
- Engine Idling at 700 rpm
- A/C Controls Set in 100 percent outside air
- Blower switch in the high A/C position
- A/C in the ON position
- Open all windows

CAUTION: A leak detector designed for R-12 refrigerant (only) will not detect leaks in a R-134a refrigerant system.

(4) Shut off the vehicle and wait 2 to 7 minutes. Then use an Electronic Leak Detector that is designed to detect R-134a type refrigerant and search for leaks. Fittings, lines, or components that appear to be oily usually indicates a refrigerant leak. To inspect the evaporator core for leaks, insert the leak detector probe into the drain tube opening or a heat duct. A R-134a dye is available to aid in leak detection, use only Chrysler approved refrigerant dye.

If a thorough leak check has been completed without indication of a leak, proceed to System Charge Level.

THERMOCOUPLE PROBE

To diagnose the A/C system, a temperature probe is required to measure liquid line temperature. The clamp-on type K probe shown in this manual is available through the Chrysler Professional Service Equipment (PSE) program. This probe is compatible with temperature-measuring instruments that accept

SERVICE PROCEDURES (Continued)

Type K Thermocouples and have a miniature connector input. Other temperature probes are available through aftermarket sources. All references in this manual will reflect the use of the probe made available through the Professional Service Equipment program.

In order to use the temperature probe, a digital thermometer will be required. If a digital thermometer is not available, an adapter is available through the Professional Service Equipment program. It can convert any standard digital multimeter into a thermometer. This adapter is designed to accept any standard K-type thermocouple.

If a digital multimeter is not available, it to can be ordered through Professional Service Equipment program.

REMOVAL AND INSTALLATION

MODE DOOR ACTUATOR MOTOR

NOTE: If battery voltage is low or not sensed at the actuator/motor for less than a (60) second interval, the actuator/motor will be out of calibration. Remove the M1 (I.O.D.) fuse for a minimum of (60) seconds. The actuator/motor will then self calibrate itself upon reinstallation of fuse.

The mode door actuator is an electric motor. It mechanically positions the A/C unit panel/bi-level door and the floor/defrost door. Prior to part replacement, re-calibration of the HVAC actuator is recommended. Calibration is performed by disconnecting the battery negative cable or the removal of the instrument panel M-1 fuse. Electrical power should be re-established after (60) seconds which will automatically initiate the software calibration procedure. If this procedure fails, it will be necessary to replace the mode door actuator/motor. The mode door actuator/motor is not serviceable and must be replaced if found to be defective.

The mode door actuator is located on the upper left side of the A/C- Heater housing (Fig. 9).

REMOVAL

(1) Disconnect battery negative cable.

(2) Remove left underpanel silencer/duct.

(3) Remove electrical connection on actuator (Fig. 10).

(4) Remove actuator retaining screws. Then pull actuator straight down. Upon removal, note the shaft position of the actuator, because the shaft on this motor is keyed. When installing new actuator, its shaft must be positioned in the same location.

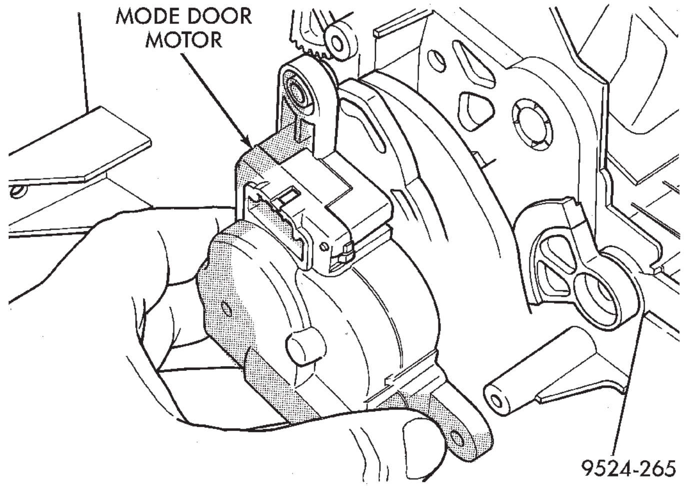


Fig. 9 Mode Door Motor Location

INSTALLATION

For installation, reverse the above procedures.

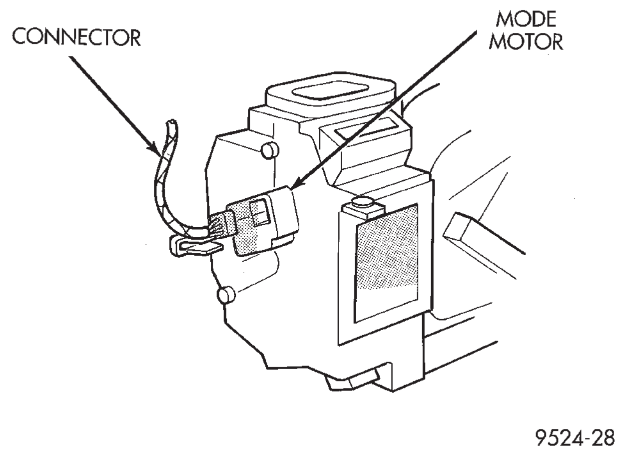


Fig. 10 Mode Motor Connector

A/C PRESSURE TRANSDUCER

CAUTION: A/C pressure transducer switch connector terminal contacts can be damaged by probing tools during system diagnosis and repair. Failure to use their respective mating terminals or pin gauge to check for tightness will cause contact beam spreads. This will result in loss of continuity.

NOTE: O-ring replacement is required whenever the pressure transducer is serviced. Be sure to use the O-ring specified for this vehicle.

REMOVAL

(1) If equipped with a 2.4L engine, hoist vehicle.

(2) Disconnect the wire harness connector from the A/C pressure transducer.

REMOVAL AND INSTALLATION (Continued)

NOTE: A slight release of pressure trapped in the fitting may be experienced. It is not necessary to discharge the refrigerant system.

(3) Remove the transducer with a counterclockwise rotation using a 14 mm open-end wrench (Fig. 11) and (Fig. 12).

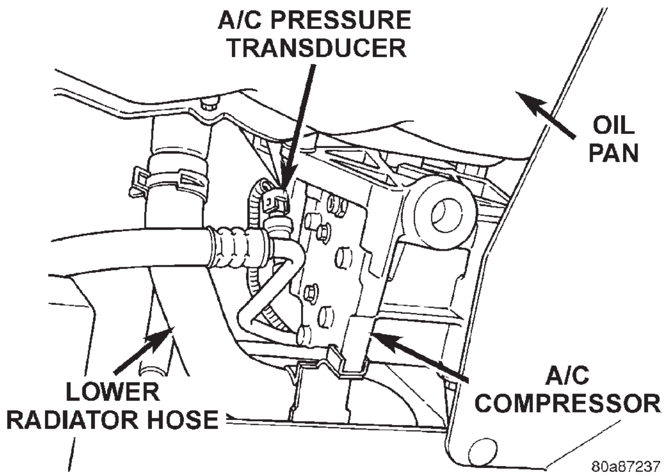


Fig. 11 Pressure Transducer (2.4L engine, viewed from beneath vehicle)

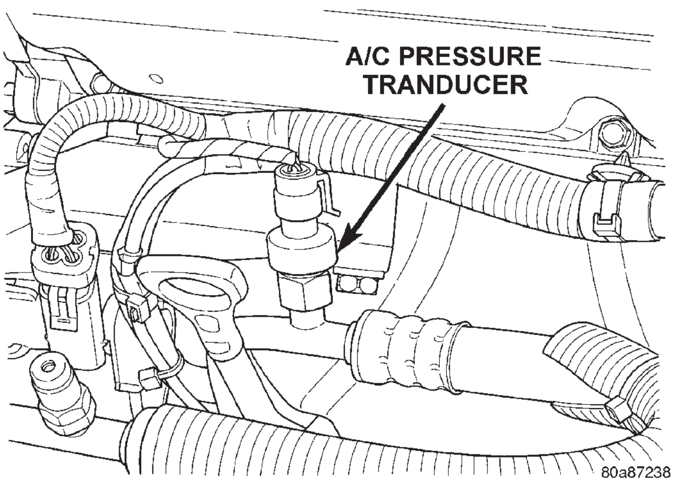


Fig. 12 Pressure Transducer (2.5L engine)

INSTALLATION

For installation, reverse above procedures. Tighten pressure transducer to 6 N·m (50 in. lbs.).

BLOWER MOTOR AND WHEEL ASSEMBLY

The blower motor is located on the right side of the heater housing.

REMOVAL

(1) Disconnect battery.
(2) Remove lower right under panel silencer duct.
(3) Remove blower motor connector from resistor block (Fig. 13).
(4) Remove blower motor case retaining screws.
(5) Lower blower motor case from housing (Fig. 14).
(6) Remove fan scroll from motor shaft.
(7) Remove motor from motor case.

INSTALLATION

For installation, reverse the above procedures.

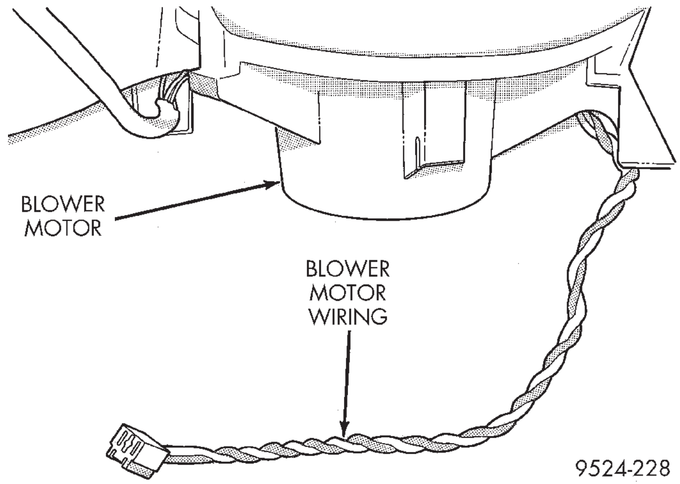


Fig. 13 Blower Motor Wiring

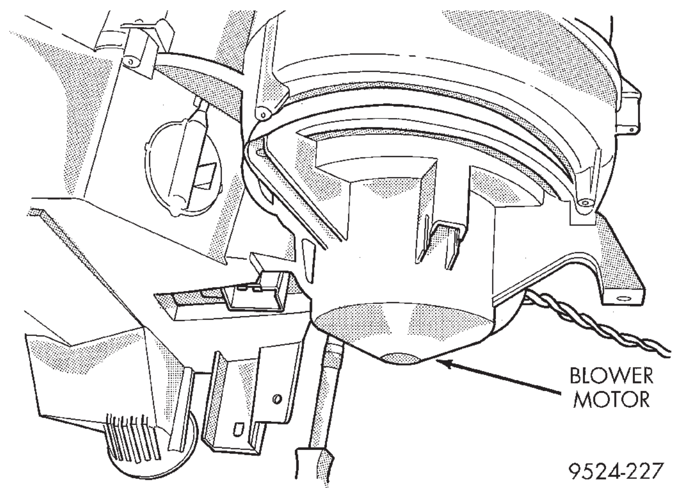


Fig. 14 Blower Motor

BLOWER MOTOR RESISTOR

The blower motor resistor is located on the lower right side of the heater housing.

REMOVAL

(1) Remove lower right underpanel silencer/duct.
(2) Disconnect wiring connectors on blower motor resistor.
(3) Remove blower motor resistor retaining screws.
(4) Pull blower motor resistor out of heater housing (Fig. 15).

INSTALLATION

For installation, reverse the above procedures.

REMOVAL AND INSTALLATION (Continued)

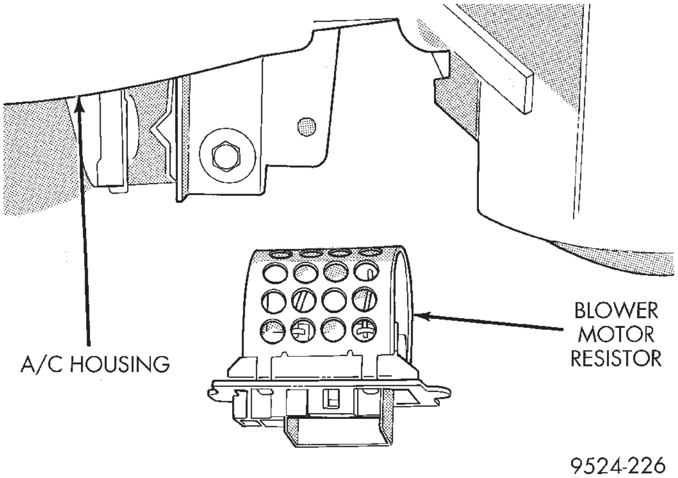


Fig. 15 Blower Motor Resistor

BLOWER MOTOR WHEEL

The blower motor wheel is only serviced with the blower motor. The wheel and the motor are balanced as an assembly. If the blower motor wheel requires replacement, the blower motor must also be replaced. Refer to blower motor for replacement procedure.

COMPRESSOR

REMOVAL

(1) Disconnect the battery negative remote cable.
(2) Loosen and remove drive belt (Fig. 16). Refer to Group 7, Engine Cooling.
(3) Disconnect compressor clutch wire lead.
(4) Recover refrigerant system with R-134a recovery unit.
(5) Remove refrigerant lines from compressor (Fig. 17).
(6) Remove compressor attaching bolts (Fig. 18) and (Fig. 19).
(7) Remove compressor (Fig. 20).

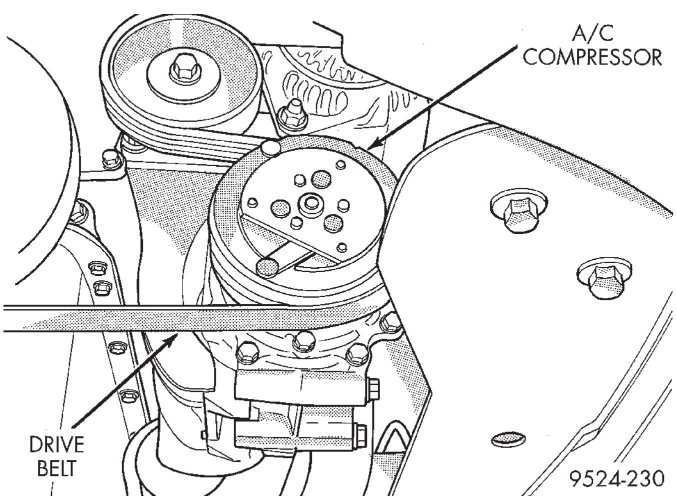


Fig. 16 Drive Belt

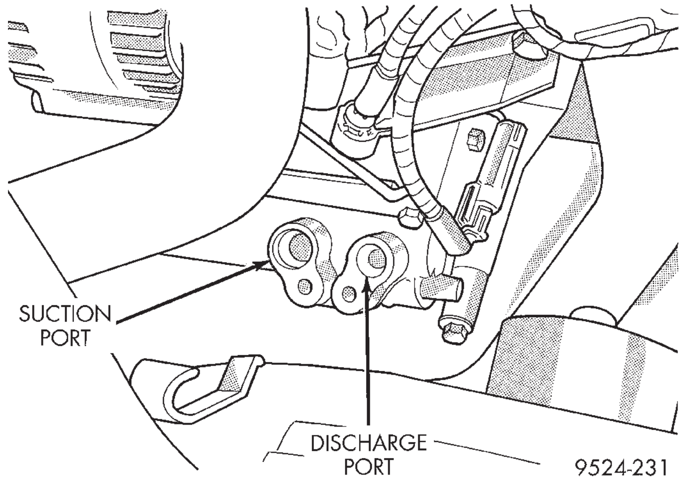


Fig. 17 A/C Lines

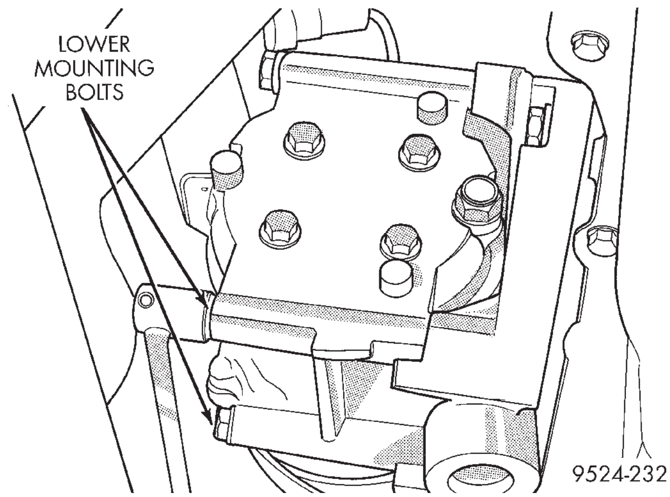


Fig. 18 Lower Attaching Bolts

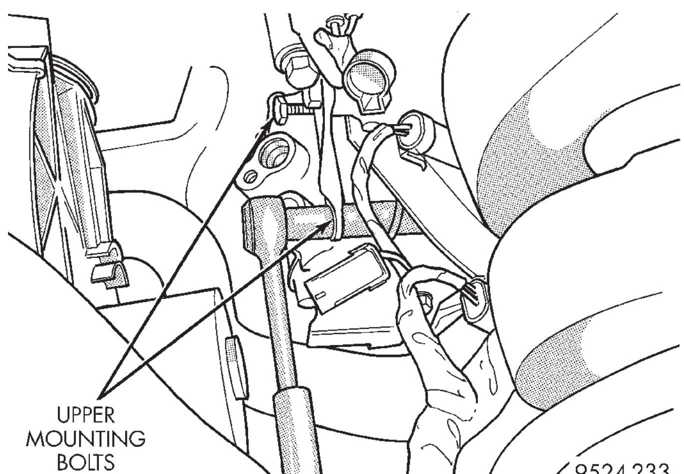


Fig. 19 Upper Attaching Bolts

INSTALLATION

(1) Position the compressor on the mount.
(2) Install the compressor attaching bolts. Tighten bolts to 41 N·m (30 ft. lbs.) torque.
(3) Install drive belt (refer to Group 7, Cooling System).

REMOVAL AND INSTALLATION (Continued)

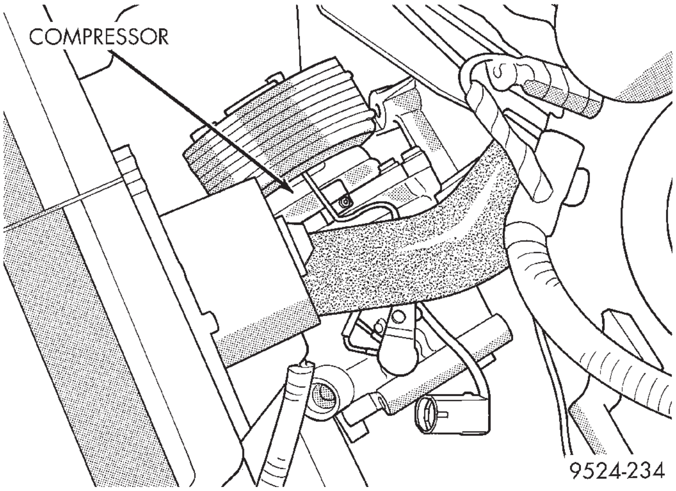


Fig. 20 Compressor Removal

(4) Install refrigerant hoses and new seals.
(5) Connect the clutch wire.
(6) Charge the system.
(7) Connect the negative cable to the battery.

COMPRESSOR CLUTCH/COIL ASSEMBLY

REMOVAL

(1) Remove the compressor from the mount.

(2) Install two (6 mm) bolts into the threaded holes in the armature plate. Hold bolts with two wrenches to prevent shaft from turning (Fig. 21). Remove compressor shaft nut.

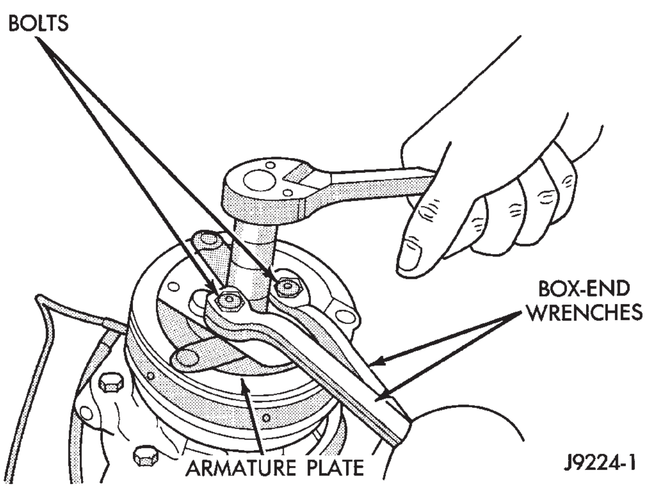


Fig. 21 Compressor Shaft Nut Removal/Installation

(3) Lightly tap clutch plate with a plastic hammer and remove plate and shim(s) (Fig. 22).

CAUTION: Do not use screwdrivers between the armature plate assembly and rotor-pulley to remove the armature plate. This may damage the armature plate assembly.

(4) Remove pulley retaining snap ring with snap ring pliers. Remove pulley assembly from compressor. Use a plastic hammer, if necessary.

(5) Loosen the lead wire retaining clamps and remove lead wire from the compressor front end cover. Disconnect the lead wire from the thermal limiter switch.

(6) Remove snap ring which secures field coil-core assembly to the front cover (Fig. 22). Note the alignment of field coil-core assembly when removing.

WARNING: TAKE CARE THAT THE SNAP RING DOES NOT FLY OUT FROM THE GROOVE.

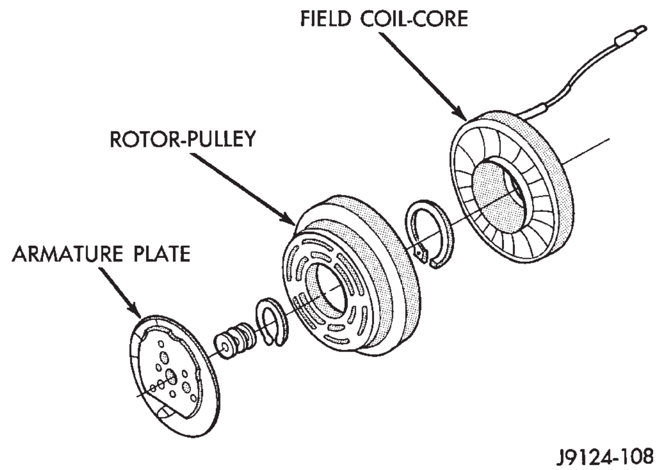


Fig. 22 Clutch Plate/Pulley/Field Coil

INSPECTION

Examine frictional faces of the rotor-pulley and armature plate for wear. The pulley and plate should be replaced if there is excessive wear or scoring. If the friction surfaces are oily, inspect the shaft nose area of the compressor for excess oil. If excess oil is present, the shaft seal is leaking and the compressor must be replaced.

Check pulley hub bearing for roughness or excessive grease leakage. Check for bearing grease contamination on armature plate faces.

CAUTION: The pulley and clutch plate were mated at the factory by a burnishing operation. No attempt should be made to separately replace either part. This will result in clutch slippage due to insufficient contact area.

INSTALLATION

(1) Position the back of the field coil on the compressor front cover. Be sure the locating nipple on the back of the coil lines up with the locating indentation on the front cover. This ensures correct position of the coil and lead wire.

REMOVAL AND INSTALLATION (Continued)

(2) Fasten lead wire to the compressor front cover with the retaining clip. Connect the lead wire to the thermal limiter switch.

(3) Install field coil retaining snap ring (bevel side outward) with snap ring pliers. Insure snap ring is properly seated into groove.

CAUTION: If snap rings on field coil or pulley assembly are not fully seated, they will vibrate out. A clutch failure and possible severe damage to the compressor could result.

(4) Position pulley assembly onto compressor.

CAUTION: Do not mar the pulley frictional surface.

(5) Install pulley assembly retaining snap ring (bevel side outward) with snap ring pliers. Insure snap ring is properly seated into groove.

(6) Place a trial stack of shims, 2.54 mm (0.10 in.) thick, on the compressor shaft.

(7) Install clutch plate on compressor shaft. Note the machined mating splines (Fig. 23).

(8) With the front clutch plate assembly tight against the shims, measure the air gap between clutch plate and pulley face with feeler gauges (Fig. 24). The air gap should be between 0.35 and 0.65 mm (0.013 and 0.025 inch). If proper air gap is not obtained, add or subtract shims until desired air gap is obtained.

(9) Install compressor shaft nut. Tighten nut to 17.6 N·m (13 ft. lbs.) torque.

(10) Shims may compress after tightening shaft bolt. Check air gap in four or more places to verify if air gap is still correct. Spin pulley for final check.

(11) Install the compressor onto the mount.

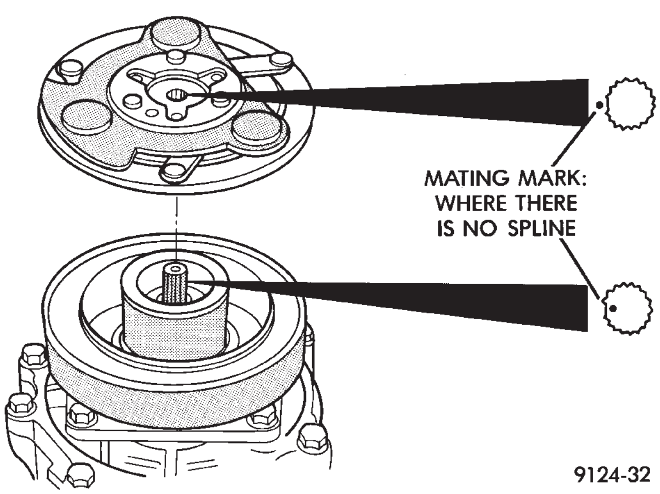


Fig. 23 Aligning Clutch Plate Splines

CLUTCH BREAK-IN

After installing a new field coil-core, check for correct voltage/amperage. Cycle the A/C clutch approximately 20 times (5 seconds on and 5 seconds off). For this procedure run engine at 1,500 to 2,000 rpm and set the system to MAX A/C mode. This procedure will seat the opposing friction surfaces and provide a higher clutch torque capability.

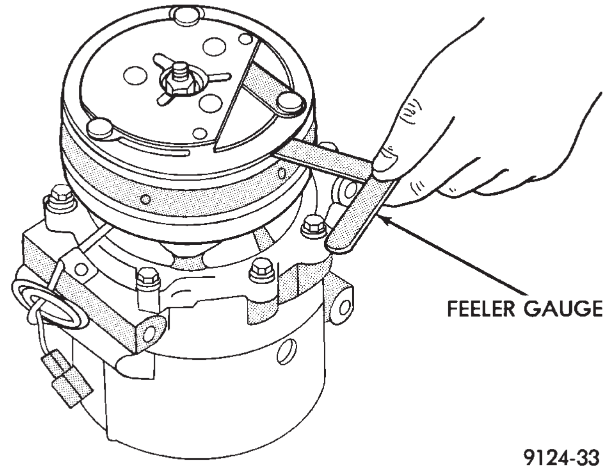


Fig. 24 Measuring Air Gap

CONDENSER

The condenser is located between the radiator and the front bumper. The condenser can be serviced without having to drain the cooling system or remove the radiator.

WARNING: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO RECOVER R-134a SYSTEM. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR/R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.

(2) Disconnect and cap A/C lines at the condenser.

(3) Remove grille retainers (Fig. 25). Refer to Group 23, Body for removal procedures.

(4) Remove upper radiator support crossmember (Fig. 26).

(5) Remove condenser lines. Use Special Tool kit 7193 for quick disconnect couplers.

(6) Remove radiator fan module mounts.

REMOVAL AND INSTALLATION (Continued)

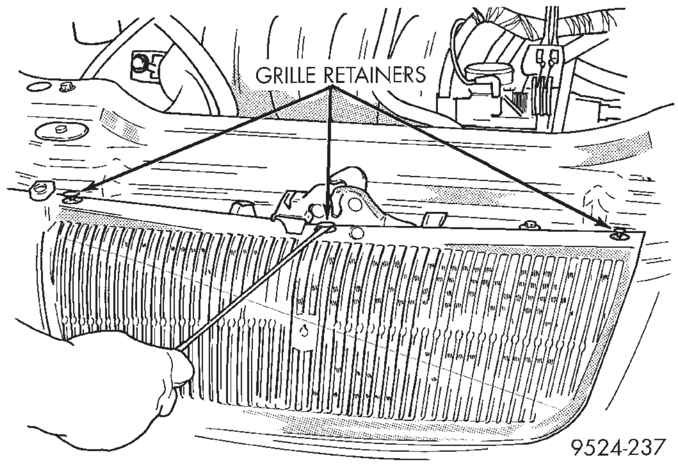


Fig. 25 Grille Retainers

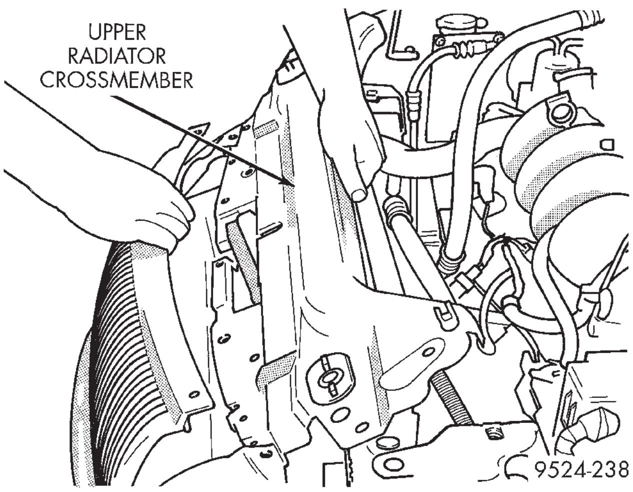


Fig. 26 Radiator Support Crossmember

(7) Remove condenser line support bracket.
(8) Remove condenser mounting bolts (Fig. 27).

