GROUP TAB LOCATOR

INTRODUCTION

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BODY CODE EMBOSS

DESCRIPTION

The vehicle is equipped with a Body Code Emboss and it is located on the rear shelf. The emboss is located in the trunk area on the forward top edge of the rear shelf panel.

FASTENER IDENTIFICATION

DESCRIPTION

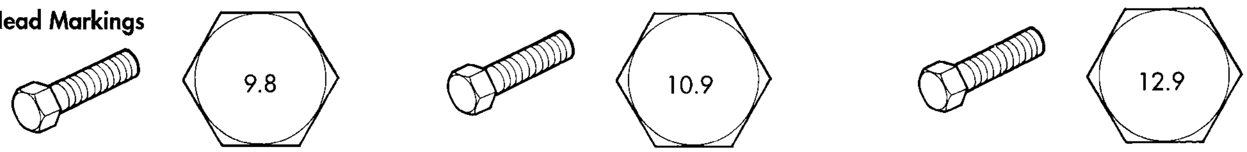
The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 10.9. 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 (Fig. 1) and (Fig. 2).

FASTENER IDENTIFICATION (Continued)

Bolt Markings and Torque - Metric

Commercial Steel Class 9.8 | 10.9 | 12.9

Bolt Head Markings

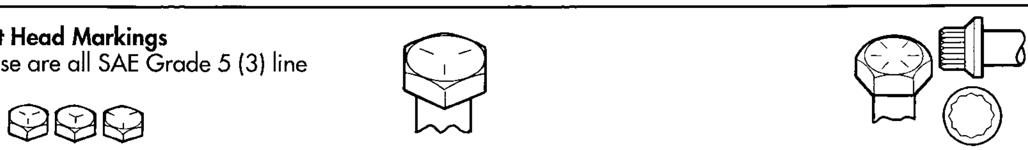


Body Size Diam. mm	9.8 Torque Cast Iron N•m	ft-lb	Aluminum N•m	ft-lb	10.9 Torque Cast Iron N•m	ft-lb	Aluminum N•m	ft-lb	12.9 Torque Cast Iron N•m	ft-lb	Aluminum N•m	ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7
7	14	9	11	7	18	14	14	11	23	18	18	14
8	25	18	18	14	32	23	25	18	36	27	28	21
10	40	30	30	25	60	45	45	35	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	ft-lb	Aluminum N•m	ft-lb	Bolt Torque - Grade 8 Bolt Cast Iron N•m	ft-lb	Aluminum N•m	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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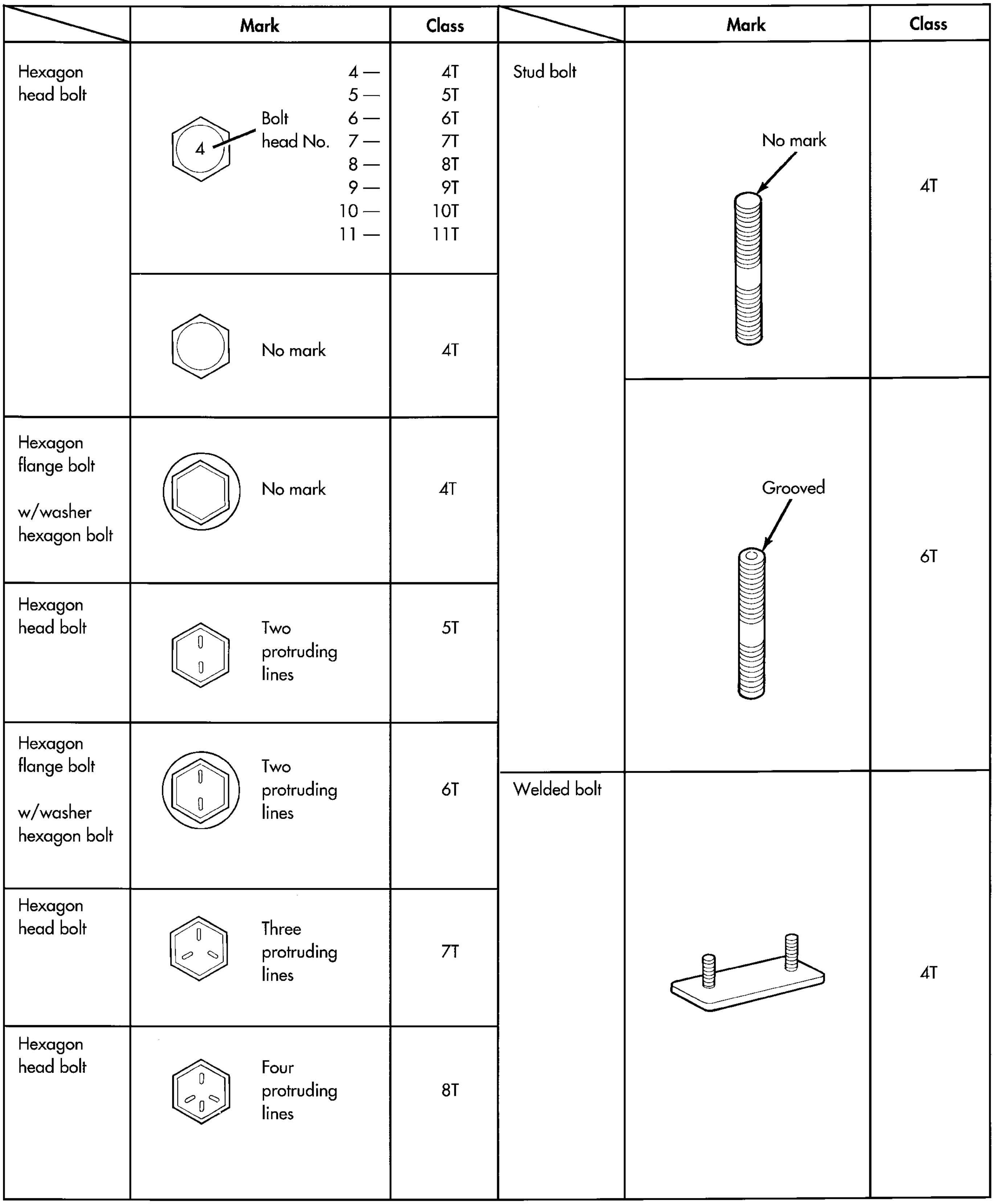
Fig. 1 FASTENER IDENTIFICATION

FASTENER IDENTIFICATION (Continued)



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

95IN-4

Fig. 2 FASTENER STRENGTH

FASTENER USAGE

DESCRIPTION

DESCRIPTION - FASTENER USAGE

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

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

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

DESCRIPTION - THREADED HOLE REPAIR

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

INTERNATIONAL SYMBOLS

DESCRIPTION

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

METRIC SYSTEM

DESCRIPTION

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

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

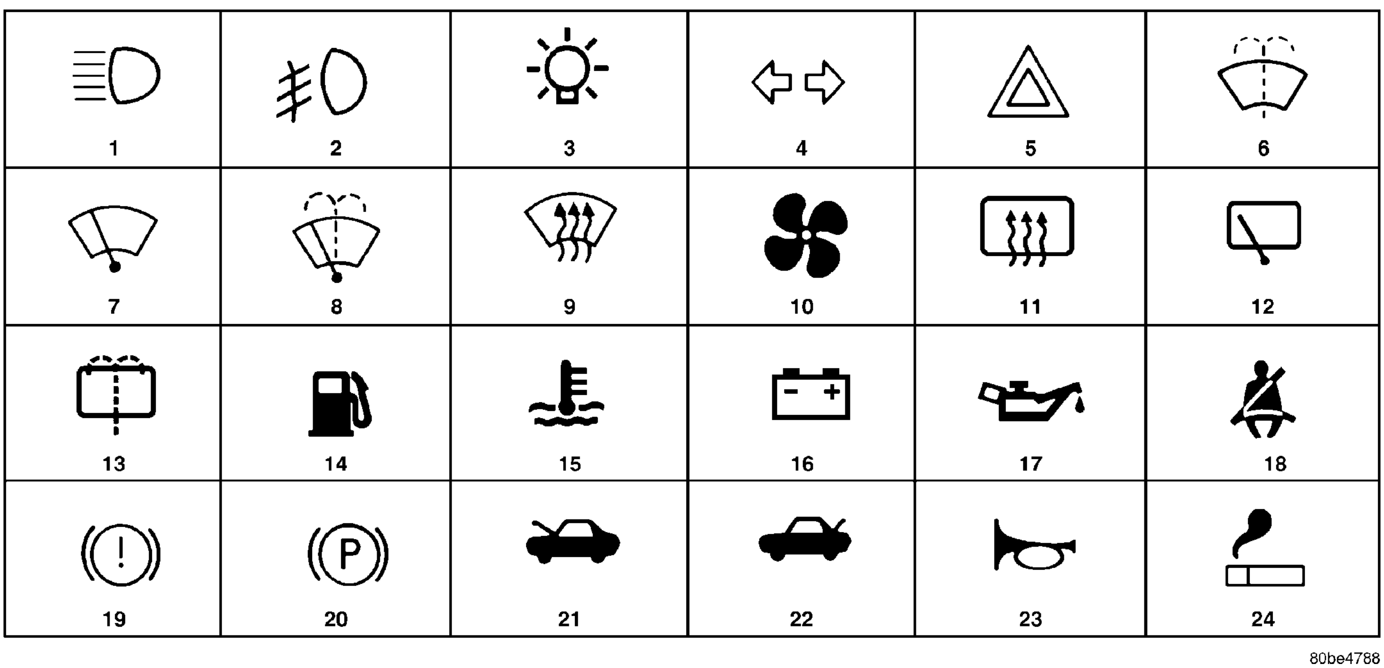


Fig. 3 INTERNATIONAL CONTROL AND DISPLAY SYMBOLS

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

METRIC SYSTEM (Continued)

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	x 1.0936	= Yards
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
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

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	

Refer to the Metric 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.) (Fig. 4).

METRIC SYSTEM (Continued)

in-lbs to N•m

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

N•m to in-lbs

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

ft-lbs to N•m

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

N•m to ft-lbs

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

in. to mm

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

mm to in.

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

J901N-10

Fig. 4 METRIC CONVERSION CHART

TORQUE REFERENCES

DESCRIPTION

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

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque: Hexagon head bolt N•m	Hexagon head bolt kgf-cm	Hexagon head bolt ft-lbf	Hexagon flange bolt N•m	Hexagon flange bolt kgf-cm	Hexagon flange bolt 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

Fig. 5 TORQUE SPECIFICATIONS

VEHICLE IDENTIFICATION NUMBER

DESCRIPTION

The Vehicle Identification Number (VIN) can be viewed through the windshield at the upper left corner of the instrument panel next to the A-pillar (Fig. 6) or (Fig. 7). The VIN consists of 17 characters in a combination of letters and numbers that provide specific information about the vehicle. Refer to the VIN Decoding Information Table to interpret VIN code.

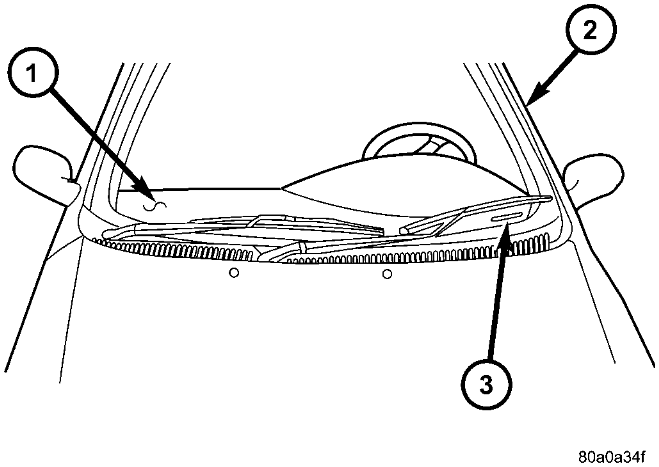


Fig. 6 VIN LOCATION - LHD

1 - INSTRUMENT PANEL
2 - A-PILLAR
3 - VIN LOCATION

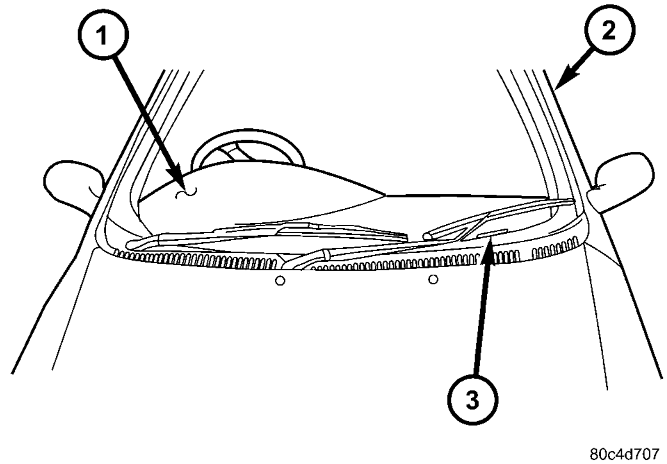


Fig. 7 VIN LOCATION - RHD

1 - INSTRUMENT PANEL
2 - A-PILLAR
3 - VIN LOCATION

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 VIN. 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.

VEHICLE IDENTIFICATION NUMBER (Continued)

VIN DECODING INFORMATION

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of origin	1 = Manufactured By DaimlerChrysler Corporation
2	Make	B = Dodge C = Chrysler
3	Vehicle Type	3 = Passenger Car
4	Passenger Safety	A = Restraint System, Active Front and Side Airbags B = Restraint System, Manual/Active Uni-Belt E = Restraint System, Active Driver and Passenger Airbags
5	Car Line	S = Neon LHD V = Neon RHD
6	Series	1 = Economy 2 = Low Line 4 = High Line 5 = Premium 6 = Sport 7 = Special
7	Body Style	6 = 4 Door Sedan
8	Engine	C = 2.0 L 4 Cyl.16V SOHC Gasoline F = 2.0 L 4 Cyl.16V High Performance Gasoline S = 2.4 L 4 Cyl. 16V DOHC High Output Turbo
9	Check Digit	See explanation in this section.
10	Model Year	4 = 2004
11	Assembly Plant	D = Belvedere Assembly
12 Thorough 17	Build Sequence	6 Digit number assigned by assembly plant

VEHICLE CERTIFICATN LABEL

DESCRIPTION

A vehicle certification label is attached to the rear shutface of the driver's door (Fig. 8). 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.

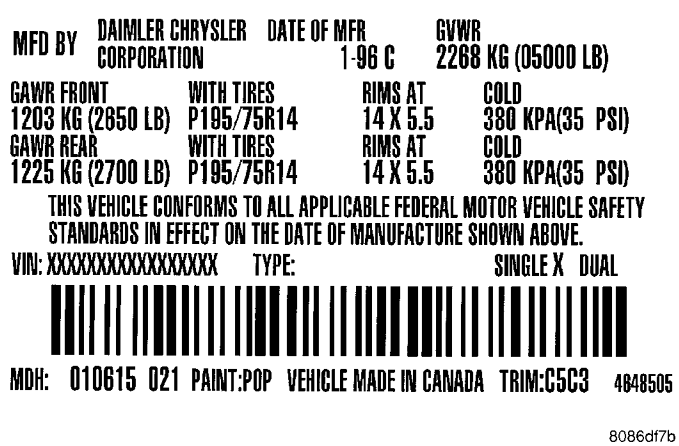


Fig. 8 VEHICLE CERTIFICATION LABEL - TYPICAL

E-MARK LABEL

DESCRIPTION

An E-mark Label (Fig. 9) is located on the rear shut face of the driver's door. The label contains the following information:

- Date of Manufacture
- Month-Day-Hour (MDH)
- Vehicle Identification Number (VIN)
- Country Codes
- Regulation Number
- Regulation Amendment Number
- Approval Number

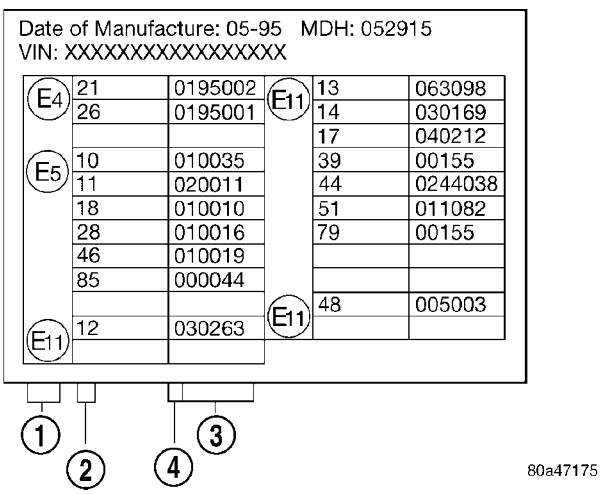


Fig. 9 E-MARK LABEL

1 - COUNTRY CODE
2 - REGULATION NUMBER
3 - APPROVAL NUMBER
4 - AMENDMENT NUMBER

VECI LABEL

DESCRIPTION

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.

MANUFACTURER PLATE

DESCRIPTION

The Manufacturer Plate (Fig. 10) is located in the engine compartment on the passenger side rear corner of the hood. The plate contains five lines of information:

1. Vehicle Identification Number (VIN)
2. Gross Vehicle Mass (GVM)
3. Gross Train Mass (GTM)
4. Gross Front Axle Rating (GFAR)
5. Gross Rear Axle Rating (GRAR)

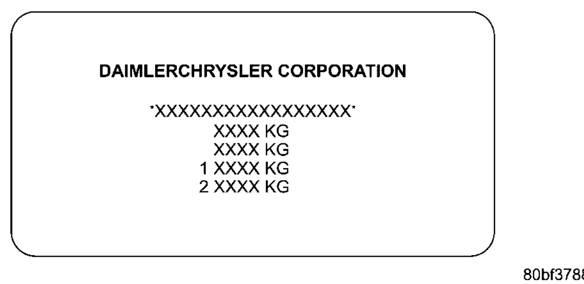


Fig. 10 MANUFACTURER PLATE

LUBRICATION & MAINTENANCE

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INTERNATIONAL SYMBOLS

DESCRIPTION

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

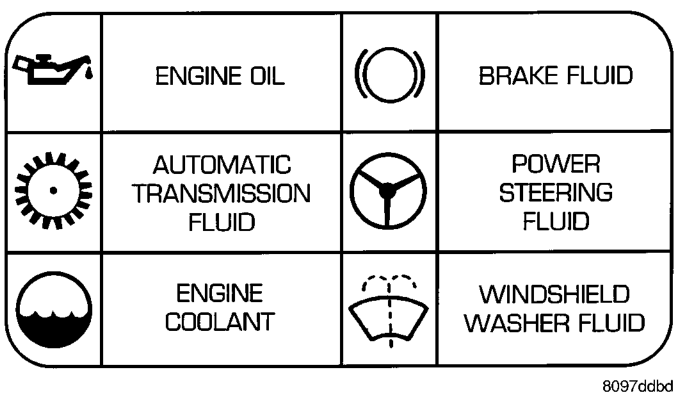


Fig. 1 INTERNATIONAL SYMBOLS

FLUID TYPES

DESCRIPTION

DESCRIPTION - ENGINE OIL AND LUBRICANTS

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.

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

Only lubricants bearing designations defined by the following organization should be used.

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

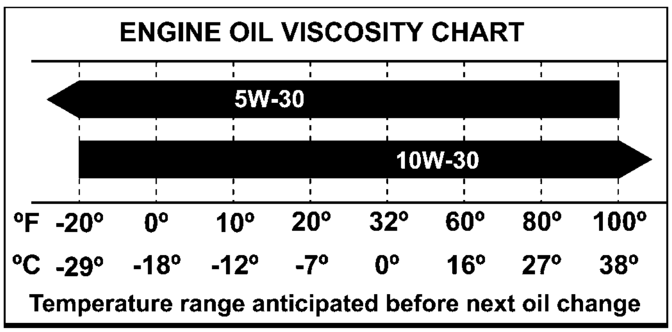
FLUID TYPES (Continued)

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Certified (GF-3). Mopar® provides engine oils, meeting Material Standard MS-6395, that meet or exceed this requirement.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30. 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. 2).



80990199

Fig. 2 TEMPERATURE/ENGINE OIL VISCOSITY

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

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 front label of engine oil plastic bottles and the top of engine oil cans (Fig. 3).

This symbol means that the oil has been certified by the American Petroleum Institute (API). Diamler-Chrysler only recommend API Certified (GF-3) engine oils that meet the requirements of Material Standard MS-6395. Use Mopar® or an equivalent oil meeting the specification MS-6395.

SYNTHETIC ENGINE OILS

There are a number of engine oils being promoted as either synthetic or semi-synthetic. If you chose to use such a product, use **only** those oils that meet the American Petroleum Institute (API) and SAE viscosity standard. Follow the service schedule that describes your driving type.

9400-9

Fig. 3 API SYMBOL

ENGINE OIL ADDITIVES/SUPPLEMENTS

The manufacturer **does not recommend** the addition of any engine oil additives/supplements to the specified engine oil. Engine oil additives/supplements should not be used to enhance engine oil performance. Engine oil additives/supplements should not be used to extend engine oil change intervals. No additive is known to be safe for engine durability and can degrade emission components. Additives can contain undesirable materials that harm the long term durability of engines by:

- Doubling the level of Phosphorus in the engine oil. The ILSAC (International Lubricant Standard Approval Committee) GF-2 and GF-3 standards require that engine oil contain no more than 0.10% Phosphorus to protect the vehicles emissions performance. Addition of engine oil additives/supplements can poison, from the added sulfur and phosphorus, catalysts and hinder efforts to guarantee emissions performance to 80,000 miles.
- Altering the viscosity characteristics of the engine oil so that it no longer meets the requirements of the specified viscosity grade.
- Creating potential for an undesirable additive compatibility interaction in the engine crankcase. Generally it is not desirable to mix additive packages from different suppliers in the crankcase; there have been reports of low temperature engine failures caused by additive package incompatibility with such mixtures.

GEAR LUBRICANTS

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

LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 4) 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

FLUID TYPES (Continued)

quality of the lubricant. The following symbols indicate the highest quality.

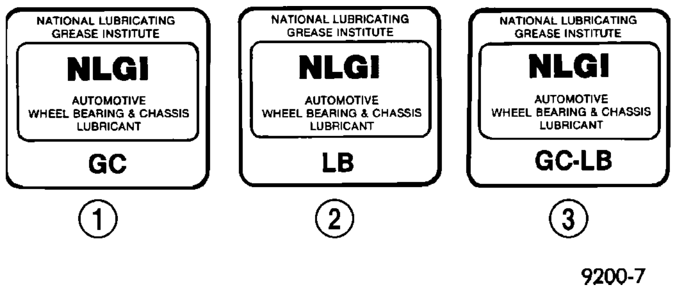


Fig. 4 NLGI SYMBOL

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

SPECIALIZED LUBRICANTS AND OILS

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

DESCRIPTION - ENGINE COOLANT

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

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

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 and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

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

The green coolant **MUST NOT BE MIXED** with the orange or magenta coolants. When replacing coolant the complete system flush must be performed before using the replacement coolant.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Doing so will reduce the corrosion protection and may result in premature water pump seal failure. If non-HOAT coolant is introduced into the cooling system in an emergency, it should be replaced with the specified coolant as soon as possible.

DESCRIPTION - AUTOMATIC/MANUAL TRANSAXLE FLUID

NOTE: Refer to the maintenance schedules for the recommended maintenance (fluid/filter change) intervals for available transaxles. The Maintenance Schedules are located in the vehicle Owner's Manual.

NOTE: For fluid level checking procedures, refer to Group 21, Transaxle.

NOTE: The 41TE automatic and T350/T850 manual transaxles have a common transmission and differential sump. Filling the transaxle accommodates the differential as well.

TRANSMISSION FLUID

Mopar® ATF+4 (Automatic Transmission Fluid) is required in both the 41TE automatic and T350/T850 manual transaxles. **Neon SRT-4 Models equipped with the T850 manual transaxle also require the addition of 0.12L (4 oz.) of Mopar® Limited Slip Additive (P/N 04318060AB).** Substitute fluids can induce torque converter clutch shudder, or premature failure of internal transaxle components.

FLUID TYPES (Continued)

Mopar® ATF+4 (Automatic Transmission Fluid) when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. This is normal. A dark brown/black fluid accompanied with a burnt odor and/or deterioration in shift quality may indicate fluid deterioration or transmission component failure.

FLUID ADDITIVES

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

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

DESCRIPTION - FUEL REQUIREMENTS

Your engine is designed to meet all emissions regulations and provide excellent fuel economy and performance when using high quality unleaded gasoline having an octane rating of 87. The use of premium gasoline is not recommended. The use of premium gasoline will provide no benefit over high quality regular gasoline, and in some circumstances may result in poorer performance.

Light spark knock at low engine speeds is not harmful to your engine. However, continued heavy spark knock at high speeds can cause damage and immediate service is required. Engine damage resulting from operation with a heavy spark knock may not be covered by the new vehicle warranty.

Poor quality gasoline can cause problems such as hard starting, stalling and hesitations. If you experience these symptoms, try another brand of gasoline before considering service for the vehicle.

Over 40 auto manufacturers world-wide have issued and endorsed consistent gasoline specifications (the Worldwide Fuel Charter, WWFC) to define fuel properties necessary to deliver enhanced emissions, performance and durability for your vehicle. We recommend the use of gasolines that meet the WWFC specifications if they are available.

REFORMULATED GASOLINE

Many areas of the country require the use of cleaner burning gasoline referred to as “reformulated” gasoline. Reformulated gasoline contain oxygenates, and are specifically blended to reduce vehicle emissions and improve air quality.

We strongly support the use of reformulated gasoline. Properly blended reformulated gasoline will provide excellent performance and durability for the engine and fuel system components.

GASOLINE/OXYGENATE BLENDS

Some fuel suppliers blend unleaded gasoline with oxygenates such as 10% ethanol, MTBE, and ETBE. Oxygenates are required in some areas of the country during the winter months to reduce carbon monoxide emissions. Fuels blended with these oxygenates may be used in your vehicle.

CAUTION: DO NOT use gasoline containing METHANOL. Gasoline containing methanol may damage critical fuel system components.

MMT IN GASOLINE

MMT is a manganese-containing metallic additive that is blended into some gasoline to increase octane. Gasoline blended with MMT provide no performance advantage beyond gasoline of the same octane number without MMT. Gasoline blended with MMT reduce spark plug life and reduce emission system performance in some vehicles. We recommend that gasoline free of MMT be used in your vehicle. The MMT content of gasoline may not be indicated on the gasoline pump; therefore, you should ask your gasoline retailer whether or not his/her gasoline contains MMT.

It is even more important to look for gasoline without MMT in Canada because MMT can be used at levels higher than allowed in the United States. MMT is prohibited in Federal and California reformulated gasoline.

SULFUR IN GASOLINE

If you live in the northeast United States, your vehicle may have been designed to meet California low emission standards with Cleaner-Burning California reformulated gasoline with low sulfur. If such fuels are not available in states adopting California emission standards, your vehicles will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be adversely affected. Gasoline sold outside of California is permitted to have higher sulfur levels which may affect the performance of the vehicle’s catalytic converter. This may cause the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon

FLUID TYPES (Continued)

light to illuminate. We recommend that you try a different brand of unleaded gasoline having lower sulfur to determine if the problem is fuel related prior to returning your vehicle to an authorized dealer for service.

CAUTION: If the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon light is flashing, immediate service is required; see on-board diagnostics system section.

MATERIALS ADDED TO FUEL

All gasoline sold in the United States and Canada are required to contain effective detergent additives. Use of additional detergents or other additives is not needed under normal conditions.

FUEL SYSTEM CAUTIONS

CAUTION: Follow these guidelines to maintain your vehicle's performance:

- The use of leaded gas is prohibited by Federal law. Using leaded gasoline can impair engine performance, damage the emission control system, and could result in loss of warranty coverage.
- An out-of-tune engine, or certain fuel or ignition malfunctions, can cause the catalytic converter to overheat. If you notice a pungent burning odor or some light smoke, your engine may be out of tune or malfunctioning and may require immediate service. Contact your dealer for service assistance.
- When pulling a heavy load or driving a fully loaded vehicle when the humidity is low and the temperature is high, use a premium unleaded fuel to help prevent spark knock. If spark knock persists, lighten the load, or engine piston damage may result.
- The use of fuel additives which are now being sold as octane enhancers is not recommended. Most of these products contain high concentrations of methanol. Fuel system damage or vehicle performance problems resulting from the use of such fuels or additives is not the responsibility of DaimlerChrysler Corporation and may not be covered under the new vehicle warranty.

NOTE: Intentional tampering with emissions control systems can result in civil penalties being assessed against you.

FLUID CAPACITIES

SPECIFICATIONS - FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
Fuel Tank	47.5 L (12.5 gal.)
Engine Oil* - 1.6 L	4.3 L (4.5 qts.)
Engine Oil* - 2.0 L	4.3 L (4.5 qts.)
Engine Oil* - 2.4 L	4.8 L (5.0 qts.)
Cooling System**	6.2 L (6.5 qts.)
Automatic Transaxle - Estimated Service Fill	3.8 L (4.0 qts.)
Automatic Transaxle - Overhaul Fill Capacity with Torque Converter Empty	8.1 L (8.6 qts.)
Manual Transaxle - NV T350	2.4-2.7 L (2.5-2.8 qts.)
Manual Transaxle - NV T850***	2.3-2.5L (2.4-2.6 qts.)
*(includes new filter)	
**(includes heater and recovery/reserve bottle)	
***(includes 0.12 L (4 oz.) of Mopar® Limited Slip Additive (P/N 04318060AB))	

FLUID FILL/CHECK LOCATIONS

DESCRIPTION

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

LUBRICATION POINTS

DESCRIPTION

Lubrication point locations are located in each applicable Sections.

MAINTENANCE SCHEDULES

DESCRIPTION

DESCRIPTION

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

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

- Day or night temperatures are below 32°F (0°C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16.2 km).
- More than 50% of your driving is sustained high speeds during hot weather, above 90°F (32°C).
- Trailer towing.†◊
- Taxi, police or delivery service (commercial services).†◊
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule "B" of the ″Maintenance Schedules″ section of this manual.

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

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

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

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

At Each Stop for Fuel

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

Once a Month

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

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints and front suspension components.
- Check the automatic transaxle fluid level.
- Check the manual transaxle fluid level and fill plug condition.
- Check the coolant level, hoses, and clamps.
- Rotate the tires at each oil change interval shown on Schedule "A" 6,000 miles (10 000 km) or every other interval shown on Schedule "B" 6,000 miles (10 000 km).

SCHEDULE B - NORTH AMERICA

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

Change the automatic transmission fluid and filter every 60,000 miles (96 000 km) if the vehicle is usually operated under one or more of the conditions marked with an ◊.

Change the manual transaxle fluid every 48,000 miles (77 000 km) if the vehicle is usually operated under one or more of the conditions marked with an †.

- Day or night temperatures are below 32°F (0°C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16.2 km).
- More than 50% of your driving is sustained high speeds during hot weather, above 90°F (32°C).
- Trailer towing.† ◊
- Taxi, police or delivery service (commercial services).† ◊
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

MAINTENANCE SCHEDULES (Continued)

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

If none of these apply to you, then change your engine oil at every interval shown on schedule ″A″ of the ″Maintenance Schedules″ section of this manual.

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (14 000)**	**12,000 (19 000)**	**15,000 (24 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X
Inspect and replace, if required, the **air cleaner element (filter)**. *					X

Miles (Kilometers)	**18,000 (29 000)**	**21,000 (34 000)**	**24,000 (38 000)**	**27,000 (43 000)**	**30,000 (48 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X	
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**. *					X
Adjust the generator belt tension.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X
Inspect the tie rod ends and boot seal.					X

Miles (Kilometers)	**33,000 (53 000)**	**36,000 (58 000)**	**39,000 (62 000)**	**42,000 (67 000)**	**45,000 (72 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.		X			X
Inspect and replace, if necessary, the **air cleaner element (filter)** . *					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**48,000 (77 000)**	**51,000 (82 000)**	**54,000 (86 000)**	**57,000 (91 000)**	**60,000 (96 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**. *‡					X
Change the automatic transaxle fluid and adjust the bands.					X
Inspect the tie rod ends and boot seals.					X
Replace the drive belts.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X
Replace the **ignition cables**.					X

Miles (Kilometers)	**63,000 (101 000)**	**66,000 (106 000)**	**69,000 (110 000)**	**72,000 (115 000)**	**75,000 (120 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X	
Inspect and replace, if necessary, the **air cleaner element (filter)** . *					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

Miles (Kilometers)	**78,000 (125 000)**	**81,000 (130 000)**	**84,000 (134 000)**	**87,000 (139 000)**	**90,000 (144 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.		X			X
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**. *‡					X
Inspect the tie rod ends and boot seals.					X
Adjust the generator drive belt tension.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**93,000 (149 000)**	**96,000 (154 000)**	**99,000 (158 000)**	**102,000 (163 000)**	**105,000 (168 000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Replace **air cleaner element (filter)**. *					X
Flush and replace the engine coolant.				X	
Replace the **engine timing belt**.					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

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

SCHEDULE A - NORTH AMERICA

Miles (Kilometers) [Months]	**6,000 (10 000) [6]**	**12,000 (19 000) [12]**	**18,000 (29 000) [18]**	**24,000 (38 000) [24]**	**30,000 (48 000) [30]**	**36,000 (58 000) [36]**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.			X			X
Replace the **engine air cleaner filter.**					X	
Replace the **spark plugs.**					X	
Inspect the tie rod ends and boot seals.					X	
Replace the **make-up air filter** (located inside the air cleaner).					X	
Adjust generator drive belt tension					X	

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers) [Months]	**42,000 (67 000) [42]**	**48,000 (77 000) [48]**	**54,000 (86 000) [54]**	**60,000 (96 000) [60]**	**66,000 (106 000) [66]**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the brake linings.			X		
Replace the **engine air cleaner filter.**				X	
Replace the **spark plugs and ignition cables.**				X	
Inspect the tie rod ends and boot seals.				X	
Inspect the **PCV valve** and replace, if necessary.*				X	
Flush and replace the engine coolant at 60 months, regardless of mileage.				X	
Replace the **make-up air filter** (located inside the air cleaner).				X	
Replace drive belts.				X	

Miles (Kilometers) [Months]	**72,000 (115 000) [72]**	**78,000 (125 000) [78]**	**84,000 (134 000) [84]**	**90,000 (144 000) [90]**	**96,000 (154 000) [96]**	**102,000 (160 000) [102]**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X		
Replace the **engine air cleaner filter.**				X		
Replace the **spark plugs.**				X		
Inspect the tie rod ends and boot seals.				X		
Inspect the **PCV valve** and replace if necessary. Not required if previously changed. * ‡				X		
Replace the **make-up air filter** (located inside the air cleaner).				X		
Adjust the generator drive belt tension.				X		
Flush and replace the engine coolant at 60 months, regardless of mileage.						X
Replace **engine timing belt.**						X

* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

MAINTENANCE SCHEDULES (Continued)

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

DESCRIPTION - EXPORT

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

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

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

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

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.† ♢
- Taxi, police, or delivery service (commercial service).† ♢
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule "B" of the ″Maintenance Schedules″ section of this manual.

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

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

At Each Stop for Fuel

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

Once a Month

- Check the tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder and transaxle and add as needed.
- Check all lights and all other electrical items for correct operation.
- Check rubber seals on each side of the radiator for proper fit.

At Each Oil Change

- Replace the engine oil filter at each oil change.
- Inspect the exhaust system.
- Inspect brake linings, hoses and calipers.
- Inspect the CV joints and front suspension components.
- Check the coolant level, hoses, and clamps.
- Rotate the tires at each oil change interval shown on Schedule "A" 12 000 km (7,500 miles) or every other interval shown on Schedule "B" 10 000 km (6,000 miles).

SCHEDULE A - EXPORT ONLY

Kilometers (Miles) [Months]	**12 000 (7,500) [6]**	**24 000 (15,000) [12]**	**36 000 (22,500) [18]**	**48 000 (30,000) [24]**	**60 000 (37,500) [30]**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Replace **air cleaner element (filter)**.				X	
Inspect the tie rod ends and boot seals.				X	
Adjust the generator drive belt.				X	
Replace the **make-up air filter** (located inside the air cleaner).				X	
Replace the **spark plugs**.				X	

MAINTENANCE SCHEDULES (Continued)

Kilometers **(Miles)** **[Months]**	**72 000** **(45,000)** **[36]**	**84 000** **(52,500)** **[42]**	**96 000** **(60,000)** **[48]**	**108 000** **(67,500)** **[54]**	**120 000** **(75,000)** **[60]**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X	
Replace **air cleaner element (filter)**.			X		
Check and replace, if necessary, the **PCV valve**. * ‡			X		
Replace drive belts.			X		
Flush and refill the engine coolant system if 60 months have been reached before 100,000 miles.					X
Replace the **make-up filter** (located inside the air cleaner).			X		
Replace the **spark plugs** and ignition cables.			X		
Inspect tie rod end boot seals.			X		

Kilometers **(Miles)** **[Months]**	**132 000** **(82,500)** **[66]**	**144 000** **(90,000)** **[72]**	**156 000** **(97,500)** **[78]**	**160 000** **(100,000)**	**168 000** **(105,000)**
Change engine oil and engine oil filter.	X	X	X		X
Inspect the front brake pads and rear brake linings and rotors.		X			
Replace **air cleaner element (filter)**.		X			
Check and replace, if necessary, the **PCV valve**. * ‡		X			
Replace the **make-up filter** (located inside the air cleaner).		X			
Inspect tie rod end boot seals.		X			
Adjust the generator belt tension.		X			
Replace the **spark plugs**.		X			
Flush and replace coolant if it was not done at 60 months.				X	
Replace the **engine timing belt**.					X

NOTE: Under NO circumstances should the engine oil change interval exceed 7,500 miles or 6 months, whichever come first.

* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

MAINTENANCE SCHEDULES (Continued)

SCHEDULE B - EXPORT ONLY

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions. Change the automatic transmission fluid and filter every 96 000 km (60,000 miles) if the vehicle is usually operated under one or more of the conditions marked with an ♢.

Change the manual transaxle fluid every 77 000 km (48,000 miles) if the vehicle is usually operated under one or more of the conditions marked with an †.

- Day or night temperatures are below 0°C (32°F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is sustained high speeds during hot weather, above 32°C (90°F).
- Trailer towing.† ♢
- Taxi, police or delivery service (commercial services).† ♢
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

If none of these apply to you, then change your engine oil at every interval shown on schedule ″A″ of the ″Maintenance Schedules″ section of this manual.

Kilometers (Miles)	**5 000 (3,000)**	**10 000 (6,000)**	**14 000 (9,000)**	**19 000 (12,000)**	**24 000 (15,000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X
Inspect and replace, if required, the **air cleaner element (filter)**. *					X

Kilometers (Miles)	**29 000 (18,000)**	**34 000 (21,000)**	**38 000 (24,000)**	**43 000 (27,000)**	**48 000 (30,000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X	
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**. *					X
Adjust the generator belt tension 2.0 Liter engine only.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X
Inspect the tie rod ends and boot seal.					X

MAINTENANCE SCHEDULES (Continued)

Kilometers **(Miles)**	**53 000** **(33,000)**	**58 000** **(36,000)**	**62 000** **(39,000)**	**67 000** **(42,000)**	**72 000** **(45,000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.		X			X
Inspect and replace, if necessary, the **air cleaner element (filter)**. *					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

Kilometers **(Miles)**	**77 000** **(48,000)**	**82 000** **(51,000)**	**86 000** **(54,000)**	**91 000** **(57,000)**	**96 000** **(60,000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**.* ‡					X
Change the automatic transaxle fluid.					X
Inspect the tie rod ends and boot seals.					X
Adjust the generator drive belt tension 2.0 Liter engine only.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X
Replace the **ignition cables**.					X

Kilometers **(Miles)**	**101 000** **(63,000)**	**106 000** **(66,000)**	**110 000** **(69,000)**	**115 000** **(72,000)**	**120 000** **(75,000)**
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.	X			X	
Inspect and replace, if necessary, the **air cleaner element (filter)**. *					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

MAINTENANCE SCHEDULES (Continued)

Kilometers (**Miles**)	**125 000** (**78,000**)	**130 000** (**81,000**)	**134 000** (**84,000**)	**139 000** (**87,000**)	**144 000** (**90,000**)
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.		X			X
Replace **air cleaner element (filter)**.					X
Check and replace, if necessary, the **PCV valve**. * ‡					X
Inspect the tie rod ends and boot seals.					X
Inspect the engine accessory drive belt, replace if necessary 2.0 Liter engines. Adjust the generator drive belt tension if not replacing belt 2.0 Liter engines only.					X
Replace the **make-up air filter** (located inside the air cleaner).					X
Replace the **spark plugs**.					X

Kilometers (**Miles**)	**149 000** (**93,000**)	**154 000** (**96,000**)	**158 000** (**99,000**)	**163 000** (**102,000**)	**168 000** (**105,000**)
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the front brake pads and rear brake linings and rotors.			X		
Replace **air cleaner element (filter)**. *					X
Flush and replace the engine coolant.				X	
Replace the **engine timing belt**.					X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

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

‡ This maintenance is not required if previously replaced.

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

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

DESCRIPTION - SRT- 4

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

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

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.†
- Taxi, police, or delivery service (commercial service).†
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

MAINTENANCE SCHEDULES (Continued)

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

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

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

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

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

At Each Stop for Fuel

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

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder and transaxle and add as needed.
- Check all lights and all other electrical items for correct operation.
- Check rubber seals on each side of the radiator for proper fit.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints and front suspension components.
- Check the manual transaxle fluid level and fill plug condition.
- Check the coolant level, hoses, and clamps.
- Rotate the tires at each oil change interval shown on SCHEDULE “A” 5,000 miles (8 000 km), or every other interval shown on SCHEDULE “B” 6,000 miles (10,000 km).

SCHEDULE B

Follow schedule “B” If you usually operate your vehicle under one or more of the following conditions.

Change the manual transaxle fluid every 48,000 miles (77 000 km) if the vehicle is usually operated under one or more of the conditions marked with an †.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16.2 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.†
- Taxi, police, or delivery service (commercial service).†
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

If none of these apply to you, then change your engine oil at every interval shown on schedule ″A″ of the ″Maintenance Schedules″ section of this manual.

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (14 000)**	**12,000 (19 000)**	**15,000 (24 000)**	**18,000 (29 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.				X		
Inspect the **engine air cleaner filter.** Replace as necessary.*					X	
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X	

Miles (Kilometers)	**21,000 (34 000)**	**24,000 (38 000)**	**27,000 (43 000)**	**30,000 (48 000)**	**33,000 (53 000)**	**36,000 (58 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.		X				X
Replace the **engine air cleaner filter.**				X		
Replace the **spark plugs.**				X		
Inspect the tie rod ends and boot seals.				X		
Inspect the **PCV valve**and replace as necessary.*				X		
Replace the **make-up air filter** (located inside the air cleaner).				X		
Adjust the generator drive belt tension.				X		

Miles (Kilometers)	**39,000 (62 000)**	**42,000 (67 000)**	**45,000 (72 000)**	**48,000 (77 000)**	**51,000 (82 000)**	**54,000 (86 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.				X		
Change the brake fluid. If vehicle is used for trailer towing.				X		
Inspect the **engine air cleaner filter.** Replace as necessary.*			X			
Change the manual transaxle fluid.				X		
Inspect and replace, if required, the the **make-up air filter** (located inside the air cleaner).			X			

MAINTENANCE SCHEDULES (Continued)

Miles **(Kilometers)**	**57,000** **(91 000)**	**60,000** **(96 000)**	**63,000** **(101 000)**	**66,000** **(106 000)**	**69,000** **(110 000)**	**72,000** **(115 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.		X				X
Replace the **engine air cleaner filter.**		X				
Replace the **spark plugs and ignition cables.**		X				
Inspect the tie rod ends and boot seals.		X				
Inspect the **PCV valve** and replace if necessary. Not required if previously changed. * ‡		X				
Replace the **make-up air filter** (located inside the air cleaner).		X				
Adjust the generator drive belt tension.		X				

Miles **(Kilometers)**	**75,000** **(120 000)**	**78,000** **(125 000)**	**81,000** **(130 000)**	**84,000** **(134 000)**	**87,000** **(139 000)**	**90,000** **(144 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.				X		
Inspect the **engine air cleaner filter** and replace as necessary.*	X					
Replace the **engine air cleaner filter.**						X
Replace the **spark plugs.**						X
Inspect the tie rod ends and boot seals.						X
Inspect the **PCV valve** and replace if necessary. Not required if previously changed. * ‡						X
Replace the **engine timing belt.***						X
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).	X					X
Adjust the generator drive belt tension.						X

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	93,000 (149 000)	96,000 (154 000)	99,000 (158 000)	102,000 (163 000)	105,000 (168 000)
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the brake linings.		X			
Change the brake fluid. If vehicle is used for trailer towing.		X			
Inspect the **engine air cleaner filter** and replace as necessary.*					X
Change the manual transaxle fluid.		X			
Flush and replace the engine coolant at 60 months or 102,000 miles.				X	
Inspect and replace, if required, the **make-up air filter** (located inside the air cleaner).					X

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

‡ This maintenance is not required if previously replaced.

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

SCHEDULE A

Miles (Kilometers) [Months]	5,000 (8 000) [6]	10,000 (16 000)	15,000 (24 000) [12]	20,000 (32 000) [18]	25,000 (40 000)	30,000 (48 000) [24]
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.				X		
Replace the **engine air cleaner filter.**						X
Replace the **spark plugs.**						X
Inspect the tie rod ends and boot seals.						X
Replace the **make-up air filter** (located inside the air cleaner).						X
Adjust the generator drive belt tension.						X

Miles (Kilometers) [Months]	35,000 (56 000) [30]	40,000 (64 000)	45,000 (72 000) [36]	50,000 (80 000) [42]	55,000 (88 000)
Change engine oil and engine oil filter.	X	X	X	X	X
Inspect the brake linings.		X			

MAINTENANCE SCHEDULES (Continued)

Miles **(Kilometers)** **[Months]**	**60,000** **(96 000)** **[48]**	**65,000** **(104 000)** **[54]**	**70,000** **(112 000)**	**75,000** **(120 000)** **[60]**	**80,000** **(128 000)** **[66]**	**85,000** **(136 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the brake linings.	X				X	
Replace the **engine air cleaner filter.**	X					
Replace the **spark plugs and ignition cables.**	X					
Inspect the tie rod ends and boot seals.	X					
Inspect the **PCV valve** and replace if necessary. Not required if previously changed. * ‡	X					
Flush and replace the engine coolant at 60 months, regardless of mileage.				X		
Replace the **make-up air filter** (located inside the air cleaner).	X					
Adjust the generator drive belt tension.	X					

Miles **(Kilometers)** **[Months]**	**90,000** **(144 000)** **[72]**	**95,000** **(156 000)** **[78]**	**100,000** **(160 000)**	**105,000** **(168 000)** **[84]**
Change engine oil and engine oil filter.	X	X	X	X
Inspect the brake linings.			X	
Replace the **engine air cleaner filter.**	X			
Replace the **spark plugs.**	X			
Adjust the generator drive belt tension.	X			
Inspect the tie rod ends and boot seals.	X			
Inspect the **PCV valve** and replace if necessary. Not required if previously changed. * ‡	X			
Flush and replace the engine coolant if not done at 60 months.			X	
Replace the **make-up air filter** (located inside the air cleaner).	X			
Replace the **engine timing belt.**				X

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

‡ This maintenance is not required if previously replaced.

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

MAINTENANCE SCHEDULES (Continued)

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

HOISTING

STANDARD PROCEDURE - 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. Do not attempt to raise one entire side of the vehicle by placing a floor jack midway between the front and rear wheels. This practice may result in permanent damage to the body.

FLOOR JACK

When properly positioned, a floor jack can be used to lift the vehicle (Fig. 5). Support the vehicle in the raised position with jack stands.

A floor jack or any lifting device, must never be used on any part of the underbody other then the described areas.

HOIST

A vehicle can be lifted with:

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

NOTE: When a frame contact type hoist is used, verify that the lifting pads are positioned properly (Fig. 5).

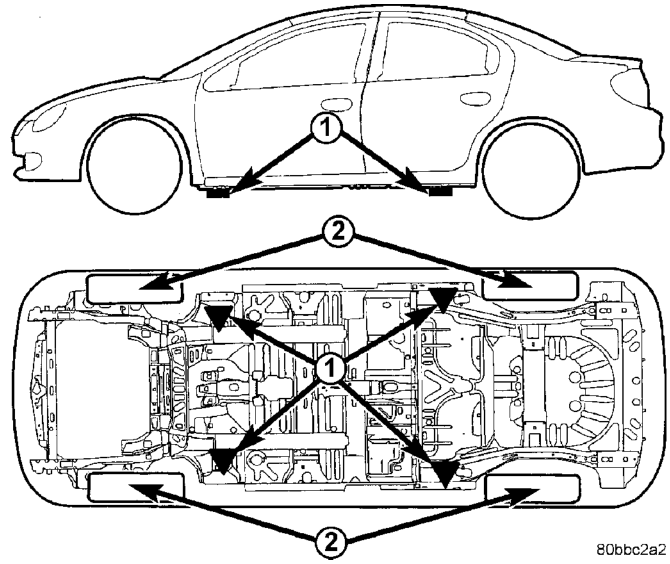


Fig. 5 Hoisting and Jacking Points

1 - FRAME CONTACT LIFT (SINGLE POST)
1 - CHASSIS LIFT (DUAL POST)
1 - OUTBOARD LIFT (DUAL POST)
1 - FLOOR JACK
2 - DRIVE ON LIFT

JUMP STARTING

STANDARD PROCEDURE - JUMP STARTING

WARNING: 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.

JUMP STARTING (Continued)

- Yellow or white color test indicator, if equipped.
- 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 (Fig. 6). Connect BLACK jumper cable clamp to engine ground as close to the ground cable attaching point as possible.

(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.

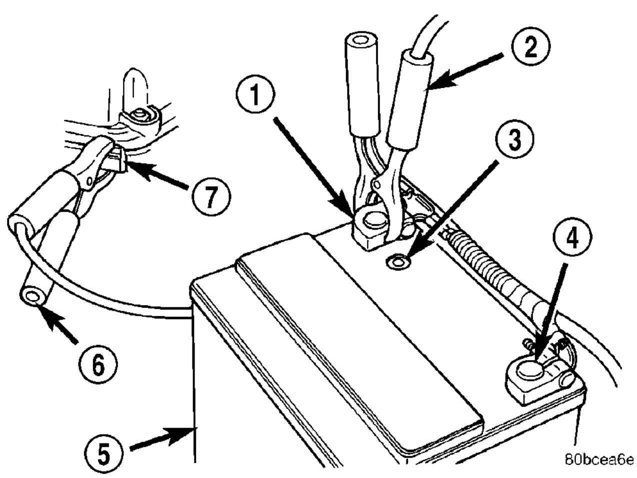


Fig. 6 Jumper Cable Clamp Connections

1 - BATTERY POSITIVE CABLE
2 - POSITIVE JUMPER CABLE
3 - TEST INDICATOR
4 - BATTERY NEGATIVE CABLE
5 - BATTERY
6 - NEGATIVE JUMPER CABLE
7 - ENGINE GROUND

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 minutes), before cranking again.

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.

TOWING

STANDARD PROCEDURE - TOWING

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.

RECOMMENDED TOWING EQUIPMENT

To avoid damage to bumper fascia and air dams use of a wheel lift or flat bed towing device (Fig. 7) 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.

TOWING (Continued)

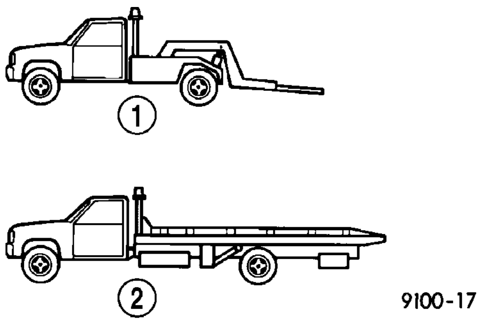


Fig. 7 Recommended Towing Devices

1 - WHEEL LIFT
2 - FLAT BED

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 lifted wheels are a minimum 100 mm (4 in) from the ground. Be sure there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or steep rises in the road. 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 opposite end 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 automatic transaxle vehicles can be flat towed at speeds not to exceed 72 km/h (44 mph) for not more than 160 km (100 miles). The steering column must be unlocked and gear selector in neutral.
- 5-speed manual transaxle vehicles can be flat towed at any legal highway speed for extended distances. The gear selector must be in the neutral position.

TOWING – FRONT WHEEL LIFT

Chrysler Corporation recommends that a vehicle be towed with the front end lifted, whenever possible.

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.
- Verify that front drive line and steering components are in good condition.
- 4-speed electronic automatic transaxle vehicles can be flat towed at speeds not to exceed 72 km/h (44 mph) for not more than 160 km (100 miles). The steering column must be unlocked and gear selector in neutral.
- 5-speed manual transaxle vehicles can be towed at any legal highway speed for extended distances. The gear selector must be in the neutral position.

SUSPENSION

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FRONT SUSPENSION

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FRONT SUSPENSION

DESCRIPTION - FRONT SUSPENSION

This vehicle has a gas pressurized MacPherson strut type front suspension design (Fig. 1).

The front suspension includes the following components:

- Hub
- Bearing
- Lower control arm
- Stabilizer bar
- Steering knuckle
- Strut assembly

For more information on the description and operation of an individual component, refer to the applicable component.

OPERATION - FRONT SUSPENSION

The front suspension allows each front wheel on a vehicle to adapt to different road surfaces and conditions without greatly affecting the opposite wheel and the ability to control the vehicle. Each side of the front suspension is allowed to pivot so the vehicle can be steered in the direction preferred.

When a vehicle strikes a bump, the force is transferred through the hub, bearing, and knuckle, into the strut assembly to absorb the force and dampen it. During steering maneuvers, the strut assembly (through a pivot bearing in the upper strut mount) and steering knuckle (through the lower ball joint mounted on the lower control arm) turn as an assembly.

WARNING

WARNINGS AND CAUTIONS

WARNING: DO NOT REMOVE THE STRUT SHAFT NUT WHILE STRUT ASSEMBLY IS INSTALLED IN VEHICLE, OR BEFORE THE COIL SPRING IS COMPRESSED WITH A COMPRESSION TOOL. THE SPRING IS HELD UNDER HIGH PRESSURE.

CAUTION: Only frame contact hoisting equipment can be used on this vehicle. All vehicles have a fully independent rear suspension. The vehicles cannot 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. It may come into contact with the strut or coil spring.

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

STANDARD PROCEDURE - LUBRICATION

There are no serviceable lubrication points on the front suspension. The front lower ball joints have grease fittings which have had the head snapped off by the manufacturer after they have been filled. This has been done to eliminate the possibility of damaging the non-vented seals. Grease will not leak from the broken grease fittings. The ball joints are sealed for life and require no maintenance.

CAUTION: No attempt should be made to replace the ball joint grease fitting with a new fitting, then filling the ball joint with grease. Damage to the grease seal can result.

FRONT SUSPENSION (Continued)

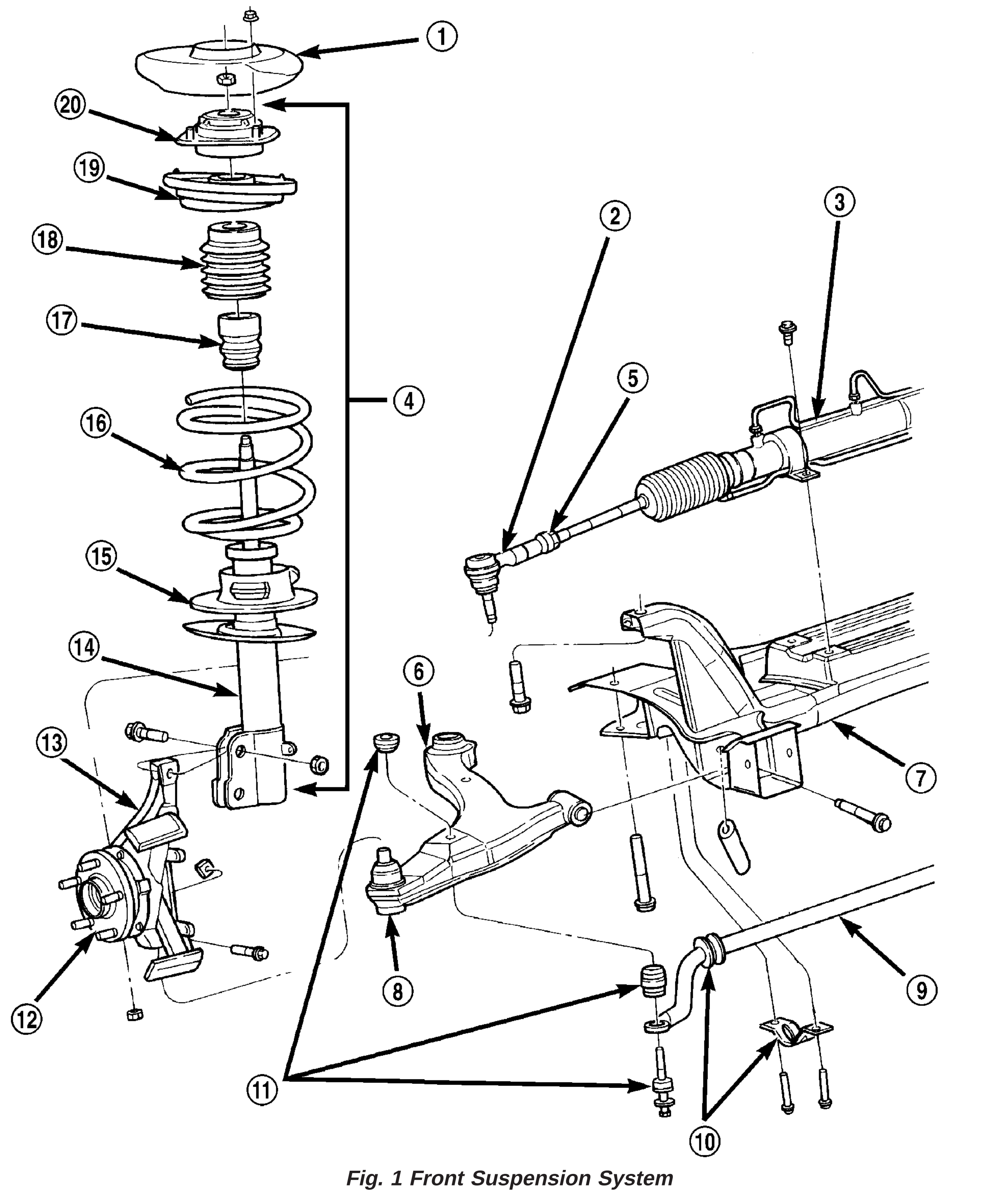


Fig. 1 Front Suspension System

1 - VEHICLE STRUT TOWER
2 - OUTER TIE ROD
3 - STEERING GEAR
4 - STRUT ASSEMBLY
5 - JAM NUT
6 - LOWER CONTROL ARM
7 - CROSSMEMBER
8 - BALL JOINT
9 - STABILIZER BAR
10 - STABILIZER BAR CUSHION AND RETAINER
11 - STABILIZER BAR LINK
12 - HUB
13 - KNUCKLE
14 - STRUT
15 - LOWER SPRING ISOLATOR
16 - COIL SPRING
17 - JOUNCE BUMPER
18 - DUST SHIELD
19 - SPRING SEAT AND BEARING
20 - UPPER MOUNT

FRONT SUSPENSION (Continued)

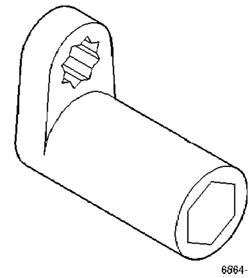
SPECIFICATIONS

FRONT SUSPENSION FASTENER TORQUE

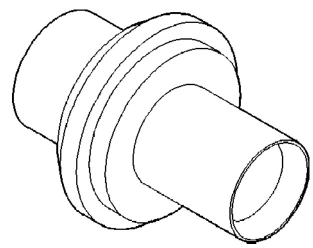
DESCRIPTION	TORQUE
STRUT ASSEMBLY:	
Tower Nuts	34 N·m (300 in. lbs.)
Steering Knuckle Nuts	54 N·m (40 ft. lbs.) + 90° Turn
Strut Shaft Nut	75 N·m (55 ft. lbs.)
STEERING KNUCKLE:	
Ball Joint Stud Pinch Bolt Nut	95 N·m (70 ft. lbs.)
Disc Brake Caliper Adapter Mounting Bolts - SRT-4	104 N·m (77 ft. lbs.)
Disc Brake Caliper Guide Bolts	22 N·m (192 in. lbs.)
Disc Brake Caliper Guide Bolts - SRT-4	35 N·m (26 ft. lbs.)
WHEEL BEARING AND HUB:	
Bearing Retainer Plate Bolts	28 N·m (250 in. lbs.)
Driveshaft Hub Nut	244 N·m (180 ft. lbs.)
Wheel Mounting Nuts	135 N·m (100 ft. lbs.)
STEERING GEAR:	
Crossmember Bolts	68 N·m (50 ft. lbs.)
Tie Rod Adjusting Jam Nut	75 N·m (55 ft. lbs.)
Tie Rod End Steering Knuckle Nut	54 N·m (40 ft. lbs.)
LOWER CONTROL ARM:	
Front Pivot Bolt	163 N·m (120 ft. lbs.)
Rear Pivot Bolt	237 N·m (175 ft. lbs.)
STABILIZER BAR:	
Cushion Retainer Bolts	28 N·m (250 in. lbs.)
Link Nut	31 N·m (275 in. lbs.)

SPECIAL TOOLS

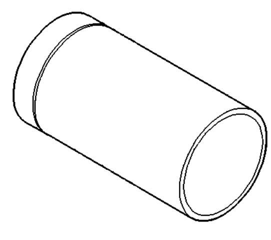
FRONT SUSPENSION



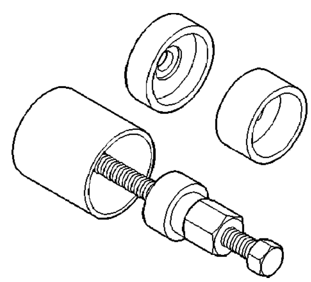
Socket/Wrench, Strut Nut 6864



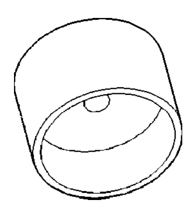
Remover 6804



Installer 6758

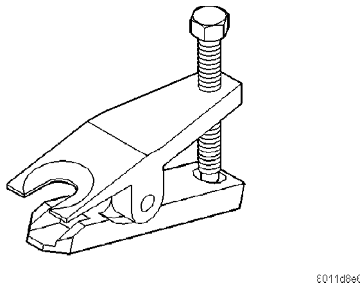


Remover/Installer 6908 (–2)

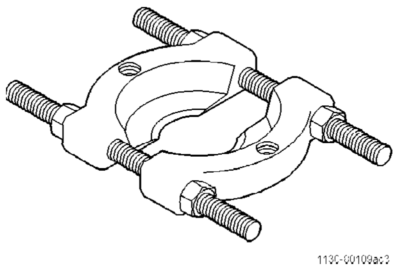


Installer 6760

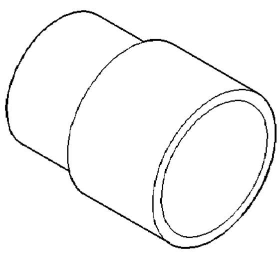
FRONT SUSPENSION (Continued)



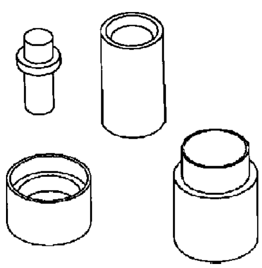
Remover MB991113



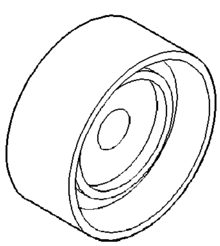
Splitter, Bearing/Gear 1130



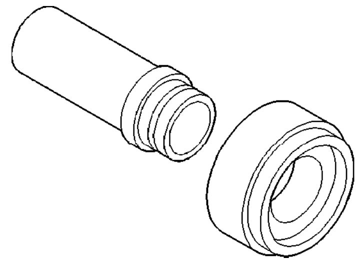
Remover MB-990799



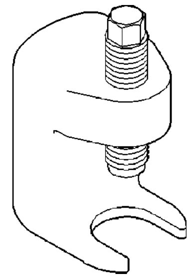
Remover/Installer 6644 (-2)



Installer, Bearing 5052



Installer Adapter C-4698-2



Remover C-4150A

HUB / BEARING

DESCRIPTION

The wheel bearing and hub are pressed into the steering knuckle. (Refer to 2 - SUSPENSION/ FRONT/KNUCKLE - DESCRIPTION)

OPERATION

The wheel bearing and hub are pressed into the steering knuckle. (Refer to 2 - SUSPENSION/ FRONT/KNUCKLE - OPERATION)

DIAGNOSIS AND TESTING - WHEEL BEARING AND HUB

The wheel 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 wheel bearing and hub.

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 bearing exhibits any of these conditions during diagnosis, the hub bearing will require replacement. Do not attempt to disassemble the bearing for repair. If the wheel bearing is disassembled for any reason, it must be replaced.

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

To diagnose a bent hub, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS

HUB / BEARING (Continued)

AND TESTING) for the procedure on measuring hub runout.

REMOVAL

The wheel bearing and hub are pressed into the knuckle. (Refer to 2 - SUSPENSION/FRONT/ KNUCKLE - REMOVAL)

INSTALLATION

The wheel bearing and hub are pressed into the knuckle. (Refer to 2 - SUSPENSION/FRONT/ KNUCKLE - INSTALLATION)

KNUCKLE

DESCRIPTION

The steering knuckle is a single casting with legs machined for attachment to the front strut assembly on the top, lower control arm ball joint on the bottom, and steering linkage on the trailing end (Fig. 1). The steering knuckle also has two machined abutments (rails) on the leading end casting to support and align the front disc brake caliper.

The knuckle supports the wheel bearing and hub (Fig. 1). The wheel hub is pressed into a sealed-for-life wheel bearing that is pressed into the steering knuckle. A retainer plate also holds the bearing in place. The hub supports the driveshaft outer constant velocity (C/V) joint. Each is splined and meshes in the center of the hub. The outer C/V joint is retained to the hub using a nut. The nut is locked to the outer C/V stub shaft using a nut retainer and cotter pin.

The wheel bearing is a Unit 1 type cartridge bearing that requires no maintenance. The wheel bearing can be serviced separately from the hub.

The hub has five studs pressed into its flange.

OPERATION

The steering knuckle pivots with the strut assembly between the lower ball joint and the pivot bearing in the strut assembly. The steering gear outer tie rod end connects to the trailing end of each knuckle, allowing the vehicle to be steered.

The center of the knuckle supports the hub, wheel bearing and axle shaft.

The hub and wheel bearing work together. The wheel bearing has internal bearings that allow the hub to rotate with the driveshaft and the tire and wheel assembly. The hub's five studs mount the tire and wheel to the vehicle.

DIAGNOSIS AND TESTING - 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.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

(1) Apply the brakes and hold in place.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the front tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(4) Remove the cotter pin, lock nut and spring washer from the hub nut (Fig. 2).

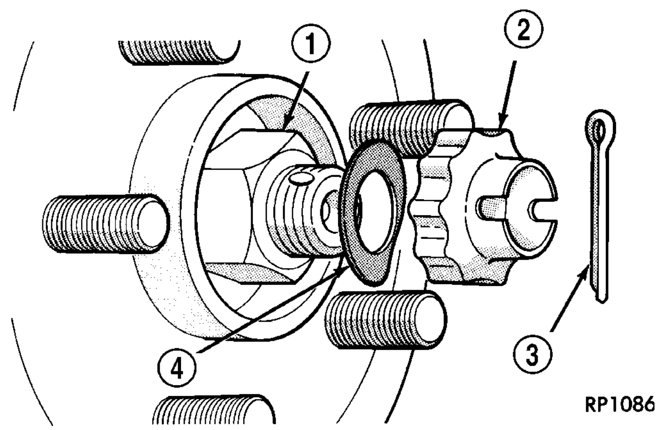


Fig. 2 Hub Nut

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

(5) While the brakes are applied, loosen and remove the hub nut (Fig. 2).

(6) Release the brakes.

KNUCKLE (Continued)

(7) Remove the two guide pin bolts securing the front disc brake caliper to the steering knuckle (Fig. 3).

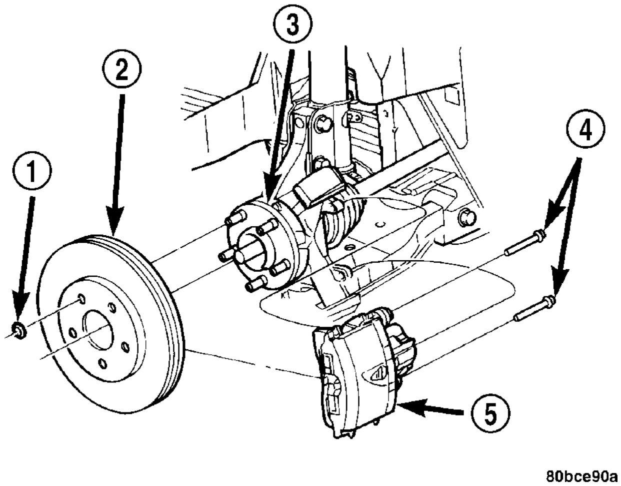


Fig. 3 Brake Caliper And Rotor

1 - RETAINER CLIP
2 - BRAKE ROTOR
3 - HUB
4 - GUIDE PIN BOLTS
5 - DISC BRAKE CALIPER

(8) Remove the disc brake caliper from the steering knuckle. The caliper is removed by first tipping either the top (right side) or bottom (left side) of the caliper away from the brake rotor, then pulling the caliper off the opposite end's caliper slide (on the knuckle) and rotor.

(9) Hang the caliper out of the way using a wire hanger or cord. Do not support the caliper by letting it hang by the hydraulic hose.

(10) Remove any retainer clips from the wheel mounting studs. Remove the brake rotor from the front hub (Fig. 3).

(11) Remove the nut attaching the outer tie rod to the steering knuckle. To do this, hold the tie rod end stud with a wrench while loosening and removing the nut with a standard wrench or crowfoot wrench (Fig. 4).

(12) Remove the tie rod end from the steering knuckle using Remover, Special Tool MB991113 (Fig. 5).

(13) Remove the tie rod heat shield.

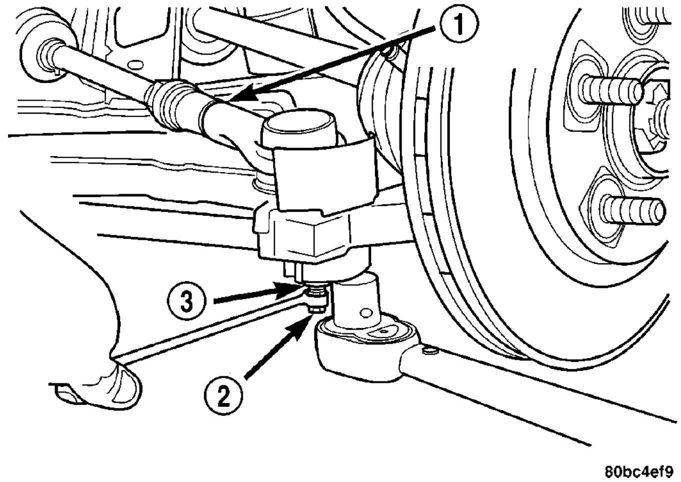


Fig. 4 Tie Rod Nut Removal/Installation

1 - OUTER TIE ROD
2 - STUD
3 - NUT

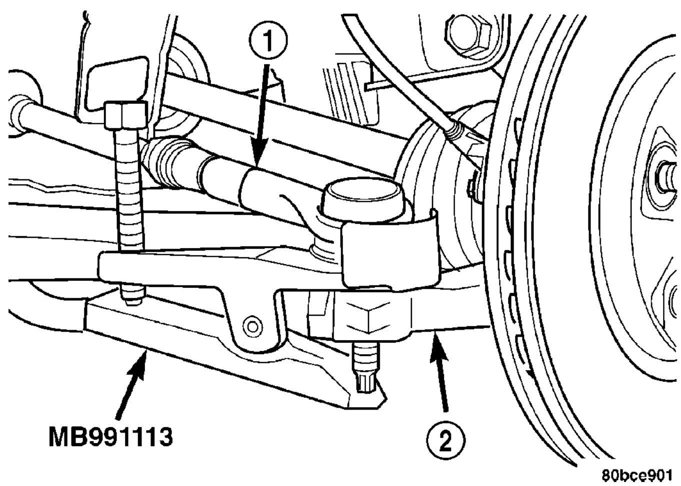


Fig. 5 Tie Rod Removal

1 - OUTER TIE ROD
2 - STEERING KNUCKLE

KNUCKLE (Continued)

(14) Remove the nut and pinch bolt clamping the ball joint stud to the steering knuckle (Fig. 6).

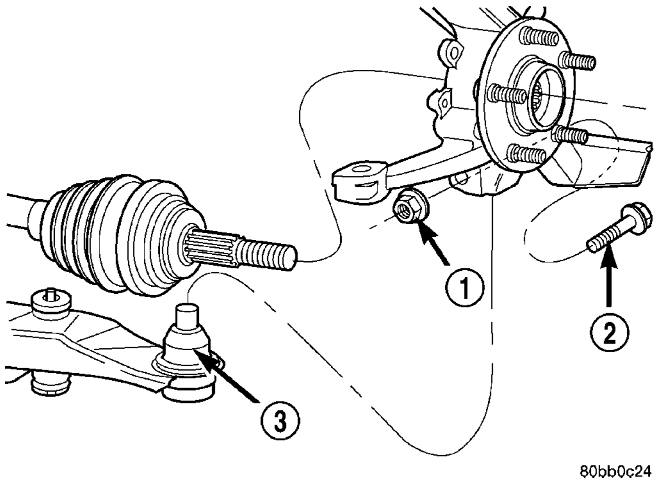


Fig. 6 Ball Joint Bolt And Nut

1 - NUT
2 - BOLT
3 - BALL JOINT

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during removal. Hold the bolts stationary in the steering knuckles while removing the nuts, then tap the bolts out using a pin punch.

(15) Remove the two bolts attaching the strut to the steering knuckle.

NOTE: Use caution when separating the ball joint stud from the steering knuckle, so the ball joint seal does not get cut.

(16) Separate the ball joint stud from the steering knuckle by prying down on lower control arm and up against the ball joint boss on the steering knuckle (Fig. 7).

NOTE: Do not allow the driveshaft to hang by the inner C/V joint; it must be supported to keep the joint from separating during this operation.

(17) Pull the steering knuckle off the driveshaft outer C/V joint splines and remove the steering knuckle.

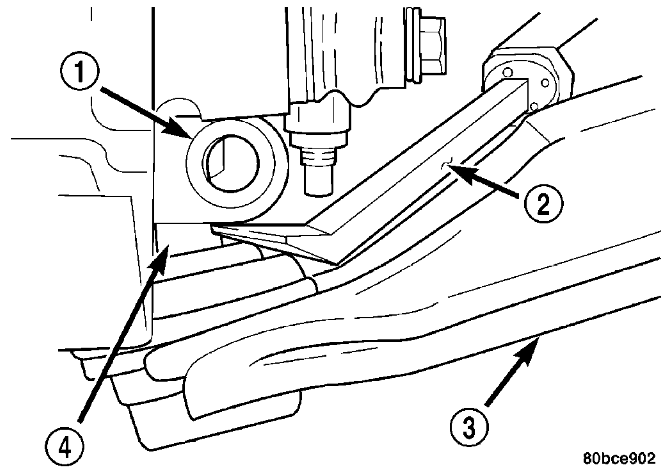


Fig. 7 Separate Ball Joint from Knuckle

1 - STEERING KNUCKLE
2 - PRY BAR
3 - LOWER CONTROL ARM
4 - BALL JOINT STUD

NOTE: The cartridge type front wheel bearing used on this vehicle is not transferable to the replacement steering knuckle. If the replacement steering knuckle does not come with a wheel bearing, a new bearing must be installed in the steering knuckle. Installation of the new wheel bearing and hub must be done before installing the steering knuckle on the vehicle.

(18) If the steering knuckle is to be replaced, the hub and wheel bearing must be removed. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - DISASSEMBLY). Do not reuse the wheel bearing.

DISASSEMBLY - WHEEL BEARING AND HUB

NOTE: The removal and installation of the wheel bearing and hub from the steering knuckle is only to be done with the steering knuckle removed from the vehicle. Removal of the wheel bearing from the steering knuckle must be done using the following procedure.

(1) Remove steering knuckle, hub, and wheel bearing as an assembly from the vehicle. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL).

KNUCKLE (Continued)

(2) Using Remover, Special Tool 4150A (Fig. 8), press one wheel mounting stud out of hub flange. Rotate the hub to align the removed wheel mounting stud with the notch in bearing retainer plate (Fig. 9). Remove the wheel mounting stud from the hub.

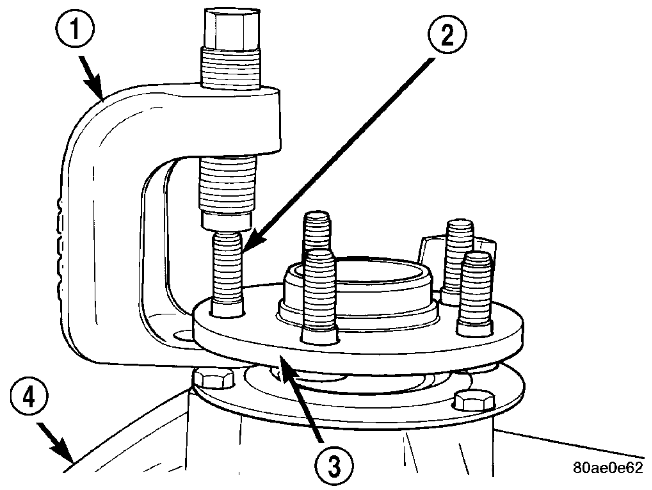


Fig. 8 Pressing Out Wheel Mounting Stud

1 - SPECIAL TOOL C-4150A
2 - WHEEL MOUNTING STUD
3 - HUB FLANGE
4 - STEERING KNUCKLE

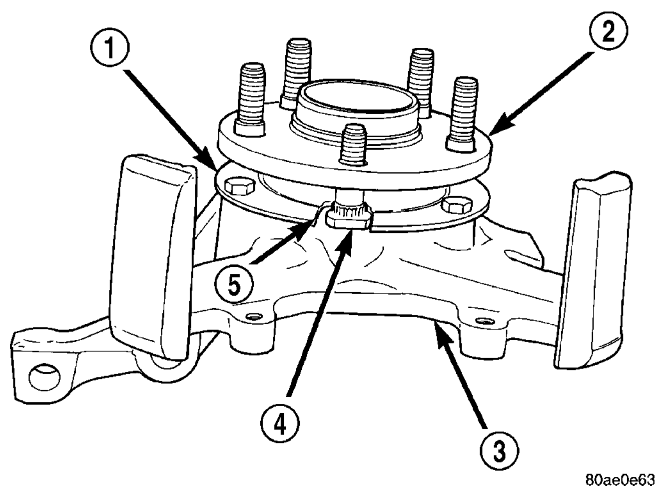


Fig. 9 Stud Removal From Hub

1 - BEARING RETAINER PLATE
2 - HUB
3 - STEERING KNUCKLE
4 - WHEEL MOUNTING STUD
5 - NOTCH

(3) Rotate the hub so the hole in the hub that wheel mounting stud was removed from is facing away from brake caliper lower rail on steering knuckle (Fig. 10). Install one half of the Bearing Splitter, Special Tool 1130, between the hub and the bearing retainer plate (Fig. 10).

NOTE: Align the threaded hole in this first half of the bearing splitter with the caliper rail on the steering knuckle (Fig. 10).

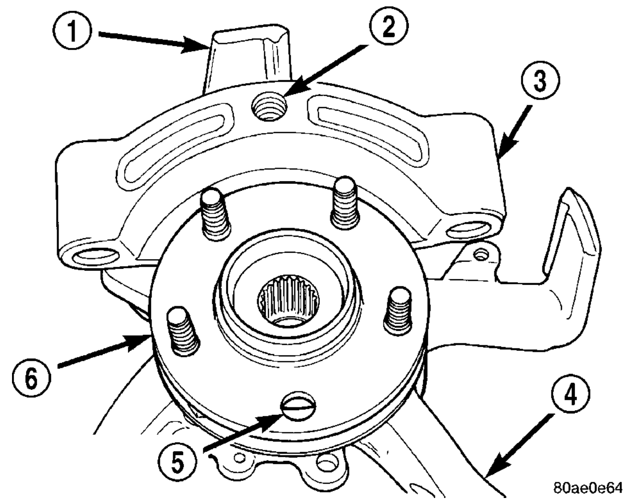


Fig. 10 Bearing Splitter Half Installed

1 - CALIPER RAIL
2 - THREADED HOLE
3 - SPECIAL TOOL 1130
4 - STEERING KNUCKLE
5 - HOLE FOR WHEEL MOUNTING STUD
6 - HUB

(4) Install the remaining pieces of Bearing Splitter, Special Tool 1130, on the steering knuckle (Fig. 11). Hand tighten the nuts to hold bearing splitter in place on steering knuckle.

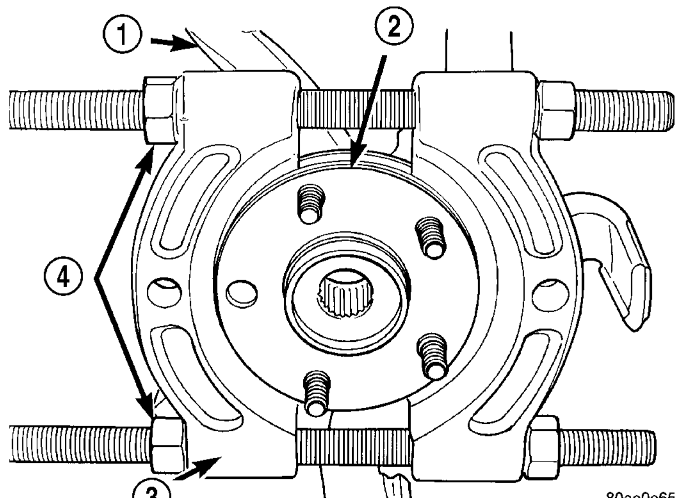


Fig. 11 Bearing Splitter Installed

1 - STEERING KNUCKLE
2 - HUB
3 - SPECIAL TOOL 1130
4 - NUTS

KNUCKLE (Continued)

(5) Once the bearing splitter in fully installed, be sure the three bolts attaching the bearing retainer plate to steering knuckle (Fig. 12) are contacting the bearing splitter (Fig. 12). The bearing retainer plate should not support the steering knuckle or contact the bearing splitter.

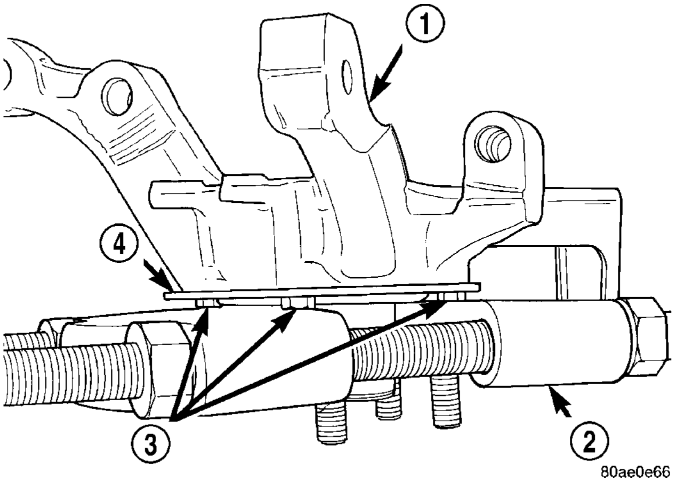


Fig. 12 Correct Installation Of Bearing Splitter

1 - STEERING KNUCKLE
2 - SPECIAL TOOL 1130
3 - BEARING RETAINER PLATE MOUNTING BOLTS
4 - BEARING RETAINER PLATE

(6) Place the steering knuckle in an arbor press supported by the bearing splitter as shown (Fig. 13).

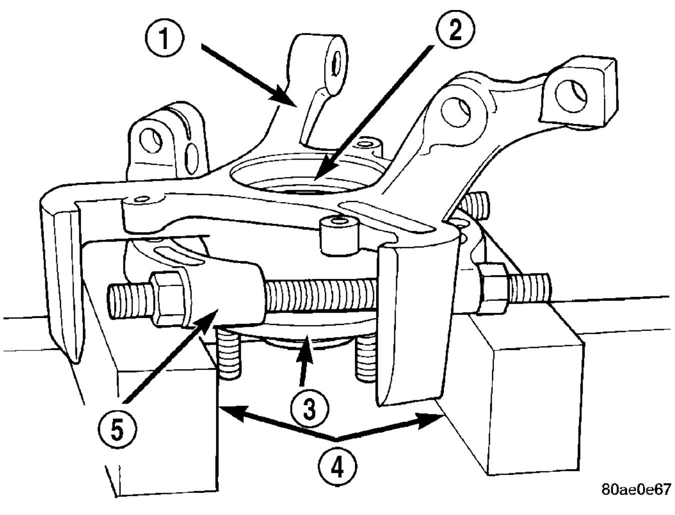


Fig. 13 Steering Knuckle Supporting For Hub Removal

1 - STEERING KNUCKLE
2 - WHEEL BEARING
3 - HUB
4 - ARBOR PRESS BLOCKS
5 - SPECIAL TOOL 1130

(7) Position Driver, Special Tool 6644-2, on the small end of the hub (Fig. 14). Using the arbor press, remove the hub from the wheel bearing. The outer bearing race will normally come out of the wheel bearing when the hub is pressed out of the bearing.

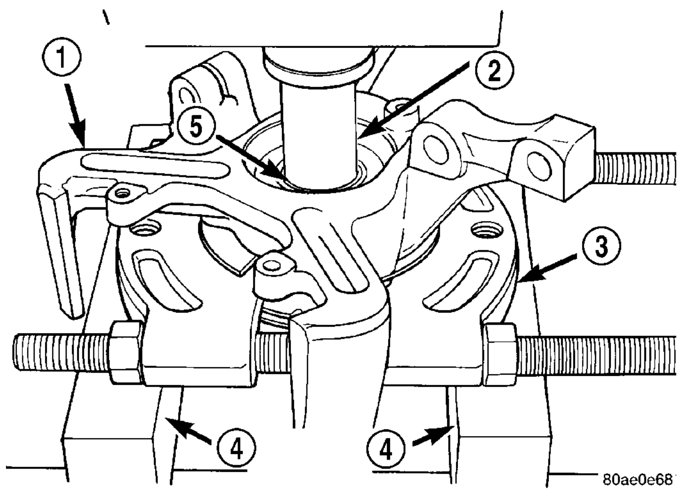


Fig. 14 Pressing Hub Out

1 - STEERING KNUCKLE
2 - SPECIAL TOOL 6644–2
3 - SPECIAL TOOL 1130
4 - ARBOR PRESS BLOCKS
5 - HUB

(8) Remove the bearing splitter from the steering knuckle.

(9) Remove the three bolts mounting the bearing retainer plate to the steering knuckle (Fig. 15). Remove the bearing retainer plate from the steering knuckle.

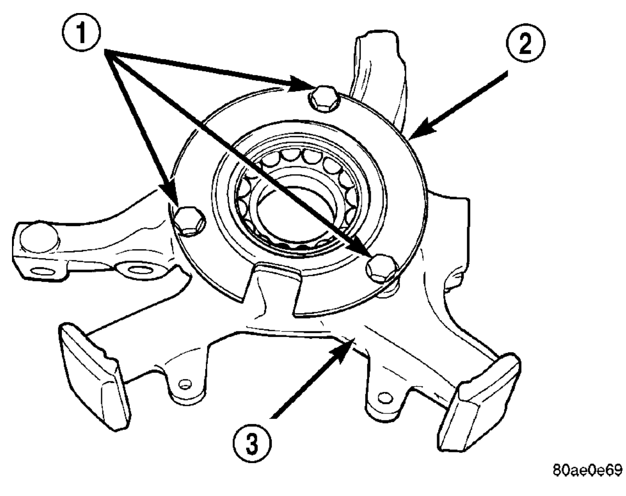


Fig. 15 Wheel Bearing Retainer Plate

1 - MOUNTING BOLTS
2 - BEARING RETAINER PLATE
3 - STEERING KNUCKLE

KNUCKLE (Continued)

(10) Place the steering knuckle back in the arbor press supported by press blocks as shown (Fig. 16). The press blocks must not obstruct the bore in the steering knuckle so the wheel bearing can be pressed out of the steering knuckle. Place Bearing Driver, Special Tool MB-990799 on the outer race of wheel bearing (Fig. 16). Press the wheel bearing out of the steering knuckle.

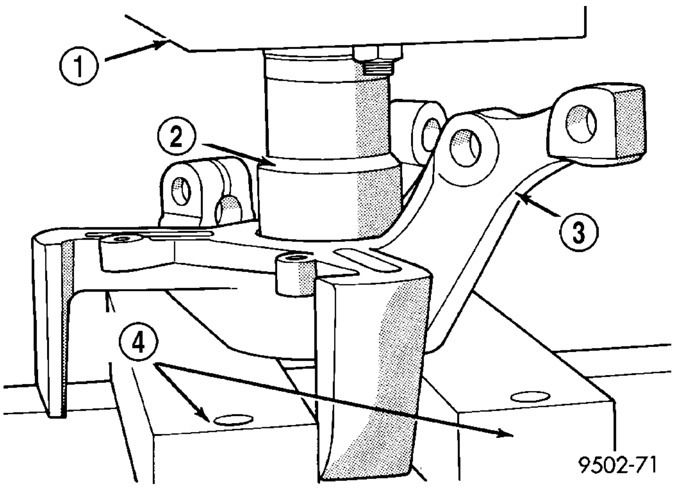


Fig. 16 Wheel Bearing Removal From Steering Knuckle

1 - ARBOR PRESS
2 - SPECIAL TOOL MB-990799
3 - STEERING KNUCKLE
4 - PRESS BLOCKS

(11) Install Bearing Splitter, Special Tool 1130, on the hub. The bearing splitter is to be installed on the hub so it is between the flange of the hub and the outer bearing race on the hub (Fig. 17). Place the hub, bearing race and bearing splitter in an arbor press as shown (Fig. 17). Place Driver, Special Tool 6644-2 on end of hub. Press the hub out of the outer bearing race.

ASSEMBLY - WHEEL BEARING AND HUB

NOTE: The removal and installation of the wheel bearing and hub from the steering knuckle is only to be done with the steering knuckle removed from the vehicle.

(1) Wipe the empty bore of the steering knuckle clean of any grease or dirt with a clean, dry shop towel.

(2) Place the new wheel bearing into the bore of the steering knuckle. Be sure the wheel bearing is placed squarely into the bore. Place the steering knuckle in an arbor press with Receiver, Special Tool C-4698-2, supporting the steering knuckle (Fig. 18). Place Driver, Special Tool 5052, on the outer race of the wheel bearing. Press the wheel bearing into the steering knuckle until it is fully bottomed in the bore of the steering knuckle. Remove the knuckle from the press.

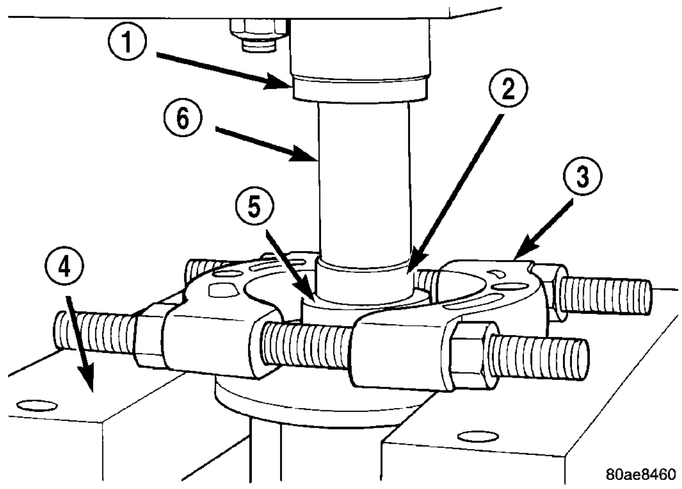


Fig. 17 Removing Bearing Race From Hub

1 - ARBOR PRESS
2 - HUB
3 - SPECIAL TOOL 1130
4 - PRESS BLOCKS (2)
5 - BEARING RACE
6 - SPECIAL TOOL 6644–2

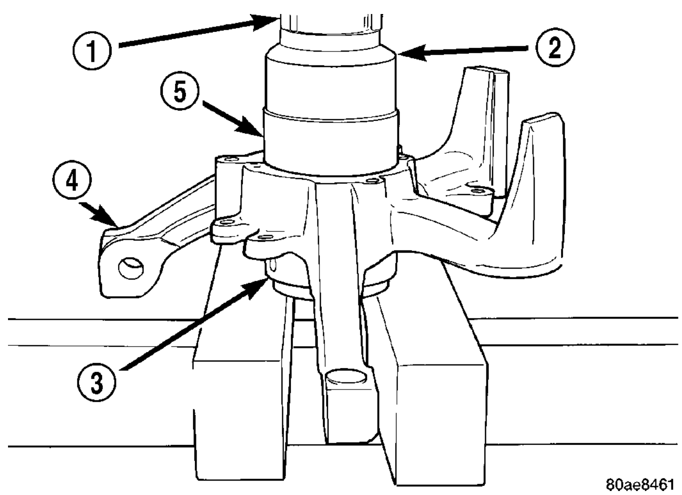


Fig. 18 Pressing Wheel Bearing Into Steering Knuckle

1 - ARBOR PRESS
2 - SPECIAL TOOL 5052
3 - SPECIAL TOOL C-4698–2
4 - STEERING KNUCKLE
5 - WHEEL BEARING

NOTE: Only the original or identical replacement bolts are to be used to mount the bearing retainer plate to the steering knuckle.

KNUCKLE (Continued)

(3) Install the bearing retainer plate on the steering knuckle (Fig. 19). Install the three bearing retainer mounting bolts. Tighten the bearing retainer plate mounting bolts to a torque of 28 N·m (250 in. lbs.).

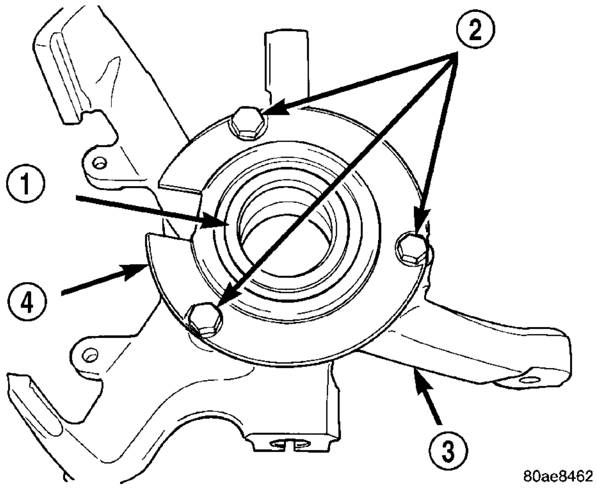


Fig. 19 Wheel Bearing Retainer Plate

1 - WHEEL BEARINGS
2 - MOUNTING BOLTS
3 - STEERING KNUCKLE
4 - BEARING RETAINER PLATE

(4) Place the previously removed wheel mounting stud back into the hub flange. Place the hub in the arbor press supported by Special Tool C-4698-1 (Fig. 20). Press wheel mounting stud into hub flange until it is fully seated against the back side on the hub flange. Remove the hub from the press.

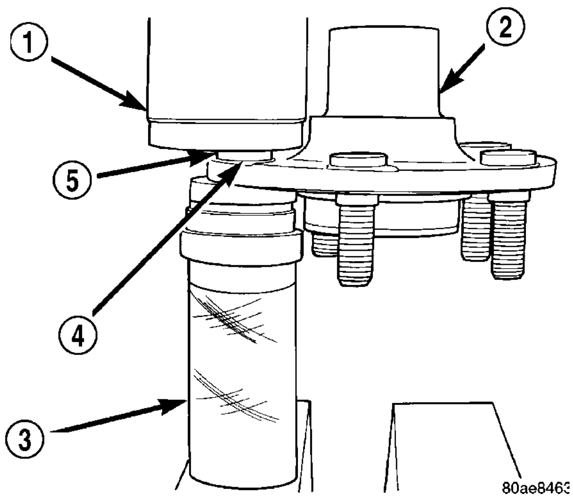


Fig. 20 Wheel Mounting Stud Installation

1 - ARBOR PRESS RAM
2 - HUB
3 - SPECIAL TOOL C-4698–1
4 - NO GAP IS ALLOWED BETWEEN STUD FLANGE AND HUB HERE
5 - WHEEL MOUNTING STUD

(5) Place the steering knuckle with the wheel bearing installed back in the arbor press with Receiver, Special Tool MB-990799 supporting the inner race of the wheel bearing as shown (Fig. 21). Place the hub in wheel bearing making sure it is square with the bearing inner race. Press the hub into the wheel bearing until it is fully bottomed in the wheel bearing. Remove the knuckle from the press.

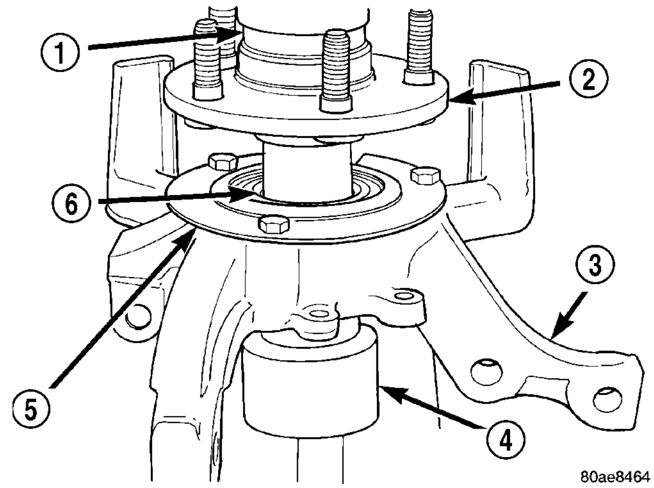


Fig. 21 Pressing Hub Into Wheel Bearing

1 - ARBOR PRESS RAM
2 - HUB
3 - STEERING KNUCKLE
4 - SPECIAL TOOL MB-990799
5 - BEARING RETAINER PLATE
6 - WHEEL BEARING

(6) Install the steering knuckle assembly on the vehicle (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - INSTALLATION).

INSTALLATION

(1) If the steering knuckle is being replaced and the wheel bearing and hub must be installed, (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - ASSEMBLY). **Do not reuse the old wheel bearing.**

(2) Slide the hub of the steering knuckle onto the splines on the driveshaft C/V joint.

(3) Install the steering knuckle onto the ball joint stud aligning the bolt hole in the knuckle boss with the notch formed in the side of the ball joint stud.

(4) Install a new ball joint stud pinch bolt and nut (Fig. 6). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during installation. Install the nuts while holding the bolts stationary in the steering knuckle.

(5) Position the lower end of the strut assembly in line with the upper end of the steering knuckle and align the mounting holes. Install the two attaching

KNUCKLE (Continued)

bolts. The bolts should be installed with so that the nuts face towards the front of the vehicle once installed. Install the nuts. Holding the bolts in place tighten the nuts to a torque of 53 N·m (40 ft. lbs.) plus an additional 90° turn after the specified torque is met.

(6) Place the tie rod heat shield on the steering knuckle arm so that the shield is positioned straight away from the steering gear and tie rod end once installed. Algn the hole in the shield with the hole in the steering knucle arm.

(7) Install the outer tie rod ball stud into the hole in the steering knuckle arm. Start the tie rod attaching nut onto the stud. Hold the tie rod end stud with a wrench while tightening the nut with a standard wrench or crowfoot wrench (Fig. 4). To fully tighten the nut to specifications, use a crowfoot wrench on a torque wrench to turn the nut, and a wrench on the stud. Tighten the nut to a torque of 55 N·m (40 ft. lbs.).

(8) Install the brake rotor on the hub (Fig. 3).

(9) Install the disc brake caliper (with pads) on the brake rotor and steering knuckle. The left side caliper is installed by first sliding the top of the caliper past the top abutment on the steering knuckle to hook the top edge of the caliper, then pushing the lower end of the caliper into place against the knuckle (Fig. 22). The right side caliper is installed by first sliding the bottom edge of the caliper past the lower abutment on the steering knuckle to hook the lower edge of the caliper, then pushing the top of the caliper into place against the steering knuckle.

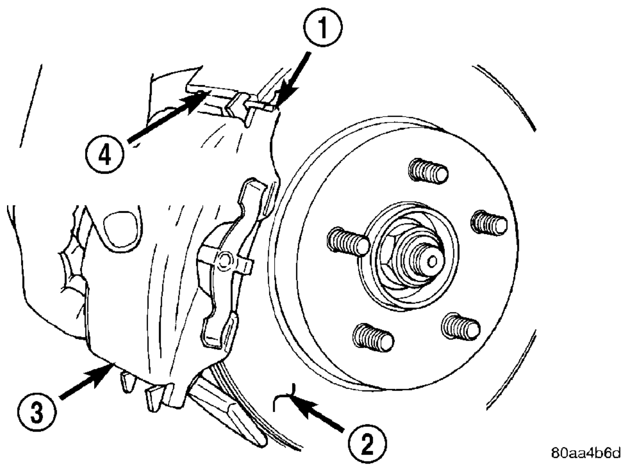


Fig. 22 Brake Caliper Installation

1 - SLIDE TOP OF BRAKE CALIPER UNDER TOP ABUTMENT OF STEERING KNUCKLE AS SHOWN
2 - BRAKING DISC
3 - DISC BRAKE CALIPER
4 - STEERING KNUCKLE BRAKE ABUTMENT

(10) Install the two guide pin bolts securing the front disc brake caliper to the steering knuckle (Fig. 3). Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(11) Clean all foreign matter from the threads of the driveshaft outer C/V joint (Fig. 2).

(12) Install the hub nut in the end of the driveshaft and snug it.

(13) Have a helper apply the brakes. With vehicle brakes applied to keep brake rotor and hub from turning, tighten the hub nut to a torque of 244 N·m (180 ft. lbs.).

(14) Install the spring washer, lock nut and cotter pin on the hub nut (Fig. 2). Wrap the cotter pin ends tightly around the lock nut (Fig. 23).

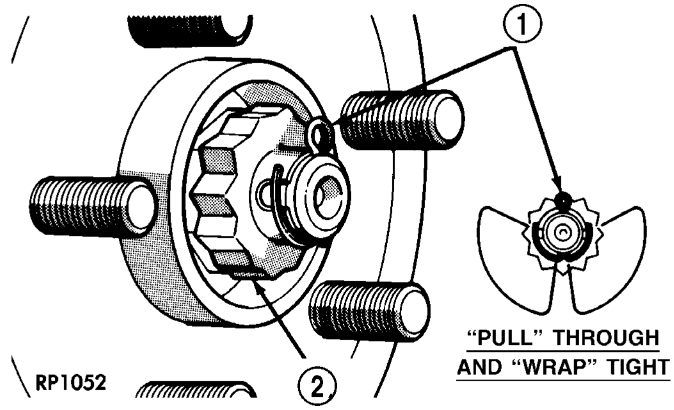


Fig. 23 Correctly Installed Cotter Pin

1 - COTTER PIN
2 - NUT LOCK

(15) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install the wheel mounting nuts and tighten them to a torque of 135 N·m (100 ft. lbs.).

(16) Lower the vehicle.

(17) Set front toe on the vehicle to specification. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

KNUCKLE - SRT-4

DESCRIPTION

The steering knuckle is a single casting with legs machined for attachment to the front strut assembly on the top, lower control arm ball joint on the bottom, and steering linkage on the trailing end. The steering knuckle also has two machined drilled and tapped legs on the leading end casting to support and align the front disc brake caliper adapter.

The knuckle supports the wheel bearing and hub. The wheel hub is pressed into a sealed-for-life wheel bearing that is pressed into the steering knuckle. A retainer plate also holds the bearing in place. The hub supports the driveshaft outer constant velocity (C/V) joint. Each is splined and meshes in the center

KNUCKLE - SRT-4 (Continued)

of the hub. The outer C/V joint is retained to the hub using a nut. The nut is locked to the outer C/V stub shaft using a nut retainer and cotter pin.

The wheel bearing is a Unit 1 type cartridge bearing that requires no maintenance. The wheel bearing can be serviced separately from the hub.

The hub has five studs pressed into its flange.

REMOVAL

NOTE: Before proceeding, review all Warnings and Cautions. (Refer to 2 - SUSPENSION/FRONT - WARNING)

(1) Apply the brakes and hold in place.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove the front tire and wheel assembly.

(4) Remove the cotter pin, lock nut and spring washer from the hub nut (Fig. 2).

(5) While the brakes are applied, loosen and remove the hub nut on the end of the driveshaft (Fig. 2).

(6) Release the brakes.

(7) Remove the front disc brake caliper and adapter as an assembly, and the brake rotor from the steering knuckle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)

(8) Remove the nut attaching the outer tie rod to the steering knuckle. To do this, hold the tie rod end stud with a wrench while loosening and removing the nut with a standard wrench or crowfoot wrench (Fig. 4).

(9) Remove the tie rod end from the steering knuckle using Remover, Special Tool MB991113 (Fig. 5).

(10) Remove the tie rod heat shield.

(11) Remove the nut and pinch bolt clamping the ball joint stud to the steering knuckle (Fig. 6).

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during removal. Hold the bolts stationary in the steering knuckles while removing the nuts, then tap the bolts out using a pin punch.

(12) Remove the two bolts attaching the strut to the steering knuckle.

NOTE: Use caution when separating the ball joint stud from the steering knuckle, so the ball joint seal does not get cut.

(13) Separate the ball joint stud from the steering knuckle by prying down on lower control arm and up against the ball joint boss on the steering knuckle (Fig. 7).

NOTE: Do not allow the driveshaft to hang by the inner C/V joint; it must be supported to keep the joint from separating during this operation.

(14) Pull the steering knuckle off the driveshaft outer C/V joint splines and remove the steering knuckle.

NOTE: The cartridge type front wheel bearing used on this vehicle is not transferable to the replacement steering knuckle. If the replacement steering knuckle does not come with a wheel bearing, a new bearing must be installed in the steering knuckle. Installation of the new wheel bearing and hub must be done before installing the steering knuckle on the vehicle.

(15) If the wheel bearing and hub need removal, (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - DISASSEMBLY). Do not reuse the wheel bearing.

KNUCKLE - SRT-4 (Continued)

DISASSEMBLY - WHEEL BEARING AND HUB

NOTE: The removal and installation of the wheel bearing and hub from the steering knuckle is only to be done with the steering knuckle removed from the vehicle using the following procedure.

(1) Remove steering knuckle, hub, and wheel bearing as an assembly from the vehicle. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL)

(2) Three wheel studs across from one another require removal from the hub flange. Rotate the hub to align each wheel mounting stud with the notch in the bearing retainer plate before removal. Using Remover, Special Tool C–4150A (Fig. 24), press the three wheel mounting studs out of the hub flange. Remove the wheel mounting studs from the hub through the open notch (Fig. 25).

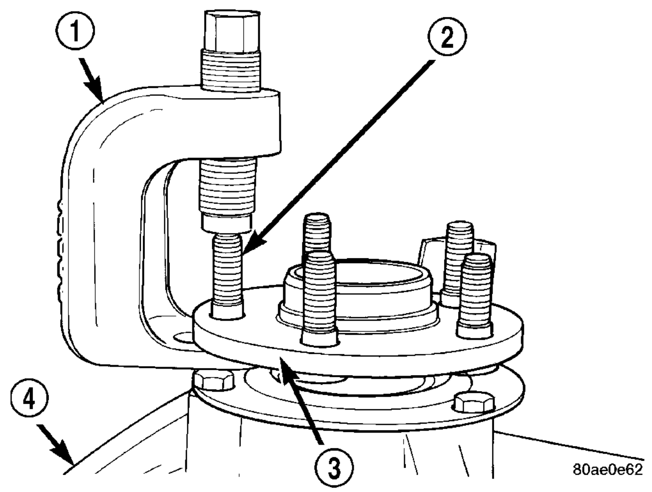


Fig. 24 Special Tool C-4150A

1 - SPECIAL TOOL C-4150A
2 - WHEEL MOUNTING STUD
3 - HUB FLANGE
4 - STEERING KNUCKLE

(3) Rotate the hub so the stud mounting holes in the hub are facing in the direction shown in the figure (Fig. 26).

(4) Install the Bearing Splitter, Special Tool 1130, between the hub and the bearing retainer plate as shown (Fig. 26). Absence of the three wheel mounting studs allows the bearing splitter to be installed behind the flange. Hand tighten the nuts to hold bearing splitter in place on steering knuckle.

(5) Place the steering knuckle face down in an arbor press supported by the bearing splitter as shown (Fig. 27).

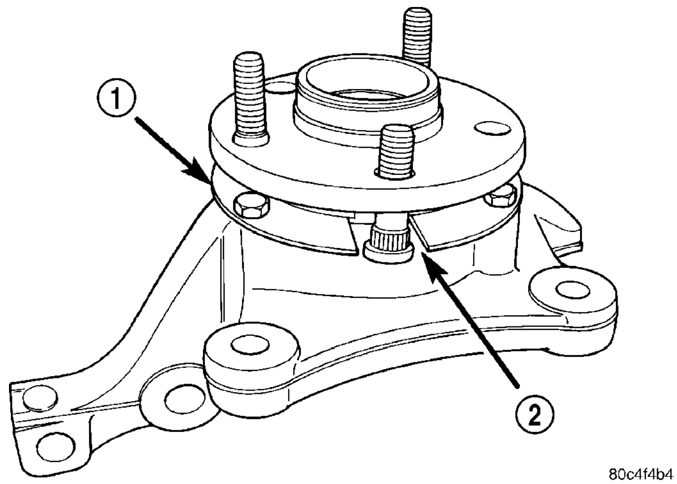


Fig. 25 Stud Removal From Hub

1 - BEARING RETAINER PLATE
2 - NOTCH

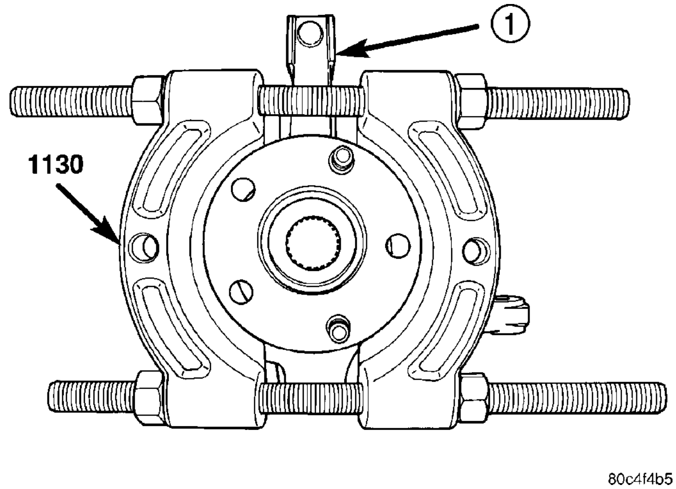


Fig. 26 Bearing Splitter Properly Installed

1 - KNUCKLE

KNUCKLE - SRT-4 (Continued)

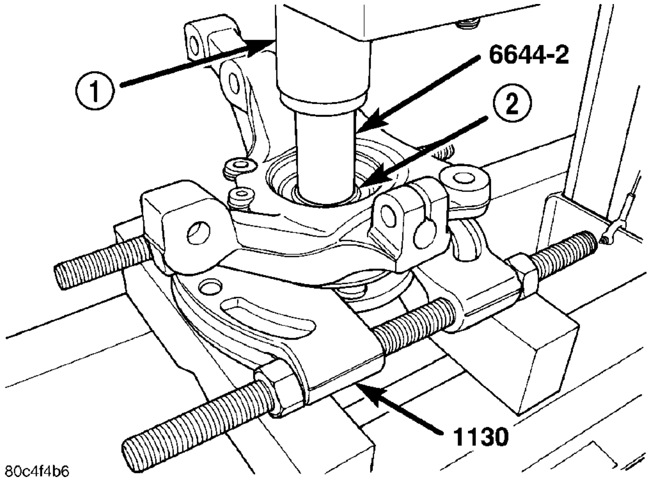


Fig. 27 Steering Knuckle Positioned In Press

1 - PRESS RAM
2 - HUB

(6) Position Remover/Installer, Special Tool 6644-2, on the small end of the hub (Fig. 27). Using the arbor press, remove the hub from the wheel bearing. The bearing race will normally come out of the wheel bearing with the hub as it is pressed out of the bearing.

(7) Remove the bearing splitter from the steering knuckle.

(8) Remove the three bolts mounting the bearing retainer plate to the steering knuckle (Fig. 28). Remove the bearing retainer plate from the steering knuckle.

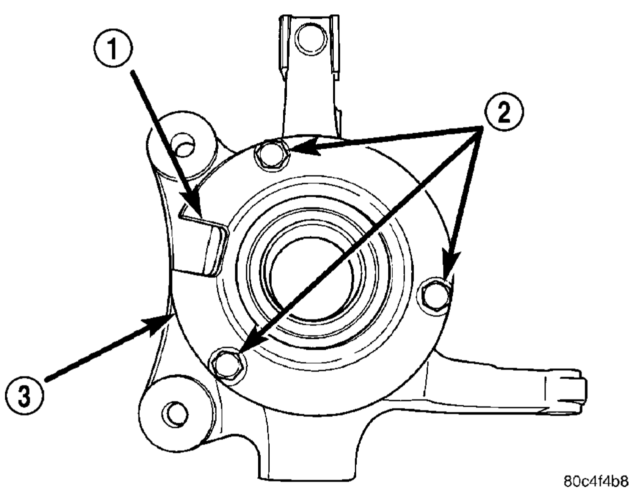


Fig. 28 Wheel Bearing Retainer Plate

1 - NOTCH
2 - BOLTS
3 - BEARING RETAINER PLATE

(9) Place the steering knuckle back in the arbor press face down as shown (Fig. 29). The press support blocks must not obstruct the bearing while it is being pressed out of the steering knuckle.

(10) Place Remover/Installer, Special Tool MB-990799 on the outer race of the wheel bearing (Fig. 29). Press the wheel bearing out of the steering knuckle.

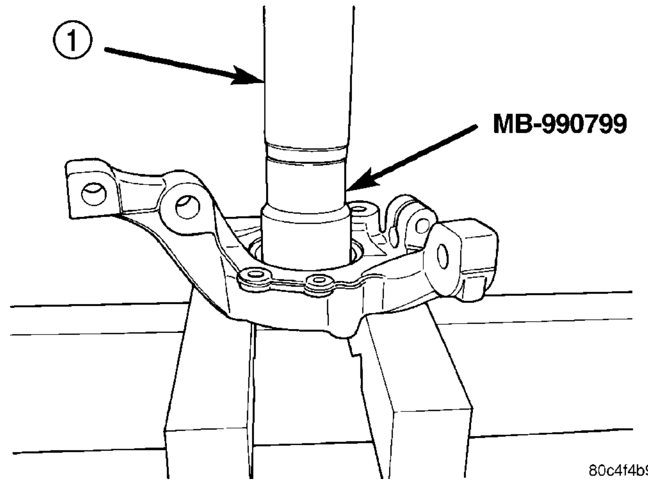


Fig. 29 Wheel Bearing Removal

1 - PRESS RAM

(11) Remove the bearing race that is still pressed onto the hub. To do so, install Bearing Splitter, Special Tool 1130, between the hub flange and the bearing race (Fig. 30). Place the hub, bearing race and bearing splitter in an arbor press as shown (Fig. 30). Place Remover/Installer, Special Tool 6644-2 on end of hub. Press the hub out of the bearing race.

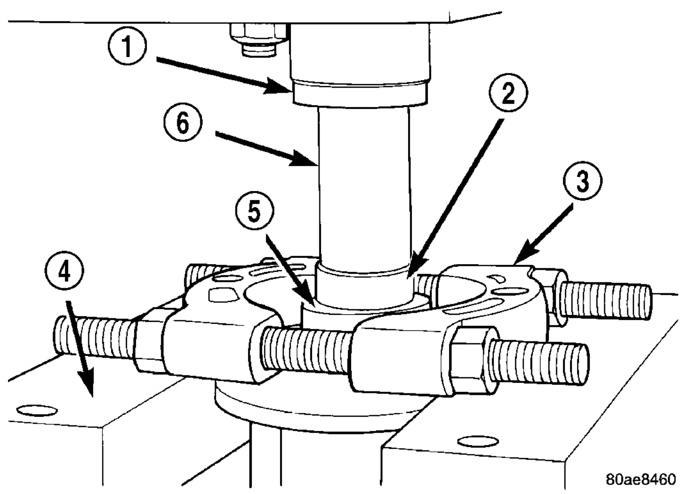


Fig. 30 Bearing Race Removal From Hub

1 - ARBOR PRESS
2 - HUB
3 - SPECIAL TOOL 1130
4 - PRESS BLOCKS (2)
5 - BEARING RACE
6 - SPECIAL TOOL 6644–2

NOTE: For steering knuckle reassembly, (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - ASSEMBLY).

KNUCKLE - SRT-4 (Continued)

ASSEMBLY - WHEEL BEARING AND HUB

(1) Wipe the bore of the steering knuckle clean of any grease or dirt with a clean, dry shop towel.

(2) Place the steering knuckle in an arbor press with Installer, Special Tool C-4698-2, supporting the steering knuckle (Fig. 31).

(3) Place the NEW wheel bearing into the bore of the steering knuckle. Be sure the wheel bearing is placed squarely into the bore.

(4) Place Installer, Special Tool 5052, on the outer race of the wheel bearing (Fig. 31). Press the wheel bearing into the steering knuckle until it is fully bottomed in the bore of the steering knuckle.

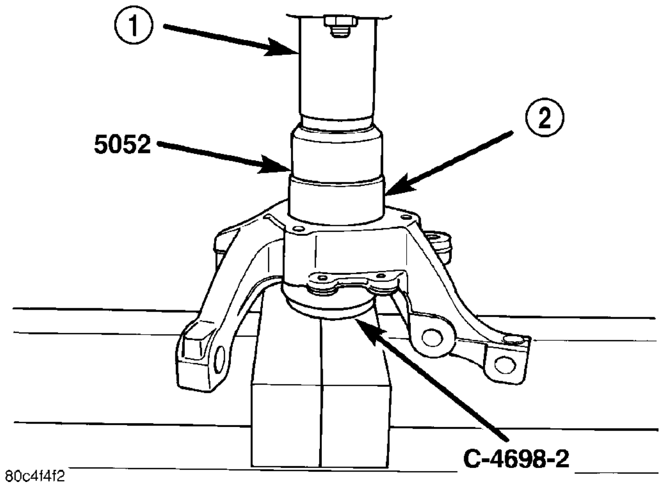


Fig. 31 Wheel Bearing Installation

1 - PRESS RAM
2 - BEARING

(5) Remove the knuckle from the press.

NOTE: Use only the original or identical replacement bolts to mount the bearing retainer plate to the steering knuckle.

(6) Noting the notch location, install the bearing retainer plate on the steering knuckle as shown (Fig. 28). Install the three bearing retainer mounting bolts. Tighten the bearing retainer plate mounting bolts to a torque of 28 N·m (250 in. lbs.).

(7) Install the previously removed wheel mounting studs back into the hub flange. To do so:

(a) Place the studs in the three holes in the hub flange.

(b) Place the hub in the arbor press supported by Special Tool C-4698-1, allowing the first stud to extend down into the tool (Fig. 32).

(c) Press the wheel mounting stud into the hub flange until it is fully seated against the back side on the hub flange.

(d) Remove the hub and tool from the press.

(e) Repeat the steps (b), (c) and (d) on the remaining two studs.

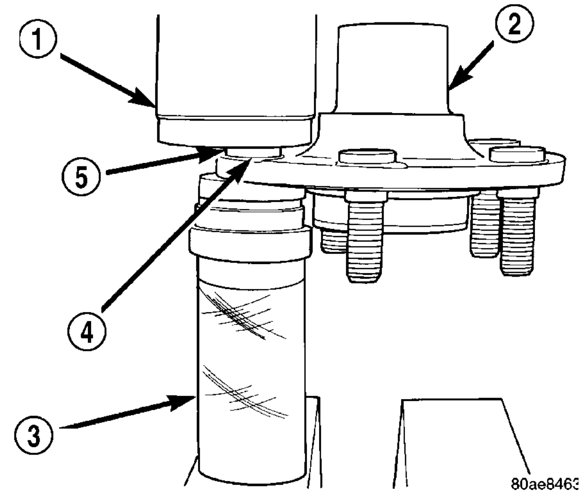


Fig. 32 Wheel Mounting Stud Installation

1 - ARBOR PRESS RAM
2 - HUB
3 - SPECIAL TOOL C-4698–1
4 - NO GAP IS ALLOWED BETWEEN STUD FLANGE AND HUB HERE
5 - WHEEL MOUNTING STUD

(8) Place the steering knuckle with the wheel bearing installed back in the arbor press with the smaller end of Remover/Installer, Special Tool MB-990799, supporting the inner race of the wheel bearing as shown (Fig. 33).

(9) Place the hub in the wheel bearing making sure it is square with the bearing inner race (Fig. 33). Press the hub into the wheel bearing until it is fully bottomed in the wheel bearing.

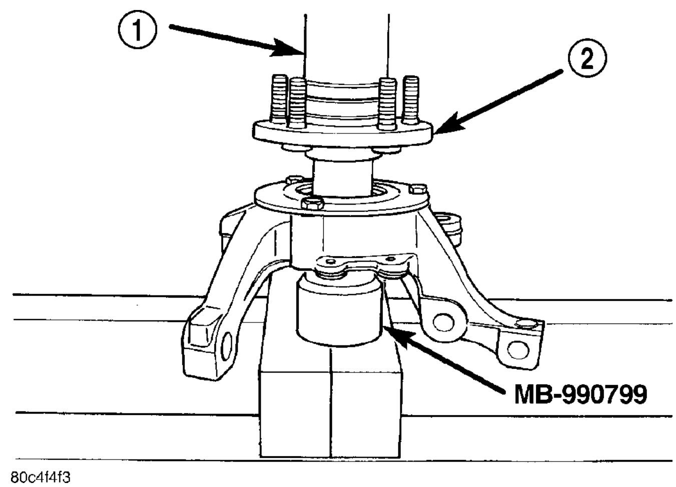


Fig. 33 Hub Installation

1 - PRESS RAM
2 - HUB

(10) Remove the steering knuckle and tools from the press.

KNUCKLE - SRT-4 (Continued)

(11) Verify the hub turns smoothly without rubbing or binding.

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

INSTALLATION

(1) Slide the hub of the steering knuckle onto the splines on the driveshaft C/V joint.

(2) Install the steering knuckle onto the ball joint stud aligning the bolt hole in the knuckle boss with the notch formed in the side of the ball joint stud.

(3) Install a new ball joint stud pinch bolt and nut (Fig. 6). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during installation. Install the nuts while holding the bolts stationary in the steering knuckle.

(4) Position the lower end of the strut assembly in line with the upper end of the steering knuckle and align the mounting holes. Install the two attaching bolts. The bolts should be installed with so that the nuts face towards the front of the vehicle once installed. Install the nuts. Holding the bolts in place tighten the nuts to a torque of 53 N·m (40 ft. lbs.) plus an additional 90° turn after the specified torque is met.

(5) Place the tie rod heat shield on the steering knuckle arm so that the shield is positioned straight away from the steering gear and tie rod end once installed. Align the hole in the shield with the hole in the steering knuckle arm.

(6) Install the outer tie rod ball stud into the hole in the steering knuckle arm. Start the tie rod attaching nut onto the stud. Hold the tie rod end stud with a wrench while tightening the nut with a standard wrench or crowfoot wrench (Fig. 4). To fully tighten the nut to specifications, use a crowfoot wrench on a torque wrench to turn the nut, and a wrench on the stud. Tighten the nut to a torque of 55 N·m (40 ft. lbs.).

(7) Install the brake rotor, disc brake caliper and adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)

(8) Clean all foreign matter from the threads of the driveshaft outer C/V joint.

(9) Install the hub nut in the end of the driveshaft and snug it (Fig. 2).

(10) Have a helper apply the brakes. With vehicle brakes applied to keep brake rotor and hub from turning, tighten the hub nut to a torque of 244 N·m (180 ft. lbs.)

(11) Install the spring washer, lock nut and cotter pin on the hub nut (Fig. 2). Wrap the cotter pin ends tightly around the lock nut (Fig. 23).

(12) Install the tire and wheel assembly. Install the wheel mounting nuts and tighten them to a torque of 135 N·m (100 ft. lbs.).

(13) Lower the vehicle.

(14) Set the front toe on the vehicle to required specification. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

LOWER BALL JOINT

DIAGNOSIS AND TESTING - BALL JOINT

With the weight of the vehicle resting on the road wheels, grasp the headless grease fitting as shown (Fig. 34). With no mechanical assistance or added force, attempt to move the grease fitting. If the ball joint is worn, the grease fitting will move. If movement is noted, replace the ball joint.

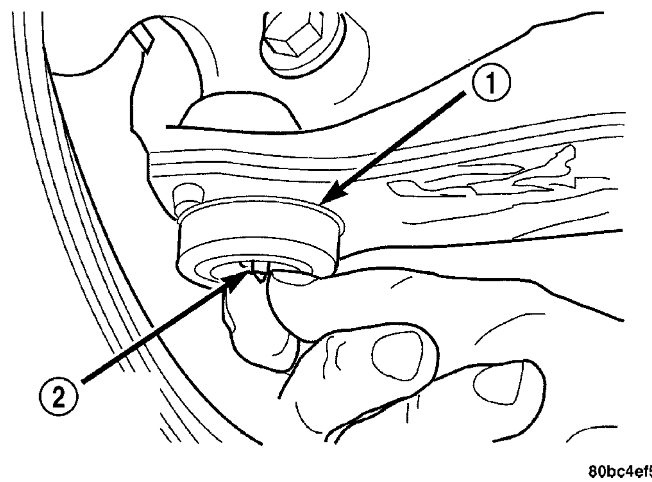


Fig. 34 Checking Ball Joint Wear

1 - BALL JOINT
2 - HEADLESS GREASE FITTING

CAUTION: No attempt should be made to service the headless grease fitting on the ball joint. It has been purposely snapped off by the manufacturer to avoid over-greasing.

LOWER BALL JOINT SEAL BOOT

REMOVAL

(1) Remove steering knuckle from vehicle. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL)

(2) Using a screwdriver or other suitable tool, pry seal boot off of ball joint (Fig. 35).

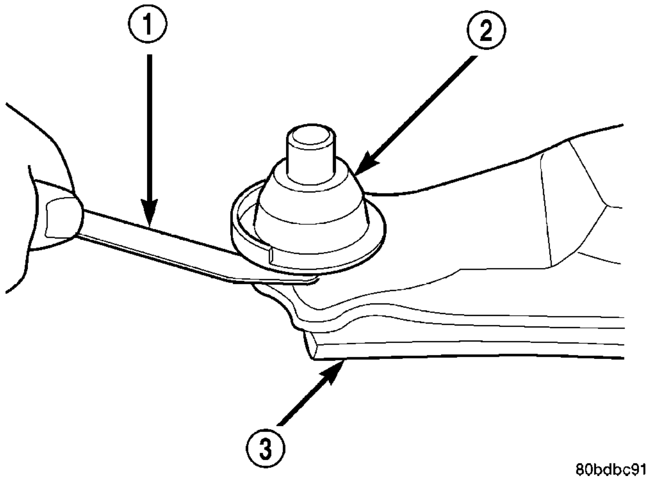


Fig. 35 Seal Boot Removal

1 - TOOL
2 - SEAL BOOT
3 - LOWER CONTROL ARM

INSTALLATION

(1) Wipe off used grease around ball joint stem.

CAUTION: When installing the sealing boot on the ball joint, position the upward lip on the seal boot outside perimeter outward, away from the control arm once installed (Fig. 36). It is there to help shield heat from the sealing boot.

(2) Place NEW ball joint seal boot over ball joint stem. Upward lip located on outside perimeter of seal boot must point outward, away from control arm once installed (Fig. 36).

(3) By hand, start sealing boot over sides of the ball joint.

(4) Position Installer, Special Tool 6758, over sealing boot outer diameter as shown (Fig. 36). By hand, apply pressure to top of Installer until seal boot is pressed squarely down against top surface of lower control arm.

(5) Remove tool.

(6) Remove headless grease fitting on ball joint and replace it with standard zirc-type grease fitting. Do not discard headless grease fitting.

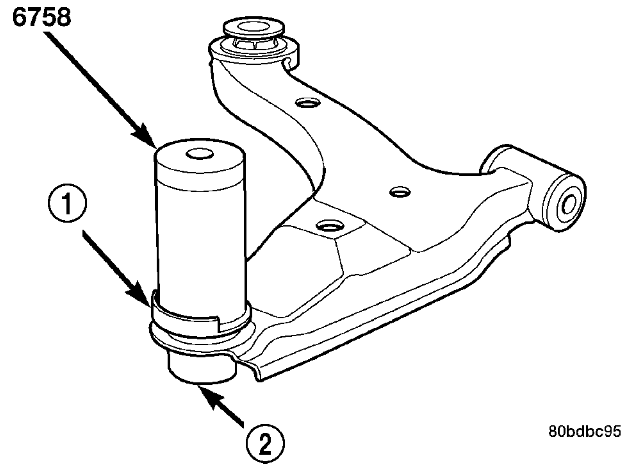


Fig. 36 Seal Boot Installation

1 - SEAL BOOT UPWARD LIP
2 - BALL JOINT

CAUTION: It is important to lubricate the ball joint before installation of steering knuckle to allow proper venting when the seal is filled. If the ball joint is lubricated after installation to knuckle, damage to the seal can occur.

(7) Using a hand operated pump grease gun, fill the ball joint seal boot with Mopar® Multi-Mileage Lube or equivalent until grease pushes out past ball joint stem. Wipe off overfill.

(8) Remove standard zirc-type grease fitting and reinstall headless grease fitting on ball joint to prevent future lubricating. See above caution.

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

LOWER CONTROL ARM

DESCRIPTION

There is one lower control arm on each side of the vehicle. Each lower control arm is a stamped steel unit using rubber isolated pivot bushings to isolate it from the front suspension crossmember and frame of the vehicle (Fig. 1). The rear bushing can be serviced separately.

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 both the front crossmember and the frame rail of the vehicle using a thru-bolt. The thru-bolt goes through both the crossmember and rear lower control arm bushing, threading directly into the frame rail of the vehicle.

The left and right lower control arms are interconnected through a linked rubber isolated stabilizer bar.

LOWER CONTROL ARM (Continued)

The outboard end of each lower control arm connects to the steering knuckle using a ball joint.

The lower control arm connects to the steering knuckle through a ball joint mounted at the outboard end of the arm (Fig. 1). The ball joint is pressed into the lower control arm and has a non-tapered stud with a notch for steering knuckle pinch bolt clearance. The ball joint stud is clamped and locked to the steering knuckle lower leg using a pinch bolt.

The ball joint is lubricated for life during the manufacturing process. Once lubricated for life, the grease fitting head is snapped off by the manufacturer. This is done to eliminate the possibility of lubrication later in the ball joints life thus damaging the non-vented ball joint seal boot.

The ball joint used on this vehicle is replaceable and, if found defective, can be serviced as a separate component of the lower control arm.

DIAGNOSIS AND TESTING - LOWER CONTROL ARM

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

The serviceable components of the lower control arm are: the ball joint, the ball joint grease seal and the lower control arm rear isolator bushing. The front isolator bushing is not replaceable. If the front isolator bushing needs to be replaced, the entire lower control arm must be replaced.

Inspect both lower control arm isolator bushings for severe deterioration and replace lower control arm or rear bushing as required. Inspect the ball joint per the inspection procedure in this section of the service manual and replace as required. (Refer to 2 - SUSPENSION/FRONT/LOWER BALL JOINT - DIAGNOSIS AND TESTING).

REMOVAL - LOWER CONTROL ARM

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the front tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Remove both stabilizer bar links from the vehicle (Fig. 37). Remove each link by holding the upper retainer/nut with a wrench and turning the link bolt.

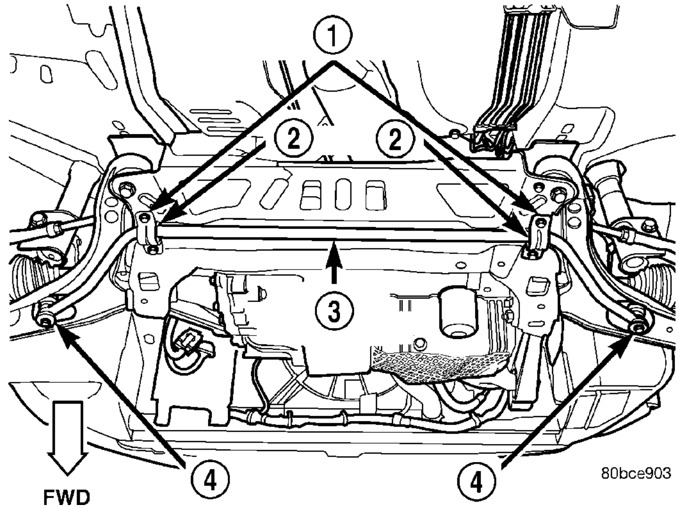


Fig. 37 Stabilizer Bar Links

1 - STABILIZER BAR CUSHION RETAINERS
2 - CUSHIONS
3 - FRONT STABILIZER BAR
4 - STABILIZER BAR LINKS

(4) Rotate the forward ends of the stabilizer bar downward. It may be necessary to loosen the stabilizer bar cushion retainer bolts a little to ease any turning resistance.

(5) Remove the nut and pinch bolt clamping the ball joint stud to the steering knuckle (Fig. 38).

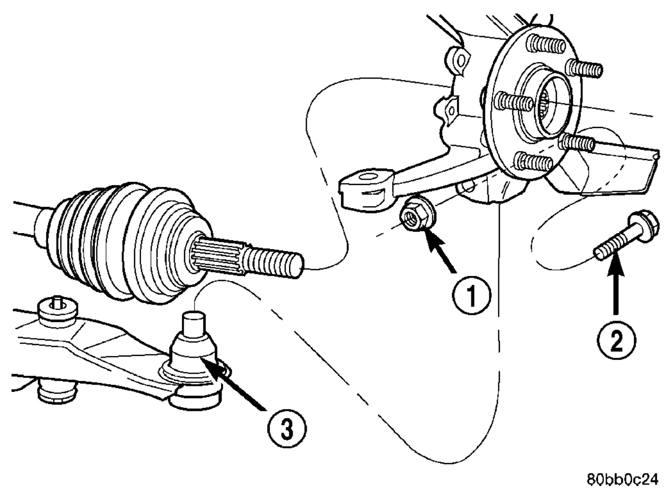


Fig. 38 Ball Joint Bolt And Nut

1 - NUT
2 - BOLT
3 - BALL JOINT

CAUTION: After removing the steering knuckle from the ball joint stud, do not pull outward on the knuckle. Pulling the steering knuckle outward at this point can separate the inner C/V joint on the driveshaft.

LOWER CONTROL ARM (Continued)

NOTE: Use caution when separating the ball joint stud from the steering knuckle, so the ball joint seal does not get cut.

(6) Separate the ball joint stud from the steering knuckle by prying down on lower control arm and up against the ball joint boss on the steering knuckle (Fig. 39).

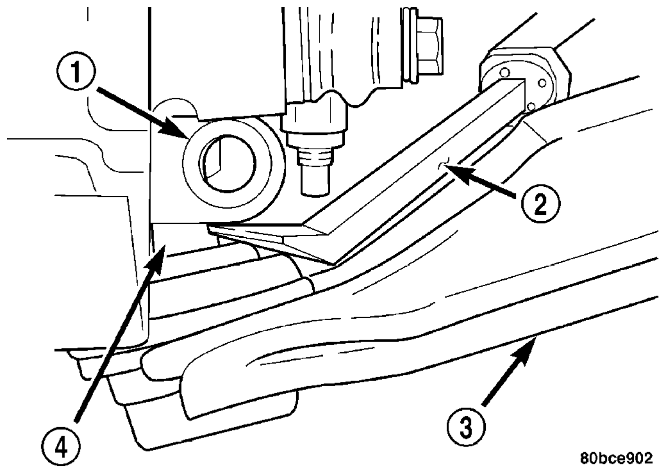


Fig. 39 Separate Ball Joint from Knuckle

1 - STEERING KNUCKLE
2 - PRY BAR
3 - LOWER CONTROL ARM
4 - BALL JOINT STUD

(7) If the right lower control arm is being serviced, perform the following:

(a) Remove the drive-belt splash shield fasteners. Remove the shield.

(b) Remove the pencil strut from the right front corner of the crossmember and body of the vehicle (Fig. 40). Remove the washer behind the strut from the torque strut bolt.

(c) Remove the bolts mounting the engine torque strut in place (Fig. 40), then remove the engine torque strut from the vehicle.

(8) Remove the front pivot bolt attaching the lower control arm to the front suspension crossmember (Fig. 41). Remove the rear pivot bolt attaching the lower control arm to the front suspension crossmember and frame rail. Remove the lower control arm from the crossmember.

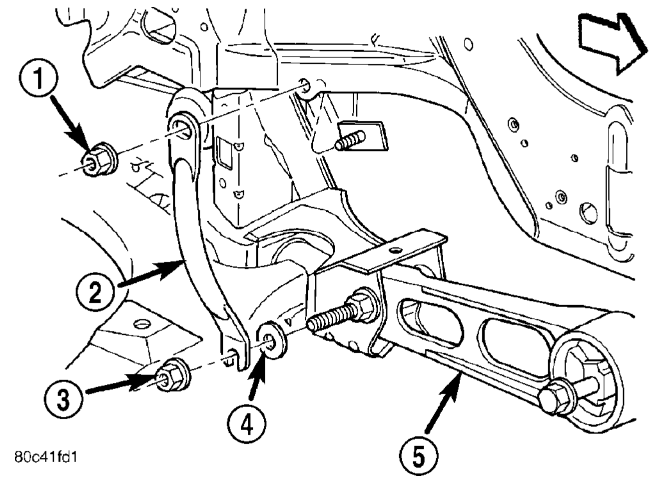


Fig. 40 Strut Mounting

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

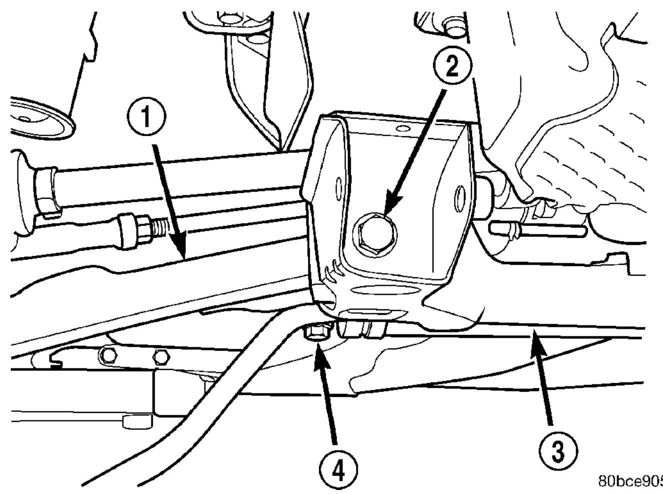


Fig. 41 Lower Control Arm Attaching Bolts

1 - LOWER CONTROL ARM
2 - FRONT BOLT
3 - CROSSMEMBER
4 - REAR BOLT

LOWER CONTROL ARM (Continued)

DISASSEMBLY

DISASSEMBLY - LOWER CONTROL ARM (BALL JOINT)

NOTE: The removal and installation of the lower ball joint from the lower control arm is to be done with the lower control arm removed from the vehicle. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL).

(1) Using a screwdriver or other suitable tool, pry the seal boot off of the ball joint (Fig. 42).

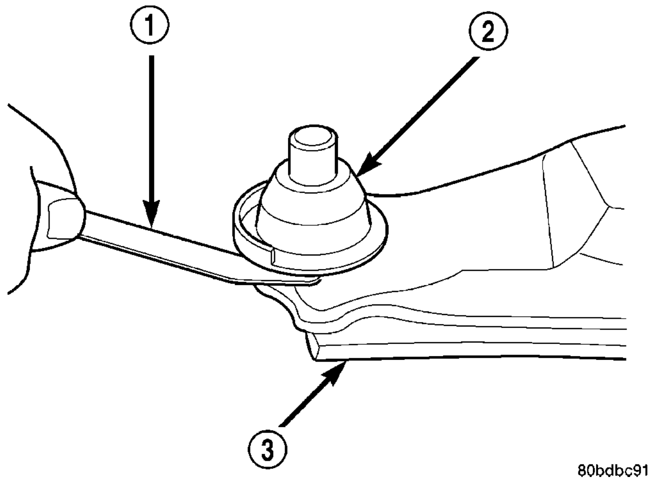


Fig. 42 Seal Boot Removal

1 - TOOL
2 - SEAL BOOT
3 - LOWER CONTROL ARM

(2) Position the Receiver, Special Tool 6908-2, on a hydraulic press to support the lower control arm (Fig. 43). Place the control arm on top of Tool 6908-2 so that the bottom of the ball joint sets into the Receiver cup.

(3) Place the larger end of the Adapter, Special Tool 6804, on top of the ball joint as shown (Fig. 43).

(4) Using the hydraulic press, press the ball joint completely out of the lower control arm, into the receiver.

(5) Remove the tools, ball joint and arm from the hydraulic press.

DISASSEMBLY - LOWER CONTROL ARM (REAR ISOLATOR BUSHING)

NOTE: The removal and installation of the rear isolator bushing from the lower control arm is only to be done with the lower control arm removed from the vehicle (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL). The front isolator bushing is not serviceable.

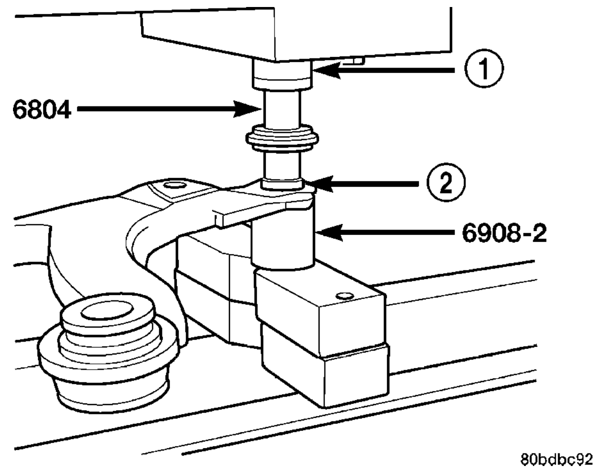


Fig. 43 Ball Joint Removal

1 - PRESS
2 - BALL JOINT

NOTE: To maintain better control when removing the rear isolator bushing, it works best to mount Ball Joint Press, Special Tool C-4212F, in a vise.

(1) Install the Receiver Cup, Special Tool 9356-4, into the cup of the Ball Joint Press, Special Tool C-4212F, and tighten the set screw (Fig. 45).

(2) Install the Remover, Special Tool 9356-2, on the tip of the Ball Joint Press screw-drive.

(3) Install the Reaction Plate, Special Tool 9356-3, over the end of the control arm so that the arrows on the Reaction Plate point toward the bushing flange on the bottom of the arm as shown (Fig. 44).

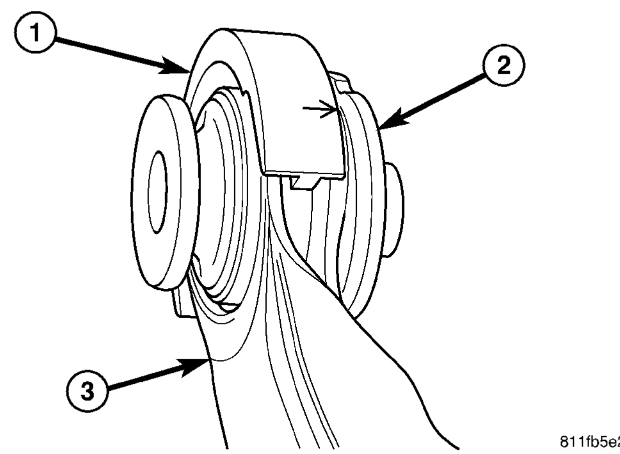


Fig. 44 Reaction Plate Installed On Arm

1 - REACTION PLATE 9356-3
2 - BUSHING FLANGE (BOTTOM OF ARM)
3 - LOWER CONTROL ARM

(4) Place the Reaction Plate (on the lower control arm) against the outer flange of the Receiver Cup as shown (Fig. 45). Line up the arrows on the Reaction Plate with that on the Receiver Cup and tighten the

LOWER CONTROL ARM (Continued)

Press screw-drive until the Remover contacts the outer circumference of the bushing (Fig. 45). Make sure the Remover contacts the bushing circumference evenly all the way around.

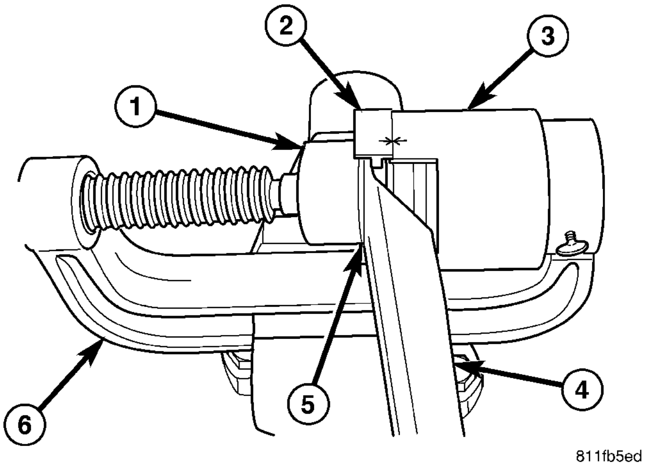


Fig. 45 Tools Positioned For Bushing Removal

1 - REMOVER 9356-2
2 - REACTION PLATE 9356-3
3 - RECEIVER CUP 9356-4
4 - LOWER CONTROL ARM
5 - BUSHING
6 - PRESS C-4212F

(5) Continue to tighten the screw-drive until the bushing is pressed completely out of the lower control arm.

(6) Back off the screw-drive and remove the lower control arm and isolator bushing. Remove the Reaction Plate from the arm.

ASSEMBLY

ASSEMBLY - LOWER CONTROL ARM (BALL JOINT)

CAUTION: When installing a ball joint in its mounting hole in the lower control arm, position the ball joint so the notch in the ball joint stud is facing the lower control arm front isolator bushing (Fig. 46). This will ease assembly of the ball joint to the steering knuckle when the installation of the pinch bolt is attempted.

(1) By hand, position ball joint into it's bore on the lower control arm (Fig. 46). To avoid binding upon installation, be sure the ball joint is not cocked in the bore.

(2) Position the Installer, Special Tool 6758, on a hydraulic press to support the lower control arm (Fig. 47). Place the control arm on top of Tool 6758 in the upside-down position, aligning the ball joint stud squarely with the Installer's cup.

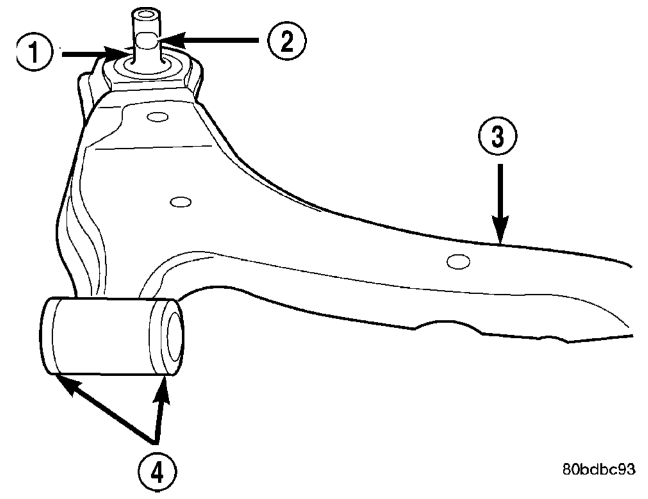


Fig. 46 Ball Joint Alignment

1 - BALL JOINT STUD
2 - NOTCH
3 - LOWER CONTROL ARM
4 - FRONT ISOLATOR BUSHING

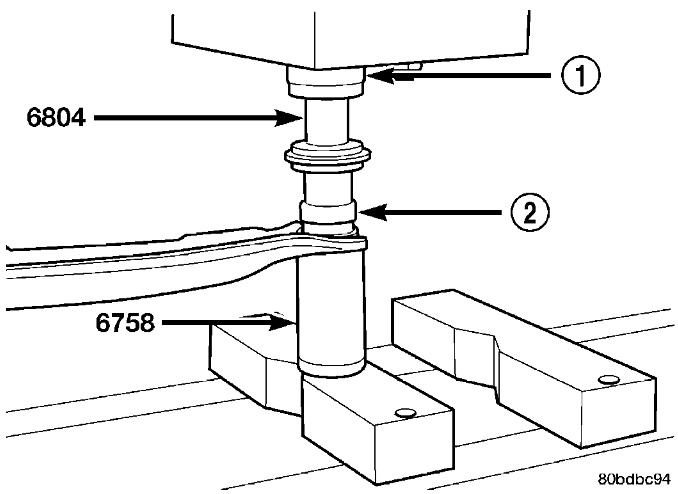


Fig. 47 Ball Joint Installation

1 - PRESS
2 - BALL JOINT

(3) Place the larger end of the Adapter, Special Tool 6804, on top of the ball joint as shown (Fig. 47).

(4) Using the hydraulic press, press the ball joint into the lower control arm until the shoulder on the ball joint bottoms against the lower control arm ball joint bore. Do not apply excessive pressure against ball joint and lower control arm once the ball joint bottoms.

(5) Remove the tools and arm from the hydraulic press.

LOWER CONTROL ARM (Continued)

CAUTION: When installing the sealing boot on the ball joint, position the upward lip on the outside perimeter of the seal boot outward, away from the control arm once installed (Fig. 48). It is there to help shield heat from the sealing boot.

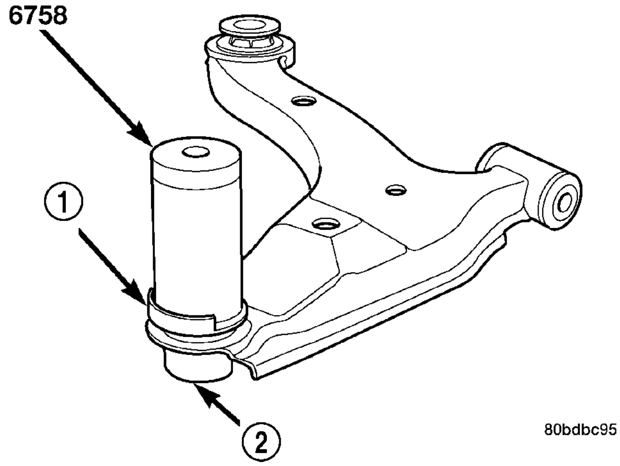


Fig. 48 Seal Boot Installation

1 - SEAL BOOT UPWARD LIP
2 - BALL JOINT

(6) Place a new ball joint seal boot over the ball joint stud. The upward lip located on the outside perimeter of the seal boot must point outward away from the control arm once installed (Fig. 48). Start the sealing boot over the sides of the ball joint by hand.

(7) Position the Installer, Special Tool 6758, over the sealing boot outer diameter as shown (Fig. 48). By hand, apply pressure to the top of the Installer until the seal boot is pressed squarely down against the top surface of lower control arm.

(8) Remove the tool.

(9) If not already installed, install standard zirc-type grease fitting in ball joint.

CAUTION: It is important to lubricate the ball joint before installation of steering knuckle to allow proper venting when the seal is filled. If the ball joint is lubricated after installation to knuckle, damage to the seal can occur.

(10) Using a hand-operated pump grease gun, fill the ball joint seal boot with Mopar® Multi-Mileage Lube or equivalent until grease pushes out past ball joint stem. Wipe off overfill.

(11) Remove standard zirc-type grease fitting and install headless grease fitting from original ball joint to prevent future lubricating. See above Caution. **Be sure to properly clean headless grease fitting prior to installation**.

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

ASSEMBLY - LOWER CONTROL ARM (REAR ISOLATOR BUSHING)

(1) Back the Ball Joint Press, Special Tool C-4212F, set screw outward so it does not extend out into the cup area (Fig. 49).

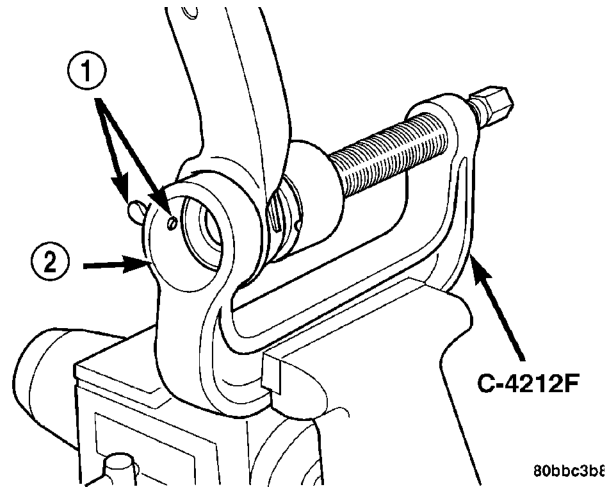


Fig. 49 Set Screw Backed Outward

1 - SET SCREW
2 - CUP AREA

(2) Start the isolator bushing into the bottom of the lower control arm bushing bore by hand. Position the bushing so the voids in the rubber are aligned in relationship to the ball joint as shown (Fig. 50). Place the larger void toward the ball joint.

(3) Install the Installer, Special Tool 9356-1, on the tip of the Ball Joint Press screw drive.

(4) Place the lower control arm upper flange against the cup area of the Ball Joint Press and tighten the screw-drive until the Installer contacts the outer circumference of the bushing (Fig. 51). Make sure the bushing flange sits squarely in the step built into the Installer.

(5) Using hand tools, slowly tighten the screw-drive until the bushing bottoms in the lower control arm bushing bore. Do not overtighten the screw-drive; damage to the bushing, arm or tool can result.

(6) Back off the screw-drive and remove the control arm from the Ball Joint Press.

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

INSTALLATION - LOWER CONTROL ARM

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

LOWER CONTROL ARM (Continued)

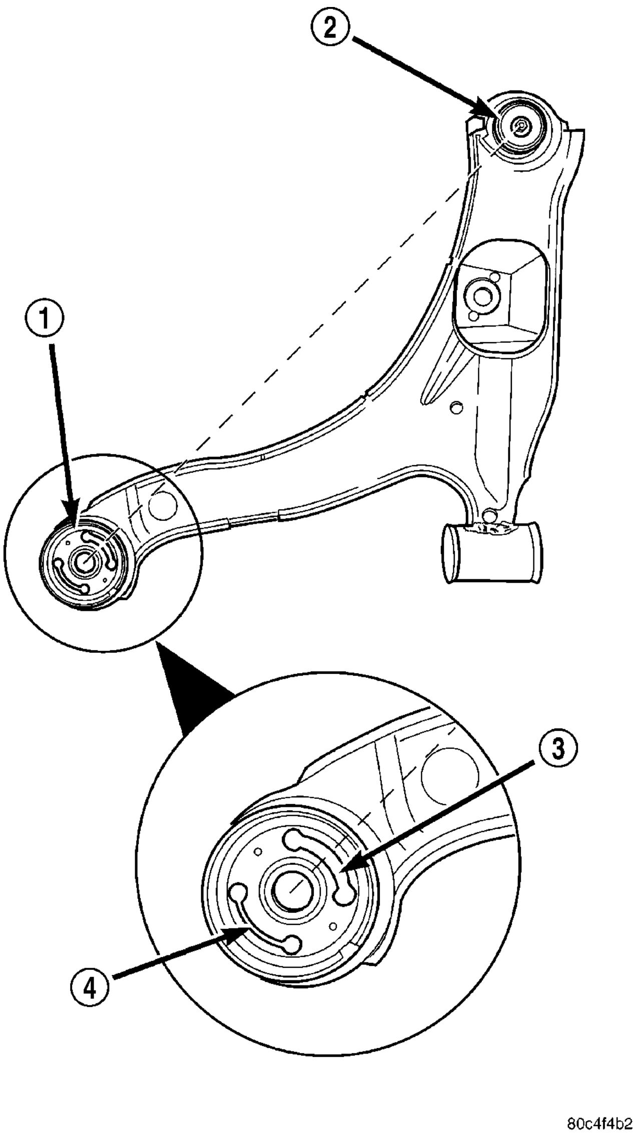


Fig. 50 Aligning Bushing With Ball Joint

1 - REAR ISOLATOR BUSHING
2 - BALL JOINT
3 - WIDE VOID
4 - NARROW VOID

(1) Position the lower control arm into the crossmember (Fig. 41). Install, but do not fully tighten, the rear pivot bolt attaching the lower control arm to the front suspension crossmember and frame rail. Install the front pivot bolt attaching the lower control arm to the front suspension crossmember.

(2) Tighten the lower control arm rear pivot (and suspension crossmember) bolt to a torque of 237 N·m (175 ft. lbs.), then tighten the lower control arm front pivot bolt to a torque of 163 N·m (120 ft. lbs.).

(3) Install the ball joint stud into the steering knuckle aligning the bolt hole in the knuckle boss with the notch formed in the side of the ball joint stud.

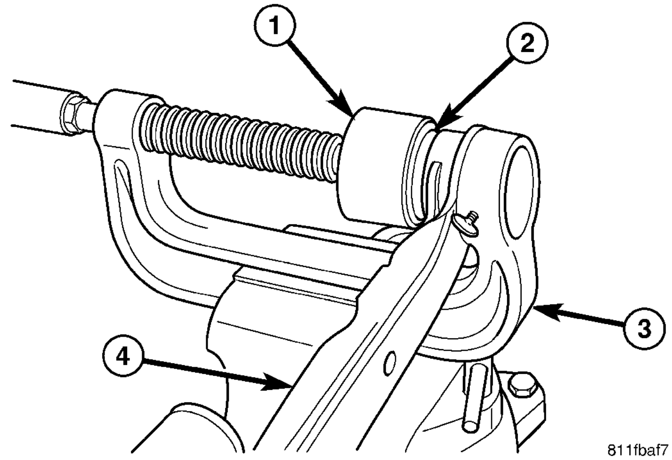


Fig. 51 Tools Positioned For Bushing Installation

1 - INSTALLER 9356-1
2 - BUSHING
3 - PRESS C-4212F
4 - LOWER CONTROL ARM

(4) If the right lower control arm has been serviced, perform the following:

(a) Install the engine torque strut and mounting bolts (Fig. 40). To properly align and tighten the torque strut, (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(b) Install the washer on the end of the stud extending from the torque strut bolt (Fig. 40).

(c) Install the pencil strut to the right front corner of the crossmember and body of the vehicle (Fig. 40). Tighten the pencil strut nuts to a torque of 58 N·m (43 ft. lbs.).

(d) Install the drive-belt splash shield and fasteners.

(5) Install a new ball joint stud pinch bolt and nut (Fig. 38). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

(6) Rotate the forward ends of the stabilizer bar into mounting position.

(7) Install both stabilizer bar links back on vehicle (Fig. 37). Start each stabilizer bar link bolt with bushing from the bottom, through the stabilizer bar, inner link bushings, lower control arm, and into the upper retainer/nut and bushing (Fig. 1). Do not fully tighten the link assemblies at this time.

(8) Lower the vehicle to ground level.

NOTE: It may be necessary to put the vehicle on a platform hoist or alignment rack to gain access to the stabilizer bar mounting bolts with the vehicle at curb height.

(9) Tighten each stabilizer bar link by holding the upper retainer/nut with a wrench and turning the

LOWER CONTROL ARM (Continued)

link bolt. Tighten each link bolt to a torque of 31 N·m (275 in. lbs.).

(10) If previously loosened, tighten the stabilizer bar cushion retainer bolts to a torque of 28 N·m (250 in. lbs.).

STABILIZER BAR

DESCRIPTION

The stabilizer bar helps control vehicle body roll. Jounce and rebound movements affecting one wheel are partially transmitted to the opposite wheel of the vehicle to stabilize body roll.

The stabilizer bar interconnects both front lower control arms of the vehicle and is attached to the front suspension crossmember (Fig. 1).

Attachment of the stabilizer bar to the front suspension crossmember is through 2 rubber-isolator cushion and retainers (Fig. 1). The stabilizer bar attachment to the lower control arm is done by utilizing an isolated stabilizer bar link at each arm. All components of the stabilizer bar are serviceable.

DIAGNOSIS AND TESTING - STABILIZER BAR (FRONT)

Inspect for broken, cracked or distorted stabilizer bar cushions and retainers. Inspect for worn or damaged stabilizer bar links (Fig. 1).

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove both stabilizer bar links from the vehicle (Fig. 52). Remove each link by holding the upper retainer/nut with a wrench and turning the link bolt.

(3) Remove the stabilizer bar cushion retainer bolts and retainers (Fig. 52), and remove the stabilizer bar with cushions attached from the vehicle.

(4) To remove the cushions from the stabilizer bar, peel back each cushion at the slit and roll it off the bar.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

NOTE: Before stabilizer bar installation, inspect the cushions and links for excessive wear, cracks, damage and distortion. Replace any pieces failing inspection.

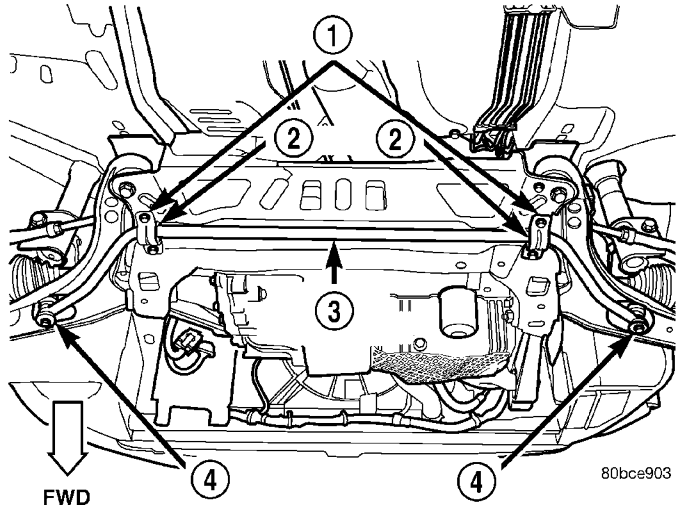


Fig. 52 Stabilizer Bar

1 - STABILIZER BAR CUSHION RETAINERS
2 - CUSHIONS
3 - FRONT STABILIZER BAR
4 - STABILIZER BAR LINKS

(1) If removed, install the stabilizer bar cushions on the stabilizer bar utilizing the slit in each cushion. Position the cushions at each end of the bar's straight beam, just before it begins to curve.

NOTE: Before installing the stabilizer bar, make sure the bar is not upside-down. The stabilizer bar must be installed with the curve on the outboard ends of the bar facing downward to clear the control arms once fully installed (Fig. 53).

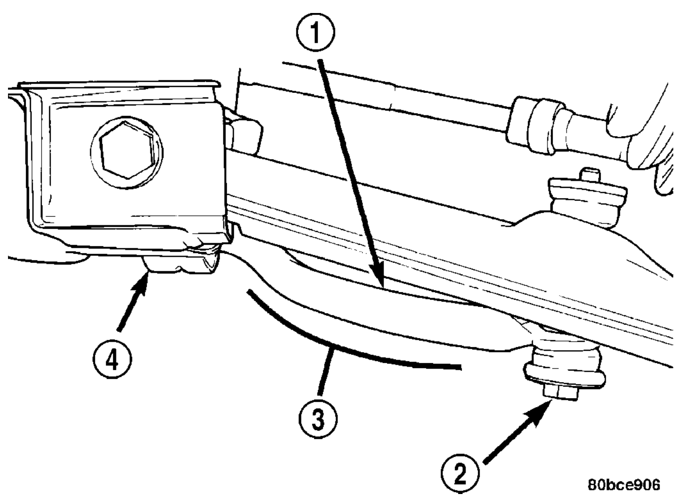


Fig. 53 Downward Curve

1 - STABILIZER BAR
2 - LINK
3 - DOWNWARD CURVE
4 - CUSHION RETAINER

STABILIZER BAR (Continued)

(2) First, place the stabilizer bar in position on the front suspension crossmember. The slits in each cushion must point toward the front of the vehicle and sit directly on top of the raised beads formed into the stamping on the crossmember. Next, install the cushion retainers, matching the raised beads formed into the cushion retainers to the grooves formed into the cushions. Install the cushion retainer bolts, but do not completely tighten them at this time.

(3) Install both stabilizer bar links back on vehicle (Fig. 52). Start each stabilizer bar link bolt with bushing from the bottom, through the stabilizer bar, inner link bushings, lower control arm, and into the upper retainer/nut and bushing (Fig. 1). Do not fully tighten the link assemblies at this time.

(4) Lower the vehicle.

NOTE: It may be necessary to put the vehicle on a platform hoist or alignment rack to gain access to the stabilizer bar mounting bolts with the vehicle at curb height.

(5) Tighten each stabilizer bar link by holding the upper retainer/nut with a wrench and turning the link bolt. Tighten each link bolt to a torque of 31 N·m (275 in. lbs.).

(6) Tighten the stabilizer bar cushion retainer bolts to a torque of 28 N·m (250 in. lbs.).

STRUT ASSEMBLY

DESCRIPTION - STRUT ASSEMBLY (FRONT)

A Macpherson type design strut assembly is used in place of the front suspension upper control arm and upper ball joint (Fig. 1). The bottom of the strut mounts directly to the steering knuckle using 2 attaching bolts and nuts going through the strut clevis bracket and steering knuckle. The top of the strut mounts directly to the strut tower of the vehicle using the three threaded studs on the strut assemblies upper mount. During steering maneuvers, the strut assembly (through a pivot bearing in the upper strut mount) and steering knuckle (through the lower ball joint) turn as an assembly.

The strut assembly includes the following components:

- Strut shaft retaining nut
- Upper mount (rubber isolated)
- Upper spring seat and bearing
- Dust shield
- Jounce bumper
- Coil spring
- Lower spring isolator
- Strut (damper)

Each component is serviced by removing the strut assembly from the vehicle and disassembling it.

The strut and front suspension of the vehicle is supported by coil springs positioned around the upper half of each strut. The springs are contained between the upper and the lower seats of the strut assembly.

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 of the strut assembly, if both springs are removed, mark the springs to ensure installation in its original position.

NOTE: If a coil spring requires replacement, be sure that it is replaced with a spring meeting the correct load rating for the vehicle and its specific options.

OPERATION - STRUT ASSEMBLY (FRONT)

The strut assembly cushions the ride of the vehicle, controlling vibration, jounce and rebound of the suspension.

The coil spring controls ride quality and maintains proper ride height.

The spring isolators isolate the coil spring at the top and bottom from coming into metal-to-metal contact with the upper mounting seat and the strut.

The jounce bumper limits suspension travel and metal-to-metal contact under full jounce condition.

The strut dampens jounce and rebound motions of the coil spring and suspension.

DIAGNOSIS AND TESTING - STRUT ASSEMBLY (FRONT)

Inspect the strut assembly for the following conditions (Fig. 54):

- Inspect for a damaged or broken coil spring.
- Inspect for a torn or damaged strut assembly dust shield.
- Lift the dust shield and inspect the strut assembly for evidence of fluid running from the upper end of the strut 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 strut shaft and strut shaft seal is not unusual and does not affect performance of the strut assembly.
- Lift the dust shield and inspect the jounce bumper for signs of damage or deterioration (non-ACR vehicles only).
- Inspect the clearance between the shock tower and the coil spring. Make sure no fasteners are protruding through the shock tower possibly contacting the coil spring and strut. Because of the minimum clearance in this area (Fig. 55), installation of metal

STRUT ASSEMBLY (Continued)

fasteners could damage the coil spring coating and lead to a corrosion failure of the spring.

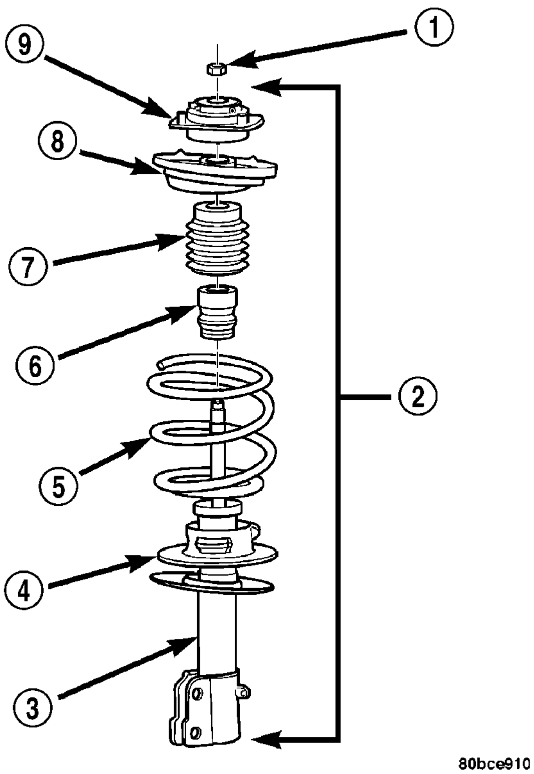


Fig. 54 Strut Assembly

1 - NUT
2 - STRUT ASSEMBLY
3 - STRUT
4 - LOWER SPRING ISOLATOR
5 - COIL SPRING
6 - JOUNCE BUMPER
7 - DUST SHIELD
8 - SPRING SEAT AND BEARING (WITH SPRING ISOLATOR)
9 - UPPER MOUNT

CAUTION: At no time when servicing a vehicle can a sheet metal screw, bolt or other metal fastener be installed into the shock tower to take the place of an original plastic clip. Also, do not drill holes into the front shock tower for the installation of any metal fasteners into the shock tower area indicated (Fig. 55).

REMOVAL - STRUT ASSEMBLY (FRONT)

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/FRONT - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove tire and wheel assembly from location on front of vehicle requiring strut removal. (Refer to 22 - TIRES/WHEELS - REMOVAL)

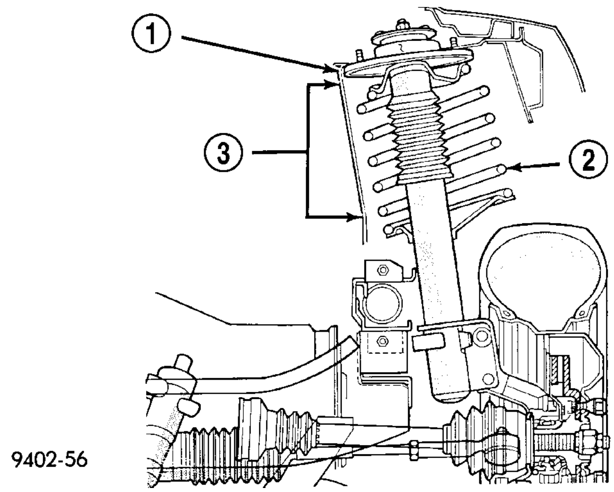


Fig. 55 Shock Tower Area (Typical)

1 - SHOCK TOWER
2 - COIL SPRING
3 - NO SHEET METAL SCREWS, BOLTS, OR ANY OTHER METAL FASTENERS ARE TO BE INSTALLED INTO SHOCK TOWER IN THIS AREA. ALSO, NO HOLES ARE TO BE DRILLED INTO SHOCK TOWER IN THIS SAME AREA.

(3) If both strut assemblies are to be removed, mark the strut assemblies right or left according to which side of the vehicle they were removed from.

(4) Remove the screw securing the ground strap to the rear of the strut (Fig. 56).

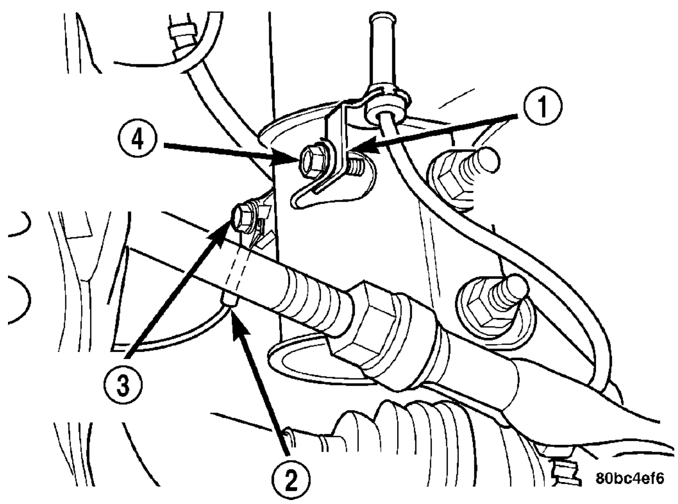


Fig. 56 Ground Strap And ABS Sensor Bracket

1 - ABS WHEEL SPEED SENSOR ROUTING BRACKET (IF EQUIPPED)
2 - GROUND STRAP
3 - GROUND STRAP SCREW
4 - ABS SENSOR BRACKET SCREW (IF EQUIPPED)

(5) If the vehicle is equipped with Antilock brakes (ABS), remove the screw securing the ABS wheel speed sensor to the rear of the strut (Fig. 56).

STRUT ASSEMBLY (Continued)

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during removal. Hold the bolts stationary in the steering knuckle while removing the nuts, then tap the bolts out using a pin punch.

(6) Remove the two bolts attaching the strut to the steering knuckle (Fig. 1).

(7) Lower the vehicle just enough to open the hood, but without letting the tires touch the floor.

(8) Remove the three nuts attaching the upper mount of the strut assembly to the vehicle's strut tower (Fig. 57).

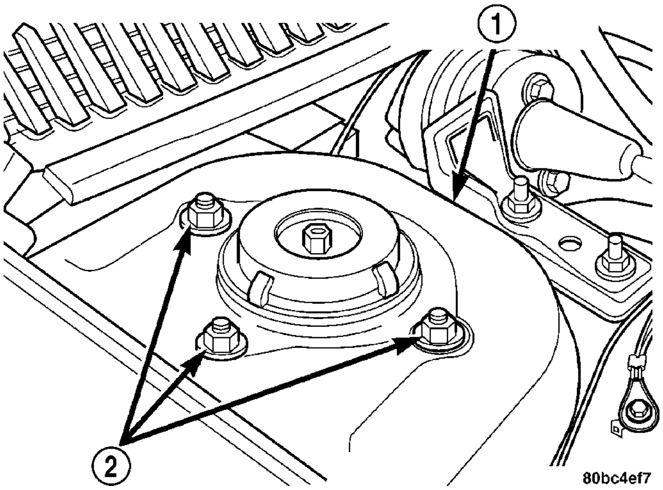


Fig. 57 Upper Mounting Nuts

1 - STRUT TOWER
2 - MOUNTING NUTS

(9) Remove the strut assembly from the vehicle.

(10) For disassembly procedures, (Refer to 2 - SUSPENSION/FRONT/STRUT - DISASSEMBLY).

DISASSEMBLY - STRUT ASSEMBLY (FRONT)

The Strut assembly must be removed from the vehicle for it to be disassembled and assembled. (Refer to 2 - SUSPENSION/FRONT/STRUT - REMOVAL).

For the disassembly and assembly of the strut assembly, use strut spring compressor, Pentastar Service Equipment (PSE) tool W-7200, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

(1) If both struts are being serviced at the same time, mark the coil spring and strut assembly according to which side of the vehicle the strut was removed from, and which strut the coil spring was removed from.

(2) Position the strut assembly in the strut coil spring compressor following the manufacturers instructions. Set the lower hooks (Fig. 58), then set the upper hooks (Fig. 59). Position the strut clevis bracket straight outward away from the compressor. Place a clamp on the lower end of the coil spring, so the strut is held in place once the strut shaft nut is removed (Fig. 58).

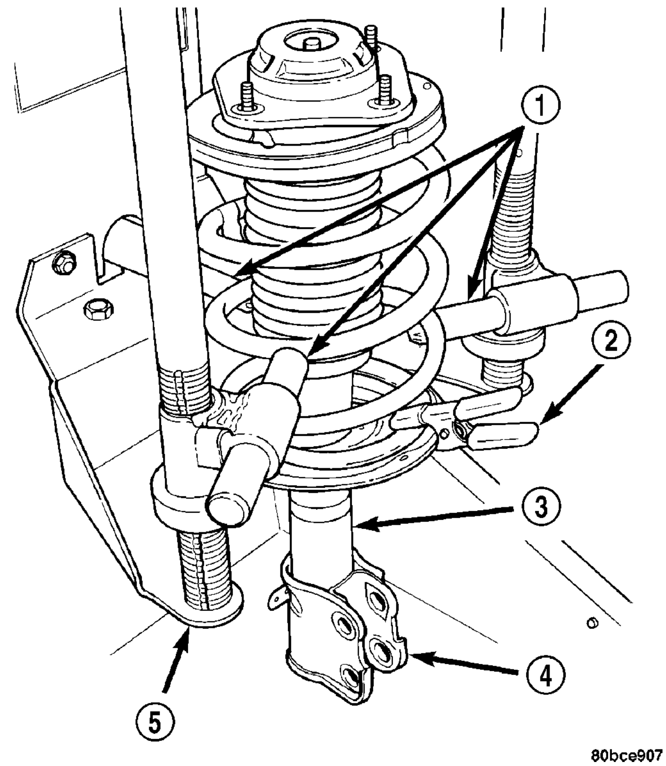


Fig. 58 Strut Assembly In Compressor (Lower)

1 - LOWER HOOKS
2 - CLAMP
3 - STRUT ASSEMBLY
4 - CLEVIS BRACKET
5 - SPRING COMPRESSOR

WARNING: DO NOT REMOVE THE STRUT SHAFT NUT BEFORE THE COIL SPRING IS COMPRESSED. THE COIL SPRING IS HELD UNDER PRESSURE AND MUST BE COMPRESSED, REMOVING SPRING TENSION FROM THE UPPER MOUNT AND PIVOT BEARING, BEFORE THE SHAFT NUT IS REMOVED.

(3) Compress the coil spring until all coil spring tension is removed from the upper mount.

(4) Once the spring is sufficiently compressed, install Strut Nut Socket, Special Tool 6864, on the strut shaft retaining nut (Fig. 60). Next, install a socket on the hex on the end of the strut shaft. While holding the strut shaft from turning, remove the nut from the strut shaft.

(5) Remove the upper mount from the strut shaft (Fig. 61).

(6) Remove the upper spring seat and bearing, along with the upper spring isolator as an assembly from the top of the coil spring by pulling them straight up (Fig. 61). The upper spring isolator can

STRUT ASSEMBLY (Continued)

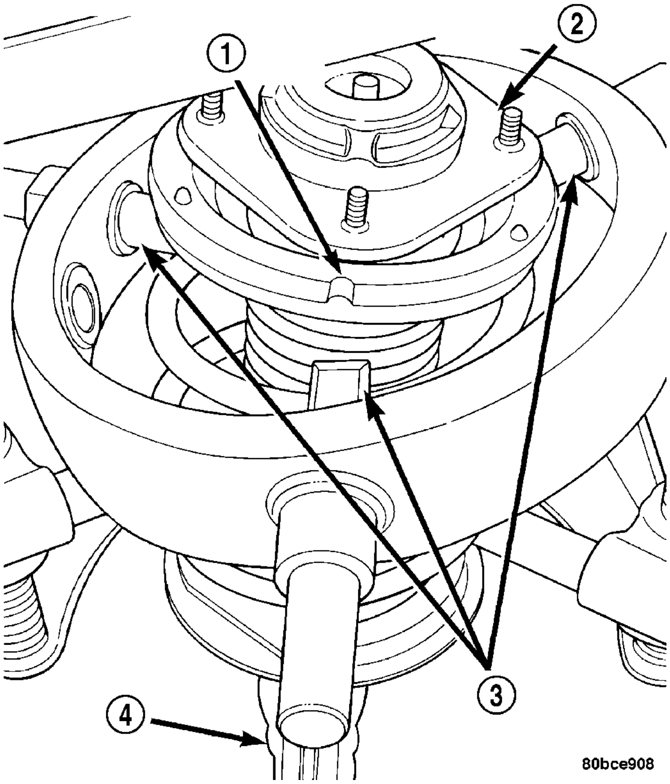


Fig. 59 Strut Assembly In Compressor (Upper)

1 - NOTCH IN UPPER SEAT
2 - UPPER MOUNT
3 - UPPER HOOKS
4 - CLEVIS BRACKET

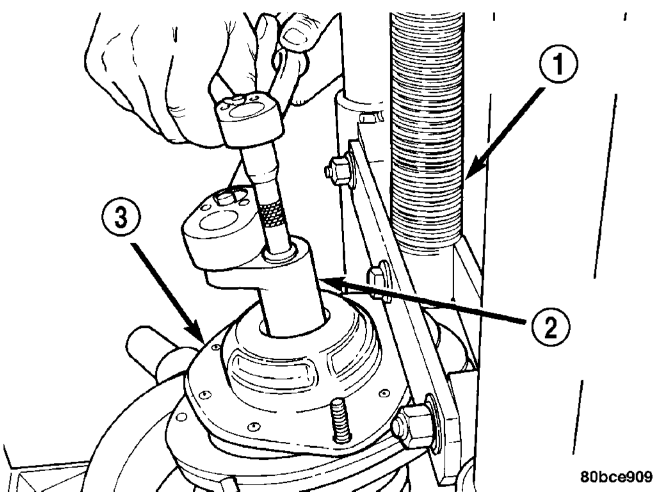


Fig. 60 Shaft Nut Removal/Installation

1 - SPRING COMPRESSOR
2 - SPECIAL TOOL 6864
3 - UPPER MOUNT

be separated from the spring seat and bearing once removed from vehicle.

(7) Remove the dust shield, then the jounce bumper from the strut shaft by pulling each straight up (Fig. 61).

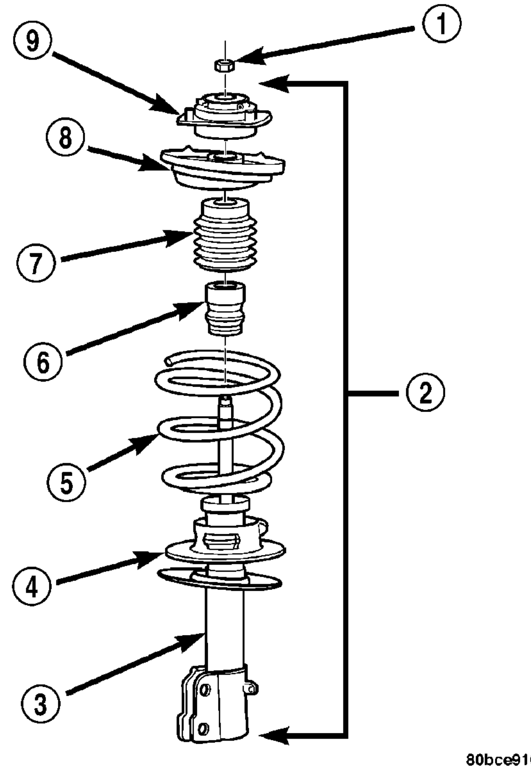


Fig. 61 Strut Assembly Components

1 - NUT
2 - STRUT ASSEMBLY
3 - STRUT
4 - LOWER SPRING ISOLATOR
5 - COIL SPRING
6 - JOUNCE BUMPER
7 - DUST SHIELD
8 - SPRING SEAT AND BEARING (WITH SPRING ISOLATOR)
9 - UPPER MOUNT

(8) Remove the clamp from the bottom of the coil spring and remove the strut out through the bottom of the coil spring.

(9) Remove the lower spring isolator from the lower spring seat on the strut.

NOTE: If the coil spring needs to be serviced, proceed with the next step, otherwise, proceed with step 11.

(10) Release the tension from the coil spring by backing off the compressor drive completely. Push back the compressor hooks and remove the coil spring.

(11) Inspect the strut assembly components for the following and replace as necessary:

- Inspect the strut for any condition of shaft binding over the full stroke of the shaft.
- Inspect the jounce bumper for cracks and signs of deterioration (non-ACR vehicles only).
- Check the upper mount for cracks and distortion and its retaining studs for any sign of damage.

STRUT ASSEMBLY (Continued)

• Check the upper spring seat and bearing for cracks and distortion.
• Check for binding of the upper spring seat and bearing pivot bearing.
• Inspect the dust shield for rips and deterioration.
• Inspect the upper and lower spring isolators for material deterioration and distortion.
• Inspect the coil spring for any sign of damage to the coating.

ASSEMBLY - STRUT ASSEMBLY (FRONT)

For the disassembly and assembly of the strut assembly, use strut spring compressor, Pentastar Service Equipment (PSE) tool W-7200, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

NOTE: If the coil spring has been removed from the spring compressor, proceed with the next step, otherwise, proceed with step 3.

(1) Place the coil spring in the compressor following the manufacturers instructions. Before compressing the spring, rotate the spring so the end of the top coil is directly in the back as shown (Fig. 62).

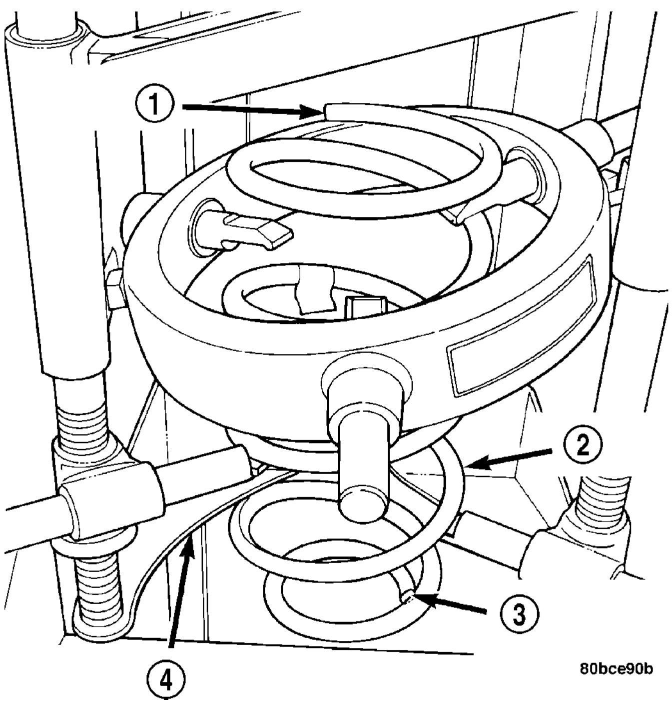


Fig. 62 Coil Spring Positioning

1 - UPPER END OF COIL
2 - COIL SPRING
3 - LOWER END OF COIL
4 - SPRING COMPRESSOR

(2) Slowly compress the coil spring until enough room is available for strut assembly reassembly.

(3) Install the lower spring isolator on the lower spring seat of the strut.

(4) Install the strut through the bottom of the coil spring until the lower spring seat contacts the lower end of the coil spring. Rotate the strut as necessary until the clevis bracket is positioned straight outward away from the compressor (Fig. 58). Install the clamp on the lower end of the coil spring and strut, so the strut is held in place.

(5) Install the jounce bumper on the strut shaft. The jounce bumper is to be installed with the smaller end pointing downward toward the lower seat (Fig. 61).

(6) Install the dust shield on the strut shaft (Fig. 61). The bottom of the dust shield will snap past the retainer on top of the strut housing.

(7) If disassembled, reinstall the upper spring isolator on the upper spring seat and bearing.

(8) Install the upper spring seat and bearing on top of the coil spring. Position the notch formed into the edge of the upper seat straight out away from the compressor (Fig. 59).

(9) Install the strut upper mount over the strut shaft and onto the top of the upper spring seat and bearing.

(10) Loosely install the retaining nut on the strut shaft. Install Strut Nut Socket (on the end of a torque wrench), Special Tool 6864, on the strut shaft retaining nut (Fig. 60). Next, install a socket on the hex on the end of the strut shaft. While holding the strut shaft from turning, tighten the strut shaft retaining nut to a torque of 75 N·m (55 ft. lbs.).

(11) Slowly release the tension from the coil spring by backing off the compressor drive completely. As the tension is relieved, make sure the upper mount and seat and bearing align properly. Verify the upper mount does not bind.

(12) Remove the clamp from the lower end of the coil spring and strut. Push back the spring compressor upper and lower hooks, then remove the strut assembly from the spring compressor.

(13) Install the strut assembly on the vehicle. (Refer to 2 - SUSPENSION/FRONT/STRUT - INSTALLATION)

INSTALLATION - STRUT ASSEMBLY (FRONT)

(1) Install the strut assembly into the strut tower, aligning the three studs on the strut upper mount with the holes in strut tower. Install the three mounting nuts on the studs (Fig. 57). Tighten the three nuts to a torque of 34 N·m (300 in. lbs.).

(2) Close the hood of the vehicle.

STRUT ASSEMBLY (Continued)

CAUTION: The strut assembly-to-steering knuckle attaching bolts are serrated and must not be turned during installation. Install the nuts while holding the bolts stationary in the steering knuckle.

(3) Position the lower end of the strut assembly in line with the upper end of the steering knuckle and align the mounting holes (Fig. 1). Install the two attaching bolts. The bolts should be installed with so that the nuts face towards the front of the vehicle once installed. Install the nuts. Holding the bolts in place tighten the nuts to a torque of 53 N·m (40 ft. lbs.) plus an additional 90° turn after the specified torque is met.

(4) If the vehicle is equipped with Antilock brakes (ABS), attach the ABS wheel speed sensor to the rear of the strut (rearward ear) using its mounting screw (Fig. 56). Tighten the mounting screw to a torque of 13 N·m (120 in. lbs.).

(5) Attach the ground strap to the rear of the strut (forward ear) using its mounting screw (Fig. 56). Tighten the mounting screw to a torque of 13 N·m (120 in. lbs.).

(6) Install the tire and wheel assembly. Install and tighten the wheel mounting nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(7) Lower the vehicle.

REAR SUSPENSION

TABLE OF CONTENTS

REAR SUSPENSION

DESCRIPTION - REAR SUSPENSION

The rear suspension system used on this vehicle is a fully independent type rear suspension system (Fig. 1). This means that each side of the rear suspension acts independently from the other.

For more information on an individual component, refer to the applicable component.

OPERATION - REAR SUSPENSION

The rear suspension is supported by a strut assembly. The strut assembly also controls ride quality. When the vehicle strikes a bump, the force is transferred through the hub, bearing, and knuckle, into the strut assembly to absorb the force and dampen it.

Lateral movement of the rear knuckle is controlled by lateral arms going from the front and rear of the knuckle to the rear crossmember. Fore and aft movement of the knuckle is controlled by a tension strut.

WARNING

WARNINGS AND CAUTIONS

WARNING: DO NOT REMOVE THE STRUT SHAFT NUT WHILE STRUT ASSEMBLY IS INSTALLED IN VEHICLE, OR BEFORE THE COIL SPRING IS COMPRESSED WITH A COMPRESSION TOOL. THE SPRING IS HELD UNDER HIGH PRESSURE.

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 it with a new component.

REAR SUSPENSION (Continued)

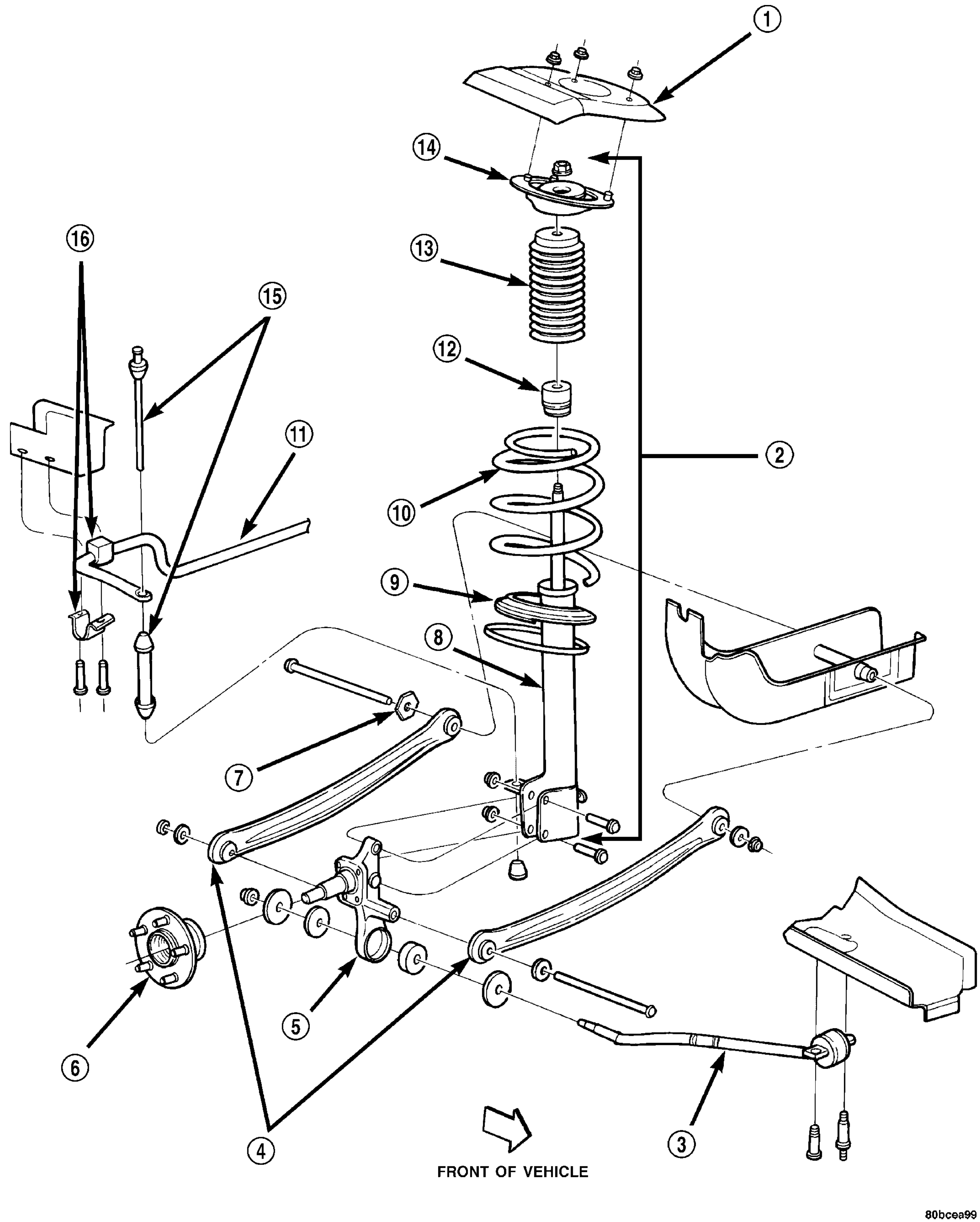


Fig. 1 Rear Suspension System

REAR SUSPENSION (Continued)

1 - VEHICLE STRUT TOWER
2 - STRUT ASSEMBLY
3 - TENSION STRUT
4 - LATERAL ARMS
5 - KNUCKLE
6 - HUB AND BEARING
7 - WHEEL ALIGNMENT ADJUSTMENT CAM
8 - STRUT
9 - LOWER SPRING ISOLATOR
10 - COIL SPRING
11 - STABILIZER BAR
12 - JOUNCE BUMPER
13 - DUST SHIELD
14 - UPPER MOUNT
15 - STABILIZER BAR LINK
16 - STABILIZER BAR CUSHION AND RETAINER

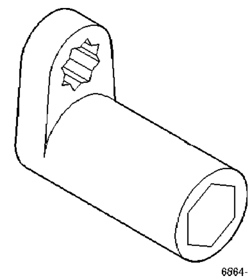
SPECIFICATIONS

REAR SUSPENSION FASTENER TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
STRUT ASSEMBLY:	
Tower Attaching Nuts	34 N·m (300 in. lbs.)
Knuckle Attaching Bolts	88 N·m (65 ft. lbs.)
Strut Assembly Shaft Nut	75 N·m (55 ft. lbs.)
Brake Hose Bracket Mounting Bolt	31 N·m (275 in. lbs.)
KNUCKLE:	
Brake Support Plate Mounting Bolts	75 N·m (55 ft. lbs.)
Disc Brake Adapter Mounting Bolts	75 N·m (55 ft. lbs.)
HUB AND BEARING:	
To Knuckle Retaining Nut	217 N·m (160 ft. lbs.)
Wheel Mounting Nuts	109-150 N·m (80-110 ft. lbs.)
LATERAL ARM:	
Nut At Crossmember	88 N·m (65 ft. lbs.)
Nut At Knuckle	95 N·m (70 ft. lbs.)
TENSION STRUT:	
Rear Nut	95 N·m (70 ft. lbs.)
Frame Rail Bolts	95 N·m (70 ft. lbs.)
Parking Brake Cable Nut	28 N·m (250 in. lbs.)
STABILIZER BAR:	
Cushion Retainer Bolts	34 N·m (300 in. lbs.)
Link Bolt Nut	23 N·m (200 in. lbs.)

SPECIAL TOOLS

REAR SUSPENSION



Socket/Wrench Strut Rod Nut 6864

HUB / BEARING

DESCRIPTION

The hub and bearing is mounted on the rear knuckle's spindle (Fig. 1). The hub and bearing adapts the tire and wheel assembly to the knuckle. It's bearing allows the tire and wheel assembly to rotate freely on the vehicle.

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.

The only serviceable components of the hub and bearing are the wheel mounting studs.

If a vehicle is equipped with antilock brakes, the tone wheels for the rear wheel speed sensors are pressed onto the hub.

DIAGNOSIS AND TESTING - HUB AND BEARING (REAR)

The hub and bearing is designed for the life of the vehicle and requires no type of periodic maintenance (Fig. 1). The following procedure may be used for diagnosing the condition of the hub and bearing.

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

Damaged bearing seals and the resulting excessive grease loss may also require hub and bearing

HUB / BEARING (Continued)

replacement. Moderate grease weapage from the bearing is considered normal and should not require replacement of the wheel bearing.

To diagnose a bent hub, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS AND TESTING) for the procedure on measuring hub runout.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear wheel and tire assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) If the vehicle is equipped with rear drum brakes, remove any retainer clips from the wheel mounting studs, then pull the brake drum off the hub and bearing.

(4) If the vehicle is equipped with rear disc brakes (Fig. 16), perform the following:

- Remove the two guide pin bolts securing the front disc brake caliper to the steering knuckle.
- Remove the disc brake caliper from the knuckle and brake rotor.
- Hang the caliper out of the way using a wire hanger or cord. Do not support the caliper by letting it hang by the hydraulic hose.
- Remove any retainer clips from the wheel mounting studs, then pull the brake rotor off the hub and bearing.

(5) Remove the dust cap from the hub and bearing assembly (Fig. 16).

(6) Remove the retaining nut, then the hub and bearing from the knuckle's spindle (Fig. 16).

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Install the hub and bearing on the knuckle's spindle, then install a new retaining nut (Fig. 16). Do not reuse the original nut. Tighten the nut to a torque of 217 N·m (160 ft. lbs.).

(2) Install the dust cap on the end of the hub and bearing (Fig. 16).

(3) If the vehicle is equipped with rear disc brakes (Fig. 16), install the brake rotor and disc brake caliper on the knuckle. Install the two guide pin bolts securing the front disc brake caliper to the steering knuckle. Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(4) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence, this time, to full specified torque of 135 N·m (100 ft. lbs.).

(5) Lower the vehicle to ground level.

KNUCKLE

DESCRIPTION

A forged rear knuckle bolts to each rear strut assembly (Fig. 1). The rear knuckle's spindle supports the rear hub and bearing. Together they support the rear tire and wheel. The movement of the rear knuckle is controlled laterally using two lateral arms attached to the knuckle. Fore and aft movement of the knuckle is controlled by using a tension strut.

DIAGNOSIS AND TESTING - KNUCKLE (REAR)

The rear knuckle is not a repairable component of the rear suspension. Upon visual inspection, if it is determined that the knuckle is cracked, bent or broken, 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.

REMOVAL - KNUCKLE (REAR)

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the rear wheel and tire assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) If the vehicle is equipped with rear drum brakes, remove the screw securing the brake hose bracket to the rear of the strut assembly (Fig. 2).

(4) If the vehicle is equipped with the antilock brake system (ABS), remove the screw securing the ABS wheel speed sensor bracket to the rear of the strut assembly (Fig. 3).

(5) If the vehicle is equipped with rear drum brakes, remove any retainer clips from the wheel mounting studs, then pull the brake drum off the hub and bearing.

(6) If the vehicle is equipped with rear disc brakes (Fig. 4), perform the following:

- Remove the two guide pin bolts securing the front disc brake caliper to the steering knuckle.
- Remove the disc brake caliper from the knuckle and brake rotor.

KNUCKLE (Continued)

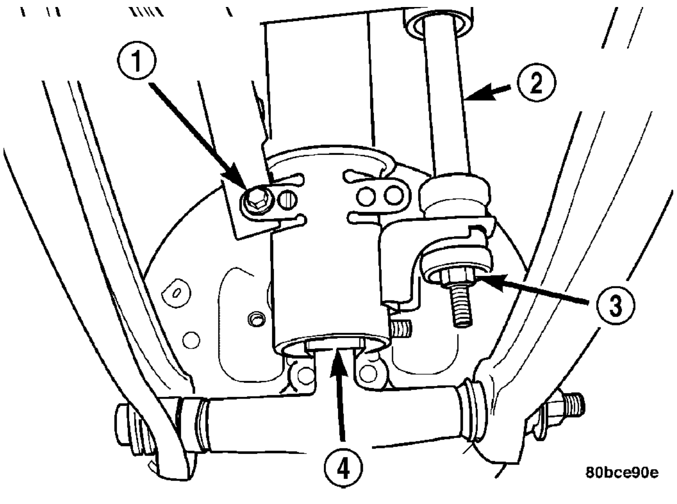


Fig. 2 Rear of Strut Assembly

1 - BRAKE HOSE BRACKET SCREW
2 - STABILIZER BAR LINK
3 - NUT
4 - STRUT ASSEMBLY

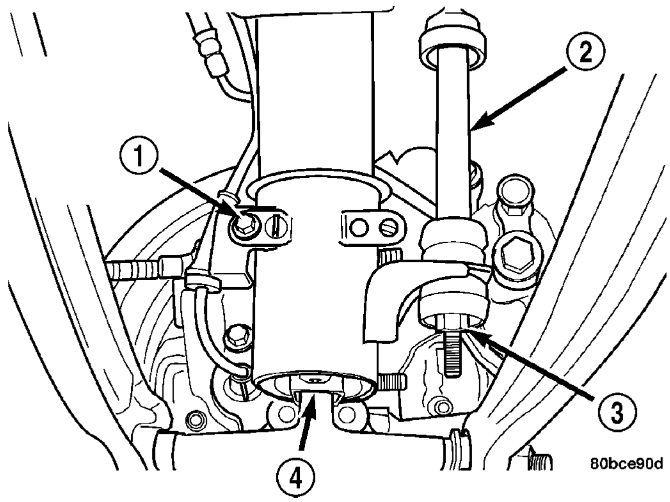


Fig. 3 Rear of Strut Assembly with ABS

1 - ABS WHEEL SPEED SENSOR BRACKET SCREW
2 - STABILIZER BAR LINK
3 - NUT
4 - STRUT ASSEMBLY

• Hang the caliper out of the way using a wire hanger or cord. Do not support the caliper by letting it hang by the hydraulic hose.

• Remove any retainer clips from the wheel mounting studs, then pull the brake rotor off the hub and bearing.

(7) Remove the dust cap from the hub and bearing assembly (Fig. 4).

(8) Remove the retaining nut, then the hub and bearing from the knuckle's spindle (Fig. 4).

(9) If vehicle is equipped with rear drum brakes, remove the four bolts attaching the rear brake support plate to the knuckle (Fig. 5). Next, remove the brake support plate, brake shoes and wheel cylinder as an assembly from the rear knuckle, then hang it out of the way using a wire hanger or cord. Do not overextend the brake hose when being hung. It is not necessary to remove the brake hose from the wheel cylinder when removing the support plate.

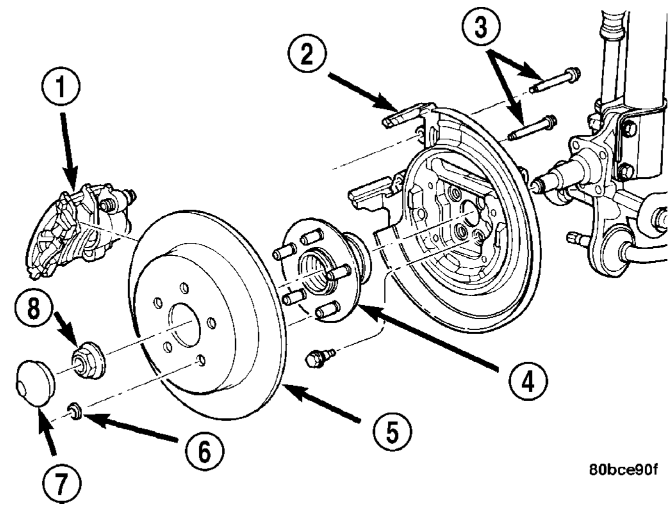


Fig. 4 Rear Disc Brakes

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

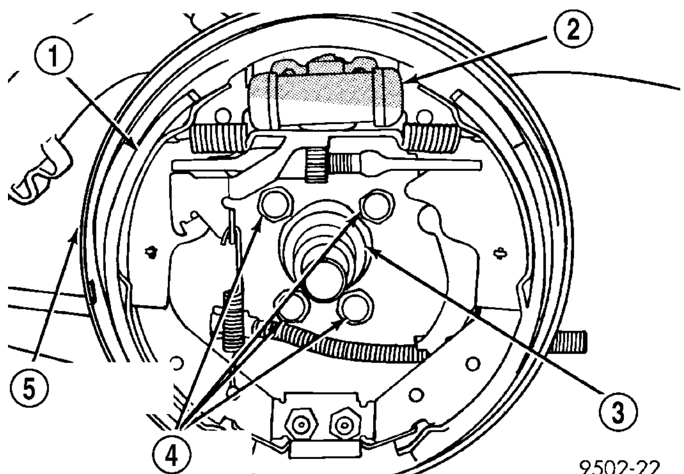


Fig. 5 Support Plate

1 - BRAKE SHOES
2 - WHEEL CYLINDER
3 - KNUCKLE
4 - BRAKE SUPPORT PLATE MOUNTING BOLTS
5 - BRAKE SUPPORT PLATE

(10) If the vehicle is equipped with rear disc brakes, remove the four bolts mounting the disc brake adapter to the rear knuckle (Fig. 6). Next,

KNUCKLE (Continued)

remove the adapter, rotor shield, parking brake shoes and parking brake cable as an assembly from the knuckle, then hang it out of the way using a wire hanger or cord.

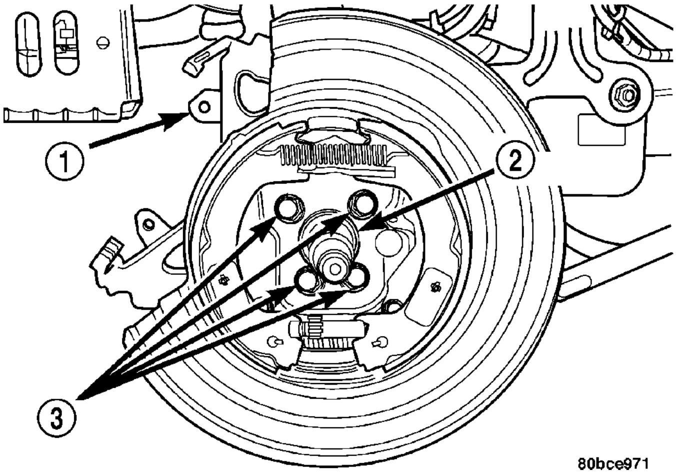


Fig. 6 Disc Brake Adapter Mounting

1 - DISC BRAKE ADAPTER
2 - KNUCKLE
3 - MOUNTING BOLTS

CAUTION: The strut-to-knuckle attaching bolts are serrated and must not be turned during removal. Hold the bolts stationary in the steering knuckle while removing the nuts, then tap the bolts out using a pin punch.

(11) Loosen , but do not completely remove the two nuts and bolts attaching the rear knuckle to the strut (Fig. 7).

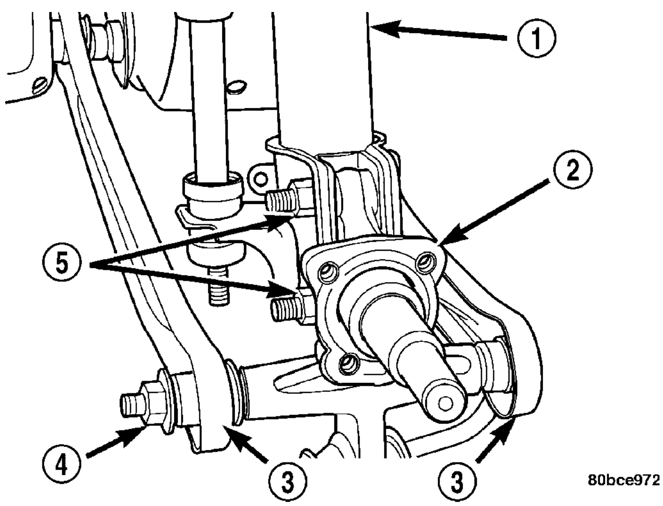


Fig. 7 Rear Knuckle Mounting

1 - STRUT ASSEMBLY
2 - KNUCKLE
3 - LATERAL ARMS
4 - NUT
5 - NUTS

(12) Remove the nuts and bolt attaching the rear knuckle to the lateral arms (Fig. 7).

(13) Disconnect the tension strut from the knuckle. To do this, first hold the tension strut from turning by using a wrench on the flat on the tension strut and then remove the nut from the rear of the tension strut (Fig. 8). Next, remove the tension strut retainer, then the rear tension strut bayonet bushing from the tension strut.

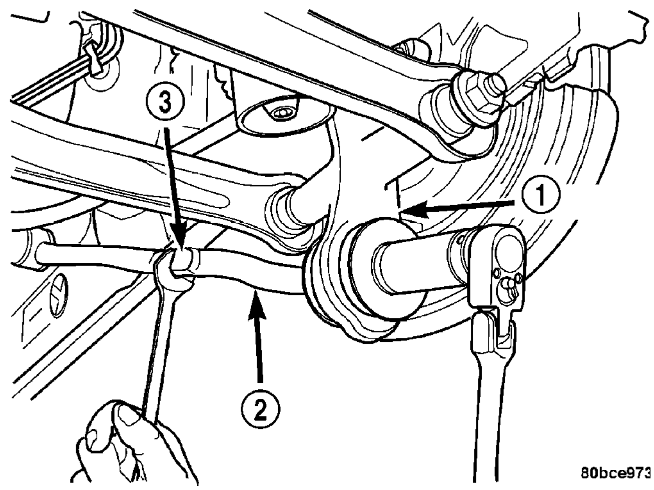


Fig. 8 Tension Strut Nut Removal/Installation

1 - KNUCKLE
2 - TENSION STRUT
3 - FLAT

(14) Remove the two nuts and bolts attaching the rear knuckle to the strut (Fig. 7). Tap the bolts from the knuckle using a pin punch.

(15) Remove the knuckle.

INSTALLATION - KNUCKLE (REAR)

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) To install the knuckle on the vehicle, first align the hole in the lower end of the rear knuckle with the forward bayonet bushing on the tension strut. Be sure the stepped area of the bushing is squarely seated into the hole in the knuckle. Next, Rotate the knuckle until the upper mounting holes in the knuckle is aligned with the holes in the strut's clevis bracket.

CAUTION: The strut-to-knuckle attaching bolts are serrated and must not be turned during installation. Once installed, hold the bolts stationary in the steering knuckle while installing and tightening the nuts.

(2) Install the two bolts attaching the strut to the rear knuckle from the front side. Install the nuts on

KNUCKLE (Continued)

the bolts (Fig. 7). Tighten the two nuts to a torque of 88 N·m (65 ft. lbs.).

(3) Align the lateral arms with the hole in the center of the knuckle. Install the bolt attaching the arms to the knuckle. When installing the bolt, start it from the front side. Install the nut, but do not completely tighten it at this time. The nut will need to be tightened when the vehicle is at curb height.

(4) Install the rear bayonet bushing on the tension strut. Be sure the stepped area of the bushing is squarely seated into the hole in the knuckle.

(5) Install the rear tension strut retainer, then the nut. To completely install the nut, place a wrench on the flat formed into the tension strut and tighten the nut (Fig. 8). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

(6) If vehicle is equipped with rear drum brakes, install the brake support plate on the knuckle and attach it using it's four mounting bolts (Fig. 5). Tighten the mounting bolts to a torque of 75 N·m (55 ft. lbs.).

(7) If the vehicle is equipped with rear disc brakes, install the disc brake adapter on the knuckle and attach it using it's four mounting bolts (Fig. 6). Tighten the mounting bolts to a torque of 75 N·m (55 ft. lbs.).

(8) Install the hub and bearing on the knuckle's spindle, then install a new retaining nut (Fig. 4). Do not reuse the original nut. Tighten the nut to a torque of 217 N·m (160 ft. lbs.).

(9) Install the dust cap on the end of the hub and bearing (Fig. 4).

(10) If the vehicle is equipped with rear disc brakes (Fig. 4), install the brake rotor and disc brake caliper on the knuckle. Install the two guide pin bolts securing the front disc brake caliper to the steering knuckle. Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(11) If the vehicle is equipped with rear drum brakes, install the screw securing the brake hose bracket to the rear of the strut assembly (Fig. 2). Tighten the screw to a torque of 31 N·m (275 in. lbs.).

(12) If the vehicle is equipped with the antilock brake system (ABS), install the screw securing the ABS wheel speed sensor bracket to the rear of the strut assembly (Fig. 3). Tighten the mounting screw to a torque of 13 N·m (120 in. lbs.).

(13) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence, this time, to full specified torque of 135 N·m (100 ft. lbs.).

(14) Lower the vehicle to ground level.

(15) Tighten the lateral arm-to-knuckle mounting bolt nut to a torque of 95 N·m (70 ft. lbs.).

(16) Set the rear toe on the vehicle to specification if necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

LATERAL ARMS

DESCRIPTION

The lateral arms control the lateral movement of the rear suspension, specifically the knuckle (Fig. 1). There are two lateral arms per side of the rear suspension. One arm is attached to the front end of the knuckle and the other is attached to the rear of the knuckle. The other end of each lateral arm attaches to the rear crossmember.

Visually it appears that the left rear arm is mounted backwards in relation to the other arms (Fig. 9). Although the left rear arm looks like it is same as the right rear arm, just reversed, it is not the same; the arms are not interchangeable.

The front arms are interchangeable, but should be mounted with the side displaying the word "FORWARD" stamped into it toward the front of the vehicle. The trimmed outer edge of the arms will then be facing the rear of the vehicle.

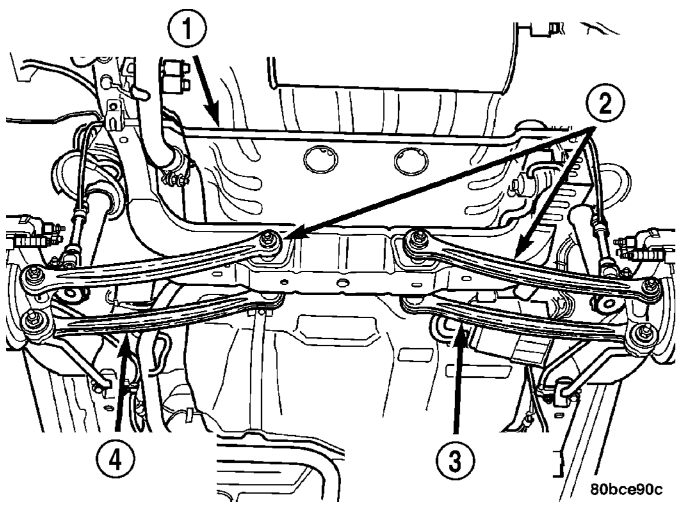


Fig. 9 Lateral Arms

1 - REAR STABILIZER BAR
2 - REAR LATERAL ARMS
3 - RIGHT FRONT LATERAL ARM
4 - LEFT FRONT LATERAL ARM

The lateral arms are made of stamped steel and have rubber isolator bushings at each end. The lateral arms are attached to the rear crossmember and knuckle using a unique bolt and nut assembly at each end. The lateral arm-to-rear crossmember attaching bolts are longer than the lateral arm-to-knuckle attaching bolts. Each lateral arm to knuckle attaching bolt and nut assembly uses two flat washers. Each lateral arm to rear crossmember attaching

LATERAL ARMS (Continued)

bolt uses one flat washer and one adjustment cam to provide a means for rear wheel alignment toe adjustment.

DIAGNOSIS AND TESTING - LATERAL ARMS

Inspect each lateral arm (Fig. 1). Look for signs of contact with an object that has caused damage to the lateral arm. If the lateral arm is bent or damaged, the lateral arm will require replacement. Do not attempt to repair or straighten a lateral arm.

Inspect the lateral arm isolator bushings and their sleeves for signs of damage or deterioration. If damage or deterioration is present, replacement of the entire lateral arm will be required. The isolator bushings cannot be serviced separately from the lateral arms.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

Use the following procedure for removal of one or both lateral arms on one side of the vehicle's rear suspension.

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Remove the nut, bolt and washers attaching both lateral arms to the knuckle (Fig. 1).

(4) Remove nut, washer, bolt and wheel alignment cam attaching the lateral arms to the rear crossmember (Fig. 1).

(5) Remove the lateral arms from vehicle.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

Use the following procedure for installation of one or both lateral arms on one side of the vehicle's rear suspension.

NOTE:
Both lateral arms when being installed, must be specifically positioned and orientated on the vehicle. The lateral arm that has the same size bushing sleeves on both ends must be mounted on the forward side of the crossmember and knuckle with the trimmed outer edge facing rearward. This front arm is also marked with the word "FORWARD." The side of the arm displaying this must face forward.
The lateral arm with two different size bushing sleeves must be mounted on the rearward side of the crossmember and knuckle. Position the smaller bushing sleeve end at the knuckle and the larger bushing sleeve end at the rear crossmember (the larger bushing sleeve is necessary to accommodate the rear wheel alignment adjustment cam). If the rear arm is to be mounted on the right side, the trimmed outer edge must face rearward. If the rear arm is to be mounted on the left side, the trimmed outer edge must face forward.

(1) Following the note above, place the forward lateral arm against the leading end of the knuckle, and then install the short lateral arm mounting bolt with a washer through the lateral arm and knuckle and out the trailing end of the knuckle (Fig. 1).

(2) Following the note above, install the small bushing sleeved end of the rear lateral arm onto the end of the bolt just installed through the knuckle (Fig. 1). Install a washer and nut onto the end of the mounting bolt, but do not completely tighten the bolt at this time.

(3) Install a wheel alignment adjustment cam on the long arm mounting bolt.

(4) Hold the rear lateral arm up against the crossmember and install the long mounting bolt with the adjustment cam through the lateral arm bushing and rear crossmember (Fig. 1). The bolt must be installed with the notch in the adjustment cam pointing straight up.

(5) Position the forward lateral arm against the rear crossmember hole. Pass the long mounting bolt through the lateral arm bushing sleeve.

(6) Install a washer and nut onto the end of lateral arm mounting bolt at the rear crossmember, but do not completely tighten the bolt at this time.

NOTE: Once installed, each lateral arm should have the bow in its length facing downward. Both right side arms should have the trimmed outer edge facing toward the rear of the car. Left side arms should have the trimmed outer edge facing each other. The mounting bolt at the knuckle should have the nut at the rear and the mounting bolt at the crossmember should have the nut at the front (Fig. 10).

(7) Install tire and wheel assembly on the vehicle (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence to the full specified torque of 135 N·m (100 ft. lbs.).

(8) Lower the vehicle to the ground.

(9) With suspension at curb height, tighten the lateral arm mounting bolt nut at the knuckle to 95 N·m (70 ft. lbs.).

(10) With suspension at curb height, tighten the lateral arm mounting bolt nut at the crossmember to 88 N·m (65 ft. lbs.).

LATERAL ARMS (Continued)

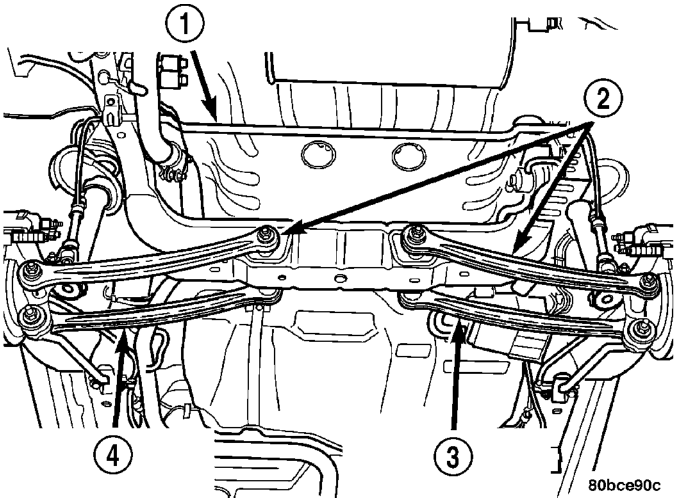


Fig. 10 Lateral Arms

1 - REAR STABILIZER BAR
2 - REAR LATERAL ARMS
3 - RIGHT FRONT LATERAL ARM
4 - LEFT FRONT LATERAL ARM

(11) Set the rear toe on the vehicle to specification as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

STABILIZER BAR

DESCRIPTION

Some versions of this vehicle are equipped with a rear stabilizer bar. The stabilizer bar interconnects both rear strut assemblies and is attached to the rear frame rails of the vehicle (Fig. 11).

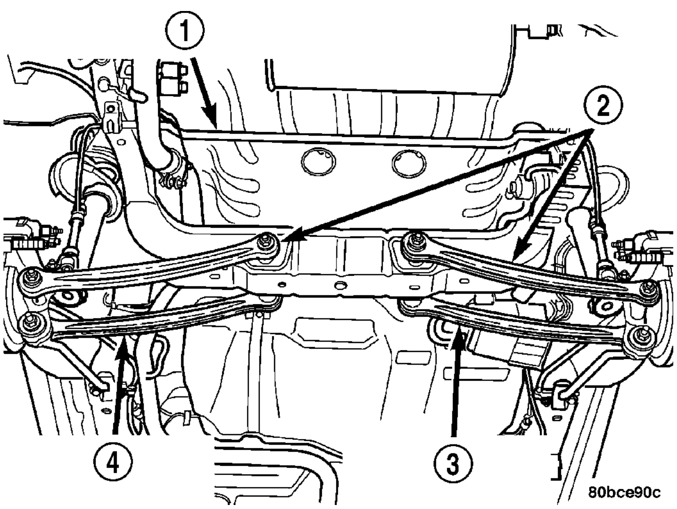


Fig. 11 Rear Stabilizer Bar

1 - REAR STABILIZER BAR
2 - REAR LATERAL ARMS
3 - RIGHT FRONT LATERAL ARM
4 - LEFT FRONT LATERAL ARM

The rear stabilizer bar allows jounce and rebound movements affecting one wheel to be partially transmitted to the opposite wheel of the vehicle to stabilize body roll.

Attachment of the stabilizer bar to the rear frame rails of the vehicle is through two rubber-isolator cushions and retainers (Fig. 1). The stabilizer bar attachment to each strut assembly is done utilizing a rubber isolated stabilizer bar link. All parts of the stabilizer bar are serviceable, and the stabilizer bar to frame rail isolator cushions are split for easy removal and installation.

DIAGNOSIS AND TESTING - STABILIZER BAR (REAR)

Inspect the stabilizer bar (Fig. 1). Look for damage or bending. If damage is evident, the bar must be replaced.

Inspect for broken, cracked or distorted stabilizer bar cushions and cushion retainers. The horizontal slit at the front of each cushion is supposed to be there. If damage is evident, the cushions can be replaced separately from the stabilizer bar utilizing the horizontal slit.

Inspect the stabilizer bar links that attach the stabilizer bar to each rear strut. Look for damage or deterioration of the bushings on the ends of each link. Inspect the stabilizer bar link to ensure it is not bent or broken. If any of these conditions are present, the stabilizer bar link must be replaced. The links can be replaced separately from the stabilizer bar.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove both rear wheel and tire assemblies from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Remove the nut from the end of each rear stabilizer bar link bolt (Fig. 12). Pull the bolt out through the top of the link and remove the link from each end of the stabilizer bar.

(4) Remove the two bolts securing each of the two cushion retainers to the frame rails (Fig. 1), then remove the cushion retainers, cushions and stabilizer bar from the vehicle as an assembly.

(5) Pull the cushion retainers off the cushions.

(6) The cushions can be removed from the bar by utilizing the pre-formed slit in each cushion and peeling it off the bar.

STABILIZER BAR (Continued)

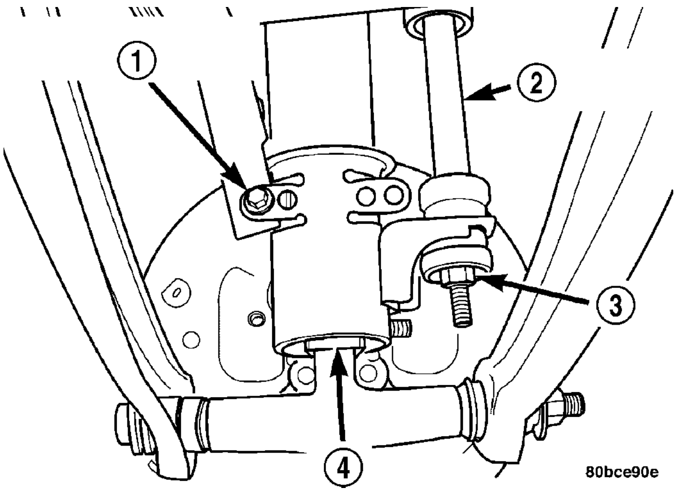


Fig. 12 Stabilizer Bar Link

1 - BRAKE HOSE BRACKET SCREW
2 - STABILIZER BAR LINK
3 - NUT
4 - STRUT ASSEMBLY

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Install the cushions on the stabilizer bar by opening the slit in the cushion and wrapping the cushion around the bar. When installed properly, the slit in the cushion should face in the same direction as the ends of the stabilizer bar, or toward the front of the car once the bar is installed. The flat side of each cushion should face upward.