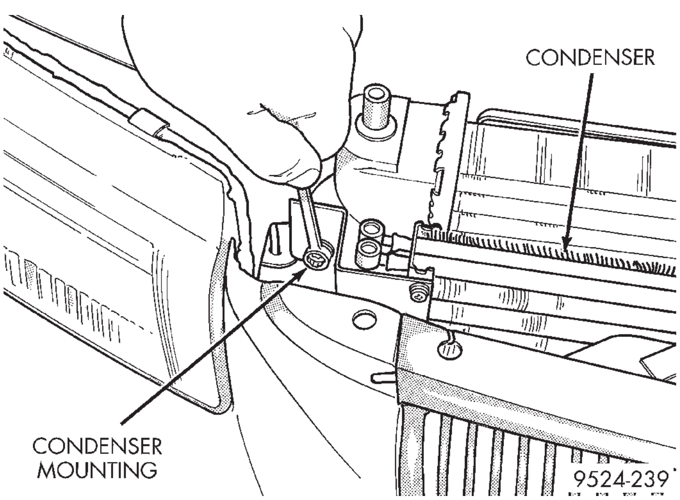


Fig. 27 Condenser Mounting

CAUTION: Avoid bending or breaking condenser inlet tube when lifting condenser from the vehicle.

(9) Lift condenser from vehicle (Fig. 28).

INSTALLATION

For installation, reverse above procedures.

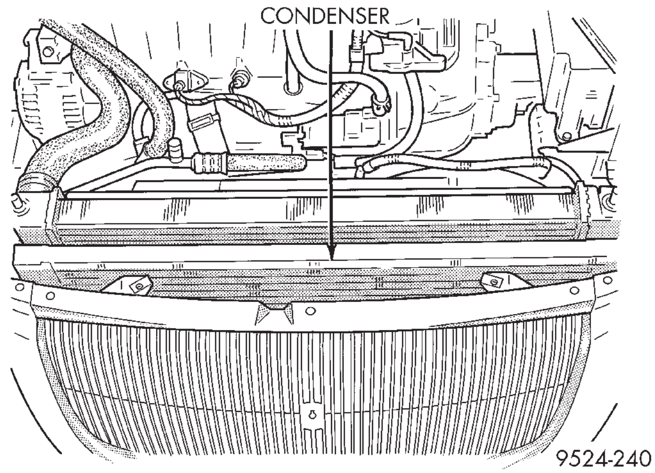


Fig. 28 Condenser Removal

CONTROL MODULE

The control module is located below the radio.

REMOVAL

(1) Place the ignition key in the OFF position before removing control module.
(2) Remove trim bezel (Fig. 29).

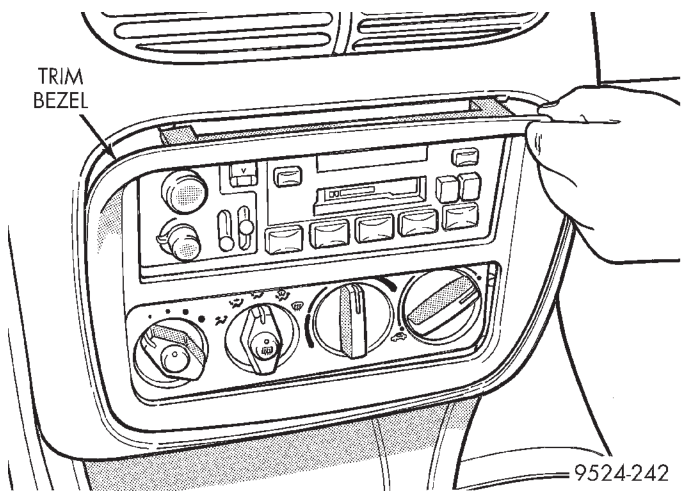


Fig. 29 Control Module

REMOVAL AND INSTALLATION (Continued)

(3) Remove cluster hood bezel retaining screws in the trim bezel opening (Fig. 30).

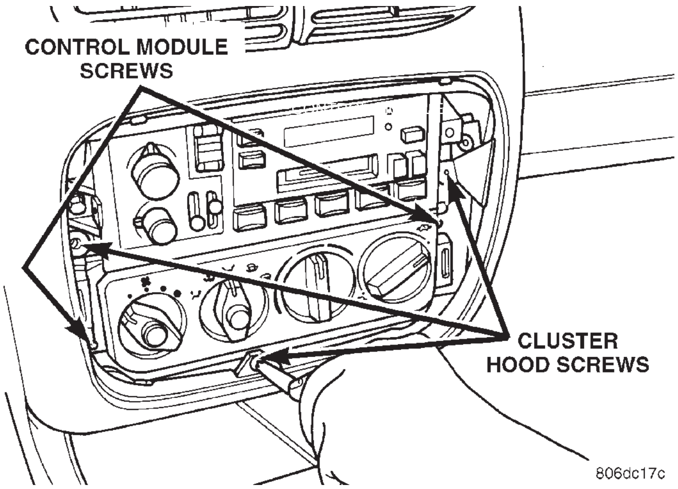


Fig. 30 Control Module Screws

(4) Pry up the cluster hood bezel a few inches to expose the cubby bin/cigar lighter bezel screws.

(5) Remove the cubby bin/cigar lighter bezel and wiring.

(6) Remove the control module retaining screws.

(7) Drop the A/C control module into the cigar lighter/cubby bin bezel opening (Fig. 31). Then disconnect the wiring on the rear of the control module.

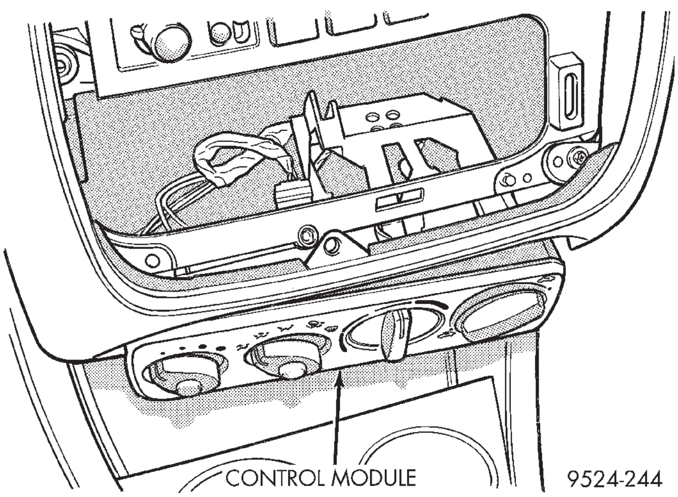


Fig. 31 Control Module At Bezel Opening

(8) Release the cable clips from the top of the control module. Retain the clips for future use. Then disconnect the temperature control and recirculation control cables.

(9) Remove the control module.

INSTALLATION

For installation, reverse the above procedures. Verify that the cables are properly adjusted and the module is seated properly.

CABLE ADJUSTMENT

The cables must be adjusted for proper function of the control module. To adjust the cable, attach the cable to the lever arm of the control module. Turn the knob fully counterclockwise. Pull the cable jacket away from the cable end until taut. Clip the cable jacket to the control module. The knob should travel a full 180° if the cable is properly adjusted.

DISCHARGE LINE

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.

(2) Disconnect A/C pressure transducer wire harness.

(3) Remove quick connect clip and disconnect quick connect at condenser using Special Tool kit 7193 (Fig. 32) and (Fig. 33).

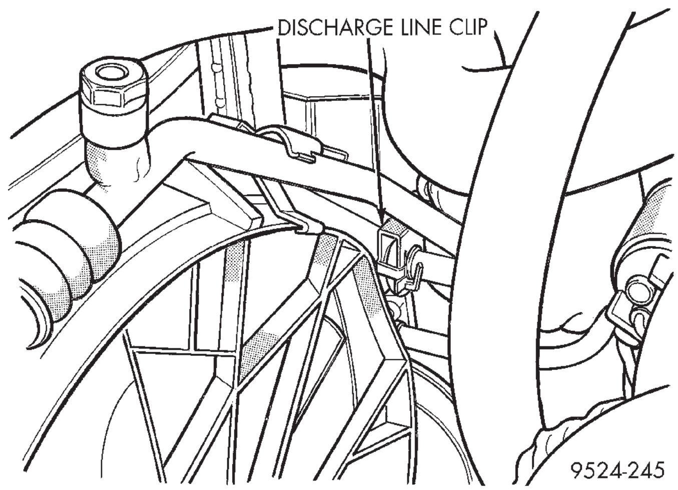


Fig. 32 Quick Connect Clip

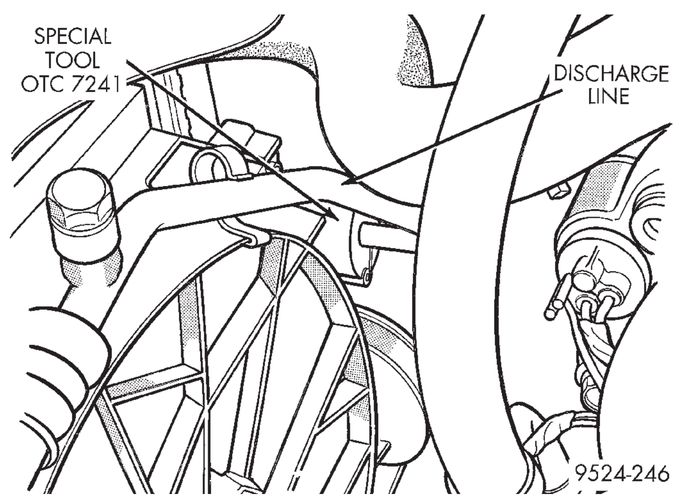


Fig. 33 Special Tool For Line At Condenser

CAUTION: Cap all lines that are not being replaced and cap the expansion valve tubes.

REMOVAL AND INSTALLATION (Continued)

(4) Disconnect line at A/C compressor (Fig. 34). Remove discharge line.

INSTALLATION

For installation, reverse the above procedures. Tighten bolts to 22 N·m (200 in. lbs.).

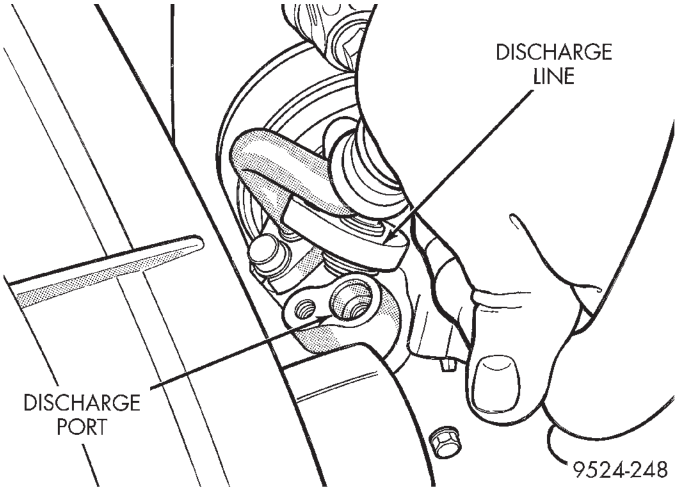


Fig. 34 Line at Compressor

EVAPORATOR

The Heater A/C housing must be removed from the vehicle when replacing the evaporator.

REMOVAL

(1) Disconnect battery negative remote cable.

CAUTION: The refrigerant must be removed from the system before removing Heater-A/C housing. Use a refrigerant recovery machine.

(2) Remove A/C housing from vehicle (Fig. 35). Refer to Heater-A/C Housing Removal and Installation in this section for procedure.

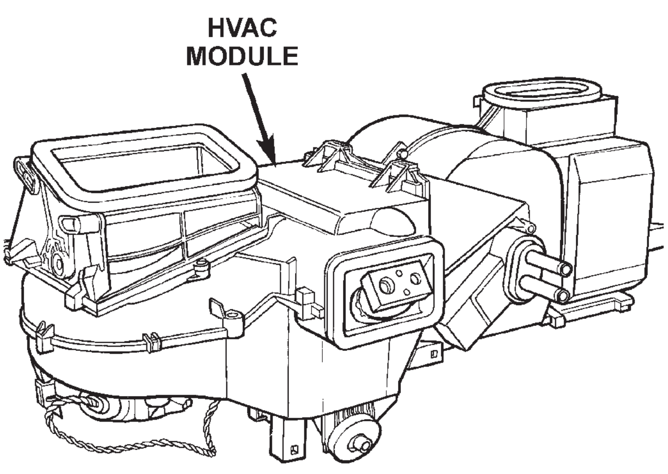


Fig. 35 A/C Housing

(3) Remove recirculation door inlet cover.
(4) Remove evaporator temperature probe.
(5) Remove clips retaining evaporator housing to heater/distribution housing (Fig. 36).
(6) Separate evaporator housing from heater/distribution housing (Fig. 37) and (Fig. 38).
(7) Remove seal around evaporator tube inlet.
(8) Remove evaporator housing upper cover (Fig. 39).
(9) Lift evaporator out of lower housing (Fig. 40).
(10) Remove styrofoam seal around evaporator.
(11) Transfer evaporator sensor. Place the evaporator sensor in the same location as on the previous evaporator.

INSTALLATION

For installation, reverse the above procedure.

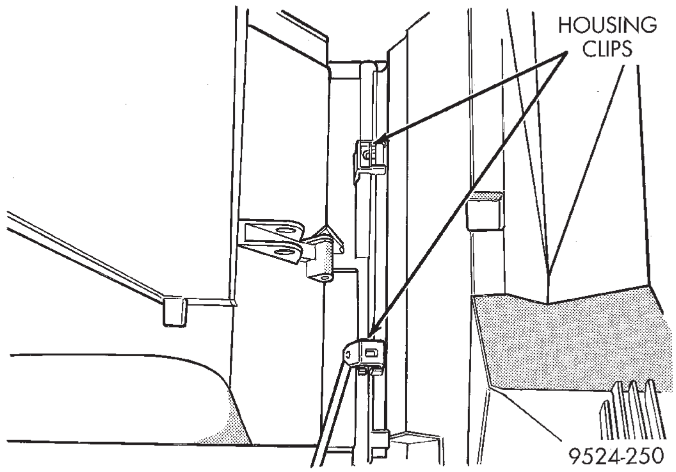


Fig. 36 Housing Clips

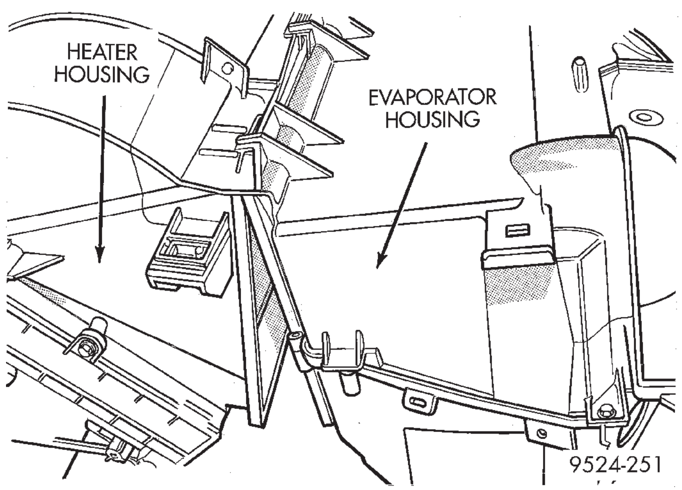


Fig. 37 Separate Housings

REMOVAL AND INSTALLATION (Continued)

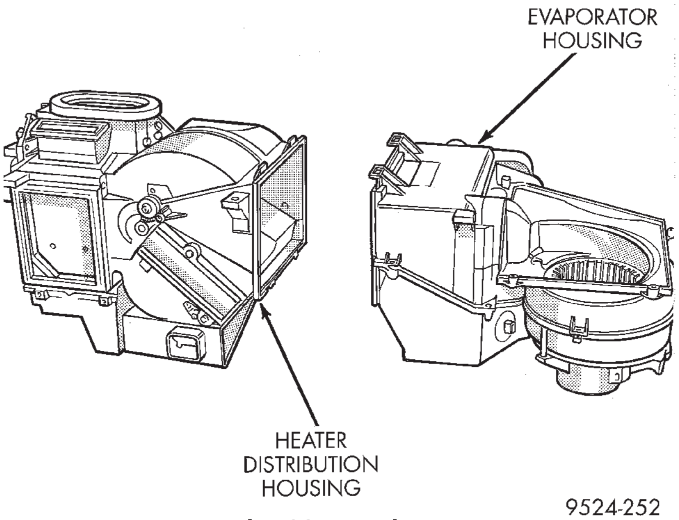


Fig. 38 Housings

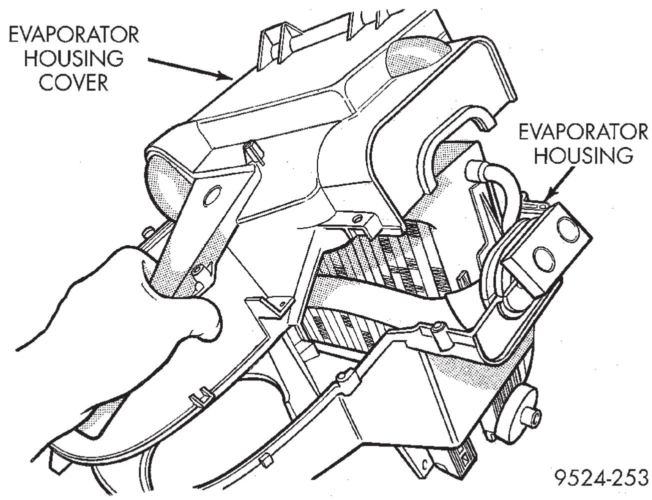


Fig. 39 Evaporator Housing Upper Cover

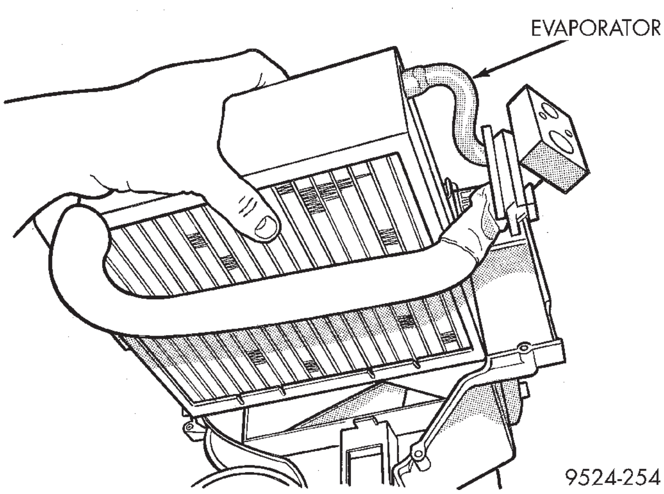


Fig. 40 Remove Evaporator From Housing

EVAPORATOR PROBE

REMOVAL

(1) Disconnect battery.

(2) Remove right under panel silencer/duct.

(3) Disconnect wiring connector for evaporator probe (Fig. 41).

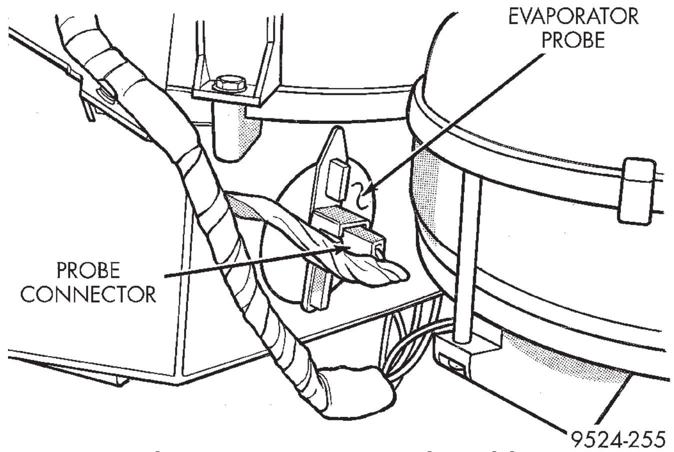


Fig. 41 Evaporator Probe Wiring

(4) Using a flat blade pry tool, pull back on the locking tab. Twist the access plate clockwise one-quarter turn and remove plate (Fig. 42).

(5) Pull probe out of evaporator core (Fig. 43). This plate must be pushed inside the A/C unit and orientated in such a way that the plate can be removed.

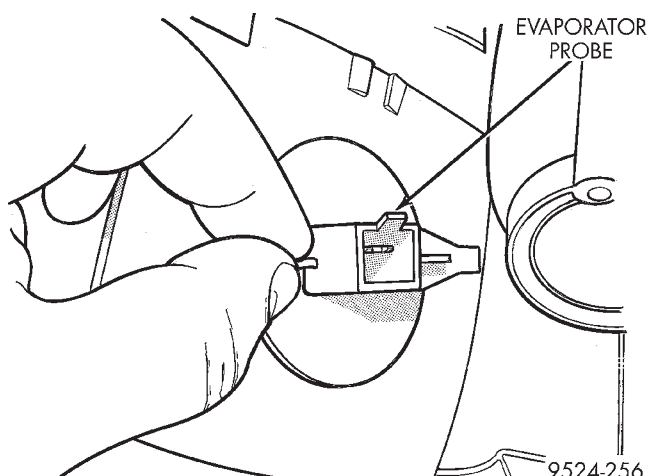


Fig. 42 Evaporator Probe

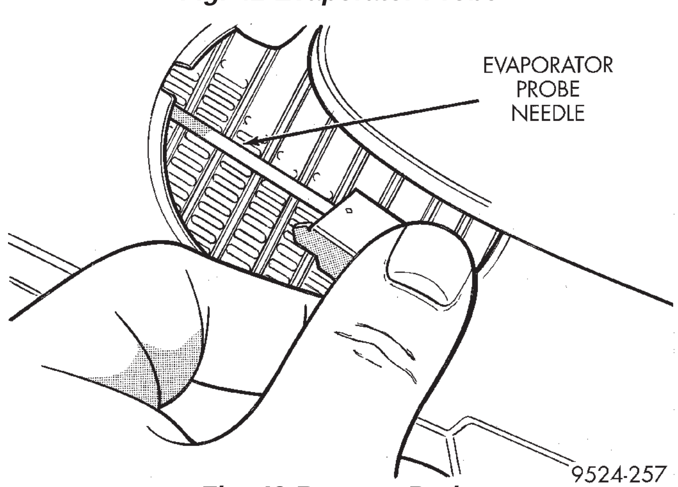


Fig. 43 Remove Probe

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install new probe into the evaporator. **The new probe must not go into the same hole (in the evaporator core) that the old probe was removed.** The evaporator is manufactured with three holes for probe insertion. Insert the probe in the uppermost hole.

(2) Install evaporator probe access panel.

(3) Connect probe wiring harness.

(4) Reconnect battery.

EXPANSION VALVE

WARNING: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO DISCHARGE R-134a SYSTEM. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR/R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.

(2) Disconnect clips from expansion valve lines (Fig. 44) and (Fig. 45).

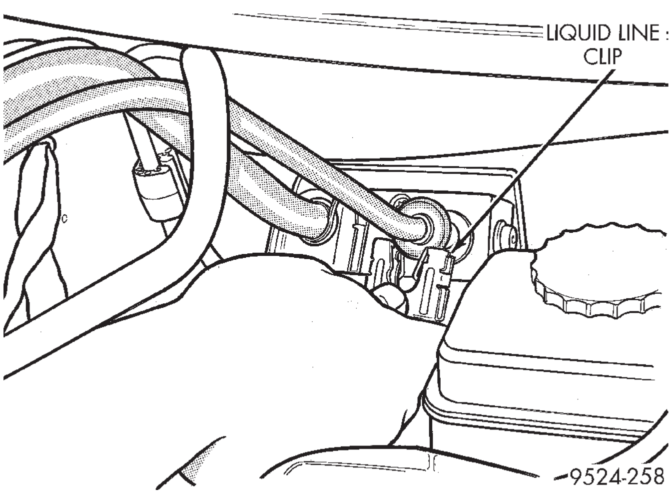


Fig. 44 Liquid Line Clip

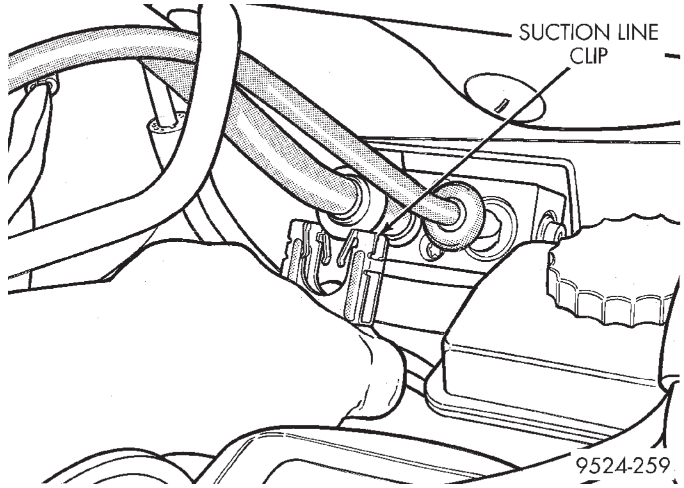


Fig. 45 Suction Line Clip

(3) Use special tool kit 7193 to disconnect quick connectors on expansion valve (Fig. 46) and (Fig. 47).

(4) Remove lines at expansion valve (Fig. 48).

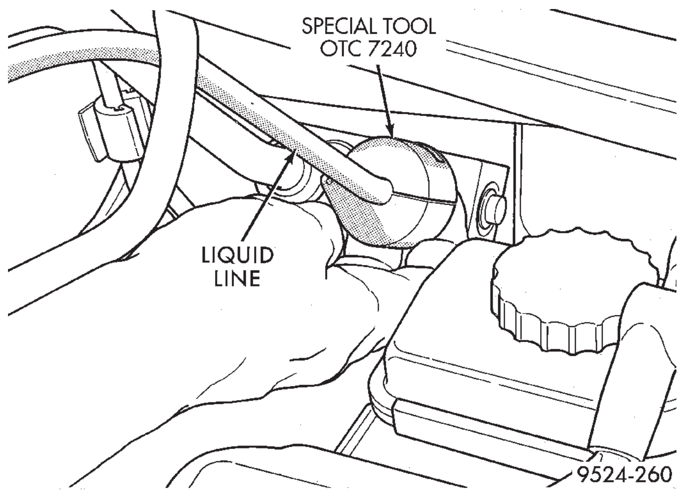


Fig. 46 Special Tool 7240 For Liquid Line

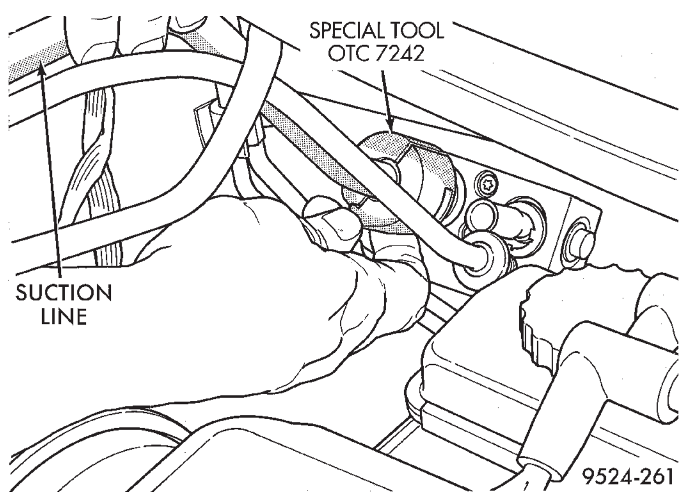


Fig. 47 Special Tool 7242 For Suction Line

REMOVAL AND INSTALLATION (Continued)

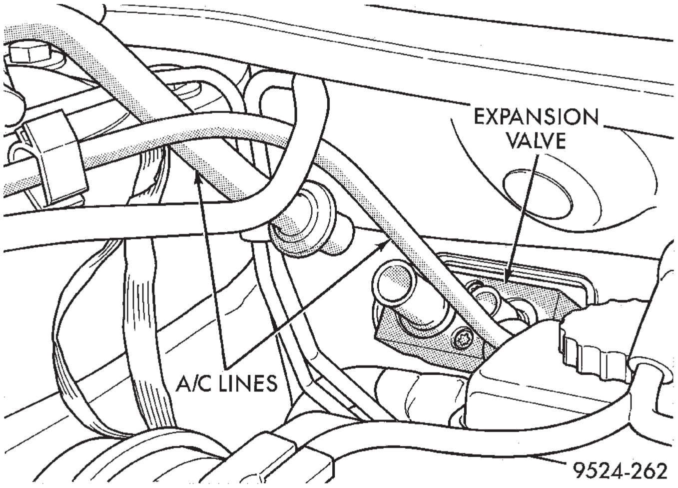


Fig. 48 Lines At Expansion Valve

(5) Remove two retaining bolts from expansion valve (Fig. 49).

(6) Remove expansion valve (Fig. 50).

(7) Remove expansion valve gasket.

INSTALLATION

CAUTION: Always install a new gasket when replacing expansion valve.

For installation, reverse the above procedures. Tighten new expansion valve to 11 N·m (100 in. lbs.).

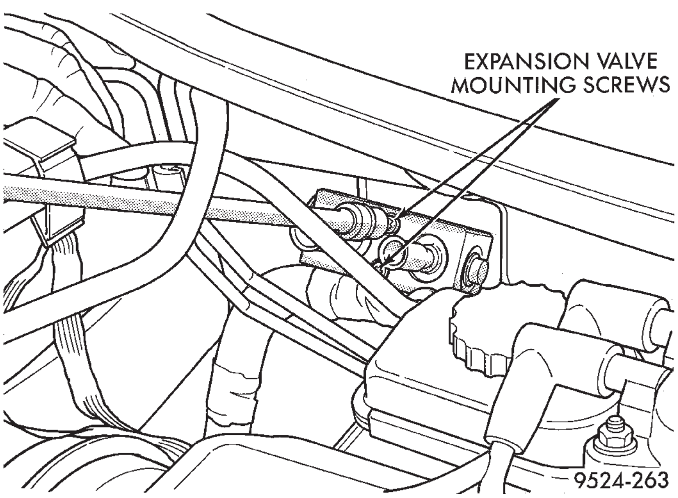


Fig. 49 Expansion Valve Bolts

FILTER/DRIER

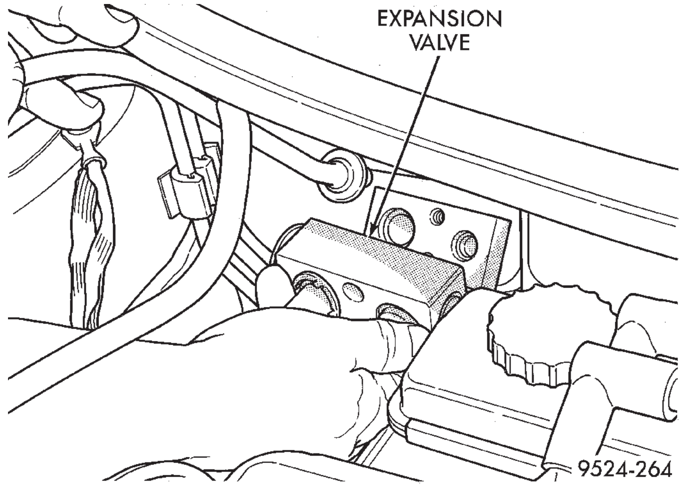


Fig. 50 Expansion Valve

The filter/drier is a receiver for reserve refrigerant. It also has a desiccant bag and a filter. This is used to absorb moisture and filter the refrigerant as it passes through the filter/drier.

The filter/drier is located left of the coolant bottle (Fig. 51). The A/C refrigerant must be removed from the system before removing the filter/drier. Always use a refrigerant recovery machine.

Replace the filter/drier if an A/C system is left open for an extended period of time.

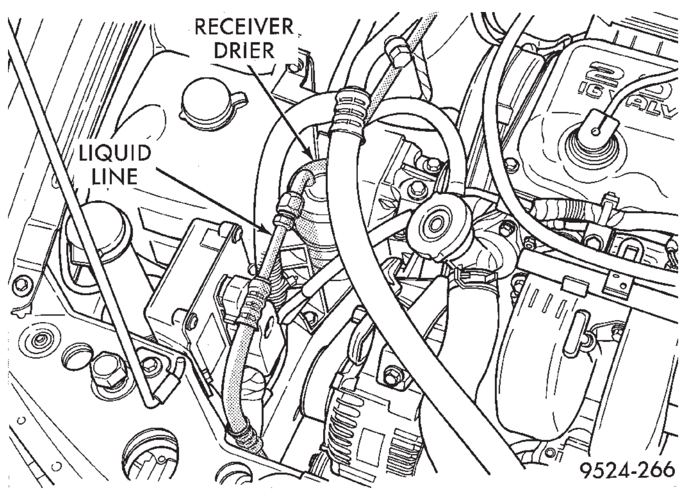


Fig. 51 Filter/Drier Location

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Remove refrigerant from A/C system using a refrigerant recovery machine.

(2) Remove liquid line at filter/drier from condenser (Fig. 52).

(3) Remove liquid line at filter/drier from expansion valve (Fig. 53).

(4) Remove filter/drier bracket bolt at base of filter/drier (Fig. 54).

(5) Cap liquid line and condenser threaded fitting while system is open to prevent moisture from entering system.

INSTALLATION

CAUTION: When installing new filter/drier do not leave open to atmosphere for a long period of time. The filter/drier contains moisture absorbing materials which will absorb moisture in the atmosphere.

For installation, reverse the above procedures.

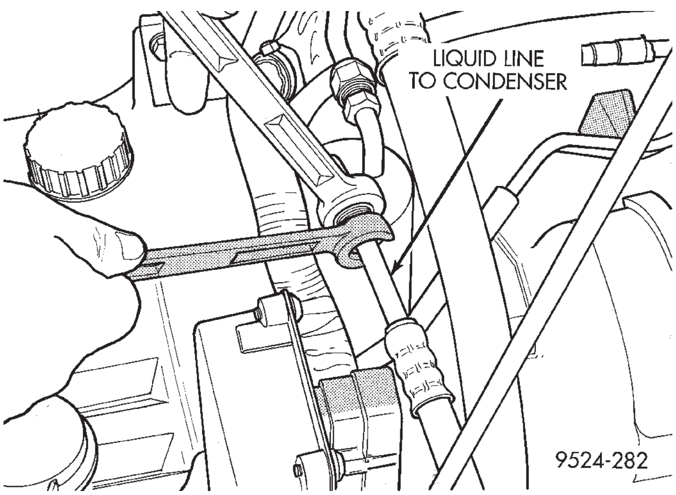


Fig. 52 Liquid Line From Condenser

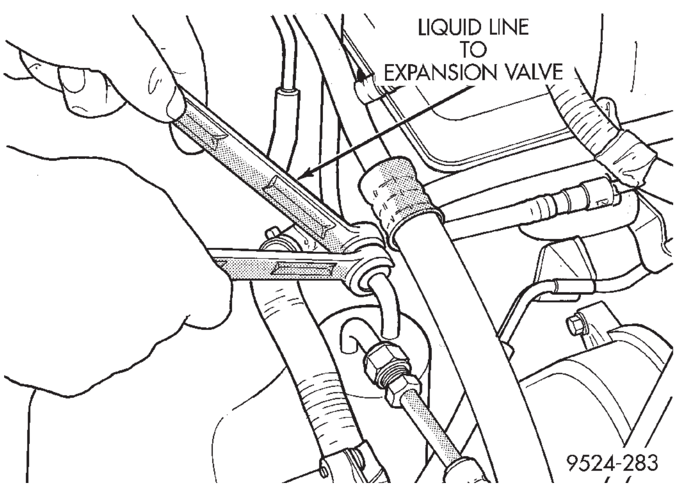


Fig. 53 Liquid Line From Expansion Valve

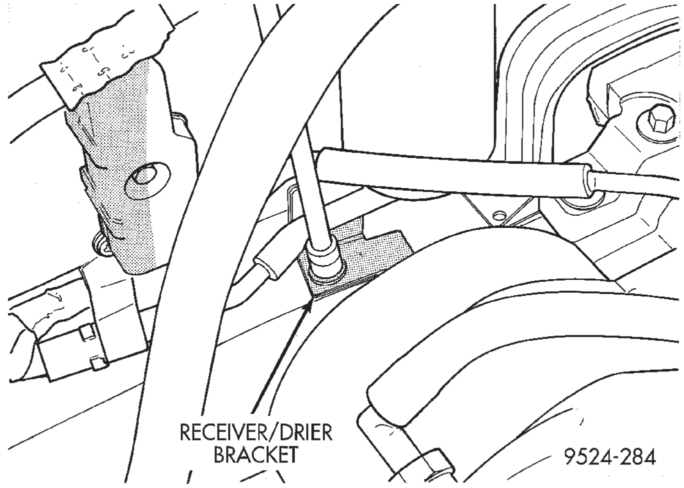


Fig. 54 Receiver/Drier Bracket

HEATER CORE

The heater core is serviceable inside the vehicle. However, if the core has leaked a significant amount of coolant, the A/C housing must be removed. The housing should be disassembled and cleaned thoroughly before heater core replacement. If housing removal is necessary, refer to Heater-A/C Housing, Removal and Installation in this section.

REMOVAL

(1) Disconnect battery negative remote cable.

(2) Remove radio/control module bezel (Fig. 29).

(3) Remove right instrument panel side trim.

(4) Remove two screws at lower right side support beam.

(5) Remove bolt for instrument panel support at A-pillar.

(6) Remove left instrument panel side trim.

(7) Remove upper instrument panel bezel.

(8) Remove lower knee bolster.

(9) Remove console screws at instrument panel.

(10) Remove gearshift knob.

(11) Remove shifter bezel.

(12) Remove console screws at rear. Remove rear half of console.

(13) Remove front console screws. Remove front half of console.

(14) Remove right side instrument panel support strut.

(15) Drain coolant.

(16) Remove heater hoses at cowl.

(17) Remove heater core cover screws and cover.

(18) Remove heater core.

INSTALLATION

(1) Carefully install new heater core into the heater housing.

(2) Fasten heater core cover to housing with screws provided.

REMOVAL AND INSTALLATION (Continued)

(3) Reinstall all necessary trim.
(4) Fill coolant to level.
(5) Reconnect battery.

HEATER HOSES

The heater hoses attach at the engine compartment cowl onto the heater core inlet/outlet and on the left side of the engine.

HEATER HOSES (2.0L-2.4L)

The heater hoses are serviced separately of each other. The hoses are serviced with bulk roll heater hose of the proper diameter and specification. If it is necessary to replace a hose, use hose of the exact diameter and size and shape. The hoses are attached using spring tension clamps.

REMOVAL

NOTE: Review Safety Precautions and Warnings before proceeding with this operation.

(1) Drain engine cooling system. Refer to Group 7, Cooling System.
(2) Using spring tension clamp pliers, remove clamps at each end of hose to be removed (Fig. 55) and (Fig. 56).
(3) Carefully rotate hose back and forth while tugging slightly away from connector nipple.

CAUTION: When removing hoses from heater core inlet or outlet nipples, do not use excessive force. Heater core may become damaged and leak engine coolant into heater unit.

INSTALLATION

For installation, reverse the above procedures.

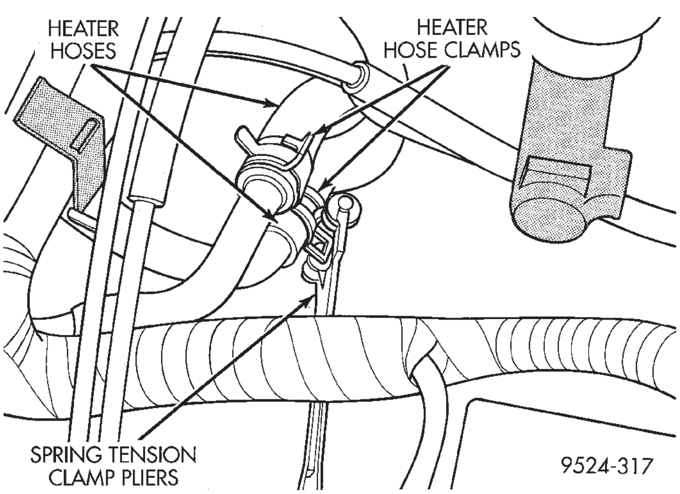


Fig. 55 Heater Hose Connection At Engine

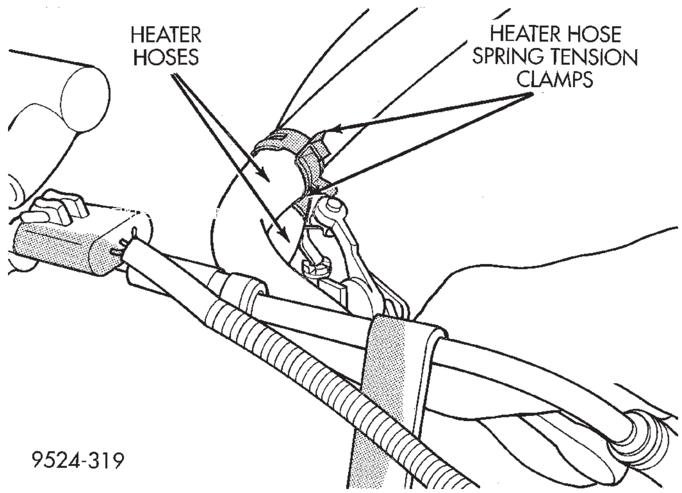


Fig. 56 Heater Hose Connection At Heater Core

HEATER HOSES (2.5L)

REMOVAL

The heater hoses for the 2.5L engine are preformed hoses with quick connect fittings at the engine. These hoses are not serviceable and must be replaced using OEM parts. The hoses are attached at the heater core using spring tension clamps.

NOTE: Review Safety Precautions and Warnings before proceeding with this operation.

(1) Drain engine cooling system. Refer to Group 7, Engine Cooling.
(2) Using thin slide-jaw pliers, pinch quick connect fitting in, of hose to be removed (Fig. 57).

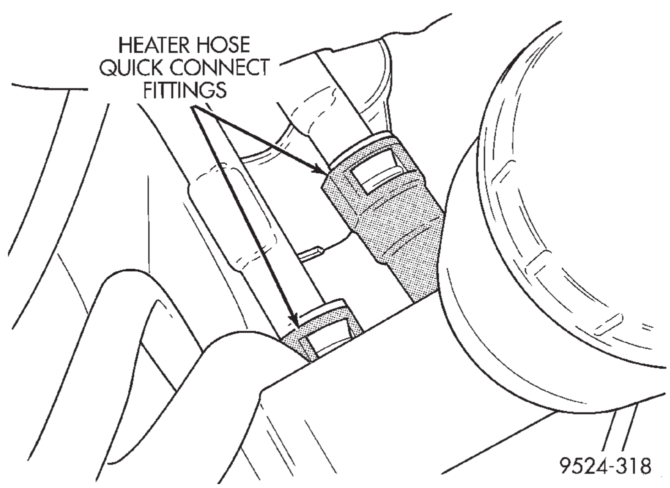


Fig. 57 Heater Hose Connection At Engine

(3) Remove intake manifold plenum. Refer to Group 11, Exhaust System And Intake Manifold for service information.
(4) Using spring tension clamp pliers, remove clamp at heater core end of hose to be removed (Fig. 56).

REMOVAL AND INSTALLATION (Continued)

(5) Carefully rotate hose back and forth while tugging slightly away from connector nipple.

CAUTION: When removing hoses from heater core inlet or outlet nipples, do not use excessive force. Heater core may become damaged and leak engine coolant into heater unit.

INSTALLATION

For installation, reverse the above procedures.

LIQUID LINE

TO EXPANSION VALVE

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.
(2) Remove A/C quick connect clip at expansion valve (Fig. 58).
(3) Disconnect quick connector on expansion valve. Remove liquid line from expansion valve. Use Special Tool kit 7193 to disconnect quick connector (Fig. 59).

CAUTION: Cap all lines that are not being replaced and cap the expansion valve tubes.

(4) Disconnect liquid line from the receiver/drier (Fig. 60).
(5) Remove the liquid line from the vehicle.

INSTALLATION

For installation, reverse the above procedu'res.

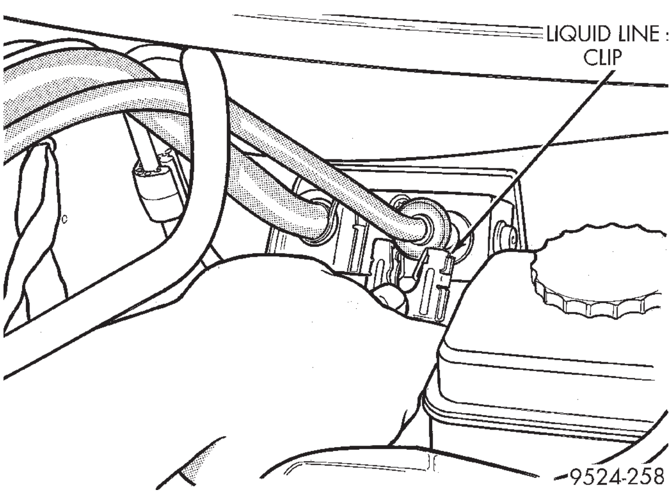


Fig. 58 Liquid Line Clip At Expansion Valve

TO CONDENSER

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.

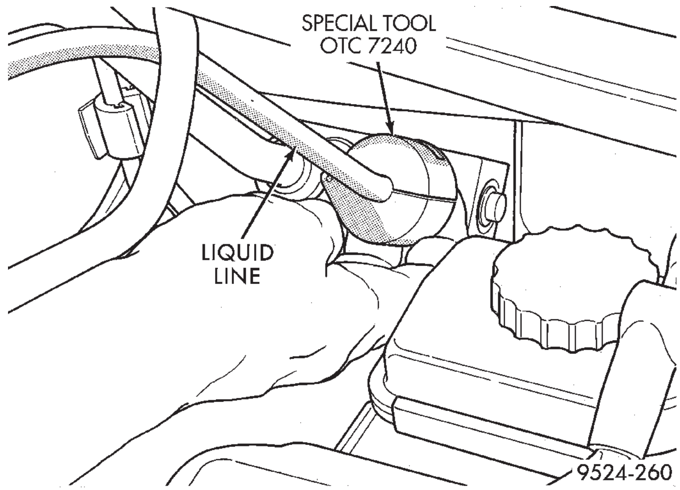


Fig. 59 Use Special Tool 7240 For Quick Connect

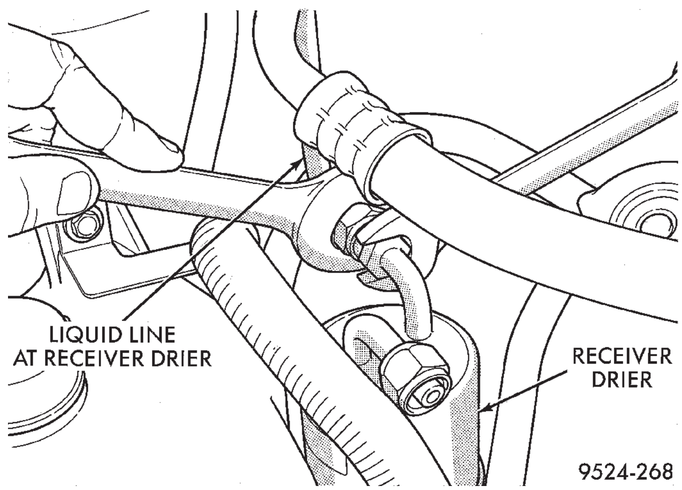


Fig. 60 Liquid Line At Receiver/Drier

(2) Remove A/C quick connect clip at condenser (Fig. 61).
(3) Disconnect quick connector at condenser. Remove liquid line from condenser. Use special tool kit 7193 to disconnect quick connector (Fig. 62). Remove line at condenser (Fig. 63).

CAUTION: Cap all lines that are not being replaced and cap the condenser inlet.

(4) Disconnect liquid line from the receiver/drier (Fig. 64).
(5) Remove the liquid line from the vehicle.

INSTALLATION

For installation, reverse the above procedures.

REMOVAL AND INSTALLATION (Continued)

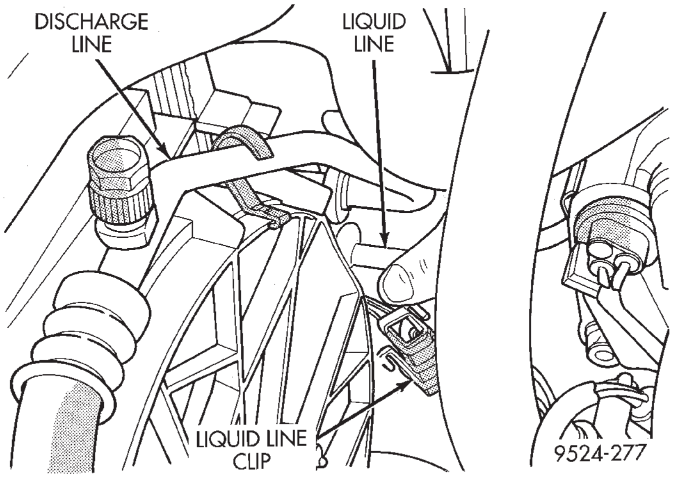


Fig. 61 Clip Removal

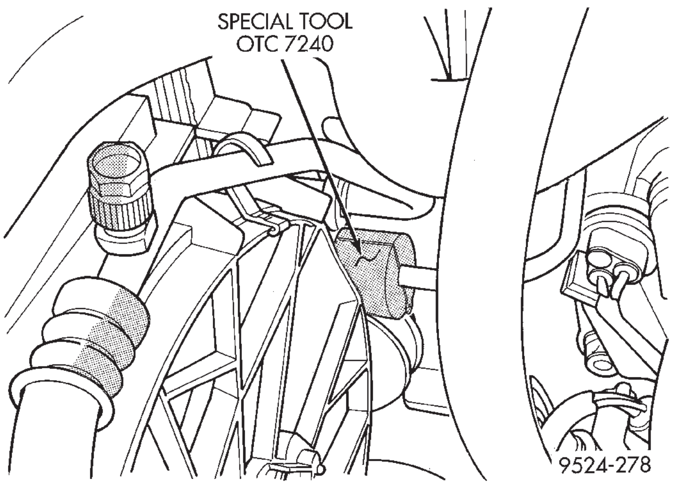


Fig. 62 Quick Coupler Using Special Tool 7240

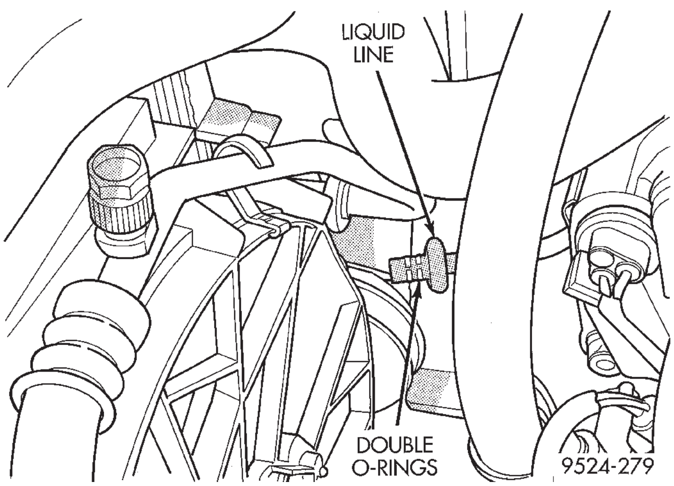


Fig. 63 Line At Condenser

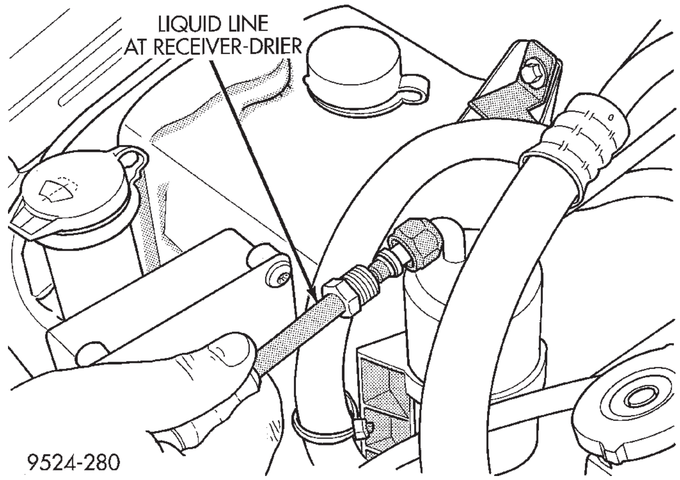


Fig. 64 Liquid Line at Receiver/Drier

RECIRCULATION DOOR CABLE

The RECIRC door is actuated by a cable which mechanically positions the door.

The RECIRC door actuator is located at the far right of the A/C Heater housing near the right A-pillar (Fig. 65).

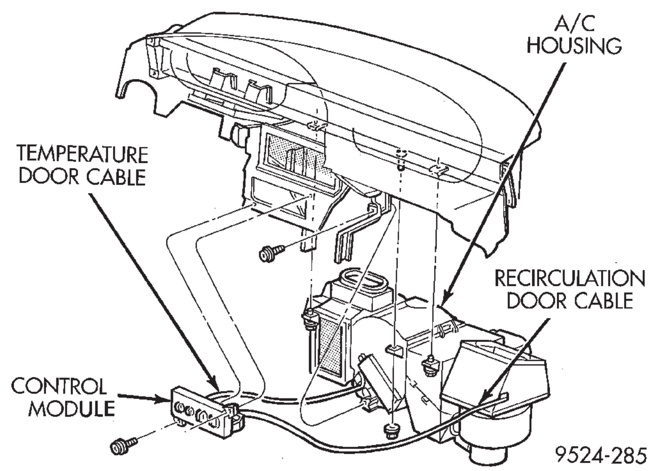


Fig. 65 Recirculation Cable Location

REMOVAL

(1) Place the ignition key in the OFF position before removing control module.

(2) Remove trim bezel (Fig. 66).

(3) Remove cluster hood bezel retaining screws in the trim bezel opening (Fig. 67).

(4) Pry up the cluster hood bezel a few inches to expose the cubby bin/cigar lighter bezel screws.

(5) Remove the cubby bin/cigar lighter bezel and wiring.

(6) Remove the control module retaining screws.

(7) Drop the A/C control module into the cigar lighter/cubby bin bezel opening (Fig. 68). Then disconnect the wiring on the rear of the control module.

(8) Release the recirculation cable retaining clip from the top of the control module. Retain the clip for future use. Then disconnect the recirculation control cable.

REMOVAL AND INSTALLATION (Continued)

(9) Remove right under panel silencer/duct.

(10) Disconnect cable flag at right of recirculation housing (Fig. 69).

(11) Remove cable core end from recirculation actuator lever.

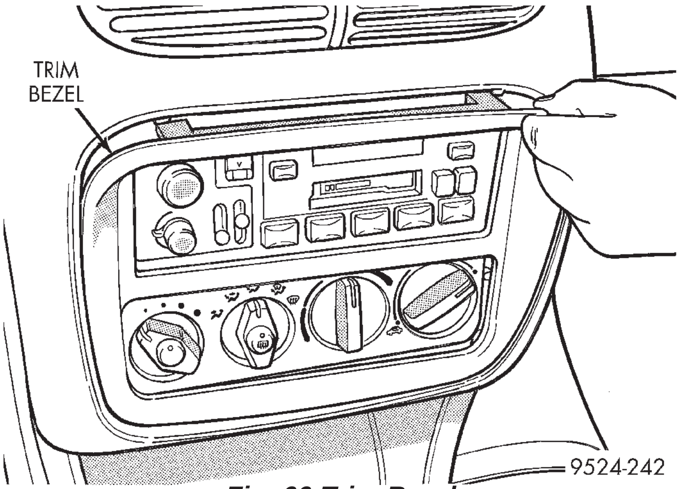


Fig. 66 Trim Bezel

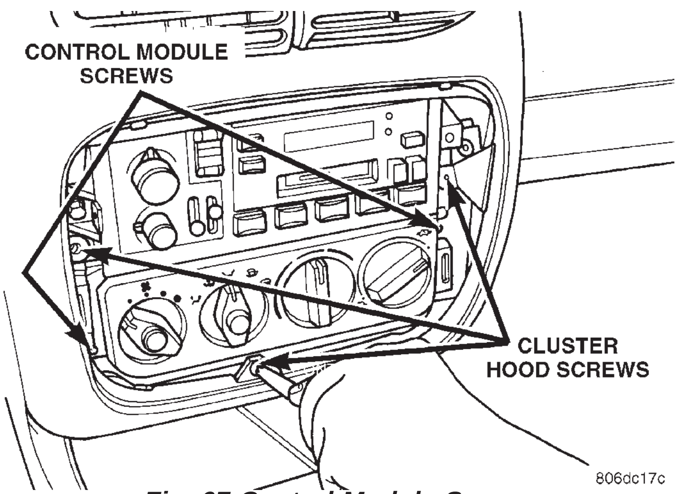


Fig. 67 Control Module Screws

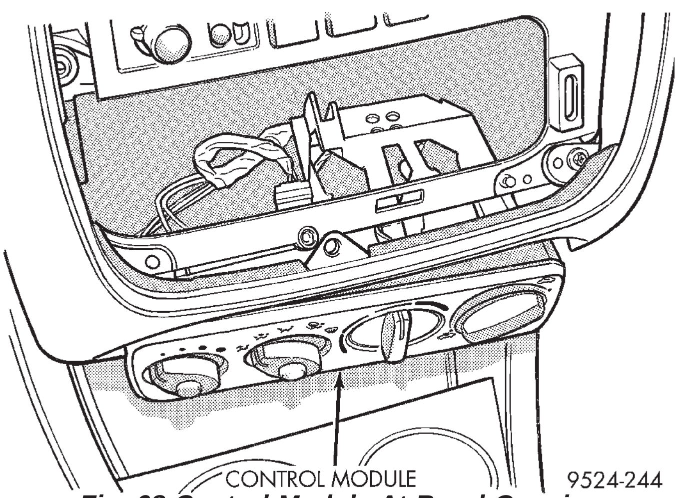


Fig. 68 Control Module At Bezel Opening

INSTALLATION

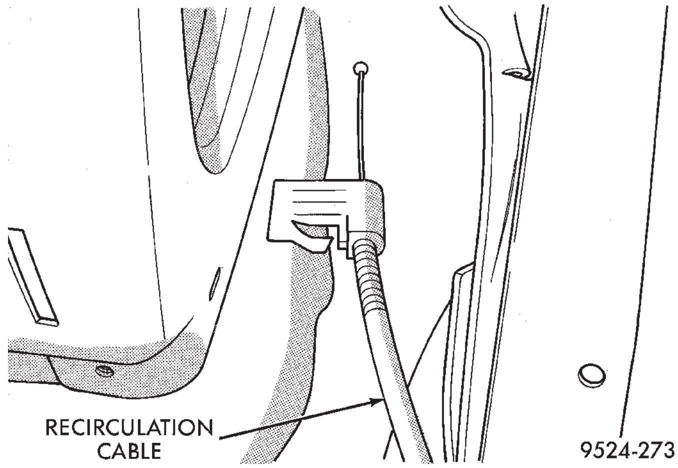


Fig. 69 Disconnect Recirculation Cable

For installation, reverse the above procedures. Verify that the cables are properly adjusted, free of interference, and the module is seated properly.

CABLE ADJUSTMENT

The cables must be adjusted for proper function of the control module. To adjust the cable, attach the cable to the lever arm of the control module. Turn the knob fully counterclockwise. Pull the cable jacket away from the cable end until taut. Clip the cable jacket to the control module. The knob should travel a full 180° if the cable is properly adjusted.

SUCTION LINE

REMOVAL

(1) Remove refrigerant from the A/C system using a refrigerant recovery machine.

(2) Remove suction line clip at right strut tower (Fig. 70).

(3) Remove quick connect clip (Fig. 71). Disconnect quick connect at expansion valve end using Special Tool Kit 7193.