(2) Install the retainers on the cushions, matching the contour of each retainer with its cushion.

(3) Install the stabilizer bar, cushions and retainers on the car as an assembly. The dipped area in the center of the bar must face down to clear the well in the luggage compartment.

(4) Install two bolts in each cushion retainer and secure the stabilizer bar to the frame of the vehicle (Fig. 1). Do not completely install the bolts at this time.

(5) Reinstall each stabilizer bar link (Fig. 1):

(a) Place the link center sleeve and bushings between the eye in the end of the stabilizer bar and the link mounting bracket on the strut.

(b) Start the stabilizer bar link bolt with bushing from the top, down through the stabilizer bar, inner link bushings and sleeve, and strut link mounting bracket.

(c) Install a lower bushing, then the nut. Do not tighten the nut at this time.

(6) Install both tire and wheel assemblies on the vehicle (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence, this time, to full specified torque of 135 N·m (100 ft. lbs.).

(7) Lower the vehicle to ground level or curb height.

(8) Tighten the rear stabilizer bar cushion retainer bolts to a torque of 34 N·m (300 in. lbs.).

(9) Tighten the stabilizer bar link nuts to a torque of 23 N·m (200 in. lbs.).

(10) Set the rear toe on the vehicle to specification if necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

STRUT ASSEMBLY

DESCRIPTION - STRUT ASSEMBLY (REAR)

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

The top of each strut assembly is bolted to the top of the inner fender through a rubber isolated mount. The bottom of the strut assembly attaches to the rear knuckle using 2 thru-bolts with prevailing torque nuts.

The rear strut assembly includes the following components (Fig. 1):

- Strut shaft retaining nut
- Upper mount (rubber isolated)
- Dust shield
- Jounce bumper
- Coil spring
- Lower spring isolator
- Strut (damper)

Any component in need of service requires removal of the strut assembly from the vehicle and disassembly of it.

Rear coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. If a coil spring requires replacement, be sure the spring needing replacement is replaced with a spring meeting the correct load rating for the vehicle with its specific options.

OPERATION - STRUT ASSEMBLY (REAR)

The strut assembly cushions the ride of the vehicle, controlling vibration, jounce and rebound of the suspension.

The coil spring controls ride quality and maintains proper ride height.

The spring isolators isolate the coil spring at the top and bottom from coming into metal-to-metal contact with the upper mounting seat and the strut.

STRUT ASSEMBLY (Continued)

The jounce bumper limits suspension travel and metal-to-metal contact under full jounce condition.

The strut dampens jounce and rebound motions of the coil spring and suspension.

DIAGNOSIS AND TESTING - STRUT ASSEMBLY (REAR)

Inspect the strut assembly for the following conditions (Fig. 13):

- Inspect for a damaged or broken coil spring.
- Inspect for a torn or damaged strut assembly dust shield.
- Lift the dust shield and inspect the strut assembly for evidence of fluid running from the upper end of the strut 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 strut shaft and strut shaft seal is not unusual and does not affect performance of the strut assembly.
- Lift the dust shield and inspect the jounce bumper for signs of damage or deterioration.

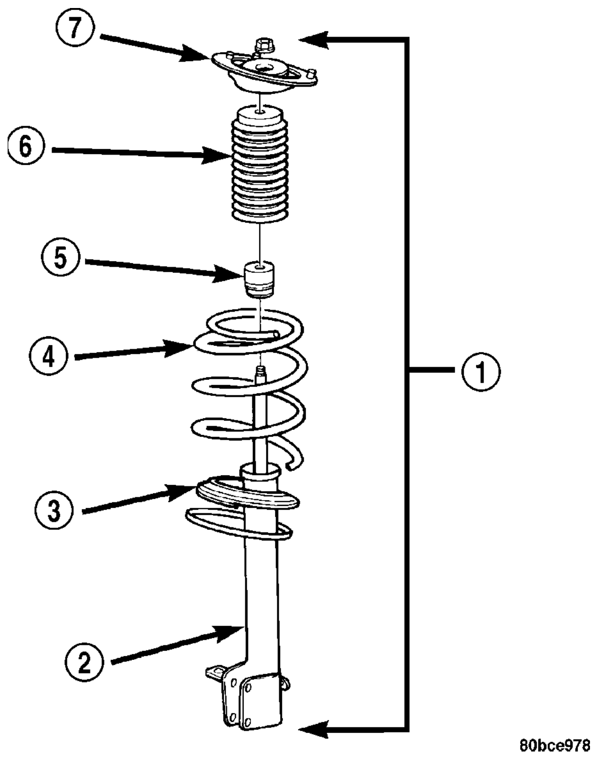


Fig. 13 Strut Assembly

1 - STRUT ASSEMBLY
2 - STRUT
3 - LOWER SPRING ISOLATOR
4 - COIL SPRING
5 - JOUNCE BUMPER
6 - DUST SHIELD
7 - UPPER MOUNT

REMOVAL - STRUT ASSEMBLY (REAR)

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear wheel and tire assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) If the vehicle is equipped with rear drum brakes, remove the screw securing the brake hose bracket to the rear of the strut assembly (Fig. 14).

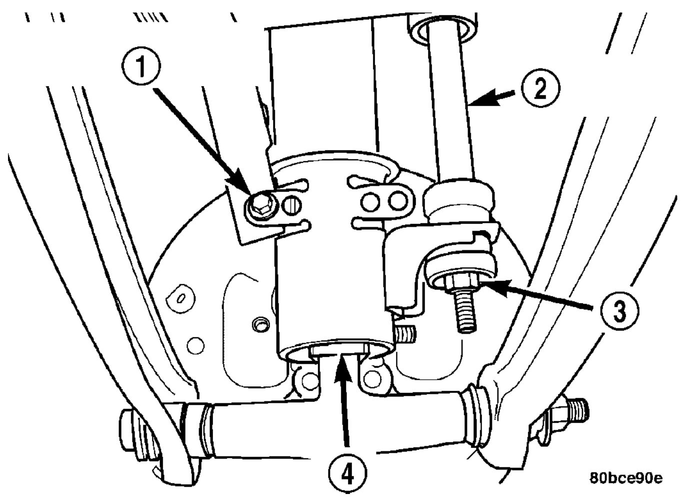


Fig. 14 Rear of Strut Assembly

1 - BRAKE HOSE BRACKET SCREW
2 - STABILIZER BAR LINK
3 - NUT
4 - STRUT ASSEMBLY

(4) If the vehicle is equipped with the antilock brake system (ABS), remove the screw securing the ABS wheel speed sensor bracket to the rear of the strut assembly (Fig. 15).

(5) If equipped with a rear stabilizer bar, remove the nut from the end of the rear stabilizer bar link bolt (Fig. 14). Pull the bolt out through the top of the link and remove the link.

(6) If the vehicle is equipped with rear disc brakes (Fig. 16), perform the following:

- Remove the two guide pin bolts securing the front disc brake caliper to the steering knuckle.
- Remove the disc brake caliper from the knuckle and brake rotor.
- Hang the caliper out of the way using a wire hanger or cord. Do not support the caliper by letting it hang by the hydraulic hose.

STRUT ASSEMBLY (Continued)

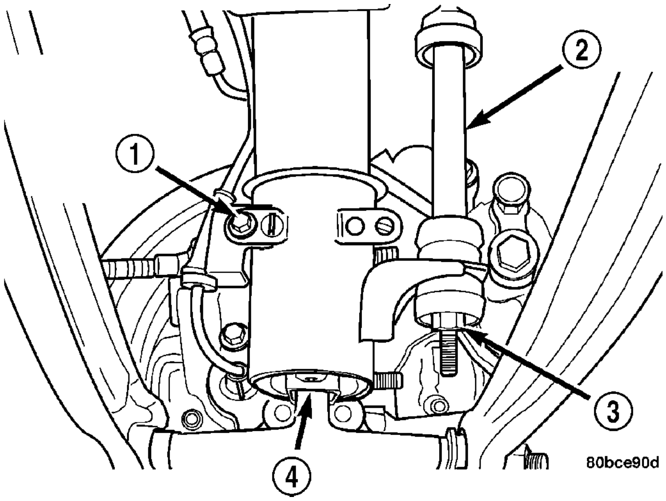


Fig. 15 Rear of Strut Assembly with ABS

1 - ABS WHEEL SPEED SENSOR BRACKET SCREW
2 - STABILIZER BAR LINK
3 - NUT
4 - STRUT ASSEMBLY

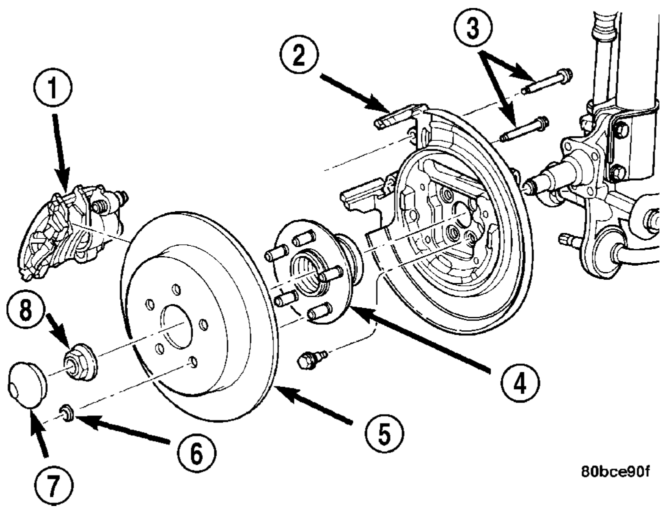


Fig. 16 Rear Disc Brakes

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

CAUTION: The strut-to-knuckle attaching bolts are serrated and must not be turned during removal. Hold the bolts stationary in the steering knuckle while removing the nuts, then tap the bolts out using a pin punch.

(7) Remove the two nuts and bolts attaching the strut to the rear knuckle (Fig. 1).

(8) Lower the vehicle just enough to access the luggage compartment without letting the tires touch the floor. Access to rear upper strut mount attaching bolts is through the luggage compartment.

(9) Open the deck lid.

(10) If equipped, remove the carpet from the top of the strut tower.

(11) Loosen, but do not completely remove the 3 nuts securing the strut assembly to the strut tower (Fig. 17).

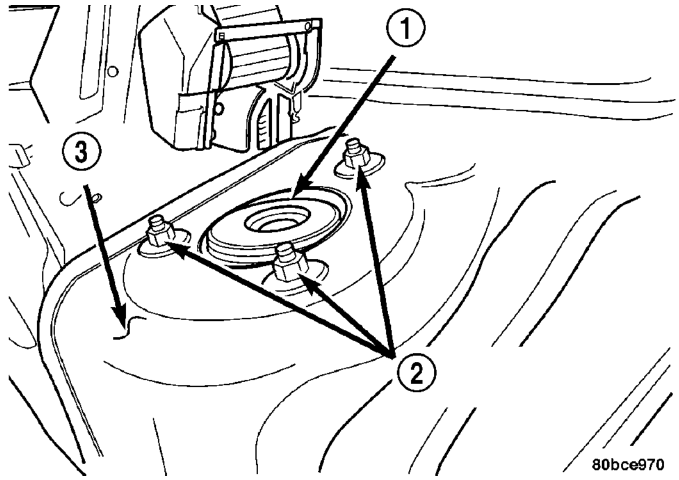


Fig. 17 Mounting At Strut Tower

1 - UPPER MOUNT
2 - MOUNTING NUTS
3 - STRUT TOWER

Grasp the strut assembly to keep it from moving, then remove the 3 mounting nuts at the strut tower.

(12) Remove the strut assembly from the knuckle by sliding it away from the knuckle, lowering it between the two lateral arms, then tipping the top outward and removing it out through the well opening.

(13) For disassembly procedures of the strut assembly, (Refer to 2 - SUSPENSION/REAR/STRUT - DISASSEMBLY).

DISASSEMBLY - STRUT ASSEMBLY (REAR)

The strut assembly must be removed from the vehicle for it to be disassembled and assembled. (Refer to 2 - SUSPENSION/REAR/STRUT - REMOVAL).

For the disassembly and assembly of the strut assembly, use strut spring compressor, Pentastar Service Equipment (PSE) tool W-7200, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

(1) If both struts are being serviced at the same time, mark the coil spring and strut assembly according to which side of the vehicle the strut was removed from, and which strut the coil spring was removed from.

(2) Position the strut assembly in the strut coil spring compressor following the manufacturers

STRUT ASSEMBLY (Continued)

instructions. Set the lower, then upper hooks on the coil spring (Fig. 18). Position the strut clevis bracket straight inward toward the compressor. Place a clamp on the lower end of the coil spring, so the strut is held in place once the strut shaft nut is removed.

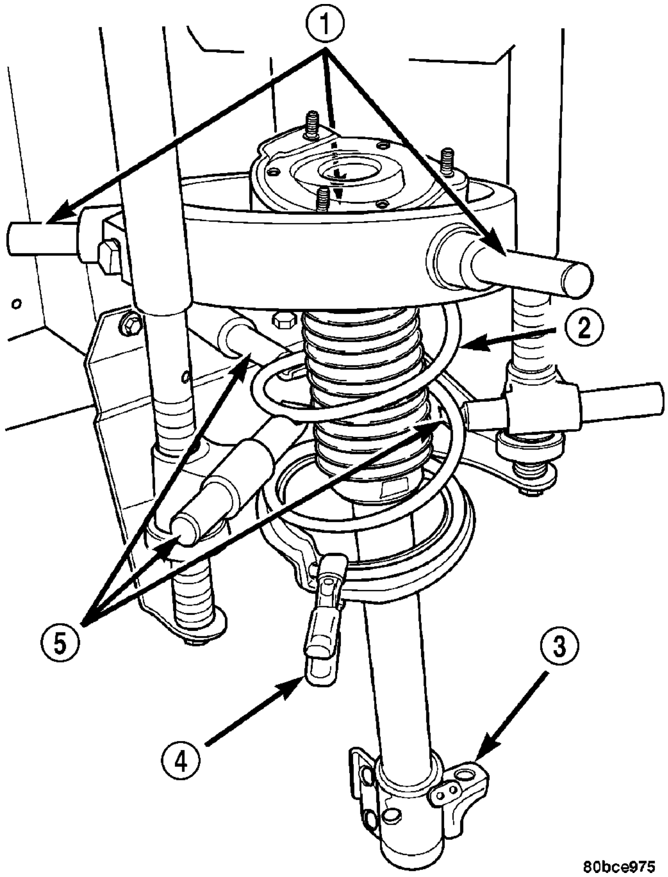


Fig. 18 Strut Assembly In Compressor

1 - UPPER HOOKS
2 - COIL SPRING
3 - CLEVIS BRACKET
4 - CLAMP
5 - LOWER HOOKS

WARNING: DO NOT REMOVE THE STRUT SHAFT NUT BEFORE THE COIL SPRING IS COMPRESSED. THE COIL SPRING IS HELD UNDER PRESSURE AND MUST BE COMPRESSED, REMOVING SPRING TENSION FROM THE UPPER MOUNT AND PIVOT BEARING, BEFORE THE SHAFT NUT IS REMOVED.

(3) Compress the coil spring until all coil spring tension is removed from the upper mount.

(4) Once the spring is sufficiently compressed, install Strut Nut Socket, Special Tool 6864, on the strut shaft retaining nut (Fig. 19). Next, install a socket on the hex on the end of the strut shaft. While holding the strut shaft from turning, remove the nut from the strut shaft.

(5) Remove the upper mount from the strut shaft (Fig. 20).

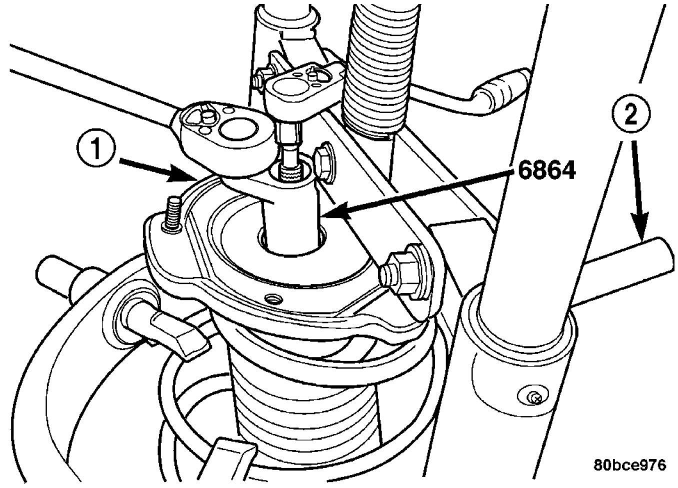


Fig. 19 Shaft Nut Removal/Installation

1 - UPPER MOUNT
2 - FRONT HOOK

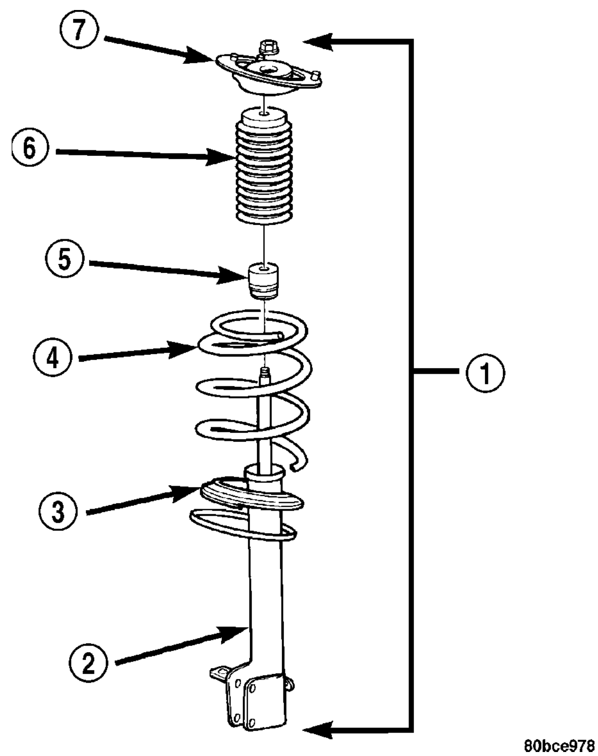


Fig. 20 Strut Assembly Components

1 - STRUT ASSEMBLY
2 - STRUT
3 - LOWER SPRING ISOLATOR
4 - COIL SPRING
5 - JOUNCE BUMPER
6 - DUST SHIELD
7 - UPPER MOUNT

(6) Remove the clamp from the bottom of the coil spring and remove the strut out through the bottom of the coil spring.

STRUT ASSEMBLY (Continued)

(7) Remove the dust shield, then the jounce bumper from the strut shaft by pulling each straight up (Fig. 20).

(8) Remove the lower spring isolator from the lower spring seat located on the strut.

NOTE: If the coil spring needs to be serviced, proceed with the next step, otherwise, proceed with step 10.

NOTE: Before removing the coil spring from the compressor, make not of its position in the compressor, for easy reassembly.

(9) Release the tension from the coil spring by backing off the compressor drive completely. Push back the compressor hooks and remove the coil spring.

(10) Inspect the strut assembly components for the following and replace as necessary:

- Inspect the strut for any condition of shaft binding over the full stroke of the shaft.
- Inspect the jounce bumper for cracks and signs of deterioration.
- Check the upper mount for cracks and distortion and its retaining studs for any sign of damage.
- Inspect the dust shield for rips and deterioration.
- Inspect the upper and lower spring isolators for material deterioration and distortion.
- Inspect the coil spring for any sign of damage to the coating.

ASSEMBLY - STRUT ASSEMBLY (REAR)

The strut assembly must be removed from the vehicle for it to be disassembled and assembled. (Refer to 2 - SUSPENSION/REAR/STRUT - REMOVAL).

For the disassembly and assembly of the strut assembly, use strut spring compressor, Pentastar Service Equipment (PSE) tool W-7200, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

NOTE: If the coil spring has been removed from the spring compressor, proceed with the next step, otherwise, proceed with step 3.

(1) Place the coil spring in the compressor following the manufacturers instructions. Before compressing the spring, rotate the spring to the position determined in the note prior to step 9 in disassembly.

(2) Slowly compress the coil spring until enough room is available for strut assembly reassembly.

(3) Install the lower spring isolator on the lower spring seat of the strut matching the step built into the isolator with the step in the lower spring seat on the strut (Fig. 20).

(4) Install the jounce bumper on the strut shaft. The jounce bumper is to be installed with the pointed end pointing downward toward the lower seat.

(5) Install the dust shield on the strut shaft (Fig. 20). The bottom of the dust shield will snap past the retainer on top of the strut housing.

(6) Install the strut through the bottom of the coil spring until the lower spring seat contacts the lower end of the coil spring. Rotate the strut until the end of the coil spring fits against the step in the lower spring seat (Fig. 18). If done correctly, the clevis on the bottom of the strut should face toward the compressor.

(7) Install the clamp on the lower end of the coil spring and strut, so the strut is held in place with the coil spring.

NOTE: Before installing the upper mount, check to make sure the correct side mount is being installed. Left and right upper mounts are different. A left mount will be marked with the letter "L" while a right mount will be marked with the letter "R" (Fig. 21).

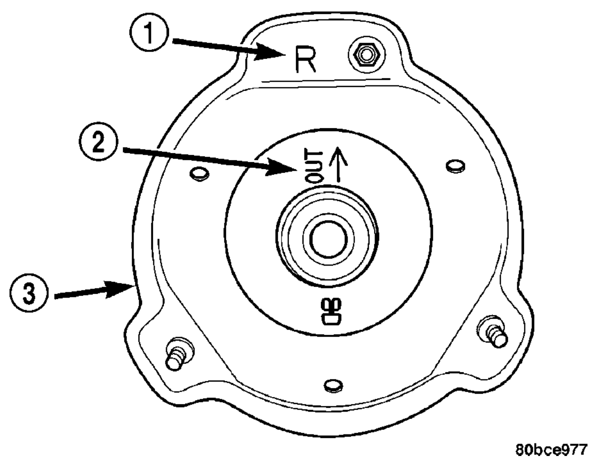


Fig. 21 Upper Mount Markings

1 - SIDE INDICATING LETTER
2 - DIRECTIONAL INDICATOR
3 - UPPER MOUNT

(8) Install the upper mount over the strut shaft and onto the top of the upper spring. Near the center on the top of the mount is the word "OUT" and an arrow (Fig. 21). Point the arrow on the mount in the same direction that the clevis bracket on the lower end of the strut is pointed in. This direction should be straight toward the compressor.

(9) Loosely install the retaining nut on the strut shaft. Install Strut Nut Socket (on the end of a torque wrench), Special Tool 6864, on the strut shaft retaining nut (Fig. 19). Next, install a socket on the hex on the end of the strut shaft. While holding the

STRUT ASSEMBLY (Continued)

strut shaft from turning, tighten the strut shaft retaining nut to a torque of 75 N·m (55 ft. lbs.).

(10) Slowly release the tension from the coil spring by backing off the compressor drive completely. As the tension is relieved, make sure the upper mount's seat aligns properly with the coil spring.

(11) Verify the arrow on the upper mount is pointing in the same direction as the strut clevis bracket as mentioned in step 9.

(12) Remove the clamp from the lower end of the coil spring and strut. Push back the spring compressor upper and lower hooks, then remove the strut assembly from the spring compressor.

(13) Install the strut assembly on the vehicle. (Refer to 2 - SUSPENSION/REAR/STRUT - INSTALLATION).

INSTALLATION - STRUT ASSEMBLY (REAR)

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) To place the strut assembly into mounting position, start the lower end of the strut over the top of the knuckle and down the back between the two lateral arms. Next, lift the top of the strut assembly up into the strut tower aligning the studs on top of the upper mount with the three mounting holes in the strut tower. While holding the strut assembly in place, install the three mounting nuts on the upper mount studs inside the luggage compartment (Fig. 17). Tighten the 3 mounting nuts to a torque of 34 N·m (300 in. lbs).

(2) Install the carpeting back on top of the rear strut tower.

(3) Close the deck lid.

(4) Raise the vehicle (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

CAUTION: The strut-to-knuckle attaching bolts are serrated and must not be turned during installation. Once installed, hold the bolts stationary in the steering knuckle while installing and tightening the nuts.

(5) Align the holes in the strut clevis bracket on the lower end of the strut with the mounting holes in the knuckle. Install the two bolts attaching the strut to the rear knuckle (Fig. 1). Install the nuts. Tighten the two nuts to 88 N·m (65 ft. lbs.).

(6) If the vehicle is equipped with disc brakes (Fig. 16), install the brake rotor and disc brake caliper on the knuckle. Install the two guide pin bolts securing the front disc brake caliper to the steering knuckle. Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(7) If equipped with a rear stabilizer bar, reinstall the stabilizer bar link (Fig. 1):

(a) Place the link center sleeve and bushings between the eye in the end of the stabilizer bar and the link mounting bracket on the strut.

(b) Start the stabilizer bar link bolt with bushing from the top, down through the stabilizer bar, inner link bushings and sleeve, and strut link mounting bracket.

(c) Install a lower bushing, then the nut. Do not tighten the nut at this time.

(8) If the vehicle is equipped with the antilock brake system (ABS), install the screw securing the ABS wheel speed sensor bracket to the rear of the strut assembly (Fig. 15). Tighten the mounting screw to a torque of 13 N·m (120 in. lbs.).

(9) If the vehicle is equipped with rear drum brakes, install the screw securing the brake hose bracket to the rear of the strut assembly (Fig. 14). Tighten the screw to a torque of 31 N·m (275 in. lbs.).

(10) Install the tire and wheel assembly on vehicle (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence, this time, to full specified torque of 135 N·m (100 ft. lbs.).

(11) Lower the vehicle to ground level.

(12) Tighten the stabilizer bar link nut to a torque of 23 N·m (200 in. lbs.).

(13) Set the rear toe on the vehicle to the required specification if necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

TENSION STRUT

DESCRIPTION

The tension strut controls the fore-and-aft movement of the rear knuckle (Fig. 1).

There is one tension strut per side of the rear suspension. The leading end of the tension strut attaches to the frame rail while the trailing end of the strut attaches to the lower end of the rear knuckle. The tension strut is isolated from the rest of the rear suspension through the use of rubber bushings located at each end. The rear bushings (bayonet type) can be serviced separately, the front bushings (spool type) cannot.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

TENSION STRUT (Continued)

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the rear wheel and tire assembly from the vehicle. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Disconnect the tension strut from the knuckle. To do this, first hold the tension strut from turning by using a wrench on the flat on the tension strut and then remove the nut from the rear of the tension strut (Fig. 22). Next, remove the tension strut retainer, then the rear tension strut bayonet bushing from the tension strut.

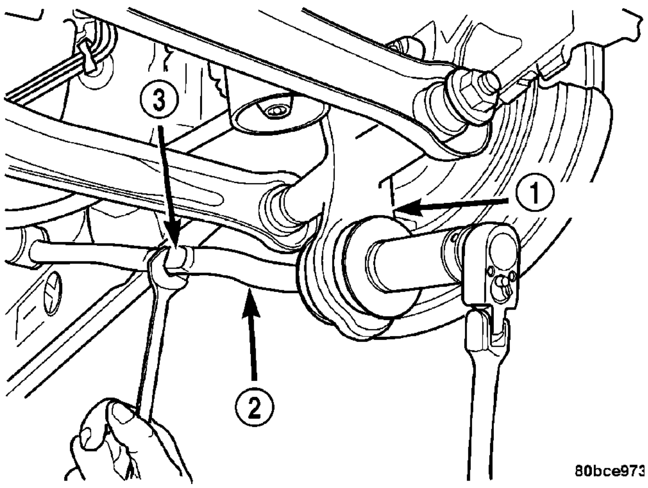


Fig. 22 Tension Strut Nut Removal/Installation

1 - KNUCKLE
2 - TENSION STRUT
3 - FLAT

(4) Remove the nuts attaching the parking brake cable bracket to the studs on the tension strut mounting bolt at the frame. Remove the parking brake cable from the studs.

(5) Remove the two mounting bolts holding the tension bolts to the frame, then remove the tension strut from the vehicle.

(6) Remove the forward bayonet bushing and retainer from the tension strut.

INSPECTION

Inspect the tension strut (Fig. 1). Look for signs of contact with any object that has bent or caused other damage to the tension strut. If the tension strut is bent or damaged, the tension strut will require replacement. Do not attempt to repair or straighten a tension strut.

Inspect the tension strut front (spool type) bushing, and rear (bayonet type) bushings and retainers for signs of deterioration or damage. If the front bushing is damaged or shows signs of deterioration, the tension strut must be replaced. The front bushing cannot be replaced separately. If the rear bushings are deteriorated or damaged, or the retainers are damaged, replacement is necessary. The bushings and retainers can be replaced separately from the tension strut.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 2 - SUSPENSION/REAR - WARNING).

(1) Install the forward retainer and a bayonet bushing on the tension strut trailing end. Be sure the stepped area of the bushing is installed to face the knuckle.

(2) To install the knuckle on the tension, first stick the trailing end through the hole in the lower end of the knuckle, seating the bayonet bushing squarely against the hole. Next, raise the end of the tension strut with the spool bushing into its mounting position on the frame. Install the mounting bolts securing the tension strut to the frame.

(3) Tighten the two mounting bolts at the frame to a torque of 95 N·m (70 ft. lbs.).

(4) Place the parking brake cable routing bracket on the studs of the tension strut mounting bolts and install the nuts securing it in place. Tighten the nuts to a torque of 28 N·m (250 in. lbs.).

(5) Install the rear bayonet bushing on the tension strut. Be sure the stepped area of the bushing is squarely seated into the hole in the knuckle.

(6) Install the rear tension strut retainer, then the nut. To completely install the nut, place a wrench on the flat formed into the tension strut and tighten the nut (Fig. 22). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

(7) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts in proper sequence until all nuts are torqued to half specification. Repeat the tightening sequence, this time, to full specified torque of 135 N·m (100 ft. lbs.).

(8) Lower the vehicle to ground level.

(9) Set the rear toe on the vehicle to specification as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

WHEEL ALIGNMENT

TABLE OF CONTENTS

WHEEL ALIGNMENT

DESCRIPTION - WHEEL ALIGNMENT

Vehicle wheel alignment is the positioning of all interrelated front and rear suspension angles. These angles affect the handling and steering of the vehicle when it is in motion. Proper wheel alignment is essential for efficient steering, good directional stability, and proper tire wear.

The method of checking a vehicle's front and rear wheel alignment varies depending on the manufacturer and type of equipment used. The manufacturer's instructions should always be followed to ensure accuracy of the alignment, except when DaimlerChrysler Corporation's wheel alignment specifications differ.

On this vehicle, the suspension angles that can be adjusted are as follows:

Front

• Camber (when proper alignment package is used)
• Toe

Rear

• Camber (when proper alignment package is used)
• Toe

Check the wheel alignment and make all wheel alignment adjustments with the vehicle standing at its proper curb height specification. Curb height is the normal riding height of the vehicle. It is measured from a certain point on the vehicle to the ground or a designated area while the vehicle is sitting on a flat, level surface. Refer to Curb Height Measurement in this section for additional information.

Typical wheel alignment angles and measurements are described in the following paragraphs.

CAMBER

Camber is the inward or outward tilt of the top of the tire and wheel assembly (Fig. 1). Camber is measured in degrees of angle relative to a true vertical line. Camber is a tire wearing angle.

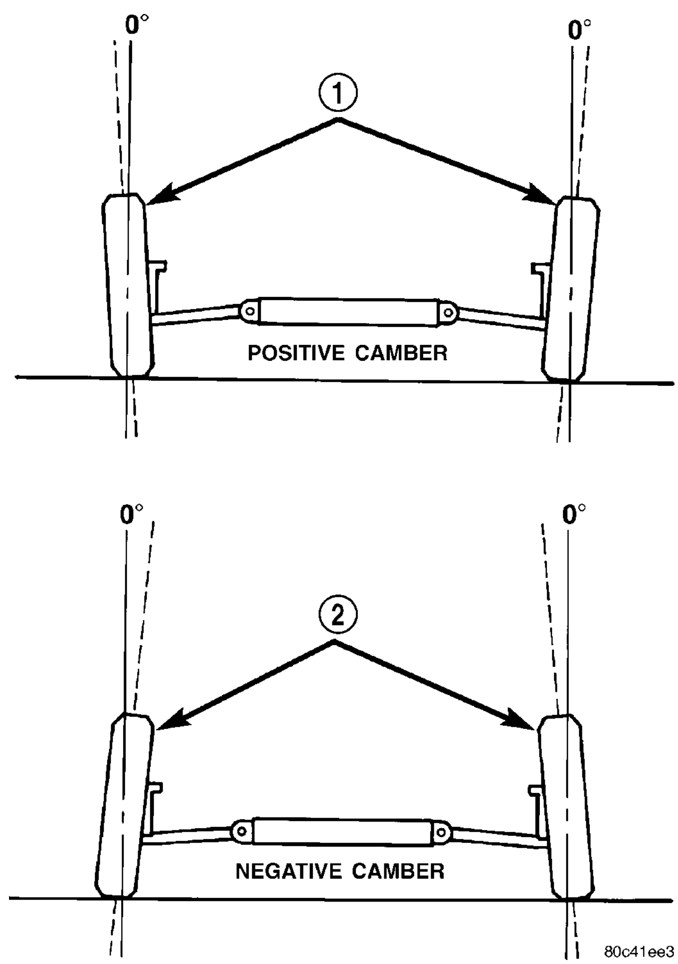


Fig. 1 Camber

1 - WHEELS TILTED OUT AT TOP
2 - WHEELS TILTED IN AT TOP

WHEEL ALIGNMENT (Continued)

- Excessive negative camber will cause tread wear at the inside of the tire.
- Excessive positive camber will cause tread wear on the outside of the tire.

CROSS CAMBER

Cross camber is the difference between left and right camber. To achieve the cross camber reading, subtract the right side camber reading from the left. For example, if the left camber is +0.3° and the right camber is 0.0°, the cross camber would be +0.3°.

CASTER

Caster is the forward or rearward tilt of the steering knuckle in reference to the position of the upper and lower ball joints. Caster is measured in degrees of angle relative to a true vertical center line. This line is viewed from the side of the tire and wheel assembly (Fig. 2).

- Forward tilt (upper ball joint ahead of lower) results in a negative caster angle.
- Rearward tilt (upper ball joint trailing lower) results in a positive caster angle.

Although caster does not affect tire wear, a caster imbalance between the two front wheels may cause the vehicle to lead to the side with the least positive caster.

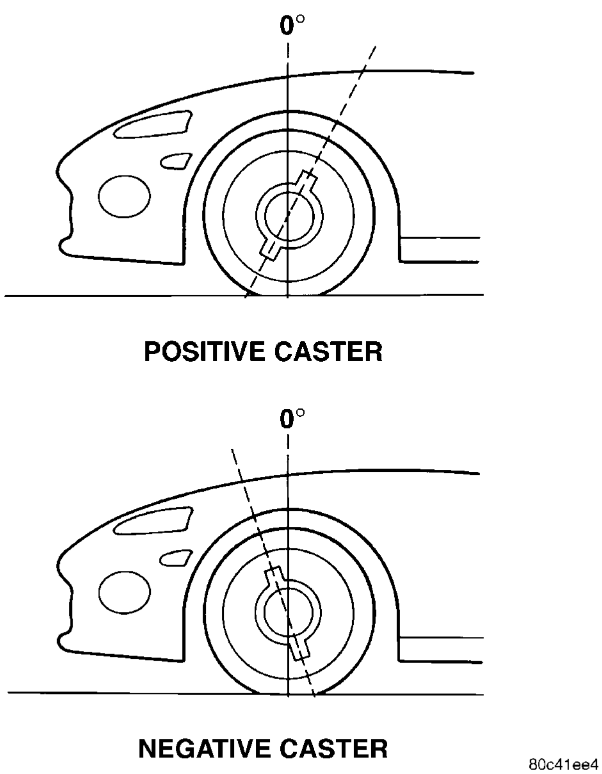


Fig. 2 Caster

CROSS CASTER

Cross caster is the difference between left and right caster.

TOE

Toe is the inward or outward angle of the wheels as viewed from above the vehicle (Fig. 3).

- Toe-in is produced when the front edges of the wheels on the same axle are closer together than the rear edges.
- Toe-out is produced when the front edges of the wheels on the same axle are farther apart than the rear edges.

Toe-in and toe-out can occur at the front wheels and the rear wheels.

Toe is measured in degrees or inches. The measurement identifies the amount that the front of the wheels point inward (toe-in) or outward (toe-out). Toe is measured at the spindle height. Zero toe means the front and rear edges of the wheels on the same axle are equally distant.

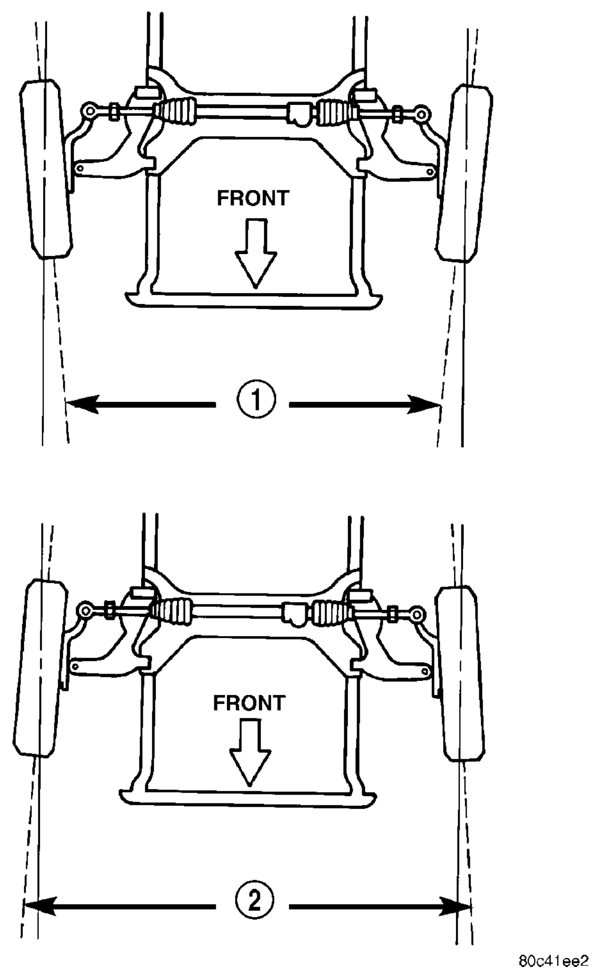


Fig. 3 Toe

1 - TOE-IN
2 - TOE-OUT

WHEEL ALIGNMENT (Continued)

TOE-OUT ON TURNS

Toe-out on turns is the relative positioning of the front wheels while steering through a turn (Fig. 4). This compensates for each front wheel's turning radius. As the vehicle encounters a turn, the outboard wheel must travel in a larger radius circle than the inboard wheel. The steering system is designed to make each wheel follow its particular radius circle. To accomplish this, the front wheels must progressively toe outward as the steering is turned from center. This eliminates tire scrubbing and undue tire wear when steering a vehicle through a turn.

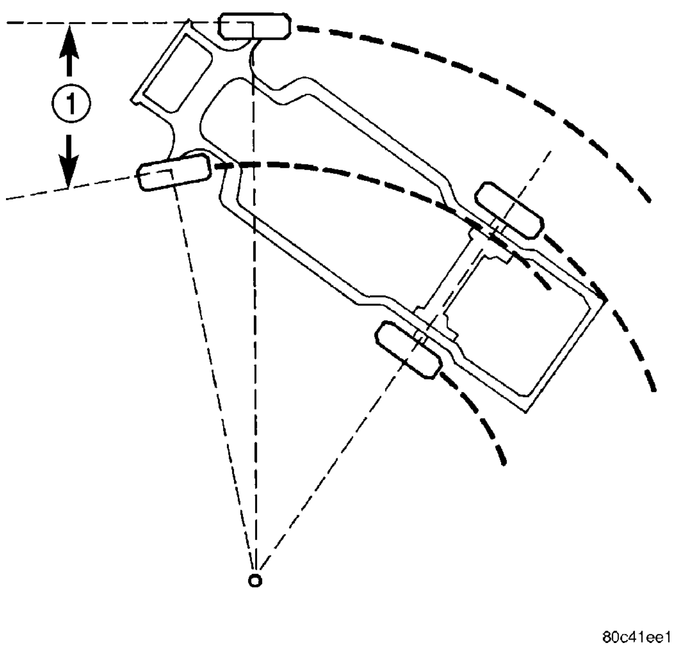


Fig. 4 Toe-Out On Turns

1 - TOE-OUT ON TURNS

DYNAMIC TOE PATTERN

Dynamic toe pattern is the inward and outward toe movement of the front and rear tires through the suspension's jounce and rebound travel. As the vehicle's suspension moves up and down, the toe pattern varies. Toe pattern is critical in controlling the directional stability of the vehicle while in motion. Front and rear dynamic toe pattern is preset by the factory at the time the vehicle is assembled.

It is not necessary to check or adjust front or rear dynamic toe pattern when doing a normal wheel alignment. The only time dynamic toe pattern needs to be checked or adjusted is if the frame of the vehicle has been damaged.

STEERING AXIS INCLINATION (S. A. I.)

Steering axis inclination is the angle between a true vertical line starting at the center of the tire at the road contact point and a line drawn through the center of the upper ball joint (or strut) and the lower ball joint (Fig. 5). S.A.I. is built into the vehicle and is not an adjustable angle. If S.A.I. is not within specifications, a bent or damaged suspension component may be the cause.

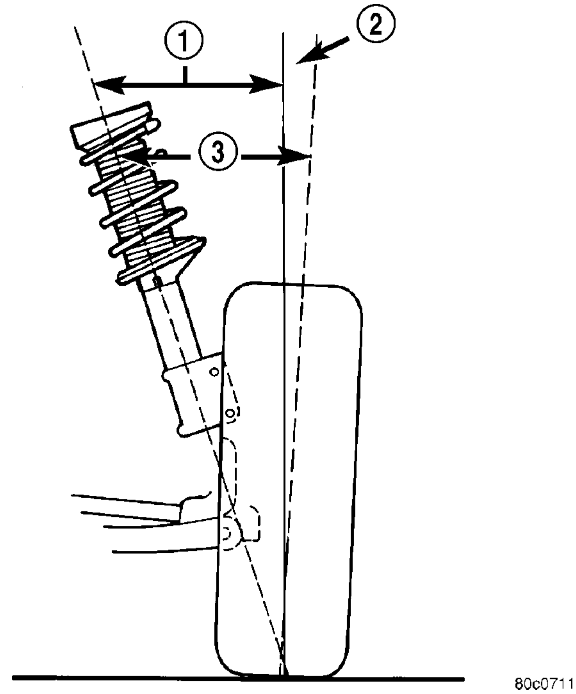


Fig. 5 S.A.I. and I.A.

1 - S.A.I.
2 - CAMBER
3 - I.A.

INCLUDED ANGLE (I. A.)

Included angle is the sum of the S.A.I. angle plus or minus the camber angle, depending on whether or not the wheel has positive or negative camber (Fig. 5). If camber is positive, add the camber angle to the S.A.I. angle. If camber is negative, subtract the camber angle from the S.A.I. angle. Included angle is not adjustable, but can be used to diagnose a frame misalignment or bent suspension component (spindle, strut).

WHEEL ALIGNMENT (Continued)

THRUST ANGLE

Thrust angle is the averaged direction the rear wheels are pointing in relation to the vehicle's center line (Fig. 6). The presence of negative or positive thrust angle causes the rear tires to track improperly to the left or right of the front tires (dog tracking).

• Negative thrust angle means the rear tires are tracking to the left of the front tires.

• Positive thrust angle means the rear tires are tracking to the right of the front tires.

Improper tracking can cause undue tire wear, a lead or pull and a crooked steering wheel. Excessive thrust angle can usually be corrected by adjusting the rear wheel toe so that each wheel has one-half of the total toe measurement.

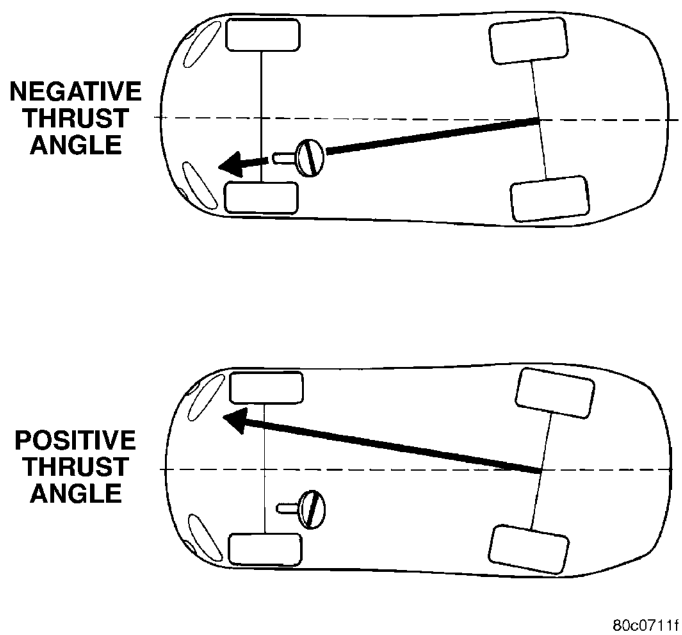


Fig. 6 Thrust Angle

DIAGNOSIS AND TESTING - SUSPENSION AND STEERING

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

WHEEL ALIGNMENT (Continued)

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
Front End Whine With Vehicle Going Straight At A Constant Speed	1. Defective Wheel Bearing	1. Replace Wheel Bearing
	2. Incorrect Wheel Alignment	2. Check And Reset Wheel Alignment
	3. Worn Tires	3. Replace Tires
Front End Growl Or Grinding With Vehicle Going Straight At A Constant Speed	1. Engine Mount Grounding	1. Reposition Engine As Required
	2. Worn Or Broken C/V Joint	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	1. Replace Engine Mount
	2. Worn Or Defective Transaxle Gears Or Bearings	2. Replace Transaxle Gears Or Bearings
	3. Loose Wheel Lug Nuts	3. Verify Wheel Lug Nut Torque
	4. Worn Or Broken C/V Joint	4. Replace C/V Joint
	5. Worn Or Loose Ball Joint	5. Tighten Or Replace Ball Joint
	6. Worn Or Loose Control Arm Bushing	6. Tighten To Specified Torque Or Replace Control Arm Bushing
	7. Loose Crossmember Bolts	7. Tighten Crossmember Bolts To Specified Torque
Road Wander	1. Incorrect Tire Pressure	1. Inflate Tires To Rcommended Pressure
	2. Incorrect Front Or Rear Wheel Toe	2. Check And Reset Front Wheel Toe
	3. Worn Wheel Bearings	3. Replace Wheel Bearing
	4. Worn Control Arm Bushings	4. Replace Control Arm Bushing
	5. Excessive Friction In Steering Gear	5. Replace Steering Gear
	6. Excessive Friction In Steering Shaft Coupling	6. Replace Steering Coupler
	7. Excessive Friction In Strut Upper Bearing	7. Replace Strut Bearing
Lateral Pull	1. Unequal Tire Pressure	1. Inflate All Tires To Recommended Pressure
	2. Radial Tire Lead	2. Perform Vehicle Lead Diagnosis And Correction Procedure - Refer To Tires And Wheels
	3. Incorrect Front Wheel Camber	3. Check And Reset Front Wheel Camber
	4. Power Steering Gear Imbalance	4. Replace Power Steering Gear
	5. Wheel Braking	5. Correct Braking Condition Causing Lateral Pull

WHEEL ALIGNMENT (Continued)

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
Excessive Steering Free Play	1. Incorrect Steering Gear Adjustment	1. Adjust Or Replace Steering Gear
	2. Worn Or Loose Tie Rod Ends	2. Replace Or Tighten Tie Rod Ends
	3. Loose Steering Gear Mounting Bolts	3. Tighten Steering Gear Bolts To The Specified Torque
	4. Loose Or Worn Steering Shaft Coupler	4. Replace Steering Shaft Coupler
Excessive Steering Effort	1. Low Tire Pressure	1. Inflate All Tires To Recommended Pressure
	2. Lack Of Lubricant In Steering Gear	2. Replace Steering Gear
	3. Low Power Steering Fluid Level	3. Fill Power Steering Fluid Reservoir To Correct Level
	4. Loose Power Steering Pump Belt	4. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	5. Lack Of Lubricant In Steering Ball Joints	5. Lubricate Or Replace Steering Ball Joints
	6. Steering Gear Malfunction	6. Replace Steering Gear
	7. Lack Of Lubricant In Steering Coupler	7. Replace Steering Coupler

STANDARD PROCEDURE

STANDARD PROCEDURE - WHEEL ALIGNMENT

PRE-WHEEL ALIGNMENT VEHICLE INSPECTION

CAUTION: If during the inspection the front suspension crossmember shows any sign of impact damage, the steering column lower coupling must be inspected. Refer to STEERING/COLUMN.

Before any attempt is made to change or correct the wheel alignment, the following inspection and necessary corrections must be made to the vehicle to ensure proper alignment.

(1) Be sure the fuel tank is full of fuel. If the fuel tank is not full, the reduction in weight will affect the curb height of the vehicle and the alignment specifications.

(2) The passenger and luggage compartments of the vehicle should be free of any load that is not factory equipment.

(3) Check the tires on the vehicle. The tires are to be inflated to the recommended air pressure. All tires must be the same size and in good condition with approximately the same tread wear.

(4) Check the front tire and wheel assemblies for excessive radial runout.

(5) Inspect all suspension component fasteners for looseness and torque.

(6) Inspect the lower front ball joints and all steering linkage for looseness and any sign of wear or damage.

(7) Inspect the rubber bushings on all the suspension components for signs of wear or deterioration. If any bushings show signs of wear or deterioration, they should be replaced prior to aligning the vehicle.

WHEEL ALIGNMENT SETUP

(1) Position the vehicle on an alignment rack.

(2) Install all required alignment equipment on the vehicle, per the alignment equipment manufacturer's instructions. On this vehicle, a four-wheel alignment is recommended.

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

(3) Read the vehicle's current front and rear alignment settings. Compare the vehicle's current alignment settings to the vehicle specifications for camber,

WHEEL ALIGNMENT (Continued)

caster and toe-in. (Refer to 2 - SUSPENSION/ WHEEL ALIGNMENT - SPECIFICATIONS)

(4) If the rear alignment is out of specification, adjust it first before proceeding to the front.

CAMBER AND CASTER

Front and rear camber and caster settings on this vehicle are determined at the time the vehicle is designed, by the location of the vehicle's suspension components. This is referred to as Net Build. The result is no required adjustment of camber and caster after the vehicle is built or when servicing the suspension components. Thus, when performing a wheel alignment, caster and camber are not normally considered adjustable angles. Camber and caster should be checked to ensure they meet vehicle specifications.

If either front or rear camber is found not to meet alignment specifications, it can be adjusted using an available camber adjustment bolt package. Before installing a camber adjustment bolt package on a vehicle found to be outside the specifications, inspect the suspension components for any signs of damage or bending.

No adjustment can be made to the caster setting on this vehicle. If the vehicle's caster is not within alignment specifications, check for damaged suspension components or body parts.

CAUTION: Do not attempt to adjust the vehicles wheel alignment by heating or bending any of the suspension components.

CAMBER ADJUSTMENT BOLT PACKAGE INSTALLATION

The camber adjustment bolt package contains new bolts and nuts for attaching the strut clevis bracket to the steering knuckle. The bolts contained in the package are slightly undersize allowing for movement between the strut clevis bracket and the steering knuckle. The movement allowed by the undersize bolts provides approximately one degree of camber adjustment per side of the vehicle. To install and adjust the camber adjustment bolt package, follow the procedure below.

CAUTION: There are separate camber adjustment bolt packages for the front and rear of the vehicle. Be sure to use the correct package.

(1) Raise the vehicle until its tires are not supporting the weight of the vehicle.

CAUTION: The knuckle to strut assembly attaching bolt shanks are serrated and must not be turned during removal. Remove the nuts while holding the bolts stationary.

(2) Remove the wheel and tire assembly at the strut requiring modification.

(3) Remove the original upper bolt attaching the strut clevis bracket to the knuckle (Fig. 7) (Fig. 8).

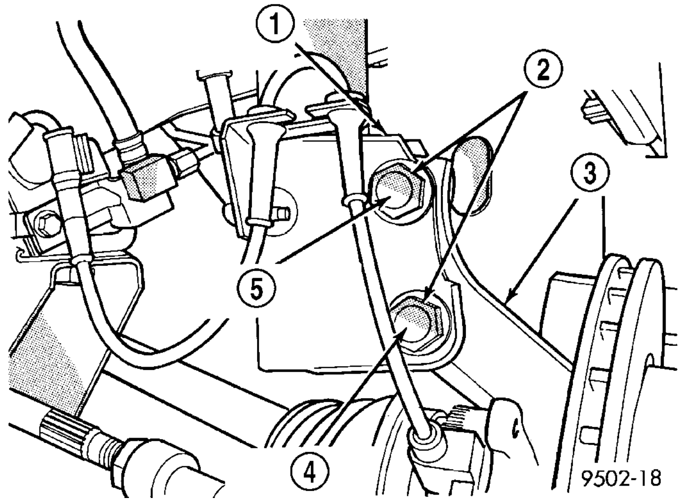


Fig. 7 Front Strut Clevis Bracket Attaching Bolts

1 - STRUT CLEVIS BRACKET
2 - STRUT CLEVIS BRACKET TO STEERING KNUCKLE ATTACHING BOLTS
3 - STEERING KNUCKLE
4 - LOOSEN THIS BOLT
5 - REMOVE AND REPLACE THIS BOLT

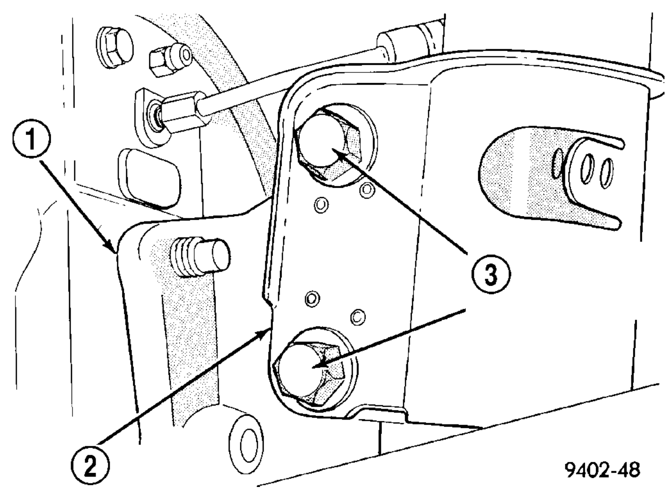


Fig. 8 Rear Strut Clevis Bracket Attaching Bolts

1 - KNUCKLE
2 - STRUT ASSEMBLY CLEVIS BRACKET
3 - CLEVIS BRACKET TO KNUCKLE ATTACHING BOLTS

(4) Install a bolt from the adjustment package into the hole where the original bolt was removed. Install the bolt from the rear.

(5) Install a nut provided in adjustment package on the replacement bolt. Tighten the nut until it's snug, but still allowing the knuckle to slide in the clevis bracket.

(6) Remove the original lower bolt.

WHEEL ALIGNMENT (Continued)

(7) Install a bolt from the adjustment package into the bottom hole of the strut clevis bracket. Install the bolt from the rear.

(8) Install a nut provided in adjustment package on the replacement bolt. Tighten the nut until it's snug.

(9) Reinstall the tire and wheel assembly.

(10) Perform the above procedure to any of the remaining struts as required.

(11) Lower the vehicle and jounce the front and rear of the vehicle.

(12) Adjust the front or rear camber to the preferred setting by pushing or pulling on the top of the tire. When camber is set to specifications, tighten the upper and lower strut clevis bracket bolts. Again jounce the front and rear of the vehicle, then verify the camber settings.

(13) Torque front strut clevis bracket-to-steering knuckle attaching bolts to 53 N·m (40 ft. lbs.), plus an additional 1/4 turn after the torque is met. Torque the rear strut clevis bracket-to-rear knuckle attaching bolts to 95 N·m (70 ft. lbs.).

(14) Once camber is within specifications, adjust toe to meet the preferred specification setting. Refer to TOE within this wheel alignment service procedure.

TOE

(1) Center the steering wheel and lock it in place using a steering wheel clamp.

NOTE: When performing the toe setting procedure, make sure the rear toe is set to the preferred specification before setting the front toe to the preferred specification.

REAR TOE

(1) Loosen the nuts on the left and right rear lateral link attaching bolts at the rear crossmember as necessary to allow rotation of the rear toe adjustment cams (Fig. 9).

CAUTION: When adjusting rear toe, the notches on the toe adjustment cams are not to be facing down. The notches in the adjustment cams are only to be facing up or toward one side.

(2) Rotate each toe adjustment cam until the preferred rear toe specification is obtained (Fig. 9). Refer to WHEEL ALIGNMENT SPECIFICATIONS in this section of this service manual group.

(3) While holding the toe adjustment cams from turning, tighten the attaching bolt nuts. This will securely hold the adjustment cams in position. Tighten the attaching bolt nuts to a torque of 88 N·m (65 ft. lbs.).

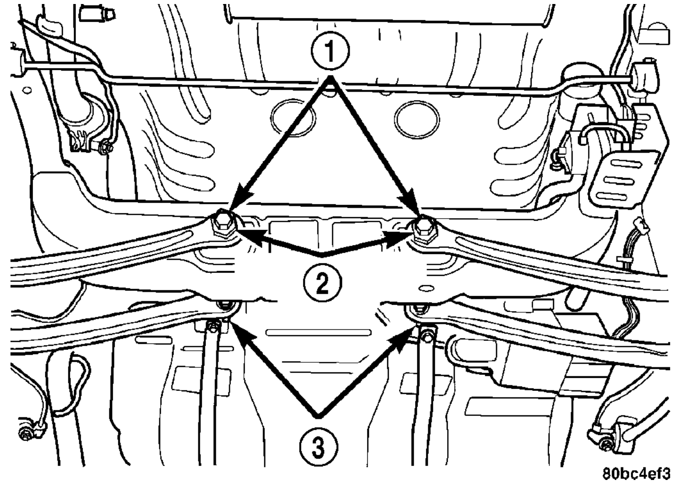


Fig. 9 Adjustment Cams

1 - BOLTS
2 - ADJUSTMENT CAMS
3 - NUTS

(4) Proceed to FRONT TOE to set the front toe.

FRONT TOE

CAUTION: Do not twist the inner tie rod-to-steering gear rubber boots while turning the inner tie rod during the front toe adjustment.

(1) Loosen the tie rod adjusting jam nuts (Fig. 10). Grasp each inner tie rod at its hex and rotate it one way or the other until the front wheel toe is set to the preferred specification. Refer to WHEEL ALIGNMENT SPECIFICATIONS in this section of this service manual group.

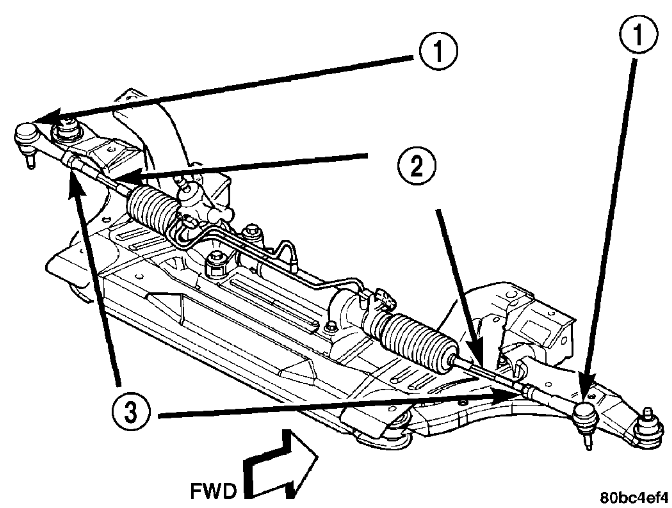


Fig. 10 Jam Nuts

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

WHEEL ALIGNMENT (Continued)

(2) Tighten tie rod adjusting jam nuts to a torque of 75 N·m (55 ft. lbs.).

(3) Make sure the inner tie rod-to-steering gear rubber boots are not twisted. If twisted, loosen the boot clamp at the inner tie rod and move the boot as necessary.

(4) Remove steering wheel clamp.

(5) Remove the alignment equipment.

(6) Road test the vehicle to verify the steering wheel is straight and the vehicle does not pull or wander.

STANDARD PROCEDURE - CURB HEIGHT MEASUREMENT

The wheel alignment is to be checked and all alignment adjustments made with the vehicle at its required curb height specification.

Vehicle height is to be checked with the vehicle on a flat, level surface, preferably a vehicle alignment rack. The tires are to be inflated to the recommended pressure. All tires are to be the same size as standard equipment. Vehicle height is checked with the fuel tank full of fuel, and no passenger or luggage compartment load.

Vehicle height is not adjustable. If the measurement is not within specifications, inspect the vehicle for bent or weak suspension components. Compare the parts tag on the suspect coil spring(s) to the parts book and the vehicle sales code, checking for a match. Once removed from the vehicle, compare the coil spring height to a correct new or known good coil spring. The heights should vary if the suspect spring is weak.

NOTE: Prior to reading the curb height measurement, the front an rear of the vehicle should be jounced. Induce jounce by grasping the center of the rear, then front bumper (or fascia) and jouncing the vehicle an equal number of times. Release the bumper at the bottom of the jounce cycle.

(1) Measure from the inboard edge of the wheel opening fender lip directly above the wheel center (spindle), to the floor or alignment rack surface.

(2) When measuring, maximum left-to-right differential is not to exceed 10 mm (0.39 in.).

(3) Compare the measurements to specifications listed in the following CURB HEIGHT SPECIFICATIONS chart.

CURB HEIGHT SPECIFICATIONS

VEHICLE	FRONT	REAR
NEON	672 mm ± 8 mm 26.46 in. ± 0.32 in.	679 mm ± 8 mm 26.73 in. ± 0.32 in.
SRT-4	685 mm ± 8 mm 26.97 in. ± 0.32 in.	697 mm ± 8 mm 27.44 in. ± 0.32 in.

WHEEL ALIGNMENT (Continued)

SPECIFICATIONS

WHEEL ALIGNMENT

NOTE: All specifications are given in degrees.

NOTE: All wheel alignments are to be set with the vehicle at curb height. Refer to Curb Height Measurement. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

FRONT WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
CAMBER	0.00°	-0.40° to +0.40°
Cross Camber (Maximum Side-To-Side Difference)	0.00°	0.50
CASTER	+2.60°	+1.60° to +3.60°
Cross Caster (Maximum Side-To-Side Difference)	0.00°	1.00°
TOTAL TOE*	+0.20°	0.00° to +0.40°
REAR WHEEL ALIGNMENT	**PREFERRED SETTING**	**ACCEPTABLE RANGE**
CAMBER	-0.25°	-0.65° to +0.15°
TOTAL TOE*	+0.30°	+0.10° to +0.50°
THRUST ANGLE	0.00°	-0.10° to +0.10°
Note: * TOTAL TOE is the sum of both the left and right wheel toe settings. TOTAL TOE must be equally split between each front wheel to ensure the steering wheel is centered after setting toe. Positive toe (+) is toe-in and negative toe (−) is Toe-out.		

DRIVELINE

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HALF SHAFT

TABLE OF CONTENTS

HALF SHAFT

DESCRIPTION

All Models Except 2.4L Turbo

Vehicles equipped with either an automatic or manual transmission use an unequal-length halfshaft system. The system incorporates two halfshaft assemblies (left and right) that consist of an inner and outer constant velocity (CV) joint and a solid interconnecting shaft (Fig. 1). The right halfshaft is longer than the left due to transaxle packaging and powertrain design.

Halfshafts used on both the right and left sides of the vehicle use a tuned rubber damper weight mounted to the interconnecting shaft (Fig. 1). The damper weight applications vary by which side of the vehicle the halfshaft is located on and the transmission application of the vehicle. When replacing a halfshaft, be sure the replacement halfshaft has the same damper weight as the original.

Both halfshaft assemblies use the same type of inner and outer joints. The inner joint of both halfshaft assemblies is a tripod joint, and the outer joint of both halfshaft 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 halfshaft length through the jounce and rebound travel of the front suspension.

2.4L Turbo-Equipped Models

Vehicles equipped with the 2.4L Turbo Engine utilize an equal-length halfshaft system. The system incorporates two halfshaft assemblies (left and right) that consist of an inner and outer constant velocity (CV) joint and a solid interconnecting shaft, and an intermediate shaft/bearing assembly as shown in (Fig. 2).

Both halfshaft assemblies use the same type of inner and outer joints. The inner joint of both halfshaft assemblies is a tripod joint, and the outer joint of both halfshaft 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 halfshaft length through the jounce and rebound travel of the front suspension. The outer C/V joint is equipped with a tone

HALF SHAFT (Continued)

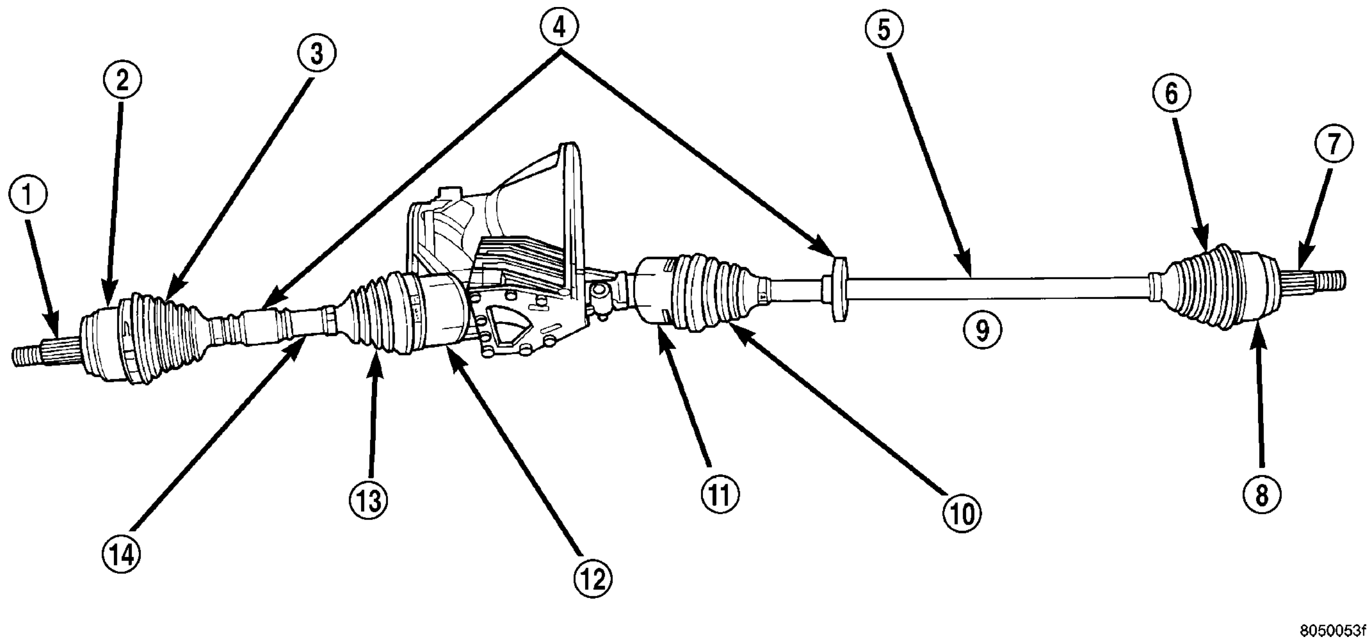


Fig. 1 Unequal Length Halfshaft System

1 - STUB AXLE
2 - OUTER C/V JOINT
3 - OUTER C/V JOINT BOOT
4 - TUNED RUBBER DAMPER WEIGHT
5 - INTERCONNECTING SHAFT—RIGHT
6 - OUTER C/V JOINT BOOT
7 - STUB AXLE
8 - OUTER C/V JOINT
9 - RIGHT HALFSHAFT
10 - INNER TRIPOD JOINT BOOT
11 - INNER TRIPOD JOINT
12 - INNER TRIPOD JOINT
13 - INNER TRIPOD JOINT BOOT
14 - INTERCONNECTING SHAFT—LEFT

wheel used to determine vehicle speed for ABS brake operation.

The left halfshaft inner tripod joint and the intermediate shaft are both splined into the transaxle side gears. The left inner tripod joint is retained using a circlip located on its stub shaft. The intermediate shaft does not utilize a circlip at the inboard end, as the support bearing/bracket assembly provides for shaft retention. The intermediate shaft utilizes a circlip on its outboard end to retain the RH shaft (tripod joint). Both outer C/V joints have a stub shaft that are splined into the wheel hub and retained by a hub nut, nut lock, wave washer and cotter pin.

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 left halfshaft inner tripod joint and the intermediate shaft are both splined into the transaxle side gears. The inner tripod joints are retained 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, nut lock, wave washer and cotter pin (Fig. 3).

NOTE: This vehicle does not use a rubber–lip bearing seal as on previous front–wheel–drive cars to prevent contamination of the front wheel bearing. On these vehicles, the face of the outer C/V joint fits deeply into the steering knuckle, using a close outer C/V joint–to–steering knuckle fit. This design deters direct water splash on bearing seal while allowing any water that gets in, to run out the bottom of the steering knuckle bearing bore. It is important to thoroughly clean the outer C/V joint and the wheel bearing area in the steering knuckle before it is assembled after servicing.

OPERATION

Halfshaft assemblies are designed to transmit power from the transaxle to the front wheels, while allowing for powertrain and suspension flex.

DIAGNOSIS AND TESTING - HALFSHAFT 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.

NOISE AND/OR VIBRATION IN TURNS

A clicking noise and/or a vibration in turns could be caused by one of the following conditions:

HALF SHAFT (Continued)

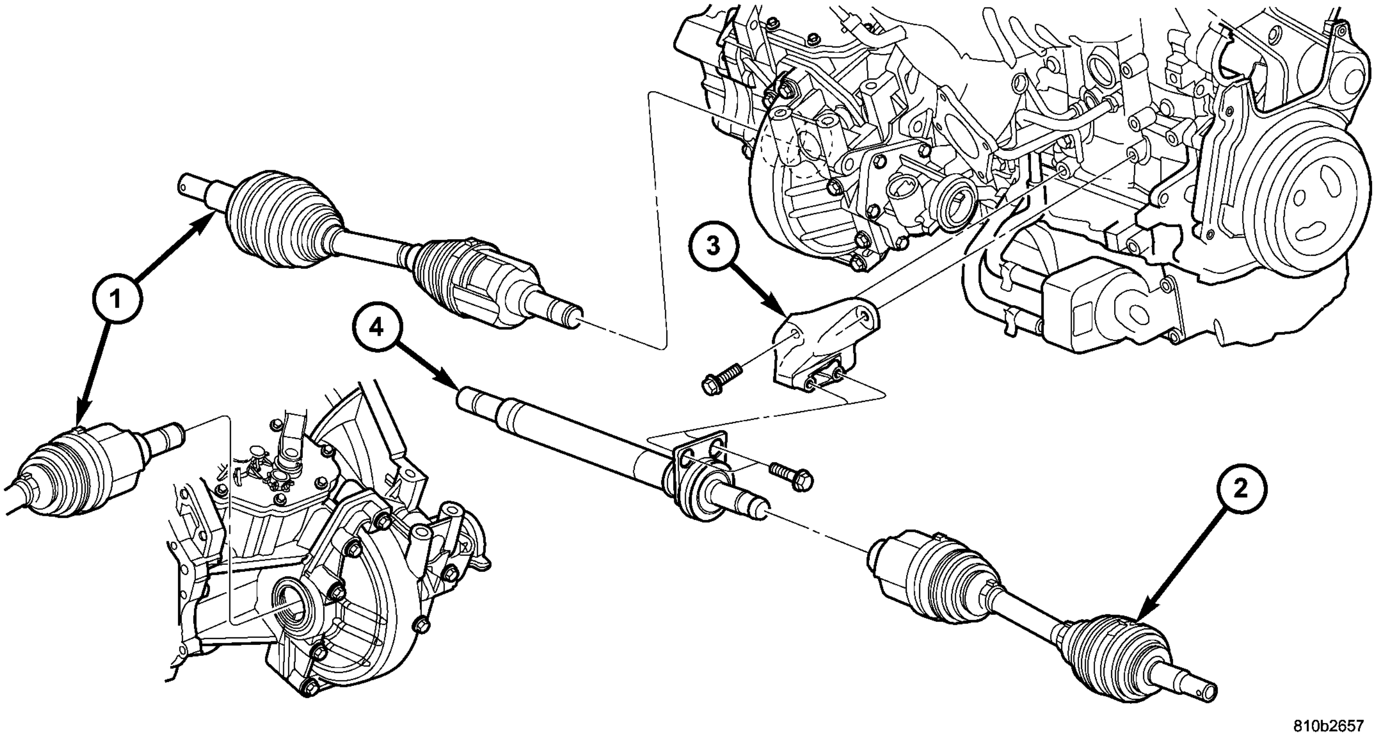


Fig. 2 Halfshaft and Intermediate Shaft—2.4L Turbo Models

1 - HALFSHAFT - LEFT
2 - HALFSHAFT - RIGHT
3 - SUPPORT BRACKET - INTERMEDIATE SHAFT
4 - INTERMEDIATE SHAFT/BEARING ASSEMBLY

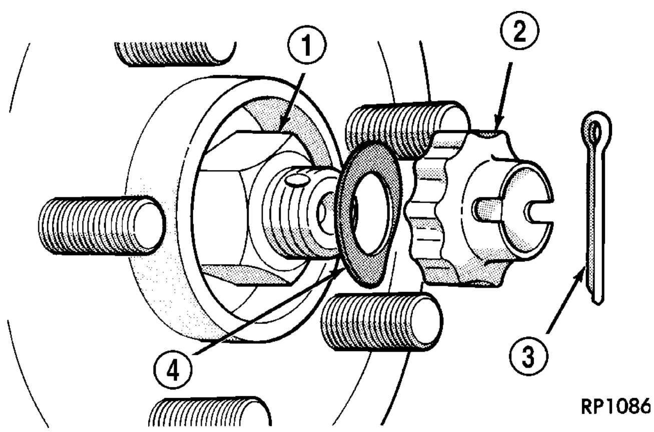


Fig. 3 Driveshaft Retaining Hardware

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

(1) Loose hub nut. Using a click-style torque wrench, torque hub nut to 244 N·m (180 ft. lbs.).

(2) Damaged outer C/V or inner tripod joint seal boot or seal boot clamps, which is evident by the presence of grease slung outward from the joint. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.

(3) Noise may also be caused by another component of the vehicle coming in contact with the halfshafts.

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 halfshaft assembly, which is evident by the presence of grease slung outward from the joint. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.

(2) A loose or missing clamp on the inner or outer joint of the halfshaft assembly. This may be accompanied by the visible loss of grease.

(3) A damaged or worn halfshaft C/V joint. Isolate the noise to one side of the vehicle. Replace only the affected side. Replacing both halfshafts is not necessary.

SHUDDER OR VIBRATION DURING ACCELERATION

(1) A worn or damaged halfshaft inner tripod joint. Isolate the condition to one side of the vehicle.

HALF SHAFT (Continued)

Replace only the affected side. Replacing both half-shafts is not necessary.

(2) A sticking tripod joint spider assembly (inner tripod joint only). Isolate the condition to one side of the vehicle. Replace only the affected side. Replacing both halfshafts is not necessary.

(3) Improper wheel balance.

VIBRATION AT HIGHWAY SPEEDS

(1) Foreign material (mud, etc.) packed on the backside of the wheel(s).

(2) Out of balance front tires or wheels.

(3) Improper tire and/or wheel runout.

REMOVAL

REMOVAL—EXCEPT 2.4L TURBO MODELS

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 halfshaft to prevent damage.

CAUTION: The halfshaft, 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 halfshaft 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) Disconnect battery negative cable.

(2) Place transaxle in gated park.

(3) Raise vehicle on hoist.

(4) Remove wheel and tire assembly (Fig. 4).

(5) Remove the halfshaft to hub cotter pin, nut lock, wave washer and hub nut (Fig. 5).

(6) If equipped with ABS, disconnect the front wheel speed sensor and secure harness out of the way.

(7) Remove nut and bolt (Fig. 6) retaining ball joint stud into steering knuckle.

CAUTION: Use caution when separating ball joint stud from steering knuckle, so ball joint seal does not get damaged.

(8) Separate ball joint stud from steering knuckle by prying down on lower control arm (Fig. 7).

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

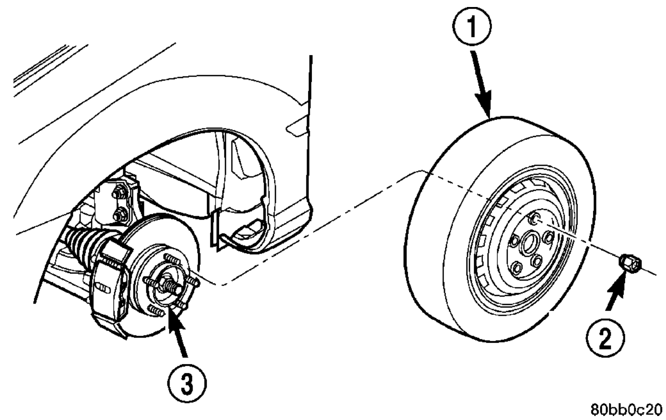


Fig. 4 Wheel and Tire Removal

1 - WHEEL/TIRE ASSY.
2 - LUG NUT (5)
3 - HUB

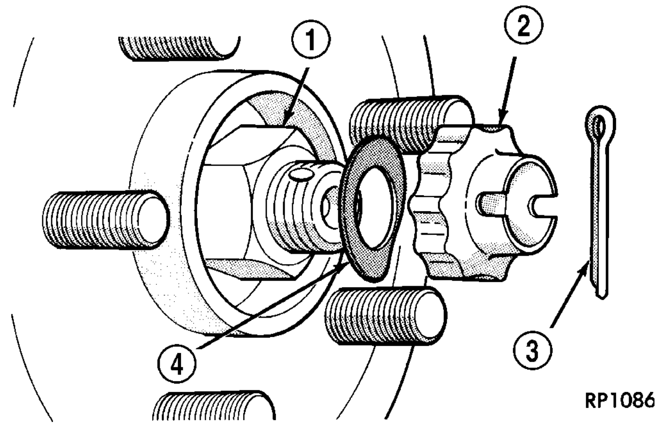


Fig. 5 Halfshaft Retaining Hardware

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

(9) Remove halfshaft from steering knuckle by pulling outward on knuckle while pressing in on half-shaft. Support outer end of halfshaft assembly. If difficulty in separating halfshaft from steering knuckle is encountered, use Puller 1026 as shown in (Fig. 8) to separate shaft. **Do not strike shaft with hammer.**

(10) Support outer end of the halfshaft assembly.

CAUTION: Do not pull on interconnecting shaft when removing halfshaft assembly. Inner joint may become separated.

(11) Remove the inner tripod joints from the side gears of the transaxle using a punch to dislodge the inner tripod joint retaining ring from the transaxle side gear. If removing the right side inner tripod

HALF SHAFT (Continued)

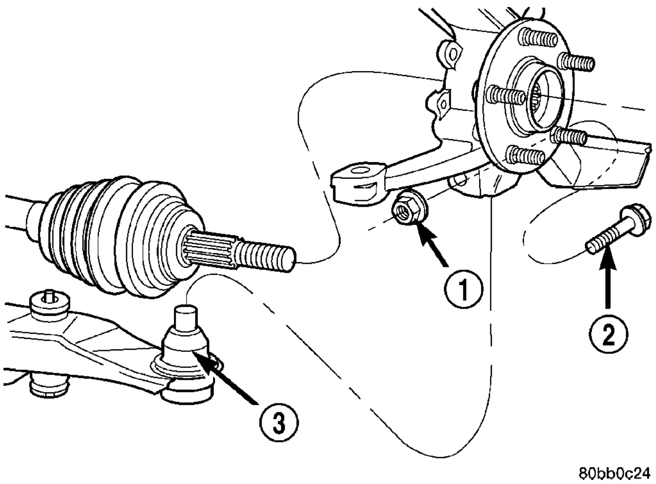


Fig. 6 Steering Knuckle at Lower Control Arm Ball Joint

1 - NUT
2 - BOLT
3 - BALL JOINT

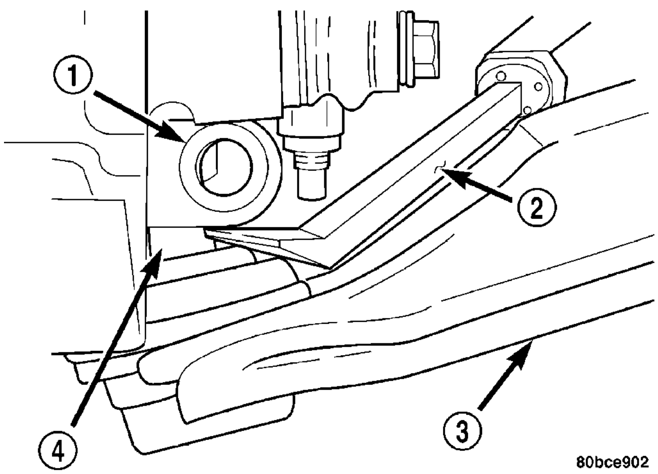


Fig. 7 Separating Lower Control Arm from Steering Knuckle

1 - STEERING KNUCKLE
2 - PRY BAR
3 - LOWER CONTROL ARM
4 - BALL JOINT STUD

joint, position punch against the inner tripod joint (Fig. 9). Strike the punch sharply with a hammer to dislodge the right inner joint from the side gear. If removing the left side inner tripod joint, position the punch in the groove of the inner tripod joint (Fig. 10). Strike the punch sharply with a hammer to dislodge the left inner tripod joint from the side gear.

NOTE: Removal of the inner tripod joints is made easier if you apply outward pressure on the joint as you strike the punch with a hammer.

(12) Hold inner tripod joint and interconnecting shaft of halfshaft assembly (Fig. 11). Remove inner

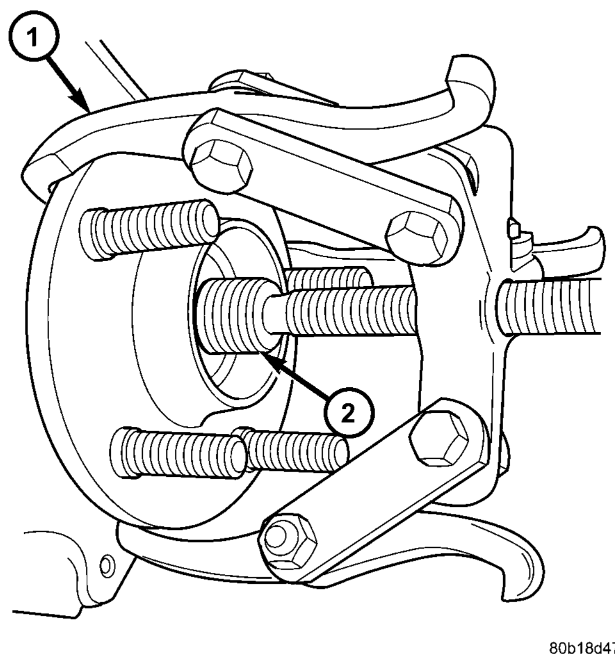


Fig. 8 Separating Halfshaft from Hub/Bearing

1 - PULLER 1026
2 - HALFSHAFT

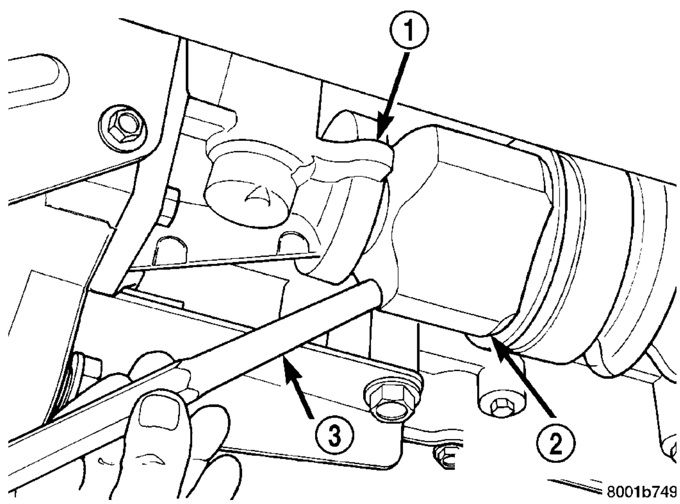


Fig. 9 Disengaging Right Inner Tripod Joint from Transaxle

1 - TRANSAXLE
2 - RIGHT INNER TRIPOD JOINT
3 - PUNCH

tripod joint from transaxle by pulling it straight out of transaxle side gear and transaxle oil seal. **When removing tripod joint, do not let spline or snap ring drag across sealing lip of the transaxle to tripod joint oil seal. When tripod joint is removed from transaxle, some fluid will leak out.**

HALF SHAFT (Continued)

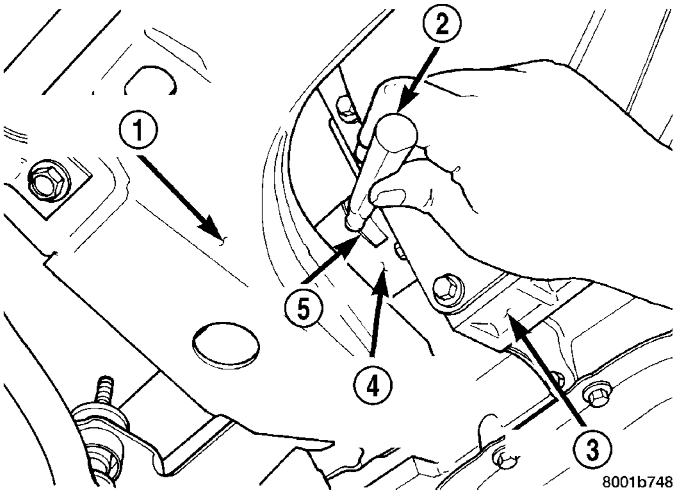


Fig. 10 Disengaging Left Inner Tripod Joint from Transaxle

1 - FRONT SUSPENSION CROSSMEMBER
2 - PUNCH
3 - TRANSAXLE
4 - DRIVESHAFT INNER TRIPOD JOINT
5 - NOTCH

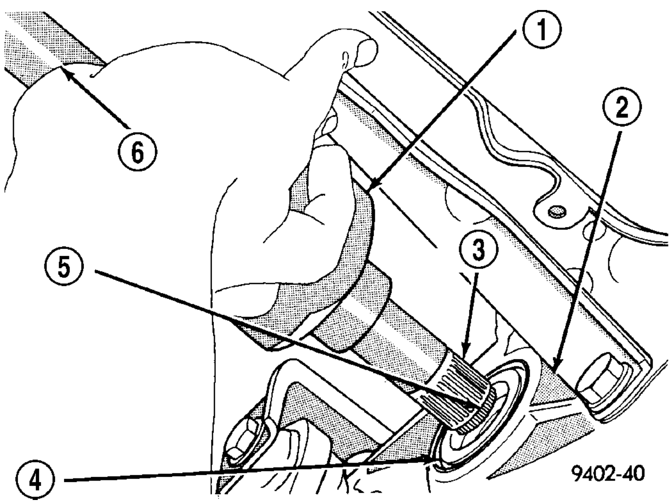


Fig. 11 Tripod Joint Removal from Transaxle

1 - INNER TRIPOD JOINT
2 - TRANSAXLE
3 - SPLINE
4 - OIL SEAL
5 - SNAP RING
6 - INTERCONNECTING SHAFT

CAUTION: The halfshaft, 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 halfshaft 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.

REMOVAL—2.4L TURBO MODELS

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 halfshaft to prevent damage.

CAUTION: The halfshaft, 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 halfshaft 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) Disconnect battery negative cable.
(2) Place transaxle in gated park.
(3) Raise vehicle on hoist.
(4) Remove wheel and tire assembly (Fig. 12).

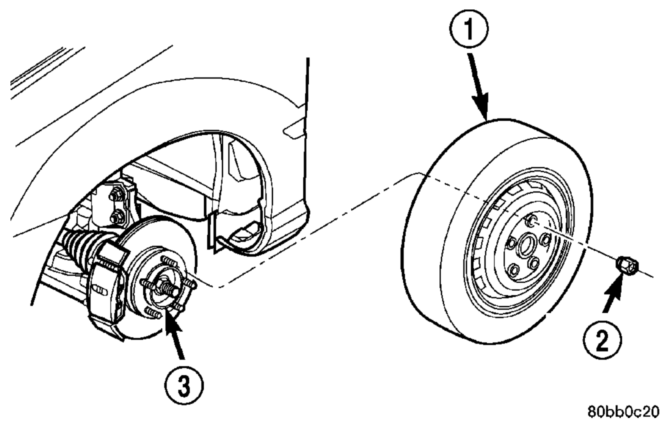


Fig. 12 Wheel and Tire Removal

1 - WHEEL/TIRE ASSY.
2 - LUG NUT (5)
3 - HUB

(5) Remove the cotter pin, nut lock, and spring washer, and hub nut from the end of the outer C/V joint stub axle (Fig. 13).
(6) If equipped with ABS, disconnect the front wheel speed sensor and secure harness out of the way.
(7) Remove nut and bolt (Fig. 14) retaining ball joint stud into steering knuckle.

NOTE: Use caution when separating ball joint stud from steering knuckle, so ball joint seal does not get damaged.

HALF SHAFT (Continued)

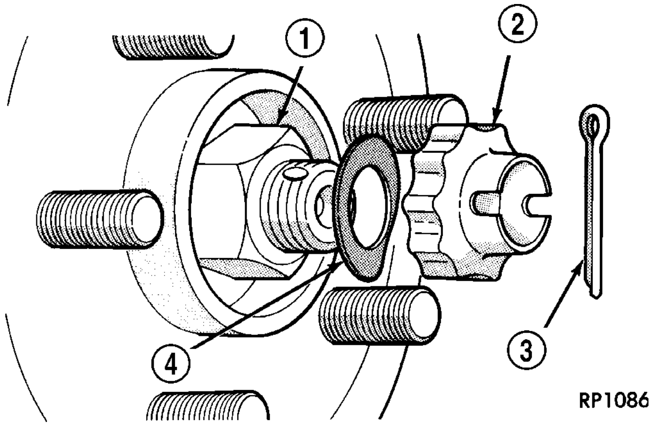


Fig. 13 Halfshaft Retaining Hardware

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

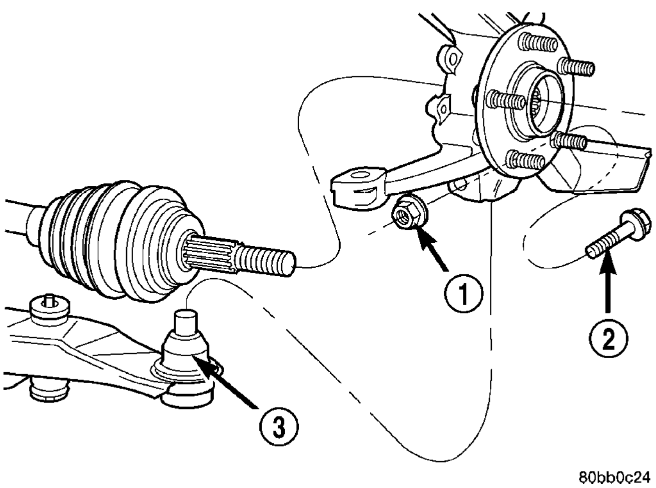


Fig. 14 Steering Knuckle at Lower Control Arm Ball Joint

1 - NUT
2 - BOLT
3 - BALL JOINT

(8) Separate ball joint stud from steering knuckle by prying down on lower control arm (Fig. 15).

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

(9) Remove halfshaft from steering knuckle by pulling outward on knuckle while pressing in on half-shaft. Support outer end of halfshaft assembly. If difficulty in separating halfshaft from hub is encountered, **do not strike shaft with hammer,** instead use puller 1026 to separate (Fig. 16).

(10) Support outer end of the halfshaft assembly.

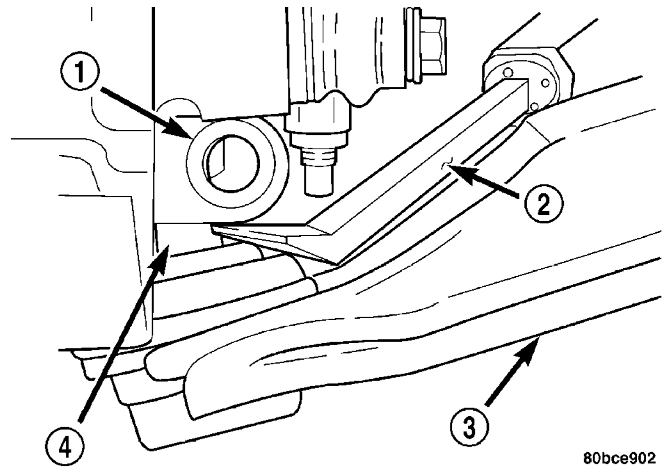


Fig. 15 Separating Lower Control Arm from Steering Knuckle

1 - STEERING KNUCKLE
2 - PRY BAR
3 - LOWER CONTROL ARM
4 - BALL JOINT STUD

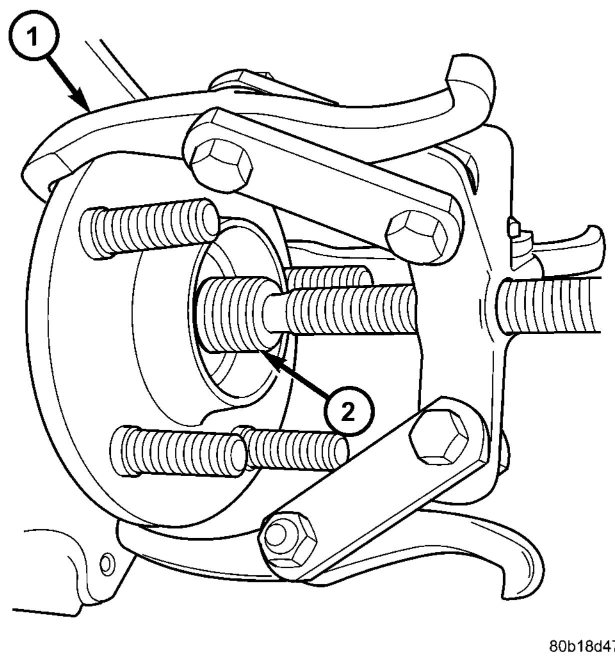


Fig. 16 Separating Halfshaft from Hub/Bearing

1 - PULLER 1026
2 - HALFSHAFT

NOTE: When left halfshaft is removed from trans-axle, some fluid may leak out.

NOTE: Removal of the inner tripod joints is made easier if you apply outward pressure on the joint as you strike the punch with a hammer. DO NOT PULL ON INTERCONNECTING SHAFT TO REMOVE, AS THE INNER JOINT WILL BECOME SEPARATED.

HALF SHAFT (Continued)

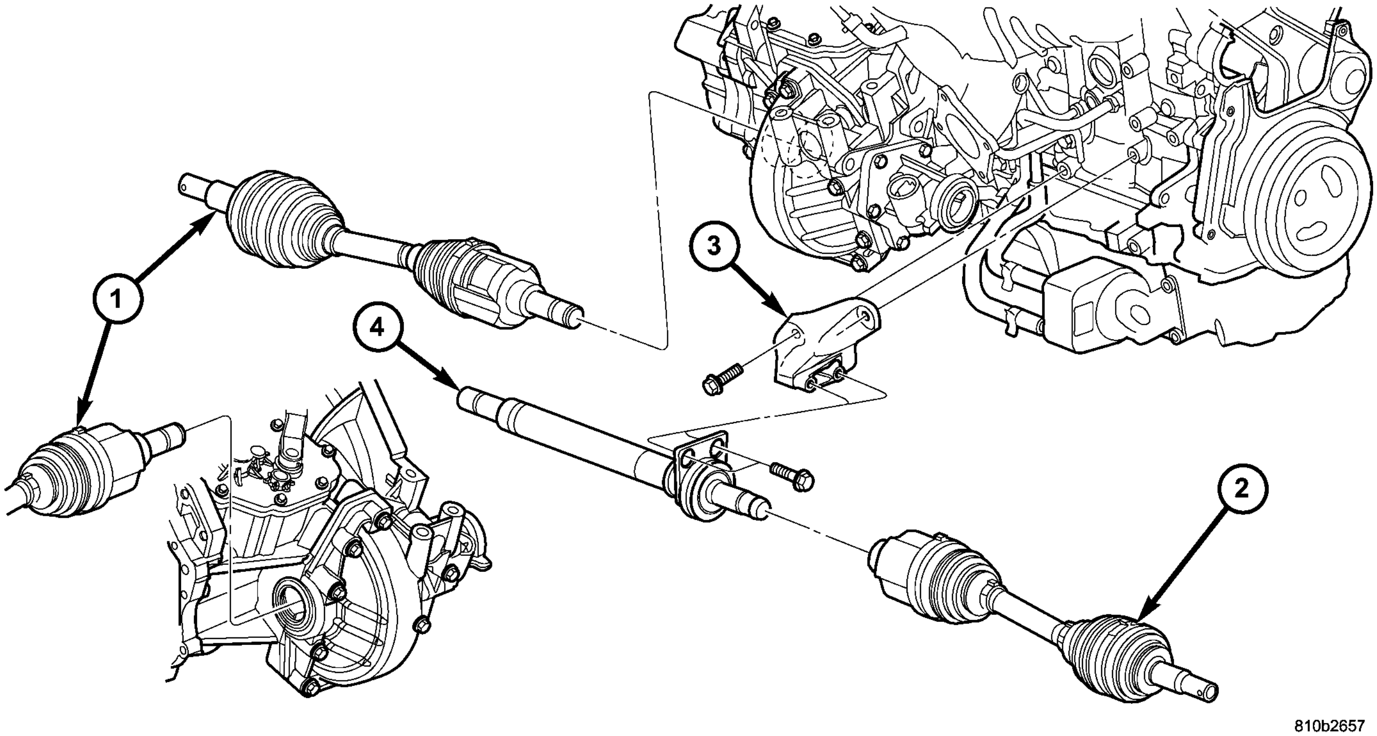


Fig. 17 Halfshaft and Intermediate Shaft—2.4L Turbo Models

1 - HALFSHAFT - LEFT
2 - HALFSHAFT - RIGHT
3 - SUPPORT BRACKET - INTERMEDIATE SHAFT
4 - INTERMEDIATE SHAFT/BEARING ASSEMBLY

(11) Remove halfshaft(s) (Fig. 17). **Left halfshaft:** While applying outward pressure on joint by hand, dislodge inner tripod joint from differential side gear by striking outward with a punch. When removing tripod joint and halfshaft, do not let spline or snap ring drag across axle seal. **Right halfshaft:** Slide inner tripod joint off of intermediate shaft. If difficulty is encountered, dislodge joint from intermediate shaft using punch.

(12) If intermediate shaft is to be removed, remove two (2) intermediate shaft bearing-to-bracket bolts (Fig. 17).

CAUTION: The halfshaft, 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 halfshaft 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.

INSTALLATION

INSTALLATION—EXCEPT 2.4L TURBO MODELS

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 halfshaft to prevent damage.

(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 halfshaft assembly by tripod joint and interconnecting shaft, install tripod joint into transaxle side gear as far as possible by hand.

(3) Carefully align tripod joint with transaxle side gears. Then grasp halfshaft interconnecting shaft and push tripod joint into transaxle side gear until fully seated. **Test that snap ring is fully engaged with side gear by attempting to remove tripod**

HALF SHAFT (Continued)

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 (Fig. 18).

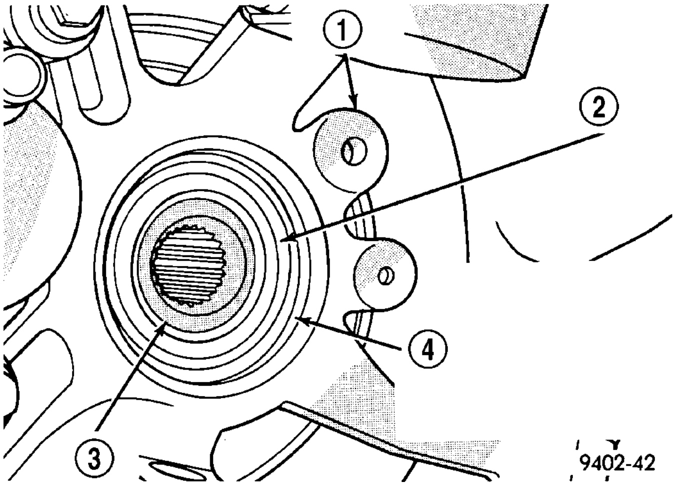


Fig. 18 Steering Knuckle to C/V Joint

1 - STEERING KNUCKLE
2 - WHEEL BEARING
3 - FRONT HUB
4 - THIS AREA OF THE STEERING KNUCKLE IS TO BE FREE OF ALL DEBRIS AND MOISTURE BEFORE INSTALLING DRIVE SHAFT IN STEERING KNUCKLE

(5) Ensure that front of outer C/V joint, which fits into steering knuckle (Fig. 19), is free of debris and moisture before assembling into steering knuckle.

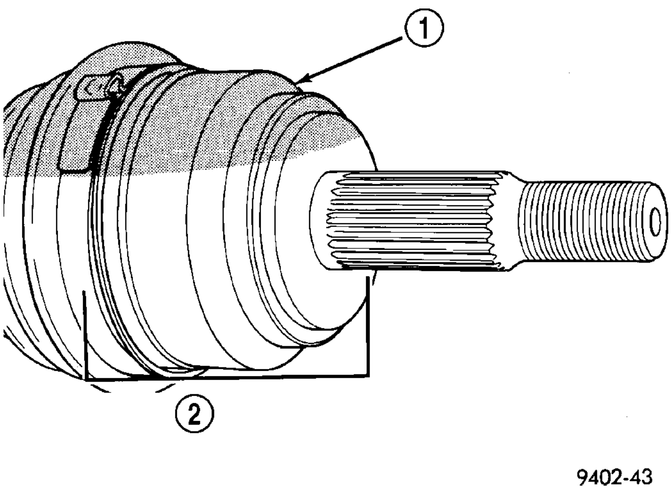


Fig. 19 Outer C/V Joint Inspection

1 - OUTER C/V JOINT
2 - THIS AREA OF OUTER C/V JOINT MUST BE FREE OF ALL DEBRIS AND MOISTURE, BEFORE INSTALLATION INTO STEERING KNUCKLE.

(6) Slide halfshaft back into front hub. Install steering knuckle onto the ball joint stud (Fig. 20).

NOTE: At this point, the outer joint will not seat completely into the front hub. The outer joint will be pulled into hub and seated when the hub nut is installed and torqued.

(7) Install a **NEW** steering knuckle to ball joint stud bolt and nut (Fig. 20). Tighten the nut and bolt to 95 N·m (70 ft. lbs.).

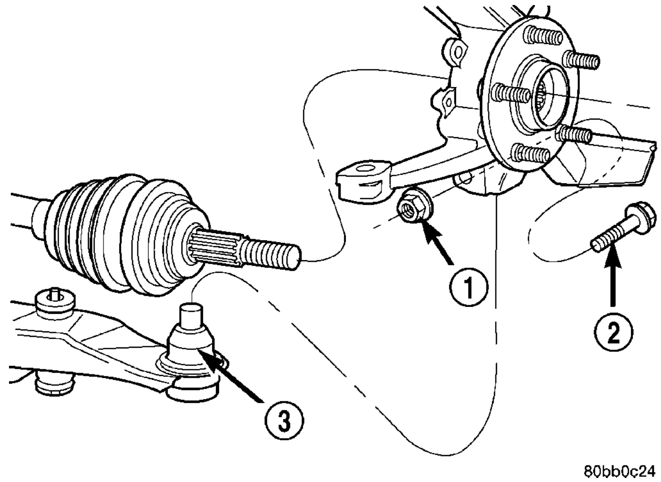


Fig. 20 Driveshaft Installation Into Hub And Steering Knuckle

1 - NUT
2 - BOLT
3 - BALL JOINT

(8) Clean all foreign matter from threads of half-shaft outer stub axle. Install hub nut onto the threads of the stub axle and tighten nut to 244 N·m (180 ft. lbs.) (Fig. 21).

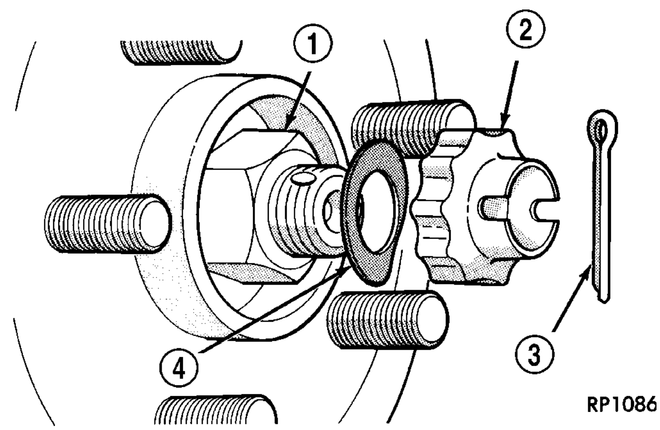


Fig. 21 Halfshaft Retaining Hardware

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

(9) Install front wheel and tire assembly. Install front wheel lug nuts (Fig. 22) and tighten to 128 N·m (95 ft. lbs.).

HALF SHAFT (Continued)

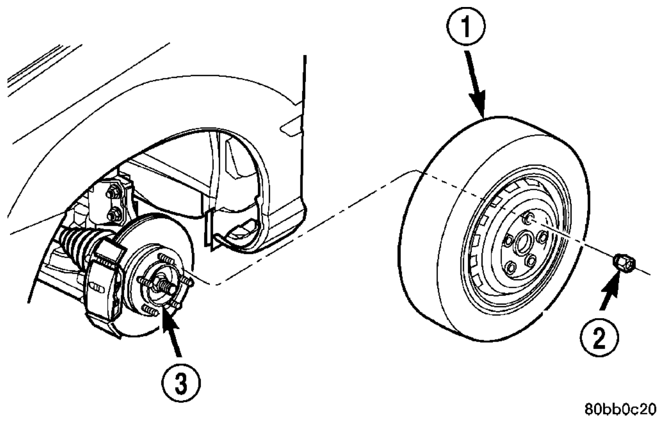


Fig. 22 Wheel and Tire Installation

1 - WHEEL/TIRE ASSY.
2 - LUG NUT (5)
3 - HUB

(10) Check for correct fluid level in transaxle assembly.

(11) Lower vehicle.

(12) Connect battery negative cable.

INSTALLATION—2.4L TURBO MODELS

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 halfshaft to prevent damage.

(1) If removed, install intermediate shaft/bearing assembly (Fig. 17). Install and torque bearing-to-bracket bolts to 54 N·m (40 ft. lbs.).

(2) Install halfshaft(s). **Left halfshaft:** Thoroughly clean spline and oil seal sealing surface on left tripod joint. Lightly lubricate oil seal sealing surface on tripod joint with fresh clean transmission lubricant. While holding halfshaft assembly by tripod joint and interconnecting shaft, install tripod joint into transaxle as far as possible by hand. Carefully align tripod joint with transaxle side gears. Then grasp halfshaft interconnecting shaft and push tripod joint into transaxle side gear until fully seated. 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. **Right halfshaft:** Thoroughly clean right halfshaft tripod joint spline, as well as intermediate shaft spline. While holding halfshaft assembly by tripod joint and interconnecting shaft, install tripod joint onto intermediate shaft as far as possible by hand.

(3) Clean all debris and moisture out of steering knuckle (Fig. 23).

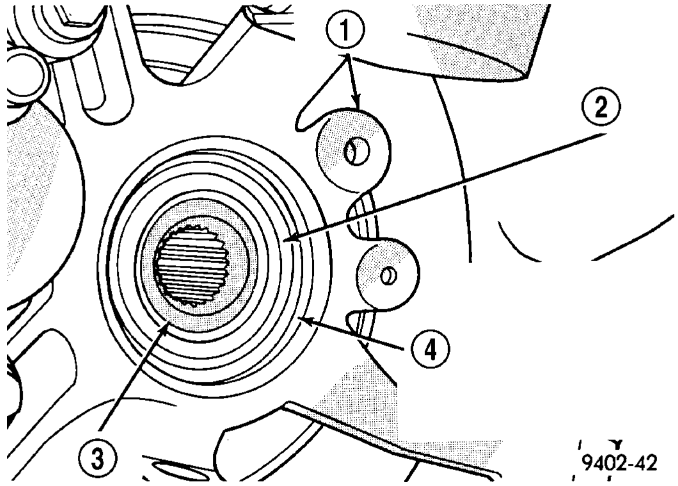


Fig. 23 Steering Knuckle to C/V Joint Sealing Area

1 - STEERING KNUCKLE
2 - WHEEL BEARING
3 - FRONT HUB
4 - THIS AREA OF THE STEERING KNUCKLE IS TO BE FREE OF ALL DEBRIS AND MOISTURE BEFORE INSTALLING HALFSHAFT IN STEERING KNUCKLE

(4) Ensure that front of outer C/V joint, which fits into steering knuckle (Fig. 24), is free of debris and moisture before assembling into steering knuckle.

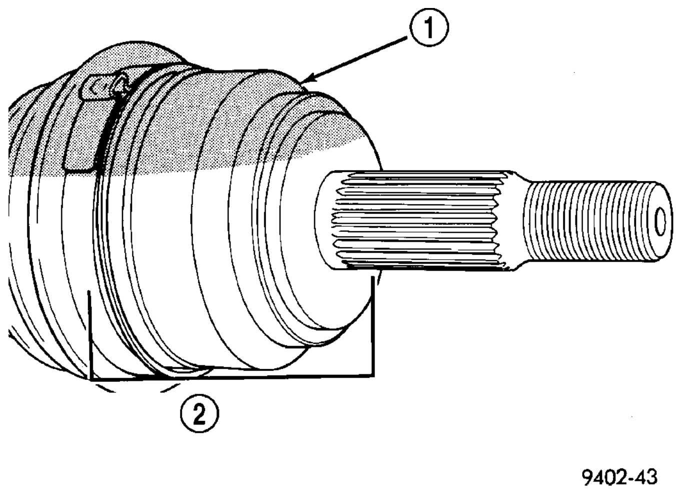


Fig. 24 Outer C/V Joint Inspection

1 - OUTER C/V JOINT
2 - THIS AREA OF OUTER C/V JOINT MUST BE FREE OF ALL DEBRIS AND MOISTURE, BEFORE INSTALLATION INTO STEERING KNUCKLE.

(5) Slide halfshaft back into front hub. Install steering knuckle onto the ball joint stud (Fig. 25).

NOTE: At this point, the outer joint will not seat completely into the front hub. The outer joint will be pulled into hub and seated when the hub nut is installed and torqued.

HALF SHAFT (Continued)

(6) Install a **NEW** steering knuckle to ball joint stud bolt and nut (Fig. 25). Tighten the nut and bolt to 95 N·m (70 ft. lbs.).

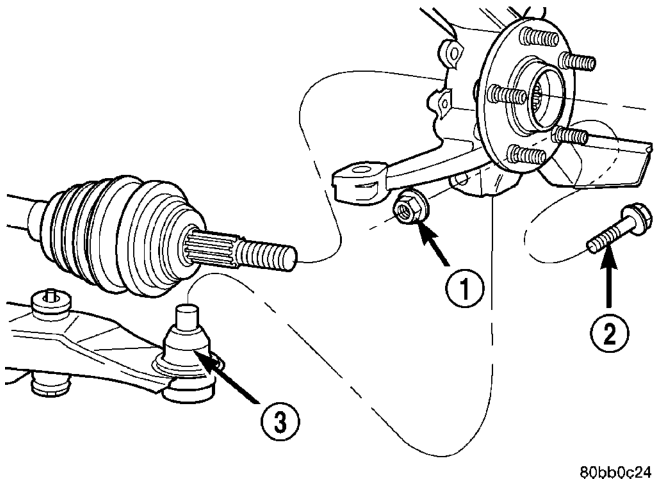


Fig. 25 Halfshaft Installation Into Hub And Knuckle

1 - NUT
2 - BOLT
3 - BALL JOINT

(7) Clean all foreign matter from threads of half-shaft outer stub axle. Install washer and hub nut onto the threads of the stub axle and tighten nut to 244 N·m (180 ft. lbs.) (Fig. 26).

(8) Install spring washer, nut lock, and cotter pin (Fig. 26).

(9) Install front wheel and tire assembly. Install front wheel lug nuts (Fig. 27) and tighten to 128 N·m (100 ft. lbs.).

(10) Check for correct fluid level in transaxle assembly.

(11) Lower vehicle.

(12) Connect battery negative cable.

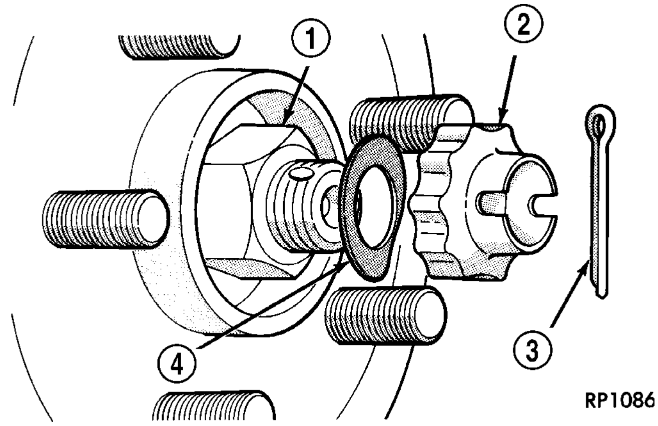


Fig. 26 Halfshaft Retaining Hardware

1 - HUB NUT
2 - NUT LOCK
3 - COTTER PIN
4 - SPRING WASHER

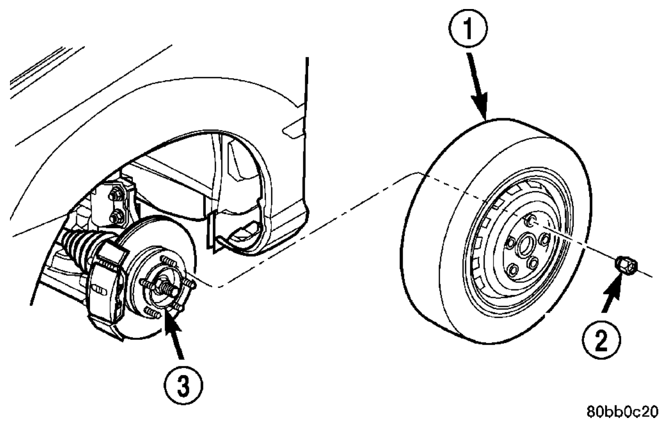


Fig. 27 Wheel and Tire Installation

1 - WHEEL/TIRE ASSY.
2 - LUG NUT (5)
3 - HUB

SPECIFICATIONS - TORQUE

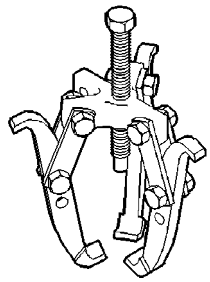
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolt, Intermediate Shaft Bearing-to-Bracket (2.4L Turbo)	28	—	250
Bolt, Intermediate Shaft Bracket-to-Block (2.4L Turbo)	54	40	—
Nut, Driveshaft-to-Hub/ Bearing	244	180	—
Nut, Knuckle-to-Ball Joint Bolt	95	70	—
Nut, Wheel to Hub	128	95	—

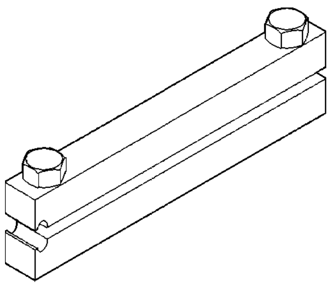
HALF SHAFT (Continued)

SPECIAL TOOLS

HALFSHAFT



Puller 1026



Boot Clamp Installer C-4975A

CV BOOT - INNER

REMOVAL

To remove sealing boot from halfshaft for replacement, the halfshaft assembly must be removed from the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

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 halfshaft requiring boot replacement from the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(2) Remove large boot clamp that retains inner tripod joint sealing boot to tripod joint housing (Fig. 28) and discard. Then remove small clamp that 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 spider joint from the tripod joint housing, hold the rollers in place on the spider trunions to prevent the rollers and needle bearings from falling away.

(3) Slide the interconnecting shaft and spider assembly out of the tripod joint housing (Fig. 29).

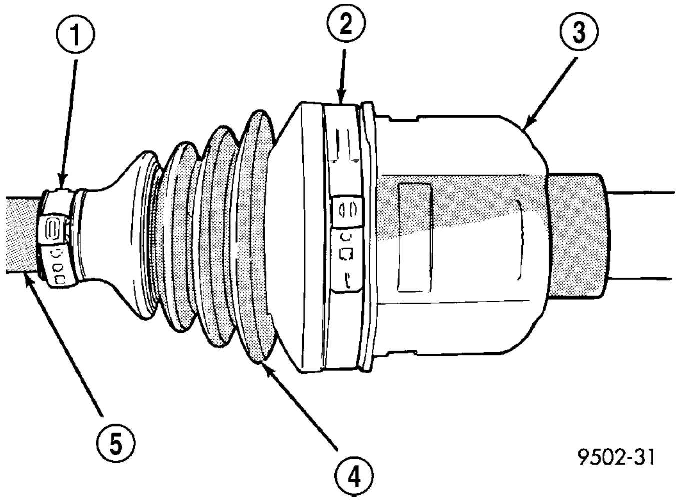


Fig. 28 Inner Tripod Joint Sealing Boot Clamps

1 - SMALL CLAMP
2 - LARGE CLAMP
3 - INNER TRIPOD JOINT
4 - SEALING BOOT
5 - INTERCONNECTING SHAFT

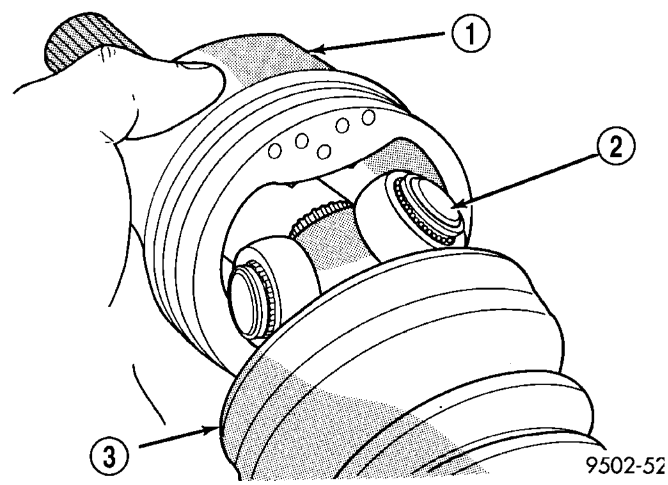


Fig. 29 Spider Assembly Joint Removal from Housing

1 - TRIPOD JOINT HOUSING
2 - SPIDER ASSEMBLY
3 - SEALING BOOT

(4) Remove snap ring that retains spider assembly to interconnecting shaft (Fig. 30). 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. 31). **Do not hit the outer tripod bearings in an attempt to remove spider assembly from interconnecting shaft.**

(5) Slide sealing boot off interconnecting shaft.

(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 halfshaft assembly**

CV BOOT - INNER (Continued)

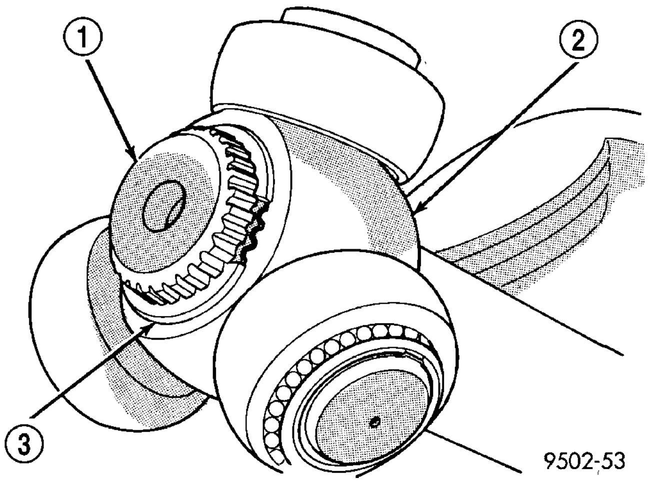


Fig. 30 Spider Assembly Retaining Snap Ring

1 - INTERCONNECTING SHAFT
2 - SPIDER ASSEMBLY
3 - RETAINING SNAP RING

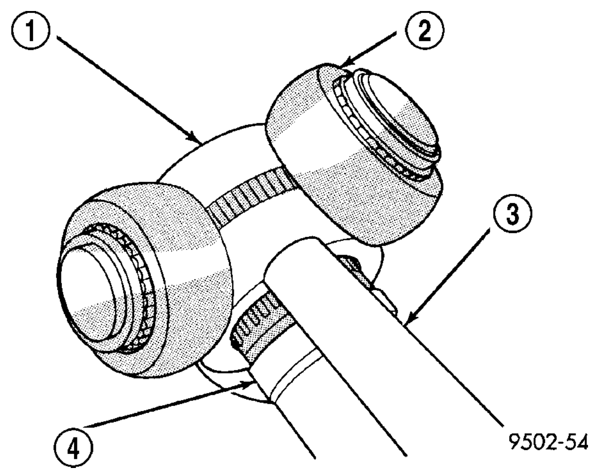


Fig. 31 Spider Assembly Removal from Interconnecting Shaft

1 - SPIDER ASSEMBLY
2 - DO NOT HIT SPIDER ASSEMBLY BEARINGS WHEN REMOVING SPIDER ASSEMBLY
3 - BRASS DRIFT
4 - INTERCONNECTING SHAFT

will require replacement. Component parts of these halfshaft assemblies are not serviceable.

INSTALLATION

NOTE: The inner tripod joint sealing boots are made from two different types of material. High-temperature applications (close to exhaust system) use silicone rubber whereas 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 that was removed.

(1) Slide inner tripod joint seal boot retaining clamp, onto interconnecting shaft. Then slide the replacement inner tripod joint sealing boot onto 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. 32).**

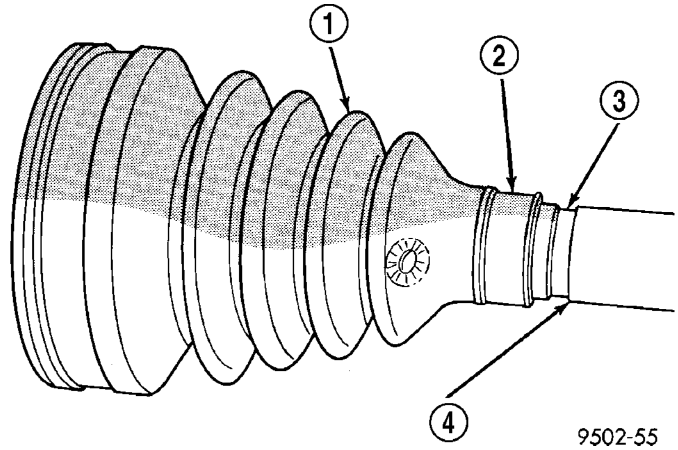


Fig. 32 Sealing Boot Installation on Interconnecting Shaft

1 - SEALING BOOT
2 - RAISED BEAD IN THIS AREA OF SEALING BOOT
3 - GROOVE
4 - INTERCONNECTING SHAFT

(2) Install spider assembly onto interconnecting shaft with chamfer on spider assembly toward interconnecting shaft (Fig. 33). 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. 34). **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. 35). Be sure the snap ring is fully seated into groove 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. 36).

(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. 37). Tighten nut on crimping

CV BOOT - INNER (Continued)

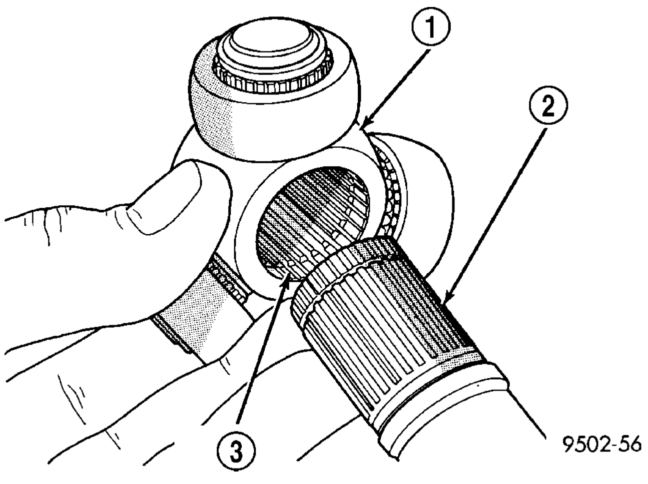


Fig. 33 Spider Assembly Installation on Interconnecting Shaft

1 - SPIDER ASSEMBLY
2 - INTERCONNECTING SHAFT
3 - CHAMFER

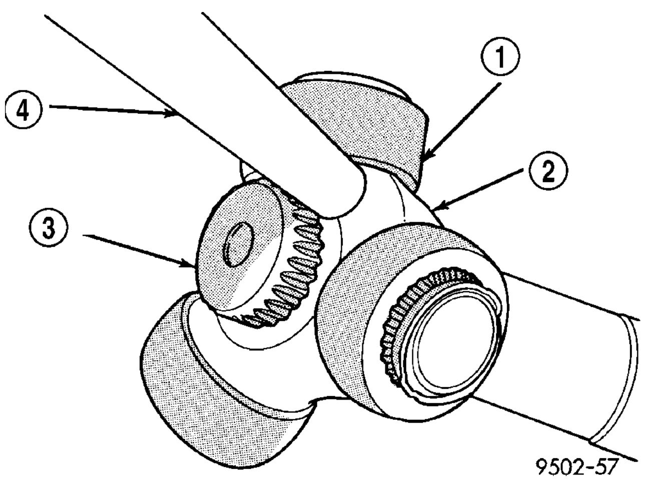


Fig. 34 Installing Spider Assembly On Interconnecting Shaft

1 - DO NOT HIT BEARINGS WHEN INSTALLING THE SPIDER ASSEMBLY
2 - SPIDER ASSEMBLY
3 - INTERCONNECTING SHAFT
4 - BRASS DRIFT

tool C-4975-A until jaws on tool are closed completely together, face to face (Fig. 38).

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.

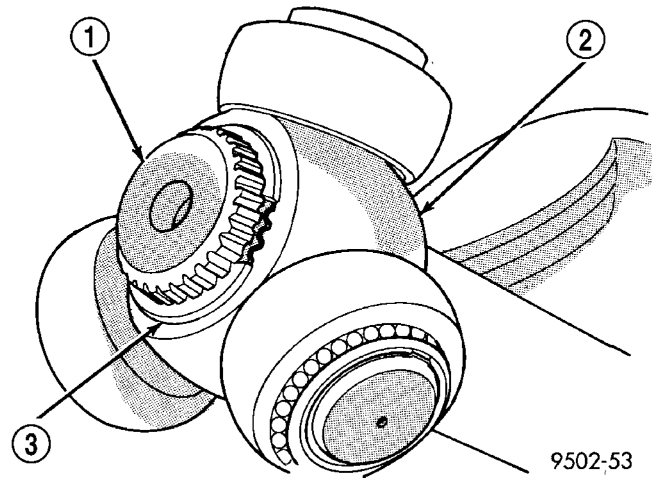


Fig. 35 Spider Assembly Retaining Snap Ring Installed

1 - INTERCONNECTING SHAFT
2 - SPIDER ASSEMBLY
3 - RETAINING SNAP RING

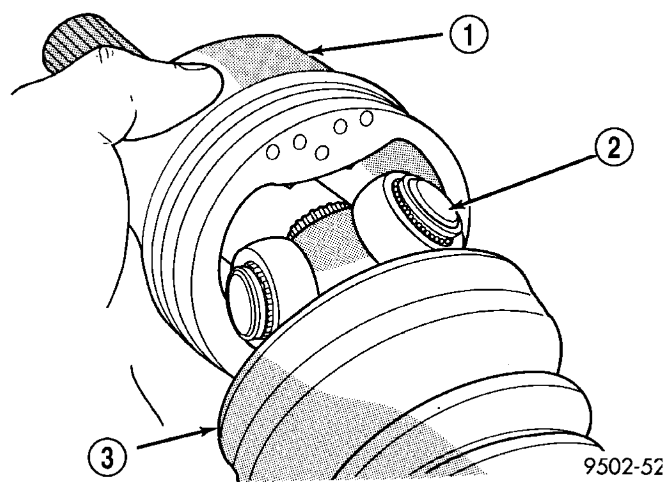


Fig. 36 Installing Tripod Housing on Spider Assembly

1 - TRIPOD JOINT HOUSING
2 - SPIDER ASSEMBLY
3 - 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, 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 while being vented, the sealing boot can not be used.

CV BOOT - INNER (Continued)

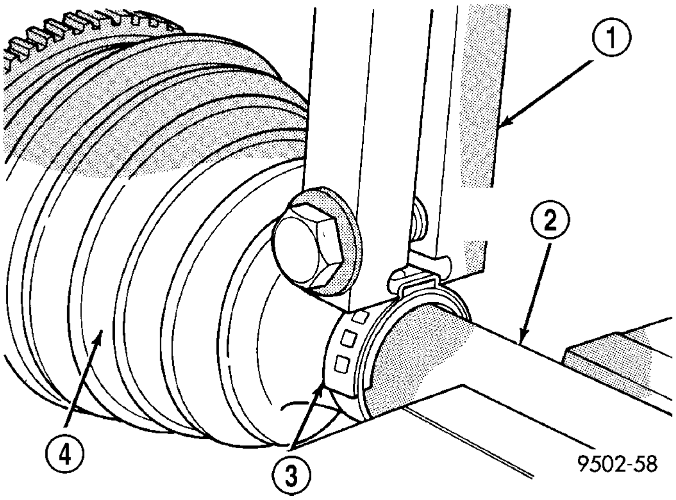


Fig. 37 Crimping Tool Installed on Sealing Boot Clamp

1 - SPECIAL TOOL C-4975A
2 - INTERCONNECTING SHAFT
3 - CLAMP
4 - SEALING BOOT

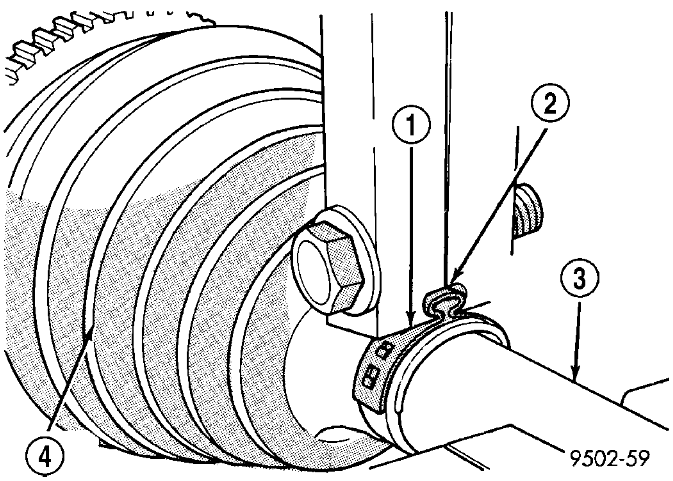


Fig. 38 Sealing Boot Retaining Clamp Installed

1 - CLAMP
2 - JAWS OF SPECIAL TOOL C-4975A MUST BE CLOSED COMPLETELY TOGETHER HERE
3 - INTERCONNECTING SHAFT
4 - SEALING BOOT

(9) Insert a trim stick between the tripod joint and the sealing boot to vent inner tripod joint assembly (Fig. 39). **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, and not the hard plastic sealing boot and soft rubber insert.

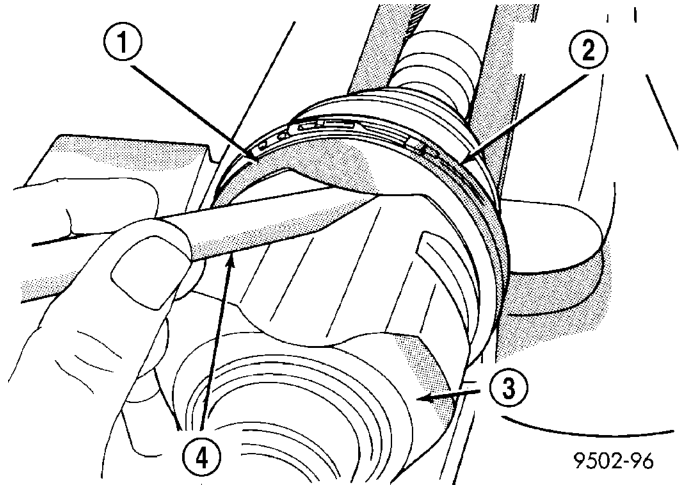


Fig. 39 Trim Stick Inserted for Venting Tripod Joint

1 - INNER TRIPOD JOINT SEALING BOOT
2 - SEALING BOOT CLAMP
3 - INNER TRIPOD JOINT HOUSING
4 - TRIM STICK

(10) With trim stick inserted between sealing boot and tripod joint housing, position inner tripod joint on halfshaft until correct sealing boot edge to edge length is obtained for type of sealing boot material being used (Fig. 40) (Fig. 41). Then remove the trim stick.

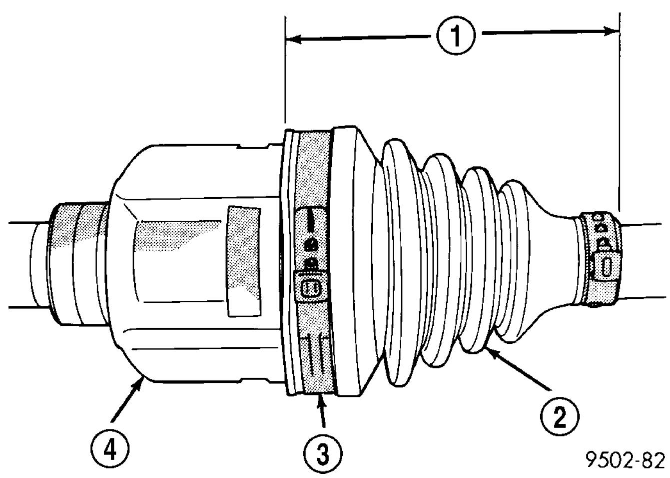


Fig. 40 Sealing Boot End to End Length with Hytrel Boot

1 - 107 MILLIMETERS
2 - HYTREL SEALING BOOT
3 - SEALING BOOT CLAMP
4 - INNER TRIPOD JOINT

(11) Clamp tripod joint sealing boot to tripod joint using required procedure for type of boot clamp application. 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. 42). Tighten nut on crimp-

CV BOOT - INNER (Continued)

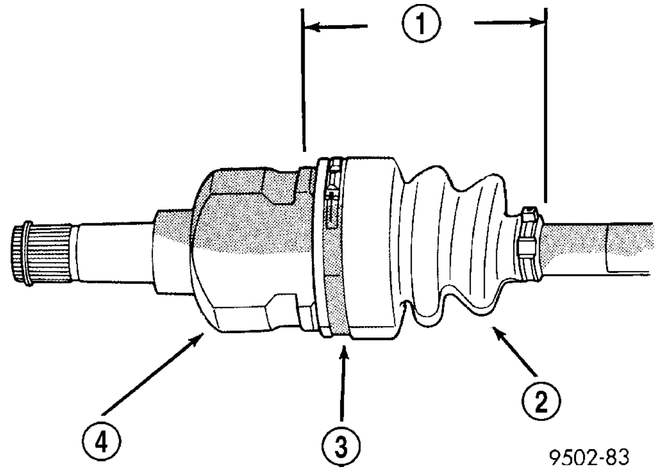


Fig. 41 Sealing Boot End to End Length with Silicone Boot

1 - 105 MILLIMETERS
2 - SILICONE SEALING BOOT
3 - CLAMP
4 - INNER TRIPOD JOINT

ing tool C-4975-A until jaws on tool are closed completely together, face–to–face (Fig. 43).

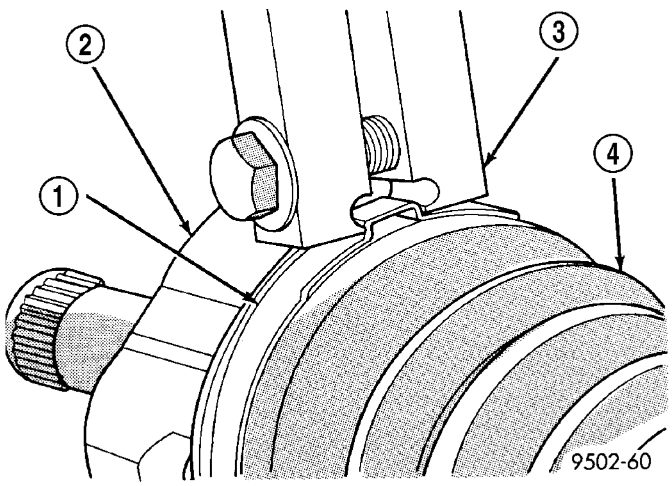


Fig. 42 Crimping Tool Installed on Sealing Boot Clamp

1 - CLAMP
2 - TRIPOD JOINT HOUSING
3 - SPECIAL TOOL C-4975A
4 - SEALING BOOT

(12) 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. 44). Squeeze tool together until top band of clamp is latched behind the two tabs on lower band of clamp (Fig. 45).

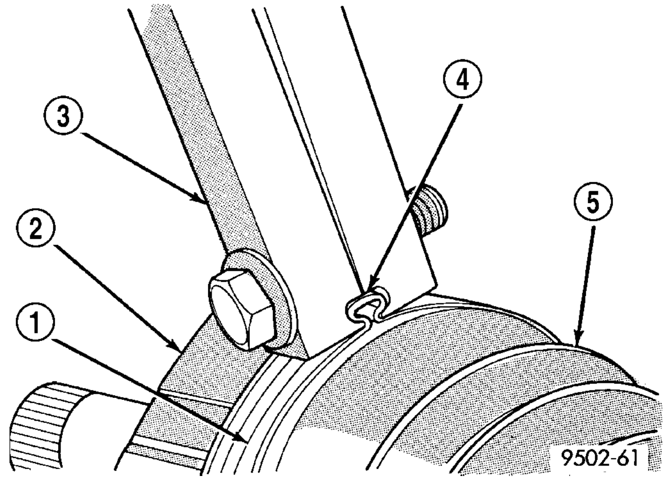


Fig. 43 Sealing Boot Retaining Clamp Installed

1 - CLAMP
2 - TRIPOD HOUSING
3 - SPECIAL TOOL C-4975A
4 - JAWS OF SPECIAL TOOL C-4975A MUST BE CLOSED COMPLETELY TOGETHER HERE
5 - SEALING BOOT

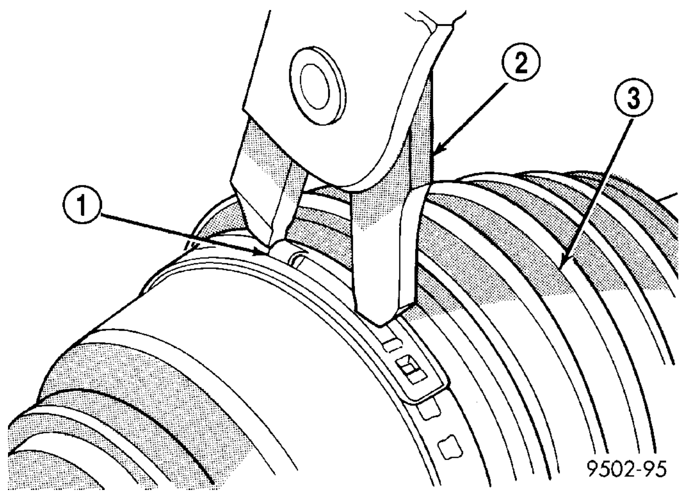


Fig. 44 Clamping Tool Installed on Sealing Boot Clamp

1 - CLAMP
2 - SPECIAL TOOL YA3050
3 - SEALING BOOT

CV BOOT - INNER (Continued)

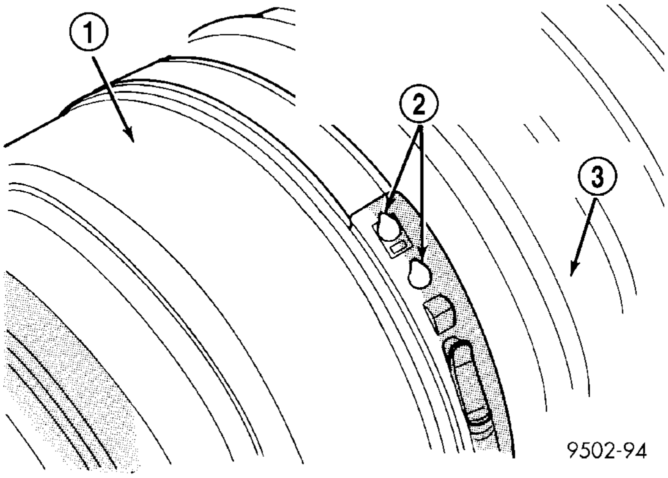


Fig. 45 Sealing Boot Clamp Correctly Installed

1 - INNER TRIPOD JOINT HOUSING
2 - TOP BAND OF CLAMP MUST BE RETAINED BY TABS AS SHOWN HERE TO CORRECTLY LATCH BOOT CLAMP
3 - SEALING BOOT

(13) Install the halfshaft requiring boot replacement back on the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)

CV BOOT - OUTER

REMOVAL

(1) Remove halfshaft assembly requiring boot replacement from vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(2) Remove large boot clamp retaining C/V joint sealing boot to C/V joint housing (Fig. 46) and discard. Remove small clamp that retains outer C/V joint sealing boot to interconnecting shaft and discard. Remove sealing boot from outer C/V joint housing and slide it down interconnecting shaft.

(3) Wipe away grease to expose outer C/V joint and interconnecting shaft.

(4) Remove outer C/V joint from interconnecting shaft using the following procedure: Support interconnecting shaft in a vise equipped with protective caps on jaws of vise to prevent damage to interconnecting shaft. Then, using a soft–faced hammer, sharply hit the end of the C/V joint housing to dislodge housing from internal circlip on interconnecting shaft (Fig. 47). Then slide outer C/V joint off end of interconnecting shaft, joint may have to be tapped off shaft using a **soft–faced** hammer.

(5) Remove large circlip (Fig. 48) from the interconnecting shaft before attempting to remove outer C/V joint sealing boot.

(6) Slide sealing boot off interconnecting shaft.

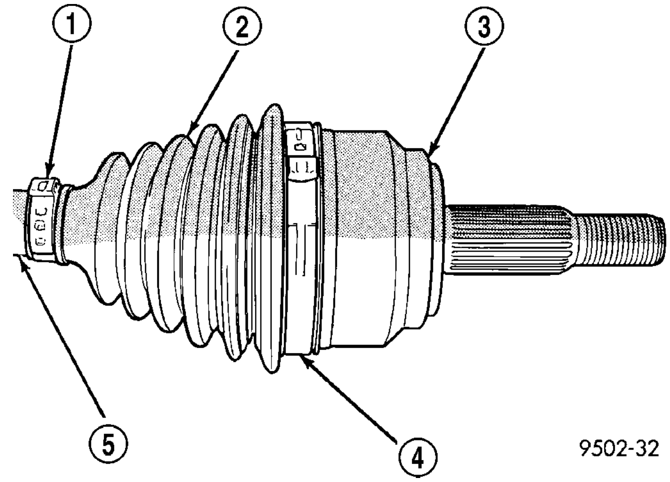


Fig. 46 Outer C/V Joint Seal Boot Clamps

1 - SMALL CLAMP
2 - SEALING BOOT
3 - OUTER C/V JOINT HOUSING
4 - LARGE CLAMP
5 - INTERCONNECTING SHAFT

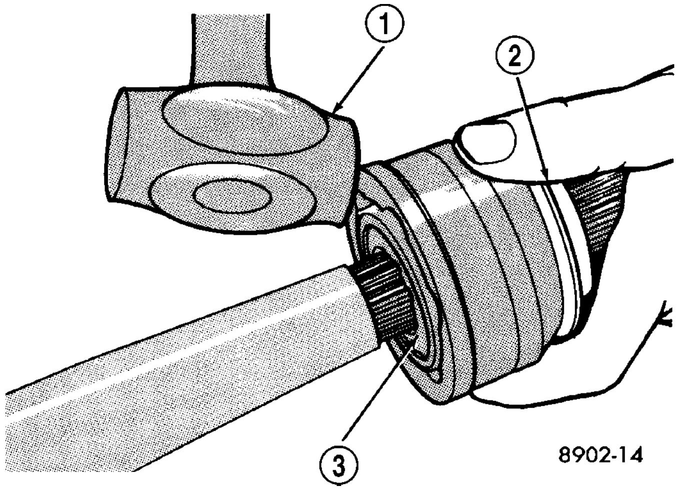


Fig. 47 Outer C/V Joint Removal from Interconnecting Shaft

1 - SOFT HAMMER (TAP INNER RACE ONLY)
2 - WEAR SLEEVE
3 - CIRCLIP (OUTER END OF SHAFT)

(7) Thoroughly clean and inspect outer C/V joint assembly and interconnecting joint for any signs of excessive wear. **If any parts show signs of excessive wear, the halfshaft assembly will require replacement. Component parts of these halfshaft assemblies are not serviceable.**

CV BOOT - OUTER (Continued)

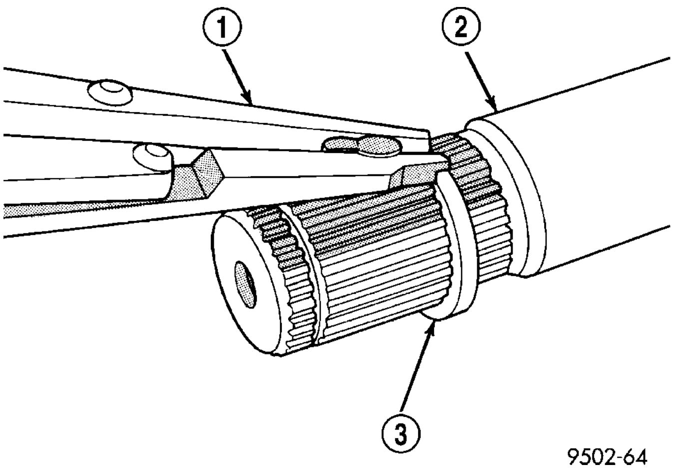


Fig. 48 Circlip Removal from Interconnecting Shaft

1 - SNAP RING PLIERS
2 - INTERCONNECTING SHAFT
3 - CIRCLIP

INSTALLATION

(1) Slide new sealing boot to interconnecting shaft retaining clamp onto interconnecting shaft. Slide the outer C/V joint assembly sealing boot onto the interconnecting shaft (Fig. 49). **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.**

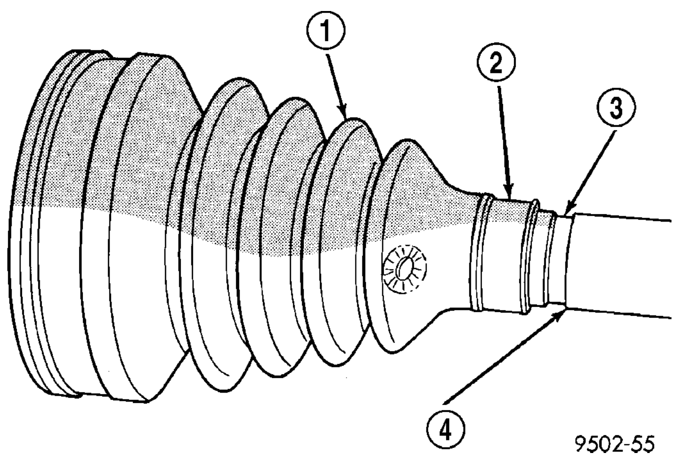


Fig. 49 Sealing Boot Installation on Interconnecting Shaft

1 - SEALING BOOT
2 - RAISED BEAD IN THIS AREA OF SEALING BOOT
3 - GROOVE
4 - INTERCONNECTING SHAFT

(2) Align splines on interconnecting shaft with splines on cross of outer C/V joint assembly and start outer C/V joint onto interconnecting shaft.

(3) Install outer C/V joint assembly onto interconnecting shaft by using a **soft–faced** hammer and tapping end of stub axle (with hub nut installed) until outer C/V joint is fully seated on interconnecting shaft (Fig. 50).

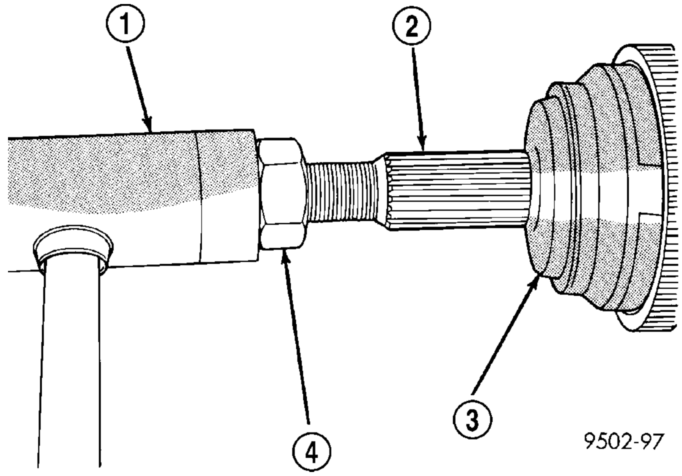


Fig. 50 Outer C/V Joint Installation on Interconnecting

1 - SOFT FACED HAMMER
2 - STUB AXLE
3 - OUTER C/V JOINT
4 - HUB NUT

(4) Outer C/V joint assembly must be installed on interconnecting shaft until cross of outer C/V joint assembly is seated against circlip on interconnecting shaft (Fig. 51).

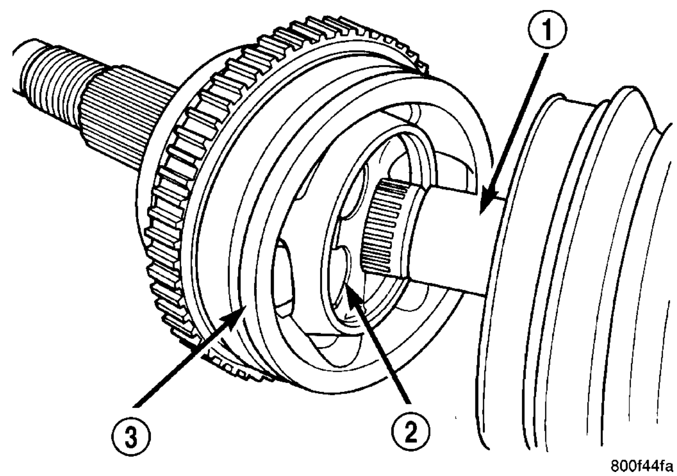


Fig. 51 Outer C/V Joint Correctly Installed on Interconnecting Shaft

1 - INTERCONNECTING SHAFT
2 - CROSS
3 - OUTER C/V JOINT ASSEMBLY

CV BOOT - OUTER (Continued)

(5) Distribute 1/2 the amount of grease provided in seal boot service package (DO NOT USE ANY OTHER TYPE OF GREASE) into outer C/V joint assembly housing. Put the remaining amount into the sealing boot.

(6) Install outer C/V joint sealing 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. 52). Tighten nut on crimping tool C-4975-A until jaws on tool are closed completely together, face to face (Fig. 53).

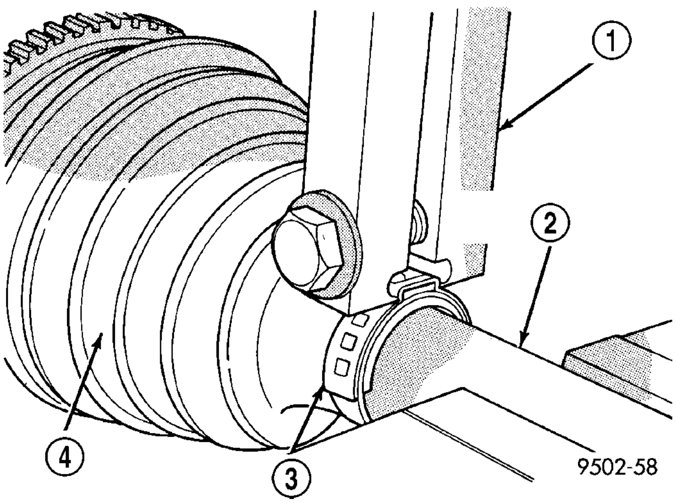


Fig. 52 Crimping Tool Installed on Sealing Boot Clamp

1 - SPECIAL TOOL C-4975A
2 - INTERCONNECTING SHAFT
3 - CLAMP
4 - SEALING BOOT

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 outer C/V joint sealing boot into its retaining groove on outer C/V joint housing. Install sealing boot to outer C/V joint retaining clamp evenly on sealing boot.

(9) Clamp sealing boot onto outer C/V joint housing using Crimper, Special Tool C-4975-A and the following procedure. Place crimping tool C-4975-A over bridge of clamp (Fig. 54). Tighten nut on crimping tool C-4975-A until jaws on tool are closed completely together, face to face (Fig. 55).

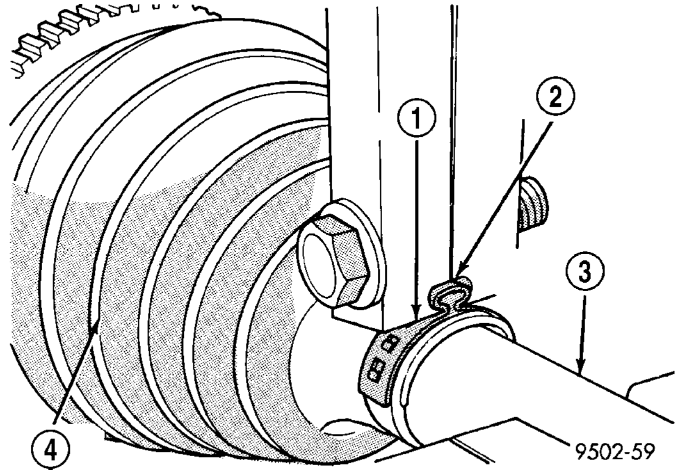


Fig. 53 Sealing Boot Retaining Clamp Installed

1 - CLAMP
2 - JAWS OF SPECIAL TOOL C-4975A MUST BE CLOSED COMPLETELY TOGETHER HERE
3 - INTERCONNECTING SHAFT
4 - SEALING BOOT

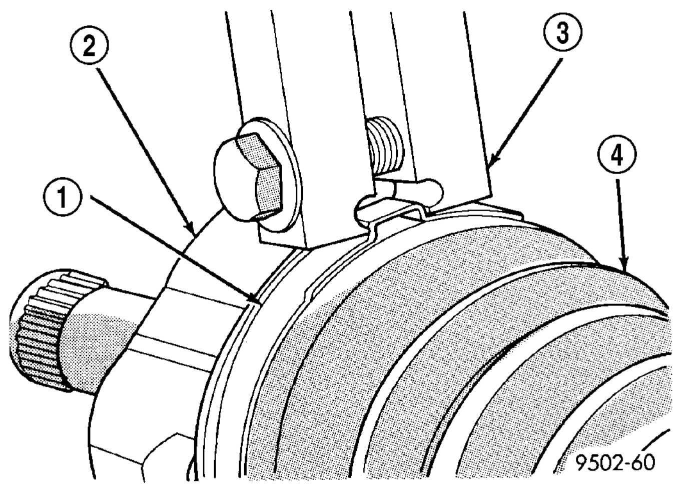


Fig. 54 Crimping Tool Installed on Sealing Boot Clamp

1 - CLAMP
2 - TRIPOD JOINT HOUSING
3 - SPECIAL TOOL C-4975A
4 - SEALING BOOT

CV BOOT - OUTER (Continued)

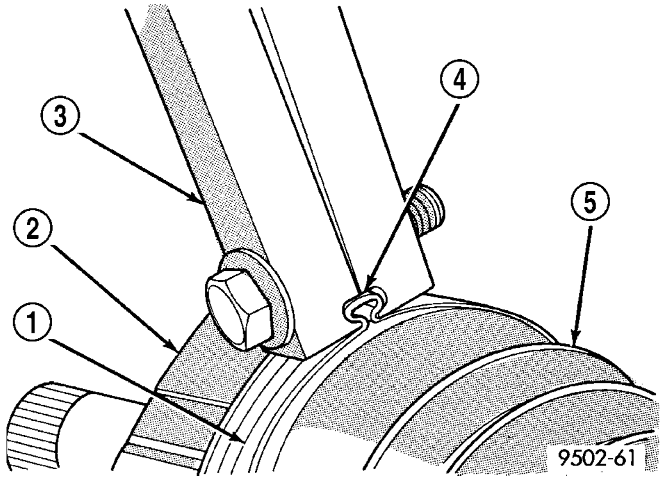


Fig. 55 Sealing Boot Retaining Clamp Installed

1 - CLAMP
2 - TRIPOD HOUSING
3 - SPECIAL TOOL C-4975A
4 - JAWS OF SPECIAL TOOL C-4975A MUST BE CLOSED COMPLETELY TOGETHER HERE
5 - SEALING BOOT

(10) Install the halfshaft requiring boot replacement back on the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)

INTERMEDIATE SHAFT

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INTERMEDIATE SHAFT

REMOVAL

NOTE: The intermediate shaft support bearing is not serviced separately. Bearing replacement requires shaft assembly replacement.

(1) Remove passenger side halfshaft assembly. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(2) Remove two (2) intermediate shaft bearing-to-bracket bolts (Fig. 1).

(3) Slide intermediate shaft/bearing assembly out of transaxle (Fig. 1).

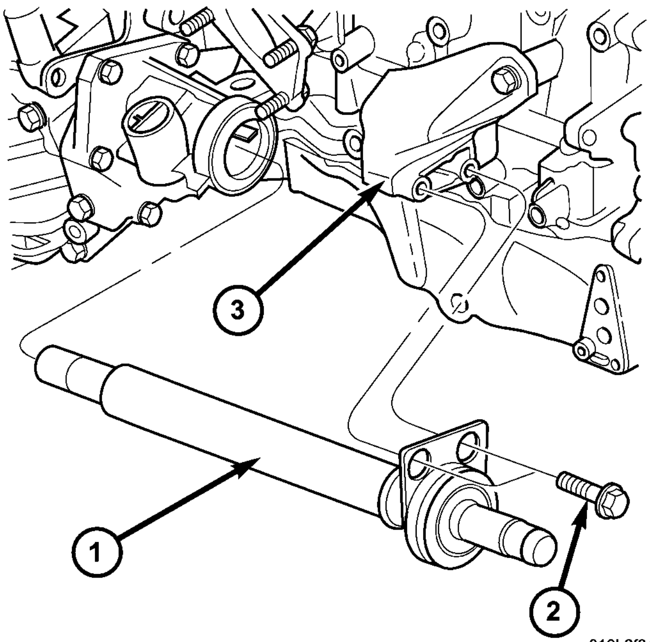

Fig. 1 Intermediate Shaft/Bearing Assembly—2.4L Turbo Models

1 - INTERMEDIATE SHAFT/BEARING ASSEMBLY
2 - BOLT (2)
3 - SUPPORT BRACKET

(4) Inspect transaxle output seal and replace as necessary.

(5) If necessary to remove support bracket, remove two (2) support bracket-to-engine block bolts and remove bracket (Fig. 2).

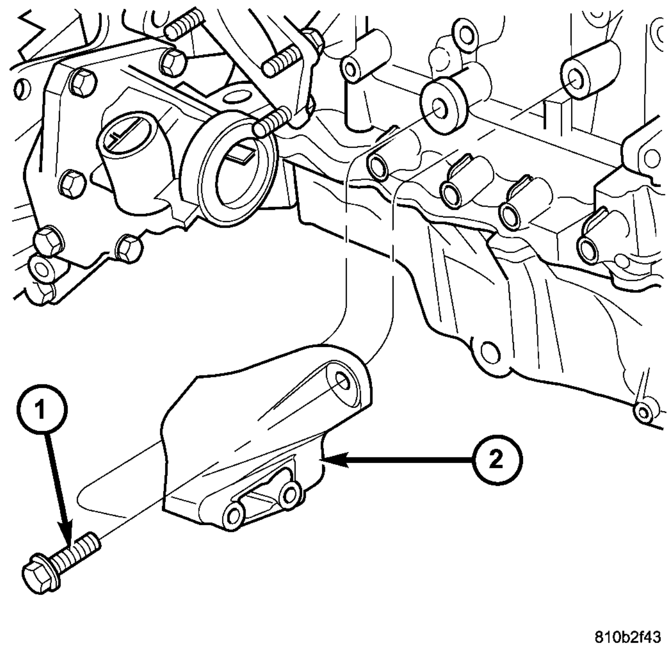

Fig. 2 Intermediate Shaft Support Bracket—2.4L Turbo Models

1 - BOLT (2)
2 - SUPPORT BRACKET

INSTALLATION

NOTE: The intermediate shaft support bearing is not serviced separately. Bearing replacement requires shaft assembly replacement.

(1) If support bracket was removed, install support bracket into position. Install two (2) support bracket-to-engine block bolts and torque to 54 N·m (40 ft. lbs.) (Fig. 2).

(2) Install intermediate shaft into position (Fig. 1). Install two (2) intermediate shaft bearing-to-support bracket bolts and torque to 28 N·m (250 in. lbs.).

(3) Install passenger side halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).

BRAKES

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BRAKES - BASE

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BRAKES - BASE

DESCRIPTION - BASE BRAKE SYSTEM

The base brake system consists of the following components:

- Brake pedal
- Brake lamp switch
- Power brake booster
- Master cylinder
- Proportioning valves (2) (on non-ABS vehicles only)
- Brake tubes and hoses
- Disc brakes (front)
- Disc brakes (rear) (optional)
- Drum brakes (rear)
- Parking brake

The hydraulic brake system is diagonally split on both the non-antilock and antilock braking systems. This means the left front and right rear brakes are on one hydraulic circuit and the right front and left rear are on the other.

Front disc brakes control the braking of the front wheels; rear braking is controlled by rear drum brakes as standard equipment. Rear disc brakes and an antilock brake system (ABS) are optional.

Vehicles equipped with the optional antilock brake system (ABS) use a system designated Mark 20e. This system shares most base brake hardware used on vehicles without ABS. A vehicle equipped with ABS, however, uses a different master cylinder and brake tubes. Also included in the ABS system is an integrated control unit (ICU) and four wheel speed sensors. All vehicles with ABS come standard with four-wheel-disc brakes. For more information on ABS (Refer to 5 - BRAKES - ABS - DESCRIPTION).

The parking brake system consists of a hand-operated lever mounted between the front seats, two parking brake cables and parking brake shoes at each rear wheel. Only vehicles with rear disc brakes receive separate parking brake shoes. Vehicles with rear drum brakes utilize the service brakes as the parking brake shoes.

OPERATION - BASE BRAKE SYSTEM

When a vehicle needs to be stopped, the driver applies the brake pedal. The brake pedal pushes the input rod of the power brake booster into the booster. The booster uses vacuum to ease pedal effort as force is transferred through the booster to the master cylinder. The booster's output rod pushes in the master cylinder's primary and secondary pistons applying hydraulic pressure through the proportioning valves (non-ABS - rear only) and chassis brake tubes to the brakes at each tire and wheel assembly.

The parking brakes are hand-operated. When applied, the parking brake lever pulls on cables that actuate brake shoes at each rear wheel. The parking brake lever has an automatic-adjusting feature that takes up any excessive slack in the parking brake cable system.

WARNING

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

CAUTION

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.

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean system components. These fluids damage rubber cups and seals.

CAUTION: During service procedures, grease or any other foreign material must be kept off the caliper assembly, brake linings, brake rotor and external surfaces of the hub.

BRAKES - BASE (Continued)

CAUTION: When handling the brake rotor and caliper, be careful to avoid damaging the brake rotor and caliper, and scratching or nicking the brake shoe lining.

DIAGNOSIS AND TESTING - BASE BRAKE SYSTEM DIAGNOSIS CHARTS

NOTE: There are three diagnosis charts following that cover the RED BRAKE WARNING INDICATOR LAMP, BRAKE NOISE and OTHER BRAKE CONDITIONS.

RED BRAKE WARNING INDICATOR LAMP

CONDITION	POSSIBLE CAUSES	CORRECTION
RED BRAKE WARNING INDICATOR LAMP ON	1. Parking brake lever not fully released.	1. Release parking brake lever.
	2. Parking brake warning lamp switch on parking brake lever.	2. Inspect and replace switch as necessary.
	3. Brake fluid level low in reservoir.	3. Fill reservoir. Check entire system for leaks. Repair or replace as required.
	4. Brake fluid level switch.	4. Disconnect switch wiring connector. If lamp goes out, replace switch.
	5. Mechanical instrument cluster (MIC) problem.	5. Refer to Appropriate Diagnostic Information.
	6. ABS EVBP malfunction.	6. Refer to ABS section and Appropriate Diagnostic Information.

BRAKE NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC BRAKE CHIRP	1. Excessive brake rotor runout.	1. Follow brake rotor diagnosis and testing. Correct as necessary.
	2. Lack of lubricant on brake caliper slides.	2. Lubricate brake caliper slides.
DISC BRAKE RATTLE OR CLUNK	1. Broken or missing anti-rattle spring clips on shoes.	1. Replace brake shoes.
	2. Caliper guide pins loose.	2. Tighten guide pins.
	3. Worn shoe plate or rails.	3. Replace shoes (pads) or knuckle.
DISC BRAKE SQUEAK AT LOW SPEED (WHILE APPLYING LIGHT BRAKE PEDAL EFFORT)	1. Brake shoe linings.	1. Replace brake shoes.
DRUM BRAKE CHIRP	1. Lack of lubricant on brake shoe support plate where shoes ride.	1. Lubricate shoe contact areas on brake shoe support plates.
	2. Wheel cylinder out of alignment.	2. Loosen wheel cylinder mounting bolts, realign wheel cylinder with brake shoes and tighten mounting bolts.
DRUM BRAKE CLUNK	1. Drum(s) have threaded machined braking surface.	1. Reface or replace drake drums as necessary.

BRAKES - BASE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
DRUM BRAKE HOWL OR MOAN	1. Lack of lubricant on brake shoe support plate where shoes ride and at the anchor.	1. Lubricate shoe contact areas on brake shoe support plates and at the anchor.
	2. Rear brake shoes.	2. Replace rear brake shoes.
SCRAPING OR WHIRRING	1. ABS wheel speed sensor and tone wheel.	1. Inspect, correct or replace faulty component(s).
SCRAPING (METAL-TO-METAL).	1. Foreign object interference with brakes.	1. Inspect brakes and remove foreign object.
	2. Brake shoes worn out.	2. Replace brake shoes. Inspect rotors and drums. Reface or replace as necessary.

OTHER BRAKE CONDITIONS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKES CHATTER	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
BRAKES DRAG (FRONT OR ALL)	1. Contaminated brake fluid.	1. Check for swollen seals. Replace all system components containing rubber.
	2. Brake lamp switch out of adjustment.	2. Replace brake lamp switch and adjust. (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL)
	3. Binding caliper pins or bushings.	3. Replace pins and bushings
	4. Master cylinder not fully returning.	4. Inspect master cylinder and replace as necessary.
	5. Binding brake pedal.	5. Replace brake pedal.
BRAKES DRAG (REAR ONLY)	1. Parking brake cables binding or froze up.	1. Check cable routing. Replace cables as necessary.
	2. Parking brake cable return spring not returning shoes.	2. Replace cables as necessary.
	3. Service brakes not adjusted properly (rear drum brakes only).	3. Adust rear brake shoes. Refer to Brake Pads/Shoes - Drum Brakes.
	4. Obstruction inside the center console preventing full return of the parking brake cables.	4. Remove console and remove obstruction.
BRAKES GRAB	1. Contaminated brake shoe linings.	1. Inspect and clean, or replace shoes. Repair source of contamination.
	2. Improper power brake booster assist.	2. Refer to power brake booster - diagnosis and testing.
EXCESSIVE PEDAL EFFORT	1. Obstruction of brake pedal.	1. Inspect, remove or move obstruction.
	2. Low power brake booster assist.	2. Refer to power brake booster.
	3. Glazed brake shoe linings.	3. Reface or replace brake rotors as necessary. Replace brake shoes.

BRAKES - BASE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Brake shoe lining transfer to brake rotor.	4. Reface or replace brake rotors as necessary. Replace brake shoes (pads).
EXCESSIVE PEDAL EFFORT (HARD PEDAL - CAN'T SKID WHEELS)	1. Power brake booster runout (vacuum assist).	1. Check booster vacuum hose and engine tune for adequate vacuum supply. Refer to power brake booster.
EXCESSIVE PEDAL TRAVEL (VEHICLE STOPS OK)	1. Air in brake lines.	1. Bleed brakes.
	2. Rear drum brake auto-adjuster malfunctioning.	2. Inspect and replace drum brake components as necessary. Adjust rear brakes.
EXCESSIVE PEDAL TRAVEL (ONE FRONT WHEEL LOCKS UP DURING HARD BRAKING)	1. One of the two hydraulic circuits is malfunctioning.	1. Inspect system for leaks. Check master cylinder for internal malfunction.
PEDAL PULSATES/ SURGES DURING BRAKING	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
PEDAL IS SPONGY	1. Air in brake lines.	1. Bleed brakes.
PREMATURE REAR WHEEL LOCKUP	1. Contaminated brake shoe linings.	1. Inspect and clean, or replace shoes. Repair source of contamination.
	2. Inoperative proportioning valve (non-ABS vehicles only).	2. Test proportioning valves following diagnosis and testing procedure. Refer to Proportioning Valve. Replace valves as necessary.
	3. ABS EVBP not functioning.	3. Refer to the ABS section and Appropriate Diagnostic Information.
STOP LAMPS STAY ON	1. Brake lamp switch out of adjustment.	1. Replace brake lamp switch and adjust. (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL)
	2. Brake pedal binding.	2. Inspect and replace as necessary.
	3. Power Brake Booster not allowing pedal to return completely.	3. Replace power brake booster.
VEHICLE PULLS TO RIGHT OR LEFT ON BRAKING	1. Frozen brake caliper piston.	1. Replace frozen piston or caliper. Bleed brakes.
	2. Contaminated brake shoe lining (most likely front linings).	2. Inspect and clean, or replace shoes. Repair source of contamination.
	3. Pinched brake lines.	3. Replace pinched line.
	4. Leaking piston seal.	4. Replace piston seal or brake caliper.
	5. Suspension problem.	5. Refer to the Suspension group.

BRAKES - BASE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
PARKING BRAKE - EXCESSIVE HANDLE TRAVEL	1. Rear brakes out of adjustment.	1. Adjust rear drum brake shoes, or rear parking brake shoes on vehicles with rear disc brakes.

STANDARD PROCEDURE - BASE BRAKE BLEEDING

NOTE: For bleeding the ABS hydraulic system, refer to Antilock Brake System Bleeding in the Antilock Brake System section.

CAUTION: Before removing the master cylinder cap, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder reservoir.

CAUTION: Use only Mopar® brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 3 specifications.

Do not pump the brake pedal at any time while a bleeder screw is open. This will only increase the amount of air in the system and make additional bleeding necessary.

Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed.

The following wheel circuit 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

MANUAL BLEEDING

NOTE: To bleed the brakes manually, the aid of a helper will be required.

(1) Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose (Fig. 1).

(2) Have a helper pump the brake pedal three or four times and hold it in the down position.

(3) With the pedal in the down position, open the bleeder screw at least 1 full turn.

(4) Once the brake pedal has dropped, close the bleeder screw. After the bleeder screw is closed, release the brake pedal.

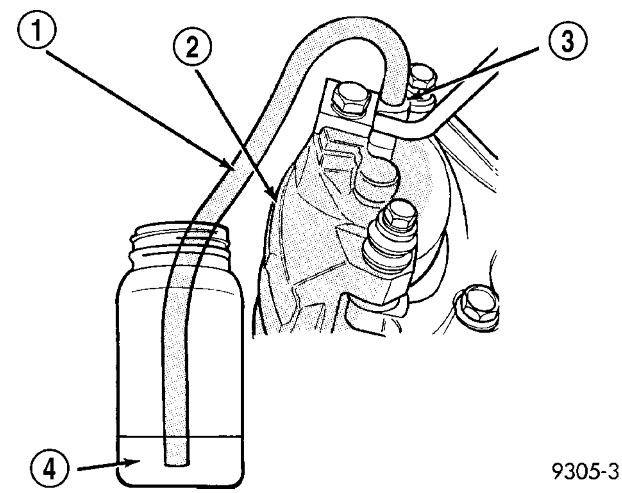


Fig. 1 Proper Method for Purging Air From Brake System (Typical)

1 - CLEAR HOSE
2 - BRAKE CALIPER
3 - BLEEDER SCREW
4 - CLEAN BRAKE FLUID

(5) Repeat the above steps until all trapped air is removed from that wheel circuit (usually four or five times).

(6) Bleed the remaining wheel circuits in the same manner until all air is removed from the brake system. Monitor the fluid level in the master cylinder reservoir to make sure it does not go dry.

(7) Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Rebleed the brakes as necessary.

(8) Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

PRESSURE BLEEDING

NOTE: Follow pressure bleeder manufacturer's instructions for use of pressure bleeding equipment.

Following the same wheel circuit sequence as prescribed for manual bleeding.

(1) Attach Adapter, Special Tool 6921, to the master cylinder reservoir (Fig. 2).

(2) Attach Bleeder Tank, Special Tool C-3496-B, or an equivalent, to the adapter on the master cylinder.

(3) Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough

BRAKES - BASE (Continued)

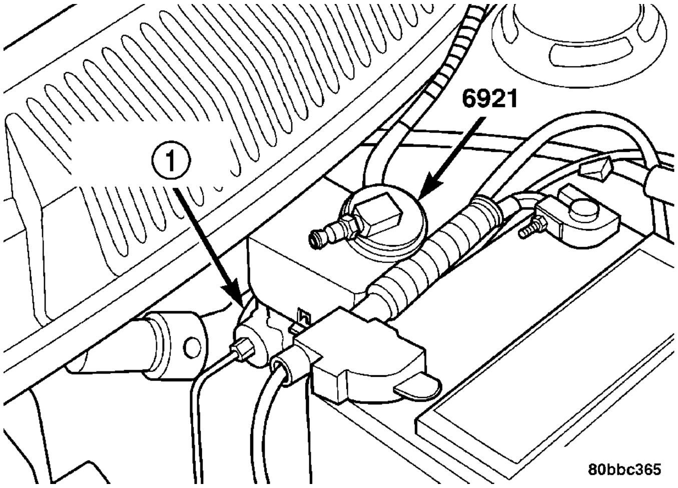


Fig. 2 Special Tool 6921

1 - MASTER CYLINDER

fresh brake fluid to submerge the end of the hose (Fig. 1).

(4) Open the bleeder screw at least one full turn or more to obtain a steady stream of brake fluid.

(5) After approximately 4–8 ounces of fluid have been bled through the brake circuit and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.

(6) Repeat this procedure at all the remaining bleeder screws.

(7) Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Rebleed the brakes as necessary.

(8) Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

SPECIFICATIONS

BRAKE ACTUATION SYSTEM

ACTUATION:	
Vacuum Operated Power Brakes	Standard
Hydraulic System	Dual-Diagonally Split
BRAKE PEDAL:	
Pedal Ratio	3.41
POWER BRAKE BOOSTER:	
Make/Type	Bosch/Vacuum
Mounting Studs	M8 x 1.25
Diaphragm Size/Type	205 mm Tandem
MASTER CYLINDER ASSEMBLY:	
Type	Dual Tandem
ACTUATION:	
Body Material	Anodized Aluminum
Reservoir Material	Polypropelene
MASTER CYLINDER BORE STROKE AND SPLIT:	
Non ABS	22.23 mm x 34.0 mm (0.875 in. x 1.34 in.)
ABS	23.82 mm x 34.0 mm (0.937 in. x 1.34 in.)
Displacement Split	50 / 50
MASTER CYLINDER FLUID OUTLET PORTS:	
Tube Fitting Type	SAE 45° Inverted Flare
W/ABS - Primary Tube Nut Thread	7/16 in.–24
W/ABS - Secondary Tube Nut Thread	3/8 in.–24
W/O ABS - All Tube Nut Threads	7/16 in.–24
ABS HYDRAULIC CONTROL UNIT:	
Hydraulic Tube Fitting Type	SAE 45° Inverted Flare
Inlet Port Threads	7/16 in.–24
Outlet Port Threads-Left Front and Left Rear	7/16 in.–24
Outlet Port Threads-Right Front and Right Rear	3/8 in.–24
PROPORTIONING VALVES: (non-ABS vehicles)	
Material	Aluminum
Function	Fixed Pressure Proportioning

BRAKE FASTENER TORQUE

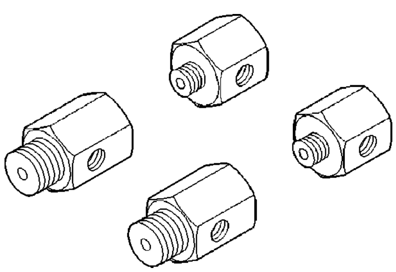
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
ABS ICU Mounting Bolts (To Bracket)	11	8	97
ABS ICU Mounting Bracket Bolts (To Frame)	23	17	200
ABS CAB Mounting Screws (To HCU)	2	—	17
ABS Wheel Speed Sensor Mounting Screw	12	9	105
Brake Hose Banjo Bolt (To Caliper)	24	18	210
Brake Tube Nuts	17	12	145
Disc Brake Caliper Adapter (To Knuckle) - Front - SRT-4	104	77	—

BRAKES - BASE (Continued)

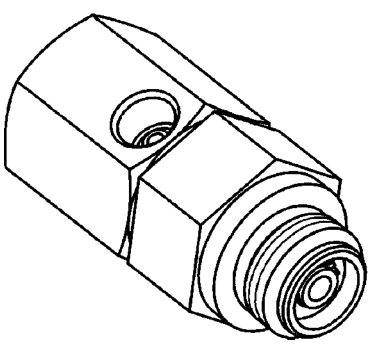
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Disc Brake Caliper Adapter (To Knuckle) - Rear	75	55	—
Disc Brake Caliper Guide Pin Bolts	22	16	192
Disc Brake Caliper Guide Pin Bolts - Front - SRT-4	35	26	—
Disc Brake Caliper Bleeder Screw	15	11	125
Drum Brake Shoe Support Plate Mounting Bolts	75	55	—
Drum Brake Wheel Cylinder Mounting Bolts	13	10	115
Drum Brake Wheel Cylinder Bleeder Screw	10	7	89
Master Cylinder Mounting Nuts	18	13	160
Parking Brake Lever Mounting Nut And Screw	28	21	250
Power Brake Booster Mounting Nuts	34	25	300
Wheel Mounting (Lug) Nuts	135	100	—

SPECIAL TOOLS

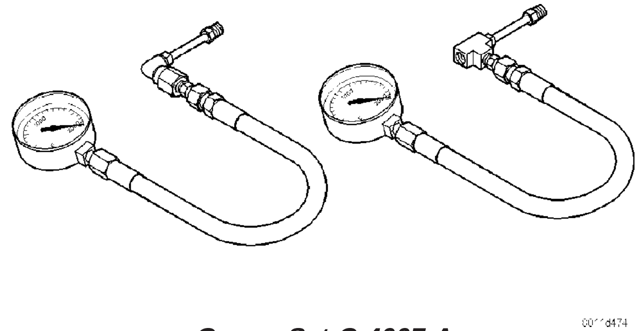
BASE BRAKE SYSTEM



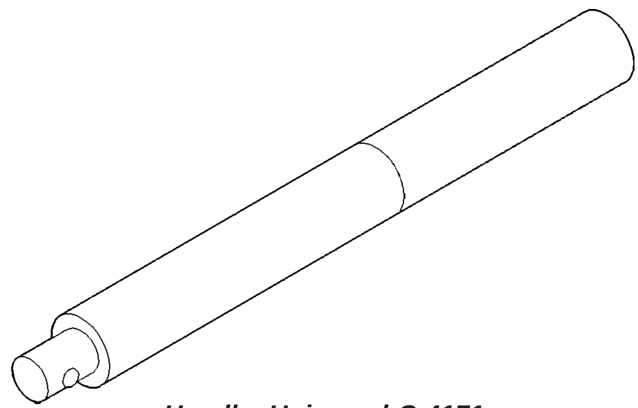
Adapters, Brake Pressure 6805



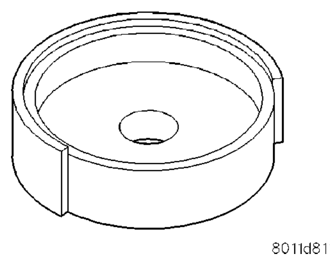
Adapter, Brake Pressure 8644



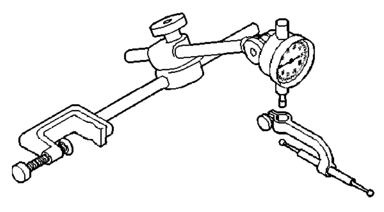
Gauge Set C-4007-A



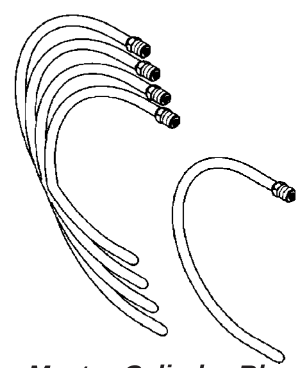
Handle, Universal C-4171



Installer, Dust Boot C-4689



Dial Indicator C-3339



Tubes, Master Cylinder Bleed 8358

BRAKE FLUID LEVEL SWITCH

DESCRIPTION

The brake fluid level switch is located in the left side of the brake fluid reservoir on the master cylinder (Fig. 3). It is clipped into the reservoir. It can be removed from the reservoir and replaced if necessary.

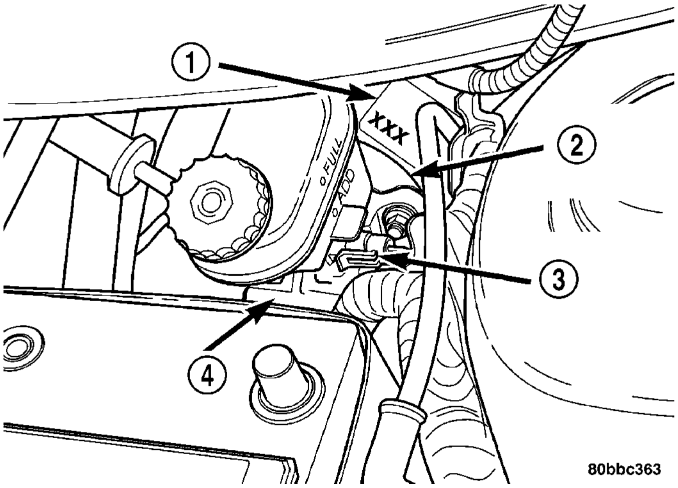


Fig. 3 Master Cylinder and Power Brake Booster

1 - POWER BRAKE BOOSTER PARTS IDENTIFICATION TAG
2 - POWER BRAKE BOOSTER
3 - BRAKE FLUID LEVEL SWITCH
4 - MASTER CYLINDER

OPERATION

The purpose of the brake fluid level switch is to provide the driver with an early warning that the brake fluid level in the master cylinder reservoir has dropped below an acceptable level.

As the fluid drops below the designed level, the fluid level switch closes and grounds the red BRAKE warning indicator circuit. This turns on the red BRAKE warning indicator. At this time, the master cylinder brake fluid reservoir must be checked and filled to the full mark with DOT 3 brake fluid. Check the entire brake hydraulic system for evidence of a leak.

CAUTION: An abnormal loss of brake fluid in the master cylinder fluid reservoir could be caused by a leak in the hydraulic system. The entire brake hydraulic system should be checked for evidence of a leak.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Remove the vehicle wiring harness connector from brake fluid level switch in master cylinder brake fluid reservoir (Fig. 3).

(2) Push together the retaining tabs holding the brake fluid level switch in place in the brake fluid reservoir (Fig. 4).

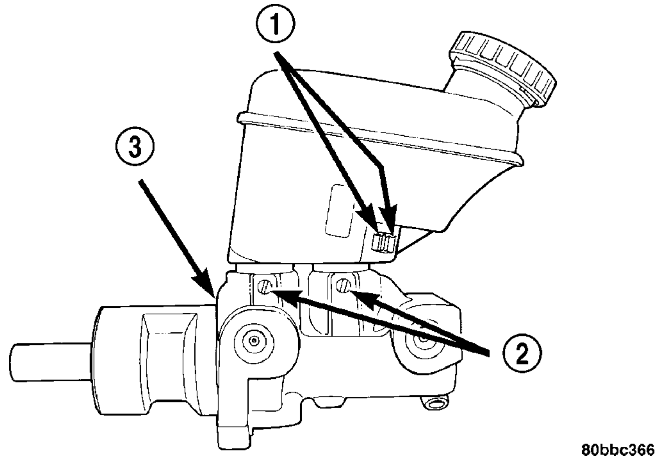


Fig. 4 Master Cylinder Reservoir

1 - BRAKE FLUID LEVEL SWITCH RETAINING TABS
2 - RESERVOIR RETAINING PINS
3 - SEAL

(3) Pull the brake fluid level switch out the other side of the reservoir.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Align the brake fluid level switch with its mounting hole on the left side of the master cylinder brake fluid reservoir. Push the switch into the fluid reservoir until the switch retaining tabs are expanded on the other side of the reservoir, locking it in place (Fig. 4).

(2) Connect the brake fluid level switch wiring connector (Fig. 3).

HYDRAULIC/MECHANICAL

DESCRIPTION

DESCRIPTION - DISC BRAKES (FRONT)

The front disc brakes consist of the following components (Fig. 5):

- Brake caliper - single-piston, floating type
- Brake shoes and linings
- Brake rotor

The caliper is a one-piece casting with the inboard side containing a single piston cylinder bore (Fig. 6).

The front disc brake caliper piston, is manufactured from a phenolic compound. The outside diameter of the caliper piston is 54 mm.

The caliper is mounted to the steering knuckle using bushings, sleeves and two guide pin bolts (Fig. 6). The guide pin bolts thread directly into bosses on the steering knuckle.

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. All of the front brake force generated during braking of the vehicle is taken up directly by the steering knuckles of the vehicle.

There are two brake shoes mounted to each caliper, one inboard and one outboard (Fig. 6). When brake

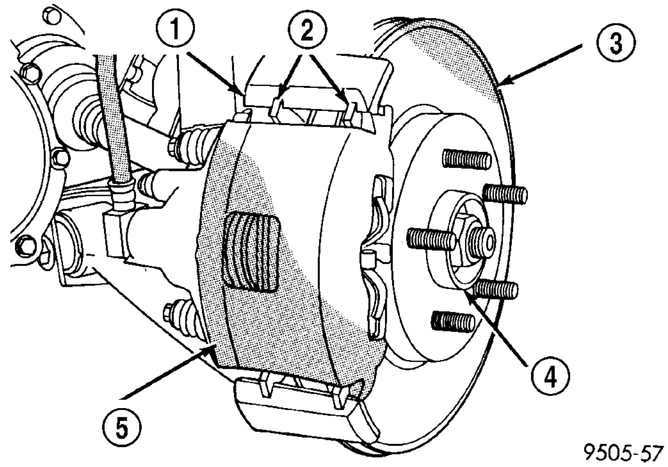


Fig. 5 Front Disc Brakes

1 - STEERING KNUCKLE
2 - BRAKE PADS AND LININGS
3 - BRAKE ROTOR
4 - DRIVING HUB
5 - CALIPER ASSEMBLY

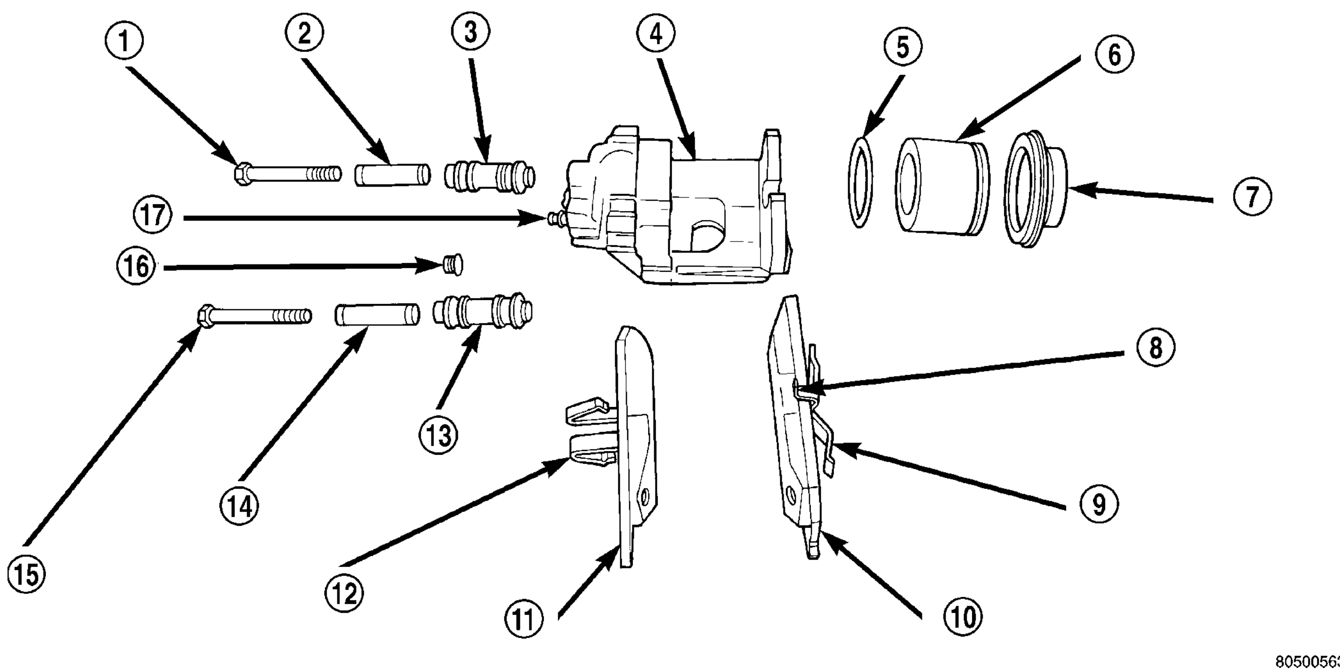


Fig. 6 Front Disc Brake Caliper

1 - CALIPER GUIDE PIN BOLT
2 - SLEEVE
3 - BUSHING
4 - CALIPER
5 - PISTON SEAL
6 - PISTON
7 - DUST SEAL
8 - WEAR INDICATOR
9 - ANTI-RATTLE CLIP
10 - BRAKE SHOE
11 - BRAKE SHOE
12 - ANTI-RATTLE CLIP
13 - BUSHING
14 - SLEEVE
15 - CALIPER GUIDE PIN BOLT
16 - CAP
17 - BLEEDER SCREW

HYDRAULIC/MECHANICAL (Continued)

shoes are replaced, only brake shoes meeting the original equipment manufacturer (OEM) formulation (such as Mopar® replacement parts) should be used.

The brake shoe linings contact the brake rotor. Each front brake rotor is vented to help cool it during and after brake applications. It is mounted on the studs of the front wheel bearing hub.

DESCRIPTION - DISC BRAKES (FRONT) - SRT-4

This vehicle is equipped with a performance brake system that features heavy duty wheel brake components. The sales code for this system is BR3. Each front disc brake assembly consists of the following components (Fig. 7):

- Caliper - single-piston, floating type
- Caliper adapter
- Shoe and lining assemblies (Pads)
- Rotor

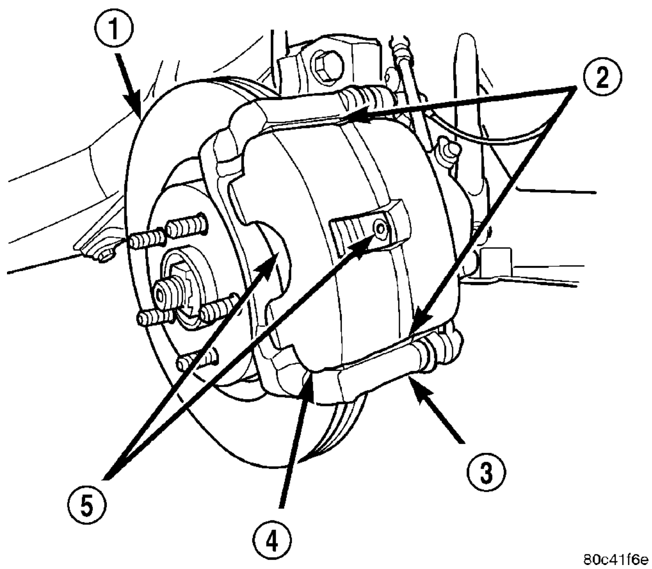


Fig. 7 Front Disc Brakes

1 - BRAKE ROTOR
2 - ABUTMENT SHIMS
3 - DISC BRAKE ADAPTER
4 - CALIPER
5 - BRAKE SHOES (PADS)

The BR3 brake caliper can be easily identified. Each BR3 brake caliper is painted red and is marked “Turbo” referring to the engine package the vehicle is equipped with. The caliper is a one-piece casting with the inboard side containing a single piston cylinder bore. The front disc brake caliper piston, is manufactured from a phenolic compound. The outside diameter of the caliper piston is 57 mm.

A square-cut rubber piston seal is located in a machined groove in the caliper cylinder bore. This seal provides a hydraulic seal between the piston and the cylinder wall (Fig. 8).

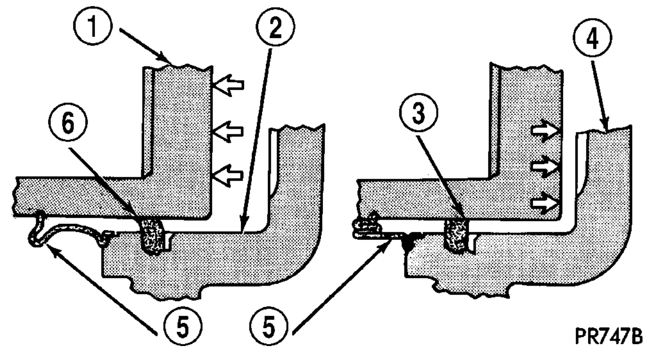


Fig. 8 Piston Seal Function

1 - PISTON
2 - CYLINDER BORE
3 - PISTON SEAL BRAKE PRESSURE OFF
4 - CALIPER HOUSING
5 - DUST BOOT
6 - PISTON SEAL BRAKE PRESSURE ON

A rubber dust boot is installed in a groove in cylinder bore opening and in a groove in the piston (Fig. 9). The boot prevents contamination in the bore area.

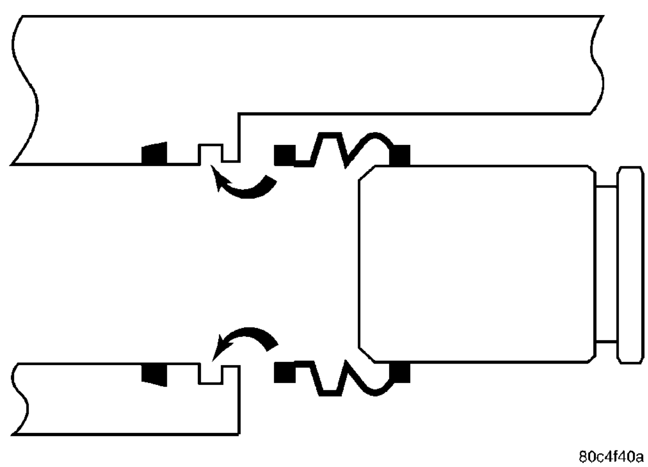


Fig. 9 Piston Boot Installation

The BR3 caliper is mounted to the caliper adapter using two guide pin bolts. These bolts thread into two guide pins, slid into the adapter (Fig. 10). The pins are lubricated and have boots to seal them in place in the adapter.

The caliper adapter is fastened to the steering knuckle using two bolts (Fig. 11).

The machined abutments on the adapter position the brake shoes and caliper. There are two brake shoes, sometimes referred to as pads, per disc brake. One shoe is placed on each side of the brake rotor (Fig. 12). Two abutment shims (upper and lower) ride between the shoes and adapter. The shoes have springs permanently attached to them to help maintain a distance between the shoes and the caliper. When brake shoes are replaced, only brake shoes meeting the original equipment manufacturer (OEM)

HYDRAULIC/MECHANICAL (Continued)

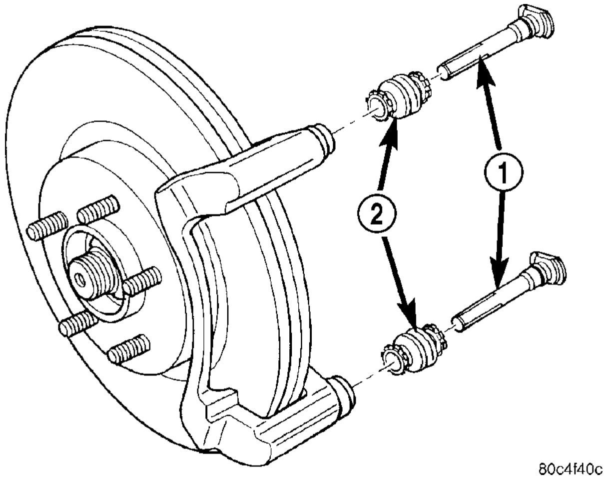


Fig. 10 Adapter, Boots And Pins

1 - PINS
2 - BOOTS

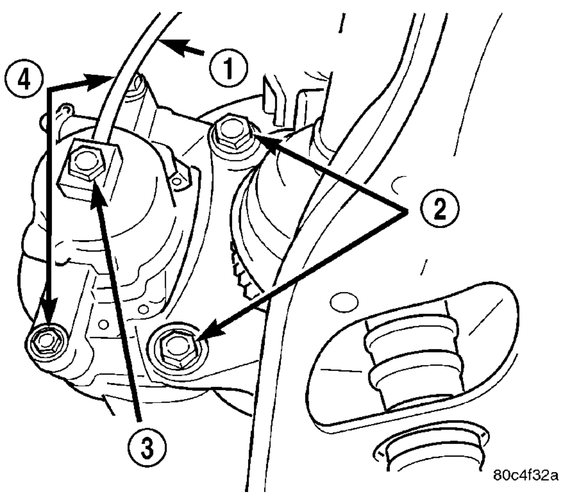


Fig. 11 Adapter Mounting

1 - BRAKE HOSE
2 - ADAPTER MOUNTING BOLTS
3 - BANJO BOLT
4 - CALIPER GUIDE PIN BOLTS

formulation (such as Mopar® replacement parts) should be used.

Front disc brakes are equipped with audible wear indicators on the inboard brake shoes.

Each front brake rotor is vented to help cool it during and after brake applications. It is mounted on the studs of the front wheel bearing hub. The BR3 rotor can be easily identified by a recessed machined area near the hub center that is not present on a standard brake rotor (Fig. 13).

NOTE: Special care should be taken to assure that the correct caliper is used only with the correct rotor.

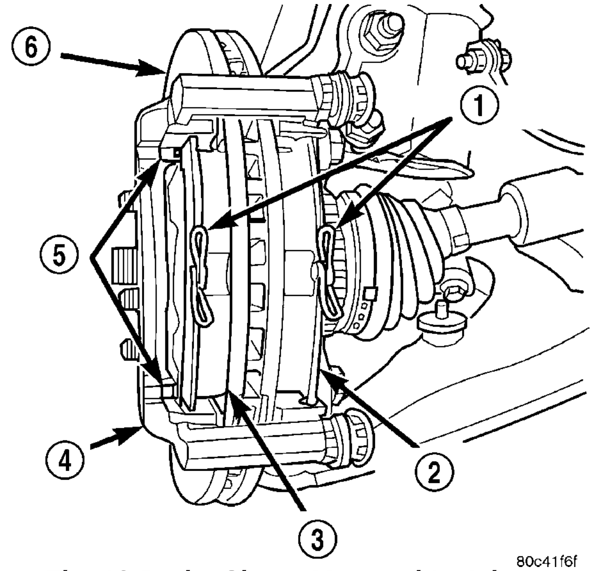


Fig. 12 Brake Shoes Mounted In Adapter

1 - SPRINGS
2 - INBOARD SHOE
3 - OUTBOARD SHOE
4 - DISC BRAKE ADAPTER
5 - ABUTMENT SHIMS
6 - BRAKE ROTOR

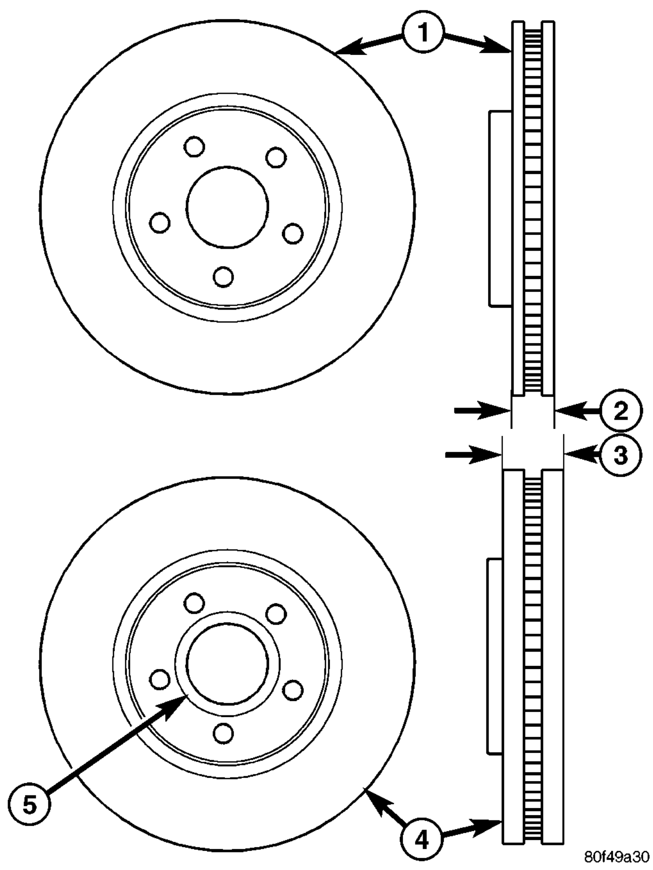


Fig. 13 Front Brake Rotor Comparison

1 - STANDARD PL BRAKE ROTOR
2 - STANDARD ROTOR THICKNESS 21.87-22.13 MM
3 - PERFORMANCE ROTOR THICKNESS 27.91-28.10 MM
4 - PERFORMANCE BRAKE ROTOR
5 - INDENTIFYING MACHINED AREA

HYDRAULIC/MECHANICAL (Continued)

DESCRIPTION - DISC BRAKES (REAR)

Rear disc brakes are optional equipment on some models of this vehicle (Fig. 14). The rear disc brakes are similar to the front disc brakes; however, there are several distinctive features that require different service procedures. The rear disc brakes consist of the following components:

- Brake caliper - single-piston, floating type
- Brake caliper adapter
- Brake shoe and linings
- Brake rotor - drum-in-hat type

All vehicles equipped with rear disc brakes have a small duo-servo drum brake mounted to the caliper adapter. This is part of the parking brake system. The drum brake shoes expand out against a braking surface (hat section) on the inside area of the disc brake rotor.

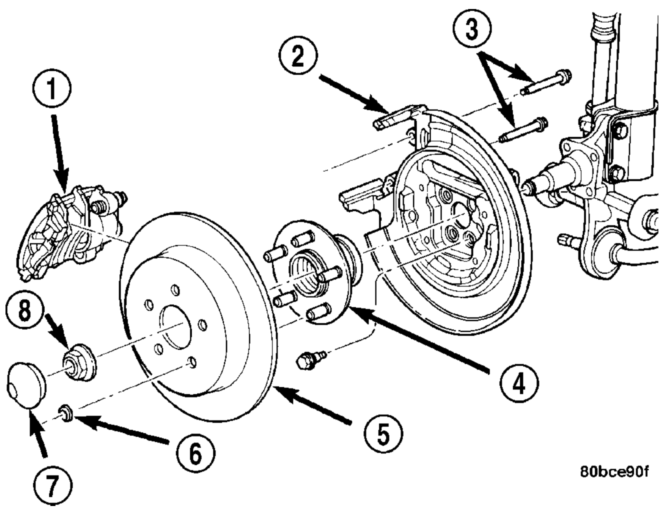


Fig. 14 Rear Disc Brakes

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

Vehicles are equipped with a caliper assembly that has a 34 mm (1.43 in.) piston and uses a solid non-vented rotor.

The caliper assembly for all applications floats on rubber bushings using internal metal sleeves that are attached to the adapter using threaded guide pin bolts.

The brake caliper adapter and rotor shield are mounted to the rear suspension knuckles of vehicle. The adapter is used to mount the brake caliper to the vehicle (Fig. 14). The adapter has two machined abutments, which are used to position and align the caliper and brake pads for movement inboard and outboard. The adapter also mounts the parking brake shoes and actuating cables to the vehicle.

DESCRIPTION - DISC BRAKES (REAR) - SRT-4

Rear disc brakes are standard on this vehicle (Fig. 14). The sales code for this performance brake system is BR3. Each rear disc brake consists of the following components:

- Caliper - single-piston, floating type
- Caliper adapter
- Shoe and lining assemblies (Pads)
- Rotor - drum-in-hat type

BR3 rear disc brakes are similar to and operate the same as standard PL brakes, but differ in the following ways. Like the standard PL with rear disc brakes, vehicles with BR3 rear disc brakes are equipped with a one piece caliper assembly that has a 36 mm (1.42 in.) piston and use a solid non-vented 270 mm (10.63 in.) drum-in-hat brake rotor. But unlike the standard PL, the BR3 rear disc brake caliper is painted red. Also, the BR3 rear disc brake rotor has a pad contact surface approximately 3 mm thicker than the standard PL. BR3 brake rotors can be easily identified by the recessed machined area near the hub center (Fig. 15).

To accommodate the additional width brake rotors, instead of using wider calipers, each rear brake shoe metal backing plate is 1.5 mm thinner than that of the standard PL with rear disc brakes (Fig. 16). When replacing brake shoes, often referred to as pads, only brake shoes meeting the original equipment manufacturer (OEM) formulation (such as Mopar® replacement parts) should be used.

NOTE: Special care should be taken to assure that the correct brake shoes are used only with the correct rotor.

As with the standard PL rear disc brakes, the BR3 caliper adapter is mounted to the rear suspension spindle. The adapter is used to mount the disc brake caliper to the vehicle (Fig. 14).

DESCRIPTION - DRUM BRAKES (REAR)

Rear drum brakes are standard equipment on this vehicle. The rear drum brakes consist of the major components listed in the figure (Fig. 17). Other components related to the brake shoes themselves can be seen in the next figure (Fig. 18).

The rear wheel drum brakes are a two-shoe, internal-expanding type with an automatic adjuster screw (Fig. 18). The automatic adjuster screw is actuated each time the brakes are applied and adjustment is made when lining wear permits. The automatic adjuster screw is located directly below the rear brake wheel cylinder.

HYDRAULIC/MECHANICAL (Continued)

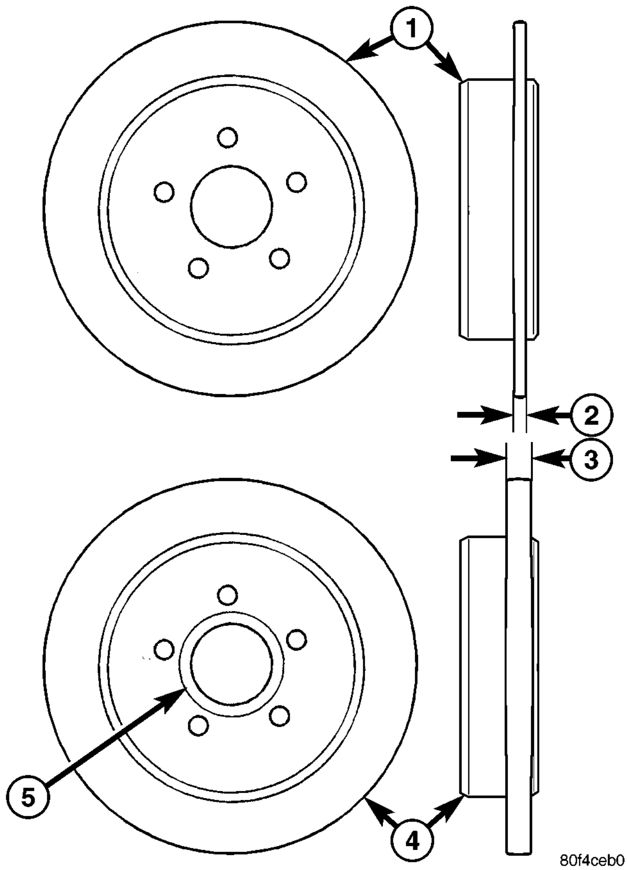


Fig. 15 Rear Brake Rotor Comparison

1 - STANDARD PL BRAKE ROTOR
2 - STANDARD ROTOR THICKNESS 8.75-9.25 MM
3 - PERFORMANCE ROTOR THICKNESS 11.75-12.25 MM
4 - BR3 PERFORMANCE BRAKE ROTOR
5 - INDENTIFYING MACHINED AREA

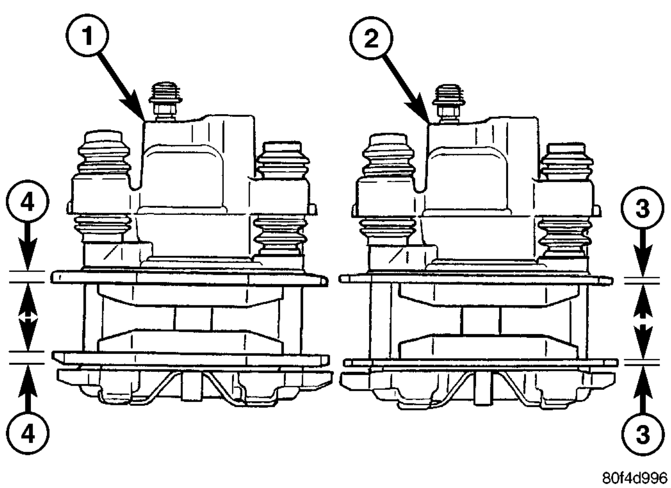


Fig. 16 Standard And BR3 Brake Shoes

1 - BRAKE CALIPER WITH STANDARD SHOES
2 - BRAKE CALIPER WITH BR3 SHOES
3 - 4.5 MM
4 - 6.0 MM

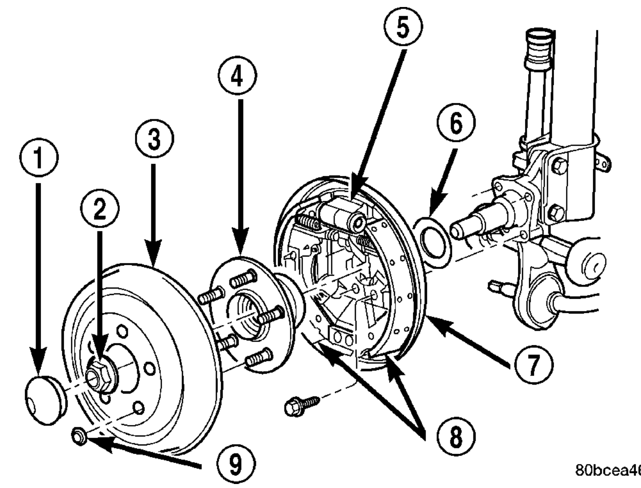


Fig. 17 Rear Drum Brakes

1 - DUST CAP
2 - NUT
3 - DRUM
4 - HUB AND BEARING
5 - WHEEL CYLINDER
6 - SEAL
7 - SUPPORT PLATE
8 - BRAKE SHOES
9 - RETAINER CLIP

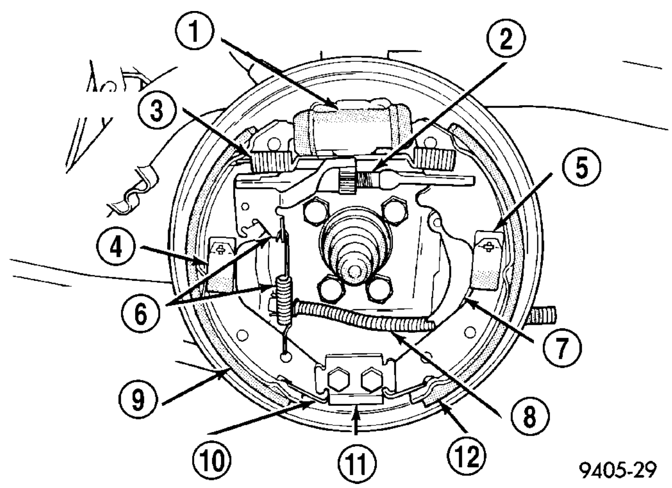


Fig. 18 Drum Brake Shoes (Left Side Shown)

1 - WHEEL CYLINDER
2 - AUTOMATIC ADJUSTER SCREW ASSEMBLY
3 - RETURN SPRING
4 - HOLD DOWN CLIP
5 - HOLD DOWN CLIP
6 - AUTOMATIC ADJUSTER LEVER AND SPRING
7 - PARK BRAKE LEVER
8 - PARK BRAKE CABLE
9 - FRONT BRAKE SHOE
10 - BRAKESHOE TO ANCHOR SPRING
11 - BRAKE ANCHOR PLATE
12 - REAR BRAKE SHOE

HYDRAULIC/MECHANICAL (Continued)

DIAGNOSIS AND TESTING - DRUM BRAKE AUTOMATIC ADJUSTER

To properly test the drum brake automatic adjuster, the aide of a helper inside the vehicle to apply the brakes will be necessary.

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the access plug from the rear adjustment slot in each brake support plate.

(3) Insert a thin screwdriver in the adjustment slot and push back the adjustment lever. With the lever in this position, back the star wheel adjustment off approximately 10 notches. This will eliminate the possibility that the brake is at full adjustment, and can be adjusted no further.

(4) Remove the screwdriver from the adjustment slot.

(5) Watch the star wheel through the adjustment slot, while a helper applies the brake pedal. As the brake shoes apply, the adjustment lever should move downward, turning the star wheel. A definite rotation of the adjuster star wheel can be observed if the automatic adjuster is working properly.

If the star wheel does not move as indicated, the brake drum needs to be removed and further inspection of the rear brakes is necessary.

(6) If the star wheel is operating properly, readjust the brakes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS).

(7) Reinstall the adjustment slot access plug.

(8) Lower the vehicle.

BRAKE LINES

DESCRIPTION - BRAKE TUBES AND HOSES

The brake tubes are steel with a corrosion-resistant nylon coating applied to the external surfaces. The flex hoses are made of reinforced rubber with fittings at each end.

OPERATION - BRAKE TUBES AND HOSES

The purpose of the brake tubes and flex hoses is to transfer brake fluid pressure, developed by the master cylinder to the brakes at each wheel of the vehicle. The flex hoses connect the chassis brake tubes which are mounted to the vehicle's underbody to the brake at each wheel, allowing for movement of the vehicle's suspension.

INSPECTION - BRAKE 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.

BRAKE PADS/SHOES - FRONT

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

NOTE: Some vehicles use a different lining material on the front disc brake shoes than other vehicles. When new brake shoes are installed, be sure the brake shoes for the correct type of brake system are used.

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove both front tire and wheel assemblies from vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Begin on one side of the vehicle.

NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the shoes and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the rear of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

(4) Remove the two brake caliper guide pin bolts (Fig. 19).

(5) Remove the disc brake caliper from the steering knuckle. The caliper is removed by first tipping either the top (right side caliper) or bottom (left side caliper) of the caliper away from the brake rotor, then pulling the caliper off the opposite end's caliper slide abutment (on the knuckle) and brake rotor.

BRAKE PADS/SHOES - FRONT (Continued)

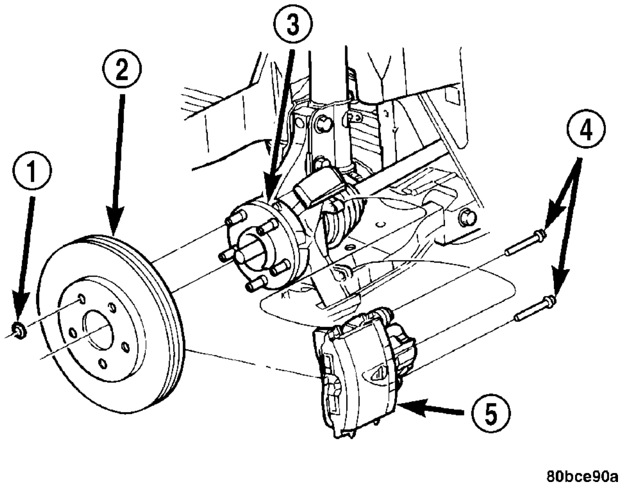


Fig. 19 Caliper And Rotor Mounting

1 - RETAINER CLIP
2 - BRAKE ROTOR
3 - HUB
4 - GUIDE PIN BOLTS
5 - DISC BRAKE CALIPER

(6) Support the caliper using a wire or cord to prevent the weight of caliper from damaging the brake hose (Fig. 20). Do not let the caliper hang by the brake hose.

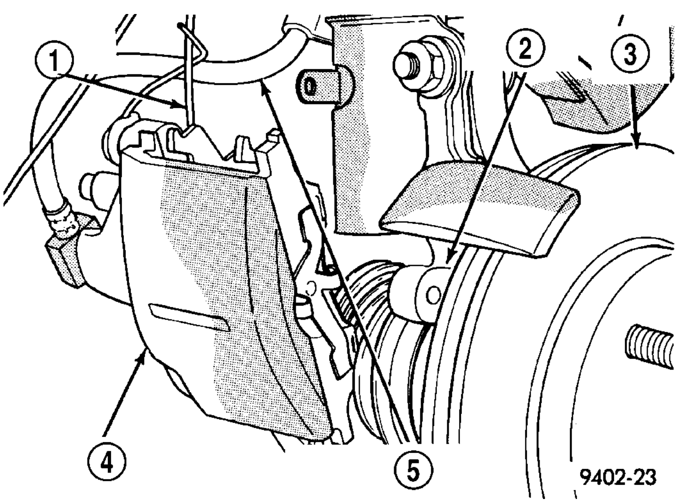


Fig. 20 Supporting Caliper

1 - WIRE HANGER
2 - STEERING KNUCKLE
3 - BRAKE DISC
4 - DISC BRAKE CALIPER ASSEMBLY
5 - BRAKE HYDRAULIC HOSE

(7) Remove the outboard brake shoe from the caliper by prying the shoe retaining clip over the raised area on the caliper. Slide the brake shoe down and off of the caliper (Fig. 21).

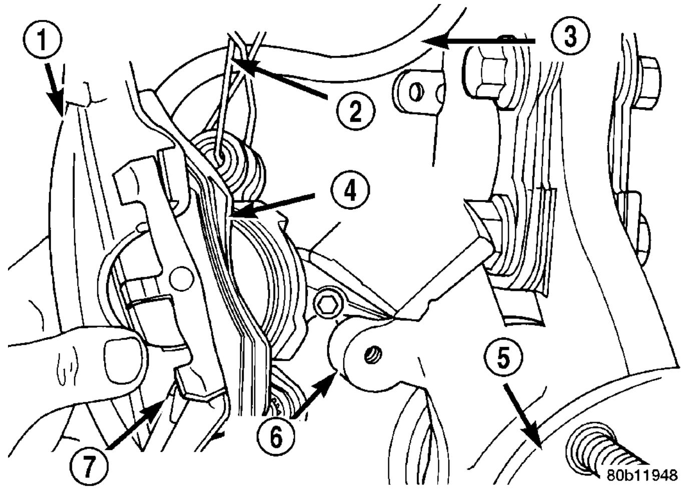


Fig. 21 Removing Outboard Brake Shoe

1 - CALIPER ASSEMBLY
2 - HANGER WIRE
3 - BRAKE FLEX HOSE
4 - OUTBOARD BRAKE PAD
5 - HUB/BEARING ASSEMBLY
6 - STEERING KNUCKLE
7 - SCREWDRIVER

(8) Pull the inboard brake shoe away from the caliper piston until the retaining clip is out of the cavity in the piston (Fig. 22) and remove the shoe.

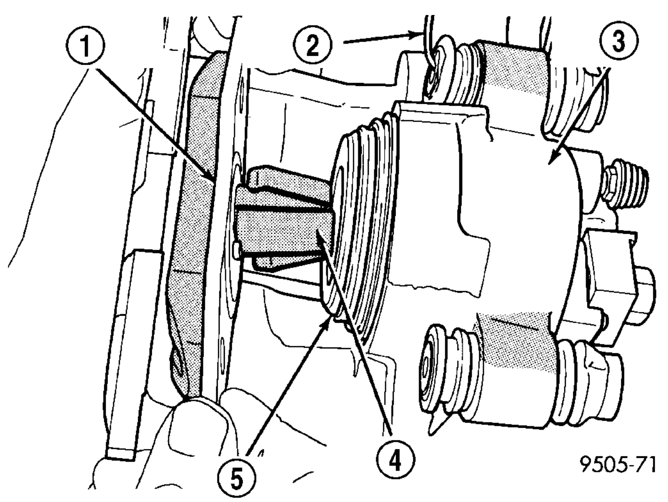


Fig. 22 Removing Inboard Brake Shoe

1 - INBOARD BRAKE SHOE
2 - HANGER WIRE
3 - CALIPER ASSEMBLY
4 - RETAINING CLIP
5 - PISTON

(9) Repeat the above procedure to the front brakes on the other side of the vehicle.

BRAKE PADS/SHOES - FRONT (Continued)

CLEANING - DISC BRAKE SHOES

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

INSPECTION - DISC BRAKE SHOES

Visually inspect brake shoes (pads) for uneven lining wear. Also inspect for excessive lining deterioration. Check the clearance between the tips of the wear indicators on the shoes (if equipped) and the brake rotors.

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the disc brake shoes from the calipers.

Measure each brake shoe. The combined brake shoe and its lining material thickness should be measured at its thinnest point.

For front disc brake shoes, when a set of brake shoes are worn to a thickness of approximately 7.95 mm (5/16 inch), they should be replaced.

Typically, if front shoes are worn out, both fronts and rears need to be replaced. Make sure to check rears. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REAR DISC - INSPECTION)

Replace **both** disc brake shoes (inboard and outboard) on each caliper. It is necessary to replace the shoes on the opposite side of the vehicle as well as the shoes failing inspection.

If the brake shoe assemblies do not require replacement, be sure to reinstall the brake shoes in the original position they were removed from.

INSTALLATION

NOTE: Some vehicles use a different lining material on the front disc brake shoes than other vehicles. When new brake shoes are installed, be sure the brake shoes for the correct type of brake system are used.

(1) Begin on one side of the vehicle.

(2) Completely retract the caliper piston back into the bore of the caliper. This is required to gain the necessary shoe-to-rotor clearance for the caliper installation onto the steering knuckle.

(3) Remove any protective paper from the noise suppression gasket on both the inner and outer brake shoes (if equipped).

(4) Install the inboard brake shoe into the caliper piston by firmly pressing the shoe in with the thumbs (Fig. 23). Be sure the inboard brake shoe is positioned squarely against the face of the caliper piston.

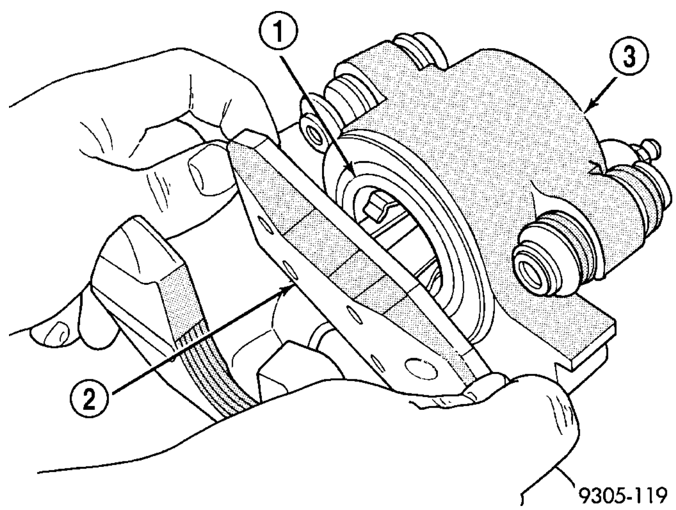


Fig. 23 Installing Inboard Brake Shoe

1 - PISTON
2 - BRAKE SHOE
3 - CALIPER ASSEMBLY

(5) Slide the new outboard brake shoe onto the caliper (Fig. 24).

(6) Lubricate both steering knuckle caliper slide abutments with a liberal amount of Mopar® Multipurpose Lubricant, or an equivalent.

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.

(7) Install the disc brake caliper (with pads) on the brake rotor and steering knuckle. The left side caliper is installed by first sliding the top of the caliper

BRAKE PADS/SHOES - FRONT (Continued)

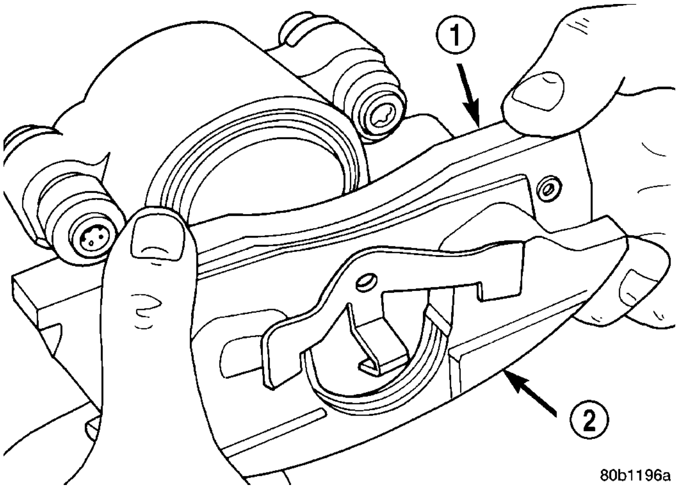


Fig. 24 Installing Outboard Brake Shoe

1 - BRAKE SHOE ASSEMBLY
2 - BRAKE CALIPER

past the top caliper slide abutment on the steering knuckle to hook the top edge of the caliper, then pushing the lower end of the caliper into place against the knuckle (Fig. 25). The right side caliper is installed by first sliding the bottom edge of the caliper past the lower caliper slide abutment on the steering knuckle to hook the lower edge of the caliper, then pushing the top of the caliper into place against the steering knuckle.