CAUTION: Cap all lines that are not being replaced and cap the expansion valve tubes.

(4) Disconnect line at compressor end (Fig. 72).

(5) Remove suction line from vehicle.

INSTALLATION

For installation, reverse the above procedures. Tighten bolts to 22 N·m (200 in. lbs.).

TEMPERATURE DOOR CABLE

The blend-air (temperature) door is actuated by a cable which mechanically positions the temperature door.

REMOVAL AND INSTALLATION (Continued)

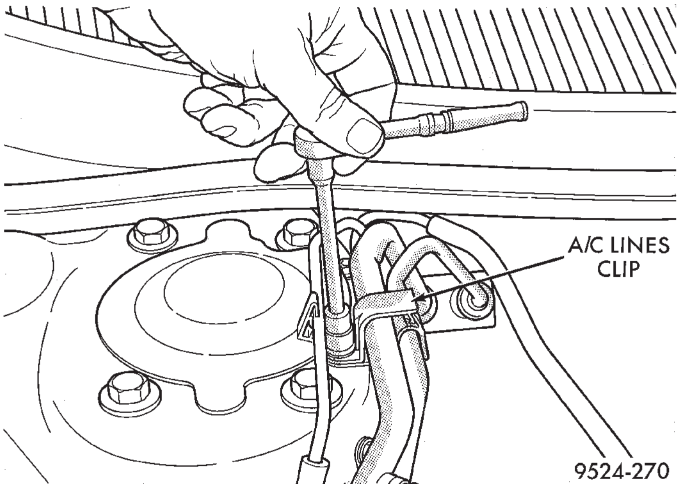


Fig. 70 Suction Line Routing Clip

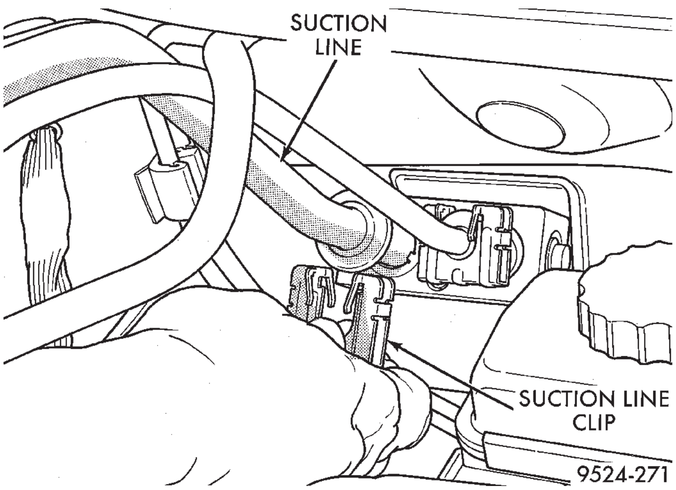


Fig. 71 Quick Connect Clip

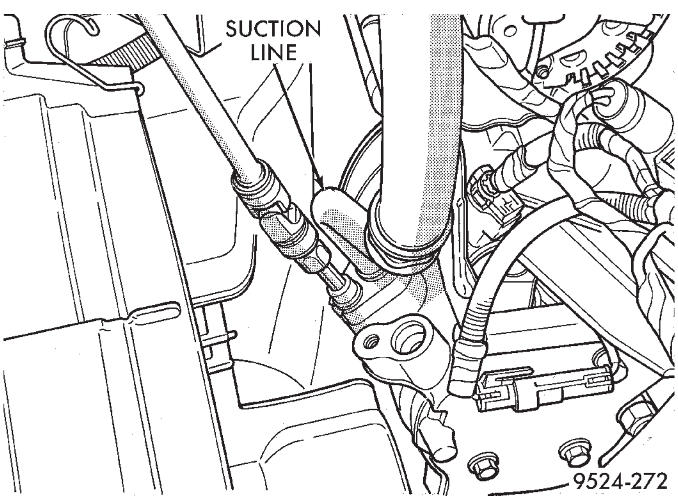


Fig. 72 Suction Line At Compressor

The temperature door actuator is located at the center of the A/C Heater housing at the center tunnel.

REMOVAL

(1) Place the ignition key in the OFF position before removing control module.

(2) Remove trim bezel (Fig. 66).

(3) Remove cluster hood bezel retaining screws in the trim bezel opening (Fig. 67).

(4) Pry up the cluster hood bezel a few inches to expose the cubby bin/cigar lighter bezel screws.

(5) Remove the cubby bin/cigar lighter bezel and wiring.

(6) Remove the control module retaining screws.

(7) Remove control module and disconnect the wire connectors.

(8) Release the temperature control cable retaining clip from the top of the control module. Retain the clip for future use. Then disconnect the temperature control cable.

(9) Disconnect cable at A/C housing (Fig. 73).

(10) Remove cable core end from temperature actuator lever.

INSTALLATION

For installation, reverse the above procedures.

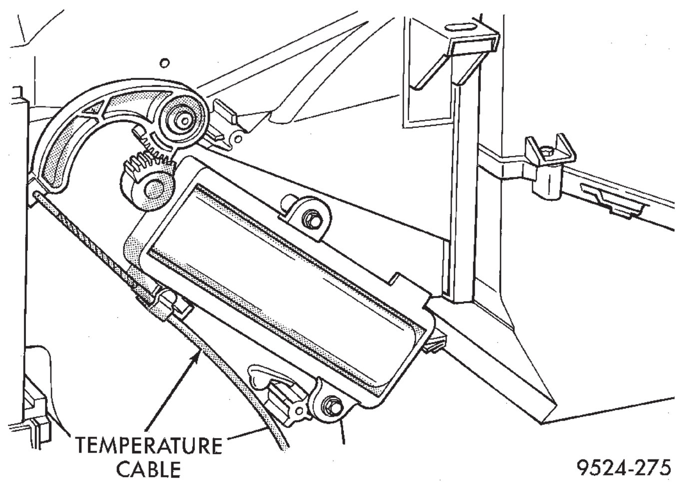


Fig. 73 Temperature Cable At A/C Housing

THERMAL LIMITER SWITCH

There is no serviceability of the thermal limiter switch. If the thermal limiter switch fails, the compressor must be replaced. To replace the compressor, refer to Compressor Replacement in this section.

UNIT HOUSING

REMOVAL

The heater core may be removed without removing the unit housing. Refer to heater core replacement in this section.

(1) Disconnect battery negative remote cable. This must be done to prevent accidental air bag deployment.

REMOVAL AND INSTALLATION (Continued)

WARNING: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE AND THROAT. USE ONLY APPROVED SERVICE EQUIPMENT MEETING SAE REQUIREMENTS TO DISCHARGE R-134a SYSTEM. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE.

R-134a SERVICE EQUIPMENT OR VEHICLE A/C SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR/R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

(2) Using an A/C recovery unit, remove all R-134a refrigerant from the A/C system.

(3) Remove air cleaner hose and air distribution duct from the engine.

(4) Drain the engine cooling system.

NOTE: If equipped with 2.5L engine, the upper intake manifold has to be removed at this time to access the heater hose connections at the bulkhead. Refer to group 11, Exhaust System And Intake Manifold for service information.

(5) Disconnect heater hoses at the dash panel. Plug the heater core inlet and outlet tubes to prevent antifreeze from spilling on the vehicle interior during removal. If an appropriate plug cannot be found pull back carpet and use caution when removing unit. Keep the heater tubes elevated to prevent spillage of coolant.

(6) Remove both A/C lines from expansion valve. Use Special Tool Kit 7193 to disconnect quick connectors on A/C lines. Refer to A/C line removal in this section for complete procedure. After removing lines cap the expansion valve openings and the A/C hose openings. This will prevent any dirt or moisture from entering the refrigerant system during servicing.

CAUTION: The lubricant used in this air conditioning system absorbs moisture readily (similar to brake fluid). Do not leave any portion of the system open for extended periods of time.

(7) Remove trim bezel (Fig. 66).

(8) Remove cluster hood bezel retaining screws in the trim bezel opening (Fig. 67).

(9) Pry up the cluster hood bezel a few inches to expose the cubby bin/cigar lighter bezel screws.

(10) Remove the cubby bin/cigar lighter bezel and wiring.

(11) Remove the control module retaining screws.

(12) Drop the A/C control module into the cigar lighter/cubby bin bezel opening (Fig. 68). Then disconnect the wiring on the rear of the control module.

(13) Release the cable clips from the top of the control module. Retain the clips for future use. Then disconnect the temperature control and recirculation control cables.

(14) Remove the control module.

(15) Remove upper instrument panel bezel.

(16) Remove right and left instrument panel end caps.

(17) Remove left lower knee bolster. Disconnect mode door motor wiring.

(18) Remove right and left interior door post kick panel.

(19) Remove front and rear halves of floor console.

(20) Remove the radio.

(21) Remove right side lower silencer/duct.

(22) Remove glove box assembly.

(23) Remove right side vertical support strut brace.

(24) Remove left side vertical support strut brace.

(25) Remove center lower distribution housing.

(26) Remove bolts securing Heater-A/C housing to metal I/P frame.

(27) Remove upper instrument panel cowl trim cover.

(28) Disconnect steering column from instrument panel. Lower steering column.

(29) Remove instrument panel bolts at cowl fence.

(30) Remove bolts at lower A-posts.

(31) Remove instrument panel frame and wiring.

(32) Remove bolts securing Heater-A/C housing to cowl.

INSTALLATION

For installation, reverse the above procedure. Verify that the cables are properly adjusted, free of interference, and the control module is seated properly.

CABLE ADJUSTMENT

The cables must be adjusted for proper function of the control module. To adjust the cable, attach the cable to the lever arm of the control module. Turn the knob fully counterclockwise. Pull the cable jacket away from the cable end until taut. Clip the cable jacket to the control module. The knob should travel a full 180° if the cable is properly adjusted.

DISASSEMBLY AND ASSEMBLY

UNIT HOUSING RECONDITION

Heater-A/C housing must be removed from vehicle before performing this operation. Refer to Heater-A/C Unit Housing—Removal and Installation.

DISASSEMBLY AND ASSEMBLY (Continued)

The heater a/c unit need not be disassembled to replace the heater core. Refer to Heater Core replacement in this section.

DISASSEMBLE

(1) Place Heater-A/C unit assembly on workbench (Fig. 74) and (Fig. 75).

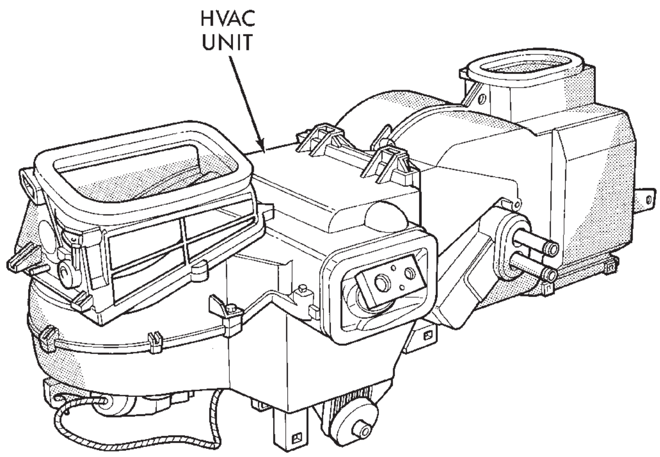


Fig. 74 Heater-A/C Unit

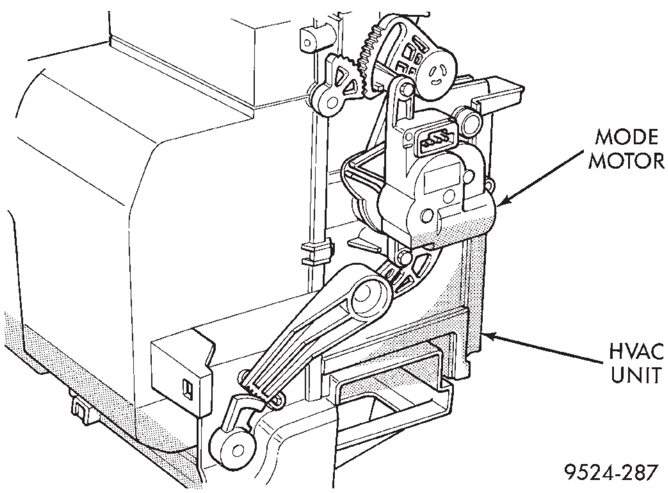


Fig. 75 Mode Motor Linkage

(2) Remove A/C mode motor (Fig. 76).

(3) Remove upper recirculation air inlet housing (Fig. 77) and (Fig. 78).

(4) From inside of air inlet, depress release tang on rear inlet door (Fig. 79).

(5) Remove rear Y-cam actuator lever (Fig. 80).

(6) Turn front toggle lever until it lines up with slots on housing.

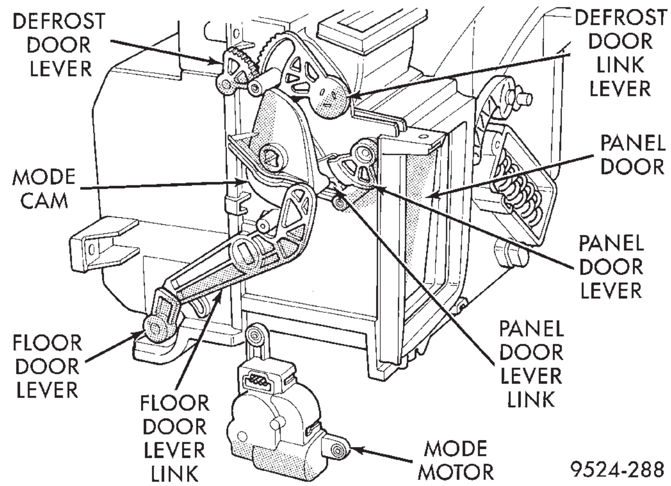


Fig. 76 Mode Motor

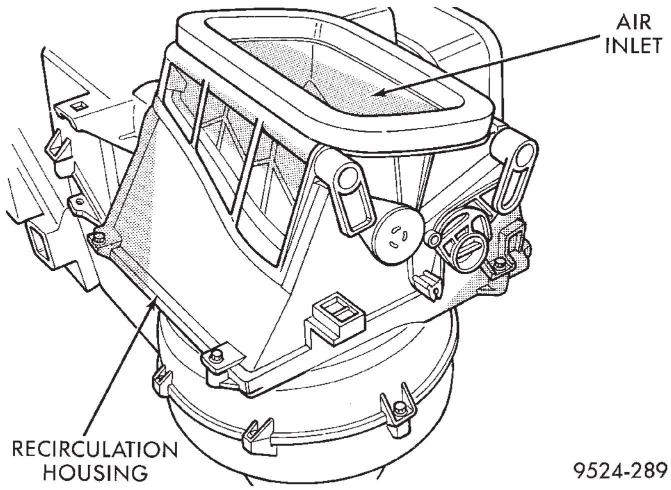


Fig. 77 Recirculation Air Inlet

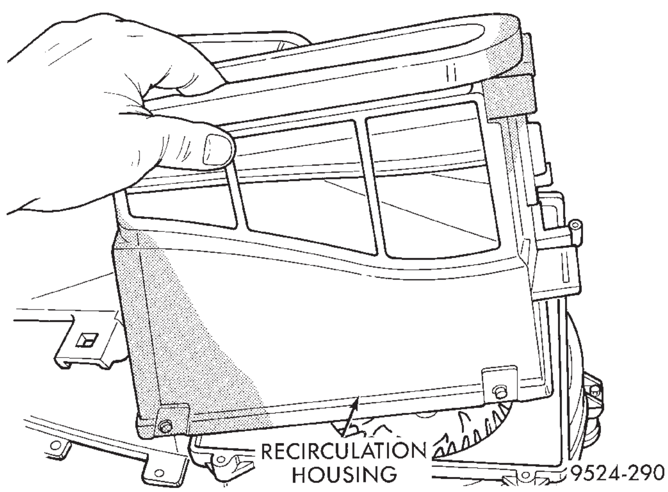


Fig. 78 Recirculation Housing Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Pull straight up on toggle lever and slide toggle lever from underneath front actuator lever (Fig. 80).

(8) Remove front toggle lever (Fig. 80).

(9) Remove Y-cam rear lever (Fig. 80).

(10) Unsnap and remove rear air inlet door (Fig. 81).

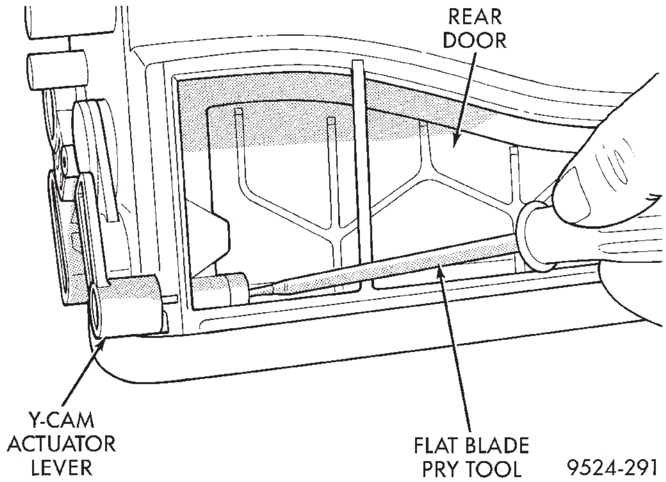


Fig. 79 Rear Y-Cam Release

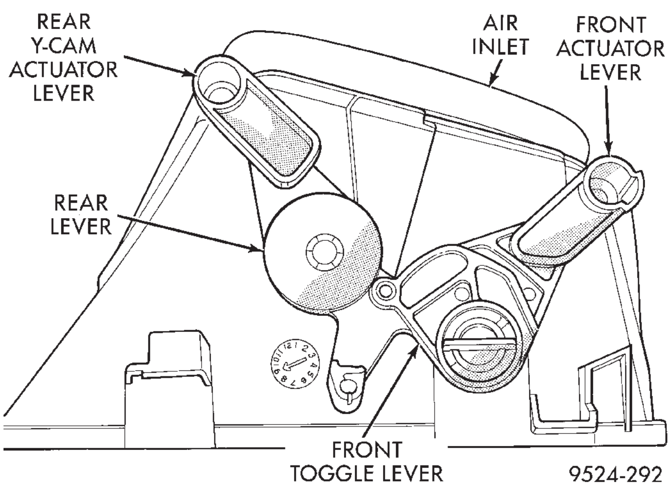


Fig. 80 Rear Y-Cam Actuator

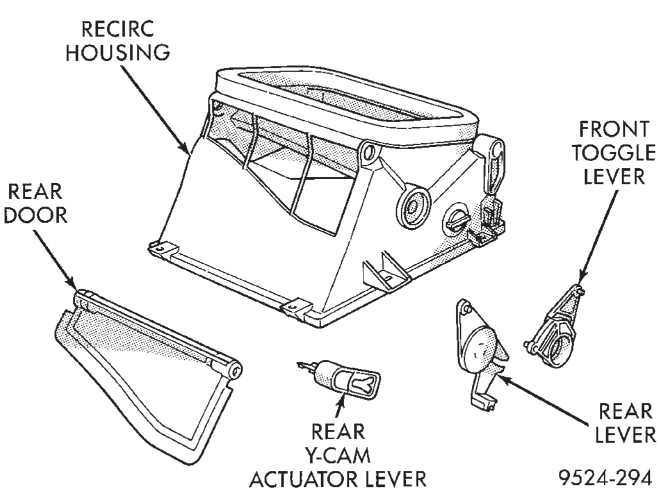


Fig. 81 Rear Air Inlet Door

(11) Front air inlet door and lever is serviced with recirculation housing.

(12) Remove blower motor wiring at resistor (Fig. 82).

(13) Remove blower motor (Fig. 83).

(14) Using a flat blade pry tool, Pull up on tab at evaporator probe cover (Fig. 84). Turn evaporator probe cover clockwise 90°.

(15) Remove evaporator probe cover. Pull evaporator needle from evaporator (Fig. 85).

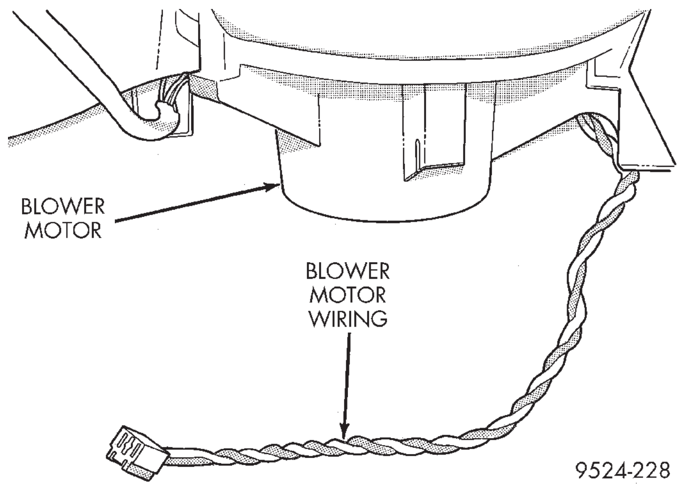


Fig. 82 Blower Motor Wiring

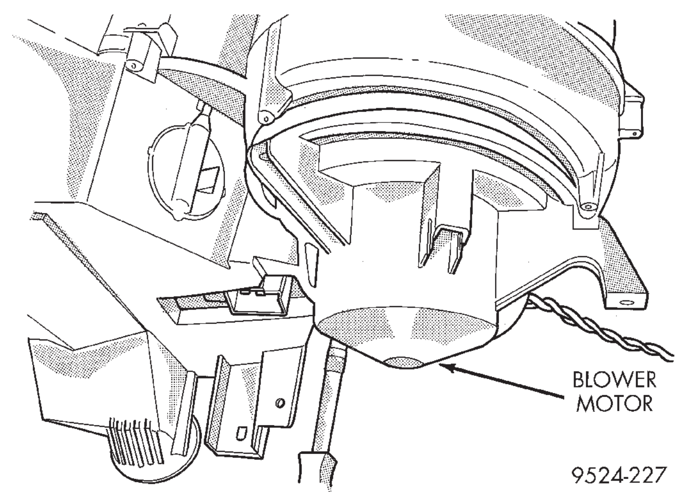


Fig. 83 Blower Motor

DISASSEMBLY AND ASSEMBLY (Continued)

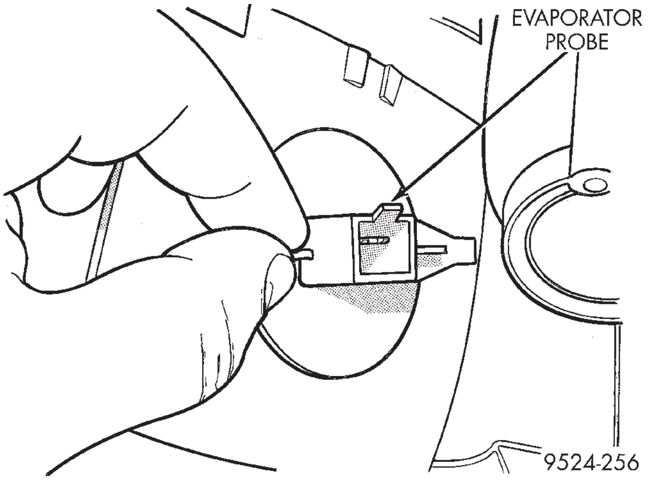


Fig. 84 Evaporator Probe

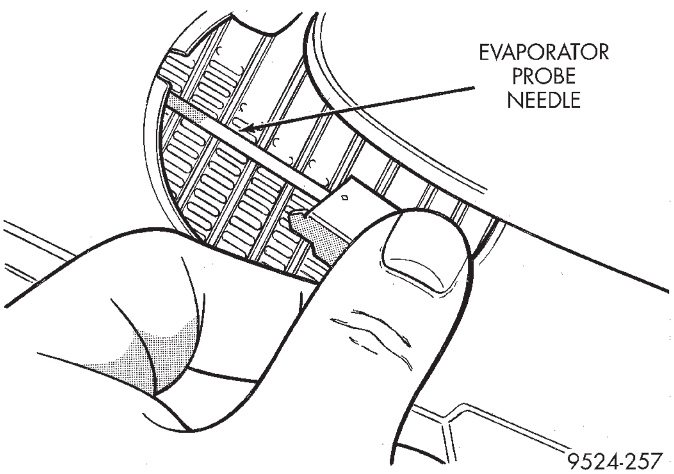


Fig. 85 Evaporator Probe Needle

(16) Remove blower motor resistor (Fig. 86).

(17) Remove clips retaining evaporator housing to heater/distribution housing (Fig. 87).

(18) Separate evaporator housing from heater/distribution housing (Fig. 88).

(19) Remove seal around evaporator tube inlet (Fig. 89).

(20) Remove evaporator housing upper cover (Fig. 90).

(21) Lift evaporator out of lower housing (Fig. 91).

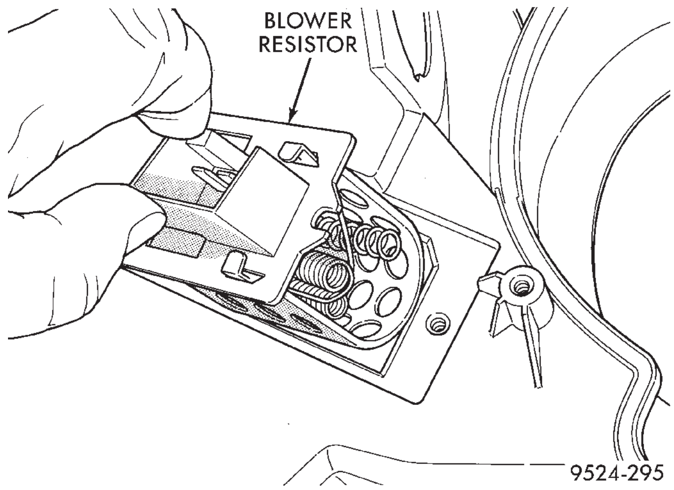


Fig. 86 Blower Motor Resistor

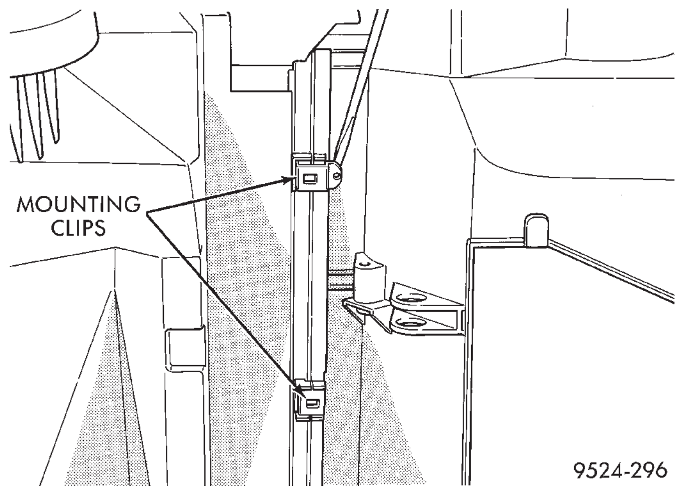


Fig. 87 Housing Clips

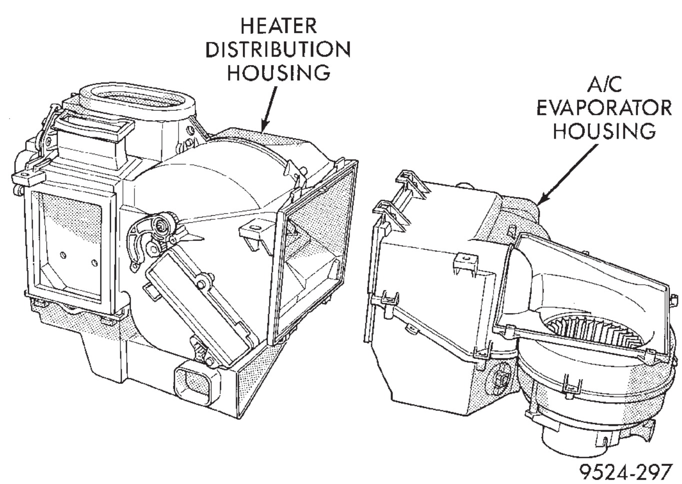


Fig. 88 Separate Housings

DISASSEMBLY AND ASSEMBLY (Continued)

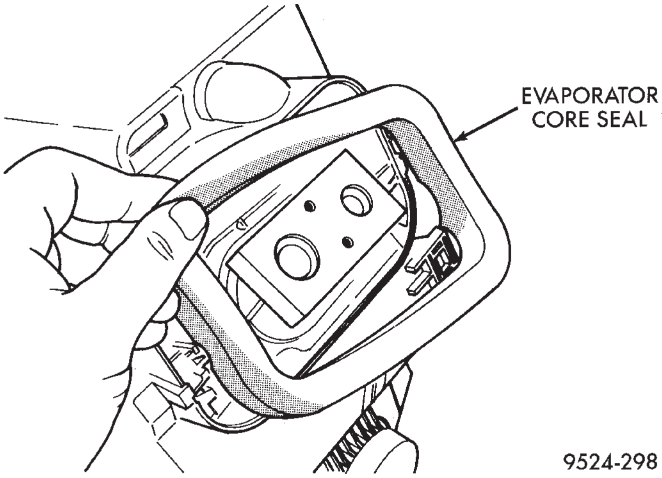


Fig. 89 Evaporator Tube Inlet Seal

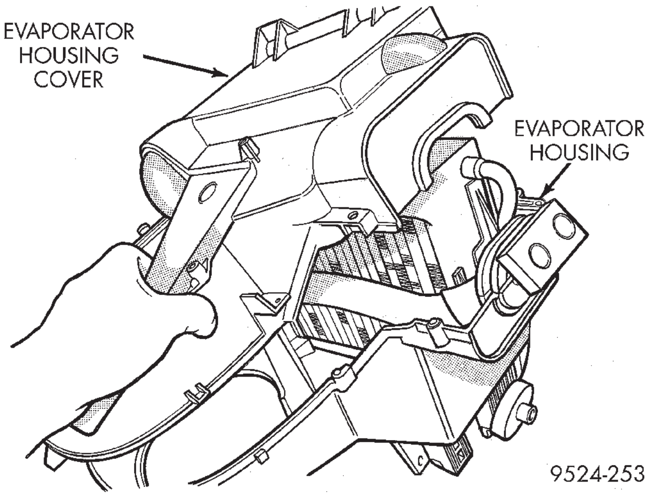


Fig. 90 Evaporator Housing Upper Cover

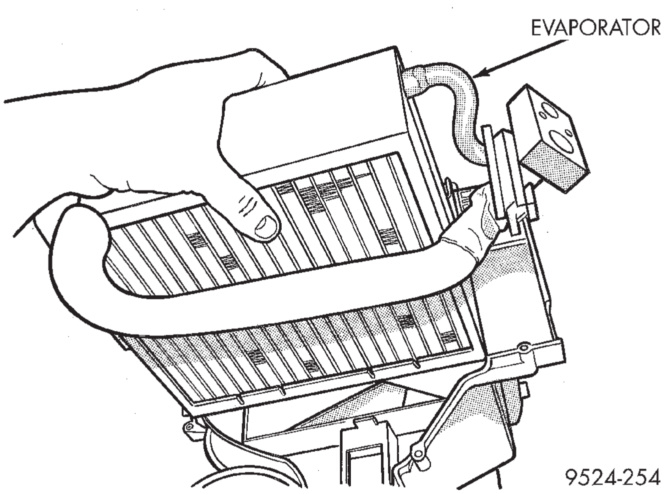


Fig. 91 Remove Evaporator From Housing

(22) Remove styrofoam seal around evaporator.

(23) Remove lower heat/distribution housing clips. Remove housing (Fig. 92).

(24) Remove heater core cover (Fig. 93) and (Fig. 94).

(25) Slide heater core out of heater housing (Fig. 95).

(26) Remove temperature door lever link retaining screw (Fig. 96).

(27) Remove temperature door lever link (Fig. 97).

(28) From the panel door air opening, using a long thin screwdriver, push in clip for floor door gear. Remove floor door gear (Fig. 98).

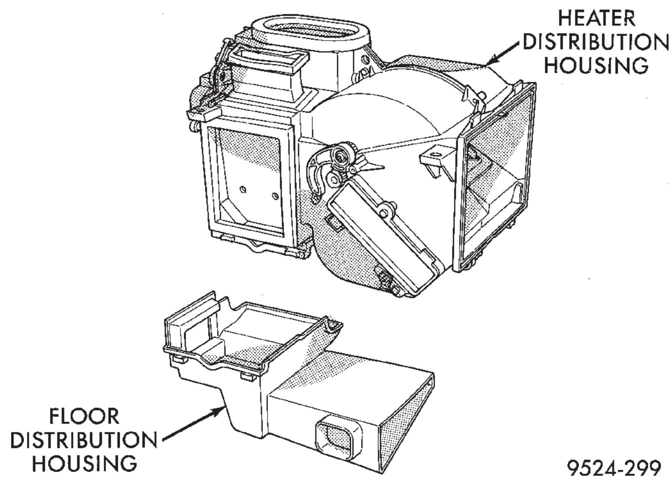


Fig. 92 Lower Floor Distribution Housing

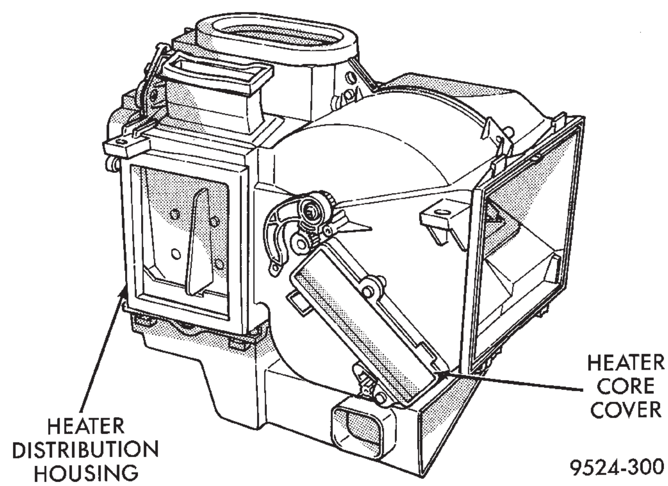


Fig. 93 Heater Core Cover

DISASSEMBLY AND ASSEMBLY (Continued)

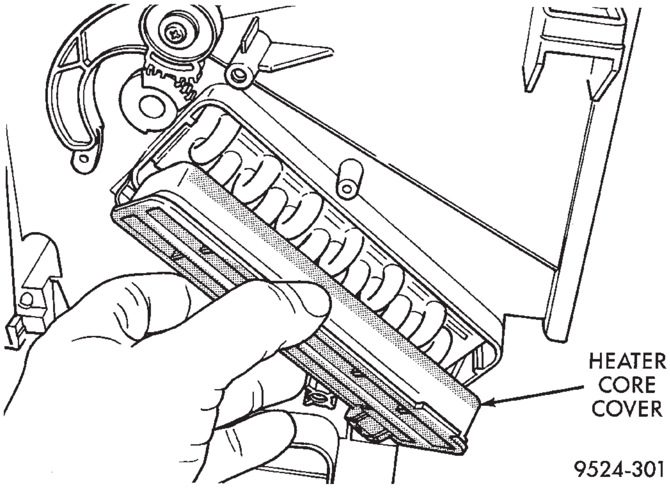


Fig. 94 Heater Core Cover Removal

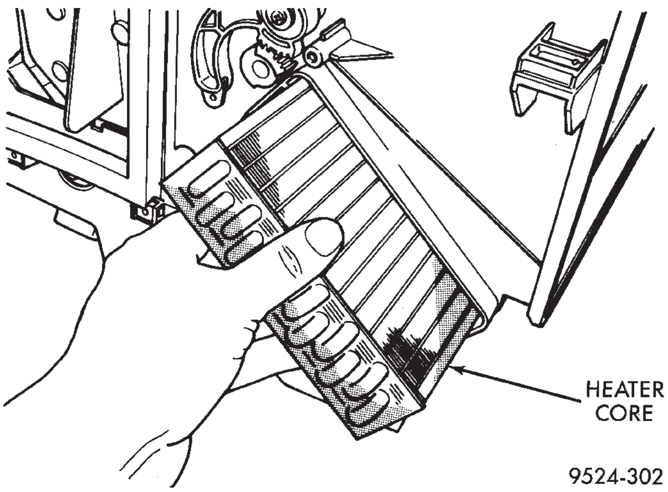


Fig. 95 Slide Out Core

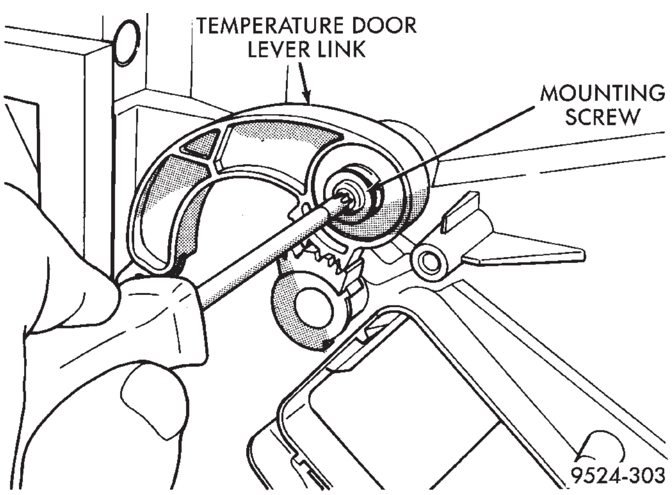


Fig. 96 Temperature Door Lever Link

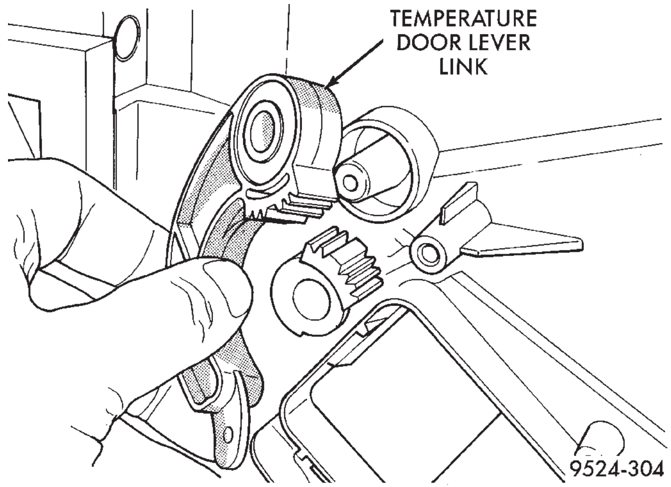


Fig. 97 Temperature Door Lever Link Removal

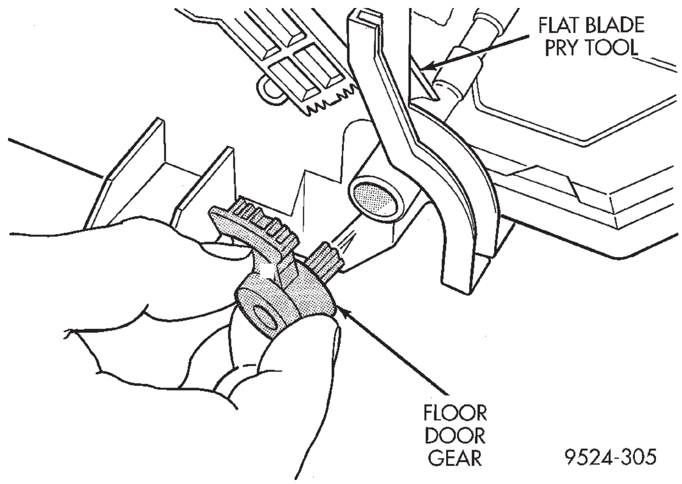


Fig. 98 Floor Door Gear

(29) Turn floor door lever link until it aligns with slots cut into it (Fig. 99). Remove floor door lever link (Fig. 100).

(30) Remove mode motor cam from housing (Fig. 101) and (Fig. 102).

(31) From panel door access, using a long thin screwdriver, push in release tang on panel door gear (Fig. 103).

(32) Remove panel door gear from housing.

(33) Line up slots on panel door lever link. Remove panel door lever link from housing (Fig. 104).

DISASSEMBLY AND ASSEMBLY (Continued)

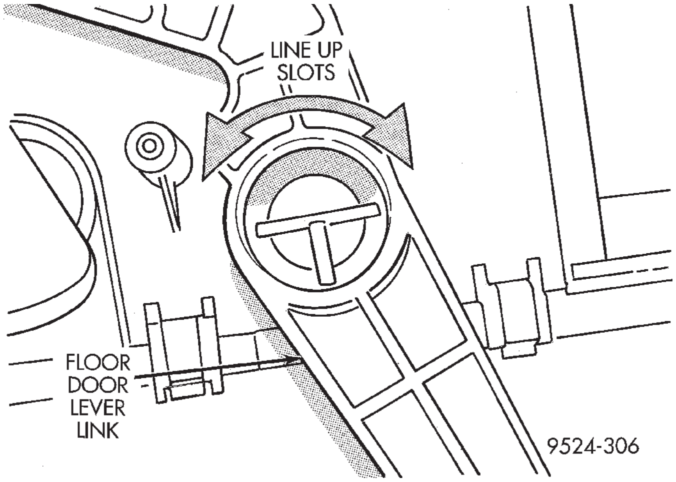


Fig. 99 Align Slots

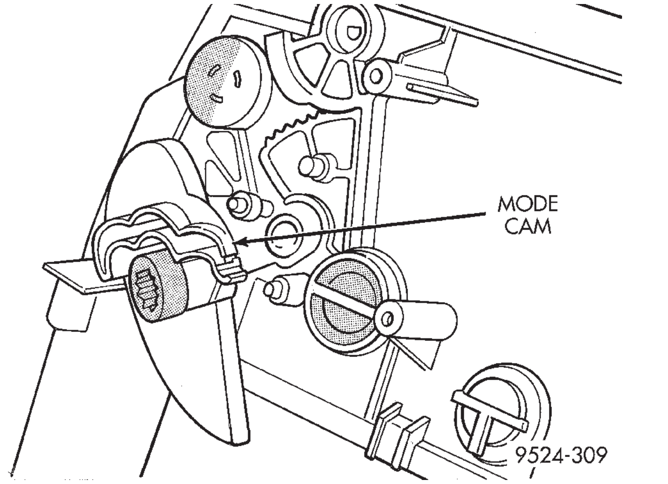


Fig. 102 Mode Motor Cam Removal

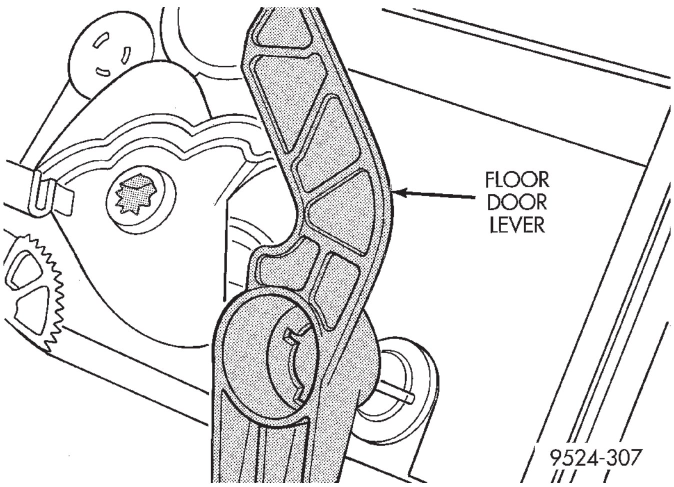


Fig. 100 Remove Lever Link

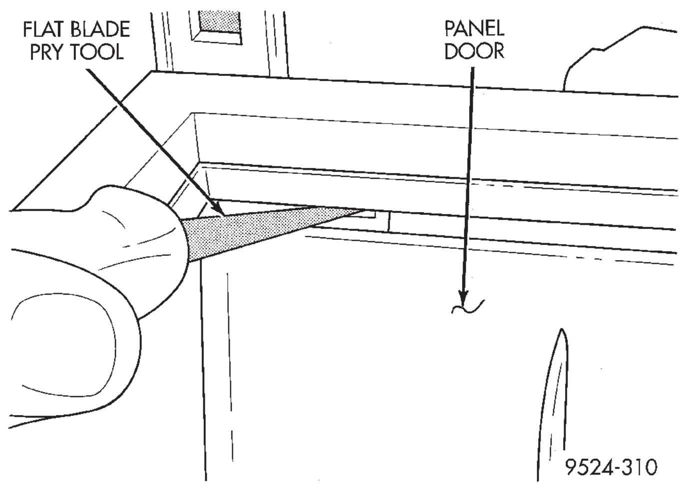


Fig. 103 Panel Door Gear Release

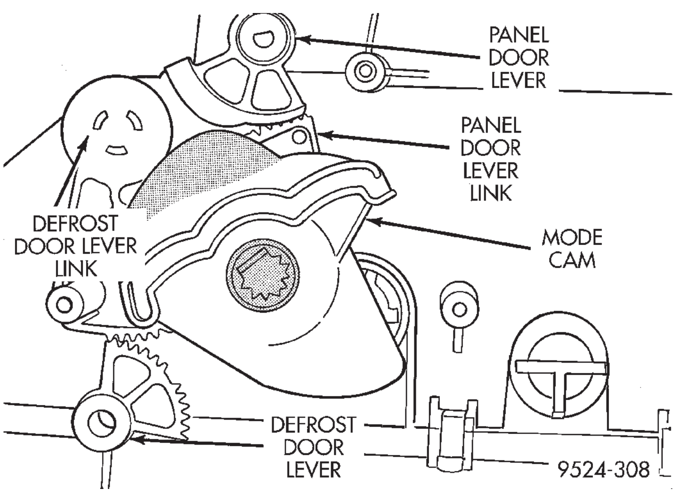


Fig. 101 Mode Motor Cam

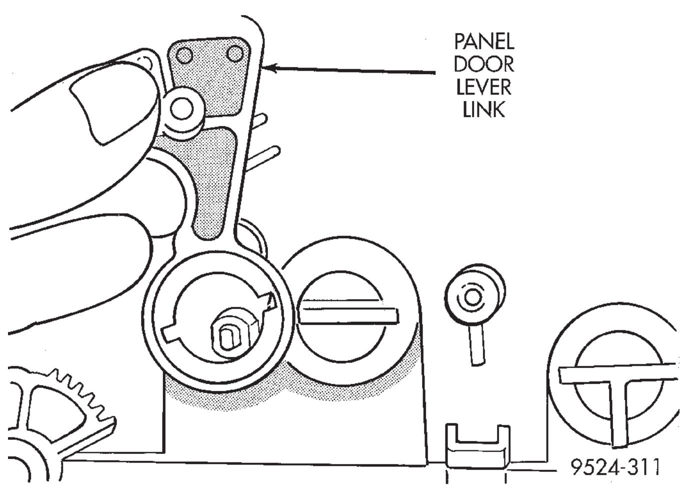


Fig. 104 Panel Door Lever Link

DISASSEMBLY AND ASSEMBLY (Continued)

(34) Unsnap defrost door lever link from housing (Fig. 105).

(35) Remove defrost door seal from housing.

(36) Remove A/C housing rear cover half from front half (Fig. 106).

(37) Remove defrost door from housing (Fig. 107).

(38) Depress retaining clip at temperature control door, remove temperature control door (Fig. 108).

(39) Unsnap panel door from rear half of housing. Remove door from housing.

(40) Unsnap floor door from front half of housing. Remove door from housing (Fig. 109).

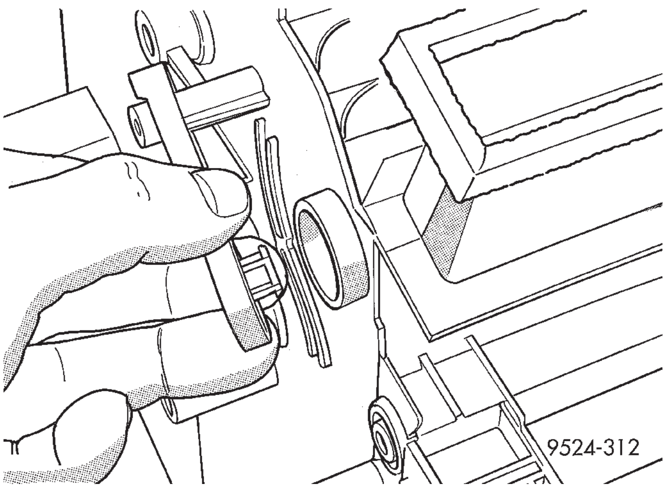


Fig. 105 Defrost Door Lever Link

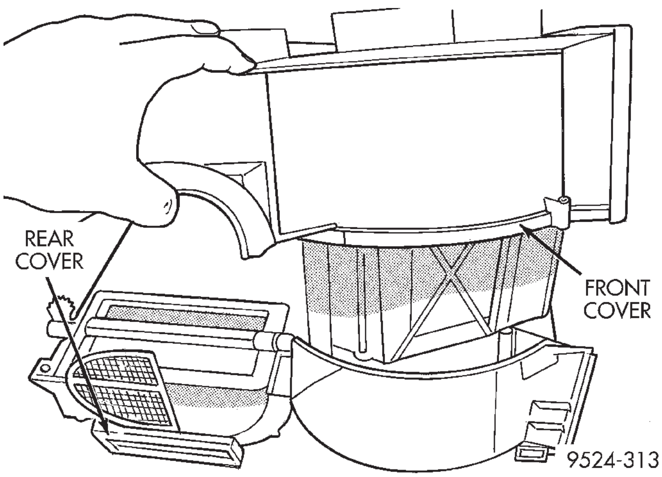


Fig. 106 Front And Rear Housing Halves

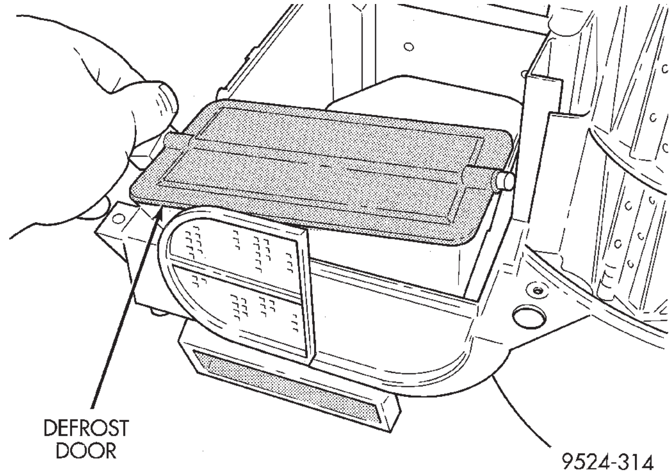


Fig. 107 Defrost Door Removal

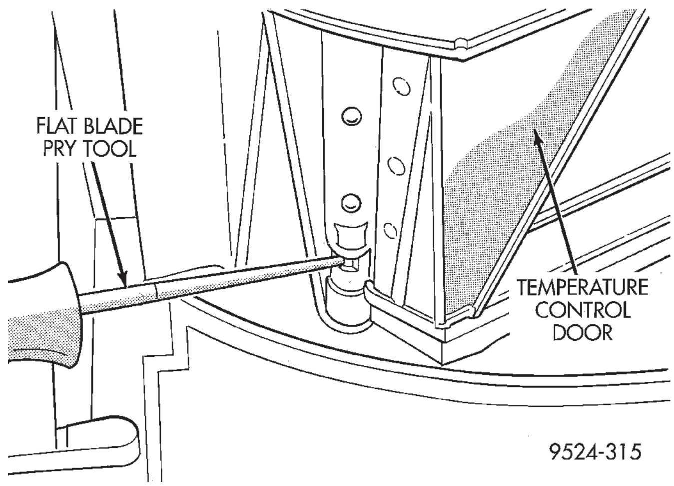


Fig. 108 Temperature Control Door Removal

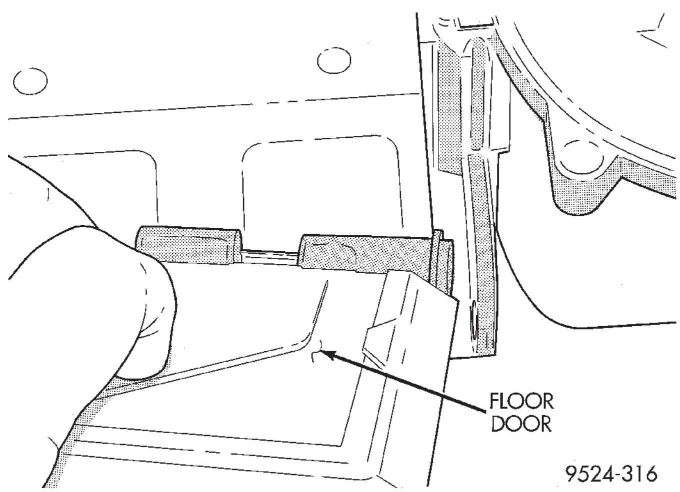


Fig. 109 Floor Door Removal

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLE

(1) Install floor, panel, temperature, and defrost doors in housings.

(2) Position front A/C housing half to rear half. Install retaining screws.

(3) Install defrost door seal.

(4) Snap defrost door lever link to door.

(5) Install panel door lever link. Install panel door lever gear.

(6) Install mode motor cam.

(7) Install floor door lever link.

(8) Install floor door lever gear.

(9) Install temperature door lever gear.

(10) Install temperature door lever link.

(11) Slide heater core into housing. Install cover.

(12) Install lower distribution housing and clips.

(13) Install styrofoam to evaporator. Install evaporator into the evaporator housing.

(14) Install upper cover to evaporator housing.

(15) Install seal around evaporator tube inlet.

(16) Install evaporator probe into evaporator and housing.

(17) Install blower motor and resistor.

(18) Install air inlet housing to evaporator housing.

(19) Install evaporator housing to heat/distribution housing.

(20) Install mode motor.

SPECIFICATIONS

COMPRESSOR

DESCRIPTION	
Displacement per Revolution	85.7 cc/rev (5.2 cu. in./rev.)
Maximum Allowable rpm	12000 rpm
Maximum Allowable Continuous rpm	10000 rpm
Refrigerant	R-134A
Oil	SP15PAG 150cc (5.08 fl. oz.)
Weight	39.2 N·m (8.82 lbs., 4.0 kgf.)

CLUTCH

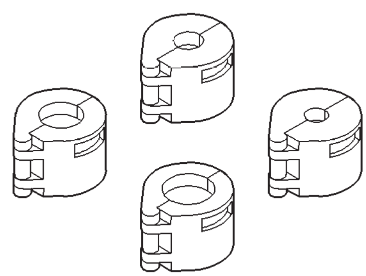
DESCRIPTION	
Rated Voltage	12 VDC
Minimum Breakaway Torque	31.4 N·m (23 ft. lbs., 3.2 Kgf.m) at 12VDC
Minimum Engagement Voltage	7.5 AT AIR GAP 0.5 mm REF
Power Consumption	50 WATTS MAX.
Pulley Diameter	110 mm DIA. (4.3 in.)
Weight	18.9 N·m (4.23 lbs., 1.92 Kgf.)
Clutch Type	Standard

THERMAL LIMITER SWITCH

DESCRIPTION	TEMPERATURE
Cut OFF Temperature	122 to 128°C (252 to 262°F)
Cut IN Temperature	104 to 116°C (225 to 235°F)

SPECIAL TOOLS

AIR CONDITIONING



A/C Line Disconnect Tool 7193

EMISSION CONTROL SYSTEMS

CONTENTS

ON-BOARD DIAGNOSTICS

INDEX

GENERAL INFORMATION

SYSTEM DESCRIPTION

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warmup cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example** , assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, use the DRB scan tool to erase all DTC's and extinguish the MIL.

GENERAL INFORMATION (Continued)

Technicians can display stored DTC's by two different methods. Refer to Diagnostic Trouble Codes in this section. For DTC information, refer to charts in this section.

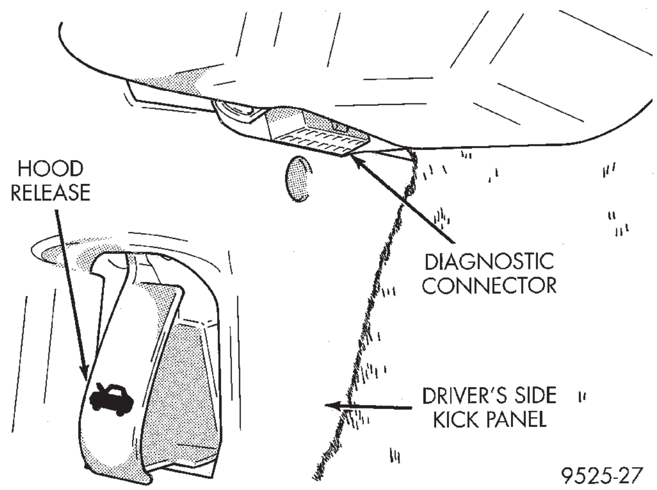


Fig. 1 Data Link (Diagnostic) Connector

DESCRIPTION AND OPERATION

MALFUNCTION INDICATOR LAMP (MIL)

As a functional test, the Malfunction Indicator Lamp (MIL) illuminates at key-on before engine cranking. Whenever the Powertrain Control Module (PCM) sets a Diagnostic Trouble Code (DTC) that affects vehicle emissions, it illuminates the MIL. If a problem is detected, the PCM sends a message over the CCD Bus to the instrument cluster to illuminate the lamp. The PCM illuminates the MIL only for DTC's that affect vehicle emissions. The MIL stays on continuously when the PCM has entered a Limp-In mode or identified a failed emission component or system. The MIL remains on until the DTC is erased. Refer to the Diagnostic Trouble Code charts in this group for emission related codes.

Also, the MIL either flashes or illuminates continuously when the PCM detects active engine misfire. Refer to Misfire Monitoring in this section.

Additionally, the PCM may reset (turn off) the MIL when one of the following occur:

- PCM does not detect the malfunction for 3 consecutive trips (except misfire and fuel system monitors).
- PCM does not detect a malfunction while performing three successive engine misfire or fuel system tests. The PCM performs these tests while the engine is operating within ± 375 RPM of and within 10 % of the load of the operating condition at which the malfunction was first detected.

STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. From the state display screen, access either State Display Inputs and Outputs or State Display Sensors.

CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly.

DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

The technician can retrieve and display DTC's in two different ways:

- The preferred and most accurate method of retrieving a DTC is by using the DRB scan tool. The scan tool supplies detailed diagnostic information which can be used to more accurately diagnose causes for a DTC.
- The second method is by observing the two-digit number displayed at the Malfunction Indicator Lamp (MIL). The MIL is displayed on the instrument panel as the Check Engine lamp. This method is to be used as a "quick-test" only. Always use the DRB scan tool for detailed information.

Remember that DTC's are the results of a system or circuit failure, but do not directly identify the failed component or components.

NOTE: For a list of DTC's, refer to the charts in this section.

BULB CHECK

Each time the ignition key is turned to the ON position, the malfunction indicator (check engine) lamp on the instrument panel should illuminate for approximately 2 seconds then go out. This is done for a bulb check.

DESCRIPTION AND OPERATION (Continued)

OBTAINING DTC'S USING DRB SCAN TOOL

(1) Connect the DRB scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.

(2) Turn the ignition switch on and access the “Read Fault” screen.

(3) Record all the DTC's and “freeze frame” information shown on the DRB scan tool.

(4) To erase DTC's, use the “Erase Trouble Code” data screen on the DRB scan tool. **Do not erase any DTC's until problems have been investigated and repairs have been performed.**

OBTAINING DTC'S USING MIL LAMP

(1) Cycle the ignition key On - Off - On - Off - On within 5 seconds.

(2) Count the number of times the MIL (check engine lamp) on the instrument panel flashes on and off. The number of flashes represents the trouble code. There is a slight pause between the flashes representing the first and second digits of the code. Longer pauses separate individual two digit trouble codes.