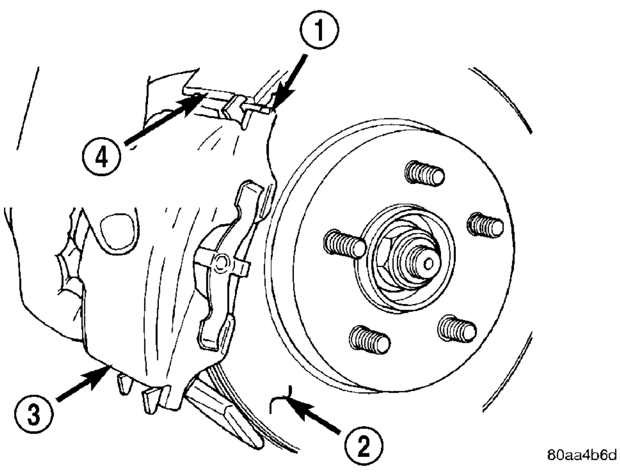


Fig. 25 Installing Left Caliper

1 - SLIDE TOP OF BRAKE CALIPER UNDER TOP ABUTMENT OF STEERING KNUCKLE AS SHOWN
2 - BRAKING DISC
3 - DISC BRAKE CALIPER
4 - STEERING KNUCKLE BRAKE ABUTMENT

(8) Install the caliper guide pin bolts and tighten them to a torque of 22 N·m (192 in. lbs.) (Fig. 19).

(9) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(10) Repeat the above procedure to the front brakes on the other side of the vehicle.

(11) Lower the vehicle.

(12) Pump the brake pedal to set the brake shoes to the brake rotors, then check brake fluid level in master cylinder reservoir. Adjust brake fluid level as necessary.

(13) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.

BRAKE PADS/SHOES - FRONT - SRT-4

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

NOTE: Perform Step 2 through Step 5 on each side of the vehicle to complete shoe set removal.

(2) Remove the front tire and wheel assembly.

(3) Remove the two brake caliper guide pin bolts (Fig. 26).

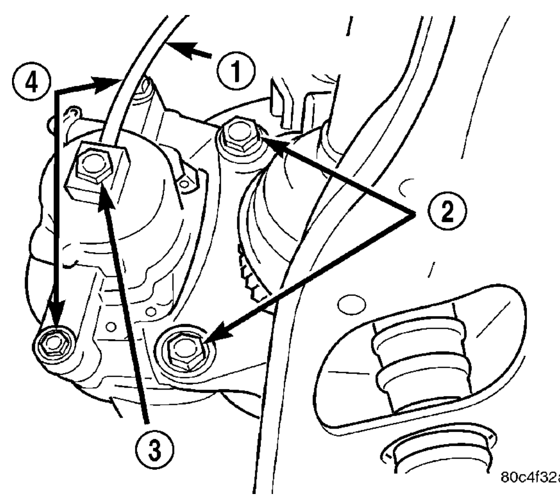


Fig. 26 Brake Caliper Mounting (Typical)

1 - BRAKE HOSE
2 - ADAPTER MOUNTING BOLTS
3 - BANJO BOLT
4 - CALIPER GUIDE PIN BOLTS

(4) Remove the disc brake caliper from the disc brake adapter and hang out of the way using wire or a bungee cord. Use care not to overextend the brake hose when doing this.

BRAKE PADS/SHOES - FRONT - SRT-4 (Continued)

(5) Remove the brake shoes from the disc brake caliper adapter (Fig. 27).

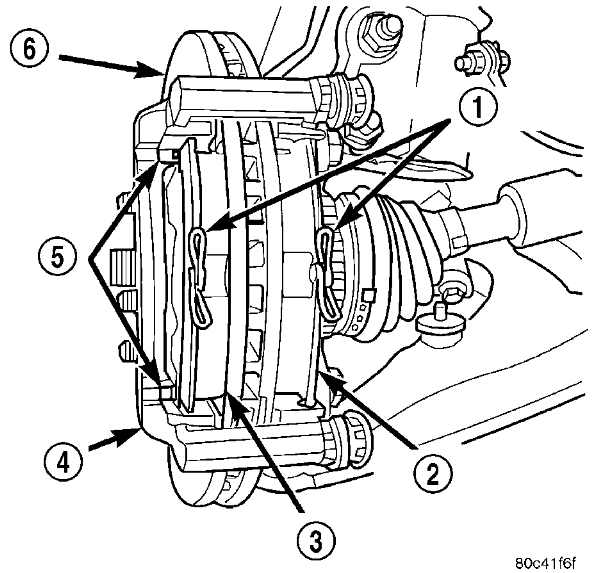


Fig. 27 Brake Shoes Mounted In Adapter

1 - SPRINGS
2 - INBOARD SHOE
3 - OUTBOARD SHOE
4 - DISC BRAKE ADAPTER
5 - ABUTMENT SHIMS
6 - BRAKE ROTOR

CLEANING - DISC BRAKE SHOES

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

INSPECTION - DISC BRAKE SHOES

Visually inspect brake shoes (pads) for uneven lining wear. Also inspect for excessive lining deterioration. Check the clearance between the tips of the wear indicators on the shoes (if equipped) and the brake rotors.

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the disc brake shoes from the calipers.

Measure each brake shoe. The combined brake shoe and its lining material thickness should be measured at its thinnest point.

For front disc brake shoes, when a set of brake shoes are worn to a thickness of approximately 7.95 mm (5/16 inch), they should be replaced.

Typically, if front shoes are worn out, both fronts and rears need to be replaced. Make sure to check rears. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REAR DISC - INSPECTION)

Replace **both** disc brake shoes (inboard and outboard) on each caliper. It is necessary to replace the shoes on the opposite side of the vehicle as well as the shoes failing inspection.

If the brake shoe assemblies do not require replacement, be sure to reinstall the brake shoes in the original position they were remove from.

INSTALLATION

NOTE: Perform Step 1 through Step 5 on each side of the vehicle to complete shoe set installation, then proceed to Step 6.

NOTE: Inboard brake shoes are not identical side-to-side. This is due to placement of the audible wear indicator on the end of each inboard shoe. Make sure that the audible wear indicators are placed toward the top when the inboard shoes are installed on each side of the vehicle.

(1) Place the brake shoes in the abutment shims clipped into the disc brake caliper adapter as shown (Fig. 27). Place the shoe with the wear indicator attached on the inboard side.

(2) Completely retract the caliper piston back into the bore of the caliper.

CAUTION: Use care when installing the caliper onto the disc brake adapter to avoid damaging the boots on the caliper guide pins.

(3) Install the disc brake caliper over the brake shoes on the brake caliper adapter. Make sure the

BRAKE PADS/SHOES - FRONT - SRT-4 (Continued)

springs on the shoes do not get caught in the hole formed into the center of the caliper housing.

(4) Align the caliper guide pin bolt holes with the guide pins. Install the caliper guide pin bolts and tighten them to a torque of 35 N·m (26 ft. lbs.) (Fig. 26).

(5) Install the tire and wheel assembly. Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(6) Lower the vehicle.

(7) Pump the brake pedal several times before moving the vehicle to set the shoes to the brake rotor.

(8) Check and adjust the brake fluid level as necessary.

(9) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

BRAKE PADS/SHOES - REAR DISC

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove both rear tire and wheel assemblies from vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

NOTE: Perform Step 3 through Step 7 on each side of vehicle to complete shoe set removal.

NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the shoes and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the rear of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

(3) Remove the two caliper guide pin bolts (Fig. 28).

(4) Remove the caliper assembly from the brake adapter by first rotating the top of the caliper away from the rotor, and then lifting the caliper assembly off the machined abutment on the adapter (Fig. 29).

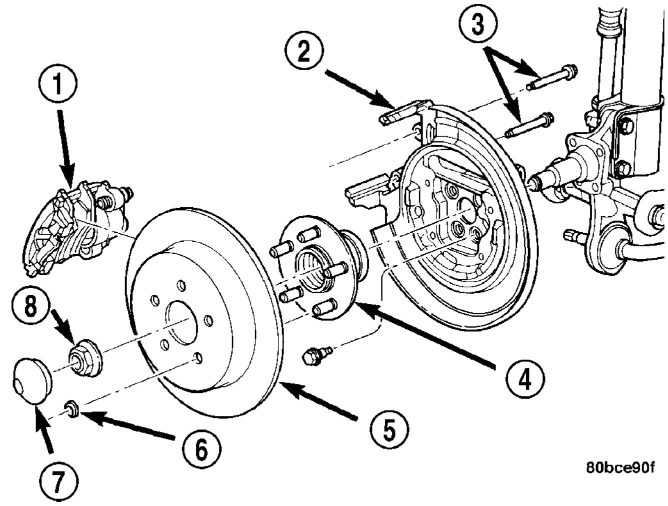


Fig. 28 Caliper And Rotor Mounting

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

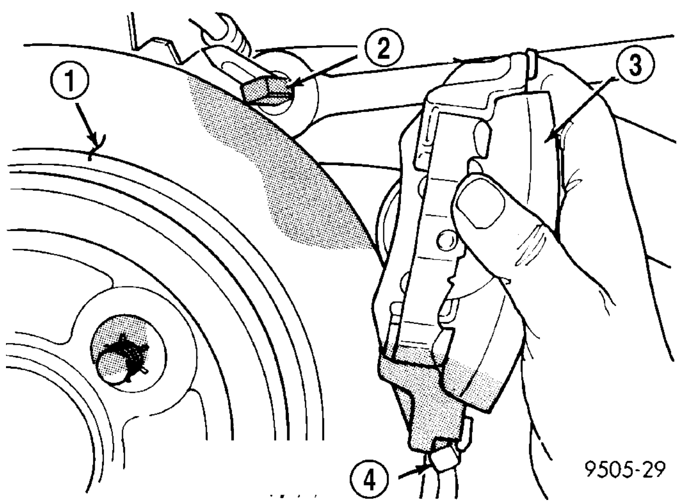


Fig. 29 Caliper Removal/Installation

1 - BRAKING DISC
2 - CALIPER ADAPTER
3 - CALIPER
4 - LOWER MACHINED ADAPTER ABUTMENT

(5) Hang the brake caliper from rear strut using wire or cord to prevent the weight of the caliper from damaging the brake hose (Fig. 30).

(6) Remove the outboard brake shoe from the caliper by prying the brake shoe retaining clip over the raised area on the caliper. Then slide the brake shoe down and off of the brake caliper (Fig. 31).

(7) Pull the inboard brake shoe away from caliper piston until the retaining clip is free from the cavity in the piston (Fig. 32).

BRAKE PADS/SHOES - REAR DISC (Continued)

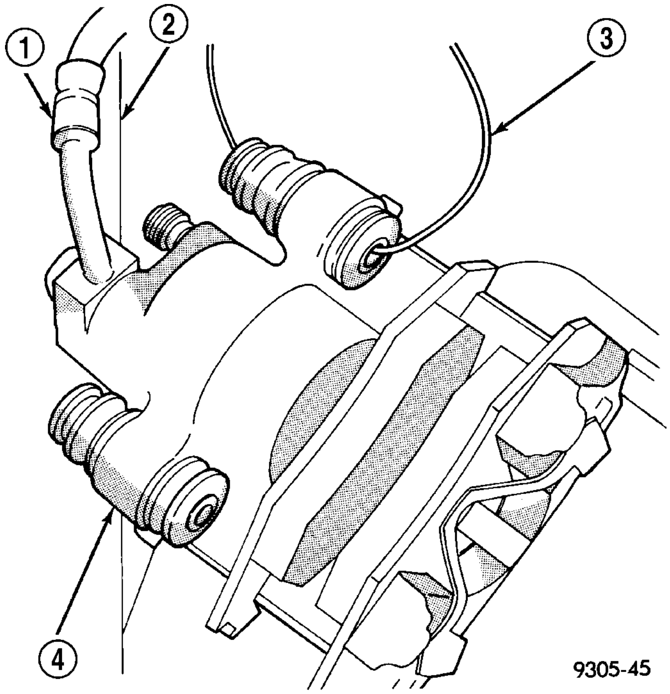


Fig. 30 Supporting Caliper

1 - FLEX HOSE
2 - STRUT
3 - WIRE HANGER
4 - CALIPER ASSEMBLY

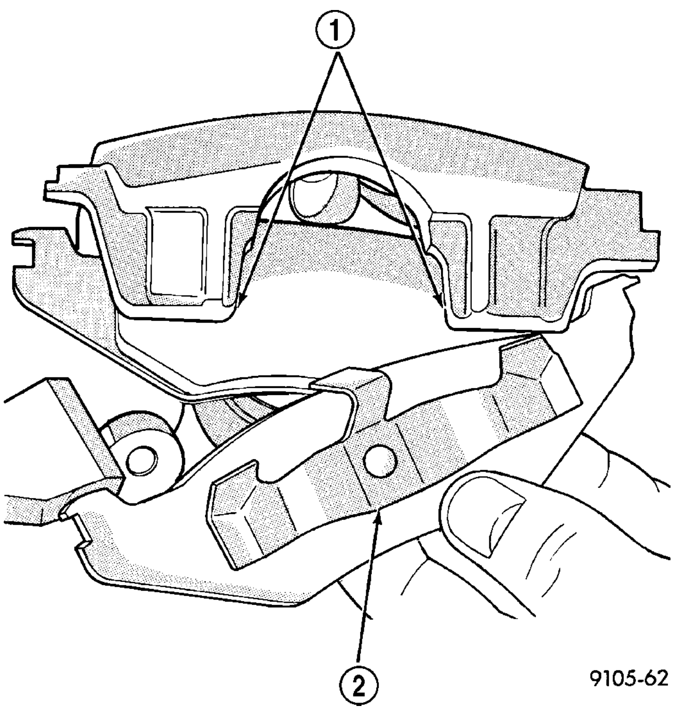


Fig. 31 Outboard Brake Shoe

1 - CALIPER FINGERS
2 - RETAINING CLIP

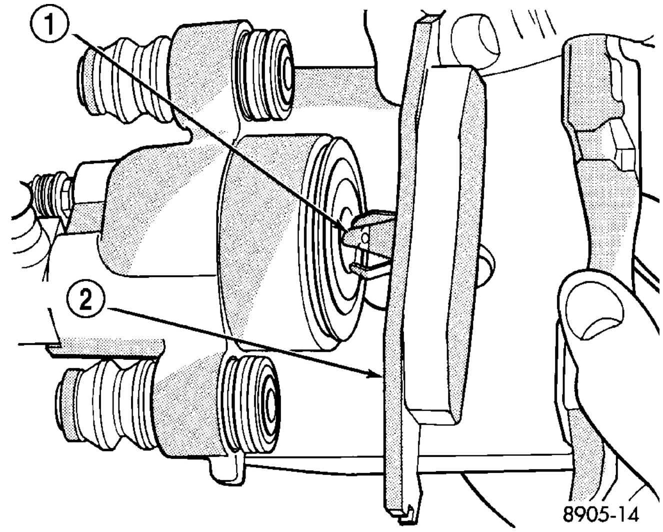


Fig. 32 Inboard Brake Shoe

1 - RETAINING CLIP
2 - INBOARD SHOE

CLEANING - DISC BRAKE SHOES

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

INSPECTION - DISC BRAKE SHOES

Visually inspect brake shoes (pads) for uneven lining wear. Also inspect for excessive lining deterioration. Check the clearance between the tips of the wear indicators on the shoes (if equipped) and the brake rotors.

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the disc brake shoes from the calipers.

Measure each brake shoe. The combined brake shoe and its lining material thickness should be measured at its thinnest point.

For rear disc brake shoes, when a set of brake shoes are worn to a thickness of approximately 7.0 mm (9/32 inch), they should be replaced.

Replace **both** disc brake shoes (inboard and outboard) on each caliper. It is necessary to replace the shoes on the opposite side of the vehicle as well as the shoes failing inspection.

If the brake shoe assemblies do not require replacement, be sure to reinstall the brake shoes in the original position they were removed from.

INSTALLATION

CAUTION: When installing new brake components, be sure to use correct parts. Parts designed for BR3 Performance Brake System must not be mixed with other brake systems. These parts, similar in appearance, can be easily identified. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - DESCRIPTION - DISC BRAKES (FRONT) - SRT-4)

NOTE: Perform Step 1 through Step 8 on each side of vehicle to complete shoe set installation, then proceed to Step 9.

(1) Completely retract the caliper piston back into piston bore of the caliper. This is required to gain the necessary shoe-to-rotor clearance for the caliper installation onto the steering knuckle.

(2) Remove any protective paper from the noise suppression gasket on both inner and outer brake shoe assemblies (if equipped).

(3) Install the inboard brake shoe into the caliper piston by firmly pressing the shoe in with the thumbs (Fig. 32). Be sure the inboard brake shoe is positioned squarely against the face of the caliper piston.

(4) Slide the outboard brake shoe onto the caliper assembly (Fig. 31). Be sure the retaining clip is squarely seated in the depressed areas on the caliper.

(5) Lubricate both adapter caliper slide abutments with a liberal amount of Mopar® Multipurpose Lubricant, or an equivalent.

CAUTION: Use care when installing the caliper assembly onto adapter so the guide pin bushings and sleeves do not get damaged by the mounting bosses on adapter.

(6) Starting with the lower end, carefully lower the caliper and brake shoes over the brake rotor and catch the caliper's bottom edge behind the caliper slide abutment (Fig. 29). Rotate the top of the caliper into mounting position on the adapter.

CAUTION: Extreme caution should be taken not to cross thread the caliper guide pin bolts when they are installed.

(7) Carefully install the caliper guide pin bolts (Fig. 28), then tighten them to a torque of 22 N·m (192 in. lbs.).

(8) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(9) Lower the vehicle.

(10) Pump the brake pedal to set the brake shoes to the brake rotors, then check brake fluid level in master cylinder reservoir. Adjust brake fluid level as necessary.

(11) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

BRAKE PADS/SHOES - REAR DRUM

REMOVAL - DRUM BRAKE SHOES (REAR)

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove both rear tire and wheel assemblies from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Begin on one side of the vehicle.

(4) Remove the brake drum retaining clips (if equipped) (Fig. 33).

(5) Remove the brake drum (Fig. 33).

(6) Remove the automatic adjustment lever-to-brake shoe spring (Fig. 34).

(7) Remove the automatic adjustment lever (Fig. 35)from the brake shoe.

(8) Remove the hold down clips and pins attaching the leading and trailing brake shoes to the brake support plate (Fig. 36).

BRAKE PADS/SHOES - REAR DRUM (Continued)

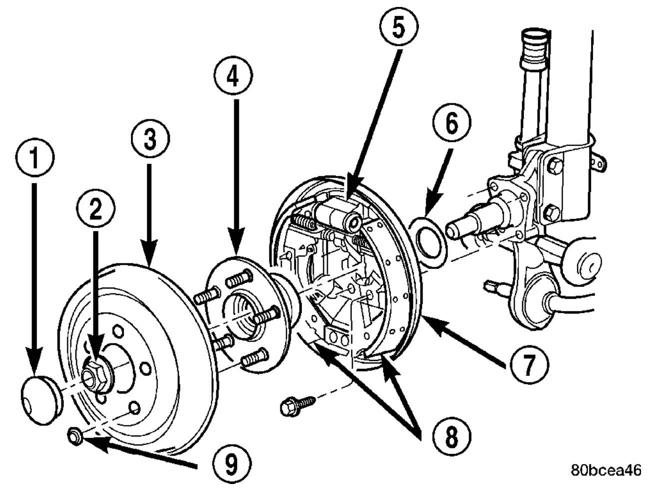


Fig. 33 Drum Brakes

1 - DUST CAP
2 - NUT
3 - DRUM
4 - HUB AND BEARING
5 - WHEEL CYLINDER
6 - SEAL
7 - SUPPORT PLATE
8 - BRAKE SHOES
9 - RETAINER CLIP

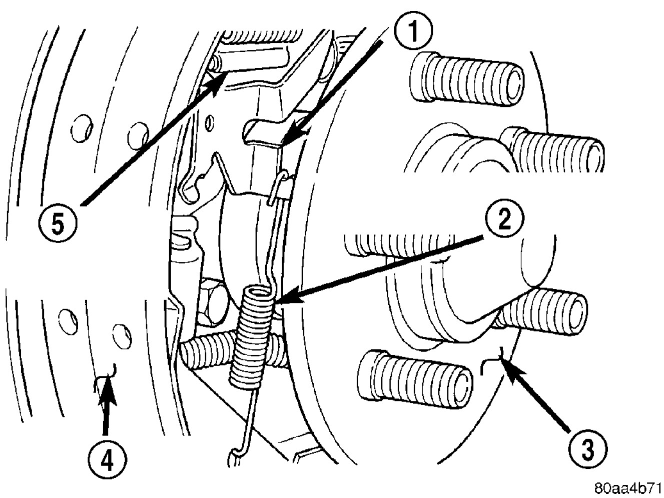


Fig. 34 Automatic Adjustment Lever Spring

1 - ADJUSTMENT LEVER
2 - ADJUSTMENT LEVER TO BRAKE SHOE SPRING
3 - HUB/BEARING
4 - LEADING BRAKE SHOE
5 - AUTOMATIC ADJUSTER SCREW

(9) Remove the lower brake shoe-to-anchor plate return spring (Fig. 37).

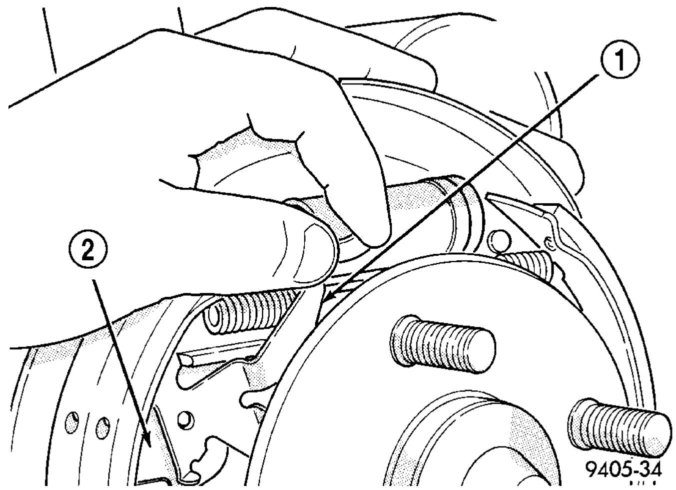


Fig. 35 AUTOMATIC ADJUSTMENT LEVER

1 - AUTOMATIC ADJUSTMENT LEVER
2 - FRONT BRAKE SHOE ASSEMBLY

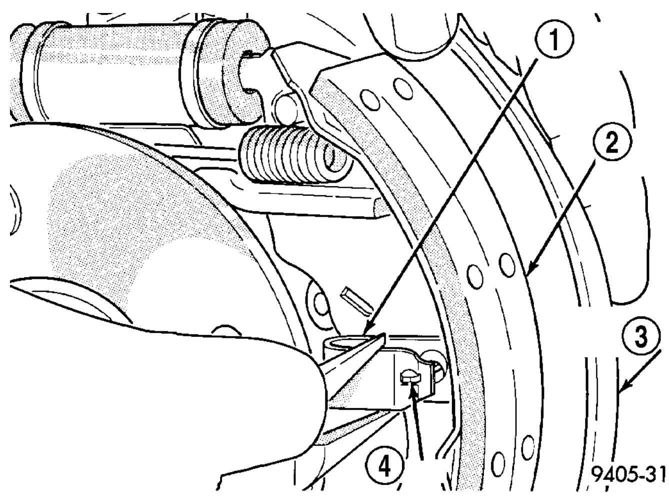


Fig. 36 Brake Shoe Hold Down Clips And Pins

1 - HOLD DOWN CLIP
2 - BRAKE SHOE
3 - SUPPORT PLATE
4 - PIN

BRAKE PADS/SHOES - REAR DRUM (Continued)

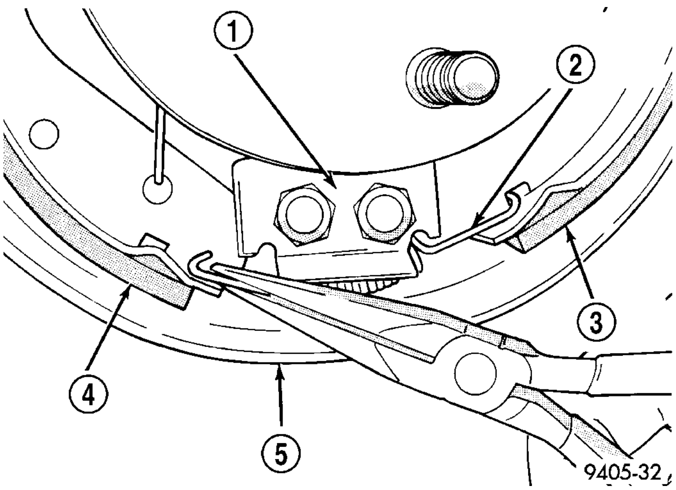


Fig. 37 Brake Shoe To Anchor Plate Return Spring

1 - ANCHOR PLATE
2 - LOWER BRAKE SHOE RETURN SPRING
3 - REAR BRAKE SHOE
4 - FRONT BRAKE SHOE
5 - BRAKE SUPPORT PLATE

(10) Remove the parking brake lever pin-to-brake shoe retaining clip (Fig. 38).

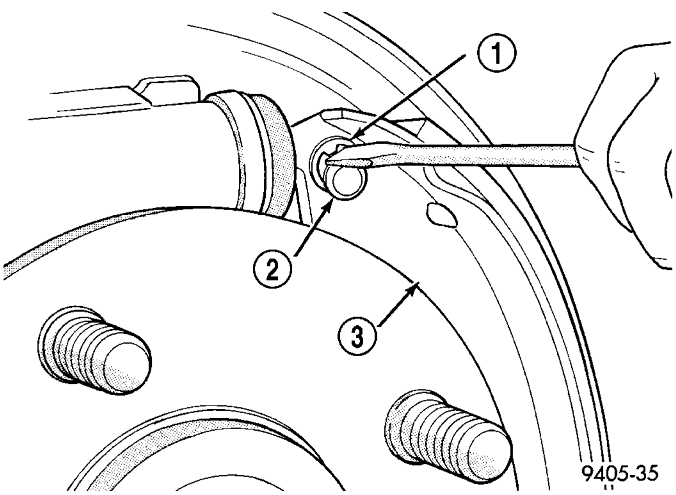


Fig. 38 Parking Brake Lever Pin To Brake Shoe Retaining Clip

1 - RETAINING CLIP
2 - PARK BRAKE LEVER PIN
3 - PARK BRAKE LEVER

(11) Remove the leading and trailing brake shoes, upper return spring and automatic adjuster screw from the brake support plate as an assembly (Fig. 39).

(12) Disassemble the shoes completely once on the bench.

(13) Repeat the above procedure to the rear brakes on the other side of the vehicle.

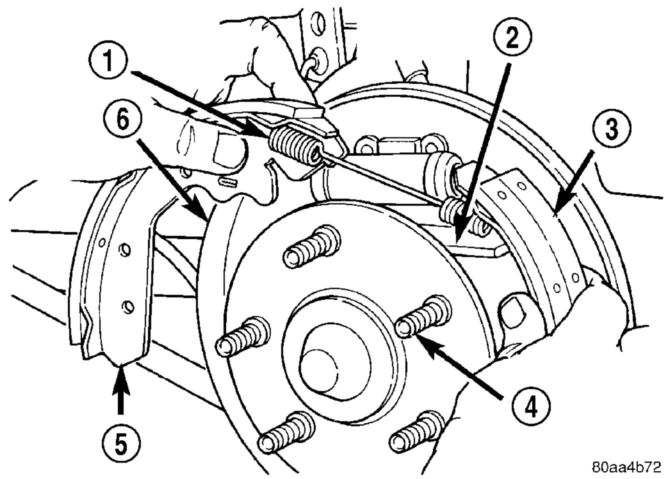


Fig. 39 Brake Shoe Removal/Installation

1 - UPPER RETURN SPRING
2 - AUTOMATIC ADJUSTER SCREW
3 - TRAILING BRAKE SHOE
4 - WHEEL MOUNTING STUDS
5 - LEADING BRAKE SHOE
6 - BRAKE SUPPORT PLATE

CLEANING - DRUM BRAKE SHOES

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

INSPECTION - DRUM BRAKE SHOES

Rear brake shoe lining should show contact across the entire width of the lining and also from the heel to the toe of the lining. Replace the shoes if noted otherwise.

BRAKE PADS/SHOES - REAR DRUM (Continued)

Brake shoes with lack of contact at the toe or heel of the brake shoe lining may be improperly ground.

Clean and inspect the brake support plate and shoe adjuster screw. Apply a thin coat of Mopar Multi-Purpose Lubricant or equivalent to the threads of the self-adjuster (Fig. 40). Replace the adjuster screw if it is corroded.

NOTE: Adjuster screws are different side-to-side. Left side adjuster screws have left-hand threads and right side adjuster screws have right-handed threads.

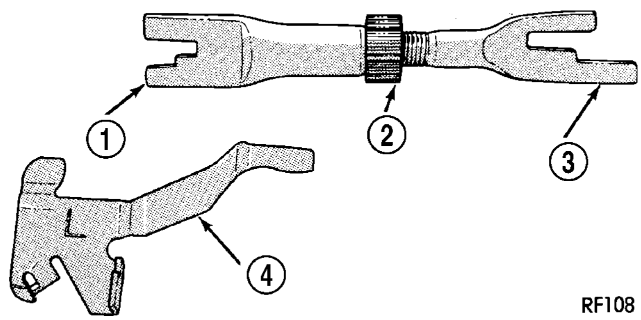


Fig. 40 Adjuster Screw And Lever (Typical)

1 - OUTBOARD FORWARD
2 - SELF ADJUSTER
3 - OUTBOARD REAR
4 - SELF ADJUSTER LEVER

If the old brake shoe return or hold down springs have overheated or are damaged, replace them. Overheating indications are paint discoloration or distorted end coils.

INSTALLATION - DRUM BRAKE SHOES (REAR)

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Begin on one side of the vehicle.

(2) Lubricate the eight shoe contact areas on the support plate and anchor using Mopar Multi-Purpose Lubricant or equivalent (Fig. 41).

(3) Assemble the front and rear brake shoe assembly, automatic adjuster screw, and upper return spring before installation on the vehicle.

(4) Install the pre-assembled brake shoes, automatic adjuster screw and upper return spring on the brake support plate (Fig. 39).

(5) Install the wave washer on the pin of park brake lever.

(6) Install the pin on the parking brake lever into hole in rear brake shoe assembly (Fig. 42).

(7) Install both brake shoe-to-brake support plate hold down pins and clips (Fig. 36).

(8) Install the lower brake shoe-to-anchor plate return spring (Fig. 37).

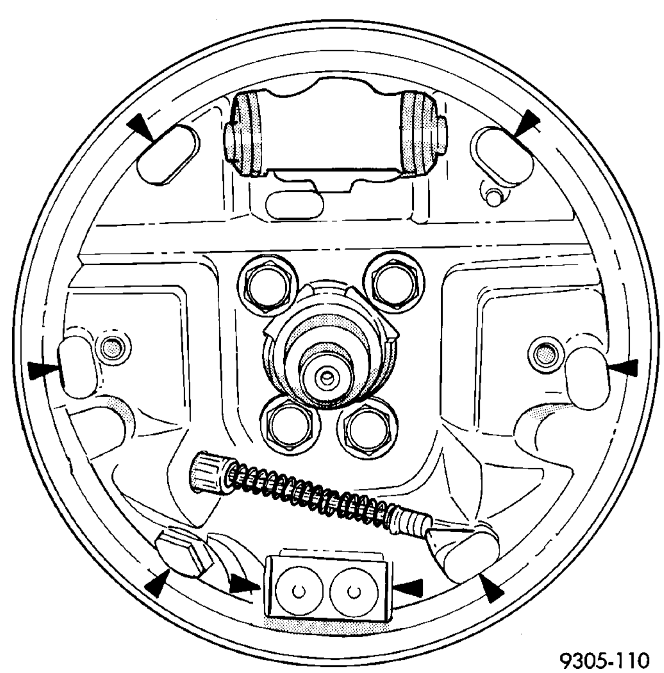


Fig. 41 Shoe Contact Areas on Support Plate

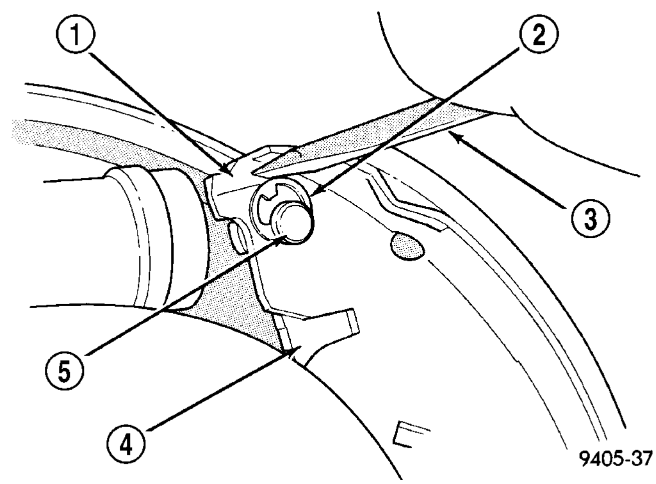


Fig. 42 Parking Brake Lever Pin Retaining Clip Installation

1 - BRAKE SHOE ASSEMBLY
2 - RETAINING CLIP
3 - SCREWDRIVER
4 - PARK BRAKE LEVER
5 - PARK BRAKE LEVER PIN

(9) Install the automatic adjustment lever on the leading brake shoe (Fig. 35).

(10) Install the automatic adjustment lever-to-brake shoe spring (Fig. 34).

(11) Adjust the brake shoes out until the drum lightly drags on the shoes when it is installed. Do not over-adjust the brakes.

(12) Install the brake drum (Fig. 33).

(13) Repeat the above procedure to the rear brakes on the other side of the vehicle.

BRAKE PADS/SHOES - REAR DRUM (Continued)

(14) Install the tire and wheel assemblies (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(15) Adjust the rear brake shoes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS).

(16) Lower the vehicle.

(17) Road test vehicle stopping in both the forward and reverse directions. The automatic adjuster will continue to adjust the brakes during the road test of the vehicle.

ADJUSTMENTS

ADJUSTMENT - DRUM BRAKE SHOES

(1) Verify the parking brake lever is in the fully released position.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the rear brake adjusting hole rubber plug from the rear brake shoe support plate (Fig. 43).

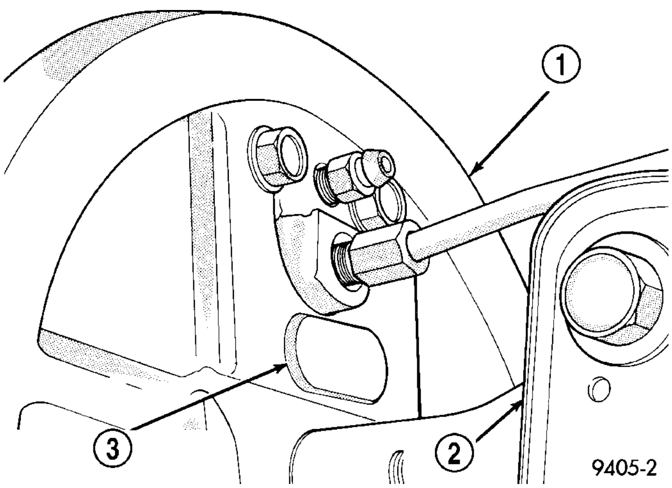


Fig. 43 Rear Brake Adjusting Hole Plug

1 - REAR BRAKE SUPPORT PLATE
2 - REAR STRUT
3 - BRAKE ADJUSTING HOLE PLUG

(4) Insert a brake adjustment tool, or a screwdriver, through the adjusting hole in support plate and against the star wheel of the adjuster screw. Move the handle of tool downward to adjust the brake drag. Rotate the tire and wheel assembly while adjusting the adjuster screw. Continue to adjust the shoes until a slight drag is noticed when the tire and wheel assembly is rotated.

NOTE: In the event the brake shoes are over-adjusted, the adjuster can be backed off using the following step. If not, proceed to step 6.

(5) If the shoes are in the over-adjusted position, insert a thin screwdriver into brake adjusting hole and push back the adjusting lever out of engagement with star wheel (Fig. 44). Take care not to bend the adjusting lever. While holding the adjusting lever out of engagement with star wheel, back off the star wheel until the tire and wheel assembly is free to turn without dragging. Repeat the adjustment procedure.

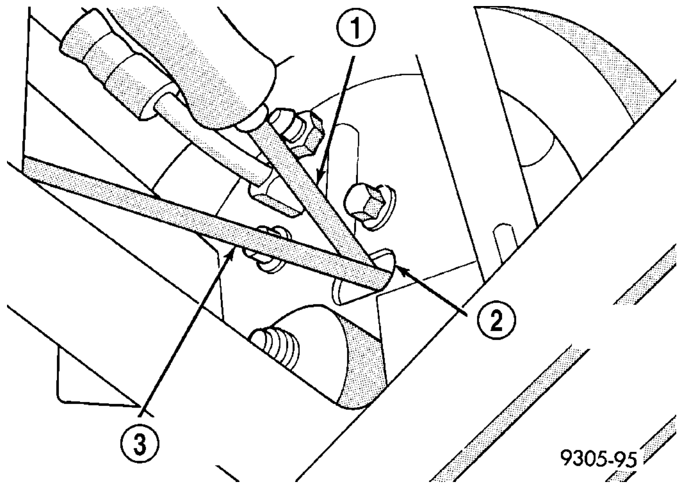


Fig. 44 Backing Off Brake Adjuster

1 - MEDIUM SCREWDRIVER
2 - BRAKE ADJUSTING HOLE
3 - THIN SCREWDRIVER OR WELDING ROD

(6) Install adjusting hole rubber plug (Fig. 43).

(7) Repeat the above adjustment procedure to the other side brakes.

(8) Apply and release the park brake lever one time after the adjustment process is completed so the parking brakes can readjust themselves to the new brake shoe adjustment.

DISC BRAKE CALIPER - FRONT

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

(1) Using a brake pedal holding tool as shown (Fig. 45), depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir when the lines are opened.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

DISC BRAKE CALIPER - FRONT (Continued)

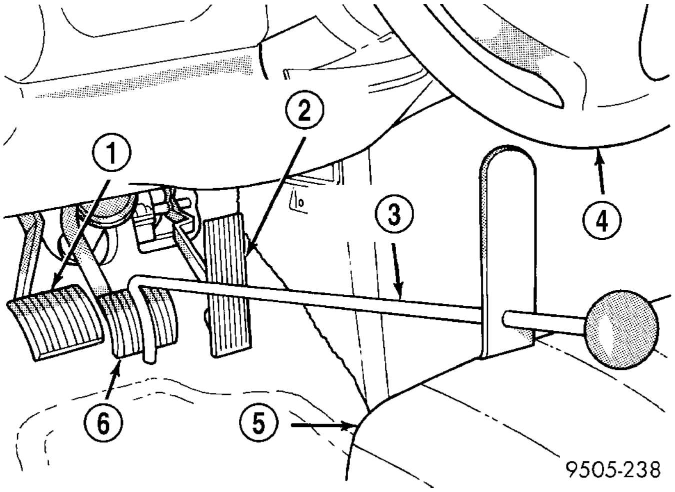


Fig. 45 Brake Pedal Holding Tool

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

(3) Remove the front tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL).

(4) Remove the banjo bolt connecting the brake hose to the brake caliper (Fig. 46). There are two washers (one on each side of the flex hose fitting) that will come off with the banjo bolt. **Discard these washers.** Replace them with new ones.

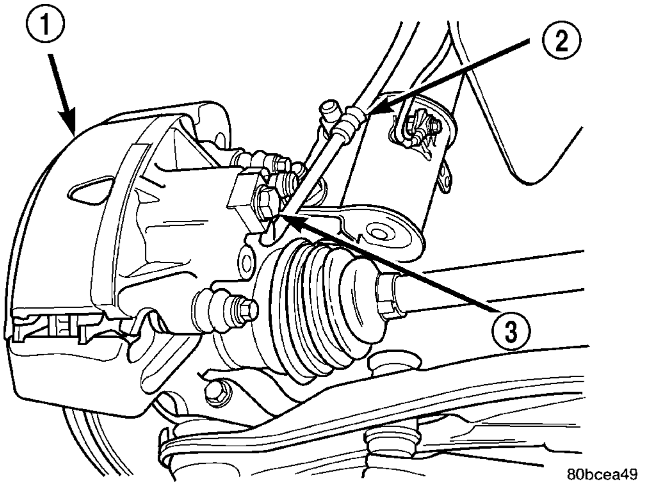


Fig. 46 Brake Hose Mounting To Caliper

1 - CALIPER
2 - HOSE
3 - BOLT

NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the shoes and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the rear of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

(5) Remove the two brake caliper to steering knuckle guide pin bolts (Fig. 47).

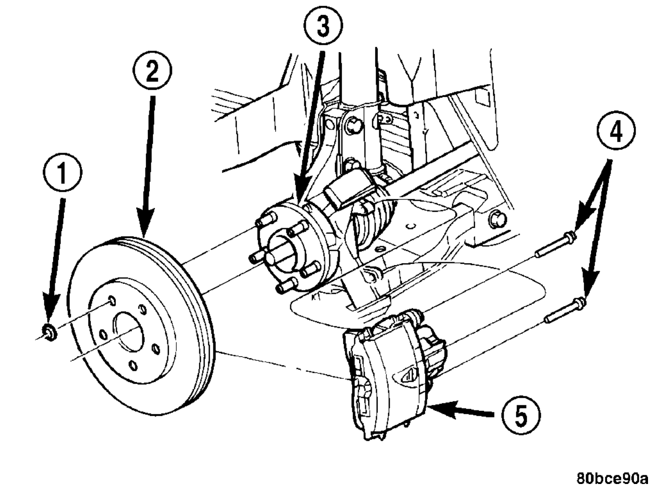


Fig. 47 Caliper Mounting

1 - RETAINER CLIP
2 - BRAKE ROTOR
3 - HUB
4 - GUIDE PIN BOLTS
5 - DISC BRAKE CALIPER

(6) Remove the disc brake caliper from the steering knuckle. The caliper is removed by first tipping either the top (right side caliper) or bottom (left side caliper) of the caliper away from the brake rotor, then pulling the caliper off the opposite end's caliper slide abutment (on the knuckle) and brake rotor.

DISASSEMBLY

DISASSEMBLY (GUIDE PIN BUSHINGS)

Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSPECTION).

(1) With one hand, push the guide pin bushing sleeve towards the back of the caliper, and at the same time, pull the sleeve out the back of the caliper and bushing (Fig. 48).

(2) Using your fingers, collapse one side of the rubber guide pin bushing. Pull the guide pin bushing out the other side of the brake caliper mounting boss (Fig. 49).

DISC BRAKE CALIPER - FRONT (Continued)

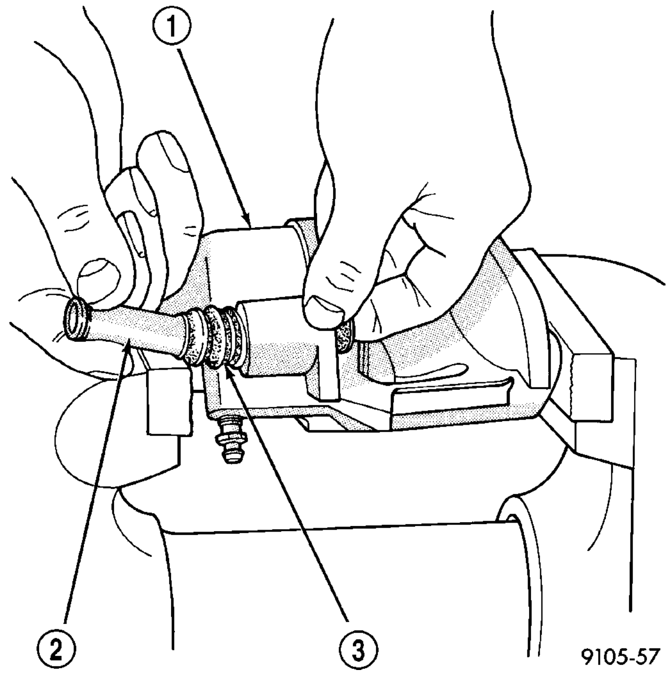


Fig. 48 Removing Sleeve From Bushing

1 - CALIPER
2 - SLEEVE
3 - BUSHING

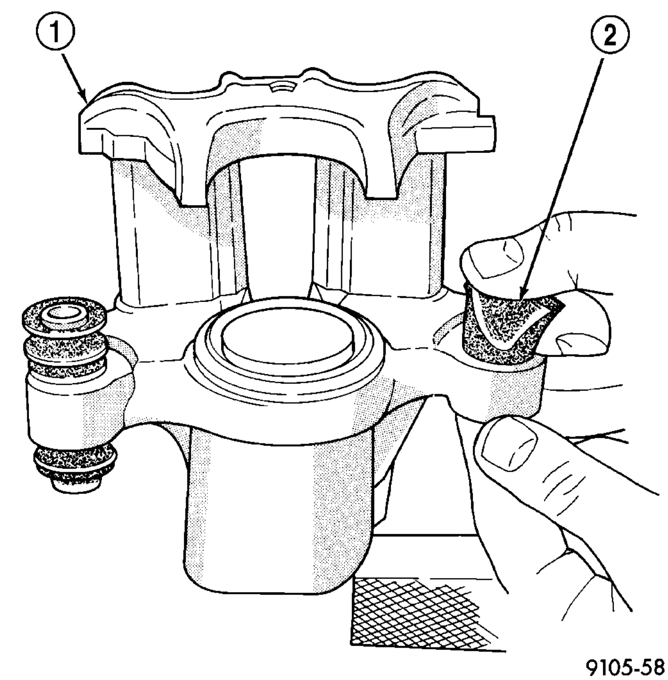


Fig. 49 Removing Bushing From Caliper

1 - CALIPER
2 - BUSHING

DISASSEMBLY (PISTON AND SEAL)

Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSPECTION).

CALIPER PISTON REMOVAL

WARNING: UNDER NO CONDITION SHOULD HIGH PRESSURE AIR EVER BE USED TO REMOVE A PISTON FROM A CALIPER BORE. PERSONAL INJURY COULD RESULT FROM SUCH A PRACTICE.

NOTE: The safest way to remove the piston from the caliper bore is to use the hydraulic pressure of the vehicle's brake system.

(1) Following the removal procedure in DISC BRAKE SHOES (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL), remove the caliper from the brake rotor and hang the assembly on a wire hook away from rotor and body of the vehicle so brake fluid cannot get on these components. Remove the brake shoes, and place a small piece of wood between the piston and caliper fingers.

(2) Carefully depress the brake pedal to hydraulically push piston out of its bore. Once completed, apply and hold down the brake pedal to any position beyond the first inch of pedal travel using a brake pedal holding tool. This will prevent the fluid in the master cylinder reservoir from completely draining out.

(3) Disconnect the brake fluid flex hose from the caliper assembly and remove it from the vehicle.

CALIPER SEAL REMOVAL

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

(1) To disassemble the caliper, mount it in a vise equipped with protective jaws.

(2) Remove the piston dust boot from the caliper and discard (Fig. 50).

NOTE: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

(3) Using a soft tool such as a plastic trim stick, work the piston seal out of its groove in caliper piston bore (Fig. 51). Discard the old seal.

(4) Clean the piston bore and drilled passage ways using alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.

DISC BRAKE CALIPER - FRONT (Continued)

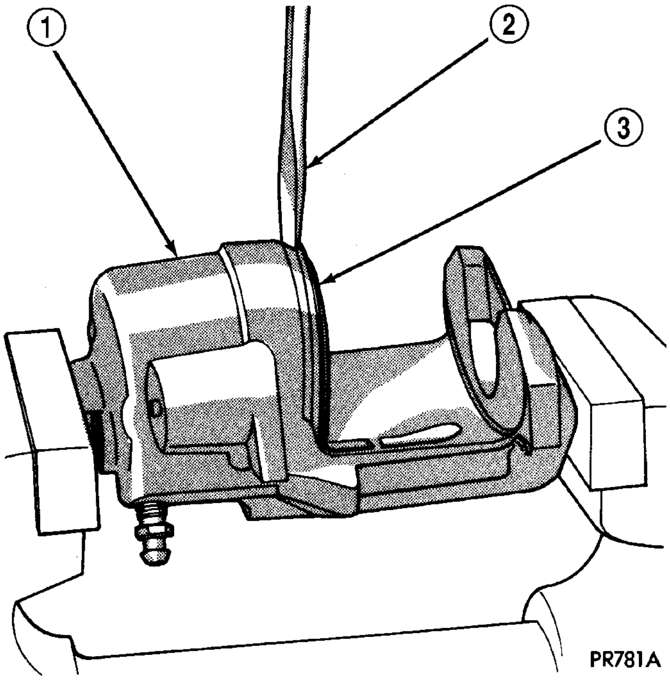


Fig. 50 Removing Caliper/Piston Dust Boot

1 - CALIPER
2 - SCREWDRIVER
3 - BOOT

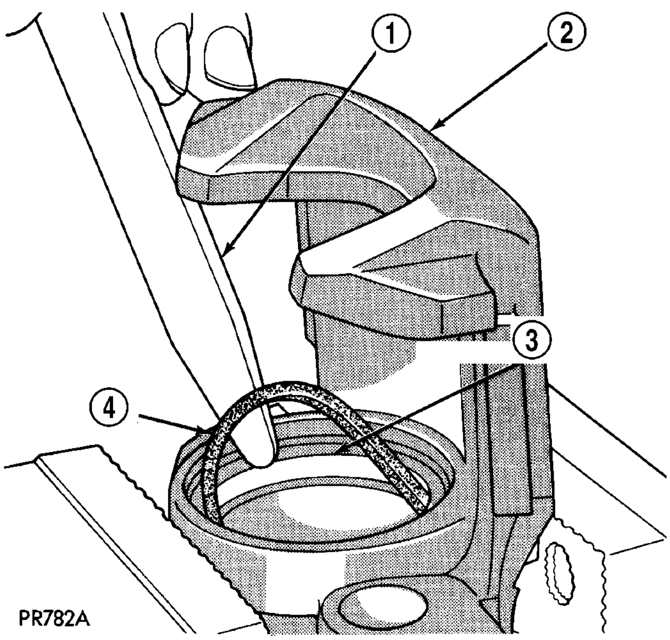


Fig. 51 Removing Piston Seal

1 - PLASTIC TRIM STICK
2 - CALIPER
3 - PISTON SEAL GROOVE
4 - PISTON SEAL

(5) 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 the equivalent to hone the bore. Do not over-hone the bore. Don not increase the diameter of the bore more than 0.0254 mm (0.001 inch) (Fig. 52). If the bore does not clean up within this specification, a new caliper housing should be installed.

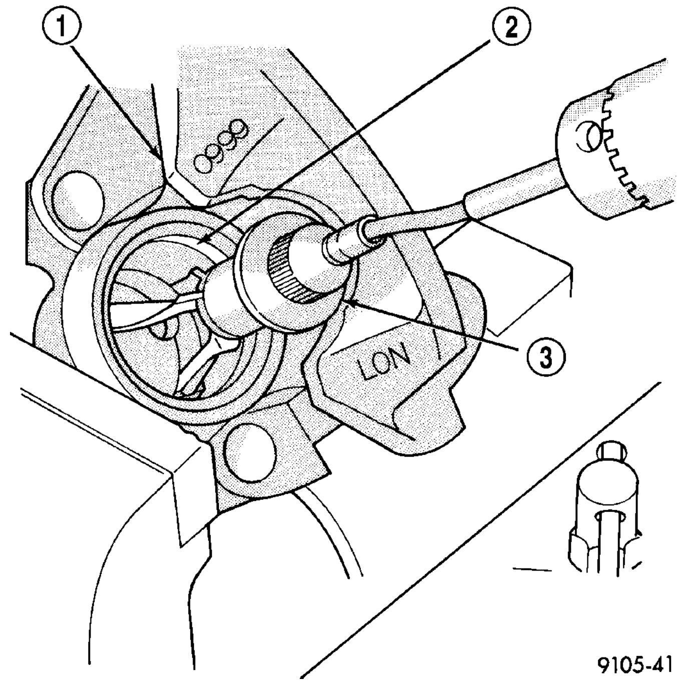


Fig. 52 Honing Brake Caliper Piston Bore

1 - CALIPER
2 - CALIPER BORE
3 - SPECIAL TOOL C-4095

NOTE: During the honing procedure, 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. Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the caliper bore with fresh clean brake fluid; wipe it dry with a clean, lint free cloth and then clean it a second time.

(6) Inspect the caliper piston for pitting, scratches, or any physical damage. Replace the piston if there is evidence of scratches, pitting or physical damage.

DISC BRAKE CALIPER - FRONT (Continued)

CLEANING - DISC BRAKE CALIPER

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

INSPECTION - DISC BRAKE CALIPER

Inspect the disc brake caliper for the following:

- Brake fluid leaks in and around boot area and inboard lining
- Ruptures, brittleness or damage to the piston dust boot
- Damaged, dry or brittle guide pin dust boots

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots.

ASSEMBLY

ASSEMBLY (GUIDE PIN BUSHINGS)

(1) Fold the guide pin bushing in half lengthwise at the solid middle section (Fig. 53).

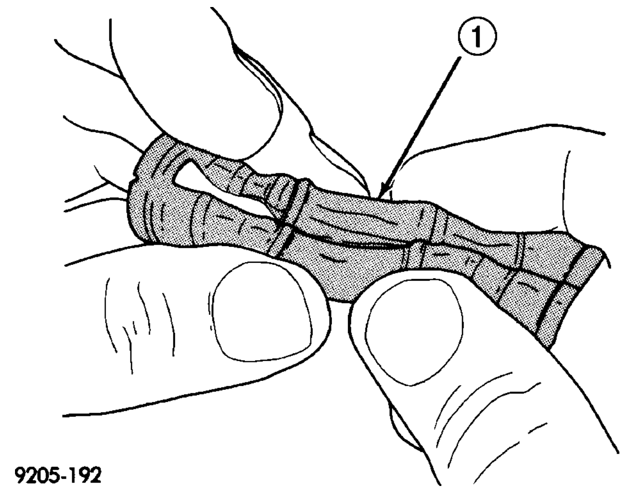


Fig. 53 Folded Caliper Guide Pin Bushing

1 - CALIPER GUIDE PIN BUSHING

NOTE: To avoid damage to the bushing, do not use a sharp object to install the guide pin bushing.

(2) Insert the folded bushing into the caliper mounting boss using your fingers (Fig. 54).

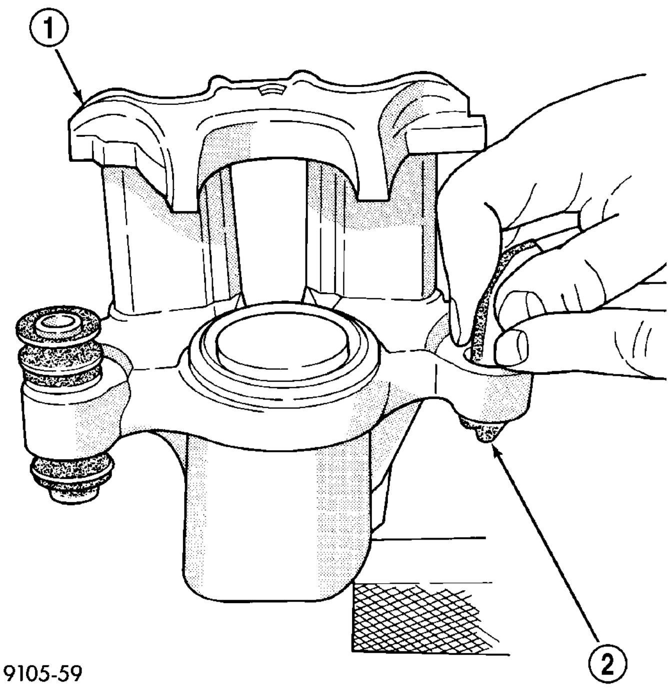


Fig. 54 Installing Caliper Guide Pin Bushing

1 - CALIPER
2 - BUSHING

DISC BRAKE CALIPER - FRONT (Continued)

(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper housing. The bushing flanges should be seated evenly on both sides of the bushing hole (Fig. 55).

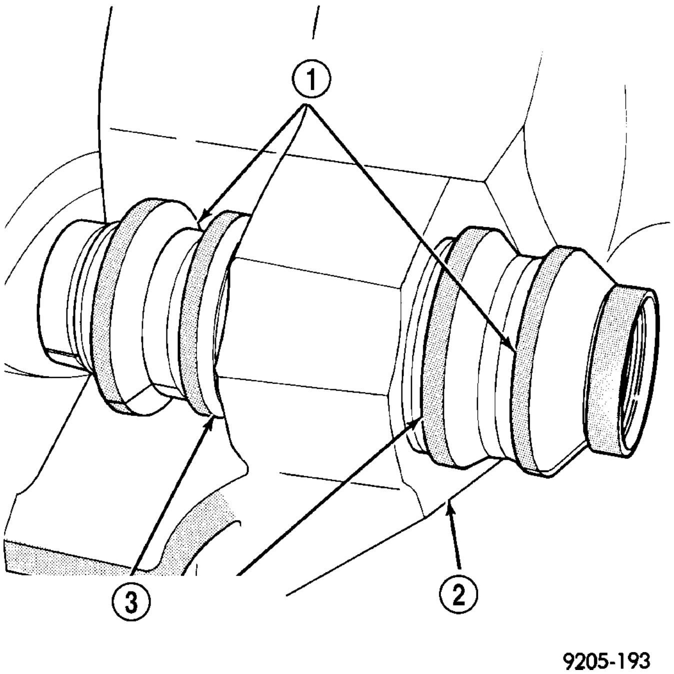


Fig. 55 Bushing Correctly Installed In Caliper

1 - BUSHING
2 - CALIPER
3 - BE SURE BOTH BUSHING FLANGES ARE FULLY SEATED AROUND CALIPER BUSHING BORES.

(4) Lubricate the inside surfaces of the bushing using Mopar Dielectric Grease or an equivalent.

(5) Install the guide pin sleeve into one end of bushing until the seal area of bushing is past the seal groove in the sleeve (Fig. 56).

(6) Holding the convoluted boot on the opposite end of the bushing, push the steel sleeve through the bushing until the bushing boot is fully seated into the seal groove on that end of sleeve (Fig. 56). Install the other end bushing boot into the groove on that end of the bushing sleeve.

(7) Verify both ends of the bushing are seated in the sleeve groves (Fig. 57). When the sleeve is seated properly into the bushing, the sleeve/bushing can be held between your fingers and easily slid back and forth without the bushing unseating from the sleeve groove.

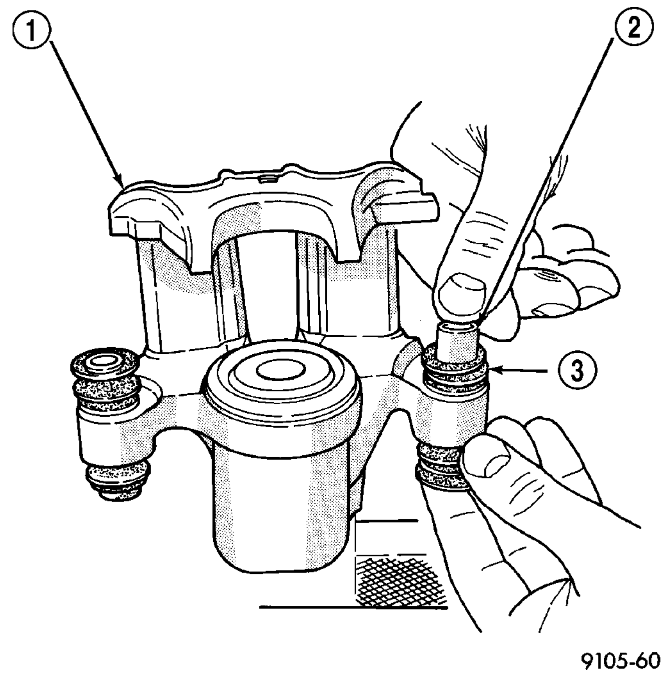


Fig. 56 Installing Sleeve In Bushing

1 - CALIPER
2 - SLEEVE
3 - BUSHING

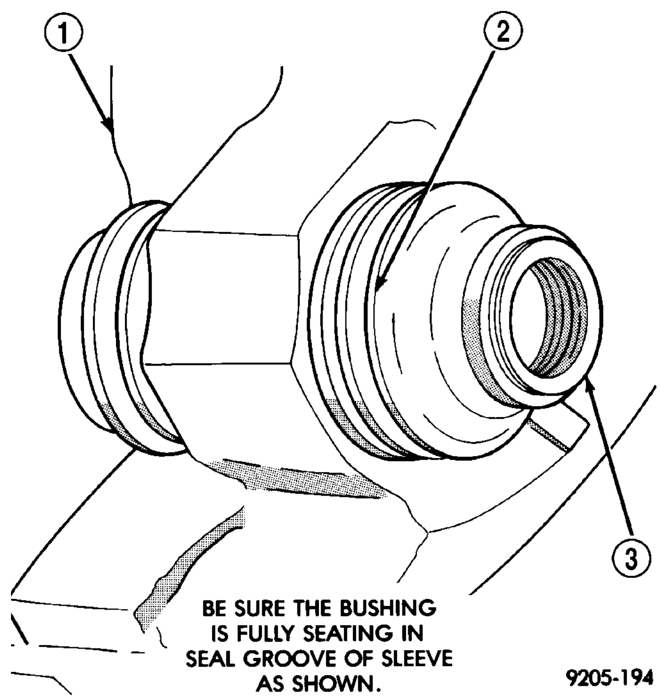


Fig. 57 Correctly Installed Guide Pin Sleeve And Bushing

1 - CALIPER
2 - BUSHING
3 - SLEEVE

DISC BRAKE CALIPER - FRONT (Continued)

ASSEMBLY (PISTON AND SEAL)

NOTE: Never use an old piston seal.

(1) Dip the new piston seal in clean brake fluid and install it in the groove of the caliper bore. The seal should be started at one area of the groove and gently worked around and into the groove (Fig. 58) using only your clean fingers to seat it.

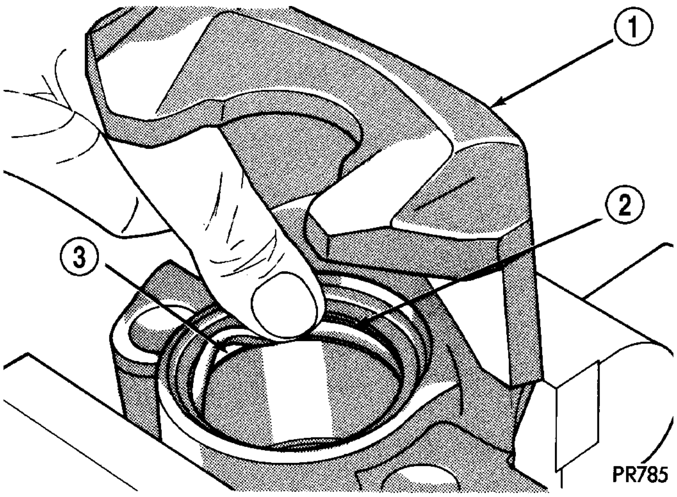


Fig. 58 Installing New Piston Seal

1 - CALIPER
2 - PISTON SEAL
3 - SEAL GROOVE

(2) Coat the new piston boot with clean brake fluid leaving a generous amount inside the boot.

(3) Position the dust boot over the piston after coating it with brake fluid.

CAUTION: Force applied to the piston to seat it in the bore must be applied uniformly to avoid cocking and binding of the piston.

(4) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 59).

(5) Position the dust boot into the counterbore of the caliper assembly piston bore.

(6) Using a hammer and Installer, Special Tool C-4689, and Handle, Special Tool C-4171, drive the boot into the counterbore of the caliper (Fig. 60).

(7) Install the brake shoes (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).

(8) Reinstall the caliper on the vehicle and bleed the brakes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

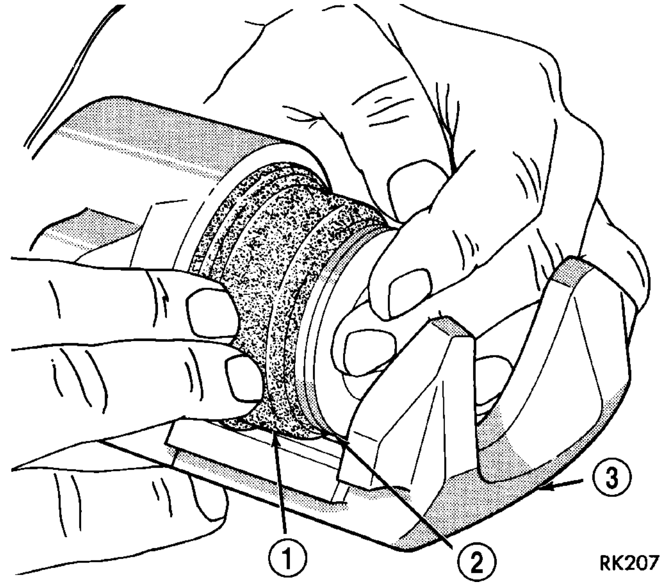


Fig. 59 Installing Piston Into Caliper Bore

1 - BOOT
2 - PISTON
3 - CALIPER

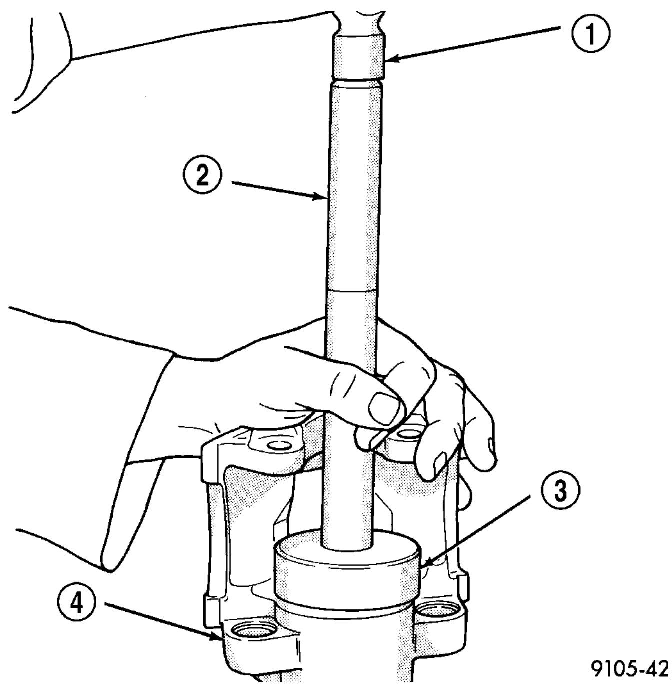


Fig. 60 Installing Dust Boot In Caliper Counterbore

1 - HAMMER
2 - SPECIAL TOOL C-4171
3 - SPECIAL TOOL C-4689
4 - CALIPER

DISC BRAKE CALIPER - FRONT (Continued)

INSTALLATION

NOTE: Step 1 below is only required when installing a caliper after new brake shoes have been installed.

(1) Completely retract the caliper piston back into the bore of the caliper.

(2) Lubricate both steering knuckle caliper slide abutments with a liberal amount of Mopar® Multipurpose Lubricant, or an equivalent.

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) Install the disc brake caliper (with pads) on the brake rotor and steering knuckle. The left side caliper is installed by first sliding the top of the caliper past the top caliper slide abutment on the steering knuckle to hook the top edge of the caliper, then pushing the lower end of the caliper into place against the knuckle (Fig. 61). The right side caliper is installed by first sliding the bottom edge of the caliper past the lower caliper slide abutment on the steering knuckle to hook the lower edge of the caliper, then pushing the top of the caliper into place against the steering knuckle.

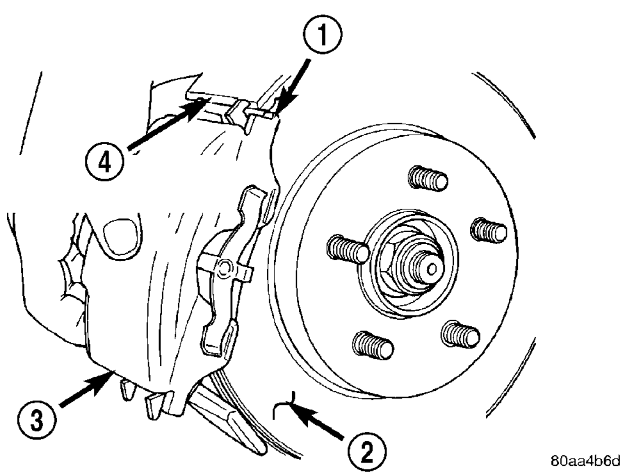


Fig. 61 Installing Left Caliper

1 - SLIDE TOP OF BRAKE CALIPER UNDER TOP ABUTMENT OF STEERING KNUCKLE AS SHOWN
2 - BRAKING DISC
3 - DISC BRAKE CALIPER
4 - STEERING KNUCKLE BRAKE ABUTMENT

(4) Install the caliper guide pin bolts and tighten them to a torque of 22 N·m (192 in. lbs.) (Fig. 47).

(5) Install the banjo bolt connecting the brake hose to the brake caliper (Fig. 46). **Install NEW washers with the banjo bolt.** Place one NEW washer on each side of the hose fitting as the banjo bolt is guided through the fitting. Thread the banjo bolt into the caliper and tighten it to a torque of 24 N·m (210 in. lbs.).

(6) Install the tire and wheel assembly(Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(7) Lower the vehicle.

(8) Remove the brake pedal holding tool.

(9) Bleed the caliper as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(10) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.

DISC BRAKE CALIPER - FRONT - SRT-4

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Using a brake pedal holding tool, depress the brake pedal past its first one inch of travel and secure it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir when the lines are opened.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove the front tire and wheel assembly.

(4) Remove the banjo bolt connecting the brake hose to the brake caliper (Fig. 62). There are two washers (one on each side of the flex hose fitting) that will come off with the banjo bolt. Discard the washers.

(5) Remove the two brake caliper guide pin bolts (Fig. 62).

(6) Remove the disc brake caliper from the disc brake adapter.

DISASSEMBLY

NOTE: Before disassembling the brake caliper, remove it from the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - REMOVAL)

NOTE: Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

DISC BRAKE CALIPER - FRONT - SRT-4 (Continued)

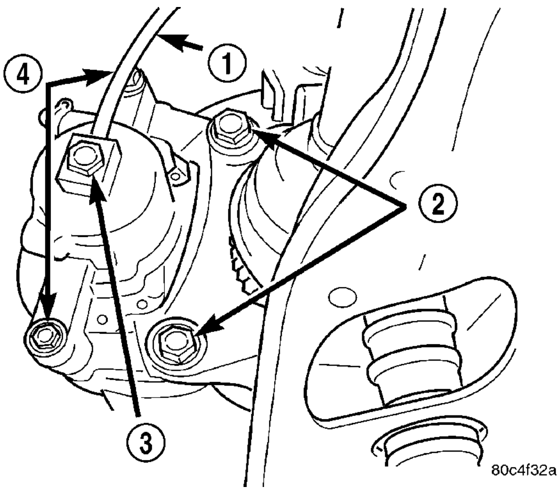


Fig. 62 Brake Caliper Mounting (Typical)

1 - BRAKE HOSE
2 - ADAPTER MOUNTING BOLTS
3 - BANJO BOLT
4 - CALIPER GUIDE PIN BOLTS

WARNING: UNDER NO CONDITION SHOULD HIGH PRESSURE AIR EVER BE USED TO REMOVE A PISTON FROM A CALIPER BORE. PERSONAL INJURY COULD RESULT FROM SUCH A PRACTICE.

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

(1) Mount the caliper in a vise equipped with protective jaws.

(2) Place a wooden block in the caliper as shown (Fig. 63).

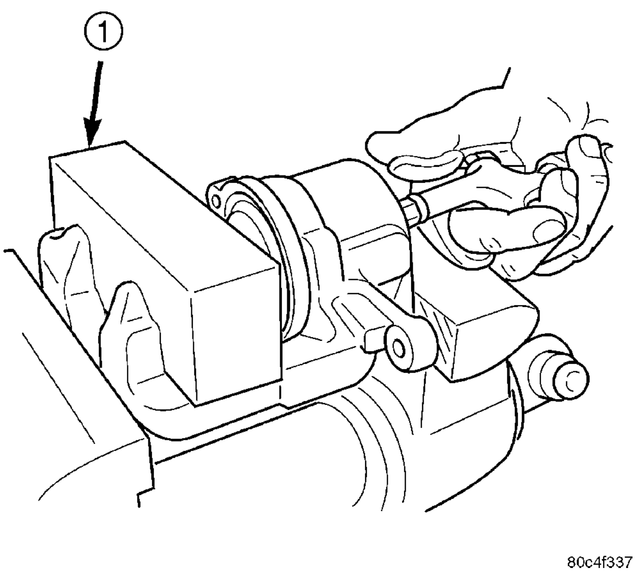


Fig. 63 Piston Removal

1 - WOOD BLOCK

WARNING: DO NOT PLACE FACE OR HANDS NEAR CALIPER AND PISTON IF USING COMPRESSED AIR PRESSURE TO REMOVE PISTON. DO NOT USE HIGH PRESSURE.

(3) If necessary, apply low pressure compressed air to the caliper fluid inlet in short spurts to force the piston out.

(4) Remove the piston from the caliper.

(5) Remove the dust boot from the piston and discard it.

CAUTION: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

(6) Using a soft tool such as a plastic trim stick, work the piston seal out of its groove in caliper piston bore (Fig. 64). Discard the old seal.

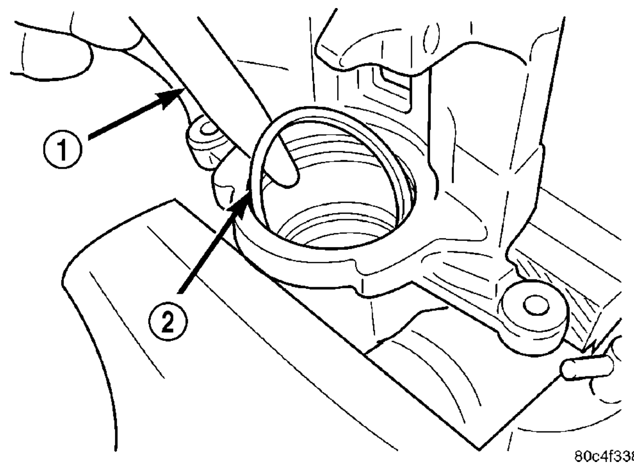


Fig. 64 Piston Seal Removal

1 - TRIM STICK
2 - SEAL

(7) Clean the piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.

(8) Inspect both the piston and 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.

DISC BRAKE CALIPER - FRONT - SRT-4 (Continued)

CLEANING - DISC BRAKE CALIPER

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

INSPECTION - DISC BRAKE CALIPER

Inspect the disc brake caliper for the following:

- Brake fluid leaks in and around piston boot area
- Ruptures, brittleness or damage to the piston dust boot

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots.

ASSEMBLY

NOTE: Always use new, clean Mopar® DOT 3 brake fluid when assembling the brake caliper.

NOTE: Never use an old piston seal.

(1) Dip the new piston seal in clean brake fluid and install it in the groove of the caliper bore (Fig. 65). The seal should be started at one area of the groove and gently worked around into the groove using only your clean fingers to seat it.

(2) Coat the new piston with clean brake fluid.

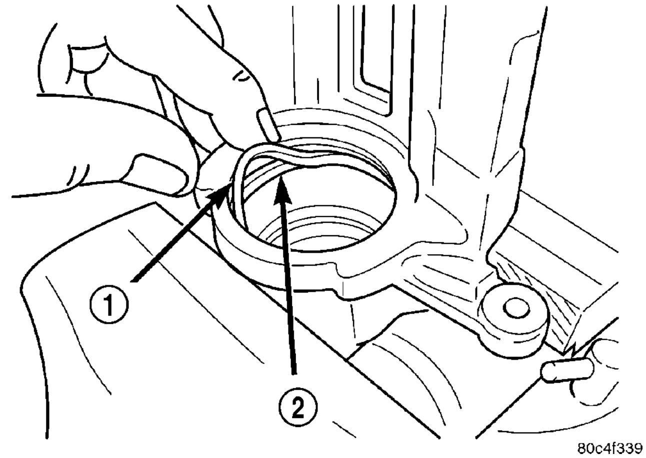


Fig. 65 New Piston Seal Installation

1 - SEAL
2 - GROOVE

(3) Coat the new piston boot with clean brake fluid leaving a generous amount inside the boot.

(4) Position the dust boot over the lower section of the piston (Fig. 66).

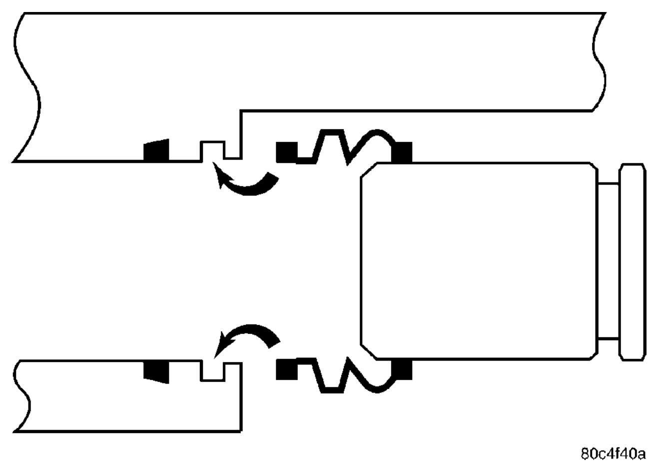


Fig. 66 Boot Installation

(5) Extend the dust boot below the bottom of the piston and guide the lip seal into the groove in the caliper piston bore.

CAUTION: Force applied to the piston to seat it in the bore must be applied uniformly to avoid cocking and binding of the piston.

(6) Install the piston into the bore carefully pushing it past the piston seal using hand pressure (Fig. 67). Push the piston in until it bottoms in the caliper bore and the dust boot lip seal falls into the groove near the top of the piston.

(7) Reinstall the caliper on the vehicle and bleed the brakes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)

DISC BRAKE CALIPER - FRONT - SRT-4 (Continued)

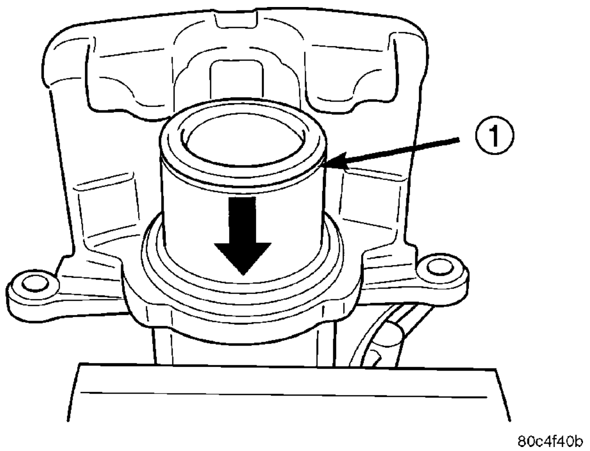


Fig. 67 Piston Installation

1 - PISTON GROOVE

INSTALLATION

CAUTION: When installing new brake components, be sure to use correct parts. Parts designed for BR3 Performance Brake System must not be mixed with other brake systems. These parts can be easily identified. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - DESCRIPTION - DISC BRAKES (FRONT))

(1) Completely retract the caliper piston back into the bore of the caliper. Use a C-clamp to retract the piston. Place a wood block over the piston before installing the C-clamp to avoid damaging the piston.

CAUTION: Use care when installing the caliper onto the disc brake adapter to avoid damaging the boots on the caliper guide pins.

(2) Install the disc brake caliper over the brake shoes on the brake caliper adapter. Make sure the springs on the shoes do not get caught in the hole formed into the center of the caliper housing.

(3) Align the caliper guide pin bolt holes with the guide pins. Install the caliper guide pin bolts and tighten them to a torque of 35 N·m (26 ft. lbs.) (Fig. 62).

(4) Install the banjo bolt connecting the brake hose to the brake caliper (Fig. 62). Install NEW washers on each side of the hose fitting as the banjo bolt is guided through the fitting. Thread the banjo bolt into the caliper and tighten it to a torque of 24 N·m (210 in. lbs.).

(5) Install the tire and wheel assembly. Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(6) Lower the vehicle.

(7) Remove the brake pedal holding tool.

(8) Bleed the caliper as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(9) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

DISC BRAKE CALIPER GUIDE PINS - FRONT - SRT-4

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the front tire and wheel assembly.

(3) Remove the two brake caliper guide pin bolts (Fig. 68).

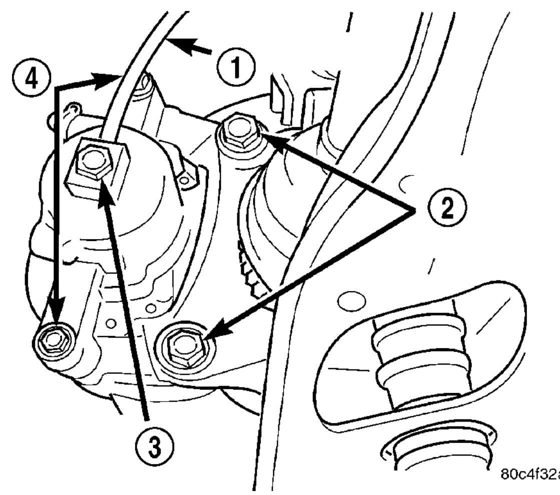


Fig. 68 Brake Caliper Mounting

1 - BRAKE HOSE
2 - ADAPTER MOUNTING BOLTS
3 - BANJO BOLT
4 - CALIPER GUIDE PIN BOLTS

(4) Remove the disc brake caliper from the disc brake caliper adapter and hang it out of the way using wire or a bungee cord. Use care not to overextend the brake hose when doing this.

(5) Remove the guide pins and boots from the adapter as shown (Fig. 69).

INSTALLATION

(1) Lubricate the guide pins and inside the boots with the packet supplied with the service kit, Sythesco GLK-1 lubricant or equivalent.

(2) Install the guide pins and boots in the adapter as shown (Fig. 69). The boots have grooves built into their inner lips to fit onto the pins and adapter.

DISC BRAKE CALIPER GUIDE PINS - FRONT - SRT-4 (Continued)

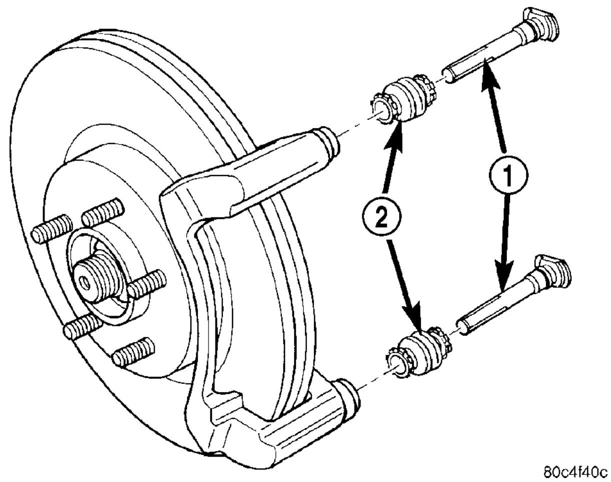


Fig. 69 Guide Pins And Boots

1 - PINS
2 - BOOTS

CAUTION: Use care when installing the caliper onto the disc brake adapter to avoid damaging the boots on the caliper guide pins.

(3) Install the disc brake caliper over the brake shoes on the brake caliper adapter. Make sure the springs on the shoes do not get caught in the hole formed into the center of the caliper housing.

(4) Align the caliper guide pin bolt holes with the guide pins. Install the caliper guide pin bolts and tighten them to a torque of 35 N·m (26 ft. lbs.) (Fig. 68).

(5) Install the tire and wheel assembly. Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(6) Lower the vehicle.

(7) Pump the brake pedal several times before moving the vehicle to set the shoes to the brake rotor.

DISC BRAKE CALIPERS - REAR

REMOVAL

(1) Using a brake pedal holding tool as shown (Fig. 70), depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the rear tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL).

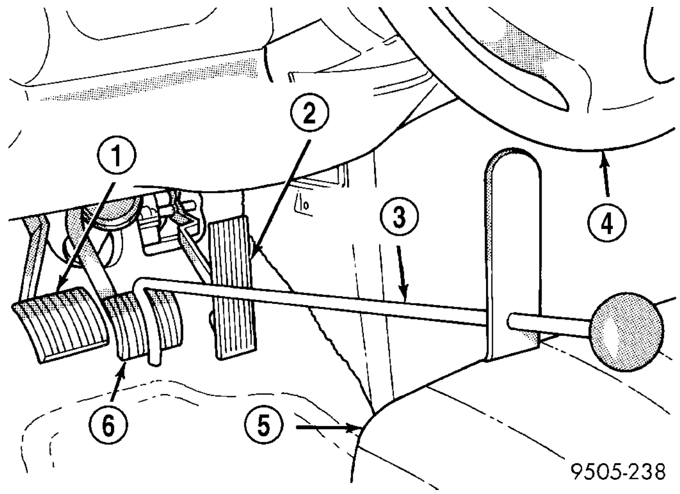


Fig. 70 Brake Pedal Holding Tool

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

(4) Remove the banjo bolt connecting the brake hose to the brake caliper (Fig. 71). There are two washers (one on each side of the flex hose fitting) that will come off with the banjo bolt. **Discard these washers.** Replace them with new ones.

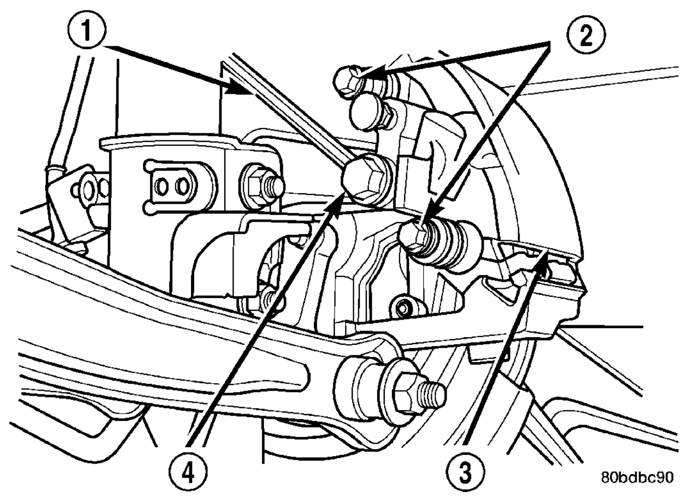


Fig. 71 Brake Hose Mounting

1 - BRAKE HOSE
2 - GUIDE PIN BOLTS
3 - CALIPER
4 - BOLT

DISC BRAKE CALIPERS - REAR (Continued)

NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the shoes and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the rear of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

(5) Remove the two caliper guide pin bolts (Fig. 72).

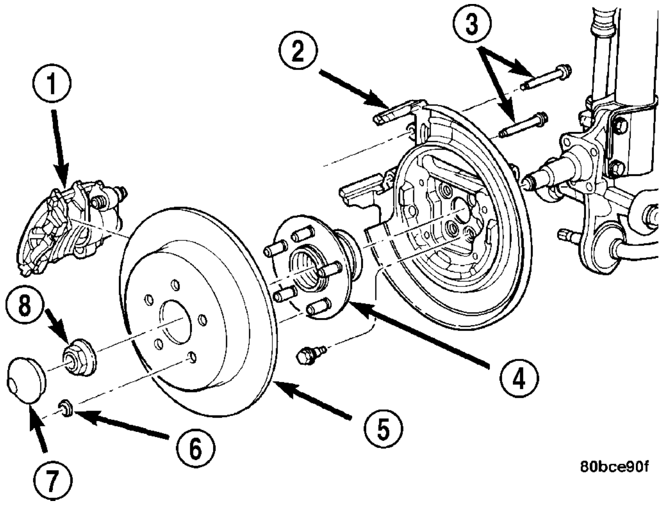


Fig. 72 Caliper Mounting

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

(6) Remove the caliper assembly from the brake adapter by first rotating the top of the caliper away from the rotor, and then lifting the caliper assembly off the machined abutment on the adapter (Fig. 73).

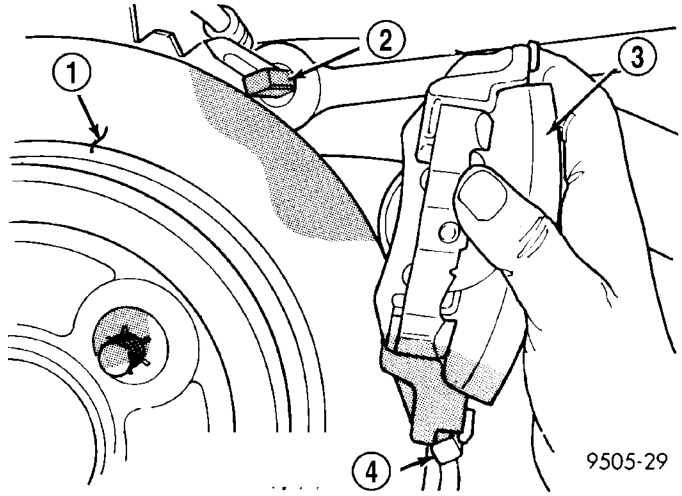


Fig. 73 Removing Caliper From Adapter

1 - BRAKING DISC
2 - CALIPER ADAPTER
3 - CALIPER
4 - LOWER MACHINED ADAPTER ABUTMENT

DISASSEMBLY

DISASSEMBLY (GUIDE PIN BUSHINGS)

Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSPECTION).

(1) With one hand, push the guide pin bushing sleeve towards the back of the caliper, and at the same time, pull the sleeve out the back of the caliper and bushing (Fig. 74).

(2) Using your fingers, collapse one side of the rubber guide pin bushing. Pull the guide pin bushing out the other side of the brake caliper mounting boss (Fig. 75).

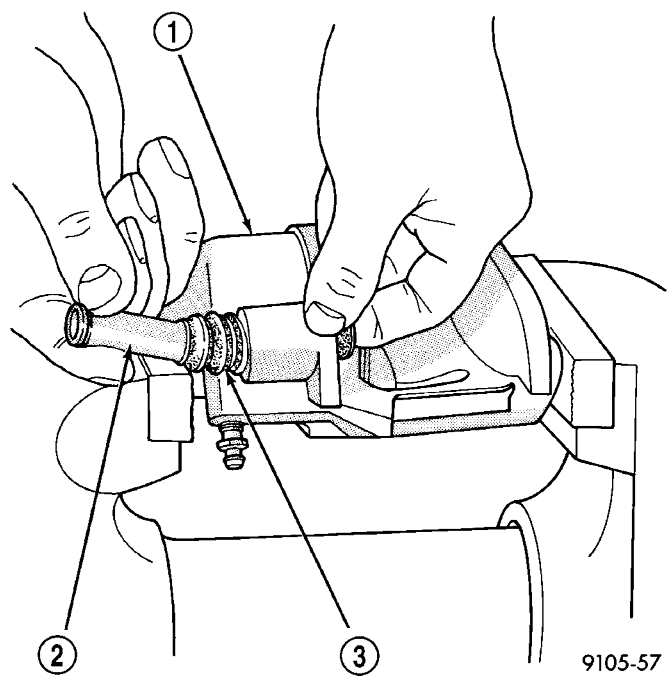


Fig. 74 Removing Sleeve From Bushing

1 - CALIPER
2 - SLEEVE
3 - BUSHING

DISASSEMBLY (PISTON AND SEAL)

Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSPECTION).

DISC BRAKE CALIPERS - REAR (Continued)

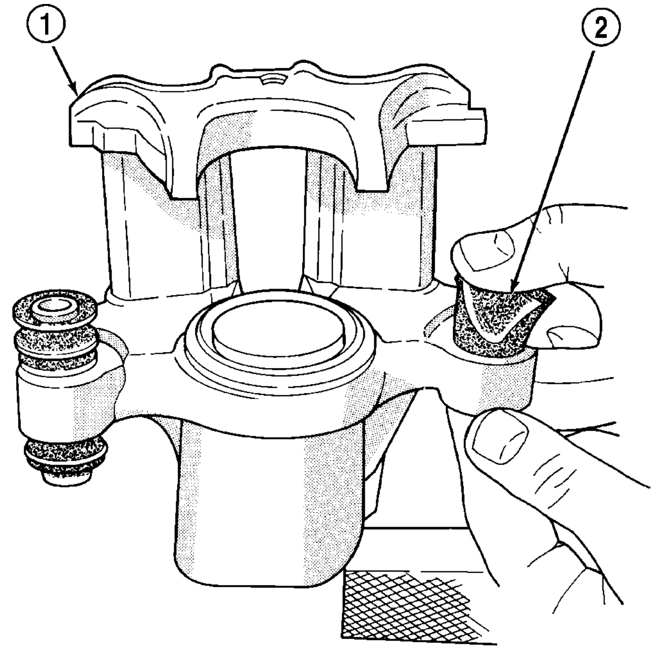


Fig. 75 Removing Bushing From Caliper

1 - CALIPER
2 - BUSHING

CALIPER PISTON REMOVAL

WARNING: UNDER NO CONDITION SHOULD HIGH PRESSURE AIR EVER BE USED TO REMOVE A PISTON FROM A CALIPER BORE. PERSONAL INJURY COULD RESULT FROM SUCH A PRACTICE.

NOTE: The safest way to remove the piston from the caliper bore is to use the hydraulic pressure of the vehicle's brake system.

(1) Following the removal procedure in DISC BRAKE SHOES (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL), remove the caliper from the brake rotor and hang the assembly on a wire hook away from rotor and body of the vehicle so brake fluid cannot get on these components. Remove the brake shoes, and place a small piece of wood between the piston and caliper fingers.

(2) Carefully depress the brake pedal to hydraulically push piston out of its bore. Once completed, apply and hold down the brake pedal to any position beyond the first inch of pedal travel using a brake pedal holding tool. This will prevent the fluid in the master cylinder reservoir from completely draining out.

(3) Disconnect the brake fluid flex hose from the caliper assembly and remove it from the vehicle.

CALIPER SEAL REMOVAL

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

(1) To disassemble the caliper, mount it in a vise equipped with protective jaws.

(2) Remove the piston dust boot from the caliper and discard (Fig. 76).

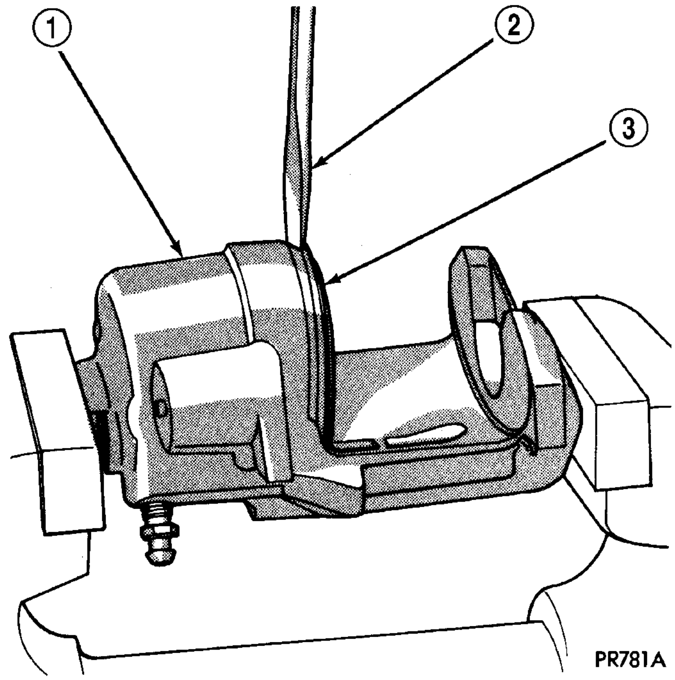


Fig. 76 Removing Caliper/Piston Dust Boot

1 - CALIPER
2 - SCREWDRIVER
3 - BOOT

NOTE: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

(3) Using a soft tool such as a plastic trim stick, work the piston seal out of its groove in caliper piston bore (Fig. 77). Discard the old seal.

(4) Clean the piston bore and drilled passage ways using alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.

(5) 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 the equivalent to hone the bore. Do not over-hone the bore. Don not increase the diameter of the bore more than 0.0254 mm (0.001 inch) (Fig. 78). If the bore does not clean up within this

DISC BRAKE CALIPERS - REAR (Continued)

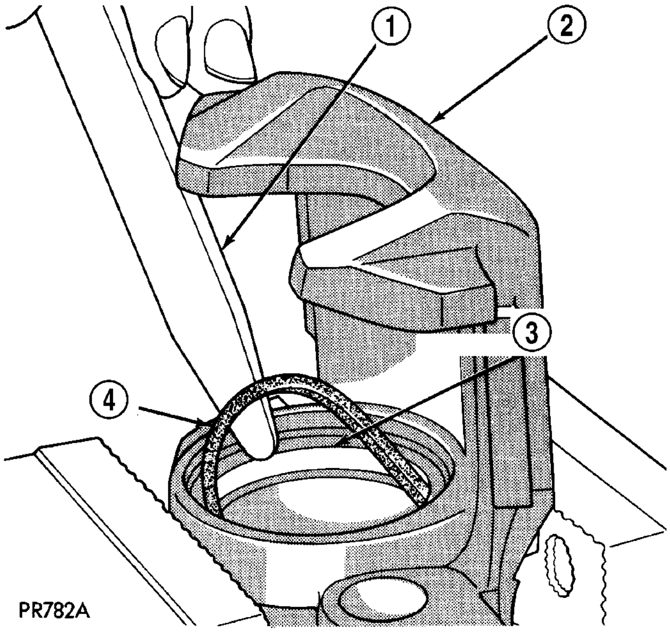


Fig. 77 Removing Piston Seal

1 - PLASTIC TRIM STICK
2 - CALIPER
3 - PISTON SEAL GROOVE
4 - PISTON SEAL

specification, a new caliper housing should be installed.

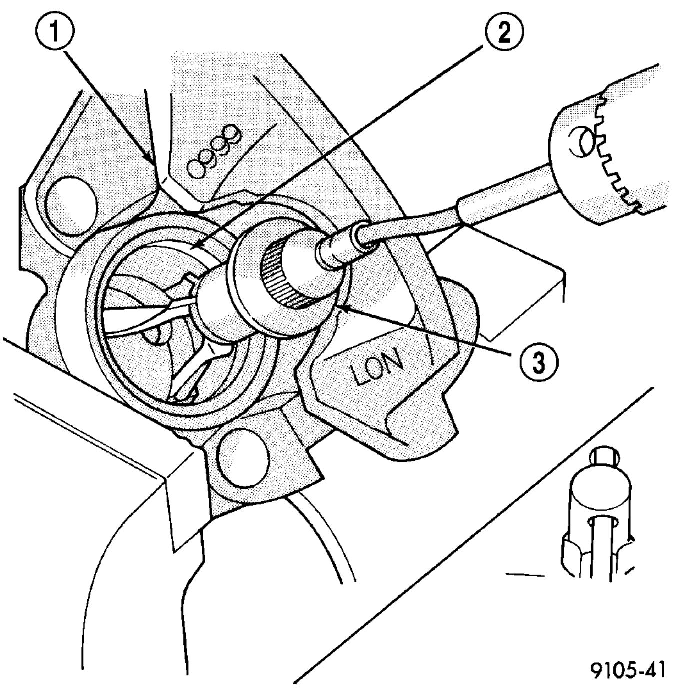


Fig. 78 Honing Brake Caliper Piston Bore

1 - CALIPER
2 - CALIPER BORE
3 - SPECIAL TOOL C-4095

NOTE: During the honing procedure, 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. Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the caliper bore with fresh clean brake fluid; wipe it dry with a clean, lint free cloth and then clean it a second time.

(6) Inspect the caliper piston for pitting, scratches, or any physical damage. Replace the piston if there is evidence of scratches, pitting or physical damage.

CLEANING - DISC BRAKE CALIPER

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

INSPECTION - DISC BRAKE CALIPER

Inspect the disc brake caliper for the following:

- Brake fluid leaks in and around boot area and inboard lining
- Ruptures, brittleness or damage to the piston dust boot
- Damaged, dry or brittle guide pin dust boots

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots.

DISC BRAKE CALIPERS - REAR (Continued)

ASSEMBLY

ASSEMBLY (GUIDE PIN BUSHINGS)

(1) Fold the guide pin bushing in half lengthwise at the solid middle section (Fig. 79).

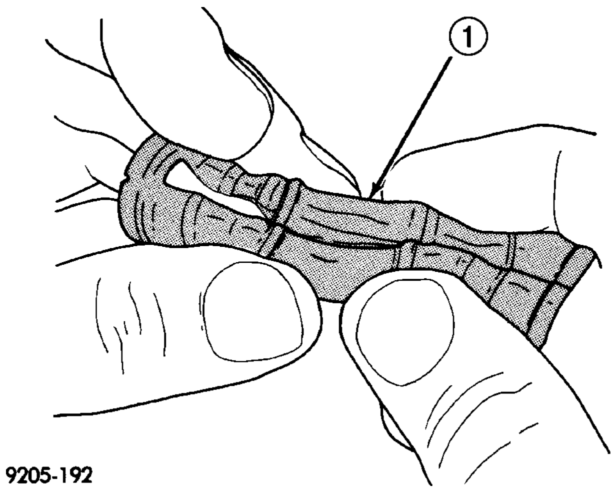


Fig. 79 Folded Caliper Guide Pin Bushing

1 - CALIPER GUIDE PIN BUSHING

NOTE: To avoid damage to the bushing, do not use a sharp object to install the guide pin bushing.

(2) Insert the folded bushing into the caliper mounting boss using your fingers (Fig. 80).

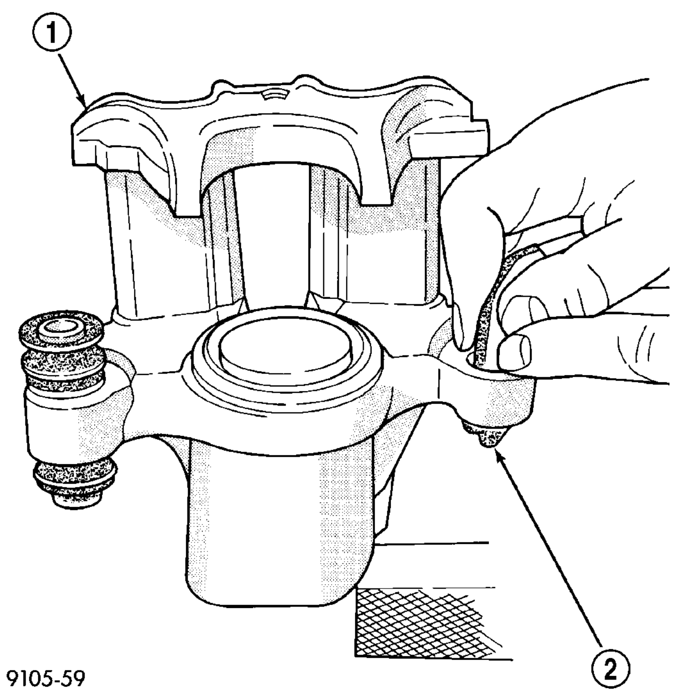


Fig. 80 Installing Caliper Guide Pin Bushing

1 - CALIPER
2 - BUSHING

(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper housing. The bushing flanges should be seated evenly on both sides of the bushing hole (Fig. 81).

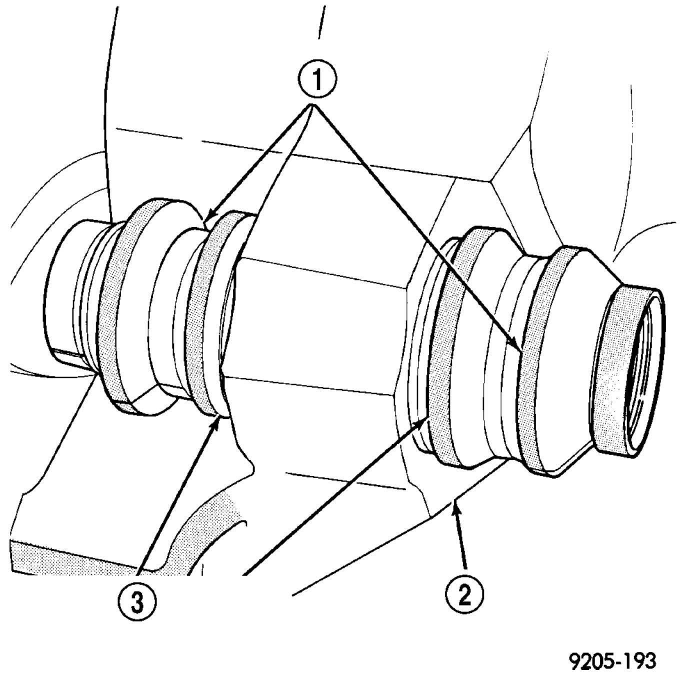


Fig. 81 Bushing Correctly Installed In Caliper

1 - BUSHING
2 - CALIPER
3 - BE SURE BOTH BUSHING FLANGES ARE FULLY SEATED AROUND CALIPER BUSHING BORES.

(4) Lubricate the inside surfaces of the bushing using Mopar Dielectric Grease or an equivalent.

(5) Install the guide pin sleeve into one end of bushing until the seal area of bushing is past the seal groove in the sleeve (Fig. 82).

(6) Holding the convoluted boot on the opposite end of the bushing, push the steel sleeve through the bushing until the bushing boot is fully seated into the seal groove on that end of sleeve (Fig. 82). Install the other end bushing boot into the groove on that end of the bushing sleeve.

(7) Verify both ends of the bushing are seated in the sleeve groves (Fig. 83). When the sleeve is seated properly into the bushing, the sleeve/bushing can be held between your fingers and easily slid back and forth without the bushing unseating from the sleeve groove.

DISC BRAKE CALIPERS - REAR (Continued)

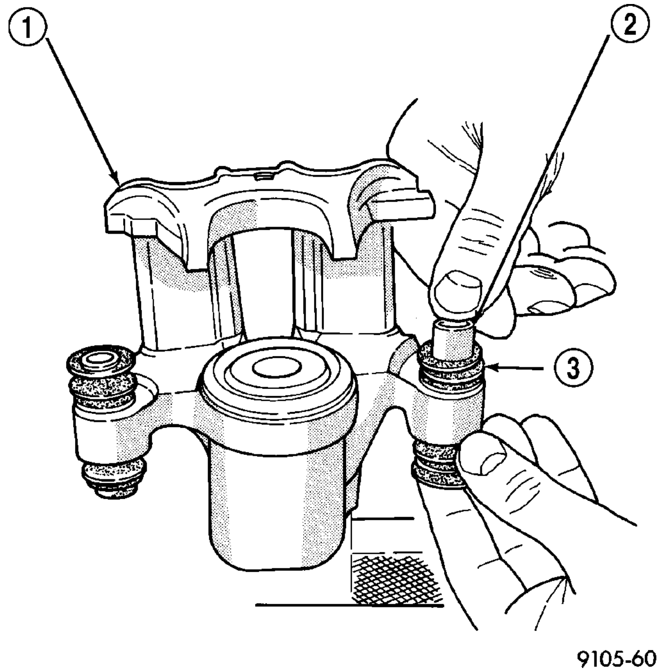


Fig. 82 Installing Sleeve In Bushing

1 - CALIPER
2 - SLEEVE
3 - BUSHING

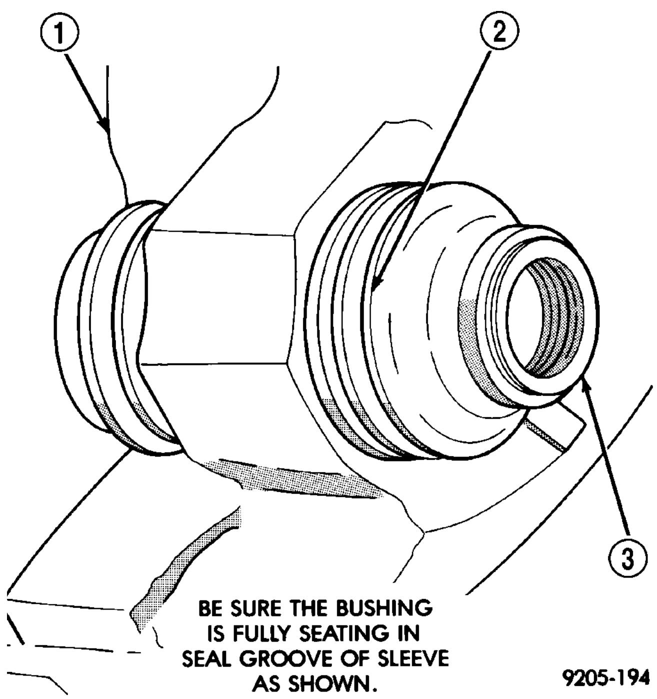


Fig. 83 Correctly Installed Guide Pin Sleeve And Bushing

1 - CALIPER
2 - BUSHING
3 - SLEEVE

ASSEMBLY (PISTON AND SEAL)

NOTE: Never use an old piston seal.

(1) Dip the new piston seal in clean brake fluid and install it in the groove of the caliper bore. The seal should be started at one area of the groove and gently worked around and into the groove (Fig. 84) using only your clean fingers to seat it.

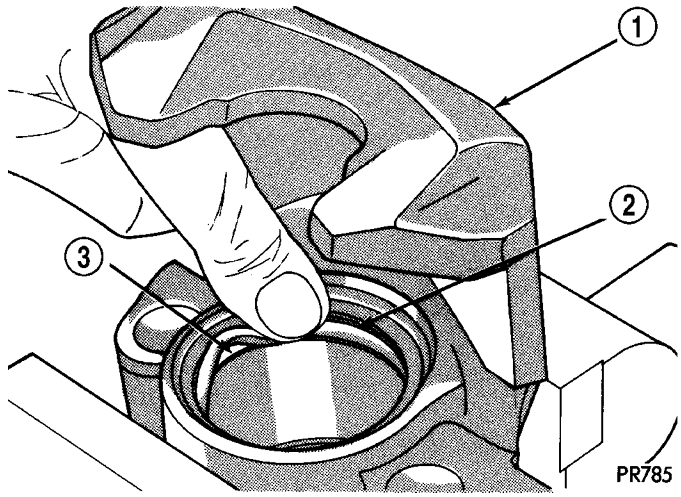


Fig. 84 Installing New Piston Seal

1 - CALIPER
2 - PISTON SEAL
3 - SEAL GROOVE

(2) Coat the new piston boot with clean brake fluid leaving a generous amount inside the boot.

(3) Position the dust boot over the piston after coating it with brake fluid.

CAUTION: Force applied to the piston to seat it in the bore must be applied uniformly to avoid cocking and binding of the piston.

(4) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 85).

(5) Position the dust boot into the counterbore of the caliper assembly piston bore.

(6) Using a hammer and Installer, Special Tool C-4689, and Handle, Special Tool C-4171, drive the boot into the counterbore of the caliper (Fig. 86).

(7) Install the brake shoes (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).

(8) Reinstall the caliper on the vehicle and bleed the brakes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

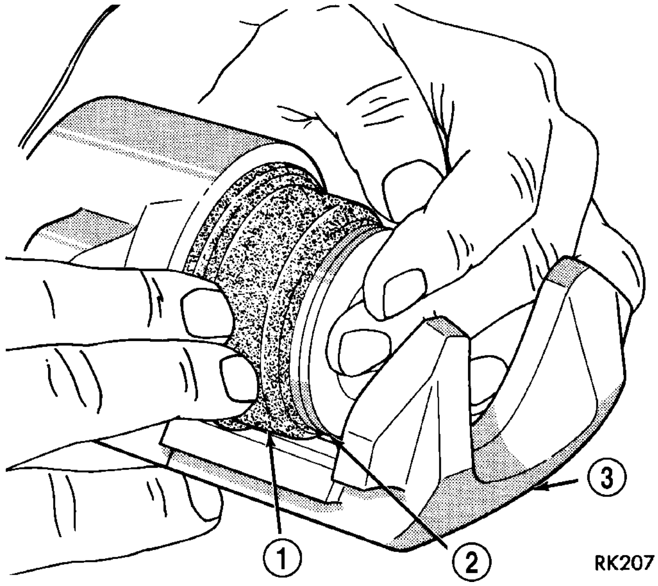


Fig. 85 Installing Piston Into Caliper Bore

1 - BOOT
2 - PISTON
3 - CALIPER

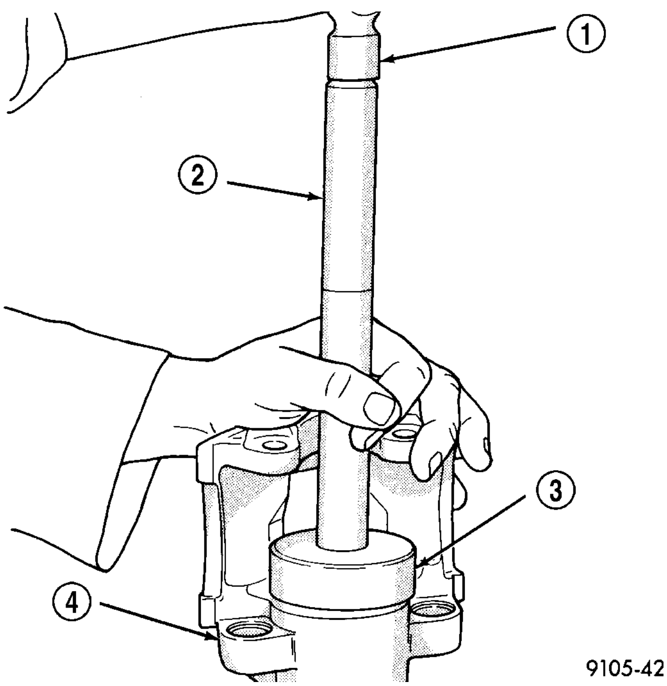


Fig. 86 Installing Dust Boot In Caliper Counterbore

1 - HAMMER
2 - SPECIAL TOOL C-4171
3 - SPECIAL TOOL C-4689
4 - CALIPER

INSTALLATION

CAUTION: When installing new brake components, be sure to use correct parts. Parts designed for BR3 Performance Brake System must not be mixed with other brake systems. These parts, similar in appearance, can be easily identified. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - DESCRIPTION - DISC BRAKES (FRONT) - SRT-4)

NOTE: Step (1) below is only required when installing the disc brake caliper after new brake shoes have been installed.

(1) Completely retract the caliper piston back into piston bore of the caliper.

(2) Lubricate both adapter caliper slide abutments with a liberal amount of Mopar® Multipurpose Lubricant, or an equivalent.

CAUTION: Use care when installing the caliper assembly onto adapter so the guide pin bushings and sleeves do not get damaged by the mounting bosses on adapter.

(3) Starting with the lower end, carefully lower the caliper and brake shoes over the brake rotor and catch the caliper's bottom edge behind the caliper slide abutment (Fig. 73). Rotate the top of the caliper into mounting position on the adapter.

CAUTION: Extreme caution should be taken not to cross thread the caliper guide pin bolts when they are installed.

(4) Carefully install the caliper guide pin bolts (Fig. 72), then tighten them to a torque of 22 N·m (192 in. lbs.).

(5) Install the banjo bolt connecting the brake hose to the brake caliper (Fig. 71). **Install NEW washers with the banjo bolt.** Place one fitting washer on each side of the hose fitting as the banjo bolt is guided through the fitting. Thread the banjo bolt into the caliper and tighten it to a torque of 24 N·m (210 in. lbs.).

(6) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(7) Lower the vehicle.

(8) Remove the brake pedal holding tool.

(9) Bleed the caliper as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(10) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

DRUM

DIAGNOSIS AND TESTING - BRAKE DRUM

With the drum off the vehicle, measure the drum for diameter variation (oval shape). The diameter variation of the drum braking surface must not exceed either 0.0635 mm (0.0025 inch) in 30° or 0.0889 mm (0.0035 inch) in 360°.

Measure brake drum runout. Brake drum runout should be checked with the drum mounted on a brake lathe. Brake drum runout should not exceed 0.1524 mm (0.006 inch).

If either of these measurements are not within specification, reface or replace the drum. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - STANDARD PROCEDURE).

Always replace the drum if machining will cause the diameter to exceed drum maximum diameter. All brake drums are marked with the maximum allowable brake drum diameter (Fig. 87).

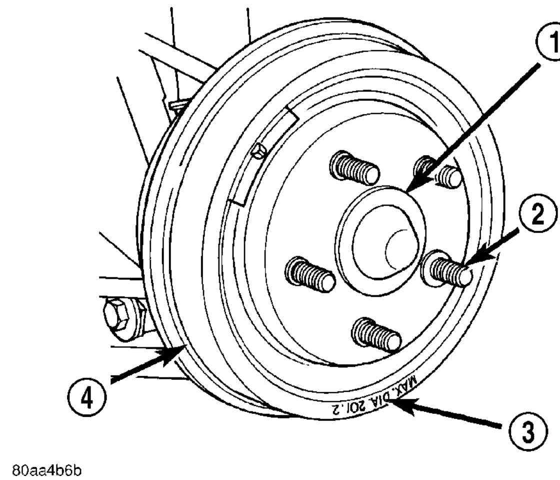


Fig. 87 Brake Drum Maximum Diameter Identification

1 - HUB/BEARING ASSEMBLY
2 - WHEEL MOUNTING STUDS
3 - BRAKE DRUM MAXIMUM DIAMETER MARKING
4 - REAR BRAKE DRUM

STANDARD PROCEDURE - BRAKE DRUM MACHINING

If a brake drum is deeply scored or warped, it can be machined on a brake lathe equipped to machine brake drums. Follow the manufacturers instructions on the machining procedure.

Measure the brake drum diameter before machining. If machining the drum will cause the drum to exceed maximum allowable diameter, do not machine the brake drum. It needs to be replaced.

CAUTION: Do not machine the brake drum if it will cause the drum to exceed maximum allowable diameter.

All brake drums are marked with the maximum allowable brake drum diameter (Fig. 87).

When machining, make sure the final finish feed cut is fine in order to avoid a screw effect on the brake shoes when the brakes are applied. This final feed cut specification varies from lathe manufacturer to lathe manufacturer.

REMOVAL

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear tire and wheel assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(3) Remove the brake drum retaining clips (if equipped) (Fig. 88).

(4) Remove the brake drum (Fig. 88).

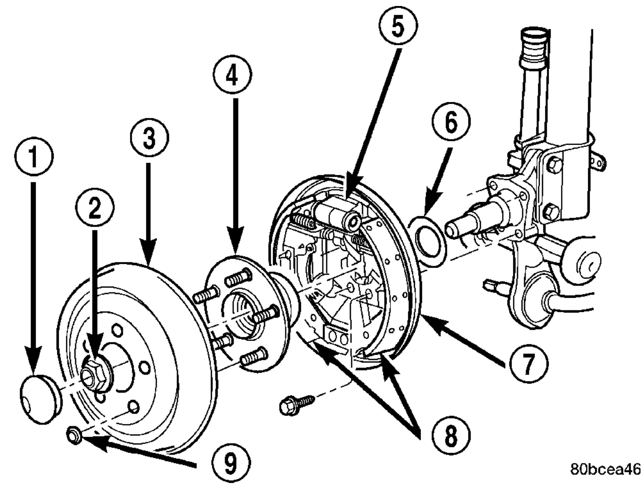


Fig. 88 Drum Brakes

1 - DUST CAP
2 - NUT
3 - DRUM
4 - HUB AND BEARING
5 - WHEEL CYLINDER
6 - SEAL
7 - SUPPORT PLATE
8 - BRAKE SHOES
9 - RETAINER CLIP

NOTE: If the drum does not come off, further brake clearance can be obtained by backing off the brake automatic adjuster screw. Remove the rubber plug from the top of brake support plate. Rotate the automatic adjuster screw in an upward motion, using a screwdriver.

DRUM (Continued)

INSTALLATION

NOTE: Before installing the drum, inspect the brake shoe linings for wear, shoe alignment, and contamination.

(1) Install the rear brake drum on rear hub and bearing (Fig. 88).

(2) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(3) Adjust the rear brake shoes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ BRAKE PADS/SHOES - ADJUSTMENTS).

(4) Lower the vehicle.

FLUID

DIAGNOSIS AND TESTING - BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts. Swelling indicates 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 the fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If the brake fluid is contaminated, drain and thoroughly flush the brake system. Replace all the rubber parts or components containing rubber coming into contact with the brake fluid including: the master cylinder and reservoir; proportioning valves (non-ABS); caliper seals; wheel cylinder seals; ABS hydraulic control unit; and all hydraulic fluid hoses.

STANDARD PROCEDURE - BRAKE FLUID LEVEL CHECKING

Brake fluid level should be checked a minimum of twice a year.

Master cylinder reservoirs are marked, FULL and MIN, indicating the allowable brake fluid level range in the master cylinder brake fluid reservoir (Fig. 89).

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.

Although there is a range, the preferred level is FULL. If necessary, adjust the brake fluid level to the FULL mark on the side of the master cylinder brake fluid reservoir.

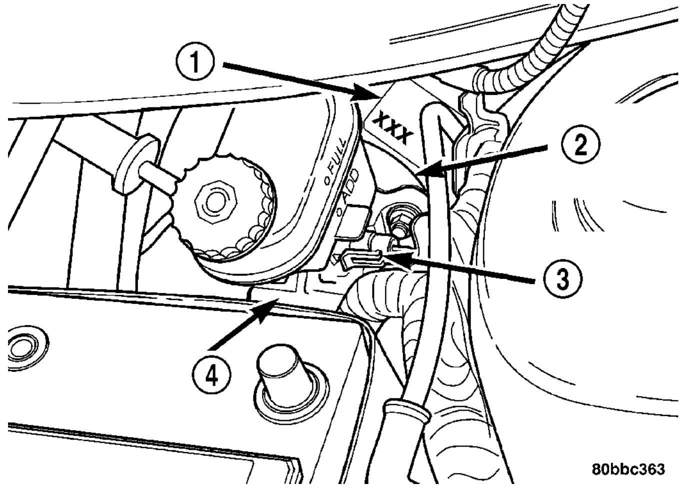


Fig. 89 Master Cylinder

1 - POWER BRAKE BOOSTER PARTS IDENTIFICATION TAG
2 - POWER BRAKE BOOSTER
3 - BRAKE FLUID LEVEL SWITCH
4 - MASTER CYLINDER

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, etc.

FLUID RESERVOIR

REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

NOTE: The master cylinder does not need to be removed from the power brake booster for removal and installation of the brake fluid reservoir.

(1) Clean the master cylinder housing and brake fluid reservoir exterior surfaces.

(2) Remove the brake fluid reservoir cap. Using a clean syringe or siphoning tool, empty as much brake fluid as possible from the reservoir.

(3) Remove the vehicle wiring harness connector from brake fluid level switch in master cylinder brake fluid reservoir (Fig. 95).

(4) Remove the two plastic pins holding the reservoir to the master cylinder (Fig. 90).

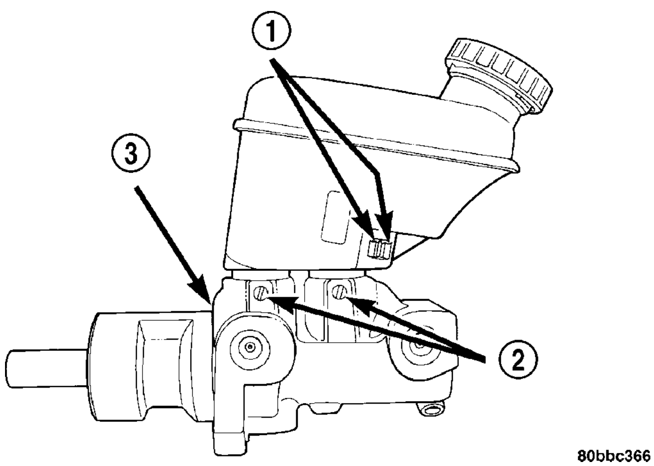


Fig. 90 Master Cylinder Reservoir

1 - BRAKE FLUID LEVEL SWITCH RETAINING TABS
2 - RESERVOIR RETAINING PINS
3 - SEAL

(5) Lift the reservoir from the master cylinder casting.

(6) Remove the grommets (O-rings) sealing the reservoir to the master cylinder housing (Fig. 91).

INSTALLATION

(1) Install NEW sealing grommets (O-rings) in the master cylinder housing (Fig. 91).

(2) Lubricate the sealing grommets with fresh clean DOT 3 brake fluid. Place the reservoir in position over the grommets making sure the filler hole is towards the front of the vehicle. Seat the reservoir into the grommets. While holding the reservoir firmly against the grommets, install new plastic pins through their mounting holes until they protrude out the other side of the master cylinder reservoir (Fig. 90).

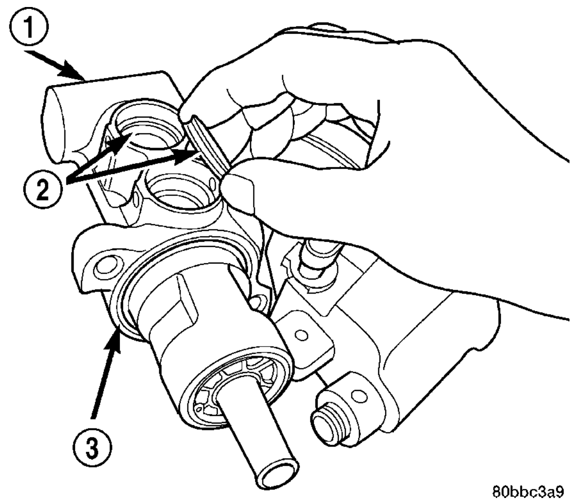


Fig. 91 Sealing Grommets

1 - MASTER CYLINDER
2 - GROMMETS (O-RINGS)
3 - SEAL

(3) Connect the brake fluid level switch wiring connector (Fig. 95).

(4) Fill the reservoir with fresh clean DOT 3 brake fluid. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - STANDARD PROCEDURE).

MASTER CYLINDER

DESCRIPTION

Two different master cylinders are used on this vehicle. Vehicles without antilock brakes (ABS) use a standard compensating-port master cylinder, while vehicles equipped with ABS use a center-valve design master cylinder.

ABS vehicles, equipped with rear disc brakes, use a master cylinder with a 23.82 mm (0.937 in.) bore diameter, while non-ABS vehicles, equipped with rear disc brakes, use a 22.23 mm (0.875 in.) bore diameter master cylinder.

The ABS master cylinder is a two-outlet design and the brake tubes from these primary and secondary outlet ports lead directly to the integrated control unit (ICU) before going to each wheel brake (Fig. 94).

The non-ABS master cylinder is a four-outlet design (one for each wheel brake) with two screw-in proportioning valves (one for each rear wheel brake). One is attached directly to the inboard side of the master cylinder housing while the other is attached to the bottom (Fig. 96).

Both type master cylinders mount to the power brake booster using two nuts. They both have a seal

MASTER CYLINDER (Continued)

on the rear of the mounting flange to seal vacuum in the booster.

The master cylinder body is an anodized aluminum casting. It has a machined bore to accept the master cylinder piston and also has threaded ports with seats for hydraulic brake line connections.

The master cylinder has the brake fluid reservoir mounted on top of it which gravity feeds brake fluid to the master cylinder when it is required. The reservoir is made of see-through plastic and it houses the brake fluid level switch. A removable brake fluid level switch is mounted in the left side.

OPERATION

When the brake pedal is pressed, the master cylinder primary and secondary pistons apply brake pressure through the proportioning valves (on non-ABS vehicles) and chassis brake tubes to each brake assembly. The brake fluid reservoir supplies the brake hydraulic system with the necessary fluid to operate properly.

The non-ABS master cylinder's primary outlet ports supply hydraulic pressure to the right front and left rear brakes while the secondary outlet ports supply hydraulic pressure to the left front and right rear brakes. ABS equipped master cylinder outlet ports supply hydraulic pressure to the ABS Integrated Control Unit (ICU) where it is distributed to the individual wheel brakes.

The master cylinder reservoir cap diaphragm is slit to allow atmospheric pressure to equalize on both sides of the diaphragm.

STANDARD PROCEDURE - MASTER CYLINDER BLEEDING

(1) Clamp the master cylinder in a vise.

(2) Refer to one of the following depending on whether the master cylinder is a non-ABS unit Step a or an ABS unit Step b:

(a) Attach four Master Cylinder Bleed Tubes, Special Tool 8358-1, to the four ports of the master cylinder and tighten each in place (Fig. 92). The bleed tubes for the ports pertaining to the rear brakes are made to attach to the proportioning valves screwed into the master cylinder. Position the other end of the tubes into the master cylinder reservoir so their outlets are below the surface of the brake fluid in the reservoir when filled.

(b) Attach Master Cylinder Bleed Tube, Special Tool 8358-1, to the primary port of the master cylinder and tighten in place (Fig. 93). Attach Master Cylinder Bleed Tube, Special Tool 8358-2, to the secondary port of the master cylinder and tighten in place. Position the other end of the tubes into the master cylinder reservoir so their outlets are below the surface of the brake fluid in the reservoir when filled.

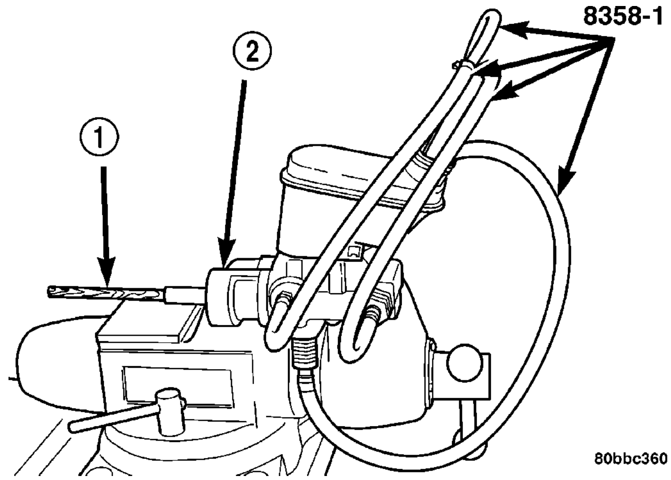


Fig. 92 Bleeding Master Cylinder - W/O ABS

1 - WOODEN DOWEL
2 - MASTER CYLINDER

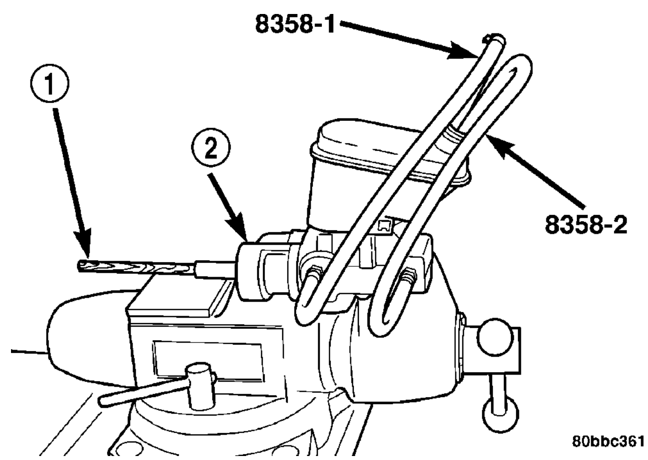


Fig. 93 Bleeding Master Cylinder - W/ABS

1 - WOODEN DOWEL
2 - MASTER CYLINDER

(3) Fill the brake fluid reservoir with fresh Mopar® brake fluid, or equivalent conforming to DOT 3 specifications.

(4) Using a wooden dowel as a pushrod (Fig. 92) (Fig. 93), press the pistons inward slowly applying brake pressure, then release the pressure, allowing the pistons to return to the released position. Repeat this several times until all air bubbles are expelled out of the tubes and master cylinder bore.

(5) Remove the bleed tubes from the master cylinder and plug the outlet ports.

(6) Install the fill cap on the reservoir.

(7) Remove the master cylinder from the vise.

MASTER CYLINDER (Continued)

REMOVAL

REMOVAL - LHD WITH ABS

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

(1) With the engine not running, pump the brake pedal 4-5 strokes until the pedal feel is firm.

(2) Disconnect the negative (ground) cable from the battery and isolate the cable.

(3) Disconnect the positive cable from the battery, then remove the battery from the battery tray. There is one nut securing the clamp on the backside of the battery holding it in place.

(4) Disconnect the wiring harness connector from the brake fluid level switch on the master cylinder reservoir (Fig. 94).

(5) Disconnect the primary and secondary brake tubes from master cylinder (Fig. 94). Install plugs in the master cylinder outlet ports.

(6) Clean the area around where the master cylinder attaches to the power brake booster using a suitable brake cleaner such as Mopar® Brake Parts Cleaner or an equivalent.

(7) Remove the 2 nuts attaching master cylinder to power brake booster (Fig. 94).

(8) Slide the master cylinder straight out of the power brake booster.

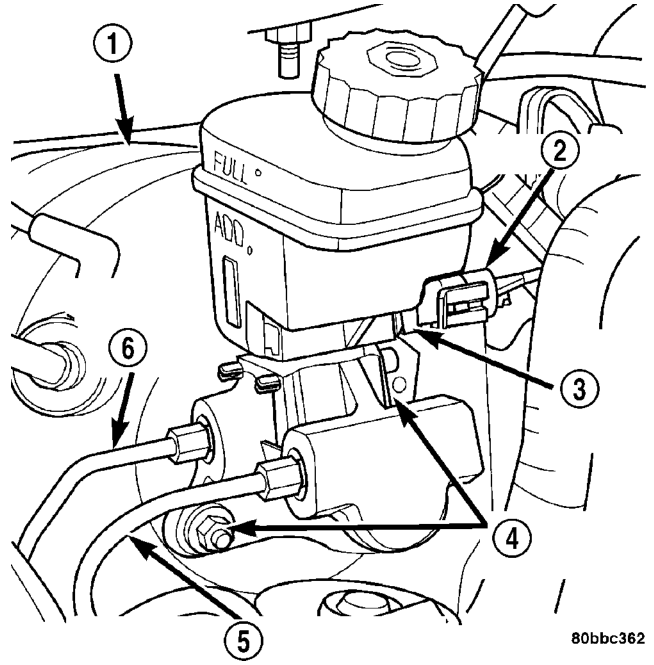


Fig. 94 Master Cylinder - W/ABS

1 - POWER BRAKE BOOSTER
2 - CONNECTOR
3 - BRAKE FLUID LEVEL SWITCH
4 - MOUNTING NUTS
5 - SECONDARY BRAKE TUBE
6 - PRIMARY BRAKE TUBE

REMOVAL - LHD WITHOUT ABS

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

(1) With the engine not running, pump the brake pedal 4-5 strokes until the pedal feel is firm.

(2) Disconnect the negative (ground) cable from the battery and isolate the cable.

(3) Disconnect the positive cable from the battery, then remove the battery from the battery tray. There is one nut securing the clamp on the backside of the battery holding it in place.

(4) Remove the vehicle wiring harness connector from brake fluid level switch in master cylinder brake fluid reservoir (Fig. 95).

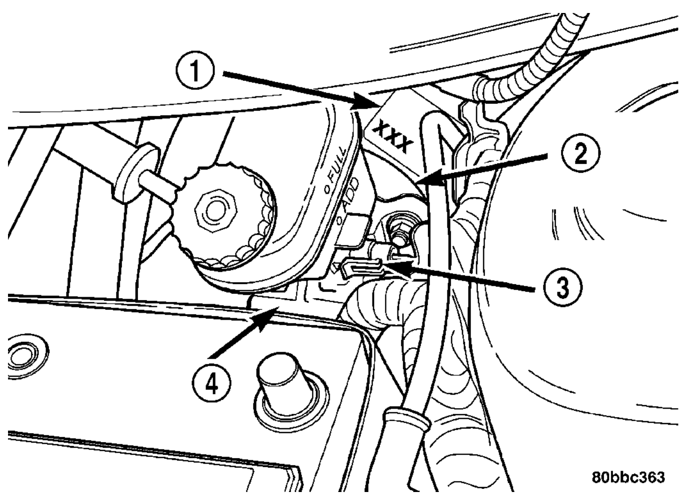


Fig. 95 Master Cylinder

1 - POWER BRAKE BOOSTER PARTS IDENTIFICATION TAG
2 - POWER BRAKE BOOSTER
3 - BRAKE FLUID LEVEL SWITCH
4 - MASTER CYLINDER

MASTER CYLINDER (Continued)

(5) Disconnect the two brake tubes from the master cylinder, and two brake tubes from the proportioning valves (Fig. 96). Install plugs at all of the open brake tube outlets on the master cylinder.

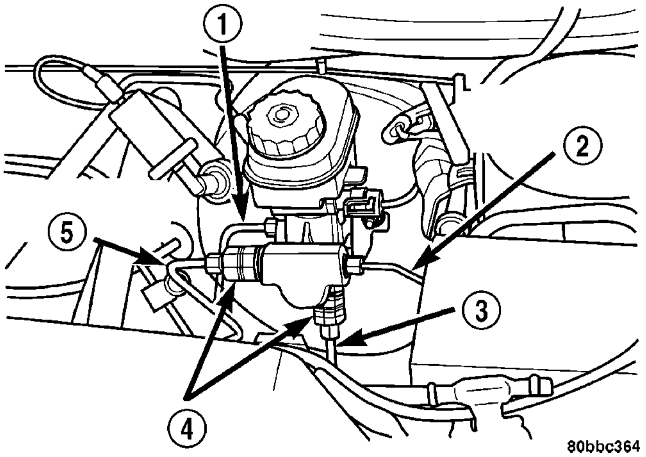


Fig. 96 Brake Tubes At Master Cylinder

1 - RIGHT FRONT BRAKE TUBE
2 - LEFT FRONT BRAKE TUBE
3 - LEFT REAR BRAKE TUBE
4 - REAR PROPORTIONING VALVES
5 - RIGHT REAR BRAKE TUBE

(6) Clean the area around where the master cylinder attaches to the power brake booster using a suitable brake cleaner such as Mopar Brake Parts Cleaner or an equivalent.

(7) Remove the two nuts attaching the master cylinder to the power brake booster.

(8) Slide the master cylinder straight out of the power brake booster.

(9) To remove the proportioning valves, unthread each from the master cylinder.

REMOVAL - RHD

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

(1) With the engine not running, pump the brake pedal 4-5 strokes until the pedal feel is firm.

(2) Disconnect the negative (ground) cable from the battery and isolate the cable.

(3) Disconnect the brake fluid level switch wiring connector (Fig. 97).

(4) Remove the brake lines from the master cylinder.

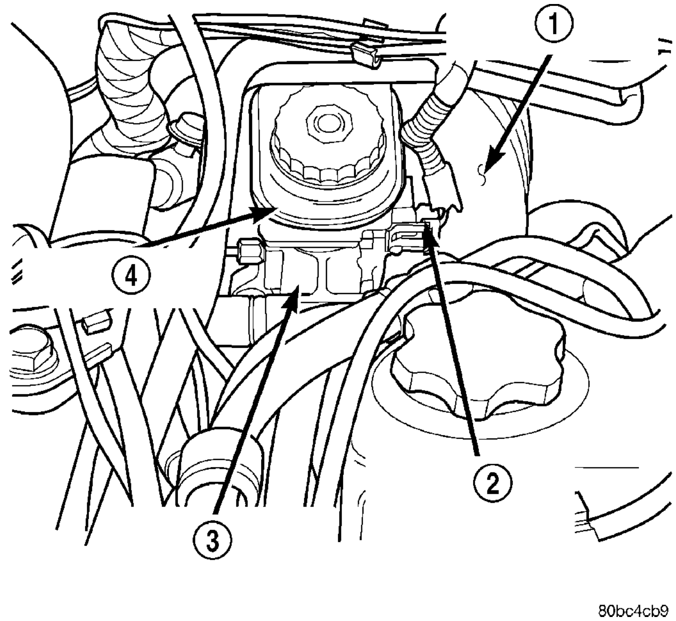


Fig. 97 RHD MASTER CYLINDER

1 - POWER BRAKE VACUUM BOOSTER
2 - BRAKE FLUID LEVEL SWITCH
3 - MASTER CYLINDER
4 - BRAKE FLUID RESERVOIR

(5) Remove the (2) master cylinder mounting nuts.

(6) Slide the master cylinder assembly straight out of the power brake booster.

INSTALLATION

INSTALLATION - LHD WITH ABS

NOTE: The master cylinder must be bled before installing it on the vehicle.

(1) Bleed the master cylinder before installing it on the vehicle. (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE).

(2) Inspect and wipe clean the O-ring vacuum seal on the master cylinder rear mounting flange to ensure a good vacuum seal once installation is complete. Replace as necessary.

(3) Wipe the face of the power brake booster clean where the master cylinder seal comes in contact when it's installed. Do not get any cleaner or debris inside the booster.

(4) Position the master cylinder on the studs of power brake vacuum booster aligning the booster push rod with the master cylinder push rod. Carefully push the master cylinder onto the studs until it contacts the face of the booster.

MASTER CYLINDER (Continued)

(5) Install the two master cylinder mounting nuts (Fig. 94). Tighten the mounting nuts to a torque of 18 N·m (160 in. lbs.).

(6) Connect the primary and secondary brake tubes to the master cylinder primary and secondary ports (Fig. 94). Tighten the nuts to a torque of 17 N·m (145 in. lbs.).

(7) Install the wiring harness connector on the master cylinder reservoir fluid level switch.

(8) Install the battery and clamp in place.

(9) Connect the positive, then the negative (ground) cable on the battery.

(10) Fill the master cylinder to the proper level.

(11) Pump the brake pedal several times, then check brake fluid level in master cylinder reservoir. Adjust brake fluid level as necessary.

CAUTION: It will be necessary to bleed the entire base hydraulic system if the brake system has been open to air for an excessive amount of time or air is present in the lines. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(12) Check for leaks.

(13) Road test the vehicle to ensure proper operation of the base and antilock brake systems.

INSTALLATION - LHD WITHOUT ABS

NOTE: The master cylinder must be bled before installing it on the vehicle.

(1) If removed, install the proportioning valves in their master cylinder ports. The valves are identical, so they can be installed in either master cylinder port going to the rear brakes. Make sure the O-rings on the proportioning valves are new.

(2) Bleed the master cylinder before installing it on the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE).

(3) Inspect and wipe clean the O-ring vacuum seal on the master cylinder rear mounting flange to ensure a good vacuum seal once installation is complete. Replace as necessary.

(4) Wipe the face of the power brake booster clean where the master cylinder seal comes in contact when it's installed. Do not get any cleaner or debris inside the booster.

(5) Position the master cylinder on the studs of the power brake booster, aligning the push rod of the power brake booster with master cylinder piston push rod. Carefully push the master cylinder onto the studs until it contacts the face of the booster.

(6) Install the two master cylinder mounting nuts and tighten each to a torque of 18 N·m (160 in. lbs.).

(7) Connect the four brake tubes to the master cylinder and proportioning valve ports (Fig. 96). Tighten all tube nuts to a torque of 17 N·m (145 in. lbs.).

(8) Connect the brake fluid level switch wiring connector.

(9) Install the battery and clamp it in place.

(10) Connect the positive, then the negative (ground) cable on the battery.

(11) Fill the master cylinder to the proper level.

(12) Pump the brake pedal several times, then check brake fluid level in master cylinder reservoir. Adjust brake fluid level as necessary.

CAUTION: It will be necessary to bleed the entire base hydraulic system if the brake system has been open to air for an excessive amount of time or air is present in the lines. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(13) Check for leaks.

(14) Road test the vehicle to ensure proper operation of the brakes.

INSTALLATION - RHD

NOTE: The master cylinder must be bled before installing it on the vehicle.

(1) If removed, install the proportioning valves in their master cylinder ports. The valves are identical, so they can be installed in either master cylinder port going to the rear brakes. Make sure the O-rings on the proportioning valves are new.

(2) Bleed the master cylinder before installing it on the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE).

(3) Inspect and wipe clean the O-ring vacuum seal on the master cylinder rear mounting flange to ensure a good vacuum seal once installation is complete. Replace as necessary.

(4) Wipe the face of the power brake booster clean where the master cylinder seal comes in contact when it's installed. Do not get any cleaner or debris inside the booster.

(5) Slide the master cylinder assembly straight in the power brake booster.

(6) Install the (2) master cylinder retaining nuts. Torque the nuts to 18 N·m (160 in. lbs.).

(7) Install the brake lines on the master cylinder. Torque the tube nuts to 17 N·m (145 in. lbs.).

(8) Connect the brake fluid level switch wiring connector (Fig. 97).

(9) Fill the master cylinder to the proper level.

(10) Pump the brake pedal several times, then check brake fluid level in master cylinder reservoir. Adjust brake fluid level as necessary.

MASTER CYLINDER (Continued)

CAUTION: It will be necessary to bleed the entire base hydraulic system if the brake system has been open to air for an excessive amount of time or air is present in the lines. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(11) Check for leaks.

(12) Road test the vehicle to ensure proper operation of the brakes.

PEDAL

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

WITH AUTOMATIC TRANSAXLE

(1) Disconnect and isolate the battery negative cable from its post on the battery.

(2) Place the steering wheel and tires in the STRAIGHT-AHEAD position. Using a steering wheel holder, lock the steering wheel in place to keep it from rotating (Fig. 98). This keeps the clockspring in the proper orientation.

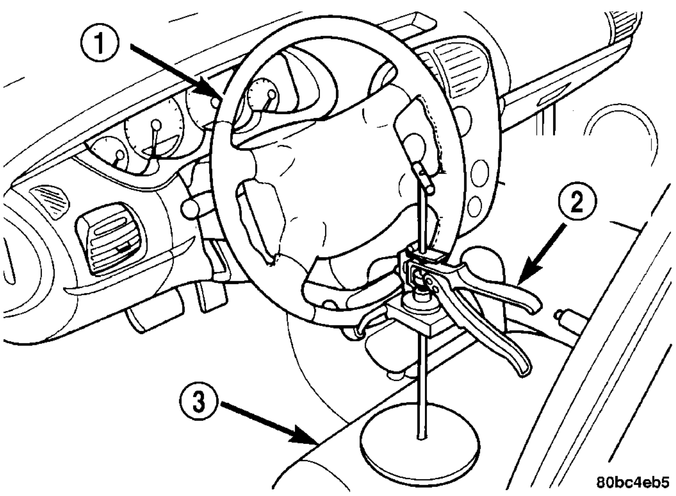


Fig. 98 Steering Wheel Holder

1 - STEERING WHEEL
2 - STEERING WHEEL HOLDER
3 - DRIVERS SEAT

(3) Remove the steering column coupling retainer pin, back off the pinch bolt nut, and remove the steering column coupling pinch bolt (Fig. 99) (the pinch bolt nut is caged to the coupling and is not removable). Separate the upper and lower steering column couplings.

(4) Remove the brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL)

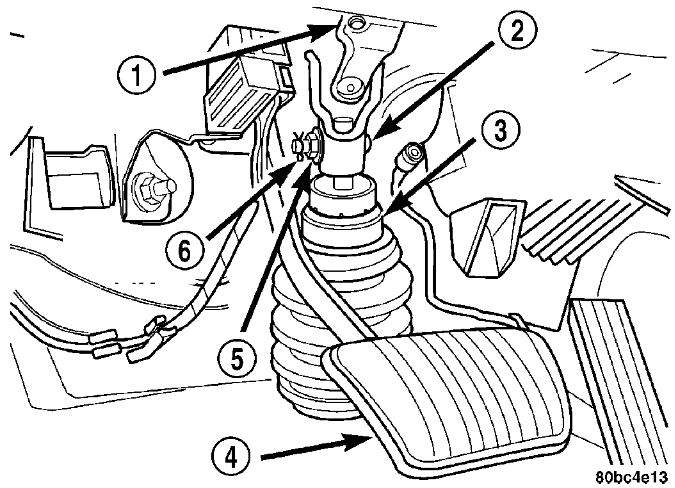


Fig. 99 Steering Column Couplings

1 - STEERING COLUMN UPPER COUPLING
2 - PINCH BOLT
3 - STEERING COLUMN LOWER COUPLING
4 - BRAKE PEDAL
5 - NUT
6 - RETAINER PIN

(5) Remove the clip securing the power brake booster input rod to the brake pedal. Remove the input rod from the brake pedal.

(6) Remove the two upper nuts fastening the brake pedal bracket to the power brake booster (Fig. 100).

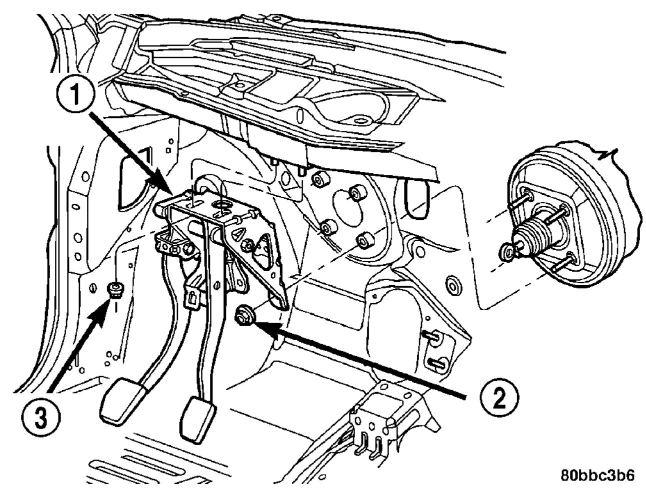


Fig. 100 Brake Pedal Mounting

1 - CLUTCH CABLE
2 - BOOSTER MOUNTING NUTS
3 - UPPER MOUNTING NUTS

(7) Carefully pry the tie bar running between the two upper booster mounting studs from its plastic retaining fasteners.

(8) Remove the two remaining nuts fastening the brake pedal bracket to the power brake booster (Fig. 100).

PEDAL (Continued)

(9) If the vehicle is equipped with antilock brakes, carefully push the power brake booster forward until the booster contacts the ABS ICU mounting bracket.

(10) If the vehicle does not have antilock brakes, carefully push the power brake booster forward one to two inches being careful not to stretch the brake lines from the master cylinder to the brakes.

(11) Remove the two nuts fastening the brake pedal bracket to the instrument panel support (Fig. 100).

(12) Carefully remove the brake pedal assembly by pulling the pedal bracket back toward the instrument panel, releasing the bracket from the booster studs. Next, tip the bracket down past the input rod, guiding the rod through the gap left by the missing brace removed in Step (8). Remove the brake pedal assembly out from under the instrument panel.

(13) The pedal can be removed from it's bracket by grinding off the peened end of the shaft, removing the shaft, pedal and bushings. A service parts package is available to replace these items.

WITH MANUAL TRANSAXLE

(1) Remove the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(2) Remove the brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL)

(3) Disconnect the clutch cable from the clutch pedal spacer (Fig. 101).

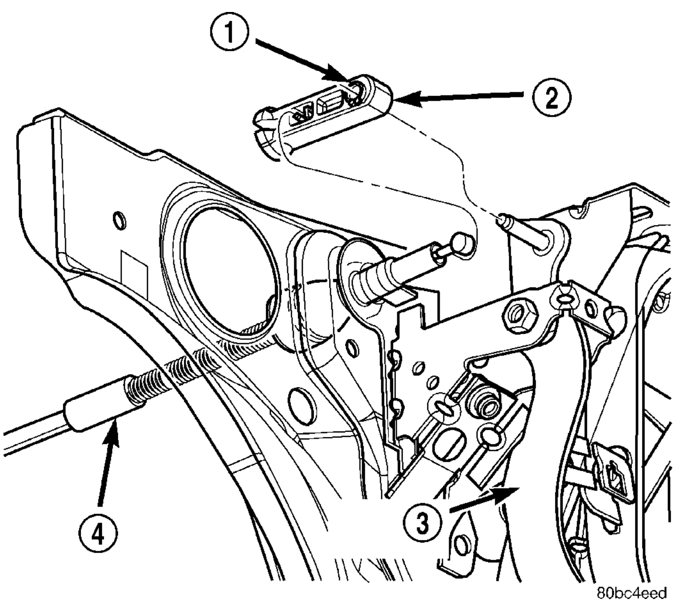


Fig. 101 Clutch Cable Connection

1 - SNAP RING
2 - CLUTCH PEDAL SPACER
3 - CLUTCH PEDAL
4 - CLUTCH CABLE

(4) Disconnect the wiring harness connector going to the clutch pedal switches (Fig. 102).

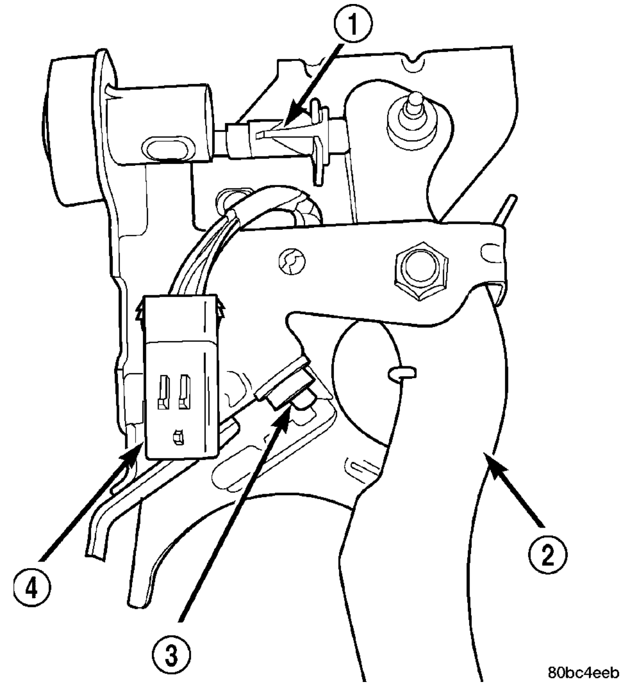


Fig. 102 Wiring Harness Connector

1 - UPSTOP SWITCH
2 - CLUTCH PEDAL
3 - INTERLOCK SWITCH
4 - CONNECTOR

(5) Remove the clip securing the power brake booster input rod to the brake pedal. Remove the input rod from the brake pedal.

(6) Remove the four nuts fastening the brake pedal bracket to the power brake booster (Fig. 100).

(7) Remove the two nuts fastening the brake pedal bracket to the instrument panel support (Fig. 100).

(8) Remove the brake pedal assembly.

(9) The pedal can be removed from it's bracket by grinding off the peened end of the shaft, removing the shaft, pedal and bushings. A service parts package is available to replace these items.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

WITH AUTOMATIC TRANSAXLE

(1) If the pedal has been removed from it's bracket, install the pedal, bushings and bolt-in-shaft on the bracket using the available service parts package.

(2) Install the brake pedal assembly by tipping the pedal bracket and guiding the power brake booster mounting portion up past the booster input rod.

PEDAL (Continued)

Guide the top of the bracket onto the studs protruding from the instrument panel support (Fig. 100), then guide the booster mounting portion onto the power brake booster mounting studs.

(3) Push the power brake booster back into mounting position from under the hood.

(4) Install the two nuts fastening the brake pedal bracket to the instrument panel support (Fig. 100). Install the nuts all the way, but do not tighten them at this time.

(5) Install the two lower power brake booster mounting nuts, but do not tighten them at this time.

(6) Place the tie bar running between the two upper booster mounting studs onto the studs with the long flat side facing upward and the curved side downward.

(7) Install the two upper power brake booster mounting nuts on their studs.

(8) Tighten all four nuts fastening the brake pedal bracket to the power brake booster to a torque of 34 N·m (300 in. lbs.).

(9) Tighten the two nuts fastening the brake pedal bracket to the instrument panel support to a torque of 34 N·m (300 in. lbs.).

(10) Install the power brake booster input rod on the pin mounted on the side of the brake pedal. Install a new retaining clip on the end of the pin. Do not reuse the old clip.

(11) Mount a new brake lamp switch into the bracket (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION).

(12) Install the dash-to-lower coupling seal in place over the lower coupling's plastic collar and dash cover.

(13) Verify the front tires are still in the STRAIGHT-AHEAD position.

(14) Reconnect the steering column lower coupling to the steering column upper coupling (Fig. 99). Install the coupling pinch bolt an tighten the pinch bolt nut to a torque of 28 N·m (250 in. lbs.). Install the pinch bolt retainer pin.

(15) Remove the steering wheel holder (Fig. 98).

(16) While looking under the instrument panel at the lower coupling, rotate the steering wheel back-and-forth to verify that the lower coupling does not squeak against the dash-to-coupling seal.

(17) Reconnect the battery negative terminal.

(18) Check the stop lamps to verify they are operating properly and not staying on when the pedal is in the released position.

(19) Road test the vehicle to ensure proper operation of the brakes.

WITH MANUAL TRANSAXLE

(1) If the pedal has been removed from it's bracket, install the pedal, bushings and bolt-in-shaft on the bracket using the available service parts package.

(2) Install the brake pedal assembly onto the studs extending down from the instrument panel support and power brake booster (Fig. 100).

(3) Install the two nuts fastening the brake pedal bracket to the instrument panel support (Fig. 100). Install the nuts all the way, but do not tighten them at this time.

(4) Install the power brake booster mounting nuts. Tighten the four nuts fastening the brake pedal bracket to the power brake booster to a torque of 34 N·m (300 in. lbs.).

(5) Tighten the two nuts fastening the brake pedal bracket to the instrument panel support to a torque of 34 N·m (300 in. lbs.).

(6) Connect the clutch cable to the clutch pedal spacer on the pedal (Fig. 101).

(7) Connect the wiring harness connector going to the clutch pedal switches (Fig. 102).

(8) Install the power brake booster input rod on the pin mounted on the side of the brake pedal. Install a new retaining clip on the end of the pin. Do not reuse the old clip.

(9) Mount a new brake lamp switch into the bracket. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)

(10) Install the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(11) Check the stop lamps to verify they are operating properly and not staying on when the pedal is in the released position.

(12) Road test the vehicle to ensure proper operation of the brakes.

POWER BRAKE BOOSTER

DESCRIPTION

There are two different power brake booster designs, although externally they appear the same. All vehicles use a 205 mm tandem diaphragm power brake booster. The two boosters are internally tuned differently depending on whether the vehicle is equipped with the standard front disc/rear drum brake combination or the optional front disc/rear disc (four-wheel disc) brake combination. If the power brake booster requires replacement, be sure it is replaced with the correct part.

The power brake booster can be identified by the tag attached to the body of the booster assembly (Fig.

POWER BRAKE BOOSTER (Continued)

103). This tag contains the following information: The production part number of the power brake booster, the date it was built and who manufactured it.

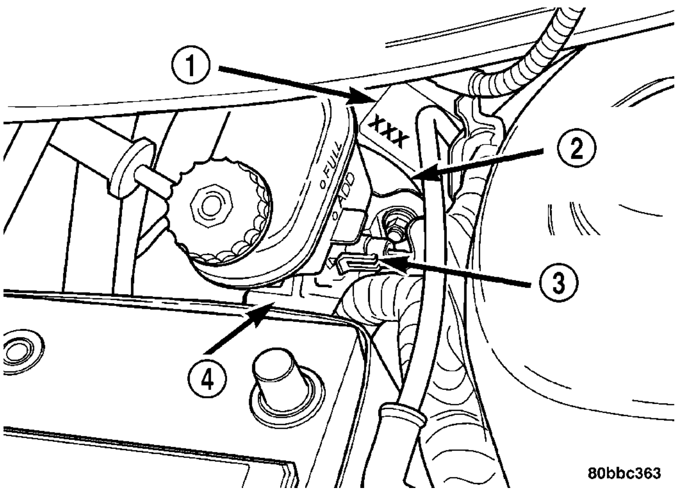


Fig. 103 Master Cylinder and Power Brake Booster

1 - POWER BRAKE BOOSTER PARTS IDENTIFICATION TAG
2 - POWER BRAKE BOOSTER
3 - BRAKE FLUID LEVEL SWITCH
4 - MASTER CYLINDER

The power brake booster reduces the amount of force required by the driver to obtain the necessary hydraulic pressure to stop the vehicle.

The power brake booster is vacuum-operated. The vacuum is supplied from the intake manifold on the engine through the power brake booster check valve (Fig. 104).

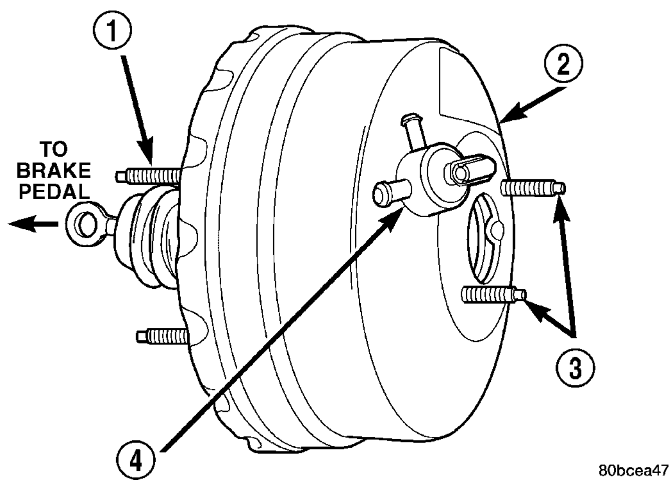


Fig. 104 Power Brake Booster

1 - MOUNTING STUD
2 - PARTS IDENTIFICATION TAG
3 - MASTER CYLINDER MOUNTING STUDS
4 - VACUUM CHECK VALVE

As the brake pedal is depressed, the power booster input rod moves forward. This opens and closes valves in the power brake 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 power booster out against the primary piston of the master cylinder. As the pistons in the master cylinder move forward, hydraulic pressure is created in the brake system.

The power brake vacuum booster assembly mounts on the engine side of the dash panel. The booster input push rod connects to the brake pedal. A vacuum line connects the power booster to the intake manifold. The master cylinder is bolted to the front of the power brake booster.

DIAGNOSIS AND TESTING - POWER BRAKE BOOSTER

BASIC TEST

(1) With engine off, depress and release the brake pedal several times to purge all vacuum from the power brake booster.

(2) Depress and hold the pedal with light effort (15 to 25 lbs. pressure), then start the engine.

The pedal should fall slightly, then hold. Less effort should be needed to apply the pedal at this time. If the pedal fell as indicated, perform the VACUUM LEAK TEST listed after the BASIC TEST. If the pedal did not fall, continue on with this BASIC TEST.

(3) Disconnect the vacuum hose on the side of the vacuum check valve that leads to the speed control, then connect a vacuum gauge to the open vacuum port on the valve.

(4) Start the engine.

(5) When the engine is at warm operating temperature, allow it to idle and check the vacuum at the gauge.

If the vacuum supply is 12 inches Hg (40.5 kPa) or more, the power brake booster is defective and must be replaced. If the vacuum supply is below 12 inches, continue on with this BASIC TEST.

(6) Shut off the engine.

(7) Connect the vacuum gauge to the vacuum reference port on the engine intake manifold.

(8) Start the engine and observe the vacuum gauge.

If the vacuum is still low, check the engine tune and repair as necessary. If the vacuum is above 12 inches, the hose or check to the booster has a restriction or leak.

Once an adequate vacuum supply is obtained, repeat the BASIC TEST.

POWER BRAKE BOOSTER (Continued)

VACUUM LEAK TEST

(1) Disconnect the vacuum hose on the side of the power brake booster vacuum check valve that leads to the speed control, then connect a vacuum gauge to the open vacuum port on the valve.

(2) Remove the remaining hose on the vacuum check valve that is not the vacuum supply hose coming from the intake manifold. Cap off the open port on the check valve.

(3) Start the engine.

(4) Allow the engine to warm up to normal operating temperature and engine idle.

(5) Using vacuum line pliers, close off the vacuum supply hose near the booster and observe the vacuum gauge.

If the vacuum drop exceeds 1.0 inch Hg (3.3 kPa) in one minute, repeat the above steps to confirm the reading. The vacuum loss should be less than 1.0 inch Hg in one minute time span. If the loss is more than 1.0 inch Hg, replace the power brake booster. If it is not, continue on with this test.

(6) Remove the pliers from the hose temporarily.

(7) Apply light effort (approximately 15 lbs. of force) to the brake pedal and hold the pedal steady. Do not move the pedal once the pressure is applied or the test results may vary.

(8) Have an assistant reattach the pliers to the vacuum supply hose.

(9) Allow 5 seconds for stabilization, then observe the vacuum gauge.

If the vacuum drop exceeds 3.0 inches Hg (10 kPa) in 15 seconds, repeat the above steps to confirm the reading. The vacuum loss should be less than 3.0 inches Hg in 15 seconds time span. If the loss is more than 3.0 inches Hg, replace the power brake booster. If it is not, the booster is not defective.

REMOVAL

REMOVAL - LHD

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

(1) Disconnect negative (ground) cable from the battery and isolate the cable.

(2) Disconnect the positive cable from the battery, then remove the battery from the battery tray. There is one nut securing the clamp on the backside of the battery holding it in place.

(3) Remove the one nut and one bolt securing the air cleaner box in place, then disconnect the wiring harness connector at the air inlet sensor.

(4) Lift the air cleaner box upward enough to clear its grommeted alignment post (Fig. 105), then move the air cleaner box forward just enough to access the battery tray mounting bolts.

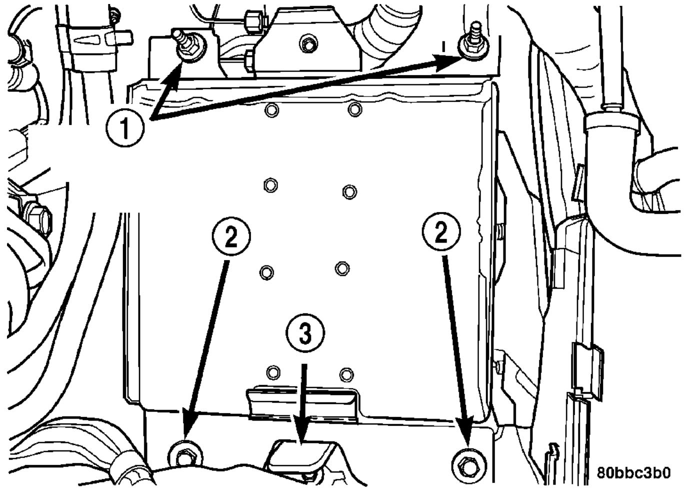


Fig. 105 Battery Tray Mounting

1 - BATTERY TRAY MOUNTING NUTS
2 - BATTERY TRAY MOUNTING BOLTS
3 - AIR CLEANER BOX POST

(5) Remove the 2 bolts, then the 2 nuts mounting the battery tray to its bracket (Fig. 105). Remove the battery tray.

CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal 4-5 times while the engine is not running until a firm brake pedal is achieved.

(6) Remove the master cylinder. For the master cylinder removal procedure, (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL).

(7) If the vehicle is equipped with ABS, remove the integrated control unit (ICU). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - REMOVAL).

(8) If the vehicle is equipped with ABS, remove the three bolts securing the ICU mounting bracket to the frame rail.

(9) Disconnect the vacuum hoses from the check valve on the power brake booster (Fig. 106), but do not remove the check valve from power brake booster.

(10) Locate the brake pedal-to-power brake booster input rod attachment under the instrument panel. Position a small screwdriver (Fig. 107) under the center tang of the retaining clip. Rotate the screwdriver enough to allow the retaining clip tang to pass over the end of the brake pedal pin. Remove the clip.

POWER BRAKE BOOSTER (Continued)

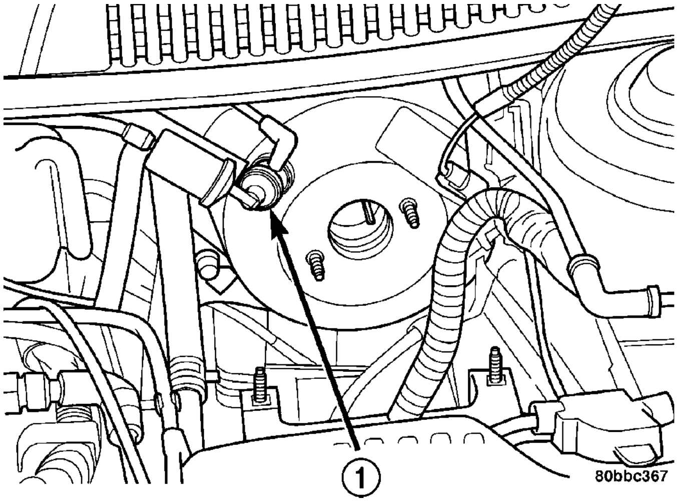


Fig. 106 Vacuum Check Valve

1 - VACUUM CHECK VALVE

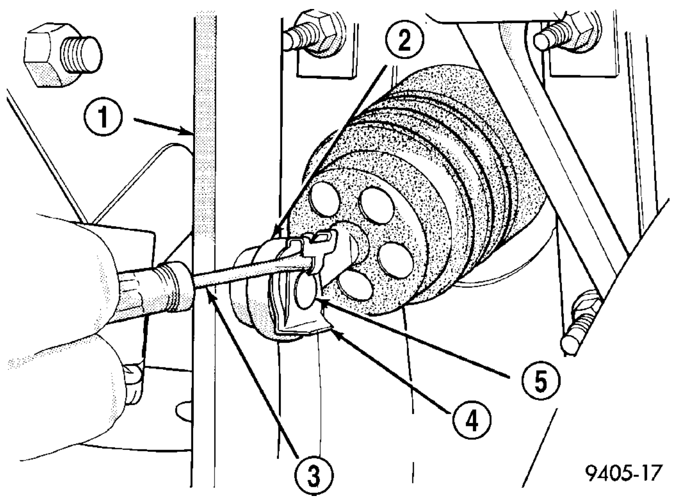


Fig. 107 Retaining Clip

1 - BRAKE PEDAL
2 - INPUT ROD
3 - SCREWDRIVER
4 - RETAINING CLIP
5 - BRAKE PEDAL PIN

CAUTION: Discard the used retaining clip, it is not to be reused. Replace the clip with a new one on reassembly.

(11) Remove the four nuts attaching the power brake booster to the instrument panel (Fig. 108). The nuts are accessible from under the instrument panel in the area of the brake pedal bracket.

(12) Slide the power brake booster forward until mounting studs clear the instrument panel. Turn the booster sideways (Fig. 109), then remove it from the vehicle.

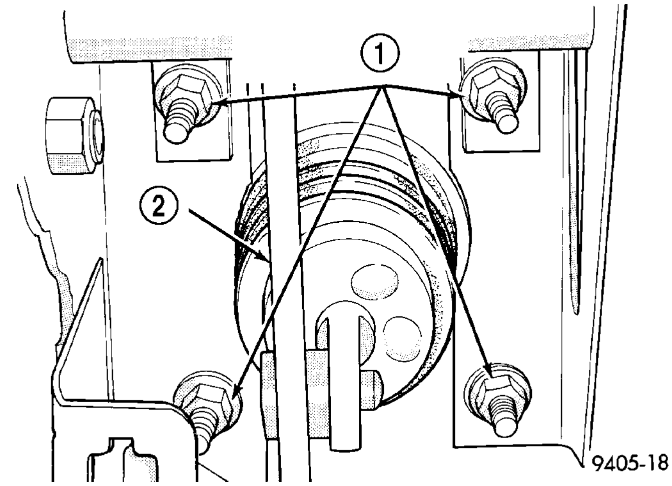


Fig. 108 Power Brake Booster Mounting

1 - POWER BRAKE BOOSTER MOUNTING NUTS
2 - BRAKE PEDAL

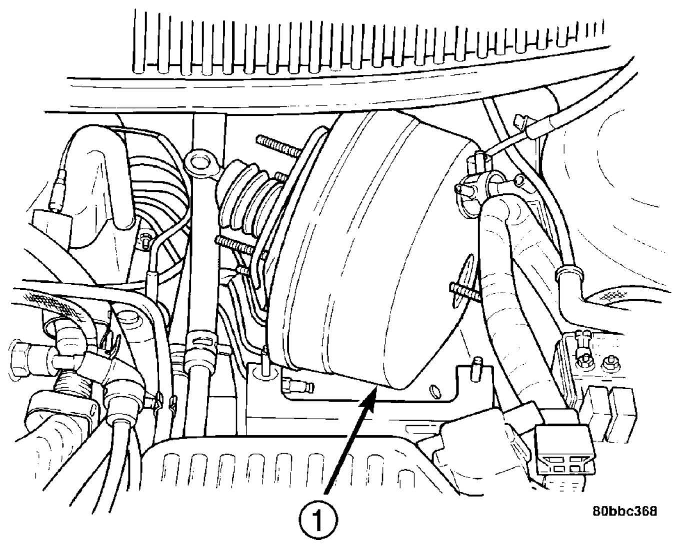


Fig. 109 Booster Removal/Installation

1 - POWER BRAKE BOOSTER

REMOVAL - RHD

(1) Disconnect and isolate the negative battery cable.

CAUTION: Pump the brake pedal several times to relieve the vacuum in the power brake booster. This will prevent the booster from sucking in any contamination when the master cylinder is removed.

(2) Remove the master cylinder from the vehicle (Fig. 110). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL).

(3) Remove the air cleaner assembly.

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

POWER BRAKE BOOSTER (Continued)

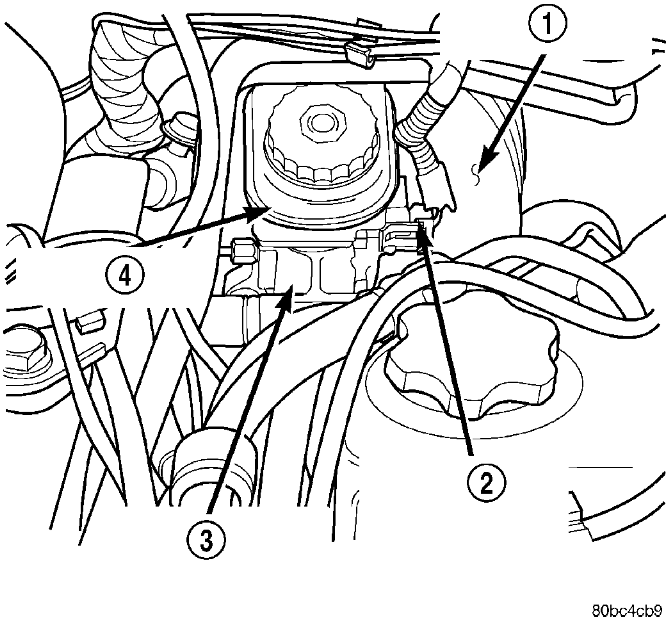


Fig. 110 RHD MASTER CYLINDER

1 - POWER BRAKE VACUUM BOOSTER
2 - BRAKE FLUID LEVEL SENSOR
3 - MASTER CYLINDER
4 - BRAKE FLUID RESERVOIR

(5) Remove the heater core coolant supply tube support bracket bolts (Fig. 111).

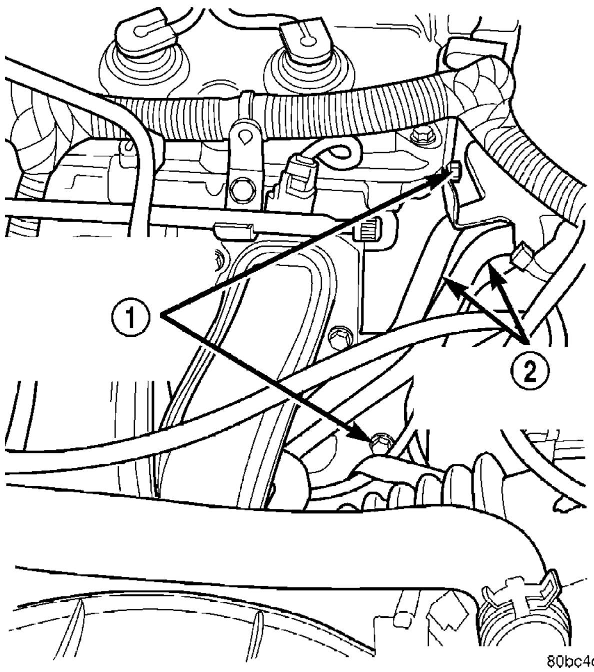


Fig. 111 HEATER CORE COOLANT SUPPLY HOSES

1 - COOLANT LINE SUPPORT BRACKET BOLTS
2 - HEATER CORE COOLANT SUPPLY LINES

(6) Remove the (2) coolant reservoir retaining bolts from the dash panel. Disconnect the coolant overflow hose from the thermostat housing and remove the coolant reservoir from the dash panel.

(7) Working from underneath the instrument panel, disconnect the brake pedal push rod. Remove the retaining clip from the end of the brake pedal mounted stud, then slide the push rod straight off the pin.

(8) If equipped, disconnect the clutch pedal push rod. Depress the plastic retention clip on the end of the clutch pedal mounted stud, while sliding the push rod straight off the stud.

(9) Rotate the clutch master cylinder to line up the square shaped retaining boss with the square shaped opening in the brake pedal support bracket.

(10) Remove the (4) brake booster retaining nuts.

(11) Working from inside the engine compartment, remove the (2) clutch fluid reservoir retaining bolts from the dash panel.

(12) Remove the clutch master cylinder from the dash panel by pulling it straight out. Position the reservoir and line assembly out of the way.

(13) Remove the brake booster from the dash panel by pulling it straight out, then rotate the booster and slide it between the engine and the dash panel towards the battery tray. Slide the booster under the heater core coolant supply hoses and out of the engine bay.

INSTALLATION

INSTALLATION - LHD

(1) Turn the power brake booster sideways (Fig. 109), then install it into the engine compartment down past the heater hoses and the strut tower. Rotate the booster so its four mounting studs and input rod are pointed straight toward the instrument panel. Slide the input rod and studs through the instrument panel and into mounting position.

(2) Under the instrument panel, install the four power brake booster mounting nuts (Fig. 108). Tighten the nuts to a torque of 34 N·m (25 ft. lbs.).

(3) Using lubriplate, or an equivalent, coat the surface of the brake pedal pin where it contacts the brake booster input rod.

CAUTION: Use only a new brake booster input rod-to-brake pedal retaining clip to ensure proper retainment.

CAUTION: Install a new brake lamp switch anytime the old switch is removed, the brake booster or pedals have been changed or removed.

POWER BRAKE BOOSTER (Continued)

(4) Connect the power brake booster input rod-to-brake pedal pin. Install a new retaining clip. Do not use the old clip.

(5) Install and adjust a new brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)

(6) Connect all previously removed vacuum hoses to the vacuum check valve (Fig. 106).

(7) If the vehicle is equipped with ABS, install the ICU mounting bracket on the frame rail using its three bolts. Tighten the nuts to a torque of 23 N·m (200 in. lbs.).

(8) If the vehicle is equipped with ABS, reinstall the ICU. (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION).

(9) Install the master cylinder. For the master cylinder installation procedure, (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION).

(10) Position the battery tray back in place. Install the two bolts, then the two nuts mounting the battery tray to its bracket (Fig. 105). Tighten the two bolts and nuts to a torque of 34 N·m (25 ft. lbs.)

(11) Reinstall the air cleaner box onto its grommeted alignment post (Fig. 105).

(12) Install the one nut and one bolt securing the air cleaner box in place, then connect the wiring harness connector at the air inlet sensor.

(13) Install the battery and clamp it in place.

(14) Connect the positive, then the negative (ground) cable on the battery.

(15) Bleed the base brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

(16) Road test the vehicle to ensure proper operation of the brakes.

INSTALLATION - RHD

(1) Position the brake booster on the dash panel by reversing the path taken to remove the booster. Slide the booster under the plenum on the battery tray side of the engine compartment. Slide the booster between the engine and dash panel until it can be installed on the right side of the dash panel.

(2) Reinstall the vacuum supply hose on the booster check valve. Make sure the booster check valve is firmly seated in the rubber grommet and did not become dislodged during the booster installation.

(3) If equipped, install the clutch master cylinder through the dash panel.

(4) Install the clutch fluid reservoir. Torque the retaining bolts to 7 N·m (62 in. lbs.).

(5) Working from underneath the instrument panel, install the four brake booster retaining nuts. Torque the nuts to 34 N·m (25 ft. lbs.).

(6) Grease the brake pedal pin and slide the brake booster push rod onto the pedal pin. Install the retaining clip.

(7) If equipped, lock the clutch master cylinder in position. Rotate the clutch master cylinder to line up the square shaped retaining boss with the square shaped opening in the brake pedal support bracket. Once the cylinder is inserted through the brake pedal support bracket rotate 90° to lock it in position.

(8) Connect the clutch pedal push rod. Slide the push rod on the clutch pedal mounted stud until the plastic retention clip locks it in place.

(9) Install the coolant reservoir. Torque the retaining bolts to 7 N·m (62 in. lbs.). Connect the coolant overflow hose on the thermostat housing.

(10) Install the heater core coolant supply tube support bracket bolts (Fig. 111). Torque the bolts to 36 N·m (27 ft. lbs.).

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

(12) Install the air cleaner assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(13) Install the master cylinder on the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)

(14) Fill the brake fluid reservoir to specification.

(15) Bleed the air from the brake hydraulic system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: Be certain a firm brake pedal is achieved before attempting to move the vehicle.

PROPORTIONING VALVE

DESCRIPTION

NOTE: Only vehicles without antilock brakes have proportioning valves. Vehicles with antilock brakes have electronic variable brake proportioning (EVBP) that is built into the integrated control unit (ICU).

Proportioning valves balance front to rear braking by controlling the brake fluid hydraulic pressure to the rear brakes. Under light pedal application, the proportioning valve allows normal fluid flow to the rear brakes. Under higher pedal effort, the valve reduces fluid pressure to the rear brakes.

The non-antilock master cylinder is a four-outlet design with two screw-in proportioning valves attached directly to the master cylinder housing (Fig. 112). One proportioning valve controls each rear brake.

PROPORTIONING VALVE (Continued)

DIAGNOSIS AND TESTING - PROPORTIONING VALVE

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 proportioning valves.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake (Fig. 112). Therefore, a road test to determine which rear brake skids first is essential.

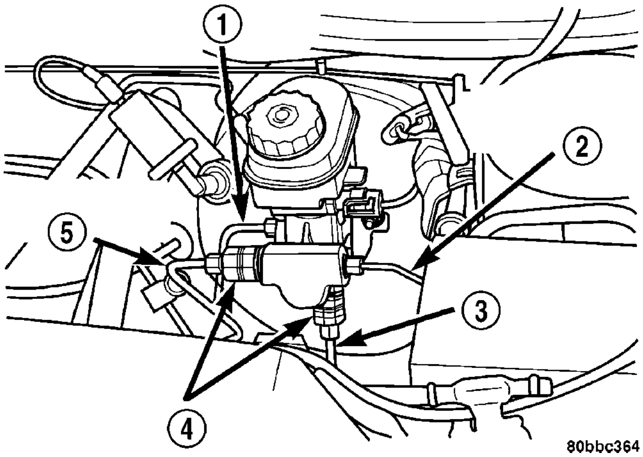


Fig. 112 Proportioning Valve Location

1 - RIGHT FRONT BRAKE TUBE
2 - LEFT FRONT BRAKE TUBE
3 - LEFT REAR BRAKE TUBE
4 - REAR PROPORTIONING VALVES
5 - RIGHT REAR BRAKE TUBE

Before testing the proportioning valve in question, inspect the rear brake linings for contamination or for replacement shoes not meeting the OEM brake lining material specifications.

The proportioning valve should always be tested prior to being replaced.

The in-line proportioning valves used on this vehicle require special pressure fittings to test the proportioning valves for proper proportioning valve function. The pressure fittings are installed before and after the proportioning valve being tested to verify proportioning valve is maintaining the required hydraulic pressure to the rear wheel brake which it controls.

The testing of proportioning valves for this vehicle, if equipped with ABS, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PROPORTIONING VALVE - DESCRIPTION).

PROPORTIONING VALVE TEST

The test procedure is the same for either rear proportioning valve. After road testing the vehicle to determine which wheel skids first, follow the procedure below for testing the suspect proportioning valve.

(1) Using a brake pedal holding tool as shown (Fig. 113), depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

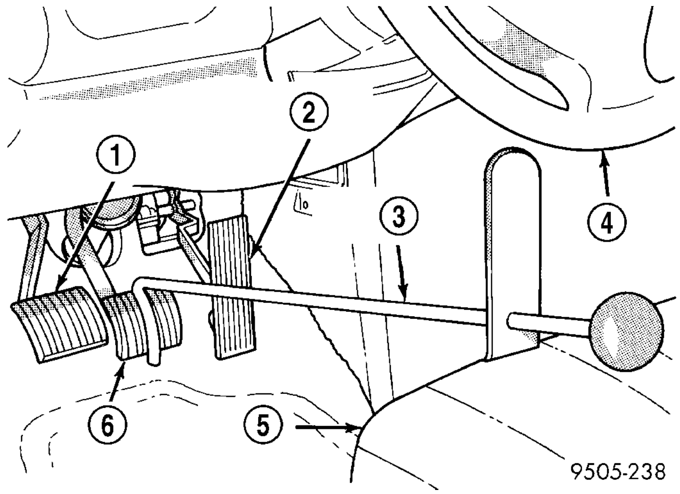


Fig. 113 Brake Pedal Holding Tool

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

(2) Use the figure shown to determine which proportioning valve needs to be tested (Fig. 112).

(3) Remove the hydraulic brake tube from the proportioning valve controlling the rear wheel of the vehicle that has premature wheel skid.

(4) Remove the proportioning valve from its outlet port on the master cylinder.

CAUTION: Be sure the pressure test fittings being installed into master cylinder and proportioning valve, have the correct thread sizes needed.

(5) Install the Brake Pressure Adapters, Special Tool 8644 and 6805-3 onto the proportioning valve (Fig. 114).

(6) Install the proportioning valve (with tools) back into the outlet port on the master cylinder.

(7) Attach a Pressure Gauge, Special Tool C-4007-A, to each pressure adapter (Fig. 115).

(8) Remove the brake pedal holding tool. Bleed any air out of the pressure gauge hoses at the pressure gauge.

(9) With the aid of a helper, apply pressure to the brake pedal until the reading on proportioning valve inlet gauge is at the target inlet pressure shown in

PROPORTIONING VALVE (Continued)

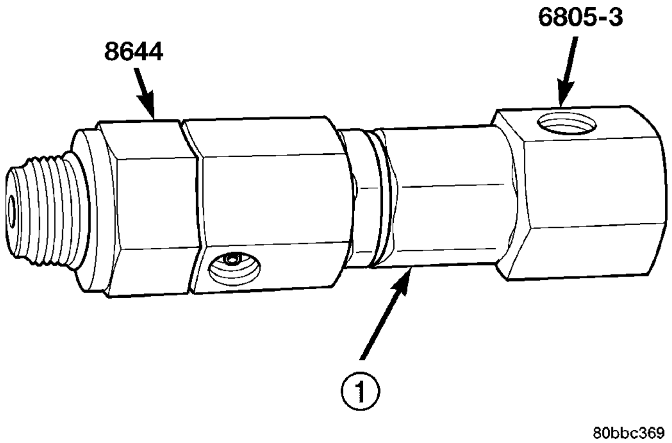


Fig. 114 Tools On Valve

1 - PROPORTIONING VALVE

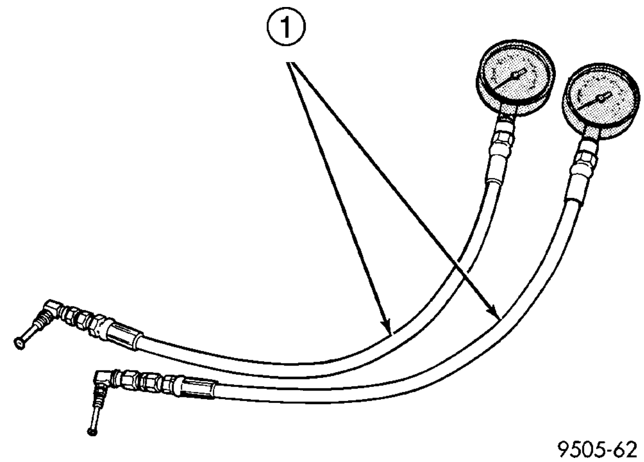


Fig. 115 Pressure Gauge Set

1 - SPECIAL TOOL C-4007–A

the BRAKE PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS table following this procedure. If the inlet gauge pressure overshoots its target pressure when the pedal is depressed, release the brake pedal, relieving the pressure in the system, before reapplying the pedal to reach the target pressure at the inlet gauge. This is necessary to get an accurate reading of the outlet pressure.

(10) Once inlet pressure has been achieved, check the pressure reading on the proportioning valve outlet gauge. If the proportioning valve outlet pressure does not agree with value shown in the table, replace the proportioning valve. If proportioning valve is within pressure specifications, the valve is good and does not require replacement.

(11) Reinstall the brake holding tool on the brake pedal and remove the test equipment from the vehicle.

(12) Remove the tools from the proportioning valve.

(13) Install the proportioning valve in the master cylinder and hand tighten until the proportioning valve is fully installed and its O-ring seal is seated into the master cylinder. Torque the proportioning valve to 17.5 N·m (155 in. lbs.).

(14) Install the brake tube on the proportioning valve. Torque the tube nut to 17 N·m (145 in. lbs.).

(15) Bleed the affected brake line. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

BRAKE PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS

Sales Code	Brake System Type	Split Point	Slope	Identification	Inlet Pressure	Outlet Pressure
BRA	14″ Disc/Drum	300 psi	0.34	Red Band	1000 psi	480-580 psi
BRD	14″ Disc/Disc	350 psi	0.34	Purple Band	1000 psi	525-625 psi
BRX	14″ Disc/Disc	350 psi	0.34	Purple Band	1000 psi	525-625 psi

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Using a brake pedal holder, depress the brake pedal past its first one inch of travel and hold it in this position (Fig. 116). This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

(2) Disconnect the brake tube from the proportioning valve requiring removal (Fig. 117).

(3) Unscrew the Proportioning valve from the master cylinder.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

PROPORTIONING VALVE (Continued)

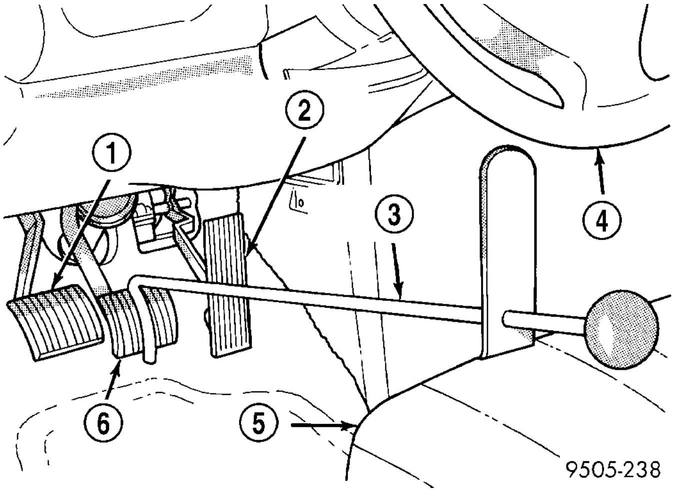


Fig. 116 Brake Pedal Holder

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

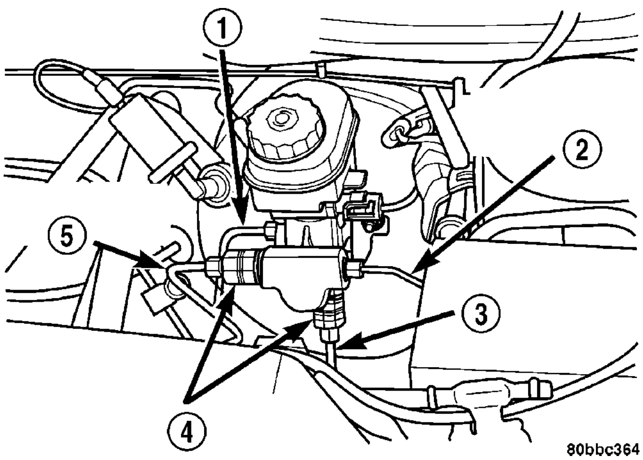


Fig. 117 Proportioning Valves On Master Cylinder

1 - RIGHT FRONT BRAKE TUBE
2 - LEFT FRONT BRAKE TUBE
3 - LEFT REAR BRAKE TUBE
4 - REAR PROPORTIONING VALVES
5 - RIGHT REAR BRAKE TUBE

(1) Lubricate the O-ring on the proportioning valve. Make sure the O-ring on the proportioning valve is new.

(2) Install the proportioning valve in its master cylinder port. Tighten the proportioning valve to a torque of 17.5 N·m (155 in. lbs.).

(3) Connect the brake tube to the proportioning valve (Fig. 117). Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(4) Remove the brake pedal holder (Fig. 116).

(5) Bleed the affected brake line. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(6) Road test the vehicle to ensure proper operation of the brakes.

ROTOR

DESCRIPTION - SRT-4

Vehicles equipped with the brake sales code BR3 (Performance Disc/Disc brake combination) use heavier brake rotors. The BR3 front brake rotor is approximately 6 mm thicker than the standard front brake rotor. The BR3 rear brake rotor is approximately 3 mm thicker than the standard rear brake rotor. The BR3 brake rotors can be easily identified by the recessed machined area near the hub center (Fig. 118) (Fig. 119).

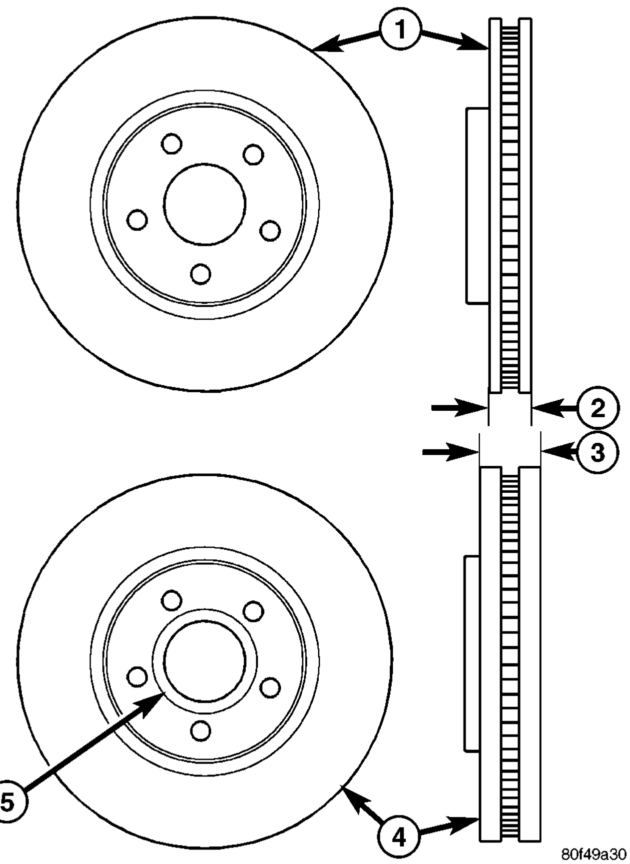


Fig. 118 Front Brake Rotor Comparison

1 - STANDARD PL BRAKE ROTOR
2 - STANDARD ROTOR THICKNESS 21.87-22.13 MM
3 - PERFORMANCE ROTOR THICKNESS 27.91-28.10 MM
4 - PERFORMANCE BRAKE ROTOR
5 - INDENTIFYING MACHINED AREA

DIAGNOSIS AND TESTING - BRAKE ROTOR

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

ROTOR (Continued)

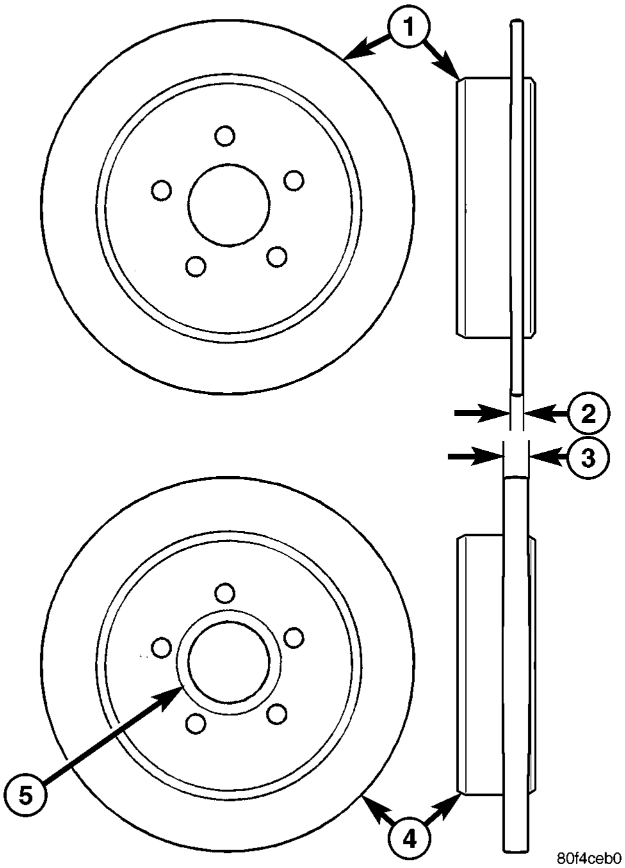


Fig. 119 Rear Brake Rotor Comparison

1 - STANDARD PL BRAKE ROTOR
2 - STANDARD ROTOR THICKNESS 8.75-9.25 MM
3 - PERFORMANCE ROTOR THICKNESS 11.75-12.25 MM
4 - BR3 PERFORMANCE BRAKE ROTOR
5 - INDENTIFYING MACHINED AREA

Excessive runout or wobble in a rotor can increase pedal travel due to piston knock-back. This increases guide pin sleeve wear due to the tendency of the caliper to follow the rotor wobble.

When diagnosing a brake noise or pulsation, the machined disc braking surface should be checked and inspected.

BRAKING SURFACE INSPECTION

Light braking surface scoring and wear is acceptable. If heavy scoring or warping is evident, the rotor must be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - STANDARD PROCEDURE)

Excessive wear and scoring of the rotor can cause improper lining contact on the rotor's braking surface. If the ridges on the rotor are not removed before new brake shoes are installed, improper wear of the shoes will result.

If a vehicle has not been driven for a period of time, the rotor's braking surface will rust in the areas not covered by the brake shoes at that time. Once the vehicle is driven, noise and chatter from the disc brakes can result when the brakes are applied until the rust wears away.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced. If cracks or burned spots are evident, the rotor must be replaced.

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if it is worn below minimum thickness or if machining the rotor will cause its thickness to fall below specifications.

CAUTION: Do not machine (turn) the rotor if it will cause the rotor to fall below minimum thickness.

Minimum thickness specifications are cast on the rotor's unmachined surface (Fig. 120) (or stamped into the hat section). Limits can also be found in this section's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

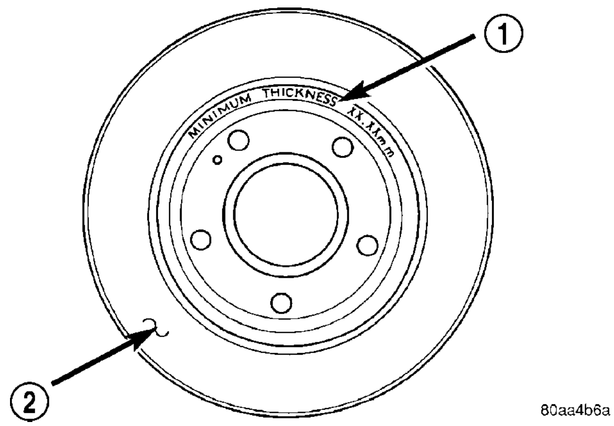


Fig. 120 Minimum Brake Rotor Thickness Markings (Typical)

1 - ROTOR MINIMUM THICKNESS MARKING
2 - ROTOR

ROTOR THICKNESS VARIATION

Thickness variation in a rotor's braking surface can result in pedal pulsation, chatter and surge. This can also be caused by excessive runout in the rotor or the hub.

Rotor thickness variation measurements should be made in conjunction with measuring runout. Measure thickness of the brake rotor at 12 equal points around the rotor braking surface with a micrometer at a radius approximately 25 mm (1 inch) from edge of rotor (Fig. 121). If thickness measurements vary beyond the specification listed in the specfaction table (Refer to 5 - BRAKES/HYDRAULIC/MECHAN-

ROTOR (Continued)

ICAL/ROTOR - SPECIFICATIONS), the rotor should be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - STANDARD PROCEDURE)

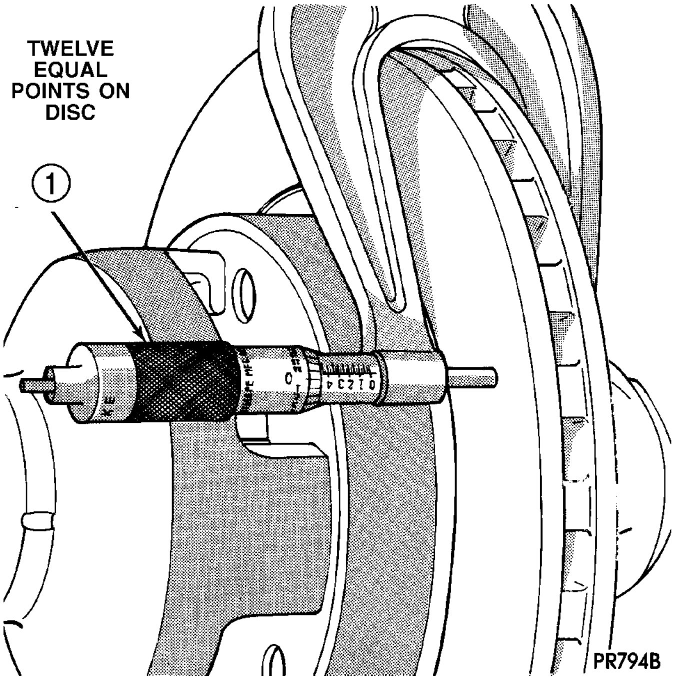


Fig. 121 Checking Rotor Thickness

1 - MICROMETER

ROTOR RUNOUT

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 rotor runout on the vehicle, first remove the tire and wheel assembly. Reinstall the wheel mounting nuts on the studs, tightening the rotor to the hub. Mount the Dial Indicator, Special Tool C-3339, with Mounting Adaptor, Special Tool SP-1910 on steering arm. The dial indicator plunger should contact braking surface of rotor approximately 25 mm (1 inch) from edge of rotor (Fig. 122). Check lateral runout on both sides of the rotor, marking the low and high spots on both. Runout limits can be found in the specification table in this section. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

If runout is in excess of the specification, check the lateral runout of the hub face. Before removing the rotor from the hub, place a chalk mark across both the rotor and the one wheel stud closest to where the high runout measurement was taken. This way, the original mounting spot of the rotor on the hub is indexed (Fig. 123).

Remove the rotor from the hub.

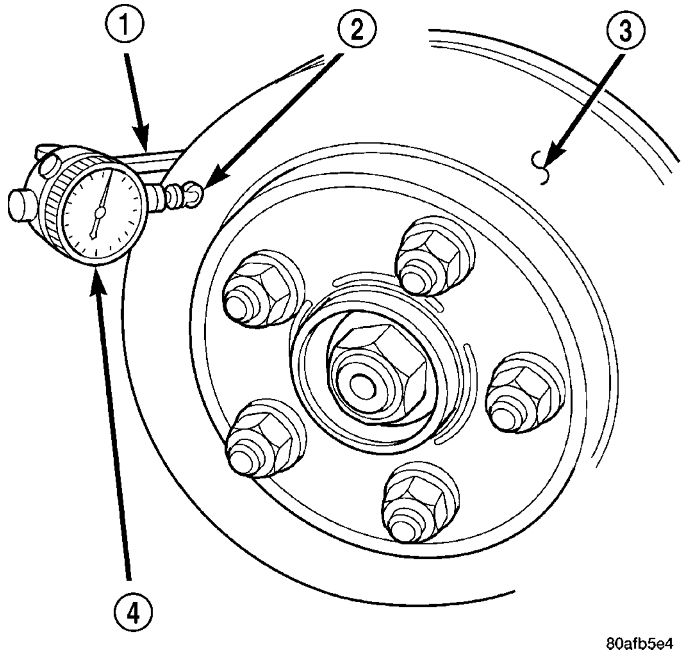


Fig. 122 Checking Rotor Runout

1 - SPECIAL TOOL SP-1910
2 - 25mm FROM EDGE
3 - DISC SURFACE
4 - SPECIAL TOOL C-3339

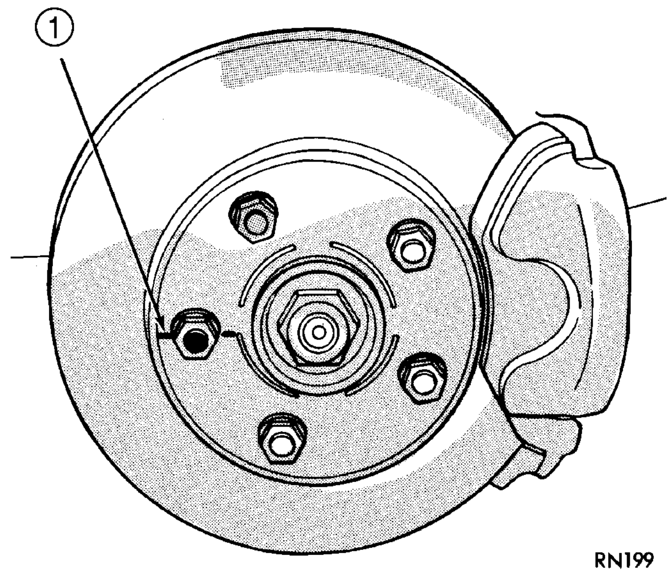


Fig. 123 Marking Rotor and Wheel Stud

1 - CHALK MARK

NOTE: Clean the hub face surface before checking runout. This provides a clean surface to get an accurate indicator reading.

Mount Dial Indicator, Special Tool C-3339, and Mounting Adaptor, Special Tool SP-1910, to the steering knuckle. Position the indicator stem so it contacts the hub face near the outer diameter. Care must be

ROTOR (Continued)

taken to position stem outside of the stud circle, but inside of the chamfer on the hub rim (Fig. 124).

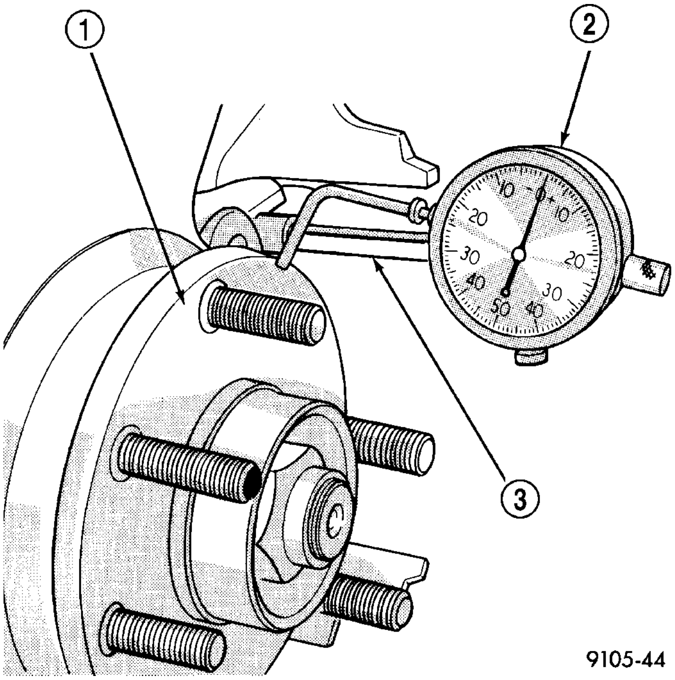


Fig. 124 Checking Hub Runout

1 - HUB SURFACE
2 - SPECIAL TOOL C-3339
3 - SPECIAL TOOL SP-1910

Hub runout should not exceed 0.08 mm (0.003 inch). If runout exceeds this specification, the hub must be replaced. For front hub removal, (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL). For rear hub removal, (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL).

If the hub runout does not exceed this specification, install the rotor back on the hub, aligning the chalk marks on the rotor with a wheel mounting stud, two studs apart from the original stud (Fig. 125). Tighten nuts in the proper sequence and torque to specifications.

Recheck brake rotor runout to see if the runout is now within specifications. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

If runout is not within specifications, reface or replace the brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - STANDARD PROCEDURE)

STANDARD PROCEDURE - BRAKE ROTOR MACHINING

NOTE: Refacing the rotor is not required each time the brake pads are replaced, only when the need is foreseen.

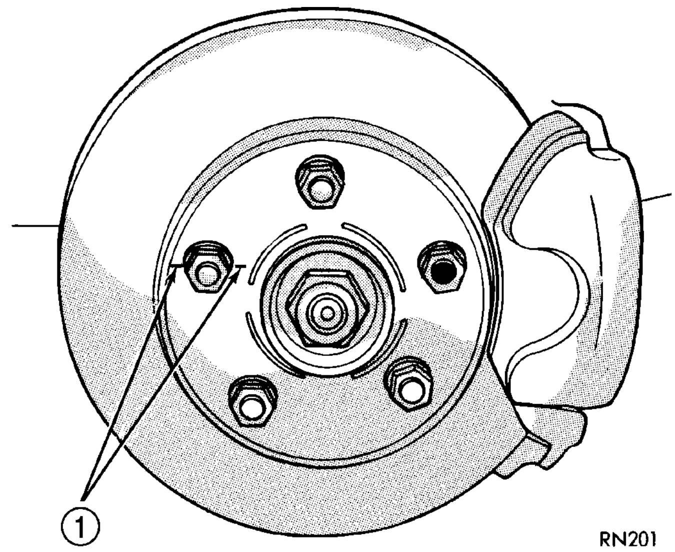


Fig. 125 Index Rotor And Wheel Stud

1 - CHALK MARK

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

If the rotor surface is deeply scored or warped, or there is a complaint of brake roughness or brake pedal pulsation, the rotor should be refaced using a hub-mounted on-car brake lathe (Fig. 126), or replaced.

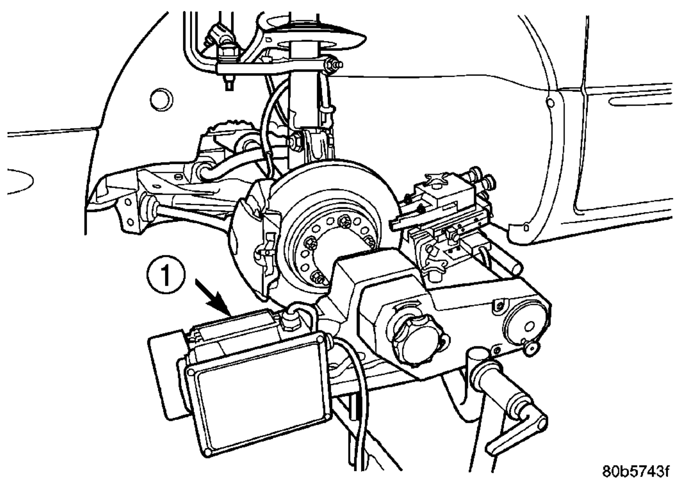


Fig. 126 On-Car Brake Lathe

1 - ON-CAR BRAKE LATHE

The use of a hub-mounted on-car brake lathe is highly recommended to eliminate the possibility of excessive runout. It trues the brake rotor to the vehicle's hub and bearing.

ROTOR (Continued)

NOTE: All rotors have markings for minimum allowable thickness cast on an un-machined surface of the rotor (Fig. 127) or stamped into the hat section. Minimum thickness specifications can also be found in the specification table in this section. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ ROTOR - SPECIFICATIONS)

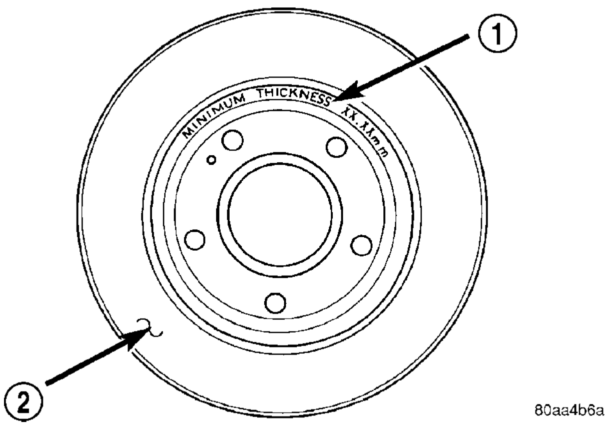


Fig. 127 Minimum Brake Rotor Thickness (Typical)

1 - ROTOR MINIMUM THICKNESS MARKING
2 - ROTOR

Minimum allowable thickness is the minimum thickness which the brake rotor machined surface may be cut to.

CAUTION: Do not machine the rotor if it will cause the rotor to fall below minimum thickness.

Before lathe installation, verify the brake rotor face and the hub adapters are free of any chips, rust, or contamination.

When mounting and using the brake lathe, strict attention to the brake lathe manufacturer's operating instructions is required.

Machine both sides of the brake rotor at the same time. Cutting both sides at the same time minimizes the possibility of a tapered or uneven cut.

When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits MUST BE MAINTAINED. Extreme care in the operation of rotor turning equipment is required. Specifications for brake rotor machining can be found in this sections specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

REMOVAL

REMOVAL - FRONT

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the front tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Remove the front disc brake caliper assembly from the brake rotor and store it out of the way. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ BRAKE PADS/SHOES - REMOVAL).

(4) Remove the clips retaining the brake rotor (Fig. 19).

(5) Remove the brake rotor by pulling it straight off the wheel mounting studs.

REMOVAL - FRONT - SRT-4

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the front tire and wheel assembly.

(3) Slide the caliper outward in an effort to retract the caliper piston into its bore.

(4) Remove the two bolts securing disc brake caliper adapter to the steering knuckle (Fig. 128).

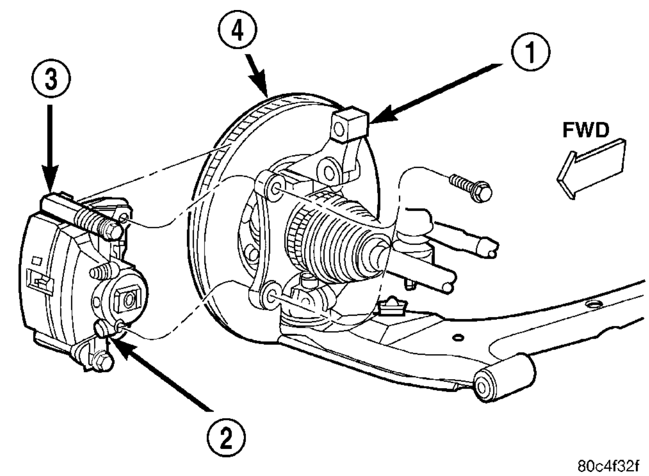


Fig. 128 Caliper/Adapter Mounting

1 - STEERING KNUCKLE
2 - DISC BRAKE CALIPER
3 - DISC BRAKE CALIPER ADAPTER
4 - BRAKE ROTOR

(5) Remove the disc brake caliper and adapter from the knuckle as an assembly. Hang the assembly out of the way using wire or a bungee cord. Use care not to overextend the brake hose when doing this.

(6) Remove the clips retaining the brake rotor to the wheel studs.

(7) Remove the brake rotor.

ROTOR (Continued)

REMOVAL - REAR

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear tire and wheel assembly.(Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Remove the rear disc brake caliper assembly from the brake rotor and store it out of the way. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL).

(4) Remove any clips retaining the brake rotor (Fig. 28).

(5) Remove the brake rotor by pulling it straight off the wheel mounting studs.

INSTALLATION

INSTALLATION - FRONT

(1) Install the brake rotor over the wheel mounting studs and onto the hub (Fig. 19).

(2) Install the front disc brake caliper. It may be necessary to retract the brake caliper piston back into the caliper to fit the shoes onto the rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).

(3) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(4) Lower the vehicle.

(5) Pump the brake pedal before moving the vehicle to set the brake shoes to the brake rotor.

INSTALLATION - FRONT - SRT-4

CAUTION: When installing new brake components, be sure to use correct parts. Parts designed for BR3 Performance Brake System must not be mixed with other brake systems. These parts, similar in appearance, can be easily identified (Fig. 118).(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - DESCRIPTION)

NOTE: Inspect disc brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

(1) Install the brake rotor over the studs on the hub.

(2) Install the disc brake caliper and adapter assembly over the brake rotor.

(3) Install the mounting bolts securing the caliper adapter to the steering knuckle (Fig. 128). Tighten the bolts to a torque of 104 N·m (77 ft. lbs.).

(4) Install the tire and wheel assembly. Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(5) Lower the vehicle.

(6) Pump the brake pedal several times before moving the vehicle to set the shoes to the brake rotor.

(7) Road test the vehicle and make several stops to seat the brake shoes to the rotor.

INSTALLATION - REAR

CAUTION: When installing new brake components, be sure to use correct parts. Parts designed for BR3 Performance Brake System must not be mixed with other brake systems. These parts, similar in appearance, can be easily identified (Fig. 119).(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - DESCRIPTION)

NOTE: Inspect disc brake shoes and parking brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

(1) Install the rear brake rotor over the wheel mounting studs and onto the hub (Fig. 28).

(2) Install rear disc brake caliper and shoes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION)

(3) Install the tire and wheel assembly. Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(4) Adjust the parking brake shoes as necessary. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS)

(5) Lower the vehicle.

(6) Pump the brake pedal before moving the vehicle to set the brake shoes to the brake rotor.

ROTOR (Continued)

SPECIFICATIONS

BRAKE ROTOR LIMITS/SPECIFICATIONS

NOTE: When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits MUST BE MAINTAINED.

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout*
Front Rotor	21.87–22.13 mm 0.861-0.871 in.	20.4 mm 0.803 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.
Rear Rotor	8.75–9.25 mm 0.344 -0.364 in.	7.25 mm 0.285 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.
* TIR Total Indicator Reading (Measured On Vehicle)				

BRAKE ROTOR LIMITS/SPECIFICATIONS - SRT-4

NOTE: When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits MUST BE MAINTAINED.

BR3 SALES CODE

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout*
Front Rotor	27.91–28.10 mm 1.099–1.106 in.	26.40 mm 1.039 in.	0.010 mm 0.0004 in.	0.13 mm 0.005 in.
Rear Rotor	11.75–12.25 mm 0.463–0.482 in.	10.25 mm 0.404 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.
* TIR Total Indicator Reading (Measured On Vehicle)				

SUPPORT PLATE - DRUM BRAKE

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Using a brake pedal holding tool as shown (Fig. 129), depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the rear tire and wheel assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(4) Disconnect the rear brake flex hose from the wheel cylinder (Fig. 130).

(5) Remove the rear brake drum (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - REMOVAL).

(6) Remove the dust cap (Fig. 131) from the rear hub and bearing.

SUPPORT PLATE - DRUM BRAKE (Continued)

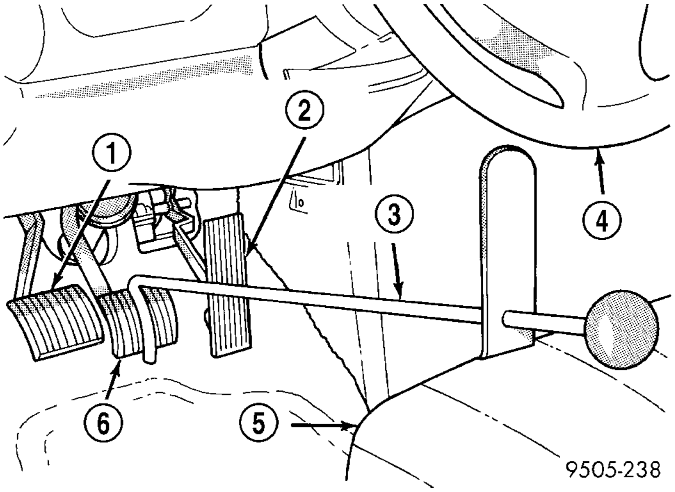


Fig. 129 Brake Pedal Holding Tool

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

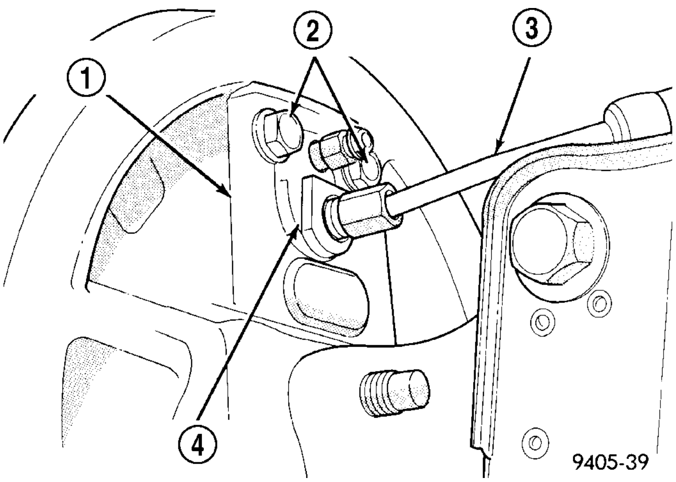


Fig. 130 Brake Flex Hose At Wheel Cylinder

1 - BRAKE SUPPORT PLATE
2 - WHEEL CYLINDER ATTACHING BOLTS
3 - REAR BRAKE FLEX HOSE TUBE
4 - WHEEL CYLINDER ASSEMBLY

(7) Remove the nut holding the rear hub and bearing to the spindle (Fig. 132). Remove the hub and bearing from the spindle.

(8) Remove the rear brake shoes from the brake support plate. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL).

(9) Remove the parking brake actuator lever from the parking brake cable.

(10) Position a ½ inch wrench over the retainer fingers on the end of the parking brake cable (Fig. 133). Compress the cable housing retaining fingers with the wrench, then pull the cable housing out of the support plate. Remove the wrench as the parking

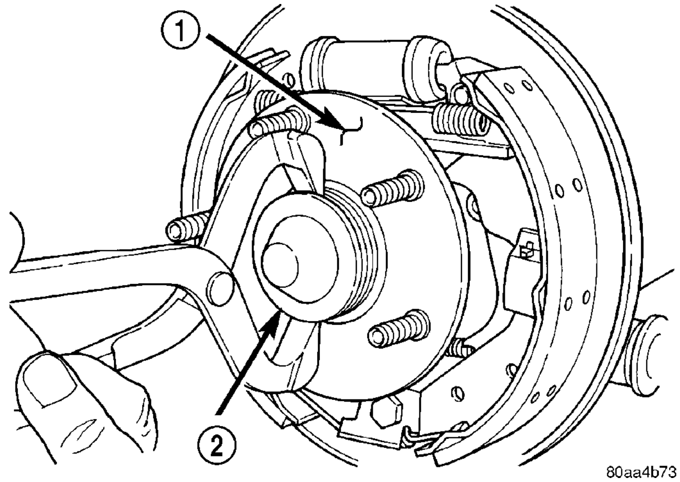


Fig. 131 Hub And Bearing Dust Cap

1 - HUB/BEARING ASSEMBLY
2 - DUST CAP

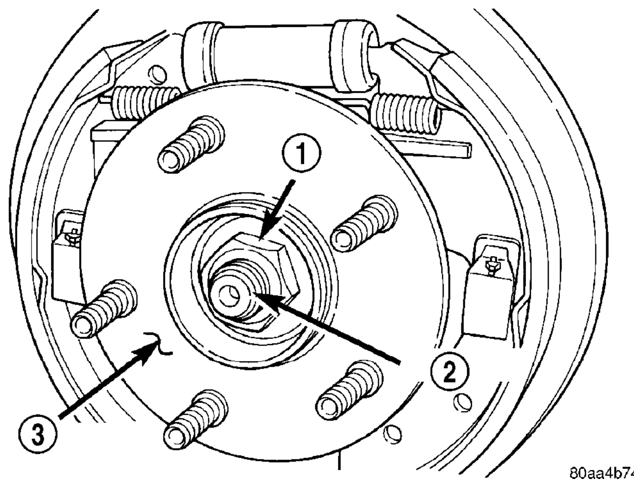


Fig. 132 Rear Hub And Bearing Retaining Nut

1 - RETAINING NUT
2 - SPINDLE
3 - HUB/BEARING ASSEMBLY

brake cable retainer is freed from the mounting hole in the brake support plate.

(11) Remove the 4 brake support plate mounting bolts and washers. Separate brake support plate from rear suspension knuckle.

(12) Remove the brake wheel cylinder attaching bolts.

(13) Remove the brake wheel cylinder from the brake support plate.

SUPPORT PLATE - DRUM BRAKE (Continued)

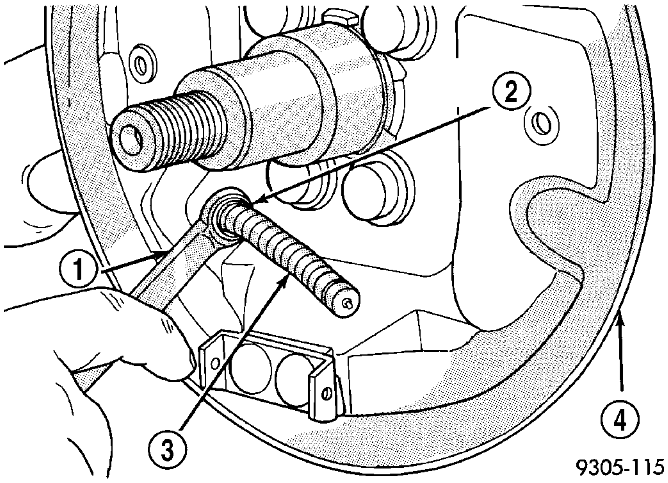


Fig. 133 Removing Park Brake Cable From Support Plate

1 - WRENCH
2 - CABLE HOUSING RETAINER
3 - PARK BRAKE CABLE
4 - SUPPORT PLATE

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Install a new O-ring at the mating surface of the wheel cylinder-to-brake support plate.

NOTE: When installing wheel cylinder on brake support plate, be sure it is positioned squarely (horizontal) to the brake support plate.

(2) Install the wheel cylinder onto brake support plate. Tighten the attaching bolts to a torque of 13 N·m (115 in. lbs.).

(3) Install the brake support plate and gasket on rear suspension knuckle. Tighten the support plate mounting bolts to a torque of 75 N·m (55 ft. lbs.).

(4) Insert the parking brake cable into its mounting hole in the brake support plate. Push the cable housing in until the retainer's fingers lock into place.

(5) Hand start the brake flex hose tube fitting to the wheel cylinder. Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(6) Attach the parking brake cable to the parking brake actuator.

(7) Install the rear brake shoe assemblies on the brake support plate (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).

(8) Install the rear hub and bearing assembly on the spindle. Install a new hub and bearing retaining nut (Fig. 132). Tighten the retaining nut to a torque of 217 N·m (160 ft. lbs.). Install dust cap.

(9) Install the brake drum.

(10) Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(11) Adjust the rear brake shoes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS).

(12) Lower the vehicle.

(13) Remove the brake pedal holding tool.

(14) Bleed the wheel cylinder as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(15) Road test the vehicle to make sure the brakes operate correctly.

WHEEL CYLINDERS - DRUM BRAKE

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Using a brake pedal holder, depress the brake pedal past its first one inch of travel and hold it in this position (Fig. 134). This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

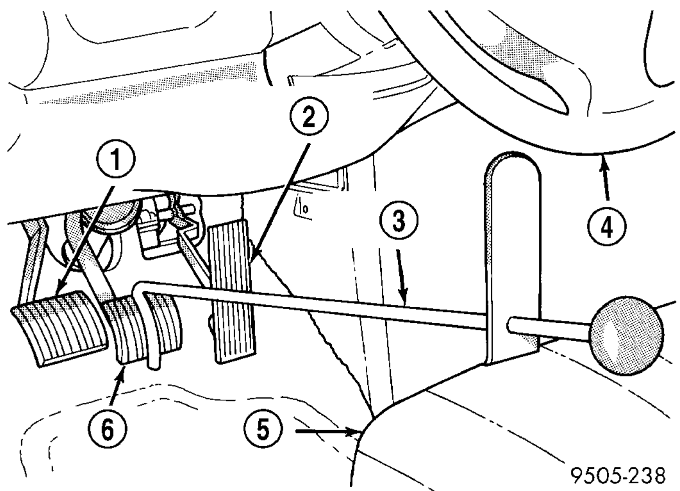


Fig. 134 Brake Pedal Holder

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

WHEEL CYLINDERS - DRUM BRAKE (Continued)

(3) Remove the rear tire and wheel assembly (Refer to 22 - TIRES/WHEELS - REMOVAL).

(4) Disconnect the rear brake flex hose from the wheel cylinder (Fig. 135).

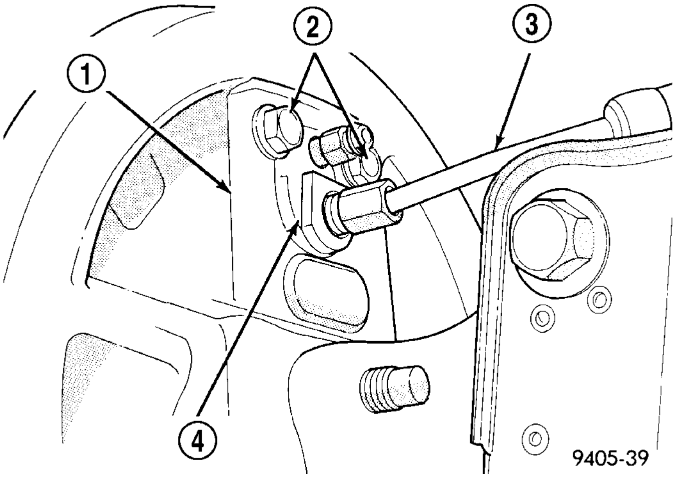


Fig. 135 Brake Flex Hose At Wheel Cylinder

1 - BRAKE SUPPORT PLATE
2 - WHEEL CYLINDER ATTACHING BOLTS
3 - REAR BRAKE FLEX HOSE TUBE
4 - WHEEL CYLINDER ASSEMBLY

(5) Remove the rear brake drum (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - REMOVAL).

(6) Remove the rear brake shoes from the brake support plate. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL)

NOTE: If the brake shoes are wet with grease or brake fluid, replace them.

(7) Remove the brake wheel cylinder attaching bolts (Fig. 135).

(8) Remove the brake wheel cylinder from the brake support plate (Fig. 136).

INSPECTION

With the 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.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

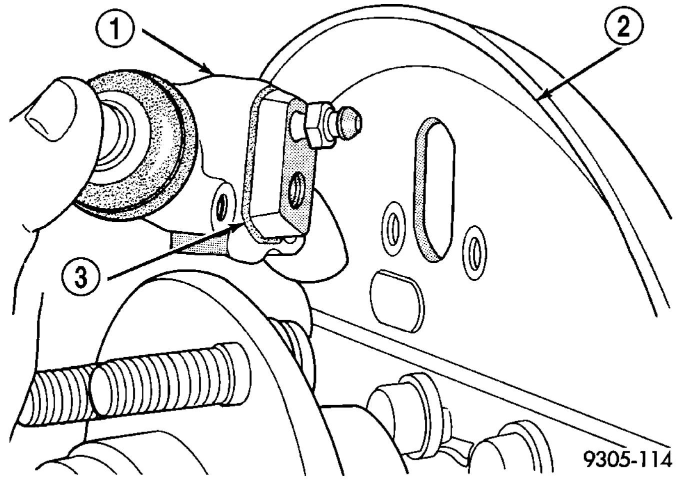


Fig. 136 Remove/Install Wheel Cylinder

1 - WHEEL CYLINDER
2 - SUPPORT PLATE
3 - O-RING

(1) Install a new O-ring at the mating surface of the wheel cylinder-to-brake support plate (Fig. 136).

NOTE: When installing wheel cylinder on brake support plate, be sure it is positioned squarely (horizontal) to the brake assembly.

(2) Install the wheel cylinder onto brake support plate (Fig. 136). Tighten the attaching bolts to a torque of 13 N·m (115 in. lbs.).

(3) Hand start the rear brake flex hose tube fitting to wheel cylinder. Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(4) Install the rear brake shoes on the brake support plate (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION). Replace them as necessary.

(5) Install the rear brake drum onto the rear hub.

(6) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(7) Adjust the rear brakes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS).

(8) Lower the vehicle.

(9) Remove the brake pedal holder.

(10) Bleed the wheel cylinder as necessary. (Refer to 5 - BRAKES - BASE - STANDARD PROCEDURE).

(11) Road test the vehicle to make sure the brakes operate correctly.

PARKING BRAKE

DESCRIPTION - PARKING BRAKE

The parking brakes consist of the following components:

- Hand-operated park brake lever - automatic-adjusting
- Parking brake cables
- Actuation levers and struts
- Duo-servo parking brake assembly (rear disc only)

All vehicles are equipped with a center-mounted, hand-operated parking brake lever mounted between the front seats (Fig. 137). This lever is an automatic-adjusting type that continuously applies minimal tension to the parking brake cables to keep them in adjustment at all times. Due to this feature, the parking brake cable system does not require adjustment. Proper parking brake system adjustment is obtained by proper drum brake or drum-in-hat brake shoe adjustment. When service is needed, the lever auto-adjust mechanism must be reloaded and locked out before service can be performed.

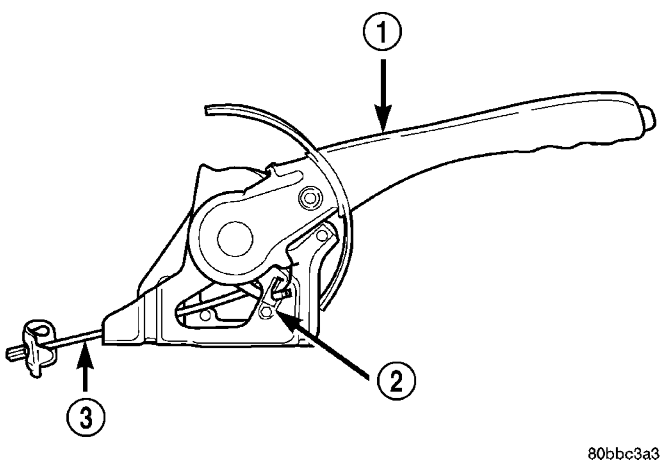


Fig. 137 Parking Brake Lever

1 - PARKING BRAKE LEVER
2 - PARKING BRAKE WARNING LAMP SWITCH
3 - OUTPUT CABLE

The parking brake lever has a short output cable with an equalizer bracket attached to it that connects to the parking brake cables (Fig. 137). The output cable can only be serviced as part of the parking brake lever.

There is an individual parking brake cable for each rear wheel that joins a parking cable equalizer, attached to the parking brake lever, to the rear parking brakes. The parking brake cables are made of flexible steel cable. Both drum rear brakes and disc rear brakes use the same parking brake cable configuration, but the cables are different.

On vehicles equipped with rear drum brakes, 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 connected to the flexible steel parking brake cable.

The parking brakes on vehicles equipped with rear disc brakes consist of a small duo-servo brake assembly mounted to the disc brake caliper adapter (Fig. 138). The hat (center) section of the rear brake rotor serves as the braking surface (drum) for the parking brakes (Fig. 139). This parking brake application uses the same operating cable configuration as the drum brake equipped vehicles, but different cables.

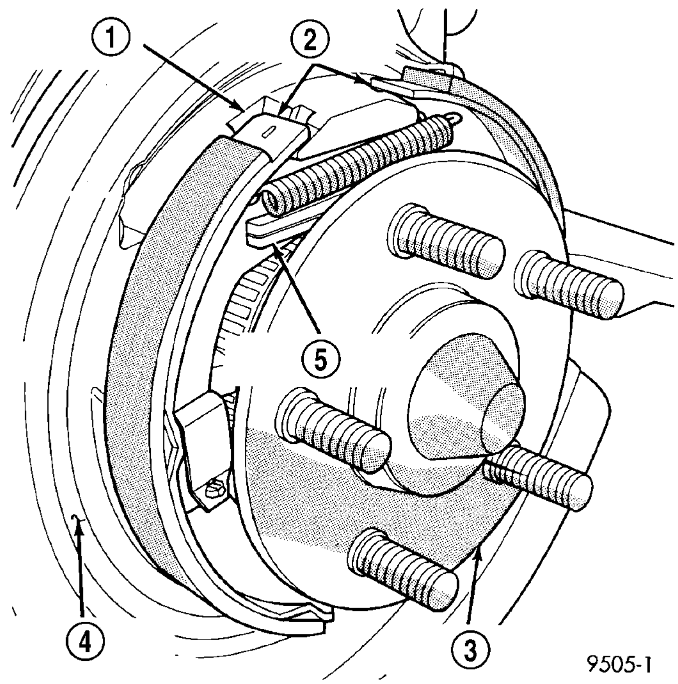


Fig. 138 Parking Brake Assembly With Rear Disc Brakes

1 - DISC BRAKE ADAPTER
2 - PARKING BRAKE BRAKE SHOES
3 - HUB/BEARING ASSEMBLY
4 - BRAKING DISC STONE SHIELD
5 - PARKING BRAKE ACTUATING STRUT

PARKING BRAKE (Continued)

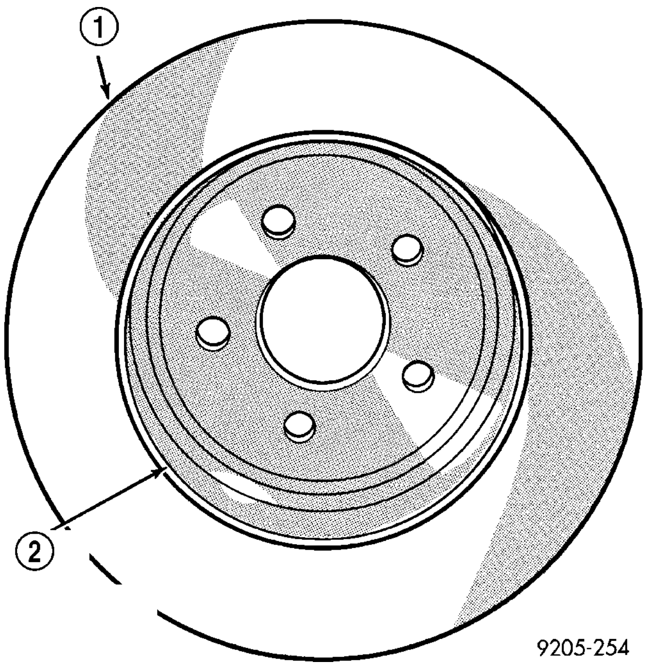


Fig. 139 Drum-In-Hat Brake Rotor

1 - REAR BRAKING DISK ROTOR
2 - HAT SECTION OF REAR BRAKING DISC (PARKING BRAKE BRAKING SURFACE)

STANDARD PROCEDURE

STANDARD PROCEDURE - AUTOMATIC ADJUSTER LOCKING OUT

WARNING: THE AUTOMATIC ADJUSTING FEATURE OF THIS PARKING BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 25 POUNDS. DO NOT RELEASE THE AUTOMATIC ADJUSTER LOCKOUT DEVICE UNLESS THE REAR PARKING BRAKE CABLES AND EQUALIZER ARE CONNECTED TO THE LEVER OUTPUT CABLE. KEEP HANDS OUT OF AUTOMATIC ADJUSTER SECTOR AND PAWL AREA. FAILURE TO OBSERVE CAUTION IN HANDLING THIS MECHANISM COULD LEAD TO SERIOUS INJURY.

WARNING: WHEN REPAIRS TO THE PARKING BRAKE LEVER OR CABLES ARE REQUIRED, THE AUTOMATIC ADJUSTER MUST BE LOADED AND LOCKED OUT TO AVOID POSSIBLE INJURY.

(1) Block the tire and wheels so the vehicle does not move once the vehicle parking brake lever is released.

(2) Fully apply the parking brake lever, then shift the transmission into neutral.

(3) Remove the screws attaching the center console, then remove the center console.

(4) Lower the parking brake lever handle to the released position.

(5) Grasp the parking brake lever output cable by hand and pull upward. Continue pulling on the cable until a pin punch can be inserted through the hole in the lever mechanism sector gear and the hole in the right side of its mounting bracket (Fig. 140). This will lock the parking brake automatic adjustment mechanism in place and take tension off the parking brake cables.

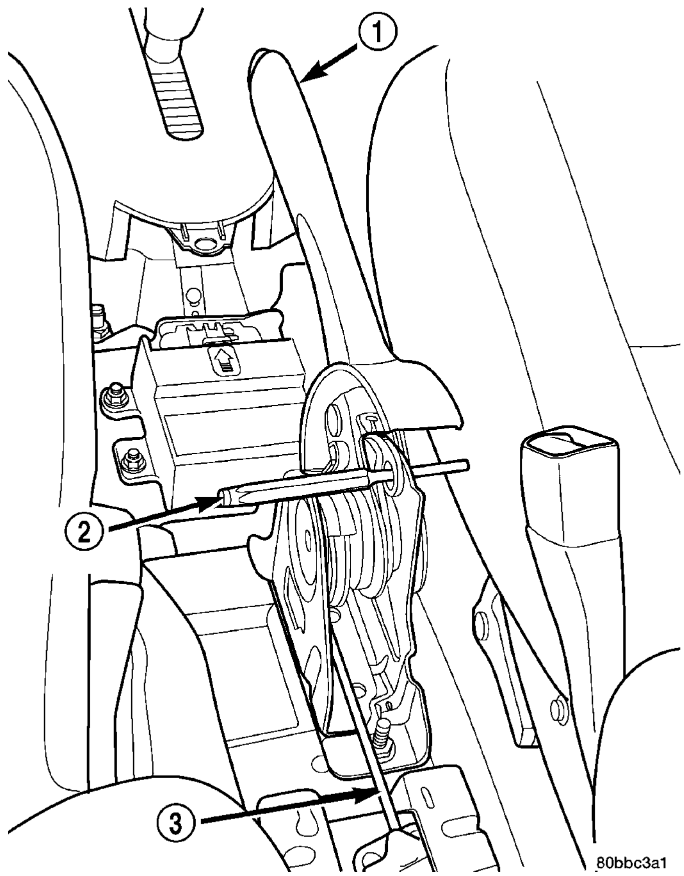


Fig. 140 Pin Punch Installed

1 - PARKING BRAKE LEVER
2 - PIN PUNCH
3 - OUTPUT CABLE

PARKING BRAKE (Continued)

STANDARD PROCEDURE - AUTOMATIC ADJUSTER UNLOCKING

WARNING: THE AUTOMATIC ADJUSTING FEATURE OF THIS PARKING BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 25 POUNDS. DO NOT RELEASE THE AUTOMATIC ADJUSTER LOCKOUT DEVICE UNLESS THE REAR PARKING BRAKE CABLES AND EQUALIZER ARE CONNECTED TO THE LEVER OUTPUT CABLE. KEEP HANDS OUT OF AUTOMATIC ADJUSTER SECTOR AND PAWL AREA. FAILURE TO OBSERVE CAUTION IN HANDLING THIS MECHANISM COULD LEAD TO SERIOUS INJURY.

WARNING: WHEN REPAIRS TO THE PARKING BRAKE LEVER OR CABLES ARE REQUIRED, THE AUTOMATIC ADJUSTER MUST BE LOADED AND LOCKED OUT TO AVOID POSSIBLE INJURY.

NOTE: The parking brake lever can only be in the released position when releasing the automatic adjuster locking pin or pin punch.

(1) Be sure the rear parking brake cables are both properly installed in the equalizer.

(2) Keeping your hands clear of the automatic adjuster sector and pawl area, firmly grasp the parking brake lever pin punch (or locking pin if a new mechanism has been installed) (Fig. 140), then quickly remove it from the parking brake lever mechanism. This will allow the park brake lever mechanism to automatically adjust the parking brake cables.

(3) Cycle the parking brake lever once to position the parking brake cables, then return the parking brake lever its released position.

(4) Check the rear wheels of the vehicle. They should rotate freely without dragging with the lever in its released position.

(5) Fully apply the parking brake lever.

(6) Install the center console and its mounting screws.

(7) Remove the blocks from the tire and wheels.

CABLES - PARKING BRAKE

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

The procedure below applies to either of the two rear parking brake cables.

(1) Block the tire and wheels so the vehicle does not move once the vehicle parking brake lever is released.

(2) Fully apply the parking brake lever, then shift the transmission into neutral.

(3) Remove the screws attaching the center console, then remove the center console.

(4) Lower the parking brake lever handle to the released position.

(5) Grasp the parking brake lever output cable by hand and pull upward. Continue pulling on the cable until a pin punch can be inserted through the hole in the lever mechanism sector gear and the hole in the right side of its mounting bracket (Fig. 149). This will lock the parking brake automatic adjustment mechanism in place and take tension off the parking brake cables.

(6) Remove both rear parking brake cables from the parking brake cable equalizer (Fig. 150).

(7) Remove the rear seat cushion from the vehicle.

(8) Fold the rear carpeting forward to expose the parking brake cables at the end of the rear floor.

(9) Install the box end of a ½ inch wrench over the parking brake cable retainer (Fig. 141). Push the wrench onto the retainer until the retainer fingers are collapsed. From under the carpeting, grasp the parking brake cable housing and pull cable straight out of the bracket attached to the floor.

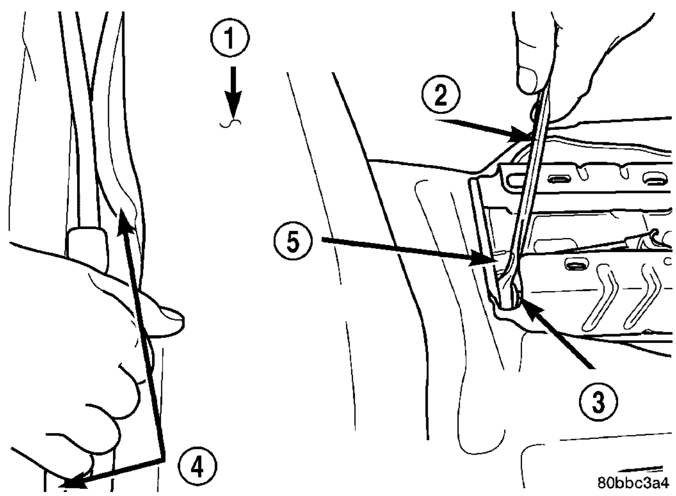


Fig. 141 Compressing Cable Retainer

1 - CARPET ROLLED FORWARD
2 - WRENCH
3 - RIGHT REAR CABLE
4 - REAR PARKING BRAKE CABLES
5 - LEFT REAR CABLE

(10) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(11) Remove the rear tire and wheel assembly from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

CABLES - PARKING BRAKE (Continued)

(12) On vehicles equipped with rear drum brakes, remove the brake drum. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - REMOVAL).

(13) On vehicles equipped with rear disc brakes:

• Remove the disc brake caliper guide pin bolts, then the caliper from disc brake adapter (Fig. 142).

• Hang the caliper out of the way using a wire hanger or cord.

• Remove the brake rotor from the rear hub and bearing.

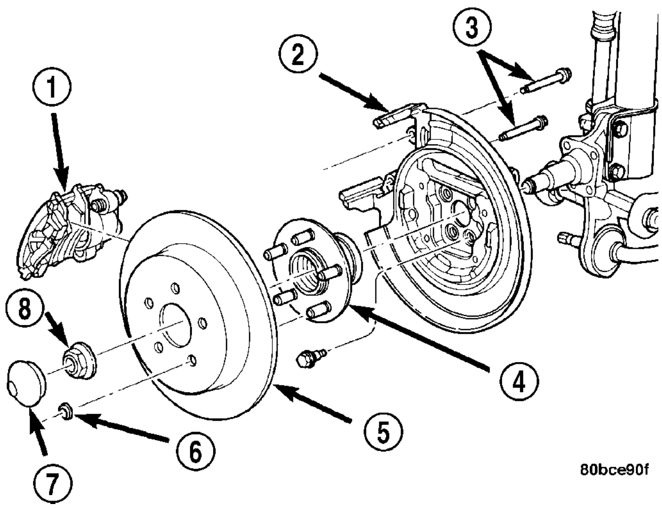


Fig. 142 Rear Disc Brakes

1 - DISC BRAKE CALIPER
2 - DISC BRAKE ADAPTER
3 - GUIDE PIN BOLTS
4 - HUB AND BEARING
5 - BRAKE ROTOR
6 - RETAINER CLIP
7 - DUST CAP
8 - NUT

(14) Remove the dust cap from the rear hub and bearing.

(15) Remove the hub and bearing retaining nut from the knuckle spindle, then remove the hub and bearing (Fig. 142).

(16) On vehicles equipped with rear disc brakes, remove the upper return spring, both shoe hold-down clips, then spread the rear parking brake shoes apart at the top enough to clear the shoe anchor and remove the parking brake shoes as an assembly from the disc brake adapter (Fig. 143).

(17) To remove the rear parking brake cable from the brake support plate on vehicles equipped with rear drum brakes:

• Remove the parking brake cable from the parking brake actuating lever (Fig. 144).

• Remove the actuating spring between the brake shoe adjustment lever and the brake shoe (Fig. 145).

• Remove the parking brake cable from the rear brake support plate. The parking brake cable can be removed from brake support plate using a ½ inch

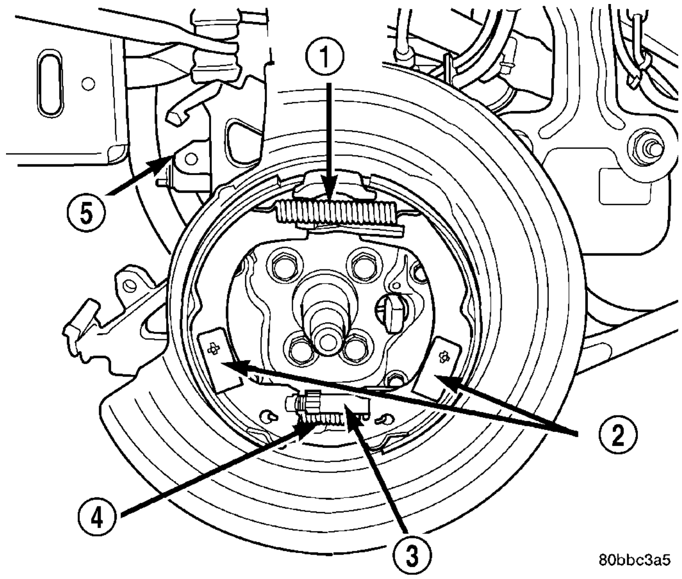


Fig. 143 Parking Brake Shoes

1 - UPPER RETURN SPRING
2 - SHOE HOLD DOWN CLIPS
3 - ADJUSTER
4 - LOWER REAR SPRING
5 - DISC BRAKE ADAPTER

box wrench to compress the locking fingers on the parking brake cable retainer (Fig. 146).

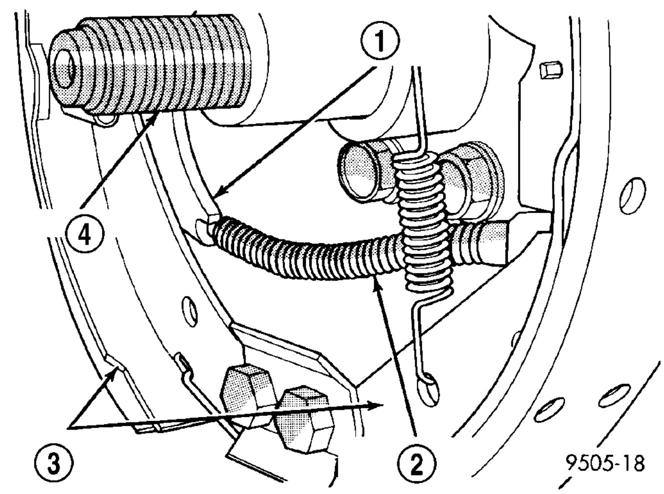


Fig. 144 Actuator Lever

1 - PARK BRAKE ACTUATING LEVER
2 - PARK BRAKE CABLE
3 - BRAKE SHOE ASSEMBLIES
4 - REAR SPINDLE

(18) To remove the rear parking brake cable from the disc brake adapter on vehicles equipped with rear disc brakes:

• Remove the parking brake actuating lever from the parking brake cable (Fig. 147).

• Remove the parking brake cable from the rear disc brake adapter. The parking brake cable can be removed from the disc brake adapter using a ½ inch

CABLES - PARKING BRAKE (Continued)

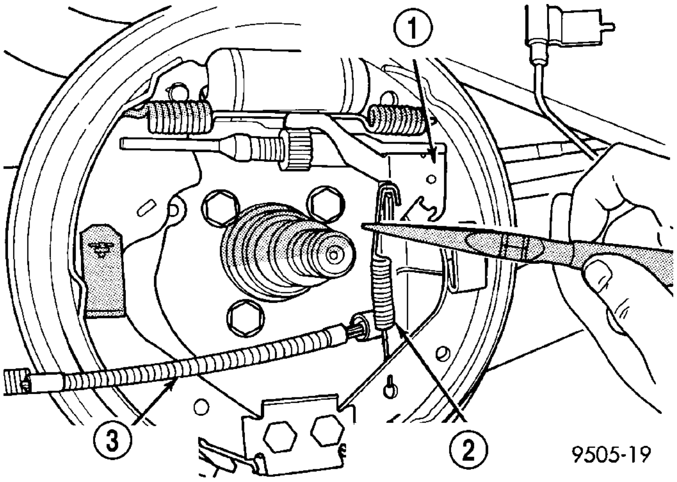


Fig. 145 Actuating Spring

1 - BRAKE SHOE ADJUSTMENT LEVER
2 - ADJUSTMENT LEVER ACTUATING SPRING
3 - PARK BRAKE CABLE

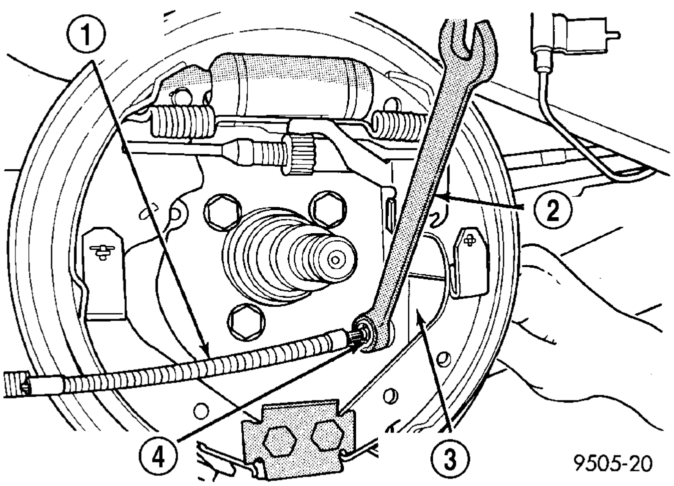


Fig. 146 Parking Brake Cable Removal

1 - PARK BRAKE CABLE
2 - 1/2′′ WRENCH
3 - REAR BRAKE SUPPORT PLATE
4 - PARK BRAKE CABLE RETAINER

offset box wrench to compress the locking fingers on the parking brake cable retainer (Fig. 148).

(19) Remove the nuts, then the parking brake cable routing bracket from the tension strut mounting bolts.

(20) Remove the parking brake cable and sealing grommet from floor pan of the vehicle.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

The procedure below applies to either of the two rear parking brake cables.

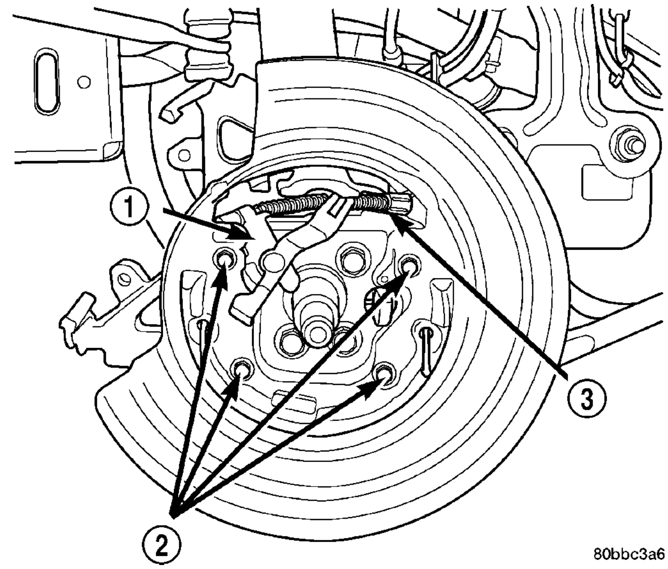


Fig. 147 Parking Brake Actuator Lever

1 - SHOE ACTUATOR LEVER
2 - SHIELD MOUNTING SCREWS
3 - REAR PARKING BRAKE CABLE

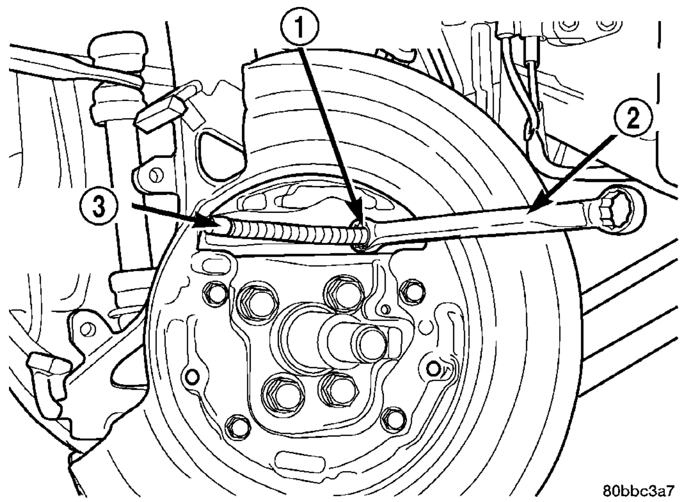


Fig. 148 Parking Brake Cable Removal

1 - CABLE RETAINER
2 - OFFSET BOX WRENCH
3 - PARKING BRAKE CABLE

(1) From underneath push the parking brake cable through the hole in the floor pan of the vehicle making sure the cable sealing grommet is installed in the floor pan as far as possible to insure a good seal.

(2) Attach the parking brake cable routing bracket to the tension strut mounting bolts. Install and tighten the mounting nuts to a torque of 28 N·m (250 in. lbs.).

(3) Install the parking brake cable into the brake support plate or the rear disc brake adapter. Be sure the locking fingers on the cable retainer are expanded once the cable is pushed all the way into

CABLES - PARKING BRAKE (Continued)

the support plate or brake adapter hole to ensure the cable is securely held in place.

(4) On vehicles equipped with rear drum brakes:

- Install the parking brake cable on the parking brake cable actuating lever (Fig. 144).
- Install the actuating spring to the brake shoe and the brake adjustment lever (Fig. 145).

(5) On vehicles equipped with rear disc brakes:

- Install the parking brake shoes actuator lever on the parking brake cable (Fig. 147).
- Install the parking brake shoe assemblies on the disc brake adapter (Fig. 143).

(6) Install the hub and bearing on the rear spindle. Install a new hub and bearing retaining nut. Tighten the retaining nut to a torque of 217 N·m (160 ft. lbs.).

(7) Install the hub and bearing dust cap.

(8) On drum brake equipped vehicles, install the rear brake drum.

(9) On vehicles equipped with rear disc brakes, install the brake rotor, then the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION) (Fig. 142). Install the two caliper guide pin bolts, then tighten them to a torque of 22 N·m (192 in. lbs.).

(10) Install the rear tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten all wheel nuts to a torque of 135 N·m (100 ft. lbs.).

(11) Lower the vehicle.

(12) Ensure that the seal grommet on the cable that was installed from underneath is fully seated into the floor pan.

(13) Route the parking brake cable under the carpeting, up to parking brake cable retaining bracket on floor pan. Install the parking brake cable through the retaining bracket. Push the cable in until the locking fingers on the cable retainer lock the cable into place.

(14) Install the rear parking brake cables into the equalizer on the parking brake lever output cable (Fig. 150).

(15) Ensure that the parking brake cables are correctly installed on the equalizer and aligned with the cable track on the parking brake lever.

NOTE: The parking brake lever can be in any position when releasing the automatic adjuster.

(16) Keeping your hands clear of the automatic adjuster sector and pawl area, firmly grasp the parking brake lever pin punch (or locking pin if a new mechanism has been installed) (Fig. 149), then quickly remove it from the parking brake lever mechanism. This will allow the park brake lever mechanism to automatically adjust the parking brake cables.

(17) Cycle the parking brake lever once to position the parking brake cables, then return the parking brake lever its released position.

(18) Check the rear wheels of the vehicle. They should rotate freely without dragging with the lever in its released position.

(19) Reposition the rear carpeting into place.

(20) Install the rear seat cushion. Be sure the seat cushion is fully installed in the retainers on the floor pan of the vehicle.

(21) Fully apply the parking brake lever.

(22) Install the center console and its mounting screws.

(23) Remove the blocks from the tires and wheels.

LEVER - PARKING BRAKE

REMOVAL

WARNING: THE AUTOMATIC ADJUSTING FEATURE OF THIS PARKING BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 25 POUNDS. DO NOT RELEASE THE AUTOMATIC ADJUSTER LOCKOUT DEVICE UNLESS THE REAR PARKING BRAKE CABLES AND EQUALIZER ARE CONNECTED TO THE LEVER OUTPUT CABLE. KEEP HANDS OUT OF AUTOMATIC ADJUSTER SECTOR AND PAWL AREA. FAILURE TO OBSERVE CAUTION IN HANDLING THIS MECHANISM COULD LEAD TO SERIOUS INJURY.

WARNING: WHEN REPAIRS TO THE PARKING BRAKE LEVER OR CABLES ARE REQUIRED, THE AUTOMATIC ADJUSTER MUST BE LOADED AND LOCKED OUT TO AVOID POSSIBLE INJURY. THE LEVER ADJUSTMENT MECHANISM CAN BE LOADED AND LOCKED OUT AS OUTLINED IN THIS PROCEDURE.

(1) Block the tire and wheels so the vehicle does not move once the vehicle parking brake lever is released.

(2) Fully apply the parking brake lever, then shift the transmission into neutral.

(3) Remove the screws attaching the center console, then remove the center console.

(4) Lower the parking brake lever handle to the released position.

(5) Grasp the parking brake lever output cable by hand and pull upward. Continue pulling on the cable until a pin punch can be inserted through the hole in the lever mechanism sector gear and the hole in the right side of its mounting bracket (Fig. 149). This will lock the parking brake automatic adjustment

LEVER - PARKING BRAKE (Continued)

mechanism in place and take tension off the parking brake cables.

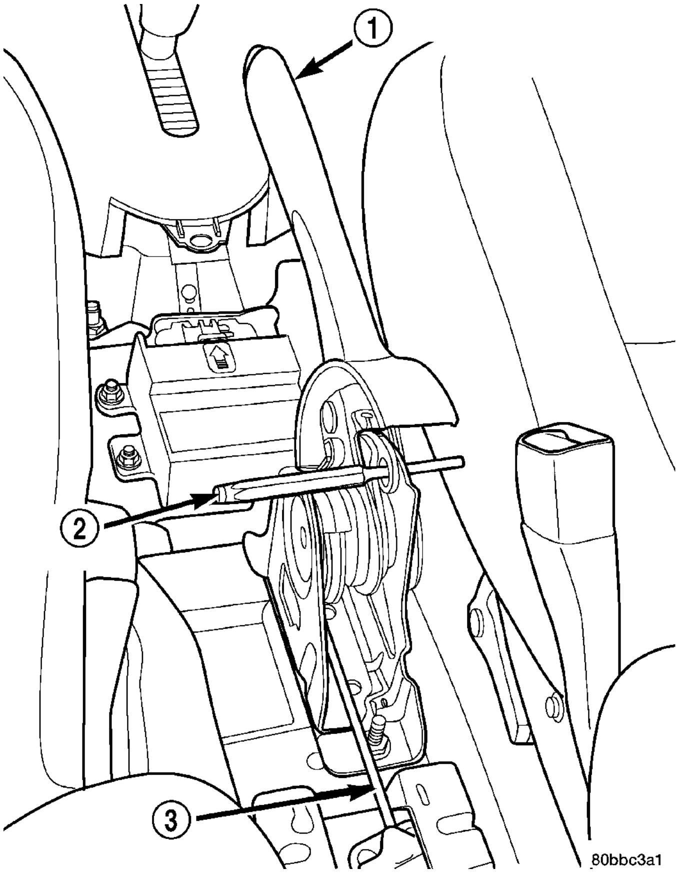


Fig. 149 Pin Punch Installed

1 - PARKING BRAKE LEVER
2 - PIN PUNCH
3 - OUTPUT CABLE

(6) Remove both rear parking brake cables from the parking brake cable equalizer (Fig. 150).

(7) Remove the wiring harness electrical connector from the parking brake warning lamp switch on the parking brake lever (Fig. 151).

(8) Remove the two nuts attaching the parking brake lever to the vehicle (Fig. 151).

(9) Remove the parking brake lever from the vehicle.

INSTALLATION

WARNING: THE AUTOMATIC ADJUSTING FEATURE OF THIS PARKING BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 25 POUNDS. DO NOT RELEASE THE AUTOMATIC ADJUSTER LOCKOUT DEVICE UNLESS THE REAR PARKING BRAKE CABLES AND EQUALIZER ARE CONNECTED TO THE LEVER OUTPUT CABLE. KEEP HANDS OUT OF AUTOMATIC ADJUSTER SECTOR AND PAWL AREA. FAILURE TO OBSERVE

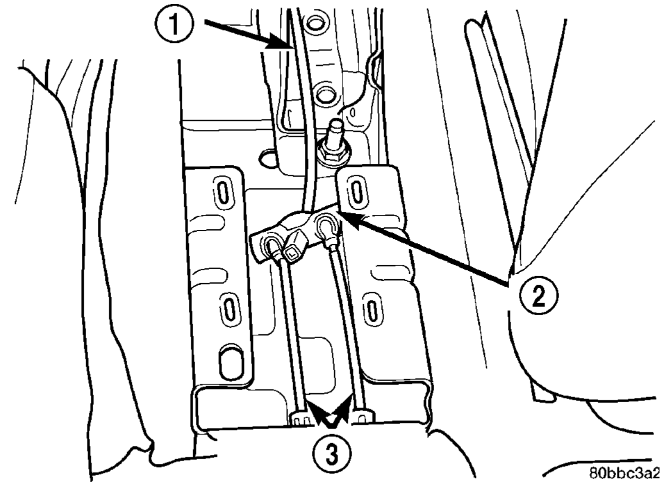


Fig. 150 Parking Brake Cables At Equalizer

1 - LEVER OUTPUT CABLE
2 - EQUALIZER
3 - REAR PARKING BRAKE CABLES

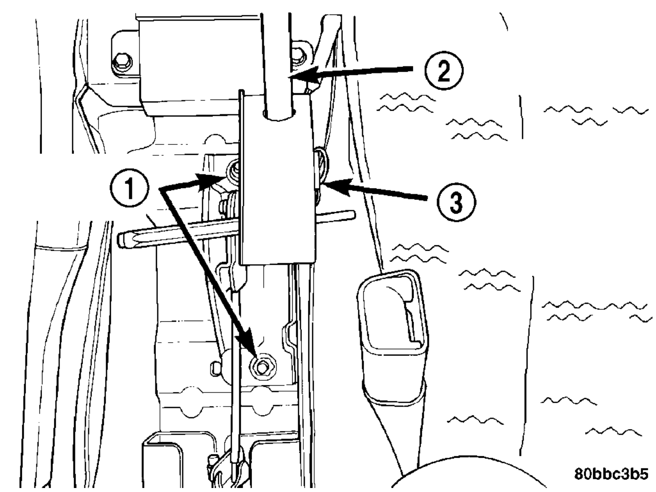


Fig. 151 Parking Brake Lever

1 - MOUNTING NUTS
2 - PARKING BRAKE LEVER
3 - PARKING BRAKE WARNING LAMP SWITCH CONNECTOR

CAUTION IN HANDLING THIS MECHANISM COULD LEAD TO SERIOUS INJURY.

(1) Place the parking brake lever on the mounting studs on the vehicle floor. Install and tighten the two mounting nuts to a torque of 28 N·m (250 in. lbs.) (Fig. 151).

(2) Connect the wiring harness electrical connector on the parking brake warning lamp switch (Fig. 151).

(3) Install both rear park brake cables into the equalizer on the parking brake lever output cable (Fig. 150).

(4) Ensure that the parking brake cables are correctly installed on the equalizer and aligned with the cable track on the parking brake lever.

LEVER - PARKING BRAKE (Continued)

NOTE: The parking brake lever can only be in the released position when releasing the automatic adjuster.

(5) Keeping your hands clear of the automatic adjuster sector and pawl area, firmly grasp the parking brake lever pin punch (or locking pin if a new mechanism has been installed) (Fig. 149), then quickly remove it from the parking brake lever mechanism. This will allow the park brake lever mechanism to automatically adjust the parking brake cables.

(6) Cycle the parking brake lever once to position the parking brake cables, then return the parking brake lever its released position.

(7) Check the rear wheels of the vehicle. They should rotate freely without dragging with the lever in its released position.

(8) Fully apply the parking brake lever.

(9) Install the center console and its mounting screws.

(10) Remove the blocks from the tires and wheels.

SHOES - PARKING BRAKE

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

NOTE: This procedure applies to vehicles with rear disc brakes only.

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove the rear tire and wheel assembly.(Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Remove the rear disc brake caliper assembly from the brake rotor and store it out of the way.(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL).

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

(5) Remove the dust cap from the rear hub and bearing.

(6) Remove the rear hub and bearing assembly retaining nut and washer.

(7) Remove the rear hub and bearing assembly from the rear spindle.

(8) Remove the rear brake shoe assembly hold-down clip (Fig. 152).

(9) Turn the brake shoe adjuster wheel until the adjuster is at shortest length.

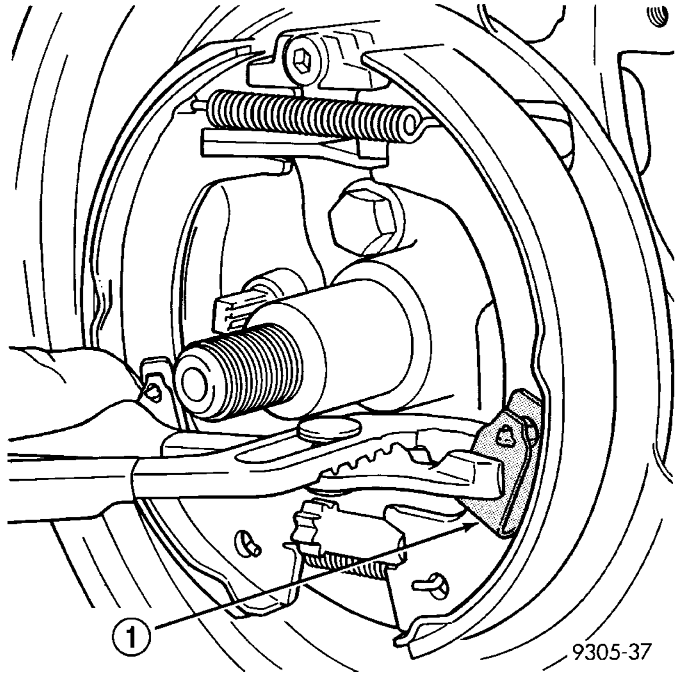


Fig. 152 Rear Brake Shoe Hold-Down Clip

1 - HOLD DOWN CLIP

(10) Remove the adjuster assembly from the parking brake shoe assemblies (Fig. 153).

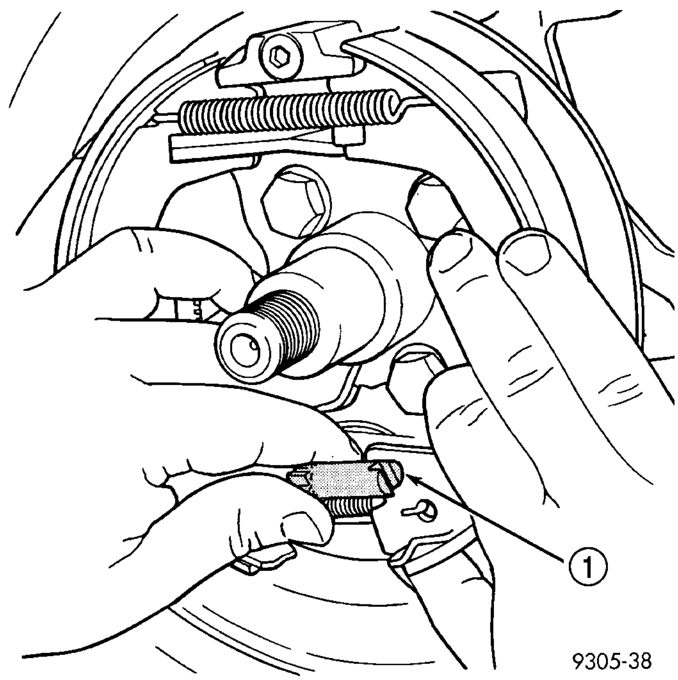


Fig. 153 Parking Brake Shoe Adjuster Assembly

1 - ADJUSTER

(11) Remove the lower shoe-to-shoe spring (Fig. 154).

SHOES - PARKING BRAKE (Continued)

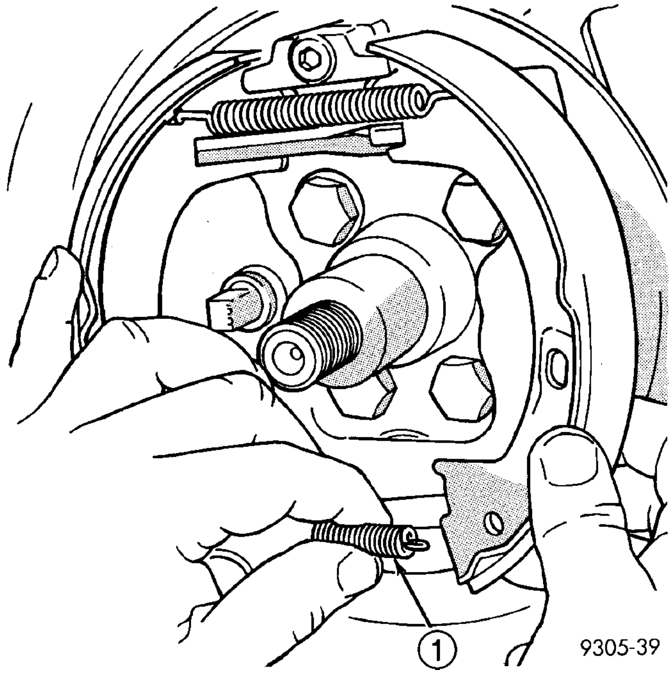


Fig. 154 Brake Shoe Lower Return Spring

1 - LOWER SPRING

(12) Pull the rear brake shoe away from anchor. Remove the rear brake shoe and upper return spring (Fig. 155).

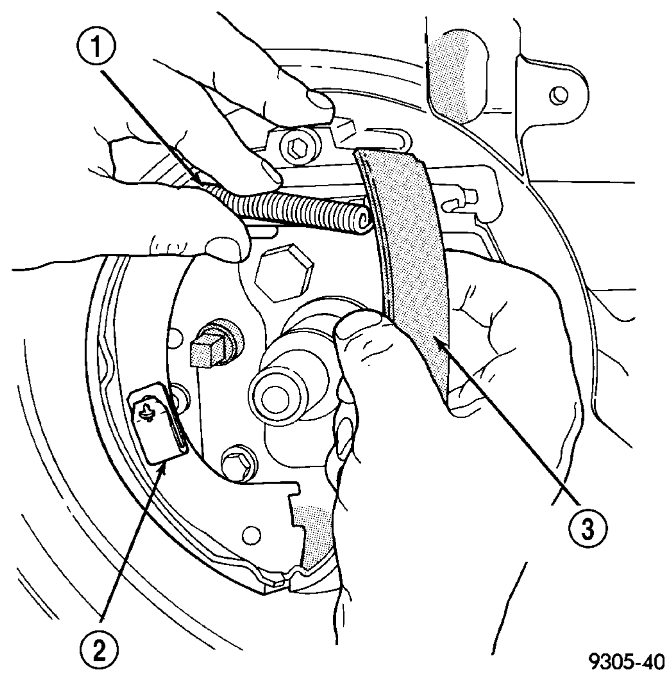


Fig. 155 Brake Shoe and Upper Spring

1 - UPPER SPRING
2 - HOLD DOWN CLIP
3 - REAR PARKING BRAKE SHOE

(13) Remove the front brake shoe hold-down clip (Fig. 156). Remove the front brake shoe assembly.

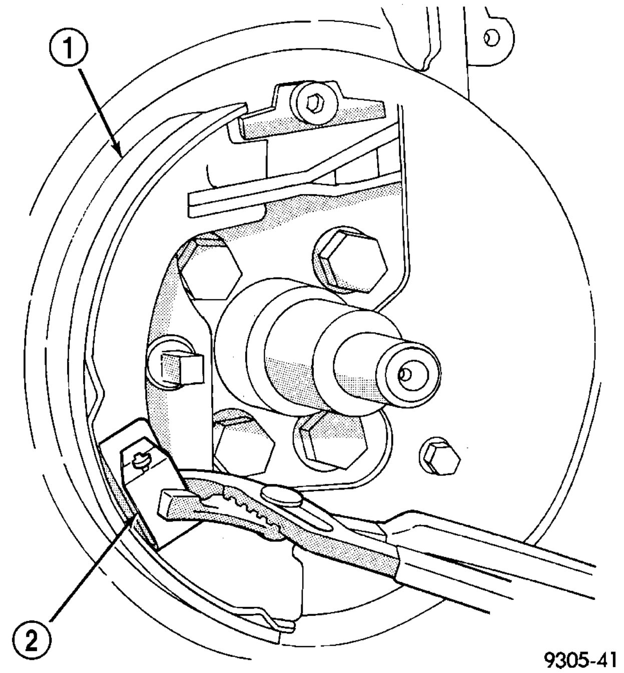


Fig. 156 Front Hold Down Clip And Brake Shoe

1 - FRONT BRAKE SHOE ASSEMBLY
2 - HOLD DOWN CLIP

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

NOTE: This procedure applies to vehicles with rear disc brakes only.

(1) Install the front brake shoe and secure it in place with a hold-down clip (Fig. 156).

(2) Install the rear brake shoe and the upper shoe return spring (Fig. 155). Pull the rear brake shoe over the anchor block until it is properly located on the adapter.

(3) Install the lower shoe-to-shoe return spring (Fig. 154).

(4) Install the brake shoe adjuster assembly with the star wheel towards the rear (Fig. 153).

(5) Install the rear brake shoe hold down clip (Fig. 152).

(6) Adjust the parking brake shoes to a diameter to 171.72– 171.50 mm (6.75–6.75 inch) (Fig. 157).

(7) Install the rear hub and bearing assembly on spindle.

(8) Install a new hub and bearing assembly retaining nut. Tighten the retaining nut to a torque of 217 N·m (160 ft. lbs.).

(9) Install the hub and bearing dust cap.

SHOES - PARKING BRAKE (Continued)

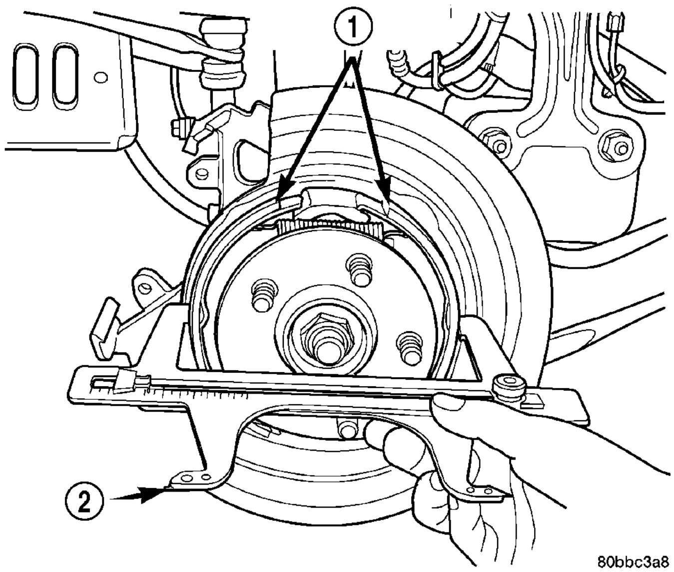


Fig. 157 Measuring Brake Shoes

1 - REAR PARKING BRAKE SHOES
2 - BRAKE SHOE GAUGE

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

(11) Install rear disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).

(12) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts to a torque of 135 N·m (100 ft. lbs.).

(13) Repeat the above procedure to the parking brake shoes on the other side of the vehicle.

(14) Adjust the parking brake shoes as necessary. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).

(15) Lower the vehicle.

ADJUSTMENTS

ADJUSTMENT

NOTE: The parking brake shoes used in the drum-in-hat park brake system do not automatically adjust to compensate for brake shoe lining wear. Therefore, it is necessary to manually adjust the parking brake shoes.

(1) Verify the parking brake lever is in the released position.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the rubber plug from the adjusting hole in the disc brake caliper adapter.

(4) Adjust the parking brakes. Use the first bullet point for the adjustment of the left side parking brake shoes. Use the second bullet point for the adjustment of the right side parking brake shoes.

- Insert a medium size screwdriver through adjustment hole in the left backing plate. Position the screwdriver against the star wheel on the parking brake shoe adjuster. Using the screwdriver, rotate the star wheel downward until a slight drag is noticed when turning the rear tire and wheel assembly. Then, using the screwdriver, slowly rotate the star wheel upward, backing off the adjuster, just enough to allow the rear tire and wheel assembly to rotate without the parking brake shoes dragging. Do not back off the adjuster star wheel more than two clicks past the point of no drag. The parking brake shoe-to-drum clearance is now properly set.
- Insert a medium size screwdriver through adjustment hole in the right backing plate. Position the screwdriver against the star wheel on the parking brake shoe adjuster. Using the screwdriver, rotate the star wheel upward until a slight drag is noticed when turning the rear tire and wheel assembly. Then, using the screwdriver, slowly rotate the star wheel downward, backing off the adjuster, just enough to allow the rear tire and wheel assembly to rotate without the parking brake shoes dragging. Do not back off the adjuster star wheel more that two clicks past the point of no drag. The parking brake shoe-to-drum clearance is now properly set.

(5) Install the rubber plug in the adjusting holes of the disc brake caliper adapter.

(6) Lower the vehicle until the rear tires are just clearing the floor.

(7) Reach inside the vehicle and fully apply and release the park brakes two times after adjusting the parking brake shoes.

(8) With the parking brake lever in the fully applied position, attempt to hand rotate each rear tire and wheel assembly to ensure that the parking brake shoes are working.

(9) With the parking brake lever in the released position, hand rotate each rear tire and wheel assembly to ensure that the parking brake shoes are not dragging.

BRAKES - ABS

TABLE OF CONTENTS

BRAKES - ABS

DESCRIPTION

DESCRIPTION - ANTILOCK BRAKE SYSTEM

This section covers the physical and operational descriptions, and the on-car service procedures for the Mark 20e Antilock Brake System (ABS). It is the only antilock brake system available on this vehicle.

All vehicles equipped with ABS use electronic variable brake proportioning (EVBP) to balance front-to-rear braking when the brakes are applied in the partial braking range. For more information on electronic brake distribution, (Refer to 5 - BRAKES - ABS - DESCRIPTION).

This system shares most base brake hardware used on vehicles without ABS. A vehicle equipped with ABS, however, uses a different master cylinder and brake tubes. Also included in the ABS system is an integrated control unit (ICU) and four wheel speed sensors. These components are described in detail in this section. All vehicles with ABS come standard with four-wheel-disc brakes.

The antilock brake system prevents wheel lockup under braking conditions on virtually any type of road surface. Antilock braking is desirable because a vehicle that is stopped without locking the wheels retains directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

DESCRIPTION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

Vehicles equipped with ABS use electronic variable brake proportioning (EVBP) to balance front-to-rear braking. The EVBP is used in place of a rear proportioning valve. The EVBP system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the integrated control unit (ICU).

EVBP activation is invisible to the customer since there is no pump motor noise or brake pedal feedback.

BRAKES - ABS (Continued)

OPERATION

OPERATION - ANTILOCK BRAKE SYSTEM

There are a few performance characteristics of the Mark 20e Antilock Brake System that may at first seem abnormal, but in fact are normal. These characteristics are described below.

NORMAL BRAKING

Under normal braking conditions, the ABS functions the same as a standard base brake system with a diagonally split master cylinder and conventional vacuum assist.

ABS BRAKING

ABS operation is available at all vehicle speeds above 5–8 km/h (3–5 mph). If a wheel locking tendency is detected during a brake application, the brake system enters 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. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

During an ABS stop, the brakes hydraulic system is still diagonally split. However, the brake system pressure is further split into four control channels. During antilock operation of the vehicle's brake system, the wheels are controlled independently and are on separate control channels.

The system can build, hold 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).

NOISE AND BRAKE PEDAL FEEL

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping, or groaning noises heard by the driver. This is normal and is 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 is turned off when the vehicle is slowed to a speed of 5–6 km/h (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 than 5 km/h (3 mph) or during an ABS stop where ABS is no longer required. These conditions 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 activates ABS because of the wheel hop caused by the bumps.

TIRE NOISE AND MARKS

Although the ABS system prevents complete wheel lockup, 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 25–30 percent. This means that the wheel rolling velocity is 25–30 percent 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 lockup.

Complete wheel lockup normally leaves black tire marks on dry pavement. The ABS will not leave dark black tire marks since the wheel never reaches a fully locked condition. However, tire marks may be noticeable as light patched marks.

START-UP CYCLE

When the ignition is turned on, a popping sound and a slight brake pedal movement may be noticed. The ABS warning indicator lamp will also be on for up to 5 seconds after the ignition is turned on. These conditions occur as part of an ABS self-diagnosis test performed by the antilock brake system. The popping noise is the result of brief activation of the solenoids inside the integrated control unit (ICU).

DRIVE-OFF CYCLE

When the vehicle is first driven off, a humming may be heard or felt by the driver at approximately 25–40 km/h (15–25 mph). This is caused by brief activation of the ABS pump motor on the ICU and is a normal function of ABS as the system is performing a diagnosis check.

PREMATURE ABS CYCLING

Symptoms of premature ABS cycling include: clicking sounds from the solenoid valves; pump/motor running; and pulsations in the brake pedal. Premature ABS cycling can occur at any braking rate of the vehicle and on any type of road surface.

Premature ABS cycling is a condition that needs to be correctly assessed when diagnosing problems with the antilock brake system. It may be necessary to use a DRBIII® scan tool to detect and verify premature ABS cycling.

Check the following common causes when diagnosing premature ABS cycling: damaged tone wheels; incorrect tone wheels; damaged steering knuckle wheel speed sensor mounting bosses; loose wheel

BRAKES - ABS (Continued)

speed sensor mounting bolts; excessive tone wheel runout; excessively large tone wheel-to-wheel speed sensor air gap, or a damaged speed sensor head face. Give special attention to these components when diagnosing a vehicle exhibiting premature ABS cycling.

After diagnosing the defective component, repair or replace it as required. When the component repair or replacement is completed, test drive the vehicle to verify that premature ABS cycling has been corrected.

OPERATION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

Upon entry into EVBP the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure, the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the hydraulic control unit (HCU) resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure, the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This back-and-forth process will continue until the required slip difference is obtained. At the end of EVBP braking (brakes released) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EVBP will remain functional during many ABS fault modes. If both the red BRAKE and amber ABS warning indicators are illuminated, the EVBP may not be functioning.

CAUTION

The ABS uses an electronic control module, the CAB. This module is designed to withstand normal current draws associated with vehicle operation. Care must be taken to avoid overloading the CAB circuits.

CAUTION: 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.

CAUTION: These circuits should only be tested using a high impedance multi-meter or the DRBIII® scan tool 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: The CAB 24-way connector should never be connected or disconnected with the ignition switch in the ON position.

CAUTION: This vehicle utilizes active wheel speed sensors. Do not apply voltage to wheel speed sensors at any time.

CAUTION: Use only factory wiring harnesses. Do not cut or splice wiring to the brake circuits. The addition of aftermarket electrical equipment (car phone, radar detector, citizen band radio, trailer lighting, trailer brakes, etc.) on a vehicle equipped with antilock brakes may affect the function of the antilock brake system.

CAUTION: When performing any service procedure on a vehicle equipped with ABS, do not apply a 12-volt power source to the ground circuit of the pump motor in the HCU. Doing this will damage the pump motor and will require replacement of the entire HCU.

CAUTION: An attempt 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: 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.

CAUTION: Many components of the ABS System are not serviceable and must be replaced as an assembly. Do not disassemble any component which is not designed to be serviced.

CAUTION: Only the recommended jacking or hoisting positions for this vehicle are to be used whenever it is necessary to lift a vehicle. Failure to raise a vehicle from the recommended locations could result in lifting a vehicle by the hydraulic control unit mounting bracket. Lifting a vehicle by the hydraulic control unit mounting bracket will result in damage to the mounting bracket and the hydraulic control unit.

BRAKES - ABS (Continued)

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surface, wash off with water immediately.

DIAGNOSIS AND TESTING - INSPECTION AND ROAD TEST

(1) Visually inspect the ABS for damaged or disconnected components and connectors.

(2) Verify the brake lamps are operational. If they are not, repair them prior to continuing.

(3) Connect the DRBIII® scan tool to the Data Link Connector located under the instrument panel to the left of the steering column (Fig. 1). If the DRBIII® does not power-up, check the power and ground supplies to the connector.

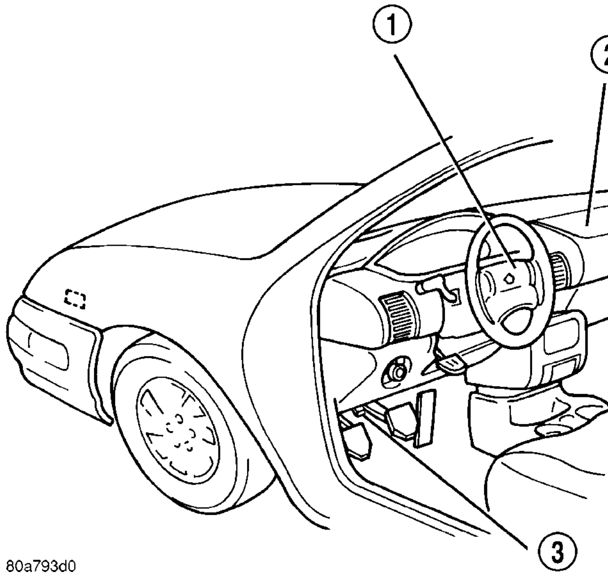


Fig. 1 Diagnostic Data Link Connector Location

1 - DRIVER AIRBAG
2 - PASSENGER AIRBAG
3 - DATA LINK CONNECTOR

(4) Turn the ignition key to the ON position. Select ANTILOCK BRAKES.

(5) Read and record any Diagnostic Trouble Codes (DTCs). If any DTCs are present, refer to the appropriate chassis diagnostic information.

NOTE: Diagnostic trouble codes (DTCs) are kept in the controller's memory until either erased by the technician using the DRBIII®, or erased automatically after 3500 miles or 255 ignition key cycles, whichever occurs first. DTCs are retained by the controller even if the ignition is turned off or the battery is disconnected. More than one DTC can be stored at a time. When accessed, the number of occurrences and the DTC that is stored are displayed.

If no problems are observed, it will be necessary to road test the vehicle.

Many ABS conditions judged to be a problem by the driver may be normal operating conditions. To become familiarized with the normal operating characteristics of this antilock brake system, (Refer to 5 - BRAKES - ABS OPERATION).

WARNING: CONDITIONS THAT RESULT IN TURNING ON THE RED BRAKE WARNING INDICATOR LAMP MAY INDICATE REDUCED BRAKING ABILITY.

Before road testing a brake complaint vehicle, note whether the red BRAKE warning indicator lamp, amber ABS warning indicator lamp, or both are turned on. If it is the red BRAKE warning indicator, there is a brake hydraulic problem that must be corrected before driving the vehicle (Refer to 5 - BRAKES - BASE - DIAGNOSIS AND TESTING). If the red BRAKE warning indicator is illuminated, there is also a possibility that there is an ABS problem and the amber ABS warning indicator is not able to illuminate, so the MIC turns on the red BRAKE warning indicator by default.

If the amber ABS warning indicator is on, road test the vehicle as described below. While only the amber ABS warning indicator is on, the ABS is not functional. The ability to stop the car using the base brake system should not be affected.

(6) Turn the key to the OFF position and then back to the ON position. Note whether the amber ABS warning indicator lamp continues to stay on.

(7) If the amber ABS warning indicator lamp stays on, shift into gear and drive the car to a speed of approximately 25 km/h (15 mph) to complete the ABS Start-Up and Drive-Off Cycles (see Antilock Brake System - Operation). If at this time the amber ABS warning indicator lamp stays on, refer to the Appropriate Diagnostic Information.

(8) If the amber ABS warning indicator lamp goes out at any time, drive the vehicle a short distance. Accelerate the vehicle to a speed of at least 64 km/h (40 mph). Bring the vehicle to a complete stop, braking hard enough to cause the ABS to cycle. Repeat this action several times. Using the DRBIII®, read and record any Diagnostic Trouble Codes (DTCs). If any DTCs are present, refer to the Appropriate Diagnostic Information.

STANDARD PROCEDURE - ANTILOCK BRAKE SYSTEM BLEEDING

The base brake's hydraulic system must be bled anytime air enters the hydraulic system. The ABS though, particularly the ICU (HCU), should only need to be bled when the HCU is replaced or removed from the vehicle. The ABS must always be

BRAKES - ABS (Continued)

bled anytime it is suspected that the HCU has ingested air. Under most circumstances that require the bleeding of the brakes hydraulic system, only the base brake hydraulic system needs to be bled.

When bleeding the ABS system, the following bleeding sequence must be followed to insure complete and adequate bleeding.

(1) Make sure all hydraulic fluid lines are installed and properly torqued.

(2) Connect the DRBIII® scan tool to the Data Link Connector. The connector is located under the lower steering column cover to the left of the steering column.

(3) Using the DRBIII®, check to make sure the CAB does not have any fault codes stored. If it does, clear them using the DRBIII®.

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 YOURSELF AND 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. (Refer to 5 - BRAKES - BASE - STANDARD PROCEDURE)

(5) Using the DRBIII®, select ANTILOCK BRAKES, followed by MISCELLANEOUS, then BLEED BRAKES. Follow the instructions displayed. When the scan tool displays TEST COMPLETED, disconnect the scan tool and proceed.

(6) Bleed the base brake system a second time. Check brake fluid level in the reservoir periodically to prevent emptying, causing air to enter the hydraulic system.

(7) Fill the master cylinder reservoir to the full level.

(8) Test drive the vehicle to be sure the brakes are operating correctly and that the brake pedal does not feel spongy.

SPECIFICATIONS

ABS FASTENER TORQUE

(Refer to 5 - BRAKES - BASE - SPECIFICATIONS - BRAKE FASTENER TORQUE)

TONE WHEEL RUNOUT

FRONT TONE WHEEL:	
Maximum Runout	0.25 mm (0.009 in.)
REAR TONE WHEEL:	
Maximum Runout	0.25 mm (0.009 in.)

WHEEL SPEED SENSOR AIR GAP

DESCRIPTION	SPECIFICATION
FRONT SENSOR	0.28 – 1.42 mm 0.011 – 0.056 in.
REAR SENSOR	0.45 – 1.12 mm 0.018 – 0.044 in.

FRONT WHEEL SPEED SENSOR

DESCRIPTION

The Mark 20e system uses two-wire wheel speed sensors, known as active wheel speed sensors. The sensors use an electronic principle known as magnetoresistive to help increase performance and durability. The sensors convert wheel speed into a small digital signal. A wheel speed sensor is used at each wheel. The gear (tooth) type tone wheel serves as the trigger mechanism for each sensor. At each wheel of the vehicle there is one wheel speed sensor and one tone wheel.

The front wheel speed sensors are attached to bosses in the steering knuckle (Fig. 2) (Fig. 3). The tone wheel is an integral part of the outboard constant velocity joint located in the front axle shaft.

WSS air gaps are not adjustable. The initial factory WSS air gap specification can be found in SPECIFICATIONS. Each WSS is serviced individually. The tone wheels are serviced as part of the drive shaft.

FRONT WHEEL SPEED SENSOR (Continued)

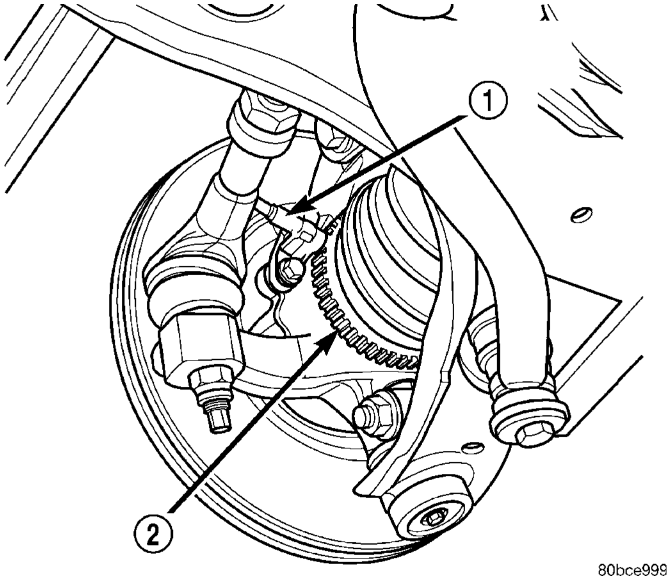


Fig. 2 Left Front Wheel Speed Sensor (Heat Shield Not Shown)

1 - LEFT FRONT WHEEL SPEED SENSOR
2 - TONE WHEEL

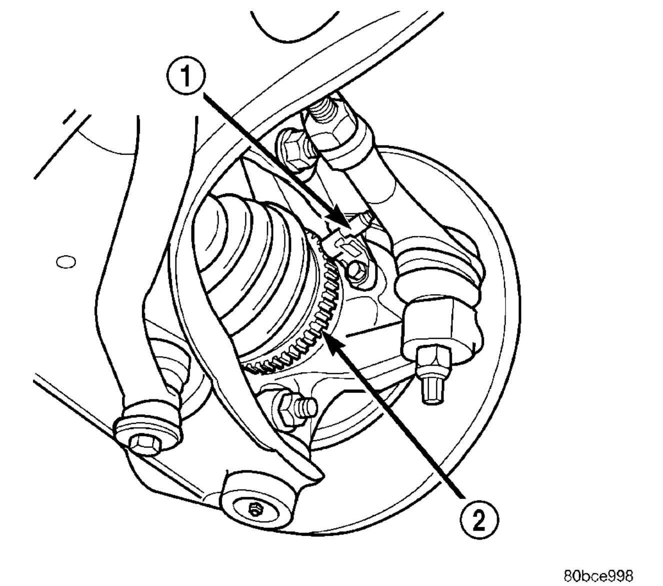


Fig. 3 Right Front Wheel Speed Sensor (Heat Shield Not Shown)

1 - RIGHT FRONT WHEEL SPEED SENSOR
2 - TONE WHEEL

OPERATION

The CAB sends 12 volts to power an Integrated Circuit (IC) in the sensor. The IC supplies a constant 7 mA power supply to the CAB. The relationship of the tooth on the tone wheel to the permanent magnet in the sensor, signals the IC to enable a second 7 mA power supply. The output of the sensor, sent to the CAB, is a DC voltage signal with changing voltage and current levels. The ground for the IC and the current sense circuit is provided by the CAB.

When a valley of the tone wheel is aligned with the sensor, the voltage signal is approximately 0.8 volts and a constant 7 mA current is sent to the CAB. As the tone wheel rotates, the tooth shifts the magnetic field and the IC enables a second 7 mA current source. The CAB senses a voltage signal of approximately 1.6 volts and 14 mA. The CAB measures the amperage of the digital signal for each wheel. The resulting signal is interpreted by the ABS CAB as the wheel speed.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Disconnect the wheel speed sensor cable connector from the wiring harness on the inside of the frame rail above the front suspension crossmember (Fig. 4). The connector has a locking tab which that must be pulled back before the connector release tang can be depressed, releasing the connection.

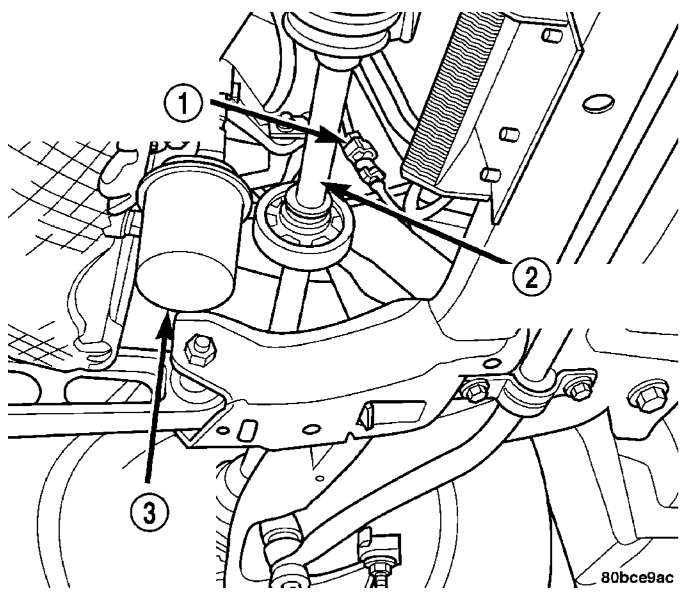


Fig. 4 Wiring Harness Connector

1 - RIGHT FRONT WHEEL SPEED SENSOR CONNECTOR
2 - RIGHT FRONT DRIVESHAFT
3 - ENGINE OIL FILTER

(3) If the sensor being removed is a left front, unclip the speed sensor cable from the brake tube on the inside of and under the frame rail (Fig. 5).

(4) Remove the speed sensor cable grommet from the retaining bracket attached to the brake hose on the outside of the frame rail.

FRONT WHEEL SPEED SENSOR (Continued)

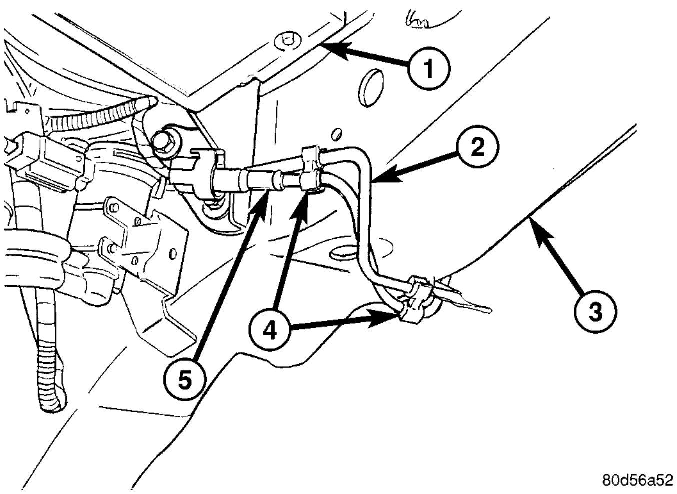


Fig. 5 LEFT SENSOR ROUTING ALONG BRAKE TUBE

1 - ABS ICU
2 - BRAKE TUBE
3 - FRAME RAIL
4 - ROUTING CLIPS
5 - WHEEL SPEED SENSOR CABLE

(5) Remove the bolt mounting the wheel speed sensor head to the steering knuckle (Fig. 6).

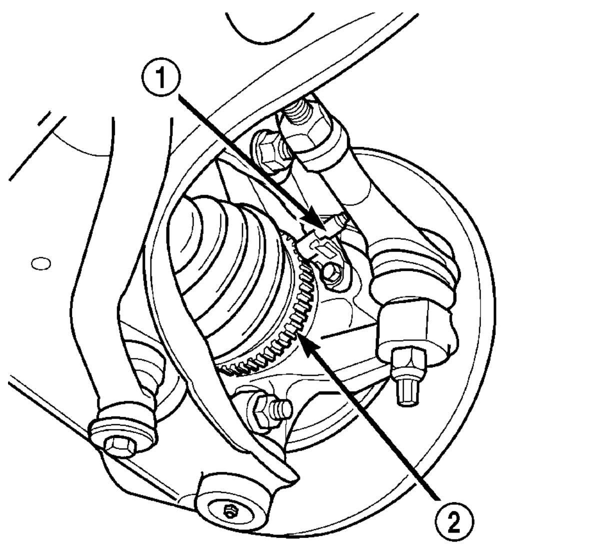


Fig. 6 Wheel Speed Sensor

1 - RIGHT FRONT WHEEL SPEED SENSOR
2 - TONE WHEEL

CAUTION: When removing a wheel speed sensor from the knuckle, do not use pliers on the sensor head. This may damage the sensor head. If the sensor has seized, use a hammer and a punch to tap the edge of the sensor head ear, rocking the sensor side-to-side until free.

(6) Carefully, remove the sensor head from the steering knuckle.

(7) Remove the screw securing the wheel speed sensor to the rear of the strut (Fig. 7). Remove the wheel speed sensor.

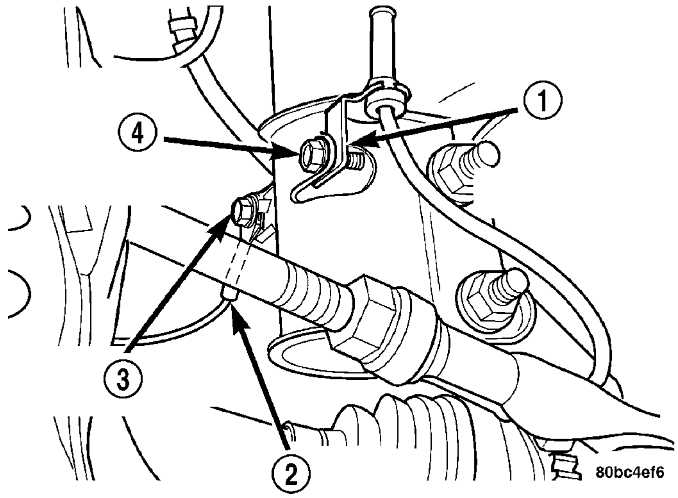


Fig. 7 Wheel Speed Sensor At Strut

1 - ABS WHEEL SPEED SENSOR ROUTING BRACKET (IF EQUIPPED)
2 - GROUND STRAP
3 - GROUND STRAP SCREW
4 - ABS SENSOR BRACKET SCREW (IF EQUIPPED)

INSTALLATION

CAUTION: Failure to install speed sensor cables properly may result in contact with moving parts or an over extension of cables causing an open circuit. Be sure that cables are installed, routed, and clipped properly.

(1) Attach the wheel speed sensor to the strut using the its mounting screw (Fig. 7).

(2) Install the wheel speed sensor head in the steering knuckle (Fig. 6). Install the mounting bolt. Tighten the mounting bolt to a torque of 12 N·m (105 in. lbs.).

(3) From the sensor bracket on the strut, loop the sensor cable upward, then downward at the outside of the frame rail. Install the speed sensor cable grommet onto the retaining bracket attached to the brake hose on the outside of the frame rail.

(4) Loop the wheel speed sensor cable around the bottom of the frame rail and connect it to the wiring harness connector on the inside of the frame rail (Fig. 4). Remember to push in the locking tab on the connector.

(5) If the sensor being installed is the left front, clip the speed sensor cable to the brake tube on the inside of and under the frame rail (Fig. 5).

(6) Lower the vehicle.

FRONT WHEEL SPEED SENSOR (Continued)

(7) Road test vehicle to ensure proper operation of the base brakes and ABS.

REAR WHEEL SPEED SENSOR

DESCRIPTION

The Mark 20e system uses two-wire wheel speed sensors, known as active wheel speed sensors. The sensors use an electronic principle known as magnetoresistive to help increase performance and durability. The sensors convert wheel speed into a small digital signal. A wheel speed sensor is used at each wheel. The gear (tooth) type tone wheel serves as the trigger mechanism for each sensor. At each wheel of the vehicle there is one wheel speed sensor and one tone wheel.

The rear wheel speed sensors are mounted through the disc brake adapter (Fig. 8) (Fig. 9). The rear tone wheels are mounted to and rotate with the hub and bearing assemblies.

The WSS air gaps are not adjustable. The initial factory WSS air gap specification can be found in SPECIFICATIONS. Each WSS is serviced individually. The tone wheels are serviced as an assembly with the hub and bearing assemblies.

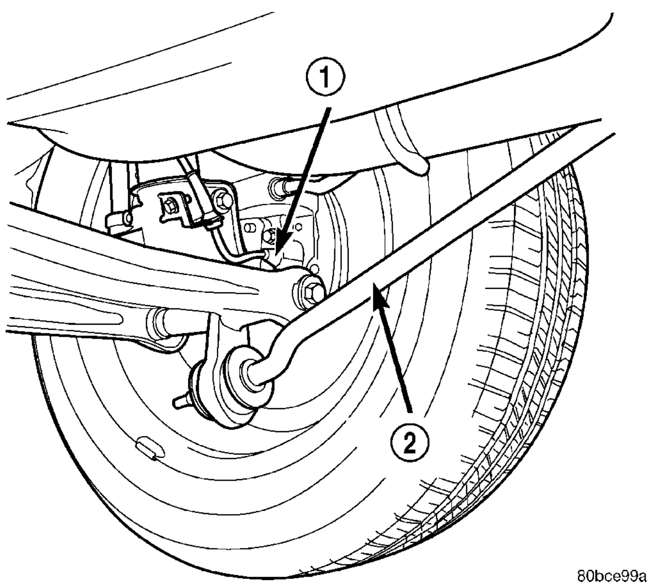


Fig. 8 Left Rear Wheel Speed Sensor

1 - LEFT REAR WHEEL SPEED SENSOR
2 - TENSION STRUT

OPERATION

The CAB sends 12 volts to power an Integrated Circuit (IC) in the sensor. The IC supplies a constant 7 mA power supply to the CAB. The relationship of the tooth on the tone wheel to the permanent magnet in the sensor, signals the IC to enable a second 7 mA power supply. The output of the sensor, sent to the CAB, is a DC voltage signal with changing voltage and current levels. The ground for the IC and the current sense circuit is provided by the CAB.

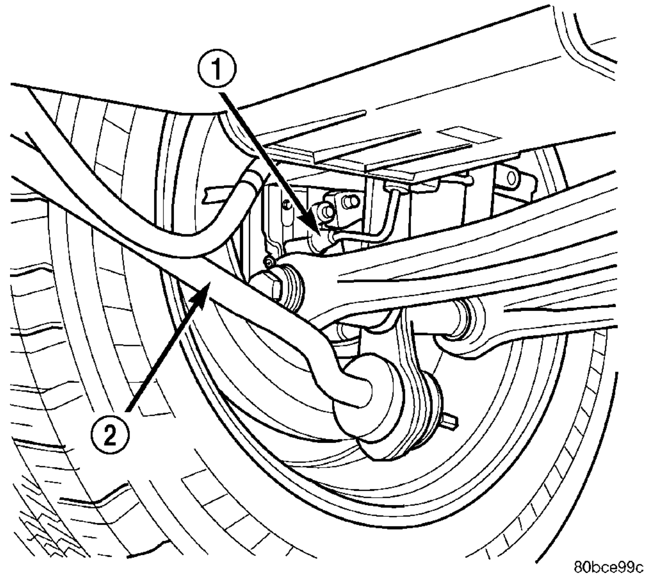


Fig. 9 Right Rear Wheel Speed Sensor

1 - RIGHT REAR WHEEL SPEED SENSOR
2 - TENSION STRUT

When a valley of the tone wheel is aligned with the sensor, the voltage signal is approximately 0.8 volts and a constant 7 mA current is sent to the CAB. As the tone wheel rotates, the tooth shifts the magnetic field and the IC enables a second 7 mA current source. The CAB senses a voltage signal of approximately 1.6 volts and 14 mA. The CAB measures the amperage of the digital signal for each wheel. The resulting signal is interpreted by the ABS CAB as the wheel speed.

REMOVAL

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Disconnect the wheel speed sensor cable connector from the vehicle wiring harness (Fig. 10). Remove the clip attaching wheel speed sensor cable connector to the vehicle's body.

(3) Remove the wheel speed sensor cable routing bracket from under rear brake flex hose mounting bracket. Then remove the speed sensor cable from the routing clips on the rear brake flex hose and chassis brake tube.

(4) Remove the bolt attaching the wheel speed sensor cable routing bracket to rear strut.

REAR WHEEL SPEED SENSOR (Continued)

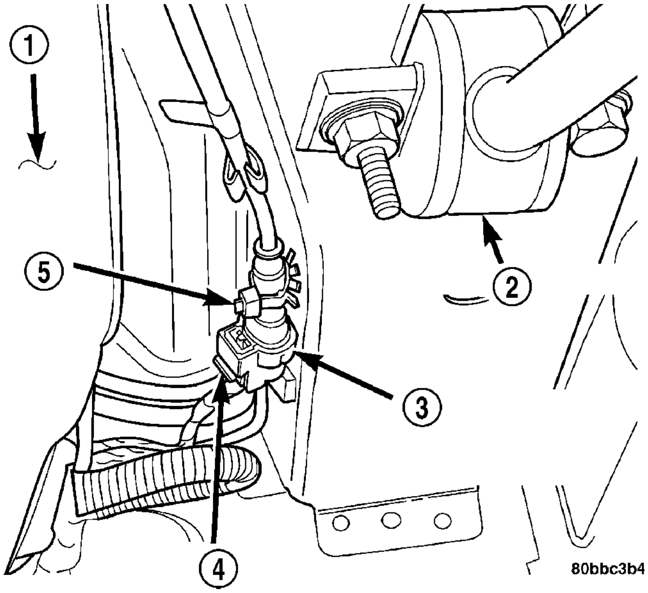


Fig. 10 Wheel Speed Sensor Connector

1 - FUEL TANK
2 - TENSION STRUT
3 - WHEEL SPEED SENSOR CONNECTOR
4 - LOCKING TAB
5 - CLIP

CAUTION: When removing a wheel speed sensor from the rear disc brake adapter, do not use pliers on the sensor head. This may damage the sensor head. If the sensor has seized, use a hammer and a punch to tap the edge of the sensor head ear, rocking the sensor side-to-side until free.

(5) Remove the bolt attaching the wheel speed sensor to the rear disc brake adapter (Fig. 11), then carefully remove the sensor head from the rear disc brake adapter and vehicle.

INSTALLATION

NOTE: Before proceeding with this procedure, (Refer to 5 - BRAKES - WARNING).

CAUTION: Failure to install speed sensor cables properly may result in contact with moving parts or an over extension of cables causing an open circuit. Be sure that cables are installed, routed, and clipped properly.

(1) Install the wheel speed sensor head into the disc brake adapter (Fig. 11).

(2) Install the wheel speed sensor mounting bolt. Tighten the mounting bolt to a torque of 12 N·m (105 in. lbs.).

(3) Install the wheel speed sensor cable routing bracket on the rear strut.

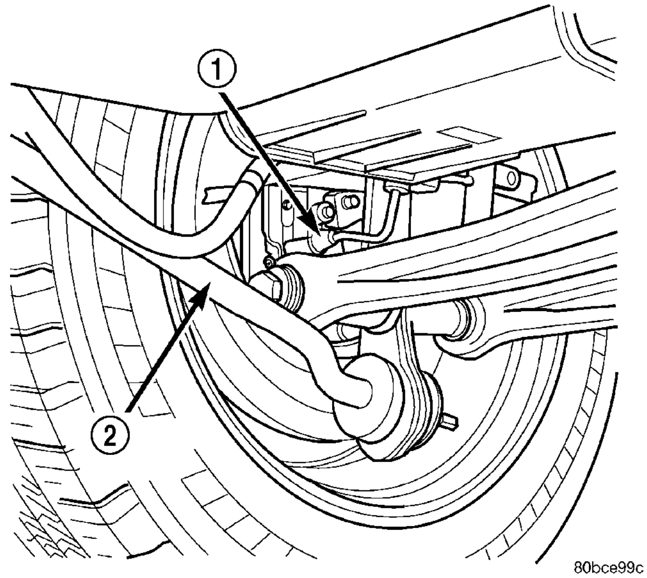


Fig. 11 Rear Wheel Speed Sensor

1 - RIGHT REAR WHEEL SPEED SENSOR
2 - TENSION STRUT

(4) Install wheel speed sensor cable into the routing clips on the rear brake hose and brake tube.

(5) Connect the wheel speed sensor cable connector into vehicle wiring harness (Fig. 10). Install the clip attaching the wheel speed sensor cable connector to vehicle's body.

(6) Lower the vehicle.

(7) Road test the vehicle to ensure proper operation of the base brakes and ABS.

TONE WHEEL

DESCRIPTION

The tone wheel is used in conjunction with the wheel speed sensors. (Refer to 5 - BRAKES - ABS/ELECTRICAL/FRONT WHEEL SPEED SENSOR - DESCRIPTION) or (Refer to 5 - BRAKES - ABS/ELECTRICAL/REAR WHEEL SPEED SENSOR - DESCRIPTION)

OPERATION

The tone wheel is used in conjunction with the wheel speed sensors. (Refer to 5 - BRAKES - ABS/ELECTRICAL/FRONT WHEEL SPEED SENSOR - OPERATION) or (Refer to 5 - BRAKES - ABS/ELECTRICAL/REAR WHEEL SPEED SENSOR - OPERATION)

INSPECTION

Tone wheels can cause erratic wheel speed sensor signals. Inspect tone wheels for the following possible causes:

- missing, chipped, or broken teeth

TONE WHEEL (Continued)

- contact with the wheel speed sensor
- wheel speed sensor to tone wheel alignment
- wheel speed sensor to tone wheel clearance
- excessive tone wheel runout
- tone wheel loose on its mounting surface

If a front tone wheel is found to need replacement, the drive shaft must be replaced. No attempt should be made to replace just the tone wheel. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).

If a rear tone wheel is found to need replacement, the rear hub and bearing must be replaced. No attempt should be made to replace just the tone wheel. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL).

If wheel speed sensor to tone wheel contact is evident, determine the cause and correct it before replacing the wheel speed sensor or tone wheel.

Check the gap between the speed sensor head and the tone wheel to ensure it is within specifications. For wheel speed sensor air gap specifications, (Refer to 5 - BRAKES - ABS - SPECIFICATIONS).

Excessive tone wheel runout can cause erratic wheel speed sensor signals. For tone wheel runout specifications, (Refer to 5 - BRAKES - ABS - SPECIFICATIONS). If tone wheel runout is excessive, determine if it is caused by a defect in the driveshaft assembly or hub and bearing. Replace as necessary.

Tone wheels are pressed onto their mounting surfaces and should not rotate independently from the mounting surface. Replace the front driveshaft or rear hub and bearing as necessary.

HCU - HYDRAULIC CONTROL UNIT

DESCRIPTION - HYDRAULIC CONTROL UNIT (HCU)

The hydraulic control unit (HCU) is mounted to the CAB as part of the ICU (Fig. 14). The HCU controls the flow of brake fluid to the brakes using a series of valves and accumulators. A pump/motor is mounted on the HCU to supply build pressure to the brakes during an ABS stop.

VALVES AND SOLENOIDS

The valve block contains four inlet valves and four outlet solenoid valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring-loaded in the closed position during normal braking. The fluid is allowed to flow from the master cylinder to the wheel brakes.

During an ABS stop, these valves cycle to maintain the proper slip ratio for each wheel. The inlet valve closes preventing further pressure increase and the outlet valve opens to provide a path from the wheel brake to the HCU accumulators and pump/motor. This releases (decays) pressure from the wheel brake, thus releasing the wheel from excessive slippage. Once the wheel is no longer slipping, the outlet valve is closed and the inlet valve is opened to reapply (build) pressure.

BRAKE FLUID ACCUMULATORS

There are two fluid accumulators in the HCU: one for the primary hydraulic circuit, and one for the secondary hydraulic circuit. Each hydraulic circuit uses a 3 cc accumulator.

The fluid accumulators temporarily store brake fluid that is removed from the wheel brakes during an ABS cycle. This stored fluid is used by the pump/motor to provide build pressure for the brake hydraulic system. When the antilock stop is complete, the accumulators are drained by the pump/motor.

There are two noise dampening chambers in the HCU on this vehicle equipped with traction control.

PUMP/MOTOR

There are two pump assemblies in the HCU: one for the primary hydraulic circuit, and one for the secondary hydraulic circuit. Both pumps are driven by a common electric motor (Fig. 14). This DC-type motor is integral to the HCU and is controlled by the CAB.

The pump/motor provides the extra amount of brake fluid needed during antilock braking. Brake fluid is released to the accumulators when the outlet valve is opened during an antilock stop. The pump mechanism consists of two opposing pistons operated by an eccentric camshaft. In operation, these pistons are used to purge fluid from the accumulators back into the master cylinder circuits. When the antilock stop is complete, the pump/motor drains the accumulators.

The pump motor is also used to build pressure when the system goes into traction control mode. For more information, (Refer to 5 - BRAKES/ELECTRICAL/TRACTION CONTROL SWITCH - DESCRIPTION).

The CAB may turn on the pump/motor when an antilock stop is detected. The pump/motor continues to run during the antilock stop and is turned off after the stop is complete. Under some conditions, the pump/motor runs to drain the accumulators during the next drive-off.

The pump/motor is not a serviceable item; if it requires replacement, the HCU must be replaced.

OPERATION - HYDRAULIC CIRCUITS AND VALVES

The hydraulic fluid control valves control the flow of pressurized brake fluid to the wheel brakes during

HCU - HYDRAULIC CONTROL UNIT (Continued)

the different modes of ABS braking. The following paragraphs explain how this works. For purposes of explanation only, it is assumed that only the right front wheel is experiencing antilock braking; the following diagrams show only the right front wheel in an antilock braking operation.

NORMAL BRAKING HYDRAULIC CIRCUIT AND SOLENOID VALVE FUNCTION

The hydraulic diagram (Fig. 12) shows the vehicle in the normal braking mode of the base brake hydraulic system. The diagram shows no wheel spin or slip occurring relative to the speed of the vehicle. The driver is applying the brake pedal; this builds pressure in the brake hydraulic system to engage the brakes and stop the vehicle.

ABS HYDRAULIC CIRCUIT AND SOLENOID VALVE FUNCTION

The hydraulic diagram (Fig. 13) shows the vehicle in the ABS braking mode. The diagram shows one wheel is slipping because the driver is attempting to stop the vehicle at a faster rate than is allowed by the surface on which the tires are riding.

- The normally open and normally closed valves modulate (build/decay) the brake hydraulic pressure as required.
- The pump/motor is switched on so that the brake fluid from the low pressure accumulators is returned to the master cylinder circuits.
- The brake fluid is routed to either the master cylinder or the wheel brake depending on the position of the normally open valve.

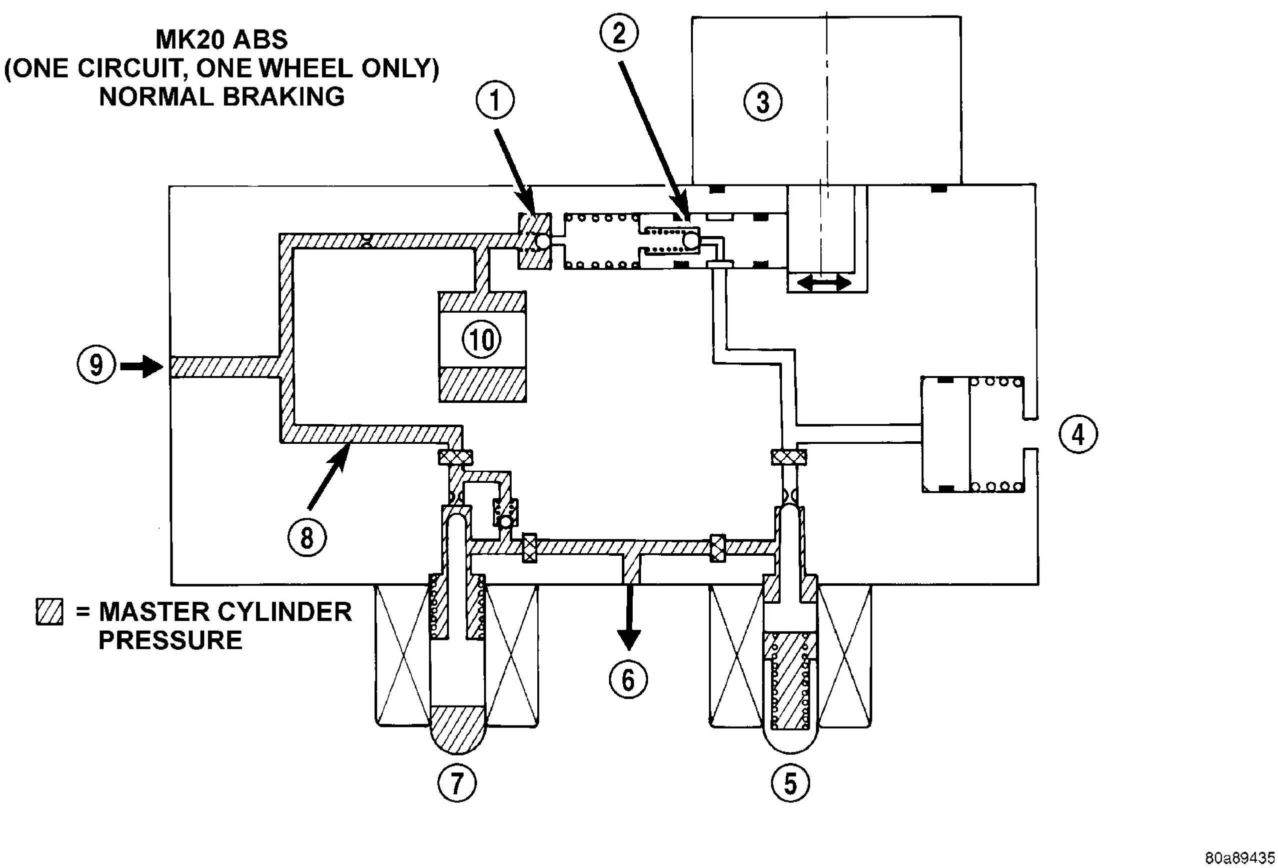


Fig. 12 Normal Braking Hydraulic Circuit

1 - OUTLET VALVE
2 - PUMP PISTON
3 - PUMP MOTOR (OFF)
4 - LOW PRESSURE ACCUMULATOR
5 - NORMALLY CLOSED VALVE (OFF)
6 - TO RIGHT FRONT WHEEL
7 - NORMALLY OPEN VALVE (OFF)
8 - MASTER CYLINDER PRESSURE
9 - FROM MASTER CYLINDER
10 - NOISE DAMPER CHAMBER

HCU - HYDRAULIC CONTROL UNIT (Continued)

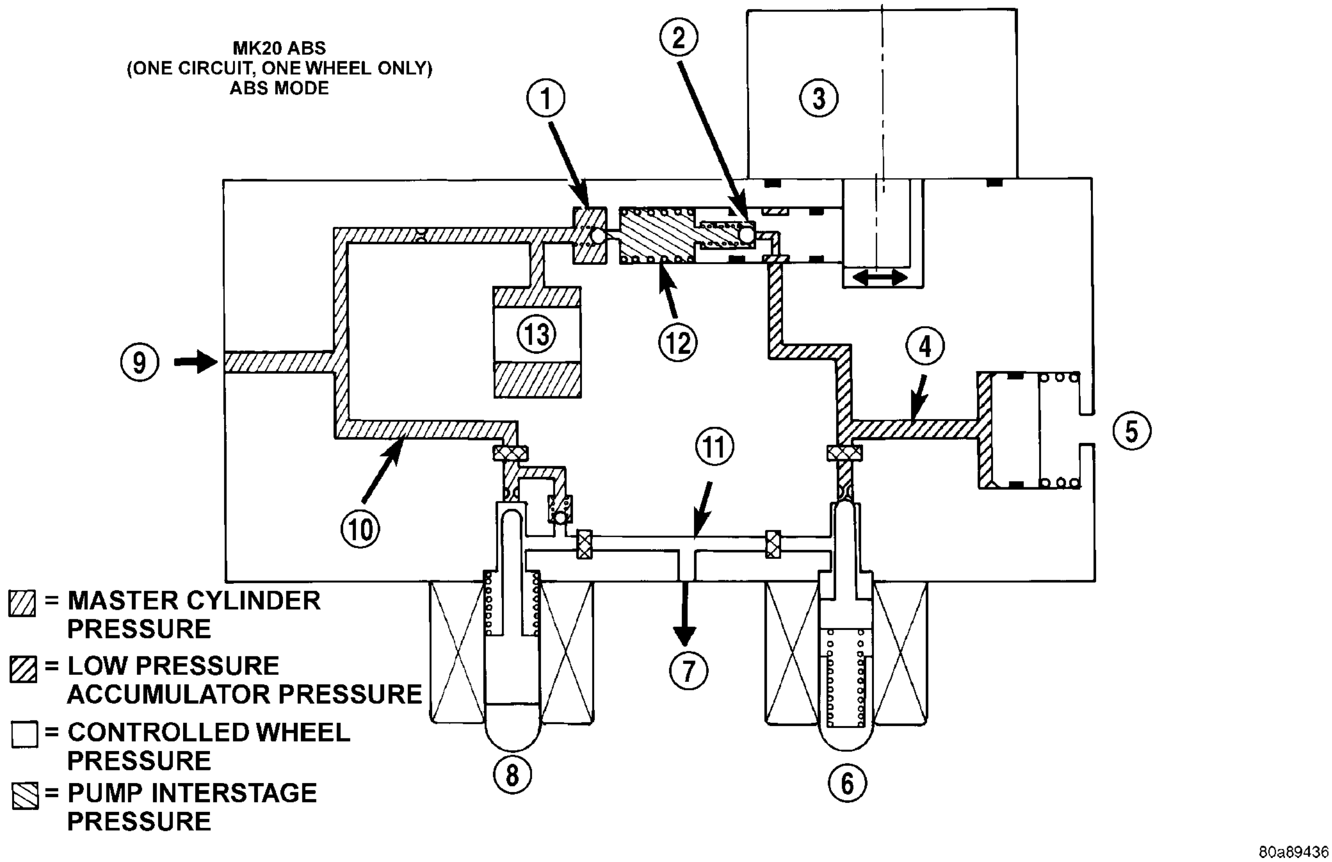


Fig. 13 ABS Mode Hydraulic Circuit (Without Traction Control)

1 - OUTLET VALVE
2 - PUMP PISTON
3 - PUMP MOTOR (ON)
4 - LOW PRESSURE ACCUMULATOR PRESSURE
5 - LOW PRESSURE ACCUMULATOR
6 - NORMALLY CLOSED VALVE (MODULATING)
7 - TO RIGHT FRONT WHEEL
8 - NORMALLY OPEN VALVE (MODULATING)
9 - FROM MASTER CYLINDER
10 - MASTER CYLINDER PRESSURE
11 - CONTROLLED WHEEL PRESSURE
12 - PUMP INTERSTAGE PRESSURE
13 - NOISE DAMPER CHAMBER

ICU - INTEGRATED CONTROL UNIT

DESCRIPTION

The hydraulic control unit (HCU) and the controller antilock brake (CAB) used with this antilock brake system are combined (integrated) into one unit, which is called the integrated control unit (ICU) (Fig. 14). The ICU is located on the driver's side of the vehicle, below the master cylinder (Fig. 15).

The ICU consists of the following components: the CAB, eight (build/decay) solenoid valves (four inlet valves and four outlet valves), valve block, fluid accumulators, a pump, and an electric pump/motor.

The replaceable components of the ICU are the HCU and the CAB. No attempt should be made to service any components of the HCU or CAB.

For additional information on the CAB, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/CONTROLLER ANTILOCK BRAKE - DESCRIPTION). For additional information on the HCU, (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - DESCRIPTION).

OPERATION

For information of the ICU, refer to these individual components of the ICU:

• CONTROLLER ANTILOCK BRAKE (CAB) (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/CONTROLLER ANTILOCK BRAKE - OPERATION)

• HYDRAULIC CONTROL UNIT (HCU) (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - OPERATION)

ICU - INTEGRATED CONTROL UNIT (Continued)

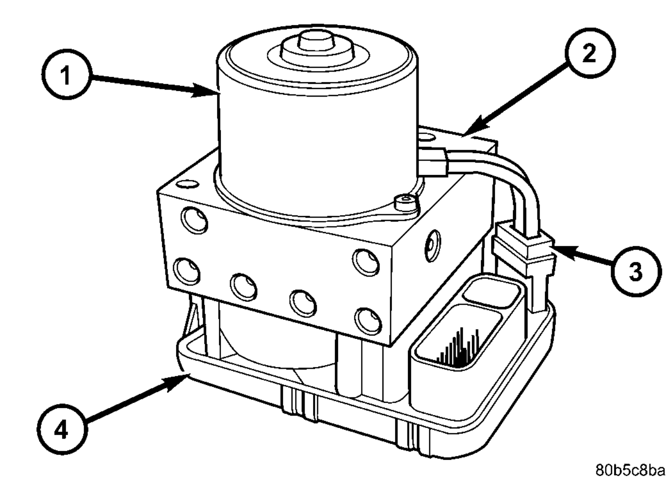


Fig. 14 Integrated Control Unit (ICU)

1 - PUMP/MOTOR
2 - HCU
3 - PUMP/MOTOR WIRING CONNECTOR
4 - CAB

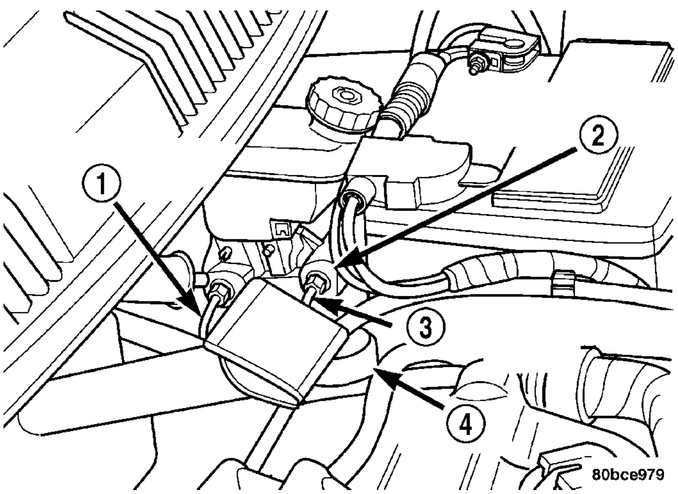


Fig. 15 Master Cylinder And ICU

1 - PRIMARY BRAKE TUBE
2 - MASTER CYLINDER
3 - SECONDARY BRAKE TUBE
4 - ABS ICU

REMOVAL - ICU

NOTE: If servicing the controller antilock brake (CAB) only, the CAB can be serviced with the ICU mounted in the vehicle. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/CONTROLLER ANTILOCK BRAKE - REMOVAL)

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING).

(1) Using a brake pedal holder, depress the brake pedal past its first one inch of travel and hold it in this position (Fig. 16). This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

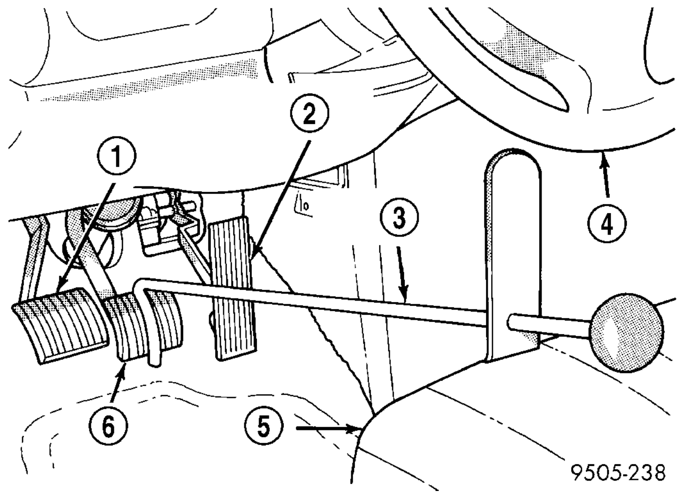


Fig. 16 Brake Pedal Holder

1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
2 - THROTTLE PEDAL
3 - BRAKE PEDAL HOLDING TOOL
4 - STEERING WHEEL
5 - DRIVER'S SEAT
6 - BRAKE PEDAL

(2) Disconnect negative (ground) cable from the battery and isolate the cable.

(3) Disconnect the positive cable from the battery, then remove the battery from the battery tray. There is one nut securing the clamp on the backside of the battery holding it in place.

(4) Remove the one nut and one bolt securing the air cleaner box in place, then disconnect the wiring harness connector at the air inlet sensor.

(5) Lift the air cleaner box upward enough to clear its grommeted alignment post (Fig. 17), then move the air cleaner box forward just enough to access the battery tray mounting bolts.

(6) Remove the 2 bolts, then the 2 nuts mounting the battery tray to its bracket (Fig. 17). Remove the battery tray.

(7) Disconnect the primary and secondary brake tubes from the master cylinder (Fig. 18). Install plugs in the master cylinder outlet ports.

(8) Disconnect the 24-way connector from the controller antilock brake (CAB) mounted on the integrated control unit (ICU) and move it out of the way. The connector is disconnected by pulling outward on the connector lock (Fig. 19). This will unlock and raise the 24-way connector out of the socket on the CAB.

(9) Tag the brake tubes coming from the master cylinder as primary and secondary (Fig. 18). This is

ICU - INTEGRATED CONTROL UNIT (Continued)

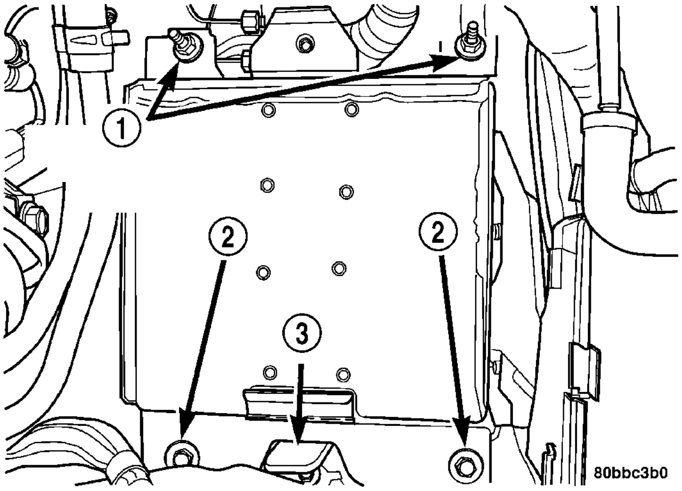


Fig. 17 Battery Tray Mounting

1 - BATTERY TRAY MOUNTING NUTS
2 - BATTERY TRAY MOUNTING BOLTS
3 - AIR CLEANER BOX POST

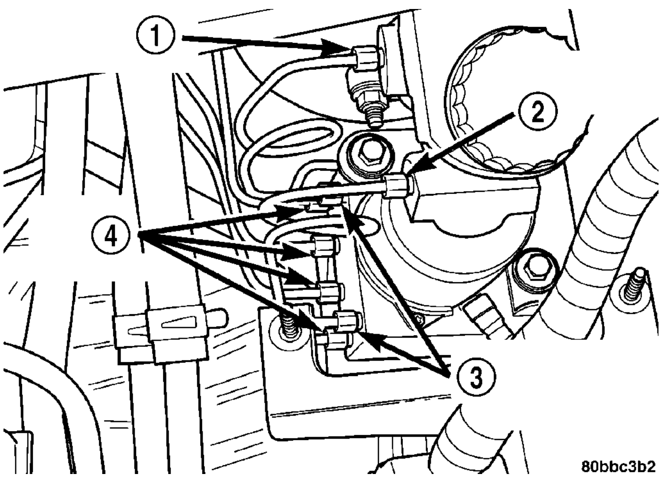


Fig. 18 Brake Tube Locations

1 - PRIMARY BRAKE TUBE
2 - SECONDARY BRAKE TUBE
3 - BRAKE TUBES FROM MASTER CYLINDER
4 - BRAKE TUBES TO BRAKES

done to avoid mix-up once the tubes are removed from the vehicle.

(10) Disconnect and remove the primary and secondary brake tubes coming from the master cylinder at the ICU hydraulic control unit (HCU) (Fig. 18).

(11) Disconnect the brake tubes going to each individual brake at the HCU (Fig. 18).

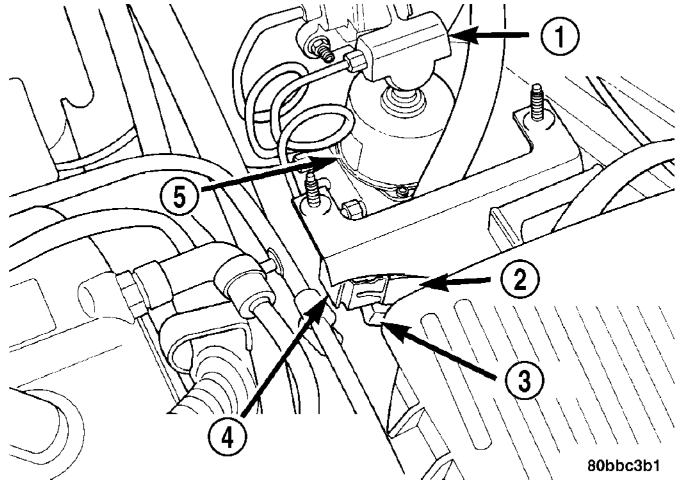


Fig. 19 Connector Lock Pulled Outward

1 - MASTER CYLINDER
2 - 24–WAY CONNECTOR
3 - CAB
4 - CONNECTOR LOCK PULLED OUTWARD
5 - ICU

(12) Remove the 3 bolts attaching the ICU to its mounting bracket. (Fig. 20).

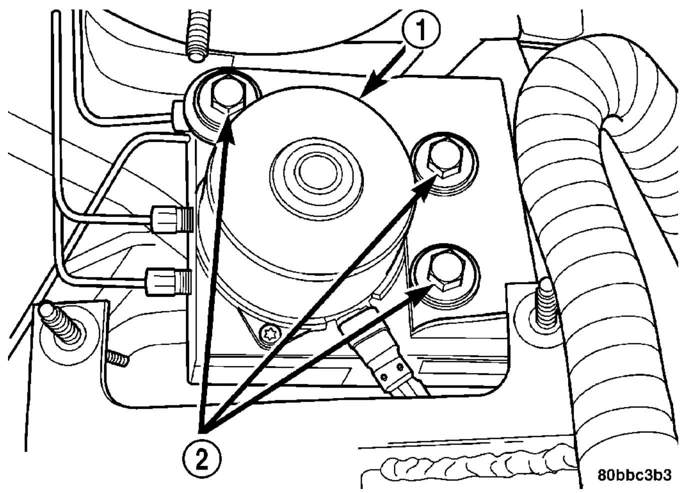


Fig. 20 ICU Mounting Bolts

1 - ICU
2 - ICU MOUNTING BOLTS

(13) Remove the ICU from the vehicle.

(14) If the CAB and HCU must be separated, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ ICU (INTEGRATED CONTROL UNIT) - DISASSEMBLY).

ICU - INTEGRATED CONTROL UNIT (Continued)

DISASSEMBLY - ICU

(1) Disconnect the pump/motor wiring harness from the CAB (Fig. 21).

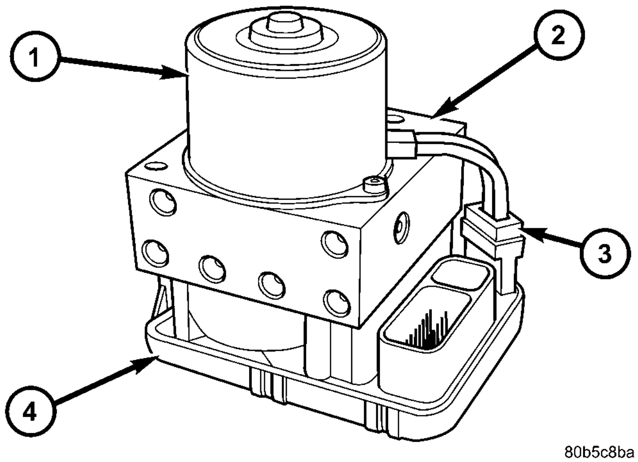


Fig. 21 Integrated Control Unit (ICU)

1 - PUMP/MOTOR
2 - HCU
3 - PUMP/MOTOR WIRING CONNECTOR
4 - CAB

(2) Remove the 4 bolts attaching the CAB to the HCU (Fig. 22).

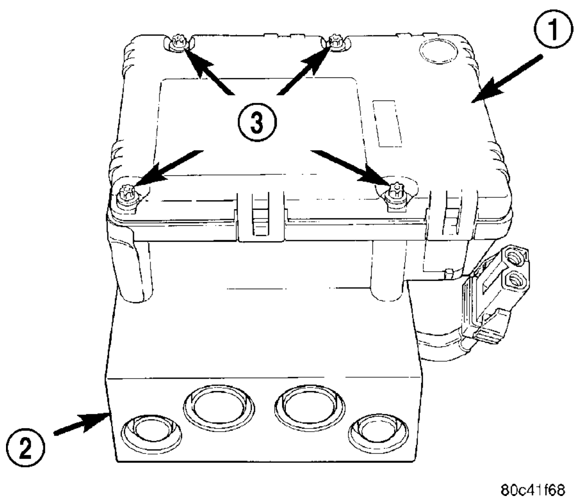


Fig. 22 CAB Attaching Bolts

1 - CAB
2 - HCU VALVE BLOCK
3 - MOUNTING BOLTS

(3) Remove the CAB from the HCU (Fig. 23).

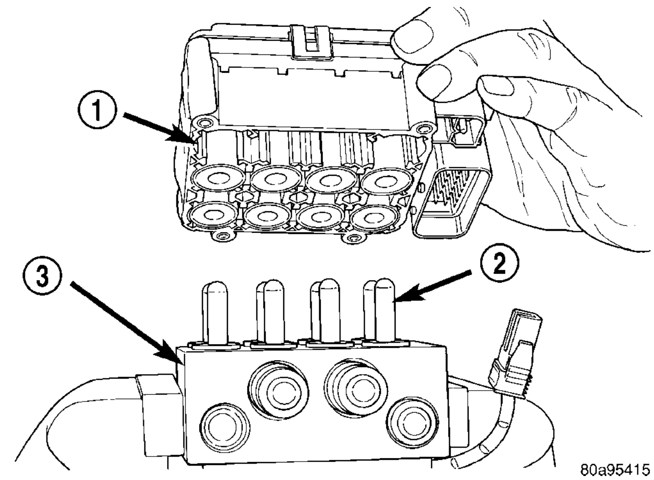


Fig. 23 Remove/Install CAB (Typical)

1 - CAB
2 - HCU VALVES
3 - HCU VALVE BLOCK

ASSEMBLY - ICU

(1) Install the CAB on the HCU (Fig. 23).

(2) Install the 4 bolts mounting the CAB to the HCU (Fig. 22). Tighten the CAB mounting bolts to a torque of 2 N·m (17 in. lbs.).

(3) Plug the pump/motor wiring harness into the CAB (Fig. 21).

(4) Install the ICU in the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION)

INSTALLATION - ICU

(1) Install the ICU onto its mounting bracket.

(2) Install the 3 bolts attaching the ICU to the mounting bracket (Fig. 20). Tighten the 3 mounting bolts to a torque of 11 N·m (97 in. lbs.)

(3) Install the four brake tubes going to the brakes into their respective outlet ports on the ICU HCU (Fig. 18). Using a crow foot on a torque wrench, tighten the four brake tube nuts to a torque of 17 N·m (145 in. lbs.).

NOTE: When installing the brake tubes from the master cylinder on the HCU, the brake tube with the small tube nut is to be installed in the forward-most port on the HCU with the small end going toward the master cylinder secondary port.

ICU - INTEGRATED CONTROL UNIT (Continued)

(4) Install the primary and secondary brake tubes from the master cylinder onto the HCU (Fig. 18). Do not completely tighten the primary and secondary tubes at this time.

(5) Connect the primary and secondary brake tubes to the master cylinder ports (Fig. 18).

(6) Using a crow foot on a torque wrench, tighten the primary and secondary brake tube nuts at both the master cylinder and HCU to a torque of 17 N·m (145 in. lbs.).

CAUTION: Before installing the 24-way connector in the CAB, be sure the seal is properly installed in the connector.

(7) Install the 24-way connector into the socket of the CAB as follows:

- Position the 24-way connector in the socket of the CAB and carefully push it down as far as possible (Fig. 19).
- When the connector is fully seated into the CAB socket, push the connector lock inward. This pulls the connector into the socket of the CAB and locks it in the installed position.

(8) Position the battery tray back in place. Install the two bolts, then the two nuts mounting the battery tray to its bracket (Fig. 17). Tighten the two bolts and nuts to a torque of 15 N·m (135 in. lbs.).

(9) Reinstall the air cleaner box onto its grommeted alignment post (Fig. 17).

(10) Install the one nut and one bolt securing the air cleaner box in place, then connect the wiring harness connector at the air inlet sensor.

(11) Install the battery and clamp it in place. Tighten the hold-down clamp bolt to a torque of 12 N·m (105 in. lbs.).

(12) Connect the positive, then the negative (ground) cable on the battery.

NOTE: The ICU may need to be initialized using the DRBIII® scan tool after ICU installation. Refer to Appropriate Diagnostic Information.

(13) Bleed the base brakes and ABS hydraulic systems. (Refer to 5 - BRAKES - ABS - STANDARD PROCEDURE).

(14) Fill the master cylinder to the proper fill level.

(15) Road test the vehicle to ensure proper operation of the base and antilock brake systems.

CLUTCH

TABLE OF CONTENTS

CLUTCH

DESCRIPTION

MECHANICAL

PL vehicles with a 2.0/2.4L engine use a modular clutch assembly (Fig. 1). The clutch is located between the engine and manual transaxle in the transaxle bellhousing. The 2.0/2.4L clutch system consists of the following components:

- Flywheel
- Clutch Disc
- Pressure Plate
- Diaphragm Spring
- Cover

HYDRAULIC

The clutch hydraulic system is a self-contained system that consists of a clutch master/slave cylinder assembly and a fluid reservoir (Fig. 2).

FLUID

CAUTION: Never use any type of petroleum-based fluid (engine oil, transmission oil, power steering fluid, etc.) in the clutch hydraulic system. Use of such fluids will result in master/slave cylinder seal damage, and cause a failure of the hydraulic clutch release system.

NOTE: The clutch hydraulic system and replacement components are pre-filled, and under normal operating conditions, additional fluid is not required for the life of the vehicle.

CLUTCH (Continued)

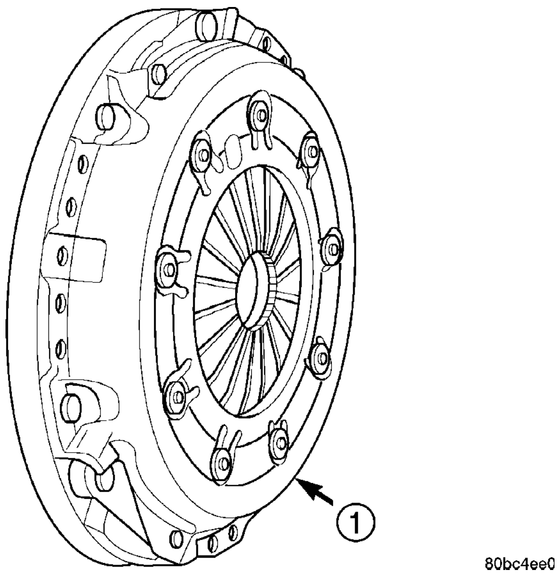


Fig. 1 Modular Clutch Assembly

1 - MODULAR CLUTCH ASSEMBLY

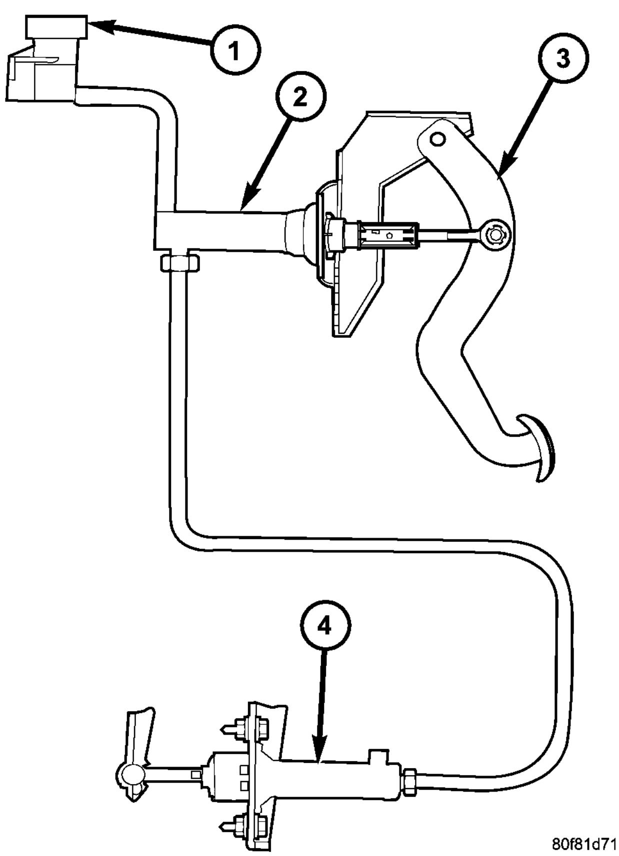


Fig. 2 Clutch Hydraulic System—Typical

1 - RESERVOIR
2 - MASTER CYLINDER
3 - PEDAL ASSEMBLY
4 - SLAVE CYLINDER

The fluid required for use in the clutch hydraulic system is brake fluid conforming to DOT 3 specifications and J1703 standards. No other type of fluid is recommended or approved for use in the clutch hydraulic system. use only Mopar® brake fluid or equivalent from a tightly sealed container.

OPERATION

MECHANICAL

The clutch assembly is designed to transmit power from the engine to the manual transaxle. This is accomplished by the friction and clamping force generated when the spring loaded pressure plate locks the clutch disc to the flywheel (Fig. 3). The clutch disc, which is splined to the transaxle input shaft, transmits power until the center of the diaphragm spring is depressed, and the clamp force is removed from the disc.

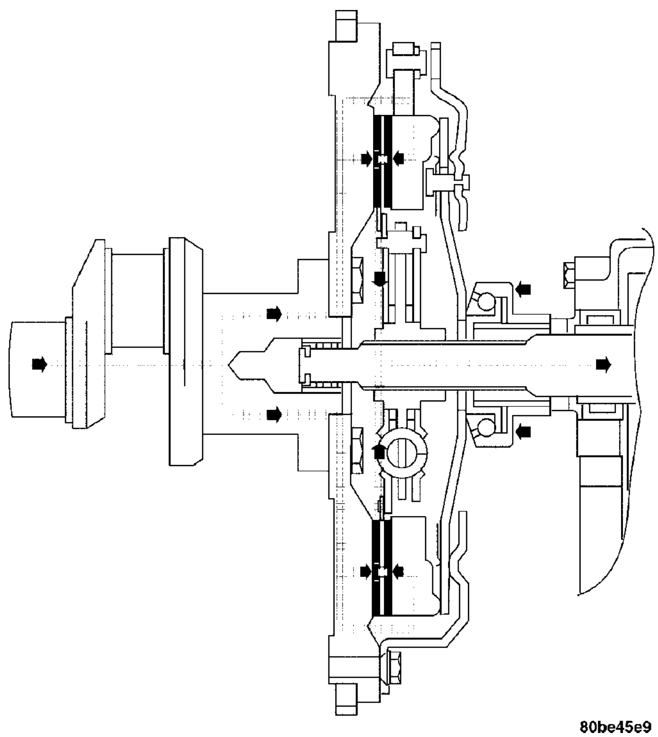


Fig. 3 Clutch Coupling Powerflow - Typical

HYDRAULIC

The clutch hydraulic system is responsible for engaging and disengaging the clutch. Depressing the clutch pedal develops fluid pressure in the clutch master cylinder. This pressure is transmitted to the slave cylinder through a connecting line. In turn, the slave cylinder operates the clutch release lever (Fig. 2).

CLUTCH (Continued)

The slave cylinder spring causes the release lever to hold the release bearing in constant contact with the diaphragm spring (release bearing preload). During a clutch pedal actuation, the hydraulic fluid pressure applies additional force to the release lever. As additional force is applied, the bearing presses the diaphragm spring fingers inward on the fulcrums. This action moves the pressure plate rearward, relieving clamp force on the disc.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CLUTCH SYSTEM

Clutch problem diagnosis will generally require a road test to determine the type of fault. Component inspection will then determine the problem after road testing.

Drive the vehicle at normal speeds during road test. Shift the transaxle through all gear ranges and observe clutch action. If chatter, grab, slip, or improper release is experienced, remove and inspect the clutch components. If the problem is noise or hard shifting, further diagnosis may be needed. The transaxle or other driveline components may actually be at fault.

SERVICE DIAGNOSIS - CLUTCH GRAB/CHATTER

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC FACING COVERED WITH OIL OR GREASE	Oil leak at engine rear main or transaxle input shaft seal.	Correct leak and replace clutch assembly.
	Too much grease applied to splines of disc and input shaft.	Apply lighter coating of grease to splines.
NO FAULT FOUND WITH CLUTCH COMPONENTS	Problem actually related to suspension or driveline component.	Further diagnosis required. Check engine/transmission mounts, suspension attaching parts and other driveline components as needed.
	Engine related problems.	Check EFI and ignition systems.
PARTIAL ENGAGEMENT OF CLUTCH DISC	Clutch cover, spring, or release fingers bent, distorted (rough handling, improper assembly).	Replace clutch assembly.
	Clutch disc damaged or distorted.	Replace clutch assembly.
	Clutch misalignment.	Verify modular clutch pilot plate alignment to crankshaft. Replace the clutch assembly if the pilot plate is loose or bent.

SERVICE DIAGNOSIS - CLUTCH SLIPS

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC FACING WORN OUT	Normal wear.	Replace clutch assembly.
	Driver frequently rides (slips) clutch, results in rapid wear, overheating.	Replace clutch assembly.
	Insufficient clutch cover diaphragm spring tension	Replace clutch assembly.
CLUTCH DISC FACING CONTAMINATED WITH OIL OR GREASE	Leak at rear main oil seal or transaxle input shaft seal	Replace leaking seals. Replace clutch assembly.
	Excessive amount of grease applied to input shaft splines	Apply less grease to input shaft. Replace clutch assembly

CLUTCH (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	Road splash, water entering housing	Seal housing. Inspect clutch assembly.
CLUTCH IS RUNNING PARTIALLY DISENGAGED	Release bearing sticking or binding, does not return to normal running position.	Verify that bearing is actually binding. Then, replace bearing and transmission front bearing retainer if sleeve surface is damaged.
	Clutch master cylinder pushrod not adjusted properly, causing high preload (LHD Models).	Verify that pushrod adjustment is correct.
	Slave cylinder binding	Replace slave cylinder.
CLUTCH DISC FACINGS HAVE FRACTURED INTO SMALL PIECES	Leak at rear main or transaxle input shaft seal	Replace seal. Replace clutch assembly.
	Excessive heat from slippage	Replace clutch assembly

SERVICE DIAGNOSIS - IMPROPER CLUTCH RELEASE

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC BINDS ON INPUT SHAFT SPLINES	Clutch disc hub splines damaged during installation	Clean, smooth, and lubricate disc and shaft splines. Replace clutch assembly and/or input shaft if splines are severely damaged.
	Input shaft splines rough, damaged.	Clean input shaft splines. Then lube.
	Corrosion or rust formations on splines of input shaft and disc	Clean input shaft splines and disc splines, then lube
CLUTCH DISC RUSTED TO FLYWHEEL AND/OR PRESSURE PLATE	Occurs in vehicles stored or not driven for extended period of time. Also occurs after steam cleaning if vehicle is not used for extended period.	Replace clutch assembly
CLUTCH WILL NOT DISENGAGE PROPERLY	Disc bent, distorted during transaxle installation	Replace clutch assembly
	Clutch cover diaphragm spring damaged during transaxle installation	Replace clutch assembly
	Release lever bent, loose, or damaged	Replace release lever if worn or damaged
	Clutch master cylinder or slave cylinder leaking	Check and replace master and/or slave cylinder
	Master cylinder adjustable pushrod loose or damaged (LHD models)	Inspect. Tighten adjustment fastener or replace master cylinder
	Master cylinder push rod not retained to pedal pin.	Inspect pushrod and bushing. Replace as necessary

CLUTCH (Continued)

SERVICE DIAGNOSIS - CLUTCH PEDAL NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH PEDAL SQUEAKS WHEN DEPRESSED TO FLOOR	Pedal bushings worn out or inadequate lubrication	Replace or lubricate bushings
	Clutch pedal return spring or return spring bushing worn out	Lubricate or replace return spring and/or bushing
	Clutch release lever pivot stud has inadequate lubrication	Lubricate or replace clutch release lever

DIAGNOSIS AND TESTING - CLUTCH CHATTER COMPLAINTS

For all clutch chatter complaints, perform the following:

(1) Check for loose, misaligned, or broken engine and transmission mounts. If present, they should be corrected at this time. Test vehicle for chatter. If chatter is gone, there is no need to go any further.

(2) If chatter persists, check hydraulic clutch release system is functioning properly.

(3) Check for loose connections in drivetrain. Correct any problems and determine if clutch chatter complaints have been satisfied. If not:

(a) Remove transaxle.

(b) Check to see if the release bearing is sticky or binding. Replace bearing, if needed.

(c) Check linkage for excessive wear on the pivot stud and fork fingers. Replace all worn parts.

(d) Check clutch assembly for contamination (dirt, oil). Replace clutch assembly, if required.

(e) Check to see if the clutch disc hub splines are damaged. Replace with new clutch assembly, if necessary.

(f) Check input shaft splines for damage. Replace, if necessary.

(g) Check for uneven wear on clutch fingers.

(h) Check for broken clutch cover diaphragm spring fingers. Replace with new clutch assembly, if necessary.

DIAGNOSIS AND TESTING - DRIVE PLATE MISALIGNMENT

Common causes of misalignment are:

- Heat warping
- Mounting drive plate on a dirty crankshaft flange
- Incorrect bolt tightening
- Improper seating on the crankshaft shoulder
- Loose crankshaft bolts

Clean the crankshaft flange before mounting the drive plate. Dirt and grease on the flange surface may misalign the flywheel, causing excessive runout. Use new bolts when mounting drive plate to crankshaft. Tighten drive plate bolts to specified torque only. Over-tightening can distort the drive plate hub causing excessive runout.

DIAGNOSIS AND TESTING - CLASH-INTO-REVERSE COMPLAINTS

All T350 manual transaxles are equipped with a reverse brake. It prevents clash when shifting into reverse, but only if the vehicle is not moving.

(1) Depress clutch pedal to floor and hold. After three seconds, shift to reverse. If clash is present, clutch has excessive spin time, and the reverse brake may not be functioning.

(2) Remove transaxle.

(3) Check the input shaft spline, clutch disc splines, and release bearing for dry rust. If present, clean rust off and apply a light coat of bearing grease to the input shaft splines. Apply grease on the input shaft splines only where the clutch disc slides. Verify that the clutch disc slides freely along the input shaft spline.

(4) Check to see if the clutch disc hub splines are damaged, and replace with new clutch assembly if required.

(5) Check the input shaft for damaged splines. Replace as necessary.

(6) Check for broken clutch cover diaphragm spring fingers.

(7) Install clutch assembly and transaxle.

STANDARD PROCEDURE—BLEEDING CLUTCH HYDRAULIC CIRCUIT

NOTE: It is necessary to bleed the clutch hydraulic release system if the system has lost an excessive amount of fluid and has ingressed air into the circuit. Air in the system typically results in a spongy pedal feel, and/or improper clutch release. If air cannot be removed from the system using this procedure, it is necessary to replace BOTH the clutch master cylinder and slave cylinder assemblies.

CLUTCH (Continued)

2.0/2.4L Engines (Except Turbo)

From driver's seat, actuate clutch pedal 60–100 times. Verify clutch operation/pedal feel. If pedal still feels spongy, or clutch does not fully disengage, excessive air is still trapped within the system. Perform the following procedure:

(1) Verify fluid level in clutch master cylinder reservoir. Top off with DOT 3 brake fluid as necessary.

(2) Raise vehicle on hoist.

(3) Remove clutch slave cylinder assembly from the transaxle case (Fig. 4), **but do not disconnect from the system**. Allow the slave cylinder hang, making it the lowest part of the system.

CAUTION: While slave cylinder is detached from the transaxle, DO NOT actuate the clutch master cylinder. Damage to the slave cylinder will result.

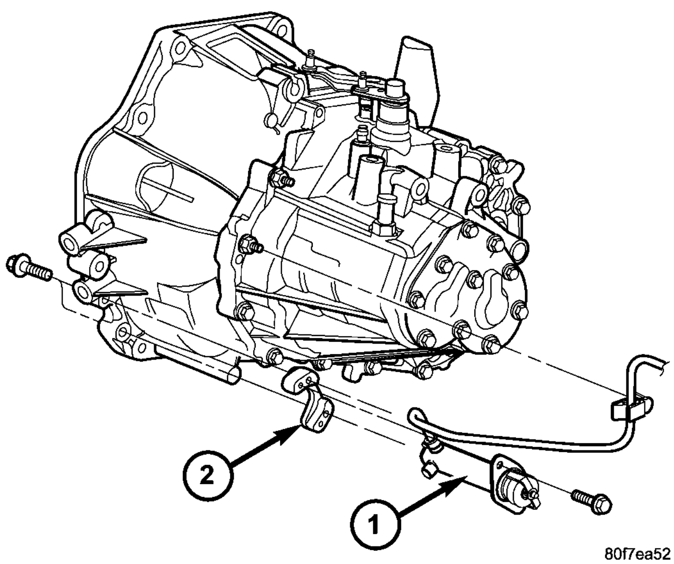


Fig. 4 Clutch Slave Cylinder - 2.0/2.4L

1 - SLAVE CYLINDER
2 - BRACKET

(4) Depress slave cylinder pushrod until it bottoms and then release. Repeat this at least ten (10) times, forcing trapped air upwards and out of the system.

(5) Re-install slave cylinder into position. Torque slave cylinder to case bolt to 19 N·m (168 in. lbs.).

(6) Lower vehicle.

(7) Check and adjust clutch master cylinder fluid level. Actuate clutch pedal thirty (30) times. Verify clutch operation/pedal feel. If pedal still feels spongy, or clutch does not fully disengage, air is still trapped within the system. Repeat Step 3 - Step 7 until air is purged. If several attempts at purging air from the system are unsuccessful, replace both the clutch master cylinder and slave cylinder assemblies.

(8) Raise vehicle.

(9) Lower vehicle.

(10) Top off clutch master cylinder fluid level with DOT 3 brake fluid as necessary.

2.4L Engine (With Turbo)

From driver's seat, actuate clutch pedal 60–100 times. Verify clutch operation/pedal feel. If pedal still feels spongy, or clutch does not fully disengage, excessive air is still trapped within the system. Perform the following procedure:

(1) Verify fluid level in clutch master cylinder reservoir. Top off with DOT 3 brake fluid as necessary.

(2) Raise vehicle on hoist.

(3) Remove clutch slave cylinder/damper assembly from the transaxle case (Fig. 5), **but do not disconnect from the hydraulic system**. Lift nylon tab with a small screwdriver, and then depress cylinder inward towards case and rotating cylinder 60° counter-clockwise. Allow the slave cylinder hang, making it the lowest part of the system.

CAUTION: While slave cylinder is detached from the transaxle, DO NOT actuate the clutch master cylinder. Damage to the slave cylinder will result.

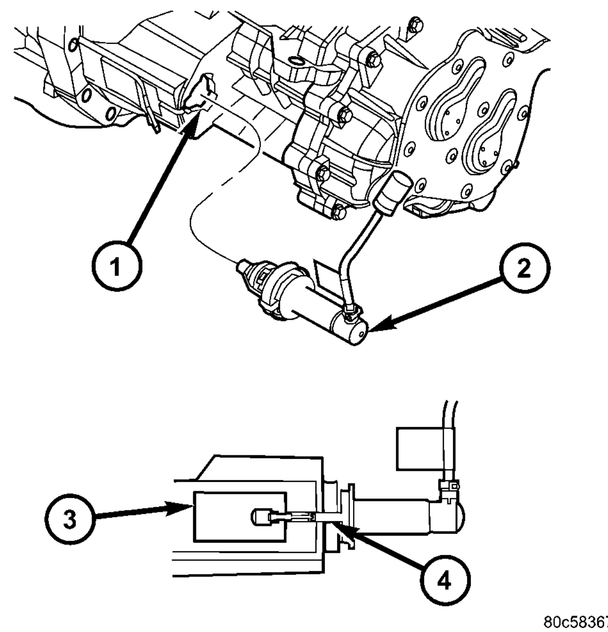


Fig. 5 Slave Cylinder Removal/Installation

1 - MOUNTING HOLE
2 - SLAVE CYLINDER
3 - ACCESS HOLE
4 - NYLON ANTI-ROTATION TAB

(4) Depress slave cylinder pushrod until it bottoms and then release. Repeat this at least ten (10) times, forcing trapped air upwards and out of the system.

(5) Install clutch slave cylinder into position, noting orientation of different sized lugs. While depressing inward, rotate slave cylinder clockwise until

CLUTCH (Continued)

nylon locating tab rests in transaxle case cutout, and the hydraulic tube is vertical (Fig. 5).

(6) Lower vehicle.

(7) Check and adjust clutch master cylinder fluid level. Actuate clutch pedal thirty (30) times. Verify clutch operation/pedal feel. If pedal still feels spongy, or clutch does not fully disengage, air is still trapped within the system. Repeat Step 3 - Step 7 until air is purged. If several attempts at purging air from the system are unsuccessful, replace both the clutch master cylinder and slave cylinder assemblies.

(8) Raise vehicle.

(9) Lower vehicle.

(10) Top off clutch master cylinder fluid level with DOT 3 brake fluid as necessary.

SPECIFICATIONS

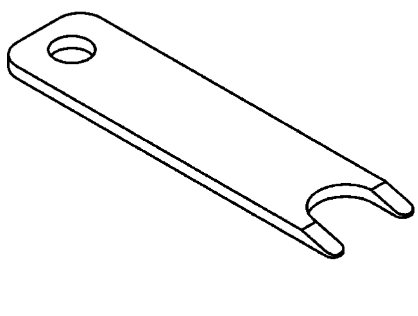
CLUTCH/HYDRAULICS/PEDALS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake/Clutch Pedal & Booster-to-Dash Nuts	34	—	300
Brake/Clutch Pedal Assembly-to-Instrument Panel	34	—	300
Clutch Cover-to-Flywheel Bolts	29	—	250
Clutch Pedal Pivot Shaft Nut	42	31	—
Damper-to-Transaxle Nuts	24	—	215
Driveplate-to-Crankshaft Bolts	95	70	—
Flywheel-to-Crankshaft Bolts	95	70	—
Master Cylinder Pushrod Adj. Screw	6	—	55
Modular Clutch-to-Drive Plate Bolts	88	65	—
Master Cylinder Mounting Nuts (LHD)	15	—	130
Master Cylinder Reservoir Mounting bolts (LHD)	11	—	100
Master Cylinder Reservior Mounting Screw (RHD)	3	—	24
Slave Cylinder-to-Transaxle (2.0L)	19	14	—
Slave Cylinder-to-Transaxle (1.6L)	12	—	105
Transaxle-to-Engine Mounting Bolts	95	70	—

CLUTCH (Continued)

SPECIAL TOOLS



Tool, Clutch Line Disconnect - 6638A

CLUTCH INTERLOCK/UPSTOP SWITCH

DESCRIPTION

LHD

The LHD clutch interlock/upstop switch is an assembly consisting of two switches: an engine starter inhibit switch (interlock) and a clutch pedal upstop switch (Fig. 6). The switch assembly is located in the clutch/brake pedal bracket assembly (Fig. 7), each switch being fastened by four plastic wing tabs.

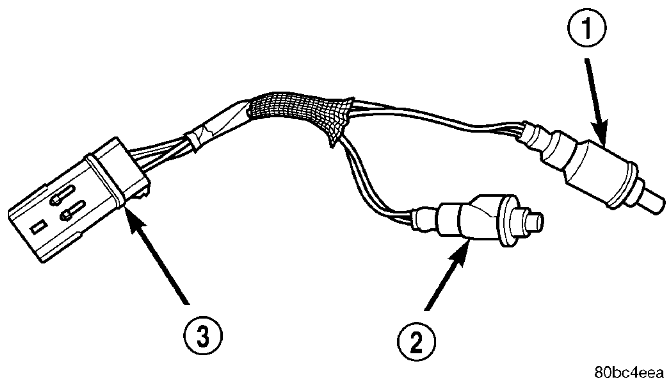


Fig. 6 Clutch Interlock/Upstop Switch

1 - UPSTOP SWITCH
2 - INTERLOCK SWITCH
3 - CONNECTOR

RHD

The RHD clutch interlock/upstop switch (Fig. 8) consists of a single, multi-function switch that is activated by hydraulic clutch master cylinder push rod travel.

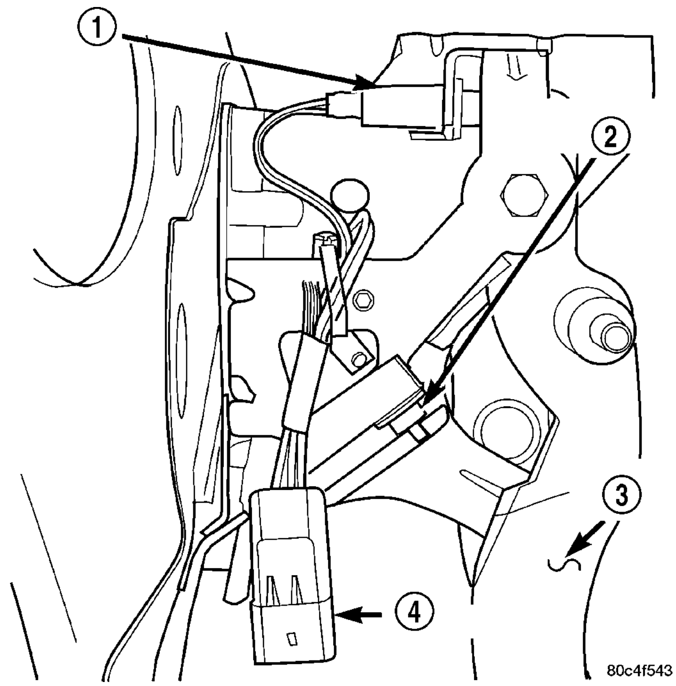


Fig. 7 Clutch/Brake Pedal Bracket Assembly

1 - UPSTOP SWITCH
2 - INTERLOCK SWITCH
3 - CLUTCH PEDAL
4 - CONNECTOR

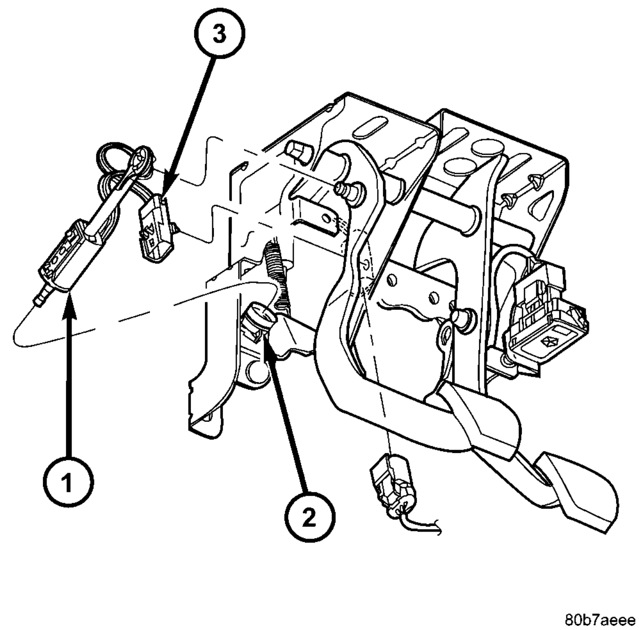


Fig. 8 Clutch Interlock/Upstop Switch

1 - INTERLOCK/UPSTOP SWITCH
2 - MASTER CYLINDER
3 - CONNECTOR

CLUTCH INTERLOCK/UPSTOP SWITCH (Continued)

OPERATION

CLUTCH INTERLOCK SWITCH

The clutch interlock switch prevents engine starter operation and inadvertent vehicle movement with the clutch pedal in the up position (not depressed), or under normal conditions with the clutch engaged and the transaxle in gear.

WARNING: WHEN THERE IS A LOSS OF CLUTCH SYSTEM HYDRAULIC FLUID, OR THE CLUTCH MASTER CYLINDER PUSHROD IS DISCONNECTED FROM THE PEDAL LEVER, THE ENGINE MAY START WITH THE CLUTCH ENGAGED, CAUSING UNDESIRABLE VEHICLE MOVEMENT IF THE TRANSAXLE IS IN ANY GEAR.

The switch is open while the clutch pedal is at rest or in the up position. When the clutch pedal is fully depressed on **LHD** models, the clutch pedal lever closes the switch, completing the signal circuit from the PCM and closing the ground path, allowing engine starter operation. When the clutch pedal is fully depressed on **RHD** models, the master cylinder push rod closes the switch, completing the signal circuit from the PCM and closing the ground path, allowing engine starter operation. The interlock switch is not adjustable.

CLUTCH PEDAL UPSTOP SWITCH

With the clutch pedal at rest, the clutch pedal upstop switch is closed, allowing speed control operation. When the clutch pedal is depressed, the upstop switch opens and signals the PCM to cancel speed control operation, and enter a modified engine calibration schedule to improve driveability during gear-to-gear shifts. The upstop switch is not adjustable.

DIAGNOSIS AND TESTING - CLUTCH INTERLOCK/UPSTOP SWITCH

The LHD clutch interlock/upstop switch is an assembly consisting of two switches: an engine starter inhibit switch (interlock) and a clutch pedal upstop switch (Fig. 9).

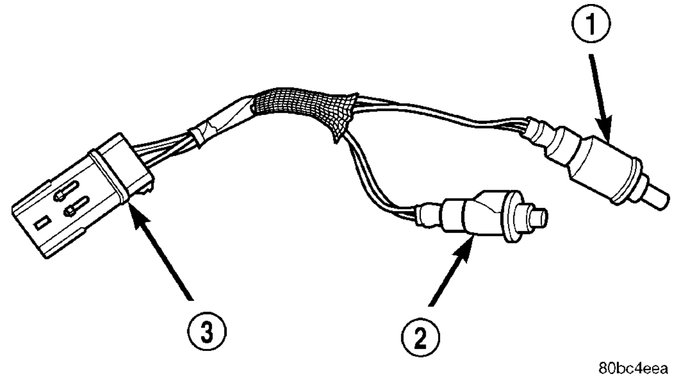


Fig. 9 Clutch Interlock/Upstop Switch—LHD

1 - UPSTOP SWITCH
2 - INTERLOCK SWITCH
3 - CONNECTOR

The RHD clutch interlock/upstop switch (Fig. 10) consists of a single, multi-function switch that is activated by the hydraulic clutch master cylinder push rod.

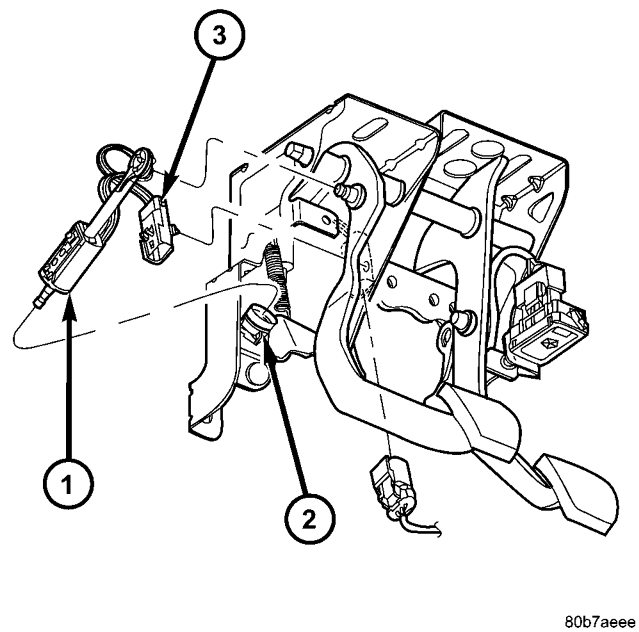


Fig. 10 Clutch Interlock/Upstop Switch—RHD

1 - INTERLOCK/UPSTOP SWITCH
2 - MASTER CYLINDER
3 - CONNECTOR

CLUTCH INTERLOCK/UPSTOP SWITCH (Continued)

CLUTCH INTERLOCK SWITCH

Mechanical Test

(1) With the park brake set and the transaxle **IN NEUTRAL,** turn the ignition key to the start position. The engine starter should not crank with the clutch pedal at rest (not depressed). If the starter cranks, proceed to the electrical test to determine whether the switch is defective or the circuit is shorted. If the vehicle does not crank, proceed to the next step.

(2) With the park brake set and the transaxle **IN NEUTRAL,** fully depress the clutch pedal and turn the ignition key to the start position. The engine starter should crank. If the starter does not crank, visually inspect the clutch pedal for obstructions (floor mat, etc.). Make sure the clutch pedal lever contacts and fully closes the switch on LHD applications, and for proper installation of the master cylinder push rod/bushing on the pedal pin on RHD applications.

Electrical Test

(1) Move ignition key to the “OFF/LOCK” position and remove key.

(2) Set park brake.

(3) Disconnect the clutch interlock/upstop switch connector.

(4) Using an ohmmeter, check for continuity between terminals 2 & 3 (Fig. 11) with the interlock switch not depressed (clutch pedal at rest). There should be no continuity between the terminals (open circuit).

(5) **LHD Models:** Fully depress the clutch pedal to close the switch. The switch button should compress at least 1.25 mm (0.050 in.) on LHD applications. The ohmmeter should show continuity (0 ohms resistance). **RHD Models:** Disconnect the push rod from the pedal pin and actuate the push rod by hand to close the switch. The ohmmeter should show continuity (0 ohms).**Inspect the plastic push rod retainer for damage. If it is damaged (broken/cracked) it MUST be replaced before reinstalling the push rod to the pedal.**

(6) If ohmmeter readings do not fall within these ranges, the switch assembly, or the pedal bracket assembly, is defective and should be replaced. If the switch tests ok, wiring is defective.

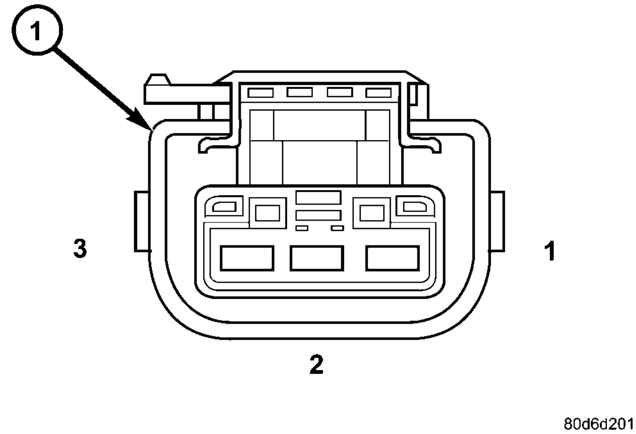


Fig. 11 Interlock/Upstop Switch Connector

1 - INTERLOCK/UPSTOP SWITCH CONNECTOR

UPSTOP SWITCH

Mechanical Test

(1) Raise vehicle on hoist.

(2) Start engine and operate speed control to maintain speed.

(3) Depress clutch pedal at least 33 mm (1.30 in.). Speed control operation should terminate. If speed control does not terminate, the upstop switch is defective or the related wiring is shorted. Proceed to the upstop switch electrical test.

Electrical Test

(1) Move ignition key to the “OFF/LOCK” position and remove key.

(2) Set park brake.

(3) Disconnect the clutch interlock/upstop switch connector.

(4) Using an ohmmeter, check for continuity between terminals 1 & 2 (Fig. 11) with the upstop switch depressed (clutch pedal at rest). The ohmmeter should show continuity (0 ohms).

(5) Depress the clutch pedal at least 33 mm (1.30 in.) check for continuity between terminals 1 & 2. There should be no continuity between the terminals (open circuit).

(6) If ohmmeter readings do not fall within these ranges, the switch assembly is defective and should be replaced. If the switch tests ok, wiring is defective.

CLUTCH INTERLOCK/UPSTOP SWITCH (Continued)

SERVICE DIAGNOSIS - CLUTCH INTERLOCK/UPSTOP SWITCH

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE STARTER WON'T CRANK WHEN CLUTCH PEDAL IS PRESSED TO THE FLOOR	Clutch interlock switch does not have continuity when plunger is fully depressed by hand on RHD models, or switch plunger is depressed 1.25 mm (0.050 in.) on LHD models.	Replace defective pedal bracket assembly (RHD Models). Replace switch assembly (LHD Models).
	Interlock switch plunger is not depressed when clutch pedal is pushed to the floor	Floor mat interferes with clutch pedal movement, LHD clutch pedal bracket is bent, or the RHD push rod/bushing is not properly installed.
	Problem is related to other components in the starting circuit.	Check other components in the starting circuit. Refer to Battery/Starting/Charging System in Group 8.
SPEED CONTROL DOES NOT TERMINATE WHEN CLUTCH PEDAL IS DEPRESSED BY AT LEAST 33 mm (1.30 in.)	Upstop switch circuit is closed when clutch pedal is depressed, or harness is shorted.	Refer to Upstop Switch Electrical Test in this group. Repair wiring or replace switch assembly as necessary.
	Other speed control system failure.	Refer to Group 8H, Speed Control for further diagnosis and testing procedures.

REMOVAL

LHD

(1) Disconnect and isolate battery negative cable.

(2) Remove left lower instrument panel bezel (Fig. 12).

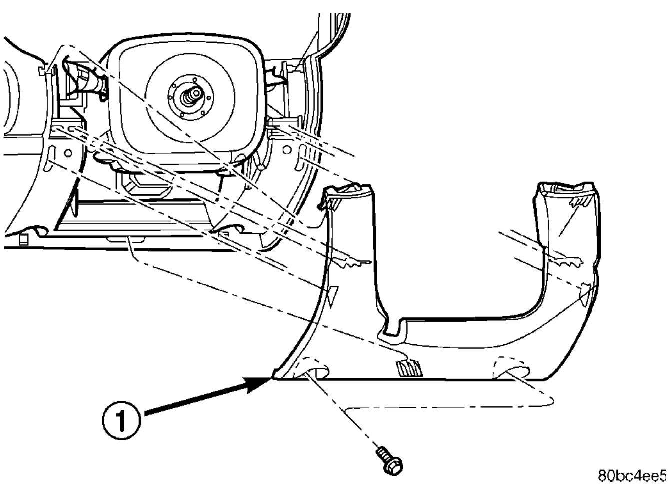


Fig. 12 Steering Column Lower Cover

1 - LOWER COVER

(3) Disconnect upstop switch and brake lamp switch connectors.

(4) Disconnect clutch master cylinder rod from clutch pedal pin. **Inspect plastic retainer upon removal. If retainer is damaged, it MUST be replaced.**

(5) Remove brake booster push rod retaining clip from brake pedal. Disengage rod from pedal (Fig. 13).

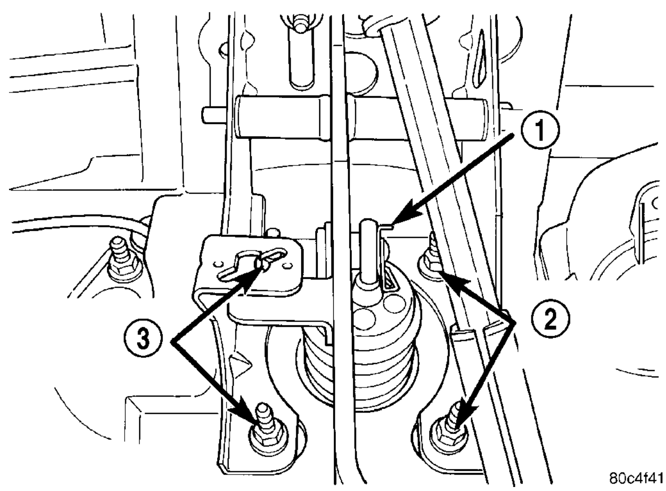


Fig. 13 Brake Booster Mounting Nuts and Rod Retaining Clip

1 - CLIP
2 - BOOSTER MOUNTING NUTS
3 - BOOSTER MOUNTING NUTS

(6) Remove two pedal assembly bracket to instrument panel nuts (Fig. 14).

(7) Remove four brake booster/pedal bracket-to-cowl panel nuts (Fig. 14).

(8) From under the hood, pull brake master cylinder/booster far enough forward to obtain pedal to bracket stud clearance.

CLUTCH INTERLOCK/UPSTOP SWITCH (Continued)

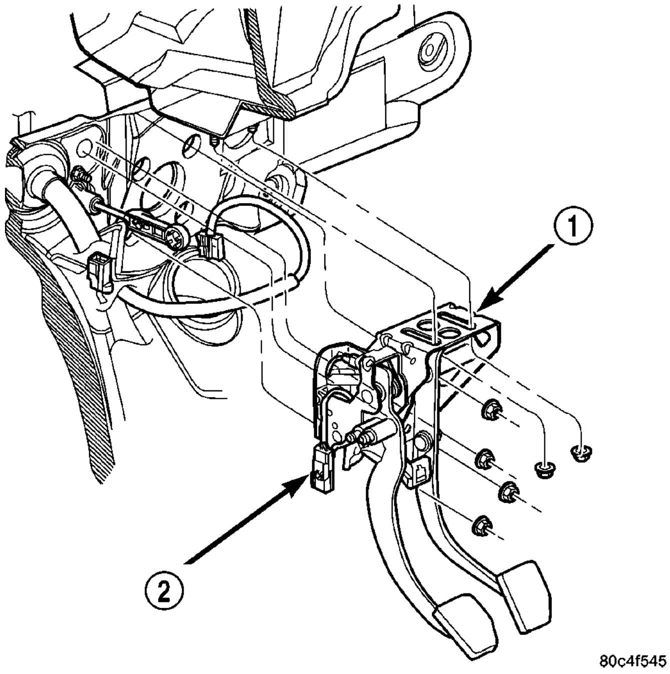


Fig. 14 Brake/Clutch Pedal Assembly Removal/ Installation

1 - CLUTCH/BRAKE PEDAL ASSEMBLY
2 - INTERLOCK/UPSTOP SWITCH CONNECTOR

(9) Remove the pedal bracket assembly (Fig. 14).

(10) Remove pedal pivot shaft and remove brake and clutch pedals.

(11) Remove the interlock/upstop switch assembly (Fig. 15) from the brake/clutch pedal bracket assembly by depressing the four plastic wing tabs on each switch.

RHD

(1) Disconnect the master cylinder push rod from the pedal pin (Fig. 16). **Inspect push rod retainer for damage. If it is damaged (broken/cracked), it must be replaced.**

(2) Squeeze together the tangs on the switch cover plate and slide the plate off the switch housing.

(3) Disconnect the clutch interlock/upstop switch connector from the instrument panel wiring harness.

(4) Remove the switch from the vehicle.

INSTALLATION

LHD

NOTE: Proper switch harness routing is critical to switch durability. Note the harness routing and location of fasteners intended to keep wires from contacting pedals.

(1) Install switches into the pedal bracket assembly as shown in (Fig. 15). Route harness as was prior to removal. Secure switch connector retaining push pin into the appropriate hole in the pedal bracket assembly.

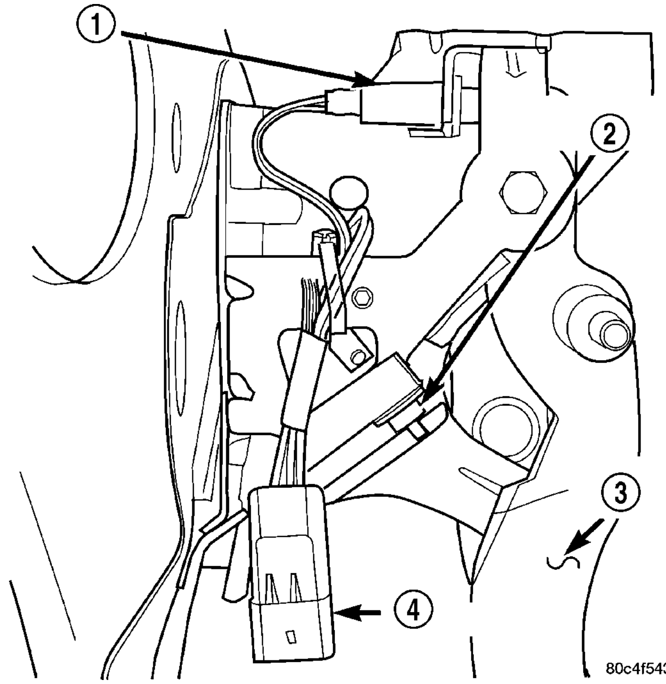


Fig. 15 Interlock/Upstop Switch

1 - UPSTOP SWITCH
2 - INTERLOCK SWITCH
3 - CLUTCH PEDAL
4 - CONNECTOR

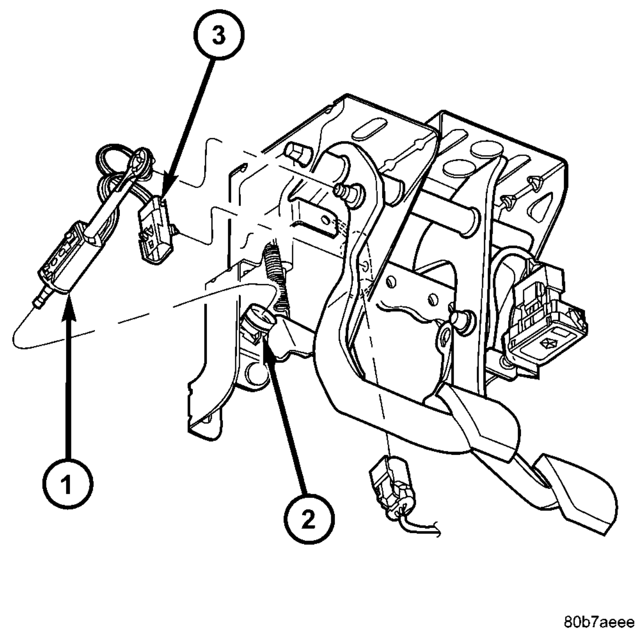


Fig. 16 Clutch Interlock/Upstop Switch

1 - INTERLOCK/UPSTOP SWITCH
2 - MASTER CYLINDER
3 - CONNECTOR

CLUTCH INTERLOCK/UPSTOP SWITCH (Continued)

(2) Install clutch and brake pedals to pedal bracket, and install pivot shaft and nut. Torque pivot shaft nut to 42 N·m (31 ft. lbs.).

(3) Install brake/clutch pedal bracket assembly into position. Install and tighten brake booster mounting nuts to 34 N·m (25 ft. lbs.). Install and tighten pedal bracket-to-instrument panel nuts to 34 N·m (25 ft. lbs.).

(4) Install new stop lamp switch.

(5) Connect brake booster rod to brake pedal. Install retainer clip (Fig. 13).

(6) Loosen adjustment screw (Fig. 17).

CAUTION: Inspect clutch master cylinder pushrod plastic retainer. If retainer is damaged in any way (broken/cracked) it MUST be replaced.

(7) Connect clutch master cylinder pushrod. Gently lift clutch pedal upwards until the clutch pedal fully depresses the the upstop switch. Torque adjustment screw to 6 N·m (55 in. lbs.).

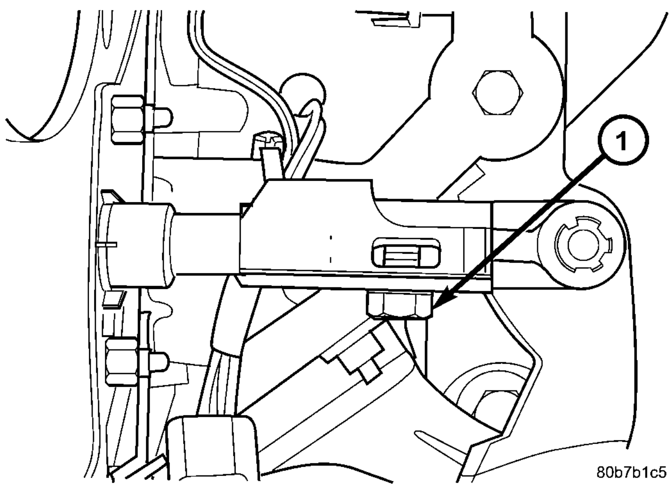


Fig. 17 Clutch Master Cylinder Pushrod Adjustment Screw

1 - ADJUSTMENT SCREW

(8) Connect interlock/upstop and stop lamp switch connectors.

(9) Install left lower instrument panel bezel (Fig. 12).

(10) Connect battery negative cable.

(11) Verify proper switch operation.

RHD

NOTE: Proper switch harness routing is critical to switch durability. Note the harness routing and location of fasteners intended to keep wires from contacting pedals.

(1) Install the clutch interlock/upstop switch onto the master cylinder push rod, making sure that the push rod is oriented with the push rod retainer toward the wiring of the switch. The master cylinder push rod must be snapped into the clutch interlock/upstop switch along the smaller diameter of the push rod between the snap ring and the transition to the larger diameter.

CAUTION: Improper assembly of the larger diameter of the push rod into the clutch interlock/upstop switch could cause damage to the switch or a clutch system failure.

(2) Install the switch cover plate.

CAUTION: Inspect the plastic push rod retainer for damage. If it is damaged (broken/cracked), it MUST be replaced.

(3) Connect clutch master cylinder pushrod to the clutch pedal pin.

(4) Route the wiring harness as it was prior to removal.

(5) Secure the switch connector retaining push pin into the appropriate hole in the pedal bracket assembly.

CLUTCH RELEASE BEARING AND LEVER

DESCRIPTION

T350-Equipped Models

A conventional release bearing is used to engage and disengage the clutch pressure plate. The clutch release bearing is mounted on the transaxle front bearing retainer. The bearing is attached to and operated by the release lever (Fig. 18), which moves the bearing into contact with the clutch cover diaphragm spring.

T850-Equipped Models

A conventional release bearing is used to engage and disengage the clutch pressure plate. The clutch release bearing is mounted on the transaxle front bearing retainer. The bearing is attached to and operated by the release lever (Fig. 19), which moves the bearing into contact with the clutch cover diaphragm spring.

CLUTCH RELEASE BEARING AND LEVER (Continued)

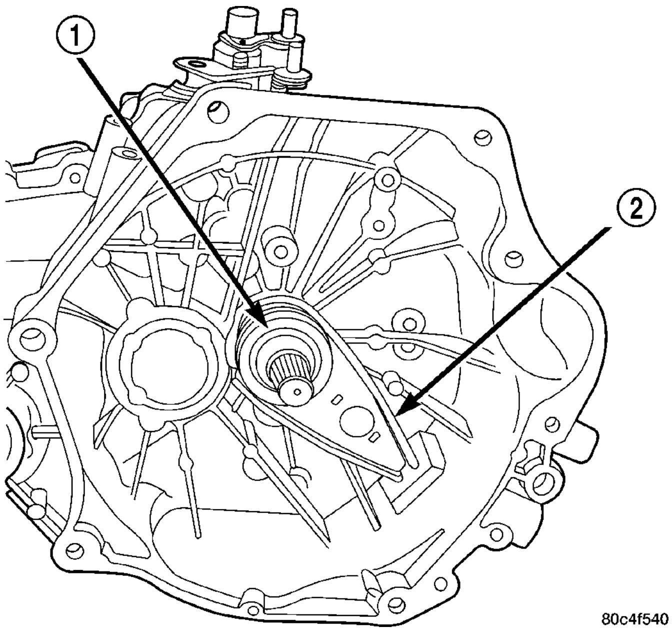


Fig. 18 Clutch Release Bearing and Lever (T350)

1 - RELEASE BEARING
2 - LEVER

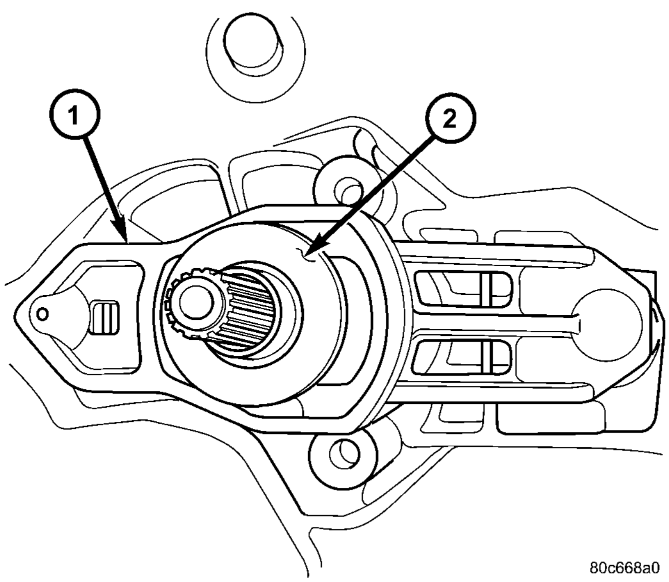


Fig. 19 Clutch Release Bearing and Lever (T850)

1 - RELEASE LEVER
2 - RELEASE BEARING

OPERATION

The release bearing is operated by the release lever. Slave cylinder force causes the release lever to move the release bearing into contact with the diaphragm spring. As additional force is applied, the bearing presses the diaphragm spring fingers inward on the fulcrums. This action moves the pressure plate rearward, relieving clamping force on the clutch disc. Releasing pedal pressure removes clutch hydraulic pressure. The release bearing then moves away from the diaphragm spring which allows the pressure plate to exert clamping force on the clutch disc.

REMOVAL

REMOVAL - T350 MODELS

(1) Remove the transaxle from the vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL)

(2) Remove modular clutch assembly (if equipped).

(3) Move the lever and bearing assembly to a vertical in-line position (Fig. 18). Grasp the release lever with two hands in the pivot stud socket area. Pull with even pressure and the lever will pop off the pivot–stud. Do not use a screwdriver or pry bar to pop off the lever. This may damage the spring clip on the lever.

(4) As a unit, remove the lever from the bearing thrust plate. Be careful not to damage retention tabs on bearing.

(5) Examine the condition of the bearing. **It is pre-lubricated and sealed and should not be immersed in oil or solvent.**

(6) The bearing should turn smoothly when held in the hand under a light thrust load. A light drag caused by the lubricant fill is normal. If the bearing is noisy, rough, or dry, replace the complete bearing assembly with a new bearing.

(7) Check the condition of the pivot stud spring clips on back side of clutch lever. If the clips are broken or distorted, replace the clutch lever.

REMOVAL - T850 MODELS

(1) Remove transaxle assembly. (Refer to 21 - TRANSMISSION/TRANSAXLE/T850 MANUAL - REMOVAL)

(2) Remove modular clutch assembly from input shaft.

CLUTCH RELEASE BEARING AND LEVER (Continued)

(3) Grasp clutch release lever and bearing (Fig. 20) with both hands and pull outward using moderate pressure to release lever from pivot ball(s).

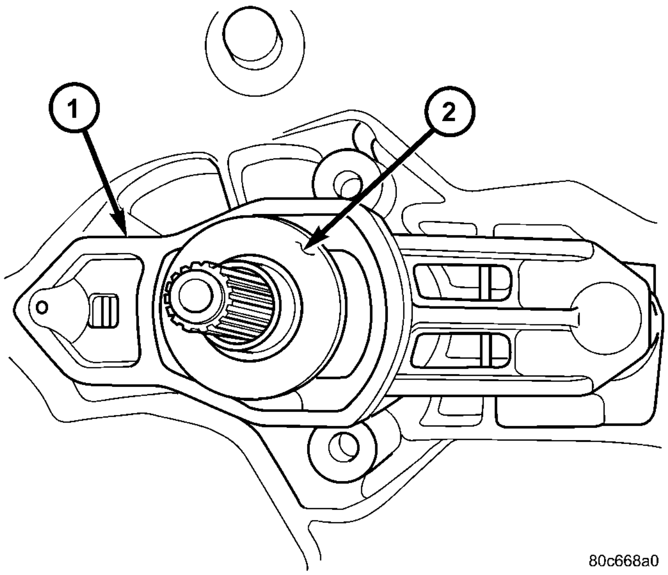


Fig. 20 Release Bearing and Lever—2.4L Turbo Models

1 - RELEASE LEVER
2 - RELEASE BEARING

(4) Separate release bearing from lever.

NOTE: Remove release lever pivot ball(s) ONLY if replacement is necessary.

(5) Remove pivot ball(s) using slide hammer C-3752 and remover/installer 6891 (Fig. 21).

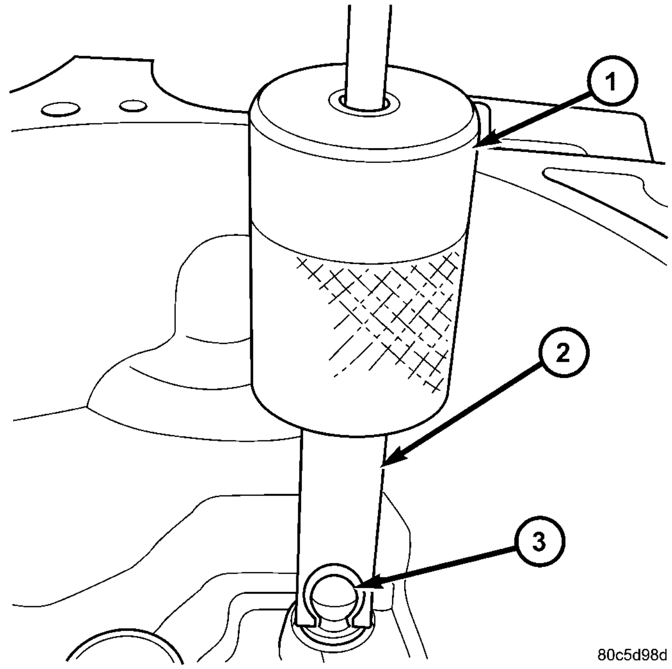


Fig. 21 Pivot Ball Removal/Installation

1 - C-3752 SLIDE HAMMER
2 - REMOVER/INSTALLER 6891
3 - PIVOT BALL

INSTALLATION

INSTALLATION - T350 MODELS

(1) The pivot ball pocket in the lever, as well as the lever arms should be lubricated with grease prior to installation.

(2) Assemble the lever to the bearing. The small pegs on the bearing must go over the lever arms.

(3) Slide the bearing and lever assembly onto the input shaft bearing retainer, as a unit (Fig. 18).

(4) Snap the clutch lever onto the pivot ball.

(5) Install modular clutch assembly (if equipped).

(6) Reinstall transaxle assembly. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - INSTALLATION)

INSTALLATION - T850 MODELS

(1) If removed, install **new** release lever pivot ball(s) using slide hammer C-3752 and remover/installer 6891 (Fig. 22) (Fig. 23).

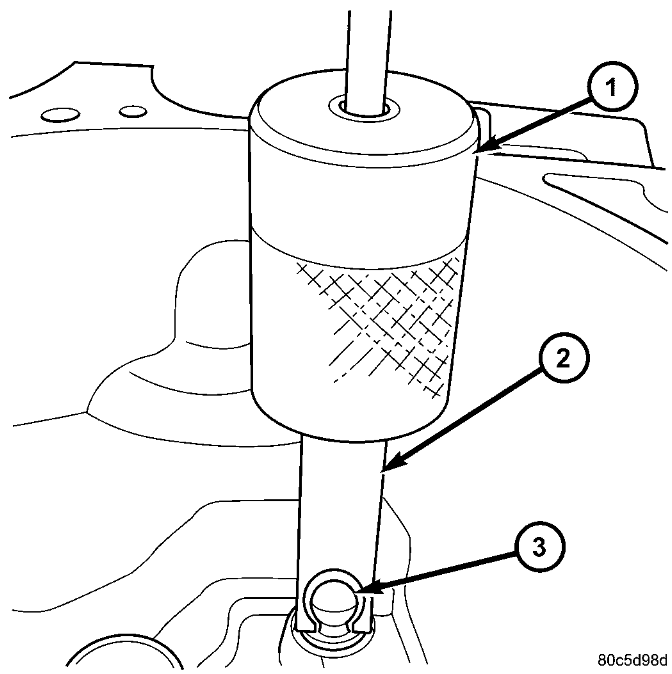


Fig. 22 Pivot Ball Removal/Installation

1 - C-3752 SLIDE HAMMER
2 - REMOVER/INSTALLER 6891
3 - PIVOT BALL

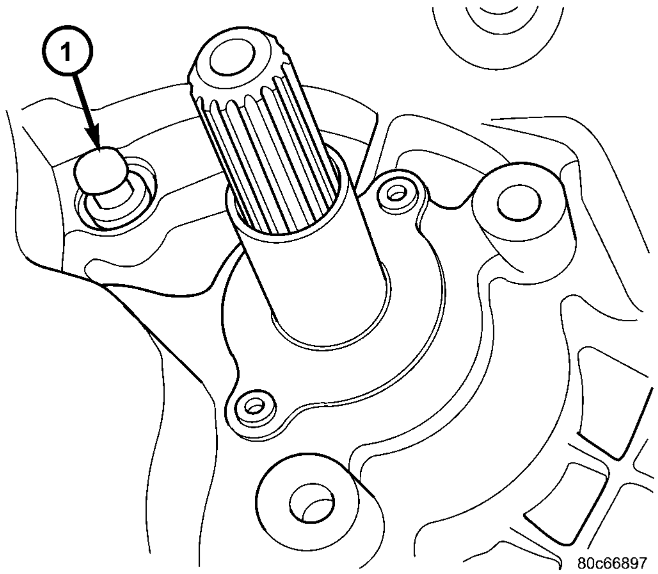


Fig. 23 Pivot Ball Orientation (RHD)

1 - PIVOT BALL (1)

(2) Install clutch release bearing to lever. Apply grease to interface points. Make sure release bearing retainers engage lever pocket as shown in (Fig. 24).

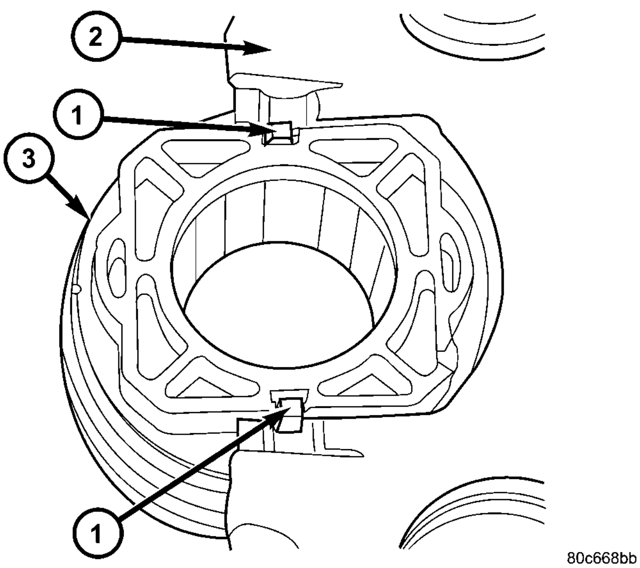


Fig. 24 Release Bearing-to-Lever

1 - RETAINER (2)
2 - RELEASE LEVER
3 - RELEASE BEARING

(3) Apply grease to pivot ball, and on release lever at slave cylinder contact point.

(4) Install clutch release bearing/lever assembly into position by sliding bearing onto input bearing retainer, and using moderate hand pressure to seat release lever to pivot ball (Fig. 25). A “pop” sound should be heard. Verify proper engagement by lightly pulling outward on lever at pivot ball location, and then actuating lever and bearing to ensure proper operation.

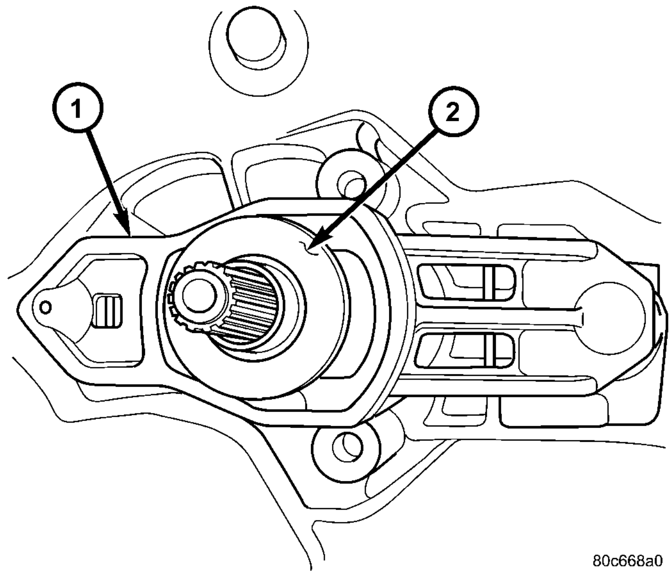


Fig. 25 Release Bearing and Lever—2.4L Turbo Models

1 - RELEASE LEVER
2 - RELEASE BEARING

(5) Reinstall transaxle assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/T 850 MANUAL - INSTALLATION)

MASTER CYLINDER-LHD

DESCRIPTION

NOTE: A one-piece master/slave cylinder assembly is used on T350 models. If the master cylinder requires replacement, the master AND slave cylinders must be replaced with a two-piece system.

The LHD clutch master cylinder mounts to the dash panel (Fig. 26). The master cylinder consists of an adjustable push rod, a piston and cylinder housing, a remote fluid reservoir, an interconnecting hydraulic tube, and an integral slave cylinder (Fig. 27).

MASTER CYLINDER-LHD (Continued)

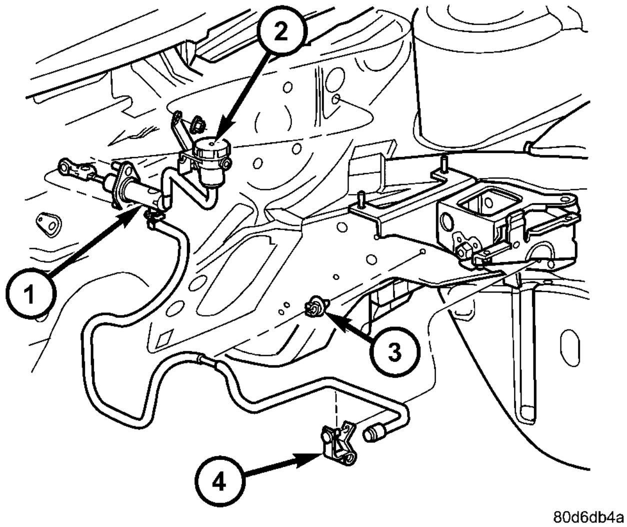


Fig. 26 Clutch Master Cylinder—LHD

1 - MASTER CYLINDER
2 - RESERVOIR
3 - RETAINER CLIP
4 - RETAINER CLIP

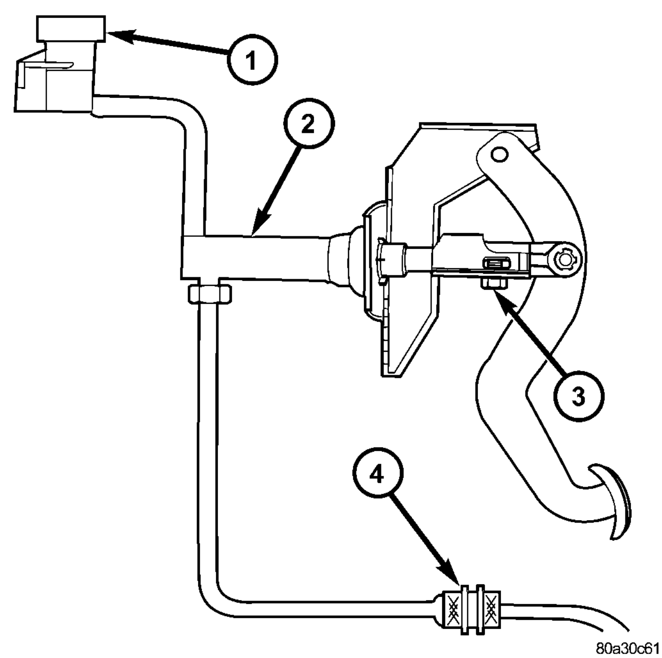


Fig. 27 Clutch Master Cylinder—LHD

1 - RESERVOIR
2 - MASTER CYLINDER
3 - ADJUSTMENT BOLT
4 - QUICK CONNECT (T850 ONLY)

REMOVAL

REMOVAL - T350 Models

NOTE: These models are equipped with a one-piece master/slave cylinder assembly. If the master cylinder requires replacement, the master AND slave cylinder must be replaced with a two-piece "quick-connect" system. If the slave cylinder requires replacement, the slave cylinder is serviced separately.

NOTE: Replacement master cylinder assemblies come pre-filled with fluid. No fluid service or system bleeding should be required, unless the hydraulic system has lost an excessive amount of fluid and has ingested air into the slave cylinder assembly.

(1) Remove air cleaner assembly (Fig. 28).

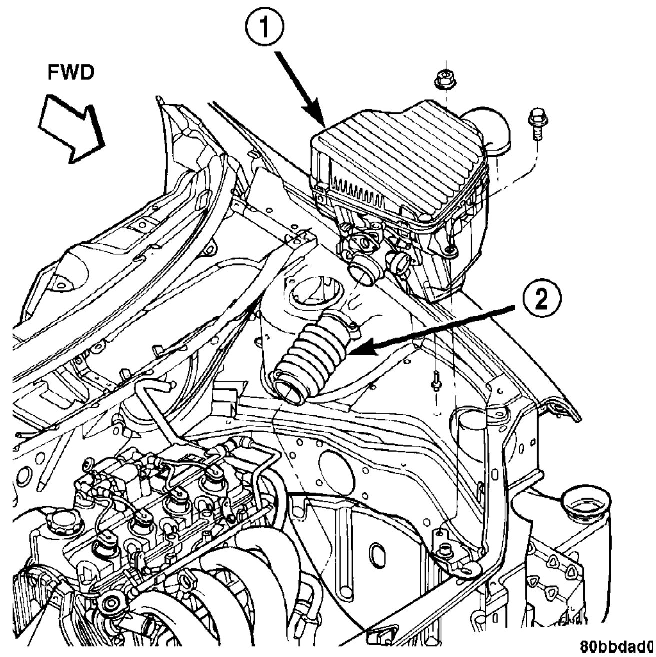


Fig. 28 Air Cleaner Assembly Removal/Installation

1 - AIR CLEANER ASSY.
2 - THROTTLE BODY DUCT

(2) Disconnect battery negative cable.
(3) Raise vehicle on hoist.
(4) Remove slave cylinder from transaxle (Fig. 29).
(5) Remove hydraulic hose from left rail retainers (Fig. 32).
(6) Lower vehicle.
(7) Remove PDC bracket and position out of way.
(8) Remove lower instrument panel bezel (Fig. 30).
(9) Remove clip and disconnect the brake booster input rod from the brake pedal pin (Fig. 31).

MASTER CYLINDER-LHD (Continued)

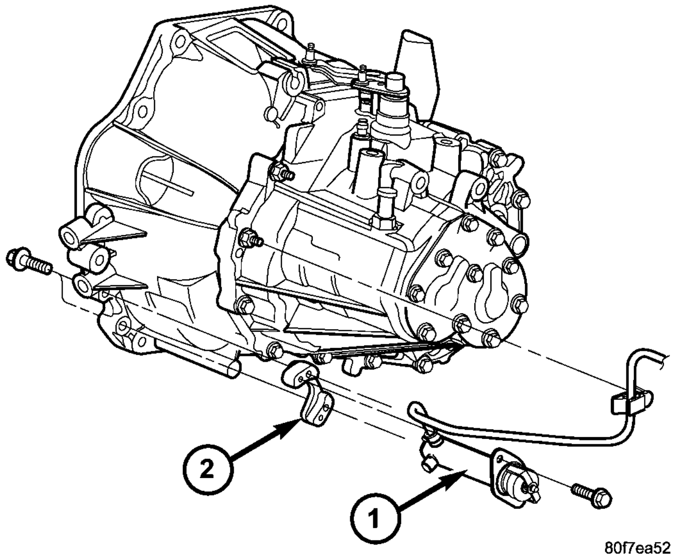


Fig. 29 Clutch Slave Cylinder at Transaxle- 2.0L Models

1 - SLAVE CYLINDER
2 - BRACKET

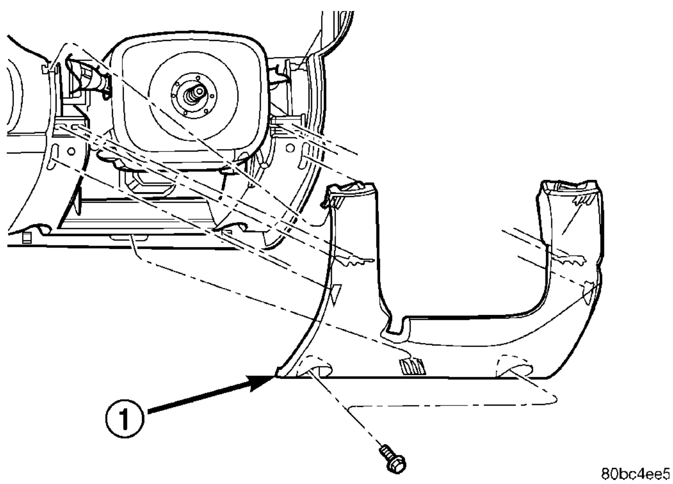


Fig. 30 Steering Column Lower Cover

1 - LOWER COVER

(10) Remove the brake booster mounting nuts (Fig. 31).

(11) Slide brake booster forward enough to gain access to and remove clutch master cylinder.

(12) Remove clutch master cylinder reservoir (Fig. 32).

(13) Disconnect clutch master cylinder rod from clutch pedal. **Inspect plastic retainer. If retainer is broken or damaged in any way, it MUST be replaced upon reassembly.**

(14) Remove two clutch master cylinder retaining nuts.

(15) Remove the self-docking connector bracket.

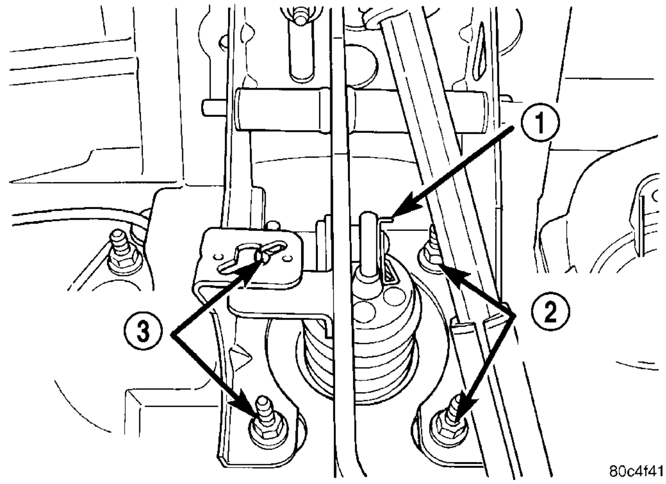


Fig. 31 Brake Booster Mounting Nuts

1 - CLIP
2 - BOOSTER MOUNTING NUTS
3 - BOOSTER MOUNTING NUTS

CAUTION: Use care when removing clutch master cylinder from engine compartment. Aggressive handling can result in a damaged hydraulic tube and improper clutch release operation upon reassembly.

(16) Remove master cylinder from mounting position and carefully work hydraulic pipe from out of engine compartment (Fig. 32). If necessary, unfasten ABS module and purge solenoid assembly to gain necessary clearance. If difficulty is encountered in removing system from vehicle, cut master cylinder hydraulic tube to divide system into two pieces.

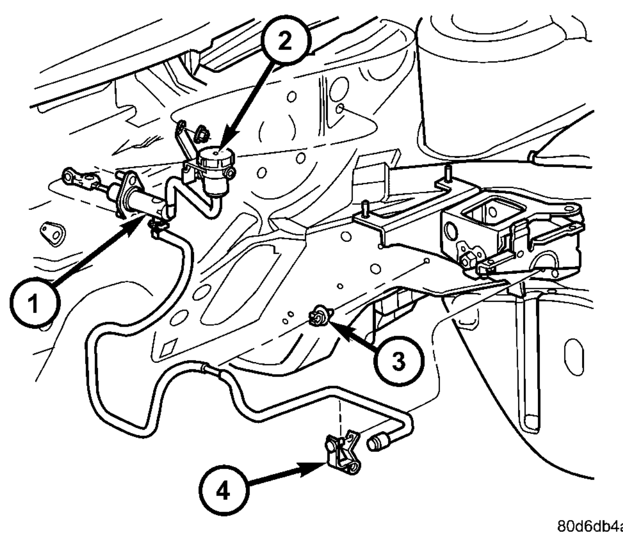


Fig. 32 Clutch Master Cylinder—LHD

1 - MASTER CYLINDER
2 - RESERVOIR
3 - RETAINER CLIP
4 - RETAINER CLIP

MASTER CYLINDER-LHD (Continued)

REMOVAL - T850 MODELS

NOTE: Replacement master cylinder assemblies come pre-filled with fluid. No fluid service or system bleeding should be required, unless the hydraulic system has lost an excessive amount of fluid and has ingested air into the slave cylinder assembly.

(1) Remove air cleaner assembly.
(2) Disconnect battery negative cable.
(3) Raise vehicle on hoist.
(4) Using Tool 6638A, disconnect clutch hydraulic quick-connect (Fig. 33).

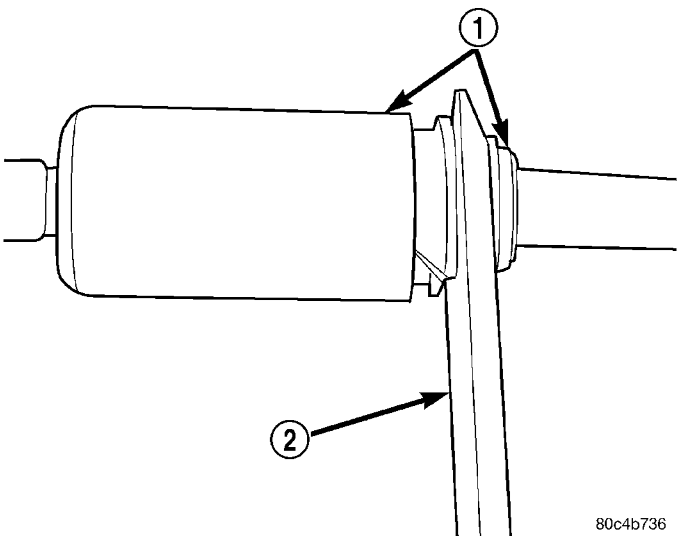


Fig. 33 Disconnect Hydraulic Circuit Usi

1 - QUICK CONNECT FITTING
2 - TOOL 6638A

(5) Remove hydraulic hose from left rail retainers (Fig. 36).
(6) Lower vehicle.
(7) Remove PDC bracket and position out of way.
(8) Remove lower instrument panel bezel (Fig. 34).
(9) Remove clip and disconnect the brake booster input rod from the brake pedal pin (Fig. 35).
(10) Remove the brake booster mounting nuts (Fig. 35).
(11) Slide brake booster forward enough to gain access to and remove clutch master cylinder.
(12) Remove clutch master cylinder reservoir (Fig. 36).
(13) Disconnect clutch master cylinder rod from clutch pedal. **Inspect plastic retainer. If retainer is broken or damaged in any way, it MUST be replaced upon reassembly.**

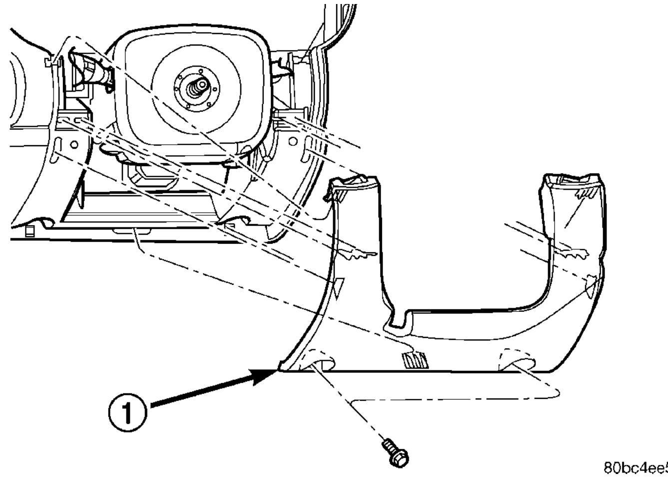


Fig. 34 Steering Column Lower Cover

1 - LOWER COVER

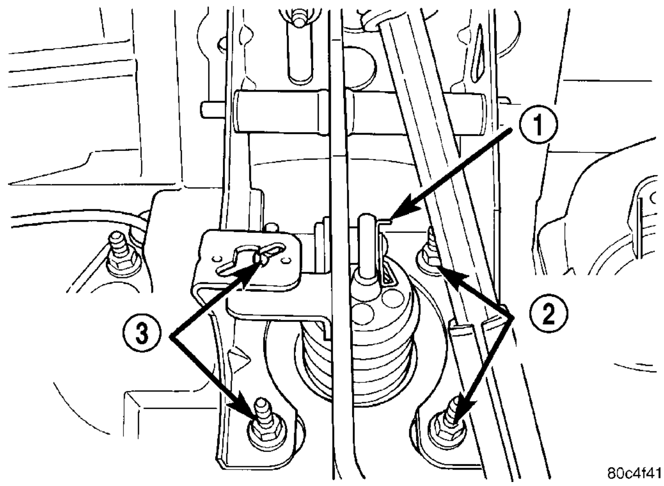


Fig. 35 Brake Booster Mounting Nuts

1 - CLIP
2 - BOOSTER MOUNTING NUTS
3 - BOOSTER MOUNTING NUTS

(14) Remove two clutch master cylinder retaining nuts.
(15) Remove the self-docking connector bracket.

CAUTION: Use care when removing clutch master cylinder from engine compartment. Aggressive handling can result in a damaged hydraulic tube and improper clutch release operation upon reassembly.

(16) Remove master cylinder from mounting position and carefully work hydraulic pipe from out of engine compartment (Fig. 36). If necessary, unfasten ABS module and purge solenoid assembly to gain necessary clearance.

MASTER CYLINDER-LHD (Continued)

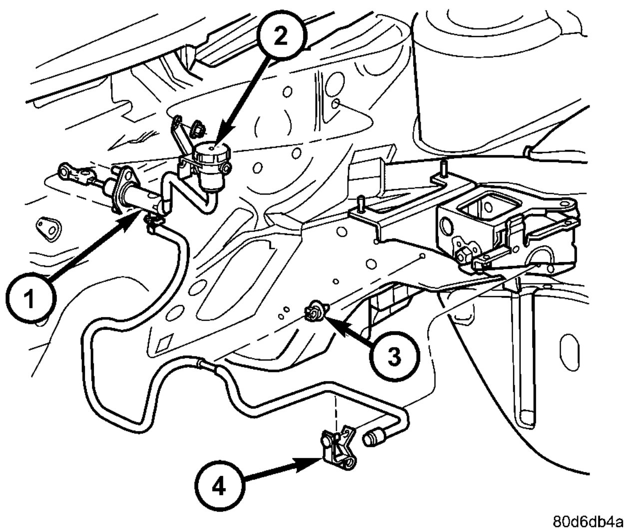


Fig. 36 Clutch Master Cylinder (LHD)

1 - MASTER CYLINDER
2 - RESERVOIR
3 - RETAINER CLIP
4 - RETAINER CLIP

INSTALLATION

INSTALLATION - T350 MODELS

NOTE: These models are equipped with a one-piece master/slave cylinder assembly. If the master cylinder requires replacement, the master AND slave cylinder must be replaced with a two-piece “quick-connect” system. If the slave cylinder requires replacement, the slave cylinder is serviced separately.

(1) Install the master cylinder into position on the dash panel. Route the hydraulic tube underhood as noted upon removal.

(2) Install the self-docking connector bracket.

(3) Install the master cylinder retaining nuts onto the master cylinder studs. Tighten the nuts to 11 N·m (100 in.lbs.).

(4) Install the master cylinder remote reservoir onto the dash panel.

(5) Install the reservoir retaining screws. Tighten the screws to 11 N·m (103 in.lbs.).

(6) Install the brake booster.

CAUTION: Inspect the clutch master cylinder push rod plastic retainer for damage. If it is damaged (broken/cracked), it MUST be replaced.

(7) Raise vehicle on hoist.

(8) If master cylinder is being replaced, install service replacement slave cylinder. If master cylinder is being re-used, install slave cylinder as shown in (Fig. 29).

(9) If master cylinder is being replaced, connect the master cylinder hydraulic line to the service replacement slave cylinder hydraulic line. An audible click should be heard. Verify the connection by pulling outward on the master cylinder line.

(10) Lower vehicle.

(11) Loosen the push rod adjustment screw (Fig. 37).

(12) Install the push rod onto the pedal pin.

(13) Gently lift clutch pedal upwards until the clutch pedal fully depresses the upstop switch. Torque adjustment screw to 6 N·m (55 in. lbs.).

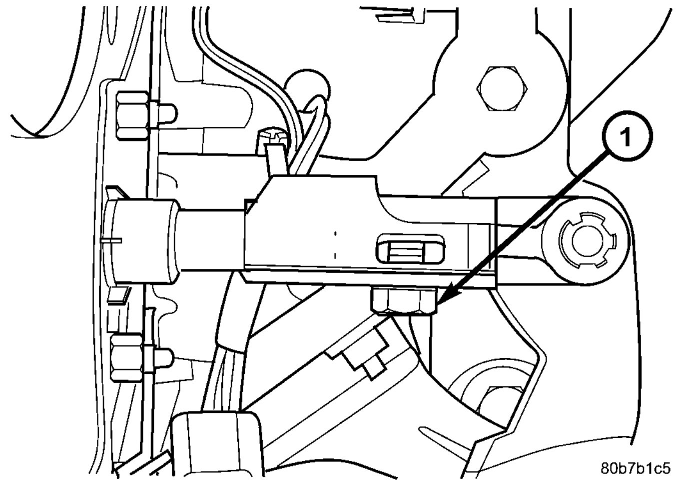


Fig. 37 Clutch Master Cylinder Pushrod Adjustment Screw

1 - ADJUSTMENT SCREW

(14) Install the ABS module/purge solenoid, PDC, and air cleaner.

(15) Depress and release the clutch pedal a minimum of ten (10) times to allow any residual air in the system to be vented to the reservoir. If residual air becomes trapped in the system, bleed the clutch hydraulic system. (Refer to 6 - CLUTCH - STANDARD PROCEDURE)

(16) Connect the negative battery cable.

(17) Top off clutch master cylinder reservoir with DOT 3 brake fluid.

(18) Verify correct clutch operation.

INSTALLATION - T850 MODELS

(1) Install the master cylinder into position on the dash panel.

(2) Install the self-docking connector bracket.

(3) Install the master cylinder retaining nuts onto the master cylinder studs. Tighten the nuts to 11 N·m (100 in.lbs.).

(4) Route the hydraulic tube as noted upon removal.

MASTER CYLINDER-LHD (Continued)

(5) Connect the master cylinder hydraulic line to the slave cylinder hydraulic line. An audible click should be heard. Verify the connection by pulling outward on the master cylinder line.

(6) Install the master cylinder remote reservoir onto the dash panel.

(7) Install the reservoir retaining screws. Tighten the screws to 11 N·m (103 in.lbs.).

(8) Install the brake booster.

CAUTION: Inspect the clutch master cylinder push rod plastic retainer for damage. If it is damaged (broken/cracked), it MUST be replaced.

(9) Loosen the push rod adjustment screw (Fig. 38).

(10) Install the push rod onto the pedal pin.

(11) Gently lift clutch pedal upwards until the clutch pedal fully depresses the upstop switch. Torque adjustment screw to 6 N·m (55 in. lbs.).

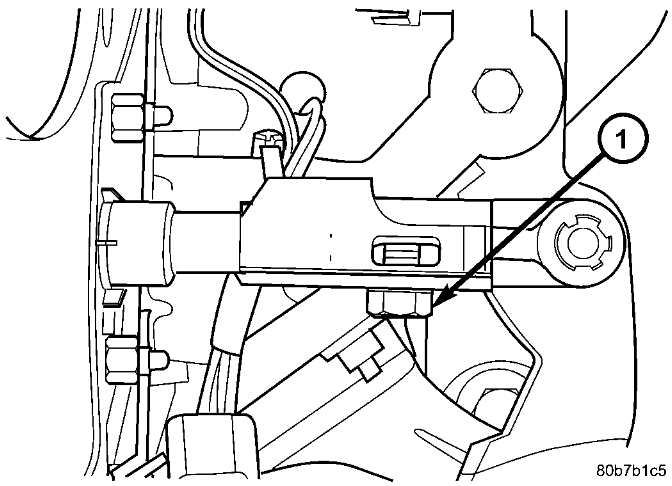


Fig. 38 Clutch

1 - ADJUSTMENT SCREW

(12) Install the ABS module/purge solenoid, PDC, and air cleaner.

(13) Depress and release the clutch pedal a minimum of ten (10) times to allow any residual air in the system to be vented to the reservoir. If residual air becomes trapped in the system, bleed the clutch hydraulic system. (Refer to 6 - CLUTCH - STANDARD PROCEDURE)

(14) Connect the negative battery cable.

(15) Top off clutch master cylinder reservoir with DOT 3 brake fluid.

(16) Verify correct clutch operation.

MASTER CYLINDER-RHD

DESCRIPTION

NOTE: A one-piece master/slave cylinder assembly is used on these models. If the master cylinder requires replacement, the master AND slave cylinders must be replaced with a two-piece system.

The RHD clutch master cylinder (Fig. 39) mounts through the dash panel and to the pedal bracket assembly. The master cylinder consists of a push rod, a piston and cylinder housing, a remote fluid reservoir, an interconnecting hydraulic tube, and an integral slave cylinder (Fig. 40).

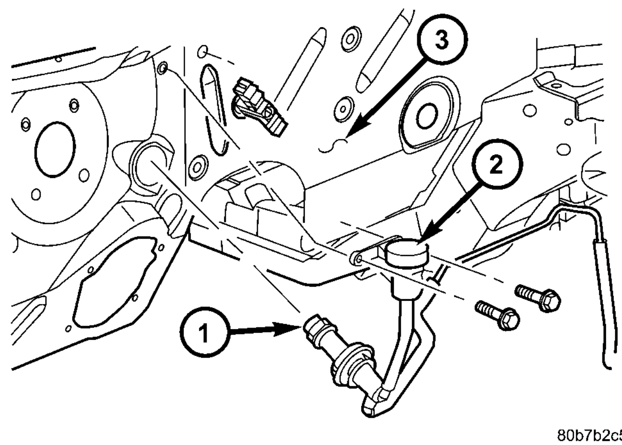


Fig. 39 Clutch Master Cylinder—RHD

1 - MASTER CYLINDER
2 - RESERVOIR
3 - DASH PANEL

REMOVAL

NOTE: These models are equipped with a one-piece master/slave cylinder assembly. If the master cylinder requires replacement, the master AND slave cylinder must be replaced with a two-piece "quick-connect" system. If the slave cylinder requires replacement, the slave cylinder is serviced separately.

NOTE: Replacement master cylinder assemblies come pre-filled with fluid. No fluid service or system bleeding should be required, unless the hydraulic system has lost an excessive amount of fluid and has ingested air into the slave cylinder assembly.

MASTER CYLINDER-RHD (Continued)

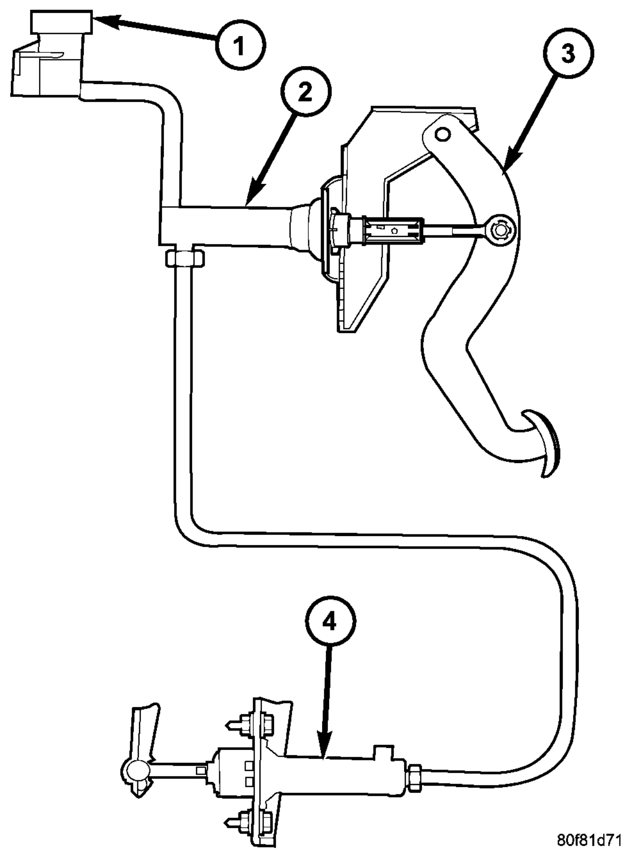


Fig. 40 Clutch Hydraulic System - RHD

1 - RESERVOIR
2 - MASTER CYLINDER
3 - PEDAL ASSEMBLY
4 - SLAVE CYLINDER

(1) Disconnect battery negative cable.

(2) Raise vehicle on hoist.

(3) Remove slave cylinder from transaxle (Fig. 41)

(4) Remove hydraulic hose (Fig. 42) from the clips along the frame rail and the dash panel.

(5) Lower vehicle.

(6) Remove the two screws holding the master cylinder remote reservoir to the dash panel.

(7) Disconnect the master cylinder push rod from the pedal pin. **Inspect plastic retainer. If retainer is damaged in any way, it MUST be replaced.**

(8) Remove the clutch interlock/upstop switch cover plate and switch housing (Fig. 43) from the master cylinder push rod.

(9) From the engine compartment, grasp the master cylinder body and rotate approximately 45° in a counter-clockwise direction.

(10) Disengage the master cylinder from the pedal bracket assembly.

(11) Remove the master cylinder from the vehicle. If difficulty is encountered in removing the master/slave cylinder assembly, cut the hydraulic tube to divide the system into two pieces and remove.

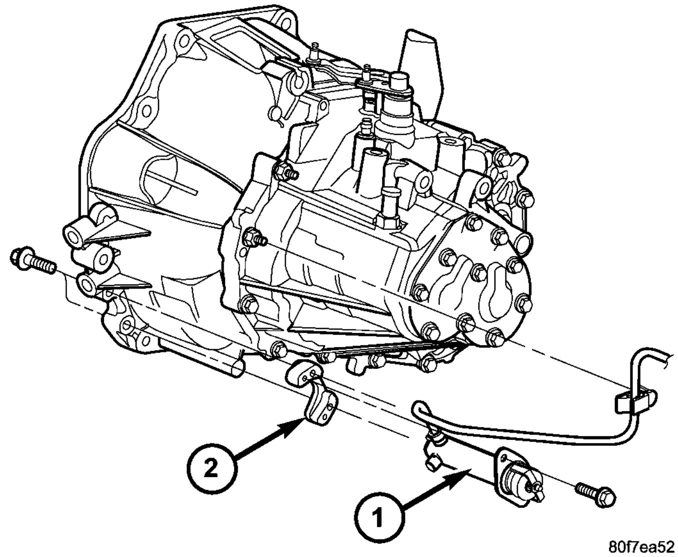


Fig. 41 Clutch Slave Cylinder at Transaxle- 2.0L Models

1 - SLAVE CYLINDER
2 - BRACKET

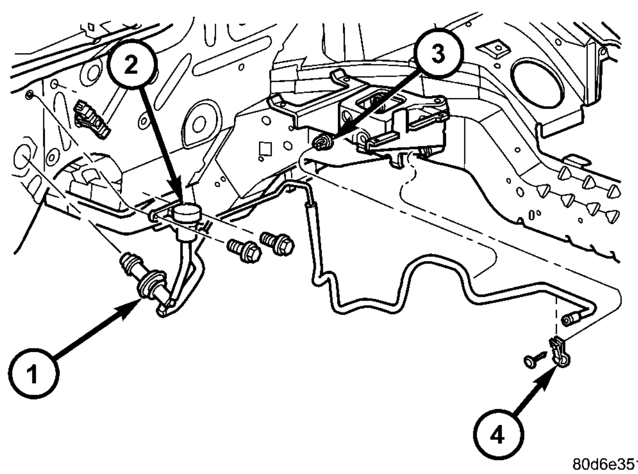


Fig. 42 Clutch Master Cylinder-XXX-RHD

1 - MASTER CYLINDER
2 - RESERVOIR
3 - RETAINER
4 - RETAINER

INSTALLATION

NOTE: These models are equipped with a one-piece master/slave cylinder assembly. If the master cylinder requires replacement, the master AND slave cylinder must be replaced with a two-piece “quick-connect” system. If the slave cylinder requires replacement, the slave cylinder is serviced separately.

MASTER CYLINDER-RHD (Continued)

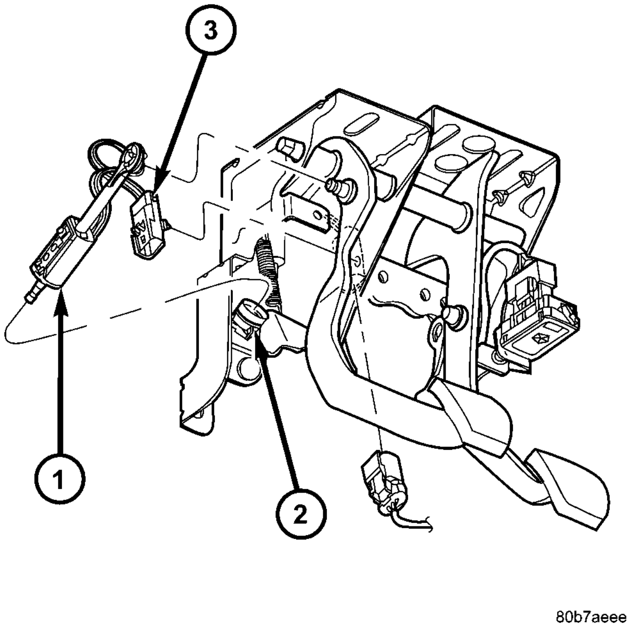


Fig. 43 Clutch Interlock/Upstop Switch

1 - INTERLOCK/UPSTOP SWITCH
2 - MASTER CYLINDER
3 - CONNECTOR

NOTE: Replacement master cylinder assemblies come pre-filled with fluid. No fluid service or system bleeding should be required.

(1) Install the master cylinder into position on the dash panel. (Fig. 44).

(2) Seat the master cylinder in the pedal bracket assembly.

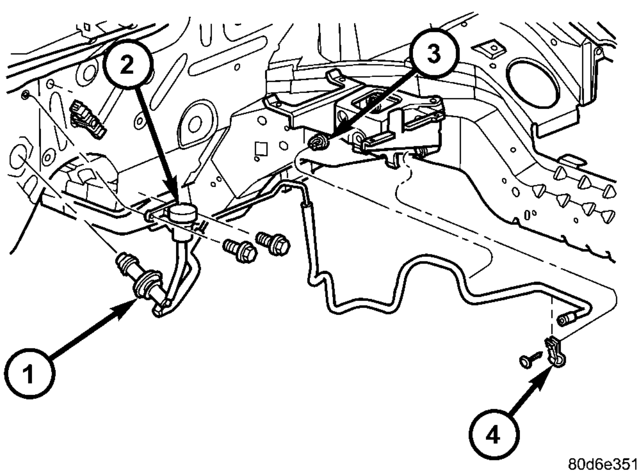


Fig. 44 Clutch Master Cylinder—RHD

1 - MASTER CYLINDER
2 - RESERVOIR
3 - RETAINER
4 - RETAINER

(3) Rotate the master cylinder approximately 45° in the clockwise direction.

(4) Route the hydraulic tube as noted upon removal.

(5) Raise vehicle on hoist.

(6) If master cylinder is being replaced, install service replacement slave cylinder. If master cylinder is being re-used, install slave cylinder as shown in (Fig. 41).

(7) If master cylinder is being replaced, connect the master cylinder hydraulic line to the service replacement slave cylinder hydraulic line. An audible click should be heard. Verify the connection by pulling outward on the master cylinder line.

(8) Lower vehicle.

(9) Install the master cylinder remote reservoir onto the dash panel.

(10) Install the reservoir retaining screws. Tighten the screws to 3 N·m (24 in.lbs.).

(11) Install the clutch interlock/upstop switch and cover plate. (Fig. 45)

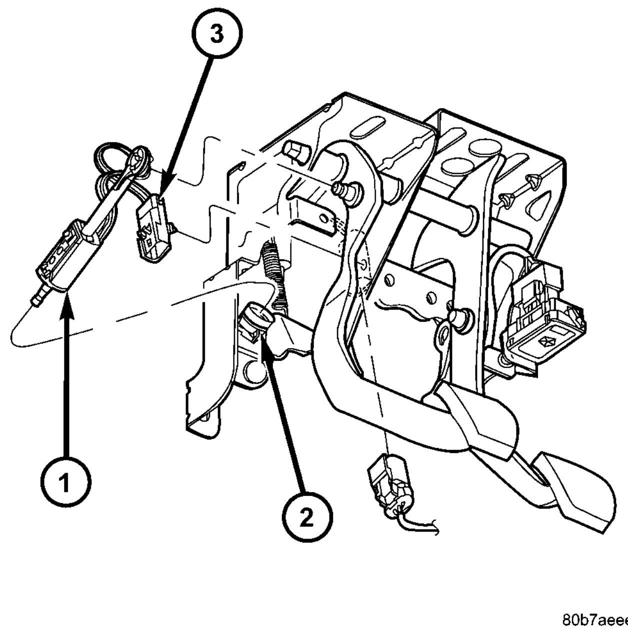


Fig. 45 Clutch Interlock/Upstop Switch

1 - INTERLOCK/UPSTOP SWITCH
2 - MASTER CYLINDER
3 - CONNECTOR

CAUTION: Inspect the clutch master cylinder push rod plastic retainer for damage. If it is damaged (broken/cracked), it MUST be replaced.

MASTER CYLINDER-RHD (Continued)

(12) Install the push rod onto the pedal pin.

(13) Depress and release the clutch pedal a minimum of ten (10) times to allow any residual air in the system to be vented to the reservoir. If residual air becomes trapped in the system, bleed the clutch hydraulic system. (Refer to 6 - CLUTCH - STANDARD PROCEDURE)

(14) Connect the negative battery cable.

(15) Top off clutch master cylinder reservoir with DOT 3 brake fluid.

(16) Verify proper clutch operation.

MODULAR CLUTCH

DESCRIPTION

The modular clutch assembly (Fig. 46) is located between the engine and manual transaxle in the transaxle bellhousing, and is responsible for transmitting engine power to the transaxle. The modular clutch assembly consists of the following components:

- Flywheel
- Clutch Disc
- Pressure Plate
- Diaphragm Spring

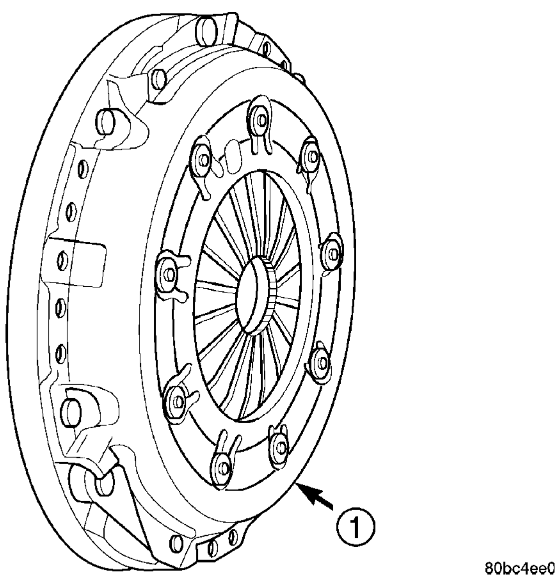


Fig. 46 Modular Clutch Assembly

1 - MODULAR CLUTCH ASSEMBLY

REMOVAL

(1) Remove transaxle from vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL)

(2) Remove modular clutch assembly (Fig. 47) from transaxle input shaft.