An example of a flashed DTC is as follows:

- Lamp flashes 4 times, pauses, and then flashes 6 more times. This indicates a DTC code number 46.
- Lamp flashes 5 times, pauses, and flashes 5 more times. This indicates a DTC code number 55. A DTC 55 will always be the last code to be displayed. This indicates the end of all stored codes.

DIAGNOSTIC TROUBLE CODE DESCRIPTIONS

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
	12*		Battery Disconnect	Direct battery input to PCM was disconnected within the last 50 Key-on cycles.
	55*			Completion of fault code display on Check Engine lamp.
01	54**	P0340	No Cam Signal at PCM	No camshaft signal detected during engine cranking.
02	53**	P0601	Internal Controller Failure	PCM Internal fault condition detected.
05	47***		Charging System Voltage Too Low	Battery voltage sense input below target charging during engine operation. Also, no significant change detected in battery voltage during active test of generator output circuit.
06	46***		Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
0A	42*		Auto Shutdown Relay Control Circuit	An open or shorted condition detected in the auto shutdown relay circuit.
0B	41***		Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
0F	34*		Speed Control Solenoid Circuits	An open or shorted condition detected in the Speed Control vacuum or vent solenoid circuits.
10	33*		A/C Clutch Relay Circuit	An open or shorted condition detected in the A/C clutch relay circuit.
11	32**	P0403	EGR Solenoid Circuit	An open or shorted condition detected in the EGR transducer solenoid circuit.
12	31**	P0443	EVAP Purge Solenoid Circuit	An open or shorted condition detected in the duty cycle purge solenoid circuit.
13	27**	P0203	Injector #3 Control Circuit	Injector #3 output driver does not respond properly to the control signal.

DESCRIPTION AND OPERATION (Continued)

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
		or		
14		P0202	Injector #2 Control Circuit	Injector #2 output driver does not respond properly to the control signal.
		or		
15		P0201	Injector #1 Control Circuit	Injector #1 output driver does not respond properly to the control signal.
19	25**	P0505	Idle Air Control Motor Circuits	A shorted or open condition detected in one or more of the idle air control motor circuits.
1A	24**	P0122	Throttle Position Sensor Voltage Low	Throttle position sensor input below the minimum acceptable voltage.
		or		
1B		P0123	Throttle Position Sensor Voltage High	Throttle position sensor input above the maximum acceptable voltage.
1E	22**	P0117	ECT Sensor Voltage Too Low	Engine coolant temperature sensor input below minimum acceptable voltage.
		or		
1F		P0118	ECT Sensor Voltage Too High	Engine coolant temperature sensor input above maximum acceptable voltage.
20	21**	P0134	Right Rear (or just) Upstream O2S Stays at Center	Neither rich or lean condition detected from the oxygen sensor.
21	17*		Engine Is Cold Too Long	Engine did not reach operating temperature within acceptable limits.
23	15**	P0500	No Vehicle Speed Sensor Signal	No vehicle speed sensor signal detected during road load conditions.
24	14**	P0107	MAP Sensor Voltage Too Low	MAP sensor input below minimum acceptable voltage.
		or		
25		P0108	MAP Sensor Voltage Too High	MAP sensor input above maximum acceptable voltage.
27	13**	P1297	No Change in MAP From Start to Run	No difference recognized between the engine MAP reading and the barometric (atmospheric) pressure reading from start-up.
28	11*		No Crank Reference Signal at PCM	No crank reference signal detected during engine cranking.
2A		P0352	Ignition Coil #2 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
		or		
2B		P0351	Ignition Coil #1 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
2C	42*		No ASD Relay Output Voltage at PCM	An Open condition Detected In The ASD Relay Output Circuit.
2E	32**	P0401	EGR System Failure	Required change in air/fuel ratio not detected during diagnostic test.

DESCRIPTION AND OPERATION (Continued)

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
30	62*	P1697	PCM Failure SRI Miles Not Stored	Unsuccessful attempt to update EMR mileage in the PCM EEPROM
31	63**	P1696	PCM Failure EEPROM Write Denied	Unsuccessful attempt to write to an EEPROM location by the PCM.
39 3A	23**	P0112 or P0113	Intake Air Temp Sensor Voltage Low Intake Air Temp Sensor Voltage High	Intake air temperature sensor input below the maximum acceptable voltage. Intake air temperature sensor input above the minimum acceptable voltage.
3B	16*		Knock Sensor #1 Circuit	Sensor is either shorted to ground or 12 volts. Will not detect open circuit.
3C	61**	P0106	Barometric Pressure Out Of Range	MAP sensor has a baro reading below an acceptable value.
3D	27**	P0204	Injector #4 Control Circuit	Injector #4 output driver does not respond properly to the control signal.
3E	21**	P0132	Right Rear (or just) Upstream O2S Shorted to Voltage	Oxygen sensor input voltage maintained above the normal operating range.
44	53**	P0600	PCM Failure SPI Communications	PCM Internal fault condition detected.
45 46	27**	P0205 or P0206	Injector #5 Control Circuit Injector #6 Control Circuit	Injector #5 output driver does not respond properly to the control signal. Injector #6 output driver does not respond properly to the control signal.
52	77*		SPD CTRL PWR RLY; or S/C 12v Driver CKT	Malfunction detected with power feed to speed control servo solenoids.
57	87		Speed Control Switch Always Low	Speed control switch input below the minimum acceptabale voltage.
5A 5B	33	or	A/C Pressure Sensor Volts Too High A/C Pressure Sensor Volts Too Low	Sensor input voltage is above 4.9 volts. Sensor input voltage is below .098 volts.
5C 5D	35**	P1490 or P1489	Low Speed Fan CTRL Relay Circuit Hi Speed Fan Relay Circuit	An open or shorted condition detected in the control circuit of the low speed radiator fan relay. An open or shorted condition detected in the control circuit of the high speed radiator fan relay.
60**	66	P1698	No CCD Messages From TCM	No messages received from Transmission Control Module.

DESCRIPTION AND OPERATION (Continued)

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
 61		or P1695	 No CCD Message From Body Control Module	 No messages received from Body Control Module
65	42*		Fuel Pump Relay Control Circuit	An open or shorted condition detected in the fuel pump relay control circuit.
66 67	21**	P0133 or P0135	Right Bank Upstream O2S Slow Response Right Rear (or just) Upstream O2S Heater Failure	Oxygen sensor response slower than minimum required switching frequency. Upstream oxygen sensor heating element circuit malfunction.
69		P0141	Right Rear (or just) Downstream O2S Heater Failure	Oxygen sensor heating element circuit malfunction.
6A 6B 6C 6D 6E	43**	P0300 or P0301 or P0302 or P0303 or P0304	Multiple Cylinder Mis-fire Cylinder #1 Mis-fire Cylinder #2 Mis-fire Cylinder #3 Mis-fire Cylinder #4 Mis-fire	Misfire detected in multiple cylinders. Misfire detected in cylinder #1. Misfire detected in cylinder #2. Misfire detected in cylinder #3. Misfire detected in cylinder #4.
70	72**	P0420	Right Rear (or just) Catalyst Efficency Failure	Catalyst efficiency below required level.
71	31*	P0441	Evap Purge Flow Monitor Failure	Insufficient or excessive vapor flow detected during evaporative emission system operation.
72	37**	P1899	P/N Switch Stuck in Park or in Gear	Incorrect input state detected for the Park/Neutral switch, auto. trans. only.
73	65*	P0551	Power Steering Switch Failure	Power steering high pressure seen at high speed (2.5L only).
76	52**	P0172	Right Rear (or just) Fuel System Rich	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
77	51**	P0171	Right Rear (or just) Fuel System Lean	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.
7E	21**	P0138	Right Rear (or just) Downstream O2S Shorted to Voltage	Oxygen sensor input voltage maintained above the normal operating range.
80	17**	P0125	Closed Loop Temp Not Reached	Engine does not reach 20°F within 5 minutes with a vehicle speed signal.

DESCRIPTION AND OPERATION (Continued)

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
81	21**	P0140	Right Rear (or just) Downstream O2S Stays at Center	Neither reich or lean condition detected from the downstream oxygen sensor.
84	24**	P0121	TPS Voltage Does Not Agree With MAP	TPS signal does not correlate to MAP sensor.
85	11**	P1390	Timing Belt Skipped 1 Tooth or More	Relationship betwwen Cam and Crank signals is not correct.
89	45**	P0700	EATX Controller DTC Present	An automatic transmission input DTC has been set in the transmission controller. Refer to Group 21.
8A	25**	P1294	Target Idle Not Reached	Actual idle speed does not equal target idle speed.
91	25**	P1299	Vacuum Leak Found (IAC Fully Seated)	MAP sensor signal does not correlate to throttle position sensor signal. Possible vacuum leak.
92	71**	P1496	5 Volt Supply Output Too Low	5 volt output from regulator does not meet minimum requirement.
95 96 97	42*	 or or	Fuel Level Sending Unit Volts Too Low Fuel Level Sending Unit Volts Too High Fuel Level Unit No Change Over Miles	Open circuit between PCM and fuel gauge sending unit. Circuit shorted to voltage between PCM and fuel gauge sending unit. No movement of fuel level sender detected.
98	65**	P0703	Brake Switch Stuck Pressed or Released	No release of brake switch seen after too many accelerations.
99 9A	44**	P1493 or P1492	Ambient/Batt Temp Sen VoltsToo Low Ambient/Batt Temp Sensor VoltsToo High	Battery temperature sensor input voltage below an acceptable range. Battery temperature sensor input voltage above an acceptable range.
9B 9C 9D	21** 11**	P0131 or P0137 P1391	Right Rear (or just) Upstream O2S Shorted to Ground Right Rear (or just) Downstream O2S Shorted to Ground Intermittent Loss of CMP or CKP	O2 sensor voltage too low, tested after cold start. O2 sensor voltage too low, tested after cold start. Intermittent loss of either camshaft or crankshaft position sensor.
A0 A1	31**	P0442 or P0455	Evap Leak Monitor Small Leak Detected Evap Leak Monitor Large Leak Detected	A small leak has been detected by the leak detection monitor. The leak detection monitor is unable to pressurize Evap system, indicating a large leak.

DESCRIPTION AND OPERATION (Continued)

HEX CODE	MIL CODE	GENERIC SCAN TOOL CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
AE AF	43**	P0305 or P0306	Cylinder #5 Mis-fire Cylinder #6 Mis-fire	Misfire detected in cylinder #5. Misfire detected in cylinder #6.
B7 B8	31**	P1495 or P1494	Leak Detect ion Pump Solenoid Circuit Leak Detect Pump Sw or Mechanical Fault	Leak detection pump solenoid circuit fault (open or short). Leak detection pump switch does not respond to input.
BA	11**	P1398	Mis-fire Adaptive Numerator at Limit	CKP sensor target windows have too much variation.
BB	31**	P1486	Evap Leak Monitor Pinched Hose Found	Plug or pinch detected between purge solenoid and fuel tank.
CO	37	P0785	Shift Solenoid Performance	

* Check Engine Lamp (MIL) will not illuminate if this Diagnostic Trouble Code was recorded. Cycle Ignition key as described in manual and observe code flashed by Check Engine lamp.

** Check Engine Lamp (MIL) will illuminate during engine operation if this Diagnostic Trouble Code was recorded.

*** Generator Lamp illuminated

MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator (Check Engine) Lamp will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the check engine lamp or a scan tool.

The following is a list of the system monitors:

- EGR Monitor
- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Evaporative System Leak Detection Monitor

Following is a description of each system monitor, and its DTC.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

DTC 21—HEX 66, and 7A—OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 air fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR, Catalyst and Fuel Monitors.

The O2S may fail in any or all of the following manners:

- Slow response rate
- Reduced output voltage
- Dynamic shift
- Shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer

DESCRIPTION AND OPERATION (Continued)

than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

DTC 21—HEX 67, 69, 7C, and 7D—OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S fault MUST be repaired first. After the O2S fault is repaired, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572 °to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly.

The O2S circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S output voltage from the other effects.

DTC 32—HEX 2E—EGR MONITOR

The Powertrain Control Module (PCM) performs an on-board diagnostic check of the EGR system.

The EGR system consists of two main components: a vacuum solenoid and a vacuum operated valve with a back pressure transducer. The EGR monitor is used to test whether the EGR system is operating within specifications. The diagnostic check activates only during selected engine/driving conditions. When the conditions are met, the EGR is turned off (solenoid energized) and the O2S compensation control is monitored. Turning off the EGR shifts the air fuel (A/F) ratio in the lean direction. The O2S data should indicate an increase in the O2 concentration in the combustion chamber when the exhaust gases are no longer recirculated. While this test does not directly measure the operation of the EGR system, it can be inferred from the shift in the O2S data whether the EGR system is operating correctly. Because the O2S is being used, the O2S test must pass its test before the EGR test.

DTC 43—HEX 6A,6B, 6C, 6D, 6E, AE, and AF—MISFIRE MONITOR

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic convertor damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

DTC 51/52—HEX 76, 77, 78, and 79—FUEL SYSTEM MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the air fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio of 14.7 to 1. This is done by making short term corrections in the fuel injector pulse width based on the O2S output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual air-fuel ratio with the O2S (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

DTC 64—HEX 70, and B4—CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

DESCRIPTION AND OPERATION (Continued)

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2Ss strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstraem O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (check engine lamp) will be illuminated.

DTC 31—HEX A0, A1, B7, and B8—LEAK DETECTION PUMP MONITOR

The leak detection assembly incorporates two primary functions: it must detect a leak in the evaporative system and seal the evaporative system so the leak detection test can be run.

The primary components within the assembly are: A three port solenoid that activates both of the functions listed above; a pump which contains a switch, two check valves and a spring/diaphragm, a canister vent valve (CVV) seal which contains a spring loaded vent seal valve.

Immediately after a cold start, between predetermined temperature thresholds limits, the three port solenoid is briefly energized. This initializes the pump by drawing air into the pump cavity and also closes the vent seal. During non test conditions the vent seal is held open by the pump diaphragm assembly which pushes it open at the full travel position. The vent seal will remain closed while the pump is cycling due to the reed switch triggering of the three port solenoid that prevents the diaphragm assembly from reaching full travel. After the brief initialization period, the solenoid is de-energized allowing atmospheric pressure to enter the pump cavity, thus permitting the spring to drive the diaphragm which forces air out of the pump cavity and into the vent system. When the solenoid is energized and de energized, the cycle is repeated creating flow in typical diaphragm pump fashion. The pump is controlled in 2 modes:

Pump Mode: The pump is cycled at a fixed rate to achieve a rapid pressure build in order to shorten the overall test length.

Test Mode: The solenoid is energized with a fixed duration pulse. Subsequent fixed pulses occur when the diaphragm reaches the Switch closure point.

The spring in the pump is set so that the system will achieve an equalized pressure of about 7.5" H20. The cycle rate of pump strokes is quite rapid as the system begins to pump up to this pressure. As the pressure increases, the cycle rate starts to drop off. If there is no leak in the system, the pump would eventually stop pumping at the equalized pressure. If there is a leak, it will continue to pump at a rate representative of the flow characteristic of the size of the leak. From this information we can determine if the leak is larger than the required detection limit (currently set at .040" orifice by CARB). If a leak is revealed during the leak test portion of the test, the test is terminated at the end of the test mode and no further system checks will be performed.

After passing the leak detection phase of the test, system pressure is maintained by turning on the LDP's solenoid until the purge system is activated. Purge activation in effect creates a leak. The cycle rate is again interrogated and when it increases due to the flow through the purge system, the leak check portion of the diagnostic is complete.

The canister vent valve will unseal the system after completion of the test sequence as the pump diaphragm assembly moves to the full travel position.

Evaporative system functionality will be verified by using the stricter evap purge flow monitor. At an appropriate warm idle the LDP will be energized to seal the canister vent. The purge flow will be clocked up from some small value in an attempt to see a shift in the 02 control system. If fuel vapor, indicated

DESCRIPTION AND OPERATION (Continued)

by a shift in the 02 control, is present the test is passed. If not, it is assumed that the purge system is not functioning in some respect. The LDP is again turned off and the test is ended.

TRIP DEFINITION

A “Trip” means vehicle operation (following an engine-off period) of duration and driving mode such that all components and systems are monitored at least once by the diagnostic system. The monitors must successfully pass before the PCM can verify that a previously malfunctioning component is meeting the normal operating conditions of that component. For misfire or fuel system malfunction, the MIL may be extinguished if the fault does not recur when monitored during three subsequent sequential driving cycles in which conditions are similar to those under which the malfunction was first determined.

Anytime the MIL is illuminated, a DTC is stored. The DTC can self erase only when the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles (80 warm-up cycles for the Fuel System Monitor and the Misfire Monitor). A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 40°F in engine temperature must occur from the time when the engine was started
- Engine coolant temperature must reach at least 160°F
- A “driving cycle” that consists of engine start up and engine shut off.

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Due to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made, all DTC’s be erased and the repair verified.

COMPONENT MONITORS

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (Check Engine) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks. Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum and 1600 rpm.

Any component that has an associated limp in will set a fault after 1 trip with the malfunction present.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

NON-MONITORED CIRCUITS

The PCM does not monitor all circuits, systems and conditions that could have malfunctions causing driveability problems. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code.

The major non-monitored circuits are listed below along with examples of failures modes that do not directly cause the PCM to set a DTC, but for a system that is monitored.

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor or fuel system diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables.

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system. It may set a EGR or Fuel system fault or O2S.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic

DESCRIPTION AND OPERATION (Continued)

trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

THROTTLE BODY AIR FLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, also during diagnostic.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

LOAD VALUE

ENGINE	IDLE/NEUTRAL	2500 RPM/NEUTRAL
2.0L SOHC	2% to 8% of Maximum Load	8% to 15% of Maximum Load
2.4L DOHC	2% to 8% of Maximum Load	7% to 15% of Maximum Load
2.5L SOHC	2% to 8% of Maximum Load	7% to 15% of Maximum Load

EVAPORATIVE EMISSION CONTROLS

INDEX

DESCRIPTION AND OPERATION

EVAPORATION CONTROL SYSTEM

The evaporation control system prevents the emission of fuel tank vapors into the atmosphere. When fuel evaporates in the fuel tank, the vapors pass through vent hoses or tubes to a charcoal filled evaporative canister. The canister temporarily holds the vapors. The Powertrain Control Module (PCM) allows intake manifold vacuum to draw vapors into the combustion chambers during certain operating conditions.

All engines use a duty cycle purge system. The PCM controls vapor flow by operating the duty cycle EVAP purge solenoid. Refer to Duty Cycle EVAP Purge Solenoid in this section.

NOTE: The evaporative system uses specially manufactured hoses. If they need replacement, only use fuel resistant hose.

PRESSURE RELIEF/ROLLOVER VALVE

All vehicles have a combination pressure relief and rollover valve. The dual function valve relieves fuel tank pressure. The valve also prevents fuel flow through the fuel tank vent valve hoses should the vehicle rollover. All vehicles pass a 360° rollover.

The pressure relief valve opens at a certain pressure. When fuel tank pressure increases above the calibrated pressure, the valve opens to release fuel tank vapors pressure. The charcoal filled evaporative canister stores the vapors. For pressure relief/rollover valve service, refer to the Fuel Tank section of Group 14.

EVAP CANISTER

All vehicles use a sealed, maintenance free, evaporative (EVAP) canister. Fuel tank pressure vents into the canister. The canister temporarily holds the fuel vapors until intake manifold vacuum draws them into the combustion chamber. The Powertrain Control Podule (PCM) purges the canister through the duty cycle EVAP purge solenoid. The PCM purges the canister at predetermined intervals and engine conditions.

The canister mounts to a bracket behind the front fascia on the passengers side of the vehicle (Fig. 1). The vacuum and vapor tube connect to the top of the canister.

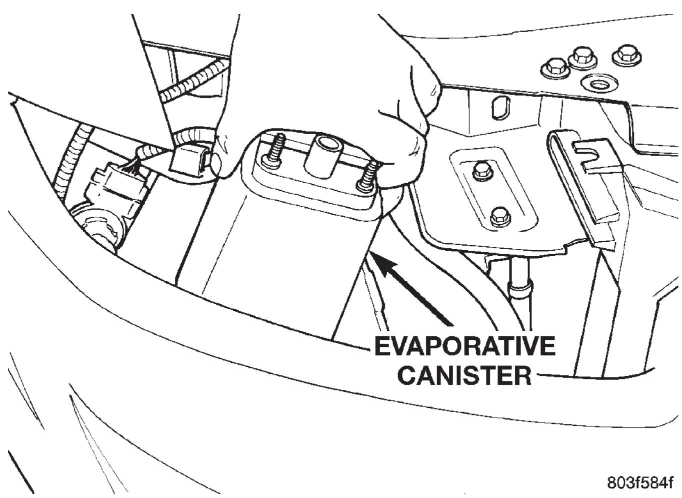


Fig. 1 EVAP Canister

DUTY CYCLE EVAP PURGE SOLENOID

The duty cycle EVAP purge solenoid regulates the rate of vapor flow from the EVAP canister to the throttle body. The Powertrain Control Module (PCM) operates the solenoid.

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged.

When purging the PCM energizes and de-energizes the solenoid approximately 5 or 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse

DESCRIPTION AND OPERATION (Continued)

width. Pulse width is the amount of time the solenoid energizes.

The solenoid attaches to a bracket on the driver's side strut tower (Fig. 2). To operate correctly, the solenoid must be installed with the electrical connector on top.

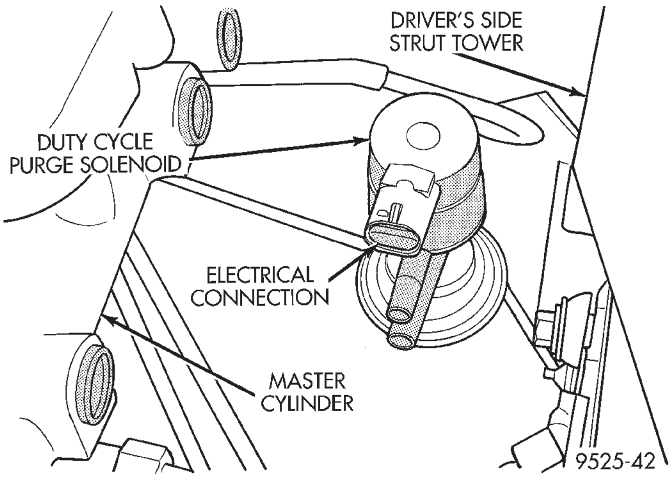


Fig. 2 Duty Cycle EVAP Purge Solenoid-Master Cylinder Removed

PRESSURE-VACUUM FILLER CAP

CAUTION: Remove the fuel filler cap to relieve fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or servicing the fuel tank.

A pressure-vacuum relief cap seals the fuel tank (Fig. 3). Tightening the cap on the fuel filler tube forms a seal between them. The relief valves in the cap are a safety feature. They prevent possible excessive pressure or vacuum in the tank. Excessive fuel tank pressure could be caused by a malfunction in the system or damage to the vent lines.

The seal between the cap and filler tube breaks when the cap is removed and relieves fuel tank pressure.

If the filler cap needs replacement, only use the correct part.

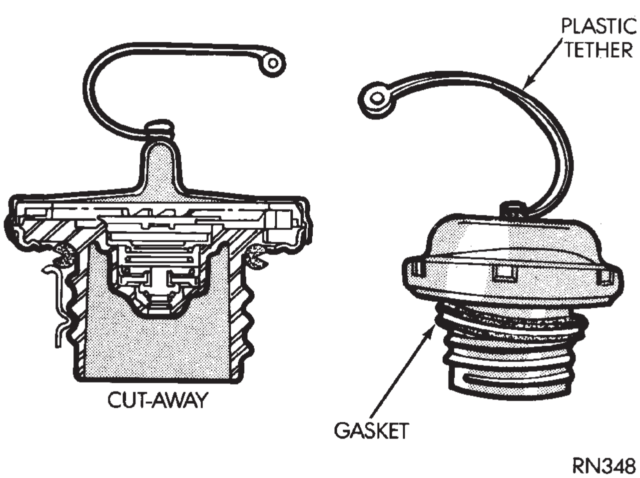


Fig. 3 Pressure Vacuum Filler Cap

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEMS

Intake manifold vacuum removes crankcase vapors and piston blow-by from the engine. The emissions pass through the PCV valve into the intake manifold where they become part of the calibrated air-fuel mixture. They are burned and expelled with the exhaust gases. The air cleaner supplies make up air when the engine does not have enough vapor or blow-by gases. In this system, fresh air does not enter the crankcase.

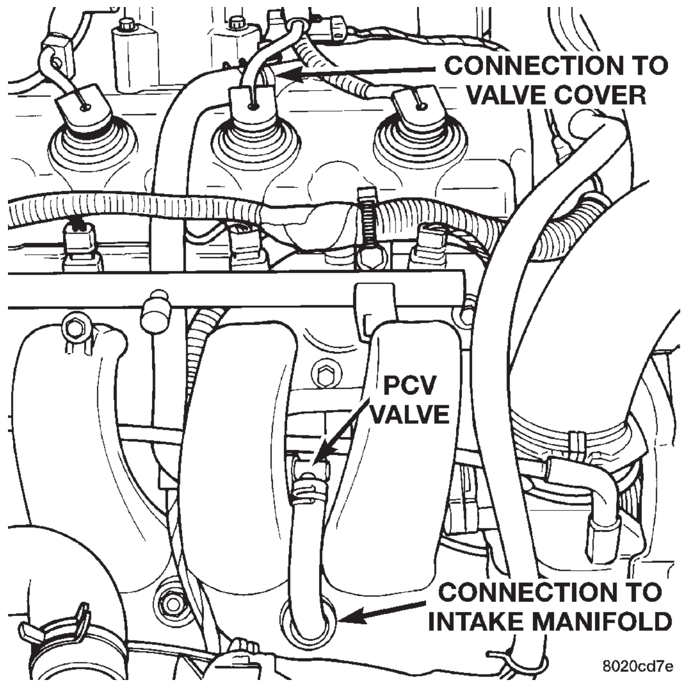


Fig. 4 PCV System—2.0L

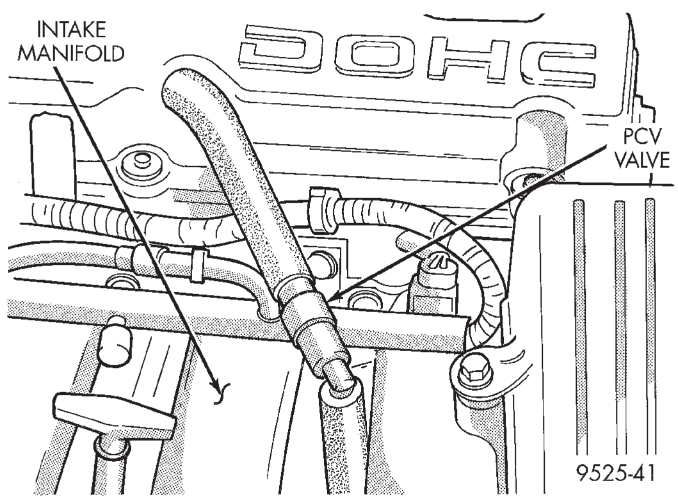


Fig. 5 PCV System—2.4L

DESCRIPTION AND OPERATION (Continued)

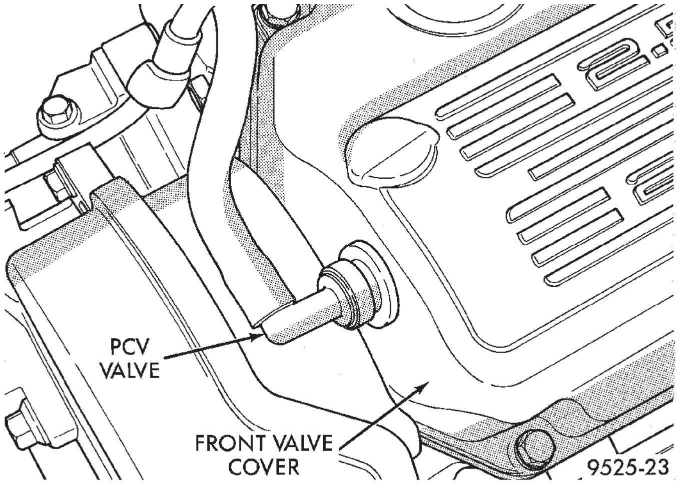


Fig. 6 PCV System—2.5L

PCV VALVE

The PCV valve contains a spring loaded plunger. The plunger meters the amount of crankcase vapors routed into the combustion chamber based on intake manifold vacuum.

When the engine is not operating or during an engine backfire, the spring forces the plunger back against the seat. This prevents vapors from flowing through the valve (Fig. 7).

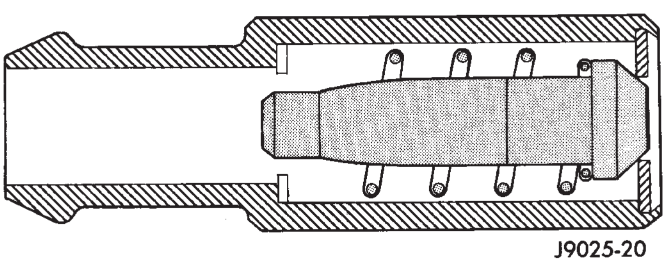


Fig. 7 Engine Off or Engine Backfire—No Vapor Flow

When the engine is at idle or cruising, high manifold vacuum is present. At these times manifold vacuum is able to completely compress the spring and pull the plunger to the top of the valve (Fig. 8). In this position there is minimal vapor flow through the valve.

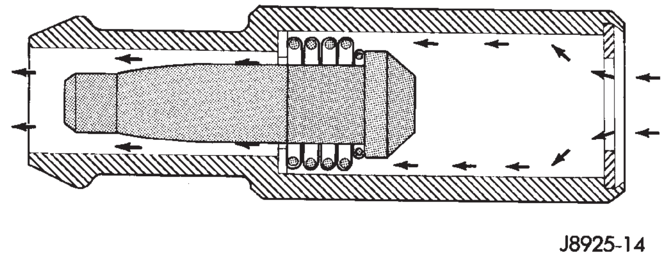


Fig. 8 High Intake Manifold Vacuum—Minimal Vapor Flow

During periods of moderate intake manifold vacuum the plunger is only pulled part way back from the inlet. This results in maximum vapor flow through the valve (Fig. 9).