INSPECTION

Fluid contamination is a frequent cause of clutch malfunctions. Oil, grease, water, or other fluids on the clutch contact surfaces will cause faulty operation.

During inspection, note if any components are contaminated. Look for evidence of oil, grease, or water/road splash on clutch components.

OIL

Oil contamination indicates a leak at the rear main seal and/or transaxle input shaft. Oil leaks produce a residue of oil on the transaxle housing interior, clutch cover and flywheel. Heat buildup caused by slippage can bake the oil residue onto the components. This glaze-like residue ranges in color from amber to black.

GREASE

Grease contamination is usually a product of overlubrication. During clutch service, apply only a small amount of grease to the input shaft splines. Excess grease may be thrown off during operation, contaminating the disc.

ROAD SPLASH/WATER

Road splash contamination is usually caused by driving the vehicle through deep water puddles. Water can be forced into the clutch housing, causing clutch components to become contaminated. Facing of disc will absorb moisture and bond to the flywheel and/or, pressure plate, if vehicle is allowed to stand for some time before use. If this condition occurs, replacement of clutch assembly may be required. Drive the vehicle until normal clutch operating temperature has been obtained. This will dry off disc assembly, pressure plate, and flywheel.

Extreme use of steam cleaning equipment on the engine compartment or vehicle undercarriage can have the same effect.

MODULAR CLUTCH (Continued)

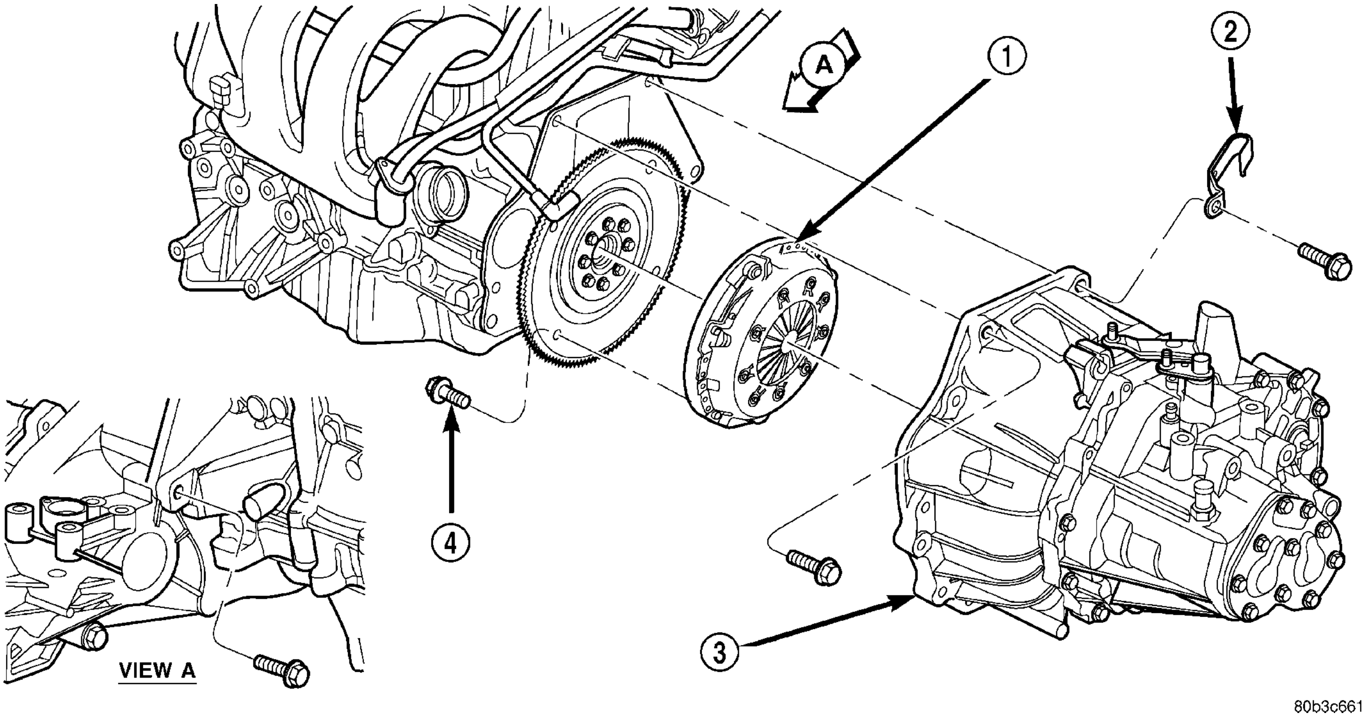


Fig. 47 Transaxle Removal/Installation

1 - MODULAR CLUTCH ASSEMBLY
2 - CLIP
3 - TRANSAXLE
4 - CLUTCH MODULE BOLT (4)

INSTALLATION

(1) Install clutch module (Fig. 47) onto input shaft.

(2) Install transaxle into vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - INSTALLATION)

SLAVE CYLINDER

DESCRIPTION

The clutch slave cylinder integral to the clutch master cylinder and is fastened to transaxle bell-housing (Fig. 48), and consists of a hydraulic piston and cylinder, seal and return spring.

REMOVAL

REMOVAL - T350 MODELS

(1) Raise vehicle on hoist.

(2) Remove cotter key from hydraulic tube-to-slave cylinder connection point.

(3) Using a suitable punch, drive out roll pin and discard.

(4) Remove slave cylinder mounting bolts (Fig. 49).

(5) Remove slave cylinder from transaxle and separate from hydraulic tube. Allow brake fluid to drain into suitable container.

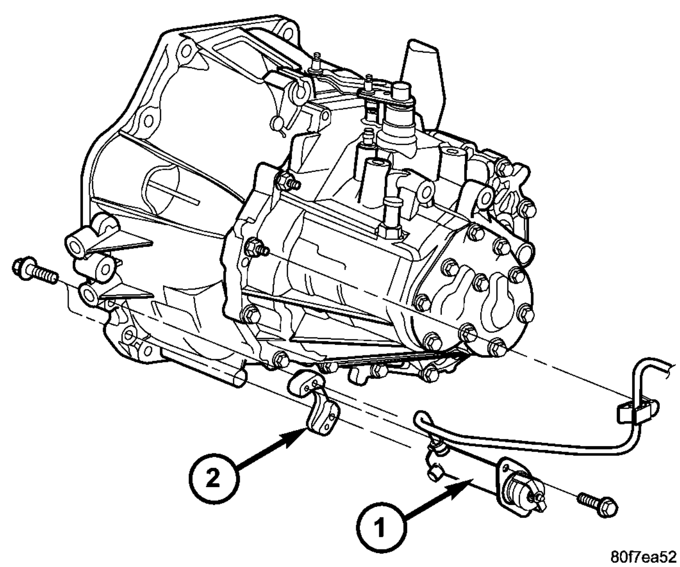


Fig. 48 Clutch Slave Cylinder at Transaxle- 2.0L Models

1 - SLAVE CYLINDER
2 - BRACKET

REMOVAL - T850 MODELS

(1) Raise vehicle on hoist.

(2) Using Tool 6638A, disconnect hyrdraulic clutch circuit quick connect fitting.

SLAVE CYLINDER (Continued)

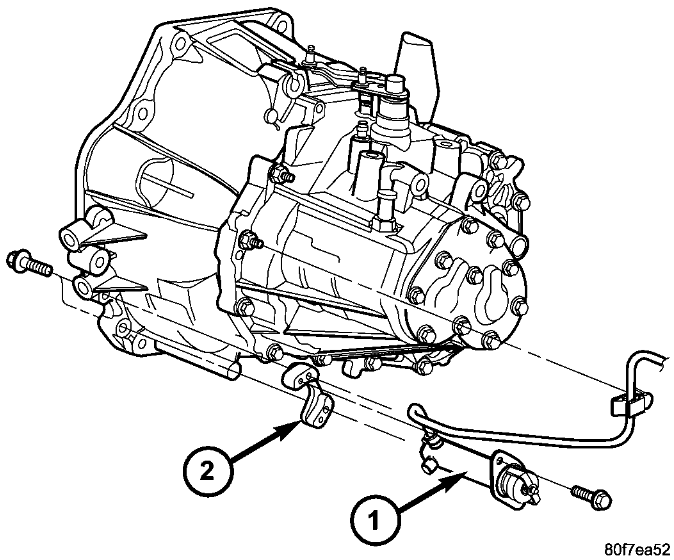


Fig. 49 Clutch Slave Cylinder at Transaxle—2.0L Models

1 - SLAVE CYLINDER
2 - BRACKET

(3) Remove clutch slave cylinder (Fig. 50) by lifting nylon tab with a small screwdriver, and then depressing cylinder inward towards case and rotating cylinder 60° counter-clockwise.

INSTALLATION

INSTALLATION - T350 MODELS

(1) Install the slave cylinder assembly into position on transaxle (Fig. 49).

(2) Tighten slave cylinder-to-transaxle bolts to 19 N·m (168 in. lbs.).

(3) Connect clutch hydraulic supply tube to slave cylinder. Install NEW roll pin and cotter key.

(4) Lower vehicle.

(5) Verify clutch master cylinder reservoir is full. Top off with DOT 3 brake fluid if necessary.

(6) Bleed clutch hydraulic system (Refer to 6 - CLUTCH - STANDARD PROCEDURE).

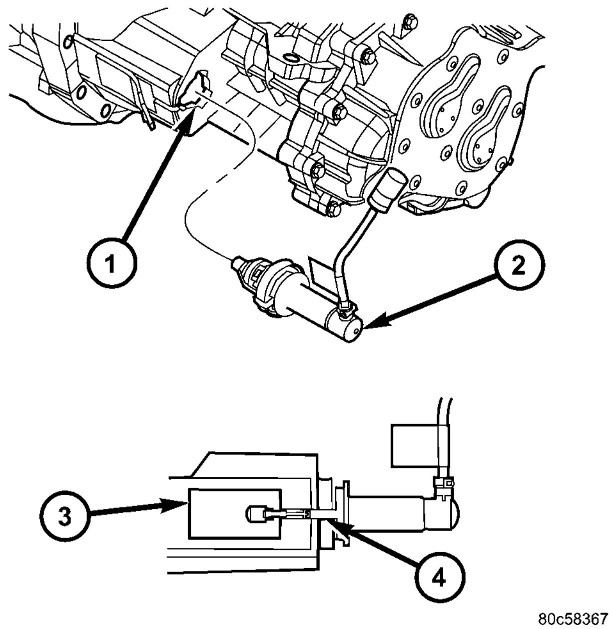


Fig. 50 Slave Cylinder Removal/Installat

1 - MOUNTING HOLE
2 - SLAVE CYLINDER
3 - ACCESS HOLE
4 - NYLON ANTI-ROTATION TAB

(7) Verify proper clutch release system operation.

INSTALLATION - T850 MODELS

(1) Install clutch slave cylinder into position, noting orientation of different sized lugs. While depressing inward, rotate slave cylinder clockwise until nylon locating tab rests in transaxle case cutout, and the hydraulic tube is vertical (Fig. 50).

(2) Connect “quick-connect” connection until an audible “click” is heard. Verify connection by pulling outward on connection.

(3) Lower vehicle.

COOLING

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COOLING

WARNING

COOLING SYSTEM WARNINGS

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

SPECIFICATIONS

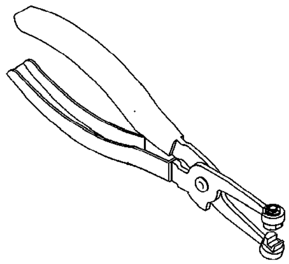
TORQUE - 2.0L SOHC

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Screws, A/C Condenser to Radiator	7.2	-	65
Bolt, Automatic Belt Tensioner Pulley	27	20	-
Nut/Screw, Coolant Recovery Container	4	-	35
Coolant Temperature Sensor	18	-	165
Screws, Radiator Fan to Radiator	7.2	-	65
Screws, Radiator Fan Motor to Shroud	3.8	-	34
Nut, Radiator Fan Blade to Motor Shaft	6.2	-	55
Screw, In-Rush Current Supressor	2.6	-	23
Pivot Bolt, Generator Mounting	54	40	-
Locking Nut, Generator Mounting	54	40	-
Screws, Radiator (Cooling Module) to Body	10	-	90
Screws, Thermostat Housing/Water Outlet Connector	12	-	105
Bolts, Water Pump to Engine Block	12	-	105
Bolts, Water Pump Inlet Tube to Engine Block	12	-	105

COOLING (Continued)

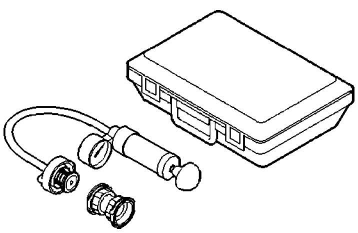
SPECIAL TOOLS

COOLING SYSTEM

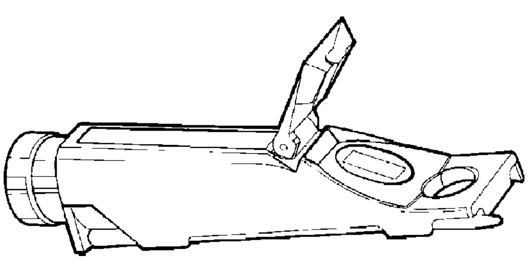


Hose Clamp Pliers 8495

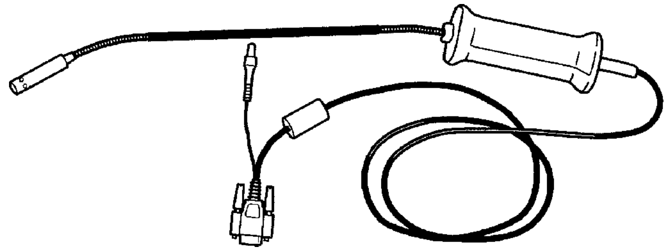
Filling Aid Funnel 8195



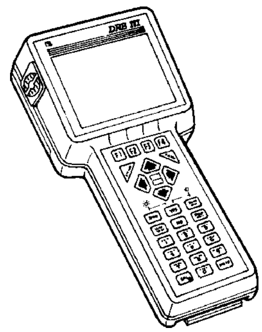
Cooling System Tester – 7700



Coolant Refractometer – 8286



Belt Tension Gauge Adapter – 8371



DRB III® with PEP Module – OT-CH6010A

ACCESSORY DRIVE - 2.0L SOHC

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DRIVE BELTS

DESCRIPTION

The accessory drive consist of two Poly-V type drive belts (Fig. 1). One belt drives the generator, the other drives the power steering pump and air conditioning compressor (if equipped). The power steering/ air conditioning belt is tensioned by an automatically controlled belt tensioner. The generator belt is manually tensioned using an adjusting bolt and a locking nut.

OPERATION

The accessory drive belts form the link between the engine crankshaft and the engine driven accessories.

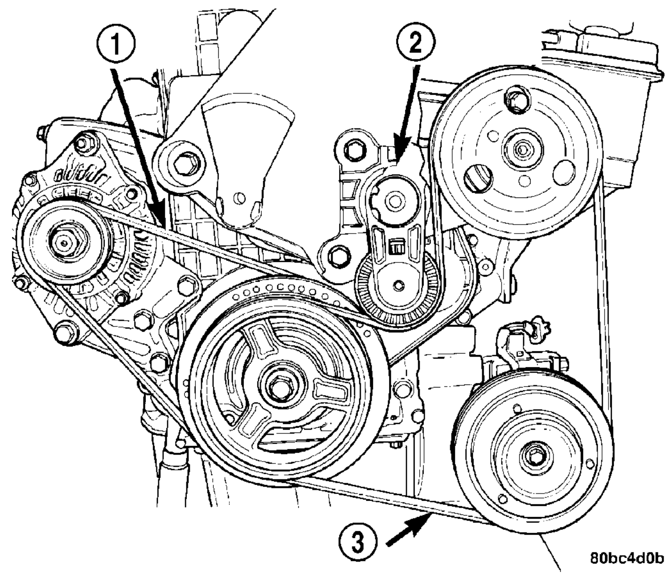

Fig. 1 Accessory Drive Belts

1 - GENERATOR BELT
2 - AUTOMATIC BELT TENSIONER
3 - POWER STEERING PUMP & A/C COMPRESSOR BELT

DRIVE BELTS (Continued)

DIAGNOSIS AND TESTING - ACCESSORY DRIVE BELT DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
BELT SLIPPAGE	1. Belt slipping because of insufficient tension.	1. Re-tension generator belt. Replace the power steering belt's automatic belt tensioner.
	2. Belt excessively glazed or hardened from heat and excessive slippage.	2. Replace belt.
	3. Incorrect belt.	3. Replace belt.
	4. Driven component bearing failure.	4. Replace faulty component.
	5. Belt or pulley subjected to substance (belt dressing, oil, ethylene glycol) that has reduced friction.	5. Replace belt and clean pulleys.
BELT NOISE (OBJECTIONABLE SQUEAL, SQUEAK, OR RUMBLE)	1. Belt slippage.	1. Re-tension generator belt, replace belt, or automatic belt tensioner.
	2. Foreign material imbedded in belt.	2. Replace belt.
	3. Non-uniform belt.	3. Replace belt.
	4. Misaligned pulley(s).	4. Align accessories.
	5. Non-uniform groove or eccentric pulley.	5. Replace pulley(s).
	6. Bearing noise.	6. Locate and repair.
BELT ROLLED OVER IN GROOVE OR BELT JUMPS OFF	1. Broken cord in belt.	1. Replace belt.
	2. Belt tension too loose, or too tight.	2. Retension generator belt. Replace the power steering belt's automatic belt tensioner.
	3. Misaligned pulleys.	3. Align accessories.
	4. Non-uniform grooves or eccentric pulley.	4. Replace pulley(s).
	5. Foreign object(s) in grooves.	5. Remove foreign objects in groove.

REMOVAL

POWER STEERING PUMP AND AIR CONDITIONING COMPRESSOR BELT

(1) Using a 17 mm wrench, rotate belt tensioner clockwise (Fig. 2) until belt can be removed from power steering pump pulley. Gently, release spring tension on tensioner.

(2) Remove the drive belt (Fig. 3).

GENERATOR BELT

(1) Remove power steering pump/air conditioning compressor drive belt.

(2) Loosen generator locking nut (Fig. 4).

(3) Raise vehicle on hoist.

(4) Remove accessory drive belt splash shield (Fig. 5).

(5) Loosen generator pivot bolt (Fig. 4).

(6) Loosen generator adjusting bolt until generator belt can be removed (Fig. 4).

(7) Remove generator belt.

DRIVE BELTS (Continued)

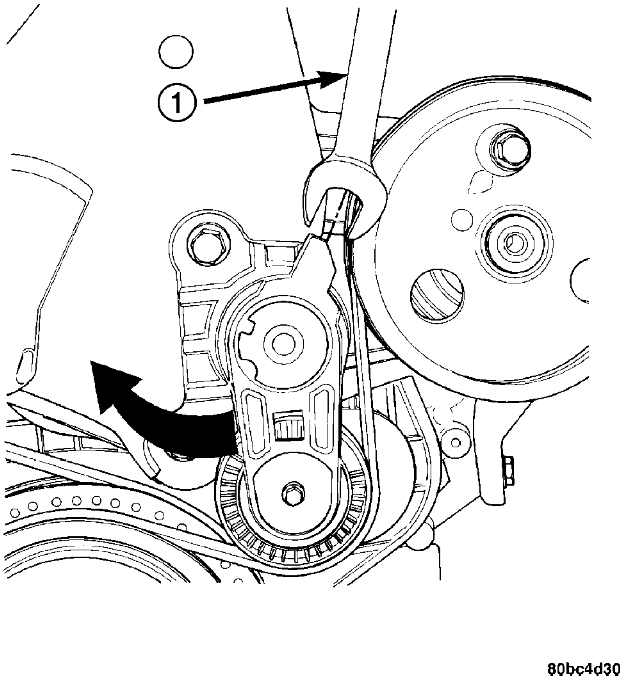

Fig. 2 Accessory Belt - Removal

1 - 17 mm WRENCH

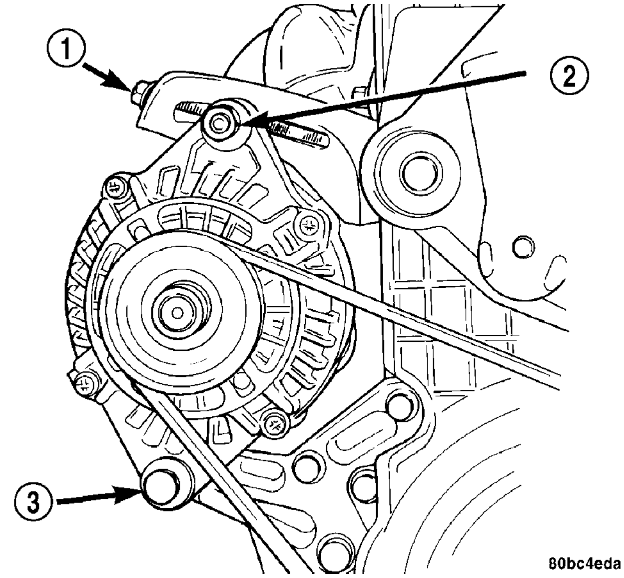

Fig. 4 Generator Belt Adjustment

1 - ADJUSTING BOLT
2 - LOCKING NUT
3 - PIVOT BOLT

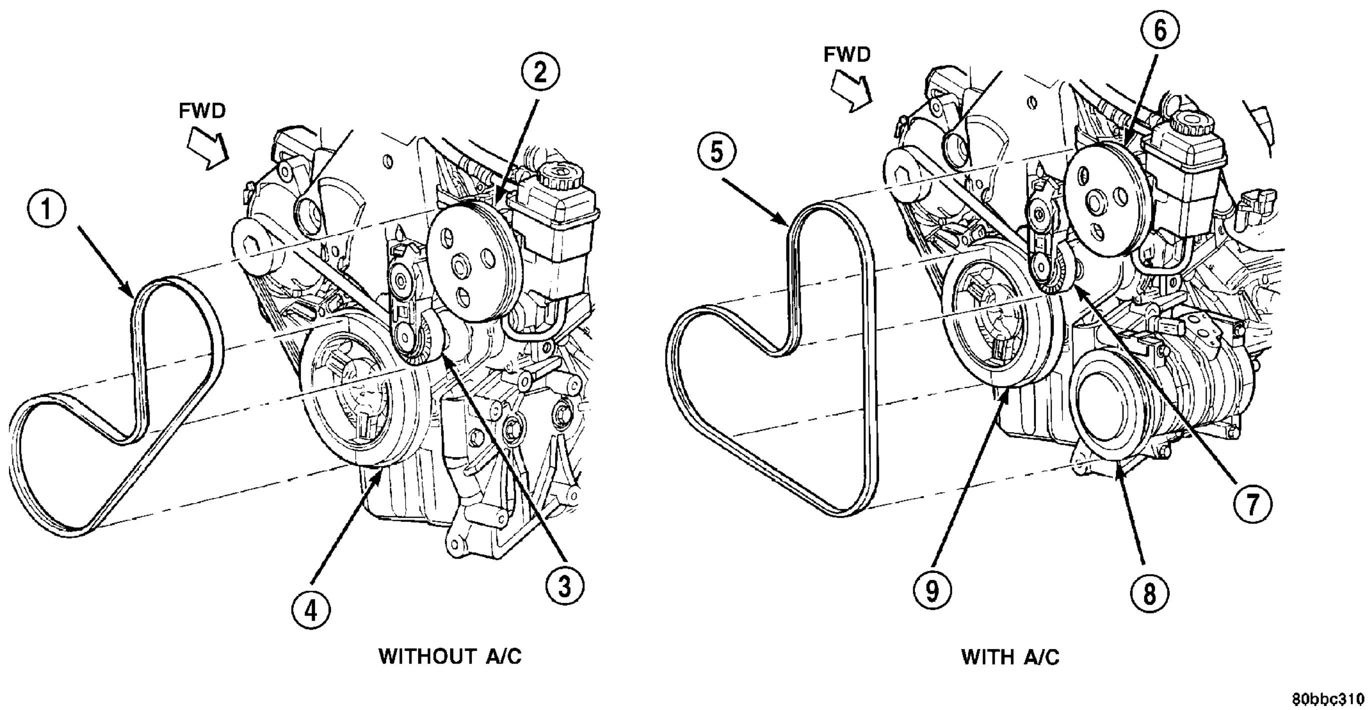

Fig. 3 Power Steering / A/C Belt

1 - BELT
2 - P/S PULLEY
3 - TENSIONER PULLEY
4 - CRANKSHAFT PULLEY
5 - BELT
6 - P/S PULLEY
7 - TENSIONER PULLEY
8 - A/C PULLEY
9 - CRANKSHAFT PULLEY

DRIVE BELTS (Continued)

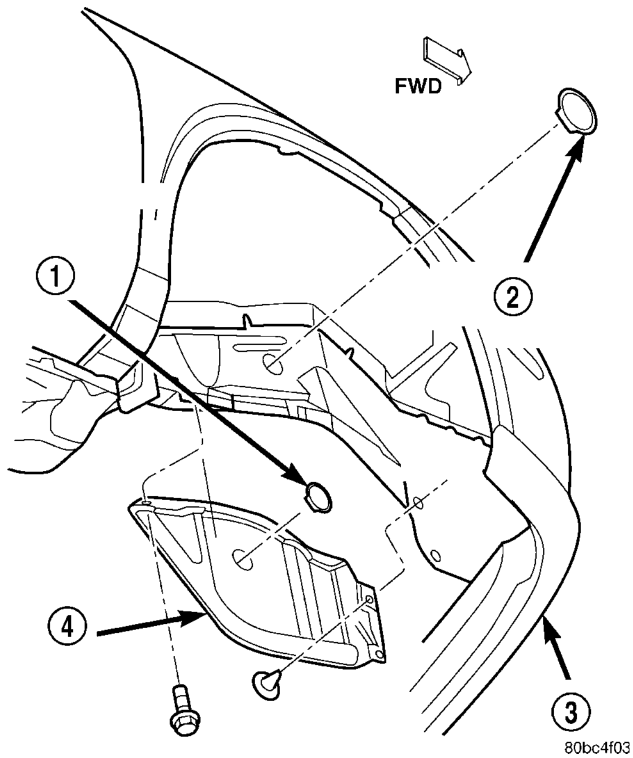

Fig. 5 Accessory Drive Belt Splash Shield

1 - CRANKSHAFT BOLT ACCESS PLUG
2 - RIGHT MOUNT BOLT ACCESS PLUG
3 - FASCIA
4 - SPLASH SHIELD

CLEANING

Clean all foreign debris from belt pulley grooves. The belt pulleys must be free of oil, grease, and coolants before installing the drive belt.

INSPECTION

New developments in belt technology allow the belt to greatly increase its life expectancy. Unless the belt exhibits one of the following conditions do not replace the belt.

- Excessive wear
- Frayed cords
- Severe glazing

Poly-V Belt system may develop minor cracks across the ribbed side (due to reverse bending). These minor cracks are considered normal and acceptable. Parallel cracks are not (Fig. 6).

NOTE: Do not use any type of belt dressing or restorer on Poly-V Belts.

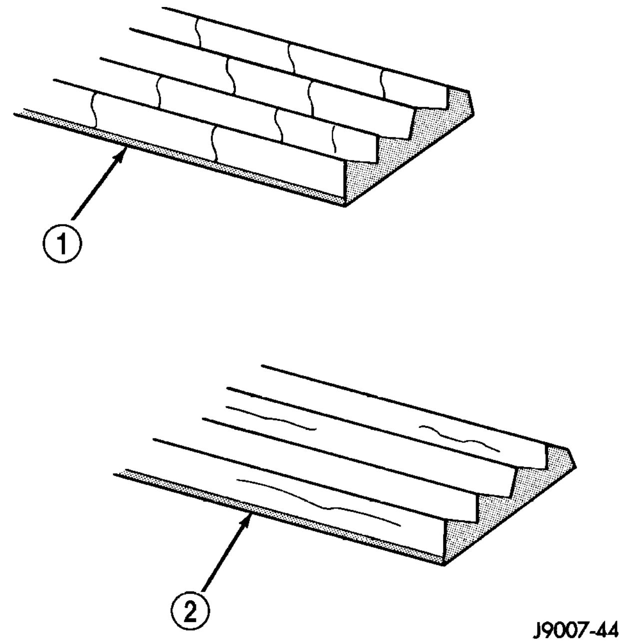

Fig. 6 Drive Belt Wear Pattern

1 - NORMAL CRACKS - BELT OK
2 - NOT NORMAL CRACKS - REPLACE BELT

INSTALLATION

NOTE: When installing drive belt on the pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulley grooves.

POWER STEERING PUMP AND AIR CONDITIONING COMPRESSOR BELT

(1) Install the drive belt (Fig. 3) over all the pulleys except for the power steering pump pulley.

(2) Using a 17 mm wrench, rotate belt tensioner clockwise (Fig. 2) until belt can be installed on the power steering pulley. Release spring tension onto belt.

(3) After belt is installed, inspect belt length indicator marks (Fig. 7). The indicator mark should be within the minimum belt length and maximum belt length marks. On a new belt, the indicator mark should align approximately with the nominal belt length mark.

DRIVE BELTS (Continued)

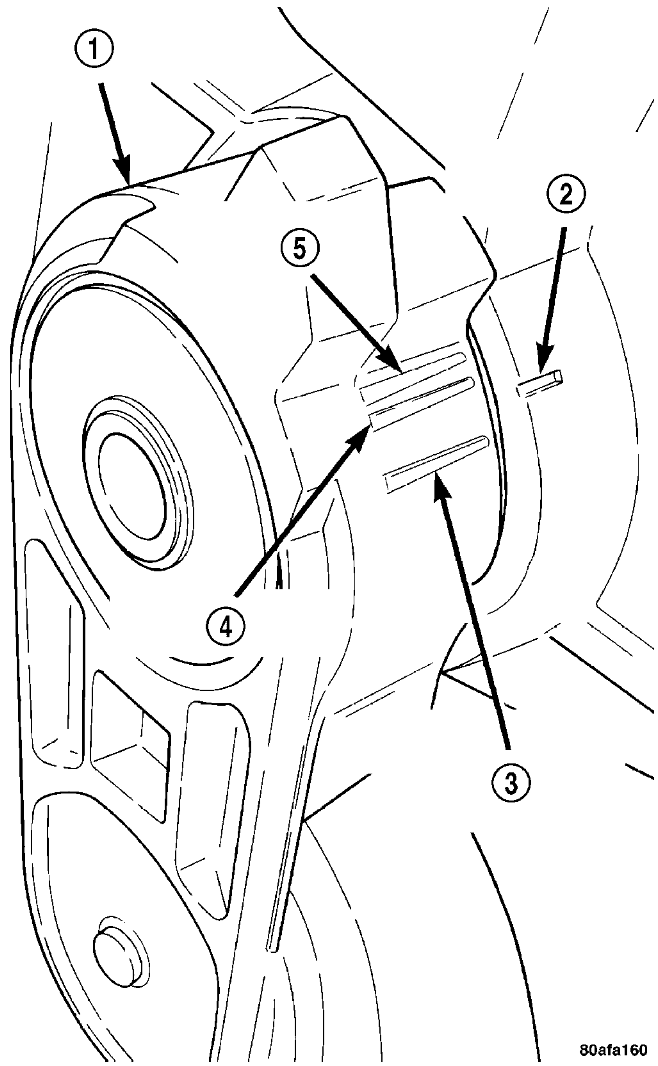

Fig. 7 Belt Length Indicator Marks

1 - AUTOMATIC BELT TENSIONER
2 - BELT LENGTH INDICATOR
3 - MAXIMUM BELT LENGTH
4 - NOMINAL BELT LENGTH
5 - MINIMUM BELT LENGTH

GENERATOR BELT

(1) Install belt around pulleys (Fig. 3).

(2) Adjust belt tension by tightening adjusting bolt (Fig. 4). Adjust belt to specification shown in DRIVE BELT TENSION CHART.

(3) Check belt tension using Special Tool 8371 – Belt Tension Gauge Adapter, and the DRBIII® using the following procedures:

WARNING: DO NOT CHECK BELT TENSION WITH ENGINE RUNNING.

(a) Connect 8371 to the DRBIII® following the instructions provided with tool.

(b) Place end of microphone probe approximately 2.54 cm (1 in.) from belt at one of the belt center span locations shown in (Fig. 8).

(c) Pluck the belt a minimum of 3 times. (Use your finger or other suitable tool)

(d) The frequency of the belt in hertz (Hz) will display on DRBIII® screen.

(e) Adjust belt to obtain proper frequency (tension). Refer to DRIVE BELT TENSION CHART for specifications.

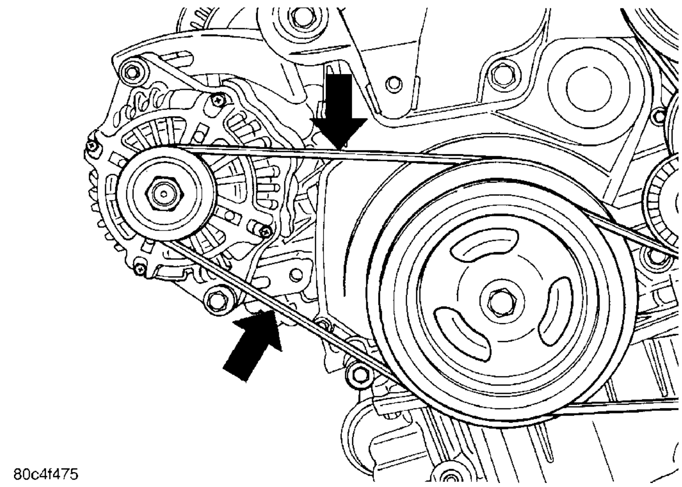

Fig. 8 Belt Center Spans

(4) Tighten generator pivot bolt to 54 N·m (40 ft. lbs.) (Fig. 4).

(5) Install accessory drive belt splash shield (Fig. 5).

(6) Lower vehicle.

(7) Tighten generator locking nut to 54 N·m (40 ft. lbs.) (Fig. 4).

(8) Install power steering pump/air conditioning compressor drive belt.

DRIVE BELT TENSION CHART

Accessory Drive Belt	Belt Tension		
Power Steering Pump & A/C Compressor	Dynamic Tensioned		
Generator	New	135 lbs.	224 – 252 Hz
	Used*	70 lbs.	172 – 181 Hz
*A belt is considered used after 15 minutes of run-in time.			

ADJUSTMENTS

For belt tension adjustment procedure, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

BELT TENSIONER

DESCRIPTION

The automatic belt tensioner (Fig. 9) maintains proper tension on the power steering and air conditioning belt. The tensioner is serviced with the engine mount bracket assembly. The tensioner pulley can be serviced separately.

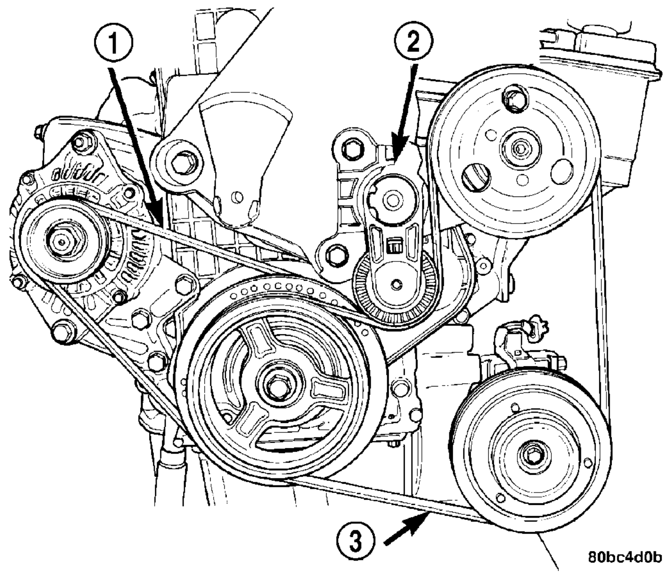

Fig. 9 Automatic Belt Tensioner

1 - GENERATOR BELT
2 - AUTOMATIC BELT TENSIONER
3 - POWER STEERING PUMP & A/C COMPRESSOR BELT

REMOVAL

NOTE: Slight axial movement of the tensioner arm is normal. Tensioner arm should move freely and maintain 50–70 lb. tension on belt.

(1) Remove engine mount bracket assembly. (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - REMOVAL)
(2) Remove the tensioner pulley mounting bolt.
(3) Remove the pulley.

INSTALLATION

(1) Install tensioner pulley, dust shield, and bolt. Tighten bolt to 27 N·m (20 ft. lbs.).
(2) Install engine mount bracket assembly. (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - INSTALLATION)

ENGINE - 2.0L SOHC

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ENGINE - 2.0L SOHC

DESCRIPTION - COOLING SYSTEM

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 and lines, hoses, clamps, and air conditioning condenser.

OPERATION

The primary purpose of a cooling system 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.

The coolant flow circuit is shown in (Fig. 1).

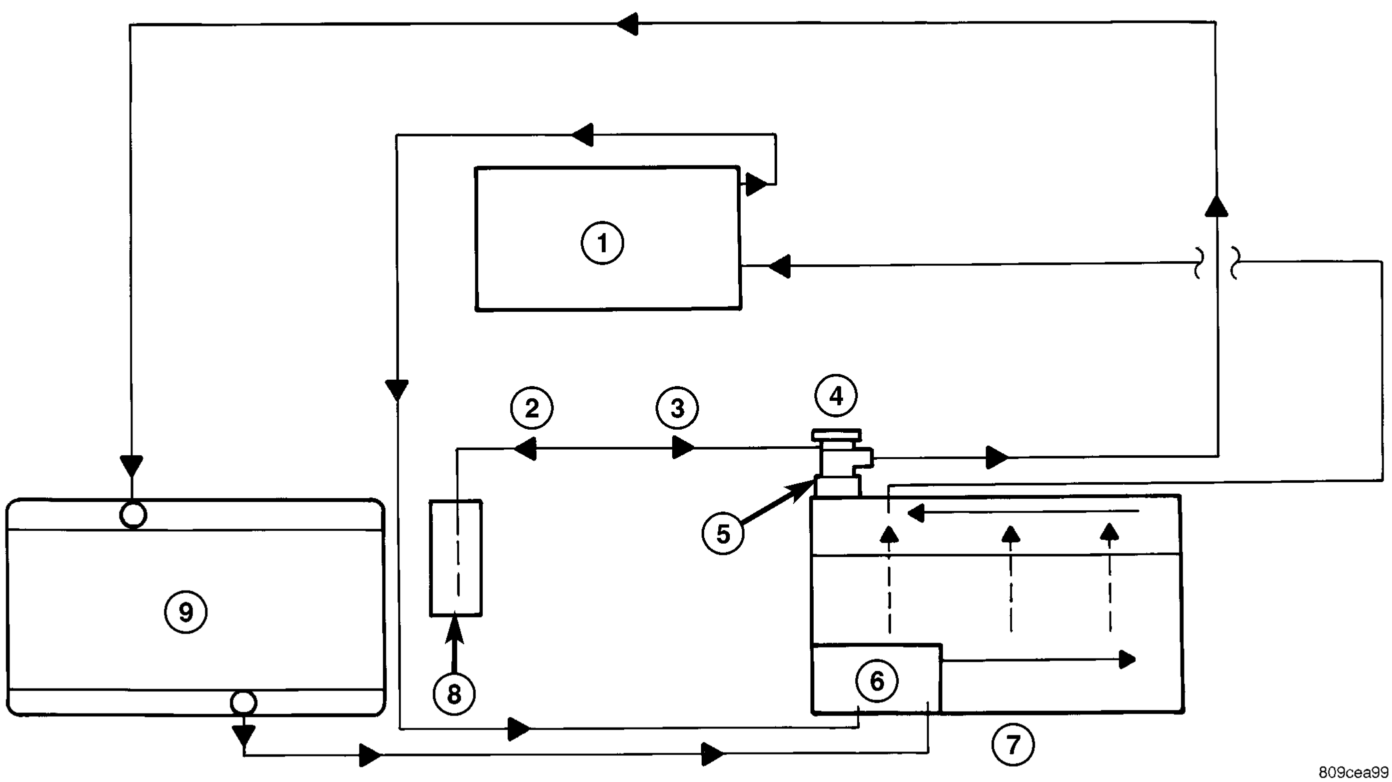

Fig. 1 Cooling System Operation

1 - HEATER
2 - HEAT UP
3 - COOL DOWN
4 - PRESSURE CAP
5 - THERMOSTAT HOUSING/COOLANT OUTLET
6 - WATER PUMP
7 - ENGINE
8 - COOLANT RECOVERY/RESERVE CONTAINER
9 - RADIATOR

ENGINE - 2.0L SOHC (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - COOLING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Diagnostic Trouble Code (P0125 or P1281) set indicating a stuck open engine thermostat	1. (Refer to Appropriate Diagnostic Information) Replace thermostat, if necessary. If a (DTC) has not been set, the problem may be with the temperature gauge.
	2. Engine coolant temperature sensor (ECT)	2. Check the connector at the ECT. Check ECT function (Refer to the Appropriate Diagnostic Information)
	3. Temperature gauge	3. Check Gauge operation. (Refer to the Appropriate Diagnostic Information)
	4. Coolant level low during cold ambient temperature, accompanied by poor heater performance.	4. Check coolant level (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE). Inspect the system for leaks. Repair as necessary.
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 cause these conditions.	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. Is temperature gauge (if equipped) reading correctly?	2. Check the gauge. (Refer to the Appropriate Diagnostic Information) Repair as necessary.
	3. Is temperature warning lamp (if equipped) illuminating unnecessarily?	3. Check warning lamp operation. (Refer to the Appropriate Diagnostic Information) Repair as necessary.
	4. Low coolant in recovery/reserve container and radiator.	4. Check for coolant leaks (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING). Repair as necessary.
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following step 6.	5. Tighten pressure cap.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
	6. Poor seals at pressure cap.	6. (a) Check condition of cap and cap seals. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - INSPECTION) Replace cap if necessary. (b) Check condition of filler neck. If neck is warped or damaged, replace as necessary.
	7. Coolant level low in radiator, but not in coolant recovery/reserve container. This indicates the radiator is not drawing coolant from the coolant recovery/reserve container 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 cannot be formed.	7. (a) Check condition of pressure cap and seals. Replace cap if necessary. (b) Check condition of filler neck. Replace if damaged. (c) Check condition of hose from filler neck to coolant container. It should be tight at both ends without any kinks or tears. Replace hose as necessary. (d) Check coolant recovery/reserve container and hose for blockage. Repair as necessary.
	8. Freeze point of coolant not correct. Mixture ratio may be too rich.	8. Check coolant concentration. (Refer to 7 - COOLING/ENGINE/ COOLANT - DIAGNOSIS AND TESTING) 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 obstruction from fins.
	11. Radiator core is plugged or corroded.	11. Clean or replace radiator as necessary.
	12. Fuel or ignition system problems.	12. (Refer to the Appropriate Diagnostic Information)
	13. Dragging Brakes.	13. Inspect brake system and repair as necessary. (Refer to 5 - BRAKES/HYDRAULIC/ MECHANICAL - DIAGNOSIS AND TESTING)
	14 Bug screen or other aftermarket accessory is being used causing reduced air flow.	14. Remove bug screen or accessory.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
	15. Thermostat partially or completely closed.	15. Check thermostat operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - DIAGNOSIS AND TESTING)
	16. Electric radiator 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 9 - ENGINE/ CYLINDER HEAD - DIAGNOSIS AND TESTING)
	18. Heater core leaking.	18. Check heater core for leaks. Repair as necessary.
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 7 - COOLING/ ENGINE/RADIATOR FAN - DIAGNOSIS AND TESTING)
	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 is defective or shorted.	3. Check operation of gauge and repair as necessary. (Refer to the Appropriate Diagnostic Information)
	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. The gauge should return to normal range after vehicle is driven.
	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 thermostat to open late).	6. Check cooling system for leaks. Repair as necessary. (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING).
	7. Cylinder head gasket leaking allowing exhaust gas to enter cooling system. This will cause thermostat to open late.	7. (a) Check for cylinder head gasket leaks. Repair as necessary. (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING)
		(b) Check for coolant in the engine oil. Inspect for white steam emitting from exhaust system. Repair as necessary.
	8. Water pump impeller or pulley loose on shaft.	8. Check water pump and replace as necessary.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
	9. Air leak on the suction side of water pump allows air to build up in cooling system. This will cause the thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT FLOWING INTO RECOVERY CONTAINER. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL, BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN RECOVERY CONTAINER.	1. Pressure relief valve in pressure cap is defective.	1. Check condition of radiator pressure cap and seals. Replace as necessary. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING)
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE IS READING HIGH OR HOT.	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. (Refer to 7 - COOLING/ ENGINE - DIAGNOSIS AND TESTING).
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.	2. Check the freeze point of the coolant. (Refer to 7 - COOLING/ ENGINE/COOLANT - DIAGNOSIS AND TESTING) Adjust 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 recovery/reserve container system.	1. (a) Radiator pressure cap relief valve stuck. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING) Replace as necessary.
		(b) Hose between coolant recovery/reserve container and radiator is kinked. Repair as necessary.
		(c) Vent at coolant recovery/reserve container is plugged. Clean vent and repair as necessary.
		(d) Recovery/reserve container is internally blocked or plugged. Check for blockage and repair as necessary.
ELECTRIC RADIATOR FAN OPERATES ALL THE TIME.	1. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective.	1. (Refer to the Appropriate Diagnostic Information) Repair as necessary.
	2. Check for low coolant level.	2. (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE). Repair as necessary.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
ELECTRIC RADIATOR FAN WILL NOT OPERATE. GAUGE READING HIGH OR HOT	1. Radiator fan motor defective.	1. (Refer to the Appropriate Diagnostic Information) Repair as necessary.
	2. Radiator fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective.	2. (Refer to the Appropriate Diagnostic Information) Repair as necessary.
	3. Blown fuse in power distribution center (PDC).	3. Determine reason for blown fuse and repair as necessary.
NOISY FAN	1. Radiator fan blade loose.	1. Replace fan blade assembly. (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - DISASSEMBLY)
	2. Radiator fan blade striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or A/C condenser.	3. Remove obstructions and/or clean debris from radiator and/or A/C condenser.
	4. Radiator fan motor defective.	4. Replace as necessary. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - DISASSEMBLY)
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 the Appropriate Diagnostic Information) 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.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
INADEQUATE HEATER PERFORMANCE.	1. Diagnostic Trouble Code (P0125 or P1281) set indicating a stuck open engine thermostat	1. (Refer to the Appropriate Diagnostic Information)
	2. Coolant level low.	2. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING) 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.	5. (Refer to 7 - COOLING/ENGINE/ WATER PUMP - DIAGNOSIS AND TESTING) Repair as necessary.
HEAT ODOR	1. Various heat shields are used at certain driveline components. One or more of these shields may be missing.	1. Locate missing shields and replace or repair as necessary.
	2. Is temperature gauge reading above the normal range?	2. Refer to the previous Temperature Gauge Reads High in these Diagnostic Charts. Repair as necessary.
	3. Radiator fan operating incorrectly.	3. (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - DIAGNOSIS AND TESTING) 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 converter to overheat.	5. (Refer to the Appropriate Diagnostic Information) Repair as 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) been set?	1. (Refer to the Appropriate Diagnostic Information) Replace thermostat if necessary.
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP, 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 contact 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.

ENGINE - 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
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 7 - COOLING/ ENGINE/COOLANT - DIAGNOSIS AND TESTING) Adjust the glycol-to-water ratio as required.
COOLANT LEVEL CHANGES IN COOLANT RECOVERY/RESERVE CONTAINER	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the container 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 - COOLING SYSTEM FLOW CHECK

To determine whether coolant is flowing through the cooling system, use one of the following procedures:

PREFERRED METHOD

WARNING: DO NOT REMOVE THE COOLING SYSTEM PRESSURE CAP OR ANY HOSE WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

- 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. Replace removed coolant into coolant recovery container.

ALTERNATIVE METHOD

- If engine is cold, idle engine until normal operating temperature is reached. Feel the upper radiator hose. If it is hot, coolant is circulating.

DIAGNOSIS AND TESTING - COOLING SYSTEM LEAK TESTING

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT 15 MINUTES BEFORE REMOVING PRESSURE CAP. PLACE 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. WHEN THE SYSTEM STOPS PUSHING COOLANT AND STEAM INTO THE COOLANT RECOVERY BOTTLE 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.

With engine not running, wipe the coolant filler neck sealing seat clean. The radiator should be full.

Attach a cooling system pressure tester (Tool 7700 or equivalent) to the coolant filler neck, as shown in (Fig. 2) 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.

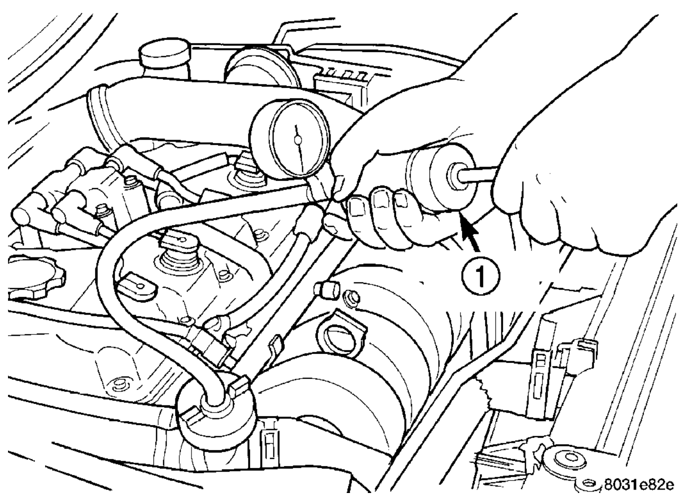

Fig. 2 Pressure Testing Cooling System—Typical

1 - PRESSURE TESTER

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. Reattach the tester. If the needle on the dial fluctuates, it indicates a combustion leak and is usually a head gasket leak.

ENGINE - 2.0L SOHC (Continued)

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 tailpipe, 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 dipstick. 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.

DIAGNOSIS AND TESTING - COOLING SYSTEM AERATION

Low coolant level in a cross flow radiator will equalize in both tanks with engine off. With engine at running and at 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, aeration will occur drawing air into the water pump resulting in the following:

- High reading shown on the temperature gauge.
- Loss of coolant flow through the heater core.
- Corrosion in the cooling system.
- Transmission oil will become hotter.
- Water pump seal may run dry, increasing the risk of premature seal failure.
- Combustion gas leaks into the coolant can also cause the above problems.

DIAGNOSIS AND TESTING - COOLING SYSTEM 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 coolant recovery bottle by thermal expansion of the coolant. It then escapes to the atmosphere in the coolant recovery bottle and is replaced with coolant on cool down.

To effectively deaerate the system, multiple thermal cycles of the system may be required.

NOTE: Deaeration does not occur at engine idle—higher engine speeds are required. Normal driving will deaerate cooling system.

STANDARD PROCEDURE

STANDARD PROCEDURE - COOLANT LEVEL SERVICING

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 engine, the engine must be **off** and **not** under pressure. Drain several ounces of coolant from the radiator draincock while observing the coolant recovery container. Coolant level in the container should drop slightly. Then remove the pressure cap, (Fig. 3). Coolant should be to the top of the pressure cap neck. If not, and the coolant level in the recovery container is at the ADD mark there is a air leak in the recovery system. Check hose or hose connections to the recovery container, radiator filler neck or the pressure cap seal to the radiator filler neck for leaks.

STANDARD PROCEDURE - ROUTINE COOLANT LEVEL CHECK

NOTE: Do not remove pressure cap for routine coolant level inspections.

The coolant recovery/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 recovery/reserve container (Fig. 4) is between the FULL HOT and ADD marks.

STANDARD PROCEDURE - ADDING ADDITIONAL COOLANT

NOTE: The radiator cap should not be removed.

When additional coolant is needed, it should be added to the coolant recovery/reserve container (Fig. 3). Use only a 50/50 concentration of the recommended ethylene glycol type antifreeze and distilled water. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION)

ENGINE - 2.0L SOHC (Continued)

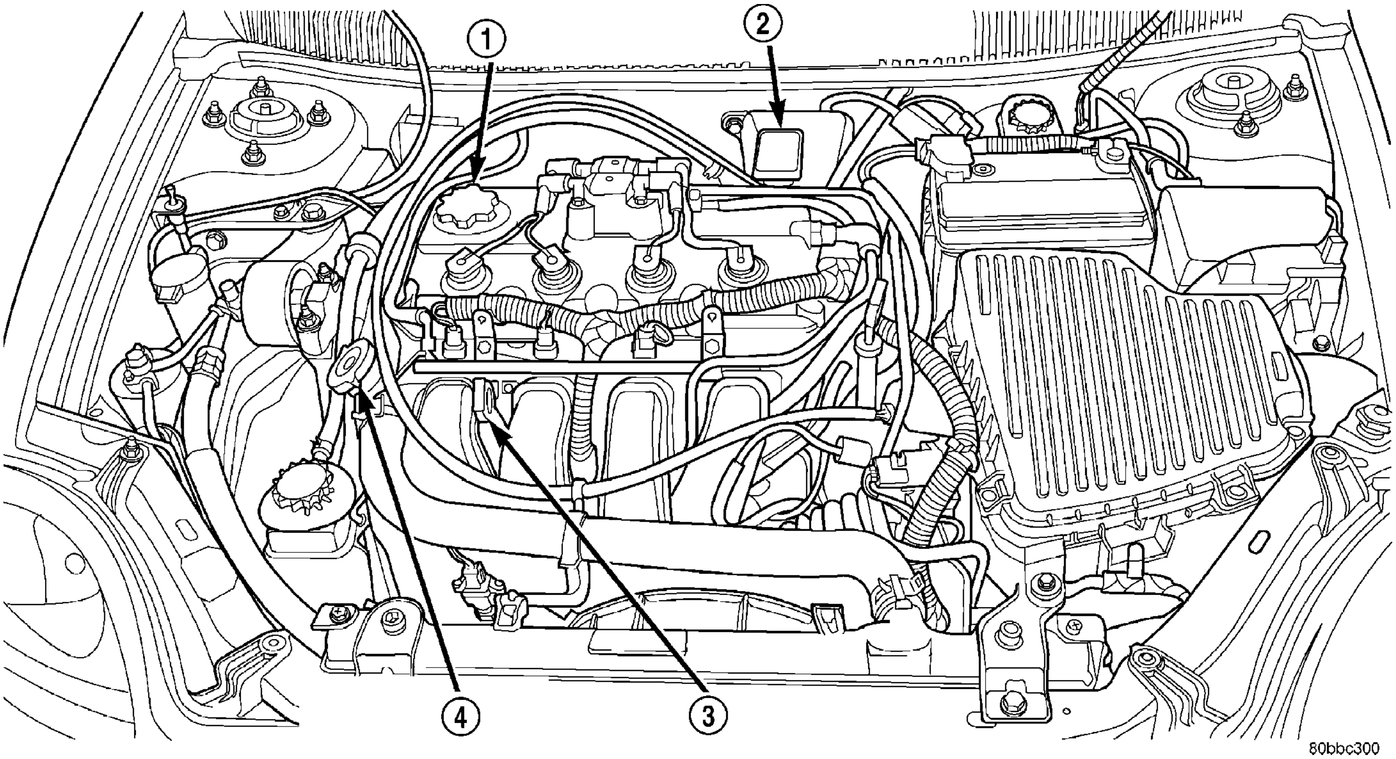

Fig. 3 Coolant Service Locations

1 - ENGINE OIL FILL
2 - ENGINE COOLANT RECOVERY CONTAINER
3 - ENGINE OIL DIPSTICK
4 - COOLING SYSTEM PRESSURE CAP

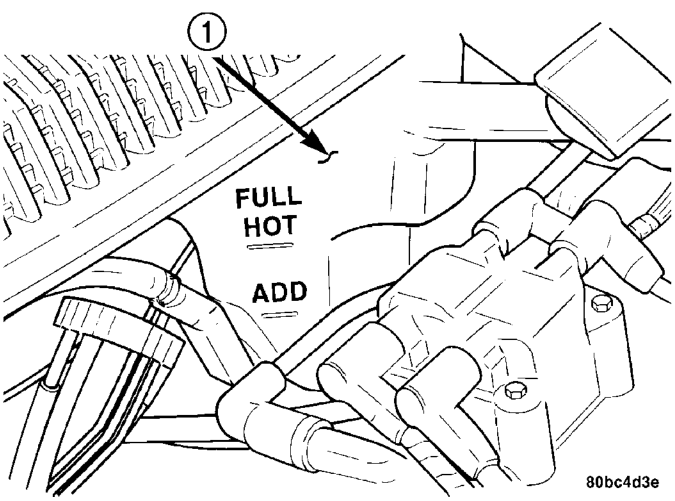

Fig. 4 Coolant Level

1 - COOLANT RECOVERY CONTAINER

STANDARD PROCEDURE - DRAINING COOLING SYSTEM (2.0L SOHC)

NOTE: Drain, flush, and fill the cooling system at the mileage or time intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). If the coolant is dirty, 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. Follow governmental regulations for disposal procedure of used engine coolant.

(1) Position a clean collecting container under the draincock location (Fig. 5).

(2) Without removing radiator pressure cap and with system not under pressure, turn draincock counterclockwise to open (Fig. 5).

(3) The coolant recovery/reserve container should empty first, then remove the pressure cap.

STANDARD PROCEDURE - FILLING COOLING SYSTEM (2.0L SOHC)

WARNING: MAKE SURE ENGINE COOLING SYSTEM IS COOL BEFORE REMOVING PRESSURE CAP OR ANY HOSE. THE COOLING SYSTEM IS PRESSURIZED WHEN HOT. SEVERE PERSONAL INJURY MAY RESULT FROM ESCAPING HOT COOLANT.

ENGINE - 2.0L SOHC (Continued)

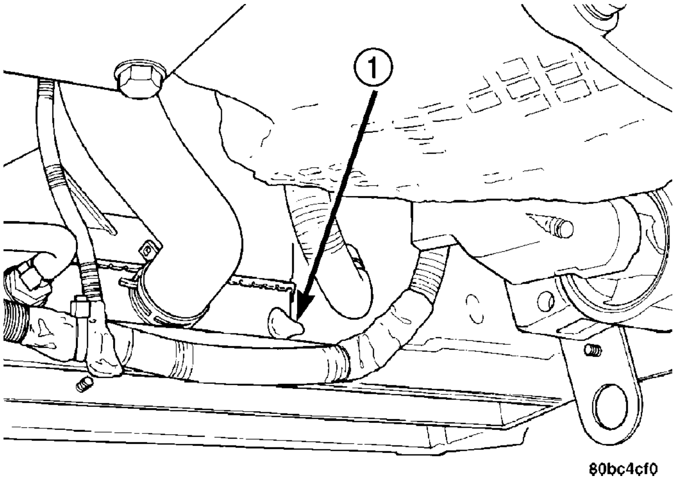

Fig. 5 Cooling System Drain Cock Location

1 - DRAIN COCK

CAUTION: Do not use well water, or suspect water supply in cooling system. A 50/50 mixture of the recommended ethylene glycol and distilled water is recommended. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION)

(1) Close radiator draincock. Hand tighten only.

(2) Remove the cooling system pressure cap and fill the cooling system with the recommended coolant. For recommended coolant usage, (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).

NOTE: Be careful not to spill coolant on drive belts or the generator.

(3) Fill coolant to the top of the pressure cap neck.

(4) Install cooling system pressure cap.

(5) Slowly fill coolant reserve/recovery bottle to at least the FULL HOT mark with the recommended coolant. It may be necessary to add additional coolant to the reserve/recovery bottle after three or four warm-up/cool down cycles to maintain coolant level between the FULL HOT and ADD marks; if any additional trapped air was removed from the system.

CLEANING

Drain cooling system and refill with clean water. Refer to drain and fill procedures in this section. 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. Refill cooling system with a 50/50 mixture of the recommended ethylene glycol and distilled water (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).

INSPECTION

After performing a cleaning/flush procedure, inspect all hoses, clamps and connections for deterioration and leaks. Inspect radiator and heater core for leaks.

COOLANT

DESCRIPTION

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection. Do not mix coolant types. If coolant other than Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula or equivalent is added, the mixed coolant will have a reduced service schedule.

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

DIAGNOSIS AND TESTING - COOLANT CONCENTRATION TESTING

Coolant concentration should be checked when any additional coolant was added to system or after a coolant drain, flush and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of -37°C (-34°F) to -46°C (-50°F). The use of a hydrometer or a refractometer can be used to test coolant concentration.

A hydrometer will test the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene glycol, the larger the number of balls that will float, and higher the freeze protection (up to a maximum of 60% by volume glycol).

A refractometer (Special Tool 8286)(Refer to 7 - COOLING - SPECIAL TOOLS) will test the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

COOLANT (Continued)

Some coolant manufactures use other types of glycols into their coolant formulations. Propylene glycol is the most common new coolant. However, propylene glycol based coolants do not provide the same freezing protection and corrosion protection and is not recommended.

CAUTION: Do not mix types of coolant—corrosion protection will be severely reduced.

STANDARD PROCEDURE - COOLANT SERVICE

For engine coolant recommended service schedule, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

COOLANT RECOVERY CONTAINER

REMOVAL

(1) Disconnect recovery hose from water outlet connector/thermostat housing (Fig. 6).

(2) Remove container attaching fasteners (Fig. 7).

(3) Remove coolant recovery container.

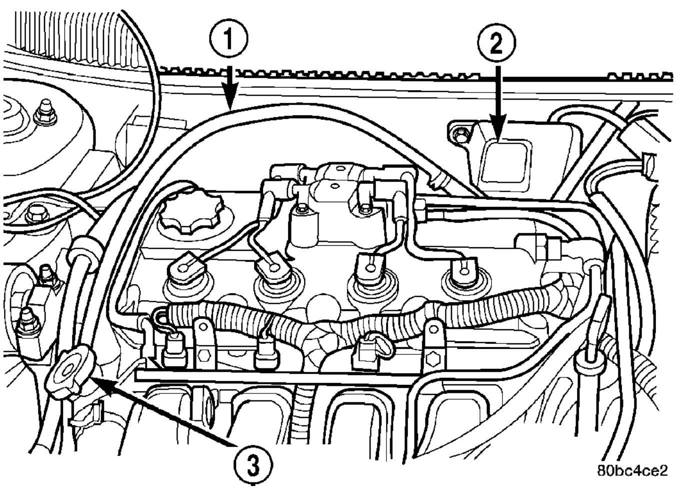

Fig. 6 Recovery Container Hose

1 - RECOVERY HOSE
2 - ENGINE COOLANT RECOVERY CONTAINER
3 - PRESSURE CAP

INSTALLATION

(1) Install coolant recovery container and tighten fasteners to 4 N·m (35 in. lbs.) (Fig. 7).

(2) Connect recovery hose to water outlet connector/thermostat housing (Fig. 6).

(3) Fill container to proper level (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

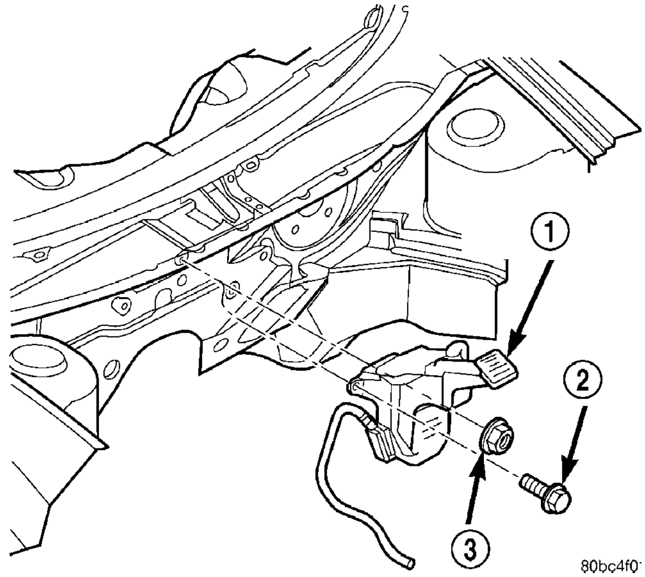

Fig. 7 Coolant Recovery Container

1 - COOLANT RECOVERY CONTAINER
2 - SCREW
3 - NUT

ENGINE BLOCK HEATER

DESCRIPTION

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. 8). The engine block heater is available as an optional accessory. The heater is operated by ordinary house current (110 Volt A.C.) through a power cord and connector behind the radiator grille.

CAUTION: The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged.

OPERATION

The block heater element is submerged in the cooling system's coolant. When electrical power (110 volt A.C.) is applied to the element, it creates heat. This heat is transferred to the engine coolant. This provides easier engine starting and faster warm-up when vehicle is operated in areas having extremely low temperatures.

DIAGNOSIS AND TESTING - ENGINE BLOCK HEATER TESTING

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.

ENGINE BLOCK HEATER (Continued)

REMOVAL

(1) Drain the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Detach power cord plug from heater (Fig. 8).

(3) Loosen screw in center of heater. Remove heater assembly (Fig. 8).

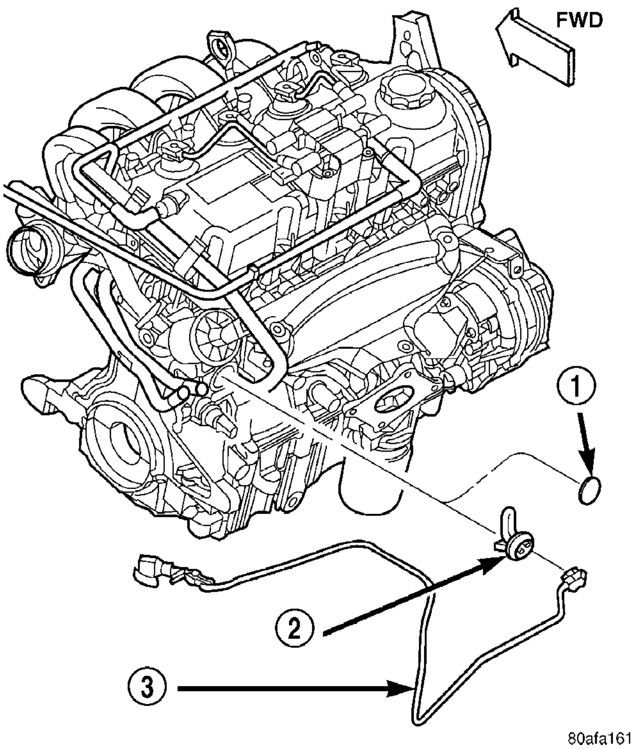

Fig. 8 Engine Block Heater

1 - CORE PLUG
2 - BLOCK HEATER
3 - POWER CORD

INSTALLATION

(1) Thoroughly clean core hole and heater seat.

(2) Insert heater assembly with element loop positioned **upward (Fig. 8)**.

(3) With heater seated, tighten center screw securely to assure a positive seal.

(4) Connect power cord to block heater (Fig. 8).

(5) Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

ENGINE COOLANT TEMP SENSOR

DESCRIPTION

The engine coolant temperature (ECT) sensor threads into the rear of the cylinder head, next to the camshaft position sensor (Fig. 9). New sensors have sealant applied to the threads.

The ECT Sensor is a Negative Thermal Coefficient (NTC) Sensor. The resistance of the ECT Sensor changes as coolant temperature changes. This results in different input voltages to the PCM. The PCM also uses the ECT Sensor input to operate the radiator cooling fan(s), and send a message over the PCI bus to the instrument cluster for temperature gauge operation.

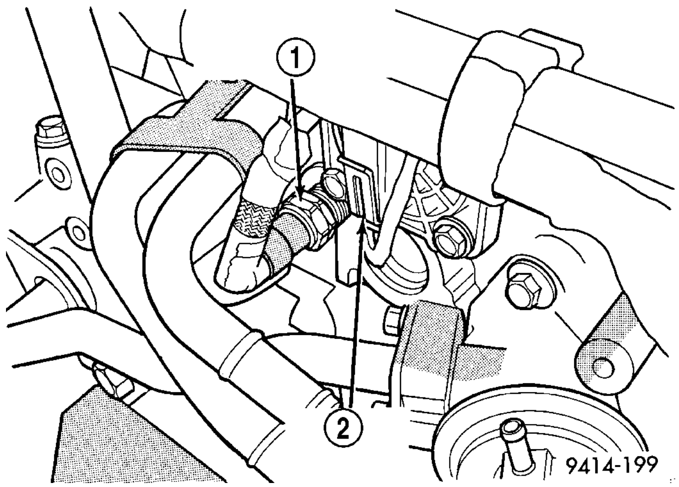

Fig. 9 Engine Coolant Temperature Sensor—SOHC

1 - ENGINE COOLANT TEMPERATURE SENSOR
2 - CAMSHAFT POSITION SENSOR

OPERATION

The ECT sensor provides an input to the PCM. As temperature increases, resistance of the sensor decreases. As coolant temperature varies, the ECT sensor resistance changes resulting in a different voltage value at the PCM ECT sensor signal circuit. The ECT sensor provides input for various PCM operations. The PCM uses the input to control air-fuel mixture, timing, and radiator fan on/off times. The PCM uses ECT sensor input to send messages over the PCI bus for temperature gauge operation.

REMOVAL

(1) With the engine cold, drain coolant until level drops below cylinder head (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Disconnect coolant sensor electrical connector (Fig. 9).

(3) Remove coolant sensor.

INSTALLATION

(1) Install coolant sensor. Tighten sensor to 18 N·m (165 in. lbs.) torque.

(2) Attach electrical connector to sensor (Fig. 9).

(3) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

ENGINE COOLANT THERMOSTAT

DESCRIPTION

The engine thermostat is located on the left front side (radiator side) of the cylinder head in the thermostat housing/engine outlet connector (Fig. 10). The thermostat has an air bleed (vent) located in the flange and a O-ring for sealing incorporate on it. A relief in the thermostat housing/outlet connector is provided for the O-ring.

OPERATION

The engine thermostat is a wax pellet driven, reverse poppet choke type. It is designed to provide the fastest warm up possible by preventing leakage through it and to guarantee a minimum engine operating temperature of 88 to 93°C (192 to 199°F). Also, the thermostat will automatically reach wide open, to accommodate unrestricted 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.

A thermostats 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. It does this by transferring heat from engine metal and automatic transmission oil cooler (if equipped) to coolant, moving this heated coolant to the heater core and radiator, and then transferring this heat to the ambient air.

DIAGNOSIS AND TESTING - ENGINE THERMOSTAT TESTING

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, a diagnostic trouble code (DTC) will be set. Do not change a thermostat for lack of heater performance or temperature gauge position, unless a DTC is present. (Refer to Appropriate Diagnostic Information) For other probable causes, (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING). 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 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING).

REMOVAL

(1) Drain cooling system to the thermostat level or below (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Remove coolant recovery/reserve system hose and radiator upper hose.

(3) Remove thermostat/engine outlet connector bolts (Fig. 10).

(4) Remove thermostat and O-ring assembly.

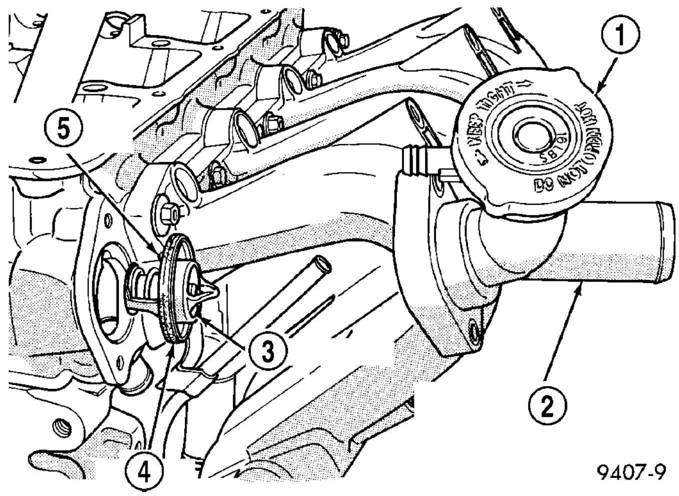

Fig. 10 Thermostat/Engine Outlet Connector

1 - PRESSURE CAP
2 - THERMOSTAT HOUSING/ENGINE OUTLET CONNECTOR
3 - THERMOSTAT
4 - O-RING
5 - VENT FACING UP

INSTALLATION

(1) Clean all sealing surfaces.

(2) Place the new thermostat assembly into the thermostat housing/outlet connector. Align vent with notch in cylinder head.

(3) Install thermostat housing/outlet connector onto cylinder head and tighten bolts to 12.5 N·m (110 in. lbs.).

(4) Install the radiator upper hose.

(5) Connect the coolant recovery/reserve system hose.

(6) Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

HEATER SUPPLY/RETURN TUBES

REMOVAL

NOTE: It is not necessary to remove the intake manifold to replace heater supply/return tubes.

(1) Disconnect negative battery cable. Disconnect positive battery cable. Remove battery.
(2) Raise vehicle on hoist.
(3) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
(4) Remove hose clamp from heater return tube located near starter. Disconnect hose from tube (Fig. 11).
(5) Lower vehicle
(6) Remove air cleaner housing and throttle body to intake manifold hose.
(7) Disconnect PCV vacuum hose at intake manifold.
(8) Remove hose clamp from heater supply tube located near thermostat housing. Disconnect hose from tube.
(9) Remove two heater hose clamps and disconnect heater hoses near battery.
(10) Unclip wiring harness from heater tube assembly.
(11) Remove transmission dipstick tube and place an appropriate plug into hole to prevent coolant from entering transmission.
(12) Remove fasteners attaching heater tube assembly to cylinder head and engine block (Fig. 11).
(13) Remove heater tube assembly.

NOTE: After heater tube assembly is removed, the short hoses connecting the tubes to the thermostat housing and water pump inlet tube can be replaced at this time.

INSTALLATION

(1) Inspect all hoses that connect to heater tubes. Replace if necessary.
(2) Position heater tube assembly near it's mounting location.
(3) Connect hoses at water pump inlet tube and thermostat housing. Ensure clamps are positioned properly to seal hoses and avoid contact with engine components.
(4) Install fasteners attaching heater tube assembly to cylinder head and engine block (Fig. 11).

NOTE: Before installing transmission dipstick tube clean any residual coolant from around the area where plug was placed.

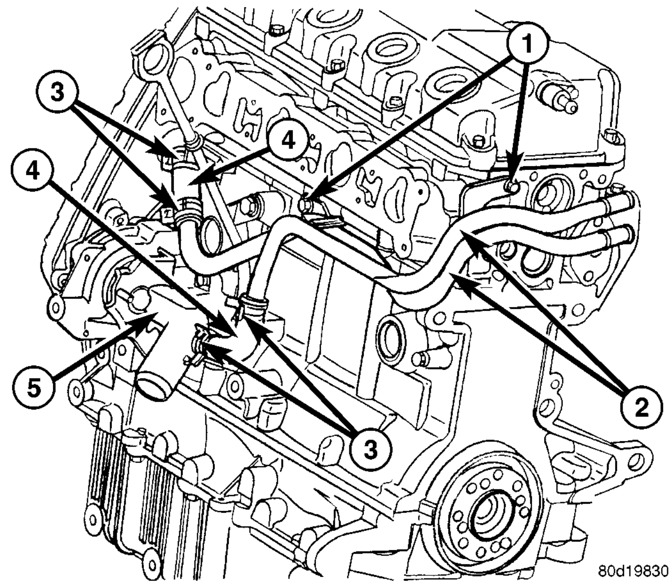

Fig. 11 Heater Supply/Return Tube Assembly

NOTE: INTAKE MANIFOLD REMOVED FOR GRAPHIC PURPOSES
1 - FASTENERS
2 - HEATER SUPPLY/RETURN TUBE ASSEMBLY
3 - CLAMPS
4 - HOSE
5 - WATER PUMP INLET TUBE

(5) Remove plug from transmission dipstick tube mounting hole. Install transmission dipstick tube.
(6) Reattach wiring harness to heater tube assembly.
(7) Connect two heater hoses to heater tubes near battery. Ensure clamps are positioned properly to seal hoses and avoid contact with engine components.
(8) Connect PCV vacuum hose to intake manifold.
(9) Install air cleaner housing and throttle body to intake manifold hose.
(10) Raise vehicle on hoist.
(11) Close radiator draincock.
(12) Lower vehicle
(13) Install battery. Connect positive battery cable. Connect negative battery cable.
(14) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

HOSE CLAMPS

DESCRIPTION - HOSE CLAMPS

The cooling system utilizes spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

HOSE CLAMPS (Continued)

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 (Fig. 12).

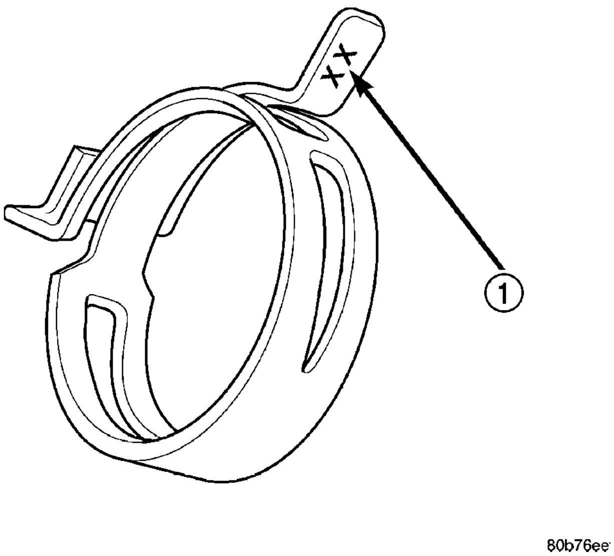

Fig. 12 Spring Clamp Size Location

1 - SPRING CLAMP SIZE LOCATION

OPERATION

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, only use constant tension clamp pliers (Special Tool 8495) designed to compress the hose clamp. For Special Tool Identification, (Refer to 7 - COOLING - SPECIAL TOOLS).

RADIATOR

REMOVAL

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.

(1) Disconnect negative cable from battery.

(2) Drain the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(3) Remove the radiator upper hose from the radiator.

(4) Disconnect the radiator fan motor electrical connector.

(5) Remove the radiator fan assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL)

NOTE: When the transaxle cooler lines are removed from the rolled-groove type fittings at the cooler and transaxle, damage to the inner wall of hose will occur. To prevent potential leakage, the cooler hoses and clamps must be replaced.

(6) Disconnect and cap automatic transmission hoses (if equipped) (Fig. 13).

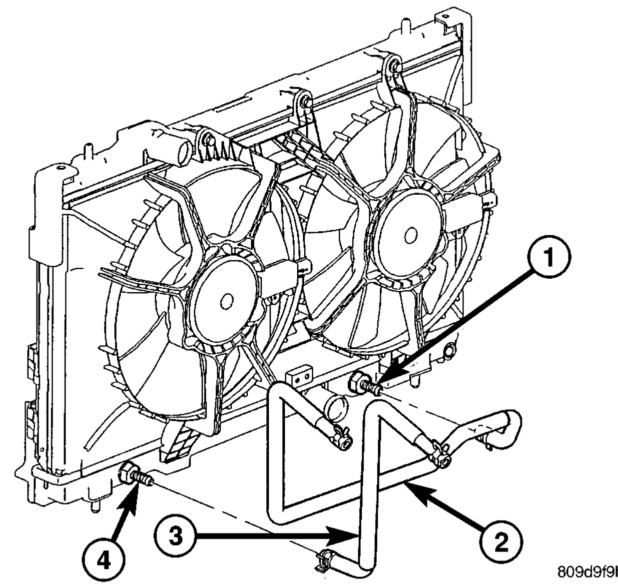

Fig. 13 Transmission Cooler Hoses to Cooler

1 - COOLER FITTING
2 - HOSE - COOLER SUPPLY
3 - HOSE - COOLER RETURN
4 - COOLER FITTING

(7) Remove the radiator lower hose.

(8) Remove radiator upper isolator bracket mounting screws (Fig. 14). Disconnect the engine block heater wire (if equipped).

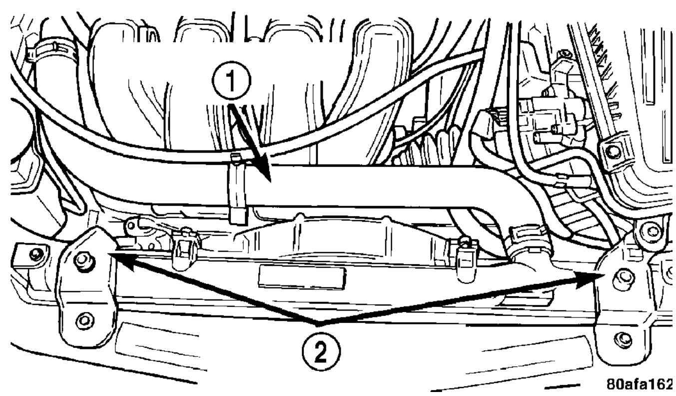

Fig. 14 Radiator Mounting

1 - RADIATOR UPPER HOSE
2 - RADIATOR UPPER MOUNTS

(9) Remove the A/C condenser attaching screws located at the front of the radiator (if equipped) (Fig. 15), then lean condenser forward.

NOTE: It is not necessary to discharge the air conditioning system to remove the radiator.

RADIATOR (Continued)

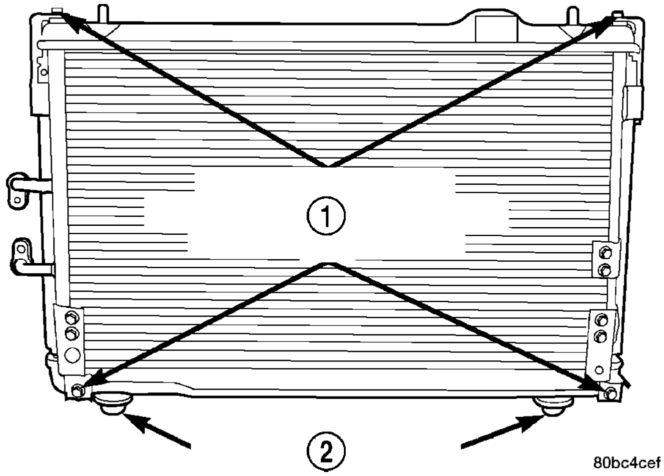

Fig. 15 A/C Condenser to Radiator Mounting Screws

1 - AIR CONDITIONING CONDENSER TO RADIATOR MOUNTING SCREWS
2 - LOWER ISOLATOR MOUNTS

(10) Radiator can now be lifted free from engine compartment. **Care should be taken not to damage radiator cooling fins or water tubes during removal.**

CLEANING

Clean radiator fins are necessary for good heat transfer. The radiator and air conditioning fins should be cleaned when an accumulation of debris has occurred. With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

Inspect the radiator tanks for cracks, broken or missing fittings also inspect the joint where the tanks seam up to the radiator core for signs of leakage and/or deteriorating seals.

Inspect radiator core for corroded, bent or missing cooling fins. Inspect the core for bent or damaged cooling tubes.

INSTALLATION

(1) Install radiator into position behind the radiator support (yoke).

(2) Attach A/C condenser to radiator (if equipped) (Fig. 15), with four mounting screws. Tighten screws to 7.2 N·m (65 in. lbs.). Then seat the radiator assembly lower rubber isolators into the mounting holes provided in the lower crossmember.

(3) Install and tighten radiator isolator mounting bracket screws to 10 N·m (90 in. lbs.) (Fig. 14). The radiator should have clearance to move up, approximately 5–8 mm (0.20–0.31 in.) after assembled.

(4) Install the radiator lower hose. Align the hose and position the clamp to prevent interference with engine components.

NOTE: When the transaxle cooler lines are removed from the rolled-groove type fittings at the cooler and transaxle, damage to the inner wall of hose will occur. To prevent potential leakage, the cooler hoses and clamps must be replaced.

(5) Replace automatic transmission hoses and clamps (if equipped) (Fig. 13).

(6) Install radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(7) Connect the radiator fan motor electrical connector.

(8) Install the radiator upper hose. Align the hose and position the clamp to prevent interference with the engine or the hood.

(9) Connect negative cable to battery.

(10) Fill cooling system with coolant (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(11) Operate engine until it reaches normal operating temperature. Check cooling system and automatic transmission for correct fluid levels.

RADIATOR DRAINCOCK

REMOVAL

(1) Drain the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Turn the draincock stem counterclockwise to unscrew the stem. When the stem is unscrewed to the end of the threads, pull the stem (Fig. 16) from the radiator tank.

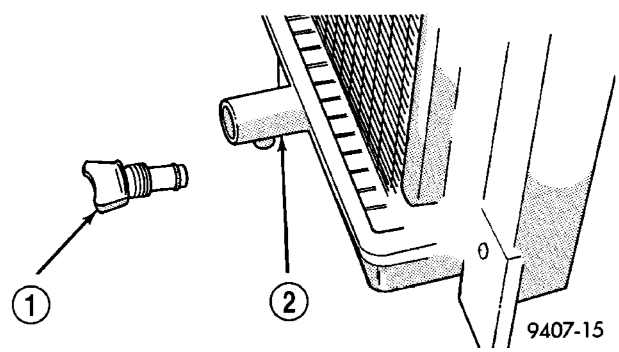

Fig. 16 Draincock

1 - DRAIN COCK BODY
2 - DRAIN COCK HOUSING

INSTALLATION

(1) Push the draincock assembly body into the tank opening.

RADIATOR DRAINCOCK (Continued)

(2) Tighten the draincock stem by turning clockwise to 2.0-2.7 N·m (18-25 in. lbs.).

(3) Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

COOLING SYSTEM PRESSURE CAP

DESCRIPTION

The cooling system is equipped with a pressure cap that releases built up pressure, maintaining a range of 97-124 kPa (14-18 psi).

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/recovery system container by vacuum through connecting hose. **If valve is stuck shut, the radiator hoses will be collapsed on cool down. Clean the vent valve (Fig. 17) to ensure proper sealing when boiling point is reached.**

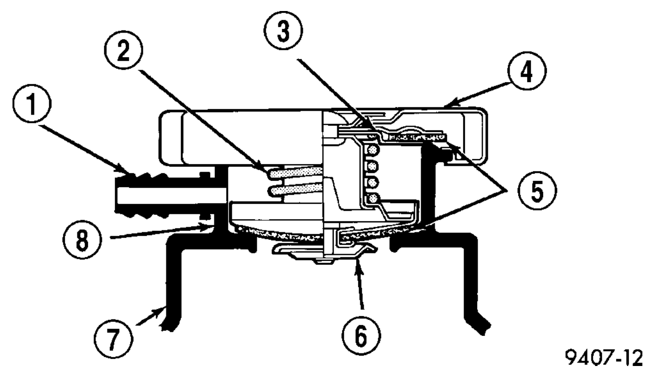

Fig. 17 Cooling System Pressure Cap

1 - OVERFLOW NIPPLE
2 - MAIN SPRING
3 - GASKET RETAINER
4 - STAINLESS-STEEL SWIVEL TOP
5 - RUBBER SEALS
6 - VENT VALVE
7 - THERMOSTAT HOUSING/ENGINE OUTLET CONNECTOR
8 - FILLER NECK

OPERATION

The pressure cap allows the cooling system to operate at higher than atmospheric pressure. The higher pressure raises the coolant boiling point; this allows increased radiator cooling capacity.

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 container.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - COOLING SYSTEM PRESSURE CAP TESTING

Dip the pressure cap in water. Clean any deposits off the vent valve or its seat and apply cap to end of the Pressure Cap Test Adaptor that is included with the Cooling System Tester 7700 (Fig. 18). Working the plunger, bring 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 pressure cap.

CAUTION: The Cooling System Tester Tool 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 tool upside down and recheck pressure cap to confirm that cap is bad.

If the pressure cap tests properly while positioned on Cooling System Tester (Fig. 18), 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.

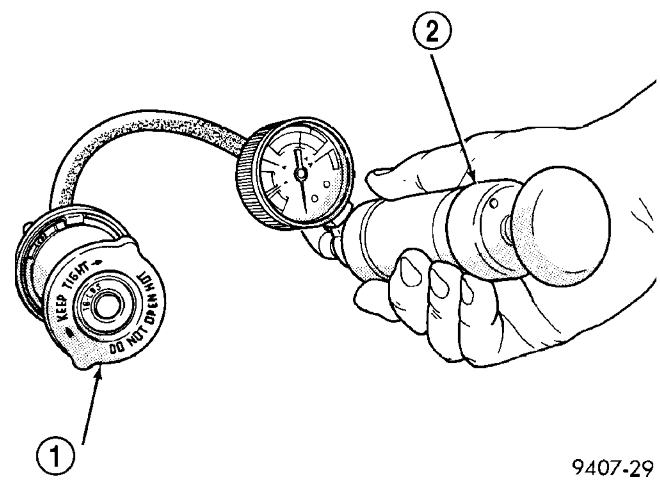

Fig. 18 Testing Cooling System Pressure Cap

1 - PRESSURE CAP
2 - PRESSURE TESTER

COOLING SYSTEM PRESSURE CAP (Continued)

DIAGNOSIS AND TESTING - COOLING SYSTEM PRESSURE RELIEF TESTING

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.

The pressure cap upper gasket to filler neck seal can be checked by removing the overflow hose at the filler neck overflow nipple (Fig. 19). Attach the radiator pressure tester to the **filler neck overflow 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.

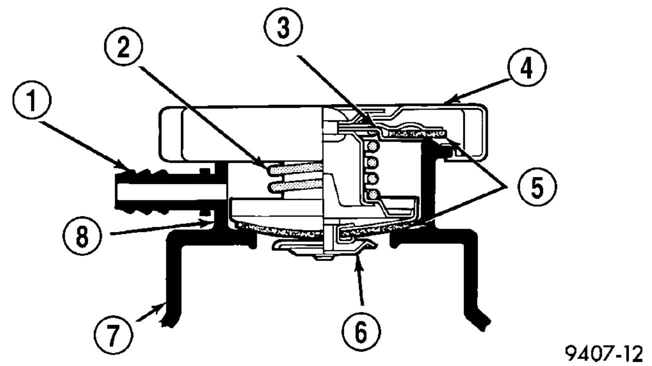

Fig. 19 Cooling System Pressure Cap to Filler Neck

1 - OVERFLOW NIPPLE
2 - MAIN SPRING
3 - GASKET RETAINER
4 - STAINLESS-STEEL SWIVEL TOP
5 - RUBBER SEALS
6 - VENT VALVE
7 - THERMOSTAT HOUSING/ENGINE OUTLET CONNECTOR
8 - 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
- 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 COUNTERCLOCKWISE 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.

CLEANING

Use only a mild soap to clean the pressure cap.

INSPECTION

Hold the cap in your hand, **top side up** (Fig. 20). 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.

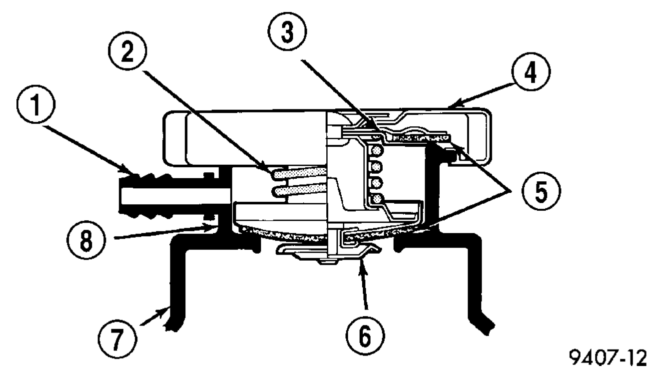

Fig. 20 Cooling System Pressure Cap

1 - OVERFLOW NIPPLE
2 - MAIN SPRING
3 - GASKET RETAINER
4 - STAINLESS-STEEL SWIVEL TOP
5 - RUBBER SEALS
6 - VENT VALVE
7 - THERMOSTAT HOUSING/ENGINE OUTLET CONNECTOR
8 - FILLER NECK

RADIATOR FAN

DESCRIPTION

The radiator fan is a single speed electric motor driven fan. The radiator fan assembly components includes an electric motor, a fan blade, and a support shroud that is attached to the radiator. Each component of the fan assembly can be serviced separately.

Depending on Engine/Transmission combination, the vehicle may be equipped with a single fan (Fig. 21) or a dual fan (Fig. 22).

NOTE: Vehicles equipped with dual fans, each fan blade is different from the other.

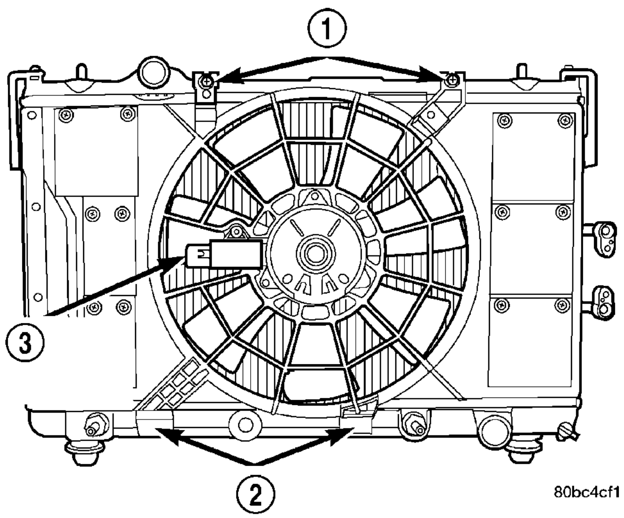

Fig. 21 Single Radiator Fan Assembly

1 - SCREWS
2 - LOWER MOUNTS
3 - FAN MOTOR ELECTRICAL CONNECTOR

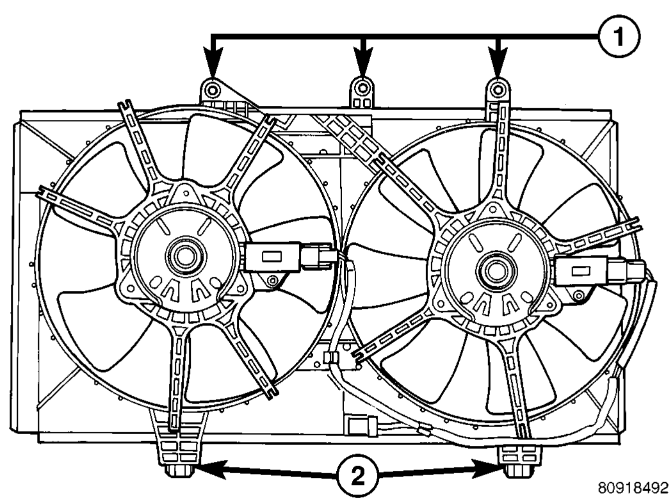

Fig. 22 Dual Radiator Fan Assembly

1 - MOUNTING SCREW LOCATIONS
2 - LOWER MOUNTS

OPERATION

Radiator fan control operation is accomplished two ways. The fan will always run when the air conditioning compressor clutch is engaged. In addition to this control, the fan is turned on by the temperature of the coolant which is sensed by the coolant temperature sensor which sends the message to the Powertrain Control Module (PCM). The PCM turns on the fan through a fan relay by grounding the relay's coil. The fan relay is located in the Power Distribution Center (PDC) (Fig. 23). Refer to the label beneath the PDC cover for location of fan relay.

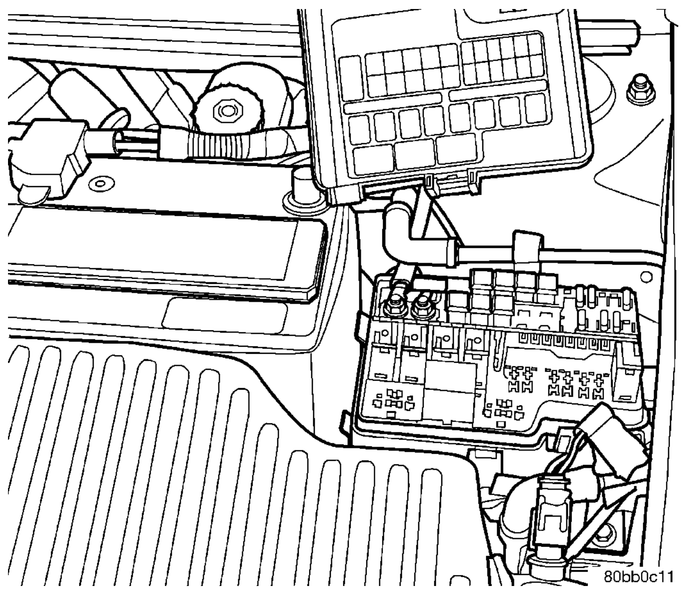

Fig. 23 Power Distribution Center (PDC)

The PCM will actuate the fan relay whenever the A/C clutch is engaged regardless of coolant temperature and vehicle speed. If the A/C clutch is not engaged, the PCM will actuate the fan relay when the coolant temperature reaches approximately (97° C) 207° F and turns off the fan relay when the coolant temperature drops to approximately (94°C) 201° F. The fan relay is also turned off when the vehicle speed is above approximately 100 Km/h (62 MPH). For wiring diagrams of the fan circuit, (Refer to Appropriate Wiring Information).

If the radiator fan is inoperative or a Diagnostic Trouble Code (DTC) related to fan control has been set, (Refer to Appropriate Diagnostic Information) for complete diagnostic procedures.

RADIATOR FAN (Continued)

RADIATOR FAN OPERATION CHART

Radiator Fan Control			
A/C Off	**Vehicle Speed < 36 mph**	**Vehicle Speed ≥ 44 mph**	
Fan On:	97° C (210° F)	104° C (219° F)	
Fan Off:	94° C (201° F)	97° C (210° F)	WOT* < 113° C (235° F)
A/C On	Fan On—regardless of coolant temperature or vehicle speed.		
*WOT = Wide Open Throttle			

DIAGNOSIS AND TESTING - RADIATOR FAN MOTOR

(Refer to Appropriate Diagnostic Information)

REMOVAL

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.

(1) Disconnect negative cable from battery.

(2) Drain cooling system below the upper radiator hose level (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(3) Remove upper hose from radiator (Fig. 24).

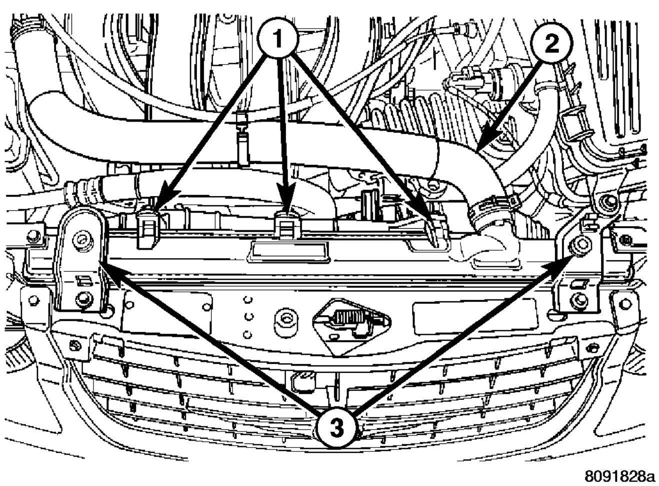

Fig. 24 Radiator and Fan

1 - RADIATOR FAN ATTACHING SCREWS
2 - RADIATOR HOSE - UPPER
3 - RADIATOR SUPPORTS - UPPER

(4) Remove fasteners that attach air cleaner housing to vehicle. Reposition air cleaner housing.

(5) Raise vehicle on hoist.

(6) Disconnect and remove the powertrain control module (PCM) with bracket (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL).

(7) Disconnect radiator fan electrical connector (Fig. 25).

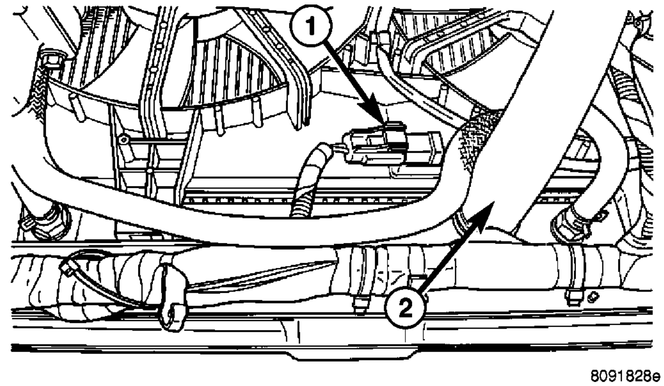

Fig. 25 Radiator Fan Motor Connector

1 - RADIATOR FAN ELECTRICAL CONNECTOR
2 - RADIATOR HOSE - LOWER

(8) Lower vehicle.

(9) Remove radiator upper support mounts (Fig. 24).

(10) Remove air conditioning line support bracket screw (Fig. 26).

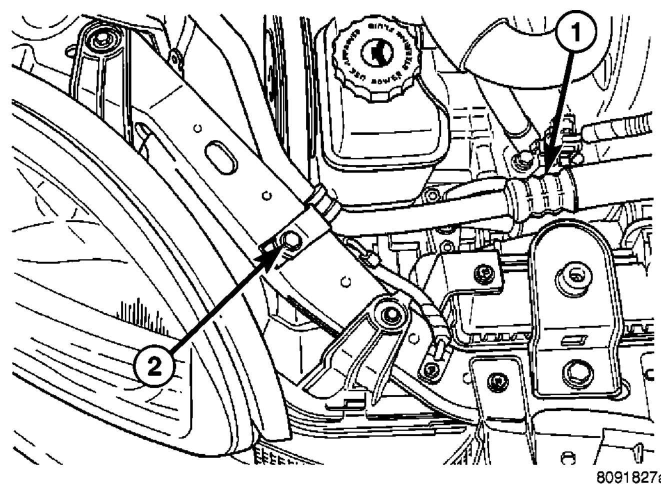

Fig. 26 A/C Line Support

1 - A/C LINE
2 - SCREW

(11) Remove radiator fan assembly screws from radiator (Fig. 24).

(12) Carefully lift radiator fan assembly up and out of lower shroud attachment clips.

(13) For radiator fan assembly sub-component removal procedures (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - DISASSEMBLY).

RADIATOR FAN (Continued)

DISASSEMBLY

The radiator fan assembly consist of the following three components: fan, fan motor, and shroud.

FAN

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) Remove radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(2) Remove fan hub retaining nut (Fig. 27) or (Fig. 28).

(3) Remove fan from motor shaft.

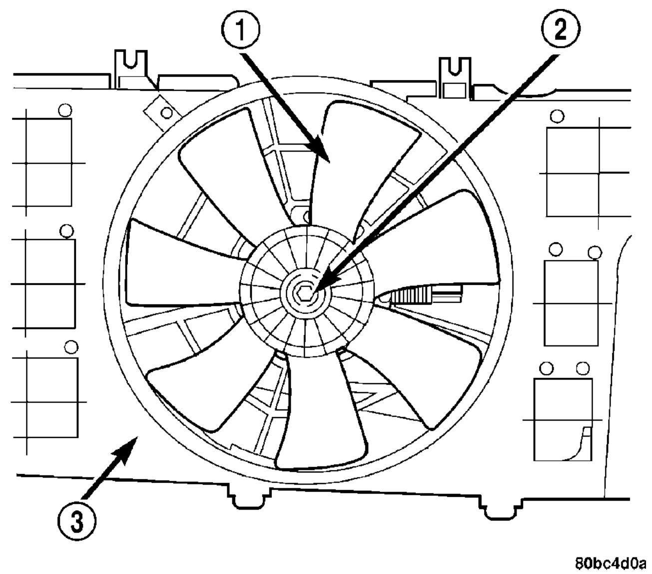

Fig. 27 Single Fan Disassembly/Assembly

1 - FAN
2 - NUT
3 - SHROUD ASSEMBLY

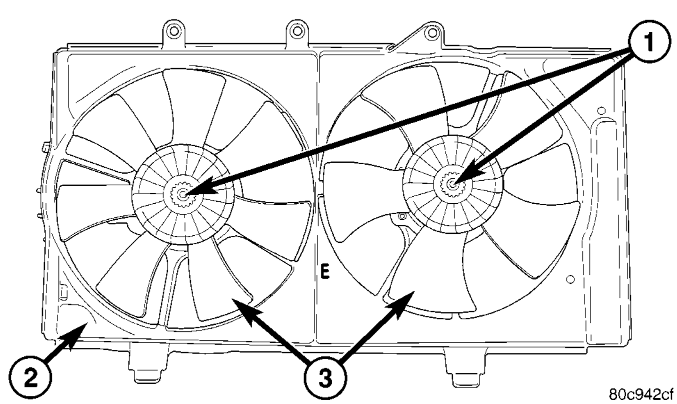

Fig. 28 Dual Fan Disassembly/Assembly

1 - NUT
2 - SHROUD
3 - FAN

FAN MOTOR

(1) Remove radiator fan assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL)

(2) Remove fan from motor shaft.

(3) Remove screw attaching the in-rush current suppressor (Fig. 29).

(4) Remove screws attaching motor to shroud (Fig. 29).

(5) Remove the fan motor.

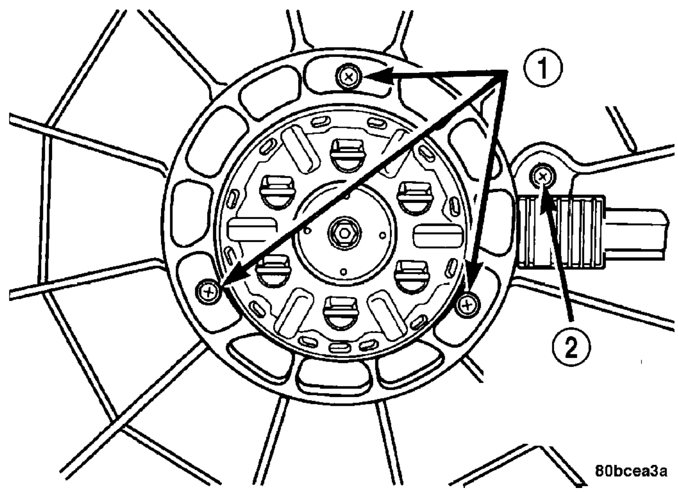

Fig. 29 Fan Motor - Removal and Installation

1 - FAN MOTOR SCREWS
2 - IN RUSH CURRENT SUPPRESSOR SCREW

SHROUD

(1) Remove radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(2) Remove the FAN.

(3) Remove the FAN MOTOR.

ASSEMBLY

FAN

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) Install fan on motor shaft.

(2) Install fan retaining nut and tighten to 6.2 N·m (55 in. lbs.) (Fig. 27) or (Fig. 28).

(3) Install radiator fan assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION)

FAN MOTOR

(1) Install the fan motor on shroud and tighten screws to 3.8 N·m (34 in. lbs.) (Fig. 29).

(2) Install screw attaching the in-rush current suppressor and tighten to 2.6 N·m (23 in. lbs.) (Fig. 29).

(3) Install the fan on motor shaft.

RADIATOR FAN (Continued)

(4) Install the radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

SHROUD

(1) Install the FAN MOTOR.
(2) Install the FAN.
(3) Install the radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

INSTALLATION

(1) Install radiator fan assembly by lowering into position on radiator. Ensure the fan assembly lower mounts (Fig. 21) or (Fig. 22) are engaged properly into slots on lower radiator tank.
(2) Install the radiator fan assembly retaining screws and tighten to 7.5 N·m (65 in. lbs.) (Fig. 24).
(3) Install radiator upper support mounts (Fig. 24) and tighten bolts to 10 N·m (90 in. lbs.).
(4) Install air conditioning line support bracket screw (Fig. 26).
(5) Raise vehicle on hoist.
(6) Connect radiator fan electrical connector (Fig. 25).
(7) Install powertrain control module (PCM) (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - INSTALLATION).
(8) Lower vehicle.
(9) Install air cleaner housing fasteners.
(10) Install radiator upper hose to radiator (Fig. 24). Align hose and position clamp to ensure proper clearance with engine or hood.
(11) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
(12) Connect negative battery cable.

THERMOSTAT HOUSING

REMOVAL

(Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL)

INSTALLATION

(Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION)

WATER PUMP

DESCRIPTION

The water pump has a diecast aluminum body and housing with a stamped steel impeller. The water pump bolts directly to the cylinder block and is driven by the timing belt (Fig. 30). Cylinder block to water pump sealing is provided by a rubber O-ring.

NOTE: The water pump on all models can be replaced without discharging the air conditioning system.

DIAGNOSIS AND TESTING - WATER PUMP DIAGNOSIS

A quick flow test to determine water pump operation is check for proper heater operation. A defective pump will not circulate heated coolant through the heater hoses.

An additional flow test can by performed by the following the procedures below:

WARNING: DO NOT remove radiator cap if the cooling system is hot or under pressure.

(1) Remove cooling system pressure cap.
(2) Remove a small amount of coolant from the system.
(3) Start the engine and warm up until thermostat opens.
(4) With the thermostat open and coolant level low, visually inspect for coolant flow. If flow is present, the water pump is pumping coolant through the system.

REMOVAL

(1) Raise vehicle on a hoist. Remove right inner splash shield.
(2) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(3) Drain the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
(4) Remove power steering pump attaching bolts and set pump and assembly aside. **Do Not** disconnect power steering lines.
(5) Remove upper and lower torque isolator struts (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).
(6) Support the engine from bottom and remove right engine mount attaching bolt.
(7) Remove right engine mount bracket (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - REMOVAL).

WATER PUMP (Continued)

(8) Remove the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL)

(9) Remove the timing belt tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - REMOVAL).

(10) Remove camshaft sprocket and rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(11) Remove screws attaching water pump to engine and remove pump (Fig. 30).

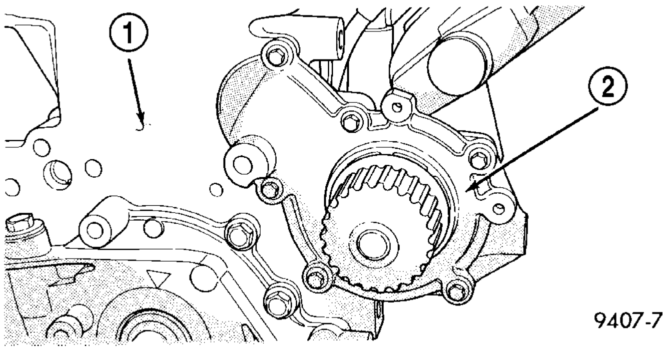

Fig. 30 Water Pump

1 - CYLINDER BLOCK
2 - PUMP BODY

INSPECTION

Replace water pump body assembly if it has any of these defects:

(1) Cracks or damage on the body.

(2) Coolant leaks from the shaft seal, evident by wet coolant traces on the pump body.

(3) Loose or rough turning bearing.

(4) Impeller rubs either the pump body or the engine block.

(5) Impeller loose or damaged.

(6) Sprocket or sprocket flange loose or damaged.

INSTALLATION

(1) Apply Mopar® Dielectric Grease to O-ring before installation.

(2) Install new O-ring gasket in water pump body O-ring groove (Fig. 31).

CAUTION: Ensure O-ring gasket is properly seated in water pump groove before tightening screws. An improperly located O-ring may cause damage to the O-ring, resulting in a coolant leak.

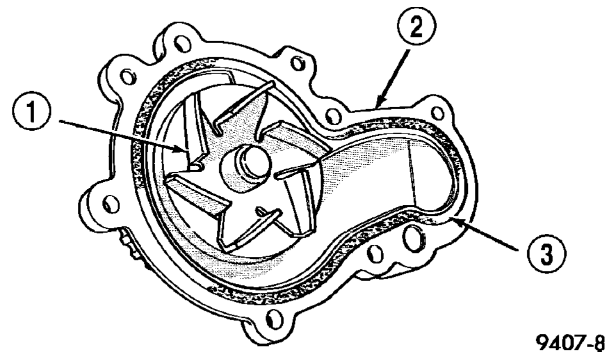

Fig. 31 Water Pump

1 - IMPELLER
2 - PUMP BODY
3 - O-RING

(3) Assemble pump body to block and tighten screws to 12 N·m (105 in. lbs.). Pressurize cooling system to 15 psi with pressure tester and check water pump shaft seal and O-ring for leaks.

(4) Rotate pump by hand to check for freedom of movement.

(5) Install timing belt rear cover and camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(6) Install timing belt tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - INSTALLATION).

(7) Install the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(8) Install the engine right mount bracket (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - INSTALLATION).

(9) Install the upper and lower torque isolator struts (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(10) Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(11) Install the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

WATER PUMP INLET TUBE

DESCRIPTION

The water pump inlet tube connects the water pump housing to the radiator lower hose and heater return hose. This plastic tube is sealed by an O-ring and held in place by fasteners to the block (Fig. 32).

REMOVAL

(1) Drain the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Remove the radiator upper hose to access the hose connections at the inlet tube.

(3) Remove the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

CAUTION: Do not use any sharp tools to remove hoses from inlet tube. This may cause the tube to leak.

(4) Remove the radiator lower hose and heater hose from the inlet tube.

(5) Remove the lower intake manifold support bracket.

(6) Remove the inlet tube to the block fasteners.

(7) Rotate tube while removing the tube from the engine block (Fig. 32).

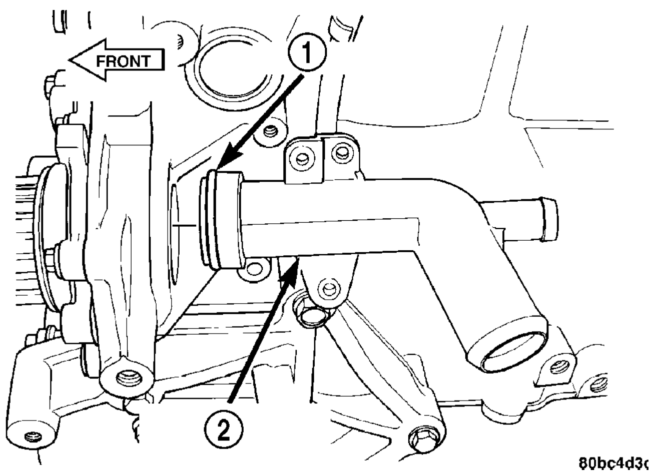

Fig. 32 Water Pump Inlet Tube

1 - O-RING
2 - WATER PUMP INLET TUBE

INSTALLATION

(1) Inspect the O-ring for damage before installing the tube into the cylinder block (Fig. 32). Replace O-ring as necessary.

(2) Lubricate O-ring with Mopar® Dielectric Grease and install inlet tube into the cylinder block opening.

(3) Install inlet tube fasteners and tighten to 12 N·m (105 in. lbs.).

(4) Install intake manifold lower support bracket fasteners and tighten to 12 N·m (105 in. lbs.).

(5) Connect the radiator lower hose and heater hose to inlet tube.

(6) Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(7) Install the radiator upper hose.

(8) Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(9) Pressure test cooling system and check for leaks (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING).

TRANSMISSION

TABLE OF CONTENTS

TRANSMISSION OIL COOLER

DESCRIPTION

The transmission oil cooler is an oil to coolant type, mounted in the radiator lower tank (Fig. 1). Rubber hoses connect the oil cooler and the automatic transmission. Use only approved transmission oil cooler hoses that are molded to fit the applicable vehicle. The transmission cooler is serviced with the radiator.

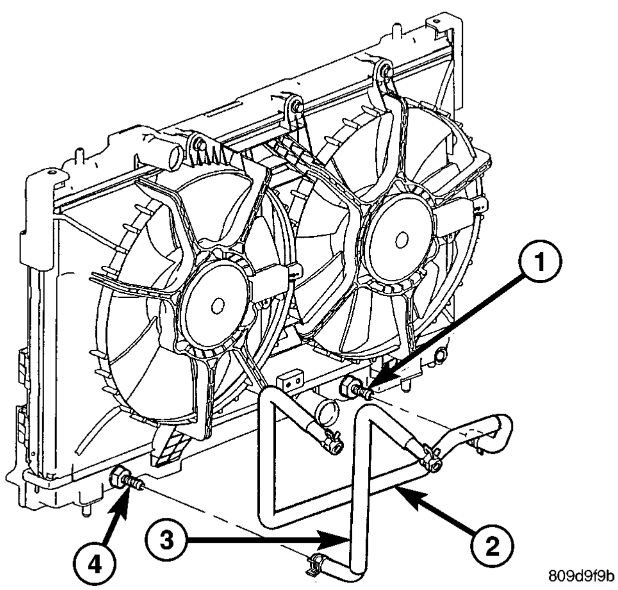

Fig. 1 Transmission Oil Cooler and Hoses

1 - COOLER FITTING
2 - HOSE - COOLER SUPPLY
3 - HOSE - COOLER RETURN
4 - COOLER FITTING

OPERATION

As oil flows through the cooler, heat from the oil is transferred to the coolant.

REMOVAL

The transmission cooler in serviced with the radiator assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL)

INSPECTION

Inspect all hoses, tubes, clamps and connections for leaks, cracks, or damage. Replace as necessary. Use only approved transmission oil cooler hoses that are molded to fit the space available.

Inspect external coolers for leaks, loose mounts, or damage. Replace as necessary.

INSTALLATION

(Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION)

TRANSMISSION COOLER HOSES

DESCRIPTION

The transmission oil cooling circuit uses special aggressive fittings for the transmission oil cooler hoses. Whenever a transmission oil cooler hose is removed from a transmission fitting (at transmission), it must be cut off flush with the fitting, and a service splice kit must be used upon reassembly. Refer to instructions provided with splice kit. Whenever a transmission oil cooler hose is removed from a transmission oil cooler fitting (at radiator), it must be replaced with a new hose. Removing the hose from the aggressive fitting will scrape material from inside the hose making the hose larger. Failure to replace the hose or install a service splice kit will result in transmission oil leaks.

When hose clamp replacement is necessary, replace with constant tension spring type hose clamps. Always use proper hose clamp pliers on clamps. Use of improper hose clamp pliers may bend hose clamps out-of-round resulting in transmission oil leaks.

TRANSMISSION COOLER HOSES (Continued)

REMOVAL

(1) While holding tension on hose clamps with pliers, move clamps off the fitting location of hose.

(2) Disconnect hoses from cooler (Fig. 2). Disconnect hoses from transmission fittings (Fig. 3).

(3) Remove cooler hoses.

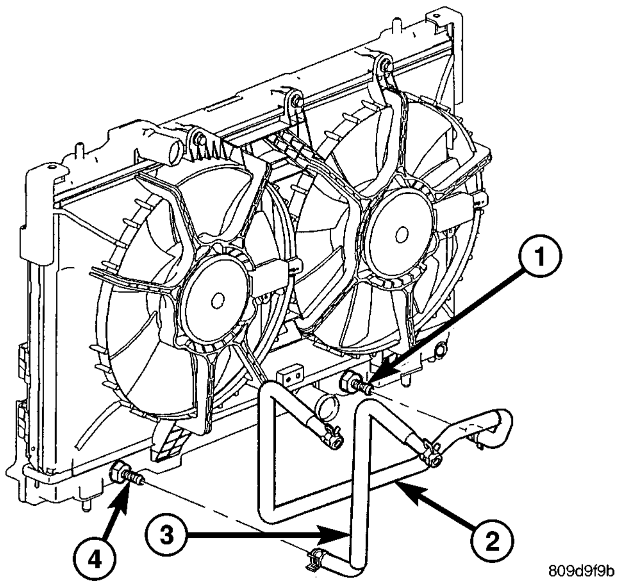

Fig. 2 Transmission Cooler Hoses to Cooler

1 - COOLER FITTING
2 - HOSE - COOLER SUPPLY
3 - HOSE - COOLER RETURN
4 - COOLER FITTING

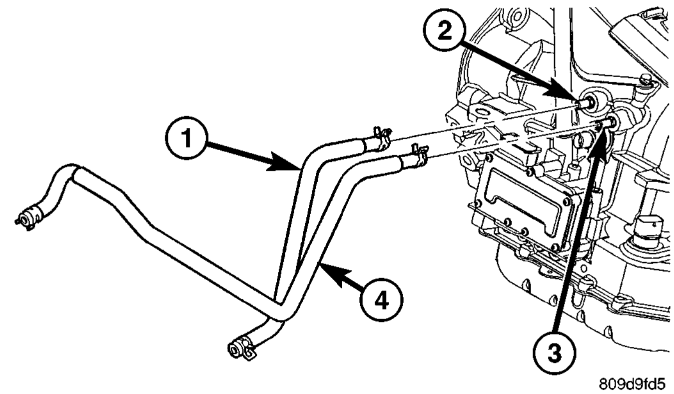

Fig. 3 Transmission Cooler Hoses to Transmission

1 - HOSE - COOLER RETURN
2 - TRANSAXLE FITTING
3 - TRANSAXLE FITTING
4 - HOSE - COOLER SUPPLY

INSTALLATION

NOTE: When the transaxle cooler lines are removed from the rolled-groove type fittings at the cooler and transaxle, damage to the inner wall of hose will occur. To prevent potential leakage, the cooler hoses must be replaced.

(1) Connect hoses to cooler (Fig. 2) and transmission (Fig. 3) fittings.

(2) Position and install hose clamps.

(3) Start engine and check transmission fluid level. Adjust level as necessary.

AUDIO/VIDEO

TABLE OF CONTENTS

AUDIO/VIDEO

DESCRIPTION

The audio system includes the following components:

- Antenna
- Compact disc changer (if equipped)
- Radio noise suppression components
- Radio receiver
- Speakers

Certain functions and features of the audio system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communication Interface (PCI) bus network. The data bus network allows the sharing of sensor information. For diagnosis of these electronic modules or of the data bus network, the use of a DRB III® scan tool and the proper Diagnostic Procedures manual are recommended.

OPERATION

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signals in both the Amplitude Modulating (AM) and Frequency Modulating (FM) commercial frequency ranges.

The audio system components operate on battery current received through a fuse in the Power Distribution Center (PDC) on a fused ignition switch output (run-acc) circuit so that the system will only operate when the ignition switch is in the Run or Accessory positions.

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

AUDIO/VIDEO (Continued)

AUDIO SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for shorted or open wires. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service Manual.
	6. Speakers inoperative.	6. Replace speaker as necessary.
NO RADIO DISPLAY	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service Manual.
CLOCK WILL NOT KEEP SET TIME	1. Fuse inoperative.	1. Check Ignition-Off Draw (IOD) fuse in the Junction Block (JB). Replace fuse, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service Manual.
POOR RADIO RECEPTION	1. Antenna inoperative.	1. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - DIAGNOSIS AND TESTING).
	2. Radio ground damaged.	2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	3. Radio noise suppression inoperative.	3. Repair or replace ground strap as necessary.
	4. Radio inoperative.	4. Refer to appropriate Diagnostic Service Manual.

AUDIO/VIDEO (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO/POOR TAPE OPERATION	1. Damaged tape.	1. Insert known good tape and test operation.
	2. Foreign objects behind tape door.	2. Remove foreign objects and test operation.
	3. Dirty cassette tape head.	3. Clean head with Mopar Cassette Head Cleaner.
	4. radio inoperative.	4. Exchange or replace radio, if required.
NO COMPACT DISC OPERATION	1. CD damaged.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. Radio inoperative.	4. Refer to appropriate Diagnostic Service Manual.

ANTENNA BODY & CABLE

DESCRIPTION

The antenna body and cable is secured below the fender panel by the antenna cap nut through a mounting hole in the right front fender. The primary coaxial antenna cable is then routed beneath the fender sheet metal and through a entry hole in the right cowl side panel into the interior of the vehicle. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right kick panel. The secondary coaxial cable is then routed behind the instrument panel to the back of the radio.

OPERATION

The antenna body and cable connects the antenna mast to the radio. The radio antenna is an electromagnetic circuit component used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast. The antenna body transfers the weak electromagnetic radio waves induced into the rigid antenna mast into the center conductor of the flexible primary antenna coaxial cable. The braided outer shield of the antenna coaxial cable is grounded through both the antenna body and the radio chassis, effectively shielding the radio waves as they are conducted to the radio. The radio then tunes and amplifies the weak radio signals into stronger electrical signals in order to operate the audio system speakers.

DIAGNOSIS AND TESTING - ANTENNA BODY AND CABLE

The following four tests are used to diagnose the antenna with an ohmmeter:

- **Test 1** - Mast to ground test
- **Test 2** - Tip-of-mast to tip-of-conductor test
- **Test 3** - Body ground to battery ground test
- **Test 4** - Body ground to antenna coaxial cable shield test.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The ohmmeter test lead connections for each test are shown in the illustration (Fig. 1).

ANTENNA BODY & CABLE (Continued)

NOTE: This model has a two-piece antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate an antenna cable problem. First, test the primary antenna cable (integral to the antenna body and cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the antenna body. Then, test the secondary antenna cable (instrument panel antenna cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the coaxial cable connector at the radio.

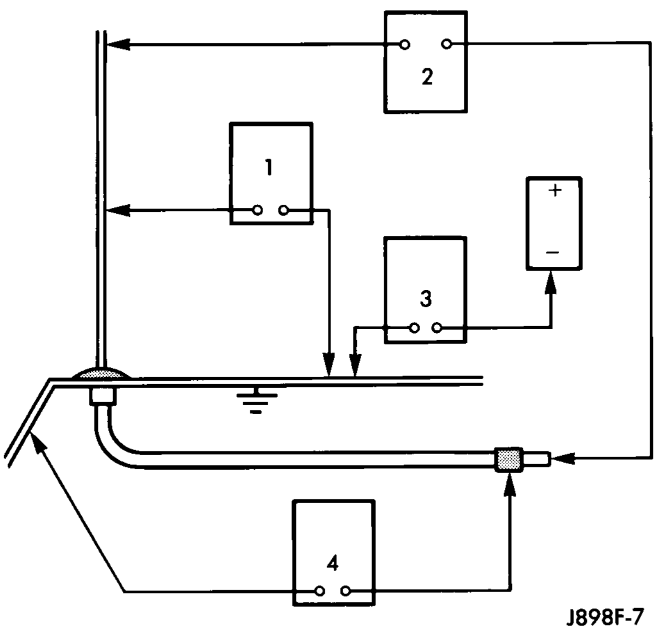

Fig. 1 Antenna Tests - Typical

TEST 1

Test 1 determines if the antenna mast is insulated from ground. Proceed as follows:

(1) Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the antenna cap nut. Check the ohmmeter reading for continuity.

(3) There should be no continuity. If OK, go to Test 2. If not OK, replace the faulty antenna body and cable.

TEST 2

Test 2 checks the antenna conductor components for an open circuit. This test should be performed first on the entire antenna circuit, from the antenna mast to the center conductor of the coaxial cable connector at the radio. If an open circuit is detected, each of the three antenna conductor components (antenna mast, antenna body and primary cable unit, instrument panel antenna secondary cable) should be isolated and tested individually to locate the exact component that is the source of the open circuit. To begin this test, proceed as follows:

(1) Disconnect the instrument panel (secondary) antenna cable coaxial connector from the back of the radio.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the center conductor pin of the instrument panel antenna cable coaxial connector for the radio. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register only a fraction of an ohm resistance. High or infinite resistance indicates a damaged or open antenna conductor. If OK, go to Test 3. If not OK, isolate and test each of the individual antenna conductor components. Replace only the faulty antenna conductor component.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. To begin this test, proceed as follows:

(1) This test must be performed with the battery positive cable disconnected from the battery. Disconnect and isolate both battery cables, negative cable first.

(2) Reconnect the battery negative cable.

(3) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the battery negative terminal post. Check the ohmmeter reading for continuity.

(4) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the battery negative terminal and the vehicle body. If OK, go to Test 4. If not OK, check the battery negative cable connection to the vehicle body and the radio noise suppression ground strap connections to the engine and the vehicle body for being loose or corroded. Clean or tighten these connections as required.

TEST 4

Test 4 checks the condition of the connection between the antenna coaxial cable shield and the vehicle body ground as follows:

(1) Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.

(2) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the outer crimp on the antenna coaxial cable connector under the right end of the instru-

ANTENNA BODY & CABLE (Continued)

ment panel near the right cowl side inner panel. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the antenna body and the vehicle body or between the antenna body and the antenna coaxial cable shield. If not OK, clean the antenna body to fender mating surfaces and tighten the antenna cap nut to specifications.

(4) Check the resistance again with an ohmmeter. If the resistance is still more then one ohm, replace the faulty antenna body and cable.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove antenna mast by unscrewing mast from antenna body.

(3) Locate the antenna lead disconnect in the instrument panel wire harness above the passenger side cowl trim panel. Disconnect the antenna cable from the instrument panel cable lead.

(4) Unfasten push pins from the rear of the plastic inner fender shield and move shield to gain access to the base/cable assembly (Fig. 2).

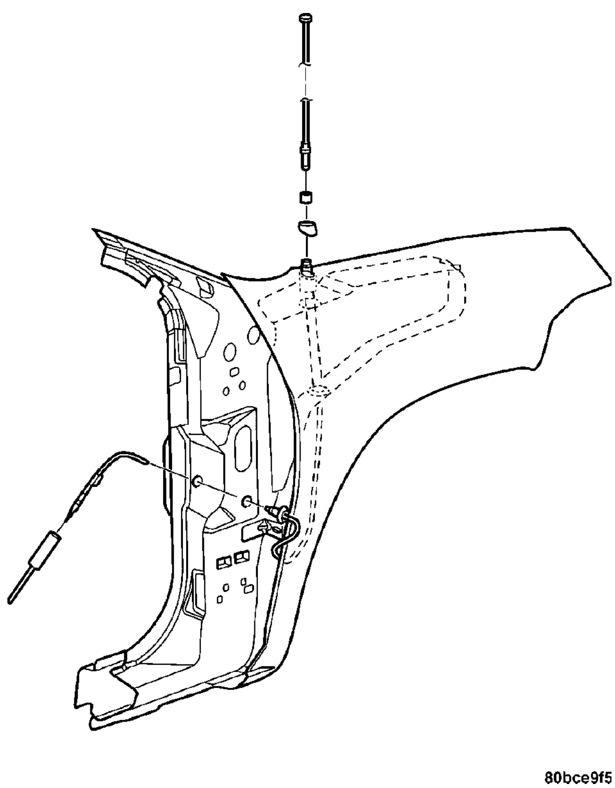

Fig. 2 Mast and Antenna Assembly Mounting

(5) Remove cap nut and adapter. Remove base/cable assembly from bottom of the load beam.

INSTALLATION

(1) From under the fender, push the antenna base and cable assembly through the hole in the fender. Seat grommet in the load beam.

(2) From above the fender, place adapter, then the cap nut on the base/cable assembly. Tighten the cap nut to 7 N·m (61 in. lbs.).

(3) Seat the grommet in the side panel and connect the cable to the instrument panel harness connector.

(4) Install the plastic inner fender shield.

(5) Install passenger cowl side trim panel.

(6) Install antenna mast.

(7) Connect battery negative cable.

CD CHANGER

DESCRIPTION

The In-Dash CD Changer (if equipped) is located in the instrument panel below the radio. The remote changer does not use a cartridge or magazine for the CD's. Up to 6 CD's (4 in some export markets) can be directly loaded into this unit, one at a time.

OPERATION

Due to its compact design, the CD changer can carry out only one operation at a time. For example, you can not load a new disc while playing another at the same time. Each operation happens sequentially.

The radio unit provides control over all features of the CD changer with the exception of the CD load and eject functions, which are controlled by buttons located on the front of the CD changer. All features you would expect, such as Disc Up/Down, Track Up/Down, Random and Scan are controlled by the radio, which also displays all relevant CD changer information on the radio display.

The CD changer contains a Load/Eject button and an indicator LED for each of the disc positions as well as an illuminated disc opening. The individual LED indicates whether a CD is currently loaded or ready to load in that particular chamber of the CD changer. Pressing the individual Load/Eject button for a particular chamber will eject a disc currently present in that chamber. If the chamber is currently empty, actuating the Load/Eject button will position that chamber to receive and load a new disc in that chamber.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick (special tool #C-4755), gently pry out on CD changer bezel and remove.

CD CHANGER (Continued)

(3) Remove two retaining screws to CD changer (Fig. 3).

(4) Pull CD changer out of instrument panel and disconnect harness connector from rear of changer (Fig. 3).

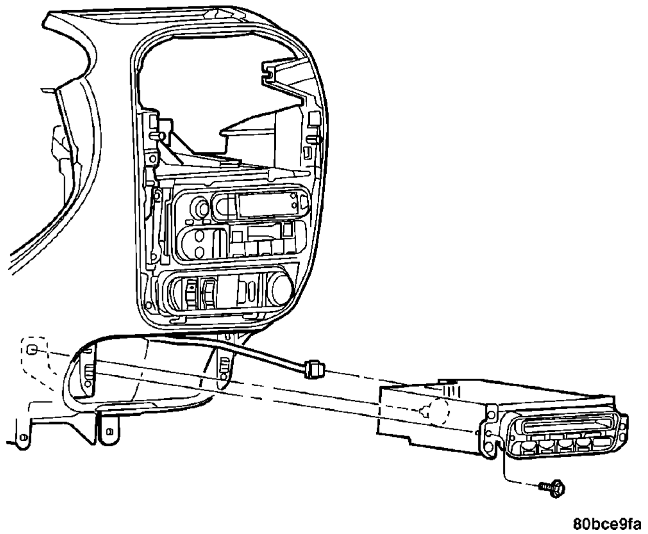

Fig. 3 CD Changer Remove/Install

(5) Remove CD changer from vehicle.

INSTALLATION

(1) Connect harness connector to CD changer.
(2) Install CD changer to vehicle.
(3) Install retaining screws.
(4) Install CD changer bezel.
(5) Connect battery negative cable.

RADIO

DESCRIPTION

Available radios for this vehicle include:

• AM/FM/cassette with CD changer control feature (RBB sales code)

• AM/FM/CD with CD changer control feature (RBK sales code)

• AM/FM/cassette/CD (RBY sales code) - export only

• AM/FM/cassette/CD with CD changer control feature (RAD sales code) - export only

OPERATION

The radio receiver operates on ignition switched battery current that is available only when the ignition switch is in the On or Accessory positions. The electronic digital clock function of the radio operates on fused battery current supplied through the IOD fuse, regardless of the ignition switch position.

For more information on the features, setting procedures, and control functions for each of the available factory-installed radio receivers, refer to the owner's manual.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(3) Remove four mounting screws on the radio and pull out of instrument panel (Fig. 4).

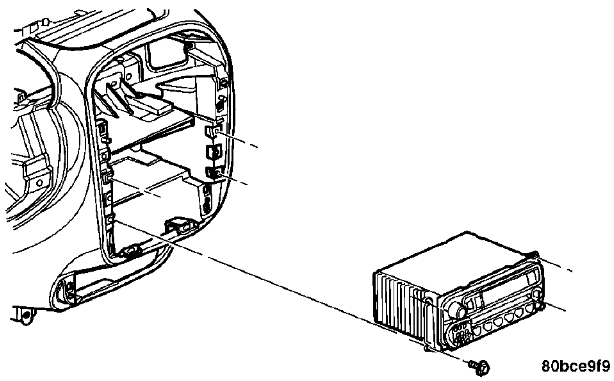

Fig. 4 Radio Remove/Install

CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

(4) Disconnect the antenna cable by pulling the locking antenna connector away from the radio (Fig. 5).

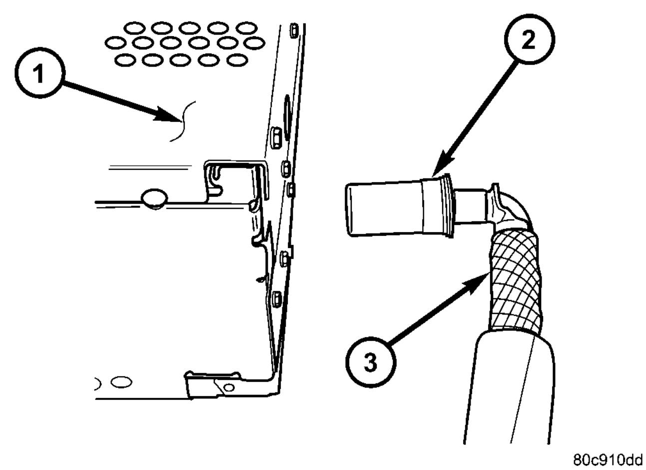

Fig. 5 ANTENNA TO RADIO

1 - RADIO
2 - LOCKING ANTENNA CONNECTOR
3 - INSTRUMENT PANEL ANTENNA CABLE

(5) Disconnect wire harness connector from radio.
(6) Remove radio from vehicle.

RADIO (Continued)

INSTALLATION

(1) Connect wire harness connector and antenna cable to radio.
(2) Install radio to vehicle.
(3) Install mounting screws.
(4) Install instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
(5) Connect battery negative cable.

RADIO NOISE SUPPRESSION COMPONENTS

DESCRIPTION

The vehicle has the following noise suppression components which, if disconnected, may interfere with radio reception:

- Cylinder head to body ground strap (Y-strap).
- Battery tray to transmission ground strap (automatic transmission only).
- Hood hinge straps (left and right).
- Noise suppression capacitor.
- Strut to body ground straps (left and right).

Resistive 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.

OPERATION

There are two common strategies that can be used to suppress Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) radio noise. The first suppression strategy involves preventing the production of RFI and EMI electromagnetic signals at their sources. The second suppression strategy involves preventing the reception of RFI and EMI electromagnetic signals by the audio system components.

The use of braided ground straps in key locations is part of the RFI and EMI prevention strategy. These ground straps ensure adequate ground paths, particularly for high current components such as many of those found in the starting, charging, ignition, engine control and transmission control systems. An insufficient ground path for any of these high current components may result in radio noise caused by induced voltages created as the high current seeks alternative ground paths through components or circuits intended for use by, or in close proximity to the audio system components or circuits.

Preventing the reception of RFI and EMI is accomplished by ensuring that the audio system components are correctly installed in the vehicle. Loose, corroded or improperly soldered wire harness connections, improperly routed wiring and inadequate audio system component grounding can all contribute to the reception of RFI and EMI. A properly grounded antenna body and radio chassis, as well as a shielded antenna coaxial cable with clean and tight connections will each help reduce the potential for reception of RFI and EMI.

SPEAKER

DESCRIPTION

The standard equipment speaker system includes speakers in six locations. One 2.5 centimeter (1.0 inch) diameter speaker is installed on each end of the instrument panel top pad. One 16.5 centimeter (6.5 inch) full-range speaker is located in each front door. There is also two full-range 15.2 X 22.8 centimeter (6 X 9 inch) diameter full-range speakers located in the rear shelf.

OPERATION

Two wires connected to each speaker, one feed circuit (+) and one return circuit (–), allow the audio output signal electrical current to flow through the voice coil. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - SPEAKER

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

SPEAKER (Continued)

CAUTION: The speaker output of the radio is a “floating ground” system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

(1) If all speakers are inoperative, check the fuses in the fuse block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the ON position. Turn the radio receiver ON. Adjust the balance and fader control controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 3.

(3) Turn the radio receiver OFF. Turn the ignition OFF. Disconnect and isolate the battery negative cable. Remove the radio receiver.

(4) Check both the speaker feed (+) circuit and return (-) circuit cavities for the inoperative speaker at the radio receiver wire harness connector for continuity to ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted speaker feed (+) and/or return (-) circuits(s) to the speaker as required.

(5) Disconnect wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (-) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open speaker feed (+) and/or return (-) circuits(s) as required.

REMOVAL

FRONT DOOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove front door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(3) Remove speaker retaining screws (Fig. 6).

(4) Remove speaker assembly and disconnect wire connector from rear of speaker.

INSTRUMENT PANEL

(1) Disconnect and isolate the battery negative cable.

(2) Remove instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)

(3) Remove speaker retaining screws (Fig. 7).

(4) Remove speaker and disconnect wire connector.

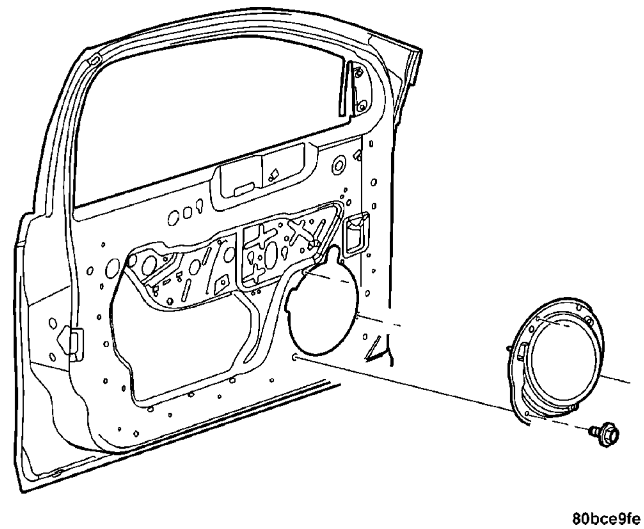

Fig. 6 Front Door Speaker Remove/Install

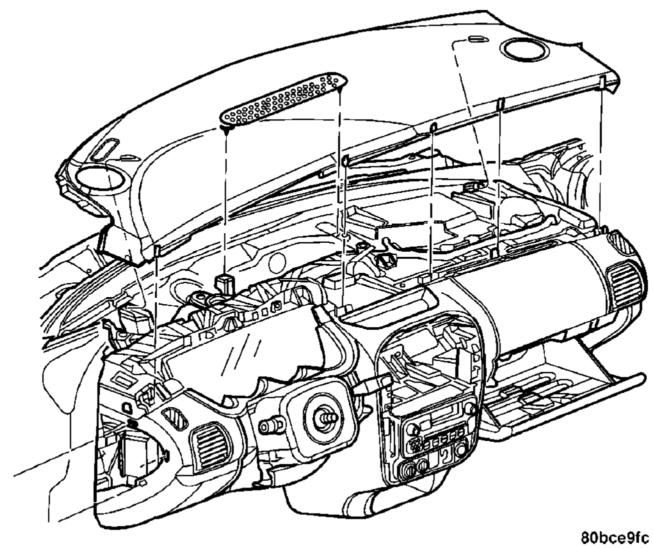

Fig. 7 Instrument Panel Speakers Remove/install

REAR

(1) Disconnect and isolate the battery negative cable.

(2) Remove Rear Seat Cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - REMOVAL).

(3) Remove rear seat back. (Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL).

(4) Remove rear shelf panel. (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).

(5) Remove four speaker retaining screws (Fig. 8).

(6) Remove speaker and disconnect wire connector.

(7) Remove speaker(s) from vehicle.

SPEAKER (Continued)

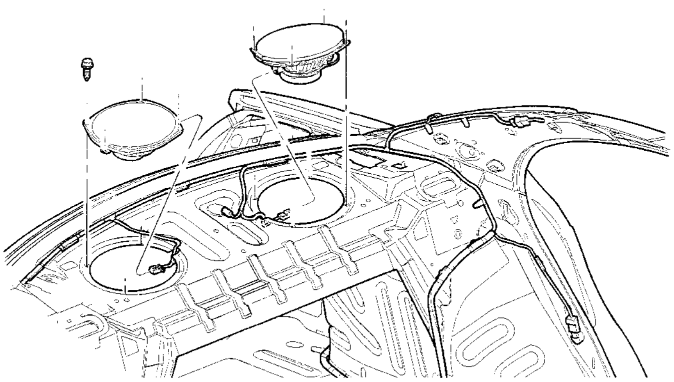

Fig. 8 Rear Shelf Speaker(s) Remove/Install

INSTALLATION

FRONT DOOR

(1) Connect wire connector to speaker and install speaker to vehicle.

(2) Install speaker retaining screws.

(3) Install front door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

(4) Connect battery negative cable.

INSTRUMENT PANEL

(1) Connect wire harness to the speaker and install speaker to instrument panel.

(2) Install speaker retaining screws.

(3) Install instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(4) Connect the battery negative cable.

REAR

(1) Connect wire connector to the speaker.

(2) Install speaker to the vehicle.

(3) Install speaker retaining screws.

(4) Install rear shelf panel. (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).

(5) Install seat back. (Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION).

(6) Install rear seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - INSTALLATION).

(7) Connect the battery negative cable.

CHIME/BUZZER

TABLE OF CONTENTS

CHIME/BUZZER

DESCRIPTION

The Chime Module is located within the instrument cluster and is not serviceable. The chime/buzzer system provides the driver with warning chimes for:

- Seat Belt
- Exterior Lamps ON
- Key-In Ignition
- Warning Lamp Announcement
- Park Brake
- Low Fuel

OPERATION

FASTEN SEAT BELT

The seat belt reminder system uses both visual and audible signals. A combined seat belt and reminder chime with a red light on the instrument panel.

The system will illuminate the seat belt reminder lamp for when the ignition switch is turned to the ON position. The CHIME will sound four to eight seconds if the driver's seat belt is not fastened. Passenger belts are not connected to the system. The light will stay illuminated at all times when the driver seat belt is not buckled.

HEADLAMPS REMINDER

These are the conditions that have to be met for the headlamps on, chime function to work:

- Headlamps ON and
- Driver's door open and
- Key removed from the ignition switch.

Chime should sound until headlamps are turned off or the drivers door is closed.

KEY IN IGNITION REMINDER

The chime will activate if the drivers door is opened and the key is in the ignition switch, with the ignition switch in either the OFF, LOCK, or the accessory (ACC) position.

DOOR AJAR CHIME

The chime will sound once when:

- Door opened and
- Ignition in RUN position and
- Vehicle speed is present

PARK BRAKE REMINDER

The cluster shall chime 10 times and continuously flash the brake indicator when:

- Park brake is activated and
- Vehicle speed is present.

LOW FUEL REMINDER

When the fuel level drops to about 1/8 tank, the fuel symbol will light and a single chime will sound. The light will remain on until fuel is added. If the fuel level drops to empty, the fuel symbol will flash several times and the chime will sound several times.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - FASTEN SEAT BELTS

To test the fasten seat belts function, 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 four to eight seconds and the tone should sound three to five times.

If the lamp does not light, check the connection at the seat belt retractor. Replace as necessary.

DIAGNOSIS AND TESTING - KEY LEFT IN IGNITION

To test the key left in ignition function, insert key into the ignition and open the driver's door. Chime should sound until key is removed from ignition or driver's door is closed.

CHIME/BUZZER (Continued)

If these conditions are met and there is still a problem with the system, refer to Electrical, Chime/ Buzzer, Diagnosis and Testing - Chime System Conditions.

DIAGNOSIS AND TESTING - CHIME SYSTEM CONDITIONS

NO TONE WHEN IGNITION SWITCH IS TURNED ON AND DRIVERS SEAT BELT IS UNBUCKLED

(1) Using an ohmmeter, with the seat belt fully retracted, check for continuity to ground at Pin 25 of the 26-way cluster harness connector. If OK, go to Step 2. If not OK, repair as necessary.

(2) Using voltmeter, check for battery feed at Pin 21 of the 26-way cluster harness connector. Check for ignition feed at Pin 15 of the 26-way cluster harness connector. If not OK, repair as necessary.

NO FASTEN SEAT BELT LAMP WHEN IGNITION SWITCH IS ON

(1) Check for battery feed at cluster harness connector Pin 21.

(2) Check for ignition feed at cluster harness connector Pin 15. Repair as necessary.

NO TONE WHEN HEADLAMPS ARE ON AND DRIVERS DOOR IS OPEN

(1) Remove the key from the ignition.

(2) Check left door jamb switch for good ground when drivers door is open.

(3) Check for ground at Pin 10 of the 26-way cluster harness connector.

(4) Check for battery feed at cluster harness connector Pin 21 of the 26-way cluster harness connector.

(5) Check for NO voltage at Pin 15. Ignition voltage must not be present for the chime to work.

(6) Check headlamp switch.

NO TONE WHEN KEY IS LEFT IN IGNITION AND DRIVERS DOOR IS OPEN

(1) Check for continuity to ground at Pin 10 of the 26-way cluster harness connector. If OK, go to Step 3. If not OK, repair as necessary.

(2) Using voltmeter, check for battery feed at Pin 21 of the 26-way cluster harness connector. Check for NO ignition feed at Pin 15 of the 26-way cluster harness connector. If OK, go to Step 3. If not OK, repair as necessary.

(3) Open driver's door and ensure the ignition key is in the OFF, LOCK, or ACC position. Check for continuity to ground at Pin 24 of the 26-way cluster harness connector. If ground OK, replace cluster printed circuit board. If no ground, check key-in switch or door switch wiring and repair as necessary.

ELECTRONIC CONTROL MODULES

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ELECTRONIC CONTROL MODULES

STANDARD PROCEDURE - PCM/SKIM PROGRAMMING

NOTE: Before replacing the PCM for a failed driver, control circuit or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal component failures (i.e. relay and solenoids) and shorted circuits (i.e. pull-ups, drivers and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has set.

When a PCM (SBEC) and the SKIM are replaced at the same time perform the following steps in order:

(1) Program the new PCM (SBEC)
(2) Program the new SKIM
(3) Replace all ignition keys and program them to the new SKIM.

PROGRAMMING THE PCM (SBEC)

The SKIS Secret Key is an ID code that is unique to each SKIM. This code is programmed and stored in the SKIM, PCM and transponder chip (ignition keys). When replacing the PCM it is necessary to program the secret key into the new PCM using the DRB III. Perform the following steps to program the secret key into the PCM.

(1) Turn the ignition switch on (transmission in park/neutral).
(2) Use the DRB III and select THEFT ALARM, SKIM then MISCELLANEOUS.
(3) Select PCM REPLACED (GAS ENGINE).
(4) Enter secured access mode by entering the vehicle four-digit PIN.
(5) Select ENTER to update PCM VIN.

ELECTRONIC CONTROL MODULES (Continued)

NOTE: If three attempts are made to enter secure access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit this lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary).

(6) Press ENTER to transfer the secret key (the SKIM will send the secret key to the PCM).

(7) Press Page Back to get to the Select System menu and select ENGINE, MISCELLANEOUS, and SRI MEMORY CHECK.

(8) The DRB III will ask, Is odometer reading between XX and XX? Select the YES or NO button on the DRB III. If NO is selected, the DRB III will read, Enter odometer Reading<From I.P. odometer>. Enter the odometer reading from the Instrument Panel and press ENTER.

PROGRAMMING THE SKIM

(1) Turn the ignition switch on (transmission in park/neutral).

(2) Use the DRB III and select THEFT ALARM, SKIM then MISCELLANEOUS.

(3) Select PCM REPLACED (GAS ENGINE).

(4) Program the vehicle four-digit PIN into SKIM.

(5) Select COUNTRY CODE and enter the correct country.

NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, the SKIM must be replaced.

(6) Select YES to update VIN (the SKIM will learn the VIN from the PCM).

(7) Press ENTER to transfer the secret key (the PCM will send the secret key to the SKIM).

(8) Program ignition keys to SKIM.

NOTE: If the PCM and the SKIM are replaced at the same time, all vehicle keys will need to be replaced and programmed to the new SKIM.

PROGRAMMING IGNITION KEYS TO THE SKIM

(1) Turn the ignition switch on (transmission in park/neutral).

(2) Use the DRB III and select THEFT ALARM, SKIM then MISCELLANEOUS.

(3) Select PROGRAM IGNITION KEY'S.

(4) Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM it (the key) cannot be transferred to another vehicle.

If ignition key programming is unsuccessful, the DRB III will display one of the following messages:

Programming Not Attempted - The DRB III attempts to read the programmed key status and there are no keys programmed into SKIM memory.

Programming Key Failed (Possible Used Key From Wrong Vehicle) - SKIM is unable to program key due to one of the following:

- faulty ignition key transponder
- ignition key is programmed to another vehicle.

8 Keys Already Learned, Programming Not Done - SKIM transponder ID memory is full.

(5) Obtain ignition keys to be programmed from customer (8 keys maximum).

(6) Using the DRB III, erase all ignition keys by selecting MISCELLANEOUS and ERASE ALL CURRENT IGN. KEYS.

(7) Program all ignition keys.

Learned Key In Ignition - Ignition key transponder ID is currently programmed in SKIM memory.

COMMUNICATION

DESCRIPTION

The DaimlerChrysler Programmable Communication Interface (PCI) data bus system is a single wire multiplex system used for vehicle communications on many DaimlerChrysler Corporation vehicles. Multiplexing is a system that enables the transmission of several messages over a single channel or circuit. All DaimlerChrysler vehicles use this principle for communication between various microprocessor-based electronic control modules. The PCI data bus exceeds the Society of Automotive Engineers (SAE) J1850 Standard for Class B Multiplexing.

Many of the electronic control modules in a vehicle require information from the same sensing device. In the past, if information from one sensing device was required by several controllers, a wire from each controller needed to be connected in parallel to that sensor. In addition, each controller utilizing analog sensors required an Analog/Digital (A/D) converter in order to "read" these sensor inputs. Multiplexing reduces wire harness complexity, sensor current loads and controller hardware because each sensing device is connected to only one controller, which reads and distributes the sensor information to the other controllers over the data bus. Also, because each controller on the data bus can access the controller sensor inputs to every other controller on the data bus, more function and feature capabilities are possible.

COMMUNICATION (Continued)

In addition to reducing wire harness complexity, component sensor current loads and controller hardware, multiplexing offers a diagnostic advantage. A multiplex system allows the information flowing between controllers to be monitored using a diagnostic scan tool. The DaimlerChrysler system allows an electronic control module to broadcast message data out onto the bus where all other electronic control modules can ″hear″ the messages that are being sent. When a module hears a message on the data bus that it requires, it relays that message to its microprocessor. Each module ignores the messages on the data bus that are being sent to other electronic control modules.

OPERATION

Data exchange between modules is achieved by serial transmission of encoded data over a single wire broadcast network. The wire colors used for the PCI data bus circuits are yellow with a violet tracer, or violet with a yellow tracer, depending upon the application. The PCI data bus messages are carried over the bus in the form of Variable Pulse Width Modulated (VPWM) signals. The PCI data bus speed is an average 10.4 Kilo-bits per second (Kbps). By comparison, the prior two-wire Chrysler Collision Detection (CCD) data bus system is designed to run at 7.8125 Kbps.

The voltage network used to transmit messages requires biasing and termination. Each module on the PCI data bus system provides its own biasing and termination. Each module (also referred to as a node) terminates the bus through a terminating resistor and a terminating capacitor. There are two types of nodes on the bus. The dominant node terminates the bus through a 1 KW resistor and a 3300 pF capacitor. The Powertrain Control Module (PCM) is the only dominant node for the PCI data bus system. A standard node terminates the bus through an 11 KW resistor and a 330 pF capacitor.

The modules bias the bus when transmitting a message. The PCI bus uses low and high voltage levels to generate signals. Low voltage is around zero volts and the high voltage is about seven and one-half volts. The low and high voltage levels are generated by means of variable-pulse width modulation to form signals of varying length. The Variable Pulse Width Modulation (VPWM) used in PCI bus messaging is a method in which both the state of the bus and the width of the pulse are used to encode bit information. A ″zero″ bit is defined as a short low pulse or a long high pulse. A ″one″ bit is defined as a long low pulse or a short high pulse. A low (passive) state on the bus does not necessarily mean a zero bit. It also depends upon pulse width. If the width is short, it stands for a zero bit. If the width is long, it stands for a one bit. Similarly, a high (active) state does not necessarily mean a one bit. This too depends upon pulse width. If the width is short, it stands for a one bit. If the width is long, it stands for a zero bit.

In the case where there are successive zero or one data bits, both the state of the bus and the width of the pulse are changed alternately. This encoding scheme is used for two reasons. First, this ensures that only one symbol per transition and one transition per symbol exists. On each transition, every transmitting module must decode the symbol on the bus and begin timing of the next symbol. Since timing of the next symbol begins with the last transition detected on the bus, all of the modules are re-synchronized with each symbol. This ensures that there are no accumulated timing errors during PCI data bus communication.

The second reason for this encoding scheme is to guarantee that the zero bit is the dominant bit on the bus. When two modules are transmitting simultaneously on the bus, there must be some form of arbitration to determine which module will gain control. A data collision occurs when two modules are transmitting different messages at the same time. When a module is transmitting on the bus, it is reading the bus at the same time to ensure message integrity. When a collision is detected, the module that transmitted the one bit stops sending messages over the bus until the bus becomes idle.

Each module is capable of transmitting and receiving data simultaneously. The typical PCI bus message has the following four components:

- **Message Header -** One to three bytes in length. The header contains information identifying the message type and length, message priority, target module(s) and sending module.
- **Data Byte(s) -** This is the actual message that is being sent.
- **Cyclic Redundancy Check (CRC) Byte -** This byte is used to detect errors during a message transmission.
- **In-Frame Response (IFR) byte(s) -** If a response is required from the target module(s), it can be sent during this frame. This function is described in greater detail in the following paragraph.

The IFR consists of one or more bytes, which are transmitted during a message. If the sending module requires information to be received immediately, the target module(s) can send data over the bus during the original message. This allows the sending module to receive time-critical information without having to wait for the target module to access the bus. After the IFR is received, the sending module broadcasts an End of Frame (EOF) message and releases control of the bus.

COMMUNICATION (Continued)

The PCI data bus can be monitored using the DRBIII® scan tool. It is possible, however, for the bus to pass all DRBIII® tests and still be faulty if the voltage parameters are all within the specified range and false messages are being sent.

CONTROLLER ANTILOCK BRAKE

DESCRIPTION

The controller antilock brake (CAB) is a microprocessor-based device which monitors the ABS system during normal braking and controls it when the vehicle is in an ABS stop. The CAB uses a 24-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 CAB is on the PCI bus.

The CAB is mounted to the HCU as part of the Integrated Control Unit (ICU) (Fig. 1). Attached to the bottom of the HCU, it can be viewed from below, just above the transaxle and left halfshaft (Fig. 2). For information on the ICU, (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DESCRIPTION)

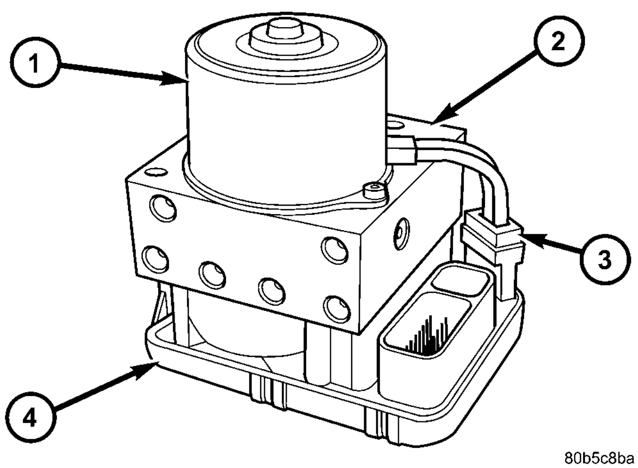

Fig. 1 Integrated Control Unit (ICU)

1 - PUMP/MOTOR
2 - HCU
3 - PUMP/MOTOR WIRING CONNECTOR
4 - CAB

OPERATION

The primary functions of the contoller antilock brake (CAB) are to:

- monitor the antilock brake system for proper operation.
- detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.

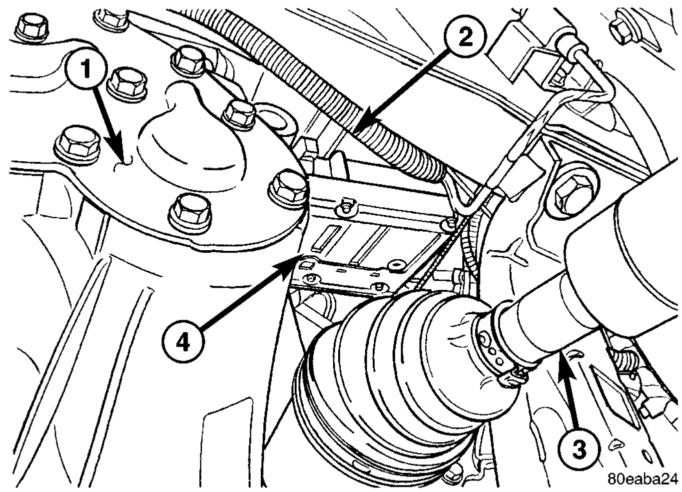

Fig. 2 CAB Location In Vehicle

1 - TRANSAXLE
2 - HCU
3 - LEFT HALFSHAFT
4 - CAB

- control fluid modulation to the wheel brakes while the system is in an ABS mode.
- store diagnostic information.
- provide communication to the DRBIII® scan tool while in diagnostic mode.

The CAB constantly monitors the antilock brake system for proper operation. If the CAB detects a fault, it will send a message to the mechanical instument cluster (MIC) instructing it to turn on the amber ABS warning indicator lamp and disable the antilock braking system. The normal base braking system will remain operational.

The CAB continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the CAB commands the CAB command coils to actuate. The CAB command coils then open and close the valves in the HCU that 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 CAB contains a self-diagnostic program that monitors the antilock brake system for system faults. When a fault is detected, the amber ABS warning lamp is turned on and the fault diagnostic trouble code (DTC) is then stored in a diagnostic program memory. These DTC's will remain in the CAB memory even after the ignition has been turned off. The DTC's can be read and cleared from the CAB memory by a technician using the DRB scan tool. If not cleared with a DRB scan tool, the fault occurrence and DTC will be automatically cleared from the CAB memory after the identical fault has not been seen during the next 3,500 miles of vehicle operation.

CONTROLLER ANTILOCK BRAKE (Continued)

CONTROLLER ANTILOCK BRAKE INPUTS

- wheel speed sensors (four)
- brake lamp switch
- ignition switch
- system relay voltage
- ground
- diagnostic communication (PCI)

CONTROLLER ANTILOCK BRAKE OUTPUTS

- amber ABS warning indicator lamp actuation (through MIC)
- red BRAKE warning indicator lamp actuation (through MIC)
- diagnostic communication. (PCI)

REMOVAL

(1) Disconnect battery negative cable.
(2) Raise vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
(3) Disconnect pump/motor connector from CAB (Fig. 3).

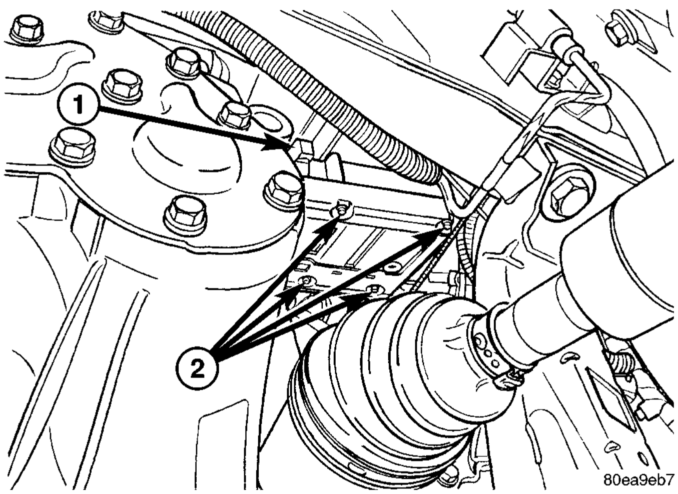

Fig. 3 CAB Mounting

1 - PUMP/MOTOR CONNECTOR
2 - CAB MOUNTING SCREWS

(4) Remove four screws securing CAB to HCU half of ICU (Fig. 3). Remove CAB from HCU.
(5) Pull outward on CAB connector lock and disconnect 24–way wiring connector. Remove CAB from vehicle.

INSTALLATION

(1) Connect 24–way wiring connector to CAB and push in connector lock.
(2) Align CAB with HCU half of ICU, then slide CAB up over HCU valves. Install four CAB mounting screws (Fig. 3). Tighten mounting screws to 2 N·m (17 in. lbs.) torque.
(3) Connect pump/motor connector (Fig. 3).
(4) Lower vehicle.
(5) Connect battery negative cable.
(6) Connect DRBIII® to vehicle to initialize system. Check and clear any faults.

DATA LINK CONNECTOR

DESCRIPTION

The data link connector is located inside the vehicle, under the instrument panel, left of the steering column (Fig. 4).

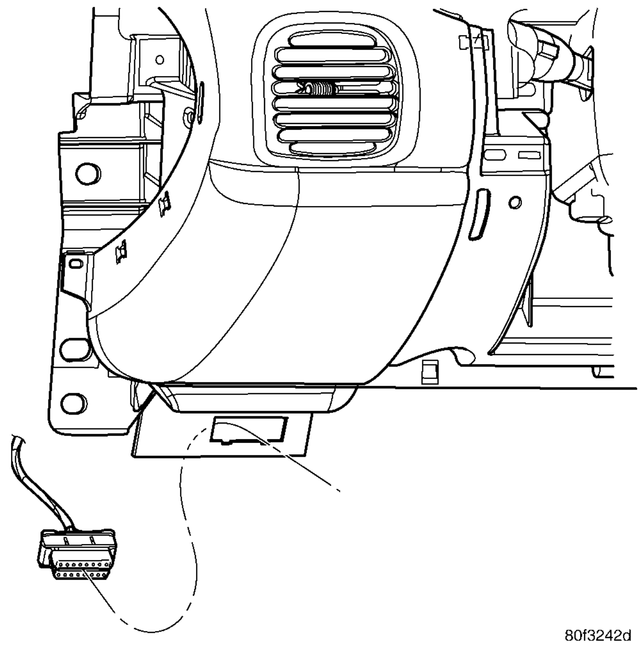

Fig. 4 DATA LINK CONNECTOR (DLC) LOCATION

OPERATION

The data link connector (diagnostic connector) links the DRB scan tool with the powertrain control module (PCM).

POWERTRAIN CONTROL MODULE

DESCRIPTION

OPERATION - 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 (PCM).

POWERTRAIN CONTROL MODULE (Continued)

OPERATION - DATA BUS COMMUNICATION RECEIVE - PCM INPUT

The PCM uses the SCI communication bus to preform engine diagnostics and flash operations. The transmission side of the PCM uses the SCI communication bus to flash new software. However, diagnostics is performed via the vehicles J1850 bus for the transmission side of the PCM.

OPERATION - 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.

OPERATION - PCM GROUND

Ground is provided through multiple pins of the PCM connector. Depending on the vehicle there may be as many as two different ground pins. There are power grounds and sensor grounds.

The power grounds are used to control the ground side relays, solenoids, ignition coil or injectors. The signal ground is used for any input that uses sensor return for ground, and the ground side of any internal processing component.

The PCM case is shielded to prevent RFI and EMI. The PCM case is grounded and must be firmly attached to a good, clean body ground.

Internally all grounds are connected together, however there is noise suppression on the sensor ground. For EMI and RFI protection the housing and cover are also grounded separately from the ground pins.

OPERATION

OPERATION

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, transmission, and vehicle operations through devices that are referred to as PCM Outputs (Fig. 5).

NOTE: PCM Inputs:

- Air Conditioning Controls
- Ambient Air temperature Sensor
- ASD Sense
- Baro/Tip (Turbo)
- Battery Voltage
- Battery Temperature Sensor
- Brake Switch
- Camshaft Position Sensor
- Clutch Upstop Switch
- Clutch Interlock
- Crankshaft Position Sensor

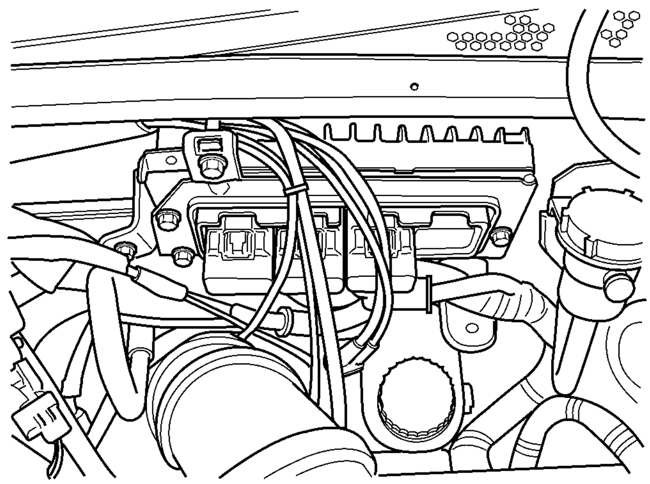

Fig. 5 PCM

- Engine Coolant Temperature Sensor
- Fuel Level Sensor (Bus message)
- Ignition Switch
- Intake Air Temperature Sensor
- J1850
- Knock Sensor (2.0, 2.4L)
- Natural Vacuum Leak Detection (NVLD)
- Manifold Absolute Pressure (MAP) Sensor
- Oil Pressure Switch
- Oxygen Sensors
- Power Steering Pressure Switch
- SCI Receive
- Speed Control Switches
- Throttle Position Sensor
- Transmission Control Relay (Switched B+)
- Transmission Input Shaft Speed Sensor
- Transmission Output Shaft Speed Sensor
- Transmission Pressure Switches (L/R, 2/4, OD)
- Transmission Range Sensor (TRS)
- Transmission Oil Temperature Sensor (Integral to TRS)
- Vehicle Speed Sensor (MTX-equipped models)

NOTE: PCM Outputs:

- Air Conditioning Clutch Relay
- Auto Shutdown (ASD) Relay
- Charging Indicator Lamp (Bus Message)
- SCI Transmit
- Proportional Purge Solenoid
- EGR Solenoid
- Fuel Injectors
- Fuel Pump Relay
- Generator Field
- Idle Air Control Motor (2.0/2.4L)
- Ignition Coils

POWERTRAIN CONTROL MODULE (Continued)

- J1850
- Malfunction Indicator (Check Engine) Lamp (Bus Message)
- Oxygen Sensors Heater Controls
- Radiator Fan Relays
- Speed Control Solenoids (2.0/2.4L)
- Transmission Control Relay
- Transmission Solenoids (LR/CC, 2/4, OD, and UD)
- Transmission PRNDL Position (to Cluster)
- Transmission Torque Reduction Request (Internal to PCM)
- Transmission Temperature (Internal to PCM and a Bus Message)
- Vehicle Speed (Manual Transmission)

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 also determines the appropriate transmission shift schedule and shift points, depending on the present operating conditions and driver demand. 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
- 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 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 5 volts direct current to power the camshaft position sensor, crankshaft position sensor, manifold absolute pressure sensor, throttle position sensor, A/C pressure switch, A/C pressure transducer, and vehicle speed sensor.

Powertrain Control Module Connectors

The PCM is an engine and transmission controller module all in one, if the vehicle is equipped with an automatic transmission. The PCM uses four wiring harness connectors to receive and send engine and transmission data. To ease assembly, the mating wiring harness connector is color-coded. Each module connector cavity has its own unique color identification stripe located on the outside of each connector cavity.

The PCM module utilizes four wiring harness connectors as described:

- Connector Cavity A is for Power & Ground (Black)
- Connector Cavity B is for Engine Side (Orange)
- Connector Cavity C is for Headlamp & Dash (White)
- Connector Cavity D is for Transmission (Green) If equipped

NOTE: Connector Cavities A, B, C, And D must be connected prior to battery connection and ignition key on to avoid setting erroneous controller fault codes. It is also recommended that cavity A connector is made prior to any other connectors.

TRANSMISSION CONTROL

CLUTCH VOLUME INDEX (CVI)

An important function of the PCM is to monitor Transmission Clutch Volume Index (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The PCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input,

POWERTRAIN CONTROL MODULE (Continued)

or Turbine Speed Sensor sends an electrical signal to the PCM that represents input shaft rpm. The Output Speed Sensor provides the PCM with output shaft speed information.

By comparing the two inputs, the PCM can determine transaxle gear ratio. This is important to the CVI calculation because the PCM determines CVIs by monitoring how long it takes for a gear change to occur (Fig. 6).

Gear ratios can be determined by using the DRBIII® Scan Tool and reading the Input/Output Speed Sensor values in the “Monitors” display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

For example, if the input shaft is rotating at 1000 rpm and the output shaft is rotating at 500 rpm, then the PCM can determine that the gear ratio is 2:1. In direct drive (3rd gear), the gear ratio changes to 1:1. The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the PCM can determine the volume of fluid used to apply or release a friction element.

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

Certain mechanical problems within the clutch assemblies (broken return springs, out of position snap rings, excessive clutch pack clearance, improper assembly, etc.) can cause inadequate or out-of-range clutch volumes. Also, defective Input/Output Speed

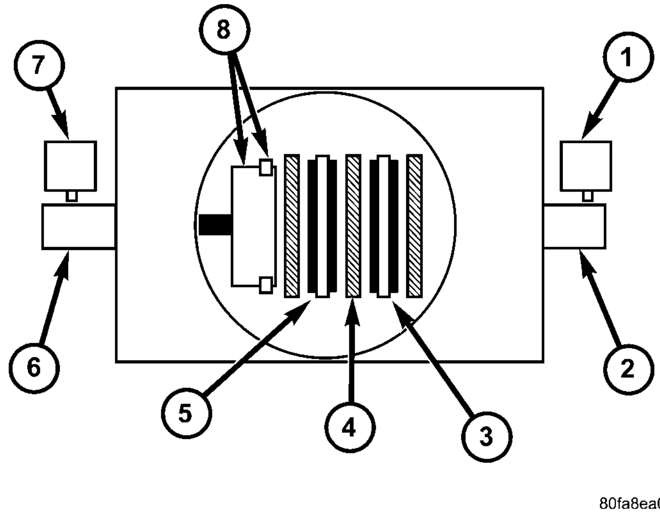

Fig. 6 Example of CVI Calculation

1 - OUTPUT SPEED SENSOR
2 - OUTPUT SHAFT
3 - CLUTCH PACK
4 - SEPARATOR PLATE
5 - FRICTION DISCS
6 - INPUT SHAFT
7 - INPUT SPEED SENSOR
8 - PISTON AND SEAL

Sensors and wiring can cause these conditions. The following chart identifies the appropriate clutch volumes and when they are monitored/updated:

<table>
<tr><th colspan="5">CLUTCH VOLUMES</th></tr>
<tr><th rowspan="2">Clutch</th><th colspan="3">When Updated</th><th rowspan="2">Proper Clutch Volume</th></tr>
<tr><th>Shift Sequence</th><th>Oil Temperature</th><th>Throttle Angle</th></tr>
<tr><td>L/R</td><td>2-1 or 3-1 coast downshift</td><td>> 70°</td><td>< 5°</td><td>35 to 83</td></tr>
<tr><td>2/4</td><td>1-2 shift</td><td rowspan="3">> 110°</td><td rowspan="2">5 - 54°</td><td>20 to 77</td></tr>
<tr><td>OD</td><td>2-3 shift</td><td>48 to 150</td></tr>
<tr><td>UD</td><td>4-3 or 4-2 shift</td><td>> 5°</td><td>24 to 70</td></tr>
</table>

TRANSMISSION SHIFT SCHEDULES

The PCM is programmed to allow it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software calibration level

As driving conditions change, the PCM appropriately adjusts the shift schedule. Refer to the following chart to determine the appropriate operation expected, depending on driving conditions.

POWERTRAIN CONTROL MODULE (Continued)

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature at start-up below -16° F	Park, Reverse, Neutral and 2nd gear only (prevents shifting which may fail a clutch with frequent shifts)
Cold	Oil temperature at start-up above -12° F and below 36° F	– Delayed 2-3 upshift (approximately 22-31 mph) – Delayed 3-4 upshift (45-53 mph) – Early 4-3 costdown shift (approximately 30 mph) – Early 3-2 coastdown shift (approximately 17 mph) – High speed 4-2, 3-2, 2-1 kickdown shifts are prevented – No EMCC
Warm	Oil temperature at start-up above 36° F and below 80 degree F	– Normal operation (upshift, kickdowns, and coastdowns) – No EMCC
Hot	Oil temperature at start-up above 80° F	– Normal operation (upshift, kickdowns, and coastdowns) – Full EMCC, no PEMCC except to engage FEMCC (except at closed throttle at speeds above 70-83 mph)
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	– Delayed 2-3 upshift (25-32 mph) – Delayed 3-4 upshift (41-48 mph) – 3rd gear FEMCC from 30-48 mph – 3rd gear PEMCC from 27-31 mph
Super Overheat	Oil temperature above 260° F	– All ″Overheat″ shift schedule features apply – 2nd gear PEMCC above 22 mph – Above 22 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

OPERATION - 5 VOLT SUPPLY - PCM OUTPUT

The PCM supplies 5 volts to the following sensors:

- A/C pressure transducer
- Ambient Temperature sensor
- Battery temperature
- Camshaft Position Sensor (NGC)
- Crankshaft Position Sensor (NGC)
- Electronic Throttle Control (1.6L)
- Engine coolant temperature sensor
- Inlet Air Temperature Sensor
- Knock sensor
- Linear EGR solenoid (if equipped)
- Manifold absolute pressure sensor
- Oil Pressure Switch
- Pedal Position Sensor (1.6L)
- Throttle position sensor
- Vehicle Speed Sensor

POWERTRAIN CONTROL MODULE (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - OBTAINING DIAGNOSTIC TROUBLE CODES

BULB CHECK

Key on: Bulb illuminated until vehicle starts, as long as all once per trip (readiness) monitors completed. If monitors have **not** been completed, then: Key on: bulb check for about 5 to 8 seconds, lamp then flashes if once per trip (readiness) monitors have **not** been completed until vehicle is started, then MIL is extinguished.

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.**

STANDARD PROCEDURE - PINION FACTOR SETTING

NOTE: This procedure must be performed if the PCM has been replaced with a NEW or replacement unit. Failure to perform this procedure will result in an inoperative or improperly calibrated speedometer.

The vehicle speed readings for the speedometer are taken from the output speed sensor. The PCM must be calibrated to the different combinations of equipment (final drive and tires) available. Pinion Factor allows the technician to set the Powertrain Control Module initial setting so that the speedometer readings will be correct. To properly read and/or reset the Pinion Factor, it is necessary to use a DRBIII® scan tool.

(1) Plug the DRBIII® scan tool into the diagnostic connector located under the instrument panel.

(2) Select the Transmission menu.

(3) Select the Miscellaneous menu.

(4) Select Pinion Factor. Then follow the instructions on the DRBIII® scan tool screen.

STANDARD PROCEDURE - QUICK LEARN PROCEDURE

The quick learn procedure requires the use of the DRBIII® scan tool. This program allows the PCM to recalibrate itself. This will provide the best possible transaxle operation.

NOTE: The quick learn procedure should be performed if any of the following procedures are performed:

- Transaxle Assembly Replacement
- Powertrain Control Module Replacement
- Solenoid/Pressure Switch Assembly Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay until prompted to shift to overdrive
- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the DRBIII® indicates the procedure is complete
- The calculated oil temperature must be above 60° and below 200°

(1) Plug the DRBIII® scan tool into the diagnostic connector. The connector is located under the instrument panel.

(2) Go to the Transmission screen.

(3) Go to the Miscellaneous screen.

(4) Select Quick Learn Procedure. Follow the instructions of the DRBIII® to perform the Quick Learn Procedure.

REMOVAL

REMOVAL - 1.6L

(1) Disconnect the negative battery cable.

(2) Remove the air cleaner box, refer to the air cleaner box removal (Fig. 7).

(3) Disconnect the Powertrain Control Module connector.

(4) Remove the 4 bolts (Fig. 8).

(5) Remove the PCM from bracket.

POWERTRAIN CONTROL MODULE (Continued)

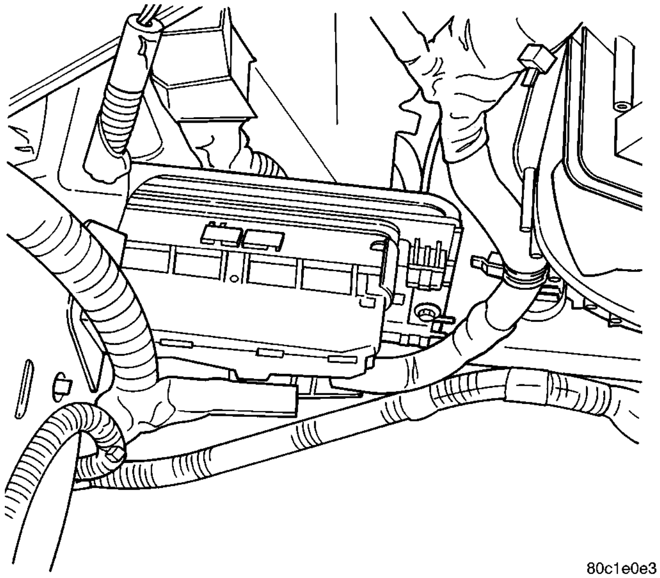

Fig. 7 PCM LOCATION

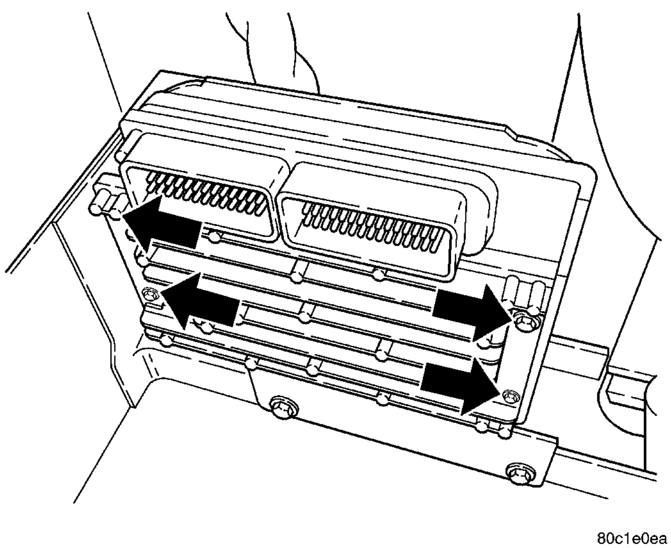

Fig. 8 PCM BOLTS

REMOVAL - 2.0/2.4/2.4 TURBO/2.4L SRT-4

(1) Disconnect the negative battery cable.

(2) Remove and relocate the air cleaner box (Fig. 9), refer to the Engine/Air Intake/Air Cleaner Housing for more information.

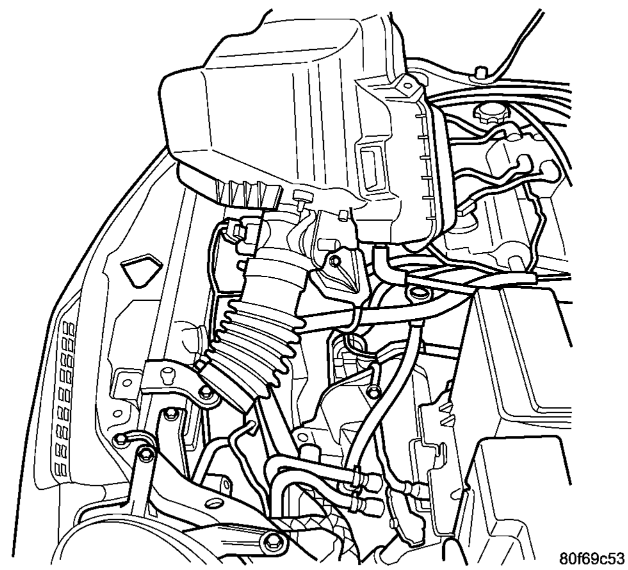

Fig. 9 AIR BOX RELOCATED

(3) Unlock and disconnect the electrical connectors (Fig. 10) at the PCM.

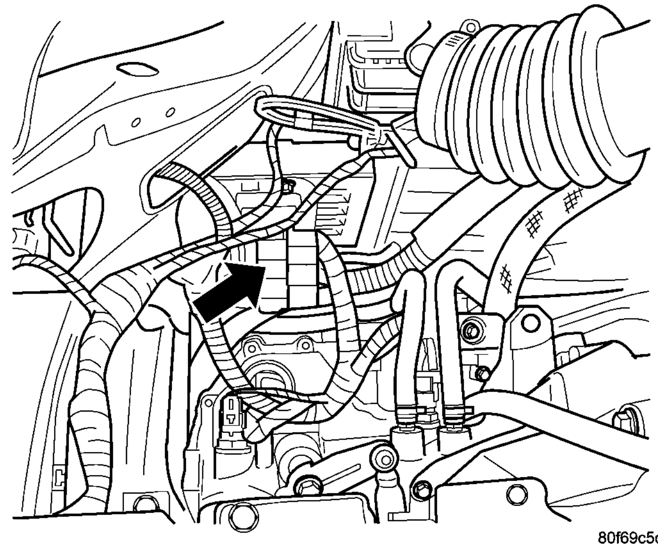

Fig. 10 CONNECTORS INSTALLED

1 - Wiring Clip
2 - PCM

POWERTRAIN CONTROL MODULE (Continued)

(4) Remove the wiring harness clip (Fig. 11) from the PCM bracket.

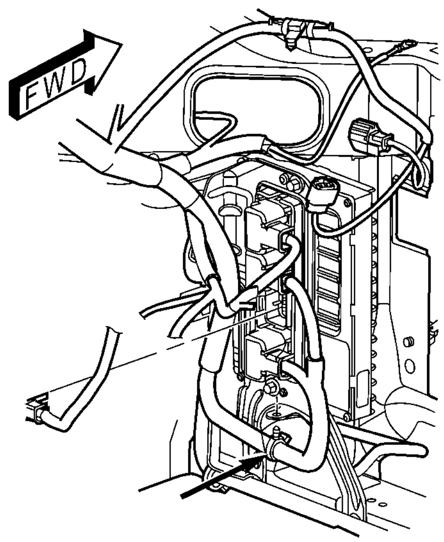

Fig. 11 WIRING HARNESS

(5) Remove the mounting bolts from the bottom of the PCM bracket (Fig. 12).

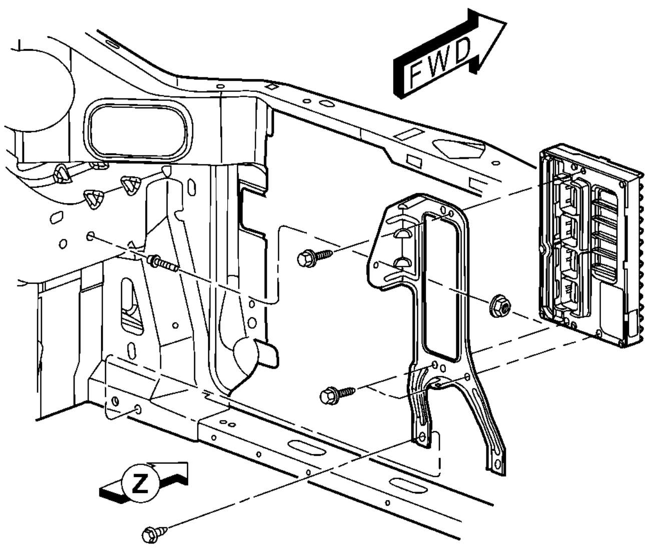

Fig. 12 PCM AND BRACKET

(6) Remove the nut and bracket screws.

NOTE: For PL 2.4L SRT-4 remove PCM from bracket then remove both parts

(7) Remove the assembly, PCM and bracket.

INSTALLATION

INSTALLATION - 1.6L

(1) Install the PCM to bracket.
(2) Install the 4 bolts (Fig. 8).
(3) Connect the Powertrain Control Module electrical connector.
(4) Install the air cleaner box, refer to the air cleaner box installation (Fig. 7).
(5) Connect the negative battery cable.

INSTALLATION - 2.0L

(1) Install the assembly, PCM and bracket.
(2) Loose install the mounting nut.
(3) Install the mounting bolts to the bottom of the PCM bracket (Fig. 12).
(4) Tighten the mounting nut, tighten to
(5) Install the wiring harness clip (Fig. 11) to the PCM bracket.

NOTE: The electrical connector for the PCM are COLOR Coded.

(6) Connect the electrical connectors and lock (Fig. 10) at the PCM.
(7) Install the air cleaner box (Fig. 9), refer to the Engine/Air Intake/Air Cleaner Housing for more information.
(8) Connect the negative battery cable.

SENTRY KEY IMMOBILIZER MODULE

DESCRIPTION

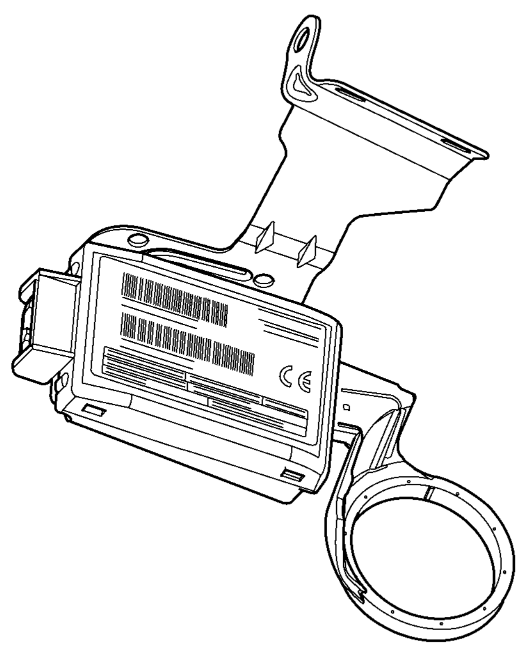

Fig. 13 SENTRY KEY IMMOBILIZER MODULE

The Sentry Key Immobilizer Module (SKIM) (Fig. 13) contains a Radio Frequency (RF) transceiver and a microprocessor. The SKIM retains in memory the ID numbers of any Sentry Key that is programmed

SENTRY KEY IMMOBILIZER MODULE (Continued)

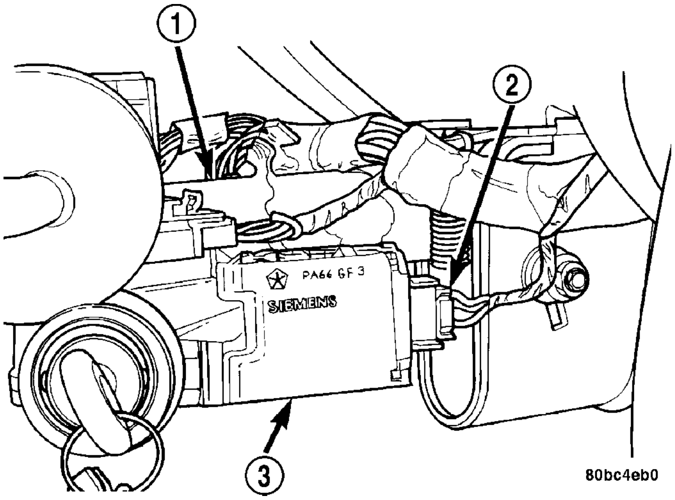

Fig. 14 SENTRY KEY IMMOBILIZER MODULE LOCATION

1 - STEERING COLUMN
2 - SKIM ELECTRICAL CONNECTOR
3 - SKIM

to it. The maximum number of keys that may be programmed to each module is eight (8). The SKIM also communicates over the PCI bus with the Powertrain Control Module (PCM), the instrument cluster, and the DRB III® scan tool. The SKIM transmits and receives RF signals through a tuned antenna enclosed within a molded plastic ring formation that is integral to the SKIM housing. When the SKIM is properly installed on the steering column, the antenna ring fits snugly around the circumference of the ignition lock cylinder housing (Fig. 14). If this ring is not mounted properly, communication problems may arise in the form of transponder-related faults.

For added system security, each SKIM is programmed with a unique ″Secret Key″ code. This code is stored in memory and is sent over the PCI bus to the PCM and to each key that is programmed to work with the vehicle. The ″Secret Key″ code is therefore a common element found in all components of the Sentry Key Immobilizer System (SKIS). In the event that a SKIM replacement is required, the ″Secret Key″ code can be restored from the PCM by following the SKIM replacement procedure found in the DRB III® scan tool. Proper completion of this task will allow the existing ignition keys to be reprogrammed. Therefore, new keys will NOT be needed. In the event that the original ″Secret Key″ code can not be recovered, new ignition keys will be required. The DRB III® scan tool will alert the technician if key replacement is necessary. Another security code, called a PIN, is used to gain secured access to the SKIM for service. The SKIM also stores in its memory the Vehicle Identification Number (VIN), which it learns through a bus message from the PCM during initialization. The SKIS scrambles the information that is communicated between its components in order to reduce the possibility of unauthorized SKIM access and/or disabling.

OPERATION

When the ignition switch is moved to the RUN position, the SKIM transmits an RF signal to the transponder in the ignition key. The SKIM then waits for a response RF signal from the transponder in the key. If the response received identifies the key as valid, the SKIM sends a ″valid key″ message to the PCM over the PCI bus. If the response received identifies the key as invalid or no response is received from the transponder in the ignition key, the SKIM sends an ″invalid key″ message to the PCM. The PCM will enable or disable engine operation based upon the status of the SKIM messages. It is important to note that the default condition in the PCM is ″invalid key.″ Therefore, if no response is received by the PCM, the engine will be immobilized after two (2) seconds of running.

The SKIM also sends indicator light status messages to the instrument cluster to tell that module how to operate the light. This may consist of turning the light ON for a three (3) second bulb test when the ignition switch is first turned to the ON position. It is also the method used to turn the light ON solid or to flash it after the indicator light test is complete to signify a fault in the SKIS. If the light comes ON and stays ON solid after the indicator light test, this signifies that the SKIM has detected a system malfunction and/or that the SKIS has become inoperative. If the SKIM detects an invalid key OR a key-related fault exists, the indicator light will flash following the indicator light test. The SKIM may also request an audible chime if the customer key programming feature is available and the procedure is being utilized. Refer to Electrical, Vehicle Theft Security, Transponder Key, Standard Procedure - Sentry Key Immobilizer System Transponder programming.

STANDARD PROCEDURE - SENTRY KEY IMMOBILIZER SYSTEM INITIALIZATION

The Sentry Key Immobilizer System (SKIS) initialization should be performed following a Sentry Key Immobilizer Module (SKIM) replacement. It can be summarized as follows:

(1) Obtain the vehicle's unique four-digit PIN assigned to its original SKIM from the vehicle owner, the vehicle's invoice, or from Chrysler's Customer Center.

(2) Using a DRB III® scan tool, select ″Theft Alarm,″ ″SKIM,″ ″Miscellaneous,″ and then ″SKIM Module Replaced.″

SENTRY KEY IMMOBILIZER MODULE (Continued)

(a) Enter Secured Access Mode using the unique four-digit PIN.

(b) Program the vehicle's VIN number into the SKIM's memory.

(c) Program the country code into the SKIM's memory (for North America, choose US or domestic).

(d) The vehicle's unique Secret Key data will be retrieved from the PCM automatically. If this data is corrupt or not present, you will be prompted to cut new keys for this vehicle.

(3) Program all customer keys into the SKIM's memory.

This process will require that the SKIM to be in the Secured Access Mode. The PIN must be entered into the DRB III® scan tool before the SKIM will enter the Secured Access Mode. Once entered, Secured Access Mode shall be active until 60 seconds after the last command requiring secured access was received and acknowledged.

Two exceptions to this rule are:

- When you have used the 'erase all keys' command **OR**
- When you have just programmed a new key.

If either of these functions are performed successfully while in the Secured Access Mode, this mode will be exited immediately following the function.

NOTE: If a PCM is replaced, the unique 'Secret Key' data must be transferred from the SKIM to the new PCM using the PCM replacement procedure. This procedure requires the Secured Access Mode as well and can be found in the DRB III® scan tool.

REMOVAL

(1) Disconnect and isolate the battery negative remote cable.

(2) Remove Lower Instrument Panel Cover. Refer to Body, Instrument Panel, Lower Instrument Panel Cover, Removal.

(3) Remove the steering column upper and lower shrouds. Refer to Steering, Column, Column Shroud, Removal.

(4) Disengage the steering column wire harness from the Sentry Key Immobilizer Module (SKIM) (Fig. 15).

(5) Remove the two screws securing the SKIM to the top of the steering column (Fig. 15).

(6) Rotate the SKIM and its mounting bracket upwards and then to the side away from the steering column to slide the SKIM antenna ring from around the ignition switch lock cylinder housing (Fig. 15).

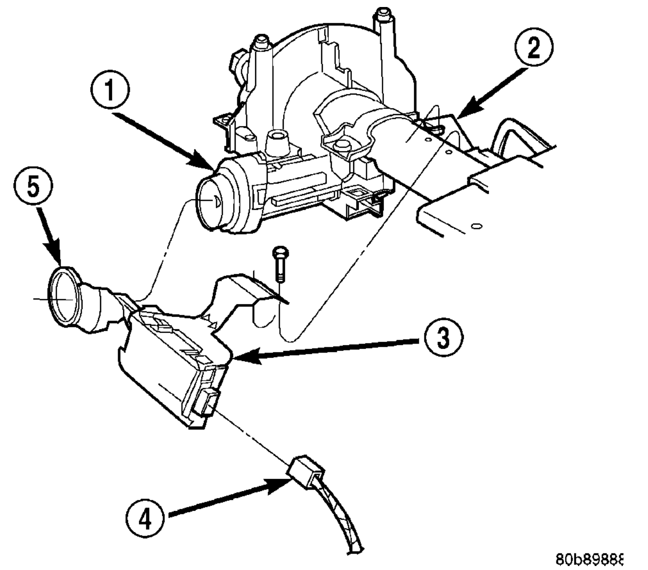

Fig. 15 SENTRY KEY IMMOBILIZER MODULE (SKIM) REMOVE/INSTALL

1 - IGNITION KEY CYLINDER
2 - STEERING COLUMN
3 - SENTRY KEY IMMOBILIZER MODULE (SKIM)
4 - SKIM CONNECTOR
5 - SKIM ANTENNA

(7) Remove the SKIM from the vehicle.

INSTALLATION

NOTE: If the SKIM is replaced with a new unit, a DRB III® scan tool MUST be used to initialize the new SKIM and to program at least two Sentry Key transponders (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/SENTRY KEY IMMOBILIZER MODULE - STANDARD PROCEDURE).

(1) Place the SKIM into position.

(2) Rotate the SKIM and its mounting bracket downwards and then to the side towards the steering column (Fig. 15).

(3) Install the two screws securing the SKIM to the top of the steering column (Fig. 15).

(4) Engage the steering column wire harness to the Sentry Key Immobilizer Module (SKIM) (Fig. 15).

(5) Install the steering column upper and lower shrouds. Refer to Steering, Column, Column Shroud, Installation.

(6) Install the Lower Instrument Panel Cover. Refer to Body, Instrument Panel, Lower Instrument Panel Cover, Installation.

(7) Connect the battery negative cable.

ENGINE SYSTEMS

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BATTERY SYSTEM

TABLE OF CONTENTS

BATTERY SYSTEM

DESCRIPTION

A single 12-volt battery is standard factory-installed equipment on this model. All of the components of the battery system are located within the engine compartment of the vehicle. The battery system for this vehicle covers the following related components, which are covered in further detail later in this section of the service manual:

- **Battery -** The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables -** The battery cables connect the positive and negatively charged battery terminal posts to the vehicle electrical system.
- **Battery Holddown -** The battery holddown hardware secures the battery in the battery tray in the engine compartment.
- **Battery Thermal Guard -** The battery thermal guard insulates the battery to protect it from engine compartment temperature extremes.
- **Battery Tray -** The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery holddown hardware.

For battery system maintenance schedules and jump starting procedure, see the owner's manual in the vehicle glove box. Optionally, refer to the Lubrication and Maintenance section of this manual for the recommended battery maintenance schedules and for the proper battery jump starting procedure. While battery charging can be considered a maintenance procedure, the battery charging procedure and related information are located later in this section of this service manual. This was done because the battery must be fully-charged before any battery system diagnosis or testing procedures can be performed.

OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

DIAGNOSIS AND TESTING - BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting, and charging systems 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-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 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. Refer to Charging System for the proper charging system on-board diagnostic test procedures.

MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to help the dealership technicians diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro 420 battery tester.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is faulty.	2. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Charge the faulty battery, as required.
	4. The battery terminal connections are loose or corroded.	4. Refer to Battery Cables for the proper battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. Refer to Battery System Specifications for the proper size and rating. Replace an incorrect battery, as required.
	6. The battery is faulty.	6. Determine the battery cranking capacity using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Replace the faulty battery, as required.
	7. The starting system is faulty.	7. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	1. The battery has an incorrect size or rating for this vehicle.	1. Refer to Battery System Specifications for the proper specifications. Replace an incorrect battery, as required.
	2. The battery terminal connections are loose or corroded.	2. Refer to Battery Cable for the proper cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	3. The electrical system ignition-off draw is excessive.	3. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the faulty electrical system, as required.
	4. The battery is faulty.	4. Test the battery using the Micro 420 battery tester. Refer to Standard Procedures for additional test procedures. Replace the faulty battery, as required.
	5. The starting system is faulty.	5. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	6. The charging system is faulty.	6. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	7. Electrical loads exceed the output of the charging system.	7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.
	8. Slow driving or prolonged idling with high-amperage draw systems in use.	8. Advise the vehicle operator, as required.
THE BATTERY WILL NOT ACCEPT A CHARGE.	1. The battery is faulty.	1. Test the battery using the Micro 420 battery tester. Charge or replace the faulty battery, as required.

ABNORMAL BATTERY DISCHARGING

Any of the following conditions can result in abnormal battery discharging:

1. A faulty or incorrect charging system component. Refer to Charging System for additional charging system diagnosis and testing procedures.
2. A faulty or incorrect battery. Use Micro 420 battery tester and refer to Battery System for additional battery diagnosis and testing procedures.
3. A faulty circuit or component causing excessive ignition-off draw.
4. Electrical loads that exceed the output of the charging system. This can be due to equipment installed after manufacture, or repeated short trip use.
5. A faulty or incorrect starting system component. Refer to Starting System for the proper starting system diagnosis and testing procedures.
6. Corroded or loose battery posts and/or terminal clamps.
7. Slow driving speeds (heavy traffic conditions) or prolonged idling, with high-amperage draw systems in use.

BATTERY SYSTEM (Continued)

CLEANING

The following information details the recommended cleaning procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Clean the battery cable terminal clamps of all corrosion. Remove any corrosion using a wire brush or a post and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 1).

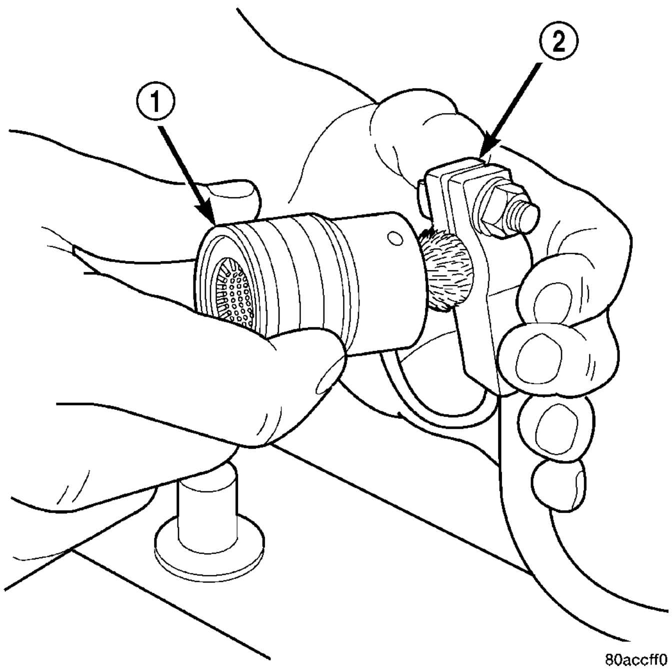


Fig. 1 Clean Battery Cable Terminal Clamp - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE

(2) Clean the battery tray and battery hold down hardware of all corrosion. Remove any corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal.

(3) If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film (Fig. 2). Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, refer to Battery System Specifications for the factory-installed battery specifications. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.

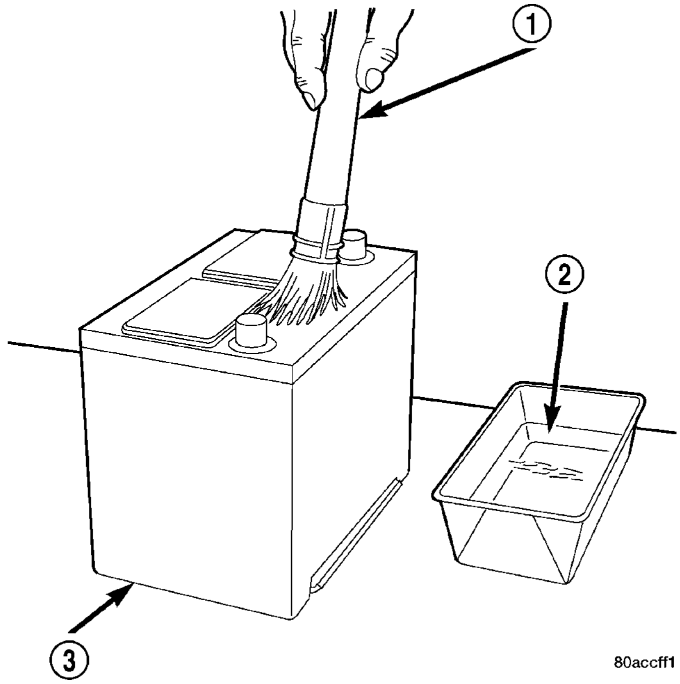


Fig. 2 Battery Cleaning - Typical

1 - CLEANING BRUSH
2 - WARM WATER AND BAKING SODA SOLUTION
3 - BATTERY

(4) If the vehicle is so equipped, clean the battery thermal guard with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film.

(5) Clean any corrosion from the battery terminal posts with a wire brush or a post and terminal cleaner, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 3).

INSPECTION

The following information details the recommended inspection procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Inspect the battery cable terminal clamps for damage. Replace any battery cable that has a damaged or deformed terminal clamp.

(2) Inspect the battery tray and battery holddown hardware for damage. Replace any damaged parts.

(3) Slide the thermal guard off of the battery case. Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose terminal posts must be replaced.

BATTERY SYSTEM (Continued)

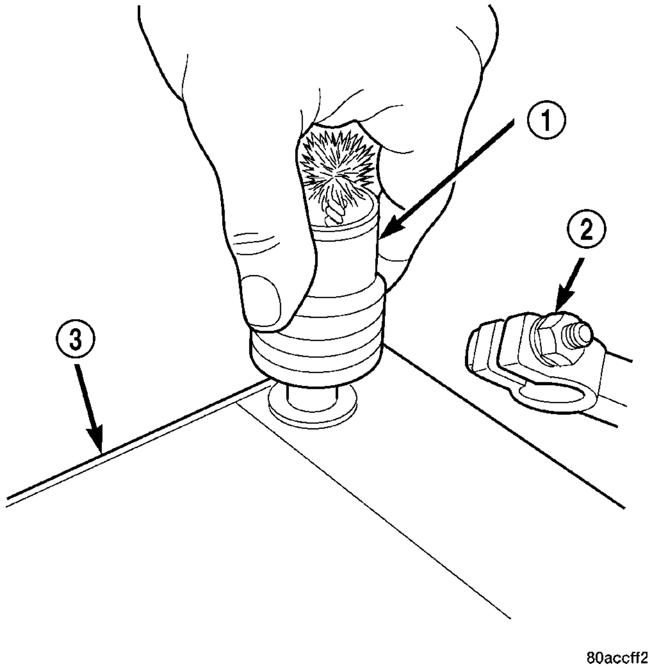


Fig. 3 Clean Battery Terminal Post - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE
3 - BATTERY

(4) Inspect the battery thermal guard for tears, cracks, deformation or other damage. Replace any battery thermal guard that has been damaged.

(5) Inspect the battery built-in test indicator sight glass for an indication of the battery condition. If the battery is discharged, charge as required. Refer to Standard Procedures for the proper battery built-in indicator test procedures. Also refer to Standard Procedures for the proper battery charging procedures.

SPECIFICATIONS

SPECIFICATIONS

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

- **Group Size -** The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.
- **Cold Cranking Amperage -** The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18° C (0° F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.
- **Reserve Capacity -** The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7° C (80° F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.
- **Ampere-Hours -** The Ampere-Hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for twenty hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the twenty-hour discharge rating.

BATTERY CLASSIFICATIONS & RATINGS					
Part Number	BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Ampere - Hours	Load Test Amperage
0503327	26R	450	80 Minutes	48	225

TORQUE

DESCRIPTION .... **TORQUE**

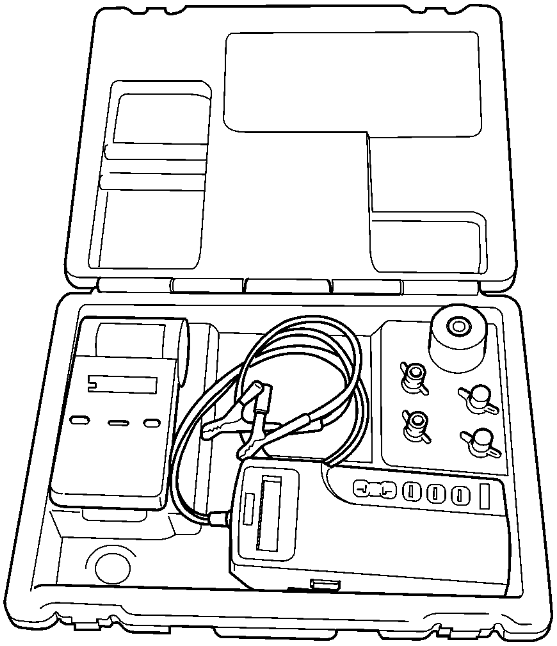
Battery Hold Down Bolt
Clamp Bolt .... 200 ± 20 in. lbs.

Battery Mount Fastener .... 200 ± 20 in. lbs.

BATTERY SYSTEM (Continued)

SPECIAL TOOLS

BATTERY SYSTEM SPECIAL TOOLS



Micro 420 Battery Tester

BATTERY

DESCRIPTION

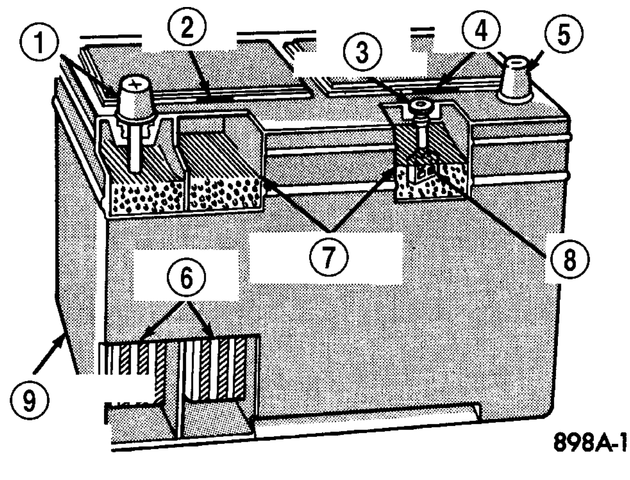


Fig. 4 Maintenance Free Battery

1 - POSITIVE POST
2 - VENT
3 - TEST INDICATOR
4 - VENT
5 - NEGATIVE POST
6 - PLATE GROUPS
7 - ELECTROLYTE LEVEL
8 - GREEN BALL
9 - MAINTENANCE FREE BATTERY

From the factory, most vehicles are equipped with a maintenance-free battery, and others with a low-maintenance battery.

Maintenance-free batteries have non-removable battery vent caps (Fig. 4). Water cannot be added to this battery. Under normal service the composition of this battery reduces gassing and water loss at normal charge rates. If the battery electrolyte level becomes low, this battery must be replaced.

Low-maintenance batteries have removable battery cell caps. Water can be added to this battery. Under normal service the composition of this battery reduces gassing and water loss at normal charge rates.

The battery is a device used to store electrical energy potential in a chemical form. When an electrical load is applied to the battery terminals, an electrochemical reaction occurs within the battery. This reaction causes the battery to discharge electrical current.

The battery is made up of six individual cells that are connected in series. Each cell contains positive charged plate groups made of lead oxide, and negatively charged plate groups made of sponge lead. The dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte.

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage

BATTERY (Continued)

potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING - BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed. Refer to Battery System Cleaning for the proper cleaning procedures, and Battery System Inspection for the proper battery inspection procedures. Refer to Standard Procedures for the proper battery charging procedures.

MICRO 420 ELECTRICAL SYSTEM TESTER

The Micro420 automotive battery and charging system tester is designed to help the dealership technicians diagnose the cause of a defective battery or charging system. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro420 electrical system tester.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

STANDARD PROCEDURE

STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER

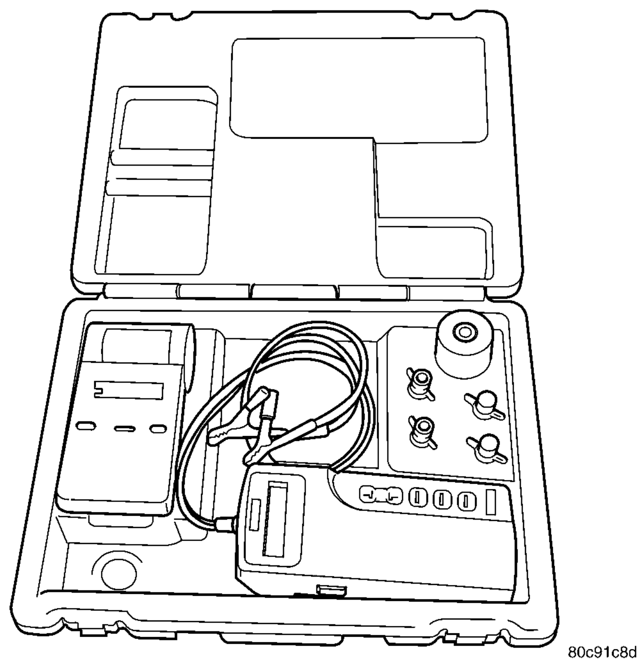


Fig. 5 Micro 420 Battery Tester

Always use the Micro 420 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:

WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION AND USE EXTREME CAUTION WHEN WORKING WITH BATTERIES.

BATTERY TESTING

(1) If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before test-

BATTERY (Continued)

ing. If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.

(2) If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. **The preferred test position is at the battery terminal**. If the battery is not accessible, you may test using both the positive and negative jumper posts. Select TESTING AT JUMPER POST when connecting to that location.

(3) Connect the tester (Fig. 5) to the battery or jumper posts, the red clamp to positive (+) and the black clamp to negative (–).

(4) Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.

(5) If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the test result table noted below.

CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.

(6) While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

NOTE: The SERVICE CODE is required on every warranty claim submitted for battery replacement.

STANDARD PROCEDURE - BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Micro 420 electrical system tester indicates battery is OK.
- All of the battery cells are gassing freely during battery charging.
- Three hydrometer tests, taken at one-hour intervals, indicate no increase in the temperature-corrected specific gravity of the battery electrolyte.
- Open-circuit voltage of the battery is 12.4 volts or above.

WARNING: NEVER EXCEED TWENTY AMPERES WHEN CHARGING A COLD (-1° C [30° F] OR LOWER) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.

BATTERY (Continued)

CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity. Refer to Standard Procedures for the proper battery load test procedures. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. Refer to Battery System Cleaning for the proper battery system cleaning procedures, and Battery System Inspection for the proper battery system inspection procedures.

CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

(1) Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt (Fig. 6). If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.

(2) Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

(3) Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

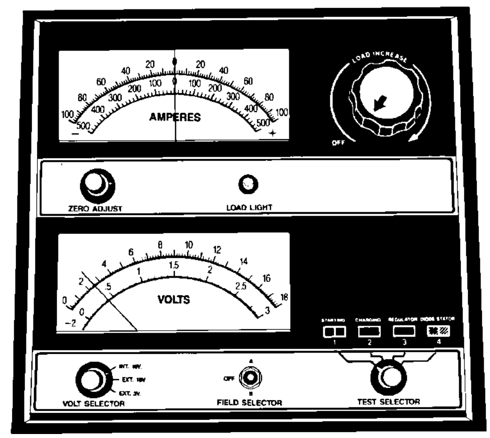


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Fig. 6 Voltmeter - Typical

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **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 battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

BATTERY (Continued)

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

STANDARD PROCEDURE - OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery. This test can be used in place of the hydrometer test when a hydrometer is not available, or for maintenance-free batteries with non-removable cell caps.

Before proceeding with this test, completely charge the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

(1) Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.

(2) Disconnect and isolate both battery cables, negative cable first.

(3) Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage (Fig. 7).

See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

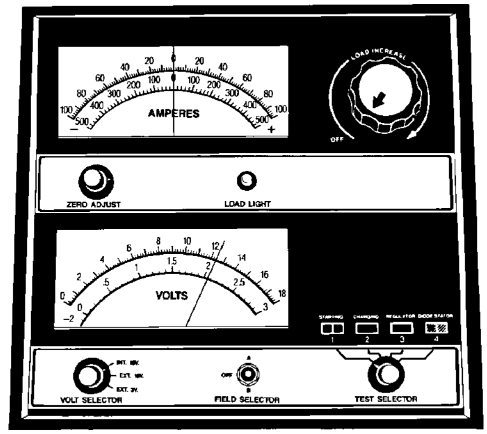

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Fig. 7 Testing Open-Circuit Voltage - Typical

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

STANDARD PROCEDURE - IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Power Distribution Center (PDC). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Faulty or improperly adjusted switches.
- Faulty or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be

BATTERY (Continued)

charged and returned to service after the excessive IOD condition has been corrected.

(1) Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to eight minutes.

(2) Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.

(3) Disconnect the battery negative cable.

(4) Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to eight minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.

(5) After about eight minutes, the high-amperage IOD reading on the multi-meter should become very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Power Distribution Center (PDC) and then in the Junction Block (JB), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information in this service manual for complete PDC and JB fuse, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, refer to Charging System for the proper charging system diagnosis and testing procedures. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multi-meter to check the low-amperage IOD.

CAUTION: Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multi-meter may be damaged.

(6) Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or a component failure is at fault.

REMOVAL

WARNING: 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.

(1) Make sure ignition switch is in OFF position and all accessories are OFF.

(2) Open hood.

(3) Disconnect and isolate the battery negative cable then the positive cable (Fig. 8).

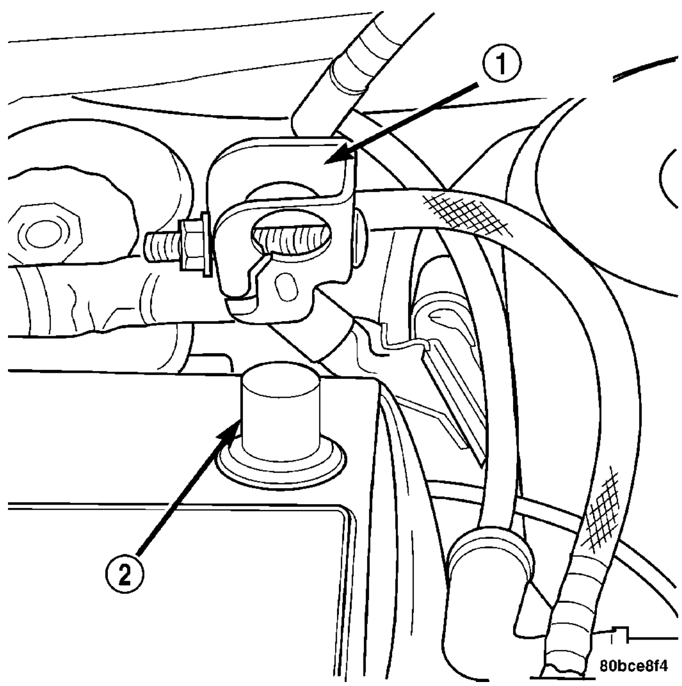


Fig. 8 Disconnect and Isolate the Battery Negative Cable

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

(4) Remove thermal guard from battery.

BATTERY (Continued)

(5) Loosen bolt and retainer that holds the battery down to the tray.

(6) Lift battery out of battery tray and remove from vehicle.

INSTALLATION

When replacing battery, the thermal guard MUST be transferred to the new battery. Refer to Battery Thermal Guard Removal and Installation in this section.

(1) Install battery in vehicle making sure that the thermal guard is present and battery is properly positioned on battery tray.

(2) Install battery hold down clamp, making sure that it is properly positioned on battery.

(3) Connect battery cable clamps to battery posts and making sure top of clamp is flush or below with top of post (Fig. 8). Install battery positive cable first.

(4) Tighten clamp nuts securely.

BATTERY HOLDDOWN

DESCRIPTION

The battery holddown includes one bolt and a holddown bracket. The battery holddown bracket consists of a formed steel bracket with one hole.

When installing a battery into the battery tray, it is important that the hold down hardware is properly installed and that the fasteners are tightened to the proper specifications. Improper hold down fastener tightness, whether too loose or too tight, can result in damage to the battery, the vehicle, or both. Refer to Battery Hold down for the proper installation procedure, including the proper hold down fastener torque specifications.

OPERATION

The battery holddown secures the battery in the battery tray. This holddown is designed to prevent battery movement during the most extreme vehicle operation conditions. Periodic removal and lubrication of the battery holddown hardware is recommended to prevent hardware seizure at a later date.

CAUTION: Never operate a vehicle without a battery holddown device properly installed. Damage to the vehicle, components and battery could result.

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the single battery hold down retaining bolt.

(3) Remove the battery hold down from the vehicle.

INSTALLATION

(1) Install the battery hold down in the vehicle.

(2) Install the single battery hold down retaining bolt.

(3) Connect the negative battery cable.

BATTERY CABLES

DESCRIPTION

The battery cables are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. The battery cables feature a clamping type female battery terminal made of soft lead that is die cast onto one end of the battery cable wire. A square headed pinch-bolt and hex nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then solder-dipped. The battery positive cable wires have a red insulating jacket to provide visual identification and feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a black insulating jacket and a smaller female battery terminal clamp.

The battery cables cannot be repaired and, if damaged or faulty they must be replaced. Both the battery positive and negative cables are available for service replacement only as a unit with the battery wire harness, which may include portions of the wiring circuits for the generator and other components on some models. Refer to the appropriate wiring information in this service manual for the location of the proper battery cable wire harness diagrams. The wiring information also includes proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts.

BATTERY CABLES (Continued)

The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

The battery positive cable terminal clamp is die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the Power Distribution Center (PDC), and the other wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the engine starter motor solenoid. The battery negative cable terminal clamp is also die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery negative cable to the vehicle powertrain through a stud on the right side of the engine cylinder block. The other wire has an eyelet terminal that connects the battery negative cable to the vehicle body through a ground screw on the right front fender inner shield, near the battery.

DIAGNOSIS AND TESTING - BATTERY CABLES

A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cable. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

VOLTAGE DROP TEST

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

- The battery is fully-charged and load tested. Refer to Standard Procedures for the proper battery charging and load test procedures.
- Fully engage the parking brake.
- If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
- Verify that all lamps and accessories are turned off.
- To prevent the engine from starting, remove the Automatic Shut Down (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. See the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.

(1) Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable terminal clamp (Fig. 9). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.

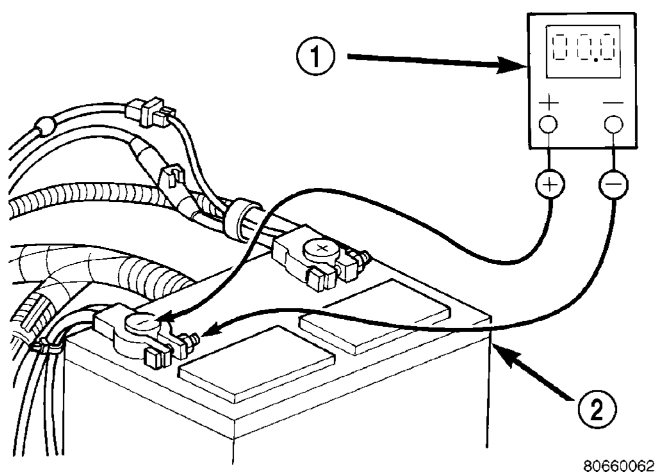


Fig. 9 Test Battery Negative Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(2) Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable terminal clamp (Fig. 10). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.

BATTERY CABLES (Continued)

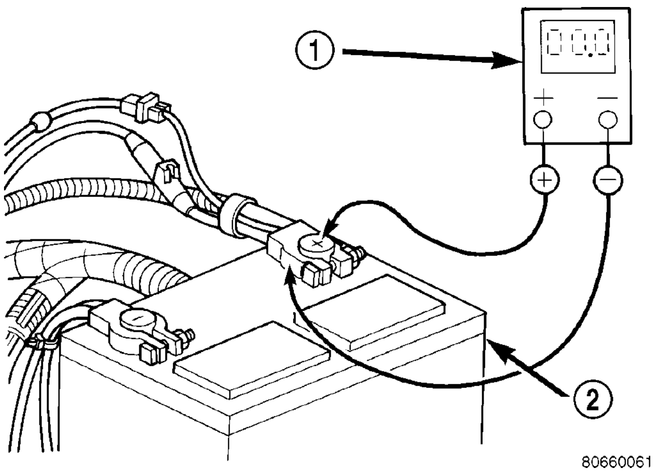


Fig. 10 Test Battery Positive Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(3) Connect the voltmeter to measure between the battery positive cable terminal clamp and the starter solenoid B(+) terminal stud (Fig. 11). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

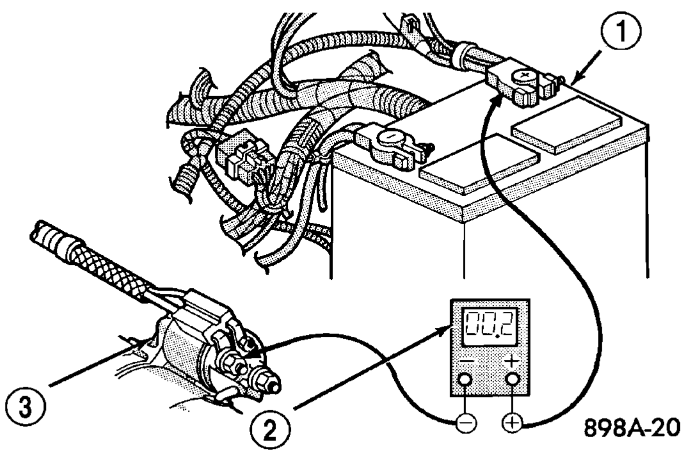


Fig. 11 Test Battery Positive Cable Resistance - Typical

1 - BATTERY
2 - VOLTMETER
3 - STARTER MOTOR

(4) Connect the voltmeter to measure between the battery negative cable terminal clamp and a good clean ground on the engine block (Fig. 12). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection to the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.