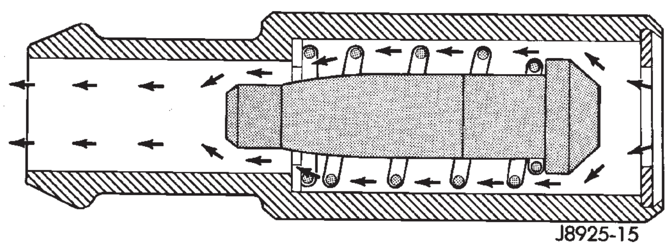


Fig. 9 Moderate Intake Manifold Vacuum—Maximum Vapor Flow

VEHICLE EMISSION CONTROL INFORMATION LABEL

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

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

If any difference exists between the VECI label on the vehicle and the vacuum schematic in the Service Manual, refer to the label on the vehicle.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS AND TESTING

PCV VALVE TEST

WARNING: APPLY PARKING BRAKE AND/OR BLOCK WHEELS BEFORE PERFORMING ANY TEST OR ADJUSTMENT WITH THE ENGINE OPERATING.

With the engine idling, remove the PCV valve from its attaching point. If the valve is operating properly, a hissing noise will be heard and a strong vacuum felt when placing a finger over the valve inlet (Fig. 10). With the engine off, shake the valve. The valve should rattle when shaken. Replace the valve if it does not operate properly. **Do not attempt to clean the PCV valve.**

VACUUM SCHEMATIC

If any difference exists between the diagram on the Vehicle Emission Control Information (VECI) label and this illustration, refer to the label on the vehicle.

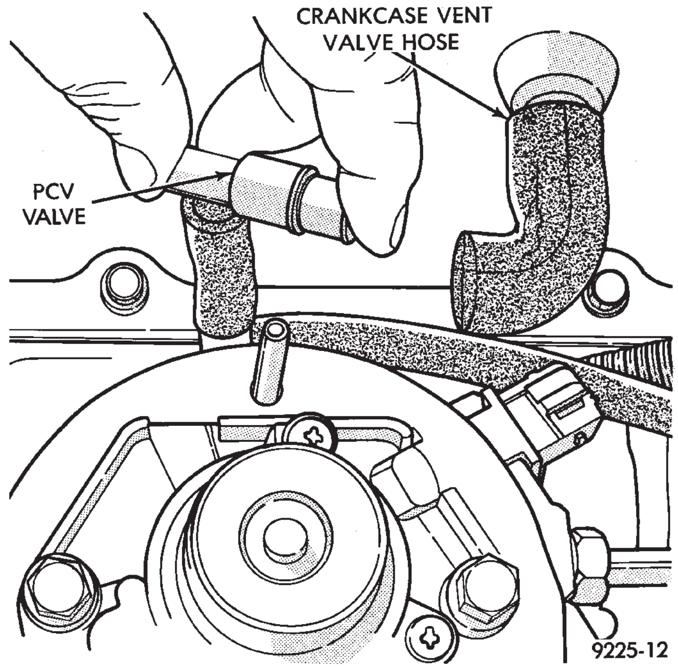
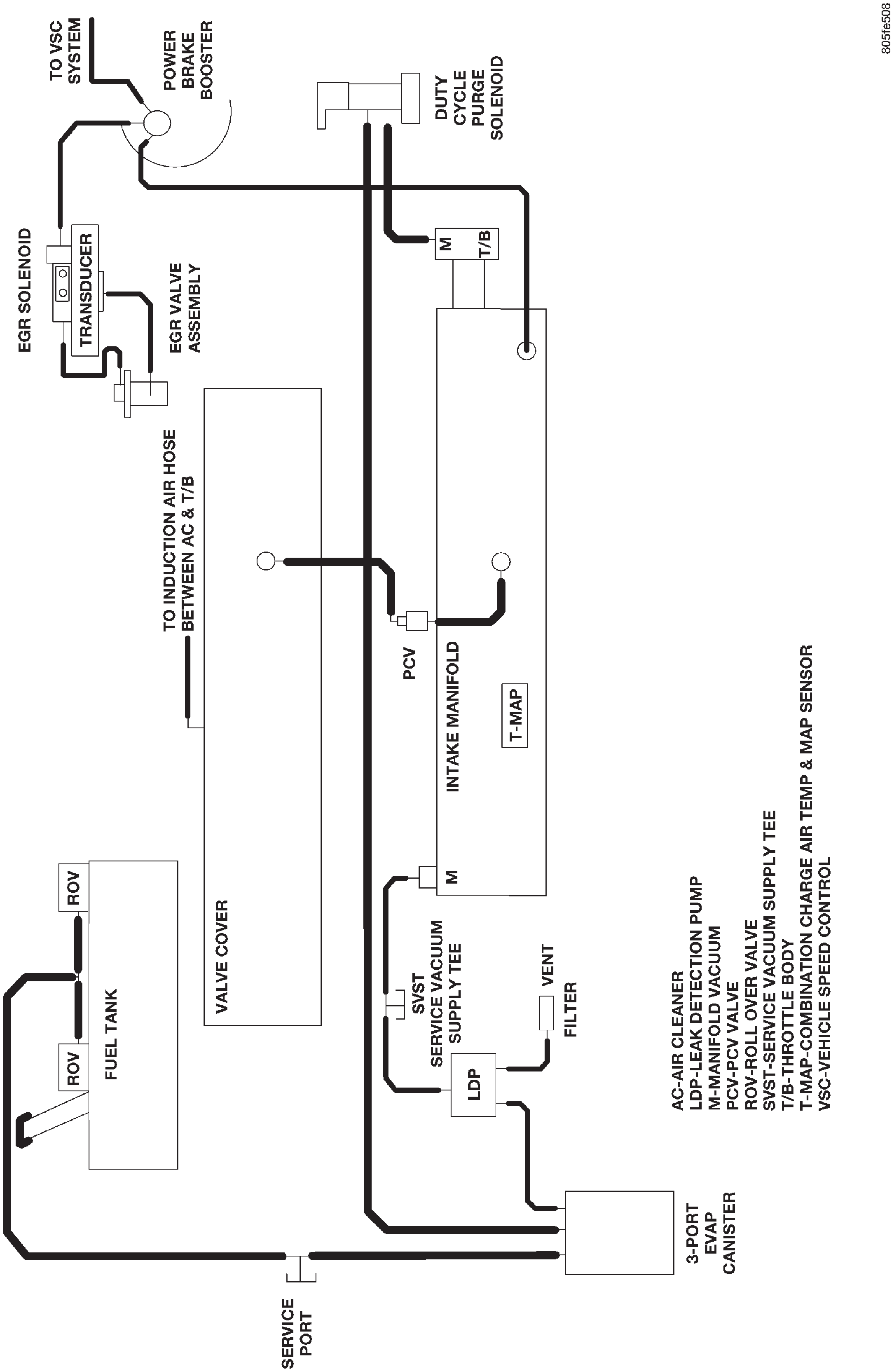


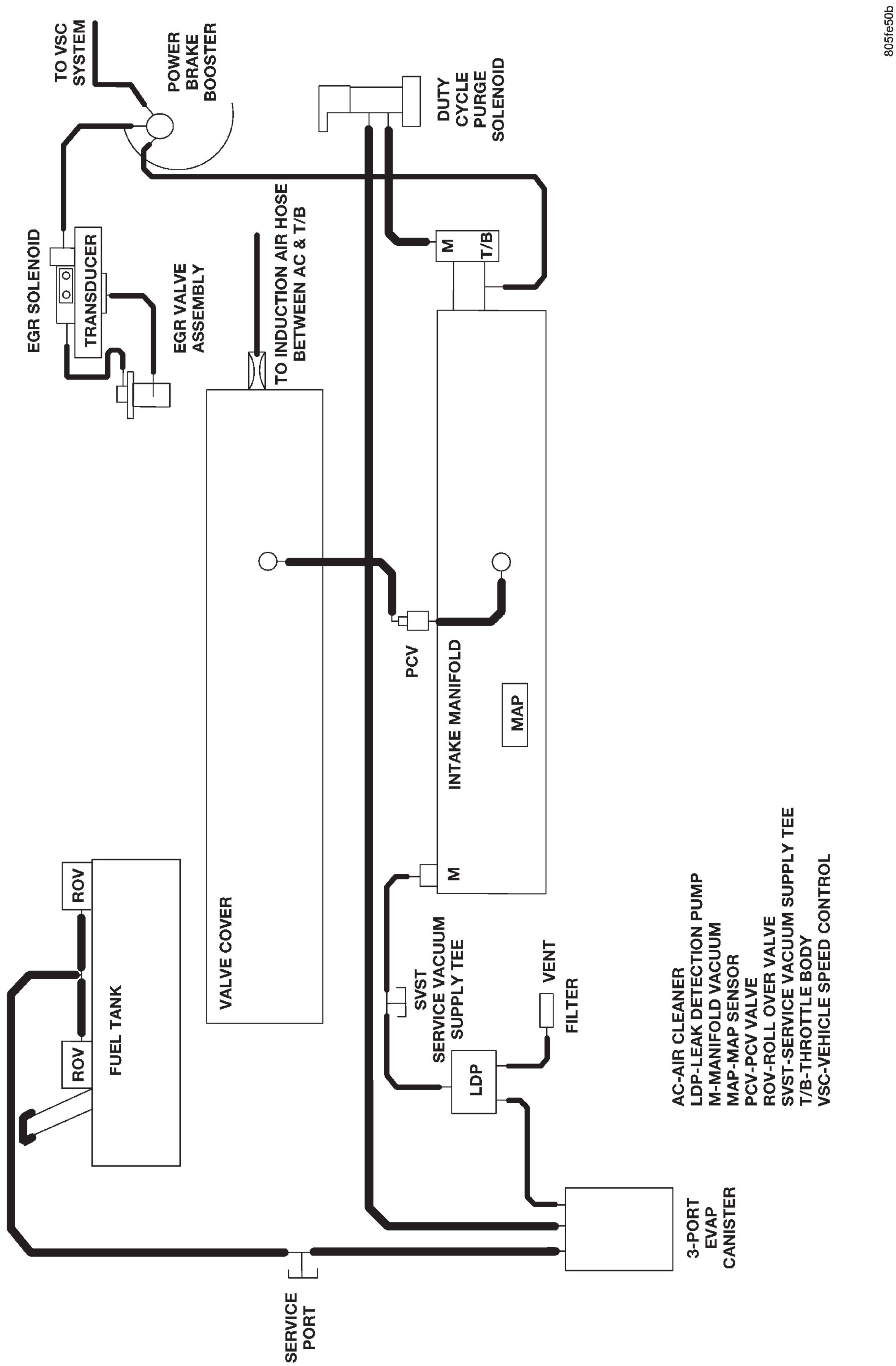
Fig. 10 PCV Test —Typical

DIAGNOSIS AND TESTING (Continued)



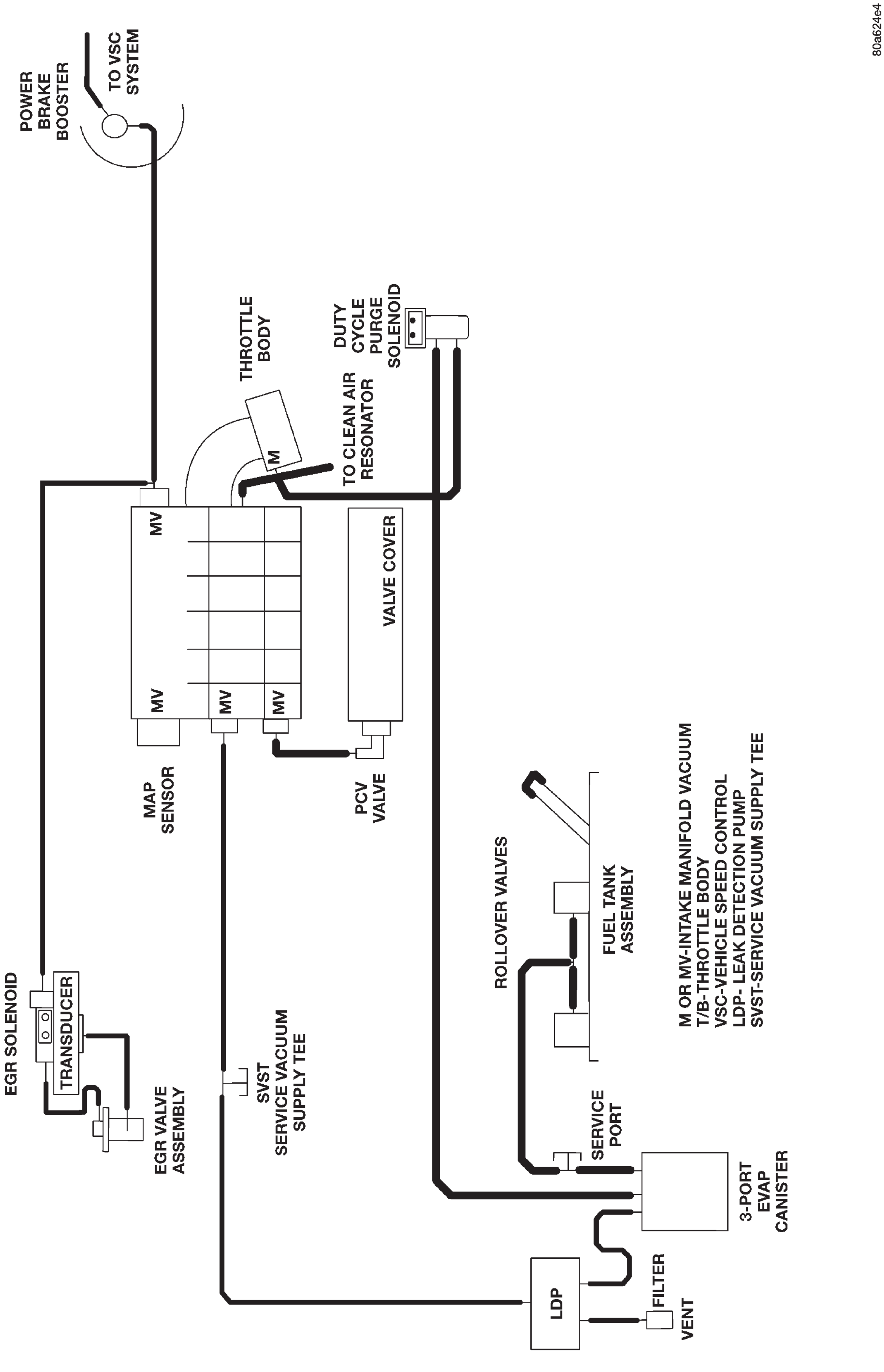
ENGINE VACUUM SCHEMATIC—2.0L

DIAGNOSIS AND TESTING (Continued)



ENGINE VACUUM SCHEMATIC—2.4L ATX

DIAGNOSIS AND TESTING (Continued)



ENGINE VACUUM SCHEMATIC—2.5L ATX

REMOVAL AND INSTALLATION

LEAD DETECTION PUMP

The Leak Detection Pump is located under the right front headlamp behind the front fascia.

REMOVAL

(1) Remove screws from headlamp.

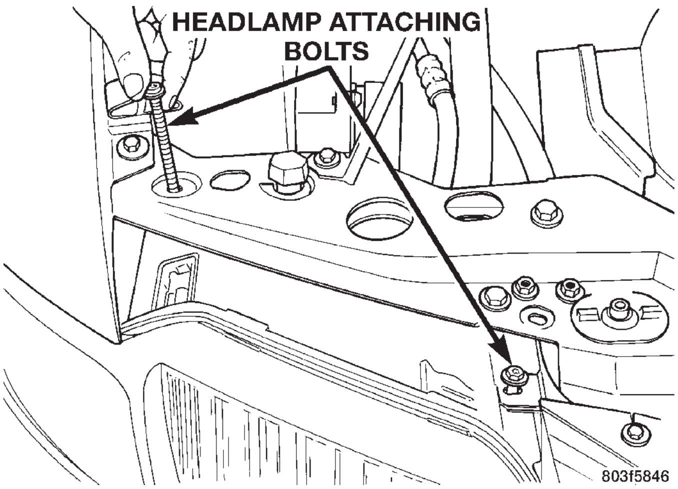


Fig. 11 Headlamp Attachment

(2) Pull headlamp away from vehicle.
(3) Disconnect electrical connector from headlamp.
(4) Remove headlamp from vehicle.

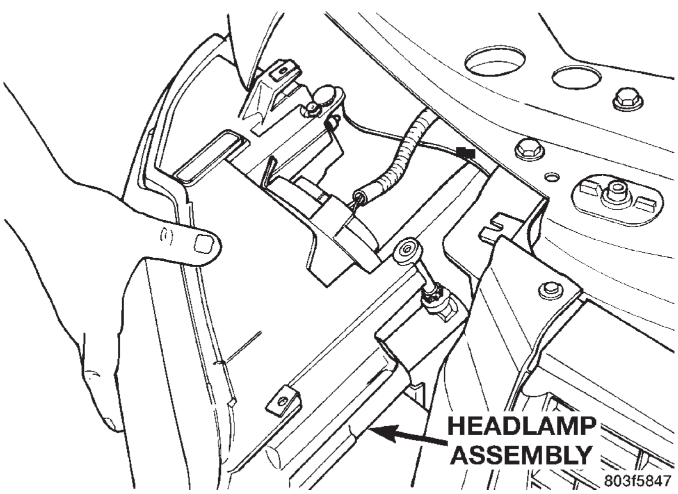


Fig. 12 Headlamp Electrical Connector Removal/ Installation

(5) Disconnect vacuum line from Leak Detection Pump (LDP).
(6) Remove hoses from evaporative canister.

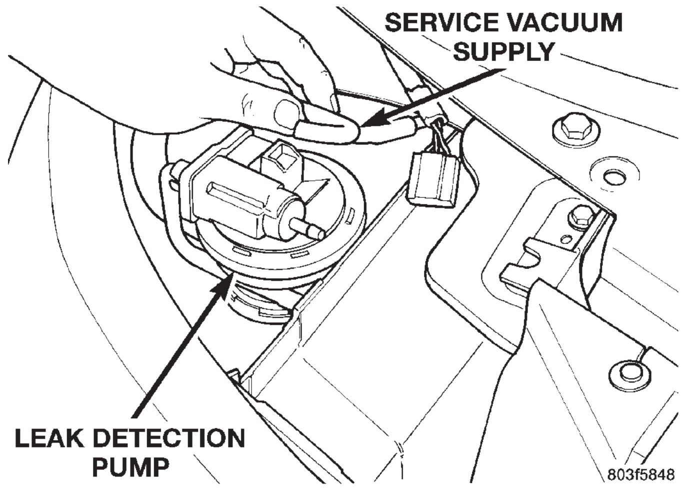


Fig. 13 Vacuum Line On LDP

(7) Remove 3 nuts retaining evaporative canister to pump bracket.

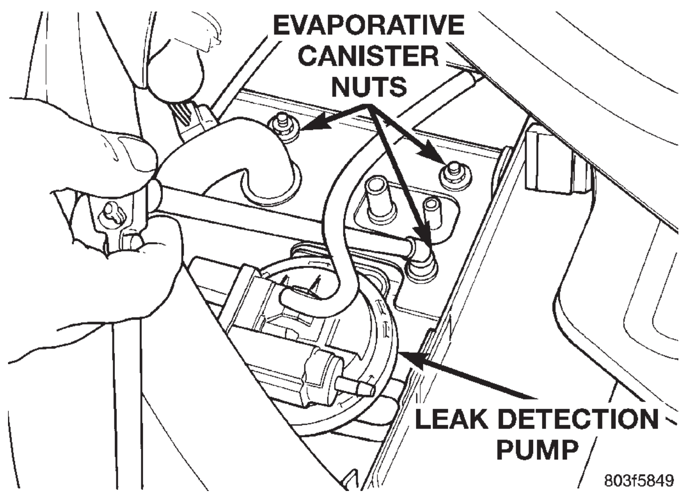


Fig. 14 Evaporative Canister Attachment Nuts

REMOVAL AND INSTALLATION (Continued)

(8) Let evaporative canister set on lower fascia.
(9) Remove 4 bolts from LDP bracket.

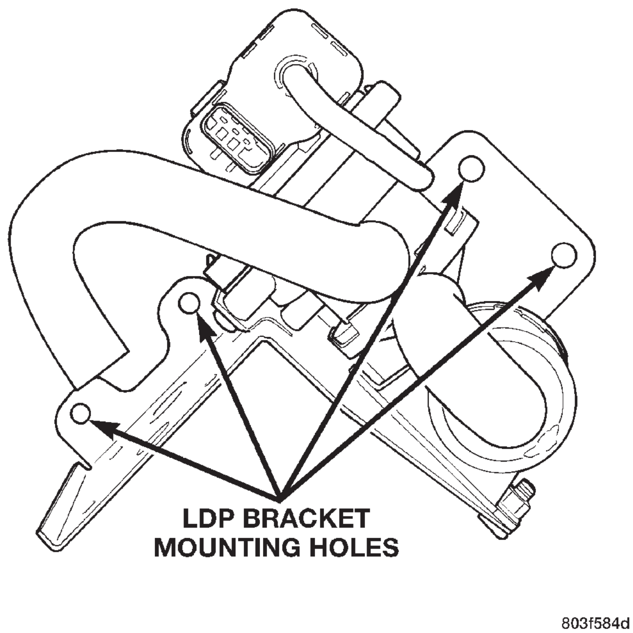


Fig. 15 LDP Bracket Mounting Holes

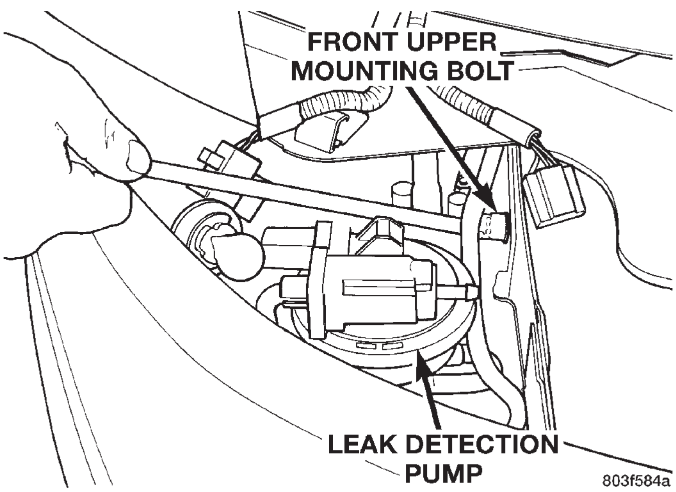


Fig. 16 Front Upper Mounting Bolt

(10) Remove LDP and bracket from vehicle.
(11) Remove evaporative canister.

INSTALLATION

(1) Set evaporative canister on lower fascia.

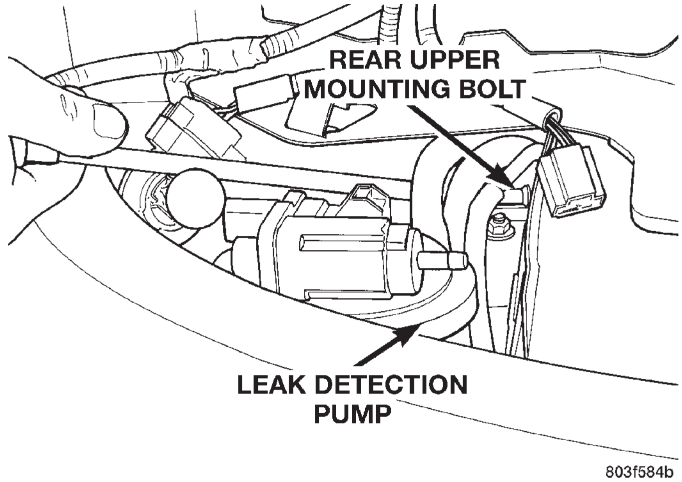


Fig. 17 Rear Upper Mounting Bolt

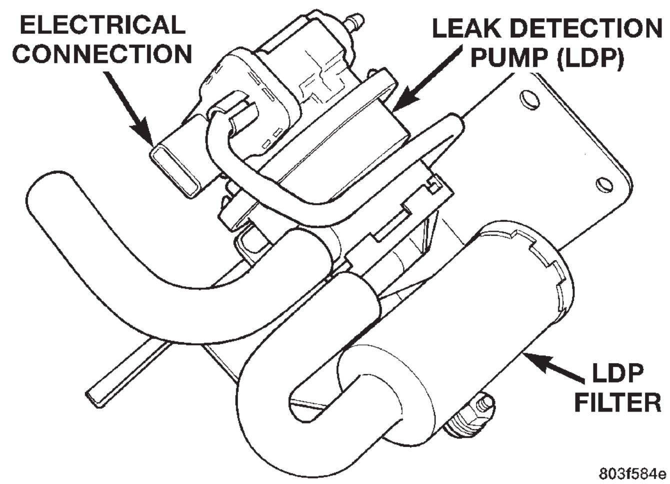


Fig. 18 LDP Pump and Filter

(2) Install LDP and bracket and tighten the 4 bolts.
(3) Pull evaporative canister up into bracket and install the 3 nuts and tighten.
(4) Install hoses onto evaporative canister and LDP pump.
(5) Connect electrical connector onto headlamp.
(6) Install headlamp and tighten 2 screws.
(7) Use the DRB to test the LDP and system.

ROLLOVER VALVES

All vehicles have 2 rollover valves on top of the fuel tank. The valves prevent fuel flow through the fuel tank vent valve hoses should the vehicle rollover.

The rollover valves on the fuel tank are not serviceable.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

INDEX

DESCRIPTION AND OPERATION

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

Refer to Monitored Systems - EGR Monitor in this group for more information.

The EGR system reduces oxides of nitrogen (NOx) in engine exhaust and helps prevent detonation (engine knock). Under normal operating conditions, engine cylinder temperature can reach more than 3000°F. Formation of NOx increases proportionally with combustion temperature. To reduce the emission of these oxides, the cylinder temperature must be lowered. The system allows a predetermined amount of hot exhaust gas to recirculate and dilute the incoming air/fuel mixture. The diluted air/fuel mixture reduces peak flame temperature during combustion.

The EGR system consists of (Fig. 1), (Fig. 2), and (Fig. 3):

- EGR tube
- EGR valve
- Electric EGR Transducer
- Connecting hoses

The electric EGR transducer contains an electrically operated solenoid and a back-pressure transducer (Fig. 4). The Powertrain Control Module (PCM) operates the solenoid. The PCM determines when to energize the solenoid. Exhaust system back-pressure controls the transducer.

When the PCM energizes the solenoid, vacuum does not reach the transducer. Vacuum flows to the transducer when the PCM de-energizes the solenoid.

When exhaust system back-pressure becomes high enough, it fully closes a bleed valve in the transducer. When the PCM de-energizes the solenoid and back-pressure closes the transducer bleed valve, vacuum flows through the transducer to operate the EGR valve.