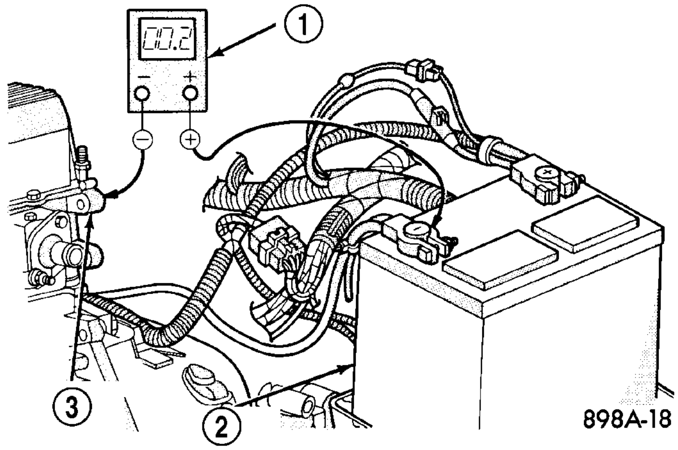


Fig. 12 Test Ground Circuit Resistance - Typical

1 - VOLTMETER
2 - BATTERY
3 - ENGINE GROUND

REMOVAL

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Disconnect and isolate the remote battery negative cable terminal.

(3) Remove the battery from the vehicle. Refer to the procedure in this group.

(4) One at a time, trace the battery cable retaining pushpins, fasteners and routing clips until the cables are free from the vehicle.

(5) Remove the battery cables from the engine compartment.

INSTALLATION

(1) Position the battery cables in the engine compartment.

(2) One at a time, install the battery cable retaining pushpins, fasteners and routing clips until the cables are installed exactly where they were in the vehicle.

(3) Install the battery in the vehicle. Refer to the procedure in this group.

(4) Connect the remote battery negative cable terminal.

BATTERY TRAY

DESCRIPTION

The battery is placed in a plastic tray located in the left front side of the vehicle, next to the left strut tower. Refer to Battery Hold down for more information on hold down hardware.

OPERATION

The battery tray provides a secure mounting location and supports the battery. On some vehicles, the battery tray also provides the anchor point/s for the battery holddown hardware. The battery tray and the battery holddown hardware combine to secure and stabilize the battery in the engine compartment, which prevents battery movement during vehicle operation. Unrestrained battery movement during vehicle operation could result in damage to the vehicle, the battery, or both.

REMOVAL

(1) Remove the battery from the vehicle. Refer to the procedure in this section.

(2) Remove two nuts to the rear and two bolts to the front of the battery tray (Fig. 13).

(3) Remove the tray retaining bolt under the center of the tray.

(4) Slide battery tray out form under the air cleaner assembly. Do not remove the air cleaner assembly.

(5) Remove battery tray from vehicle.

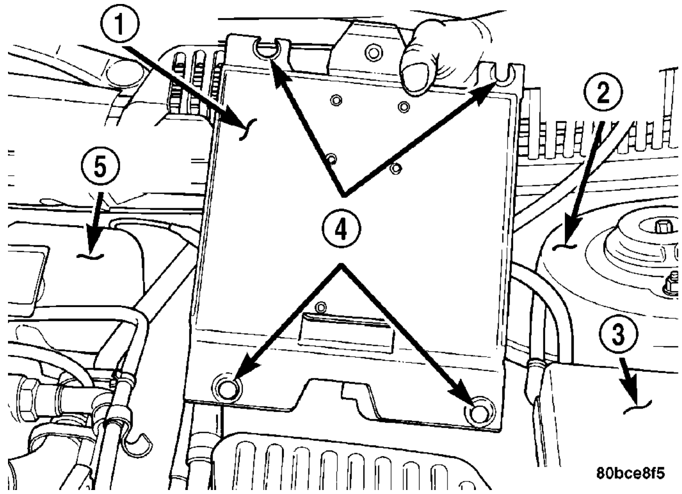


Fig. 13 Battery Tray Removal

1 - BATTERY TRAY
2 - LEFT STRUT TOWER
3 - PDC
4 - MOUNTING HOLES/SLOTS
5 - COOLANT RESERVOIR

INSTALLATION

(1) Slide battery tray in under the air cleaner assembly.

(2) Install two nuts at the rear and two bolts at the front of the battery tray.

(3) Install the bolt located under the tray.

(4) Install the battery in the vehicle. Refer to the procedure in this section.

THERMAL GUARD

DESCRIPTION

A flexible plastic bubble-wrap style thermal guard wraps around the battery case to enclose the sides of the battery. The thermal guard consists of a heavy black plastic outer skin and two lighter plies of plastic that have been formed into a sheet with hundreds of small air pockets entrapped between them.

OPERATION

The thermal guard protects the battery from engine compartment temperature extremes. The temperature of the battery can affect battery performance. The air trapped between the plastic plies of the thermal guard create a dead air space, which helps to insulate the sides of the battery case from the air temperature found in the surrounding engine compartment.

REMOVAL

(1) Open hood.

(2) Disconnect and isolate the battery negative cable then the positive cable.

(3) Carefully lift the thermal guard off over the battery (Fig. 14) taking care not to rip it.

(4) Remove the thermal guard from vehicle.

INSTALLATION

(1) Carefully install the thermal guard over the battery taking care not to rip it.

(2) Connect the battery negative and positive cables.

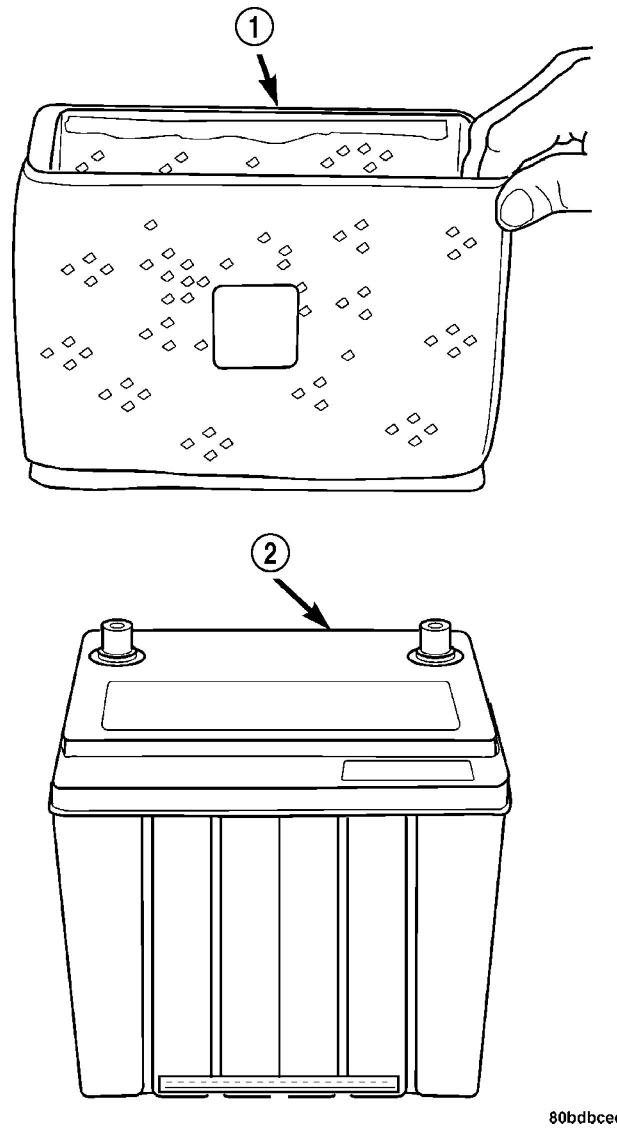


Fig. 14 Battery Thermal Guard

1 - BATTERY THERMAL GUARD
2 - BATTERY

CHARGING

TABLE OF CONTENTS

CHARGING

DESCRIPTION - CHARGING SYSTEM

The charging system consists of:

- Generator
- Decoupler Pulley (If equipped)
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to the Ignition System section for information)
- Battery (refer to the Battery section for information)
- Battery Temperature Sensor (2.0L)
- Inlet Air Temperature (calculated battery temperature) (1.6L)
- Voltmeter (refer to the Instrument Cluster section for information if equipped)
- Wiring harness and connections (refer to the Wiring section for information)
- Accessory drive belt (refer to the Cooling section for more information)

OPERATION - CHARGING SYSTEM

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. The ASD relay is energized when the PCM grounds the ASD control circuit. This voltage is connected through the PCM or IPM (intelligent power module) and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The generator is driven by the engine through a serpentine belt and pulley or decoupler 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.

Battery temperature is predicted using the battery temperature sensors input for the 2.0L engines. For the 1.6L engines battery temperature is calculated using these inputs: Inlet Air Temperature Sensor, Coolant Sensor, Vehicle Speed Sensor, and Fan State (on/off). The charging lamp will come on if either the inlet air temperature, coolant temperature, or vehicle speed sensor fail. If one of these sensors fail the charging system will default to 13.5 Volts. This temperature data, along with data from monitored line voltage (ASD voltage sense circuit), is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly to maintain system voltage at the targeted system voltage based on battery temperature.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including 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 certain failures it detects. Refer to On-Board Diagnostics in the Electronic Control Modules(Refer to 8 - ELECTRICAL/ELECTRONIC CON-

CHARGING (Continued)

TROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION) section for more DTC information.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The signal to activate the lamp is sent via the PCI bus circuits. The lamp is located on the instrument panel. Refer to the Instrument Cluster section for additional information.

DIAGNOSIS AND TESTING - ON-BOARD DIAGNOSTIC SYSTEM

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 40 good trip if the problem does not occur again.

DIAGNOSTIC TROUBLE CODES

A DTC description can be read using the DRBIII® 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.

ERASING DIAGNOSTIC TROUBLE CODES

The DRBIII® Scan Tool must be used to erase a DTC.

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp or battery lamp is illuminated with the engine running
- the voltmeter (if equipped) does not register 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. Refer to Ignition-Off Draw Test (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/ BATTERY - STANDARD PROCEDURE)
- loose generator belt.

INSPECTION

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 On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the DRBIII® scan tool. Perform the following inspections before attaching the scan tool.

(1) Inspect the battery condition. Refer to the Battery section (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING) for procedures.

(2) 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.

(3) Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) or IPM (if equipped) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.

(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 (Refer to 8 - ELECTRICAL/ CHARGING - SPECIFICATIONS).

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications(Refer to 7 - COOLING/ ACCESSORY DRIVE - SPECIFICATIONS).

(6) Inspect decoupler pulley (if equipped). Ensure decoupler pulley is driving the alternator rotor.

(7) Inspect automatic belt tensioner (if equipped). Refer to the Cooling System for more information.

(8) Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

CHARGING (Continued)

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Battery Terminal Nut	9	6.6	75
Battery Hold Down Clamp Bolt	9	6.6	75
Generator Mounting Bolt	54	40	
Generator Pivot Bolt	54	40	
Pivot Bracket Bolts	54	40	
Generator Mounting Bolt 1.6L	28	21	250

GENERATOR RATINGS

TYPE	PART NUMBER	RATED SAE AMPS	ENGINES	MINIMUM TEST AMPS
Mitsubishi	4794222AC	85 AMPS	2.0L	75 AMPS

BATTERY TEMPERATURE SENSOR

DESCRIPTION

The Battery Temperature sensor is mounting in the side of the battery thermal guard (Fig. 1).

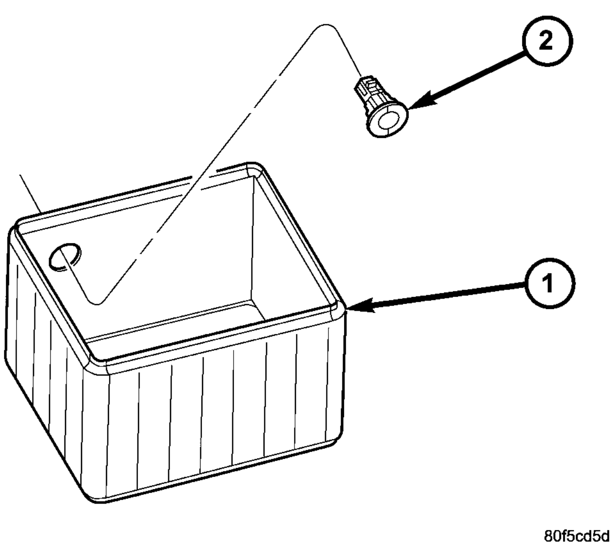


Fig. 1 BATTERY TEMPERATURE SENSOR

1 - Battery Thermal Guard
2 - Battery Temperature Sensor

OPERATION

The PCM uses the temperature of the battery area to control the charge system voltage. This temperature, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. The system voltage is higher at cold temperatures and is gradually reduced as temperature around the battery increases.

For vehicles with 1.6L engine, there is no physical battery temp sensor in place to detect battery temp. Rather, an algorithm buit in PCM is employed to predict battery temp using inlet air temp, vehicle speed, and coolant temp, among other signals. The PCM maintains the optimal output of the generator by monitoring battery voltage and controlling it to a range of 13.5 - 14.7 volts based on battery temperature. The system target voltage is 13.5 – 14.7 volts. However the actual voltage go below this during heavy electrical loads and generator speeds. Also the actual voltage can be lower than the target voltage between the battery and the battery voltage sense circuit, approximately 0.2 — 0.3 volts.

The battery temperature sensor is also used for OBD II diagnostics. Certain faults and OBD II monitors are either enabled or disabled depending upon the battery temperature sensor input (example: disable purge and EGR, enable LDP). Most OBD II monitors are disabled below 20°F.

BATTERY TEMPERATURE SENSOR (Continued)

REMOVAL

(1) Open hood.

(2) Disconnect and isolate the battery negative cable then the positive cable.

(3) Disconnect the Battery Temperature Sensor electrical connector.

(4) Carefully lift the thermal guard off over the battery.

(5) Remove the thermal guard from vehicle.

(6) Unsnap the Battery Temperature Sensor and remove the sensor (Fig. 2).

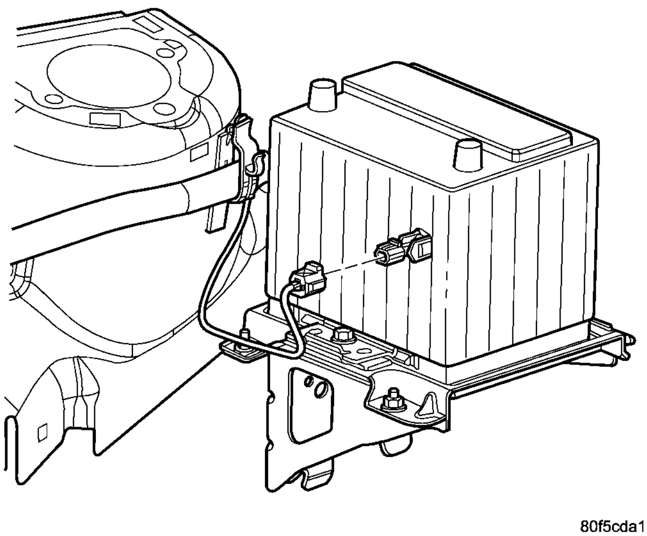


Fig. 2 BATTERY TEMPERATURE SENSOR CONNECTION

INSTALLATION

(1) Install the Battery Temperature Sensor to the thermal guard (Fig. 2).

(2) Carefully install the thermal guard over the battery.

(3) Connect the Battery Temperature Sensor electrical connector.

(4) Connect the battery positive cable then the negative cable.

(5) Close hood.

GENERATOR

DESCRIPTION

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. The generator produces DC voltage.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil.

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 vehicles 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
- Damaged internal fins

REMOVAL

REMOVAL - 2.0L

(1) Disconnect battery negative cable (Fig. 3).

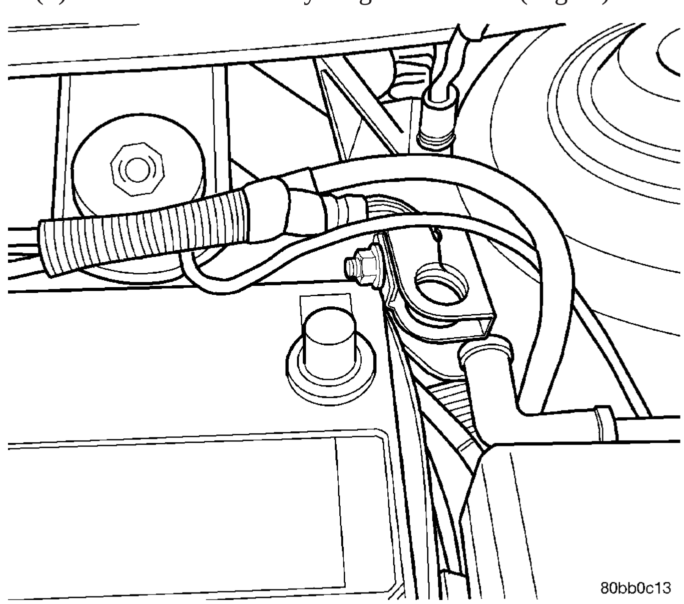


Fig. 3 Battery Cable

(2) Loosen the jam nut and adjustment bolt.

(3) Raise vehicle and support.

GENERATOR (Continued)

(4) Remove accessary drive splash shield (Fig. 4).

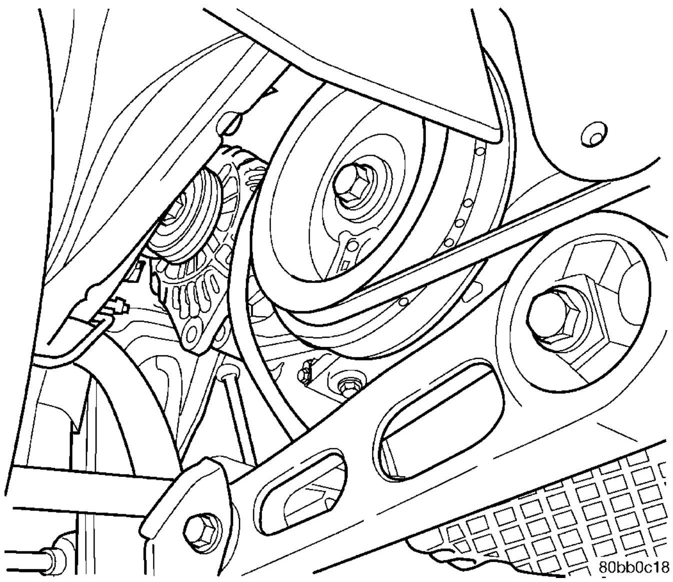


Fig. 4 Splash Shield and Belt

(5) Loosen the lower mounting bolt.

(6) Remove the generator drive belt.

(7) Disconnect the generator field circuit wiring connector. Push the **RED** locking tab to release.

(8) Remove the B+ terminal nut and wire.

(9) Remove the upper and lower mounting bolt (Fig. 5) and move generator off of pivot bracket.

(10) Remove pivot bracket.

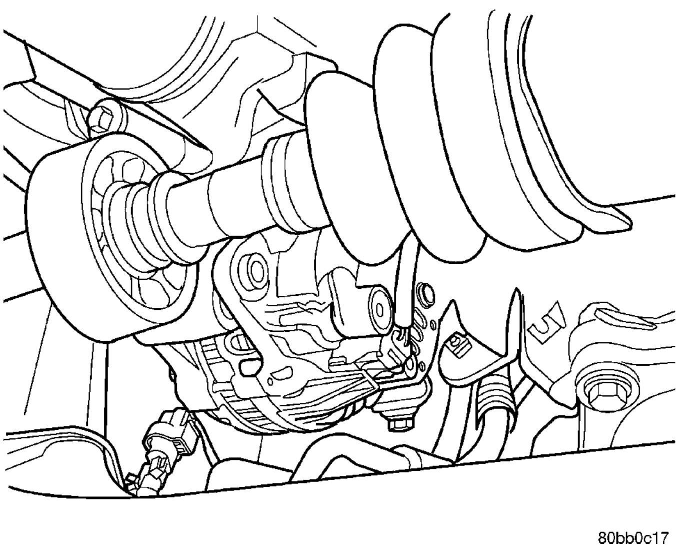


Fig. 5 Lower Mounting Bolt

(11) Remove Generator (Fig. 6) through wheel well.

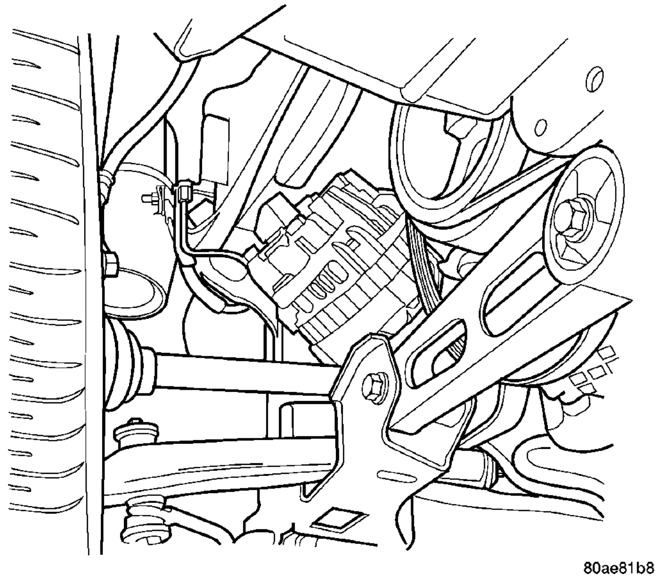


Fig. 6 Generator

REMOVAL - 1.6L

(1) Disconnect battery negative cable.

(2) Remove the powersteering reservoir bracket (Fig. 7) and reposition the reservoir (Fig. 8).

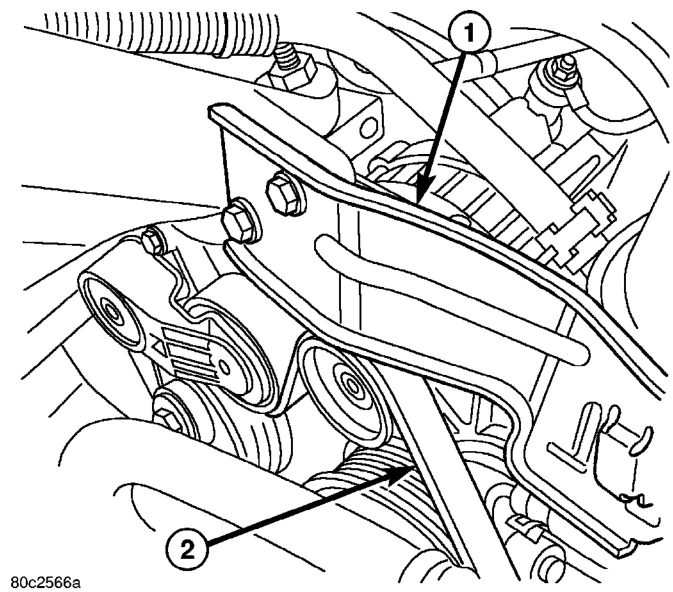


Fig. 7 ACCESSORY DRIVE BELT

1 - Power Steering Reservoir Bracket
2 - Accessory Drive Belt

(3) Remove the generator drive belt.

GENERATOR (Continued)

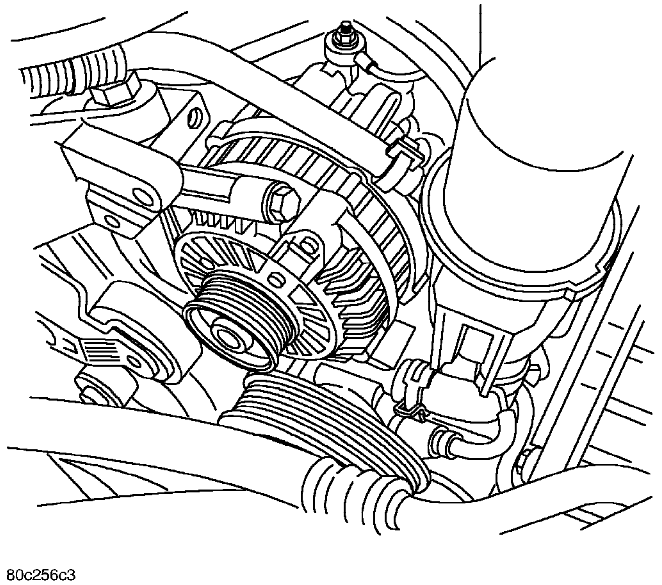


Fig. 8 POWERSTEERING RESERVOIR BRACKET

(4) Remove the lower mounting bolts.

(5) Remove the upper mounting bolt and remove generator to access the battery cable and field connector (Fig. 9).

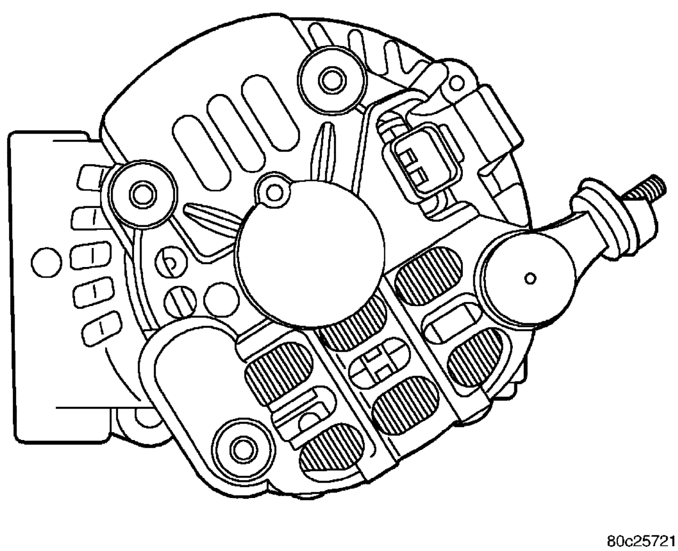


Fig. 9 GENERATOR

(6) Disconnect the generator field circuit wiring connector. Push the **RED** locking tab to release.

(7) Remove the B+ terminal nut and wire (Fig. 10).

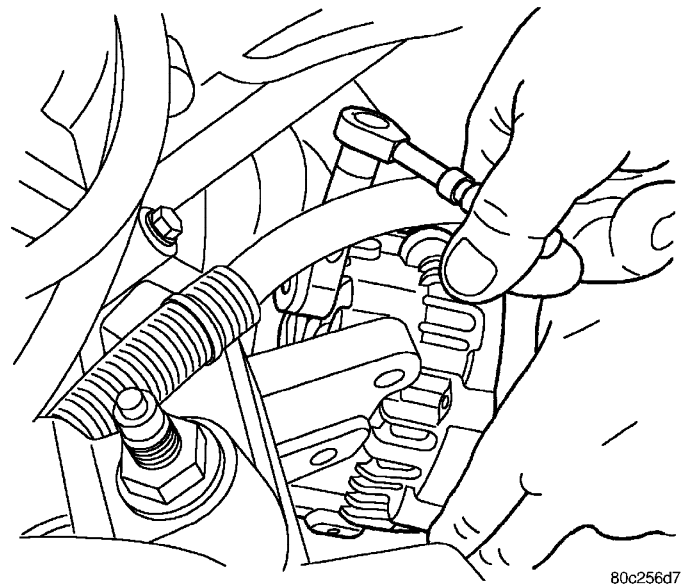


Fig. 10 POSITIVE BATTERY CABLE

(8) Remove generator (Fig. 11).

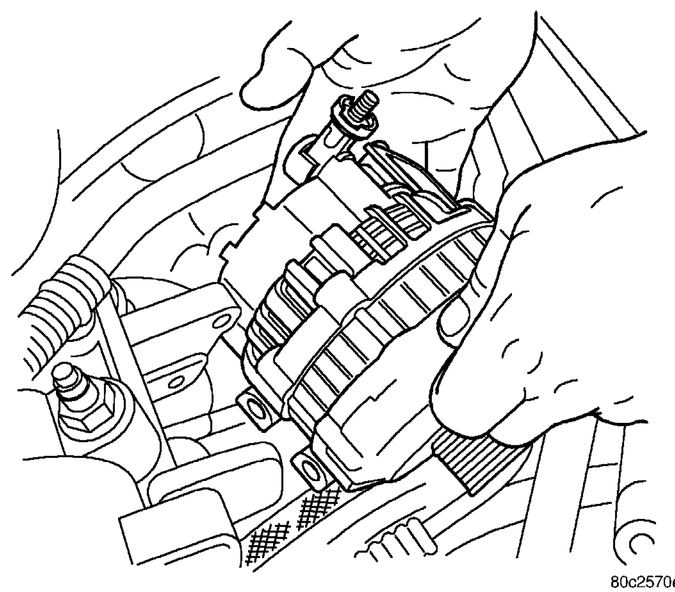


Fig. 11 GENERATOR REMOVAL/INSTALLATION

GENERATOR (Continued)

REMOVAL - 2.4L SRT-4

The generator is located above the oil filter and axle shaft (Fig. 12).

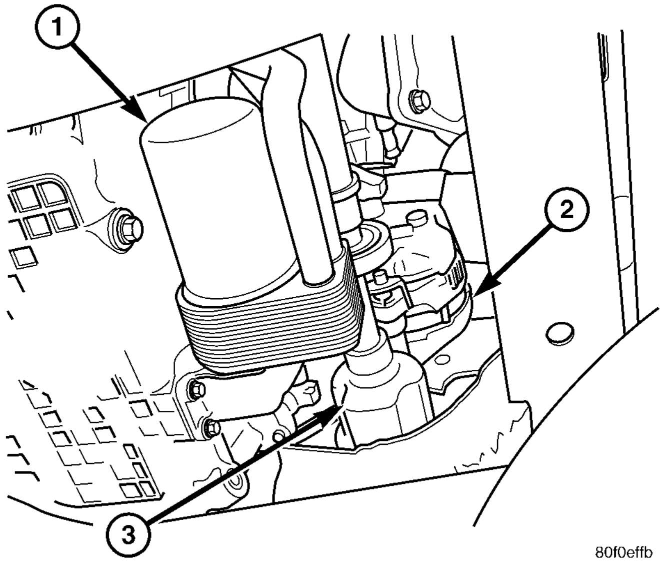


Fig. 12 GENERATOR LOCATION - 2.4L TURBO

1 - Oil Filter
2 - Generator
3 - Axle Shaft

(1) Disconnect the negative battery cable.

(2) Remove the 2 bolts (Fig. 13) from the top of the heat shield on the generator.

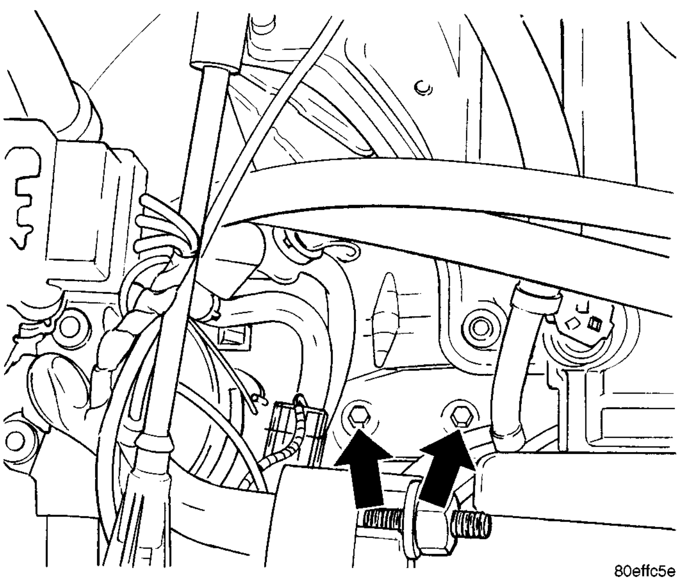


Fig. 13 GENERATOR HEAT SHIELD

(3) Remove nut from the upper T-bolt adjustment bracket (Fig. 14).

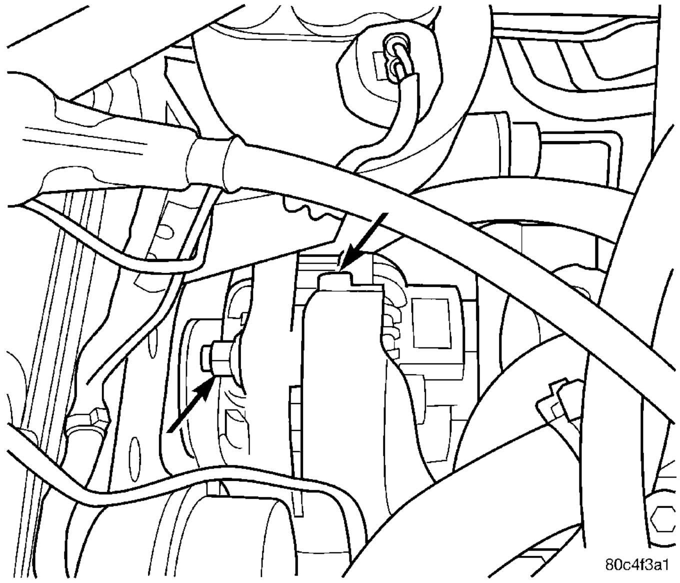


Fig. 14 Generator T-Bolt and Upper Pivot Bolt

(4) Raise vehicle and support.

(5) Remove the right front wheel.

(6) Remove the accessory drive splash shield (Fig. 15).

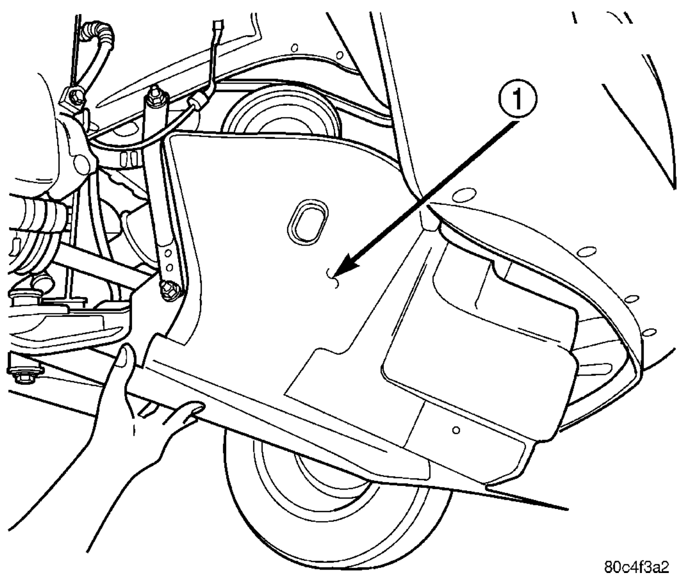


Fig. 15 Accessory Drive Splash Shield

1 - ACCESSORY DRIVE BELT SPLASH SHIELD

GENERATOR (Continued)

(7) Remove the axle retaining nut.

(8) Remove the lower control arm from the steering knuckle (Fig. 16).

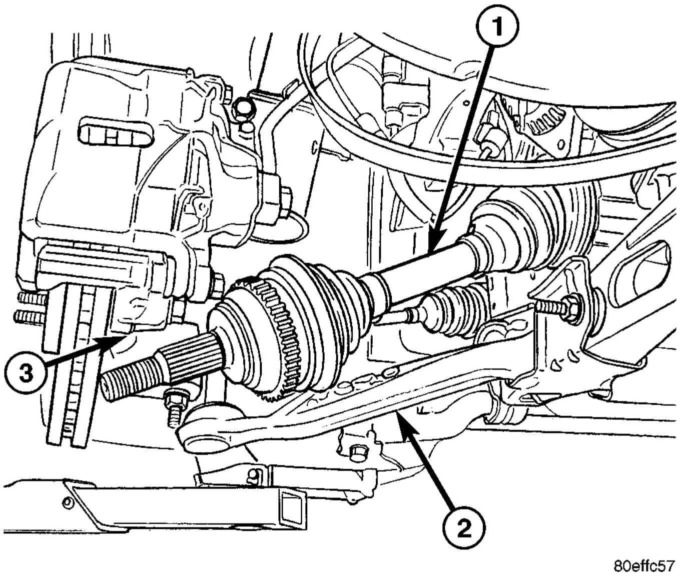


Fig. 16 AXLE SHAFT

1 - Axle Shaft
2 - Lower Control Arm
3 - Steering Knuckle

(9) Remove the 2 bolts for the axle shaft bearing support.

(10) Remove the axle shaft assembly (Fig. 16). Put a container under the transmission to catch the transmission fluid from the transmission.

(11) Remove the lower heat shield bolt (Fig. 17).

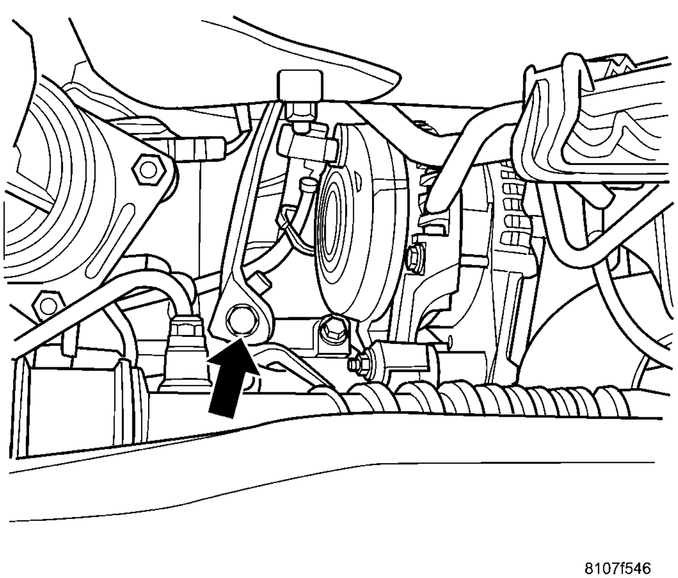


Fig. 17 LOWER HEAT SHIELD MOUNTING

(12) Remove the generator heat shield.

(13) Unplug the field circuit from the generator (Fig. 18).

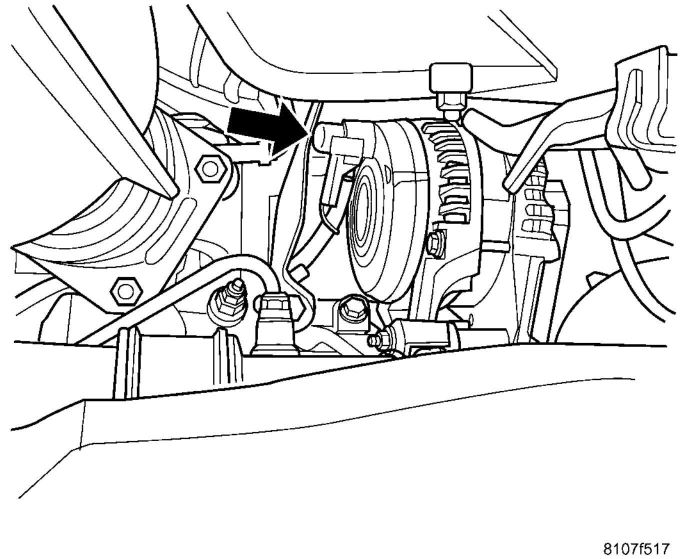


Fig. 18 BATTERY CONNECTION ON GENERATOR

(14) Remove the B+ terminal nut and wire (Fig. 19).

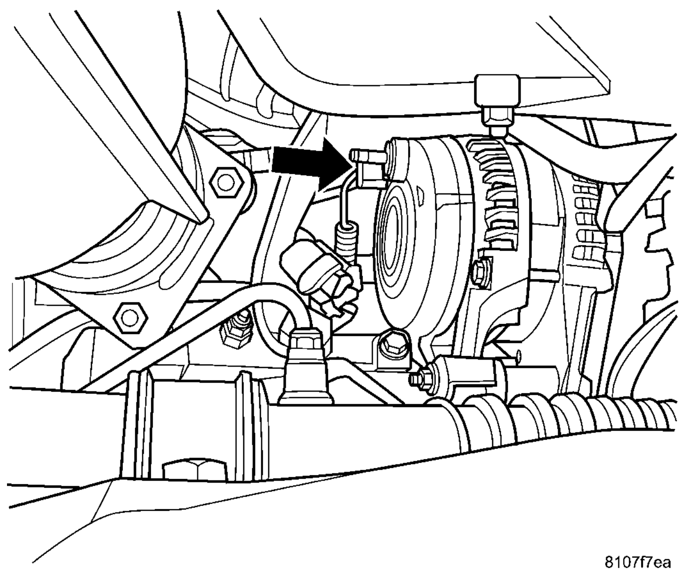


Fig. 19 GENERATOR FIELD CONNECTIONS

GENERATOR (Continued)

(15) Loosen the accessory drive belt t-bolt (Fig. 14).

(16) Remove the pencil strut (Fig. 20).

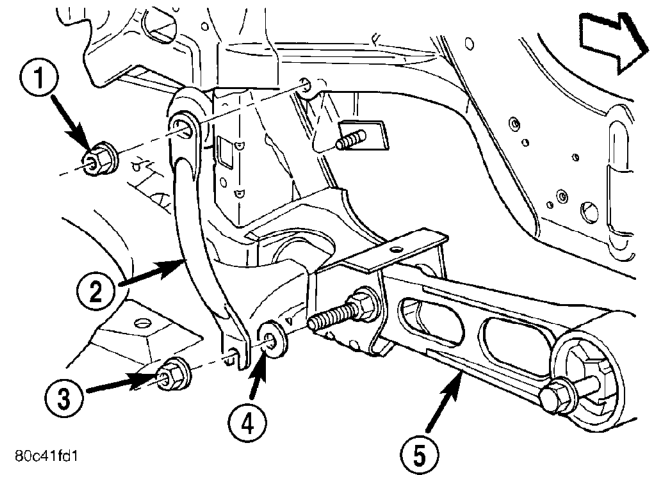


Fig. 20 Pencil Strut

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

(17) Loosen the lower generator pivot bolt (Fig. 21).

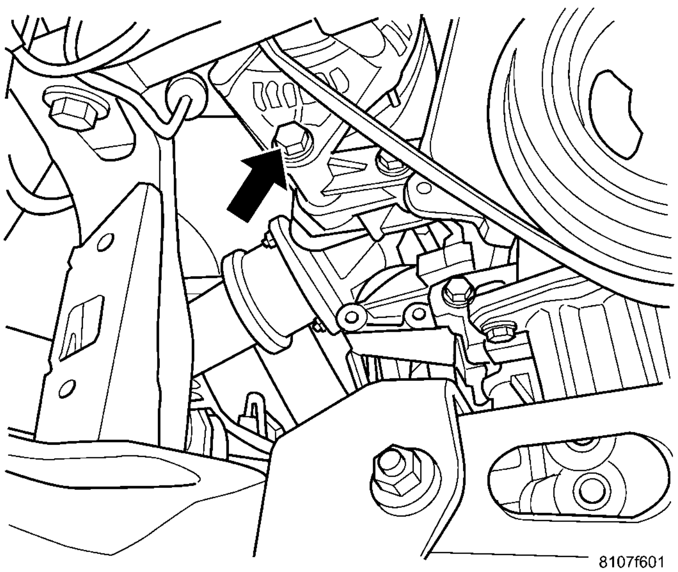


Fig. 21 LOWER PIVOT BOLT

(18) Remove the generator belt, refer to the Cooling section for more information.

(19) Remove the generator from the lower mounting bracket and set generator to the side.

(20) Remove the lower mounting bracket (Fig. 22) for the generator.

(21) Remove generator through the axle shaft hole (Fig. 23).

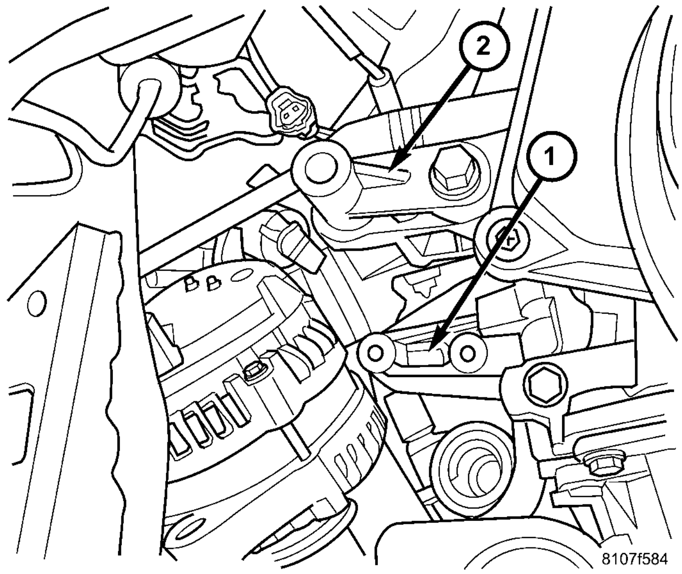


Fig. 22 LOWER MOUNTING BRACKET

1 - Axle Shaft Bearing Mount
2 - Lower Generator Mount

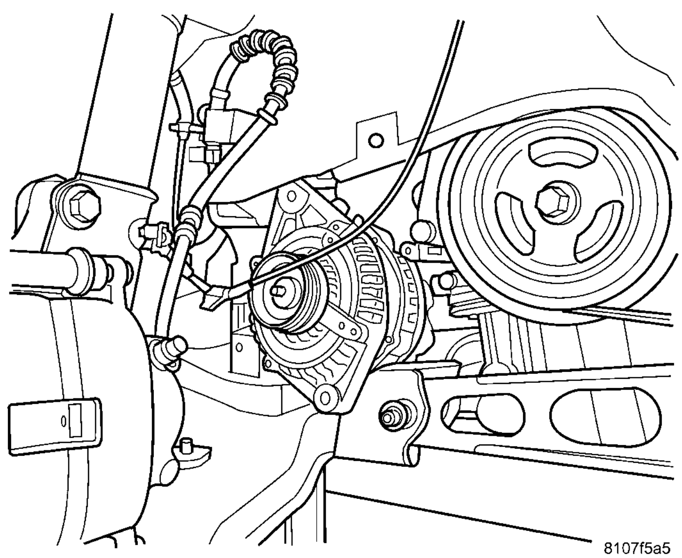


Fig. 23 GENERATOR REMOVAL/INSTALLATION

INSTALLATION

INSTALLATION - 2.0L

(1) Install generator (Fig. 6) through wheel well.

(2) Install lower pivot bracket and tighten bolts to 54 N·m (40 ft. lbs.).

(3) Loose install the upper and lower mounting bolts (Fig. 5).

(4) Connect the generator field circuit wiring connector. Push the **RED** locking tab to lock.

(5) Install the B+ terminal nut and wire.

(6) Install the generator drive belt.

(7) Lower vehicle.

GENERATOR (Continued)

(8) Tension belt. Refer to the Cooling System section for belt tension specification.
(9) Tighten adjustment bolt.
(10) Tighten the jam nut and tighten nut to 54 N·m (40 ft. lbs.).
(11) Raise vehicle and support.
(12) Tighten lower mounting bolt and tighten bolts to 54 N·m (40 ft. lbs.).
(13) Install splash shield (Fig. 4).
(14) Lower vehicle.
(15) Connect battery cable (Fig. 3).

INSTALLATION - 1.6L

(1) Install generator (Fig. 11).
(2) Install the B+ terminal nut and wire (Fig. 10).
(3) Connect the generator field circuit wiring connector. Push the **RED** locking tab to Lock.
(4) Install the upper mounting bolt. Torque to 28 N·m (250 in. lbs.).
(5) Install the lower mounting bolts. Torque to 28 N·m (250 in. lbs.).
(6) Install the generator drive belt. Refer to the Cooling System section for belt tension specification.
(7) Install the powersteering reservoir bracket (Fig. 7) and reposition the reservoir to bracket (Fig. 8).
(8) Connect battery negative cable.

INSTALLATION - 2.4L SRT-4

(1) Install generator through the axle shaft hole in wheel well (Fig. 23).
(2) Put generator on upper t-bolt and loosely install the nut (Fig. 14).
(3) Install the lower mounting bracket (Fig. 22) for the generator to the block and tighten bolts to 54 N·m (40 ft. lbs.).
(4) Loose install the lower pivot bolt for the generator (Fig. 21).
(5) Install the B+ terminal nut and wire (Fig. 19) and tighten nut to 11.3 N·m (100 in. lbs.).
(6) Plug in the field circuit to the generator.
(7) Install the axle shaft assembly (Fig. 16).
(8) Install the 2 bolts for the axle shaft bearing support and tighten bolts to 54.2 N·m (40 ft. lbs).
(9) Install the axle shaft into the steering knuckle (Fig. 16).
(10) Install the lower control arm to the steering knuckle and install the bolt and tighten bolts to 94.9 N·m (70 ft. lbs.).
(11) Install the axle retaining nut and tighten nut to 244 N·m (180 ft. lbs.).
(12) Install and tension the generator belt, refer to the Cooling section for more information.
(13) Tighten the accessory drive belt t-bolt and tighten nut to 54 N·m (40 ft. lbs.) (Fig. 14).
(14) Tighten the lower generator pivot bolt and tighten bolts to 54 N·m (40 ft. lbs.).
(15) Install the pencil strut (Fig. 20).
(16) Install the generator heat shield.
(17) Install the lower heat shield bolt and tighten bolt to 54.2 N·m (40 ft. lbs.).
(18) Install the accessory drive splash shield (Fig. 15).
(19) Install the right front wheel.
(20) Lower vehicle.
(21) Tighten nut to the upper adjustment bracket (Fig. 14) and tighten to 25 N·m (18 ft. lbs.).
(22) Install the 2 bolts to the heat shield on the generator (Fig. 13) and tighten bolts to 4.5 N·m (40 in. lbs.).
(23) Connect the negative battery cable.

VOLTAGE REGULATOR

DESCRIPTION

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 within the PCM on the NGC vehicles, to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage at the PDC and calculated battery temperature or inlet air temperature sensor (refer to Inlet Air Temperature Sensor, if equipped, for more information). It then determines a target charging voltage. If sensed battery voltage is lower than the target voltage, the PCM feeds the field winding until sensed battery voltage is at the target voltage. A circuit in the PCM cycles the feed side of the generator field at 250 times per second (250Hz), but has the capability to feed the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 20% is used by the PCM in order to have some generator output. Also refer to Charging System Operation for additional information.

STARTING

TABLE OF CONTENTS

STARTING

DESCRIPTION

The starting system consists of:

- Starter relay
- Starter motor (including an integral starter solenoid)

Other components to be considered as part of starting system are:

- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Clutch pedal position switch (manual transmission)
- Park/neutral position switch (automatic transmission)
- Wire harnesses and connections.

The Battery, Starting, and Charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in each of 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-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

OPERATION

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.

The PCM controls a double start over-ride safety that does not allow the starter to be engaged if the engine is already running.

STARTING (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - STARTING SYSTEM TEST

For circuit descriptions and diagrams, refer to the Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO THE 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 cable connections. Determine the state-of-charge and cranking capacity of the battery. Charge or replace the battery, if required. Refer to the Battery section for more information.
- **Ignition Switch** - Visually inspect the ignition switch for indications of physical damage and loose or corroded wire harness connections.
- **Transmission Range Sensor or Park/Neutral Switch** - Visually inspect the transmission range sensor 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 Motor** - Visually inspect the starter motor 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. Check for loose or corroded wire harness connections at main engine ground and remote jump post.
- **Power Distribution Center (PDC)** - Visually inspect the B+ connections at the PDC for physical damage and loose or corroded harness connections.

STARTING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO ENGAGE.	1. BATTERY DISCHARGED OR FAULTY.	1. REFER TO THE BATTERY SECTION FOR MORE INFORMATION. CHARGE OR REPLACE BATTERY, IF REQUIRED.
	2. STARTING CIRCUIT WIRING FAULTY.	2. REFER TO FEED CIRCUIT RESISTANCE TEST AND FEED CIRCUIT TEST IN THIS SECTION.
	3. STARTER RELAY FAULTY.	3. REFER TO RELAY TEST, IN THIS SECTION. REPLACE RELAY, IF NECESSARY.
	4. IGNITION SWITCH FAULTY.	4. REFER TO IGNITION SWITCH TEST, IN THE STEERING SECTION OR 8 WIRING DIAGRAMS. REPLACE SWITCH, IF NECESSARY.
	5. PARK/NEUTRAL POSITION SWITCH (AUTO TRANS) FAULTY OR MIS-ADJUSTED.	5. REFER PARK/NEUTRAL POSITION SWITCH TEST, IN THE TRANSAXLE. SECTION FOR MORE INFORMATION. REPLACE SWITCH, IF NECESSARY.
	6. CLUTCH INTERLOCK SWITCH (MAN TRANS) FAULTY.	6. REFER TO CLUTCH PEDAL POSITION SWITCH TEST, IN THE CLUTCH. SECTION. REPLACE SWITCH, IF NECESSARY.
	7. STARTER SOLENOID FAULTY.	7. REFER TO SOLENOID TEST, IN THIS SECTION. REPLACE STARTER ASSEMBLY, IF NECESSARY.
	8. STARTER ASSEMBLY FAULTY.	8. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY.

STARTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
	9. FAULTY TEETH ON RING GEAR.	9. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.
	10. PCM DOUBLE START OVERRIDE OUTPUT FAILURE.	10. REFER TO PCM DIAGNOSTIC. CHECK FOR CONTINUITY BETWEEN PCM AND TERMINAL 85. REPAIR OPEN CIRCUIT AS REQUIRED. IF OK, PCM MAY BE DEFECTIVE.
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. BATTERY DISCHARGED OR FAULTY.	1. REFER TO THE BATTERY SECTION FOR MORE INFORMATION. CHARGE OR REPLACE BATTERY AS NECESSARY.
	2. STARTING CIRCUIT WIRING FAULTY.	2. REFER TO THE FEED CIRCUIT RESISTANCE TEST AND THE FEED CIRCUIT TEST IN THIS SECTION. REPAIR AS NECESSARY.
	3. STARTER ASSEMBLY FAULTY.	3. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY.
	4. ENGINE SEIZED.	4. REFER TO THE ENGINE SECTION, FOR DIAGNOSTIC AND SERVICE PROCEDURES.
	5. LOOSE CONNECTION AT BATTERY, PDC, STARTER, OR ENGINE GROUND.	5. INSPECT FOR LOOSE CONNECTIONS.
	6. FAULTY TEETH ON RING GEAR.	6. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. BROKEN TEETH ON STARTER RING GEAR.	1. REMOVE STARTER. INSPECT RING GEAR AND REPLACE IF NECESSARY.
	2. STARTER ASSEMBLY FAULTY.	2. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY.
STARTER DOES NOT DISENGAGE.	1. STARTER IMPROPERLY INSTALLED.	1. INSTALL STARTER. TIGHTEN STARTER MOUNTING HARDWARE TO CORRECT TORQUE SPECIFICATIONS.
	2. STARTER RELAY FAULTY.	2. REFER TO RELAY TEST, IN THIS SECTION. REPLACE RELAY, IF NECESSARY.
	3. IGNITION SWITCH FAULTY.	3. REFER TO IGNITION SWITCH TEST, IN THE STEERING SECTION. REPLACE SWITCH, IF NECESSARY.
	4. STARTER ASSEMBLY FAULTY.	4. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY.
	5. FAULTY TEETH ON RING GEAR.	5. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.

STARTING (Continued)

DIAGNOSIS AND TESTING - CONTROL CIRCUIT TEST

The starter control circuit has:

- Starter motor with integral solenoid
- Starter relay
- Transmission range sensor, or Park/Neutral Position switch with automatic transmissions
- Ignition switch
- Battery
- All related wiring and connections
- Powertrain Control Module (PCM)

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 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. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

(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) Perform a visual inspection of the starter/starter solenoid for corrosion, loose connections or faulty wiring.

(4) Locate and remove the starter relay from the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location.

(5) 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 crank or solenoid chatters, check wiring and connectors from starter relay to starter solenoid and from the battery positive terminal to starter post 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. Inspect the ring gear teeth.

STARTER RELAY

WARNING: CHECK TO ENSURE THAT THE TRANSMISSION IS IN THE PARK/NEUTRAL POSITION WITH THE PARKING BRAKE APPLIED. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

RELAY TEST

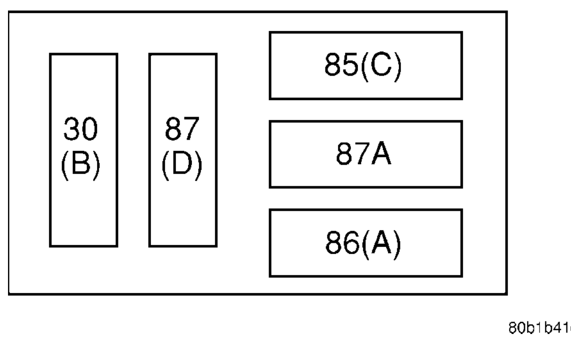
The starter relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

Remove the starter relay from the PDC as described in this group to perform the following tests:

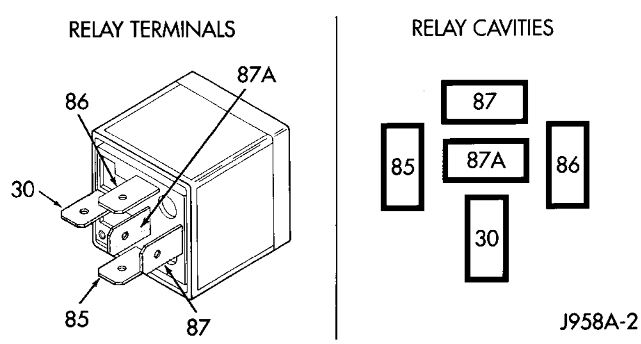
(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(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 85 and a ground lead to terminal 86 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.

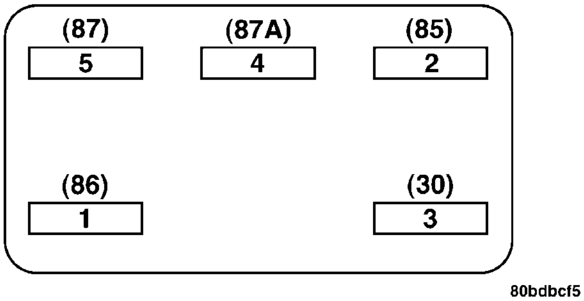


Starter Relay Pinout



Starter Relay Pinout

STARTING (Continued)



Starter Relay Pinout

CAV	FUNCTION
30	B (+)
85	IGNITION SWITCH OUTPUT
86	PCM-CONTROLLED GROUND
87	STARTER RELAY OUTPUT
87A	NO CONNECT

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 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 (85) is connected to the electromagnet in the relay. It is energized when the ignition switch is held in the Start position and the clutch pedal is depressed (manual trans). Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the Start position and the clutch pedal is depressed (manual trans), and no voltage when the ignition switch is released to the On position. If OK, go to Step 5. If not OK, 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.

(5) The coil ground terminal (86) is connected to the electromagnet in the relay. It is grounded by the PCM if the conditions are right to start the car. For automatic trans. cars the PCM must see Park Neutral switch low and near zero engine speed (rpm). For manual trans. cars the PCM only needs to see near zero engine speed (rpm) and low clutch interlock input and see near zero engine speed (rpm). To diagnose the Park Neutral switch of the trans range sensor refer to the transaxle section. Check for continuity to ground while the ignition switch is in the start position and if equipped the clutch pedal depressed. If not OK and the vehicle has an automatic trans. verify Park Neutral switch operation. If that checks OK check for continuity between PCM and the terminal 86. Repair open circuit as required. Also check the clutch interlock switch operation if equipped with a manual transmission. If OK, the PCM may be defective.

SAFETY SWITCHES

For diagnostics of the Transmission Range Sensor, refer to the Transaxle section for more information.

If equipped with Clutch Interlock/Upstop Switch, refer to Diagnosis and Testing in the Clutch section.

IGNITION SWITCH

After testing starter solenoid and relay, test ignition switch and wiring. Refer to the Ignition Section or Wiring Diagrams for more information. Check all wiring for opens or shorts, and all connectors for being loose or corroded.

BATTERY

For battery diagnosis and testing, refer to the Battery section for procedures.

ALL RELATED WIRING AND CONNECTORS

Refer to Wiring Diagrams for more information.

DIAGNOSIS AND TESTING - FEED CIRCUIT RESISTANCE

Before proceeding with this operation, review Diagnostic Preparation and Starter Feed Circuit Tests. The following operation will require a voltmeter, accurate to 1/10 of a volt.

CAUTION: Ignition system also must be disabled to prevent engine start while performing the following tests.

(1) To disable the ignition and fuel systems, disconnect the Automatic Shutdown (ASD) Relay. The ASD relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for proper relay location.

(2) With all wiring harnesses and components properly connected, perform the following:

(a) Connect the negative lead of the voltmeter to the battery negative post, and positive lead to the battery negative cable clamp (Fig. 1). Rotate and hold the ignition switch in the START position.

STARTING (Continued)

Observe the voltmeter. If voltage is detected, correct poor contact between cable clamp and post.

(b) Connect positive lead of the voltmeter to the battery positive post, and negative lead to the battery positive cable clamp (Fig. 1). Rotate and hold the ignition switch key in the START position. Observe the voltmeter. If voltage is detected, correct poor contact between the cable clamp and post.

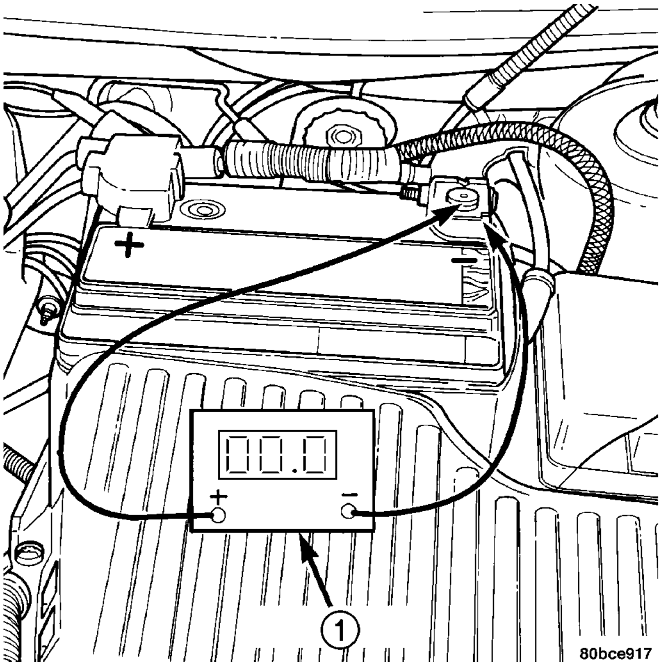


Fig. 1 Battery Connection Resistance

1 - VOLTMETER

(c) 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, correct poor contact at ground cable attaching point. If voltage reading is still above 0.2 volt after correcting poor contacts, replace ground cable.

(3) Connect positive voltmeter lead to the starter motor housing and the negative lead to the battery negative terminal (Fig. 3). Hold the ignition switch key in the START position. If voltage reads above 0.2 volt, correct poor starter to engine ground.

(a) Connect the positive voltmeter lead to the battery positive terminal, and negative lead to battery cable terminal on starter solenoid (Fig. 4). Rotate and hold the ignition switch in the START position. If voltage reads above 0.2 volt, correct poor contact at battery cable to solenoid connection. If reading is still above 0.2 volt after correcting poor contacts, replace battery positive cable.

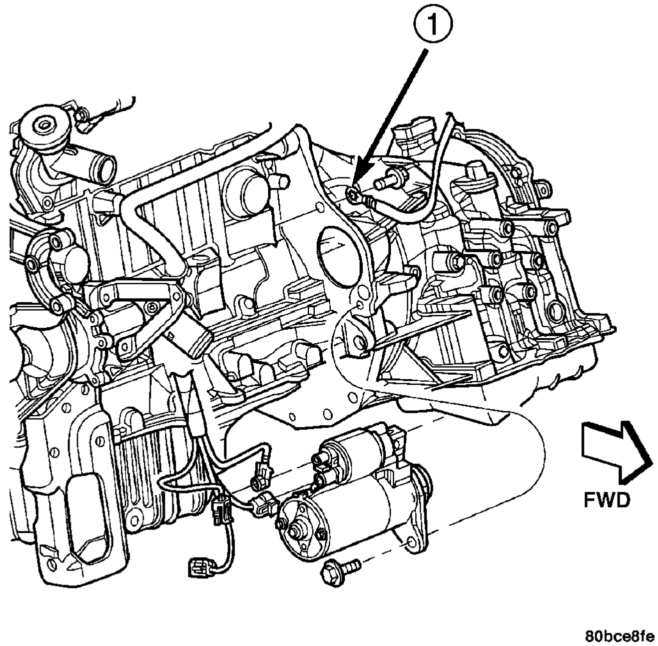


Fig. 2 Ground Circuit Resistance

1 - NEGATIVE BATTERY CABLE

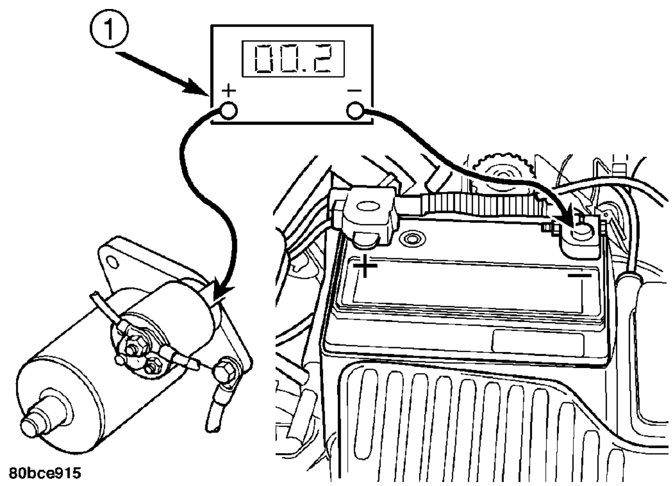


Fig. 3 Starter Motor Ground Resistance

1 - VOLTMETER

(b) If resistance tests do not detect feed circuit failures, replace the starter motor.

STARTING (Continued)

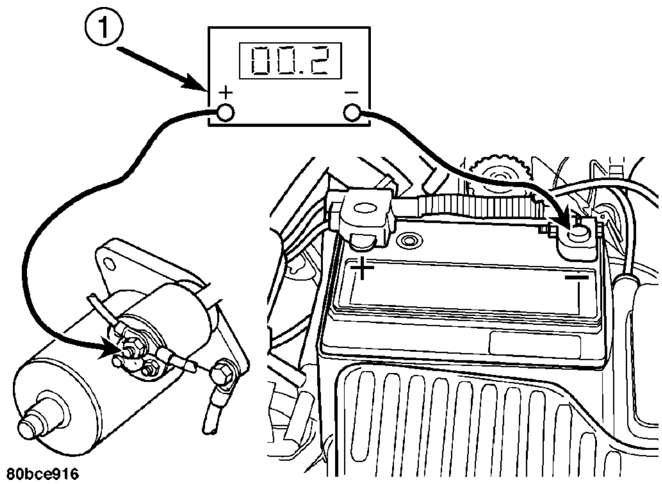


Fig. 4 Battery Positive Cable Resistance

1 - VOLTMETER

DIAGNOSIS AND TESTING - FEED CIRCUIT

The following procedure will require a suitable volt-ampere tester (Fig. 5).

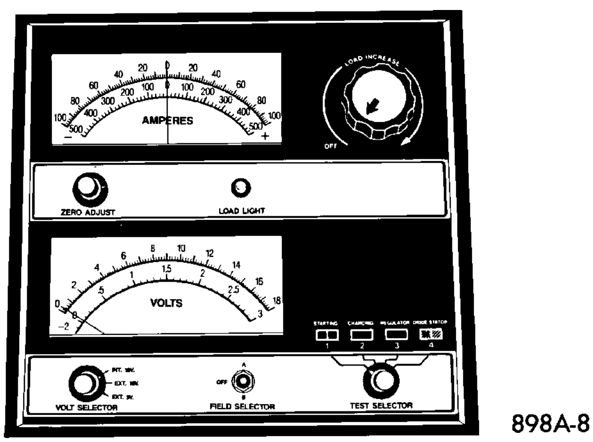


Fig. 5 Volt Ampere Tester - Typical

CAUTION:
Before performing any starter tests, the ignition and fuel systems must be disabled.

(1) Check battery before performing this test. Battery must be fully charged.

(2) Connect a volt-ampere tester to the battery terminals (Fig. 6). Refer to the operating instructions provided with the tester being used.

(3) To disable the ignition and fuel systems, disconnect the Automatic Shutdown (ASD) Relay. The ASD relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for proper relay location.

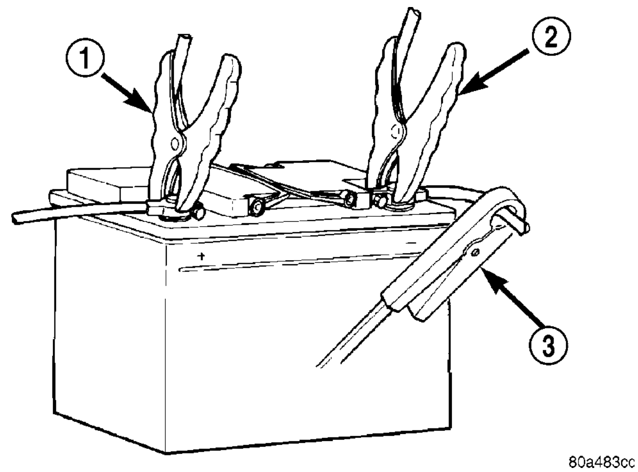


Fig. 6 Volt-Ampere Tester Connections - Typical

1 - POSITIVE CLAMP
2 - NEGATIVE CLAMP
3 - INDUCTION AMMETER CLAMP

(4) Verify that all lights and accessories are OFF, and the transmission shift selector is in the PARK position or with the clutch pedal depressed and SET parking brake.

CAUTION:
Do not overheat the starter motor or draw the battery voltage below 9.6 volts during cranking operations.

(5) Rotate and hold the ignition switch in the START position. Observe the volt-ampere tester (Fig. 5).

- If voltage reads above 9.6 volts, and amperage draw reads above 280 amps, check for engine seizing or faulty starter.
- If voltage reads 12.4 volts or greater and amperage reads 0 to 10 amps, check for corroded cables and/or bad connections.
- If voltage is below 9.6 volts and amperage draw is above 300 amps, the problem is the starter. Replace the starter. Refer to Starter Removal and Installation in this section.

(6) 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 the ASD relay. Start the vehicle several times to assure the problem has been corrected.

STARTING (Continued)

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Starter Mounting Bolts	54	40	
Starter Solenoid Battery Nut	10		90

STARTER MOTOR

Engine Application	2.0L OHC - DOHC
Power rating	1.1 Kw
Voltage	12 VOLTS
No. of Fields	6
No. of Poles	6
Brushes	4
Drive	Planetary Gear Train
Cranking Amperage Draw test	150 - 280 Amps.

NOTE: Engine should be up to operating temperature. Extremely heavy oil or tight engine will increase starter amperage draw.

STARTER MOTOR

DESCRIPTION

The starter is a permanent magnet starter motor. The fields have six permanent magnets. A planetary gear train transmits power between starter motor and pinion shaft. The starter provides mechanical torque to rotate the crankshaft at an RPM (crank speed) necessary for self-sustained spark/ignition.

REMOVAL - 2.0L

(1) Disconnect and isolate the battery negative cable (Fig. 7).

(2) Raise vehicle on hoist.

(3) Remove starter bolts (Fig. 8).

(4) Remove starter assembly.

(5) Disengage latch and remove solenoid connector from starter assembly.

(6) Remove battery positive connector from starter assembly. It is not necessary to remove the alternator output lead from the connector.

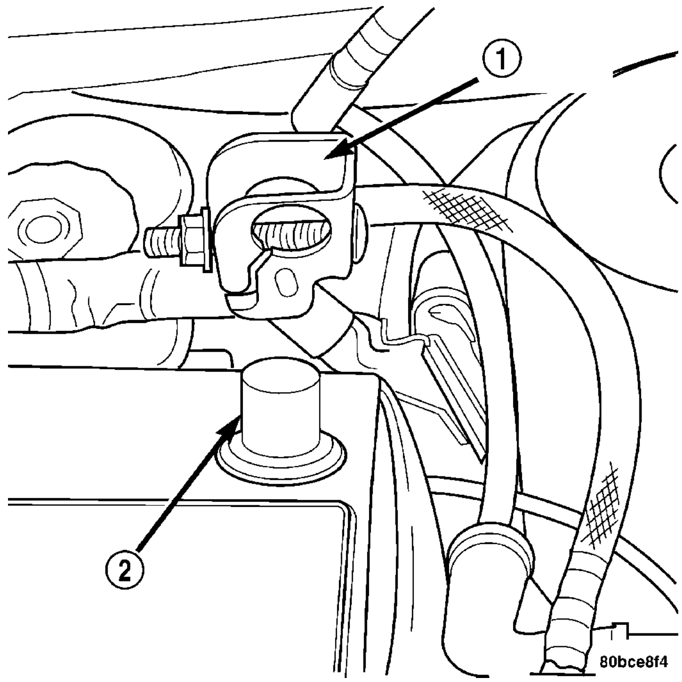


Fig. 7 Battery Negative Cable Remove/Install

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

INSTALLATION - 2.0L

(1) Clean corrosion/dirt from the cable and wire terminals before installing wiring to the solenoid.

(2) Attach battery positive connector to starter. Ensure alternator output connector is snapped into the battery positive connector. Tighten the captive nut to 10 N·m (90 in. lbs.).

CAUTION: It is critical that the alternator output terminal be connected to the battery positive terminal of the starter solenoid, for proper operation of the charging and cranking systems.

(3) Install solenoid connector to starter. Ensure that latch is fully engaged.

(4) Position the starter face into transmission housing. Start bottom mounting bolt and thread in until bolt is snug.

(5) Attach ground cable to upper starter mounting bolt.

STARTER MOTOR (Continued)

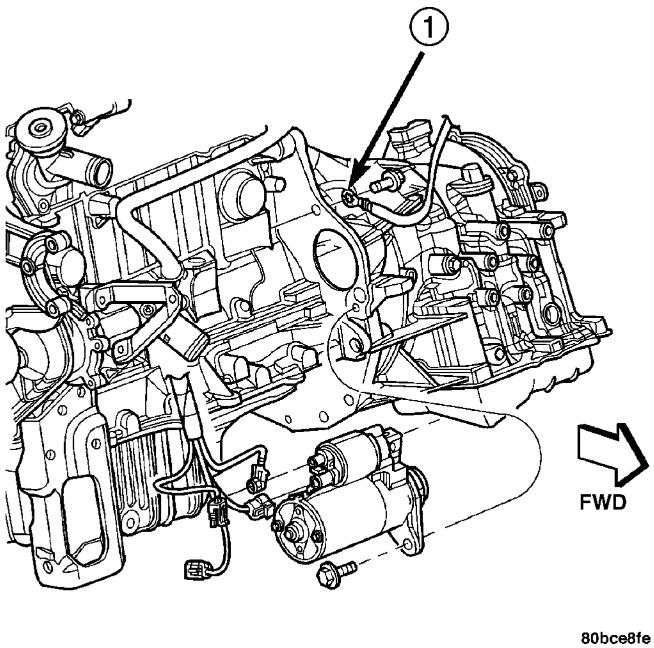


Fig. 8 Starter Mounting/Location

1 - NEGATIVE BATTERY CABLE

(6) Ensure the proper starter alignment before tightening the starter mounting bolts to 54 N·m (40 ft. lbs.) torque.

(7) Lower vehicle.

(8) Connect negative battery cable.

STARTER MOTOR 1.6L

REMOVAL - 1.6L

(1) Disconnect the negative battery cable.

(2) Raise and support the vehicle.

(3) Disconnect the battery cable (Fig. 9).

(4) Disconnect the solenoid connector.

The starter and heat shield are removed as an assembly.

(5) Remove the heat shield bolt (Fig. 10).

(6) Remove the 2 starter mounting bolts (Fig. 11).

(7) Tip starter and heat shield to the rear of vehicle (Fig. 12).

(8) Slip starter and heat shield over rear cross member (Fig. 13).

(9) Remove assembly.

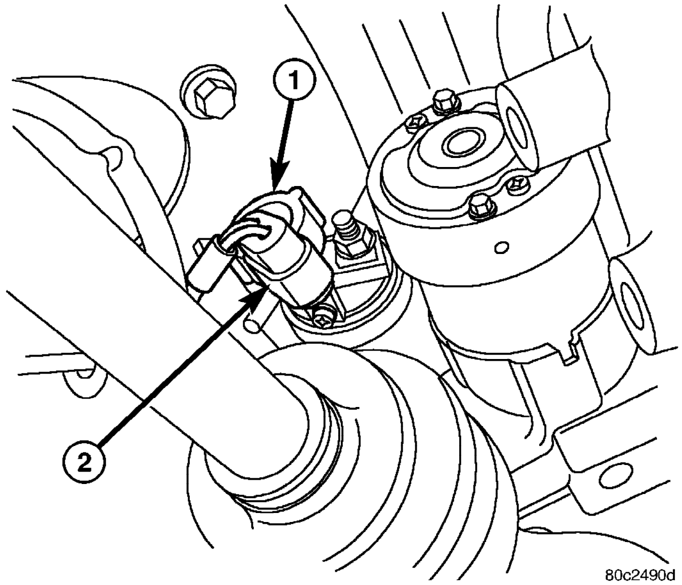


Fig. 9 STARTER LOCATION

1 - Battery Connection
2 - Solenoid Connection

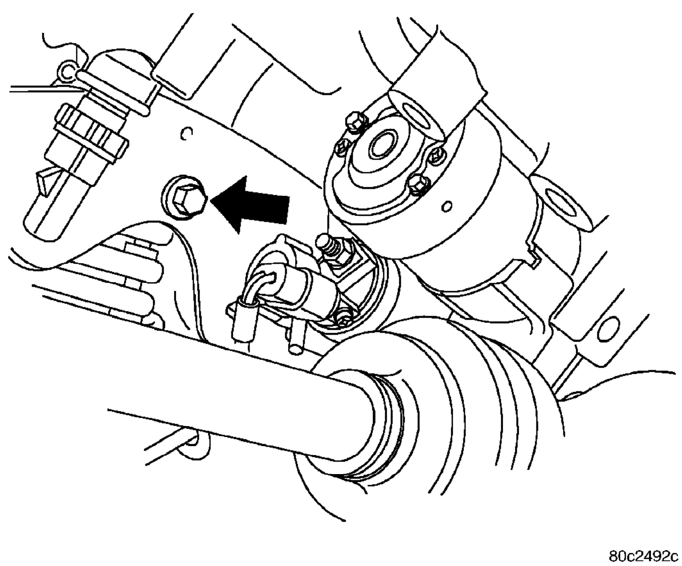


Fig. 10 HEAT SHIELD BOLT

STARTER MOTOR 1.6L (Continued)

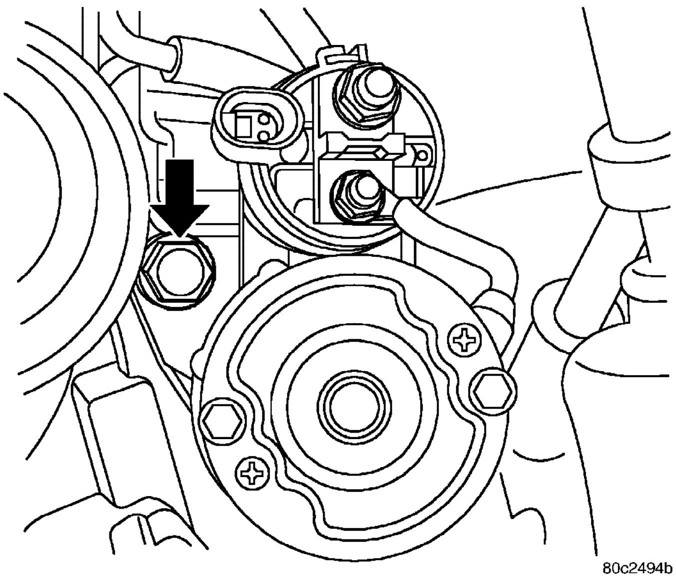


Fig. 11 MOUNTING BOLTS

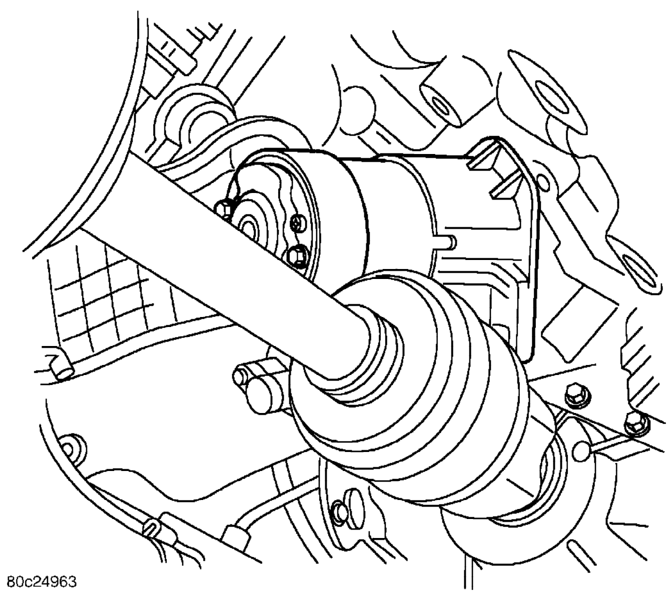


Fig. 12 STARTER REMOVAL AND HEAT SHIELD

INSTALLATION - 1.6L

The starter and heat shield are removed/installed as an assembly.

(1) Slip starter and heat shield over rear cross member (Fig. 13).

(2) Tip starter and heat shield to the rear of vehicle (Fig. 12).

(3) Install the 2 starter mounting bolts (Fig. 11).

(4) Install the heat shield bolt (Fig. 10).

(5) Connect the solenoid connector.

(6) Connect the battery cable (Fig. 9).

(7) Lower the vehicle.

(8) Connect the negative battery cable.

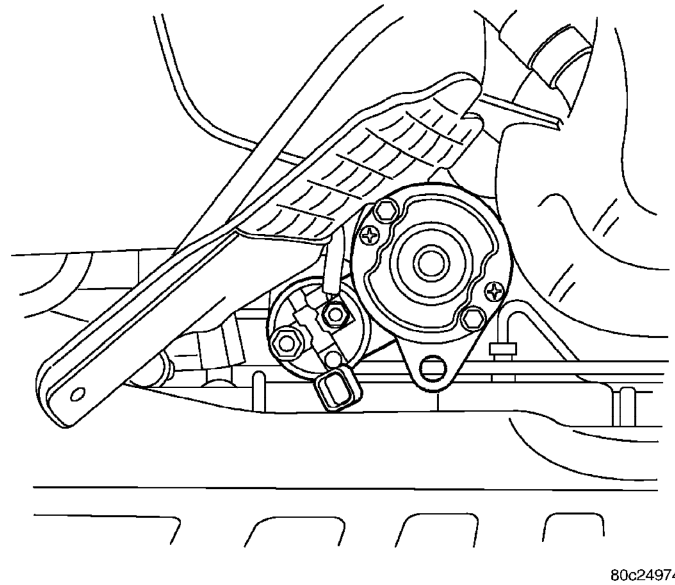


Fig. 13 STARTER REMOVAL

STARTER MOTOR - 2.0L HIGH OUTPUT

REMOVAL - 2.0L HIGH OUTPUT

(1) Disconnect and isolate the battery negative cable (Fig. 14).

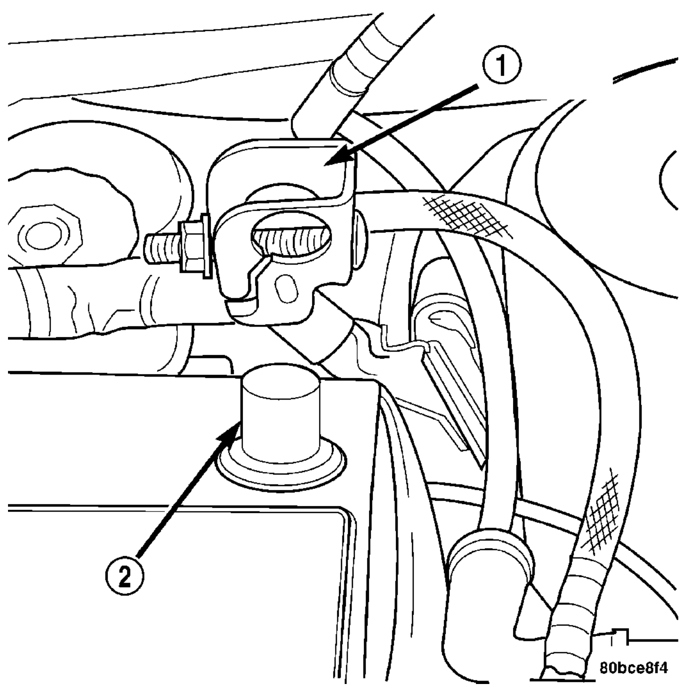


Fig. 14 Battery Negative Cable Remove/Install

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

STARTER MOTOR - 2.0L HIGH OUTPUT (Continued)

(2) Disconnect the inlet hose from intake manifold and reposition the air cleaner box (Fig. 15).

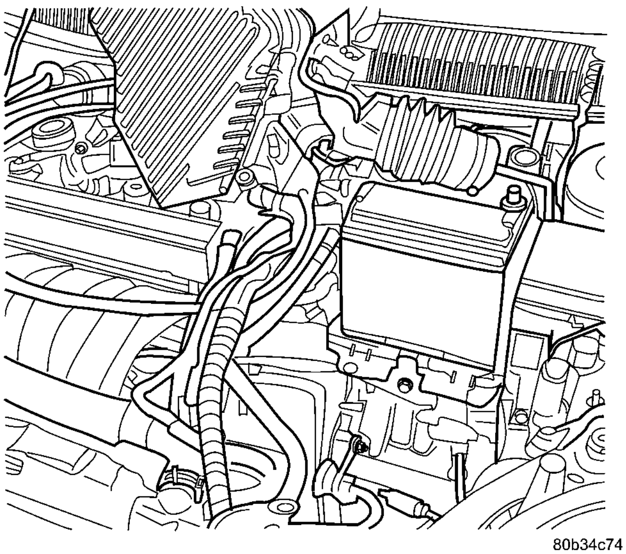


Fig. 15 AIR CLEANER BOX

(3) Starter location (Fig. 16).

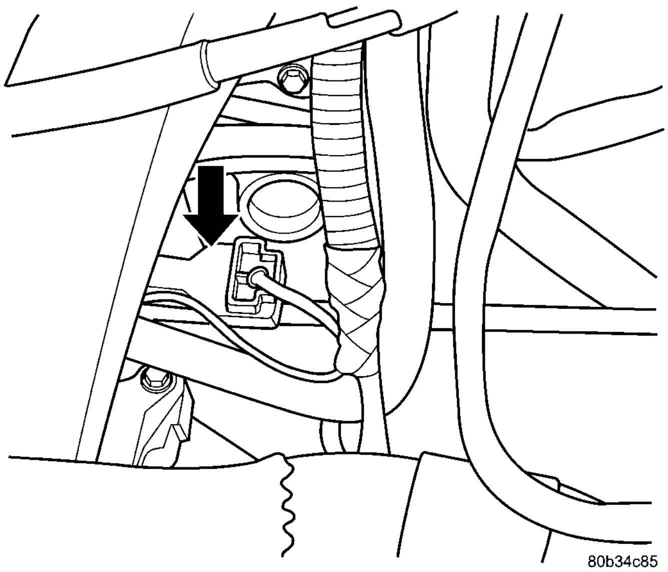


Fig. 16 STARTER LOCATION

(4) Remove starter bolts (Fig. 17).

(5) Remove starter assembly (Fig. 18).

(6) Disengage latch and remove solenoid connector from starter assembly.

(7) Remove battery positive connector from starter assembly. It is not necessary to remove the alternator output lead from the connector (Fig. 19).

(8) Remove starter from vehicle.

INSTALLATION - 2.0L HIGH OUTPUT

(1) Clean corrosion/dirt from the cable and wire terminals before installing wiring to the solenoid.

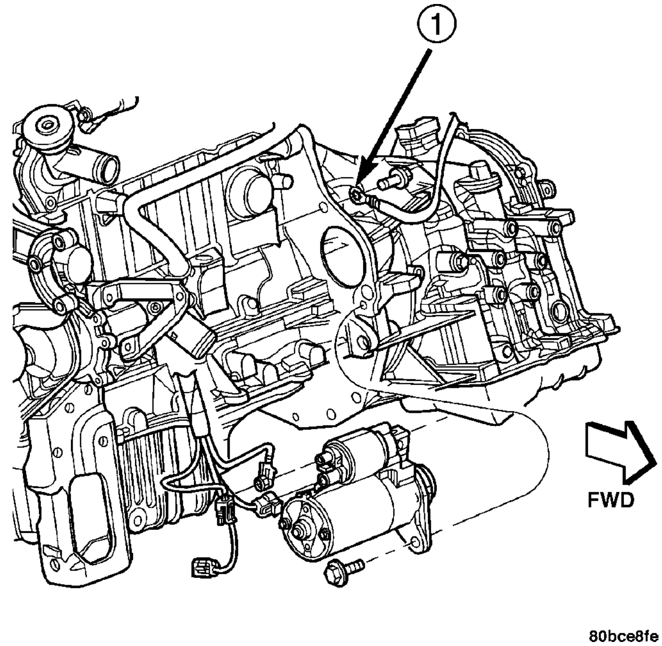


Fig. 17 Starter Mounting/Location

1 - NEGATIVE BATTERY CABLE

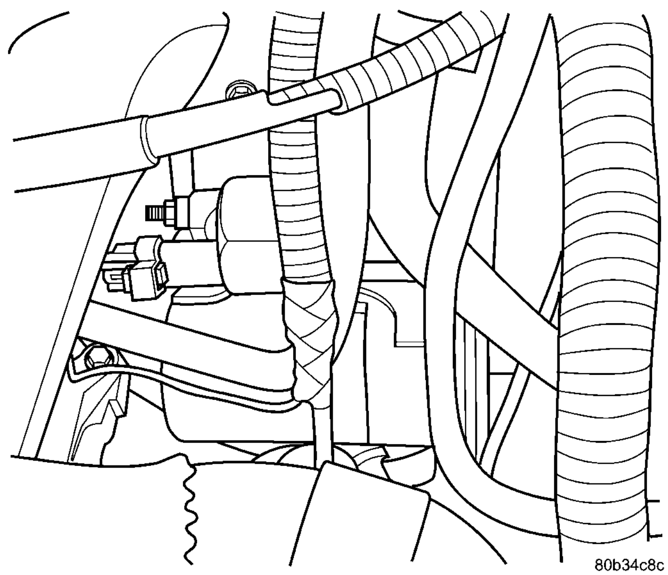


Fig. 18 STARTER ELECTRICAL CONNECTION

(2) Attach battery positive connector to starter. Ensure alternator output connector is snapped into the battery positive connector. Tighten the captive nut to 10 N·m (90 in. lbs.).

CAUTION: It is critical that the alternator output terminal be connected to the battery positive terminal of the starter solenoid, for proper operation of the charging and cranking systems.

(3) Install solenoid connector to starter. Ensure that latch is fully engaged (Fig. 18).

STARTER MOTOR - 2.0L HIGH OUTPUT (Continued)

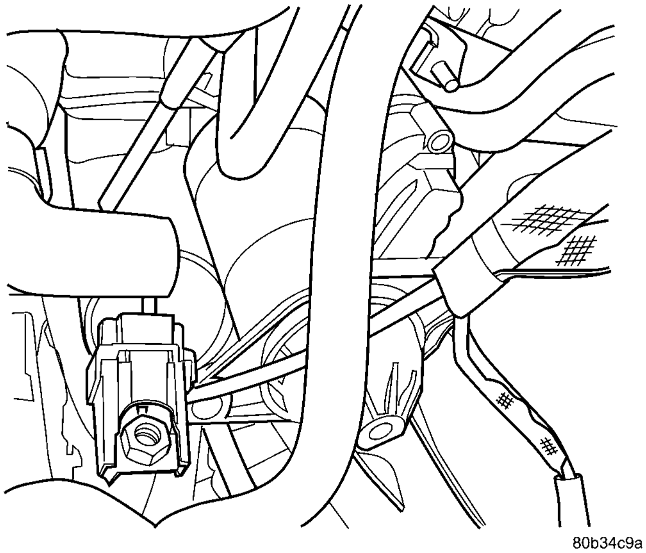


Fig. 19 STARTER

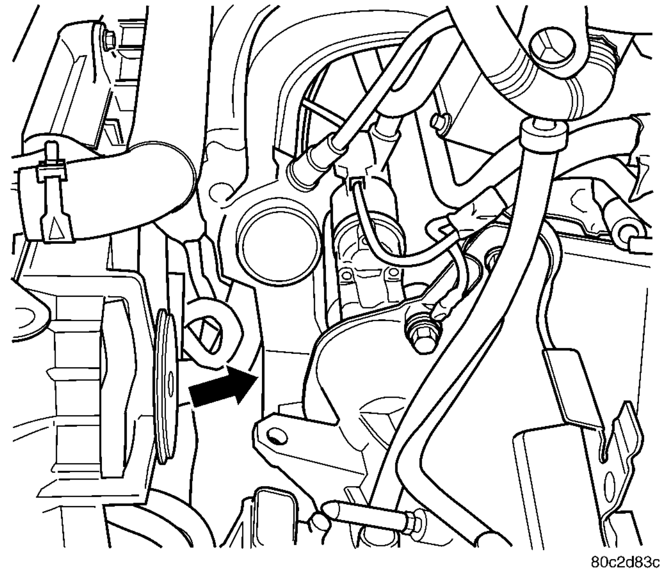


Fig. 20 INTAKE SUPPORT BRACKET

(4) Position the starter face into transmission housing. Start bottom mounting bolt and thread in until bolt is snug (Fig. 8).

(5) Attach ground cable to upper starter mounting bolt.

(6) Ensure the proper starter alignment before tightening the starter mounting bolts to 54 N·m (40 ft. lbs.) torque.

(7) Reposition the air cleaner box into postion and connect the inlet hose from intake manifold (Fig. 15).

(8) Connect negative battery cable (Fig. 7).

STARTER MOTOR 2.0L 4 SPD AUTO

REMOVAL - 2.0L AUTOMATIC TRANSMISSION

(1) Disconnect the negative battery cable.

(2) Remove the air cleaner box, refer to the air cleaner box removal/installation in this section.

(3) Remove the 2 upper bracket bolts for the intake support (Fig. 20).

(4) Raise vehicle and support.

(5) Remove the oil pan support bracket (Fig. 21).

(6) Remove the intake support bracket (Fig. 22).

(7) Disconnect the battery cable and solenoid connection from the starter.

(8) Remove the starter bolts.

(9) Remove starter.

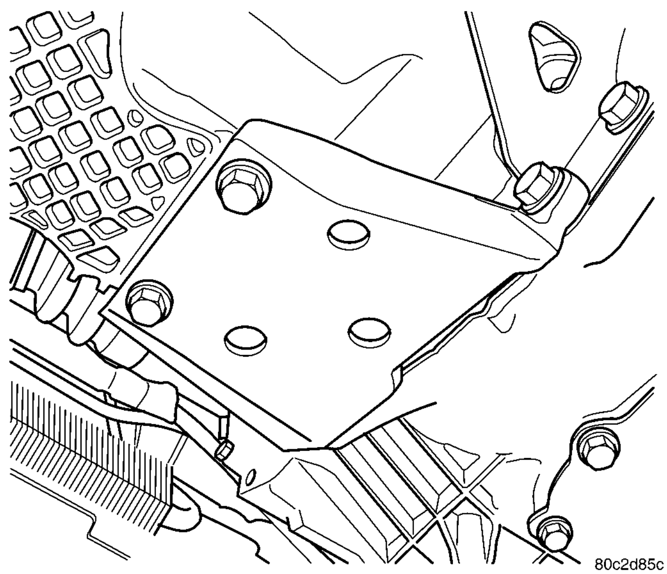


Fig. 21 OIL PAN BRACKET

INSTALLATION - 2.0L AUTOMATIC TRANSMISSION

(1) Install starter.

(2) Install the starter bolts.

(3) Connect the battery cable and solenoid connection from the starter.

(4) Install the intake support bracket (Fig. 22).

(5) Install the oil pan support bracket (Fig. 21).

(6) Lower vehicle.

(7) Install the 2 upper bracket bolts for the intake support (Fig. 20).

(8) Install the air cleaner box, refer to the air cleaner box removal/installation in this section.

(9) Connect the negative battery cable.

STARTER MOTOR 2.0L 4 SPD AUTO (Continued)

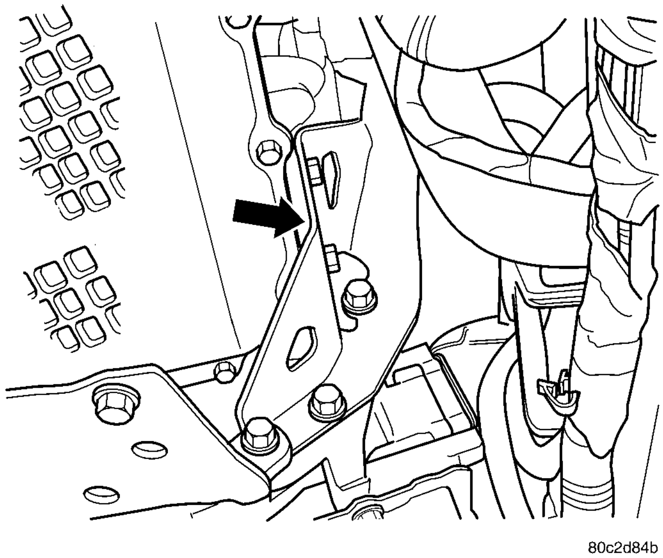


Fig. 22 INTAKE SUPPORT BRACKET LOWER BOLTS

STARTER MOTOR - 2.4L SRT-4

REMOVAL - 2.4L SRT-4

(1) Disconnect and isolate the battery negative cable (Fig. 23).

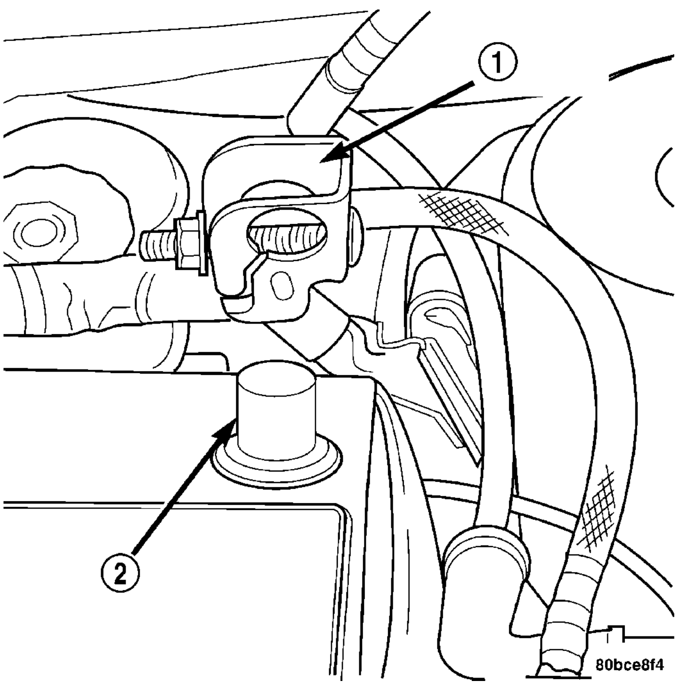


Fig. 23 Battery Negative Cable Remove/Install

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

(2) Remove the air cleaner box, refer to the Engine/Air Intake/Air Cleaner Assembly for more information.

(3) Remove the throttle body, refer to the Throttle body in the Fuel/Injection for more information.

(4) Remove the upper mounting bolt and ground wire (Fig. 24).

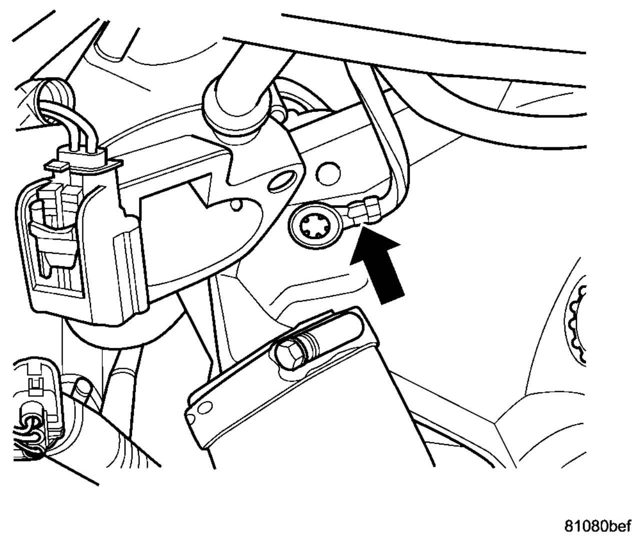


Fig. 24 MOUNTING BOLT & GROUND WIRE

(5) Raise vehicle and support.

(6) Disconnect the battery positive cable from starter (Fig. 25).

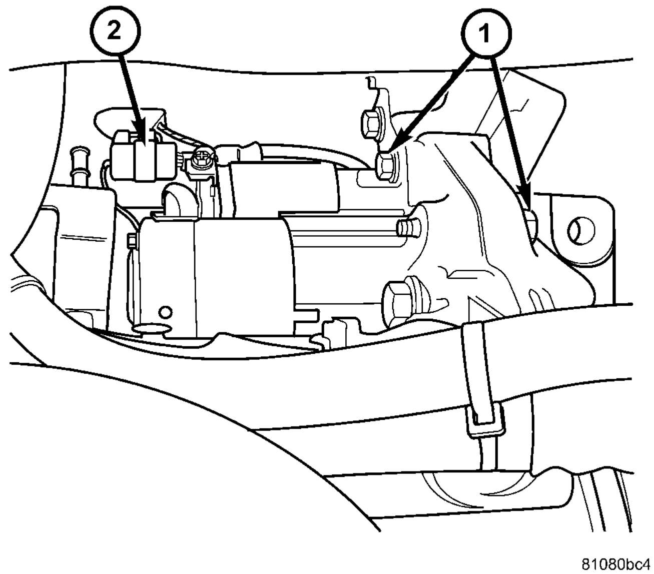


Fig. 25 MOUNTING BOLTS & ELECTRICAL CONNECTIONS

1 - Mounting Bolts
2 - Electrical Connections

(7) Disconnect the solenoid connector from starter (Fig. 25).

(8) Remove the middle starter mounting bolt (Fig. 25).

STARTER MOTOR - 2.4L SRT-4 (Continued)

(9) Loosen the upper bolt for the intake manifold support and swing bracket out of the way (Fig. 26).

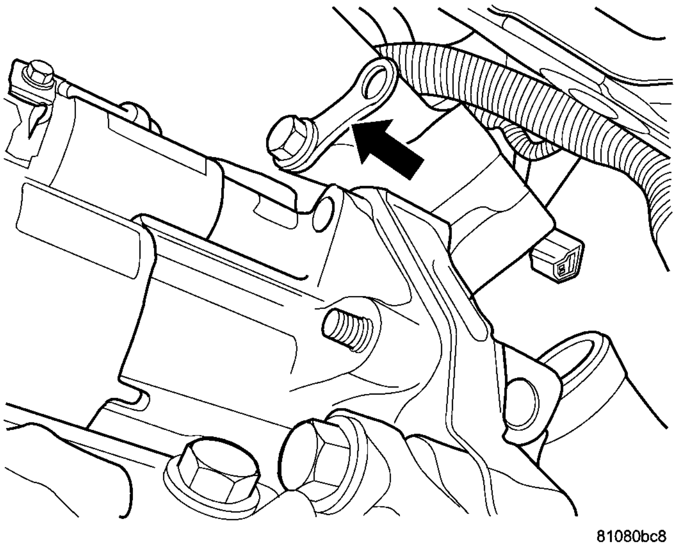


Fig. 26 INTAKE BRACKET

(10) Remove the lower mounting bolt.
(11) Remove the starter (Fig. 27).

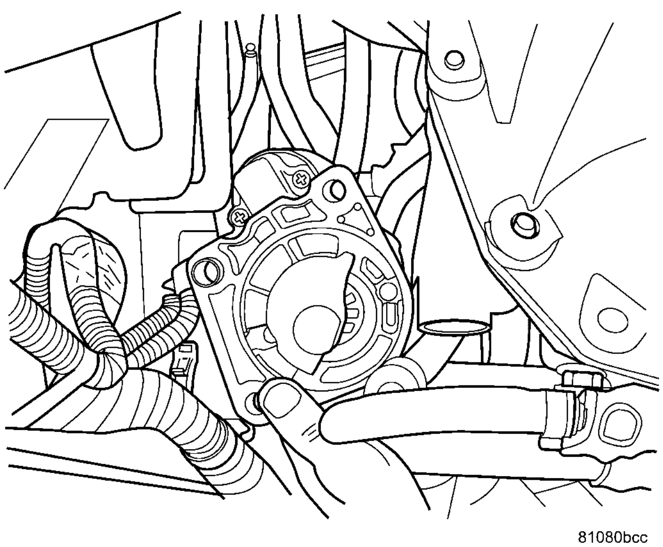


Fig. 27 STARTER REMOVE/INSTALL

INSTALLATION - 2.4L SRT-4

(1) Install the starter (Fig. 27).
(2) Install the lower mounting bolt.
(3) Loosen upper bolt for the intake manifold support bracket and swing bracket back into place (Fig. 26).
(4) Install the middle starter mounting bolt (Fig. 25).
(5) Tighten the intake manifold support bracket bolt.
(6) Tightening the starter mounting bolts to 54 N·m (40 ft. lbs.) torque
(7) Connect the solenoid connector to starter (Fig. 25).
(8) Connect the battery positive cable to starter (Fig. 25) Tighten the captive nut to 10 N·m (90 in. lbs.).
(9) Lower vehicle.
(10) Install the upper mounting bolt and ground wire (Fig. 24) and tighten the starter mounting bolt to 54 N·m (40 ft. lbs.) torque.
(11) Install the throttle body, refer to the Fuel/Injection/Throttle Body for more information.
(12) Install the air cleaner box, refer to the Engine/Air Intake/Air Cleaner Assembly for more information.
(13) Connect the battery negative cable (Fig. 23).

STARTER MOTOR RELAY

DESCRIPTION

The Starter Relay is a micro relay located in the Power Distribution Center (PDC), positioned in the left front corner of the engine compartment.

OPERATION

As battery power is applied to the relay from the ignition switch, battery power is applied to the starter motor through the relay to the starter solenoid.

REMOVAL

The relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for relay location.

STARTER SOLENOID

DESCRIPTION

The Starter Solenoid is mounted directly to the Starter Motor.

OPERATION

The Starter Solenoid is a switching device used to activate the high amperage starter motor circuit from a low amperage control circuit.

HEATED SYSTEMS

TABLE OF CONTENTS

HEATED GLASS

TABLE OF CONTENTS

HEATED GLASS

DESCRIPTION

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.

The heated window system consists of a back glass with two vertical bus bars and a series of electrically connected grid lines fired onto the inside surface of the glass (Fig. 1).

The heated window system is turned ON or OFF by a control switch and a timing circuit, which are combined into a single push-button switch located on the accessory switch bezel at the center of the instrument panel, below the radio.

Circuit protection is provided by a cartridge fuse located in the Power Distribution Center (PDC) for the heated grid circuit, and by a fuse in the fuse block for the control circuit.

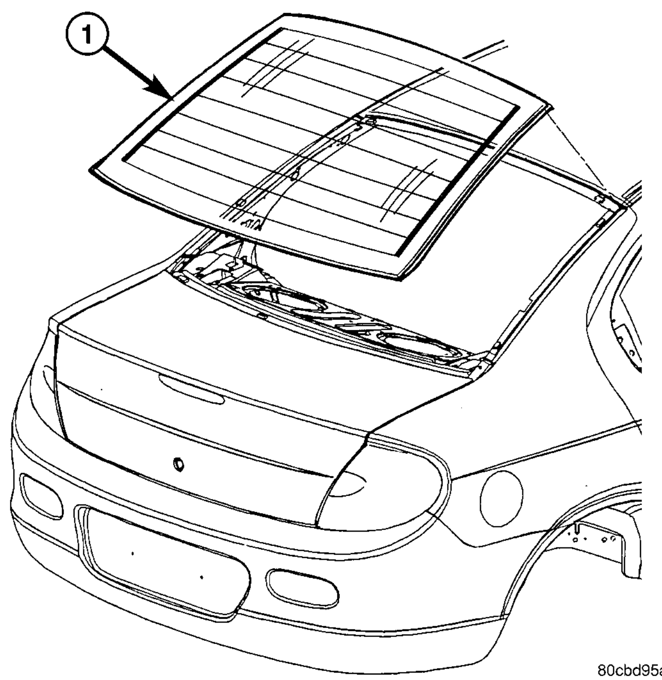


Fig. 1 Rear Window Defogger- Typical

1 - REAR WINDOW DEFOGGER

OPERATION

When the rear window defogger switch is turned to the ON position, current is directed to the rear defogger grid lines and the heated power mirrors (if equipped). The heated grid lines heat the glass to help clear the surface of fog or frost.

The defogger system is controlled by a momentary switch located in the accessory switch bezel on the

HEATED GLASS (Continued)

instrument panel. An amber indicator lamp in the switch will illuminate to indicate when the defogger system is turned on. The rear window defogger switch also contains the defogger system control circuitry including the timer logic and the defogger relay.

NOTE: The rear window defogger turns off automatically after 10 minutes of initial operation. Each following activation cycle of the defogger system will last five minutes.

The defogger system will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the defogger system will automatically turn off after about five minutes.

The defogger system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the defogger switch a second time. Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the defogger system.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM

Electrically heated rear window defogger operation can be checked in the vehicle in the following manner:

(1) Turn the ignition switch to the ON position.

(2) Connect an ammeter in series with the battery. Push the rear window defogger switch to the ON position. A distinct increase in amperage draw should be noted.

(3) 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 three to four minutes of operation.

(4) Using a DC voltmeter, connect the negative lead to Point B, and the positive lead to Point A (Fig. 2). The voltmeter should read 10-14 volts.

(5) Step 2, Step 3 or Step 4 above will confirm system operation. Indicator light illumination means that there is power available at the switch output, and does not necessarily verify system operation.

(6) 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.

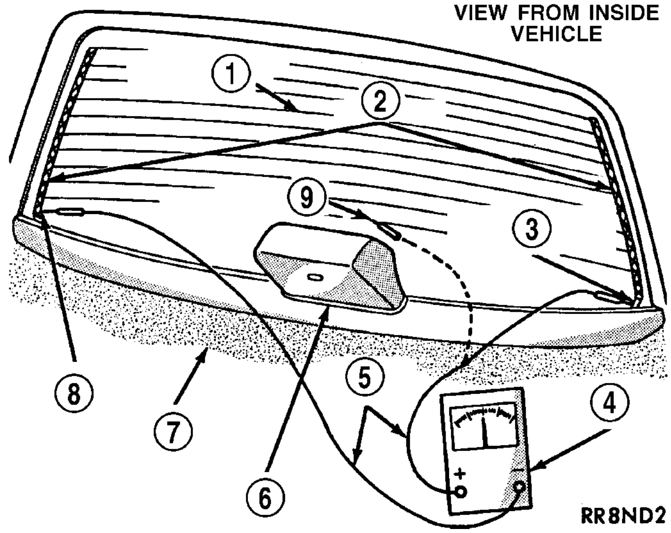


Fig. 2 Rear Glass Grid Line Test - Typical

1 - REAR WINDOW DEFOGGER
2 - BUS BARS
3 - VOLTAGE FEED "A"
4 - VOLTMETER
5 - PICK-UP LEADS
6 - C.H.M.S.L. TRIM COVER
7 - PARCEL SHELF
8 - GROUND "B"
9 - MID-POINT "C"

(c) Ensure that the cartridge fuse and control circuit fuse are OK and all electrical connections are secure.

(7) When the above steps have been completed and the system is still inoperative, one or more of the following is defective:

(a) Rear Window Defogger Switch.

(b) All rear window grid lines would have to be broken or one of the feed wires are not connected for the system to be inoperative.

(8) If turning the switch ON produces severe voltmeter deflection, the circuit should be closely checked for a shorting condition.

(9) If the system operation has been verified but indicator lamp does not light, replace the switch.

(10) For detailed wiring information, refer to Wiring Diagrams.

DEFOGGER SWITCH

DESCRIPTION

The rear window defogger switch is a control and timing circuit integrated into a single panel mounted switch assembly. The rear window defogger switch is located in the accessory switch bezel (Fig. 3) on the instrument panel, just below the radio.

When the rear window defogger switch is turned to the ON position, current is directed to the rear defogger grid lines and the heated power mirrors (if

DEFOGGER SWITCH (Continued)

equipped). The heated grid lines heat the glass to help clear the surface of fog or frost.

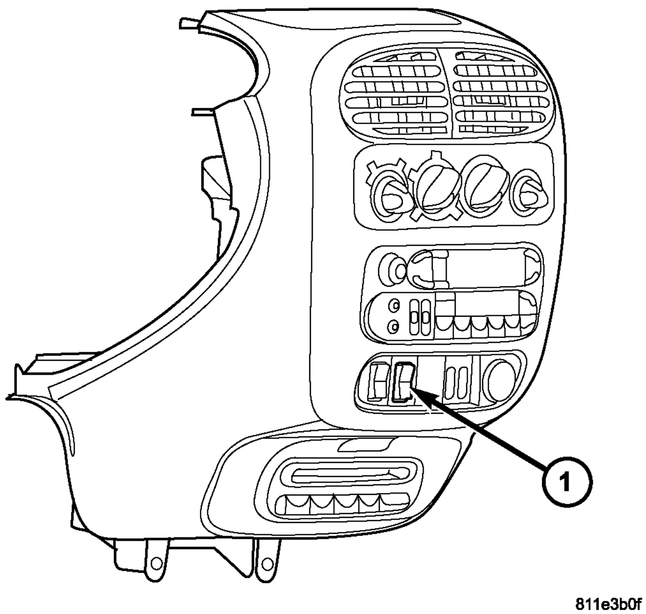


Fig. 3 Rear Window Defogger Switch - Typical

1 - ACCESSORY SWITCH BEZEL

OPERATION

Energizing the rear window defogger relay provides electrical current to the rear window defogger grid and, if the vehicle is so equipped, the outside rear view mirror heating grids. An amber indicator lamp in the defogger switch illuminates to indicate when the defogger system is On.

The rear window defogger switch and indicator lamp cannot be repaired and, if faulty or damaged, the rear window defogger switch must be replaced.

DIAGNOSIS AND TESTING - DEFOGGER SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: The rear window defogger switch may be tested in the vehicle or out of the vehicle, on a bench.

For rear window defogger switch circuit descriptions and diagrams, refer to Appropriate Wiring Information.

IN-VEHICLE TESTING

(1) Remove the rear window defogger switch from the instrument panel, but leave the switch connected (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - REMOVAL).

(2) Turn the ignition switch ON.

(3) Using a voltmeter, check for battery voltage at Pin 1 and 2 of the rear window defogger switch (Fig. 4).

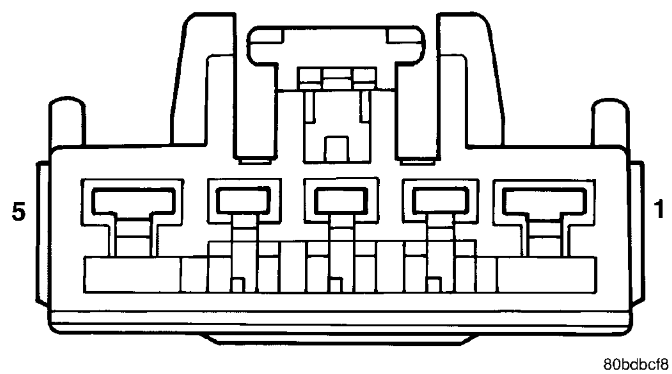


Fig. 4 Rear Window Defogger Switch Harness Connector

REAR WINDOW DEFOGGER SWITCH AND HARNESS CONNECTOR PIN CALL-OUT

PIN	FUNCTION
1	FUSED B+
2	FUSED IGNITION SWITCH OUTPUT (RUN)
3	GROUND
4	PANEL LAMPS DRIVER
5	PANEL LAMPS DRIVER

(a) If OK, go to Step 4.

(b) If NOT OK, check the 10 Amp fuse 6 in the fuse block and the 40 Amp fuse 8 in the Power Distribution Center (PDC). If fuses are OK, check wiring circuit. Refer to Wiring Diagrams.

(4) Check Pin 5, with switch in the ON position there should be battery voltage and no voltage in the OFF position.

(a) If OK, go to Step 5.

(b) If NOT OK, no voltage in the ON position or voltage in the OFF position. Replace the switch.

DEFOGGER SWITCH (Continued)

(5) Press switch to ON position. The indicator lamp should come on and remain on for approximately 10 minutes. If the indicator lamp fails to light or no voltage is present, replace the rear window defogger switch (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - REMOVAL) and (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - INSTALLATION).

BENCH TESTING

(1) Remove the rear window defogger switch (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - REMOVAL).

(2) With switch removed from vehicle, use a jumper wire and connect a 12 volt supply to Pin 1 and 2. Using a third jumper wire, ground Pin 3. Refer to (Fig. 5) and the Rear Window Defogger Switch and Harness Connector Pin Call-Out table.

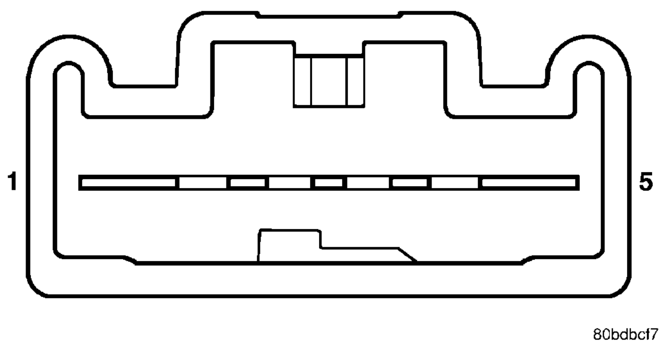


Fig. 5 Rear Window Defogger Switch Connector

(3) Follow the same procedures used for IN-VEHICLE TESTING, except for step Step 2.

REAR WINDOW DEFOGGER GRID

DIAGNOSIS AND TESTING

GRID LINES

The horizontal grid lines and vertical bus bar lines printed and fired on the inside surface of rear window glass 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 ON and turn control switch to ON. The LED should come on.

(2) Using a DC voltmeter with 0-15 volt range, contact terminal (B) with the negative lead of the voltmeter. With the positive lead of the voltmeter, contact terminal (A). The voltmeter should read 10-14 volts. A lower voltage reading indicates a poor connection in the feed or the ground circuit.

(3) With the negative lead of the voltmeter, contact a good body ground point. The voltage reading should not change.

(4) Connect the negative lead of the voltmeter to terminal (B) and touch each grid line at Mid-Point with the positive lead. A reading of:

- Approximately 6 volts indicates the line is OK.
- 0 volts indicates a break in line between Mid-Point (C) and terminal (A).
- 10-14 volts indicates a break between Mid-Point (C) and terminal (B).

Move the lead toward the break and voltage will change as soon as the break is crossed.

STANDARD PROCEDURE

REAR WINDOW DEFOGGER GRID LINE REPAIR

WARNING: THE REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION. 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 SKIN CONTACT OCCURS, WASH AFFECTED AREAS WITH SOAP AND WATER.**
- **IF EYE CONTACT OCCURS, 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.

NOTE: The rear window defogger grid lines are serviced with the rear window glass. If the repair of a grid line does not completely fix the grid line and allow it to function properly, replacement of the liftgate glass will be necessary.

The repair of the grid lines is possible using the Mopar® Grid Line Repair Package or an equivalent.

(1) Mask the repair area so the conductive epoxy can be extended onto the grid line(s) or the bus bar (Fig. 6).

(2) Follow the instructions in the repair kit for preparing the damaged area.

(3) Remove the package separator clamp and mix the conductive epoxy thoroughly. Fold in half and cut the center corner to dispense the epoxy.

REAR WINDOW DEFOGGER GRID (Continued)

(4) Apply the conductive epoxy through the slit in the masking tape. Overlap both ends of the break(s) by 19 mm (3/4 inch).

(5) Carefully remove the masking tape from the grid line(s).

CAUTION: To prevent the glass from fracturing, do not allow the glass surface to exceed 204° C (400° F).

(6) Allow the epoxy to cure 24 hours at room temperature or use a heat gun with a 260° to 371° C (500° to 700° F) range for 15 minutes. Hold the heat gun approximately 254 mm (10 inches) from the repaired area.

(7) After the conductive epoxy is properly cured, verify operation of the rear window defogger.

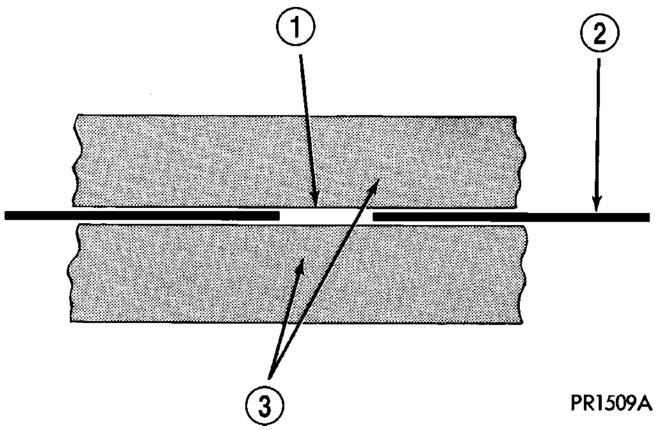


Fig. 6 Grid Line Repair

1 - BREAK
2 - GRID LINE
3 - MASKING TAPE

REAR WINDOW DEFOGGER GRID TERMINAL REPAIR

WARNING: THE REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION. 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 SKIN CONTACT OCCURS, WASH AFFECTED AREAS WITH SOAP AND WATER.**
- **IF EYE CONTACT OCCURS, 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.

If the rear window defogger grid terminal(s) is damaged or separated from the rear window, the repair of the grid terminals is possible using the Mopar® Grid Line Repair Package or an equivalent.

(1) If the grid terminal(s) is broken and a portion of the terminal is still attached to the heating grid, remove the portion of the clip remaining in the wire harness connector(s).

(2) Mask the areas so the conductive epoxy can be extended onto the adjacent grid line(s) as well as the bus bar.

(3) Apply a thin layer of conductive epoxy to the area where the terminal(s) where fastened and to the adjacent grid line(s).

(4) Apply a thin layer of conductive epoxy on the terminal(s) and properly orient the terminal(s) at the desired location(s).

NOTE: To prevent the terminal(s) from moving while the epoxy is curing, a wedge or clamp must be used.

CAUTION: To prevent the glass from fracturing, do not allow the glass surface to exceed 204° C (400° F).

(5) Allow the epoxy to cure 24 hours at room temperature or use a heat gun with a 260° to 371° C (500° to 700° F) range for 15 minutes. Hold the heat gun approximately 254 mm (10 inches) from repaired area.

(6) After the conductive epoxy has properly cured, remove the wedge or clamp from the terminal(s), reconnect the wire harness connector(s) and verify operation of the rear window defogger.

NOTE: To ensure proper installation, do not attach the wire harness connector(s) to the terminal(s) until the epoxy is completely cured.

HEATED MIRRORS

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HEATED MIRRORS

DESCRIPTION

The optional heated mirror system only operates in concert with the rear window defogger system, and will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the heated mirror system will automatically turn off after about five minutes.

The heated mirror system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the rear window defogger switch a second time. Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the heated mirror system.

OPERATION

When the rear window defogger switch is in the On position, an electric heater grid located behind the glass of each of the outside rear view mirrors is energized. When energized, each of these heater grids produce heat to help clear the outside rear view mirrors of ice, snow, or fog.

The heated mirror system is controlled by a momentary rear window defogger switch in the accessory switch bezel. An amber indicator lamp in the switch will illuminate to indicate when the defogger system is turned on. The rear window defogger switch also contains the defogger system control circuitry including the timer logic and the defogger relay.

If the outside mirror heating grids are both inoperative, see Rear Window Defogger System in the Diagnosis and Testing section of this group. If only one of the outside mirror heating grids is inoperative (Refer to 8 - ELECTRICAL/POWER MIRRORS - DIAGNOSIS AND TESTING).

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the entire power mirror unit must be replaced (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - REMOVAL).

HORN

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HORN SYSTEM

DESCRIPTION

The horn circuit consist of a horn switch, horn relay and horn.

OPERATION

The horn circuit feed is from the fuse to the horn relay in the Power Distribution Center (PDC). The PDC is mounted on the battery tray. When the horn switch is depressed, it completes the ground circuit. The horn relay coil closes contacts and allows current to flow to the horn. The horn is grounded to the headlamp ground connection.

DIAGNOSIS AND TESTING - HORN SYSTEM

Refer to Horn System Test table. If the horn does not sound, check the horn fuse located in the Power Distribution Center. If the fuse is blown, replace with the correct fuse. If the horn fails to sound and the new fuse blows when depressing the horn switch, a short circuit in the horn or the horn wiring between the fuse terminal and the horn is responsible, or a defective horn switch allowed the horn to burn out is responsible.

(1) If the fuse is OK, test horn relay. (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DIAGNOSIS AND TESTING).

(2) If the relay is OK, test horn. (Refer to 8 - ELECTRICAL/HORN/HORN - DIAGNOSIS AND TESTING).

CAUTION: Continuous sounding of horn will cause horn to fail.

Should the horn sound continuously:

• Unplug the horn relay from Power Distribution Center.

Refer to the appropriate wiring information.

HORN SYSTEM TEST TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
HORN SOUNDS CONTINUOUSLY. NOTE: IMMEDIATELY UNPLUG HORN RELAY IN THE POWER DISTRIBUTION CENTER (PDC)	(1) HORN RELAY INOPERATIVE.	(1) REPLACE HORN RELAY.
	(2) HORN CONTROL CIRCUIT TO RELAY SHORTED TO GROUND.	(2) CHECK TERMINAL 41 IN PDC FOR CONTINUITY TO GROUND. IF CONTINUITY TO GROUND INDICATES: (A) STEERING WHEEL HORN SWITCH/LEAD SHORTED TO GROUND. (B) WIRING HARNESS SHORTED TO GROUND. FIND THE SHORT AND REPAIR AS NECESSARY.

HORN SYSTEM (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
	(3) PINCHED HORN SWITCH WIRE UNDER DRIVER AIRBAG MODULE.	(3) REPLACE DRIVER AIRBAG.
	(4) HORN SWITCH INOPERATIVE	(4) REPLACE DRIVER AIRBAG.
HORN SOUND INTERMITTENTLY AS THE STEERING WHEEL IS TURNED.	(1) HORN RELAY CONTROL CIRCUIT X3 IS SHORTED TO GROUND INSIDE STEERING WHEEL.	(1) REMOVE DRIVER AIRBAG AND/OR STEERING WHEEL. CHECK FOR RUBBING OR LOOSE WIRE/CONNECTOR, REPAIR AS NECESSARY.
	(2) PINCHED HORN SWITCH WIRE UNDER DRIVER AIRBAG	(2) REPLACE DRIVER AIRBAG.
	(3) HORN SWITCH INOPERATIVE.	(3) REPLACE DRIVER AIRBAG.
HORN DOES NOT SOUND	(1) CHECK FUSE 18 IN PDC	(1) REPLACE FUSE IF BLOWN REPAIR AS NECESSARY.
	(2) NO VOLTAGE AT HORN RELAY TERMINALS 40 & 39, AND FUSE IS OK.	(2) NO VOLTAGE, REPAIR PDC AS NECESSARY.
	(3) OPEN CIRCUIT FROM TERMINAL 43 OF THE HORN RELAY TO HORN SWITCH X3 CIRCUIT.	(3) REPAIR CIRCUIT AS NECESSARY.
	(4) HORN INOPERATIVE.	(4) IF VOLTAGE AT HORN WHEN HORN SWITCH IS PRESSED, REPLACE HORN.
	(5) HORN SWITCH INOPERATIVE	(5) REPLACE DRIVER AIRBAG.
FUSE BLOWS WHEN HORN SOUNDS	(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 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 40 & 39 AND THE FUSE TERMINAL. REPAIR AS NECESSARY.

HORN

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 System Test. 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.

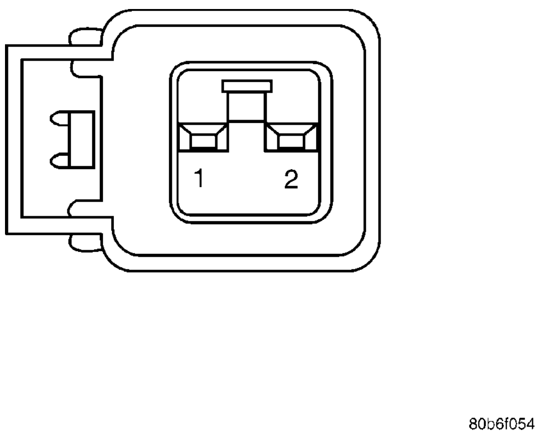

Fig. 1 Horn Harness Connector

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove the right side headlamp (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ HEADLAMP UNIT - REMOVAL).
(3) Disconnect the harness connector.
(4) Remove the one screw holding the horn assembly to vehicle (Fig. 2).

INSTALLATION

(1) Install horn assembly to the vehicle.
(2) Reconnect the harness connector.
(3) Install the headlamp (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).
(4) Connect the battery negative cable.

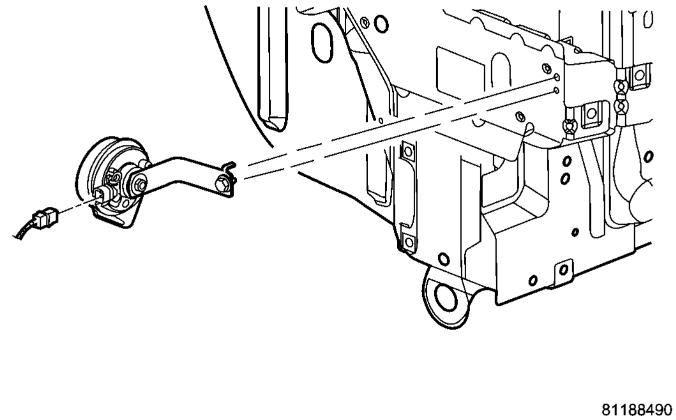

Fig. 2 HORN MOUNTING

HORN SWITCH

DESCRIPTION

The horn switch is mounted between the outer and inner cover of the Driver Airbag.

OPERATION

When the Driver Airbag is pressed, the horn switch makes contact to ground. The ground signal is carried to the horn relay and the horn sounds.

DIAGNOSIS AND TESTING - HORN SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY 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.

(1) Remove horn relay from the Power Distribution Center.
(2) Using ohmmeter, connect one lead to ground and the other lead to cavity 41 of the power distribution center. Refer to Wiring Diagrams.
(3) Depress horn switch, should have continuity. If no continuity go to Step 4.
(4) Test continuity at horn switch, remove the Driver Airbag. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
(5) Using ohmmeter, connect one lead to the airbag module ground and the other lead to B+ wire.
(6) Depress horn switch, and the meter should show continuity. If no continuity, replace the Driver Airbag. If OK, repair as necessary.

HORN SWITCH (Continued)

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY 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.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the Driver Airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(3) Clip off strap tie holding the horn switch wire to the airbag.

(4) Remove the horn switch wire connector from airbag.

(5) Remove four torx screws from top side of airbag.

(6) Fold airbag module cover down to expose the horn switch.

(7) Lift the horn switch off indexing tabs and remove from vehicle.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY 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.

(1) Install horn switch to the indexing tabs on the airbag.

(2) Install screws to the top of airbag.

(3) Reconnect horn switch connector to airbag.

(4) Install the airbag module (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

(5) Connect the battery negative cable.

IGNITION CONTROL

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IGNITION CONTROL

DESCRIPTION - IGNITION SYSTEM

NOTE: All 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 ignition system used on these engines is referred to as the Direct Ignition System (DIS). The system's three main components are the coils, crankshaft position sensor, and camshaft position sensor. If equipped with the coil on plug ignition system it utilizes an ignition coil for every cylinder, it is mounted directly over the each spark plug.

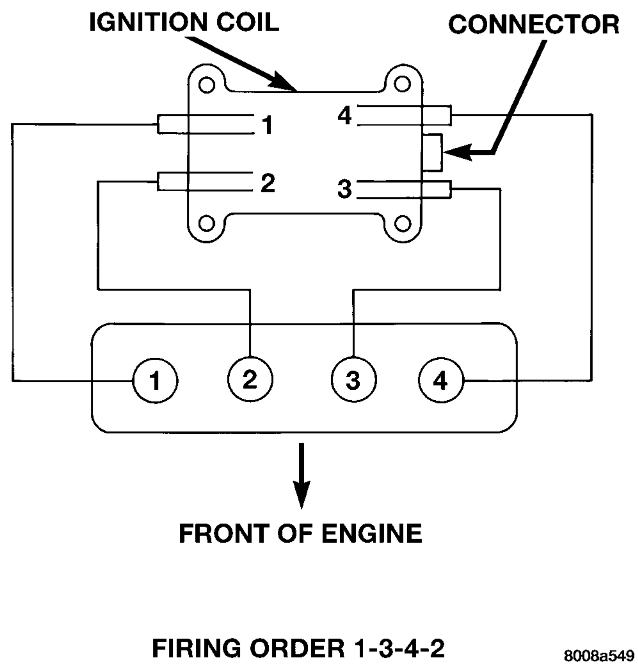
OPERATION - IGNITION SYSTEM

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 engine position from these sensors. The PCM calculates injector sequence and ignition timing from crankshaft & camshaft position. For a description of both sensors, refer to Camshaft Position Sensor and Crankshaft Position Sensor.

IGNITION CONTROL (Continued)

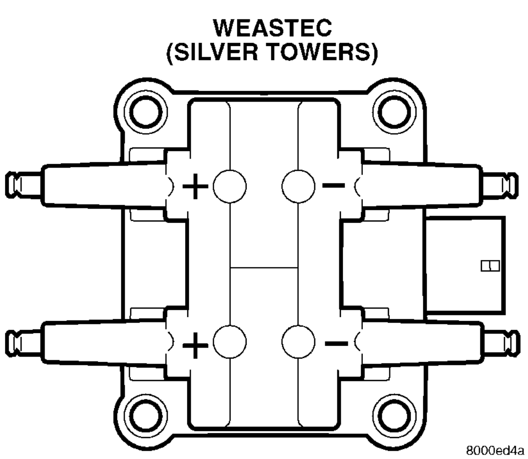
SPECIFICATIONS

FIRING ORDER - 2.0/2.4/2.4 TURBO

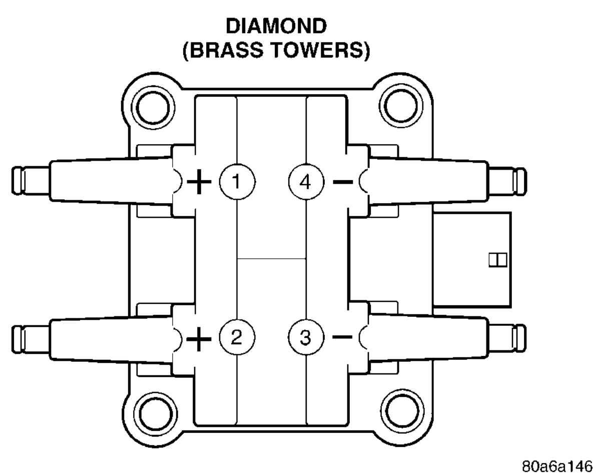


IGNITION COIL

Coil Manufacture	Primary Resistance at 21°C-27°C (70°F-80°F)	Secondary Resistance at 21°C-27°C (70°F-80°F)
Weastec (Steel Towers)	0.45 to 0.65 Ohms	11,500 to 13,500 Ohms
Diamond (Brass Towers)	0.53 to 0.65 Ohms	10,900 to 14,700 Ohms



Coil Polarity



Coil Polarity

IGNITION CONTROL (Continued)

SPARK PLUG CABLE RESISTANCE

1.6L

CABLE	RESISTANCE
#1	2746 ohms— 8533 ohms
#2	2532 ohms— 7352 ohms
#3	3386 ohms— 10,453 ohms
#4	3632 ohms— 11,191 ohms

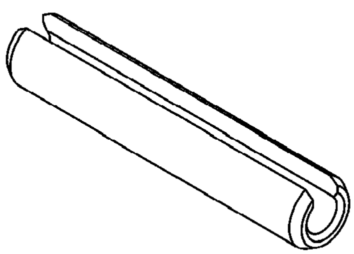
2.0/2.4L

CABLE	RESISTANCE
#1, #2, #3, #4	2280 ohms— 7290 ohms

2.4L TURBO

CABLE	RESISTANCE
#1,#2, #3	2280 ohms— 7290 ohms
#4	2686 ohms— 8062 ohms

SPECIAL TOOLS - EXPORT



PROTECTIVE SLEEVE

AUTOMATIC SHUT DOWN RELAY

DESCRIPTION

The ASD relay is located in the PDC (Fig. 1). The inside top of the PDC cover has label showing relay and fuse identification.

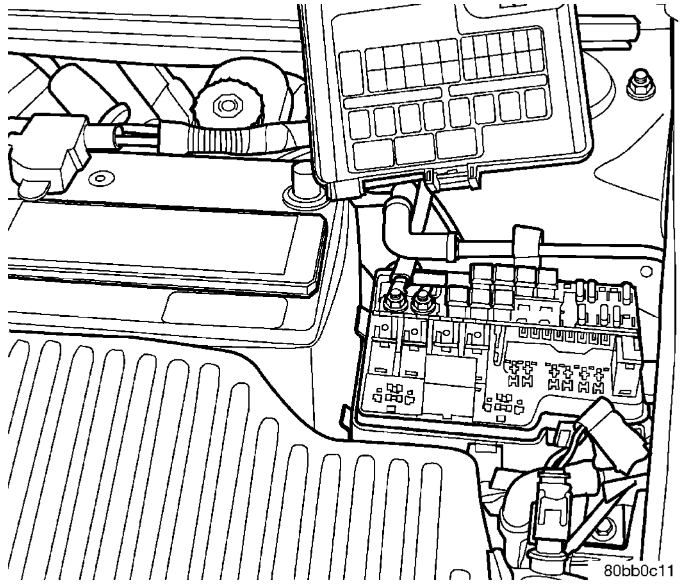


Fig. 1 Power Distribution Center (PDC)

OPERATION

The Automatic Shutdown (ASD) relay supplies battery voltage to the fuel injectors, electronic ignition coil and the heating elements in the oxygen sensors.

A buss bar in the Power Distribution Center (PDC) supplies voltage to the solenoid side and contact side of 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 the 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. When the ignition switch is in On or Start, 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.

AUTOMATIC SHUT DOWN RELAY (Continued)

REMOVAL

The relay is located in the Power Distribution Center (PDC) (Fig. 2). 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.

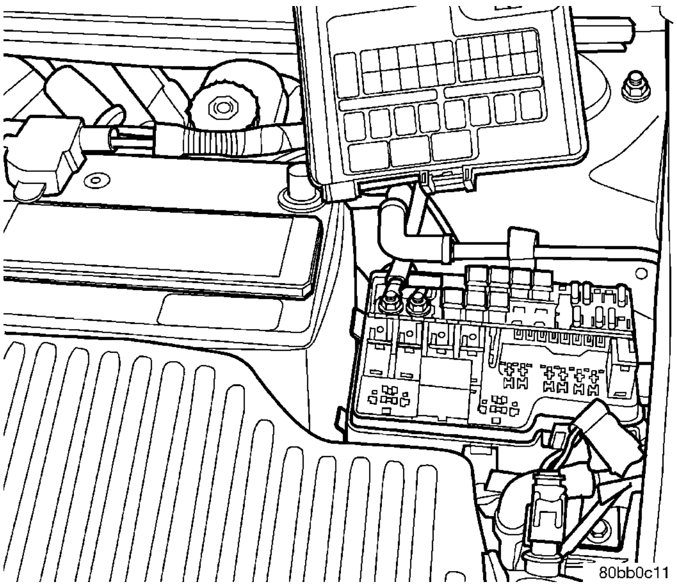


Fig. 2 Power Distribution Center (PDC)

CAMSHAFT POSITION SENSOR

DESCRIPTION

On 2.0/2.4L engines the camshaft position sensor attaches to the rear of the cylinder head. On 1.6L engines it is mounted on the front side of the cylinder head. The PCM determines fuel injection synchronization and cylinder identification from inputs provided by the camshaft position sensor (Fig. 3) and crankshaft position sensor. From the two inputs, the PCM determines crankshaft position.

OPERATION

The PCM sends approximately 5 volts to the hall affect sensor. This voltage is required to operate the hall effect chip and the electronics inside the sensor. A ground for the sensor is provided through the sensor return circuit. The input to the PCM occurs on a 5 volt output reference circuit.

On 2.0/2.4L engines a target magnet attaches to the rear of the camshaft and indexes to the correct position. The target magnet has fourteen different poles arranged in an asymmetrical pattern (Fig. 4). As the target magnet rotates, the camshaft position sensor senses the change in polarity (Fig. 5). The sensor output switch switches from high (5.0 volts) to

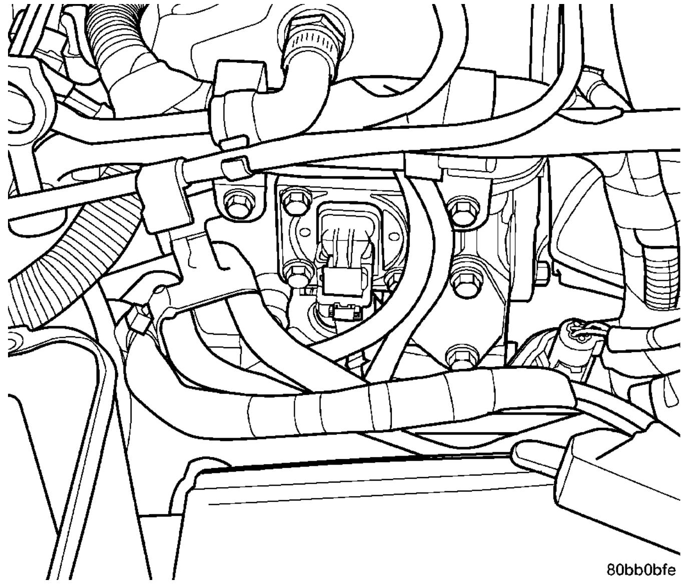


Fig. 3 Camshaft

low (0.5 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.

On 1.6L a raised platform on the cam sprocket serves as a target. When the sensor detects the step, the input voltage from the sensor to the PCM switches from high (5 volts) to low (0.3 volts). As the step returns away from the sensor, the input voltage switches back to high (5 volts).

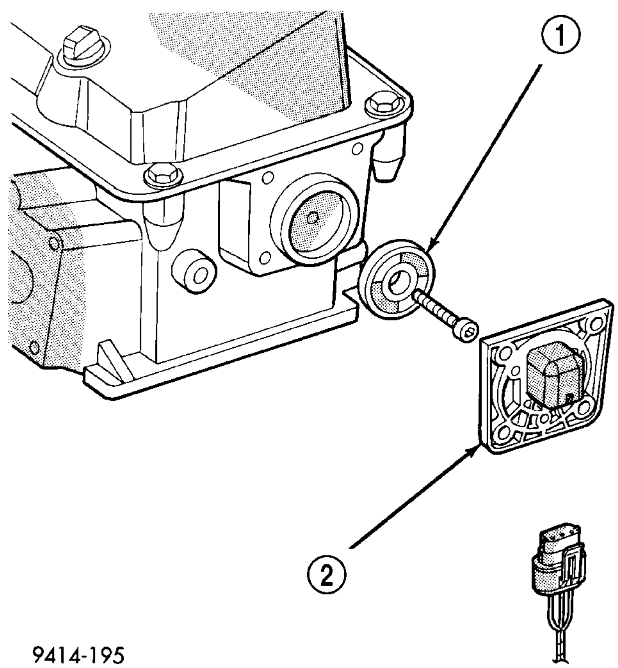


Fig. 4 Target Magnet—Typical

1 - CAM MAGNET/TARGET
2 - CAMSHAFT POSITION SENSOR

CAMSHAFT POSITION SENSOR (Continued)

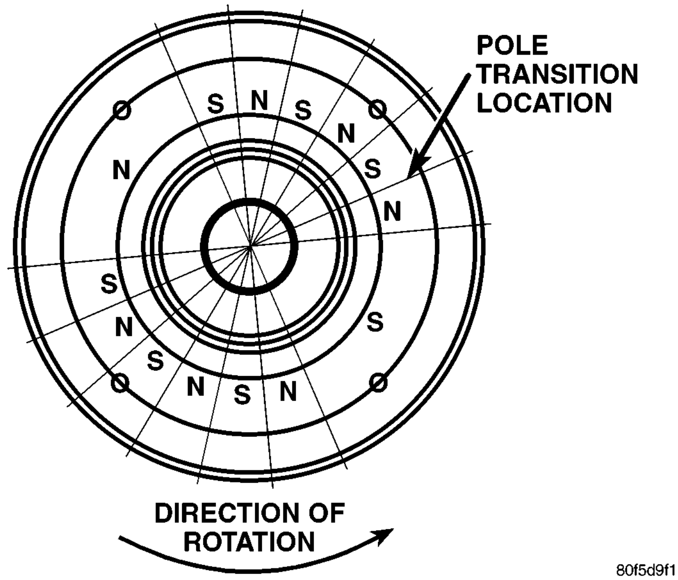


Fig. 5 Target Magnet Polarity

1 - TARGET MAGNET

The sensor also acts as a thrust plate to control camshaft endplay.

REMOVAL

REMOVAL - 1.6L

(1) Disconnect the negative battery cable.

(2) Relocate the fuel line and radiator over flow hose (Fig. 6) and (Fig. 7).

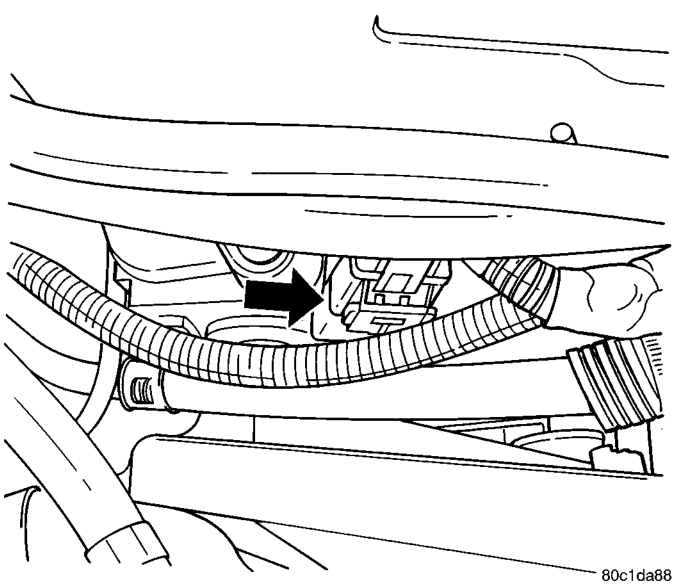


Fig. 6 CAMSHAFT POSITION SENSOR LOCATION

(3) Disconnect the electrical connector from the camshaft sensor.

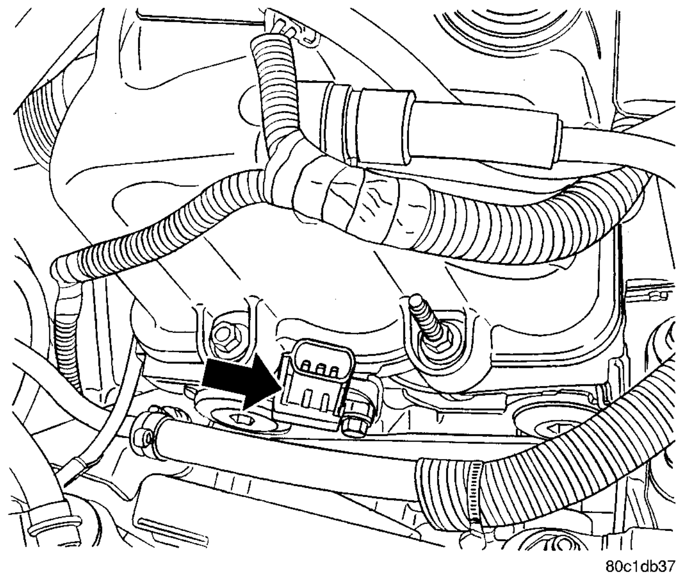


Fig. 7 CAMSHAFT ACCESS

(4) Remove the 2 bolts from the powersteering reservoir and relocate.

(5) Remove 1 screws from sensor.

(6) Remove sensor (Fig. 8).

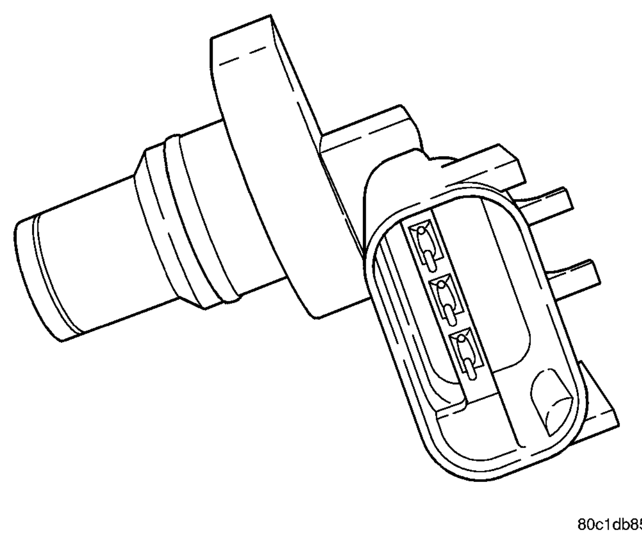


Fig. 8 CAMSHAFT POSITION SENSOR

REMOVAL - 2.0L

The camshaft position sensor is mounted to the rear of the cylinder head (Fig. 9).

(1) Remove brake booster hose and electrical connector from holders on end of cylinder head cover and reposition.

(2) Disconnect electrical connectors from camshaft position sensor.

(3) Remove camshaft position sensor mounting screws. Remove sensor.

CAMSHAFT POSITION SENSOR (Continued)

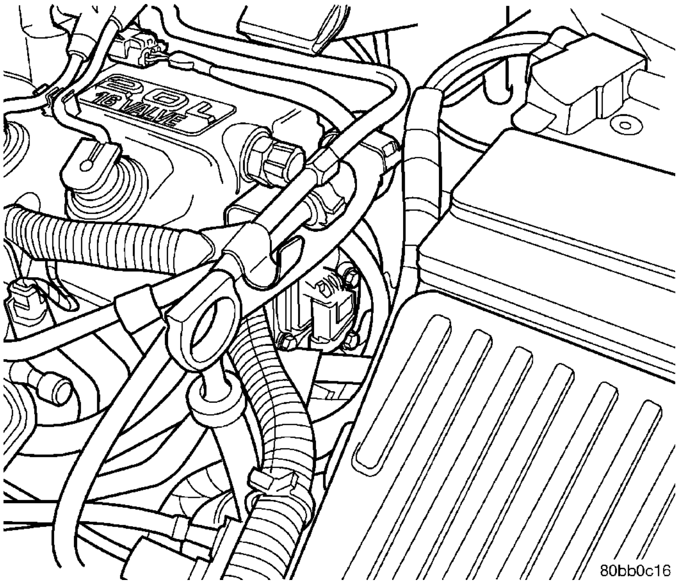


Fig. 9 Camshaft Position Sensor Location

(4) Loosen screw attaching target magnet to rear of camshaft (Fig. 10).

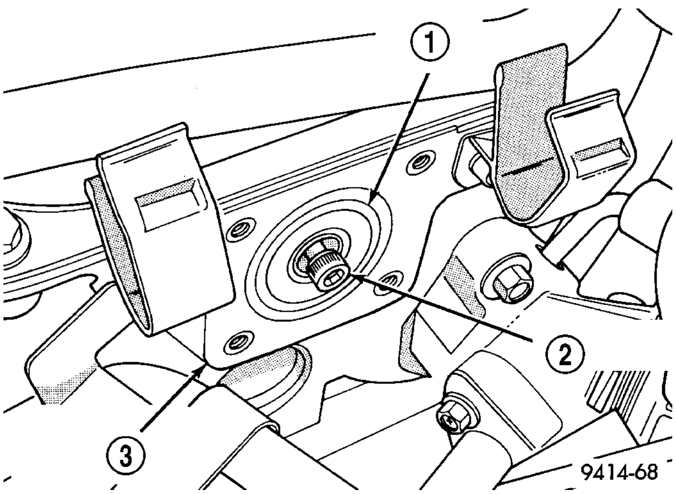


Fig. 10 Target Magnet Removal/Installation

1 - TARGET MAGNET
2 - MOUNTING BOLT
3 - REAR OF CYLINDER HEAD

INSTALLATION

INSTALLATION - 1.6L

(1) Install sensor to cylinder head (Fig. 8).

(2) Tighten screws to 9 N·m (80 in. lbs.).

(3) Connect the electrical connector to the sensor (Fig. 7).

(4) Relocate and install the 2 bolts to the power-steering reservoir.

(5) Relocate the fuel line and radiator over flow hose (Fig. 6).

(6) Connect the negative battery cable

INSTALLATION - 2.0L

The camshaft position sensor is mounted to the rear of the cylinder head (Fig. 9).

The target magnet has two locating dowels that fit into machined locating holes in end of the camshaft.

(1) Install target magnet in end of camshaft. Tighten mounting screw to 3.4 N·m (30 in. lbs.) torque. Over torquing could cause cracks in magnet. If magnet cracks replace it.

(2) Install camshaft position sensor. Tighten sensor mounting screws to 9 N·m (80 in. lbs.) torque.

(3) Place brake booster hose and electrical harness in holders on end of valve cover.

(4) Attach electrical connectors to camshaft position sensor.

IGNITION COIL

DESCRIPTION

The coil pack consists of 2 coils molded together. The coil pack is mounted on the valve cover (Fig. 11).

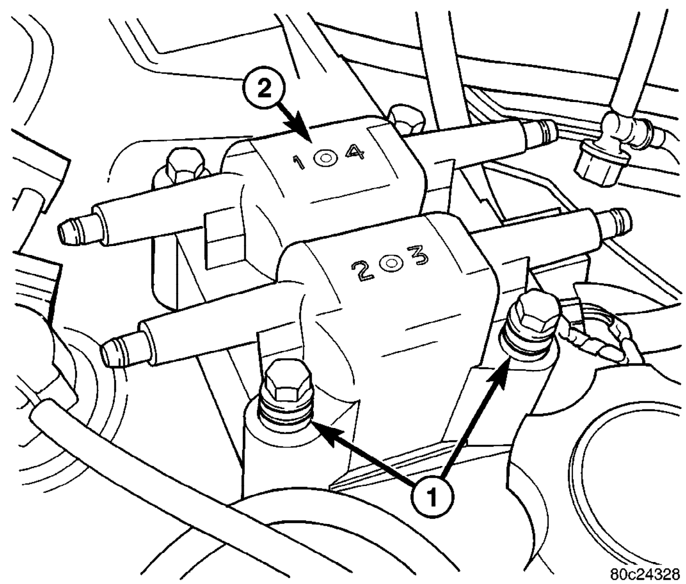


Fig. 11 Ignition Coil Pack

1 - RUBBER INSULATORS
2 - COIL

OPERATION

WARNING: THE DIRECT IGNITION SYSTEM GENERATES APPROXIMATELY 40,000 VOLTS. PERSONAL INJURY COULD RESULT FROM CONTACT WITH THIS SYSTEM.

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

IGNITION COIL (Continued)

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.

REMOVAL

REMOVAL - 1.6L

NOTE: The 1.6L is attached with a rubber isolator system. Care must be exercised in retaining all the pieces and reinstalling in the order they where removed.

The electronic ignition coil pack attaches directly to the valve cover (Fig. 12).

(1) Disconnect the negative battery cable.

(2) Remove the 4 spark plug cables, twist the cables to remove.

(3) Remove the 4 bolts.

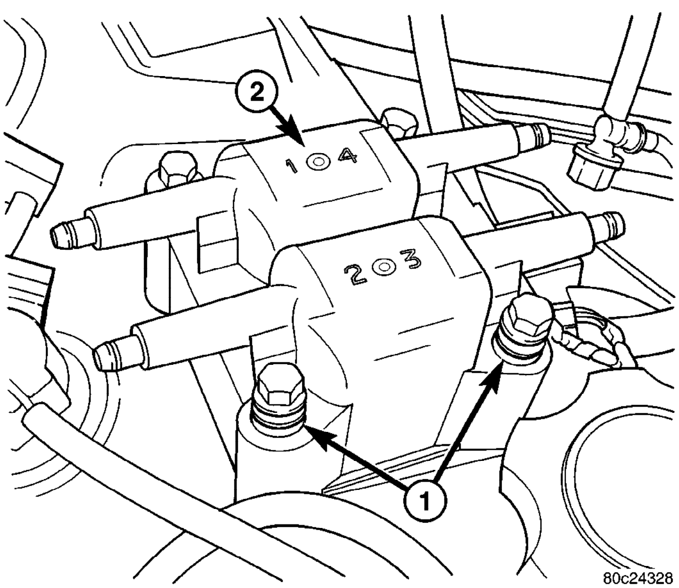


Fig. 12 IGNITION COIL

1 - RUBBER INSULATORS
2 - COIL

(4) Remove the coil.

(5) Remove the rubber insulators from the valve cover, they will be required for installation.

REMOVAL - 2.0L

The electronic ignition coil pack attaches directly to the valve cover (Fig. 14).

(1) Disconnect electrical connector from coil pack (Fig. 13).

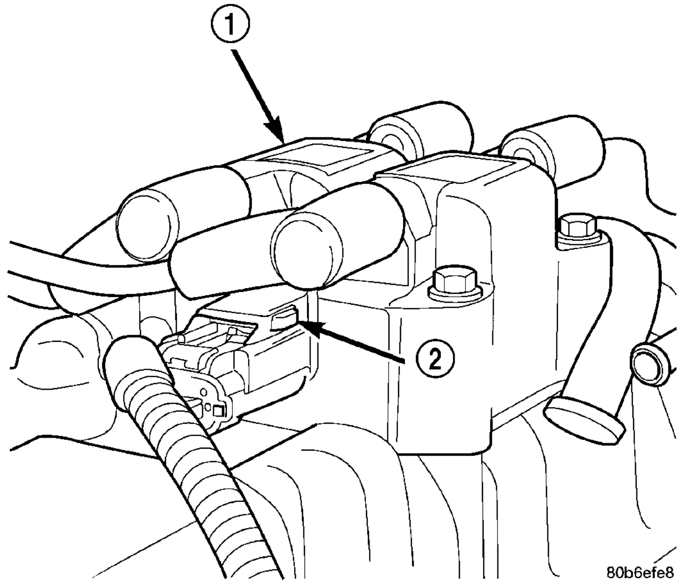


Fig. 13 Electronic Ignition Coil Connector

1 - COIL
2 - LOCKING TAB

(2) Remove coil pack mounting bolts.

(3) Remove coil pack.

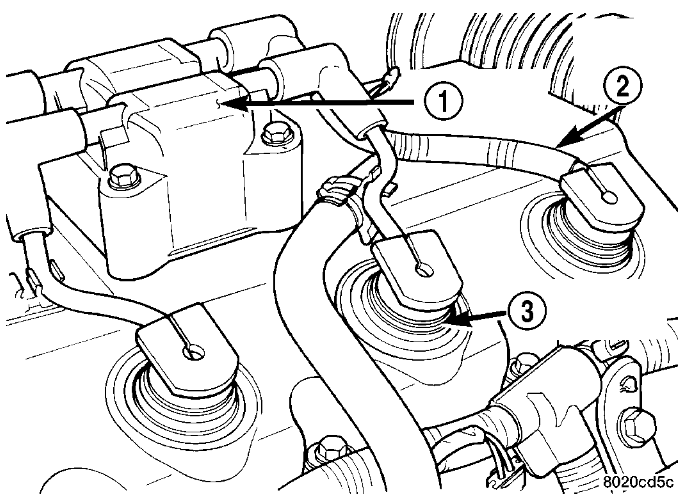


Fig. 14 Electronic Ignition Coil Pack

1 - IGNITION COILS
2 - SPARK PLUG CABLE
3 - SPARK PLUG INSULATOR

IGNITION COIL (Continued)

INSTALLATION

INSTALLATION - 1.6L

Make sure that the rubber insulators are in place both on the top and bottom of the coil bolts.

(1) Install coil and insulators (Fig. 15).

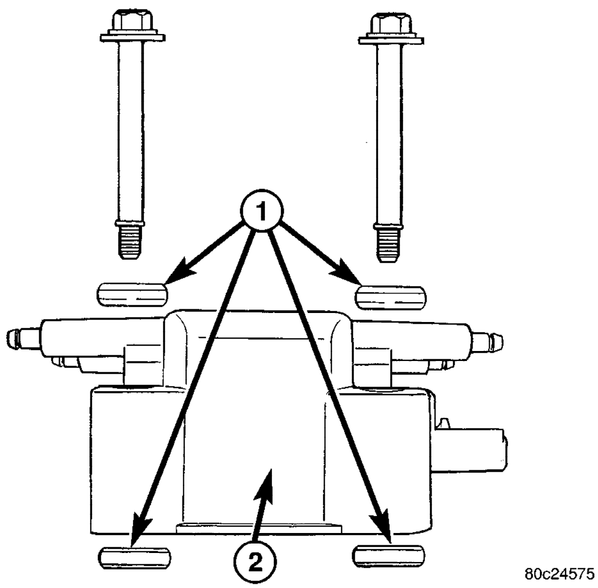


Fig. 15 RUBBER INSULATORS AND COIL

1 - Rubber Insulators
2 - Coil

(2) Tighten bolts to 12 N·m (105 ±20 in. lbs.).

(3) Install spark plug cables.

(4) Connect the negative battery cable.

INSTALLATION - 2.0L

The electronic ignition coil pack attaches directly to the valve cover (Fig. 14).

(1) Install coil pack on valve cover. Tighten the bolts to 11.8 N·m (105 ±20 in. lbs.).

(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.

(3) Connect the negative battery cable.

KNOCK SENSOR

DESCRIPTION

The knock sensor is bolted to the cylinder block. The knock sensor is designed to detect engine vibration that is caused by detonation or preignition.

OPERATION

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 intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

The voltage signal produced by the knock sensor increases with the amplitude of vibration. The PCM receives as an input the knock sensor voltage signal. If the signal rises above a predetermined level, the PCM will store that value in memory and retard ignition timing to reduce engine knock. If the knock sensor voltage exceeds a preset value, the PCM retards ignition timing for all cylinders. It is not a selective cylinder retard.

The PCM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Knock retard uses its own short term and long term memory program.

Long term memory stores previous detonation information in its battery-backed RAM. The maximum authority that long term memory has over timing retard can be calibrated.

Short term memory is allowed to retard timing up to a preset amount under all operating conditions (as long as rpm is above the minimum rpm) except WOT. The PCM, using short term memory, can respond quickly to retard timing when engine knock is detected. Short term memory is lost any time the ignition key is turned off.

NOTE: Over or under tightening affects knock sensor performance, possibly causing improper spark control.

KNOCK SENSOR (Continued)

REMOVAL

REMOVAL - 1.6L

(1) Disconnect the negative battery cable.
(2) Remove the fuel rail cover (Fig. 16).

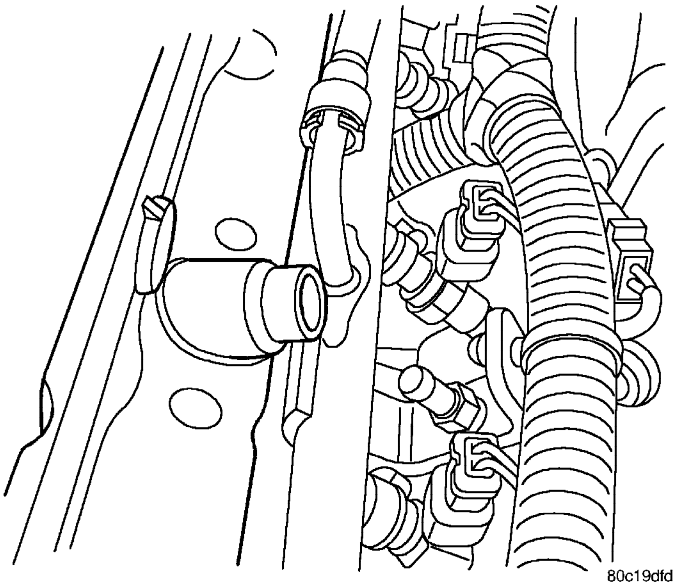


Fig. 16 FUEL RAIL COVER

(3) Locate the electrical connector (Fig. 17).

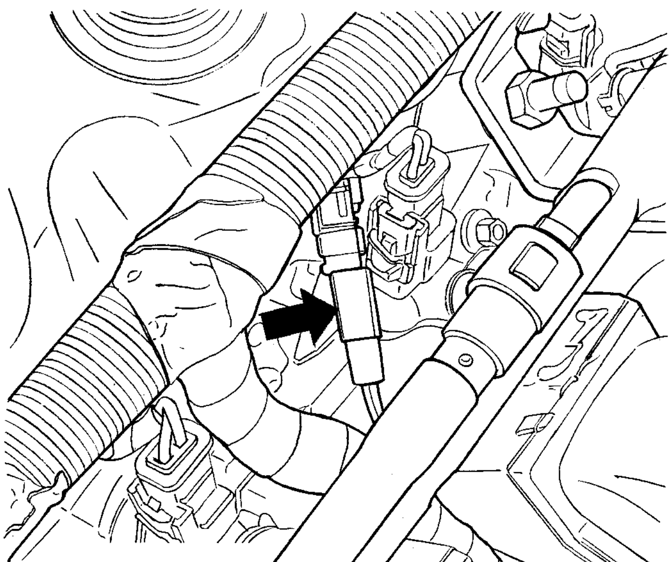


Fig. 17 CONNECTOR LOCATION

(4) Disconnect the electrical connector (Fig. 18).

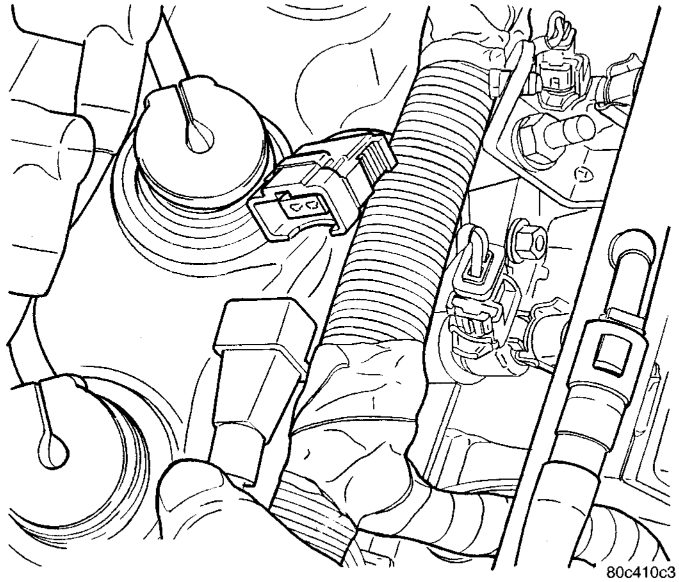


Fig. 18 ELECTRICAL CONNECTOR

(5) Remove the bolt holding the sensor (Fig. 19).

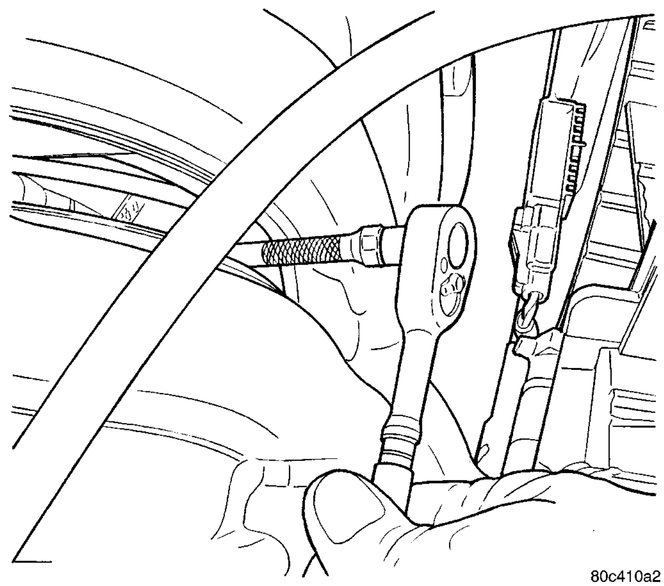


Fig. 19 KNOCK SENSOR

(6) Remove the sensor (Fig. 20).

KNOCK SENSOR (Continued)

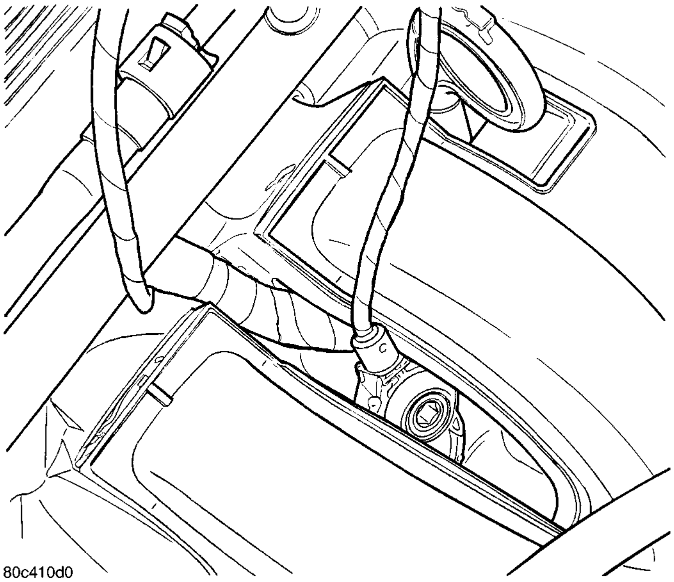


Fig. 20 KNOCK SENSOR REMOVAL/INSTALLATION

REMOVAL - 2.0/2.4/2.4 TURBO/2.4L SRT-4

The knock sensor bolts into the side of the cylinder block in front of the starter under the intake manifold (Fig. 21).

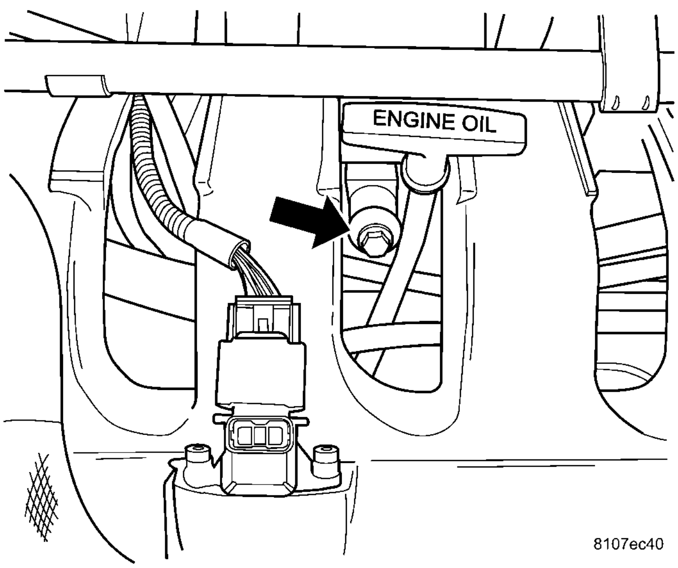


Fig. 21 KNOCK SENSOR LOCATION

(1) Disconnect the negative battery cable.
(2) Disconnect electrical connector from knock sensor (Fig. 22).
(3) Remove the bolt holding the knock sensor
(4) Remove the knock sensor (Fig. 23).

REMOVAL - 2.0L

The knock sensor bolts into the side of the cylinder block in front of the starter under the intake manifold.

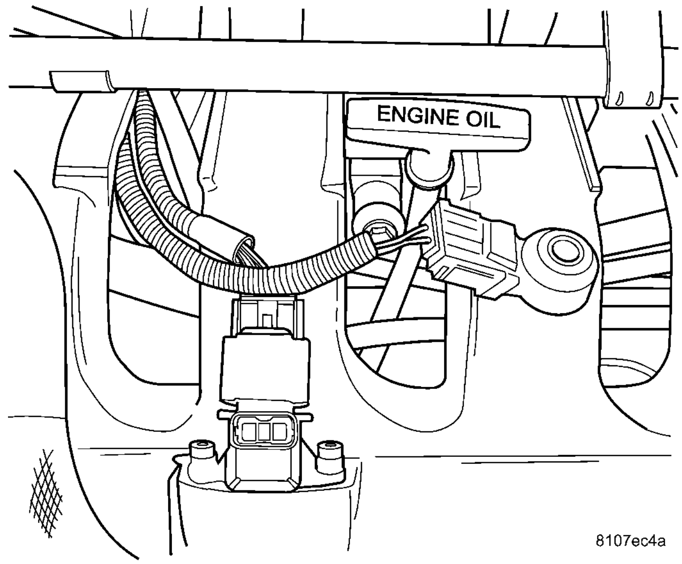


Fig. 22 KNOCK SENSOR REMOVED

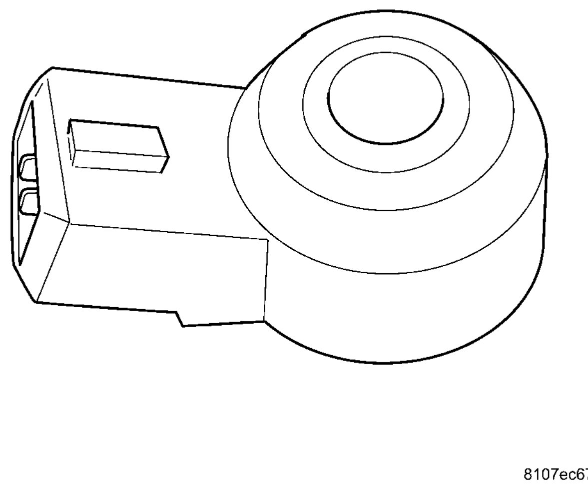


Fig. 23 KNOCK SENSOR

(1) Disconnect electrical connector from knock sensor.
(2) Use a crow foot socket to remove the knock sensors.

INSTALLATION

INSTALLATION - 1.6L

(1) Install the sensor (Fig. 20).
(2) Install knock sensor (Fig. 19). Tighten knock sensor bolt to 22 N·m (195 in. lbs.) torque. **Over or under tightening effects knock sensor performance resulting in possible improper spark control.**
(3) Locate the electrical connector (Fig. 17).

KNOCK SENSOR (Continued)

(4) Connect the heretical connector (Fig. 18).
(5) Install the fuel rail cover (Fig. 16).
(6) Connect the negative battery cable.

INSTALLATION - 2.0/2.4/2.4 TURBO/2.4L SRT-4

The knock sensor bolts into the side of the cylinder block in front of the starter under the intake manifold.

(1) Install knock sensor (Fig. 23). Tighten knock sensor bolt to 22 N·m (195 in. lbs.) torque. **Over or under tightening effects knock sensor performance, possibly causing improper spark control.**

(2) Attach electrical connector to knock sensor (Fig. 22).

(3) Connect the negative battery cable.

INSTALLATION - 2.0L

The knock sensor bolts into the side of the cylinder block in front of the starter.

(1) Install knock sensor. Tighten knock sensor bolt to 22 N·m (195 in. lbs.) torque. **Over or under tightening effects knock sensor performance, possibly causing improper spark control.**

(2) Attach electrical connector to knock sensor.

SPARK PLUG

DESCRIPTION

The engines uses resistor spark plugs. For spark plug identification and specifications, refer to Specifications.

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.

Spark plugs that have low mileage may be cleaned and reused if not otherwise defective. Refer to the Spark Plug Condition section of this group. After cleaning, file the center electrode flat with a small point file or jewelers file. Adjust the gap between the electrodes (Fig. 24) to the dimensions specified in the chart at the end of this section by bending the ground electrode (just above the attachment weld) with the appropriate tool.

Never apply any force between the electrode or damage to the center electrode assembly will result.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion and damage. Tighten spark plugs to 28 N·m (20 ft. lbs.) torque.

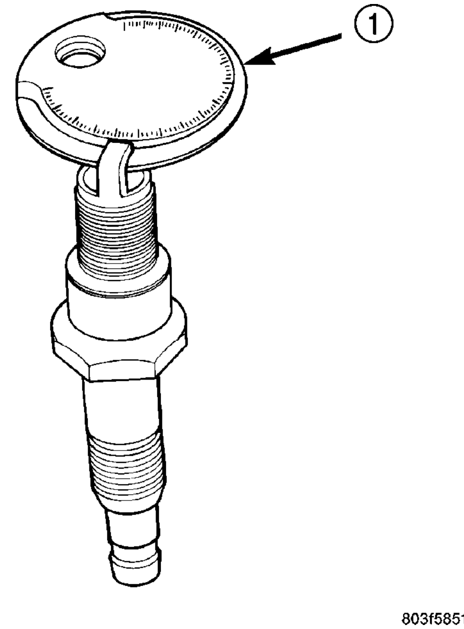


Fig. 24 Checking Spark Plug Electrode Gap

1 - TAPER GAUGE

REMOVAL

REMOVAL - 1.6L

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.

REMOVE CABLES FROM COIL FIRST.

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 and special tool # 8448 (Fig. 25) on the extention to keep from damageing the spark plug tubes in the cylinder head and valve cover.

(2) Inspect the spark plug condition.

REMOVAL - 2.0/2.4L

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.

REMOVE CABLES FROM COIL FIRST.

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.

SPARK PLUG (Continued)

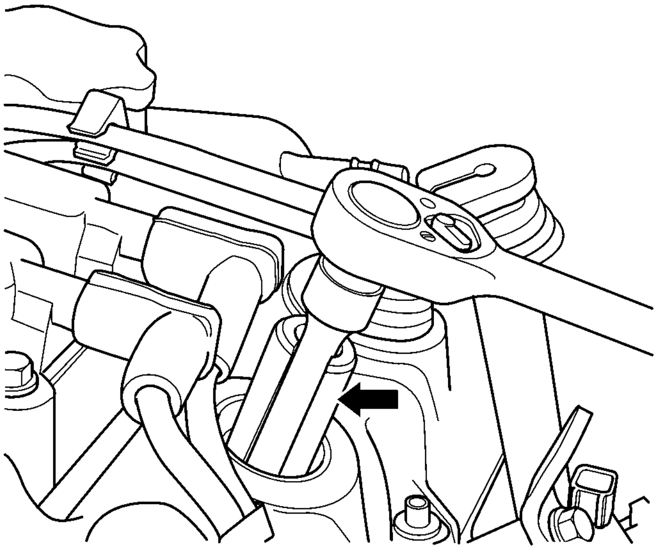


Fig. 25 SPECIAL TOOL # 8448

INSTALLATION

INSTALLATION - 1.6L

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.

(1) To avoid cross threading, start the spark plug into the cylinder head by hand.

(2) Use special tool 8448 (Fig. 25) to install and tighten the spark plug. 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) Reconnect to coil.

INSTALLATION - 2.0/2.4L

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.

(1) To avoid cross threading, start the spark plug into the cylinder head by hand.

(2) Tighten spark plugs to 17.6 N·m +/- 2 (13 +/- 2 ft. lbs.) torque.

WARNING: The tapered seat plugs for this application are torque-critical! It is imperative that 17.6 N·m +/- 2 (13 +/- 2 ft. lbs.) is NOT exceeded!

(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) Reconnect to coil.

SPARK PLUG CABLE

DESCRIPTION

Spark Plug cables are sometimes referred to as secondary ignition wires. The wires transfer electrical current from the ignition coil pack to individual spark plugs at each cylinder. The resistive spark plug cables are of nonmetallic construction. The cables provide suppression of radio frequency emissions from the ignition system.

Check the spark plug cable connections for good contact at the coil, and spark plugs. Terminals should be fully seated. The insulators should be in good condition and should fit tightly on the coil, and spark plugs. Spark plug cables with insulators that are cracked or torn must be replaced.

Clean Spark Plug cables with a cloth moistened with a non-flammable solvent. Wipe the cables dry. Check for brittle or cracked insulation. The spark plug cables and spark plug boots are made from high temperature materials.

REMOVAL

REMOVAL - 1.6L

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.

Remove spark plug cable from coil first.

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.

REMOVAL - 2.0/2.4L

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.

Remove spark plug cable from coil first.

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.

INSTALLATION - 2.0/2.4L

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. Install spark plug insulators over spark plugs. Ensure the top of the spark plug insulator covers the upper end of the spark plug tube, then connect the other end to coil pack.

INSTRUMENT CLUSTER

TABLE OF CONTENTS

INSTRUMENT CLUSTER

DESCRIPTION

There are four conventional instrument cluster assemblies available. The clusters electronically drive the speedometer, odometer, gauges, and tachometer (if equipped).

- Base
- Premium - Base cluster with tachometer and Low Fuel indicator.
- Luxury - Same features as Premium with black overlay and chrome rings.
- Autostick - Luxury cluster with Autostick.

The overlays for premium, luxury, and autostick clusters have the same indicator layout.

The cluster speedometer, tachometer, and engine coolant temperature gauges are positioned using Programmable Communication Interface (PCI) bus messages received from the Powertrain Control Module (PCM). The fuel level information is calculated by the cluster based on a hard wire input from the fuel level sensor in the fuel pump module.

INDICATORS

The instrument cluster has indicators for the following systems:

- Front Fog Lamp
- Rear Fog Lamp (if so equipped)
- Brake
- ABS (if so equipped)
- Cruise (if so equipped)
- Door
- Left Turn Signal
- Right Turn Signal
- High Beam
- Malfunction Indicator Lamp (MIL)
- Low Oil Pressure
- Low Fuel Indicator
- Seat Belt
- Battery
- Airbag
- Security (if so equipped)

The mileage and message display is composed of six, 7-segment displays and a decimal point. The display may show the odometer mileage, the trip odometer mileage, P-codes, “no buS” for loss of bus communication, and “FUSE” for loss of battery fuse.

- PRND/Autostick (if so equipped) - The PRND/ Autostick display is controlled by the transmission control module (TCM). The cluster will illuminate the appropriate PRND/gear based upon the message received by the TCM.

The instrument cluster warning/indicator lamps are all serviceable Light Emitting Diodes (LED’s). The instrument cluster must first be removed, and then the defective LED just turns out with needle nose pliers.

ILLUMINATION LAMPS

The high beam indicator, turn signals, and illumination bulbs are serviceable. The instrument cluster must first be removed, and then the defective bulb and socket turns out. The bulb locations are printed on the back cover of the instrument cluster.

OPERATION

The instrument cluster controls the courtesy lamps, it receives and sends messages to other modules via the Programmable Communication Interface (PCI) data bus circuit, it controls all the instrument illumination and the chime is also an integral part of the cluster. The front turn signals are wired through the cluster and then go to the front lamps.

All gauges in the electronic clusters are the analog type gauges. When the ignition switch is moved to

INSTRUMENT CLUSTER (Continued)

the OFF position, the cluster drives each gauge to its lowest position. The individual gauges are not serviceable and require complete replacement of the cluster if one or more gauges are inoperable.

NOTE: If any of the gauge pointers are stuck on the wrong side of the pointer stop, perform one of the following:

- **Pull the M1 fuse in the fuseblock (refer to Wiring Diagrams for fuse locations) and key on. The gauge pointer will "sweep" the gauges and return all pointers to the correct side of the stop. Key OFF, reinsert the M1 fuse. The cluster will "sweep" the gauges one additional time. The cluster will "sweep" the gauges anytime there was a change in the state of the M1 fuse.**
- **Perform the instrument self-diagnostic check (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - STANDARD PROCEDURE). This will "sweep" all the pointers to the correct side of the pointer stop.**

One button is used to switch the display from trip to total mileage. Holding the button when the display is in the trip mode will reset the trip mileage. This button is also used to put the cluster in self-diagnostic mode. Refer to Electrical, Instrument Cluster, Standard Procedures- Cluster Self-Diagnostics. Most of the indicators will come on briefly for a bulb check when the ignition is turned from OFF to ON. All of the LED's are replaceable.

The cluster calculates the appropriate odometer mileage based on PCI bus information received from the PCM. The VF display also displays the "Door" and "Cruise" messages. If the instrument cluster experiences a loss of communication with the PCI bus, the cluster will display "no buS" in the display. If the cluster determines that there is not 8.0 volts at the battery input, then the cluster shall alternately display "FUSE" and the odometer mileage.

- **Front Fog Lamp** (if so equipped) - Hard wire input - Cluster will illuminate the indicator when the front fog lamp input is at Vehicle System Voltage (VSV).
- **Rear Fog Lamp** (if so equipped) - Hard wire input - Cluster will illuminate the indicator when the rear fog lamp input is at VSV.
- **Brake** - Hard wire **OR** PCI bus driven - Cluster will illuminate the indicator if the park brake switch is grounded **OR** after receiving the appropriate message from the ABS/PCM modules.
- **ABS** (if so equipped) - PCI bus driven - Cluster will illuminate the indicator after receiving the appropriate message from the ABS module.
- **Cruise** (if so equipped) - PCI bus driven - Cluster will illuminate the indicator after receiving the appropriate message from the PCM.
- **Door** - Hard wire input - Cluster will illuminate the indicator if either door input is grounded for more than 250 milliseconds.
- **Left Turn Signal** - Hard wire input - Cluster will illuminate the indicator if the left turn signal input is at VSV.
- **Right Turn Signal** - Hard wire input - Cluster will illuminate the indicator if the right turn signal input is at VSV.
- **High Beam** - Hard wire input - Cluster will illuminate the indicator whenever the high beam switch input is at VSV.
- **Malfunction Indicator Lamp (MIL)** - PCI bus driven - Cluster will illuminate the indicator after receiving the appropriate message from the PCM.
- **Low Oil Pressure** - PCI bus driven - Cluster will illuminate the indicator after receiving the appropriate message from the PCM.
- **Low Fuel Indicator** - Cluster will illuminate based upon fuel level calculated by the cluster (using data received from the hard wire input from the fuel level sensor).
- **Seat Belt** - Hard wire - Cluster will illuminate whenever the seat belt input is grounded with the ignition in RUN mode.
- **Battery** - PCI bus driven - Cluster will illuminate after receiving the appropriate message from the PCM.
- **Airbag** - PCI bus driven - Cluster will illuminate after receiving the appropriate message from the airbag control module.
- **Security** (if so equipped) - PCI bus driven - Cluster will illuminate whenever the remote keyless entry (RKE) input is grounded and the cluster has a battery feed. Cluster will flash the indicator based upon the message received from the sentry key immobilizer module (SKIM).

The 7-position dimmer switch input is used by the cluster to determine lighting intensity. the cluster transmits dimming information to other modules via the PCI bus.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - INSTRUMENT CLUSTER LAMPS

Every time the vehicle is switched to the START/RUN position, the cluster goes through a BULB CHECK. This tests most of the indicator lamps and Vacuum Fluorescent (VF) displays. If only one lamp is out, remove the instrument cluster and replace the defective bulb or Light Emitting Diode (LED). If some or all of the lamps fail to light, refer to the proper Body Diagnostics Procedures Manual.

INSTRUMENT CLUSTER (Continued)

To diagnose the cluster lamps first place the cluster in self-diagnostic mode. With the ignition switch in the OFF position, press the trip odometer reset button down. Simultaneously turn the ignition key to the ON position and release the trip reset button. All the indicator lamps and VF displays should illuminate except for the fog lamp, turn signal, and high beam select indicators.

DIAGNOSIS AND TESTING - MULTIPLE/ INDIVIDUAL GAUGES INOPERATIVE

Test speedometer, tachometer and other gauges for malfunction:

(1) Remove the cluster (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - REMOVAL).

(2) Check for ignition voltage at Pin 15 of the cluster wire harness connector (Fig. 1). Check for battery voltage at Pin 21 of the connector. If no voltage, repair as necessary.

(3) Check Pin 10 of the connector for continuity to ground. If no ground, repair as necessary.

(4) If the voltage and ground are OK, and the pins or the connectors are not damaged nor spread, replace the instrument cluster.

(5) Install cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

STANDARD PROCEDURE - SELF-DIAGNOSTICS

To put the cluster in self-diagnostic mode, press the trip odometer reset button down, and then turn the ignition to the ON position simultaneously, then release the button.

The cluster will:

- Illuminate the Light Emitting Diodes (LED's).
- Illuminate all segments in all Vacuum Fluorescent (VF) displays.
- Set the minor gauge pointers to the minimum scale reading, mid scale, and maximum scale reading. The pointer will pause at each point for a minimum of 1/2 a second.
- Set the major gauge pointers to minimum scale, 60, 120, 180 degrees, and maximum scale. The pointer will pause at each point for a minimum of 500 milliseconds.
- Return the gauge pointers to the minimum scale reading in a smooth sweep.

REMOVAL

CAUTION: The Instrument Cluster MUST be stored in a face up position or damage will occur to the gauge operation.

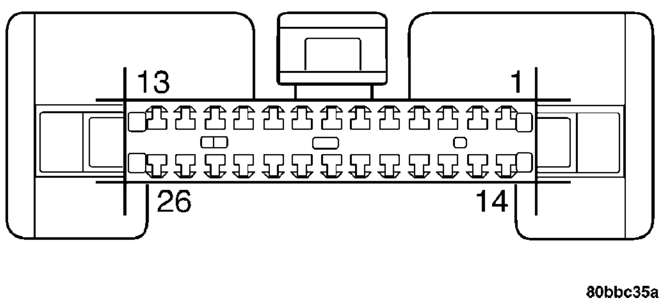


Fig. 1 CLUSTER WIRE HARNESS CONNECTOR

INSTRUMENT CLUSTER CONNECTOR PIN CALL-OUT

PIN	DESCRIPTION	PIN	DESCRIPTION
1	REAR FOG LAMP FEED	14	PARK LAMP SWITCH OUTPUT
2	PCI BUS	15	IGNITION OFF/RUN/START - FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	COURTESY LAMPS	16	LEFT TURN LAMP OUTPUT
4	SPARE - BASE CLUSTER/FOG LAMP SWITCH OUTPUT	17	RIGHT TURN LAMP OUTPUT
5	VTSS INDICATOR DRIVER	18	LEFT TURN SIGNAL INPUT
6	PANEL LAMPS DIMMER SIGNAL	19	RIGHT TURN SIGNAL INPUT
7	FUEL LEVEL SENSOR SIGNAL	20	LOW BEAM OUTPUT
8	NOT USED	21	M1 BATTERY
9	IGNITION RUN/START - AUTOSTICK ONLY	22	RED BRAKE WARNING INDICATOR DRIVER
10	GROUND	23	KEY-IN IGNITION SWITCH SENSE
11	NOT USED	24	DRIVER DOOR AJAR SWITCH SENSE
12	PANEL LAMPS DRIVER	25	SEAT BELT SWITCH SENSE
13	PASSENGER DOOR AJAR/KEYLESS ENTRY SIGNAL	26	DIMMER SWITCH HIGH BEAM OUTPUT

INSTRUMENT CLUSTER (Continued)

(1) Disconnect and isolate the battery negative cable.
(2) Remove both left and right A-Pillar trim covers.
(3) Remove the instrument panel top cover.
(4) Remove cluster bezel.
(5) Remove the four screws attaching cluster housing to the base panel (Fig. 2).
(6) Pull the cluster rearward to disconnect from base panel.
(7) Remove the cluster assembly.

INSTALLATION

CAUTION: The Instrument Cluster MUST be stored in a face up position or damage will occur to the gauge operation.

(1) Install the cluster assembly.
(2) Push the cluster forward to connect to base panel.
(3) Install the four screws attaching cluster housing to the base panel.
(4) Install the cluster bezel.
(5) Install the instrument panel top cover.
(6) Install both left and right A-Pillar trim covers.
(7) Connect the battery negative cable.

MALFUNCTION INDICATOR LAMP MIL

DESCRIPTION

Refer to the Instrument Cluster for more information.

OPERATION

The PCM supplies the malfunction indicator (check engine) lamp on/off signal to the instrument panel through the PCI Bus. The PCI Bus is a communications port. Various modules use the PCI Bus to exchange information.

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 the On-Board Diagnostics section.

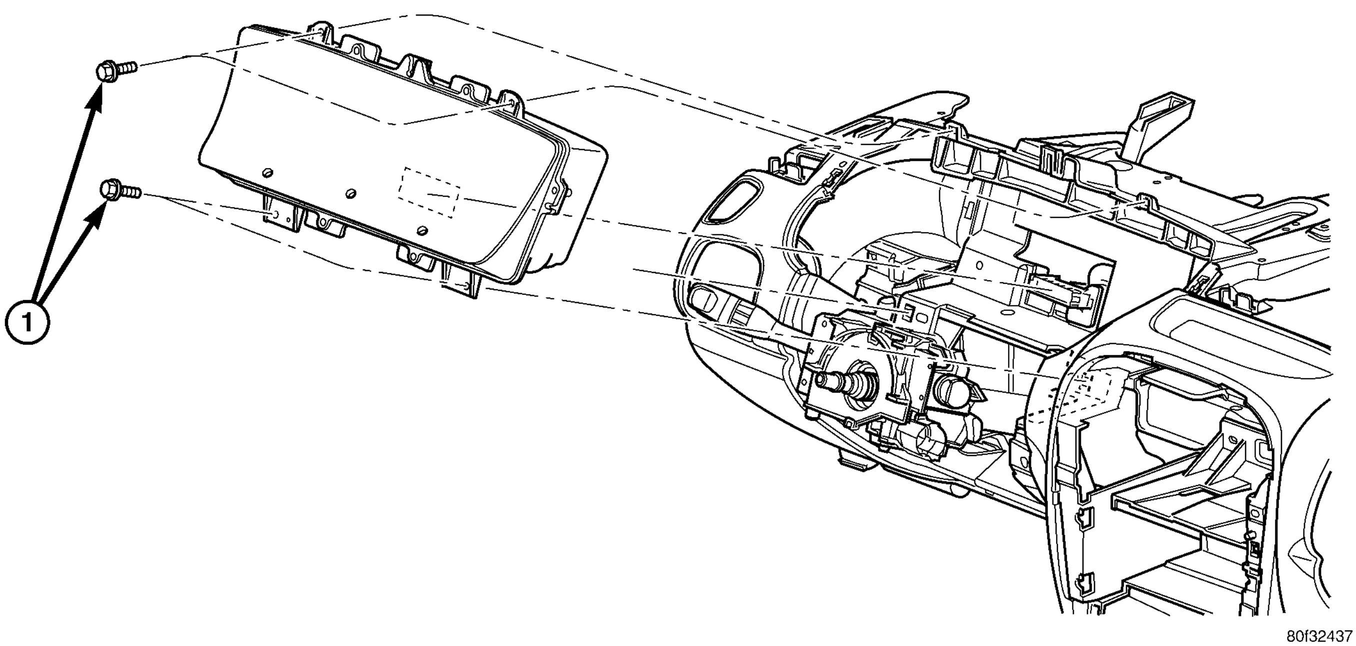


Fig. 2 INSTRUMENT CLUSTER - REMOVE/INSTALL

1 - INSTRUMENT CLUSTER RETAINING SCREWS

TURBO BOOST GAUGE - SRT-4

REMOVAL

(1) Open hood, remove battery negative cable. Wait two minutes for the airbag system reserve capacitor to discharge before beginning component service.

(2) Remove both left and right A-pillar trim panels (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).

(3) Remove the instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(4) Remove the turbo boost gauge assembly.

(5) Remove the turbo boost gauge bezel.

(6) To change bulb, turn counterclockwise and pull out.

INSTALLATION

(1) To change bulb, place new bulb in opening and turn clockwise.

(2) Install the turbo boost gauge bezel.

(3) Install the turbo boost gauge assembly.

(4) Install the instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(5) Remove both left and right A-pillar trim panels (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(6) Connect the battery negative cable.

(7) Verify vehicle and system operation.

LAMPS

TABLE OF CONTENTS

LAMPS/LIGHTING - EXTERIOR

TABLE OF CONTENTS

LAMPS/LIGHTING - EXTERIOR

SPECIFICATIONS

EXTERIOR LAMPS

CAUTION: Do not use bulbs other than the bulb listed in the table below. Damage to lamp can result. Do not touch halogen bulbs with fingers or other oily surfaces. Bulb life will be reduced.

BULB APPLICATION TABLE

LAMP	BULB
BACK UP LAMP	W16W
CENTER HIGH MOUNTED STOP LAMP (CHMSL)	W16W
FRONT FOG LAMP	GE 899
FRONT PARK/TURN SIGNAL LAMP	3457 AK
FRONT SIDE MARKER LAMP	168
HEADLAMP	9007
LICENSE PLATE LAMP	168
REAR TAIL/STOP/TURN SIGNAL LAMP	3157 - P27/7W

BULB APPLICATION TABLE - EXPORT/RHD

LAMP	BULB
FRONT FOG LAMP	9145
FRONT PARK/TURN SIGNAL LAMP	4157NAK

BACKUP LAMP SWITCH

REMOVAL

(1) Lift vehicle on hoist.

(2) From bottom side of vehicle, disconnect back-up lamp switch connector (Fig. 1).

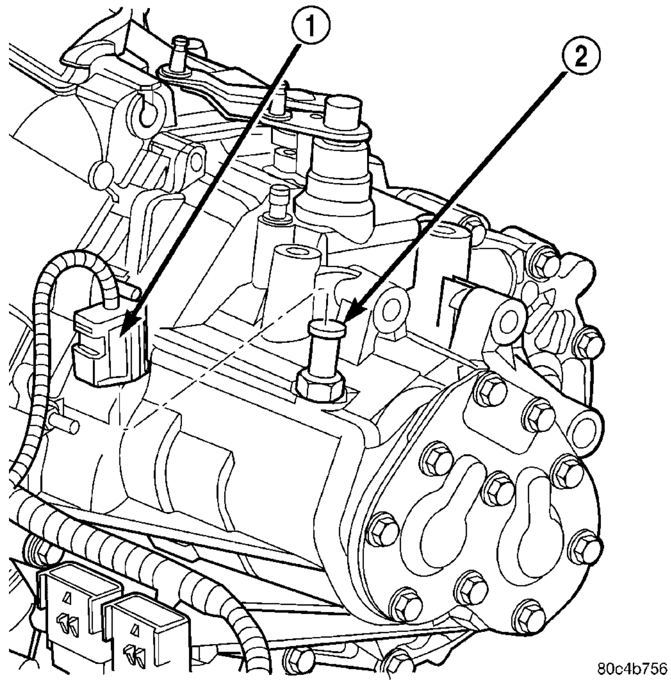


Fig. 1 BACK-UP LAMP SWITCH

1 - CONNECTOR
2 - BACK UP LAMP SWITCH

(3) Unscrew switch from transaxle.

INSTALLATION

(1) Install back-up lamp switch. Teflon tape or equivalent must be used on switch threads. Tighten switch to 24 N·m (18 ft. lbs.) torque.

CAUTION: Do not overtighten switch.

(2) Connect back-up lamp switch connector (Fig. 1).

(3) Lower vehicle.

(4) Verify back-up lamp operation.

BRAKE LAMP SWITCH

DESCRIPTION

The brake lamp switch is located under the instrument panel, at the brake pedal arm (Fig. 2). It has three internal switches controlling various functions of the vehicle. It's main function is to control operation of the vehicle's brake lamps. Other functions include speed control deactivation, brake sense for the antilock brake system and brake sense for the brake transmission shift interlock.

CAUTION: The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.

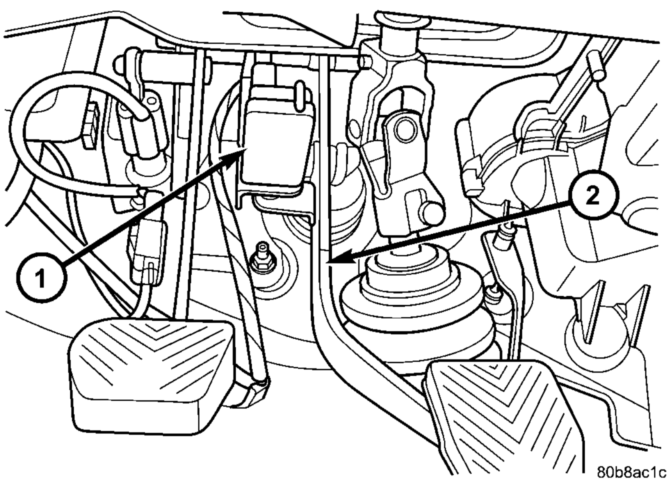


Fig. 2 BRAKE LAMP SWITCH

1 - SWITCH
2 - BRAKE PEDAL ARM

OPERATION

When the brake pedal is pressed, the plunger on the outside of the brake lamp switch extends outward. This action opens or closes the contacts of the three switches inside the brake lamp switch.

With the brake pedal pressed down (plunger extended), the switch for terminals 1 and 2 is closed completing the circuit. The switch for terminals 3 and 4 is open and so is the switch for terminals 5 and 6.

When the brake pedal is released (plunger pushed in), the three switches assume the opposite positions. The switch for terminals 1 and 2 is now open while the other two switches are now closed, completing their circuits.

A lever on the back of the switch is used to set the switch into the "adjusted" position. A non-adjusted switch will have the lever set to the diagonal position in relation to the switch housing. The plunger can be moved in and out, but the states of the internal switches will not change.

CAUTION: Never move the adjustment lever of the new brake lamp switch without it being properly installed in the vehicle first. Such action will render the switch unusable and the switch must be discarded.

Once installed in the vehicle as described in the brake lamp switch installation procedure (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - INSTALLATION), the new switch's adjustment lever is rotated to the adjusted position as indicated (Fig. 5). This action locks the plunger to the internal switches. **Once in this position the switch is permanently adjusted (or locked) and cannot be readjusted or released even if the lever is moved back.**

DIAGNOSIS AND TESTING - BRAKE LAMP SWITCH

NOTE: Before proceeding with this diagnostic test, verify the adjustment lever on the back of the switch is in the adjusted position. If the lever is in the non-adjusted (diagonal) position it may have never been adjusted (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - OPERATION). For adjustment, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - INSTALLATION)

If the electrical circuit has been tested and the brake lamp switch is suspected of being faulty, it can be tested using the following method.

(1) Remove the switch from the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL)

(2) With the switch in the released position (plunger extended), use an ohmmeter to test each of the three internal switches as shown (Fig. 3). You should achieve the results as listed in the figure.

(3) Gently push the plunger on the brake lamp switch in until it stops.

(4) With the switch in this depressed position (plunger pushed in), use an ohmmeter to test each of the three internal switches as shown (Fig. 4). You should achieve the results as listed in the figure.

If you do not achieve the results as listed in both figures, the switch is faulty and must be replaced. Refer to Removal And Installation in this section.

If the switch is found to be operating properly, it may be misadjusted. Do not reinstall the switch, replace it. (Refer to 8 - ELECTRICAL/LAMPS/ LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)

BRAKE LAMP SWITCH (Continued)

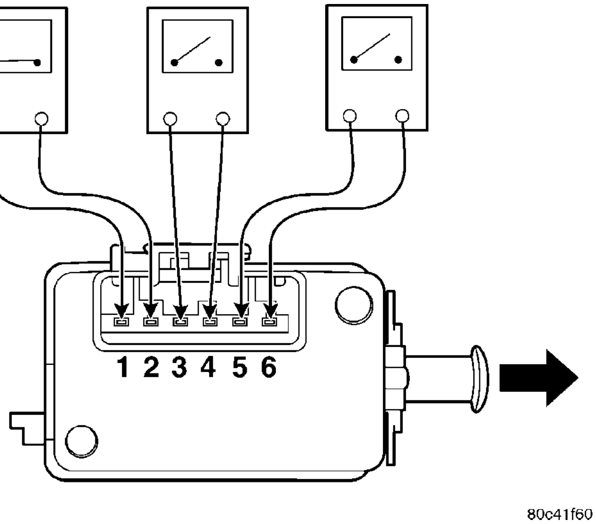


Fig. 3 SWITCH TEST - RELEASED POSITION

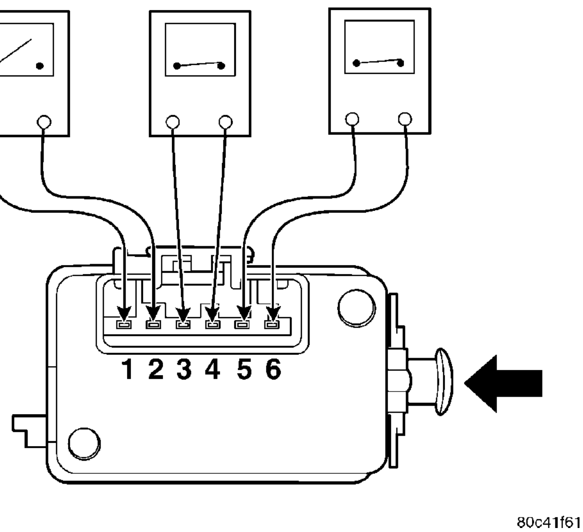


Fig. 4 SWITCH TEST - DEPRESSED POSITION

CAUTION: The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for any reason, a new switch must be installed and adjusted.

REMOVAL

(1) Disconnect and isolate the battery negative cable from its post on the battery.

(2) Under the instrument panel, remove the brake lamp switch by rotating the switch in a counterclockwise direction approximately 30 degrees and pulling it out of the bracket.

(3) Disconnect the wiring harness from the connector on the switch.

(4) Discard the brake lamp switch. **It must not be reused.**

INSTALLATION

CAUTION: Do not reuse the original brake lamp switch. This switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.

(1) Obtain NEW brake lamp switch. The adjustment lever on the new switch should be at a 45° angle from the wiring connector. **If the adjustment lever is parallel with the wiring connector, the switch has been preset and must be scrapped. DO NOT ATTEMPT TO RESET (OR READJUST) THE BRAKE LAMP SWITCH.**

(2) Connect the wiring harness to the connector on the switch.

(3) Mount and adjust the NEW brake lamp switch using the following steps:

(a) Install the switch in its bracket by aligning the index tab on the switch with the notch in the mounting bracket.

(b) When the switch body is fully seated in its bracket, rotate the switch clockwise approximately 30° to lock the switch into place.

(c) With the brake pedal in the fully released position, move the adjustment lever on the brake lamp switch from the 45° angled non-adjusted position, clockwise as shown, until it is parallel with the wiring connector (Fig. 5). The brake lamp switch is now properly adjusted to the vehicle.

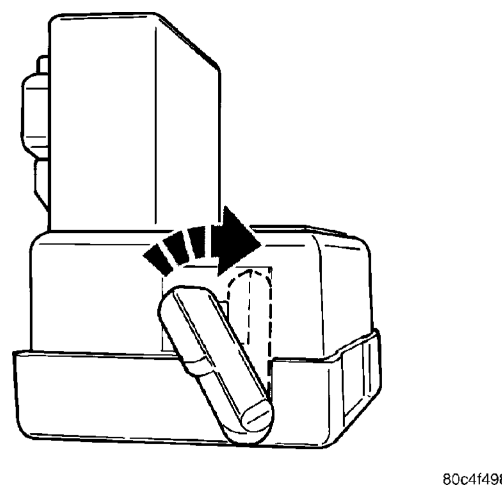


Fig. 5 Adjustment Lever Movement

(4) Reconnect the battery negative terminal.

(5) Check the stop lamps to verify they are operating properly and not staying on when the pedal is in the released position.

(6) Road test the vehicle to ensure proper operation of the brakes (including ABS if equipped) and speed control (if equipped).

CENTER HIGH MOUNTED STOP LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove bulb socket from center high mounted stop lamp.
(3) Pull bulb from socket.

INSTALLATION

(1) Install bulb into socket.
(2) Install bulb socket into center high mounted stop lamp.
(3) Connect battery negative cable.

CENTER HIGH MOUNTED STOP LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove socket and bulb from lamp.
(3) Remove nuts attaching center high mounted stop lamp to deck lid.
(4) Remove CHMSL from deck lid.

INSTALLATION

(1) Place CHMSL into position on deck lid.
(2) Install nuts attaching CHMSL to deck lid.
(3) Install socket and bulb into lamp.
(4) Connect the battery negative cable.

COMBINATION FLASHER

DESCRIPTION

The turn signal flasher and the hazard warning flasher are combined into one unit called a Combination Flasher (combo-flasher). The combo-flasher is a smart relay located on the back of the multi-function switch. The combo-flasher is black in color and has a dampener material wrapped on it. Constant battery voltage is supplied to the flasher so that it can perform the hazard warning function, and ignition switched battery voltage is supplied for the turn signal function. However, when the flasher is idle no current is drawn through the module. The unit does not become active until it is provided a signal ground from the turn signal switch or hazard warning switch.

OPERATION

The combo-flasher controls the flashing of the hazard warning system and the turn signal system. An inoperative bulb or incomplete turn signal circuit will cause the flasher rate to double. Typical flash rate is about ninety flashes per minute. When a bulb is burnt out, or when a circuit for a lamp is open, the turn signal flash rate will increase to a minimum of 180 flashes per minute. However, an open lamp circuit or burnt out bulb does not change the hazard warning flash rate.

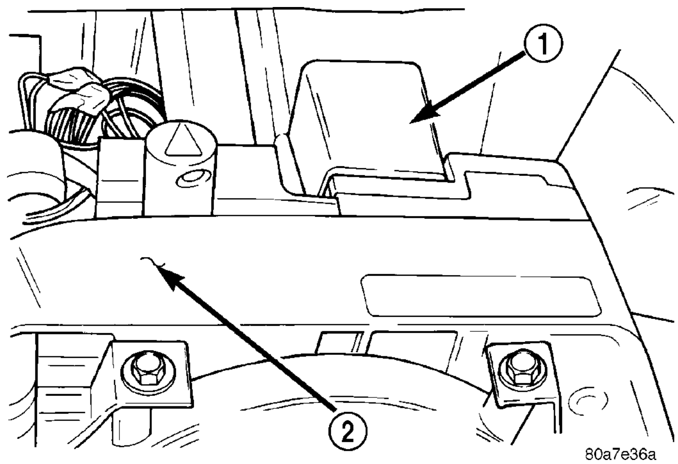


Fig. 6 COMBINATION FLASHER LOCATION

1 - COMBINATION FLASHER
2 - MULTI-FUNCTION SWITCH

Turn signal inputs that actuate the combination flasher are low current grounds, each drawing a maximum of 300 milliamperes. The turn signal inputs are provided to the flasher through the multi-function switch on the steering column. The hazard warning signal input is a low current ground drawing a maximum of 600 milliamperes. The hazard warning input can be provided through the multi-function switch on the steering column.

REMOVAL

The flasher is mounted to the back side of the multi-function switch (Fig. 6).
(1) To gain access the upper steering column shroud must be removed. Refer to Steering, Column, Column Shroud, Removal.
(2) The flasher can be removed by pulling it toward the instrument cluster (forward).
The flasher is serviced separately from the multi-function switch.

INSTALLATION

The flasher is serviced separately from the multi-function switch.
(1) The flasher can be installed by pushing it toward the back of the steering wheel.
(2) Install the upper steering column shroud. Refer to Steering, Column, Column Shroud, Installation.

DAYTIME RUNNING LAMP MODULE

DESCRIPTION

Vehicles built for use in Canada are equipped with a Daytime Running Lamp (DRL) system. The DRL function is provided by the cluster. The DRL Module is an integral part of the instrument panel cluster.

FOG LAMP

DIAGNOSIS AND TESTING - FOG LAMP

FOG LAMP DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FOG LAMPS 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.
	4. Battery has insufficient charge.	4. Test battery state-of -charge.
	5. Battery is sulfated or shorted.	5. Load test battery.
	6. Poor lighting circuit Z1-ground.	6. Test for voltage drop across Z1-ground locations.
FOG LAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high.	1. Test and repair charging system.
	2. Loose or corroded terminals or splices in circuit.	2. Inspect and repair all connectors and splices.
FOG LAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE	1. Charging system output too low.	1. Test and repair charging system.
	2. Poor lighting circuit Z1-ground.	2. Test for voltage drop across Z1-ground locations.
	3. High resistance in fog lamp circuit.	3. Test amperage draw of fog lamp circuit.
FOG LAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1-ground.	1. Test for voltage drop across Z1-ground locations.
	2. High resistance in fog lamp circuit.	2. Test amperage draw of fog lamp circuit.
	3. Faulty fog lamp switch.	3. Replace fog lamp switch.
	4. Loose or corroded terminals or splices in circuit.	4. Inspect and repair all connectors and splices.
FOG LAMPS DO NOT ILLUMINATE	1. Blown fuse for fog lamp.	1. Replace fuse.
	2. No Z1-ground at fog lamps.	2. Repair circuit ground.
	3. Faulty fog lamp switch.	3. Replace fog lamp switch.
	4. Broken connector terminal or wire splice in fog lamp circuit.	4. Repair connector terminal or wire splice.
	5. Faulty or burned out bulb.	5. Replace bulb.
FOG LAMPS STAY ON WITH KEY OUT (DRL EQUIPPED VEHICLES ONLY)	1. Failed DRL function in cluster.	1. Replace cluster.

FOG LAMP (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove nuts attaching fog lamp to fascia (Fig. 7) and (Fig. 8).

(3) Disconnect wire connector from fog lamp (Fig. 7) and (Fig. 8).

(4) Remove fog lamp unit from fascia (Fig. 7) and (Fig. 8).

(5) Remove bulb from lamp unit (Fig. 7) and (Fig. 8).

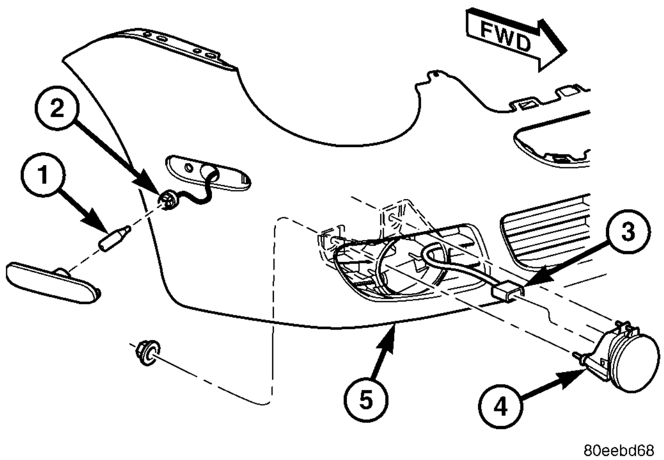


Fig. 7 DOMESTIC (U.S. AND CANADA) FOG LAMP/FOG LAMP UNIT - REMOVE/INSTALL

1 - SIDE MARKER LAMP
2 - SIDE MARKER LAMP SOCKET
3 - FOG LAMP CONNECTOR
4 - FOG LAMP BULB/UNIT
5 - FRONT FASCIA

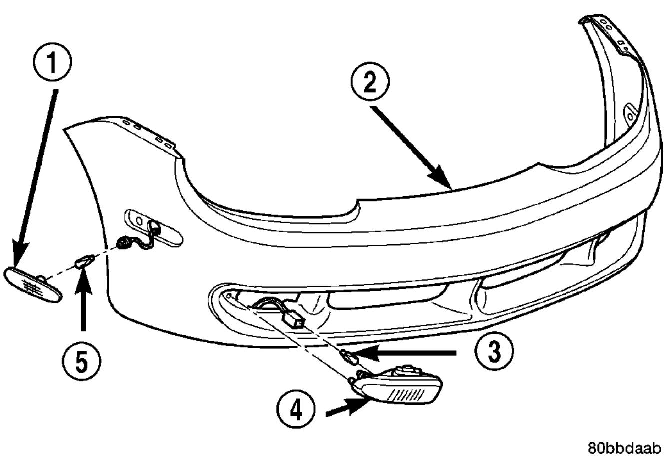


Fig. 8 FOG LAMP - EXPORT/RHD

1 - FRONT SIDE MARKER
2 - FRONT FASCIA
3 - BULB
4 - FOG LAMP
5 - BULB

INSTALLATION

(1) Install bulb into lamp.

(2) Install fog lamp unit into fascia (Fig. 7) and (Fig. 8).

(3) Connect wire connector to fog lamp (Fig. 7) and (Fig. 8).

(4) Install nuts attaching fog lamp to fascia (Fig. 7) and (Fig. 8).

(5) Connect battery negative cable.

FOG LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove nuts attaching fog lamp to fascia (Fig. 7) and (Fig. 8).

(3) Disconnect wire connector from fog lamp (Fig. 7) and (Fig. 8).

(4) Remove fog lamp unit from fascia (Fig. 7) and (Fig. 8).

(5) Remove bulb from lamp unit (Fig. 7) and (Fig. 8).

INSTALLATION

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.

(1) Place lamp unit into position (Fig. 7) and (Fig. 8).

(2) Install fog lamp unit into fascia (Fig. 7) and (Fig. 8).

(3) Connect wire connector to the fog lamp (Fig. 7) and (Fig. 8).

(4) Install nuts attaching fog lamp unit to fascia (Fig. 7) and (Fig. 8).

(5) Connect the battery negative cable.

ADJUSTMENTS - FOG LAMP

Prepare an alignment screen (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - ADJUSTMENTS). Disengage the wire connectors from the back of the headlamp bulbs to disable the headlamps. This will allow a more accurate projection reading of the fog lamps. Turn on the headlamp switch and actuate the fog lamp switch. A properly aligned fog lamp will project a pattern on the alignment screen 100 mm (4 in.) below the horizontal fog lamp center line (Fig. 9) and straight ahead.

FOG LAMP UNIT (Continued)

FOG LAMP ALIGNMENT

To adjust fog lamp alignment, rotate the alignment screw located at the top edge of the fog lamp until desired position on alignment screen is reached.

FOG LAMP ALIGNMENT - CANADA/EXPORT/RHD

To adjust fog lamp alignment, rotate the alignment screw located on the bottom of the fog lamp from under the fascia to achieve the specified pattern position. (Fig. 9).

HEADLAMPS

DIAGNOSIS AND TESTING - HEADLAMPS

Always begin any diagnosis by testing all of the fuses and circuit breakers in the system. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

Conventional and halogen headlamps are interchangeable. It is recommended that they not be intermixed on a given vehicle.

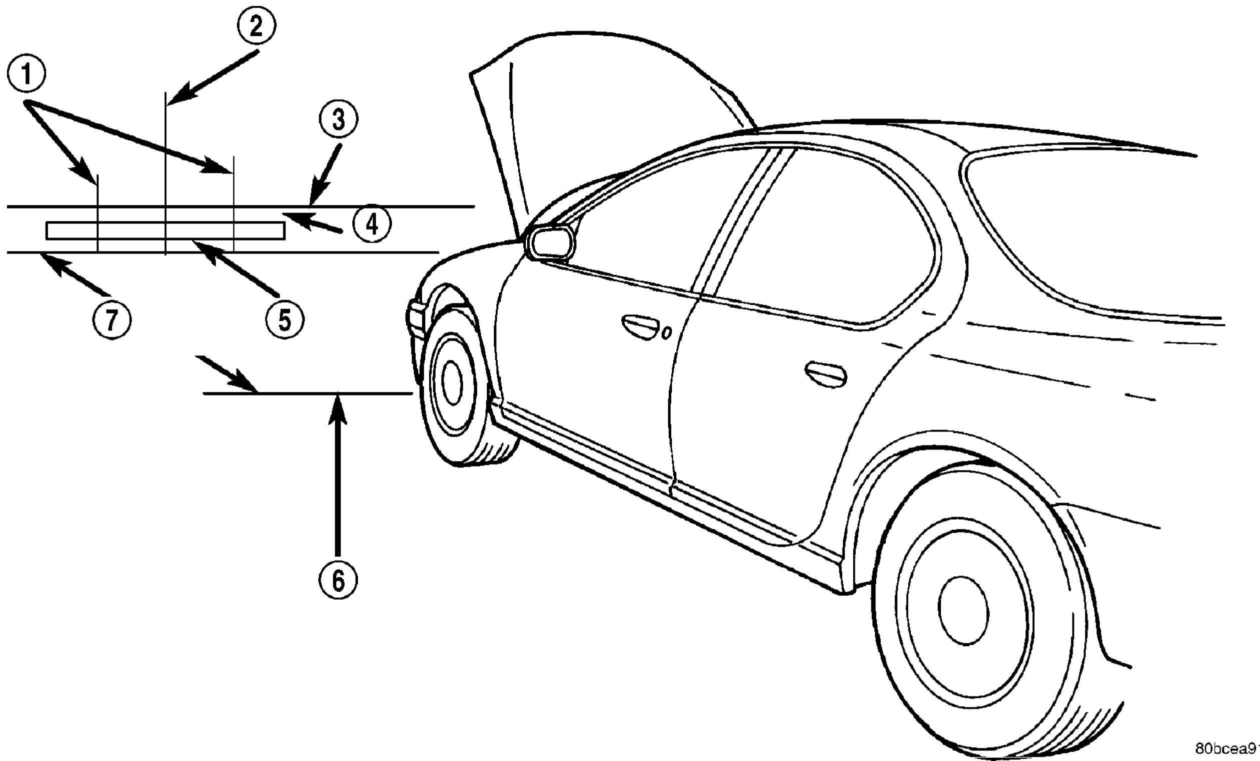


Fig. 9 LAMP ALIGNMENT SCREEN

1 - CENTER LINE OF FOG LAMPS
2 - CENTER LINE VEHICLE
3 - FLOOR TO CENTER OF FOG LAMP
4 - 4 INCHES
5 - FOG LAMP HOT SPOT
6 - FRONT OF FOG LAMP
7 - 7.62 METERS (25 FEET)

HEADLAMPS (Continued)

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.
	4. Battery has insufficient charge.	4. Test battery state-of - charge.
	5. Battery is sulfated or shorted.	5. Load test battery.
	6. Poor lighting circuit Z1 - ground.	6. Test for voltage drop across Z1 - ground locations.
	7. Both headlamp bulbs faulty.	7. Replace both headlamp bulbs.
HEADLAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high.	1. Test and repair charging system.
	2. Loose or corroded terminals or splices in circuit.	2. Inspect and repair all connectors and splices.
HEADLAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE*	1. Charging system output too low.	1. Test and repair charging system.
	2. Poor lighting circuit Z1 - ground.	2. Test for voltage drop across Z1 - ground locations.
	3. High resistance in headlamp circuit.	3. Test amperage draw of headlamp circuit.
	4. Both headlamp bulbs faulty.	4. Replace both headlamp bulbs.
HEADLAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1 - ground.	1. Test for voltage drop across Z1 - ground locations.
	2. High resistance in headlamp circuit.	2. Test amperage draw of headlamp circuit. Should not exceed 30 amps.
	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.
HEADLAMPS DO NOT ILLUMINATE	1. No voltage to headlamps.	1. Repair open headlamp circuit.
	2. No Z1 - ground at headlamps.	2. Repair circuit ground.
	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.
Turn signals do not come ON.	1. Wrong cluster installed.	1. Replace cluster.
	2. Bit not set.	2. Set bit.
*Canada vehicles must have lamps ON.		

HEADLAMPS (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove two screws attaching headlamp unit to upper crossmember.
(3) Remove three screws attaching fascia to radiator crossmember and carefully bend fascia forward to allow removal of headlamp unit.
(4) Remove headlamp unit from vehicle.
(5) Disconnect wire connector from back of headlamp (Fig. 10).
(6) Rotate retaining ring counterclockwise one quarter turn.
(7) Remove retaining ring from headlamp unit.
(8) Remove bulb from headlamp unit (Fig. 11).

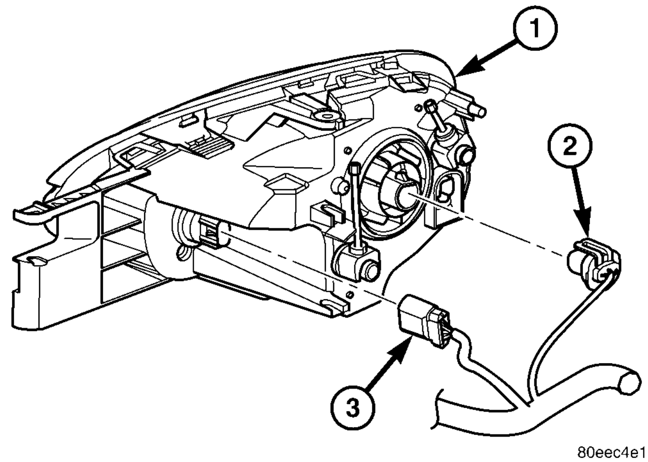


Fig. 10 HEADLAMP UNIT

1 - HEADLAMP UNIT
2 - HEADLAMP CONNECTOR
3 - FRONT TURN SIGNAL CONNECTOR

INSTALLATION

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.

(1) Install bulb into headlamp module.
(2) Install retaining ring to headlamp unit.
(3) Rotate retaining ring clockwise one quarter turn.
(4) Connect wire connector to the back of headlamp bulb.
(5) Place headlamp unit in position.
(6) Install two screws attaching headlamp unit to upper crossmember.
(7) Install screws attaching fascia to upper radiator crossmember.
(8) Connect the battery negative cable.