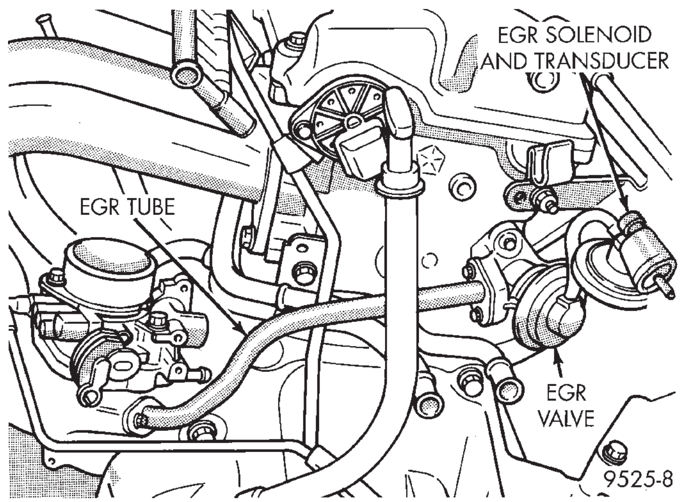


Fig. 1 EGR System—2.4L

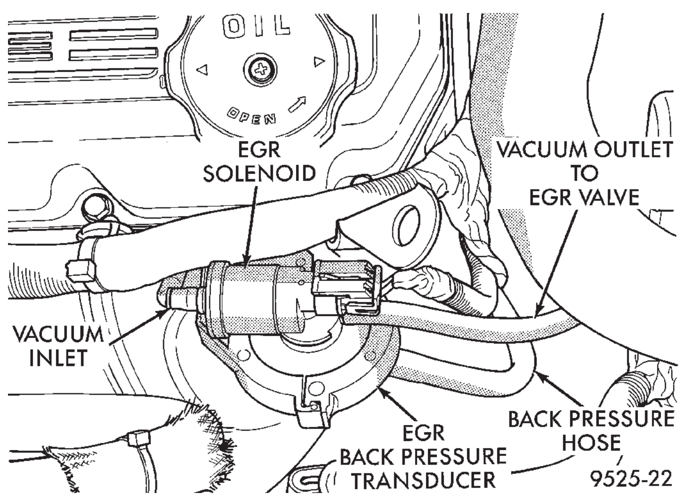


Fig. 2 EGR Control Valve—2.5L

De-energizing the solenoid, but not fully closing the transducer bleed hole (because of low back-pressure), varies the strength of vacuum applied to the EGR

DESCRIPTION AND OPERATION (Continued)

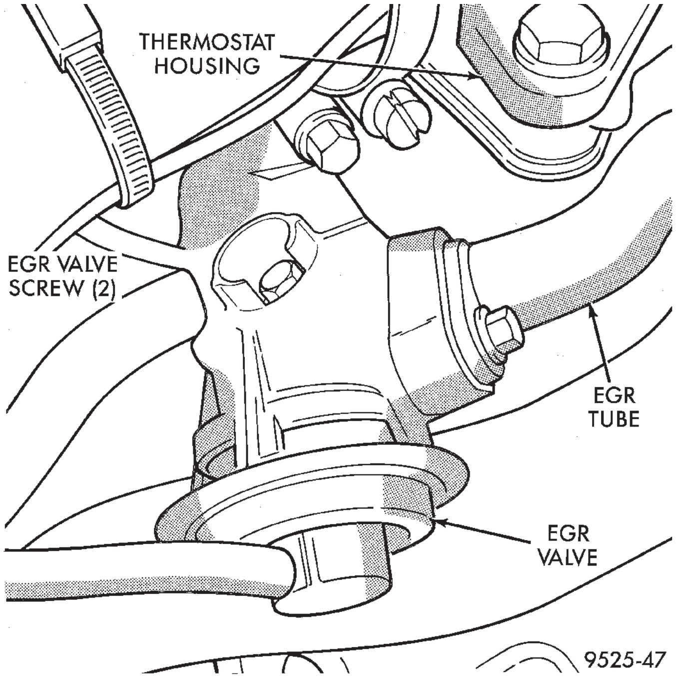


Fig. 3 EGR Valve—2.5L

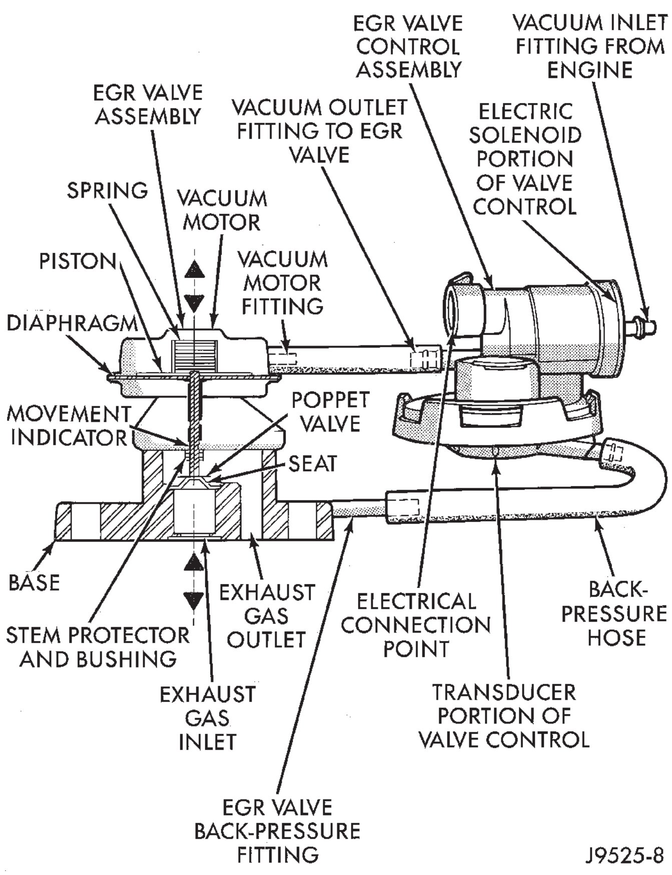


Fig. 4 Electric EGR Transducer

valve. Varying the strength of the vacuum changes the amount of EGR supplied to the engine. This provides the correct amount of exhaust gas recirculation for different operating conditions.

This system does not allow EGR at idle.

A failed or malfunctioning EGR system can cause engine spark knock, sags or hesitation, rough idle, engine stalling and increased emissions.

DIAGNOSIS AND TESTING

EGR SYSTEM ON-BOARD DIAGNOSTICS

The PCM performs an on-board diagnostic check of the EGR system. The diagnostic system uses the electronic EGR transducer for the system tests.

The diagnostic check activates only during selected engine/driving conditions. When the conditions are met, the PCM energizes the transducer solenoid to disable the EGR. The PCM checks for a change in the heated oxygen sensor signal. If the air-fuel mixture goes lean, the PCM will attempt to enrichen the mixture. The PCM registers a Diagnostic Trouble Code (DTC) if the EGR system has failed or degraded. After registering a DTC, the PCM turns on the malfunction indicator (Check Engine) lamp. The Malfunction Indicator Lamp (MIL) indicates the need for service.

If a problem is indicated by the MIL and a DTC for the EGR system is set, check for proper operation of the EGR system. Use the System Test, EGR Gas Flow Test and EGR Diagnosis Chart. If the EGR system tests properly, check the system using the DRB scan tool. Refer to On-Board Diagnosis sections in this Group. Also, refer to the DRB scan tool and the appropriate Powertrain Diagnostics Procedure manual.

EGR SYSTEM ON-BOARD DIAGNOSTICS

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DIAGNOSIS AND TESTING (Continued)

EGR SYSTEM TEST

WARNING: APPLY PARKING BRAKE AND/OR BLOCK WHEELS BEFORE TESTING THE EGR SYSTEM.

(1) Check the condition of all EGR system hoses and tubes for leaks, cracks, kinks and hardening of rubber hoses. Repair and correct these conditions before performing any tests.

(2) Be sure the hoses at both the EGR valve and EGR valve control are connected to the proper fittings (Fig. 5).

(3) Be sure the electrical connector is firmly connected at the valve control.

(4) To check EGR system operation, connect the DRB scan tool to the 16–way data link connector. The data link connector is located on the lower edge of the instrument panel near the steering column. Refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool when diagnosing the EGR system.

(5) After checking the system with the DRB scan tool, proceed to the following EGR Valve Leakage and EGR Valve Control Tests and repair as necessary.

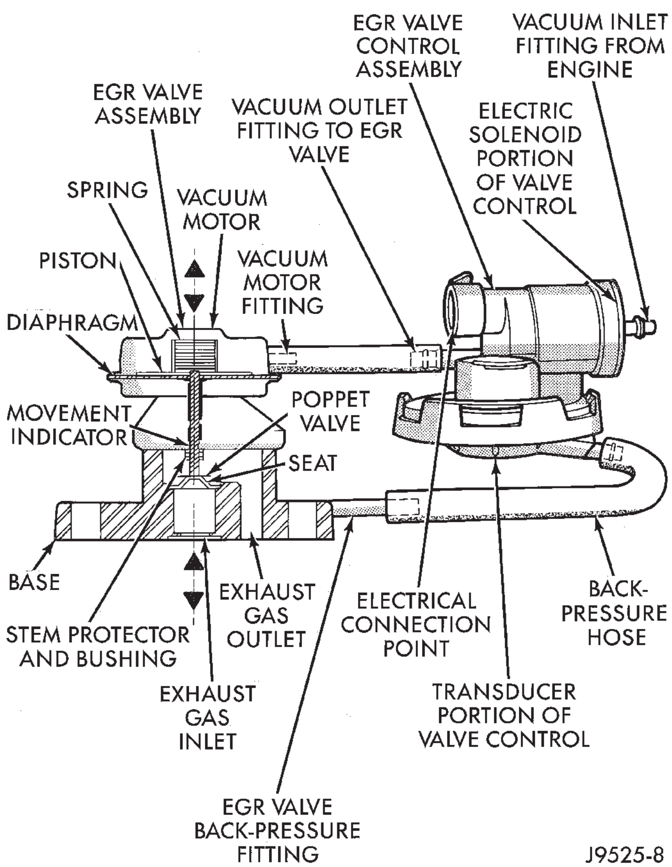

Fig. 5 EGR Value and EGR Value —Typical

EGR GAS FLOW TEST

Use the following test procedure to determine if exhaust gas is flowing through the EGR valve. It can also be used to determine if the EGR tube is plugged, or the system passages in the intake or exhaust manifolds are plugged.

This is not to be used as a complete test of the EGR system.

The engine must be started, running and warmed to operating temperature for this test.

(1) All engines are equipped with two fittings located on the EGR valve (Fig. 6). The upper fitting (located on the vacuum motor) supplies engine vacuum to a diaphragm within the EGR valve for valve operation. The lower fitting (located on the base of the EGR valve) is used to supply exhaust back-pressure to the EGR valve control.

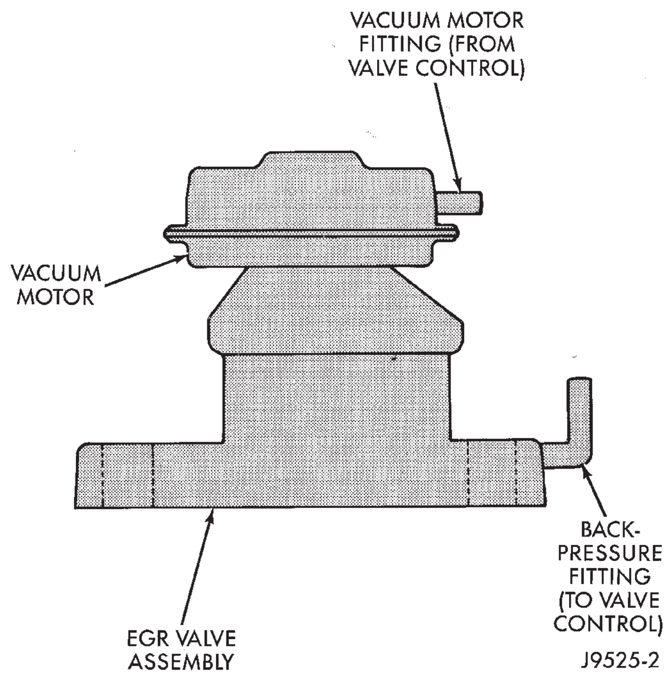

Fig. 6 Typical EGR Valve

(2) Disconnect the rubber hose at the vacuum motor fitting (Fig. 6) on the top of the EGR valve vacuum motor.

(3) Connect a hand-held vacuum pump to this fitting.

(4) Start the engine.

(5) Slowly apply 5 inches of vacuum to the fitting on the EGR valve motor.

(6) While applying vacuum, a minimum of 3 inches of vacuum, and with the engine running at idle speed, the idle speed should drop or the engine may even stall, if the vacuum is applied quickly. This is indicating that exhaust gas is flowing through the EGR tube between the intake and exhaust manifolds.

DIAGNOSIS AND TESTING (Continued)

(7) If the engine speed did not change, the EGR valve may be defective, or EGR tube may be plugged with carbon, or the passages in the intake and exhaust manifolds may be plugged with carbon.

(a) Remove EGR valve from engine. Refer to EGR Valve Removal in this group.

(b) Apply vacuum to the vacuum motor fitting and observe the stem on the EGR valve. If the stem is moving, it can be assumed that the EGR valve is functioning correctly. The problem is in either a plugged EGR tube or plugged passages at the intake or exhaust manifolds, refer to step (c). If the stem will not move, replace the EGR valve. Note: The EGR valve, valve control and attaching hoses are serviced as one unit. Refer to EGR Valve Removal/Installation in this group.

(c) Remove the EGR tube between the intake and exhaust manifolds. Check and clean the EGR tube and its related openings on the manifolds. Refer to EGR Tube in this group for procedures.

(8) Do not attempt to clean the EGR valve. If the valve shows evidence of heavy carbon build-up near the base, replace it.

EGR VALVE LEAKAGE TEST

This is not to be used as a complete test of the EGR system.

If the engine will not idle, dies out on idle, or idle is rough or slow, the poppet valve (Fig. 5) at the base of the EGR valve may be leaking in the closed position.

(1) The engine should be off for the following test.

(2) Disconnect the rubber hose from the fitting (Fig. 5) at the top (vacuum motor) side of the EGR valve.

(a) Connect a hand-held vacuum pump to this fitting.

(b) Apply 15 inches of vacuum to the pump.

(c) Observe the gauge reading on the pump.

(d) If vacuum falls off, the diaphragm in the EGR valve has ruptured.

(e) Replace the EGR valve. Note: The EGR valve, valve control and attaching hoses are serviced as one assembly. Refer to EGR Valve Removal/Installation in this group.

(f) Proceed to the next step.

(3) A small metal fitting (back-pressure fitting) is located at the base of the EGR valve (Fig. 5). A rubber back-pressure hose connects it to the back-pressure fitting on the EGR valve control. Disconnect this rubber hose at the EGR valve fitting.

(4) Remove the air cleaner housing from the throttle body.

(5) Using compressed air, and using an air nozzle with a rubber tip, apply approximately 50 psi of regulated shop air to the metal back- pressure fitting on the EGR valve.

(6) By hand, open the throttle to the wide open position. Air **SHOULD NOT BE HEARD** emitting from the intake manifold while applying air pressure at the back-pressure fitting.

(7) If air **CAN BE HEARD** emitting from the intake manifold, the poppet valve (Fig. 5) is leaking at the bottom of the EGR valve. Replace the EGR valve. Note: The EGR valve, valve control and attaching hoses are serviced as one assembly. Refer to EGR Valve Removal/Installation in this group. Do not attempt clean the old EGR valve.

EGR VALVE CONTROL (TRANSDUCER) TEST

TESTING ELECTRICAL SOLENOID PORTION OF VALVE

This is not to be used as a complete test of the EGR system.

Electrical operation of the valve should be checked with the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool. Replace solenoid if necessary, unit serviced only as an assembly.

TESTING VACUUM TRANSDUCER PORTION OF VALVE

The first part of this test will determine if the transducer diaphragm at the back-pressure side of the valve has ruptured or is leaking. The second part of the test will determine if engine vacuum (full-manifold) is flowing from the inlet to the outlet side of the valve. This is not to be used as a complete test of the EGR system.

(1) Disconnect the rubber back-pressure hose from the fitting at the bottom of EGR valve (Fig. 5).

(2) Connect a hand-held vacuum pump to this fitting.

(3) Apply 10 inches of vacuum to this fitting.

(4) If vacuum falls off, the valve diaphragm is leaking.

(5) Replace the EGR valve assembly. Proceed to next step for further testing.

(6) Remove the rubber hose at the vacuum **inlet** fitting (Fig. 5) on the EGR valve.

(7) Connect a vacuum gauge to this disconnected hose.

(8) Start the engine and bring to operating temperature. Hold engine speed at approximately 1500 rpm.

(9) Check for steady engine vacuum (full-manifold) at this hose.

(10) If engine vacuum (full-manifold) is not present, check vacuum line to engine and repair as necessary before proceeding to next step.

DIAGNOSIS AND TESTING (Continued)

(11) Reconnect the rubber hose to the vacuum **inlet** fitting (Fig. 5) on the EGR valve.

(12) Disconnect the rubber hose at the vacuum **outlet** fitting (Fig. 5) on the EGR valve.

(13) Connect a vacuum gauge to this fitting.

(14) Disconnect the electrical connector (Fig. 5) at the valve control. This will simulate an open circuit (no ground from the PCM) at the valve.

(15) Start the engine and bring to operating temperature.

(16) Hold the engine speed to approximately 2000 rpm while checking for engine vacuum (full-manifold) at this fitting. **To allow full manifold vacuum to flow through the valve, exhaust back-pressure must be present at valve. It must be high enough to hold the bleed valve in the transducer portion of the valve closed.** Have a helper momentarily (a second or two) hold a rag over the tailpipe opening to build some exhaust back-pressure while observing the vacuum gauge. Heavy gloves should be worn. **Do not cover the tailpipe opening for an extended period of time as damage to components or overheating may result.**

(17) As temporary back-pressure is built, full manifold vacuum should be observed at the vacuum outlet fitting. Without back-pressure, and engine at approximately 2000 rpm, the gauge reading will be low. This low reading is normal. At idle speed, the gauge reading will be erratic. This is also normal.

(18) If full manifold vacuum is not present at the outlet fitting, but was present at the inlet fitting, replace the valve. Note: The EGR valve, valve control and attaching hoses are serviced as one assembly. Refer to EGR Valve Removal/Installation in this group.

REMOVAL AND INSTALLATION

EGR VALVE AND TRANSDUCER—2.0L

If the EGR system operates incorrectly, replace the entire EGR valve and transducer together. The EGR valve and electrical transducer are calibrated together.

REMOVAL

The EGR valve and EGR transducer attach to the rear of the cylinder head (Fig. 7).

(1) Disconnect vacuum supply tube from EGR transducer solenoid.

(2) Disconnect electrical connector from solenoid.

(3) Remove EGR tube to EGR valve screws.

(4) Remove EGR valve mounting screws. Remove EGR valve and transducer.

(5) Clean gasket surfaces. Discard old gaskets. If necessary, clean EGR passages.

INSTALLATION

(1) Loosely install EGR valve with new gaskets.

(2) Finger tighten EGR tube fasteners.

(3) Tighten EGR tube fasteners to 11 N·m (95 in. lbs.) torque.

(4) Tightening EGR valve mounting screws to 22 N·m (200 in. lbs.) torque.

(5) Connect vacuum supply tube to solenoid.

(6) Attach electrical connector to solenoid.

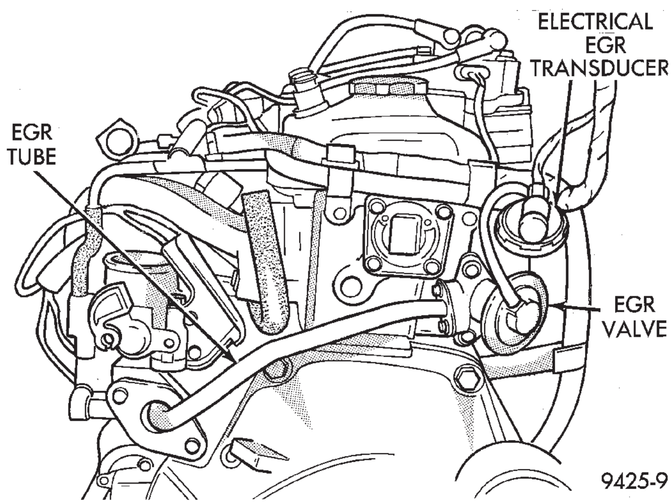

Fig. 7 EGR System

EGR VALVE AND TRANSDUCER—2.4L

If the EGR system operates incorrectly, replace the entire EGR valve and transducer together. The EGR valve and electrical transducer are calibrated together.

REMOVAL

(1) Disconnect vacuum supply tube from solenoid.

(2) Disconnect electrical connector from solenoid.

(3) Remove EGR tube to EGR valve screws.

(4) Remove EGR valve mounting screws. Remove EGR valve and transducer.

(5) Clean gasket surfaces. Discard old gaskets. If necessary, clean EGR passages.

INSTALLATION

(1) Loosely install EGR valve with new gaskets.

(2) Finger tighten EGR tube fasteners.

(3) Tighten EGR tube fasteners to 11 N·m (95 in. lbs.) torque.

(4) Tightening EGR valve mounting screws to 22 N·m (200 in. lbs.) torque.

(5) Connect vacuum supply tube to solenoid.

(6) Attach electrical connector to solenoid.

EGR VALVE AND TRANSDUCER—2.5L

The EGR valve attaches to the front exhaust manifold. The transducer/solenoid attach to the front cylinder head.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Disconnect vacuum supply from solenoid.

(2) Disconnect electrical connector from solenoid.

(3) Remove screws holding transducer to bracket.

(4) Remove screws holding Transmission Control Module (TCM) to bracket (Fig. 8). Swing TCM up to allow access to EGR screws (Fig. 9).

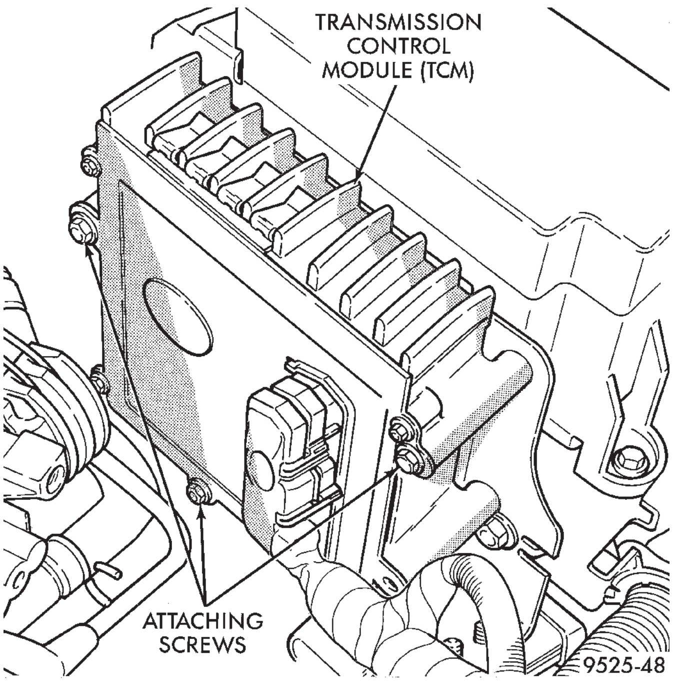

Fig. 8 TCM Removal

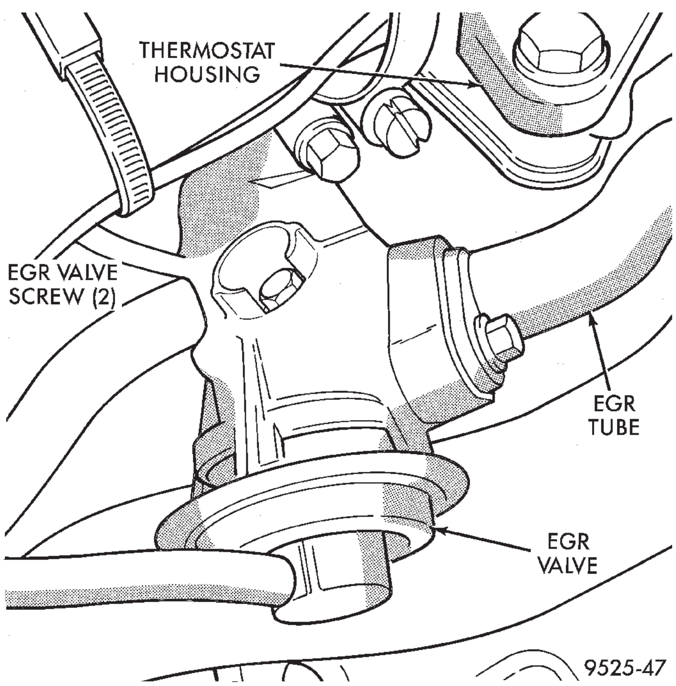

Fig. 9 EGR Removal

(5) Remove screws holding EGR tube.

(6) Remove EGR valve mounting screws. Remove EGR valve and transducer.

(7) Clean gasket surfaces. Discard old gaskets. If necessary, clean EGR passages.

INSTALLATION

(1) Loosely install EGR valve with new gaskets.

(2) Finger tighten EGR tube fasteners.

(3) Tighten EGR tube fasteners to 11 N·m (95 in. lbs.) torque.

(4) Tightening EGR valve mounting screws to 22 N·m (200 in. lbs.) torque.

(5) Install transducer to bracket.

(6) Connect vacuum supply to solenoid.

(7) Attach electrical connector to solenoid.

EGR TUBE—2.0L

The EGR tube attaches to the intake manifold plenum below the throttle body and EGR valve.

REMOVAL

(1) Remove screws attaching EGR tube to intake manifold (Fig. 10).

(2) Remove EGR tube to EGR valve screws.

(3) Remove EGR tube. Clean gasket surface on the EGR valve. Wipe clean the grommet on the intake manifold.

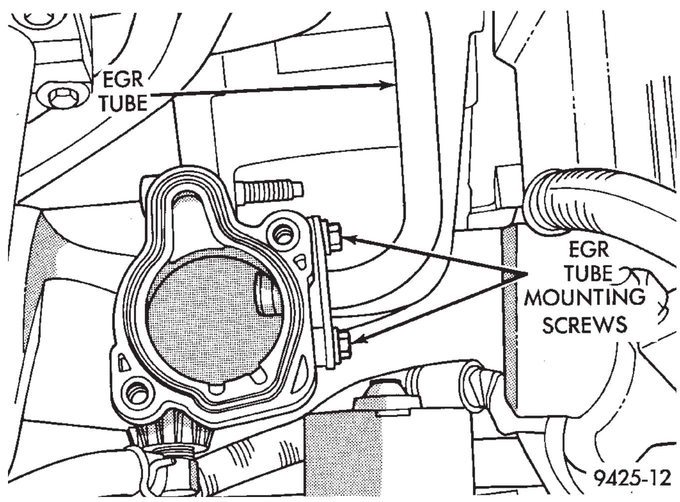

Fig. 10 EGR Tube Stud Bolts

INSTALLATION

The rubber grommet that seals the EGR tube to intake manifold connection is reusable.

(1) Loosely install the EGR tube and fasteners.

(2) Tighten the EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs) torque.

(3) Tighten the EGR tube to EGR valve screws to 11 N·m (95 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

EGR TUBE—2.4L

The EGR tube attaches to the intake manifold plenum below the throttle body and to the EGR valve (Fig. 1).

REMOVAL

(1) Remove screws attaching EGR tube to intake manifold (Fig. 11).

(2) Remove EGR tube to EGR valve screws.

(3) Remove EGR tube. Clean gasket surface on the EGR valve. Wipe the grommet clean on the intake manifold.

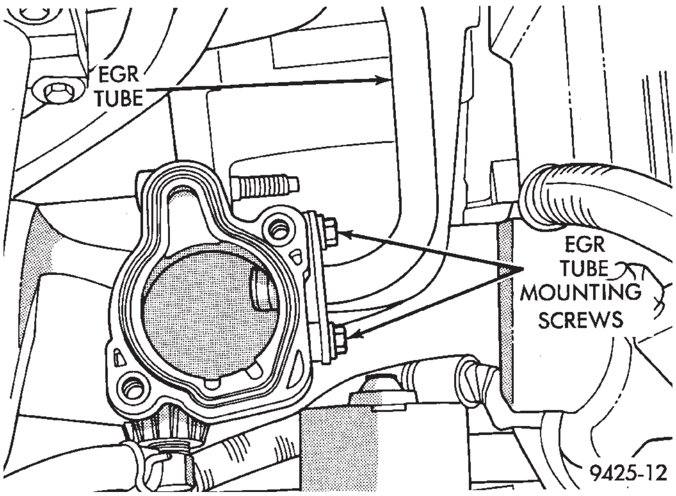

Fig. 11 EGR Tube Stud Bolts

INSTALLATION

The rubber grommet that seals the EGR tube to intake manifold connection is reusable.

(1) Loosely install the EGR tube and fasteners.

(2) Tighten the EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs) torque.

(3) Tighten the EGR tube to EGR valve screws to 11 N·m (95 in. lbs.) torque.

EGR TUBE—2.5L

The EGR tube attaches to the intake manifold plenum behind the throttle body and to the EGR valve.

REMOVAL

(1) Remove screws attaching EGR tube to intake manifold (Fig. 12).

(2) Remove EGR tube to EGR valve screws (Fig. 13).

(3) Remove EGR tube. Clean gasket surface on the EGR valve. Wipe clean the grommet on the intake manifold.

INSTALLATION

Use new gaskets on both ends of the EGR tube.

(1) Loosely install the EGR tube and fasteners.

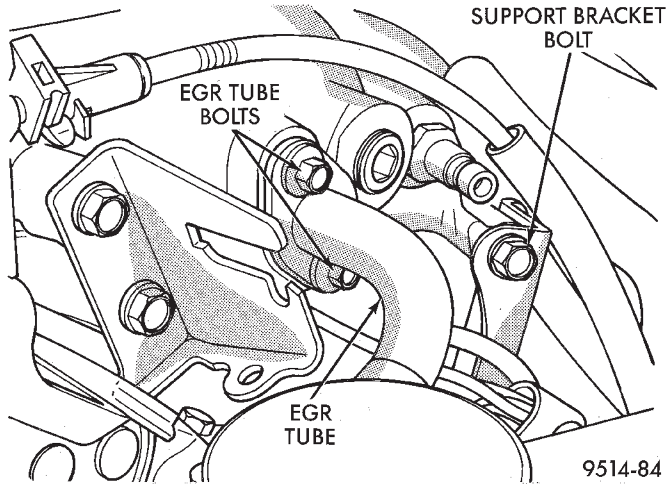

Fig. 12 EGR Tube at Intake Manifold

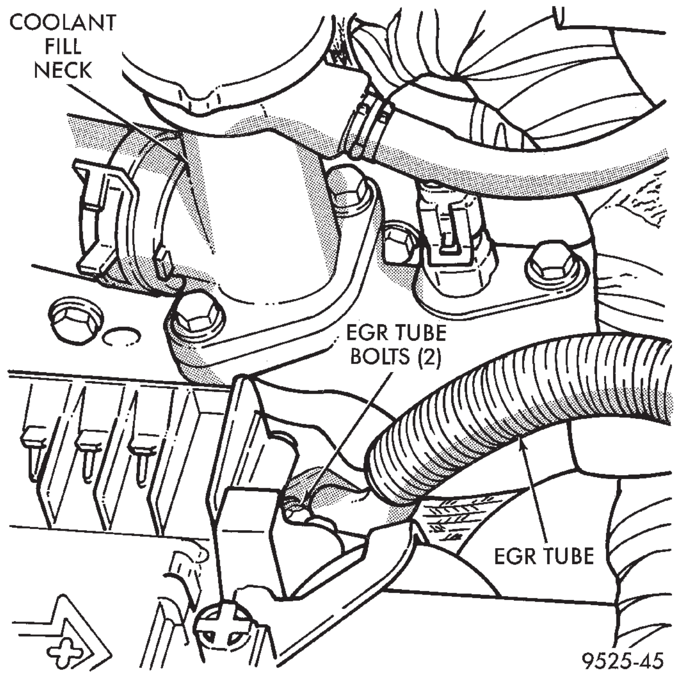

Fig. 13 EGR Tube at EGR Valve

(2) Tighten the EGR tube to intake manifold plenum screws to 11 N·m (95 in. lbs) torque.

(3) Tighten the EGR tube to EGR valve screws to 11 N·m (95 in. lbs.) torque.

SPECIFICATIONS

TORQUE

Description	Torque
EGR valve to cyl. head	22 N·m (200 in. lbs.)
EGR tube to EGR valve	11 (95 in. lbs.)
EGR tube to intake manifold	11 N·m (95 in. lbs.)