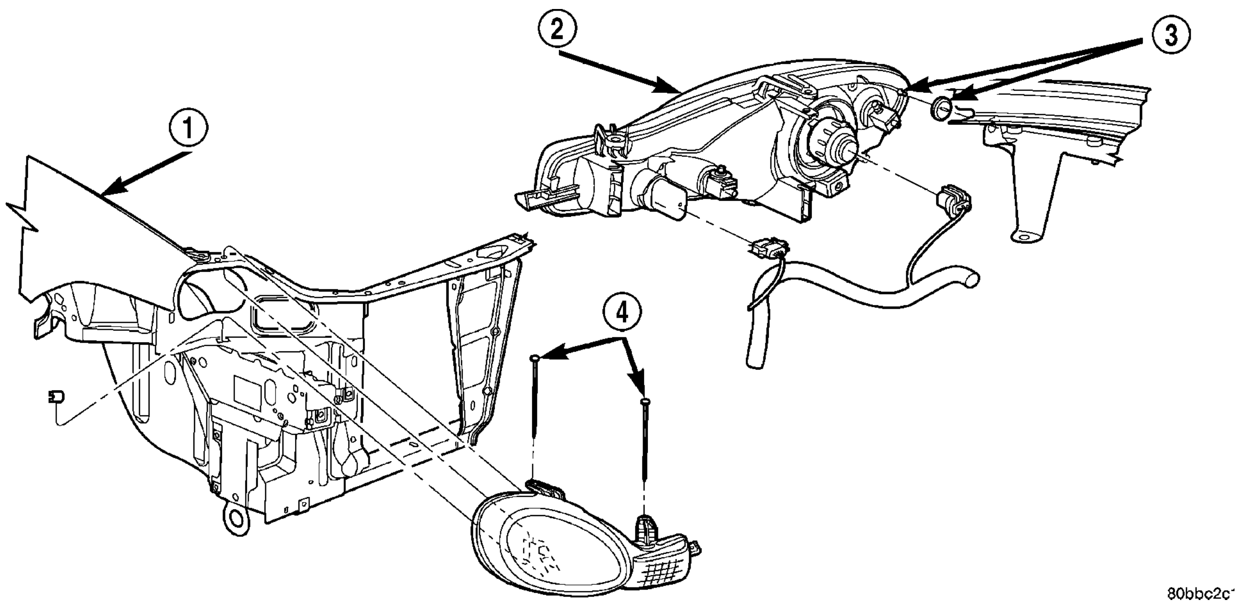


Fig. 11 HEADLAMP AND HEADLAMP UNIT - CANADA/EXPORT/RHD

1 - FENDER
2 - HEADLAMP UNIT
3 - HEADLAMP TO FENDER RETAINER
4 - JACKSCREWS

HEADLAMP LEVELING MOTOR

DESCRIPTION

Two leveling motors are used per vehicle, one for each headlamp. These leveling motors are attached to the rear of the headlamp. They can be described as a small semi-square shaped module with an electrical connector attached to one side. Due to vehicle design these motors can only be serviced or accessed from the under side of the vehicle.

OPERATION

The headlamp leveling motors move the headlamp and beam pattern according to the signal received from the headlamp leveling switch. With the vehicles headlamps "ON,“ a signal voltage is sent from the headlamp leveling switch and received at each of the headlamp leveling motors. This signal voltage (typically 2 - 9 volts) tells the headlamp leveling motors were to position the headlamps.

DIAGNOSIS AND TESTING - HEADLAMP LEVELING MOTOR - EXPORT

HEADLAMP LEVELING MOTOR DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
ONE MOTOR DOES NOT OPERATE.	1. Poor electrical connection at motor.	1. Check for proper electrical connection at motor.
	2. No voltage at motor.	2. Repair no voltage condition. Refer to Wiring Diagrams.
	3. No ground at motor.	3. Repair no ground condition. Refer to Wiring Diagrams.
	4. Defective motor.	4. Replace leveling motor.
BOTH MOTORS DO NOT OPERATE.	1. No voltage at or from headlamp leveling switch.	1. Repair no voltage condition. Check for proper headlamp leveling switch operation.
	2. No voltage at leveling motors.	2. Repair no voltage condition. Refer to Wiring Diagrams.
	3. No ground at leveling motors.	3. Repair no ground condition. Refer to Wiring Diagrams.
	4. Both motors defective.	4. Replace both motors.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the appropriate headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).

(3) Disconnect the headlamp leveling motor electrical connector (Fig. 12). Depress the steel retaining clip while pulling the connector from the motor.

(4) Rotate the headlamp leveling motor counterclockwise. Pull it slightly away from the headlamp and rotate it down to remove the ball from the socket (Fig. 12).

NOTE: Significant force will be required to unsnap the ball and socket connection between the headlamp leveling motor and the headlamp unit.

HEADLAMP LEVELING MOTOR (Continued)

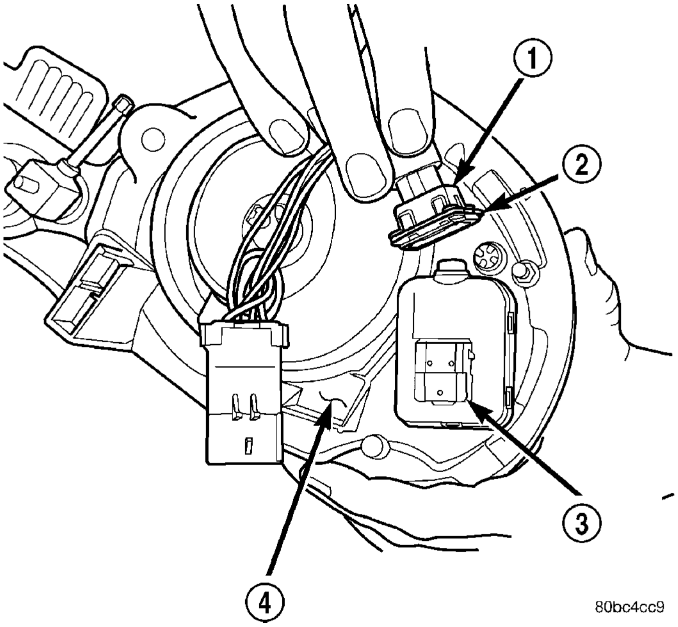


Fig. 12 HEADLAMP LEVELING MOTOR

1 - HEADLAMP LEVELING MOTOR ELECTRICAL CONNECTOR
2 - RETAINING CLIP
3 - HEADLAMP LEVELING MOTOR
4 - HEADLAMP MODULE

INSTALLATION

(1) Install the headlamp leveling motor in the headlamp unit. Push the headlamp leveling motor pushrod straight into its mating socket while holding the headlamp unit in the fully retracted position.

(2) Once the ball and socket connection is secured, push and rotate the headlamp leveling motor clockwise into the headlamp unit to lock in place.

(3) Connect the headlamp leveling motor electrical connector (Fig. 12).

(4) Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).

(5) Connect the battery negative cable.

(6) Verify system operation.

HEADLAMP LEVELING SWITCH

DESCRIPTION

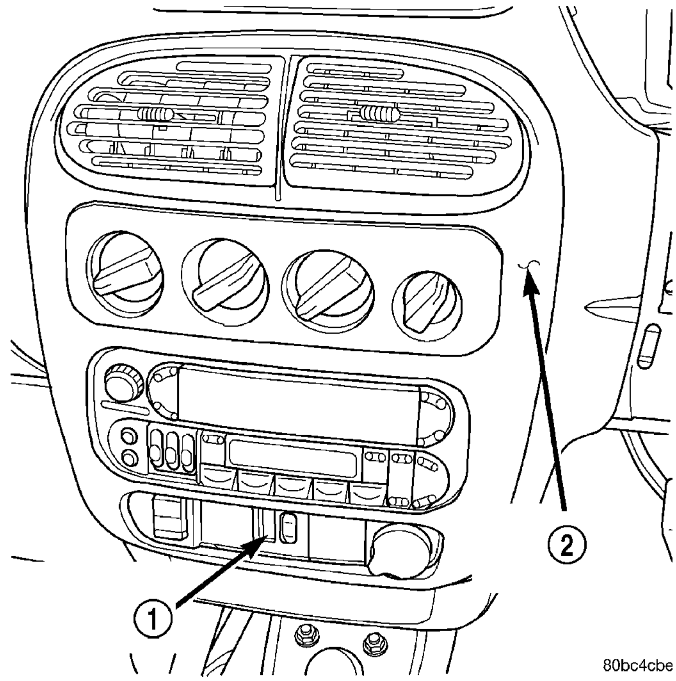


Fig. 13 HEADLAMP LEVELING SWITCH LOCATION

1 - HEADLAMP LEVELING SWITCH LOCATION
2 - ACCESSORY SWITCH BEZEL

The Headlamp Leveling Switch is located on the center instrument panel area in the accessory switch bezel (Fig. 13), and is the primary controller of the headlamp leveling system. The leveling switch has four settings 0-3, 3 being the lowest, and 0 being the highest headlamp beam vertical setting.

OPERATION

With the rotation of the headlamp leveling switch control knob, voltage is adjusted at the headlamp leveling switch (rheostat). This signals the headlamp leveling motors (headlamp module mounted) to adjust the vertical headlamp beam pattern accordingly. Headlamps must be "ON" in order for the leveling system to function.

HEADLAMP LEVELING SWITCH (Continued)

DIAGNOSIS AND TESTING - HEADLAMP LEVELING SWITCH - EXPORT

(1) Disconnect and isolate the negative battery cable.

(2) Remove the headlamp leveling switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ HEADLAMP LEVELING SWITCH - REMOVAL).

(3) Using an ohmmeter and the HEADLAMP LEVELING SWITCH RESISTANCE table, check the resistance between switch connector pins 1&2.

(4) If the test results are **not** as indicated in the table below, replace the switch. If test results **are** as indicated below, the switch is OK.

HEADLAMP LEVELING SWITCH RESISTANCE

SWITCH POSITION	RESISTANCE BETWEEN PINS 1&2
0	0.752Ω
1	0.564Ω
2	348.8Ω
3	249.2Ω

REMOVAL

(1) Rotate the A/C outlet registers to the full down position. Grip each outlet at its outboard end and gently over-rotate to release from its pivot point. Swing outlet straight out and remove by hand.

(2) Remove the (4) HVAC control knobs by pulling straight off the switch shaft.

(3) Remove the (2) screws from the center instrument bezel.

(4) Remove the center instrument bezel. Pull it straight out to unsnap the (4) retaining clips.

(5) Remove the (2) screws from the accessory switch bank.

(6) Pull the accessory switch bank out and disconnect the electrical connector from the headlamp leveling switch.

(7) Gently pry the headlamp leveling switch out of its mounting clips (Fig. 14).

INSTALLATION

(1) Snap the headlamp leveling switch into the accessory switch bank.

(2) Install the headlamp leveling switch electrical connector.

(3) Verify switch operation.

(4) Position the accessory switch bank and install the (4) retaining screws.

(5) Snap the center instrument bezel in position and install the retaining screws.

(6) Install the (4) HVAC control knobs.

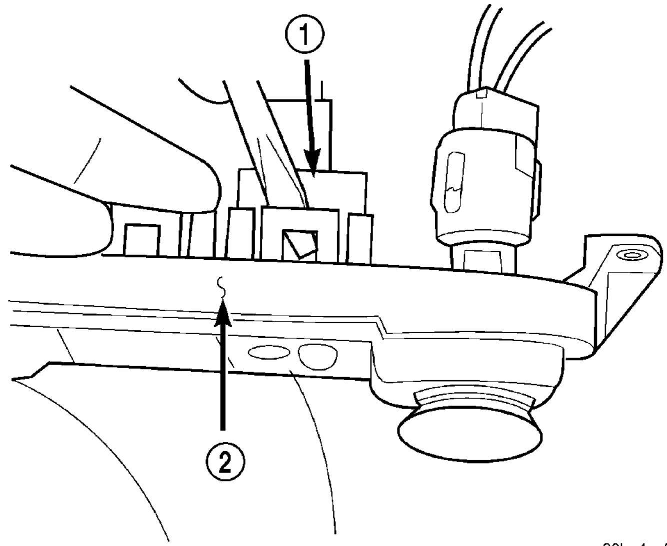


Fig. 14 LEVELING SWITCH REMOVAL

1 - HEADLAMP LEVELING SWITCH
2 - ACCESSORY SWITCH BANK

(7) Install the A/C outlet registers on the center instrument bezel.

HEADLAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove screws attaching headlamp module to upper crossmember.

(3) Remove headlamp module from vehicle.

(4) Disconnect wire connector from back of headlamp (Fig. 10).

(5) Remove bulb from headlamp unit (Fig. 11).

INSTALLATION

CAUTION:
Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.

(1) Connect wire connectors to the back of headlamp module.

(2) Place headlamp module in position.

CAUTION:
There is a grommet installed on the inboard jackscrew. This grommet can be compressed too much and squeezed out if overtorqued. Pull grommet down off screw and look at the top of the screw at the threads. If there are threads underneath the grommet (threads go all the way up to the jackscrew head), upon installation, only torque to 5 in. lbs. If a shoulder is present and there are no threads underneath the grommet, then torque jackscrew to 40 in. lbs.

HEADLAMP UNIT (Continued)

(3) Install screws attaching headlamp module to upper crossmember.

(4) Connect battery negative cable.

ADJUSTMENTS - HEADLAMP AIMING

LAMP 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.

(2) If necessary, tape a line on the floor 7.62 meters (25 ft.) away from and parallel to the wall (Fig. 15).

(3) From the floor up 1.27 meters (5 ft.), tape a line on the wall at the center line of the vehicle. Sight along the center line 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) A small dot is molded into each headlamp lens signifying the center of the headlamp. Measure the distance from the center of the headlamp to the floor. Transfer measurement to the alignment screen (with tape). Use this line for up/down adjustment reference.

(7) Measure distance from the center line of the vehicle to the center of each headlamp being aligned. Transfer measurements to screen (with tape) to each side of vehicle center line. Use these lines for left/right adjustment reference.

VEHICLE PREPARATION FOR HEADLAMP ALIGNMENT

Headlamps and Fog Lamps should be aligned using the screen method. **The preferred headlamp alignment setting is 0 for the left/right adjustment and 0 for the up/down adjustment.**

(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.

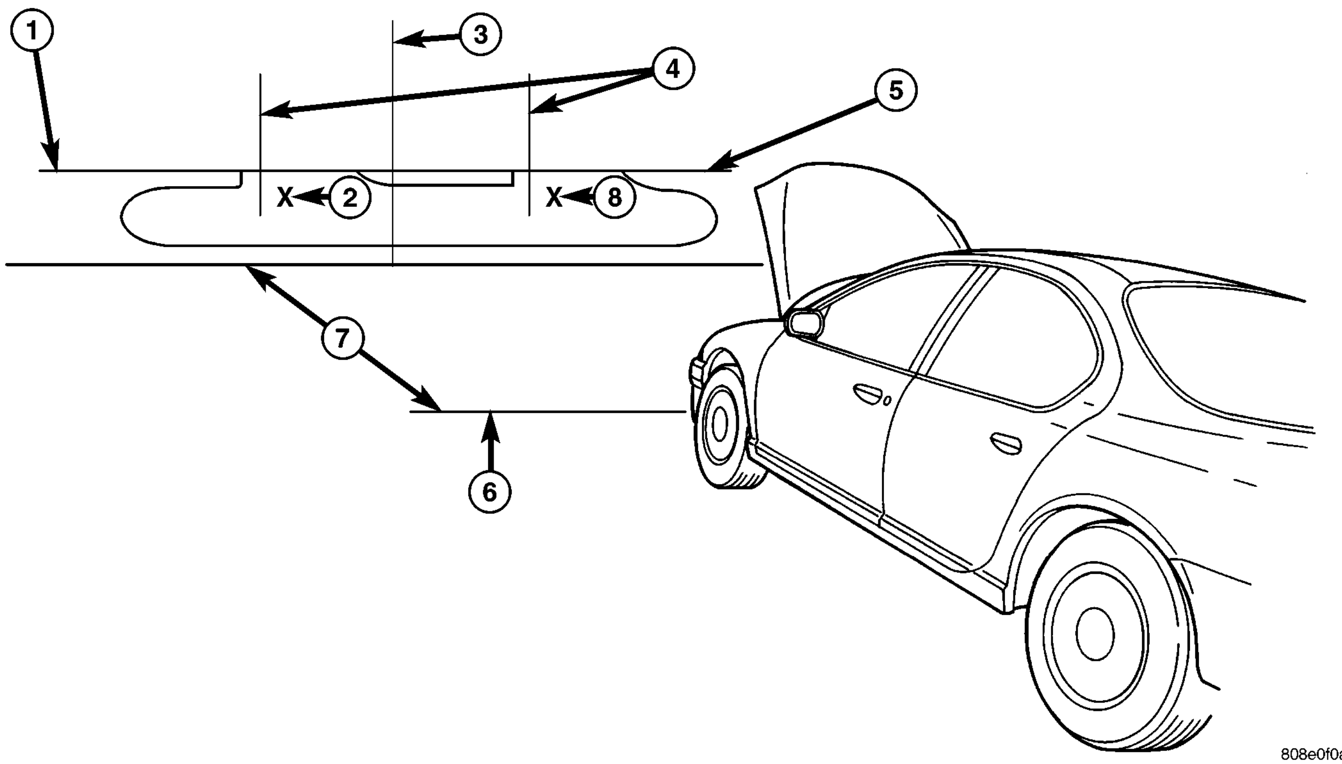


Fig. 15 HEADLAMP ALIGNMENT SCREEN

1 - FLOOR TO CENTER OF HEADLAMP
2 - 32 mm (1.25 inches) CENTER OF HOTSPOT
3 - VEHICLE CENTER LINE
4 - HEADLAMP CENTER LINE
5 - LOW BEAM HORIZONTAL CUTOFF LINE
6 - FRONT OF HEADLAMP
7 - 7.62 meters (25 feet)
8 - 127 mm (5 inches) CENTER OF HOTSPOT

HEADLAMP UNIT (Continued)

HEADLAMP ADJUSTMENT

The PL headlamp low beam pattern has a distinct horizontal cutoff line which is used to visually align the headlamps. A properly aimed headlamp will have the horizontal cutoff line of the low beam pattern centered on the low beam pattern centered on the horizontal center of headlamp line. The side to side left edge of the low beam hot spot should be located 75 mm (3 inches) to the left of the headlamp center line (Fig. 15). The high beams on a vehicle with aero headlamps cannot be aligned. The high beam pattern should be correct when the low beams are aligned properly.

To adjust headlamp alignment, rotate alignment screws to achieve the specified low beam hot spot pattern.

LICENSE PLATE LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove screws attaching license plate lamp to rear bumper fascia (Fig. 16).
(3) Remove lamp from bumper fascia.
(4) Remove bulb socket from lamp.
(5) Pull bulb from socket.

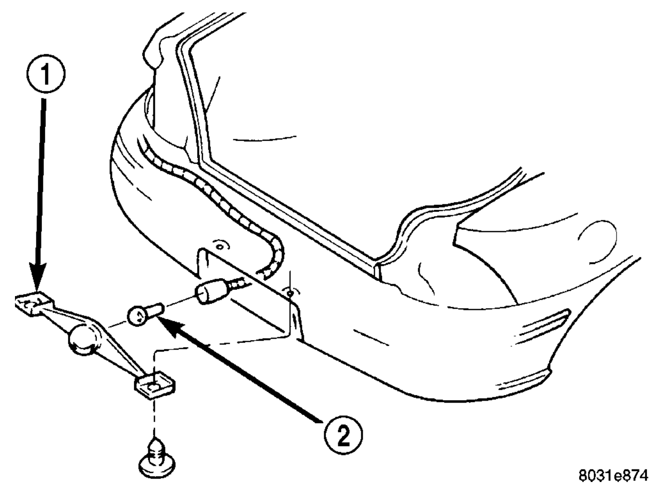


Fig. 16 LICENSE PLATE LAMP

1 - LICENSE PLATE LAMP
2 - BULB

INSTALLATION

(1) Install bulb into socket.
(2) Install bulb socket into lamp.
(3) Place lamp in position.
(4) Install screws attaching license plate lamp to rear bumper fascia.
(5) Connect the battery negative cable.

LICENSE PLATE LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove screws attaching license plate lamp to rear bumper fascia (Fig. 16).
(3) Remove lamp from rear bumper fascia.
(4) Remove bulb socket from lamp.
(5) Remove lamp.

INSTALLATION

(1) Install bulb socket into lamp.
(2) Place lamp in position.
(3) Install screws attaching license plate lamp to rear bumper fascia.
(4) Connect the battery negative cable.

MARKER LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Reach behind front bumper fascia forward of front wheel and remove attaching clip from the front side marker lamp (Fig. 7) and (Fig. 8).
(3) Remove lamp from front fascia.
(4) Remove bulb from socket.

INSTALLATION

(1) Install bulb into socket.
(2) Install bulb socket into lamp unit
(3) Install lamp unit into front fascia (Fig. 7) and (Fig. 8).
(4) Install attaching clip to the front side market lamp unit.
(5) Connect the battery negative cable.

MARKER LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Reach behind front bumper fascia forward of front wheel and remove attaching clip from the front side marker lamp (Fig. 7) and (Fig. 8).
(3) Remove lamp.
(4) Remove bulb from socket.

INSTALLATION

(1) Install bulb socket into lamp.
(2) Place lamp into front fascia (Fig. 7) and (Fig. 8).
(3) Install attaching clip to the front side marker lamp.
(4) Connect the battery negative cable.

MULTI-FUNCTION SWITCH

DESCRIPTION

The multi-function switch is secured to the upper steering column housing at the top of the steering column, just below the steering wheel (Fig. 17). The visible parts of the multi-function switch are the turn signal control stalk that extends through a dedicated opening in the left side of the upper steering column shrouds, the windshield wiper/washer, exterior lighting control stalk that extends through a dedicated opening in the right upper steering column shrouds, the hazard warning switch push button that protrudes through an opening in the upper steering column shroud on the top of the steering column. The remainder of the switch, its mounting provisions, and its electrical connections are all concealed beneath the steering column shrouds. The multi-function switch control stalk has both nomenclature and International Control and Display Symbol graphics applied to it, which identify its many functions. An International Control and Display Symbol icon for "Hazard Warning" is applied to the top of the hazard warning switch push button.

The switch housing and its controls are constructed of molded black plastic. A connector receptacle with up to twenty terminals is located on the back of the switch housing and connects the switch to the vehicle electrical system through a take out and connector of the instrument panel wire harness.

The multi-function switch supports the following functions and features:

- **Continuous Wipe Modes -** The control knob of the multi-function switch provides two continuous wipe switch positions, low speed or high speed.
- **Intermittent Wipe Mode -** The control knob of the multi-function switch provides an intermittent wipe mode with multiple delay interval positions.
- **Washer Mode -** A button on the end of the control stalk of the multi-function switch provides washer system operation when the button is depressed towards the steering column.
- **Hazard Warning Control -** The internal circuitry and hardware of the multi-function switch provide detent switching for activation and deactivation of the hazard warning system.
- **Exterior Lighting Control -** The internal circuitry and hardware of the multi-function switch provide for activation and deactivation of exterior lighting.
- **Headlamp Beam Selection -** The internal circuitry and hardware of the multi-function switch provide detent switching for selection of the headlamp high or low beams.
- **Headlamp Optical Horn -** The internal circuitry and hardware of the multi-function switch includes momentary switching of the headlamp high beam circuits to provide an optical horn feature (sometimes referred to as flash-to-pass), which allows the vehicle operator to momentarily flash the headlamp high beams as an optical signalling device.

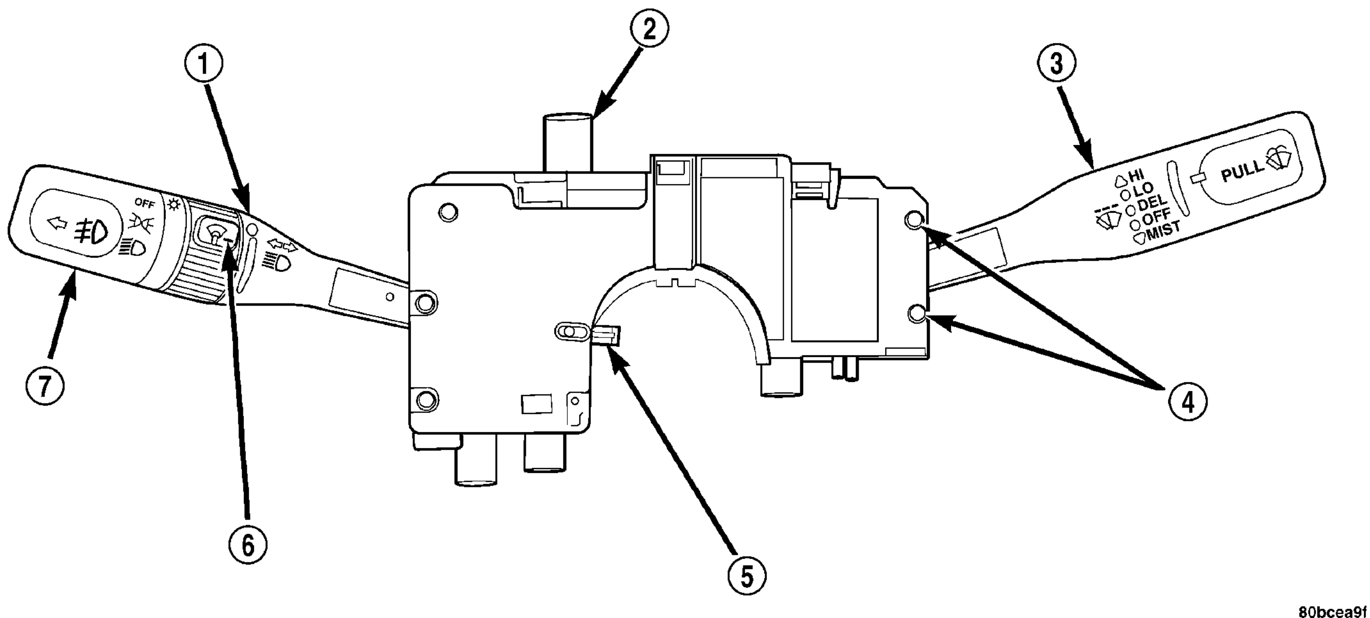


Fig. 17 MULTI-FUNCTION SWITCH

1 - TURN SIGNAL CONTROL STALK
2 - HAZARD WARNING SWITCH
3 - WINDSHIELD WIPER/WASHER CONTROL
4 - WINDSHIELD WIPER/WASHER SWITCH RETAINING SCREWS
5 - CANCELLING CAM
6 - PANEL DIMMER/INTERIOR LIGHT SWITCH
7 - EXTERIOR LIGHTING CONTROL/FOG LAMP

MULTI-FUNCTION SWITCH (Continued)

• **Turn Signal Control** - The internal circuitry and hardware of the multi-function switch provide both momentary non-detent switching and detent switching with automatic cancellation for both the left and right turn signals.

The multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch unit must be replaced.

HAZARD WARNING SYSTEM

The hazard warning system is actuated by a push button located in the multi-function switch (Fig. 17) 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 front of the button.

The hazard warning system allows the vehicle operator to provide the drivers of other vehicles in near proximity an optical indication that the vehicle is disabled or is an obstacle to traffic flow. Unlike the turn signal system, the hazard warning system has battery current at all times, regardless of ignition switch position.

OPERATION

The multi-function switch uses conventionally switched outputs and a variable resistor to control the many functions and features it provides using hard wired circuitry. The switch is grounded at all times through a single wire take out with an eyelet terminal connector of the instrument panel wire harness that is secured by a nut to a ground stud located on the instrument panel armature, just above and to the left of the glove box opening. When the ignition switch is in the ACCESSORY or ON positions, battery current from a fuse in the Junction Block (JB) is provided through a fused ignition switch output (RUN/ACC) circuit. Following are descriptions of the how the multi-function switch operates to control the many functions and features it provides:

• **Continuous Wipe Modes** - When the control knob of the windshield wiper/washer control stalk on the right side of the multi-function switch is rotated to the High or Low positions, the circuitry within the switch provides a battery current output directly to the high or low speed brush of the wiper motor. When the control knob is in the OFF position, the wiper system completes the cycle and the blades park in the lowest portion of the wipe pattern

• **Intermittent Wipe Mode** - When the windshield wiper/washer control switch control is rotated to the Delay position, the circuitry within the switch connects the output of the wiper motor relay to the low speed brush of the wiper motor and provides a battery current signal to the Electromechanical Instrument Cluster (EMIC). If the Delay mode is selected, the control knob can then be rotated to multiple minor detent positions, which actuates a variable resistor within the switch and provides a hard wired output to the EMIC that signals the desired delay interval for the intermittent wiper feature.

• **Washer Mode** - Pulling windshield wiper/washer control towards the steering wheel provides a battery current output through the momentary single pole, single throw washer switch circuitry to operate the washer pump/motor and provides a signal to the EMIC. If the wipers are not operating when the washer switch is actuated, the EMIC will operate the wiper motor for as long as the washer switch is depressed plus about three additional wipe cycles. If the wipers are operating in the intermittent mode when the washer switch is actuated, the EMIC will operate the wiper motor at a fixed low speed for as long as the washer switch is depressed plus about three additional wipe cycles before the wipers return to the selected intermittent wipe interval.

• **Headlamp Beam Selection** - The turn signal control stalk on the left side of the multi-function switch is pulled towards the steering wheel past a detent, then released to actuate the headlamp beam selection switch. Each time the control stalk is actuated in this manner, the opposite headlamp mode from what is currently selected will be activated. The internal circuitry of the headlamp beam selection switch directs the output of the headlamp switch through hard wired circuitry to activate the selected headlamp beam.

• **Headlamp Optical Horn** - The turn signal control stalk is pulled towards the steering wheel to just before a detent, to momentarily activate the headlamp high beams. The high beams will remain illuminated until the control stalk is released. The internal circuitry of the headlamp beam selection switch provides a momentary ground path to the headlamp high beams.

• **Turn Signal Control** - The turn signal control stalk actuates the turn signal switch. When the control stalk is moved in the upward direction, the right turn signal circuitry is activated; and, when the control stalk is moved in the downward direction, the

MULTI-FUNCTION SWITCH (Continued)

left turn signal circuitry is activated. The multi-function switch turn signal circuitry simultaneously provides a signal to the turn signal sense of the combination flasher to activate or deactivate the flasher output, and directs the output of the flasher to the proper turn signal lamps. The turn signal switch has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary position in each direction that provides turn signals only until the left multi-function switch control stalk is released. When the control stalk is moved to a turn signal switch detent position, the cancel actuator extends toward the center of the steering column. A turn signal cancel cam that is integral to the clock spring mechanism rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the multi-function switch. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. In other words, if the left turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral 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.

HAZARD WARNING SYSTEM

The hazard warning push button is pushed down to unlatch the switch and activate the hazard warning system, and pushed down again to latch the switch and turn the system OFF. When the hazard warning switch is latched (hazard warning off), the push button will be in a lowered position on the top of the steering column shroud; and, when the hazard warning switch is unlatched (hazard warning on), the push button will be in a raised position. The multi-function switch hazard warning circuitry simultaneously provides a signal to the hazard warning sense of the combination flasher to activate or deactivate the flasher output, and directs the output of the flasher to the hazard warning lamps. When the hazard warning system is activated, the combination flasher will cause both the right and left side turn signal indicator lamps, front park/turn signal lamps, front side marker lamps and rear turn signal lamps to flash on and off. If the exterior lamps are turned off, the front park/turn signal lamps and the front side marker lamps will flash in unison. If the exterior lamps are turned on, the front park/turn signal lamps and the side marker lamps will flash alternately.

DIAGNOSIS AND TESTING - MULTI-FUNCTION SWITCH

FLASHER DIAGNOSIS

Should any function of the multi-function switch fail, the entire switch assembly must be replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - REMOVAL).

MULTI-FUNCTION SWITCH (Continued)

TURN SIGNAL AND HAZARD WARNING FLASHER DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
TURN SIGNAL FLASHES AT TWICE THE NORMAL RATE.	(1) FAULTY EXTERNAL LAMP.	(1) REPLACE LAMP.
	(2) POOR GROUND AT LAMP.	(2) CHECK AND/OR REPAIR WIRING
	(3) OPEN CIRCUIT IN WIRING TO EXTERNAL LAMP.	(3) CHECK AND/OR REPAIR WIRING
	(4) FAULTY CONTACT IN SWITCH.	(4) REPLACE MULTI FUNCTION SWITCH.
INDICATOR LAMP ILLUMINATED BRIGHTLY, EXTERNAL LAMP GLOWS DIMLY AT A RAPID RATE.	(1) LOOSE OR CORRODED EXTERNAL LAMP CONNECTION.	(1) REPLACE SOCKET CONNECTION.
	(2) POOR GROUND CIRCUIT AT EXTERNAL LAMP.	(2) REPAIR WIRING HARNESS. CHECK CONNECTORS.
	(3) OPEN INSTRUMENT CLUSTER.	(3) REPLACE INSTRUMENT CLUSTER.
HAZARD WARNING SYSTEM DOES NOT FLASH.	(1) FAULTY FUSE.	(1) REPLACE FUSE.
	(2) FAULTY FLASHER.	(2) REPLACE FLASHER.
	(3) OPEN CIRCUIT IN FEED WIRE TO SWITCH.	(3) REPAIR WIRING HARNESS, CHECK CONNECTORS.
	(4) FAULTY CONTACT IN SWITCH.	(4) REPLACE MULTI FUNCTION SWITCH.
	(5) OPEN OR GROUNDED CIRCUIT IN WIRING TO EXTERNAL LAMPS.	(5) REPAIR WIRING HARNESS.
INDICATOR LAMP ILLUMINATES BRIGHTLY, EXTERNAL LAMP DOES NOT LIGHT.	(1) OPEN CIRCUIT IN WIRE TO EXTERNAL LAMP.	(1) REPAIR WIRING HARNESS.
	(2) BURNED OUT LAMP.	(2) REPLACE LAMP.

MULTI-FUNCTION SWITCH (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SYSTEM DOES NOT FLASH ON EITHER SIDE.	(1) FAULTY FUSE.	(1) REPLACE FUSE.
	(2) FAULTY FLASHER UNIT.	(2) REPLACE FLASHER.
	(3) LOOSE BULKHEAD CONNECTOR.	(3) TIGHTEN CONNECTOR.
	(4) LOOSE OR FAULTY REAR WIRING HARNESS OR TERMINALS.	(4) REPAIR WIRING HARNESS
	(5) OPEN CIRCUIT TO FLASHER UNIT.	(5) CHECK CONNECTORS, REPAIR WIRING HARNESS.
	(6) OPEN CIRCUIT IN FEED WIRE TO TURN SIGNAL SWITCH.	(6) CHECK CONNECTORS, REPAIR WIRING HARNESS.
	(7) FAULTY SWITCH CONNECTION IN SWITCH.	(7) REPLACE MULTI FUNCTION SWITCH.
	(8) OPEN OR GROUNDED CIRCUIT IN WIRING TO EXTERNAL LAMPS.	(8) REPAIR WIRING HARNESS.
SYSTEM DOES NOT CANCEL AFTER COMPLETION OF THE TURN.	(1) BROKEN CANCELLING FINGER ON SWITCH.	(1) REPLACE MULTI FUNCTION SWITCH.
	(2) BROKEN OR MISSING CANCELLING CAM ON CLOCK SPRING.	(2) REPLACE CLOCK SPRING.
EXTERNAL LAMPS OPERATE PROPERLY, NO INDICATOR LAMP OPERATION.	(1) FAULTY INDICATOR LAMP IN INSTRUMENT CLUSTER.	(1) REPLACE LAMP.
	(2) OPEN CIRCUIT OR WIRING.	(2) REPAIR WIRING HARNESS.

MULTI-FUNCTION SWITCH (Continued)

SWITCH DIAGNOSIS

To test the switch:

(1) Disconnect and isolate the battery negative cable (Fig. 21).

(2) Remove the upper and lower steering column shrouds. (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - REMOVAL).

(3) Disconnect the switch connector.

Using an ohmmeter, test for continuity (no resistance) between the terminals of the switch as shown in the Multi-Function Switch Continuity Test table for diagnosis. Refer to (Fig. 18), (Fig. 19), and (Fig. 20) for connector terminal locations.

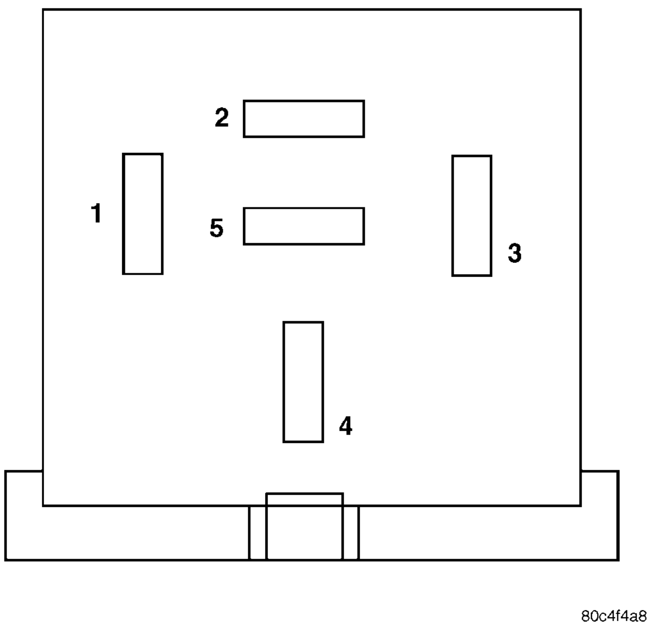


Fig. 18 COMBINATION FLASHER CONNECTOR (A)

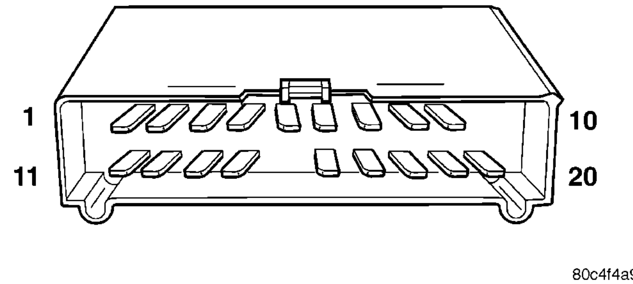


Fig. 19 MULTI-FUNCTION SWITCH CONNECTOR (B)

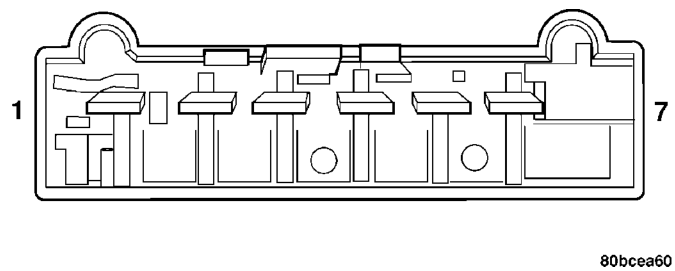


Fig. 20 WINDSHIELD WIPER/WASHER SWITCH CONNECTOR (C)

MULTI-FUNCTION SWITCH (Continued)

MULTI-FUNCTION SWITCH CONTINUITY TEST

SWITCH POSITION	MODE	CONTINUITY BETWEEN
TURN SIGNAL IN NEUTRAL HAZARD WARNING SWITCH OFF	HAZARD OFF	B-1 AND B-4 B-1 AND B-5 B-18 AND B-19 B-4 AND B-5
TURN SIGNAL ON HAZARD WARNING SWITCH OFF	LEFT TURN	A-2 AND B-2 A-2 AND B-4 B-1 AND B-5 B-2 AND B-4 B-18 AND B-19
	RIGHT TURN	A-2 AND B-5 B-1 AND B-4 B-5 AND B-6 B-18 AND B-19
TURN SIGNAL IN NEUTRAL HAZARD WARNING SWITCH ON	HAZARD ON	A-2 AND B-2 A-2 AND B-4 A-2 AND B-5 A-2 AND B-6 A-3 AND A-5 A-3 AND B-7 B-2 AND B-4 B-2 AND B-5 B-2 AND B-6 B-4 AND B-5 B-4 AND B-6 B-5 AND B-6 B-18 AND B-19
PARK LAMP	PARK	B-9 AND B-20 B-18 AND B-19

MULTI-FUNCTION SWITCH (Continued)

SWITCH POSITION	MODE	CONTINUITY BETWEEN
HEADLAMP BEAM	LOW	B-16 AND B-18 B-16 AND B-19 B-9 AND B-20 B-1 AND B-4 B-18 AND B-19
	HIGH	B-17 AND B-18 B-17 AND B-19 B-9 AND B-20 B-1 AND B-4 B-18 AND B-19
OPTICAL HORN	ON	B-17 AND B-18 B-17 AND B-19 B-18 AND B-19
FRONT FOG	ON	B-13 AND B-14 B-9 AND B-20 B-16 AND B-18 B-16 AND B-19 B-18 AND B-19
REAR FOG	ON	B-12 AND B-14 B-13 AND B-14 B-9 AND B-20 B-16 AND B-18 B-16 AND B-19 B-18 AND B-19 B-12 AND B-13

MULTI-FUNCTION SWITCH DIMMER CONTROL RESISTANCE

SWITCH POSITION	RESISTANCE VALUE
DOME ON	0 ± 1% + 20Ω
PARADE MODE	90.9 ± 1% + 20Ω
DIM 5 (BRIGHTEST INTENSITY)	252.9 ± 1% + 20Ω
DIM 4	600.9 ± 1% + 20Ω
DIM 3	1204.9 ± 1% + 20Ω
DIM 2	1853.9 ± 1% + 20Ω
DIM 1 (DIMMEST INTENSITY)	3223.9 ± 1% + 20Ω

MULTI-FUNCTION SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable (Fig. 21).

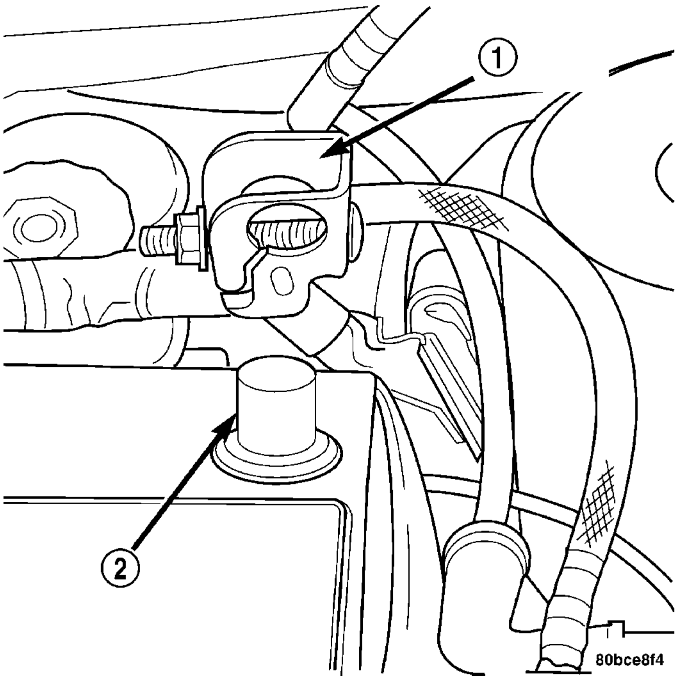


Fig. 21 DISCONNECT AND ISOLATE BATTERY NEGATIVE CABLE

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

(2) Remove both upper and lower steering column shrouds. (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - REMOVAL).

(3) Disconnect both posi-lock harness connectors at the rear of the multi-function switch (Fig. 22) and (Fig. 23).

(4) Remove multi-function switch mounting screws (Fig. 22) and (Fig. 23).

(5) The combination flasher must be transferred to new multi-function switch if replacing (Fig. 22).

(6) The windshield wiper/washer switch must be transferred to the new multi-function switch. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER/WASHER SWITCH - REMOVAL).

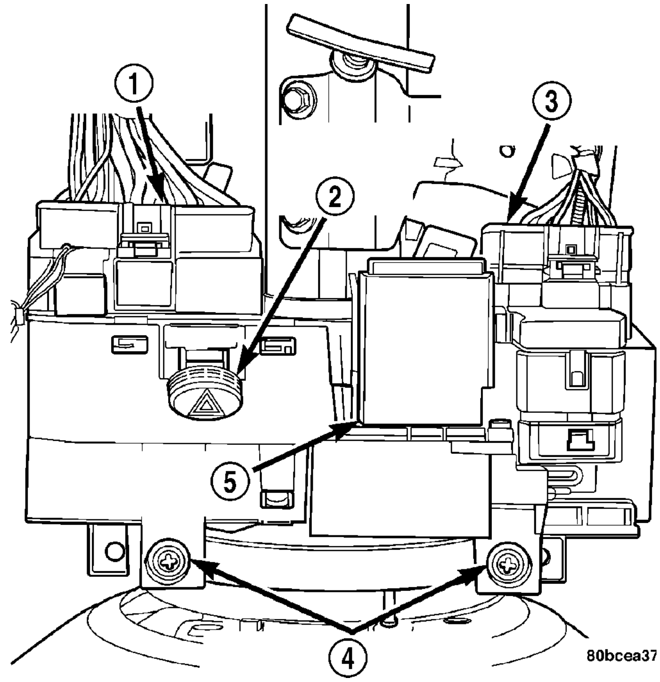


Fig. 22 MULTI-FUNCTION SWITCH MOUNTING

1 - MULTI-FUNCTION SWITCH CONNECTOR
2 - HAZARD/WARNING SWITCH
3 - WINDSHIELD WIPER/WASHER SWITCH CONNECTOR
4 - MOUNTING SCREWS
5 - COMBINATION FLASHER

INSTALLATION

(1) The windshield wiper/washer switch must be transferred to the new multi-function switch. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER/WASHER SWITCH - INSTALLATION).

(2) The combination flasher must be transferred to new multi-function switch if replacing.

(3) Install the multi-function switch mounting screws. Tighten multi-function switch to column retaining screws to 3 N·m (27 in. lbs.) torque.

(4) Connect both posi-lock harness connectors at the rear of the multi-function switch.

(5) Instal both upper and lower steering column shrouds. (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - INSTALLATION).

(6) Connect the battery negative cable.

MULTI-FUNCTION SWITCH (Continued)

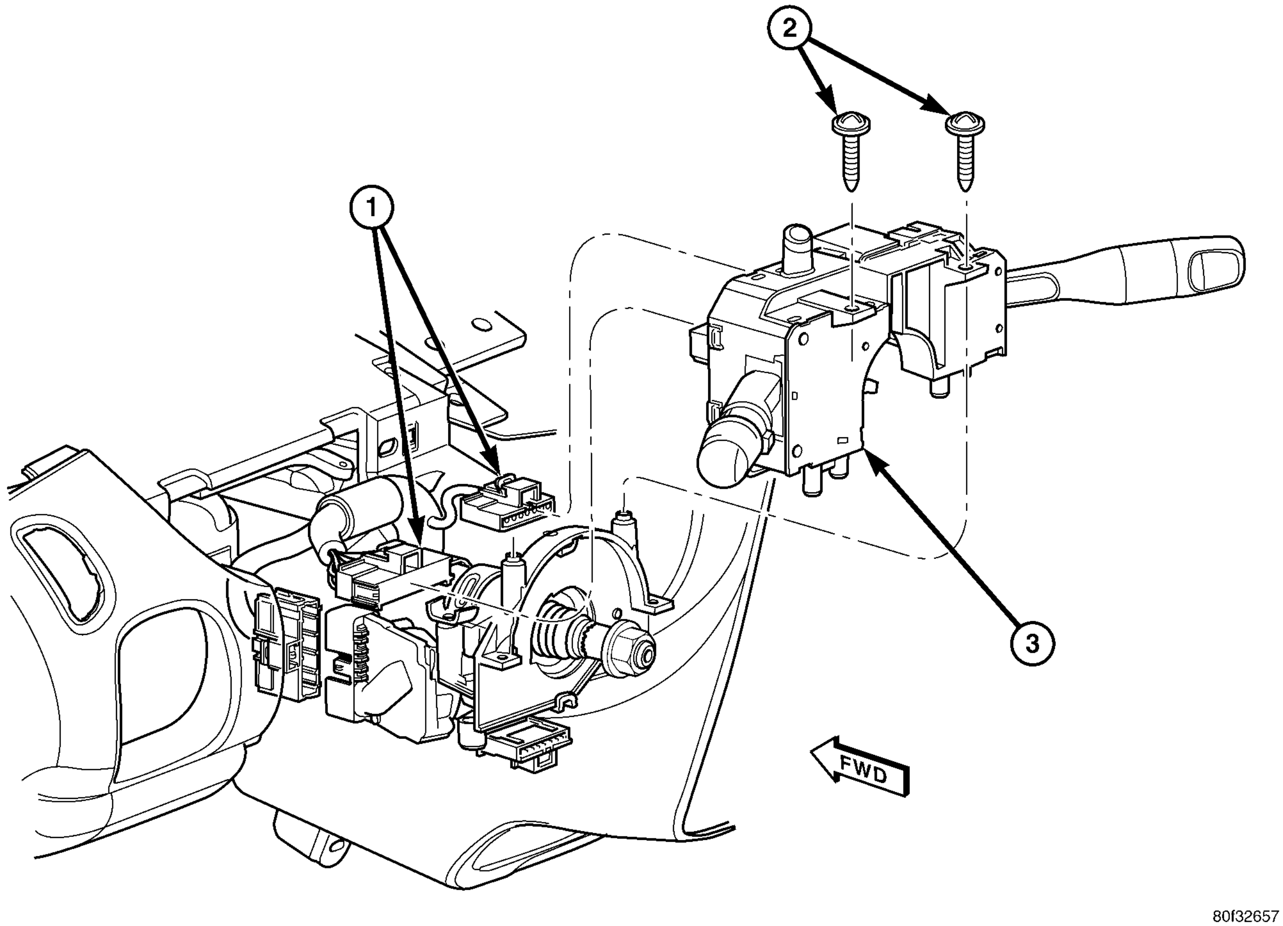


Fig. 23 MULTI-FUNCTION SWITCH - REMOVE/INSTALL

1 - MULTI-FUNCTION SWITCH CONNECTORS
2 - RETAINING SCREWS
3 - MULTI-FUNCTION SWITCH

REAR FOG LAMP

DESCRIPTION

Therear fog lamps can be found in the rear of the vehicle, integrated into the rear tail lamp assembly. Rear fog lamps utilize a red lens and clear bulb.

OPERATION

The rear fog lamps are turned ON and OFF with the rear fog lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FOG LAMP SWITCH - OPERATION). Refer to Wiring Diagrams for a complete system schematic.

DIAGNOSIS AND TESTING - REAR FOG LAMP - EXPORT

Refer to Wiring Diagrams for a complete system schematic.

(1) Remove the rear fog lamp bulb and check for burned out condition. Replace bulb if necessary.

(2) If bulb appears OK, reinstall the bulb in its socket and rotate the ignition switch to the “ON” position. Turn the rear fog lamp “ON” and check for lamp operation. If lamp is still inoperative proceed to Step 3

(3) Remove lamp bulb and check for proper power (12v) and ground connections in lamp socket. If power and/or ground connections are not present, trace wire until open or short is found. Refer to Wiring Diagrams for a complete system schematic.

REMOVAL

REAR FOG LAMP UNIT

(1) Disconnect and isolate the battery negative cable.

(2) Remove the appropriate two rear fog lamp retaining screws.

(3) Pull the fog lamp assembly from the rear bumper fascia.

(4) Rotate and pull the lamp socket from the lamp housing.

(5) Remove lamp assembly from vehicle.

REAR FOG LAMP BULB

(1) Remove the fog lamp unit from the rear bumper fascia (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FOG LAMP - REMOVAL).

(2) Pull bulb out of socket and replace bulb (Fig. 24).

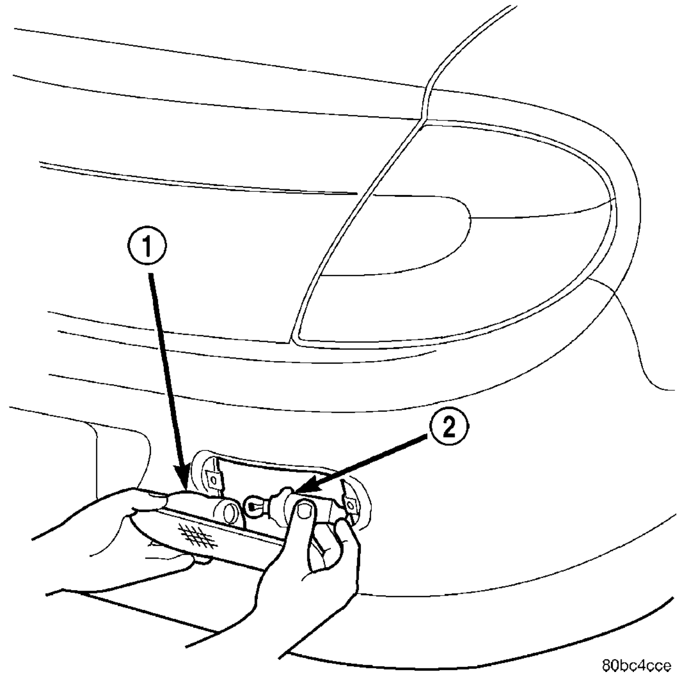


Fig. 24 REAR FOG LAMP SOCKET

1 - REAR FOG LAMP
2 - REAR FOG LAMP SOCKET

INSTALLATION

REAR FOG LAMP UNIT

(1) Install the lamp socket into the lamp housing.

(2) Install the lamp assembly into rear bumper fascia.

(3) Install the appropriate two rear fog lamp retaining screws.

(4) Connect the battery negative cable.

REAR FOG LAMP BULB

(1) Push in bulb (Fig. 24).

(2) Install the fog lamp unit into the rear bumper fascia (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FOG LAMP - INSTALLATION).

TAIL LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Move trunk lining as necessary from rear closure panel to gain access to back of tail lamp.

(3) Remove bulb socket from tail lamp through openings in rear closure panel (Fig. 25).

(4) Pull bulb from socket.

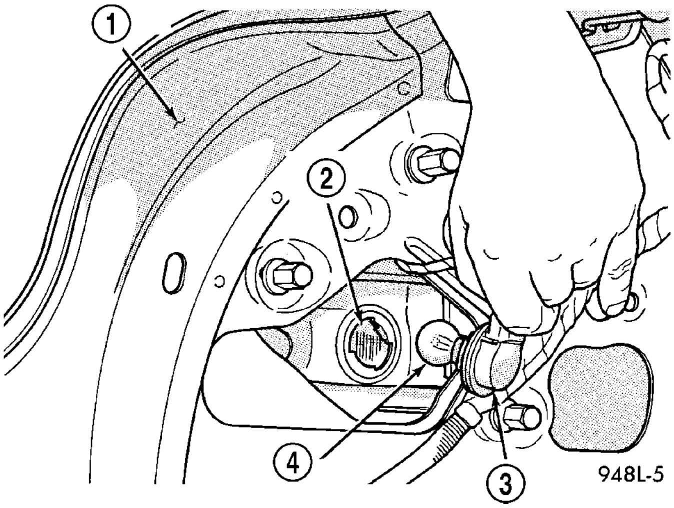


Fig. 25 TAIL AND STOP LAMP BULB

1 - REAR CLOSURE PANEL
2 - TAIL LAMP
3 - SOCKET
4 - BULB

INSTALLATION

(1) Push bulb into socket.

(2) Install bulb socket into tail lamp through openings in rear closure panel.

(3) Reposition trunk lining to rear closure panel.

(4) Connect the battery negative cable.

TAIL LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Move trunk lining as necessary from rear closure panel to gain access to back of tail lamp.

(3) Remove nuts attaching tail lamp to the rear closure panel.

(4) Disconnect the wiring connectors from the bulb sockets.

(5) Remove lamp housing from vehicle.

INSTALLATION

(1) Pull wiring and connectors through opening in rear closure panel and install wiring connectors into bulb sockets.

(2) Place lamp assembly into position.

(3) Install lamp assembly nuts.

(4) Reposition trunk lining.

(5) Connect the battery negative cable.

(6) Verify vehicle and system operation.

TRUNK LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Insert a trim stick or small flat blade between the lamp lens and rear shelf reinforcement panel.

(3) Pry the lamp lens downward.

(4) Disconnect wire connector.

(5) Remove lamp from vehicle.

INSTALLATION

(1) Place lamp into position.

(2) Connect wire connector.

(3) Install lamp lens.

(4) Connect battery negative cable.

LAMPS/LIGHTING - INTERIOR

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LAMPS/LIGHTING - INTERIOR

SPECIFICATIONS

INTERIOR LAMPS

CAUTION: Do not use bulbs other than those listed in the chart below. Damage to lamp can result.

BULB APPLICATION CHART

LAMP	BULB
ABS INDICATOR	LED
AIRBAG INDICATOR	LED
BRAKE SYSTEM WARNING INDICATOR	LED
CLIMATE CONTROLS	LED
CONSOLE GEAR SELECTOR W/AUTO	PC 194
DOME LAMP	T579
FRONT FOG LAMP INDICATOR	LED
GLOVE COMPARTMENT	T194
HIGH BEAM LAMP INDICATOR	PC194
IGNITION LOCK	161
INSTRUMENT CLUSTER ILLUMINATION	PC194
LOW FUEL INDICATOR	LED
LOW OIL PRESSURE INDICATOR	LED
REAR CARGO	T906
SEAT BELT INDICATOR	LED
SECURITY ALARM INDICATOR	LED
SHIFT BEZEL (PRNDL) LAMP	T37
MALFUNCTION INDICATOR LIGHT	LED
TRAC OFF INDICATOR	LED
TURN SIGNAL INDICATOR	PC194
UNDERHOOD	105
VISOR VANITY	6501966
VOLTAGE INDICATOR	LED

All the interior bulbs are brass or glass wedge base. Aluminum base bulbs are not approved and should not be used for replacement.

CUP HOLDER LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Insert a small screwdriver into notch by lens and gently pry out unit.
(3) Slide back rear cover to expose bulb.
(4) Remove bulb.

INSTALLATION

(1) Install bulb.
(2) Insert bulb into cover.
(3) Align bulb holder with slots on instrument panel and firmly snap into place.
(4) Connect battery negative cable.

DOME LAMP

REMOVAL

LAMP

(1) Disconnect and isolate the battery negative cable.
(2) Insert a trim stick between the dome lamp bezel and dome lamp lens.
(3) Carefully pull down on lamp lens to remove lamp from headliner.
(4) Disconnect wire connector.
(5) Remove lamp.

BULB

(1) Disconnect and isolate the battery negative cable.
(2) Insert a trim stick between the dome lamp bezel and dome lamp lens.
(3) Carefully swing down one side of the lamp lens.
(4) Remove bulb from lamp socket.

INSTALLATION

LAMP

(1) Place lamp into position.
(2) Connect wire connector.
(3) Install dome lamp and lens.
(4) Connect the battery negative cable.

BULB

(1) Push bulb in socket and snap into place.
(2) Position lens on lamp and snap into place.
(3) Connect the battery negative cable.

GLOVE BOX LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Open glove box door.
(3) Pull downward on lamp/switch assembly to disengage tabs from instrument panel.
(4) Pull bulb from socket.

INSTALLATION

(1) Push bulb into socket.
(2) Place lamp/switch assembly into position.
(3) Push lamp/switch assembly to lock tabs.
(4) Check lamp operation, and close glove door.
(5) Connect the battery negative cable.

GLOVE BOX LAMP SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Open glove box door.
(3) Pull downward on lamp/switch assembly to disengage tabs from instrument panel.
(4) Pull bulb from socket.
(5) Disconnect wire connector from lamp and remove glove box lamp/switch.

INSTALLATION

(1) Push bulb into socket.
(2) Place lamp/switch assembly into position.
(3) Connect wire connector to the lamp/switch.
(4) Push lamp/switch assembly to lock tabs.
(5) Check lamp operation, and close glove box door.
(6) Connect the battery negative cable.

READING LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Using a small thin blade tool, pry at the center of the lens nearest the mirror to remove lens.
(3) Remove cartridge lamp.

INSTALLATION

(1) Install lens by setting lens into position and applying pressure until it is locked into position.
(2) Connect the battery negative cable.

SHIFT BEZEL (PRNDL) ILLUMINATION

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove floor console.
(3) Remove wiring and socket from shift bezel (PRNDL).
(4) Remove bulb from socket.

INSTALLATION

(1) Push bulb in socket and snap into place.
(2) Install floor console.
(3) Connect the battery negative cable.

VANITY LAMP

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Lower visor.
(3) Insert a small flat bladed tool between the lamp lens and lamp.
(4) Carefully pry lens outward.
(5) Remove bulb from socket.

INSTALLATION

(1) Position bulb in socket and snap into place.
(2) Position lens on lamp and snap into place.
(3) Connect the battery negative cable.

MESSAGE SYSTEMS

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COMPASS/TEMPERATURE MIRROR

DESCRIPTION

COMPASS / TEMPERATURE MIRROR

The Compass/Temperature Mirror consists of an electronic control module with a vacuum fluorescent display (VFD) screen (Fig. 1), two map/reading lamps and function switches. The electronic module displays the outside temperature and one of eight compass headings to indicate the direction the vehicle is facing. The compass/temperature mirror transmits and receives data on the PCI Data Bus Circuitry.

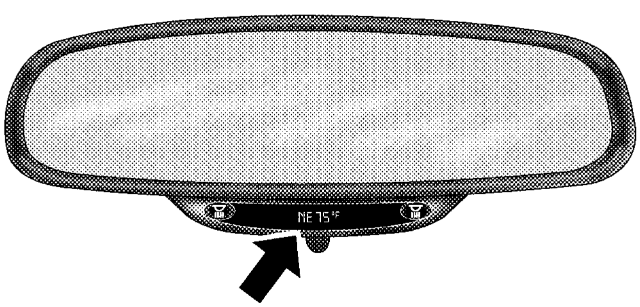

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Fig. 1 Compass/Temperature Mirror

COMPASS

The compass is capable of self-calibrating. Refer to the procedures later in this section of the service manual. The compass is located within the mirror module and can not be serviced separately.

THERMOMETER

The Compass/Temperature Mirror displays the outside temperature using data from the NGC engine controller on the PCI databus. Engine temperature can increase the displayed temperature.

OPERATION

The optional compass/temperature mirror incorporates 2 reading lamp buttons, which also function as STEP and ZONE/CALIBRATION buttons. The desired function is obtained by pressing and holding a button depressed for a specific time period. The STEP button provides the selections between English and Metric. The Zone/Cal. button is used to change the compass zone or calibrate the compass.

The STEP button (right reading lamp button) operates a momentary contact switch, which is used to toggle through the following four modes:

- Turn the right reading lamp on and off.
- To select degrees Fahrenheit or Celsius for the temperature display (Press and Hold for 5 to 10 seconds).
- To turn display off (Press and Hold for 10 to 15 seconds).

The ZONE/CALIBRATION button (left reading lamp button) operates a momentary contact switch, which is used to toggle through the following two modes:

- Turn the left reading lamp on and off.
- To actuate compass Zone/Calibration modes (Press and Hold for 5 to 10 seconds).

DIAGNOSIS AND TESTING - COMPASS/ TEMPERATURE MIRROR

If the Compass/Temperature mirror lights up and functions, however the accuracy of the information displayed is in question or certain displays are not

COMPASS/TEMPERATURE MIRROR (Continued)

working, refer to the self-diagnostic test below. If the mirror doesn't light up or function, proceed with the following preliminary tests:

(1) Disconnect the compass/temperature mirror electrical connector. Using a voltmeter, check for 12v on the fused B+ circuit cavity. Voltage should be present. If OK go to Step 2, If NOT OK, repair the short or open circuit as required.

(2) Using a voltmeter, check for 12v on the fused ignition run circuit cavity with the ignition switch in the RUN position. Voltage should be present. If OK go to Step 3, If NOT OK, repair the short or open circuit as required.

(3) Key Off. Using a ohmmeter, check for continuity to a good ground on the ground circuit cavities of the compass/temperature mirror electrical connector. Continuity should be present. If OK, replace the mirror assembly, If NOT OK, repair the short or open circuits as required.

COMPASS/TEMPERATURE MIRROR SELF-DIAGNOSTIC TEST

NOTE: If the ignition switch is turned off during any period of the self diagnostic procedure, the mirror will exit the self diagnostic mode.

NOTE: Pressing and releasing the zone/calibration button will exit the self diagnostic mode and return to the standard compass/temperature mode

To perform the compass/temperature mirror self diagnostic routine:

(4) Turn the ignition to the ON position.

(5) Press and hold the zone/calibration (left reading lamp button) button for 20 to 25 seconds.

(6) During testing, if any of the test fail, a “F” will appear. If more than one test fail, “F0” will appear. If “F” or F0” appear, replace the compass/temperature mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL).

(7) If a “P” is displayed, that indicates that the compass/temperature mirror has passed the self diagnostic procedure.

NOTE: If, after performing the self diagnostic procedure the compass still has an incorrect reading, perform the compass calibration or compass variation adjustment. (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR - STANDARD PROCEDURE - COMPASS CALIBRATION) or (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR - STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT).

STANDARD PROCEDURE

STANDARD PROCEDURE - COMPASS CALIBRATION

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or out of calibration, perform the following calibration procedure. Also, new service replacement compass/temperature mirrors must have their compass calibrated using this procedure. Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

FIRST TIME COMPASS CALIBRATION

The mirror is shipped in the first time calibration mode with the CAL symbol illuminated. After completing three 360° turns in an area free from large metal objects, the CAL symbol should turn off and the compass will function normally.

MANUAL COMPASS CALIBRATION

(1) Press and hold the Zone/Calibration (left reading lamp button) button for 10 to 15 seconds. This will toggle the CAL mode on/off, causing the CAL symbol to illuminate/darken respectively.

(2) Release the button once the CAL symbol illuminates/darkens. Manual compass calibration has been initiated at this point.

(3) Drive the vehicle in circles in an area free from large metal objects until the CAL symbol is no longer displayed.

When the CAL symbol is no longer displayed, the compass is calibrated and should display correct headings. Verify proper calibration by checking North (N), South (S), East (E), and West (W). If the compass does not appear accurate, repeat the calibration procedure in another area.

NOTE: If the “CAL” message remains in the display, either there is excessive magnetism near the compass, or the unit is faulty. Repeat the calibration procedure at least one more time.

NOTE: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

COMPASS/TEMPERATURE MIRROR (Continued)

STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT

Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and true geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance must be set.

ZONE METHOD

(1) Using the Variance Settings map, find your geographic location and note the zone number (Fig. 2).

(2) Turn the ignition switch to the On position. Press and hold the Zone/Calibration (left reading lamp button) button for 5 to 10 seconds. The Zone symbol should be illuminated.

(3) Releasing the Zone /Calibration button while the ZONE symbol is illuminated will cause the mirror to enter the zone display mode.

(4) The current variance zone will now be displayed. To change the zone, press the Zone/Calibration button until the correct zone is displayed. Wait for 5 seconds.

(5) After five seconds, the displayed zone will automatically be set in the mirror memory and normal operation will resume.

(6) Confirm that the correct directions are now indicated by the compass.

REMOVAL

For compass/temperature mirror removal procedure, (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL).

AMBIENT TEMPERATURE SENSOR

DESCRIPTION

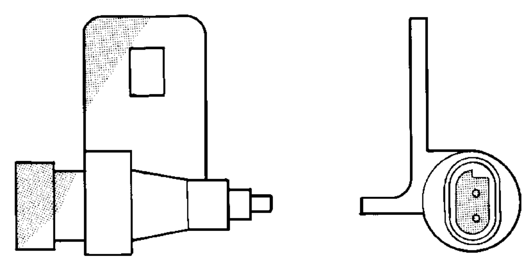

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Fig. 3 Ambient Temperature Sensor - Typical

Ambient air temperature is monitored by the Compass Temperature Mirror through a PCI databus message from the NGC engine controller. The ambient temperature sensor (Fig. 3) is the source for the NGC engine controller. The sensor is a variable resistor mounted in front the radiator, behind the grille, near the left lower side of the radiator support assembly.

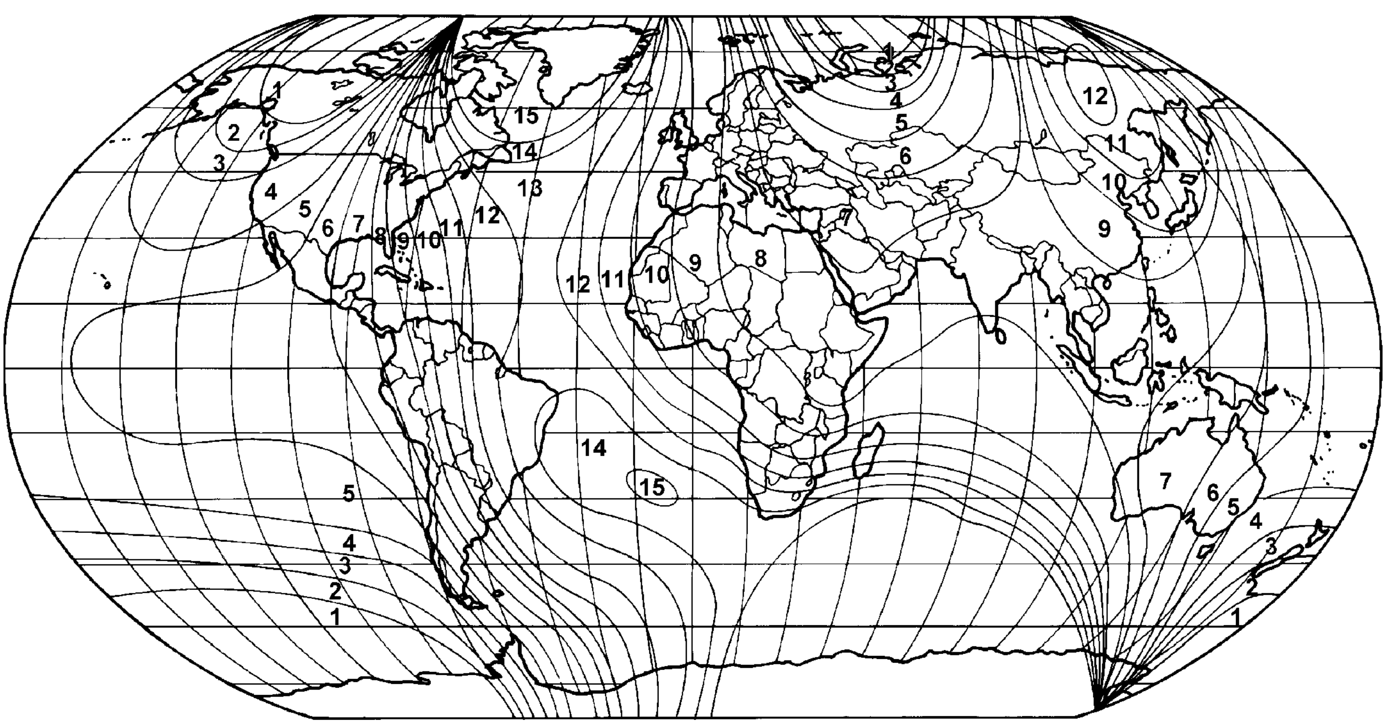

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Fig. 2 Variance Settings

AMBIENT TEMPERATURE SENSOR (Continued)

For complete circuit diagrams, refer to the appropriate wiring information. The ambient temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal sent to it by the NGC engine controller. The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the NGC engine controller. Based upon the resistance in the sensor, the mirror senses a specific voltage on the temperature sensor signal circuit, which it is programmed to correspond to a specific temperature.

DIAGNOSIS AND TESTING - AMBIENT TEMPERATURE SENSOR

The ambient temperature sensor can be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, replace the compass/temperature display.

SENSOR TESTING

(1) Turn the ignition switch to the OFF position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor wire harness connector.

(2) Measure the resistance of the ambient temperature sensor. At room temperature (approx. 68°F), the sensor resistance should be between 9-11 Kilohms (9000-11000 ohms). The sensor resistance should read between these two values. If OK, refer to Sensor Circuit Testing below. If not OK, replace the faulty ambient temperature sensor.

SENSOR CIRCUIT TESTING

(1) Turn the ignition switch to the OFF position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor wire harness connector and the NGC engine controller wire harness connector.

(2) Connect a jumper wire between the two terminals in the body half of the ambient temperature sensor wire harness connector.

(3) Check for continuity between the sensor return circuit and the ambient temperature sensor signal circuit cavities of the NGC engine controller wire harness connector. There should be continuity. If OK, go to Step 4. If not OK, repair the open sensor return circuit or ambient temperature sensor signal circuit to the ambient temperature sensor as required.

(4) Remove the jumper wire from the body half of the ambient temperature sensor wire harness connector. Check for continuity between the sensor return circuit cavity of the NGC engine controller wire harness connector and a good ground. There should be no continuity. If OK, replace the compass/temperature display unit. If not OK, repair the shorted sensor return circuit as required.

REMOVAL

(1) Open hood, disconnect and isolate the negative battery cable.

(2) Working in the front of the vehicle, reach through the lower opening in the front fascia to access the ambient temperature sensor.

(3) Remove the ambient temperature sensor from the radiator closure panel (Fig. 4).

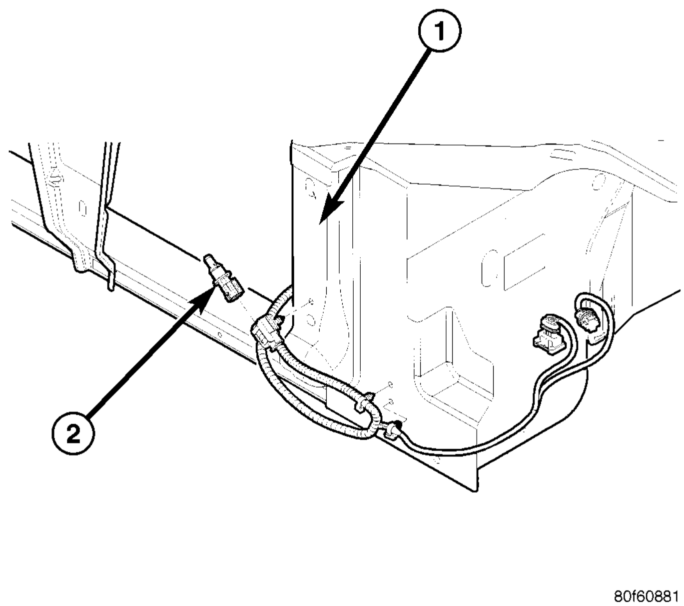

Fig. 4 Ambient Air Temperature Sensor Location

1 - Radiator Closure Panel
2 - Ambient Air Temperature Sensor

(4) Disconnect the ambient temperature sensor electrical connector.

(5) Remove the ambient temperature sensor from the vehicle.

INSTALLATION

(1) Working in the front of the vehicle, reach through the lower opening in the front fascia to connect the ambient temperature sensor electrical connector.

(2) Position the ambient temperature sensor and install in radiator closure panel.

(3) Connect the negative battery cable.

POWER SYSTEMS

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POWER LOCKS

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POWER LOCKS

DESCRIPTION

POWER DOOR LOCKS

All doors can be locked or unlocked electrically by operating the switch on either front door panel. When the door lock switch is activated the Remote Keyless Entry Module provides power to the door lock motors through relays internal to the module.

The Remote Keyless Entry (RKE) Module also controls the Vehicle Theft Security System (VTSS).

The power lock motors are also equipped with a thermal protection system which prevents the motors from burning out. The motors may chatter if they are continuously activated.

The power lock motor is integral to the door latch. If there is a problem with the motor the entire latch must be replaced. Refer to Body, Doors - Front (or Rear), Latch, Removal, and Installation.

POWER LOCKS (Continued)

REMOTE KEYLESS ENTRY SYSTEM

The system allows locking and unlocking of vehicle door(s), deck lid release, and panic by remote control using a hand held radio frequency transmitter. The vehicle speed must be less than 8 kmh (5 mph) before the trunk lid can be unlatched with the transmitter.

The receiver may receive signals from up to four transmitters. Each transmitter has its own code, and the code is programmed and stored into receiver memory. If a transmitter is replaced or additional transmitters are added, the codes for all units have to be reprogrammed into the receiver memory. If a receiver module is replaced, the transmitter codes must be stored in the new receiver memory.

ROLLING DOOR LOCKS

The system includes the rolling door locking feature. The vehicle is shipped with the system enabled. When the system is disabled the door locks will work by use of the door lock switches and the Remote Keyless Entry system only. When the rolling door lock system is enabled, the RKE module will automatically lock all the vehicle doors when all of the following conditions are met:

- All doors are closed
- The vehicle speed exceeds 15 ± 1 mph.
- The throttle position sensor tip-in is greater than 10 ± 2 degrees.

The RKE module will automatically re-lock all doors if the above conditions are met and if any of the doors become ajar and then closed again.

The enabling/disabling of the rolling door lock feature is customer programmable, as well as programmable with the DRB III® scan tool.

DOOR LOCK INHIBIT

With the key in the ignition switch and the driver door open, the Remote Keyless Entry (RKE) Module will ignore the command to lock the power door locks via the interior driver door lock switch. Once the key is removed, or the driver door is closed, the RKE module will allow the power door locks to lock via the interior door lock switches.

CENTRAL LOCKING/UNLOCKING

The door locks can be locked or unlocked electrically via the exterior door key cylinders to provide the central locking/unlocking feature. The central locking/unlocking feature incorporates a customer programmable ″Double activation unlock″ feature which operates in the following manner: When enabled, the first turn of the key cylinder to the UNLOCK position (toward the front of the vehicle) will mechanically unlock the door whose key cylinder is being turned. A second turn of the key cylinder to the UNLOCK position (within five seconds of the first turn) will cause all vehicle doors to unlock electrically. When this feature is disabled, all vehicle doors will be unlocked electrically upon the first turn of a key cylinder to the UNLOCK position. The vehicle is locked electrically by turning the key cylinder to the LOCK position once, regardless of the state of the double activation unlock feature.

CHILD PROTECTION LOCKS

To provide a safer environment for children riding in the rear seat, the rear doors have the “child-protection” door lock system.

The child protection locks are on the rear doors only. The lock, when engaged, will disable the inside door handle from opening the door. The lock is part of the latch/lock assembly. If there is a problem with the child protection locks, the entire latch must be replaced. (Refer to 23 - BODY/DOORS - REAR/LATCH - REMOVAL).

WARNING: TO AVOID TRAPPING ANYONE IN A VEHICLE IN A COLLISION. REMEMBER THAT THE REAR DOORS CAN ONLY BE OPENED FROM THE OUTSIDE WHEN THE CHILD PROTECTION LOCKS ARE ENGAGED.

OPERATION

POWER DOOR LOCKS

All doors can be locked or unlocked mechanically and independently with their respective locking knobs. The front doors can also be unlocked by actuation of the inside remote door handle.

REMOTE KEYLESS ENTRY SYSTEM

The transmitter has four buttons for operation. They are LOCK, UNLOCK, DECK LID RELEASE, and PANIC.

- The UNLOCK button will unlock the driver’s door, flash the park lamps twice and enable illuminated entry. Pushing and releasing the button once will unlock the driver’s door. Pushing and releasing the button two times, within a five second interval, will unlock all doors.
- Upon pressing the LOCK button, the horn will sound a short CHIRP (if enabled) and flash the park lamps to notify that the all door lock signal was received and set. Illuminated entry is cancelled and the interior lamps are faded to off.
- Pushing and releasing the DECK LID RELEASE button two times within five seconds, will slightly ajar the deck lid.
- Pushing the PANIC button will cause the panic alarm to sound for three minutes, until the panic button is pressed a second time, or the vehicle reaches a speed of 15 mph.

POWER LOCKS (Continued)

The receiver is capable of retaining a Vehicle Access Code (VAC) even when power is removed.

Each Remote Keyless Entry (RKE) module must have at least one and no more than four transmitters.

CHILD PROTECTION LOCKS

The lock is engaged by moving a lever that is located on the rearward inside edge of the door.

To use the system, open each rear door and move the control UP to engage. When the system on a door is engaged, that door can only be opened by using the outside door handle even if the inside door lock is in the unlocked position.

WARNING: AVOID TRAPPING ANYONE IN A VEHICLE IN A COLLISION. REMEMBER THAT THE REAR DOORS CAN ONLY BE OPENED FROM THE OUTSIDE WHEN THE CHILD PROTECTION LOCKS ARE ENGAGED.

NOTE: For emergency exit with the system engaged, move the lock rocker switch rearward (unlocked position), roll down window and open the door with the outside door handle.

STANDARD PROCEDURE

STANDARD PROCEDURE - DOUBLE ACTIVATION UNLOCK

The toggling of the double activation unlock feature (between enabled and disabled) can be performed with the use of the DRB III® scan tool, or by the customer.

DRB III® PROGRAMMING

When using the DRB III® scan tool, select:

(1) “Theft Alarm”

(2) “VTSS”

(3) “Miscellaneous”

and then the desired function.

CUSTOMER PROGRAMMING

(1) Open the driver door, sit in the driver seat, and close the driver door.

(2) Turn the ignition switch to the RUN position (without starting the vehicle) and then back to OFF. Repeat this step three additional times (for a total of four key ON/OFF cycles).

(3) Within ten seconds of switching the ignition switch to the OFF position for the last time (at the end of the fourth cycle in the above step), press the driver interior door lock switch to UNLOCK. **Steps 2 and 3 must be completed within 10 seconds.**

(4) A single chime will be heard to verify that the customer programmable toggle of the double activation unlock was successfully completed.

NOTE: When toggling the double activation unlock feature (customer programmable), the toggle that happens will be from the last state of the double activation unlock. If the double activation unlock feature was enabled, after the toggle process, it will now be disabled and vice versa. There is no telltale to inform you of which state the double activation unlock feature is in.

STANDARD PROCEDURE - ROLLING DOOR LOCKS

The toggling of the rolling door lock feature (between enabled and disabled) can be performed with the use of the DRB III® scan tool or by the customer.

DRB III® PROGRAMMING

When using the DRB III® scan tool, select:

(1) “Theft Alarm”

(2) “VTSS”

(3) “Miscellaneous”

and then the desired function.

CUSTOMER PROGRAMMING

(1) Open the driver door, sit in the driver seat, and close the driver door.

(2) Turn the ignition switch to the RUN position (without starting the vehicle) and then back to OFF. Repeat this step three additional times (for a total of four key ON/OFF cycles).

(3) Within ten seconds of switching the ignition switch to the OFF position for the last time (at the end of the fourth cycle in the above step), press the driver interior door lock switch to LOCK. **Steps 2 and 3 must be completed within 10 seconds.**

(4) A single chime will be heard to verify that the customer programmable toggle of the rolling door locks was successfully completed.

NOTE: When toggling the rolling door locks (customer programmable), the toggle that happens will be from the last state of the rolling door locks. If the rolling door locks were enabled, after the toggle process, they will now be disabled and vice versa. There is no telltale to inform you of which state the rolling door locks are in.

POWER LOCKS (Continued)

STANDARD PROCEDURE - TOGGLING CUSTOMER PREFERENCES

HORN CHIRP TOGGLE

Once the transmitters have been programmed, the horn chirp can be enabled/disabled. This can be done using a DRB III® scan tool or by the customer. The horn chirp will enter the opposite state of its current programmed state. The Remote Keyless Entry Module is responsible for keeping track of the horn chirp status.

The toggling of the horn chirp (between enabled and disabled) can be performed with the use of the DRB III® scan tool or by the customer.

DRB III® PROGRAMMING

When using the DRB III® scan tool, select:

(1) "Theft Alarm"

(2) "VTSS"

(3) "Miscellaneous"

and then the desired function.

CUSTOMER PROGRAMMING

Using a transmitter programmed to the RKE Module, the status of the horn chirp may be toggled by the customer.

NOTE: The RKE Module is responsible for keeping track of the horn chirp status; thus this procedure does not need to be repeated for each transmitter programmed to the system.

(1) With the ignition switch in RUN position, press and hold the transmitter Unlock button for a minimum of 4 seconds to a maximum of 10 seconds.

(2) Within the 4-10 second range, depress the transmitter Lock button. A chime will be heard to indicate a successful toggle, at which time the buttons may be released.

DECK LID SOLENOID

DIAGNOSIS AND TESTING - DECK LID SOLENOID

(1) Confirm operation of RKE transmitter(s) by actuating LOCK and UNLOCK functions.

(2) Confirm lead is connected to the deck lid release solenoid.

(3) Unplug lead, and use an ohmmeter to verify continuity of connection between pin 2 of the harness connector and ground. Refer to Wiring Diagrams for Connector Pin-Outs.

(4) Connect test light to pin 1 of the harness connector and actuate deck lid release button on transmitter. Refer to Wiring Diagrams for Connector Pin-Outs.

(5) If test light comes on, the wiring circuit between the RKE module and the solenoid is functional, and the deck lid solenoid should be replaced.

(6) If test light does not come on, refer to the proper Body Diagnostic Procedures manual for further troubleshooting information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Raise deck lid to the full up position.

(3) Unplug connector from solenoid.

(4) Remove two solenoid mounting screws.

(5) Remove solenoid from vehicle.

INSTALLATION

(1) Install the solenoid into the vehicle.

(2) Install the two solenoid mounting screws.

(3) Plug the connector into the solenoid.

(4) Close the deck lid.

(5) Connect the battery negative cable.

Adjust the deck lid latch and striker so that the deck lid latches with a moderate slam, and so that the deck lid releases properly whenever the power deck lid release is activated.

DECK LID RELEASE SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box door.

(3) Using a trim stick (special tool #C-4755) or equivalent, gently pry out on the deck lid release switch and pull out of instrument panel.

(4) Disconnect the wiring connector.

(5) Remove switch from vehicle.

INSTALLATION

(1) Connect the wiring connector.

(2) Align switch in hole and firmly snap into place.

(3) Close the glove box door.

(4) Connect the battery negative cable.

DOOR LOCK MOTOR

DIAGNOSIS AND TESTING - DOOR LOCK MOTOR

(1) Make certain battery is in normal condition and fuses powering the RKE module aren't blown before circuits are tested.

DOOR LOCK MOTOR (Continued)

(2) To determine which motor is faulty, check each individual door for electrical lock and unlock or disconnect the motor connectors one at a time, while operating the door lock switch.

(3) In the event that none of the motors work, the problem may be caused by a shorted motor, a bad switch or a bad relay internal to the RKE module. Disconnecting a defective motor will allow the others to work.

(4) To test an individual door lock motor, disconnect the electrical connector from the motor.

(5) To lock the door, connect a 12 volt power source to one pin of the lock motor and a ground wire to the other pin.

(6) To unlock the door, reverse the wire connections at the motor pin terminals.

(7) If these results are NOT obtained, replace the motor.

REMOTE KEYLESS ENTRY TRANSMITTER

DESCRIPTION

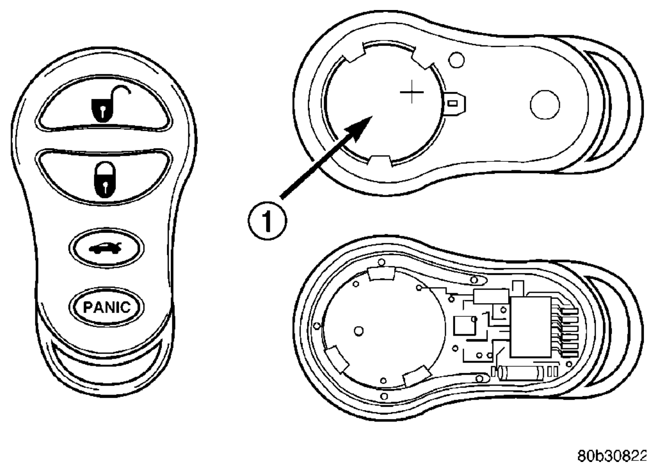

Fig. 1 REMOTE KEYLESS ENTRY TRANSMITTER

1 - BATTERY

The Remote Keyless Entry (RKE) system Radio Frequency (RF) transmitter (Fig. 1) is equipped with four buttons, labeled LOCK, UNLOCK, DECK LID RELEASE, and PANIC. It is also equipped with a key ring and is designed to serve as a key fob. The operating range of the transmitter radio signal is up to 10 meters (30 feet) from the RKE receiver.

Each RKE transmitter has a different vehicle access code, which must be programmed into the memory of the RKE receiver in the vehicle in order to operate the RKE system. Two transmitters are provided with the vehicle, but the RKE receiver can retain the access codes of up to four transmitters in its memory.

The RKE transmitter operates on two Panasonic CR2016 (or equivalent) batteries (Fig. 1). Typical battery life is from one to two years. The RKE transmitter cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

The transmitter has four buttons for operation. They are LOCK, UNLOCK, DECK LID RELEASE, and PANIC.

- The UNLOCK button will unlock the driver's door, flash the park lamps twice and enable illuminated entry. Pushing and releasing the button once will unlock the driver's door. Pushing and releasing the button two times, within a five second interval, will unlock all doors.
- Upon pressing the LOCK button, the horn will sound a short CHIRP (if enabled) and flash the park lamps to notify that the all door lock signal was received and set. Illuminated entry is cancelled and the interior lamps are faded to off.
- Pushing and releasing the DECK LID RELEASE button two times within a five second interval, will slightly ajar the deck lid.
- Pushing and holding the PANIC button will cause the panic alarm to sound for three minutes, until the panic button is pressed and held a second time, or the vehicle reaches a speed of 15 mph.

The receiver is capable of retaining a Vehicle Access Code (VAC) even when power is removed.

Each Remote Keyless Entry (RKE) module must have at least one and no more than four transmitters.

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY TRANSMITTER

Using special tool 9001, first test to ensure that the transmitter is functioning. Typical testing distance is 2.5 centimeters (1 inch) for Asian transmitters and 30.5 centimeters (12 inches) for all others. To test, position the transmitter as shown (Fig. 2). Press any transmitter button, then test each button individually. The tool will beep if a radio signal strength that lights five or more LED's is detected. Repeat this test three times. If transmitter fails any of the test refer to the Diagnostic Procedures manual.

STANDARD PROCEDURE - TRANSMITTER PROGRAMMING

The Remote Keyless Entry transmitters can be programmed with the use of the DRB III® scan tool or by the customer.

REMOTE KEYLESS ENTRY TRANSMITTER (Continued)

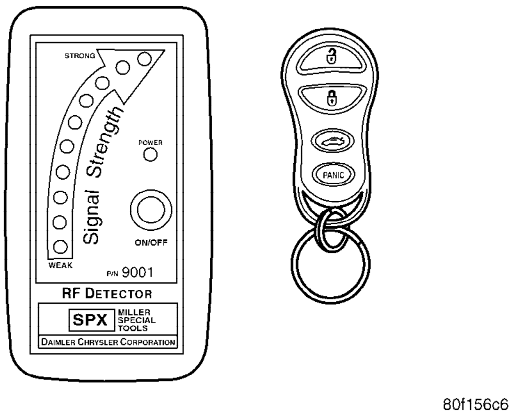

Fig. 2 RKE TRANSMITTER DIAGNOSIS

DRB III® PROGRAMMING

When using the DRB III® scan tool, select:
(1) "Theft Alarm"
(2) "VTSS"
(3) "Miscellaneous"
and then the desired function.

CUSTOMER PROGRAMMING

For a customer to be able to program RKE transmitters themselves, at least one RKE transmitter must be programmed already. This procedure is to add additional transmitters. If all transmitters are lost, the DRB III® scan tool must be used to program the new transmitters.

(1) Insert the key into the ignition switch, and turn the ignition switch to the RUN position without starting the vehicle (allow chimes to stop).

(2) Using the RKE transmitter programmed to the RKE module, press and continuously hold down the UNLOCK button for 4-10 seconds.

(3) Within the 4-10 second time range, continue to hold the UNLOCK button and press the PANIC button. Both buttons may then be released. Upon the PANIC button being depressed, the message for customer programming mode will be transmitted to the RKE module.

(4) A chime will be heard to verify that the customer programming mode has been entered (allow 3 seconds to hear chimes).

(5) Press and release any button on each transmitter that is to be programmed to the RKE module, including any transmitters which were previously programmed to the RKE module (with a maximum of four possible). After each transmitter is successfully programmed, a chime will be heard to verify that successful programming of the transmitter has occurred.

(6) After thirty seconds, or upon the ignition switch being turned OFF, the RKE module will exit programming mode.

POWER LOCK SWITCH

DIAGNOSIS AND TESTING - POWER LOCK SWITCH

(1) Remove the switch from its mounting location, and disconnect from vehicle wiring harness. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - REMOVAL).

(2) Using an ohmmeter, refer to the resistance table to determine if switch resistance is correct in the Lock and Unlock switch positions (Fig. 3).

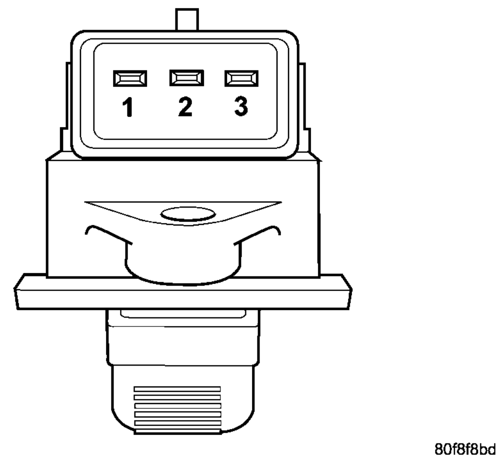

Fig. 3 POWER LOCK SWITCH

DOOR LOCK SWITCH RESISTANCE TABLE

SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE
LOCK	2 AND 3	1000 OHMS
UNLOCK	2 AND 3	249 OHMS

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove front door trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
(3) Disconnect wire connector.
(4) Remove two attaching screws.
(5) Remove the switch from the door panel.

INSTALLATION

(1) Install the switch to the door panel.
(2) Install the two attaching screws.
(3) Connect the one wire connector.

POWER LOCK SWITCH (Continued)

(4) Install the front door trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

(5) Connect the battery negative cable.

REMOTE KEYLESS ENTRY MODULE

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY MODULE

For procedures on diagnosing and testing the RKE Module's RKE functions, refer to the proper Body Diagnostic Procedures manual.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(3) Remove the two screws holding the RKE module to the instrument panel assembly (Fig. 4).

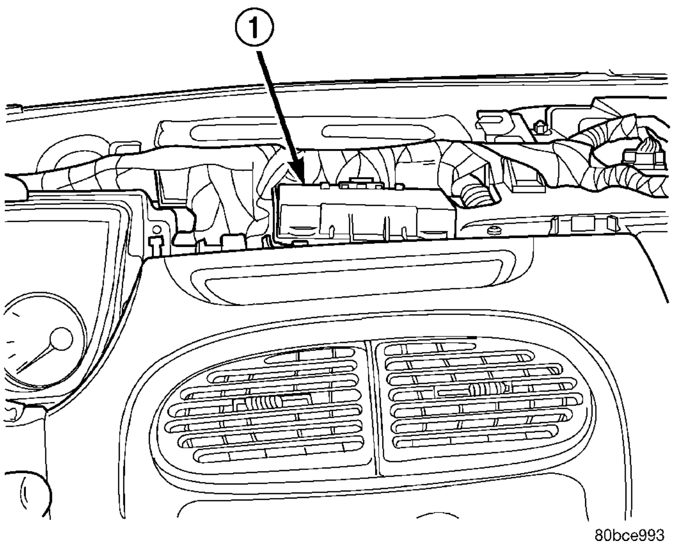

Fig. 4 RKE MODULE LOCATION

1 - RKE MODULE

(4) Slide locking tab of the wiring connector sideways to unlock tab, and remove connector from RKE module.

(5) Remove RKE module from vehicle.

NOTE: When replacing a faulty RKE Module, the replacement module must be configured with the DRB III® scan tool for proper operation. Additionally, all transmitters must be reprogrammed to the new RKE module.

INSTALLATION

NOTE: When replacing a faulty RKE Module, the replacement module must be configured with the DRB III® scan tool for proper operation. Additionally, all transmitters must be reprogrammed to the new RKE module.

(1) Install the RKE module into the vehicle.

(2) Connect the RKE wiring connector.

(3) Install the two screws holding the RKE module to the instrument panel assembly.

(4) Install the instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(5) Connect the battery negative cable.

POWER MIRRORS

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POWER MIRRORS

DESCRIPTION

The available power operated sideview mirrors allow the driver to adjust both outside mirrors electrically from the drivers seat by operating a switch on the driver side front door trim panel.

Some vehicles are equipped with Power Fold-Away Side View Mirrors. This feature allows both the driver and passenger side view mirrors to fold inward (retract) on demand. This feature is controlled by a additional switch located on the power mirror switch.

The fold-away side view mirror is attached to the vehicle's door in the same manner as mirrors without the fold-away option. The fold-away mirrors unique option is the internal motor which allows the mirrors to fold inward on demand. The fold-away mirror motor is not serviceable separately and if a motor is found to be faulty the entire side view mirror must be replaced.

OPERATION

The push button rocker switch uses L (left) and R (right) for mirror selection and a button to push for the desired direction of mirror movement.

When the mirror retract switch (if equipped) is depressed, both of the side view mirrors will fold inward, Thus making the overall width of the vehicle the smallest possible. This can be helpful were parking space is a absolute minimum.

The power mirrors receive ignition current through fuses in the fuse block, and will only operate when the ignition switch is in the Run position.

DIAGNOSIS AND TESTING - POWER MIRRORS

WIRING VOLTAGE TEST

The following wiring test determines whether or not voltage is continuous through the body harness to switch.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove the power mirror switch.

(2) Disconnect wire connector from back of power mirror switch.

(3) Switch ignition to the RUN position.

(4) Connect the clip end of a 12 volt test light to Pin 4 in the harness connector at the mirror switch. Touch the test light probe to Pin 3, then Pin 10.

If the test light illuminates at both pins, the wiring circuit between the battery and switch is OK.

If the lamp does not illuminate, first check fuse 7 and fuse 1 in the Fuse Block. If fuses are OK, then check for broken wire(s).

POWER MIRROR MOTOR TEST

If the power mirror switch is receiving proper current and ground and mirrors do not operate, proceed with power mirror motor test. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove front door trim panel to gain access to power mirror wire connector.

POWER MIRRORS (Continued)

(2) Disconnect wire harness connector to power mirror switch.

(3) Using two jumper wires:

- Connect one to a 12 volt source
- Connect the other to a good body ground
- Refer to the Mirror Motor Test Chart for proper wire connections at the switch connector.

MIRROR MOTOR TEST CHART

12 VOLTS	GROUND	MIRROR REACTION	
SWITCH CONNECTOR		RIGHT	LEFT
PIN 2	PIN 6	-	UP
PIN 6	PIN 1	-	LEFT
PIN 6	PIN 2	-	DOWN
PIN 1	PIN 6	-	RIGHT
PIN 9	PIN 6	UP	-
PIN 6	PIN 10	LEFT	-
PIN 6	PIN 9	DOWN	-
PIN 10	PIN 6	RIGHT	-

(4) If results shown in table are not obtained, check for open or shorted circuit. Replace mirror assembly as necessary.

POWER MIRROR SWITCH

DIAGNOSIS AND TESTING - POWER MIRROR SWITCH

(1) Remove power mirror switch.

(2) Disconnect wiring harness connector from switch and position as shown (Fig. 1).

(3) Using a ohmmeter, test for continuity between the terminals of the switch.

(4) If results shown in the table are not obtained, replace the switch.

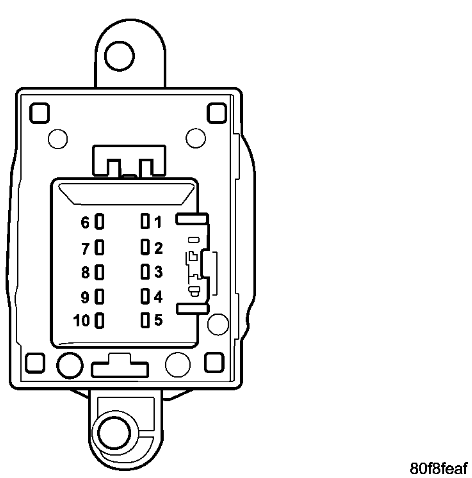

Fig. 1 POWER MIRROR SWITCH

POWER MIRROR SWITCH TABLE

SWITCH POSITION	CONTINUITY BETWEEN
MIRROR SELECT SWITCH IN ″LEFT″ POSITION	
UP	4 AND 5
	4 AND 8
	5 AND 8
	6 AND 9
	6 AND 10
	9 AND 10
DOWN	4 AND 5
	4 AND 6
	5 AND 6
	8 AND 9
	8 AND 10
	9 AND 10
LEFT	4 AND 5
	4 AND 8
	5 AND 8
	7 AND 9
	7 AND 10
	9 AND 10
RIGHT	4 AND 5
	4 AND 7
	5 AND 7
	8 AND 9
	8 AND 10
	9 AND 10
MIRROR SELECT SWITCH IN ″RIGHT″ POSITION	
UP	1 AND 9
	1 AND 10
	4 AND 5
	4 AND 8
	5 AND 8
	9 AND 10
DOWN	1 AND 4
	1 AND 5
	4 AND 5
	9 AND 10
LEFT	2 AND 9
	2 AND 10
	4 AND 5
	4 AND 8
	5 AND 8
	9 AND 10
RIGHT	2 AND 4
	2 AND 5
	4 AND 5
	8 AND 9
	8 AND 10
	9 AND 10

POWER MIRROR SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Using a trim stick (special tool #C-4755) or equivalent, gently pry up on window switch bezel and remove from door trim panel.
(3) Disconnect wire connector from switch.
(4) Remove two switch retaining screws.

INSTALLATION

(1) Install the retaining screws.
(2) Reconnect the wire connector to the switch.
(3) Insert switch into door trim panel.
(4) Connect the battery negative cable.

POWER FOLDAWAY MIRROR

DIAGNOSIS AND TESTING - POWER FOLD-AWAY MIRROR - EXPORT

The following test is intended to test the fold-away mirror circuits up to the power fold-away mirror.

NOTE: Battery must be fully charged prior to performing this test.

(1) Remove the appropriate door trim panel retaining fasteners.
(2) Remove power mirror electrical connector push pin from inner door panel.
(3) Disconnect mirror electrical connector and position as shown (Fig. 2).

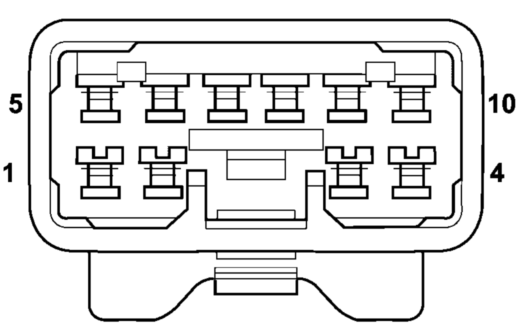

Fig. 2 POWER MIRROR ELECTRICAL CONNECTOR FROM DOOR HARNESS

(4) Depress the mirror "fold"switch and using a voltmeter check pin # 7 for 12v. If battery voltage is not present check wiring and or fuse for open. Refer to Wiring Diagrams for a complete schematic of the mirror fold-away system.
(5) Depress the mirror "unfold"switch and using a voltmeter check pin # 4 for 12v. If battery voltage is not present check wiring and or fuse for open. Refer to Wiring Diagrams for a complete schematic of the mirror fold-away system.
(6) Check for ground at pin # 3. If ground is not present, check wiring for open. Refer to Wiring Diagrams for a complete schematic of the mirror fold-away system.
(7) If the test above concluded that 12v is present at pin # 7 and pin # 4, and a good ground is present, the system up to the mirror is functioning properly. If after reconnecting the power folding mirror to the door wiring harness the mirrors do not fold/unfold, replace the side view mirror assembly.

POWER FOLDAWAY MIRROR SWITCH

DIAGNOSIS AND TESTING - POWER FOLDAWAY MIRROR SWITCH - EXPORT

The following test is designed to be used only on vehicles equipped with power fold-away side view mirrors.
(1) Remove power mirror switch from mounting position (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER FOLDAWAY MIRROR SWITCH - REMOVAL).
(2) Using an ohmmeter, test for continuity between the terminals of the switch as shown in the tables below (Fig. 3).

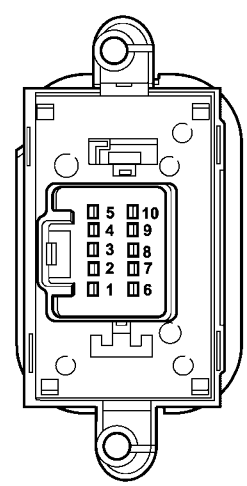

Fig. 3 POWER FOLD-AWAY MIRROR SWITCH

NOTE: When testing using the chart below be certain to read the chart correctly. Example - When testing left mirror "DOWN↓", pins 1, 9, 10 will show continuity to each other, and pins 3, 4, 5 will show continuity to each other.

POWER FOLDAWAY MIRROR SWITCH (Continued)

(3) If test results are not obtained as shown in the tables below, replace the switch.

WOBBLE PLATE POSITION (MIRROR IN UNFOLD POSITION)	LEFT MIRROR SELECTED	RIGHT MIRROR SELECTED
	CONTINUITY BETWEEN PINS	CONTINUITY BETWEEN PINS
↓	5-6-7	6-7-10
	1-2-3	1-2-3
↑	1-2-5	1-2-10
	3-6-7	3-6-7
→	1-2-3	1-2-3
	4-6-7	6-7-9
←	1-2-4	1-2-9
	3-6-7	3-6-7
MIRROR IN FOLD POSITION	1 AND 6	1 AND 6

SIDEVIEW MIRROR

REMOVAL

(Refer to 23 - BODY/EXTERIOR/SIDE VIEW MIRROR - REMOVAL) for the service procedures.

POWER SEAT SYSTEM

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POWER SEAT SYSTEM

DESCRIPTION

A drivers side power front seat is an available factory-installed option for this vehicle. The power seat system option allows the driver to electrically adjust his/her seating position for optimum control and comfort using the power seat switch located on the outboard seat cushion side shield of the drivers front seat.

The power seat system includes the following components:

- Power seat switch
- Power seat track assembly.
- Wire harness

WARNING: SOME VEHICLES ARE EQUIPPED WITH SEATBACK MOUNTED AIRBAGS (Fig. 1). BEFORE ATTEMPTING TO DIAGNOSE OR SERVICE ANY SEAT OR POWER SEAT SYSTEM COMPONENT YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

Refer to **Power Seat** in Wiring Diagrams for complete circuit diagrams. Following are general descriptions and operations of the major components in the power seat system.

OPERATION

The power seat system receives battery current through a fuse in the Power Distribution Center (PDC) and a circuit breaker in the junction block so that the power seats remain operational, regardless of the ignition switch position. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power seat system.

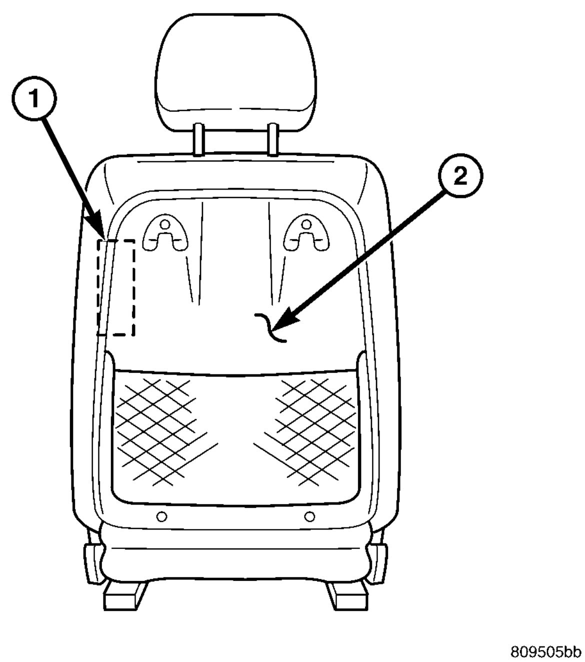

Fig. 1 AIRBAG EQUIPPED SEAT - TYPICAL

1 - INTERNAL AIRBAG
2 - LEFT SEAT BACK

DIAGNOSIS AND TESTING - POWER SEAT SYSTEM

Before any testing of the power seat system is attempted, the battery should be fully-charged and all wire harness connections and pins cleaned and

POWER SEAT SYSTEM (Continued)

tightened to ensure proper continuity and grounds. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

(1) If all power seats are inoperative, check the automatic resetting circuit breaker in the Junction Block (JB), if equipped.

(2) With the dome lamp on, apply the power seat switch in the direction of the failure.

(3) If the dome lamp dims, the seat or the power seat track may be jammed. Check under and behind the seat for binding or obstructions.

(4) If the dome lamp does not dim, proceed with testing of the individual power seat system components and circuits.

DRIVER SEAT SWITCH

DESCRIPTION

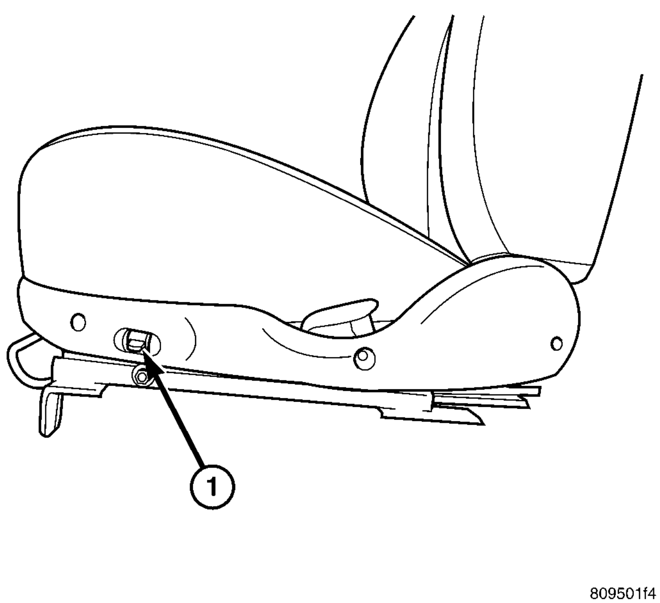

Fig. 2 Outboard View Of Left Seat Cushion

1 - PL POWER SEAT SWITCH

A single two-way momentary power seat switch is located on the outboard seat cushion side shield of the drivers front seat. The power seat switch is secured to the back of the seat cushion side shield with two screws, and the switch paddle protrudes through a hole to the outside of the shield (Fig. 2). The switch paddle is located in a shallow depression molded into the outer surface of the seat cushion side shield that helps to shroud it from unintentional actuation when entering or exiting the vehicle.

The power seat switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

When the power seat switch paddle is actuated, a battery feed and a ground path are applied through the switch contacts to the power seat track adjuster motor. The motor operates to move the seat track adjuster through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the motor to run in the opposite direction.

The power seat switch should not be held applied in either direction after the adjuster has reached its travel limit. The power seat adjuster motor contains a self-resetting circuit breaker to protect it from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

DIAGNOSIS AND TESTING - DRIVER SEAT SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power seat switch from the outboard seat cushion side shield. Refer to **Power Seat Switch** in the Removal and Installation section of this group for the procedure.

(3) Use an ohmmeter to test the continuity of the power seat switch in each switch position. See the Power Seat Switch Continuity chart (Fig. 3). If OK, refer to the **Seat Track** Diagnosis and Testing section of this group. If not OK, replace the faulty power seat switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the three screws that secure the outboard seat cushion side shield to the seat cushion frame (Fig. 4).

(3) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power seat switch wire harness connector.

(4) Disconnect the power seat wire harness connector from the power seat switch connector receptacle.

DRIVER SEAT SWITCH (Continued)

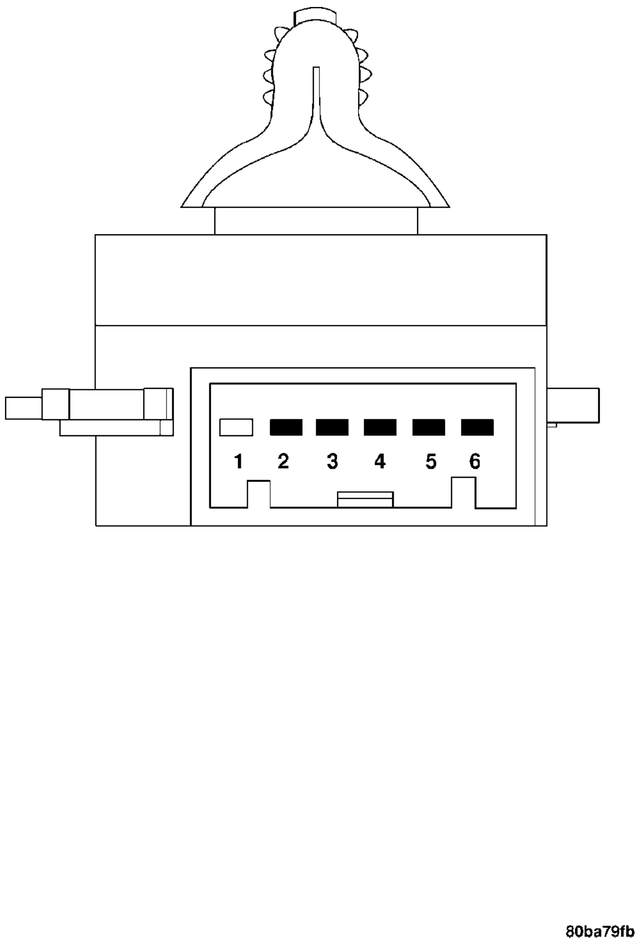

Fig. 3 Power Seat Switch Electrical Pin I.D.

TESTING POWER SEAT SWITCH

SWITCH POSITION	CONTINUITY BETWEEN
Off	2-4, 3-5
UP	3-5, 4-6
DOWN	2-4, 3-6

(5) Remove the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield.

(6) Remove the power seat switch from the outboard seat cushion side shield.

INSTALLATION

(1) Position the power seat switch onto the outboard seat cushion side shield.

(2) Install and tighten the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(3) Reconnect the power seat wire harness connector to the power seat switch connector receptacle.

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the three screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) Reconnect the battery negative cable.

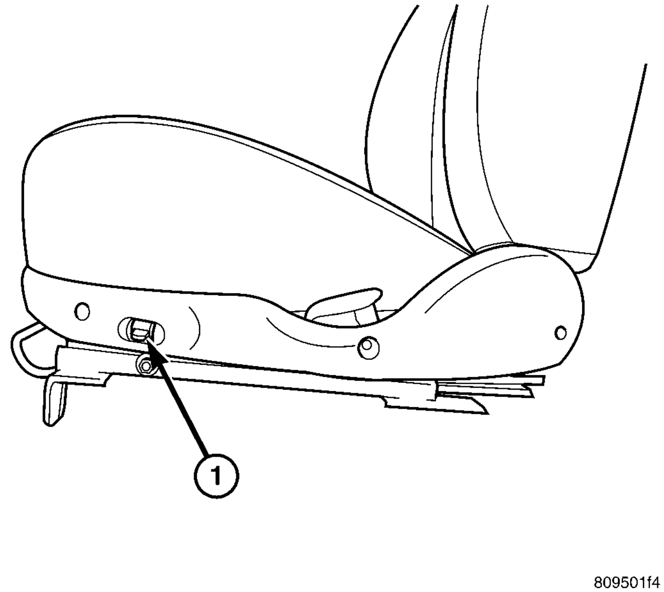

Fig. 4 POWER SEAT SWITCH

1 - PL POWER SEAT SWITCH

SEAT TRACK

DESCRIPTION

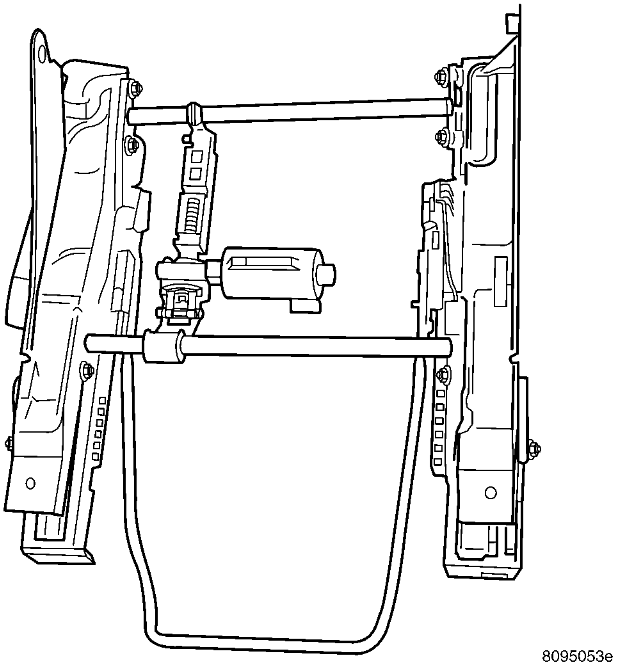

Fig. 5 POWER SEAT TRACK

There is one motor that operates the power seat track (Fig. 5). The motor is connected to a worm-drive gearbox that moves the seat adjuster accordingly. The drivers front seat can be raised or lowered using the power seat switch, located on the seat cushion side shield. When the seat switch is pushed to the Up or Down position the seat will move up or down.

The motor contains a self-resetting circuit breaker to protect it from overload. Consecutive or frequent resetting of the circuit breakers must not be allowed to continue, or the motors may be damaged.

The power seat track cannot be repaired, and is serviced only as a complete unit. If any component in this unit is faulty or damaged, the entire power seat track unit must be replaced.

OPERATION

When a power seat switch is actuated, a battery feed and a ground path are applied through the switch contacts to the appropriate motor. The motor and drive operate to move the seat in the selected direction until the power seat switch is released, or until the travel limit of the power seat track adjuster is reached. When the power seat switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the motor and drive to run in the opposite direction.

DIAGNOSIS AND TESTING - SEAT TRACK

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

Operate the power seat switch to move the seat motor in each direction. The seat should move in each of the selected directions. If the power seat track fails to operate in only one direction, move the seat a short distance in the opposite direction and test again to be certain that the adjuster is not at its travel limit. If the power seat track still fails to operate in only one direction, begin by testing the power seat switch for the inoperative seat. If the power seat track fails to operate in more than one direction, proceed as follows:

(1) Test the circuit breaker in the Junction Block (JB). If OK, Step 2. If not OK, replace the faulty circuit breaker.

(2) Remove the power seat switch from the seat. Check for battery voltage at the fused B(+) circuit cavity of the power seat wire harness connector for the power seat switch. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit between the power seat switch and the JB as required.

(3) Check for continuity between the ground circuit cavity of the power seat wire harness connector for the power seat switch and a good ground. There should be continuity. If OK, Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Test the power seat switch. If the switch tests OK, test the circuits of the power seat wire harness for the inoperative power seat motor(s) between the power seat switch and the inoperative motor for shorts or opens. If the circuits check OK, replace the faulty power seat track. If the circuits are not OK, repair the power seat wire harness as required.

REMOVAL

(1) Remove the power seat from the vehicle. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)

(2) Disengage and disconnect the power seat wire harness from the power seat track.

(3) Remove the power seat track retaining fasteners and remove the power seat track from the seat.

INSTALLATION

(1) Reinstall the power seat track onto the seat cushion frame.

(2) Secure and connect the power seat wire harness on the power seat track.

(3) Reinstall the power seat assembly into the vehicle as a unit. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

(4) Reconnect the battery negative cable.

POWER WINDOWS

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POWER WINDOWS

DESCRIPTION

The power window system allows each of the front door windows to be raised and lowered electrically by actuating a switch on each front door trim panel. A master switch on the driver's door allows the driver to raise or lower each of the front door windows. The power window system receives battery feed through a fuse in the Power Distribution Center (PDC), only when the ignition switch is in the RUN or ACCESSORY position.

OPERATION

WINDOW SWITCH

The power window switches control the battery and ground feeds to the power window motors.

WINDOW MOTOR

Front door window lift motors use permanent type magnets. The B+ and ground applied at the motor terminal pins will cause the motor to rotate in one direction. Reversing current through the motor terminals will cause the motor to rotate in the opposite direction.

Refer to the appropriate wiring information.

DIAGNOSIS AND TESTING - POWER WINDOWS

WIRING VOLTAGE TEST

The following wiring test determines whether or not voltage is continuous through the body harness to the switch.

(1) Remove the power window switch and bezel.

(2) Disconnect wire connector from back of power window switch.

(3) Switch ignition to the ON position.

(4) Connect the clip end of a 12 volt test light to Pin 4 of the window switch harness connector. Touch the test light probe to Pin 3.

- If the test light illuminates, the wiring circuit between the battery and switch is OK.
- If the lamp does not illuminate, first check the 30 amp circuit in the fuse block. If circuit breaker is OK, then check for a broken wire.

Refer to the appropriate wiring information.

POWER WINDOW MOTOR TEST

If the power window motor is receiving proper current and ground and does not operate, proceed with motor test. Refer to the appropriate wiring information.

(1) Remove front door trim panel as necessary to gain access to power window motor wire connector.

(2) Disconnect power window motor connector from motor.

(3) Using two jumper wires, connect one to a battery (+) source and the other to a good ground (-).

(4) Connect the Negative (-) jumper probe to one of the motor connector terminals.

(5) Momentarily touch the Positive (+) jumper probe to the other motor connector terminal.

When positive probe is connected the motor should rotate in one direction to either move window up or down. If window is all the way up or down the motor will grunt and the inner door panel will flex when actuated in that one direction.

(6) Reverse jumper probes at the motor connector terminals and window should now move in opposite direction. If window does not move or grunt, replace the motor.

If window moved completely up or down, reverse the jumper probes and cycle window to the opposite position to verify full operation.

If motor grunts and does not move, verify that regulator is not binding.

WINDOW MOTOR

DESCRIPTION

The power window system allows each of the front door windows to be raised and lowered electrically by actuating a switch on each respective door. A master switch on the driver side door trim panel allows the driver to raise or lower each of the front door windows.

OPERATION

The 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 motor is grounded through the master switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Move the window to the full-up position, if possible.
(3) Remove front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
(4) Remove front door water shield.
(5) Remove three screws to front door radio speaker so that motor has room to pivot.
(6) Pivot window motor out of door panel.
(7) Remove three motor retaining screws to drive cable.
(8) Remove motor from drive cable assembly.

INSTALLATION

(1) Install motor to the cable drive assembly.
(2) Install motor retaining screws to drive cable.
(3) Install the screws to the front door radio speaker.
(4) Install the front door water shield.
(5) Install the front door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
(6) Reconnect the battery negative cable.

WINDOW SWITCH

DIAGNOSIS AND TESTING - WINDOW SWITCH

Remove the switch from its mounting, (Refer to 8 - ELECTRICAL/POWER WINDOWS/POWER WINDOW SWITCH - REMOVAL). Using an ohmmeter, test the window switch for continuity in all positions Refer to Power Window Switch Continuity table to determine if continuity is correct (Fig. 1). If the correct results are not obtained, replace the switch.

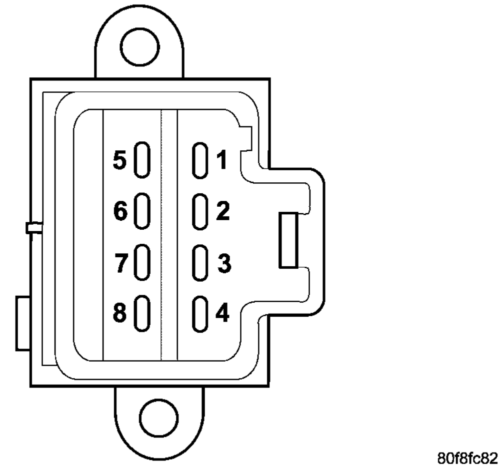

Fig. 1 POWER WINDOW SWITCH

POWER WINDOW SWITCH CONTINUITY

SWITCH POSITION	CONTINUITY BETWEEN
OFF	PIN 1 AND 4 PIN 2 AND 5 PIN 3 AND 8
DOWN	PIN 1 AND 4 PIN 4 AND 8 PIN 2 AND 5
UP	PIN 1 AND 4 PIN 4 AND 5 PIN 3 AND 8

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Using a trim stick (special tool #C-4755) or equivalent, gently pry up on window switch bezel and remove from door trim panel.
(3) Disconnect wire connector from switch.
(4) Remove two switch retaining screws.

INSTALLATION

(1) install the switch retaining screws.
(2) Reconnect the wire connector to the switch.
(3) Insert switch into the door trim panel.
(4) Reconnect the battery negative cable.

RESTRAINTS

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RESTRAINTS

DESCRIPTION

FRONT AIRBAG SYSTEM

A dual front airbag system is standard factory-installed safety equipment on this model. Both the driver and passenger airbag are certified to new federal regulations, which allows them to deploy with less force than prior airbags. The primary passenger restraints in this vehicle are the seat belts, which require active use by the vehicle occupants. The front airbag system is a supplemental passive restraint that was designed and is intended to enhance the protection for the front seat occupants of the vehicle when used in conjunction with the seat belts.

The driver airbag includes an inflatable airbag and an inflator unit behind a trim cover in the hub area of the steering wheel. The passenger airbag includes an inflatable airbag and an inflator unit behind an airbag door in the instrument panel above the glove box.

RESTRAINTS (Continued)

The dual front airbag system consists of the following components:

- Airbag Control Module (ACM)
- Airbag indicator lamp
- Clock Spring
- Driver and passenger airbags (including the airbag inflators)
- Wire harness and connections.

Refer to the proper Body Diagnostic Procedures manual to test or diagnose a problem with any component of the front airbag system.

SIDE IMPACT AIRBAG SYSTEM

Vehicles equipped with the Side Impact Airbag System utilize two airbags mounted to each front seat back frame. This system is designed to protect occupants in the event of a side impact collision.

OPERATION

FRONT AIRBAG SYSTEM

The front airbag system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Airbag Control Module (ACM). The ACM also contains an impact sensor and a safing sensor, which are monitored by the ACM to determine when an impact occurs that is severe enough to require front airbag system protection. When a frontal impact is severe enough, the ACM initiates the inflator units of both front airbag modules to deploy the airbags.

An airbag indicator lamp in the instrument cluster lights for about six to eight seconds as a bulb test each time the ignition switch is turned to the ON position. Following the bulb test, the airbag indicator lamp is turned ON or OFF by the ACM to indicate the status of the airbag system. If the airbag indicator lamp comes ON at any time other than during the bulb test, it indicates that there is a problem in the airbag system circuits. Such a problem may cause the airbags not to deploy when required, or to deploy when not required.

During a frontal vehicle impact, the knee blockers work in concert with properly adjusted seat belts to restrain the driver and front seat passenger in the proper position for an airbag deployment. The knee blockers also work to absorb and distribute the crash energy from the driver and front seat passenger to the structure of the instrument panel. The driver side knee blocker is integral to the left lower instrument panel bezel. The passenger side knee blocker is integral to the glove box door.

Following are general descriptions of the major components in the airbag system.

SIDE IMPACT AIRBAG SYSTEM

The side impact airbag control module (SIACM) controls the seat back mounted airbags. If the SIACM determines the impact is severe enough, the appropriate airbag/s will inflate, tearing open the front seat back trim cover/s protecting the passenger/s. Once a seat back mounted airbag has been deployed, all damaged parts must be replaced.

RESTRAINTS (Continued)

WARNING

WARNINGS

FRONT AIRBAG SYSTEM

WARNING: THIS SYSTEM IS A SENSITIVE, COMPLEX ELECTRONIC UNIT. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE REMOTE 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 OR DEATH.

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, THE TRIM SIDE OF THE AIRBAG SHOULD BE POINTING TOWARD THE BODY TO MINIMIZE POSSIBILITY OF PERSONAL INJURY OR DEATH IF ACCIDENTAL DEPLOYMENT OCCURS.

REPLACE AIRBAG SYSTEM COMPONENTS WITH MOPAR® REPLACEMENT PARTS ONLY. 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 THE VEHICLE AFTER AN 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 OR DEATH 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.

AIRBAGS SHOULD BE STORED IN A COOL, DRY PLACE, AWAY FROM EXCESSIVE HEAT AND STATIC ELECTRICAL ACTIVITY WITH THE FABRIC AIRBAG FACING UP. IF NOT, A PREMATURE DEPLOYMENT CAN RESULT AND RESULT IN PERSONAL INJURY OR DEATH.

CAUTION:
Deployed and Nondeployed Air Bags may or may not have live pyrotechnic material within the air bag inflator. Do not dispose of Driver and Passenger Airbags unless you are sure of complete deployment. Please refer to the Hazardous Substance Control System for Proper Disposal. Dispose of deployed air bags in a manner consistent with state, provincial, local, and federal regulations.

WARNING: DURING, AND FOLLOWING, ANY CHILD RESTRAINT ANCHOR SERVICE, DUE TO IMPACT EVENT OR VEHICLE REPAIR, CAREFULLY INSPECT ALL MOUNTING HARDWARE, TETHER STRAPS AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. IF A CHILD RESTRAINT ANCHOR IS FOUND DAMAGED IN ANY WAY, THE ANCHOR MUST BE REPLACED TO PREVENT POSSIBLE OCCUPANT PERSONAL INJURY OR DEATH.

RESTRAINTS (Continued)

SIDE IMPACT AIRBAG SYSTEM

WARNING:
THE SIDE IMPACT AIRBAG SYSTEM CONTAINS SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNITS. BEFORE ATTEMPTING TO DIAGNOSE OR SERVICE ANY SIDE IMPACT AIRBAG SYSTEM COMPONENTS, YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THIS IS THE ONLY SURE WAY TO DISABLE THE SIDE IMPACT AIRBAG SYSTEM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL SIDE IMPACT AIRBAG MODULE DEPLOYMENT AND POSSIBLE PERSONAL INJURY OR DEATH.
ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR TWO MINUTES BEFORE REMOVING AIRBAG COMPONENTS.
DO NOT PLACE A NON-DEPLOYED SIDE AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN PERSONAL INJURY OR DEATH.
BEFORE SERVICING A SIDE IMPACT AIRBAG CONTROL MODULE (SIACM), ALWAYS DISCONNECT THE APPROPRIATE (LEFT OR RIGHT) SIDE IMPACT AIRBAG CONNECTOR UNDER THE SEAT TO ENGAGE THE SIDE IMPACT AIRBAG SYSTEM SHORTING BAR TO PREVENT ACCIDENTAL DEPLOYMENT THAT COULD CAUSE PERSONAL INJURY OR DEATH.
DO NOT ATTEMPT TO DISMANTLE A SIDE IMPACT AIRBAG MODULE OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93° C (200° F).
REPLACE SIDE IMPACT AIRBAG SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE MOPAR PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.
THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE SIDE IMPACT AIRBAG SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE SIDE IMPACT AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE MOPAR PARTS CATALOG.

CAUTION:
Deployed and Nondeployed Air Bags may or may not have live pyrotechnic material within the air bag inflator. Do not dispose of Driver and Passenger Airbags unless you are sure of complete deployment. Please refer to the Hazardous Substance Control System for Proper Disposal. Dispose of deployed air bags in a manner consistent with state, provincial, local, and federal regulations.

WARNING: DURING, AND FOLLOWING, ANY CHILD RESTRAINT ANCHOR SERVICE, DUE TO IMPACT EVENT OR VEHICLE REPAIR, CAREFULLY INSPECT ALL MOUNTING HARDWARE, TETHER STRAPS AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. IF A CHILD RESTRAINT ANCHOR IS FOUND DAMAGED IN ANY WAY, THE ANCHOR MUST BE REPLACED TO PREVENT POSSIBLE OCCUPANT PERSONAL INJURY OR DEATH.

DIAGNOSIS AND TESTING - AIRBAG SYSTEM

(1) With the battery negative remote cable disconnected, connect the DRB III® scan tool to the Data Link connector.

(2) Turn the ignition key to the ON position. Exit vehicle with the scan tool.

(3) After checking that no one is inside the vehicle, connect the battery negative remote terminal.

(4) Read and record the **ACTIVE** Diagnostic Trouble Code (DTC) data.

(5) Read and record any **STORED** DTC's.

(6) Refer to the proper Body Diagnostic Procedures manual if any DTC's are found in Step 4 and Step 5.

(7) If the airbag warning lamp either fails to light, or goes ON and stays ON, there is a system malfunction. To test the airbag warning lamp (bulb) operation in the cluster, refer to Electrical, Instrument Cluster, Diagnosis and Testing - Instrument Cluster. Refer to the proper Body Diagnostic Procedures manual for any other system problems.

RESTRAINTS (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - HANDLING AIRBAGS

DEPLOYED AIRBAG

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 AIRBAG

The airbags 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 accidental deployment occurs.

STANDARD PROCEDURE - SERVICE AFTER AN AIRBAG DEPLOYMENT

DRIVER AIRBAG

After a Driver Airbag has been deployed due to a collision, the following **MUST** be replaced:

- Driver Airbag
- Clock Spring Assembly
- Steering Wheel
- Complete Steering Column Assembly with Lower Steering Column Coupler

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

PASSENGER AIRBAG

After a Passenger Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Passenger Airbag

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

SEAT AIRBAG

After a Seat Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Complete Seat Back Assembly

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

SEAT BELTS AND RETRACTORS

After a frontal impact. the following **MUST** be replaced:

- Front Driver Seat Belt Retractor
- Front Passenger Seat Belt Retractor (if occupied at time of impact)

All other seat belts should be closely inspected for cuts, tears, fraying, or damage in any way following any frontal impact or airbag deployment. The seat belts are to be replaced when visible damage is incurred. Inspect the Lower Anchors and Tether for CHildren (LATCH) child restraint anchors for damage after an impact event and replace as needed.

CLEAN UP PROCEDURE

Roll or fold the airbag towards its mounting point (i.e. instrument panel, steering wheel, or seat back). Then tape the ripped cover over the deployed airbag.

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. 1). 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 be necessary to decontaminate the interior of the vehicle.

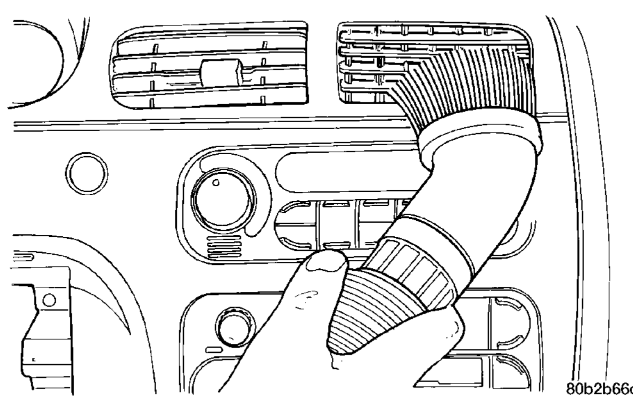

Fig. 1 VACUUM HEATER AND A/C OUTLETS - TYPICAL

AIRBAG CONTROL MODULE

DESCRIPTION

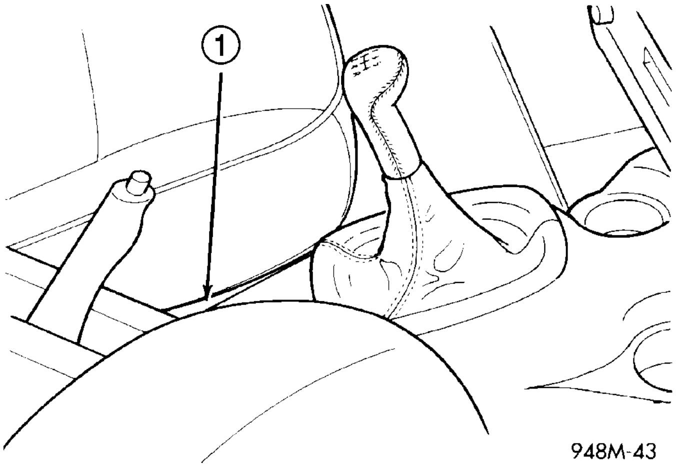

Fig. 2 AIRBAG CONTROL MODULE (ACM) LOCATION

1 - AIRBAG CONTROL MODULE

The Airbag Control Module (ACM) is also sometimes referred to as the Occupant Restraint Controller (ORC). The ACM contains the sensing element, safing sensor, and energy reserve capacitor. The module is mounted on the tunnel/floor pan between the gear shift lever and the park brake lever (Fig. 2).

OPERATION

The ACM monitors the system to determine the system readiness. The ACM contains on-board diagnostics, and will illuminate the AIRBAG warning lamp in the cluster when a fault occurs. The warning equipment is tested for six to eight seconds every time the vehicle is started.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(3) Remove center console. Refer to Body, Interior, Floor Console, Removal.

(4) Remove module mounting nuts and remove module (Fig. 3).

(5) Disconnect ACM 23-way connector.

(6) Remove ACM from vehicle.

INSTALLATION

(1) Connect ACM connector and ensure that the connector and all locking tabs are engaged.

CAUTION: USE SUPPLIED NUTS ONLY.

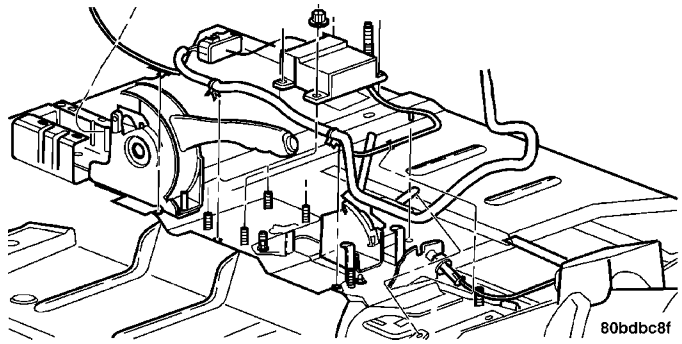

Fig. 3 AIRBAG CONTROL MODULE (ACM) REMOVE/ INSTALL

(2) Position ACM (arrow pointing forward) in the console floor bracket, attach the nuts and tighten to 9.6 to 14 N·m (85 to 125 in. lbs.) torque.

(3) Install center console assembly. Refer to Body, Interior, Floor Console Installation.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

CHILD RESTRAINT ANCHOR

DESCRIPTION

Vehicles manufactured for sale in the North American market are equipped with a Lower Anchors and Tether for CHildren, or LATCH child restraint anchorage system. The LATCH system provides for the installation of suitable child restraints in certain seating positions without using the standard equipment seat belt provided for that seating position. The rear seat in these models are equipped with a fixed-position child restraint upper tether anchor and child restraint lower anchors for the two outboard seating positions only. Vehicles manufactured for sale outside of North America are equipped with a fixed-position child restraint upper tether anchor for both the center and the two outboard seating positions, but does not have the child restraint lower anchors.

Vehicles manufactured for sale in North America also have two lower anchors for each rear outboard seating position (Fig. 4). These anchors are mounted on a bracket and secured to the floor pan. They are each accessed from the front of their respective seats, at each side where the seat back meets the seat cushion. These lower anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with their mounting bracket.

CHILD RESTRAINT ANCHOR (Continued)

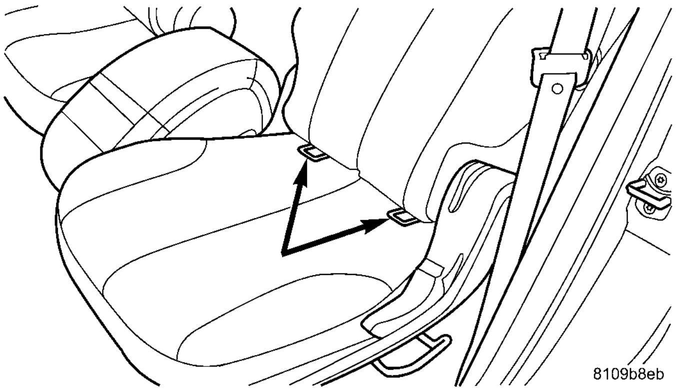

Fig. 4 CHILD RESTRAINT LOWER ANCHORS SECOND ROW - LOCATION - TYPICAL

OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of all of the factory-installed child restraint anchors.

REMOVAL

WARNING: DURING, AND FOLLOWING, ANY CHILD RESTRAINT ANCHOR SERVICE, DUE TO IMPACT EVENT OR VEHICLE REPAIR, CAREFULLY INSPECT ALL MOUNTING HARDWARE, TETHER STRAPS AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. IF A CHILD RESTRAINT ANCHOR IS FOUND DAMAGED IN ANY WAY, THE ANCHOR MUST BE REPLACED. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(1) Remove the lower seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - REMOVAL).
(2) Remove two nuts to LATCH bracket.
(3) Remove bracket from vehicle.

INSTALLATION

WARNING: DURING, AND FOLLOWING, ANY CHILD RESTRAINT ANCHOR SERVICE, DUE TO IMPACT EVENT OR VEHICLE REPAIR, CAREFULLY INSPECT ALL MOUNTING HARDWARE, TETHER STRAPS AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. IF A CHILD RESTRAINT ANCHOR IS FOUND DAMAGED IN ANY WAY, THE ANCHOR MUST BE REPLACED. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(1) Place LATCH bracket on studs and install retaining nuts. Torque nuts to 40 N·m (350 in. lbs.).
(2) Install the rear seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - INSTALLATION).

CHILD TETHER CUP

DESCRIPTION

The Child Tether Assembly (Fig. 5) consists of the Child Tether Anchor and the Child Tether Assembly Caps. The Child Tether Anchor (Fig. 6) is not serviceable. The anchor is located on the rear shelf panel. The Child Tether Assembly Cap (Fig. 7) is not serviceable. The rear trim panel will have to be replaced.

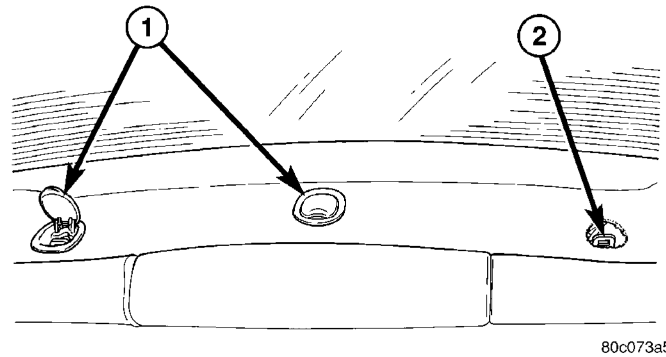

Fig. 5 CHILD TETHER ASSEMBLY

1 - CHILD TETHER CAPS
2 - CHILD TETHER ANCHORS

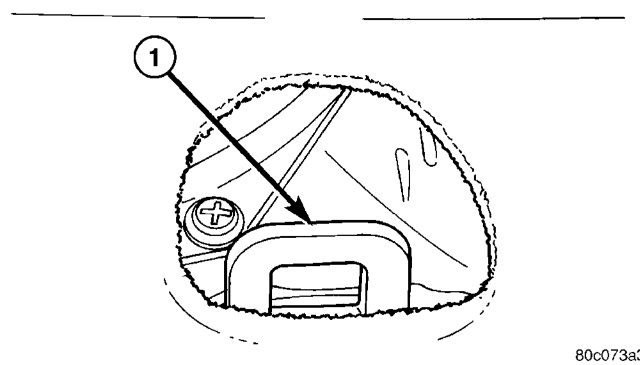

Fig. 6 CHILD TETHER ANCHOR

1 - CHILD TETHER ANCHOR

CHILD TETHER CUP (Continued)

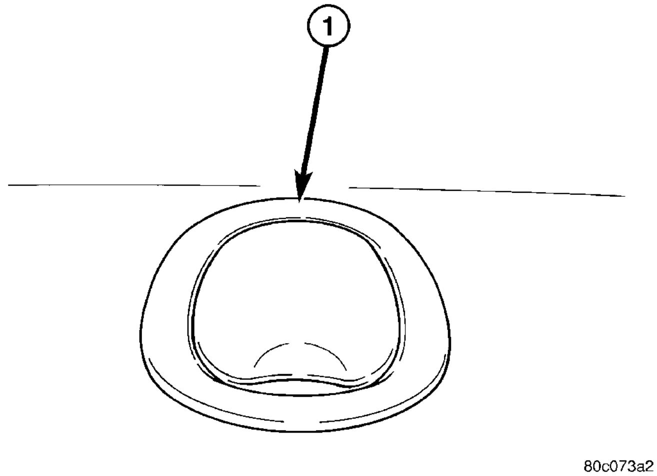

Fig. 7 CHILD TETHER ASSEMBLY CAP

1 - CHILD TETHER ASSEMBLY CAP AND COVER

OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of all of the factory-installed child restraint anchors.

REMOVAL

(1) Open Child Tether Assembly Cap Cover to the full open position (Fig. 8).

(2) Pull cover upward until cover detaches from cap.

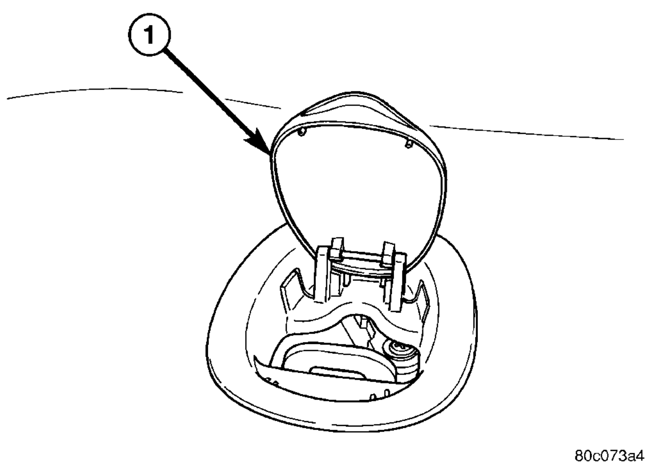

Fig. 8 CHILD TETHER ASSEMBLY CAP

1 - Cap cover

INSTALLATION

(1) Place Child Tether Assembly Cap Cover into position in the cap (Fig. 8).

(2) Push downward on Child Tether Assembly Cap Cover till it locks into position (will hear part click into position)

CLOCKSPRING

DESCRIPTION

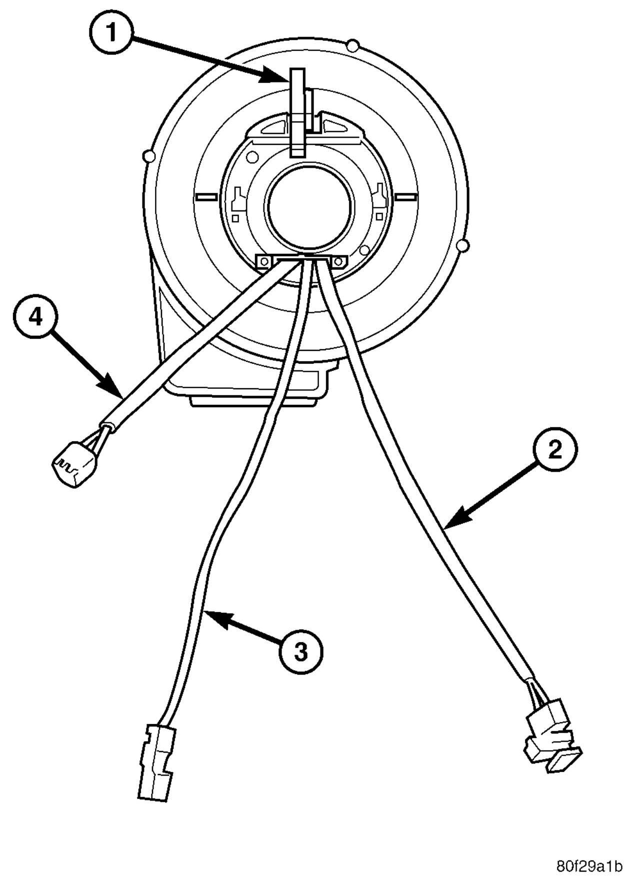

Fig. 9 CLOCK SPRING

1 - LOCKING PIN
2 - DRIVER AIRBAG WIRE/CONNECTOR
3 - HORN WIRE/CONNECTOR
4 - SPEED CONTROL WIRE/CONNECTOR

The clock spring is mounted to the steering column behind the steering wheel (Fig. 9). The clock spring is used to maintain a continuous electrical circuit between the wiring harness and the:

- Driver Airbag.
- Speed Control Switch.
- Horn Switch.

OPERATION

The clockspring consists of a flat, ribbon like, electrically conductive tape which winds and unwinds with the steering wheel rotation.

CLOCKSPRING (Continued)

STANDARD PROCEDURE - CLOCK SPRING CENTERING

If the rotating tape within the clock spring is not positioned properly with the steering wheel and the front wheels, the clock spring may fail during use. The following procedure **MUST BE USED** to center the clock spring if:

- The clock spring is not known to be properly positioned.
- The front wheels were moved.
- The steering wheel was moved from the half turn (180 degrees) to the right (clockwise) position.

(1) Remove clock spring. Refer to Electrical, Restraints, Clock Spring, Removal.

(2) Rotate the clock spring rotor in the **CLOCKWISE DIRECTION** to the end of travel. Do not apply excessive torque.

(3) From the end of travel, rotate the rotor three full turns in the counterclockwise direction. The horn wire and the squib wire should end up at the bottom. If not, rotate the rotor counter clockwise until the wires are properly orientated, but not more than half turn (180 degrees). Engage clock spring locking mechanism.

(4) Install the clock spring. Refer to Electrical, Restraints, Clock Spring, Installation.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

REMOVAL

(1) Place the front road wheels in the straight ahead position then:

(2) Disconnect and isolate the battery negative cable.

(3) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(4) Remove steering wheel. Refer to Steering, Column, Steering Wheel, Removal.

(5) Remove upper and lower steering column shrouds to gain access to clock spring wiring. Refer to Steering, Column, Upper Shroud Removal.

(6) Remove multi-function switch. Refer to Electrical, Lamps/Lighting - Exterior, Multi-Function Switch, Removal.

(7) Disconnect the 7-way connector between the clock spring and the instrument panel wiring harness at the base of the clock spring.

(8) Remove clock spring by lifting the top latch tab up slightly to guide it over the lock housing (Fig. 10). The clock spring cannot be repaired, and must be replaced if faulty.

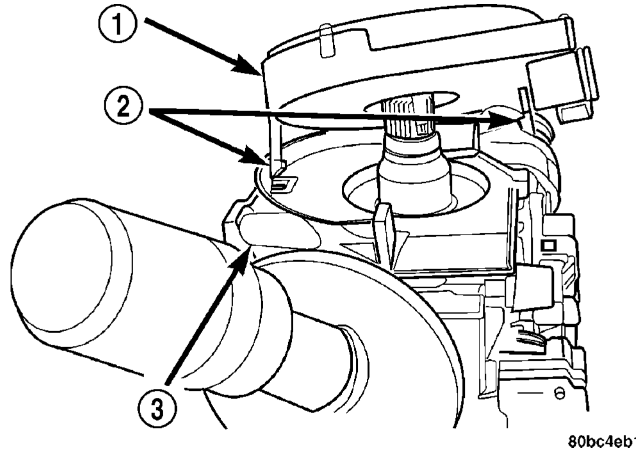

Fig. 10 CLOCK SPRING LATCH HOOKS

1 - CLOCK SPRING
2 - LATCH HOOKS
3 - STEERING COLUMN

(9) Rotate clock spring rotor a half turn (180 degrees) to the left (counter clockwise).

(10) Lock the clock spring rotor in the center position as follows: Insert a paper clip wire through the hole in the rotor at the 10 O'clock position and bend to prevent it from falling out.

INSTALLATION

- When reusing the clock spring, Locate the clock spring on the steering shaft and push down on the rotor until the clock spring is fully seated on the steering column (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCK SPRING - STANDARD PROCEDURE - CLOCK SPRING CENTERING).
- When installing a new clock spring, position the front wheels straight a head. Remove locking pin (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCK SPRING - STANDARD PROCEDURE - CLOCK SPRING CENTERING).

(1) Connect the clock spring to the instrument panel harness, ensure wiring is properly routed. Then check that the connectors and locking tabs are properly engaged.

(2) Install the multi-function switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - INSTALLATION).

(3) Install steering column shrouds. Be sure all wires are inside of shrouds (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - INSTALLATION).

(4) Install steering wheel ensuring the flats on hub align with the clock spring. Feed the horn, airbag and speed control wires through the bottom slot. Ensure wires do not get pinched under the steering wheel.

(5) Connect the speed control wire to the switch.

CLOCKSPRING (Continued)

(6) Connect the horn connector and the airbag squib connector to the driver airbag.

(7) Install steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).

(8) Install the driver airbag and tighten bolts to 12 to 14 N·m (105 to 125 in. lbs.) torque.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

DRIVER AIRBAG

DESCRIPTION

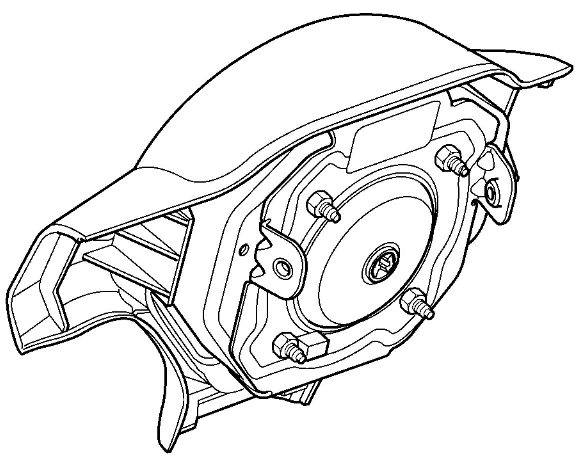

Fig. 11 DRIVER AIRBAG

The driver airbag protective trim cover is the most visible part of the driver airbag system (Fig. 11). The driver airbag is mounted directly to the steering wheel. Located under the airbag trim cover are the horn switch, the folded airbag cushion, and the airbag cushion supporting components. The resistive membrane-type horn switch is secured within a plastic tray between the driver airbag cover and the backer plate which is heat staked on to the driver airbag cover.

The driver airbag cannot be repaired, and must be replaced if deployed or in any way damaged. The horn switch, located underneath the driver airbag trim cover, is available for service replacement.

OPERATION

The driver airbag includes a stamped metal housing to which the cushion and an inflator unit are attached and sealed. The conventional pyrotechnic-type inflator assembly is mounted to studs on the back of the airbag module housing. The inflator seals the hole in the airbag cushion so it can discharge the gas it produces directly into the cushion when supplied with the proper electrical signal. Following an airbag deployment, the airbag cushion quickly deflates by venting this gas towards the instrument panel through the porous fabric material used on the steering wheel side of the airbag cushion.

The protective trim cover is fitted to the front of the airbag and forms a decorative cover in the center of the steering wheel. The inside of the trim cover has locking blocks molded into it that engage a lip on the airbag metal housing. One stamped metal retainer is fit over the inflator mounting studs. On the back of the airbag housing the stamped steel retainer is engaged in slots on the inside of the cover, securely locking the trim cover into place. The trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch and tray unit upon airbag deployment.

REMOVAL

CAUTION: When removing a deployed airbag, rubber gloves, eye protection and long sleeved 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 cable.

(2) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(3) Remove two bolts attaching Driver Airbag to the steering wheel.

(4) Lift airbag and disconnect airbag squib wire connector and horn wire (Fig. 12).

(5) Remove Driver Airbag from vehicle.

WARNING: WHEN REPLACING A DEPLOYED DRIVER AIRBAG, THE CLOCK SPRING MUST ALSO BE REPLACED (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCK SPRING - REMOVAL). FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

INSTALLATION

(1) Connect the airbag squib wire to the driver airbag. Make airbag connection by pressing straight in on the connector. The connector should be fully

DRIVER AIRBAG (Continued)

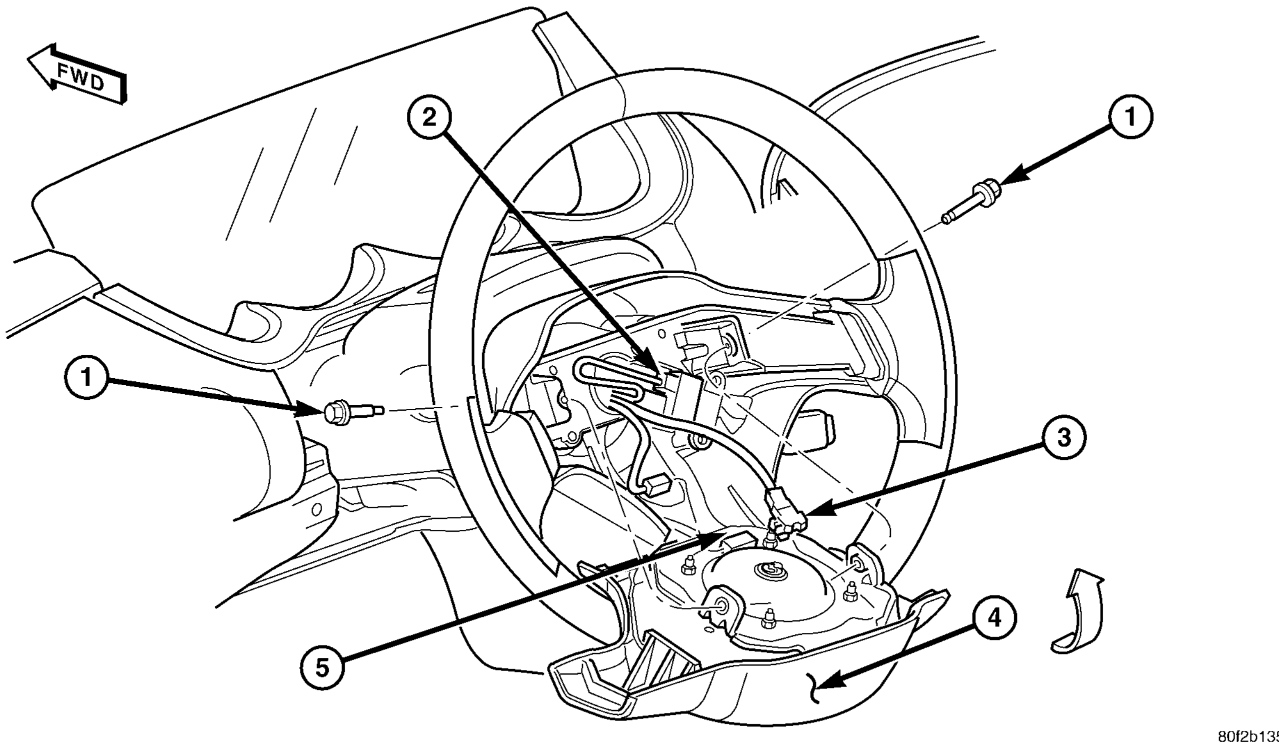

Fig. 12 DRIVER AIRBAG - REMOVE/INSTALL

1 - AIRBAG RETAINING BOLTS
2 - SPEED CONTROL SWITCH CONNECTOR
3 - AIRBAG SQUIB CONNECTOR
4 - DRIVER AIRBAG
5 - HORN SWITCH CONNECTOR

seated. Feel for positive snap to assure positive connection.

(2) Connect the horn wire.

(3) Place driver airbag into steering wheel airbag cavity.

(4) Install two bolts and tighten to 10 to 11 N·m (90 to 100 in. lbs.) torque.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

FRONT SEAT BELT & RETRACTOR

REMOVAL

CAUTION: Front seat belt assemblies must be replaced after a collision.

(1) Remove B-pillar trim.
(2) Remove bolt attaching seat belt retractor to B-pillar (Fig. 13).
(3) Disconnect the wire connector to the retractor.
(4) Remove seat belt retractor from vehicle.

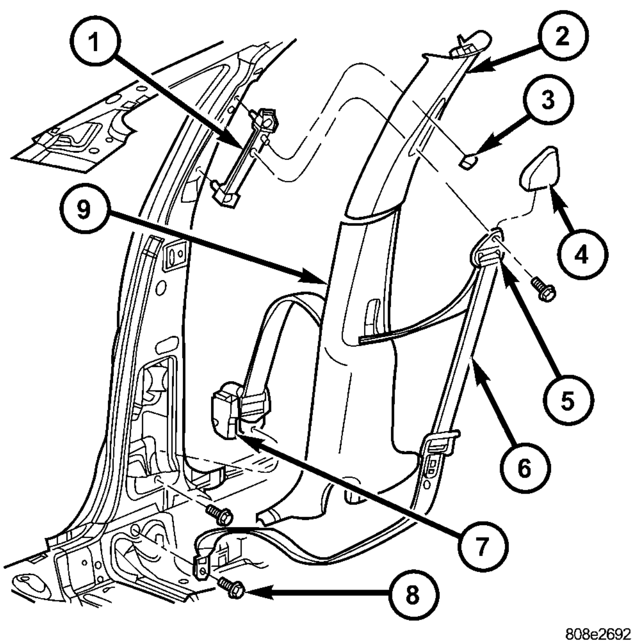

Fig. 13 FRONT SEAT BELT RETRACTOR

1 - FRONT SEAT BELT ADJUSTER
2 - UPPER B-PILLAR TRIM PANEL
3 - ADJUSTER BUTTON
4 - TURNING LOOP COVER
5 - TURNING LOOP
6 - SEAT BELT
7 - SEAT BELT RETRACTOR
8 - ANCHOR BOLT
9 - LOWER B-PILLAR TRIM PANEL

INSTALLATION

CAUTION: Front seat belt assemblies must be replaced after a collision.

(1) Connect the wire connector to the retractor.
(2) Install seat belt retractor into vehicle.
(3) Install bolt attaching seat belt retractor to B-pillar. Tighten seat belt anchor bolt to 40 N·m (30 ft. lbs.) torque.
(4) Install B-pillar trim.

PASSENGER AIRBAG

DESCRIPTION

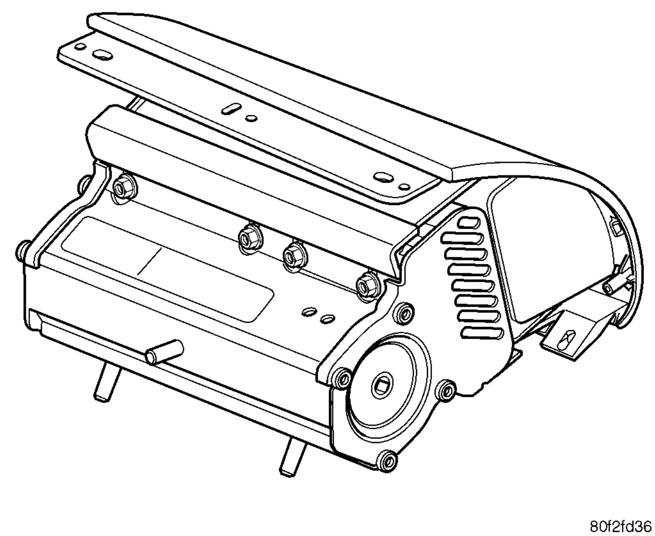

Fig. 14 PASSENGER AIRBAG

The passenger airbag (Fig. 14) is located behind the passenger airbag cover, between the glove box and instrument panel top cover.

The passenger airbag includes an aluminum housing within which the cushion and inflator are mounted and sealed. Two stamped metal brackets, one on each end of the housing, enclose the cushion and inflator. The mounting scheme consists of two weld studs and a bracket with two tabs off the bottom of the housing.

Following a passenger airbag deployment, the passenger airbag and the passenger airbag cover must be replaced. If inspection reveals that the passenger airbag mounting points on the instrument panel have been cracked or damaged, the instrument panel assembly must also be replaced. The passenger airbag cannot be repaired, and must be replaced if deployed or in any way damaged.

OPERATION

The hybrid-type inflator assembly includes a small canister of highly compressed argon gas. The inflator seals the hole in the airbag cushion so it can discharge the gas it produces directly into the cushion when supplied with the proper electrical signal. Following an airbag deployment, the airbag cushion quickly deflates by venting this gas through the porous fabric material used on each end panel of the airbag cushion.

The passenger airbag is secured with nuts to the instrument panel beneath the instrument panel top pad and above the glove box opening.

PASSENGER AIRBAG (Continued)

REMOVAL

NONDEPLOYED MODULE

When removing an airbag for any reason other than DEPLOYMENT.

(1) Disconnect and isolate the battery negative cable.

(2) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(3) Remove instrument panel top cover. Refer to Body, Instrument Panel, Instrument panel Top Cover, Removal.

(4) Remove three screws to glove box door and remove door from instrument panel.

(5) Remove three passenger airbag cover screws attaching cover to top of instrument panel (Fig. 15).

(6) Remove two passenger airbag cover screws attaching cover to front lower instrument panel.

(7) Remove three airbag attaching nuts from the support structure.

(8) Lift the airbag up until the wire connector is visible and disconnect the connector.

DEPLOYED MODULE

When removing a deployed airbag, rubber gloves, eye protection, and a long-sleeved shirt should be worn, as there may be deposits on the surface which could irritate the skin and eyes.

(1) Roll/fold airbag towards instrument panel.

(2) Close door over folded airbag and tape door closed.

(3) Disconnect and isolate the battery negative cable.

(4) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(5) Remove instrument panel top cover. Refer to Body, Instrument Panel, Instrument panel Top Cover, Removal.

(6) Remove three screws to glove box door and remove door from instrument panel.

(7) Remove three passenger airbag cover screws attaching cover to top of instrument panel (Fig. 15).

(8) Remove two passenger airbag cover screws attaching cover to front lower instrument panel.

(9) Remove three airbag attaching nuts from the support structure.

(10) Lift the airbag up until the wire connector is visible and disconnect the connector.

INSTRUMENT PANEL TRAY ASSEMBLY (IF EQUIPPED) - EXPORT

In some countries the passenger airbag may be deleted. An optional instrument panel tray assembly (Fig. 16) will be installed in its place.

(1) Remove instrument panel top cover. Refer to Body, Instrument Panel, Instrument panel Top Cover, Removal.

(2) Remove three screws to glove box door and remove door from instrument panel.

(3) Remove three screws attaching the instrument panel tray assembly to the top of instrument panel.

(4) Remove two instrument panel tray assembly screws attaching assembly to front lower instrument panel.

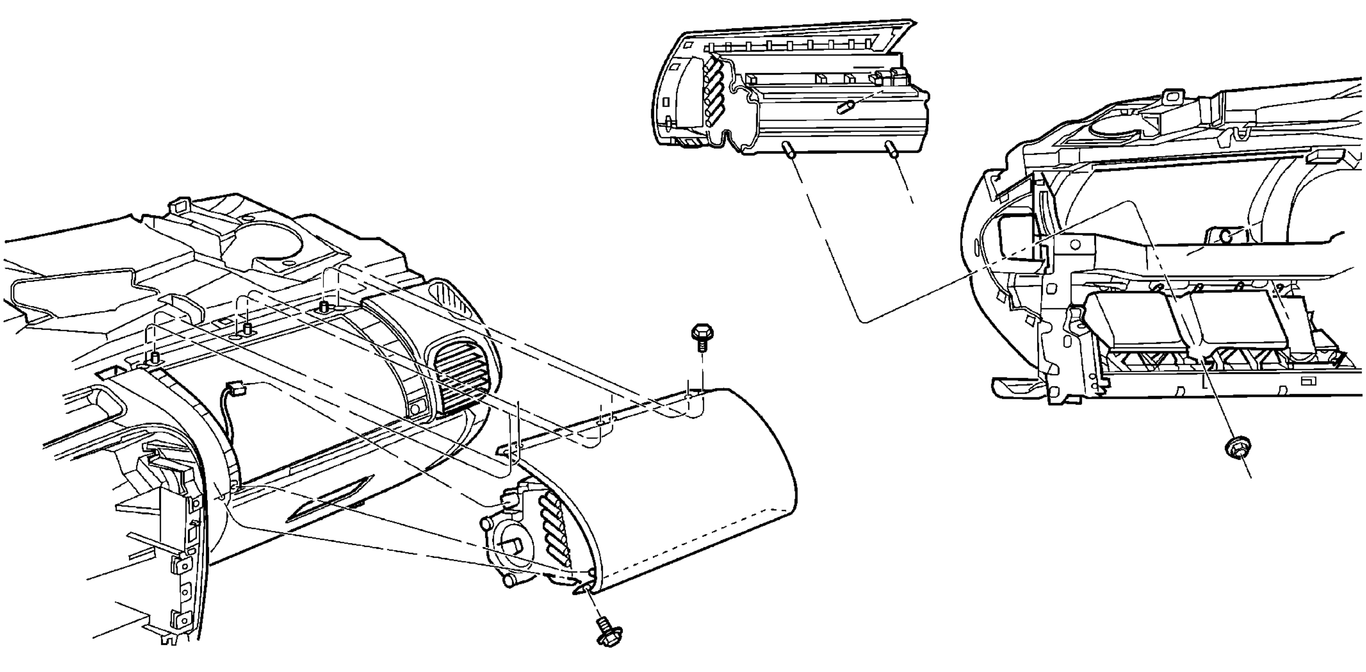

Fig. 15 PASSENGER AIRBAG REMOVE/INSTALL

PASSENGER AIRBAG (Continued)

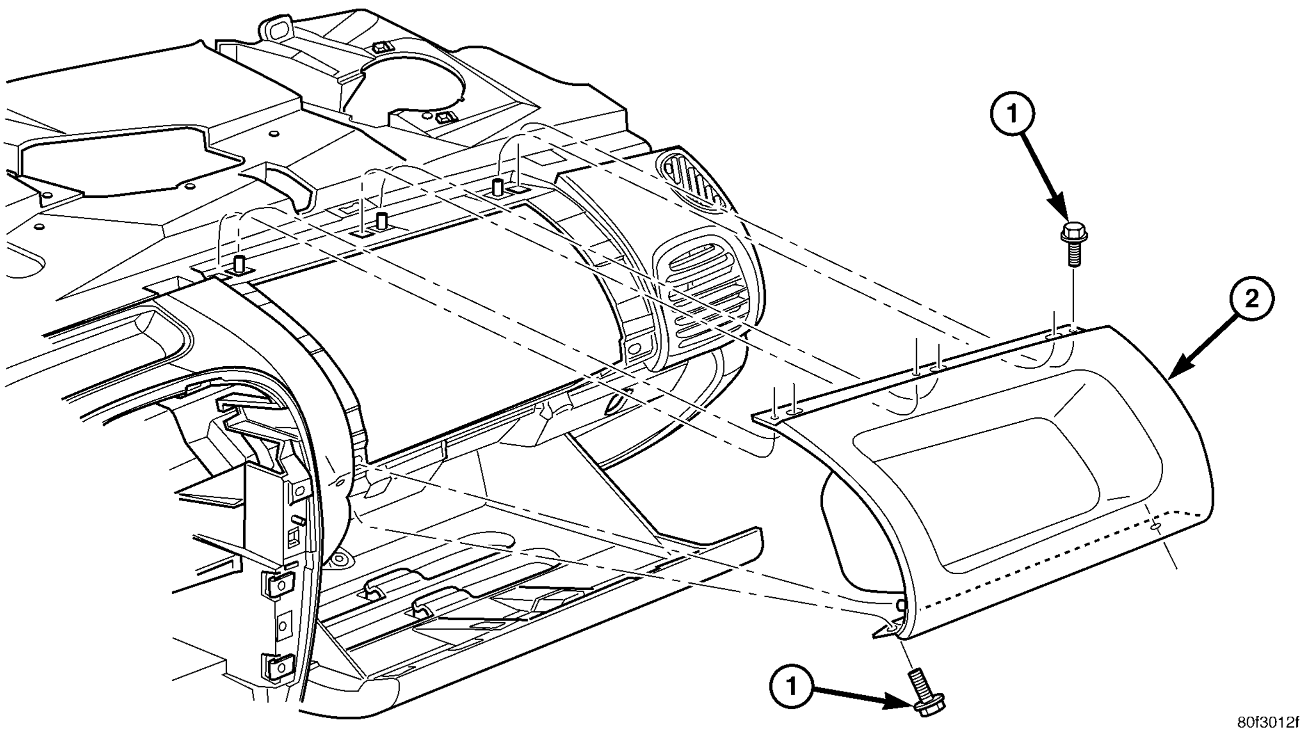

Fig. 16 INSTRUMENT PANEL TRAY ASSEMBLY - EXPORT

1 - INSTRUMENT PANEL TRAY ASSEMBLY RETAINING BOLTS
2 - INSTRUMENT PANEL TRAY ASSEMBLY

(5) Pull tray assembly out of instrument panel and remove from vehicle.

INSTALLATION

NOTE: When installing a module for any reason other than DEPLOYMENT.

(1) Connect the passenger airbag wire connector to the airbag. Lower the airbag into the instrument panel in its mounting position.

(2) Install the three airbag attaching nuts to the support structure. Tighten the three airbag retaining nuts to 22 to 34 N·m (200 to 300 in. lbs.) torque.

(3) Install the two passenger airbag cover screws attaching cover to the front lower instrument panel. Tighten screws to 2 N·m (20 in. lbs.) torque.

(4) Install the three passenger airbag cover screws attaching cover to top of instrument panel (Fig. 15). Tighten screws to 2 N·m (20 in. lbs.) torque.

(5) Install the door onto the instrument panel and install the three screws to the glove box door. Tighten screws to 2 N·m (20 in. lbs.) torque.

(6) Install the instrument panel top cover. Refer to Body, Instrument Panel, Instrument panel Top Cover, Installation.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

INSTRUMENT PANEL TRAY ASSEMBLY (IF EQUIPPED) - EXPORT

In some countries the passenger airbag may be deleted. An optional instrument panel tray assembly (Fig. 16) will be installed in its place.

(1) Place the tray assembly into the instrument panel.

(2) Install the two instrument panel tray assembly screws attaching assembly to front lower instrument panel.

(3) Install the three screws attaching the instrument panel tray assembly to the top of instrument panel.

(4) Place glove box door in glove box opening and install the three screws to glove box door.

(5) Install the instrument panel top cover. Refer to Body, Instrument Panel, Instrument panel Top Cover, Installation.

REAR CENTER SEAT BELT & RETRACTOR

REMOVAL

(1) Remove rear seat cushion and back.

(2) Remove seat belt bezel from parcel shelf cover.

(3) Remove bolt attaching seat belt lower anchor to floor.

(4) Remove two push fasteners to NVH cover over retractor (Fig. 17).

(5) Push seat belt bezel and buckle stab through access hole in parcel shelf.

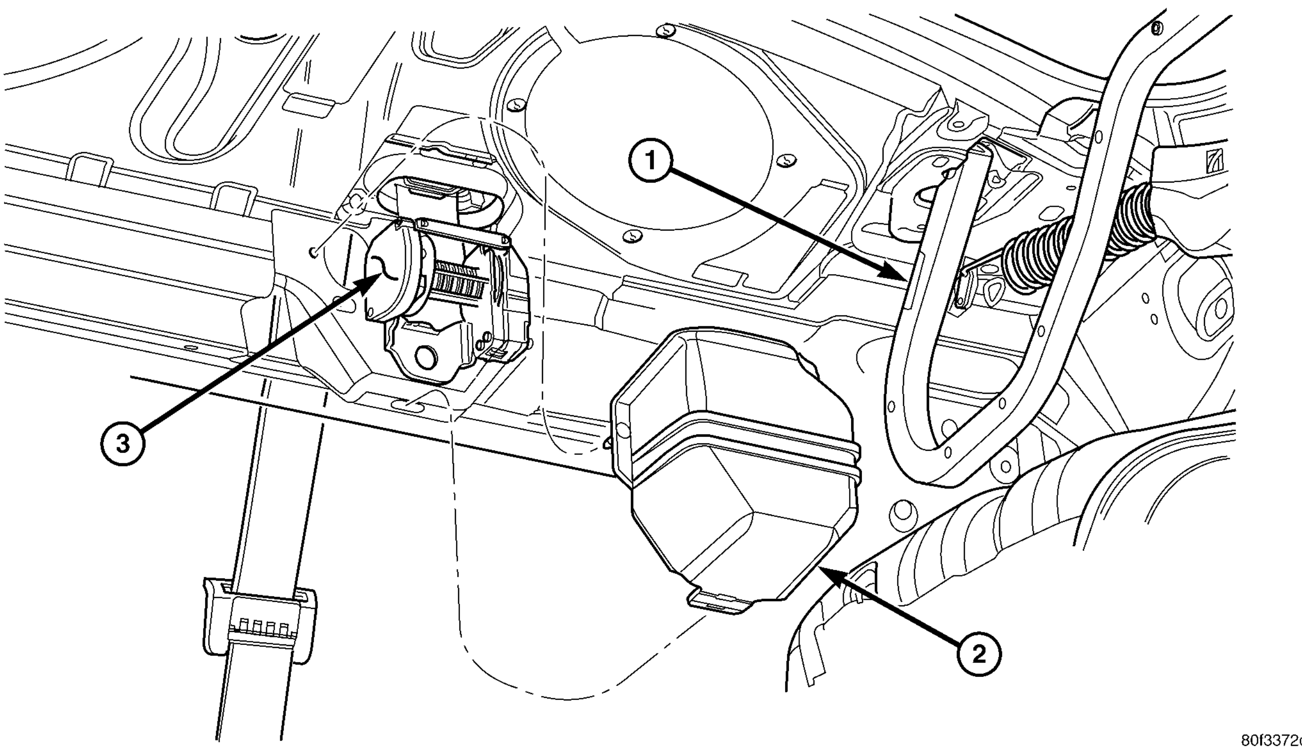

Fig. 17 REAR CENTER SEAT BELT & RETRACTOR SILENCER COVER ASSEMBLY

1 - RIGHT DECK LID HINGE
2 - REAR CENTER SEAT BELT & RETRACTOR SILENCER COVER
3 - REAR CENTER SEAT BELT & RETRACTOR

REAR CENTER SEAT BELT & RETRACTOR (Continued)

(6) Remove bolt attaching retractor to lower shelf reinforcement bracket (Fig. 18).

(7) From in trunk compartment, remove rear seat belt retractor from vehicle (Fig. 18).

INSTALLATION

(1) Position rear seat belt retractor in trunk compartment.

(2) Push seat belt bezel and buckle stab through access hole in rear shelf trim panel.

(3) Install bolt attaching retractor to rear floor. Tighten to 40 N·m (30 ft. lbs.) torque.

(4) Install the NVH cover and two push fasteners over the center retractor.

(5) Install bolt attaching seat belt lower anchor to floor. Tighten the seat belt bolt to 57 N·m (42 ft. lbs.) torque.

(6) Install seat belt bezel to the rear shelf trim panel.

(7) Install rear seat cushion and back.

REAR SEAT BELT & RETRACTOR

REMOVAL

(1) Remove rear seat cushion and back.

(2) Remove seat belt bezel from parcel shelf cover.

(3) Remove rear seat closure panel silencer pad as necessary to gain access to retractor.

(4) Remove bolt attaching seat belt lower anchor to floor.

(5) Remove bolt attaching retractor to rear seat closure panel (Fig. 19).

(6) Push seat belt bezel and buckle stab through access hole in parcel shelf.

(7) From in trunk compartment, remove rear seat belt retractor from vehicle.

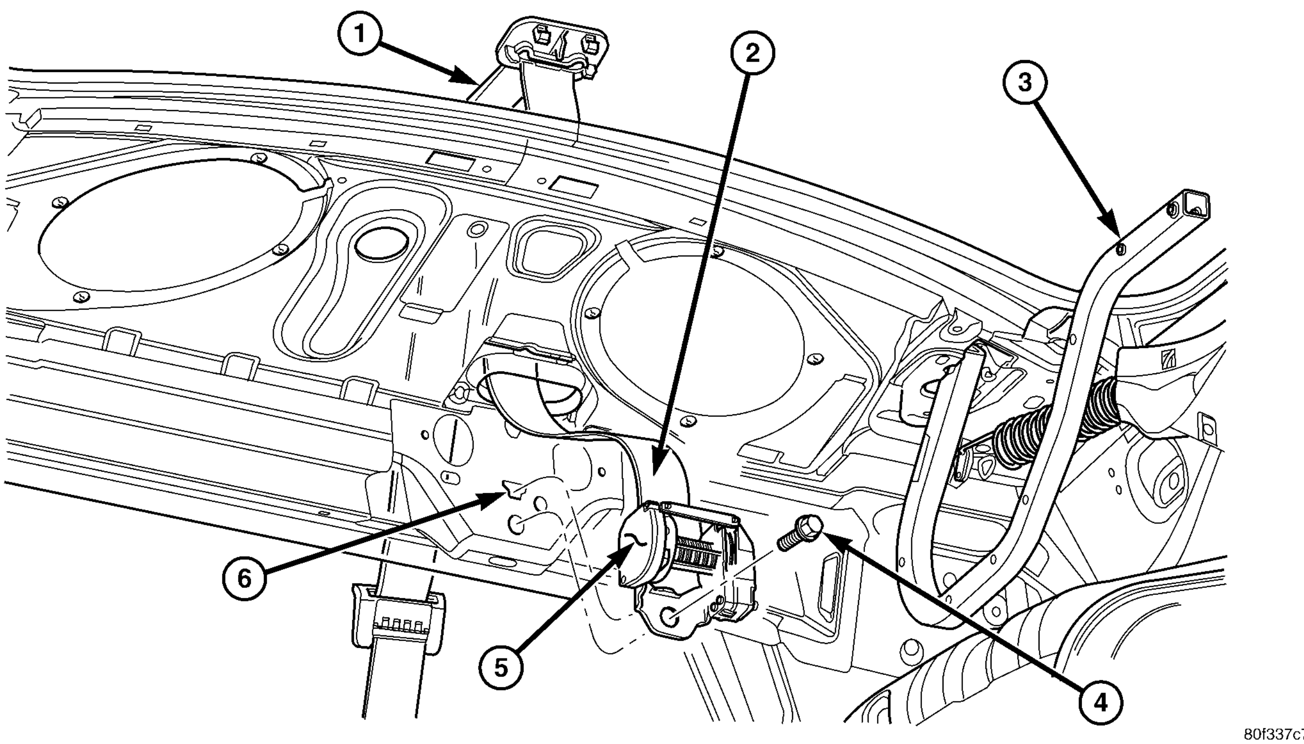

Fig. 18 REAR CENTER SEAT BELT & RETRACTOR - REMOVE/INSTALL

1 - SEAT BELT AND REAR SHELF TRIM
2 - REAR CENTER SEAT BELT
3 - RIGHT DECK LID HINGE
4 - RETRACTOR RETAINING BOLTS
5 - REAR CENTER SEAT BELT & RETRACTOR ASSEMBLY
6 - LOWER SHELF REINFORCEMENT BRACKET

REAR SEAT BELT & RETRACTOR (Continued)

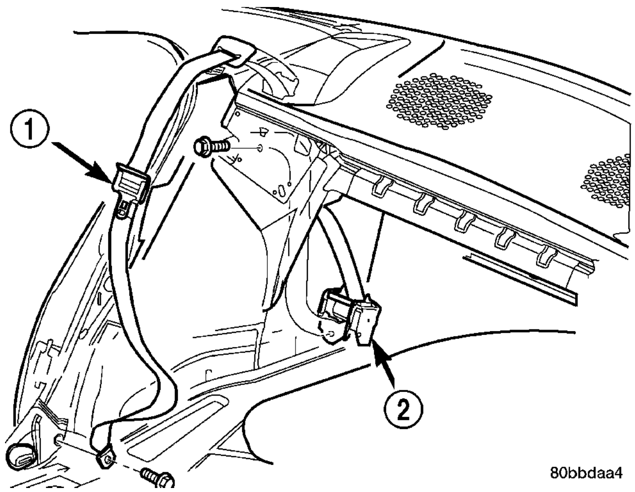

Fig. 19 REAR SEAT BELT & RETRACTOR

1 - REAR RIGHT OUTER SEAT BELT
2 - SEAT BELT RETRACTOR

INSTALLATION

(1) Position rear seat belt retractor in trunk compartment.

(2) Push seat belt bezel and buckle stab through access hole in rear shelf trim panel.

(3) Install bolt attaching retractor to rear seat closure panel. 40 N·m (30 ft. lbs.) torque.

(4) Install bolt attaching seat belt lower anchor to floor. Tighten the seat belt bolt to 40 N·m (30 ft. lbs.) torque.

(5) Install rear seat closure panel silencer pad.

(6) Install seat belt bezel to the rear shelf trim panel.

(7) Install rear seat cushion and back.

SEAT AIRBAG

DESCRIPTION

The left and right seat airbags are located in the outboard edge of the front seat backs. The airbag contains a bag, an inflator (small canister of highly compressed gas), and a mounting bracket. The seat airbag cannot be repaired and must be replaced if deployed or in any way damaged. If it is found to be defective, replacement is acceptable.

OPERATION

When supplied with the proper electrical signal, the inflator seals the hole in the airbag cushion so it can discharge the compressed gas directly into the cushion. Upon deployment, the seat back trim cover will tear open and allow the seat airbag to fully deploy between the seat and the door.

REMOVAL

(1) Position the left front seat in the full forward position.

(2) Open hood.

(3) Disconnect and isolate the battery negative cable (Fig. 20).

(4) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

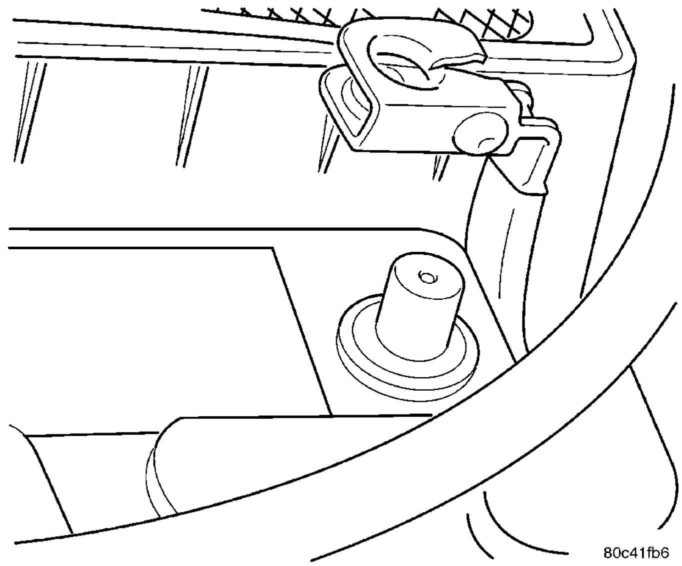

Fig. 20 BATTERY NEGATIVE CABLE REMOVE/ INSTALL

(5) Remove front seat from vehicle. Refer to Body, Seats, Front Seat, Removal.

(6) Disengage seat back trim cover J-strap from the upper, lower and airbag side of seat back.

(7) Disconnect the seat airbag electrical connector (Fig. 21). Slide yellow locking tab down to unlock. Then with two fingers, push two side retaining tabs in and pull connector straight from module.

(8) Remove the seat airbag retaining nuts.

(9) Grasp the upper airbag side of the seat back trim cover and pull trim cover and cushion over top of seat back frame. This will allow room to remove seat airbag without damaging trim cover or cushion.

(10) Working between seat back trim cover/cushion and frame carefully unhook seat airbag studs from nylon sleeve and slide seat airbag out of sleeve. Be careful not to tear nylon sleeve as this will affect function of airbag system.

CAUTION: Be certain not to tear the side impact airbag module nylon sleeve during removal.

SEAT AIRBAG (Continued)

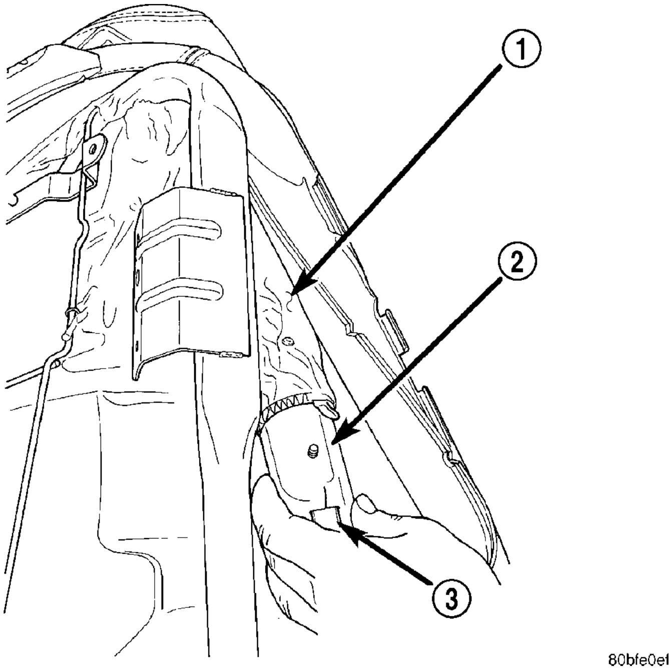

Fig. 21 SEAT AIRBAG ELECTRICAL CONNECTOR

1 - SEAT AIRBAG NYLON SLEEVE
2 - SEAT AIRBAG
3 - SEAT AIRBAG ELECTRICAL CONNECTOR

INSTALLATION

NOTE: The seat airbag connector must face down (toward seat cushion) after installation.

(1) Carefully slide the seat airbag in nylon sleeve until mounting studs line up with holes provided in nylon sleeve. Be careful not to tear nylon sleeve as this will affect function of airbag system.

CAUTION: The seat airbag must be inside the nylon sleeve before installing retaining nuts. Failure to do so will adversely affect the function of the side impact airbag system.

(2) Pull seat airbag and nylon sleeve assembly up to line up mounting studs and mistake proofing pin with holes provided in seat back frame mounting bracket (Fig. 22). Install the seat airbag retaining nuts. Torque to 10.7 N·m (94.7 in. lbs.).

(3) Position the upper seat back trim cover and cushion over seat back frame.

(4) Connect the seat airbag electrical connector. After initial connector is installed be certain the yellow locking tab is in the upper "locked" position. Check to be certain connector cannot be removed once yellow locking tab is positioned.

(5) Position seat back trim cover and install seat back trim cover J-straps on the upper, lower and airbag side of seat back frame.

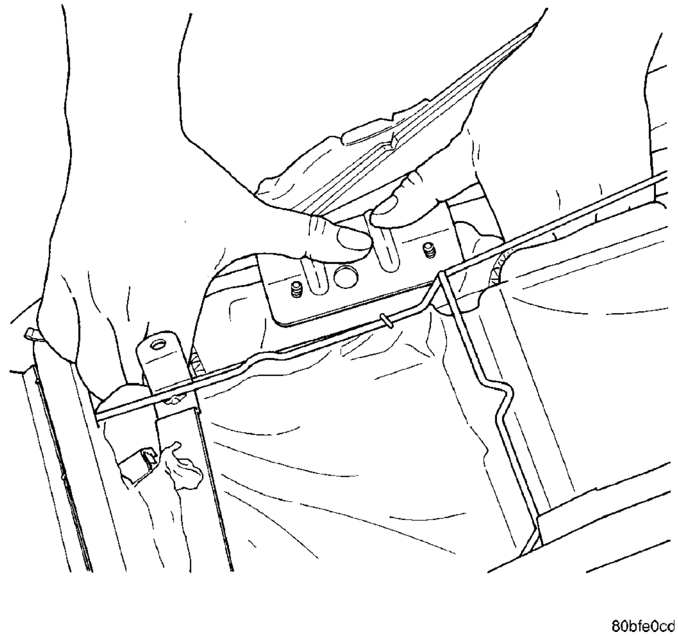

Fig. 22 INSTALLING SEAT AIRBAG

(6) Install the front seat back in vehicle. Refer to Body, Seats, Front Seat, Installation.

CAUTION: Be certain plastic back panel is securely installed on the seat back. Failure to do so will adversely affect the side impact airbag system.

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(7) Close hood.

(8) Verify vehicle and system operation.

SEAT BELT BUCKLE - FRONT

REMOVAL

CAUTION: Front seat belt assemblies must be replaced after a collision.

(1) Remove bolt attaching seat belt buckle from seat anchor.

(2) Remove seat belt buckle from seat.

INSTALLATION

CAUTION: Front seat belt assemblies must be replaced after a collision.

SEAT BELT BUCKLE - FRONT (Continued)

(1) Place seat belt buckle in position on seat anchor.

(2) Install bolt and grommet attaching seat belt buckle to seat anchor. Tighten seat belt anchor bolt to 40 N·m (30 ft. lbs.) torque.

SEAT BELT BUCKLE - REAR

REMOVAL

(1) Remove rear seat cushion.
(2) Remove rear seat belt buckle bolt.
(3) Remove rear seat belt buckle from vehicle.

INSTALLATION

(1) Install rear seat belt buckle. Tighten the seat belt nut to 57 N·m (42 ft. lbs.) torque.
(2) Install rear seat cushion.

SHOULDER BELT HEIGHT ADJUSTER

REMOVAL

CAUTION: Front seat belt assemblies must be replaced after a collision.

(1) Remove B-pillar trim (Fig. 13).
(2) Remove the two bolts attaching shoulder belt adjuster to B-pillar (Fig. 23).
(3) Remove shoulder belt adjuster from vehicle.

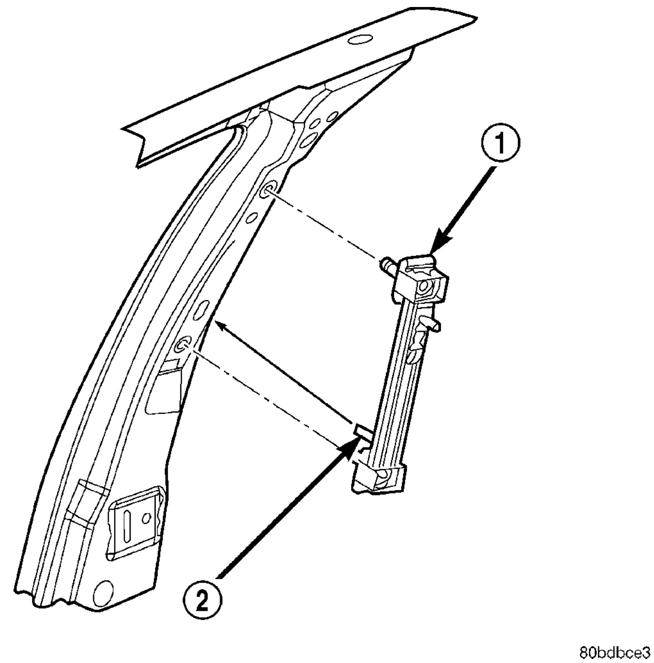

Fig. 23 FRONT SHOULDER BELT ADJUSTER

1 - FRONT SHOULDER BELT ADJUSTER
2 - TAB IS ON BOTTOM

INSTALLATION

CAUTION: Front seat belt assemblies must be replaced after a collision.

CAUTION: Front seat belt adjuster must be in the lowest position when Installing adjuster knob.

(1) Place into position the shoulder belt adjuster.
(2) Install bolts attaching shoulder belt adjuster to B-pillar. Tighten all seat belt bolts to 40 N·m (30 ft. lbs.) torque.
(3) Install B-pillar trim.

SIDE IMPACT AIRBAG CONTROL MODULE

DESCRIPTION

Vehicles equipped with side airbags use two Side Impact Airbag Control Modules (SIACM's). One is located on each side of the vehicle just in front of the body B-pillar (Fig. 24) inboard of the door entry sill, covered by the door sill trim.

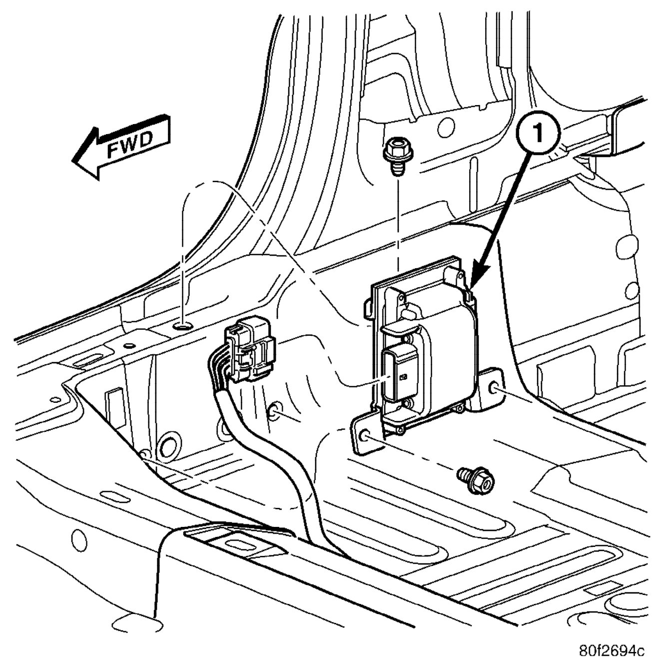

Fig. 24 SIDE IMPACT AIRBAG CONTROL MODULE (SIACM) LOCATION

1 - SIDE IMPACT AIRBAG CONTROL MODULE (SIACM)

SIDE IMPACT AIRBAG CONTROL MODULE (Continued)

OPERATION

Each side impact airbag control module (SIACM) serves as the impact sensor for its seat mounted airbag. The right side SIACM controls the right seat airbag. The left side SIACM controls the left seat airbag. Each SIACM contains two accelerometers, both accelerometers must agree in order to deploy the side airbag. In the event of a side impact, the appropriate SIACM will send a electronic signal to its airbag, deploying the airbag. The SIACM communicates with the Airbag Control Module (ACM) via the PCI bus circuit.

The SIACM perform self-diagnostics and circuit tests to determine if the system is functioning properly. If the test finds a problem, the SIACM will set both active and stored Diagnostic Trouble Codes (DTC's). If a DTC is active, the SIACM will request that the airbag warning lamp be turned on. The results of the system test are transmitted on the PCI bus circuit to the ACM once each second, or on a change in lamp state (ON/OFF). If the warning lamp status message from either SIACM contains a lamp ON request, the ACM will set an active DTC. At the same time as the DTC is set, the ACM sends a PCI bus message to the cluster requesting the airbag warning lamp to be turned ON. Observe all ACM WARNING and CAUTION statements when servicing or handling the SIACM. The SIACM's are not serviceable and must be replaced even if they are dropped.

REMOVAL

The removal and installation of the driver and passenger side modules is identical. The orientation of the modules is the only difference.

WARNING: THE MODULES CANNOT BE INTERCHANGED. THEY ARE UNIQUE TO EACH SIDE. FAILURE TO INSTALL THEM PROPERLY COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(1) Open hood.

(2) Disconnect and isolate the battery negative cable (Fig. 20).

(3) Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

(4) Remove the door sill trim from the appropriate side of the vehicle (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL).

(5) Peel back carpet to gain access to the retaining screws.

(6) Remove the SIACM retaining screws (Fig. 24).

(7) Disconnect the SIACM electrical connector (Fig. 24).

(8) Remove the SIACM from the vehicle.

INSTALLATION

The removal and installation of the driver and passenger side modules is identical. The orientation of the modules is the only difference.

WARNING: THE MODULES CANNOT BE INTERCHANGED. THEY ARE UNIQUE TO EACH SIDE. FAILURE TO INSTALL THEM PROPERLY COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(1) Connect the SIACM electrical connector (Fig. 24).

(2) Position the SIACM below the front door sill and install the retaining screws (Fig. 24). Torque the nuts to 15 N·m (135 in. lbs.).

(3) Install the door sill trim on the appropriate side of the vehicle (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION).

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE. REFER TO ELECTRICAL, RESTRAINTS, DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. FAILURE TO DO SO COULD RESULT IN OCCUPANT PERSONAL INJURY OR DEATH.

(4) Close hood.

(5) Verify vehicle and system operation.

SPEED CONTROL

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SPEED CONTROL

DESCRIPTION

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 a single switch. The ON, OFF, RESUME, ACCEL, SET, COAST, and CANCEL, lever is located on the right of the steering wheel (Fig. 1). For identification and location of the major components (Fig. 2).

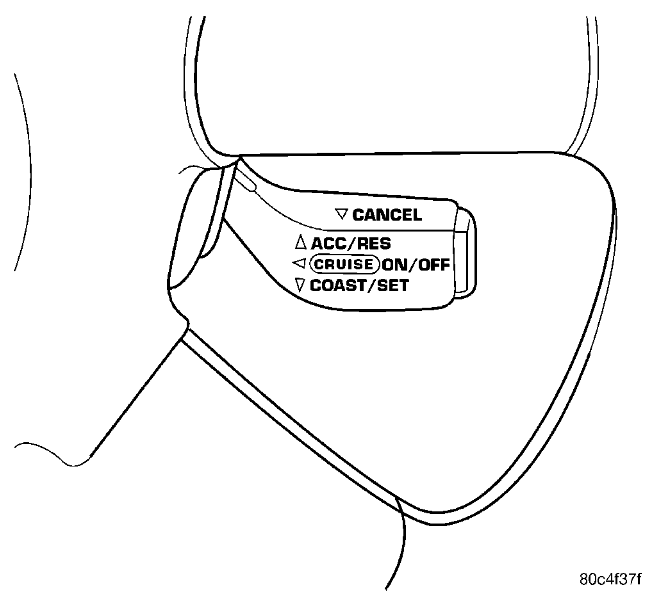

Fig. 1 Speed Control Switch

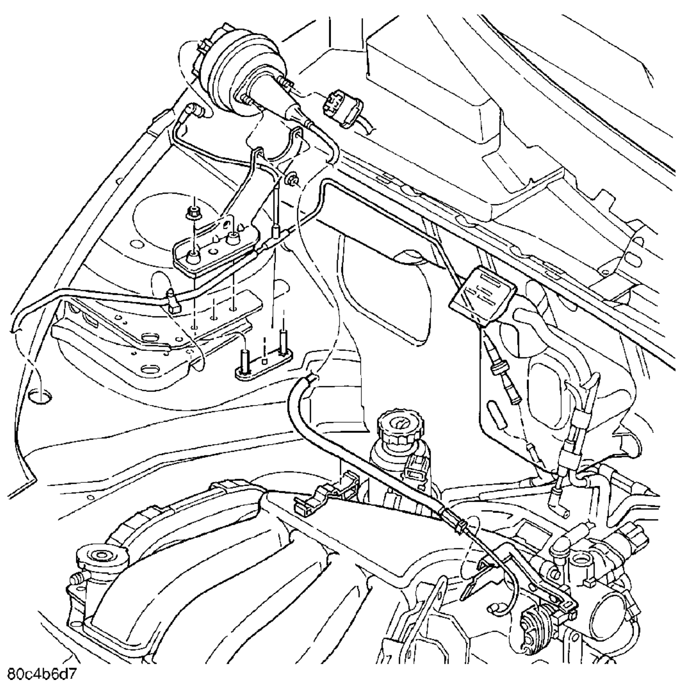

Fig. 2 Speed Control System

The system is designed to operate at speeds above 25 mph (40 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.

SPEED CONTROL (Continued)

OPERATION

OPERATION

When speed control is activated 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 and release the SET switch while the vehicle is moving at a speed between 25 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 (ATX) or 1st/2nd gear (MTX). The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.
- Depressing the clutch pedal
- Operating in 1st or 2nd gear (autostick, if equipped)

NOTE: Turning the system off by depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed 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)
- The speed 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 greater than 20 mph over the set speed.
- Autostick shifts into 1st or 2nd gear (autostick, if equipped)

Once the speed control has been disengaged, depressing the RESUME switch when speed is greater than 20 mph allows the vehicle to resume control to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the ACCEL switch. The new target speed is stored in the PCM when the ACCEL switch is released. The PCM also has a ″tap-up″ feature in which target speed increases by 2 mph for each momentary switch activation of the ACCEL switch. The PCM also provides a means to decelerate to a new lower target speed without disengaging speed control. Depress and hold the COAST switch until the desired speed is reached, then release the switch.

The PCM also has a “Tap Down” feature in which target speed decreases at 1 mph for each momentary switch activation of the coast switch.

OPERATION - INTERACTIVE SPEED CONTROL (4 Speed EATX Only)

Interactive means that communication between the PCM and the TCM is taking place, this communication is internal to the PCM on NGC vehicles. Interactive speed control avoids unnecessary shifting for smoother, quieter operation and when downshifts are required, makes the shifts smoother.

CLIMBING A GRADE

DESCRIPTION

When climbing a grade the interactive speed control tries to maintain the set speed by increasing the throttle opening, while inhibiting/delaying downshifts.

OPERATION

If opening the throttle alone cannot maintain the set speed and the vehicle speed drops more than three mph below the set speed, the transmission will downshift to third gear. If the vehicle continues to lose speed, by more than 6 mph, the transmission will downshift again to maintain the set speed. After the vehicle encounters a less-steep grade, or has crested the grade (reduced the load on the powertrain) and can maintain the set speed at a reduced throttle position, the transmission will upshift, as appropriate, until the set speed can be maintained in Overdrive.

GRADE HUNTING

DESCRIPTION

All vehicles equipped with a four speed automatic transmission have a grade hunting feature for the 2nd to 3rd gear upshift and the 3rd to Overdrive upshift.

OPERATION

The PCM on NGC vehicles identifies the powertrain loading conditions and selects the proper gear to maintain the current vehicle speed. Under moderate loading conditions the transaxle will stay in 3rd gear until the top of the grade is reached or the powertrain loading is reduced.

If powertrain loading is severe, the transaxle may shift into 2nd gear and remain there until powertrain loading is reduced, then a 2nd to 3rd gear upshift will be scheduled. Grade hunting features

SPEED CONTROL (Continued)

always operate regardless of whether or not the interactive speed control is engaged. **If the interactive speed control is not engaged and powertrain loading is not reduced, the driver may have to completely lift off of the throttle before an upshift will occur**. If the driver does lift off the throttle to induce an upshift under these conditions, vehicle speed will reduce and the Overdrive to 3rd and 3rd to 2nd gear downshifts will reoccur when the throttle is reapplied. If grade hunting is repeatedly induced by the driver, transaxle damage may result.

AUTOMATIC SPEED CONTROL OVERSPEED REDUCTION

DESCRIPTION

Transmission control software includes an automatic speed control overspeed reduction feature. This maintains vehicle speed at the selected set point when descending a grade.

OPERATION

The PCM on NGC vehicles 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 PCM on NGC vehicles 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 PCM on NGC vehicles waits until the speed control system opens the throttle at least 6 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 PCM on NGC vehicles maintains this gear until the driver opens the throttle at least 6 degrees to avoid an inappropriate upshift. The upshift is also delayed for 2.5 seconds after reaching the 6 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.

OPERATION - CHECKING FOR DIAGNOSTIC CODES

When trying to verify a speed control system electronic malfunction: Connect a DRBIII® scan tool if available to the data link connector. The connector is located near the steering column, and at lower edge of the dash panel.

A speed control malfunction may occur without a diagnostic code being indicated. For further information and usage of the DRBIII® scan tool and a more complete list of Diagnostic Trouble Code and No Trouble Codes, refer to the Powertrain Diagnostic Manual.

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 the Instrument Cluster 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 DTC exists, conduct tests per the Powertrain Diagnostic Procedures 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.
- Leaking vacuum reservoir.
- Loose or leaking vacuum hoses or connections.
- Defective one-way vacuum check valve.
- Secure attachment at both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Conduct electrical test at PCM.
- 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.

CABLE

DESCRIPTION

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage.

OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

CABLE (Continued)

REMOVAL

(1) Disconnect the negative battery cable.

(2) Remove the throttle cable cover.

(3) Remove speed control cable from throttle lever by sliding clasp out of the hole (Fig. 3).

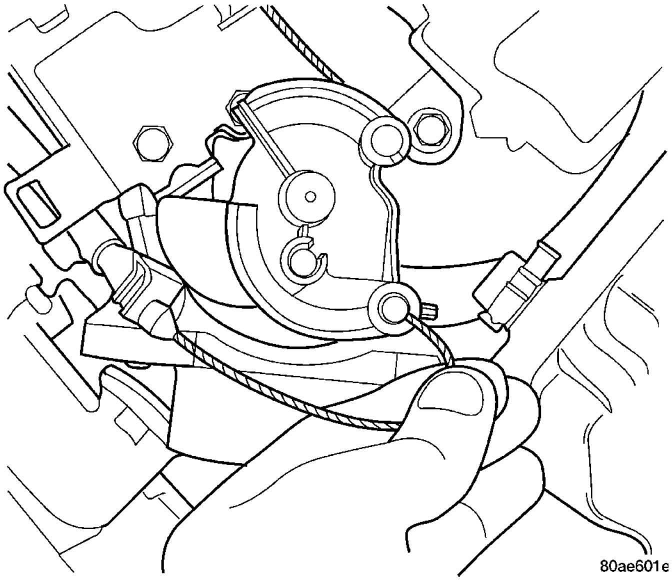

Fig. 3 Disconnecting Throttle Cable

(4) Lift the retaining tab on the throttle cable and slide cable out of bracket. Lift the retaining tab on the speed control cable and slide cable out of bracket.

(5) Disconnect electrical connector from servo.

(6) Disconnect vacuum hose from servo

(7) Remove 2 nuts retaining bracket to servo (Fig. 4).

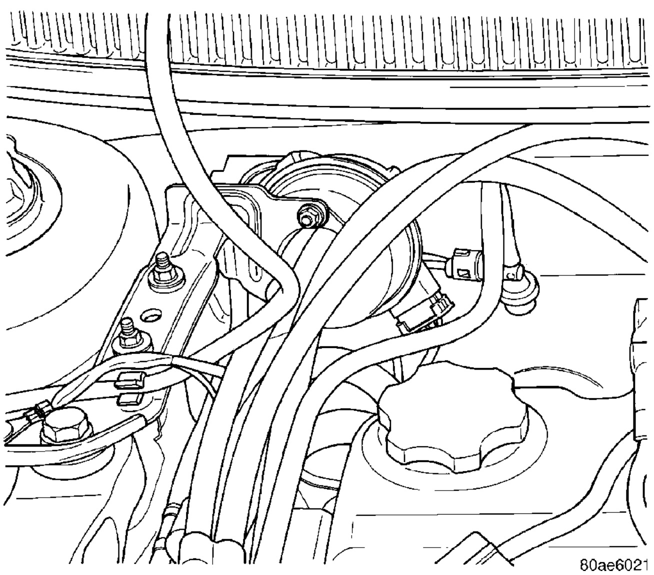

Fig. 4 Speed Control Servo

(8) Remove push nuts holding cable housing to servo.

(9) Remove retaining clip holding cable to servo (Fig. 5).

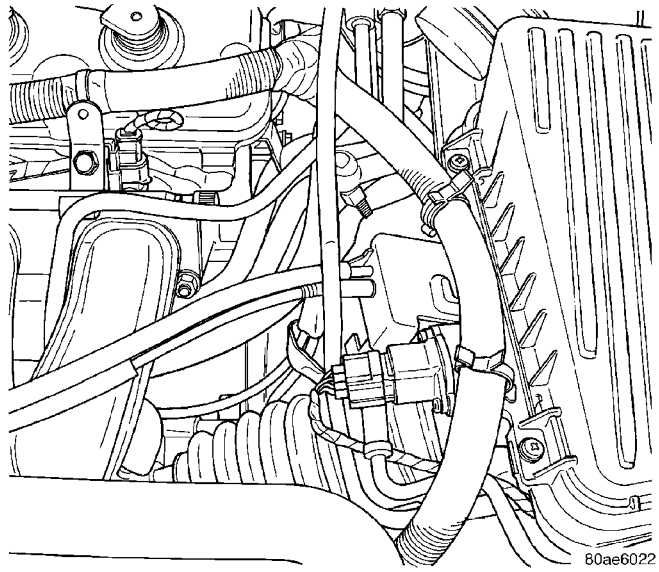

Fig. 5 Speed Control Cable

INSTALLATION

(1) Install retaining clip to cable at servo.

(2) Slide cable bell housing over servo mounting studs.

(3) Install servo mounting studs into bracket.

(4) Install 2 nuts at cable to servo and servo bracket, tighten to 7 N·m (60 in. lbs.).

(5) Connect electrical connector to servo.

(6) Connect vacuum hose to servo

(7) Rotate the throttle lever forward to the wide open position and install speed control cable clasp.

(8) Slide speed control cable into throttle cable bracket and engage retaining tab. Slide throttle cable into throttle cable bracket and engage retaining tab.

(9) Install the Throttle cable cover.

(10) Connect the negative battery cable.

SERVO

DESCRIPTION

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.

OPERATION

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 (Continued)

servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

The vacuum and vent solenoids must be grounded by the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids.

REMOVAL

(1) Disconnect electrical connector from servo (Fig. 6).

(2) Disconnect vacuum hose from servo

(3) Remove 2 nuts retaining bracket to servo.

(4) Remove cable bell housing from servo mounting studs.

(5) Remove retaining clip pin holding cable to servo.

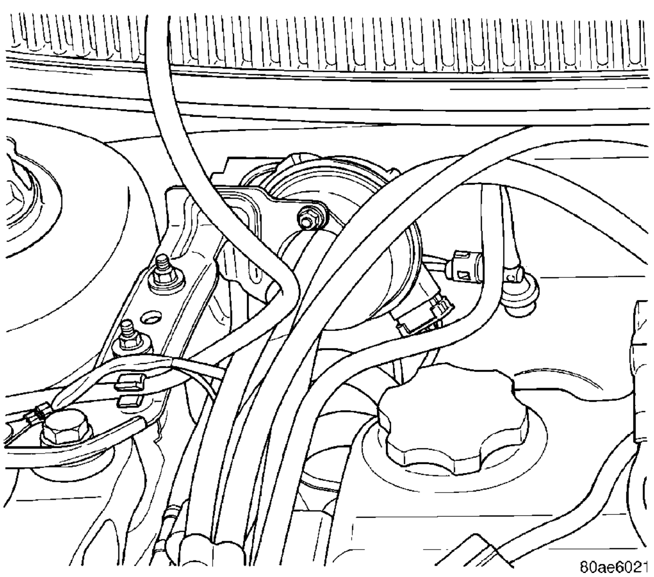

Fig. 6 Speed Control Servo

INSTALLATION

(1) Install retaining clip to cable at servo.

(2) Install 2 nuts at cable to servo and servo bracket, tighten to 7 N·m (60 in. lbs.).

(3) Connect electrical connector to servo.

(4) Connect vacuum hose to servo

SWITCH

OPERATION

The speed control system has five separate resistive switches that provide a single multiplexed (MUX) voltage inputs to the PCM.The switch names are: ON, OFF, SET, COAST, RESUME, ACCEL, TAP-UP, COAST, and CANCEL. Based on conditions when the buttons are pushed (and released), the five voltage ranges provided to the PCM result in the following functions: ON, OFF, SET, COAST, RESUME, ACCEL, TAP-UP, TAP-DOWN, COAST, and CANCEL. Refer to the Speed Control Section for more information

Also the PCM receives an input from the brake switch to sense whether the brake pedal has been depressed. When the PCM receives the brake depressed input, it turns off power to the speed control servo and disengages speed control. Also the power to the servo is supplied through the brake switch, which opens the circuit when the brake pedal is depressed.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

REMOVAL

The speed control switches is mounted in the steering wheel and wired through the clock spring device under the airbag module (Fig. 7).

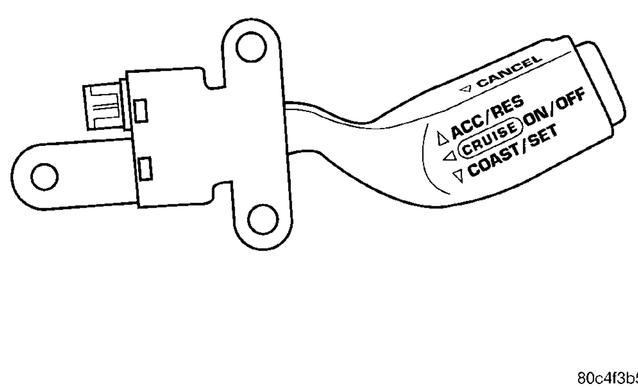

Fig. 7 Speed Control Switch

SWITCH (Continued)

WARNING: IF REMOVAL OF AIRBAG MODULE IS NECESSARY, REFER TO THE RESTRAINT SYSTEMS.

(1) Remove the air cleaner lid, disconnect the inlet air temperature sensor and makeup air hose.
(2) Remove the negative battery cable.
(3) Turn off ignition.
(4) Remove air bag, refer to the Restraint systems section.
(5) Remove the top mounting screw (Fig. 8).

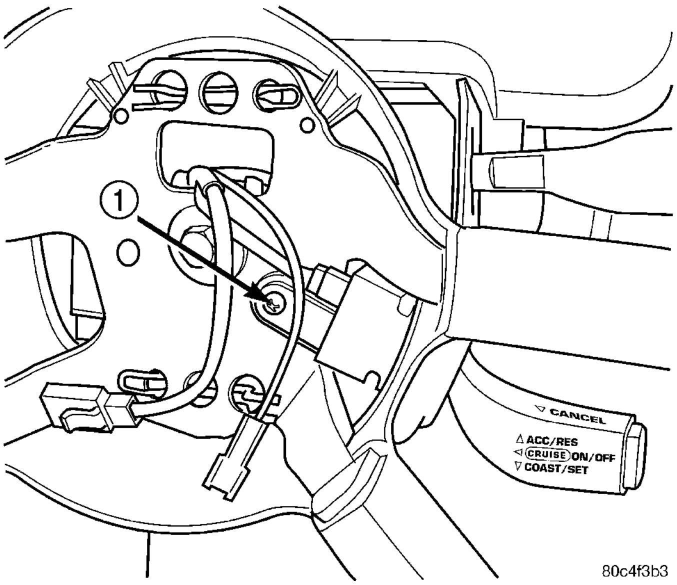

Fig. 8 Switch Top Mounting Screw
1 - TOP MOUNTING SCREW

(6) Rotate steering wheel so that the switch is in the 6 o'clock position. Remove 2 screws from the back side of the speed control switch.
(7) Disconnect the electrical connector.
(8) Remove switch (Fig. 9).

INSTALLATION

The speed control switch is mounted in the steering wheel and wired through the clock spring device under the airbag module (Fig. 7).

WARNING: IF REMOVAL OF AIRBAG MODULE IS NECESSARY, REFER TO THE RESTRAINT SYSTEMS.

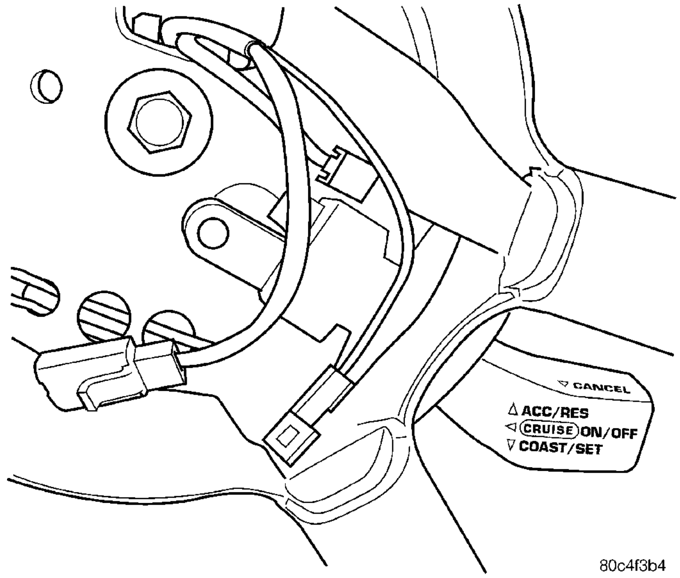

Fig. 9 Switch Removal

(1) Connect the electrical connector.
(2) Install switch (Fig. 9) and tighten the screws to 1.6 N·m (15 ins. lbs.). Make sure rubber seal is in place around switch.
(3) Install airbag, refer to the Restraint Systems section.
(4) Install the negative battery cable.
(5) Install the air cleaner lid, connect the inlet air temperature sensor and makeup air hose.

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is located in the engine compartment. It is made of plastic.

OPERATION

The reservoir stores engine vacuum. Manifold vacuum is supplied from the brake booster check valve. The speed control vacuum supply hose has a check valve at the source (brake booster) to maintain the highest available vacuum level in the servo, reservoir and vacuum hoses. 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.

VACUUM RESERVOIR (Continued)

REMOVAL

(1) Remove the passanger side cowl screen..

(2) Remove vacuum reservoir mounting nuts (Fig. 10).

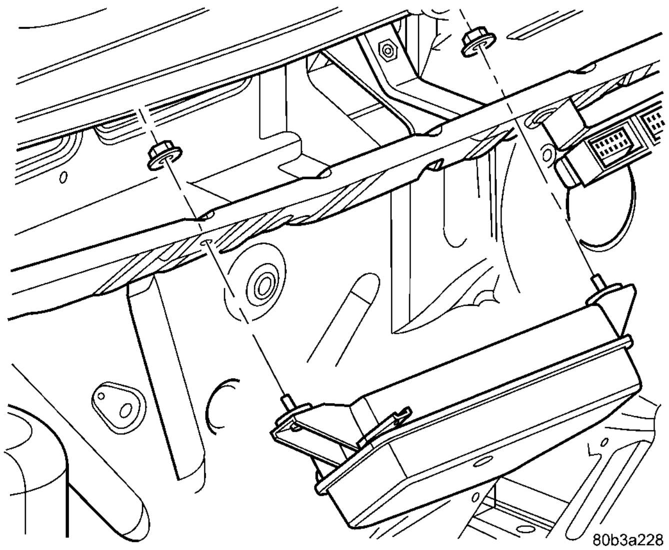

Fig. 10 VACUUM RESERVOIR MOUNTING

(3) Remove vacuum hose and throttle cable tie strap push clip (Fig. 11).

(4) Remove vacuum reservoir.

INSTALLATION

(1) Install vacuum reservoir, install nuts and tighten to 4.5 N.m (40 in. lbs.) (Fig. 10).

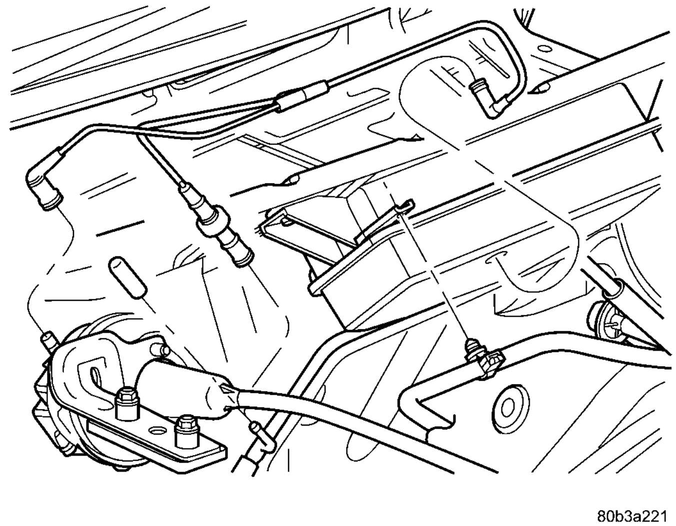

Fig. 11 VACUUM RESERVOIR CONNECTIONS

(2) Install vacuum hose.

(3) Install the throttle cable push clip onto reservoir (Fig. 11).

NOTE: Throttle cable must be clipped to the reservoir to prevent contact with the exhaust manifold.

(4) Install the passenger side cowl screen.

VEHICLE THEFT SECURITY

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VEHICLE THEFT SECURITY

DESCRIPTION

VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft/Security System (VTSS) is designed to protect against whole vehicle theft. The system monitors vehicle doors, liftgate, and ignition for unauthorized operation.

The VTSS activates:
- Sounding of the horn.
- Flashing of the park lamps.
- Flashing of the headlamps.

The vehicle theft security system contains a built-in tamper alert feature. This feature is designed to notify the driver that the system had been activated during its armed state. When the vehicle is disarmed, 3 horn pulses will be followed by the initial disarming pulse letting the driver know the system had been activated.

VEHICLE THEFT SECURITY SYSTEM - EXPORT

Some vehicles are equipped with a Premium Vehicle Theft Security System (VTSS). The premium VTSS is designed to protect against whole vehicle theft and the loss of its contents. This system monitors vehicle doors, hood, liftgate and ignition key cylinders for unauthorized operation, as well as monitoring any movement inside the cabin when the intrusion sensor is armed.

Some vehicles are equipped with a standard vehicle theft security system. This system is designed to protect against whole vehicle theft. This system monitors the vehicle doors, liftgate, and ignition key cylinders for unauthorized operation.

SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is available as a factory-installed option on this vehicle. It is designed to provide passive protection against unauthorized vehicle use by disabling the engine, after two (2) seconds of running, whenever an invalid key is used to start the vehicle. The SKIS is active whenever the ignition is on and does not require any customer intervention. The primary components of the system are the Sentry Key Immobilizer Module (SKIM), Sentry Key (ignition key with a transponder molded into the head), indicator light, and the Powertrain Control Module (PCM). The SKIM is mounted to the steering column with the molded, integral antenna mounted on the trim ring surrounding the ignition lock cylinder. The indicator light, is located in the instrument cluster.

OPERATION

VEHICLE THEFT SECURITY SYSTEM

The system is armed when the vehicle is locked using the:
- Power door lock switches.
- Remote Keyless Entry (RKE) transmitter.
- Key cylinder switches.

After the vehicle is locked and the last door is closed, the circular red VTSS indicator in the instrument cluster will flash quickly for 16 seconds, indi-

VEHICLE THEFT SECURITY (Continued)

cating that arming is in progress. If no monitored systems are activated during this period the system will arm. After 16 seconds, the LED will continue to flash at a slower rate indicating the system is armed.

If the VTSS indicator does not illuminate at all upon door closing it indicates that the system is not arming.

VTSS disarming occurs upon normal vehicle entry by unlocking either door via the key cylinders or RKE transmitter, or by starting the vehicle with a valid Sentry Key. This disarming will also halt the alarm once it has been activated.

A tamper alert exists to notify the driver that the system had been activated. This alert consists of 3 horn pulses when the vehicle is disarmed.

The VTSS will not arm by mechanically locking the vehicle doors. This will manually override the system.

The VTSS functionality is contained within the Remote Keyless Entry (RKE) Module, sometimes referred to as the Alarm Remote Keyless Entry Module (ARKEM) (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION).

TRIGGERING THE VTSS

ARMING THE VTSS

Locking the power door switch and closing the door or the keyless transmitter will arm the system, or locking any door or liftgate with the key cylinder switch.

SETTING OFF THE VTSS Any of the following actions will trigger the system:

(1) Opening any door or knocking out the decklid lock cylinder.

NOTE: Only EXPORT alarm systems will include a hood ajar switch, motion sensor, and decklid ajar switch.

(2) Turning the ignition to the ON position with an invalid key.

VEHICLE THEFT SECURITY SYSTEM - EXPORT

In the event the Premium VTSS is triggered, the VTSS siren will sound and the turn indicator lamps will flash on the premium security system. The premium system cannot be disarmed via the key cylinders.

In the event the Standard VTSS is triggered, the VTSS will sound the vehicle horn and flash the headlamp and park lamps in a alternating fashion.

The VTSS and RKE system receives signals from the hand-held key fob or transmitter. European market vehicles use 433 MHz frequency. Japan market vehicles use 268 MHz frequency.

SENTRY KEY IMMOBILIZER SYSTEM

The SKIS includes keys from the factory which are pre-programmed. Each SKIM will recognize a maximum of eight Sentry Keys. If the customer would like to own additional keys other than those provided with the vehicle, they can be purchased from any authorized dealer. These keys must be programmed to the SKIM on the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer with a DRB III® scan tool or by a customer if this feature is available in their market and they have two (2) valid keys already available to them. Refer to the Service Procedures portion of this system for additional details. The SKIS performs a self-test each time the ignition switch is turned to the ON position and will store Diagnostic Trouble Codes (DTC's) if a system malfunction is detected. The DTC's can be retrieved using a DRB III® scan tool. The SKIS can be diagnosed using the proper Powertrain Diagnostic Procedures manual.

DIAGNOSIS AND TESTING - SENTRY KEY IMMOBILIZER SYSTEM

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, (Refer to 8 - ELECTRICAL/RESTRAINTS - WARNING). FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT PERSONAL INJURY OR DEATH.

NOTE: The following tests may not prove conclusive in the diagnosis of this system. The most reliable, efficient, and accurate means to diagnose the Sentry Key Immobilizer System (SKIS) involves the use of a DRB lll® scan tool and the proper Powertrain Diagnostic Procedures manual.

The Sentry Key Immobilizer System (SKIS) and the Programmable Communication Interface (PCI) bus network should be diagnosed using a DRB lll® scan tool. The DRB lll® will allow confirmation that the PCI bus is functional, that the Sentry Key Immobilizer Module (SKIM) is placing the proper messages on the PCI bus, and that the Powertrain Control Module (PCM) and the instrument cluster are receiving the PCI bus messages. Refer to the proper Powertrain Diagnostic Procedures manual. Refer to Wiring Diagrams for complete circuit descriptions and diagrams.

(1) Check the fuses in the fuse block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Disconnect and isolate the battery negative cable (Fig. 1). Unplug the wire harness connector at the SKIM. Check for continuity between the ground

VEHICLE THEFT SECURITY (Continued)

circuit cavity of the SKIM wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to ground as required.

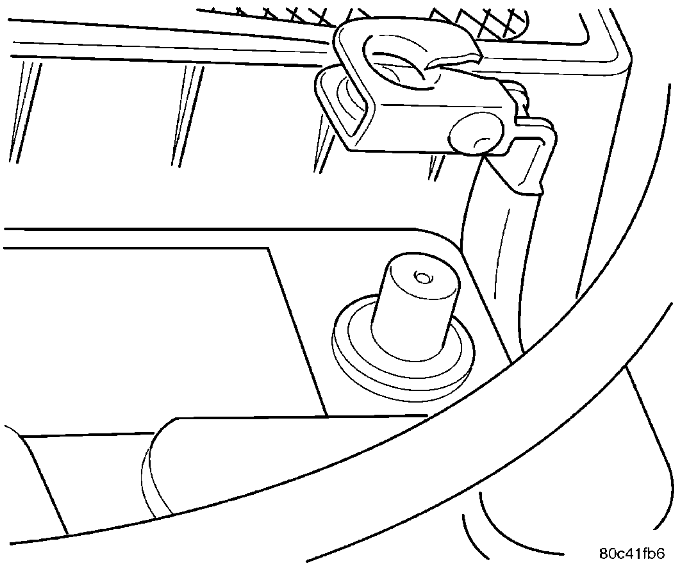


Fig. 1 BATTERY NEGATIVE CABLE - REMOVE/ INSTALL

(3) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the SKIM wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the fuse in the fuse block as required.

(4) Turn the ignition switch to the ON position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the SKIM wire harness connector. If OK, use a DRB lll® scan tool and the proper Powertrain Diagnostic Procedures manual to complete the diagnosis of the SKIS. If not OK, repair the open circuit to the fuse in the fuse block as required.

GENERAL TROUBLESHOOTING TIPS

(1) Using a DRB III® scan tool, read and record the faults as they exist in the module when you first start your analysis of the vehicle. It is important to document these faults because the SKIM does not differentiate between historical faults (those faults that occurred in the past) and active faults (those faults that are present now). If this problem turns out to be an intermittent condition, this information may become very valuable to your analysis.

(2) Using a DRB III® scan tool, erase the faults in the Sentry Key Immobilizer Module (SKIM).

(3) Turn the ignition off and back on again.

(4) Using a DRB III® scan tool, read the faults now listed in the Sentry Key Immobilizer Module (SKIM).

(5) Using the fault information you now have, refer to the proper Powertrain Diagnostic Procedures manual for additional specific steps.

STANDARD PROCEDURE

STANDARD PROCEDURE - RKE/VTSS CONFIGURING A NEW MODULE

To switch operating modes or to configure a new module, a DRB lll® scan tool must be used.

(1) Hook up the DRB lll® scan tool to the Data Link Connector (DLC).

(2) With the key in the ignition, turn the key to the RUN position.

(3) After the DRB lll® scan tool initialization, perform the following:

(a) Select “Theft Alarm.”

(b) Select “VTSS.”

(c) Select “Miscellaneous.”

(4) Once in the “Miscellaneous” screen:

(a) If you wish to configure a new module, select “Configure Module.”

STANDARD PROCEDURE - SENTRY KEY IMMOBILIZER SYSTEM INITIALIZATION

The Sentry Key Immobilizer System (SKIS) initialization should be performed following a Sentry Key Immobilizer Module (SKIM) replacement.

It can be summarized by the following:

(1) Obtain the vehicles unique PIN number assigned to it’s original SKIM from the vehicle owner, the vehicle’s invoice or from Chrysler’s Customer Center.

(2) With the DRB lll® scan tool, select “Theft Alarm,” “SKIM,” Miscellaneous.” Select “SKIM Module Replaced” function and the DRB lll® will prompt you through the following steps.

(3) Enter secured access mode using the unique four digit PIN number.

(4) Program the vehicle’s VIN number into the SKIM’s memory.

(5) Program the country code into the SKIM’s memory.

(6) Transfer the vehicle’s unique Secret Key data from the PCM. This process will require the SKIM to be in **secured access mode**. The PIN number must be entered into the DRB lll® before the SKIM will enter **secured access mode**. Once **secured access mode** is active, the SKIM will remain in that mode for 60 seconds.

(7) Program all customer keys into the SKIM’s memory. This required that the SKIM be in **secured access mode** The SKIM will immediately exit **secured access mode** after each key is programmed.

VEHICLE THEFT SECURITY (Continued)

NOTE: If a PCM is replaced, the unique "Secret Key" data must be transferred from the SKIM to the PCM. This procedure requires the SKIM to be placed in SECURED ACCESS MODE using the four digit PIN code.

DECKLID SECURITY SWITCH

REMOVAL

The Vehicle Theft Security System (VTSS) Deck Lid Security Switch is mounted to the back of the deck lid lock cylinder.

(1) Open deck lid.
(2) Disconnect wire connector to switch.
(3) Remove the spring clip retainer.
(4) Pull switch off of deck lid lock cylinder and remove from vehicle.

INSTALLATION

(1) Push switch onto the deck lid lock cylinder.
(2) Install the spring clip retainer.
(3) Connect the wire connector to switch.
(4) Close the deck lid.

DOOR CYLINDER LOCK SWITCH

REMOVAL

(1) Remove the door trim panel. Refer to Body, Door - Front, Trim Panel, Removal.
(2) Remove the illuminated entry switch wiring clip and disconnect connector.
(3) Remove door cylinder lock switch from door handle.

INSTALLATION

(1) Install the door cylinder lock switch from door handle.
(2) Install the illuminated entry switch wiring clip and disconnect connector.
(3) Install the door trim panel. Refer to Body, Door - Front, Trim Panel, Installation.

HOOD AJAR SWITCH - EXPORT

REMOVAL

(1) Open hood.
(2) Disconnect and isolate the battery negative cable (Fig. 1).
(3) Disconnect wire harness connector from hood ajar switch.
(4) Firmly press tangs on the bottom side of the switch together and push up through bracket (Fig. 2).

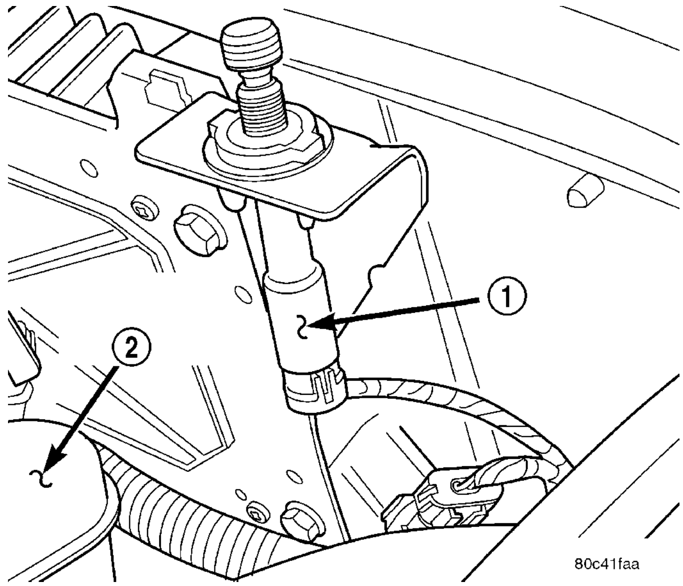


Fig. 2 HOOD AJAR SWITCH LOCATION

1 - HOOD AJAR SWITCH CONNECTOR
2 - BRAKE FLUID RESERVOIR

(5) Remove switch from vehicle.

INSTALLATION

(1) Firmly press hood ajar switch through bracket (Fig. 2).
(2) Connect wire harness connector to hood ajar switch.
(3) Connect the battery negative cable (Fig. 1).
(4) Close hood.
(5) Verify vehicle and system operation.

SKIS INDICATOR LAMP

DESCRIPTION

The Sentry Key Immobilizer System (SKIS) uses the Vehicle Theft Security System (VTSS) indicator LED to give an indication when the SKIS is faulty or when the vehicle has been immobilized due to the use of an invalid ignition key. The LED is controlled by the instrument cluster circuitry based upon messages received from the Sentry Key Immobilizer Module (SKIM).

OPERATION

The SKIM sends messages to the instrument cluster, to turn the LED on for about three seconds when the ignition switch is turned to the ON position as a bulb test. After completion of the bulb test, the SKIM sends PCI bus messages to keep the LED off for a duration of about one second. Then the SKIM sends

SKIS INDICATOR LAMP (Continued)

messages to the instrument cluster circuitry to turn the LED on or off based upon the results of the SKIS self-tests. If the VTSS indicator LED comes on and stays on after the bulb test, it indicates that the SKIM has detected a system malfunction and/or that the SKIS has become inoperative. If the SKIM detects an invalid key when the ignition switch is turned to the ON position, it sends messages to the instrument cluster to flash the VTSS indicator LED.

The SKIM can also send messages to the instrument cluster to flash the LED and to generate a single audible chime tone. These functions serve as an indication to the customer that the SKIS has been placed in its “Customer Learn” programming mode. See Sentry Key Immobilizer System Transponder Programming in this group for more information on the “Customer Learn” programming mode.

The VTSS indicator LED uses a Light Emitting Diode (LED) on the instrument cluster electronic circuit board. It is not serviceable separate from the instrument cluster assembly. If the VTSS indicator LED comes on and stays on after the bulb test function, diagnosis of the SKIS should be performed with a DRB lll® scan tool and the proper Powertrain Diagnostic Procedures manual.

TRANSPONDER KEY

DESCRIPTION

The Sentry Key Immobilizer System (SKIS) uses a transponder chip that is integral to each ignition key (Fig. 3) to communicate with the Sentry Key Immobilizer Module (SKIM). Ignition keys are supplied with the vehicle when it is shipped from the factory. The transponder chip is undermolded within the head of the key. This undermold is hidden beneath an overmolded rubber cap.

OPERATION

Each Sentry Key transponder has a unique transponder identification code programmed into it by the manufacturer. The Sentry Key Immobilizer Module (SKIM) has a unique “Secret Key” code programmed into it by the manufacturer. When a Sentry Key transponder is programmed into the memory of the SKIM, the SKIM learns the transponder identification code from the transponder, and the transponder

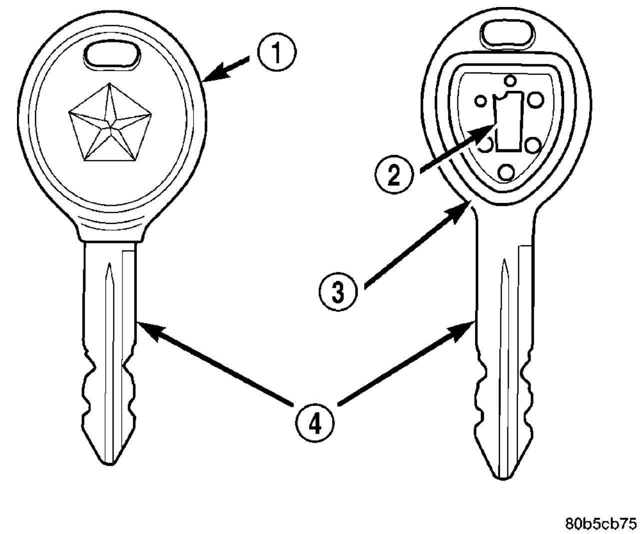


Fig. 3 SENTRY KEY IMMOBILIZER TRANSPONDER

1 - MOLDED CAP
2 - TRANSPONDER
3 - MOLDED CAP REMOVED
4 - SENTRY KEY

learns the “Secret Key” code from the SKIM. Each of these codes is stored within the transponder and in the nonvolatile memory of the SKIM. Therefore, blank keys for the SKIS must be programmed by and into the SKIM, in addition to being cut to match the mechanical coding of the ignition lock cylinder. See Sentry Key Immobilizer System Transponder Programming in this section for more information.

The Sentry Key’s transponder is within the range of the SKIM’s transceiver antenna ring when it is inserted into the ignition lock cylinder. When the ignition switch is turned to the ON position, the SKIM communicates with the Sentry Key via a radio frequency (RF) signal. The SKIM determines if a valid key is present based on the information it receives from the Sentry Key. If a valid key is detected, that fact is communicated to the PCM via the PCI bus and the vehicle is allowed to continue running. If an invalid key is received by the PCM or no status at all is communicated, the vehicle will stall after two (2) seconds of running. The indicator light will be flashing at this point. The Sentry Key’s transponder can not be repaired. If it is faulty or damaged, it must be replaced.

TRANSPONDER KEY (Continued)

STANDARD PROCEDURE - TRANSPONDER PROGRAMMING

USING A DRB III® SCAN TOOL

All Sentry Keys included with the vehicle are pre-programmed to work with the Sentry Key Immobilizer System (SKIS) when it is shipped from the factory. The Sentry Key Immobilizer Module (SKIM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition lock cylinder of the vehicle for which it will be used. The vehicle's four digit PIN code will be required to complete this task since you will need it to enter the Secured Access Mode in the SKIM. The following steps must be completed using a DRB III® scan tool:

(1) Insert the blank key into the ignition and turn it to the RUN position.

(2) Using a DRB III® scan tool, select ″Theft Alarm,″ ″SKIM,″ ″Miscellaneous,″ and then ″Program Ignition Key.″

(3) Enter the four digit PIN code using the DRB III® scan tool. When programming is completed, the SKIM will exit Secured Access Mode and the DRB III® scan tool will display the results of your attempt to program the key. One of five distinct results may be displayed. All five are listed below:

- **″Programming Successful″** is displayed if the Sentry Key programming is successful.
- **″Learned Key in Ignition″** is displayed if the key in the ignition has already been programmed into that vehicle's SKIM.
- **″Eight Keys Already Learned (At The Maximum) Programming Not Done″** is displayed if eight keys have already been programmed into the SKIM. In this case, if a new key needs to be added due to a lost or defective key, the ″Erase All Keys″ command (which requires entering the Secured Access Mode) has to be performed. Following the ″Erase All Keys″ command, all keys that will be used to operate the vehicle **MUST** be reprogrammed to the SKIM.
- **″Programming Not Attempted″** is displayed after an ″Erase All Keys″ function is executed.
- **″Programming Key Failed″** is displayed if further diagnosis is required.

To learn additional keys, turn the ignition OFF, remove the learned key, insert the next new blank key, and repeat the steps from the beginning.

"CUSTOMER LEARN" MODE

This feature is only available on domestic vehicles or those which have a U.S. country code designator. This procedure requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, Sentry Key programming will require the use of a DRB III® scan tool.

The steps required to program Sentry Keys with two valid Sentry Keys follows:

(1) Obtain the blank Sentry Key(s) that need to be programmed. Cut the keys to match the ignition lock cylinder mechanical key codes.

(2) Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the ON position.

(3) After the ignition switch has been in the ON position for longer than three seconds, but no more than fifteen seconds, cycle the ignition switch back to the OFF position. Replace the first valid Sentry Key in the ignition lock cylinder with the second valid Sentry Key and turn the ignition switch back to the ON position. The second valid Sentry Key must be inserted, and the ignition key to the ON position, within 15 seconds of removing the first valid Sentry key.

(4) About ten seconds after the completion of Step 3, the indicator light will start to flash and a single audible chime tone will sound to indicate that the system has entered the ″Customer Learn″ programming mode.

(5) Within sixty seconds of entering the ″Customer Learn″ programming mode, turn the ignition switch to the OFF position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the ON position.

(6) About ten seconds after the completion of Step 5, a single audible chime tone will sound and the indicator light will stop flashing and stay on solid for three seconds and then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKIS will immediately exit the ″Customer Learn″ programming mode and the vehicle may be started using the newly programmed Sentry Key.

These steps must be completed in their entirety for each additional Sentry Key to be programmed. If any of the above steps are not completed in the given sequence, or within the allotted time, the SKIS will exit the ″Customer Learn″ programming mode and the programming will be unsuccessful. The SKIS will also automatically exit the ″Customer Learn″ programming mode if:

- It sees a non-blank Sentry Key when it should see a blank.
- If it has already programmed eight (8) valid Sentry Keys.
- If the ignition switch is turned to the OFF position for more than about fifty (50) seconds.

NOTE: If you attempt to start the vehicle while in "Customer Learn" mode (LED flashing), the vehicle will behave as though an invalid key is being used (i.e. the engine will stall after two (2) seconds of running). No faults will be logged.

NOTE: Once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle.

WIPERS/WASHERS

TABLE OF CONTENTS

WIPERS/WASHERS

DESCRIPTION

WIPER SYSTEM

The front windshield wiper/washer switch is mounted on the right side of the multi-function switch (Fig. 1) on the steering column, behind the steering wheel.

The wiper system has LOW, HIGH, and INTERMITTENT switch positions. The intermittent wiper system, in addition to low and high speed, has a delay mode and a pulse wipe mode.

The intermittent wiper function is integral to the wiper switch. All electronics and relay are inside the switch assembly. The wiper switch also includes the MIST feature which provides a single wipe when actuated.

WASHER SYSTEM

This vehicle is equipped with an electrically operated windshield washer pump. The washers are operated by a switch in the multi-function switch control lever (Fig. 1). The lever is located on the right side of the steering column.

The electric pump assembly is mounted directly to the reservoir. A permanently lubricated motor is coupled to an impeller type pump. The pump and reservoir are serviced as separate assemblies.

OPERATION

WIPER SYSTEM

Move the control lever up to select the desired wiper speed. Move the lever upward to the second detent for LOW speed wiper operation, or to the third detent for HIGH speed operation.

Use the intermittent wiper when weather conditions make a single wiping cycle, with a variable pause between cycles, desirable. Move the lever to the DEL position, then select the delay interval by turning the end of the lever. The delay can be regulated from a maximum of approximately 18 ± 0.5 seconds between cycles, to 1 ± 0.5 second.

The windshield wipers will only operate with the ignition switch in the ACCESSORY or IGNITION RUN position. The wiper circuit is protected against

WIPERS/WASHERS (Continued)

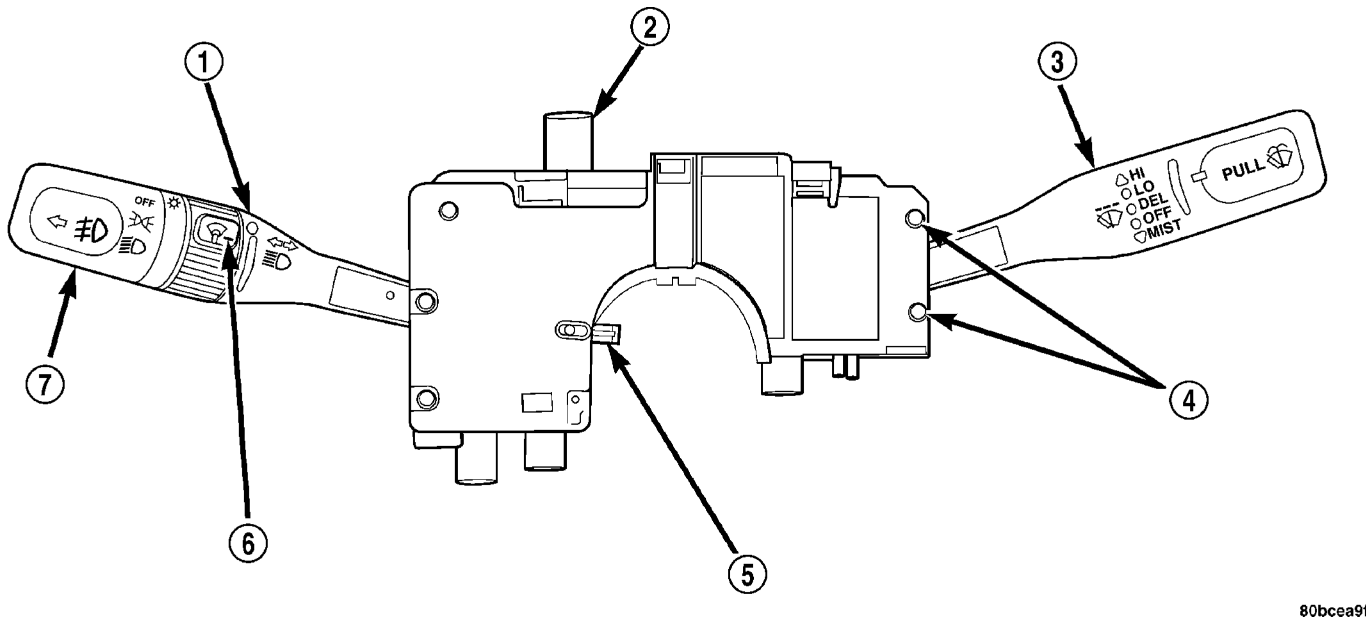


Fig. 1 WINDSHIELD WIPER/WASHER SWITCH LOCATION

1 - TURN SIGNAL CONTROL STALK
2 - HAZARD WARNING SWITCH
3 - WINDSHIELD WIPER/WASHER CONTROL
4 - WINDSHIELD WIPER/WASHER SWITCH RETAINING SCREWS
5 - CANCELLING CAM
6 - PANEL DIMMER/INTERIOR LIGHT SWITCH
7 - EXTERIOR LIGHTING CONTROL/FOG LAMP

over loads by a fuse in the fuse block and a thermal breaker within the wiper motor. This protects the circuitry of the wiper system and the vehicle. The wiper motor has permanent magnet fields.

Pulse wipe is accomplished by holding stalk lever in the WASH position momentarily. The wiper blades then sweep once or twice after the WASH at low speed and then return to the previous wiper switch mode.

The wiper system completes the wipe cycle when the switch is turned OFF. The blades park in the lowest portion of the wipe pattern.

Push down on the wiper lever to the mist position to activate a single wipe to clear off road mist or spray from a passing vehicle. As long as the lever is held down, the wipers will continue to operate on low speed.

WASHER SYSTEM

To use the washer, pull the stalk lever toward you and hold while spray is desired. If the stalk lever is pulled while in the delay range, the wiper will operate for two wipe cycles (±1) after the stalk lever is released, and then resume the intermittent interval previously selected.

The wash function can be accessed in the OFF position of the wiper control switch. Pulling the washer stalk lever rearward when the switch is in the OFF position will operate the wipers and washer motor pump continuously until the stalk lever is released. Releasing the stalk 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.

Fluid, gravity fed from the reservoir, is forced by the pump through rubber hoses to the hood mounted nozzles which direct the fluid to the windshield.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - WIPER CONDITIONS

The following is a list of general wiper motor system problems, the tests that are to be performed to locate the faulty part, and the corrective action to be taken.

Whatever the problem, disconnect motor wire harness and clean the terminals, then connect motor wire harness and test.

Refer to Wiring Diagrams for circuit information and connector call-outs.

MOTOR WILL NOT OPERATE ALL SWITCH POSITIONS

(1) Check fuse 1, in the fuse block (Fig. 2).

(a) If fuse is OK, go to Step 2.

(b) If fuse is defective, replace and check motor operation in all switch positions.

WIPERS/WASHERS (Continued)

(c) If motor is still inoperative and the fuse does not blow, go to Step 2.

(d) If replacement fuse blows, go to Step 6.

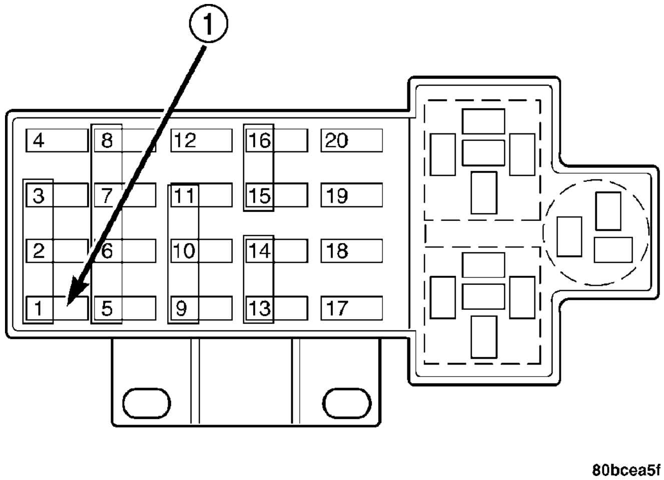


Fig. 2 FUSE BLOCK

1 - FUSE 1 WIPER

(2) Disconnect motor harness connector.

(3) Check motor low speed. Using two jumper wires, connect one jumper wire between the battery positive terminal and terminal 4 of the motor connector. Connect the other jumper wire to the battery negative terminal and terminal 1 of the motor (Fig. 3). Check motor high speed, connect the positive jumper wire to terminal 5 of the motor connector. Connect the negative jumper wire to terminal 1 of the motor.

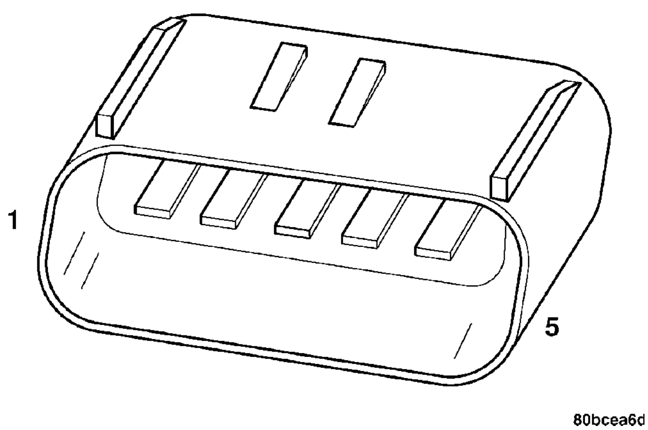


Fig. 3 WINDSHIELD WIPER MOTOR CONNECTOR

(a) If motor does not run in high or low speed go to Step 4.

(b) If motor does run, go to Step 5.

(4) Using an ohmmeter, check for good ground at terminal 1 of the motor. If OK, replace motor. If not repair the ground circuit as necessary.

(5) Check terminal 2 of wiper switch connector for continuity to ground. If OK, go to Step 6. If not OK, repair the ground circuit as necessary.

(6) Using a voltmeter, with wiper switch connected, connect negative lead to terminal 1 of the motor. Connect the positive lead to terminal 4 of the wiper switch connector (Fig. 4).

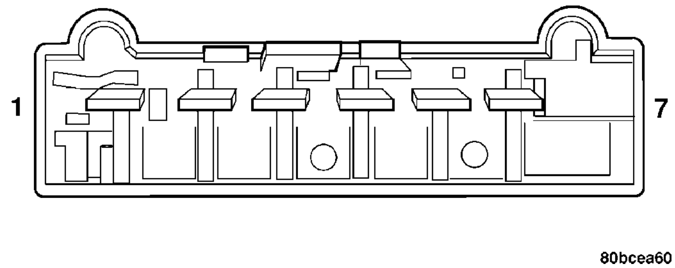


Fig. 4 WIPER/WASHER SWITCH CONNECTOR

(a) If no voltage, repair wiring as necessary. If OK, go to Step b.

(b) Check wiper switch low speed. Connect voltmeter positive lead to terminal 6 of the wiper switch connector. Move wiper stalk to LOW position. If no voltage, replace switch.

(c) Check wiper switch high speed, connect voltmeter positive lead to terminal 5 of the wiper switch connector. Move wiper stalk to HIGH position. If no voltage, replace switch.

(7) Disconnect motor connector and replace fuse 1 in fuse block.

(a) If fuse does not blow, replace motor.

(b) If fuse blows, disconnect wiper switch and replace fuse.

(c) If fuse does not blow, replace switch.

(d) If fuse blows, repair wiring as necessary.

MOTOR OPERATES SLOWLY AT ALL SPEEDS

(1) Remove wiper arms and cowl screen. Disconnect motor linkage from motor. Connect an ammeter between battery positive terminal and terminal 4 of the motor connector. Turn wiper motor on and check ampere reading.

If motor runs and ammeter reading is more than 6 amps, go to Step 2. If less than 6 amps, go to Step 3.

(2) Using an ohmmeter, check the high and low circuits for a short to ground. Refer to Wiring Diagrams.

(3) Check to see if wiper linkage or pivots are binding or caught.

WIPERS RUN AT HIGH SPEED WITH SWITCH IN LOW SPEED POSITION OR WIPERS RUN AT LOW SPEED WITH SWITCH IN HIGH SPEED POSITION.

(1) Check for crossed wires in the motor pigtail wire connector. Refer to Wiring Diagrams.

(2) Check for crossed wires in harness connector from wiper switch to motor.

(3) If OK, replace wiper switch.

WIPERS/WASHERS (Continued)

WIPERS WILL OPERATE CONTINUOUSLY WITH THE SWITCH IN THE INTERMITTENT POSITION - WHEN WIPER SWITCH IS TURNED OFF, WIPERS STOP WHEREVER THEY ARE WITHOUT RETURNING TO PARK POSITION.

(1) Check at terminal 1 of the motor for a good ground.

(2) Turn ignition switch OFF. Disconnect the wiper switch harness connector. Using an ohmmeter with the motor in the park position, check for continuity between terminal 2 of the wiper switch harness connector (Fig. 5) and terminal 1 of the motor. If continuity, replace wiper switch. If no continuity, repair wiring as necessary.

WIPERS DO NOT OPERATE WHEN WASHER MOTOR IS ENGAGED (PULSE WIPE) OR WIPERS DO OPERATE IN INTERMITTENT POSITION.

Check for a good ground at terminal 1 of the motor and at wiper switch terminal 2. If OK, replace wiper switch. If not OK, repair wiring as necessary.

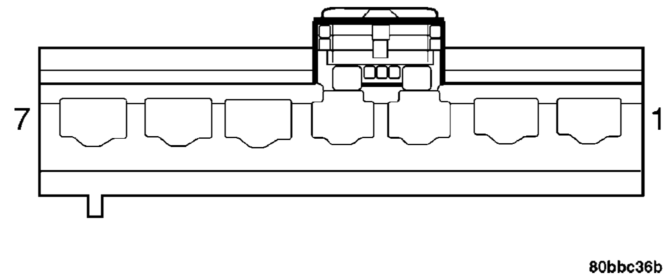


Fig. 5 WINDSHIELD WIPER SWITCH HARNESS CONNECTOR

DIAGNOSIS AND TESTING - WASHER SYSTEM

Whenever a windshield washer malfunction occurs, first verify that the washer pump wire harness is properly connected to all connectors before starting normal diagnosis and repair procedures. Refer to the WASHER SYSTEM DIAGNOSIS table.

WASHER SYSTEM DIAGNOSIS

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
	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.

WASHER HOSES

REMOVAL

For damaged or plugged washer hose, remove the effected piece of hose and replace, routing hose the same way as removed (Fig. 6).

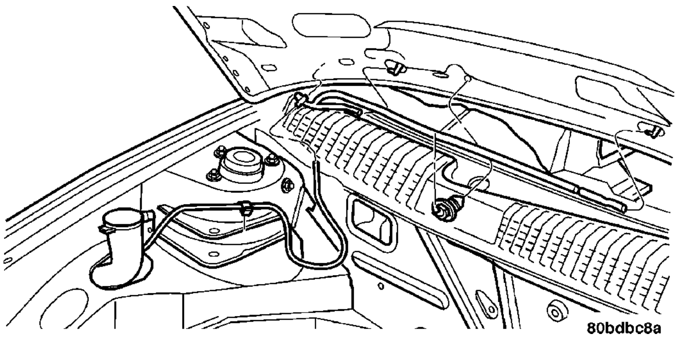


Fig. 6 WASHER HOSE

WASHER NOZZLE

DESCRIPTION

There are two hood mounted washer nozzles. The right and left nozzles have common aims and can be installed in either hood hole. The nozzles can not be aimed.

OPERATION

Each nozzle emits a fan spray into the wiper pattern. If the nozzle performance is unsatisfactory they cannot be adjusted.

To adjust front washer nozzle(s):

• Insert a pin into the nozzle ball and move so that it sprays into the proper pattern area.

NOTE: The spray is aimed towards the top of the pattern area. When proceeding down the road at speed, the spray will hit the windshield lower than when the vehicle is at rest.

REMOVAL

(1) Open hood.

(2) Disconnect the washer hose from the underside of the washer nozzle.

(3) Using a plastic body filler spreader or equivalent (credit card), gently place it underneath the front of the washer nozzle. Be careful not to damage the hood seal underneath the nozzle.

(4) Rock the nozzle back and forth slightly to release it from the hood panel.

INSTALLATION

(1) Position nozzle over hole in hood panel and firmly snap into place. Make sure the seal is present and not damaged.

(2) Connect hose to nozzle on underside of hood.

(3) After connecting hose, check for proper system function and to assure leak free connections by actuating the washer system switch from inside of vehicle. Verify nozzle aim.

WASHER PUMP MOTOR

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Raise vehicle on hoist.

(3) Disconnect the wire connector from the reservoir pump.

(4) Disconnect the washer hose at the pump and drain the reservoir.

(5) Gently pry pump away from reservoir and out of grommet. Care must be taken not to puncture reservoir.

(6) Remove rubber grommet from reservoir. If replacing the pump, discard the old washer pump grommet. If replacing the reservoir only, reuse the old washer pump grommet.

INSTALLATION

NOTE: Make sure to use new grommet when installing new washer pump.

(1) Install the rubber grommet into the reservoir. If replacing the pump, discard the old washer pump grommet. If replacing the reservoir only, reuse the old washer pump grommet.

(2) Position pump in hole and firmly snap into the grommet. Care must be taken not to puncture reservoir.

(3) Connect the washer hose at the pump and fill the reservoir.

(4) Connect the wire connector to the reservoir pump.

(5) Lower vehicle from hoist.

(6) Connect the battery negative cable.

WASHER RESERVOIR

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Raise vehicle on hoist.
(3) Disconnect the wire connector from the reservoir pump.
(4) Disconnect the washer hose at the pump and drain the reservoir.
(5) Remove three fasteners from reservoir.
(6) Remove the reservoir through fender opening.
(7) Remove the windshield washer pump from the reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER PUMP MOTOR - REMOVAL).

INSTALLATION

(1) Install the windshield washer pump into the reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER PUMP MOTOR - INSTALLATION).
(2) Install the reservoir through fender opening.
(3) Install the fasteners to the reservoir. Tighten the reservoir screws to 6.8 to 8.5 N·m (60 to 75 in. lbs.) torque.
(4) Connect the washer hose at the pump and fill the reservoir.
(5) Connect the wire connector to the reservoir pump.
(6) Lower vehicle from hoist.
(7) Connect the battery negative cable.

WIPER ARMS

REMOVAL

(1) Place the wiper arm/blades in the PARK position and turn ignition OFF.
(2) Using a trim stick (special tool #C-4755) or equivalent, gently pry up on arm cap and remove.
(3) Remove the wiper arm retaining nut.
(4) Remove the arm from the pivot using a rocking motion while the arm is in an over/centered position.
(5) Clean metal splinters OFF the pivot shafts.

INSTALLATION

Ensure the wiper module is in the PARK position (cycle motor if necessary). Position wiper arms so that the heel of the blade(s) is on the park line on the windshield. Refer to Electrical, Wipers/Washers, Wiper Arms, Adjustments. for wiper arm adjustment.
(1) Clean metal splinters OFF the pivot shafts.
(2) Install the arm onto the pivot using a rocking motion while the arm is in an over/centered position.
(3) Install the wiper arm retaining nut. Torque nut to 19.7 - 21.5 N·m (175 - 190 in. lbs.).
(4) Install the arm nut cap.
(5) Cycle the Place the wiper arm/blades, and verify that they end up in the PARK position and turn ignition OFF.

ADJUSTMENTS

(1) Cycle the wiper motor into the PARK position.
(2) Lift the wiper blade off the windshield and release it.
(3) The wiper blade heel should be parked within 5 mm of the park line. The park line is mark on the windshield (Fig. 7).

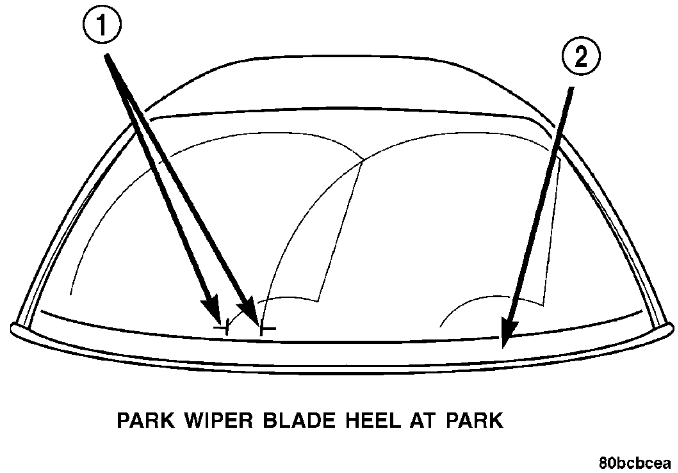


Fig. 7 WIPER BLADE/ARM PARK LINES
1 - PARK LINES
2 - BLACK OUT AREA

(4) In the event that the wiper blade tip excessively strikes the cowl screen due to long term normal wear, reposition the wiper blade heel slightly above the park line. Make sure that the wipers are in the PARK position.

WIPER BLADES

REMOVAL

(1) Lift wiper arm to the over center position.
(2) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 8).
(3) Gently place wiper arm tip on glass surface.

CLEANING

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. 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 BLADES (Continued)

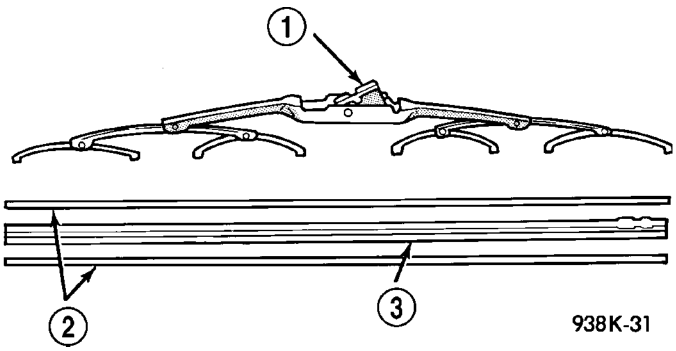


Fig. 8 WIPER BLADE AND ELEMENT

1 - ARM RELEASE TAB
2 - VERTABRAE
3 - RUBBER ELEMENT

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 Electrical, Wipers/Washers, Wiper Blades, Adjustments.

INSTALLATION

(1) Gently lift wiper arm tip off glass surface and to the over center position.

(2) Install the blade assembly onto the arm by sliding blade towards arm tip (Fig. 8).

(3) Lower the wiper arm to the glass surface and check the wiping pattern.

WIPER BLADE ELEMENT

REMOVAL

(1) Lift wiper arm to raise blade off glass.

(2) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 8). Gently place wiper arm tip on glass surface.

(3) Remove wiping element from blade assembly. Pull stopper of the rubber element out of the end claw together with vertebrae (metal rails) (Fig. 9).

INSTALLATION

(1) Install the wiping element onto the blade assembly. Push into the end of the blade assembly by pressing the claw together with vertebrae (metal rails) (Fig. 9).

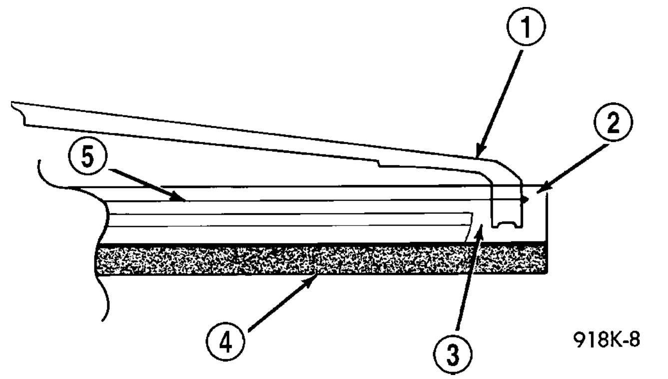


Fig. 9 WIPER BLADE AND ELEMENT

1 - CLAW
2 - TO GRASP AND PULL
3 - CHANNEL
4 - RUBBER ELEMENT
5 - VERTABRAE

(2) Install the blade assembly onto the arm by sliding onto the arm tip (Fig. 8). Gently place wiper arm tip on glass surface.

Check that the element and vertebrae are through all claws and the final claw is locked in the stopper.

WIPER LINKAGE

REMOVAL

(1) Remove wiper module. Refer to Electrical, Wipers/Washers, Wiper Module, Removal.

(2) With the wiper module on the bench, disconnect wiper arm linkage by inserting a screwdriver or equivalent between ball cap and linkage. Twist and lift straight up on linkage.

INSTALLATION

(1) With the wiper module on the bench, connect wiper arm linkage by using pliers or your hand and press the ball cap straight on to the ball stud.

(2) Install the wiper module. Refer to Electrical, Wipers/Washers, Wiper Module, Installation.

WIPER MODULE

REMOVAL

(1) Disconnect and isolate the battery negative cable (Fig. 10).

WIPER MODULE (Continued)

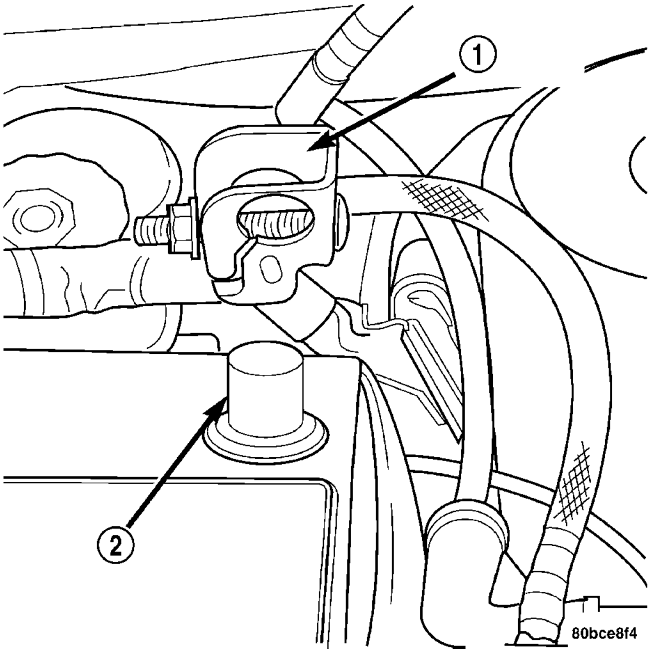


Fig. 10 BATTERY NEGATIVE CABLE REMOVE/INSTALL

1 - NEGATIVE BATTERY CABLE
2 - NEGATIVE BATTERY POST

(2) Remove wiper arms. Refer to Electrical, Wipers/Washers, Wiper Arm, Removal.

(3) Remove the left side cowl cover. Refer to Body, Exterior, Cowl Cover, Removal.

(4) Disconnect the motor posi-lock harness connector.

(5) Remove the wiper module mounting screws (Fig. 11) and remove the module from vehicle.

INSTALLATION

(1) Install the windshield wiper module into the vehicle (Fig. 11).

(2) Install the mounting screws (Fig. 11) and tighten to 7 to 9 N·m (60 to 80 in. lbs.) torque.

(3) Connect the motor posi-lock harness connector (Fig. 11).

(4) Install the left side cowl cover (Fig. 11). Refer to Body, Exterior, Cowl Cover, Installation.

(5) Install the wiper arms. Refer to Electrical, Wipers/Washers, Wiper Arm, Installation.

(6) Connect the battery negative cable (Fig. 10).

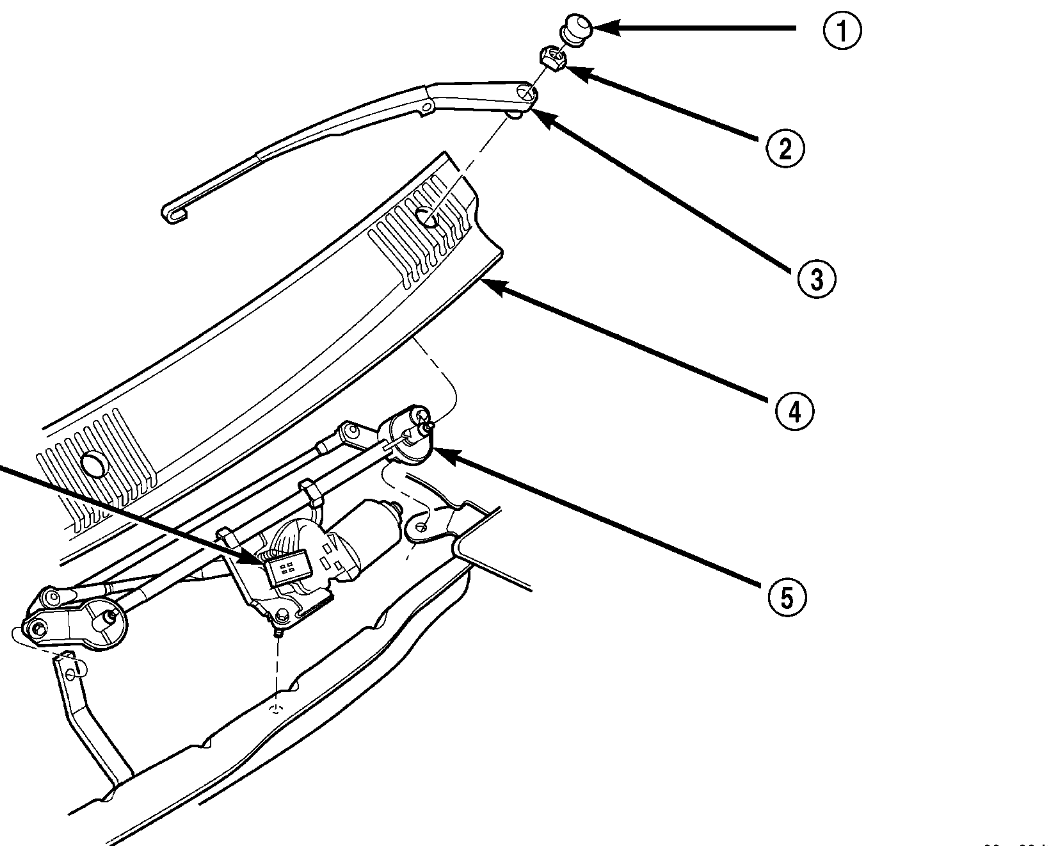


Fig. 11 WIPER MODULE REMOVE/INSTALL

1 - CAPS
2 - MOUNTING NUTS
3 - WIPER ARM
4 - COWL SCREEN
5 - WIPER MOTOR MODULE
6 - INTEGRAL MOTOR CONNECTOR

WIPER MOTOR

DIAGNOSIS AND TESTING - WIPER MOTOR

Whenever a wiper motor malfunction occurs, verify that the wire harness is properly connected, then start normal diagnosis and repair procedures. Refer to the WIPER MOTOR DIAGNOSIS table.

WIPER MOTOR DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER BLADES DO NOT PARK PROPERLY.	(1) WIPER ARMS IMPROPERLY PARKED.	(1) REMOVE WIPER ARMS AND REPARK. REFER TO ELECTRICAL, WIPERS/WASHERS, WIPER ARM, REMOVAL.
	(2) WIPER ARMS ARE LOOSE ON PIVOT SHAFT.	(2) REMOVE WIPER ARM AND REPARK. REFER TO ELECTRICAL, WIPERS/WASHERS, WIPER ARM, REMOVAL.
	(3) MOTOR CRANK LOOSE AT OUTPUT SHAFT.	(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 ANY FOREIGN MATTER FROM THE MOTOR SHAFT. INSTALL THE MOTOR CRANK IN ITS ORIGINAL POSITION.
MOTOR STOPS IN ANY POSITION WHEN THE SWITCH IS TURNED OFF.	(1) OPEN PARK CIRCUIT.	(1) CHECK PARK SWITCH BY DISCONNECTING THE WIRE CONNECTOR. PLACE A JUMPER WIRE FROM PIN 2 TO PIN 4. APPLY BATTERY VOLTAGE TO PIN 3 AND THEN TO GROUND. REPLACE MOTOR IF IT DOES NOT PARK.
MOTOR WILL NOT STOP WHEN THE SWITCH IS TURNED OFF.	(1) FAULTY SWITCH.	(1) CHECK SWITCH IN LOW, HIGH AND INTERMITTENT POSITION.
	(2) LOCK OF DYNAMIC BRAKE ON WET GLASS.	(2) ENSURE PARK SWITCH HAS CLEAN GROUND.
WIPER BLADES SLAP AGAINST COWL SCREEN OR WINDOW MOLDINGS.	(1) WIPER ARMS ARE PARKED INCORRECTLY.	(1) PARK WIPER ARMS. REFER TO WIPER ARM ADJUSTMENT.
BLADES CHATTER.	(1) FOREIGN SUBSTANCE SUCH AS POLISH ON GLASS OR BLADES.	(1) CLEAN GLASS AND BLADE ELEMENT WITH NON-ABRASIVE CLEANER.
	(2) ARMS TWISTED, BLADE AT WRONG ANGLE ON GLASS.	(2) REPLACE ARM.
	(3) BLADE STRUCTURE BENT.	(3) REPLACE BLADE.
	(4) BLADE ELEMENT HAS PERMANENT SET.	(4) REPLACE BLADE ELEMENT.

WIPER MOTOR (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER KNOCK AT REVERSAL.	(1) LINKAGE BUSHINGS WORN.	(1) REPLACE WORN LINK. REFER TO ELECTRICAL, WIPERS/WASHERS, WIPER LINKAGE, REMOVAL.
	(2) ARMATURE ENDPLAY IN MOTOR.	(2) REPLACE WIPER MOTOR. REFER TO ELECTRICAL, WIPERS/WASHERS, WIPER MOTOR REMOVAL.
WIPER MOTOR WILL NOT RUN.	(1) BLOWN FUSE.	(1) REPLACE FUSE, AND RUN SYSTEM.
	(2) NEW FUSE BLOWS.	(2) CHECK FOR SHORT IN WIRING OR SWITCH.
	(3) NEW FUSE BLOWS.	(3) REPLACE FUSE, REMOVE MOTOR CONNECTOR, TURN SWITCH ON, FUSE DOES NOT BLOW, REPLACE MOTOR.
	(4) NO VOLTAGE AT MOTOR.	(4) CHECK SWITCH AND WIRING HARNESS. REFER TO WIRING DIAGRAMS.
	(5) POOR GROUND.	(5) REPAIR GROUND WIRE CONNECTION AS NECESSARY.

REMOVAL

(1) Remove wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).

(2) Remove linkage from motor crank. Insert screwdriver or equivalent between crank and linkage then twist and lift straight up on linkage.

(3) Remove three motor mounting screws and separate motor from linkage.

INSTALLATION

(1) Attach motor to module. Install the three motor mounting screws and tighten the motor mounting screws to 5 to 6 N·m (45 to 55 in. lbs.) torque.

NOTE: If motor crank was taken off for any reason, install and tighten drive link nut to 11 to 12 N·m (98 to 106 in. lbs.) torque.
Make sure motor is parked before attaching the wiper arms.

(2) Add unilube grease to the linkage socket and install the linkage onto the motor crank.

(3) Install the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).

WIPER/WASHER SWITCH

DIAGNOSIS AND TESTING - WIPER/WASHER SWITCH

To test the wiper/washer switch, first remove the switch (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER/WASHER SWITCH - REMOVAL). Then refer to the WIPER/WASHER SWITCH CONTINUITY TEST and (Fig. 12).

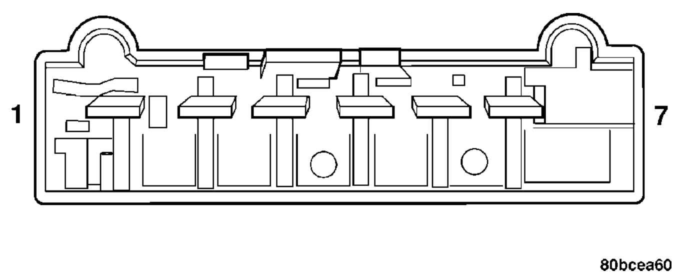


Fig. 12 WINDSHIELD WIPER/WASHER SWITCH CONNECTOR (C)

WIPER/WASHER SWITCH (Continued)

WIPER/WASHER SWITCH CONTINUITY TEST

SWITCH POSITION	MODE	CONTINUITY BETWEEN
WIPER	OFF	C-1 AND C-6
	LOW/MIST	C-4 AND C-6
	HIGH	C-4 AND C-5
	WASH	C-4 AND C-3
	INTERMITTENT	CANNOT BE CHECKED

REMOVAL

(1) Remove the Multi-Function Switch from the vehicle. Refer to Electrical, Lamps/Lighting - Exterior, Multi-Function Switch, Removal.

(2) Remove the two retaining screws to the Wiper/Washer Switch (Fig. 13).

(3) Separate the two switches.

INSTALLATION

(1) Attach the two switches.

(2) Install the two retaining screws to the Wiper/Washer Switch (Fig. 13).

(3) Install the Multi-Function Switch from the vehicle. Refer to Electrical, Lamps/Lighting - Exterior, Multi-Function Switch, Installation.

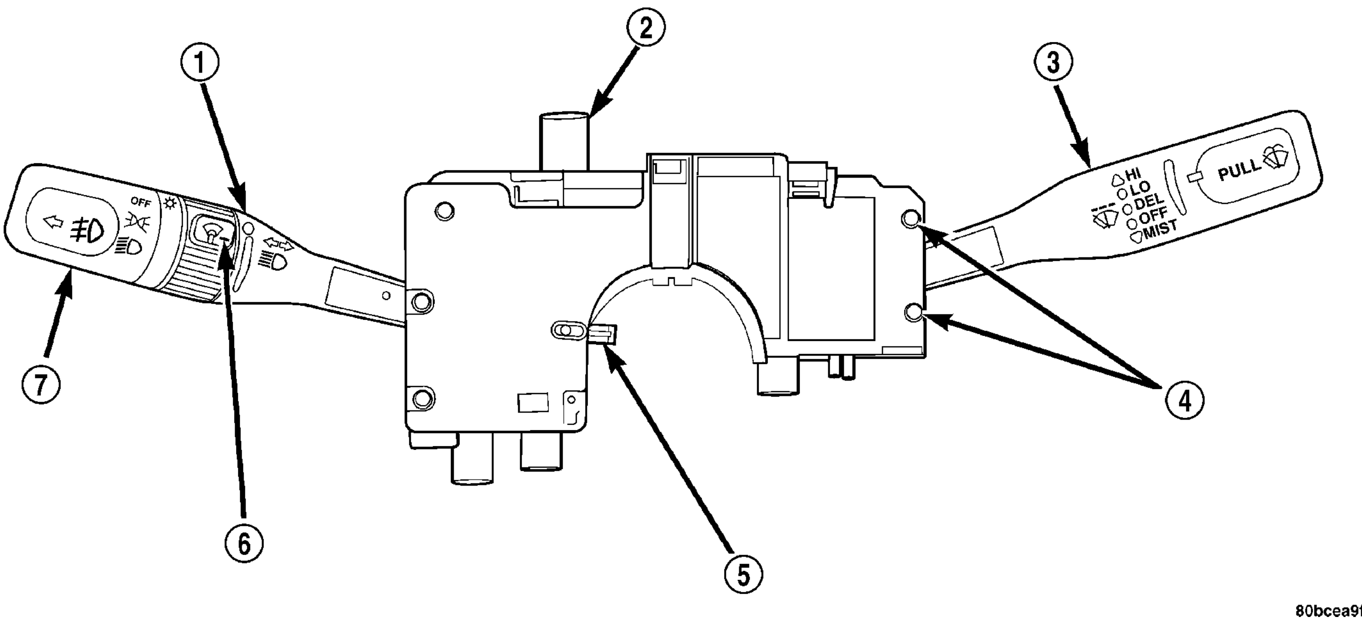


Fig. 13 WIPER/WASHER SWITCH

1 - TURN SIGNAL CONTROL STALK
2 - HAZARD WARNING SWITCH
3 - WINDSHIELD WIPER/WASHER CONTROL
4 - WINDSHIELD WIPER/WASHER SWITCH RETAINING SCREWS
5 - CANCELLING CAM
6 - PANEL DIMMER/INTERIOR LIGHT SWITCH
7 - EXTERIOR LIGHTING CONTROL/FOG LAMP

WIRING

TABLE OF CONTENTS

8W-01 WIRING DIAGRAM INFORMATION

TABLE OF CONTENTS

WIRING DIAGRAM INFORMATION

DESCRIPTION

DESCRIPTION - HOW TO USE WIRING DIAGRAMS

DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page (Fig. 1).

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition (Fig. 2).

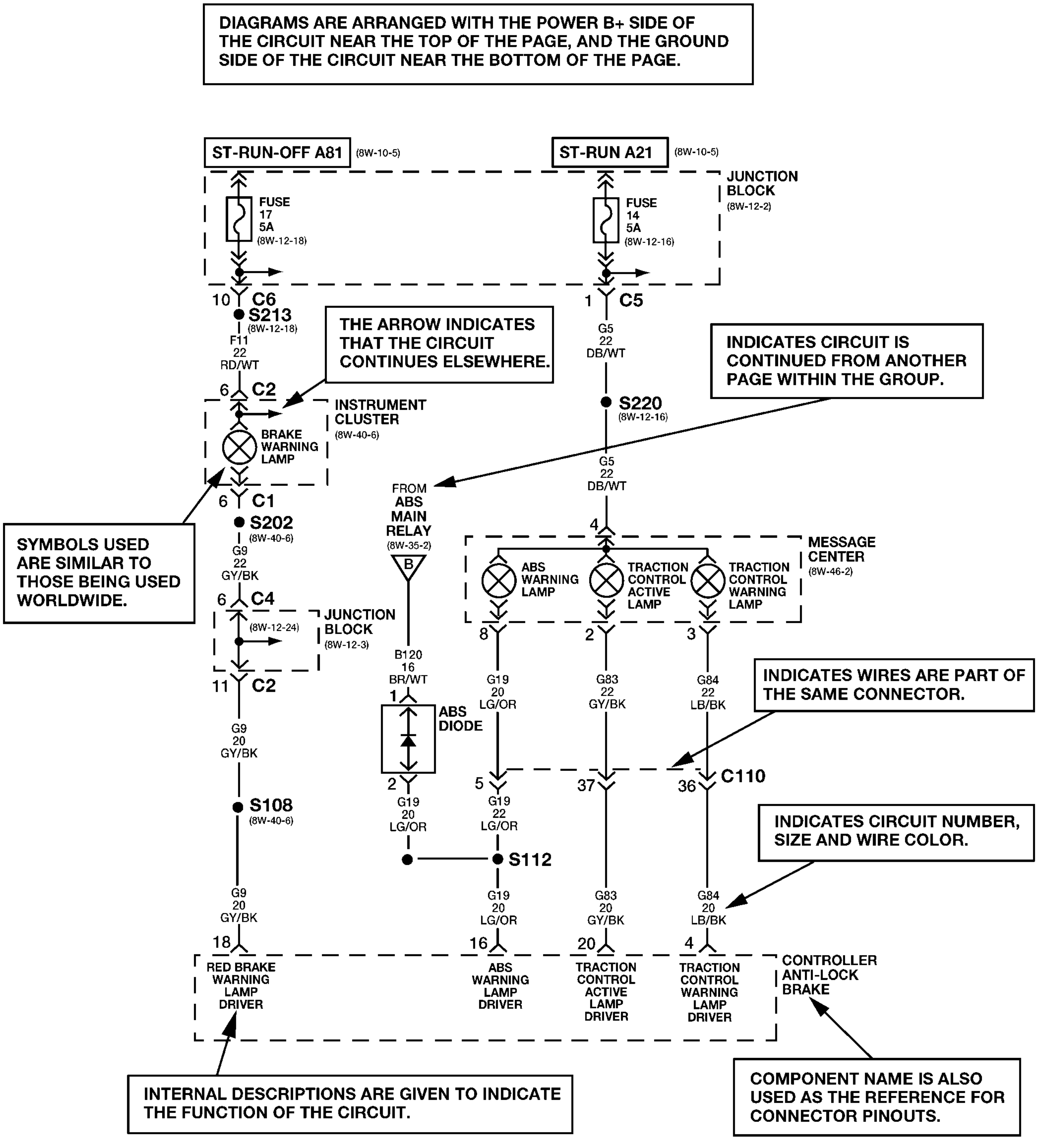
Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

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.

SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world (Fig. 3).

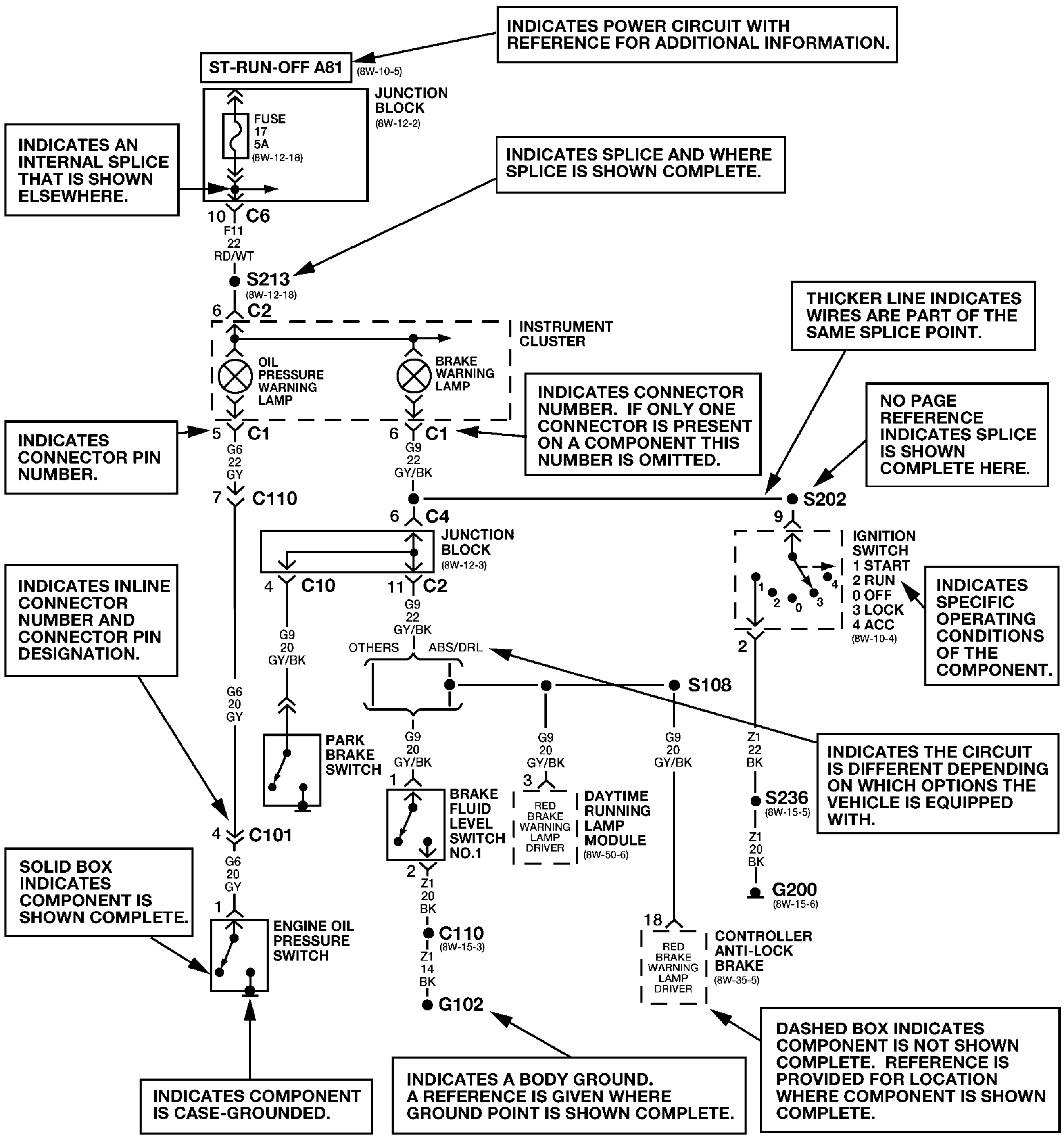
WIRING DIAGRAM INFORMATION (Continued)



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

Fig. 1 WIRING DIAGRAM EXAMPLE 1

WIRING DIAGRAM INFORMATION (Continued)



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

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Fig. 2 WIRING DIAGRAM EXAMPLE 2

WIRING DIAGRAM INFORMATION (Continued)

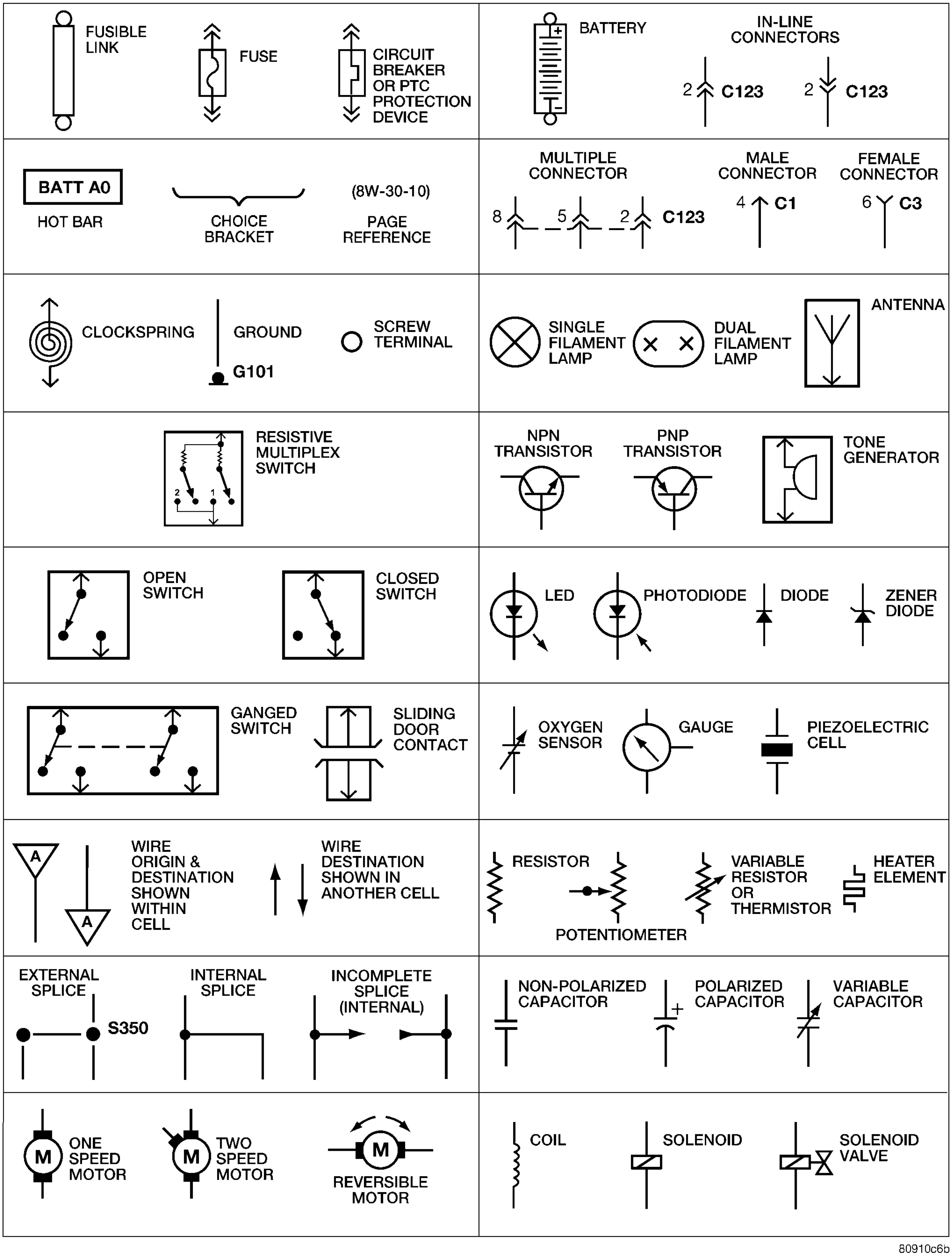


Fig. 3 WIRING DIAGRAM SYMBOLS

WIRING DIAGRAM INFORMATION (Continued)

TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD . . . . Left Hand Drive Vehicles
RHD . . . . Right Hand Drive Vehicles
ATX . . Automatic Transmissions-Front Wheel Drive
MTX . . . Manual Transmissions-Front Wheel Drive
AT . . . . Automatic Transmissions-Rear Wheel Drive
MT . . . . . Manual Transmissions-Rear Wheel Drive
SOHC . . . . Single Over Head Cam Engine
DOHC . . . . Double Over Head Cam Engine
Built-Up-Export . . . . Vehicles Built For Sale In Markets Other Than North America
Except Built-Up-Export . Vehicles Built For Sale In North America

DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, part of the main circuit, gage of wire, and color (Fig. 4).

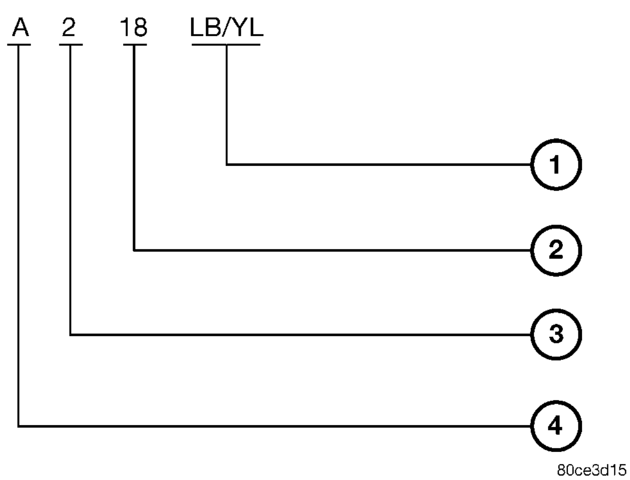


Fig. 4 WIRE CODE IDENTIFICATION

1 - COLOR OF WIRE (LIGHT BLUE WITH YELLOW TRACER
2 - GAGE OF WIRE (18 GAGE)
3 - PART OF MAIN CIRCUIT (VARIES DEPENDING ON EQUIPMENT)
4 - MAIN CIRCUIT IDENTIFICATION

WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it's function. 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.

CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	OPEN
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	NOT USED
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/ TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/ WASHER
W	OPEN
X	AUDIO SYSTEMS
Y	OPEN
Z	GROUNDS

DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

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.

WIRING SECTION CHART

GROUP	TOPIC
8W-01 thru 8W-09	General information and Diagram Overview
8W-10 thru 8W-19	Main Sources of Power and Vehicle Grounding
8W-20 thru 8W-29	Starting and Charging
8W-30 thru 8W-39	Powertrain/Drivetrain Systems
8W-40 thru 8W-49	Body Electrical items and A/C
8W-50 thru 8W-59	Exterior Lighting, Wipers and Trailer Tow
8W-60 thru 8W-69	Power Accessories
8W-70	Splice Information
8W-80	Connector Pin Outs
8W-91	Connector, Ground and Splice Locations

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

CAUTION: Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers
- In-line connectors located in the Instrument Panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a "G" and follow the same series numbering as the in-line connectors.
- Splices are identified with an "S" and follow the same series numbering as the in-line connectors.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

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. The abbreviation N/S means Not Shown in the illustrations

WARNING

WARNINGS - GENERAL

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 AVOID LOOSE CLOTHING.

DIAGNOSIS AND TESTING - WIRING HARNESS

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 vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

WIRING DIAGRAM INFORMATION (Continued)

• 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 vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

• Probing Tools - These tools are used for probing terminals in connectors (Fig. 5). Select the proper 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.

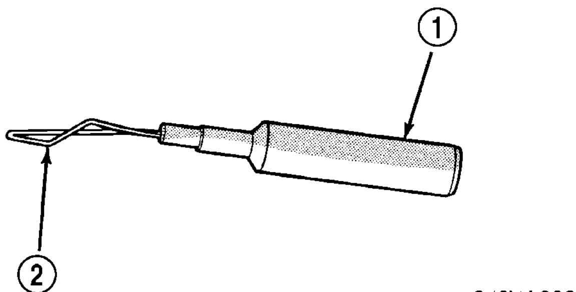


Fig. 5 PROBING TOOL

1 - SPECIAL TOOL 6801
2 - PROBING END

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 into 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 or moisture
• Wire insulation that has rubbed through causing a short to ground
• Some or all of the wiring strands broken inside of the insulation
• Wiring broken inside of the insulation

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 area.
(6) Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

STANDARD PROCEDURE

STANDARD PROCEDURE - 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 form it's protective packing until it is time to install the part.
(5) Before removing the part from it's pakage, ground the pakage to a known good ground on the vehicle.

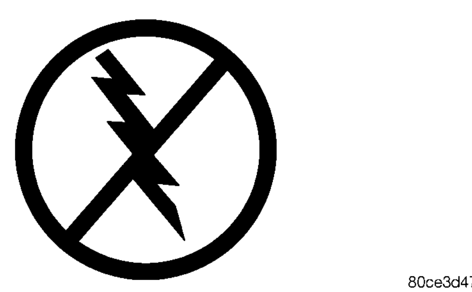


Fig. 6 ELECTROSTATIC DISCHARGE SYMBOL

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 7).

(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.

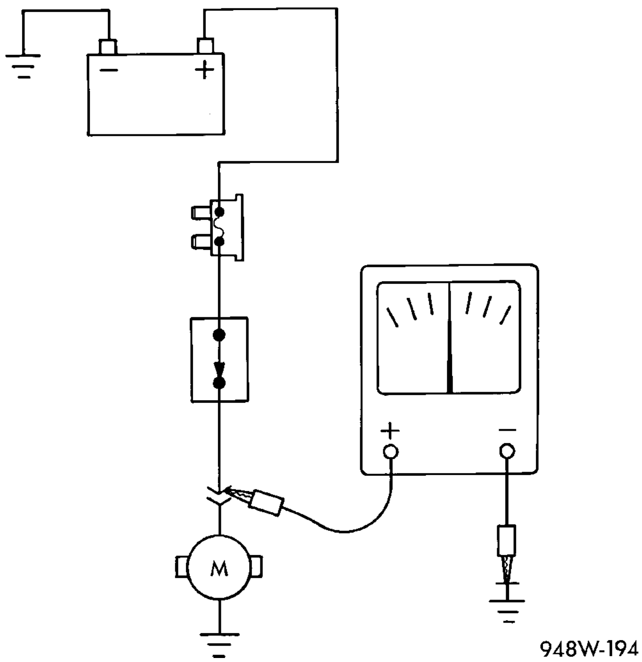


Fig. 7 TESTING FOR VOLTAGE POTENTIAL

STANDARD PROCEDURE - 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. 8).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

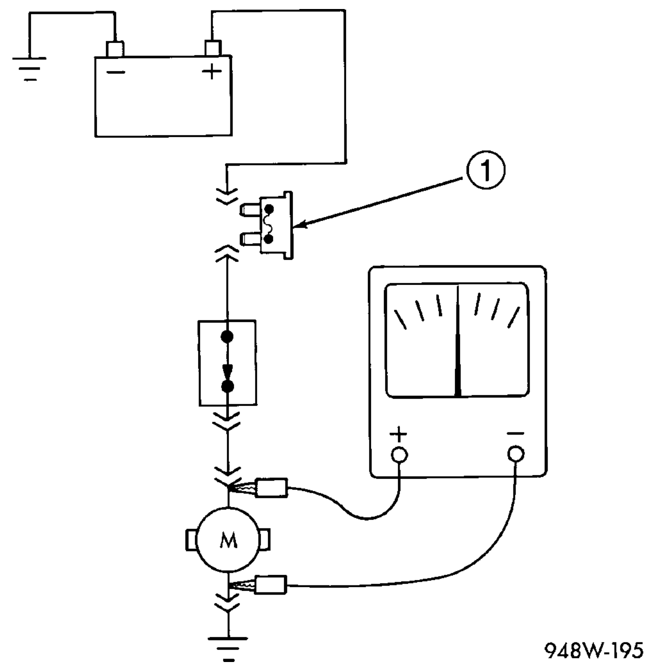


Fig. 8 TESTING FOR CONTINUITY

1 - FUSE REMOVED FROM CIRCUIT

STANDARD PROCEDURE - 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.

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - 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 suspected fused circuits.

(2) Replace the blown fuse.

(3) Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.

(4) Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 9).

(2) Connect the other lead of the voltmeter to the other side of the switch, component or circuit.

(3) Operate the item.

(4) The voltmeter will show the difference in voltage between the two points.

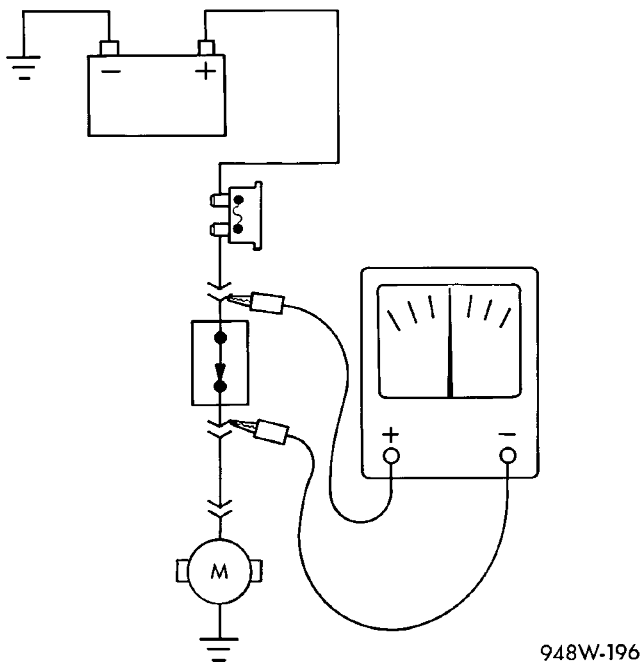
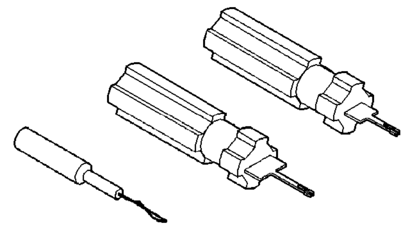


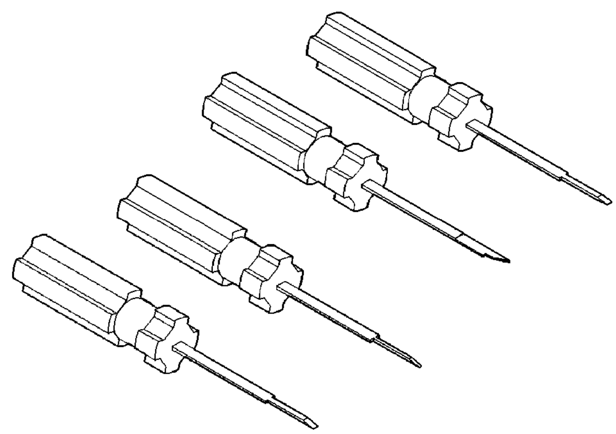
Fig. 9 TESTING FOR VOLTAGE DROP

SPECIAL TOOLS

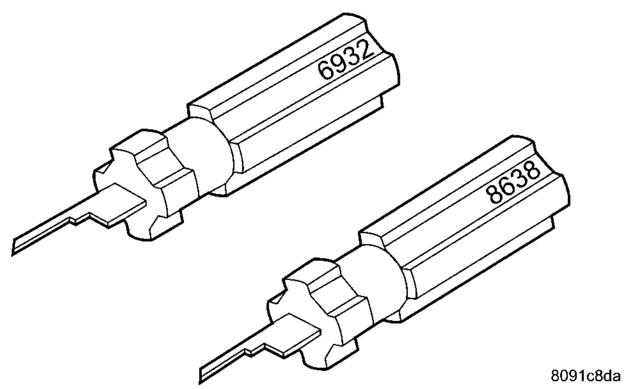
WIRING/TERMINAL



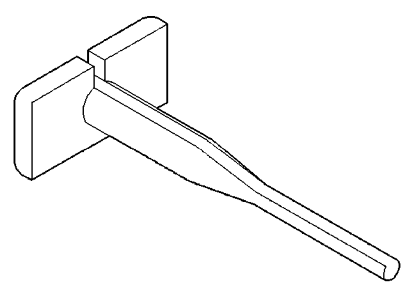
PROBING TOOL PACKAGE 6807



TERMINAL PICK TOOL SET 6680



TERMINAL REMOVING TOOLS 6932 AND 8638



TERMINAL REMOVING TOOL 6934

CONNECTOR

REMOVAL

(1) Disconnect battery.

(2) Release Connector Lock (Fig. 10).

(3) Disconnect the connector being repaired from its mating half/component.

(4) Remove the dress cover (if applicable) (Fig. 10).

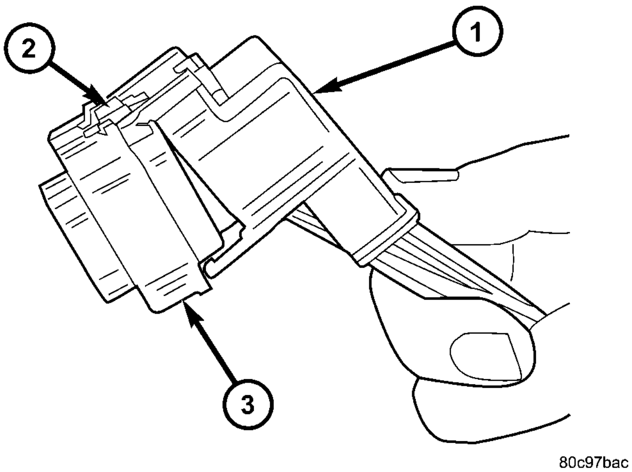


Fig. 10 REMOVAL OF DRESS COVER

1 - DRESS COVER
2 - CONNECTOR LOCK
3 - CONNECTOR

(5) Release the Secondary Terminal Lock, if required (Fig. 11).

(6) Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector (Fig. 12).

INSTALLATION

(1) Insert the removed terminal in the same cavity on the repair connector.

(2) Repeat steps for each terminal 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.

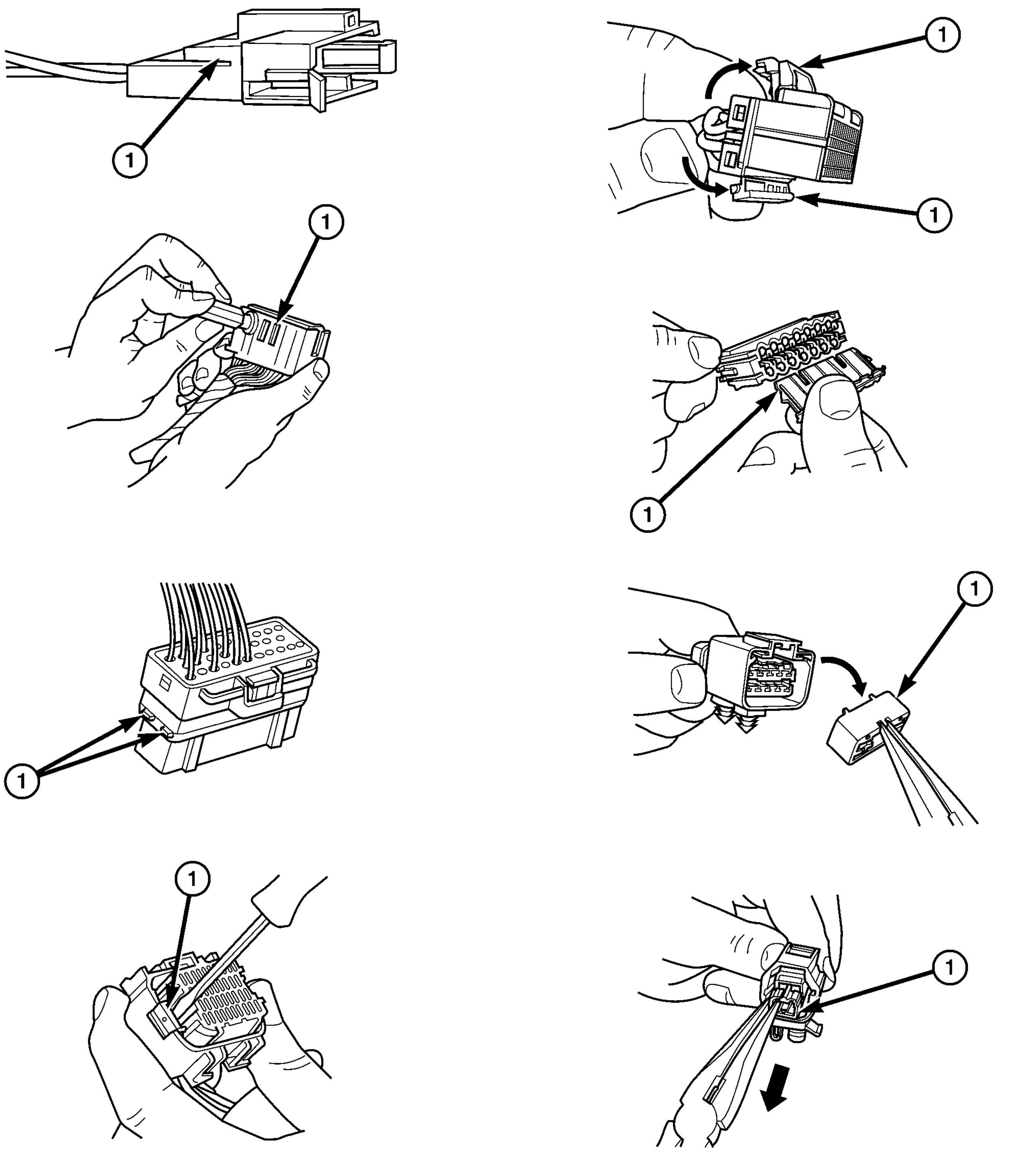
(3) When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.

(4) Replace dress cover (if applicable).

(5) Connect connector to its mating half/component.

(6) Connect battery and test all affected systems.

CONNECTOR (Continued)



80ca8802

Fig. 11 EXAMPLES OF CONNECTOR SECONDARY TERMINAL LOCKS

1 - Secondary Terminal Lock

CONNECTOR (Continued)

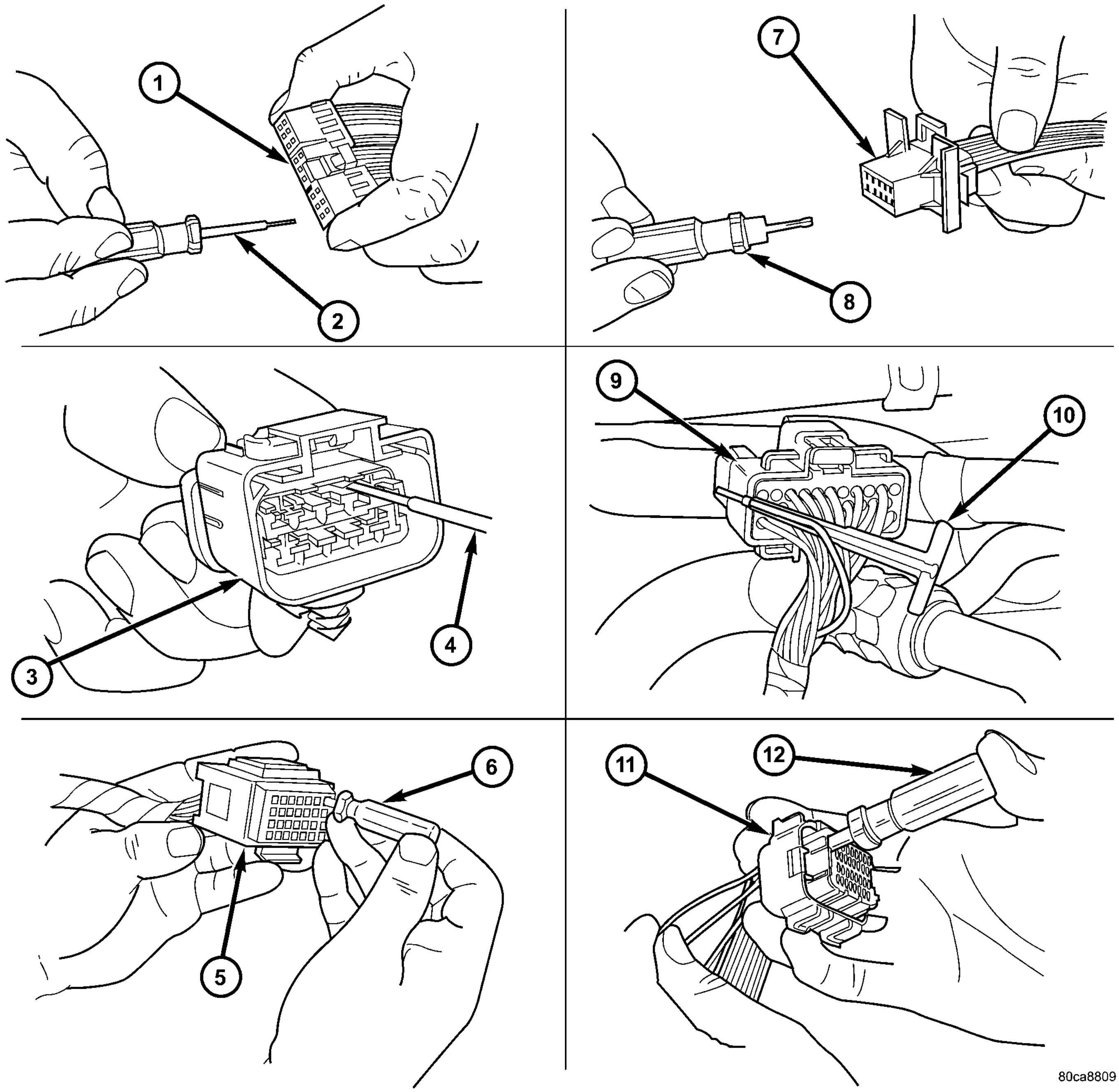


Fig. 12 TERMINAL REMOVAL

1 - TYPICAL CONNECTOR
2 - PICK FROM SPECIAL TOOL KIT 6680
3 - APEX CONNECTOR
4 - PICK FROM SPECIAL TOOL KIT 6680
5 - AUGAT CONNECTOR
6 - SPECIAL TOOL 6932
7 - MOLEX CONNECTOR
8 - SPECIAL TOOL 6742
9 - THOMAS AND BETTS CONNECTOR
10 - SPECIAL TOOL 6934
11 - TYCO CONNECTOR
12 - SPECIAL TOOL 8638

DIODE

REMOVAL

(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. 13).

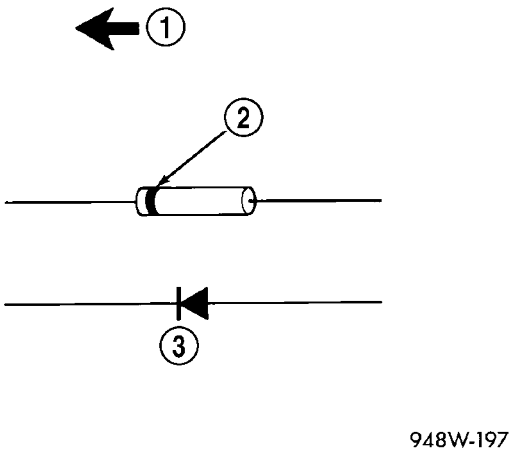


Fig. 13 DIODE IDENTIFICATION

1 - CURRENT FLOW
2 - BAND AROUND DIODE INDICATES CURRENT FLOW
3 - DIODE AS SHOWN IN THE DIAGRAMS

INSTALLATION

(1) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(2) Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow (Fig. 13).

(3) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(4) Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.

(5) Re-connect the battery and test affected systems.

TERMINAL

REMOVAL

(1) Follow steps for removing terminals described in the connector removal section.

(2) Cut the wire 6 inches from the back of the connector.

INSTALLATION

(1) Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.

(2) Cut the repair wire to the proper length and remove one–half (1/2) inch of insulation.

(3) Splice the repair wire to the wire harness (see wire splicing procedure).

(4) Insert the repaired wire into the connector.

(5) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(6) Re-tape the wire harness starting at 1–1/2 inches behind the connector and 2 inches past the repair.

(7) Connect battery and test all affected systems.

WIRE

STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

(1) Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.

(2) Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(3) Place the strands of wire overlapping each other inside of the splice clip (Fig. 14).

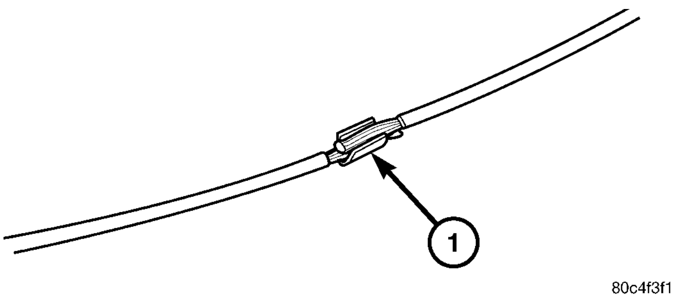


Fig. 14 SPLICE BAND

1 - SPLICE BAND

(4) Using crimping tool, Mopar p/n 05019912AA, crimp the splice clip and wires together (Fig. 15).

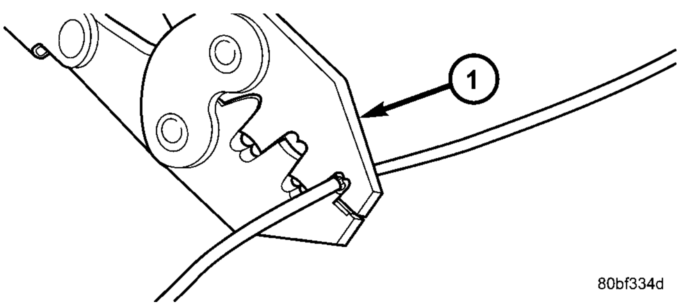


Fig. 15 CRIMPING TOOL

1 - CRIMPING TOOL

(5) Solder the connection together using rosin core type solder only (Fig. 16).

CAUTION: DO NOT USE ACID CORE SOLDER.

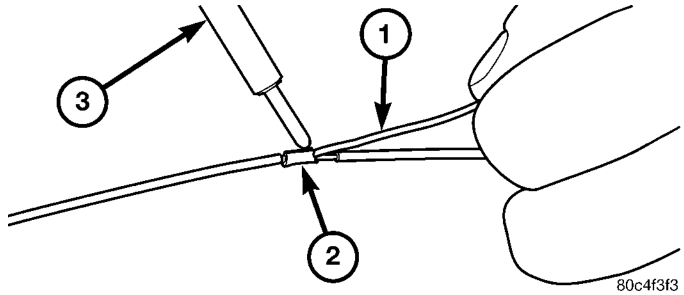


Fig. 16 SOLDER SPLICE

1 - SOLDER
2 - SPLICE BAND
3 - SOLDERING IRON

(6) 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 (Fig. 17).

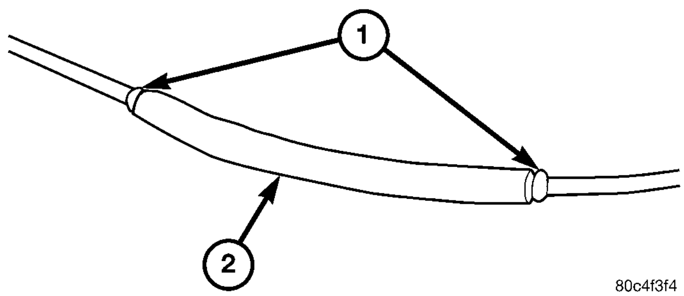


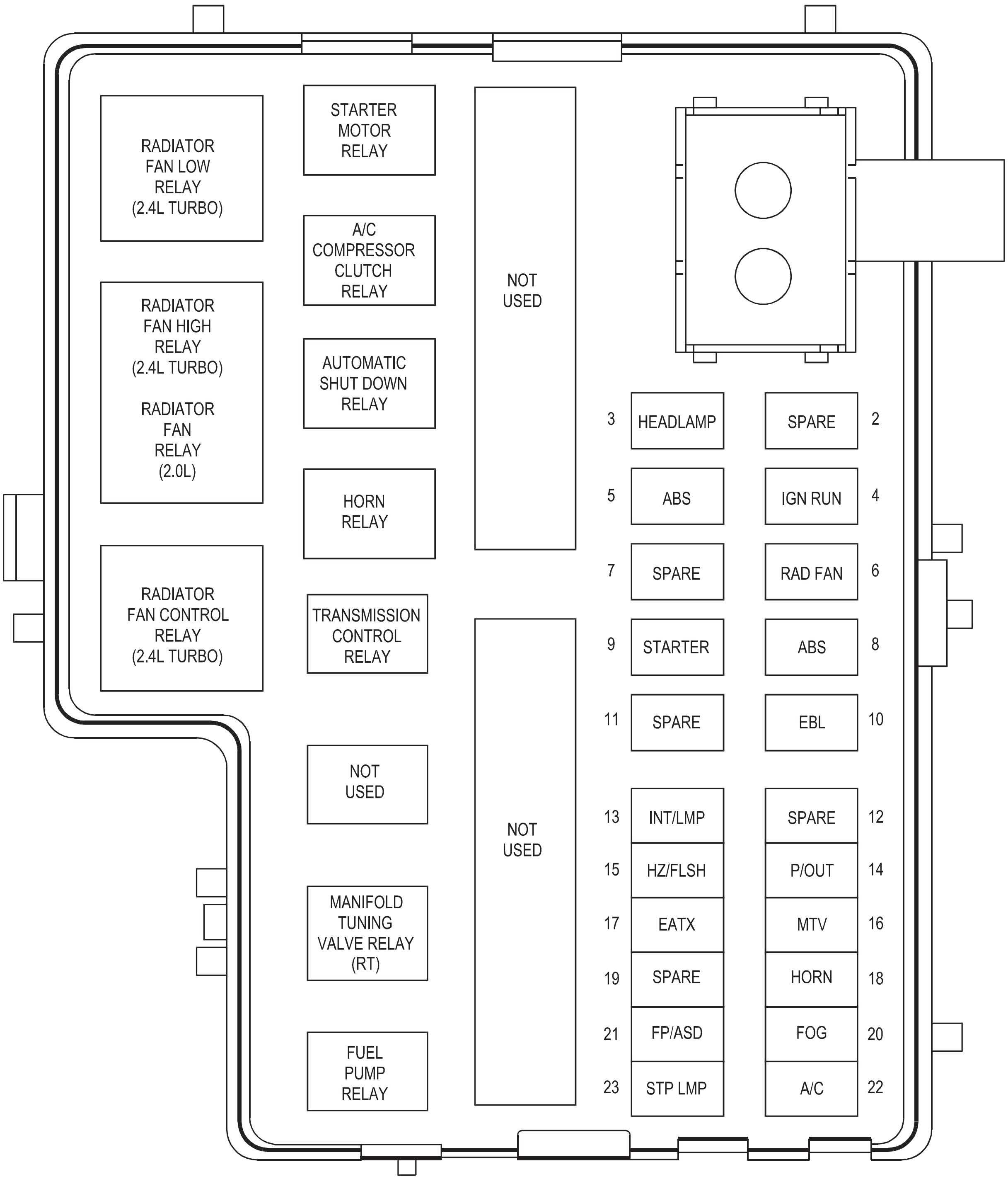
Fig. 17 HEAT SHRINK TUBE

1 - SEALANT
2 - HEAT SHRINK TUBE

8W-02 COMPONENT INDEX

8W-10 POWER DISTRIBUTION

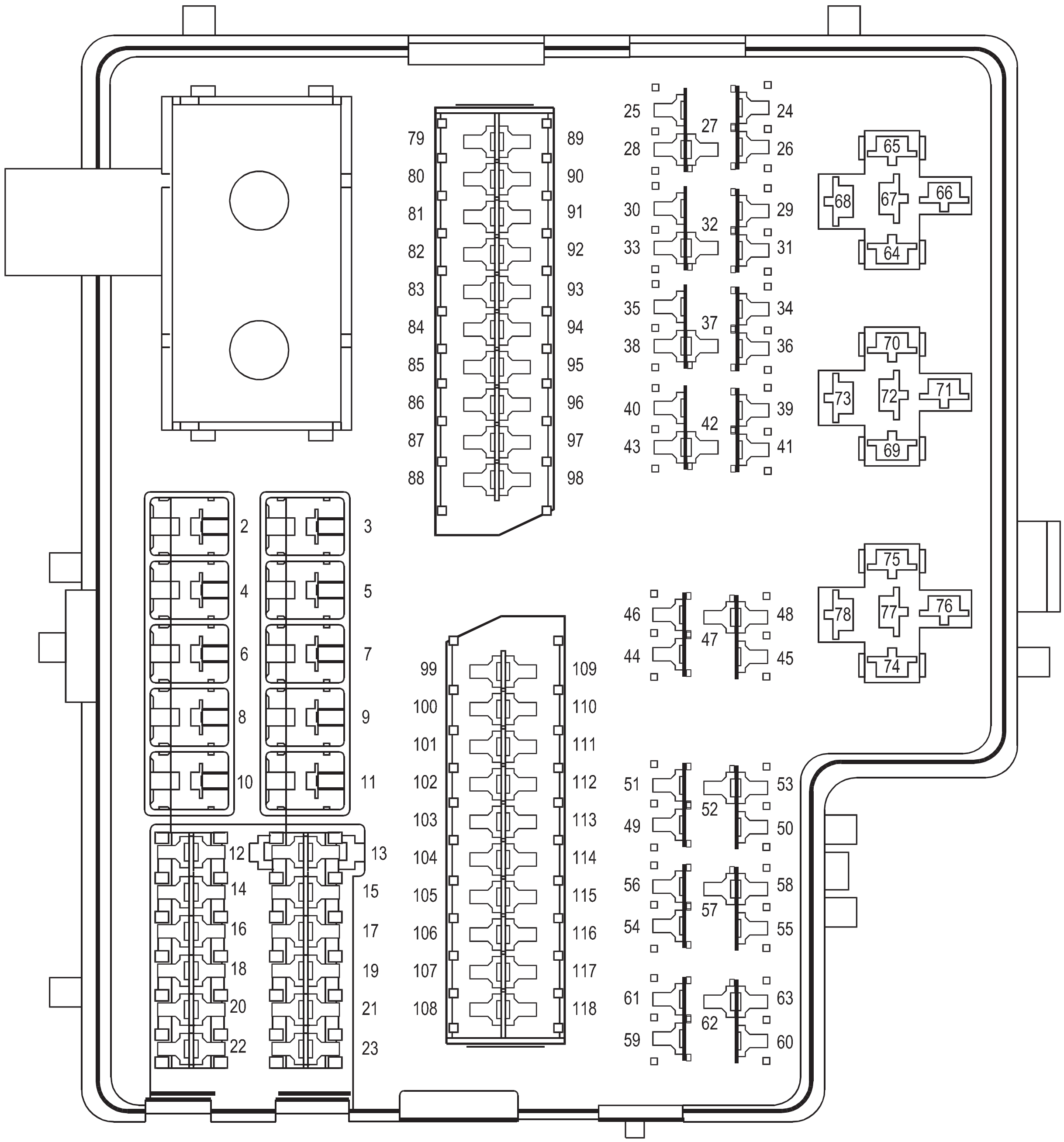
POWER DISTRIBUTION CENTER



048W-10

PL401002

POWER DISTRIBUTION CENTER



FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	-	-	-
2	-	-	-
3	40A	A3 12RD/WT	FUSED B(+)
4	40A	A2 12PK/BK	FUSED B(+)
5	30A	A20 12RD/DB ◇◇◇	FUSED B(+)
6	30A	A16 14GY *	FUSED B(+)
		A16 12GY **	FUSED B(+)
7	-	-	-
8	40A	A10 12RD/DG ◇◇◇	FUSED B(+)
9	30A	A1 14RD	FUSED B(+)
10	40A	A4 10BK/RD *	FUSED B(+)
		A4 10BK/PK **	FUSED B(+)
11	-	-	-
12	-	-	-
13	20A	M11 16PK/LB	FUSED B(+)
14	20A	F1 16DB	FUSED B(+)
15	15A	A15 18RD/PK **	FUSED B(+)
		A15 18WT *	FUSED B(+)
16	15A	A200 18RD/BR ***	FUSED B(+)
17	20A	A30 16RD/WT ■■	FUSED B(+)
18	10A	F62 20RD *	FUSED B(+)
		F62 20RD *	FUSED B(+)
18	15A	F62 18RD **	FUSED B(+)
		F62 18RD **	FUSED B(+)
19	-	-	-
20	25A	F61 16WT/OR ▲▲	FUSED B(+)
21	20A	A14 16RD/WT	FUSED B(+)
22	10A	A17 20RD/BK	FUSED B(+)
23	15A	F32 18PK/DB	FUSED B(+)

* 2.0L
** 2.4L TURBO
*** 2.0L RT
▲▲ EXPORT
■■ EATX
◇◇◇ ABS

RELAYS

A/C COMPRESSOR CLUTCH RELAY

CAVITY	CIRCUIT	FUNCTION
29	C28 18DB/OR ⁎⁎	A/C CLUTCH RELAY CONTROL
	C28 20DB/OR ⁎	A/C CLUTCH RELAY CONTROL
30	A17 20RD/BK	FUSED B(+)
31	C3 20DB/BK	A/C CLUTCH RELAY OUTPUT
32	-	-
33	F12 18DB/WT ⁎	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F12 18DB/RD ⁎⁎	FUSED IGNITION SWITCH OUTPUT (RUN-START)

AUTOMATIC SHUT DOWN RELAY

CAVITY	CIRCUIT	FUNCTION
34	A14 18RD/WT	FUSED B(+)
35	A14 18RD/WT	FUSED B(+)
36	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
	A142 18DG/OR ⁎	AUTOMATIC SHUT DOWN RELAY OUTPUT
37	-	-
38	K51 20DB/YL ⁎	AUTOMATIC SHUT DOWN RELAY CONTROL
	K51 18DB/YL ⁎⁎	AUTOMATIC SHUT DOWN RELAY CONTROL

FUEL PUMP RELAY

CAVITY	CIRCUIT	FUNCTION
59	F12 18DB/RD ⁎⁎	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F12 18DB/WT ⁎	FUSED IGNITION SWITCH OUTPUT (RUN-START)
60	A14 18RD/WT	FUSED B(+)
61	A141 18DG/WT	FUEL PUMP RELAY OUTPUT
62	-	-
63	K31 20BR ⁎	FUEL PUMP RELAY CONTROL
	K31 18BR ⁎⁎	FUEL PUMP RELAY CONTROL

⁎ 2.0L
⁎⁎ 2.4L TURBO

HORN RELAY

CAVITY	CIRCUIT	FUNCTION
39	F62 18RD **	FUSED B(+)
	F62 20RD *	FUSED B(+)
40	F62 18RD **	FUSED B(+)
	F62 20RD *	FUSED B(+)
41	X2 20DG/RD *	HORN RELAY OUTPUT
	X2 18DG/RD **	HORN RELAY OUTPUT
42	-	-
43	X3 20BK/RD	HORN RELAY CONTROL

MANIFOLD TUNING VALVE RELAY (RT)

CAVITY	CIRCUIT	FUNCTION
54	Z1 20BK	GROUND
55	A200 18RD/BR	FUSED B(+)
56	K201 20BR/YL	MTV RELAY OUTPUT
57	-	-
58	K200 20VT/OR	MTV CONTROL

RADIATOR FAN CONTROL RELAY (2.4L TURBO)

CAVITY	CIRCUIT	FUNCTION
74	C27 18DB/PK	RAD FAN RELAY CONTROL
75	F12 18DB/RD	FUSED IGNITION SWITCH OUTPUT (RUN-START)
76	C116 12LG/WT	RAD FAN HIGH/LOW FEED
77	C23 12DG	RAD FAN CONTROL/HIGH RELAY OUTPUT
78	Z1 12BK	GROUND

RADIATOR FAN RELAY (2.0L)

CAVITY	CIRCUIT	FUNCTION
69	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
70	C27 20DB/PK	RAD FAN RELAY CONTROL
71	C25 12YL	RAD FAN RELAY OUTPUT
72	-	-
73	A16 14GY	FUSED B(+)

* 2.0L
** 2.4L TURBO

RADIATOR FAN HIGH RELAY (2.4L TURBO)

CAVITY	CIRCUIT	FUNCTION
69	C27 18DB/PK	HIGH SPEED RAD FAN RELAY CONTROL
	C27 18DB/PK	HIGH SPEED RAD FAN RELAY CONTROL
70	F12 18DB/RD	FUSED IGNITION SWITCH OUTPUT (RUN-START)
71	A16 12GY	FUSED B(+)
72	-	-
73	C23 12DG	RAD FAN CONTROL/HIGH RELAY OUTPUT

RADIATOR FAN LOW RELAY (2.4L TURBO)

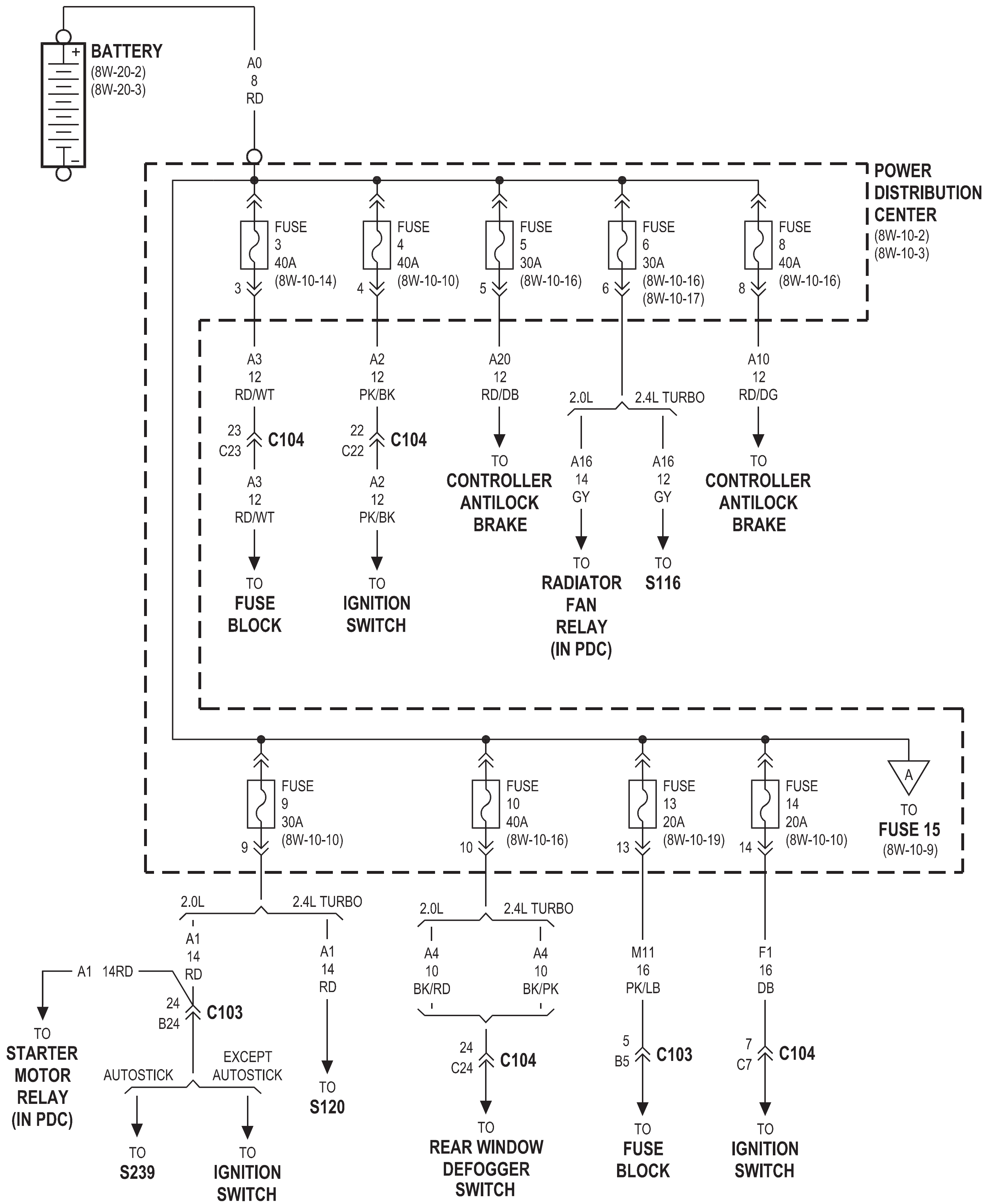
CAVITY	CIRCUIT	FUNCTION
64	F12 18DB/RD	FUSED IGNITION SWITCH OUTPUT (RUN-START)
65	C24 18DB/RD	RAD FAN LOW RELAY CONTROL
66	A16 12GY	FUSED B(+)
67	-	-
68	C25 12YL	RAD FAN LOW RELAY OUTPUT

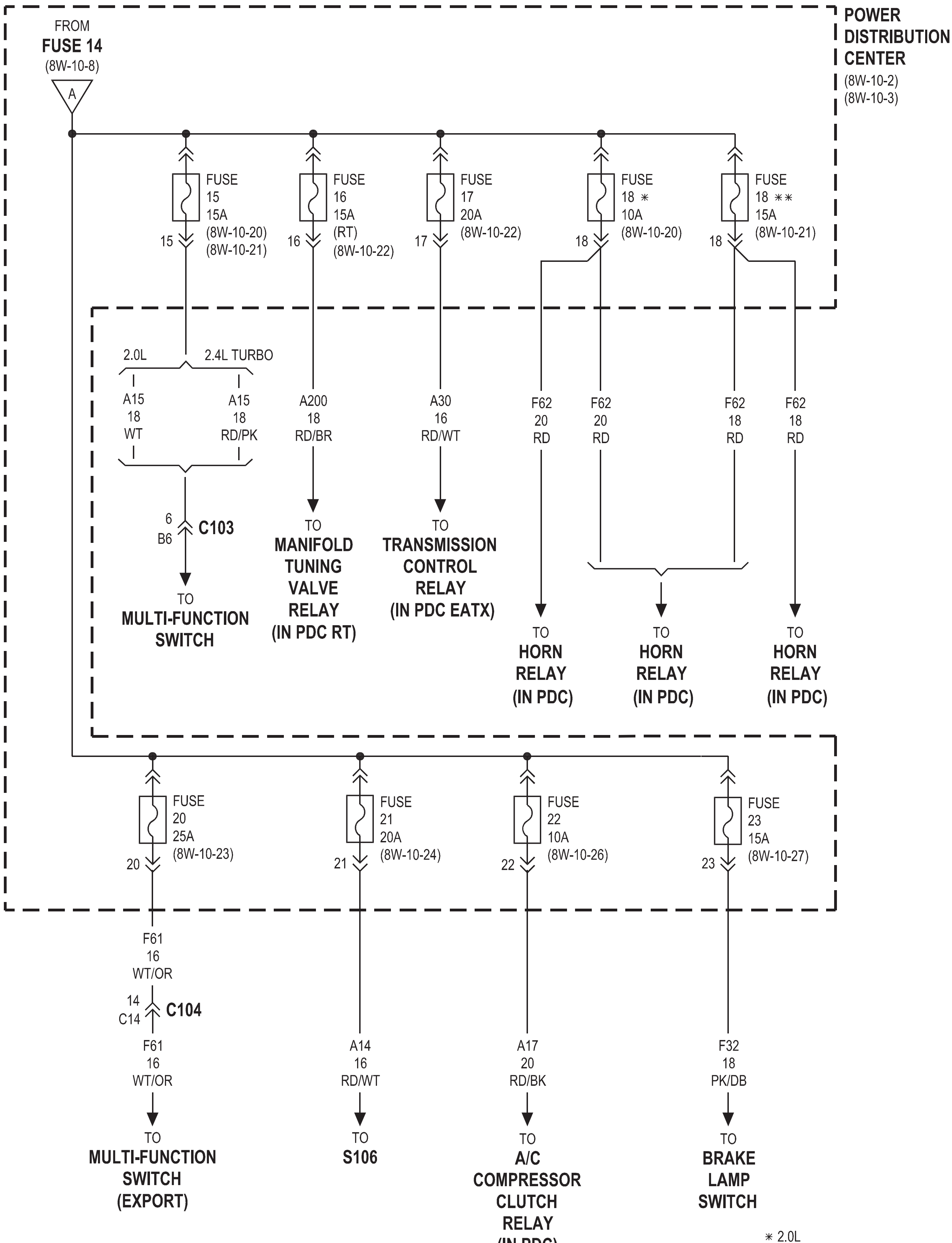
STARTER MOTOR RELAY

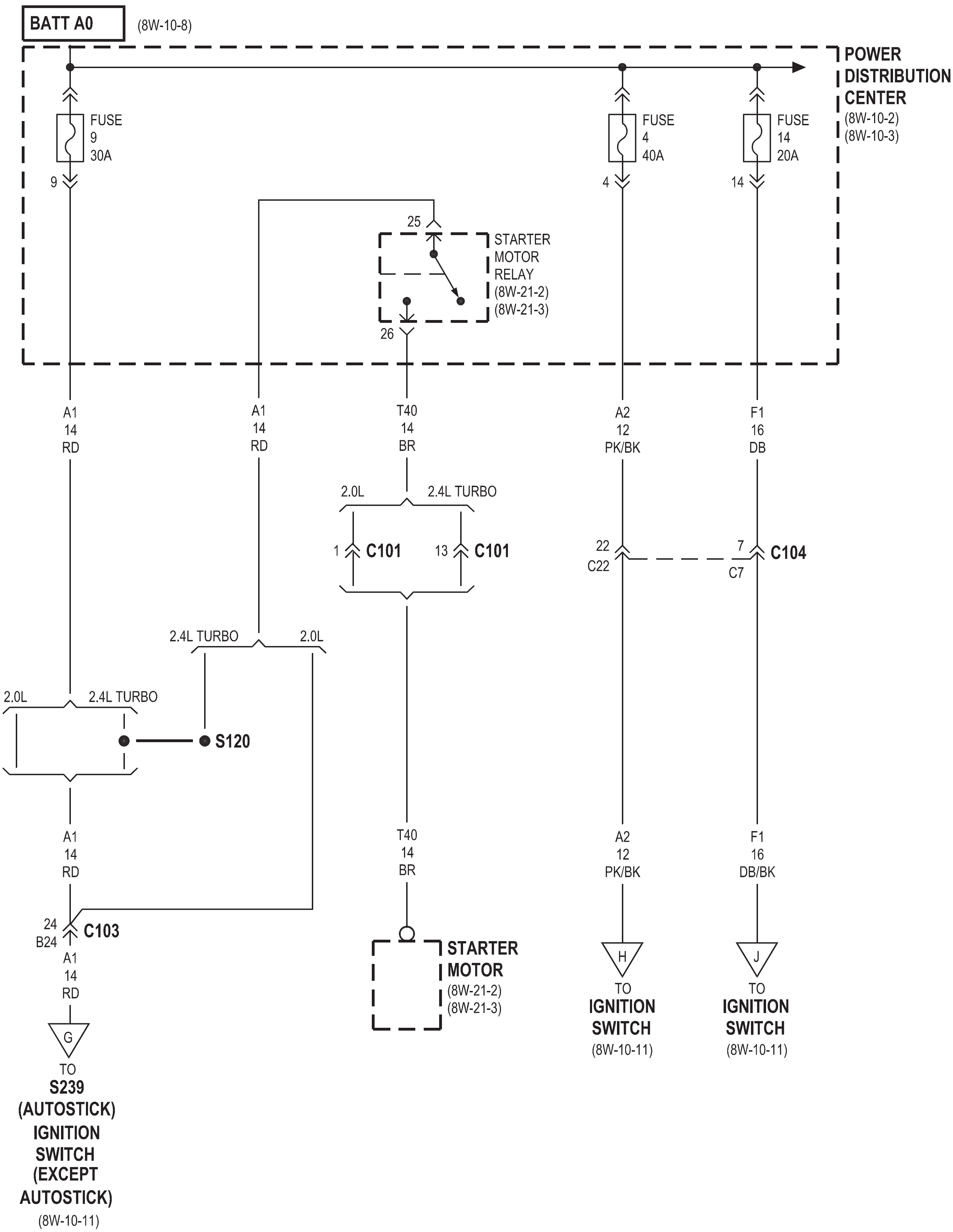
CAVITY	CIRCUIT	FUNCTION
24	A41 14YL	IGNITION SWITCH OUTPUT (START)
25	A1 14RD	FUSED B(+)
26	T40 14BR	ENGINE STARTER MOTOR RELAY OUTPUT
27	-	-
28	K90 20TN	STARTER RELAY CONTROL

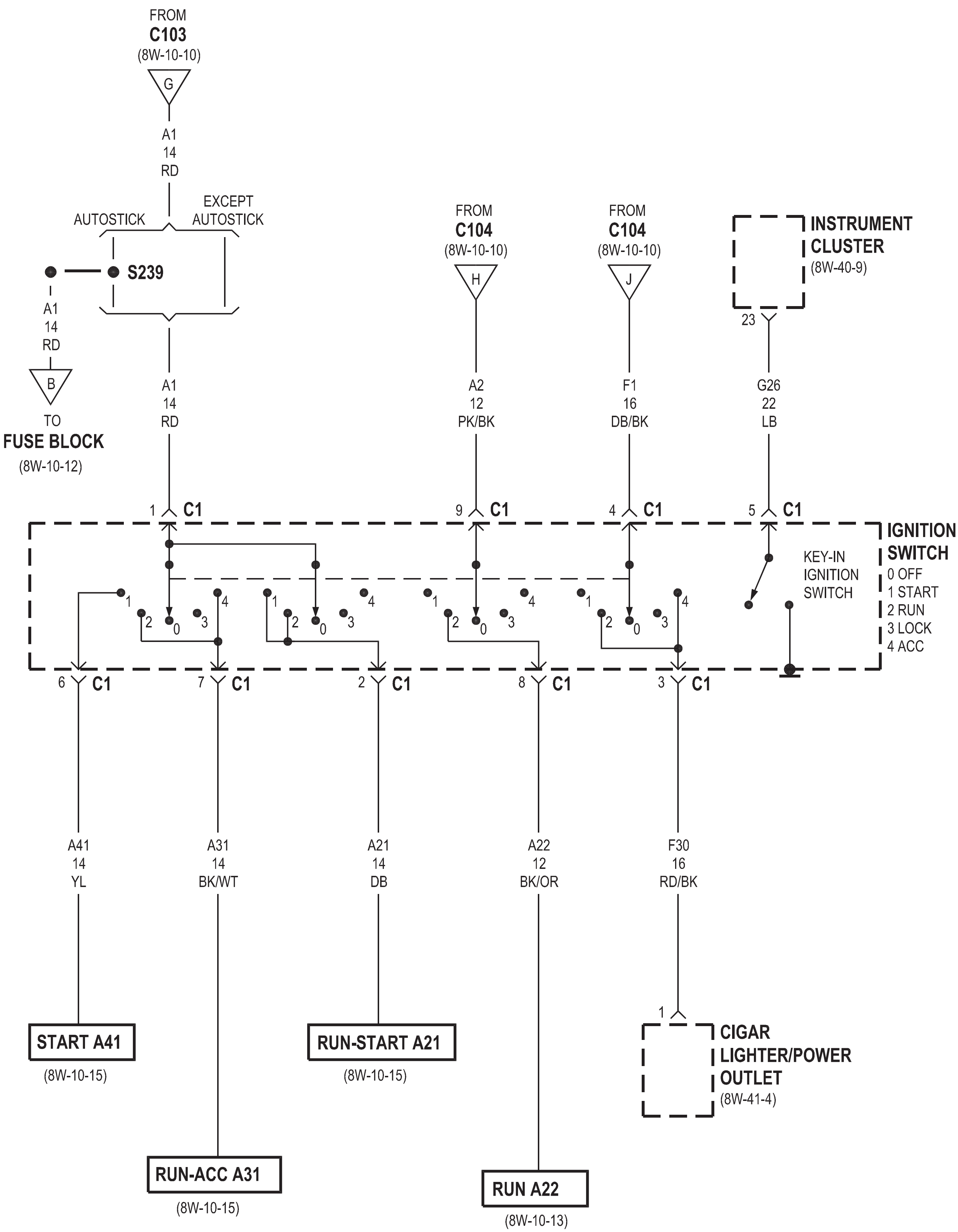
TRANSMISSION CONTROL RELAY (EATX)

CAVITY	CIRCUIT	FUNCTION
44	Z1 20BK	GROUND
45	A30 16RD/WT	FUSED B(+)
46	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
47	-	-
48	T15 20LG	TRANSMISSION CONTROL RELAY CONTROL

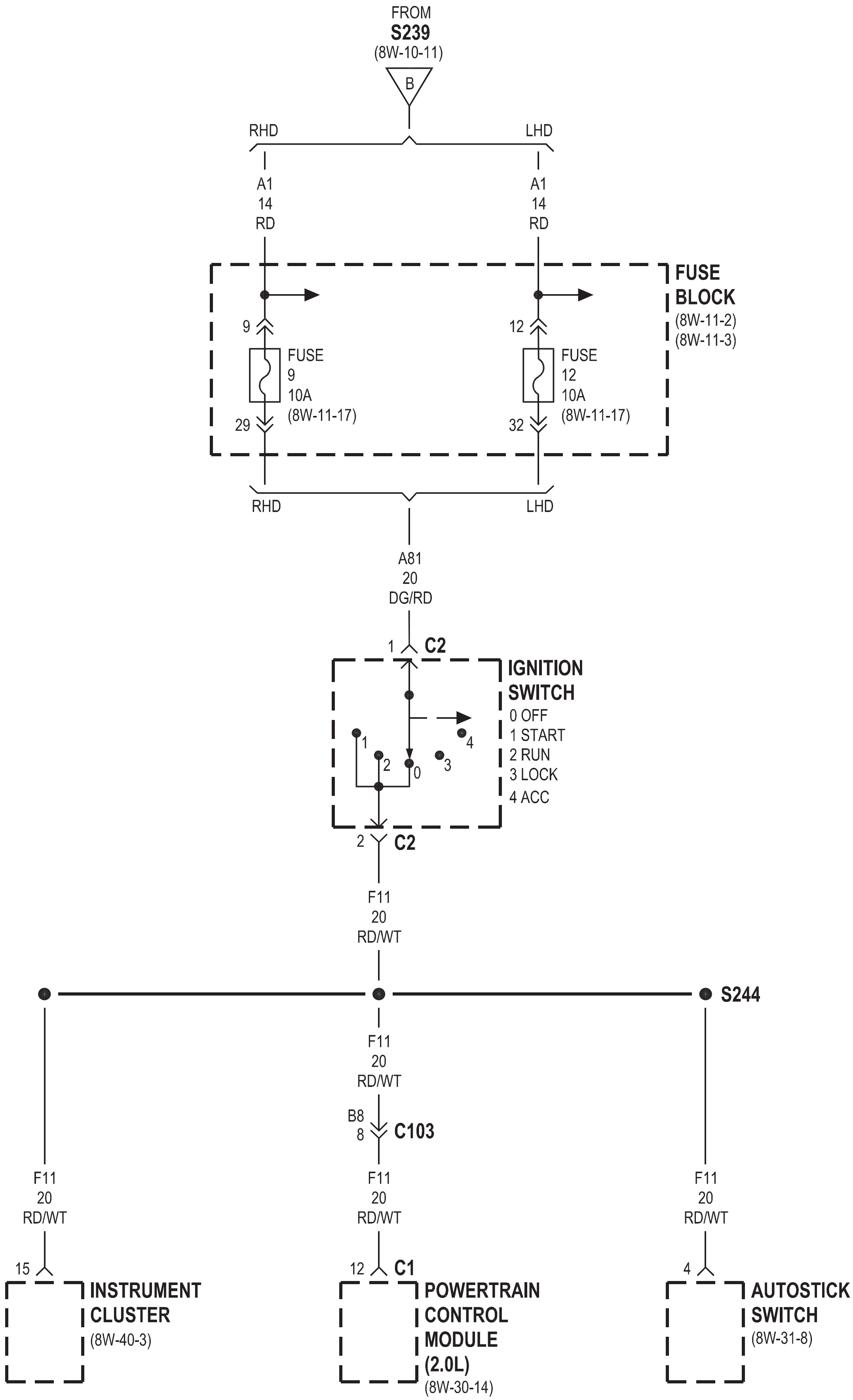

BATTERY
(8W-20-2)
(8W-20-3)
A0
8
RD
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
3
40A
(8W-10-14)
FUSE
4
40A
(8W-10-10)
FUSE
5
30A
(8W-10-16)
FUSE
6
30A
(8W-10-16)
(8W-10-17)
FUSE
8
40A
(8W-10-16)
A3
12
RD/WT
C104
A2
12
PK/BK
A20
12
RD/DB
TO
CONTROLLER
ANTILOCK
BRAKE
2.0L
2.4L TURBO
A16
14
GY
A16
12
GY
A10
12
RD/DG
TO
FUSE
BLOCK
TO
IGNITION
SWITCH
TO
RADIATOR
FAN
RELAY
(IN PDC)
TO
S116
FUSE
9
30A
(8W-10-10)
FUSE
10
40A
(8W-10-16)
FUSE
13
20A
(8W-10-19)
FUSE
14
20A
(8W-10-10)
TO
FUSE 15
(8W-10-9)
A1
14
RD
A1 14RD
C103
TO
STARTER
MOTOR
RELAY
(IN PDC)
AUTOSTICK
EXCEPT
AUTOSTICK
TO
S239
TO
S120
A4
10
BK/RD
A4
10
BK/PK
TO
REAR WINDOW
DEFOGGER
SWITCH
M11
16
PK/LB
F1
16
DB

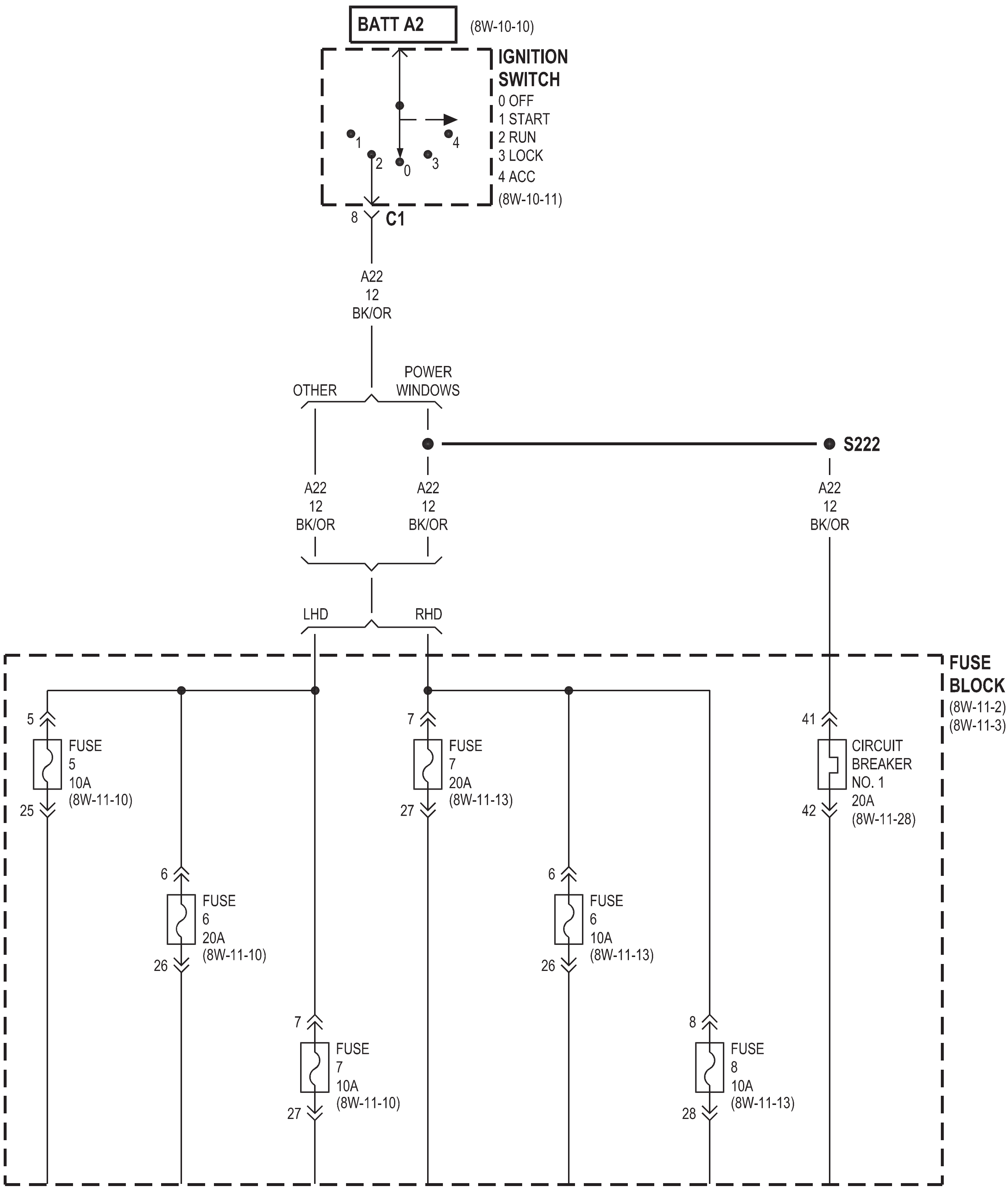

POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FROM
FUSE 14
(8W-10-8)
A
FUSE 15 15A (8W-10-20) (8W-10-21)
15
FUSE 16 15A (RT) (8W-10-22)
16
FUSE 17 20A (8W-10-22)
17
FUSE 18 ∗ 10A (8W-10-20)
18
FUSE 18 ∗∗ 15A (8W-10-21)
18
2.0L
2.4L TURBO
A15 18 WT
A15 18 RD/PK
A200 18 RD/BR
A30 16 RD/WT
F62 20 RD
F62 20 RD
F62 18 RD
F62 18 RD
6
B6
C103
TO MULTI-FUNCTION SWITCH
TO MANIFOLD TUNING VALVE RELAY (IN PDC RT)
TO TRANSMISSION CONTROL RELAY (IN PDC EATX)
TO HORN RELAY (IN PDC)
TO HORN RELAY (IN PDC)
TO HORN RELAY (IN PDC)
FUSE 20 25A (8W-10-23)
20
FUSE 21 20A (8W-10-24)
21
FUSE 22 10A (8W-10-26)
22
FUSE 23 15A (8W-10-27)
23
F61 16 WT/OR
14
C14
C104
F61 16 WT/OR
A14 16 RD/WT
A17 20 RD/BK
F32 18 PK/DB
TO MULTI-FUNCTION SWITCH (EXPORT)
TO S106
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
TO BRAKE LAMP SWITCH
∗ 2.0L
∗∗ 2.4L TURBO

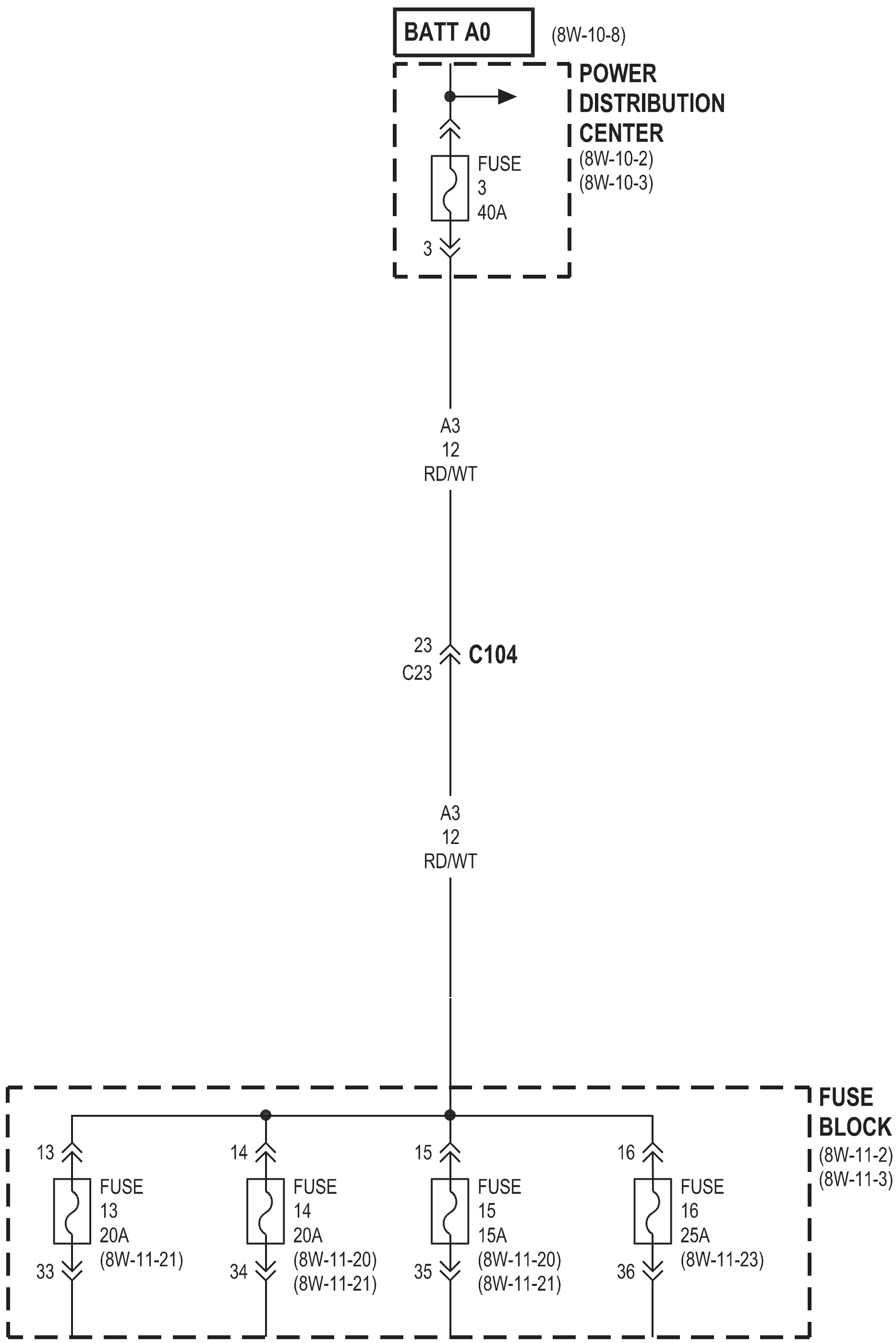

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
9
30A
9
FUSE
4
40A
4
FUSE
14
20A
14
25
STARTER
MOTOR
RELAY
(8W-21-2)
(8W-21-3)
26
A1
14
RD
A1
14
RD
T40
14
BR
A2
12
PK/BK
F1
16
DB
2.0L
2.4L TURBO
1
C101
13
C101
22
C22
7
C7
C104
2.4L TURBO
2.0L
2.0L
2.4L TURBO
S120
A1
14
RD
T40
14
BR
A2
12
PK/BK
F1
16
DB/BK
24
B24
C103
A1
14
RD
STARTER
MOTOR
(8W-21-2)
(8W-21-3)
H
TO
IGNITION
SWITCH
(8W-10-11)
J
TO
IGNITION
SWITCH
(8W-10-11)
G
TO
S239
(AUTOSTICK)
IGNITION
SWITCH
(EXCEPT
AUTOSTICK)
(8W-10-11)

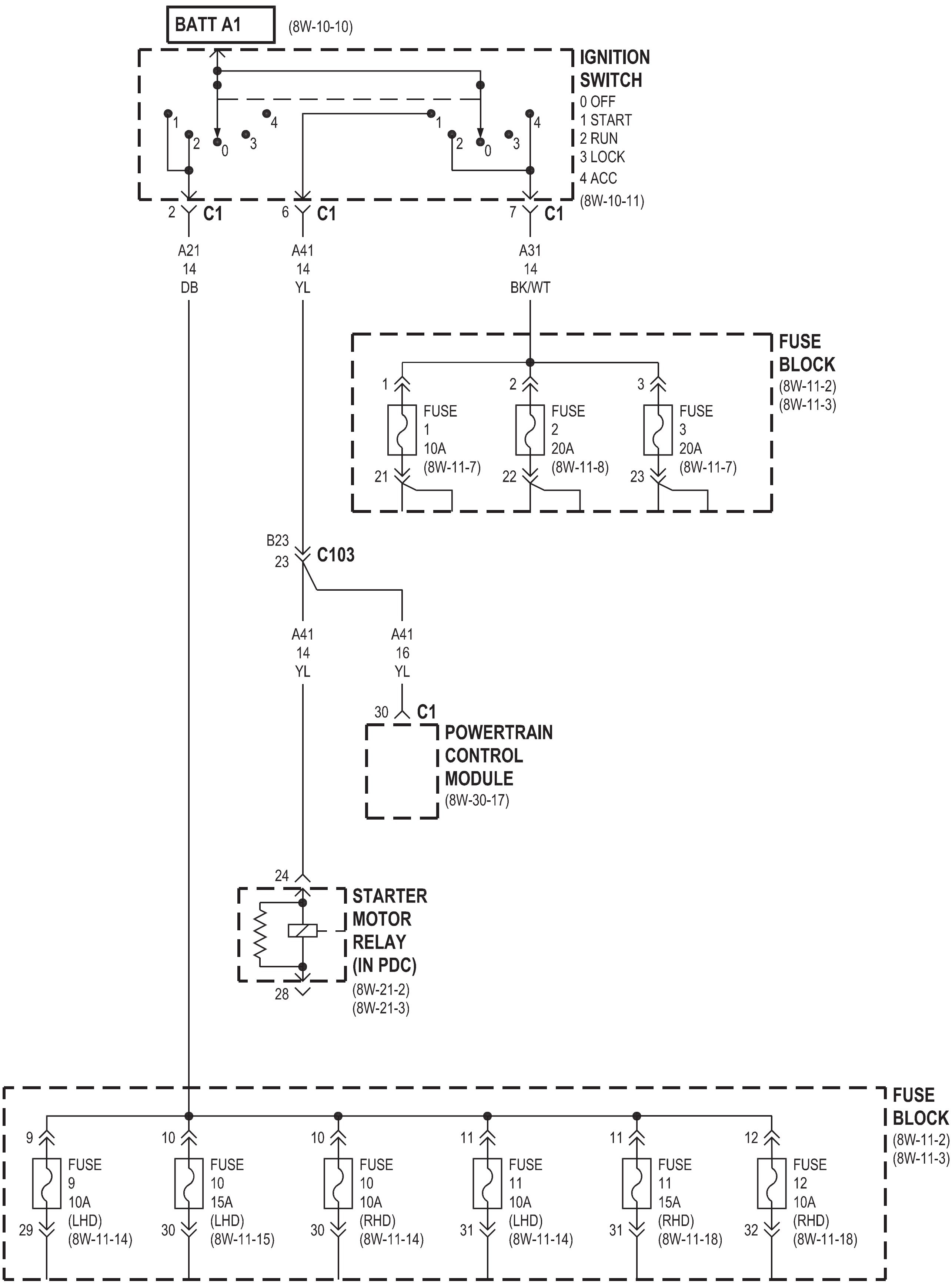

FROM
C103
(8W-10-10)
G
A1
14
RD
AUTOSTICK
EXCEPT AUTOSTICK
S239
A1
14
RD
B
TO
FUSE BLOCK
(8W-10-12)
A1
14
RD
FROM
C104
(8W-10-10)
H
A2
12
PK/BK
FROM
C104
(8W-10-10)
J
F1
16
DB/BK
INSTRUMENT CLUSTER
(8W-40-9)
23
G26
22
LB
1 C1
9 C1
4 C1
5 C1
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
KEY-IN IGNITION SWITCH
6 C1
7 C1
2 C1
8 C1
3 C1
A41
14
YL
A31
14
BK/WT
A21
14
DB
A22
12
BK/OR
F30
16
RD/BK
START A41
(8W-10-15)
RUN-START A21
(8W-10-15)
1
CIGAR LIGHTER/POWER OUTLET
(8W-41-4)
RUN-ACC A31
(8W-10-15)
RUN A22
(8W-10-13)

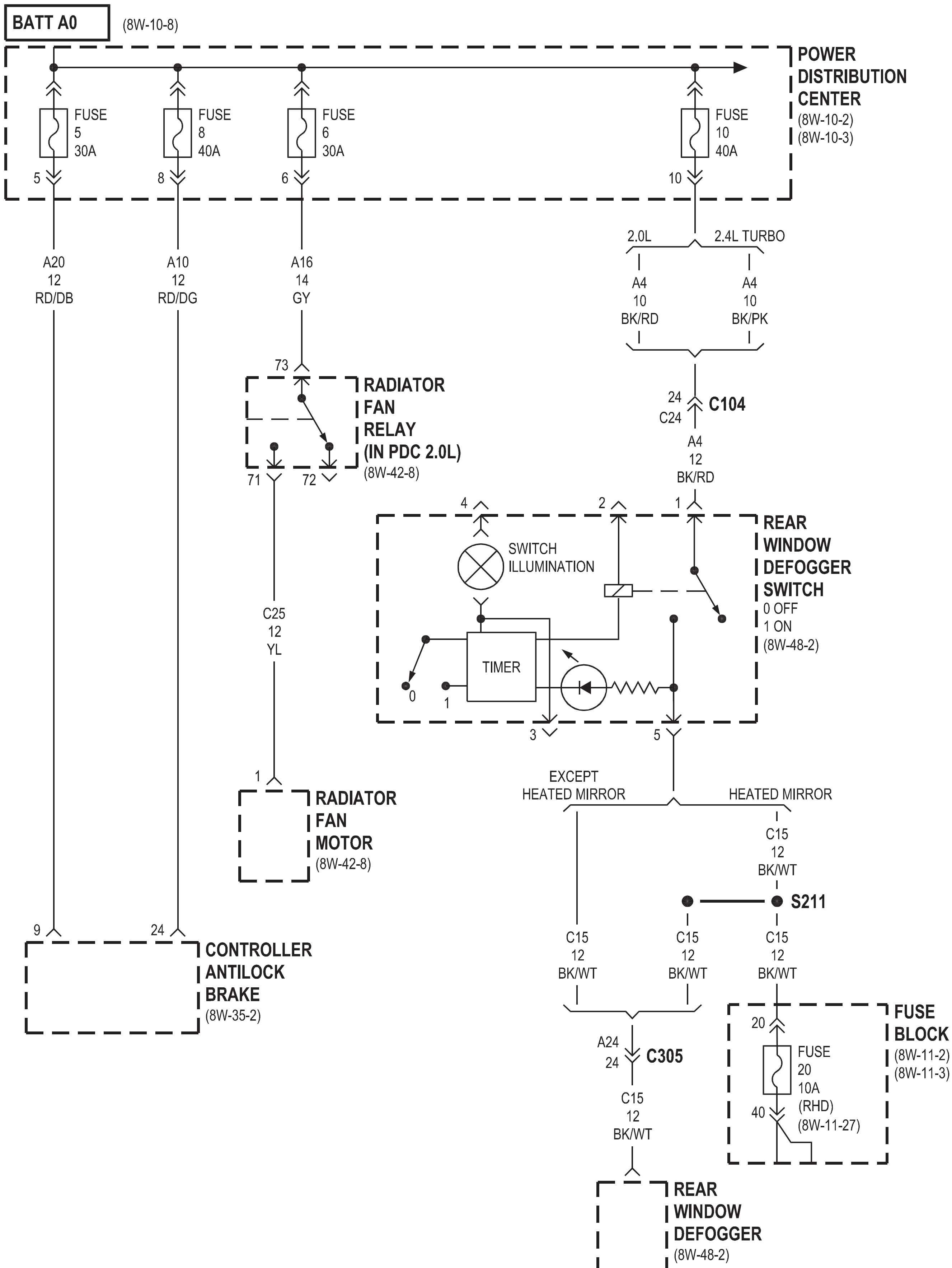
AUTOSTICK


FROM
S239
(8W-10-11)
B
RHD
LHD
A1
14
RD
A1
14
RD
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
9
FUSE
9
10A
(8W-11-17)
29
12
FUSE
12
10A
(8W-11-17)
32
RHD
LHD
A81
20
DG/RD
1
C2
IGNITION
SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
2
C2
F11
20
RD/WT
S244
F11
20
RD/WT
B8
8
C103
F11
20
RD/WT
F11
20
RD/WT
F11
20
RD/WT
15
INSTRUMENT
CLUSTER
(8W-40-3)
12
C1
POWERTRAIN
CONTROL
MODULE
(2.0L)
(8W-30-14)
4
AUTOSTICK
SWITCH
(8W-31-8)

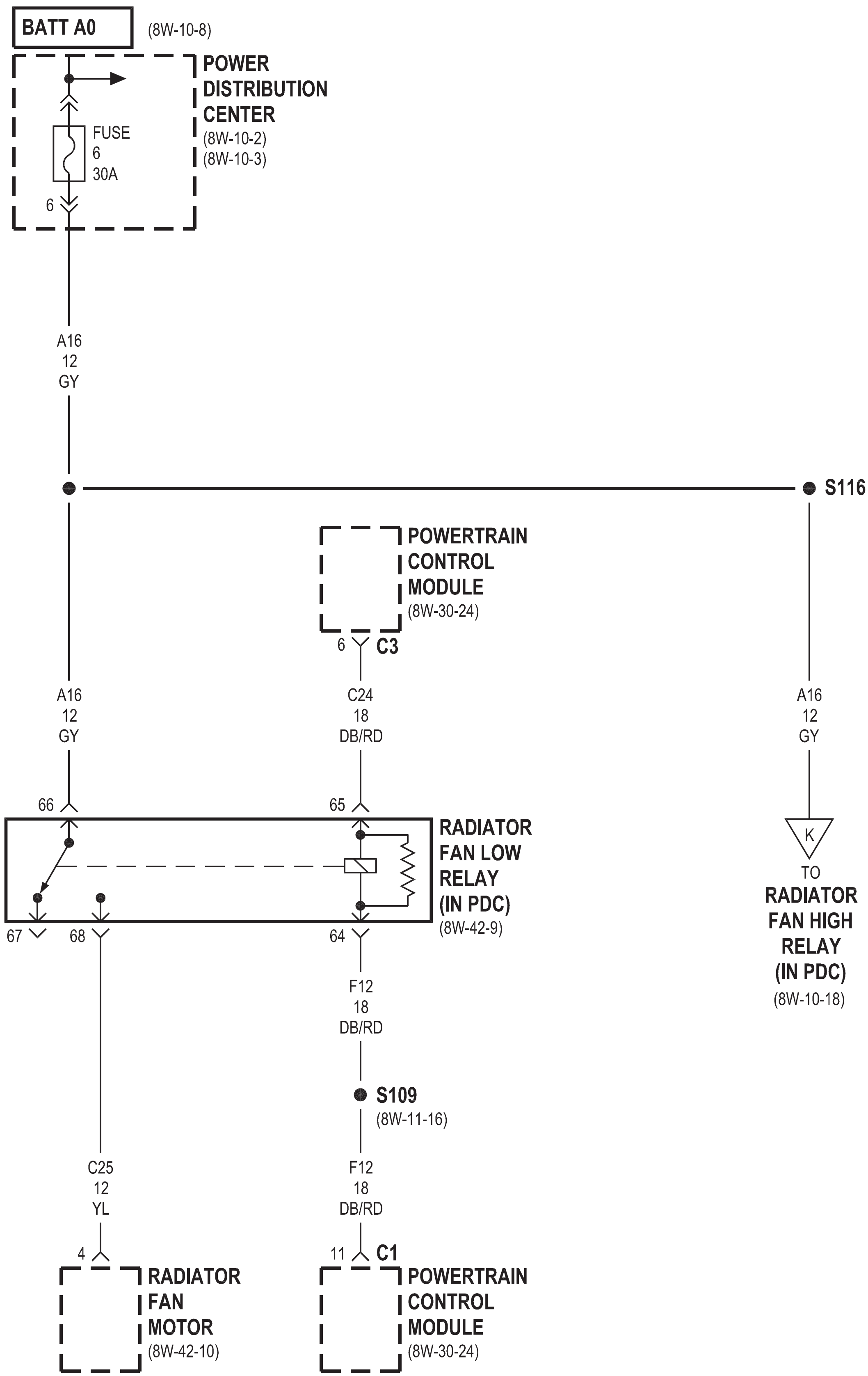

BATT A2
(8W-10-10)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-11)
8
C1
A22
12
BK/OR
OTHER
POWER WINDOWS
S222
A22
12
BK/OR
A22
12
BK/OR
A22
12
BK/OR
LHD
RHD
FUSE BLOCK
(8W-11-2)
(8W-11-3)
5
FUSE
5
10A
(8W-11-10)
25
6
FUSE
6
20A
(8W-11-10)
26
7
FUSE
7
10A
(8W-11-10)
27
7
FUSE
7
20A
(8W-11-13)
27
6
FUSE
6
10A
(8W-11-13)
26
8
FUSE
8
10A
(8W-11-13)
28
41
CIRCUIT BREAKER NO. 1
20A
(8W-11-28)
42

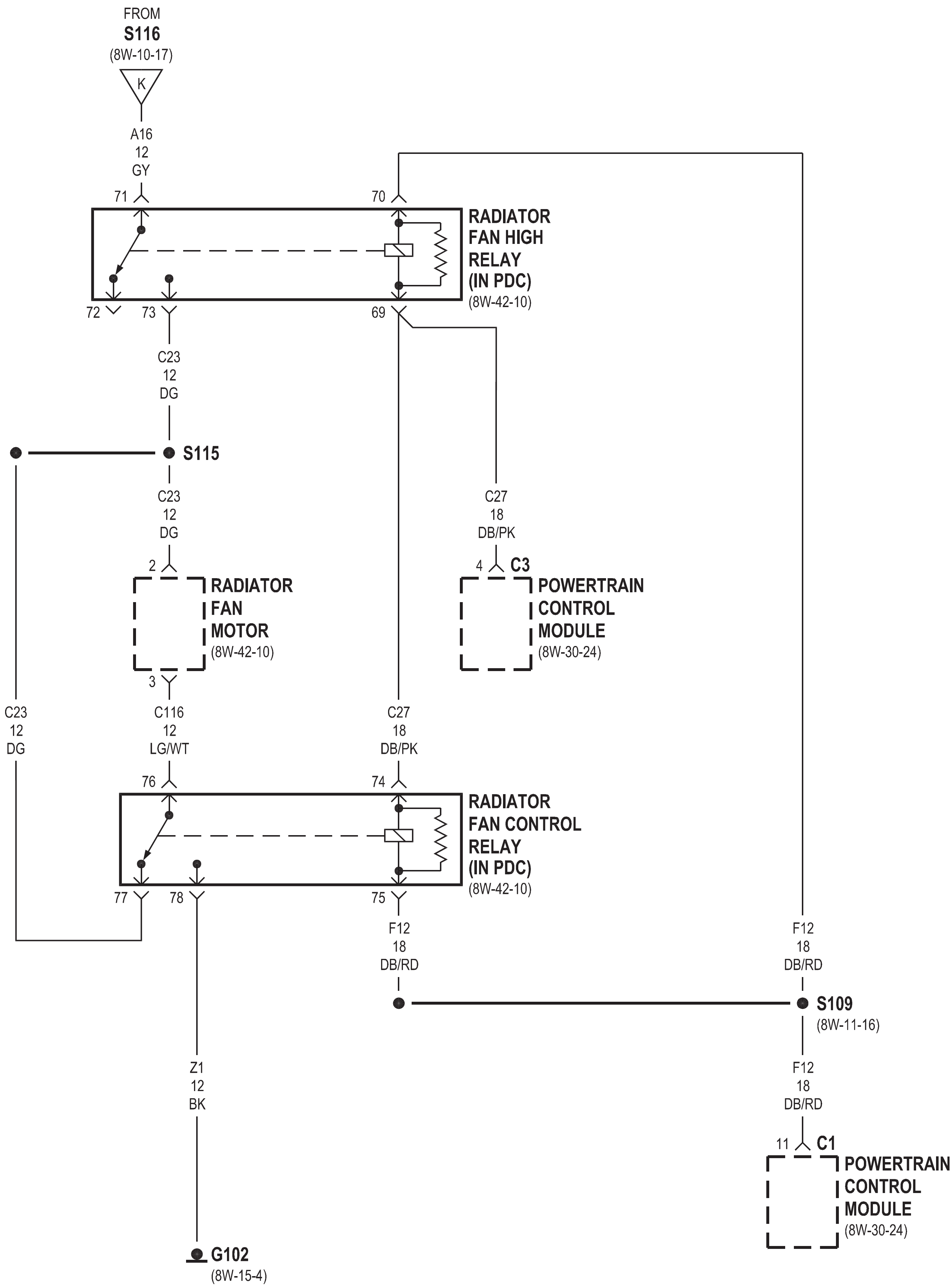

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
3
40A
3
A3
12
RD/WT
23
C23
C104
A3
12
RD/WT
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
13
FUSE
13
20A
(8W-11-21)
33
14
FUSE
14
20A
(8W-11-20)
(8W-11-21)
34
15
FUSE
15
15A
(8W-11-20)
(8W-11-21)
35
16
FUSE
16
25A
(8W-11-23)
36

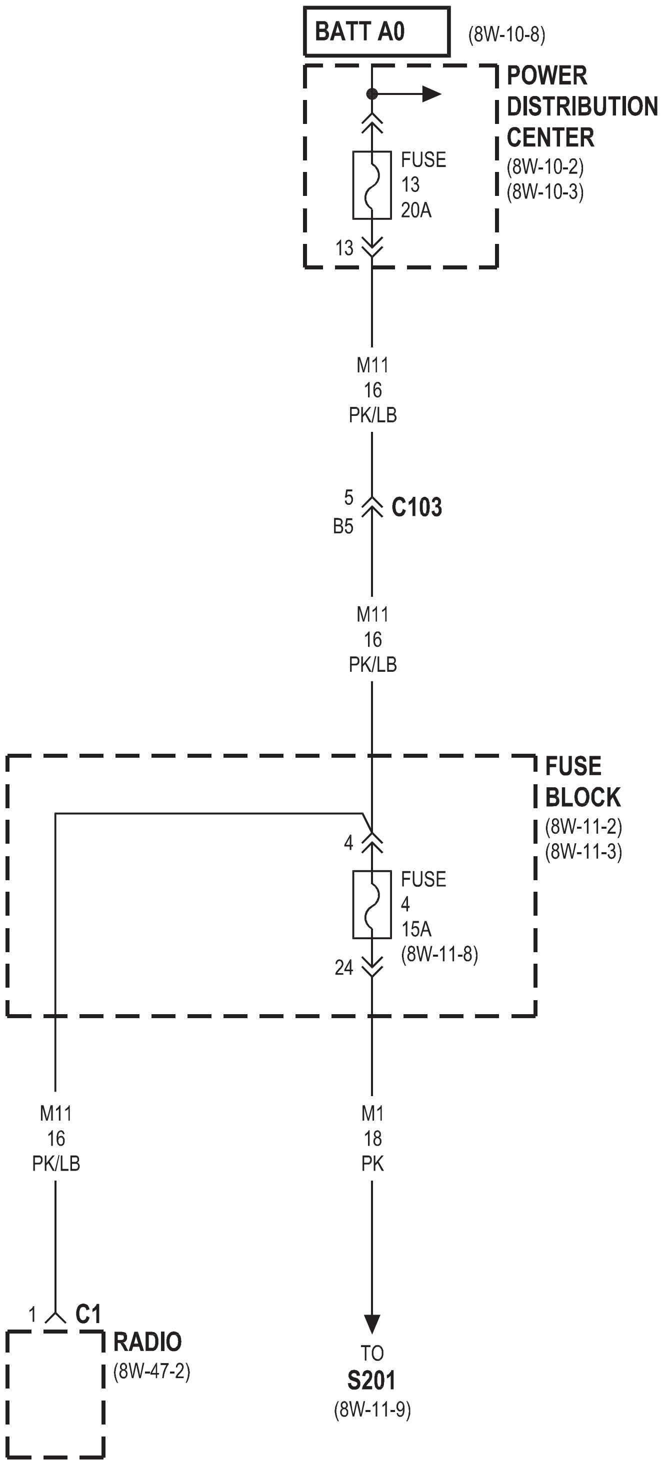

BATT A1
(8W-10-10)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-11)
C1
A21
14
DB
A41
14
YL
A31
14
BK/WT
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 1 10A (8W-11-7)
FUSE 2 20A (8W-11-8)
FUSE 3 20A (8W-11-7)
B23
23
C103
A41
14
YL
A41
16
YL
30
C1
POWERTRAIN CONTROL MODULE
(8W-30-17)
24
STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
28
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 9 10A (LHD) (8W-11-14)
FUSE 10 15A (LHD) (8W-11-15)
FUSE 10 10A (RHD) (8W-11-14)
FUSE 11 10A (LHD) (8W-11-14)
FUSE 11 15A (RHD) (8W-11-18)
FUSE 12 10A (RHD) (8W-11-18)

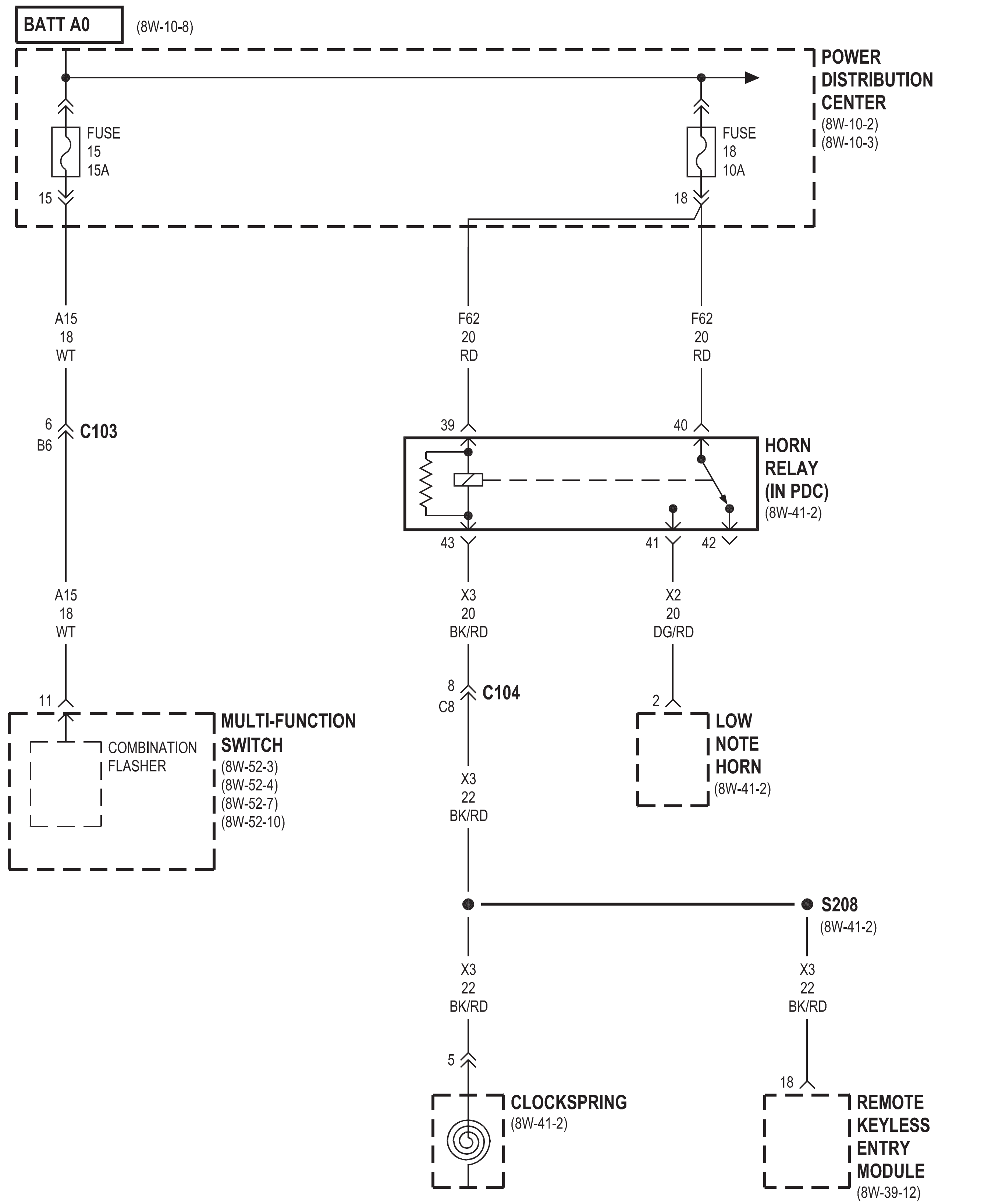


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 5 30A
FUSE 8 40A
FUSE 6 30A
FUSE 10 40A
5
8
6
10
A20 12 RD/DB
A10 12 RD/DG
A16 14 GY
2.0L
2.4L TURBO
A4 10 BK/RD
A4 10 BK/PK
73
RADIATOR FAN RELAY (IN PDC 2.0L)
(8W-42-8)
71
72
24
C24
C104
A4 12 BK/RD
4
2
1
SWITCH ILLUMINATION
REAR WINDOW DEFOGGER SWITCH
0 OFF
1 ON
(8W-48-2)
TIMER
0
1
3
5
C25 12 YL
1
RADIATOR FAN MOTOR
(8W-42-8)
EXCEPT HEATED MIRROR
HEATED MIRROR
C15 12 BK/WT
S211
9
24
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
C15 12 BK/WT
C15 12 BK/WT
C15 12 BK/WT
A24
24
C305
C15 12 BK/WT
20
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 20 10A (RHD)
(8W-11-27)
40
REAR WINDOW DEFOGGER
(8W-48-2)

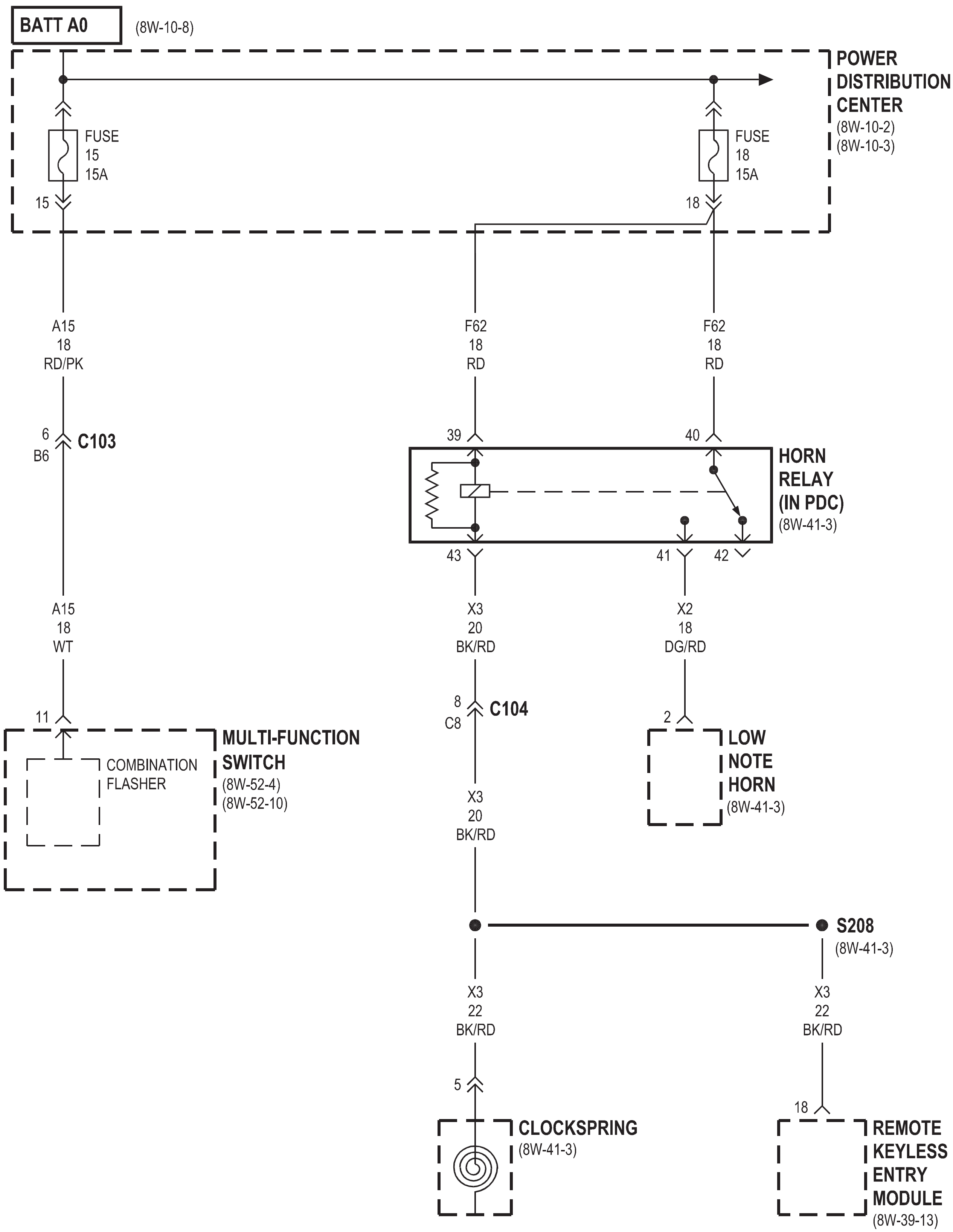

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 6 30A
6
A16 12 GY
S116
POWERTRAIN CONTROL MODULE
(8W-30-24)
6 C3
A16 12 GY
C24 18 DB/RD
A16 12 GY
66
65
RADIATOR FAN LOW RELAY (IN PDC)
(8W-42-9)
K
TO RADIATOR FAN HIGH RELAY (IN PDC)
(8W-10-18)
67
68
64
F12 18 DB/RD
S109
(8W-11-16)
C25 12 YL
F12 18 DB/RD
4
11 C1
RADIATOR FAN MOTOR
(8W-42-10)
POWERTRAIN CONTROL MODULE
(8W-30-24)


FROM
S116
(8W-10-17)
K
A16
12
GY
71
70
RADIATOR
FAN HIGH
RELAY
(IN PDC)
(8W-42-10)
72
73
69
C23
12
DG
S115
C23
12
DG
C27
18
DB/PK
2
RADIATOR
FAN
MOTOR
(8W-42-10)
4
C3
POWERTRAIN
CONTROL
MODULE
(8W-30-24)
3
C23
12
DG
C116
12
LG/WT
C27
18
DB/PK
76
74
RADIATOR
FAN CONTROL
RELAY
(IN PDC)
(8W-42-10)
77
78
75
F12
18
DB/RD
F12
18
DB/RD
S109
(8W-11-16)
Z1
12
BK
F12
18
DB/RD
11
C1
POWERTRAIN
CONTROL
MODULE
(8W-30-24)
G102
(8W-15-4)

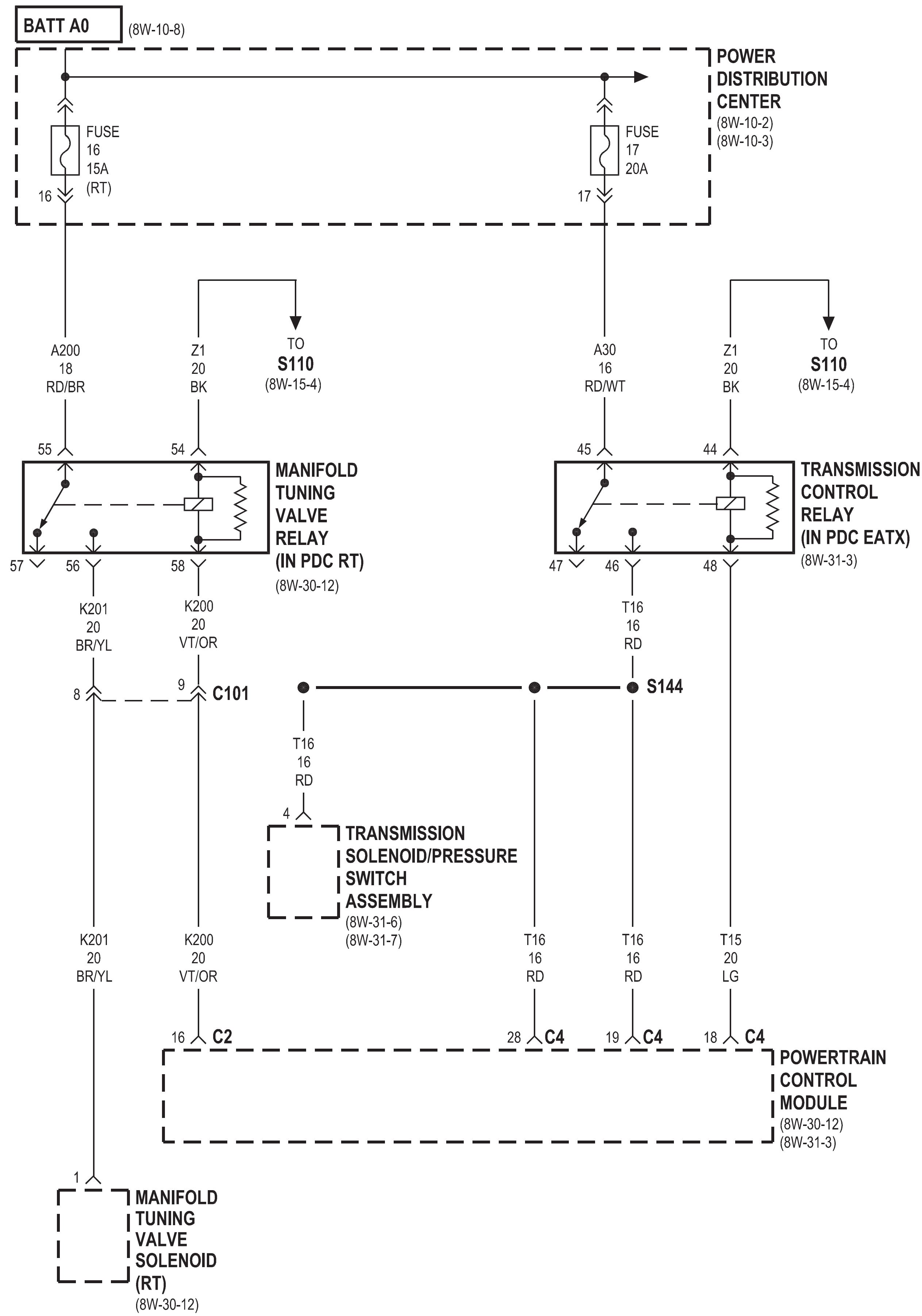

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
13
20A
13
M11
16
PK/LB
5
B5
C103
M11
16
PK/LB
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
4
FUSE
4
15A
(8W-11-8)
24
M11
16
PK/LB
M1
18
PK
1
C1
RADIO
(8W-47-2)
TO
S201
(8W-11-9)

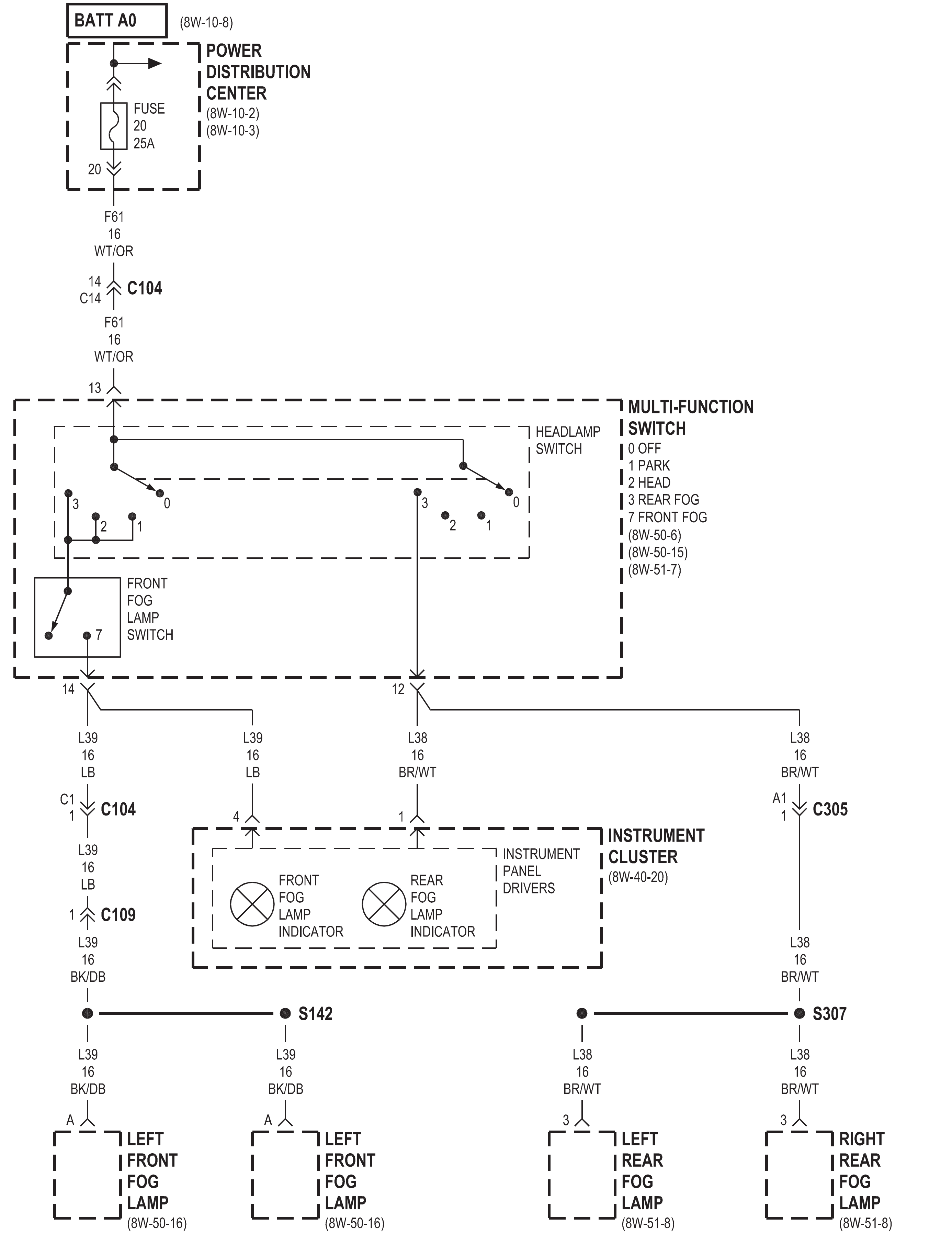


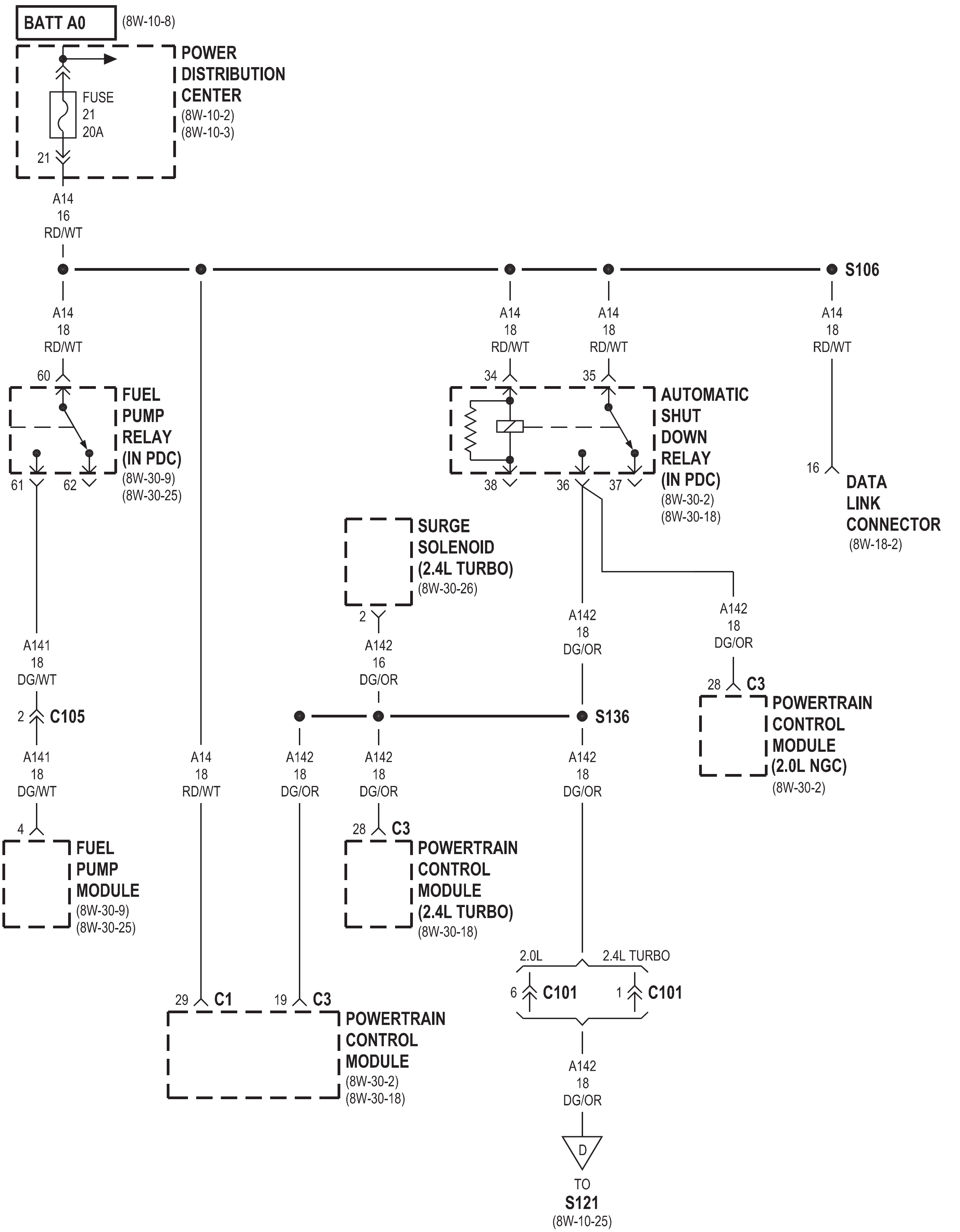
BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
15
15A
15
FUSE
18
10A
18
A15
18
WT
F62
20
RD
F62
20
RD
6
B6
C103
39
40
HORN
RELAY
(IN PDC)
(8W-41-2)
43
41
42
A15
18
WT
X3
20
BK/RD
X2
20
DG/RD
11
MULTI-FUNCTION
SWITCH
(8W-52-3)
(8W-52-4)
(8W-52-7)
(8W-52-10)
COMBINATION
FLASHER
8
C8
C104
2
LOW
NOTE
HORN
(8W-41-2)
X3
22
BK/RD
S208
(8W-41-2)
X3
22
BK/RD
X3
22
BK/RD
5
18
CLOCKSPRING
(8W-41-2)
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-12)

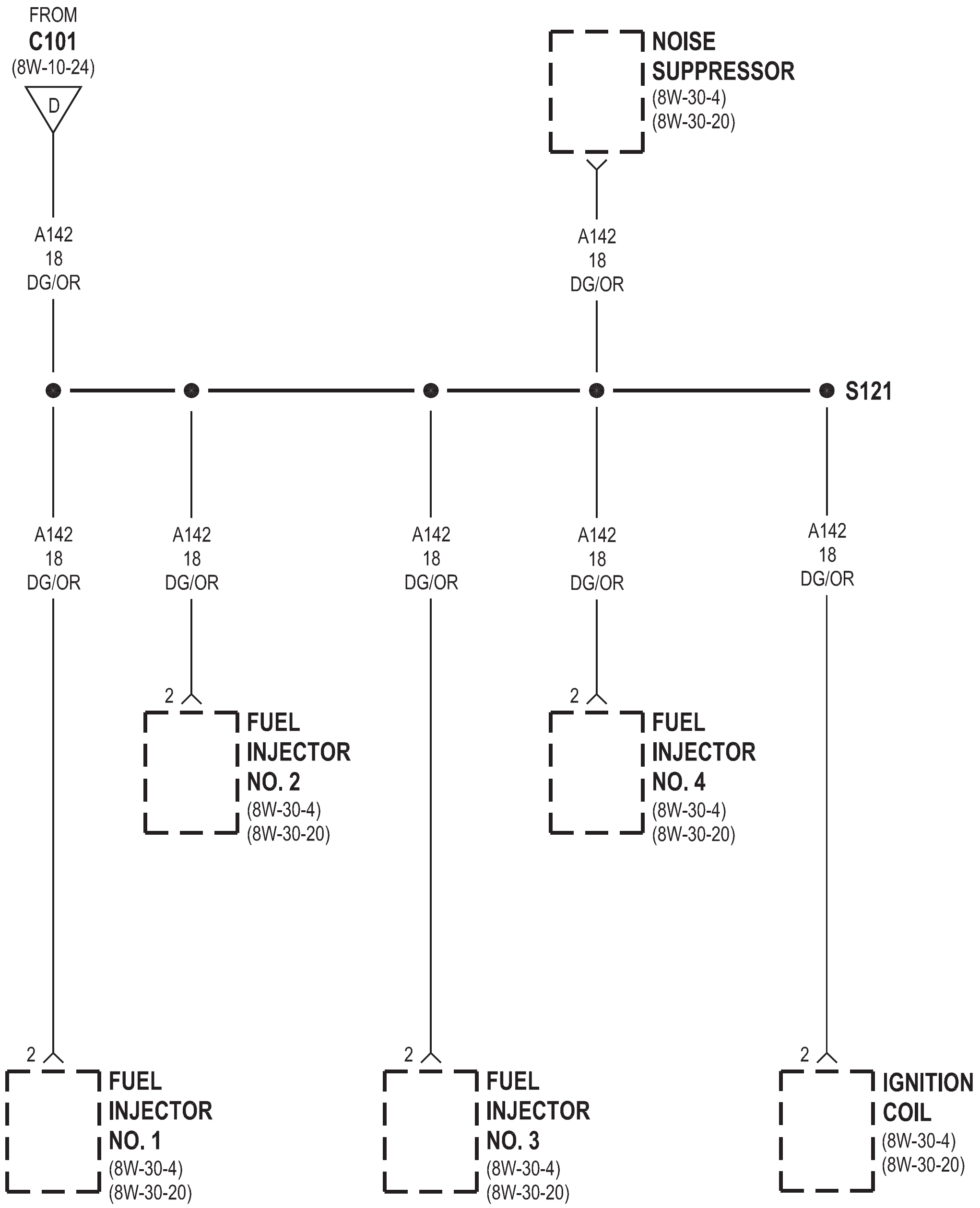

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
15
15A
FUSE
18
15A
15
18
A15
18
RD/PK
F62
18
RD
F62
18
RD
6
B6
C103
39
40
HORN
RELAY
(IN PDC)
(8W-41-3)
43
41
42
A15
18
WT
X3
20
BK/RD
X2
18
DG/RD
11
8
C8
C104
2
MULTI-FUNCTION
SWITCH
(8W-52-4)
(8W-52-10)
COMBINATION
FLASHER
LOW
NOTE
HORN
(8W-41-3)
X3
20
BK/RD
S208
(8W-41-3)
X3
22
BK/RD
X3
22
BK/RD
5
18
CLOCKSPRING
(8W-41-3)
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-13)

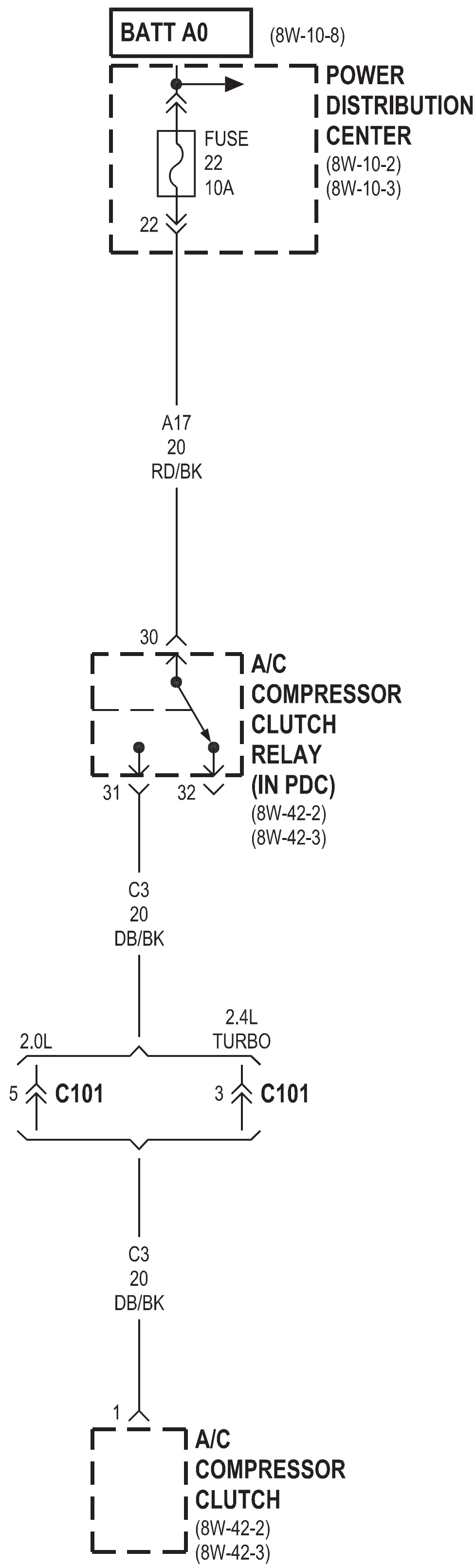
EATX

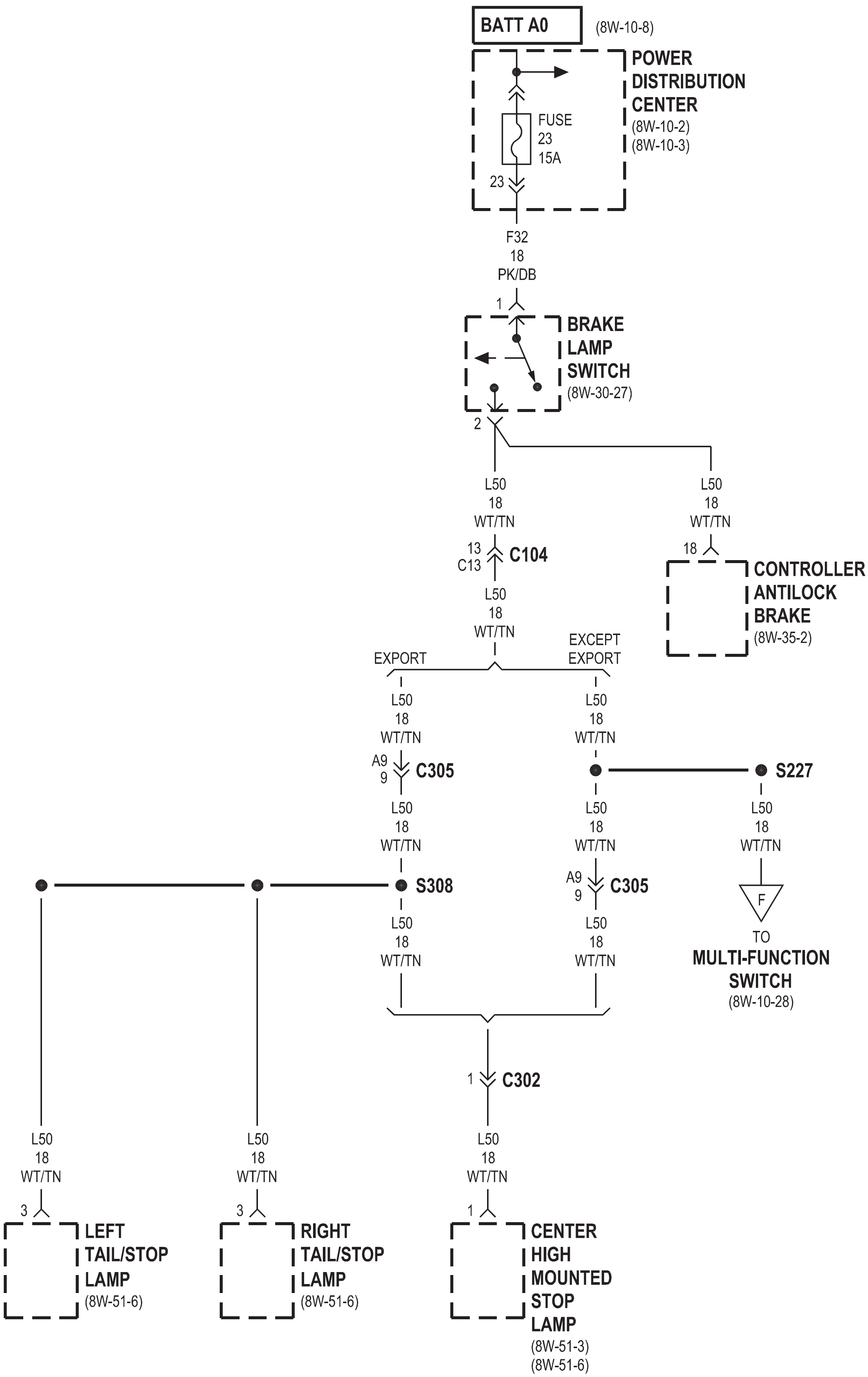

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 16 15A (RT)
16
FUSE 17 20A
17
A200 18 RD/BR
Z1 20 BK
TO S110 (8W-15-4)
A30 16 RD/WT
Z1 20 BK
TO S110 (8W-15-4)
55
54
45
44
MANIFOLD TUNING VALVE RELAY (IN PDC RT)
(8W-30-12)
TRANSMISSION CONTROL RELAY (IN PDC EATX)
(8W-31-3)
57
56
58
47
46
48
K201 20 BR/YL
K200 20 VT/OR
T16 16 RD
8
9
C101
S144
T16 16 RD
4
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
(8W-31-6)
(8W-31-7)
K201 20 BR/YL
K200 20 VT/OR
T16 16 RD
T16 16 RD
T15 20 LG
16 C2
28 C4
19 C4
18 C4
POWERTRAIN CONTROL MODULE
(8W-30-12)
(8W-31-3)
1
MANIFOLD TUNING VALVE SOLENOID (RT)
(8W-30-12)

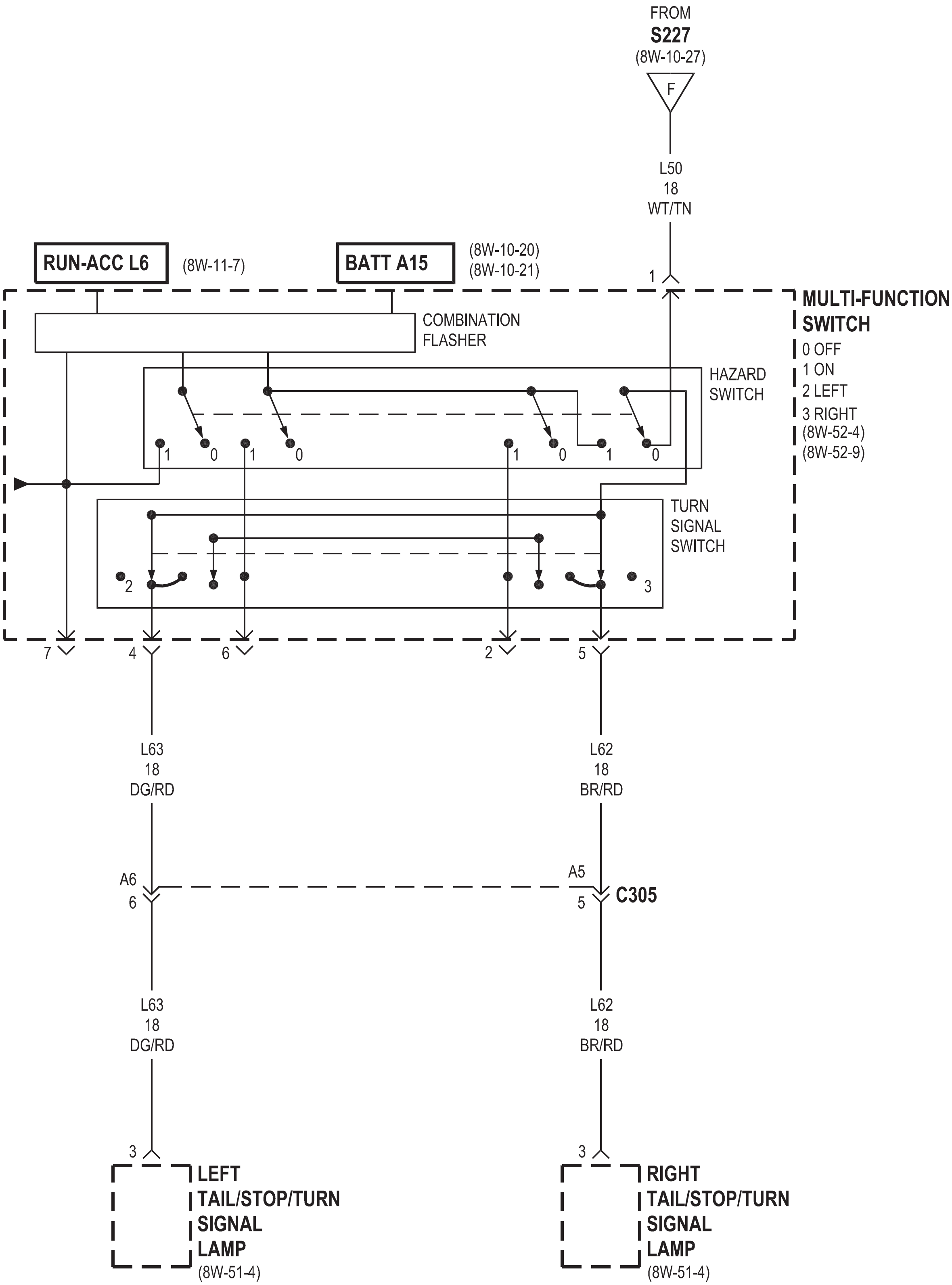

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 20 25A
20
F61 16 WT/OR
14 C14
C104
F61 16 WT/OR
13
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
7 FRONT FOG
(8W-50-6)
(8W-50-15)
(8W-51-7)
HEADLAMP SWITCH
3 2 1 0
3 2 1 0
FRONT FOG LAMP SWITCH
7
14
12
L39 16 LB
L39 16 LB
L38 16 BR/WT
L38 16 BR/WT
C1 1
C104
4
1
A1 1
C305
INSTRUMENT CLUSTER
(8W-40-20)
INSTRUMENT PANEL DRIVERS
FRONT FOG LAMP INDICATOR
REAR FOG LAMP INDICATOR
L39 16 LB
1
C109
L39 16 BK/DB
L38 16 BR/WT
S142
S307
L39 16 BK/DB
L39 16 BK/DB
L38 16 BR/WT
L38 16 BR/WT
A
A
3
3
LEFT FRONT FOG LAMP
(8W-50-16)
LEFT FRONT FOG LAMP
(8W-50-16)
LEFT REAR FOG LAMP
(8W-51-8)
RIGHT REAR FOG LAMP
(8W-51-8)


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 21 20A
21
A14 16 RD/WT
S106
A14 18 RD/WT
60
61
62
FUEL PUMP RELAY (IN PDC)
(8W-30-9)
(8W-30-25)
34
35
38
36
37
AUTOMATIC SHUT DOWN RELAY (IN PDC)
(8W-30-2)
(8W-30-18)
16
DATA LINK CONNECTOR
(8W-18-2)
SURGE SOLENOID (2.4L TURBO)
(8W-30-26)
2
A142 16 DG/OR
A142 18 DG/OR
A141 18 DG/WT
2 C105
S136
28 C3
POWERTRAIN CONTROL MODULE (2.0L NGC)
(8W-30-2)
A14 18 RD/WT
4
FUEL PUMP MODULE
(8W-30-9)
(8W-30-25)
POWERTRAIN CONTROL MODULE (2.4L TURBO)
(8W-30-18)
2.0L
2.4L TURBO
6 C101
1 C101
29 C1
19 C3
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-18)
D
TO
S121
(8W-10-25)


FROM
C101
(8W-10-24)
D
NOISE
SUPPRESSOR
(8W-30-4)
(8W-30-20)
A142
18
DG/OR
S121
2
FUEL
INJECTOR
NO. 2
(8W-30-4)
(8W-30-20)
FUEL
INJECTOR
NO. 4
(8W-30-4)
(8W-30-20)
FUEL
INJECTOR
NO. 1
(8W-30-4)
(8W-30-20)
FUEL
INJECTOR
NO. 3
(8W-30-4)
(8W-30-20)
IGNITION
COIL
(8W-30-4)
(8W-30-20)

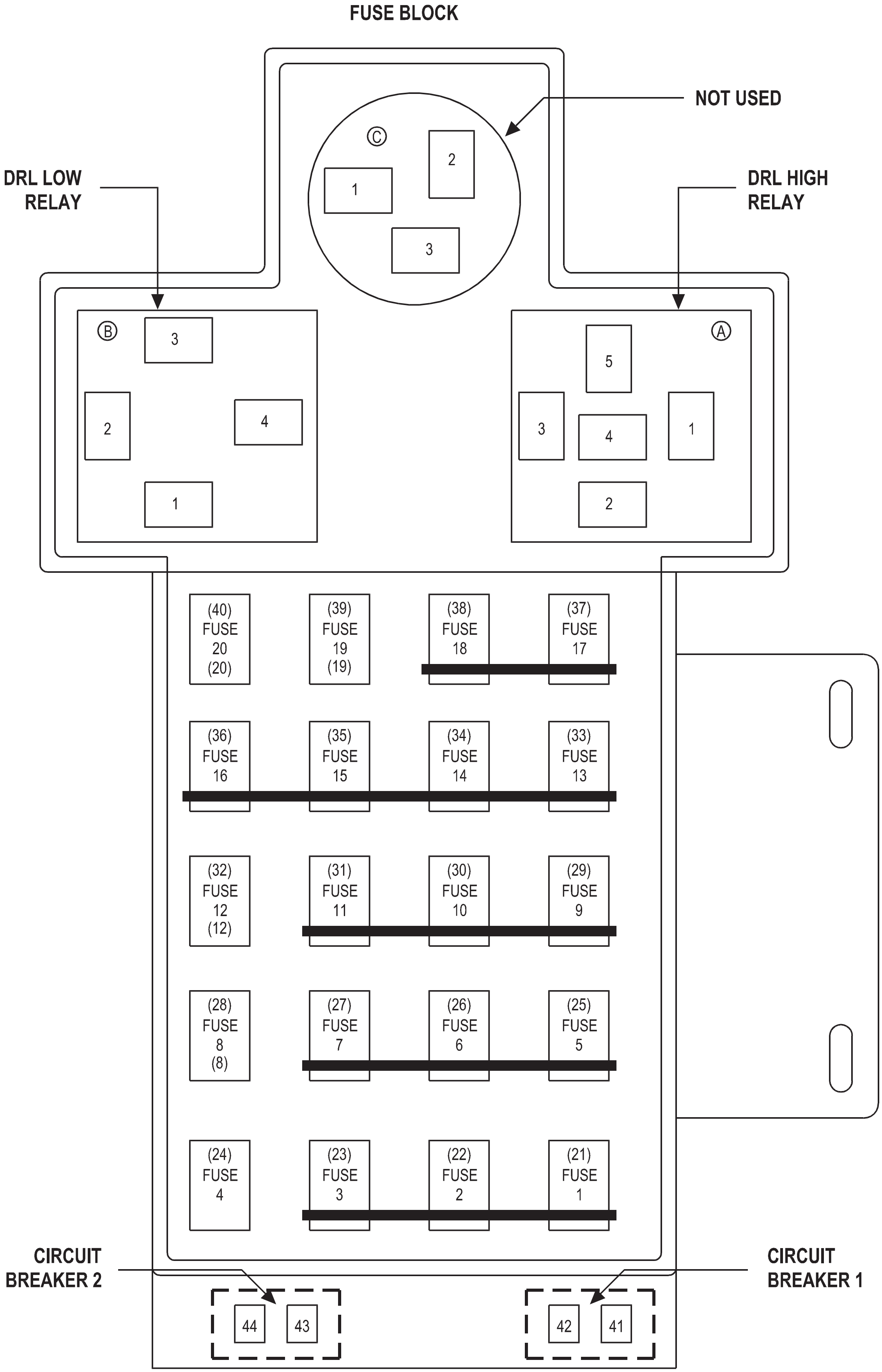

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
22
10A
22
A17
20
RD/BK
30
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
(8W-42-2)
(8W-42-3)
31
32
C3
20
DB/BK
2.0L
2.4L
TURBO
5
C101
3
C101
C3
20
DB/BK
1
A/C
COMPRESSOR
CLUTCH
(8W-42-2)
(8W-42-3)


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
23
15A
23
F32
18
PK/DB
1
BRAKE LAMP SWITCH
(8W-30-27)
2
L50
18
WT/TN
13
C13
C104
18
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
EXPORT
EXCEPT EXPORT
A9
9
C305
S227
S308
F
TO
MULTI-FUNCTION SWITCH
(8W-10-28)
1
C302
3
LEFT TAIL/STOP LAMP
(8W-51-6)
RIGHT TAIL/STOP LAMP
(8W-51-6)
CENTER HIGH MOUNTED STOP LAMP
(8W-51-3)
(8W-51-6)

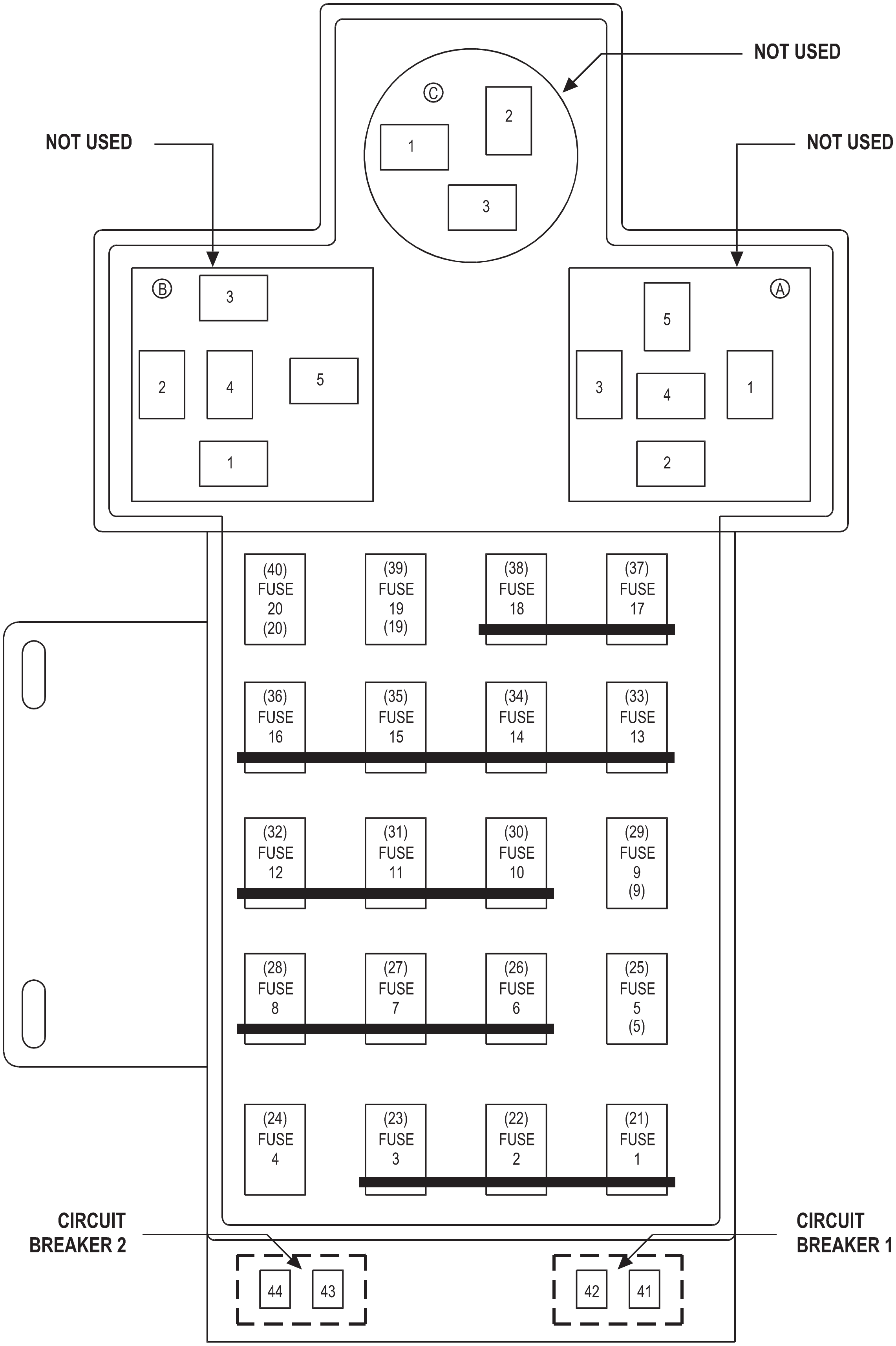

FROM
S227
(8W-10-27)
F
L50
18
WT/TN
RUN-ACC L6
(8W-11-7)
BATT A15
(8W-10-20)
(8W-10-21)
1
MULTI-FUNCTION
SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
(8W-52-4)
(8W-52-9)
COMBINATION
FLASHER
HAZARD
SWITCH
1 0 1 0 1 0 1 0
TURN
SIGNAL
SWITCH
2
3
7
4
6
2
5
L63
18
DG/RD
L62
18
BR/RD
A6
6
A5
5
C305
L63
18
DG/RD
L62
18
BR/RD
3
LEFT
TAIL/STOP/TURN
SIGNAL
LAMP
(8W-51-4)
3
RIGHT
TAIL/STOP/TURN
SIGNAL
LAMP
(8W-51-4)

8W-11 FUSE BLOCK

LHD


FUSE BLOCK
NOT USED
DRL LOW RELAY
DRL HIGH RELAY
C
1
2
3
B
3
2
4
1
A
5
3
4
1
2
(40) FUSE 20 (20)
(39) FUSE 19 (19)
(38) FUSE 18
(37) FUSE 17
(36) FUSE 16
(35) FUSE 15
(34) FUSE 14
(33) FUSE 13
(32) FUSE 12 (12)
(31) FUSE 11
(30) FUSE 10
(29) FUSE 9
(28) FUSE 8 (8)
(27) FUSE 7
(26) FUSE 6
(25) FUSE 5
(24) FUSE 4
(23) FUSE 3
(22) FUSE 2
(21) FUSE 1
CIRCUIT BREAKER 2
CIRCUIT BREAKER 1
44
43
42
41

FUSE BLOCK


NOT USED
NOT USED
NOT USED
C
1
2
3
B
3
2
4
5
1
A
5
3
4
1
2
(40) FUSE 20 (20)
(39) FUSE 19 (19)
(38) FUSE 18
(37) FUSE 17
(36) FUSE 16
(35) FUSE 15
(34) FUSE 14
(33) FUSE 13
(32) FUSE 12
(31) FUSE 11
(30) FUSE 10
(29) FUSE 9 (9)
(28) FUSE 8
(27) FUSE 7
(26) FUSE 6
(25) FUSE 5 (5)
(24) FUSE 4
(23) FUSE 3
(22) FUSE 2
(21) FUSE 1
CIRCUIT BREAKER 2
CIRCUIT BREAKER 1
44
43
42
41

8W-11 FUSE BLOCK
LHD

FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	10A	L6 20RD/WT L6 20RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	20A	V6 16DB V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	20A	F10 18YL/RD X12 18RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	15A	M1 18PK	FUSED B(+)
5	10A	F25 20TN/LG	FUSED IGNITION SWITCH OUTPUT (RUN)
6	20A	C1 14DG	FUSED IGNITION SWITCH OUTPUT (RUN)
7	10A	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
8	15A	L3 14RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
9	10A	F15 20DG/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
10	15A	F12 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	10A	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	10A	A81 20DG/RD ●●●	FUSED B(+)
13	-	-	-
14	20A	F35 18RD ▲▲▲	FUSED B(+)
15	15A	F33 18PK/RD	FUSED B(+)
16	25A	F3 12LB/OR	FUSED B(+)
17	10A	L43 14VT	FUSED LEFT LOW BEAM OUTPUT
18	10A	L44 14VT/RD	FUSED RIGHT LOW BEAM OUTPUT
19	10A	L39 20LB ○○○ L39 20LB ○○○	FRONT FOG LAMP SWITCH OUTPUT
20	-	-	-

CIRCUIT BREAKERS

C.B. NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F21 14TN △	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-	-

●●● AUTOSTICK
○○○ FOG LAMPS
△ POWER OPTIONS
▲▲▲ RKE

RELAYS

DRL HIGH RELAY

CAVITY	CIRCUIT	FUNCTION
A1	L33 14LG/BR	DIMMER SWITCH HIGH BEAM OUTPUT
A2	F3 16LB/OR	FUSED B(+)
A3	L26 16WT/VT	FOG LAMP RELAY CONTROL
A4	L27 16WT/TN	FOG LAMP SWITCH SENSE
A5	F39 16PK/LG	FRONT FOG LAMP SWITCH OUTPUT

DRL LOW RELAY

CAVITY	CIRCUIT	FUNCTION
B1	L94 14OR/WT	LOW BEAM RELAY CONTROL
B2	L26 16WT/VT	FOG LAMP RELAY CONTROL
B3	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
B4	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)

8W-11 FUSE BLOCK
RHD

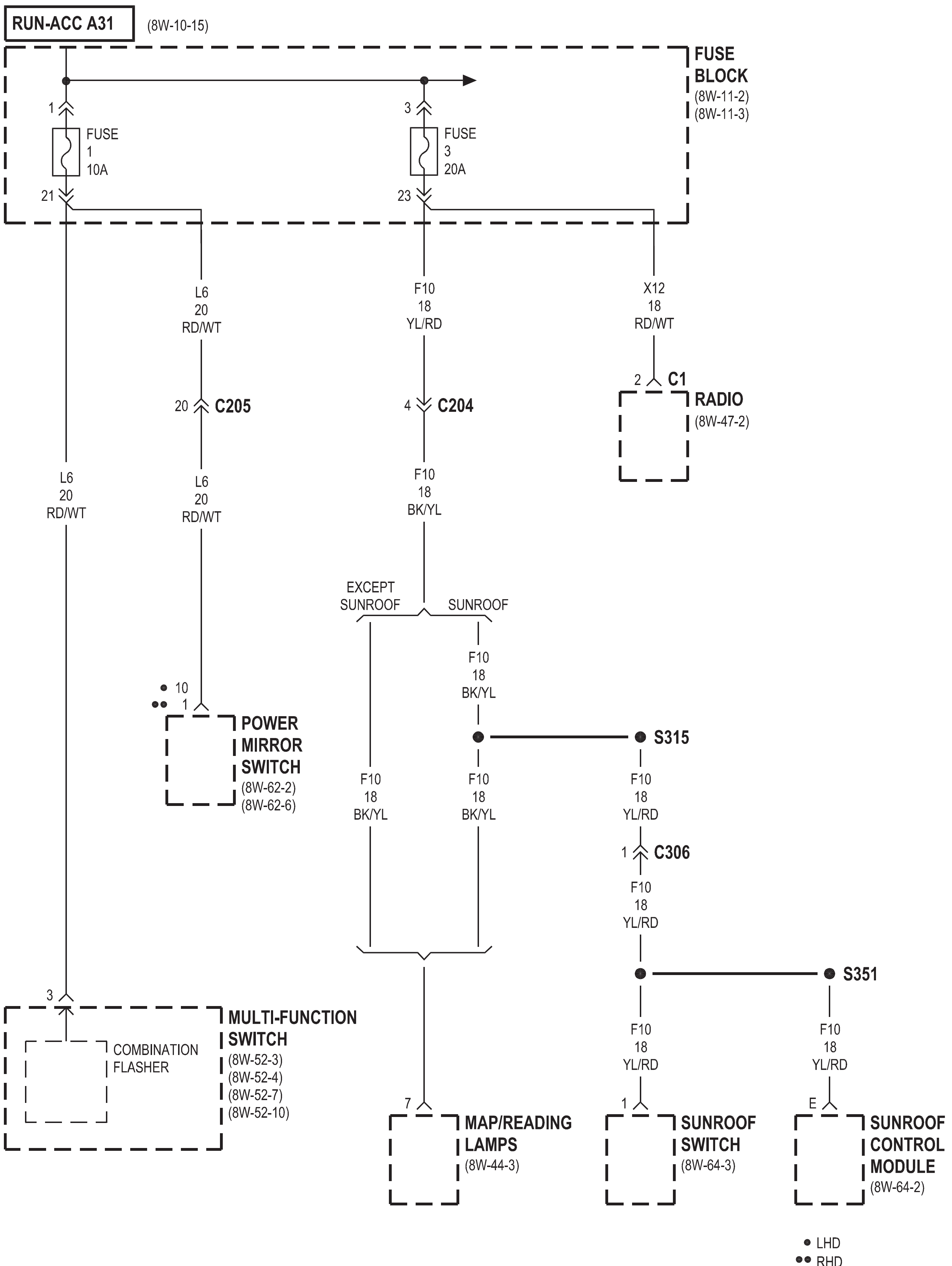
FUSES

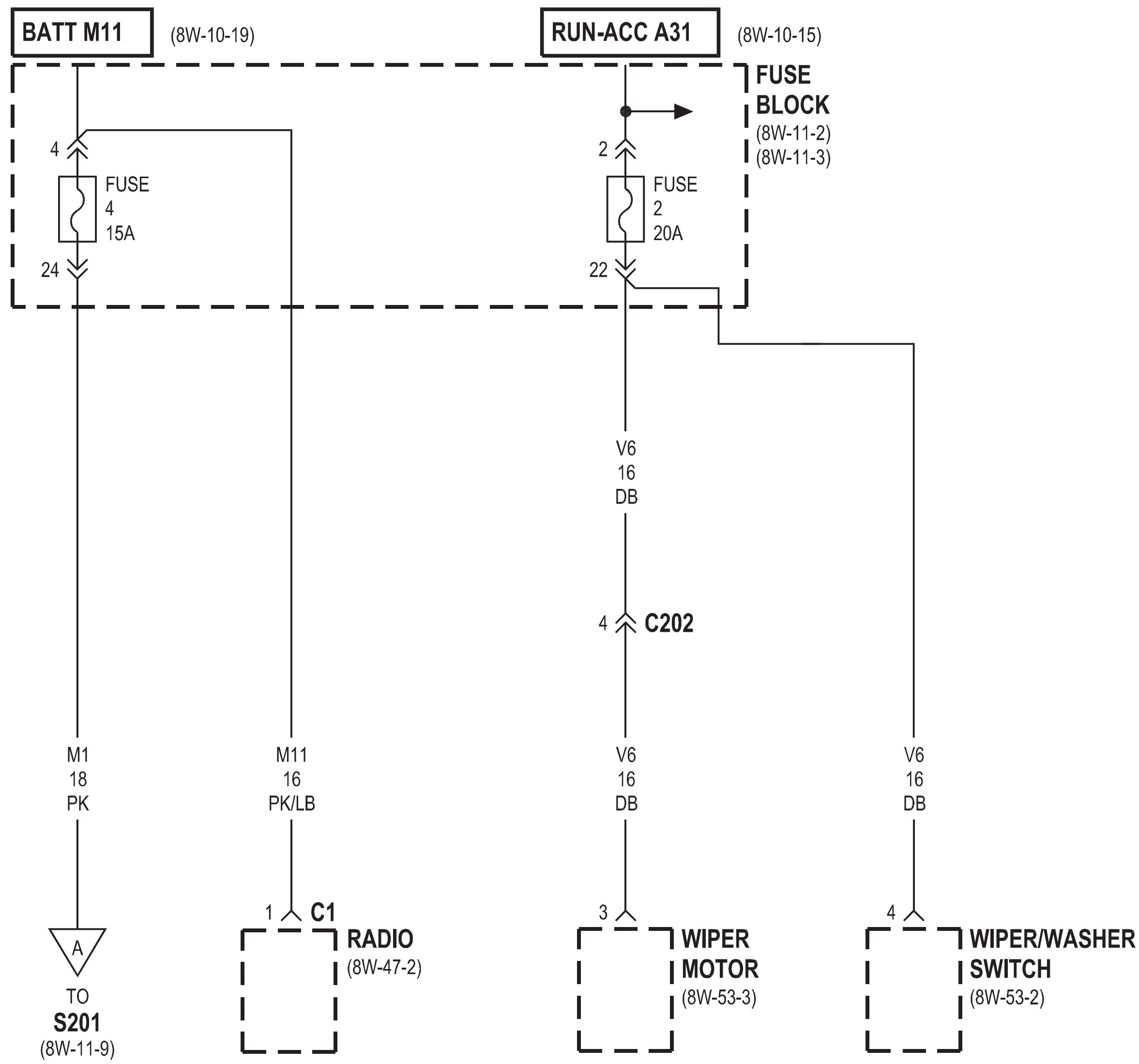
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	10A	L6 20RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
		L6 20RD/WT	
2	20A	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
		V6 16DB	
3	20A	F10 18YL/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
		X12 18RD/WT	
4	15A	M1 18PK	FUSED B(+)
5	15A	L3 14RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
6	10A	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
7	20A	C1 14DG	FUSED IGNITION SWITCH OUTPUT (RUN)
8	10A	F25 20TN/LG	FUSED IGNITION SWITCH OUTPUT (RUN)
9	10A	A81 20DG/RD ●●●	FUSED B(+)
10	10A	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	15A	F12 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	10A	F15 20DG/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
13	20A	A120 16RD/LG	FUSED B(+)
14	20A	F35 18RD ▲▲▲	FUSED B(+)
15	15A	F33 18PK/RD	FUSED B(+)
16	25A	F3 12LB/OR	FUSED B(+)
17	10A	L43 14VT	FUSED LEFT LOW BEAM OUTPUT
18	10A	L44 14VT/RD	FUSED RIGHT LOW BEAM OUTPUT
19	-	-	-
20	10A	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER SWITCH OUTPUT
		C16 20LB/YL	

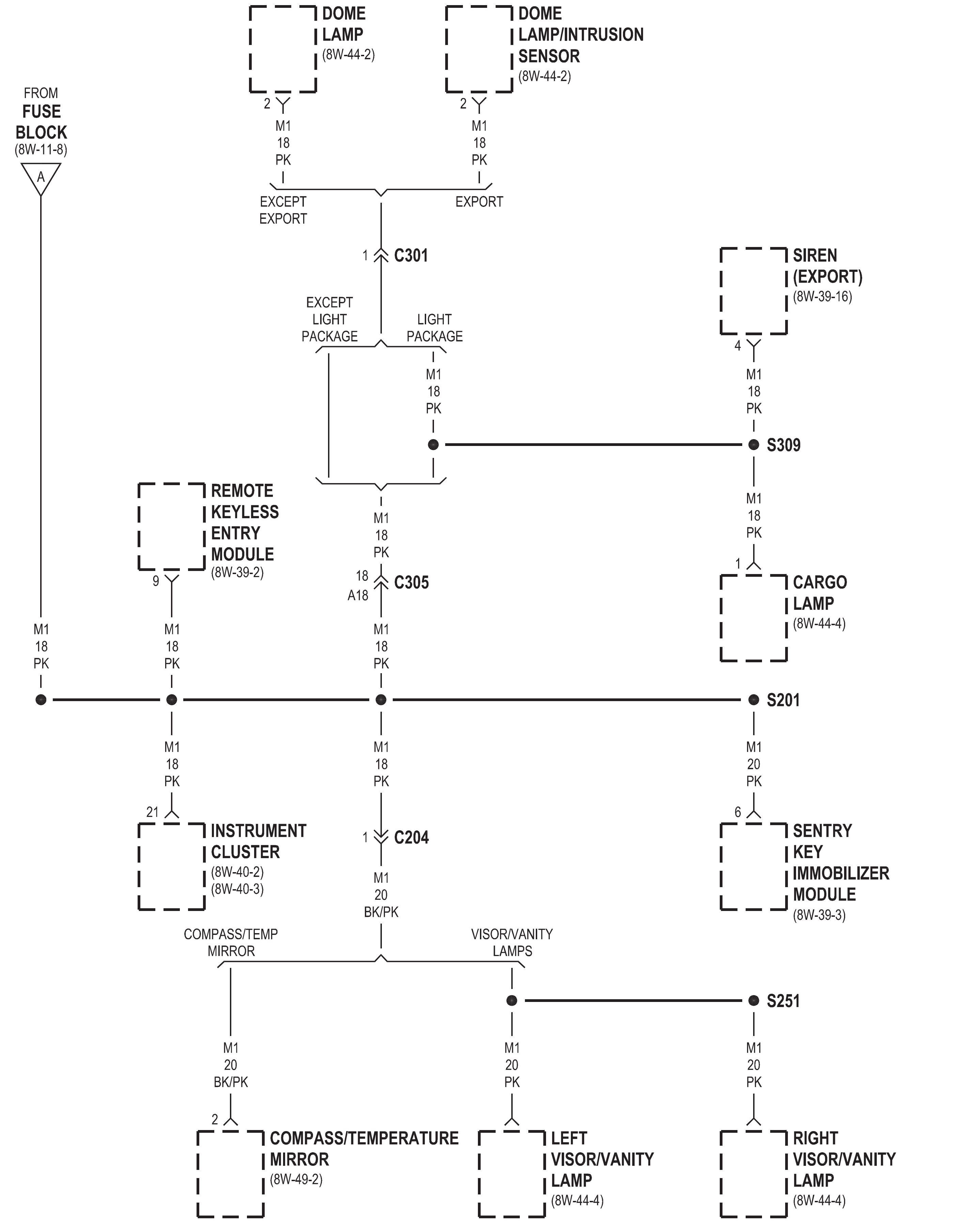
CIRCUIT BREAKERS

C.B. NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F21 14TN △	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-	-

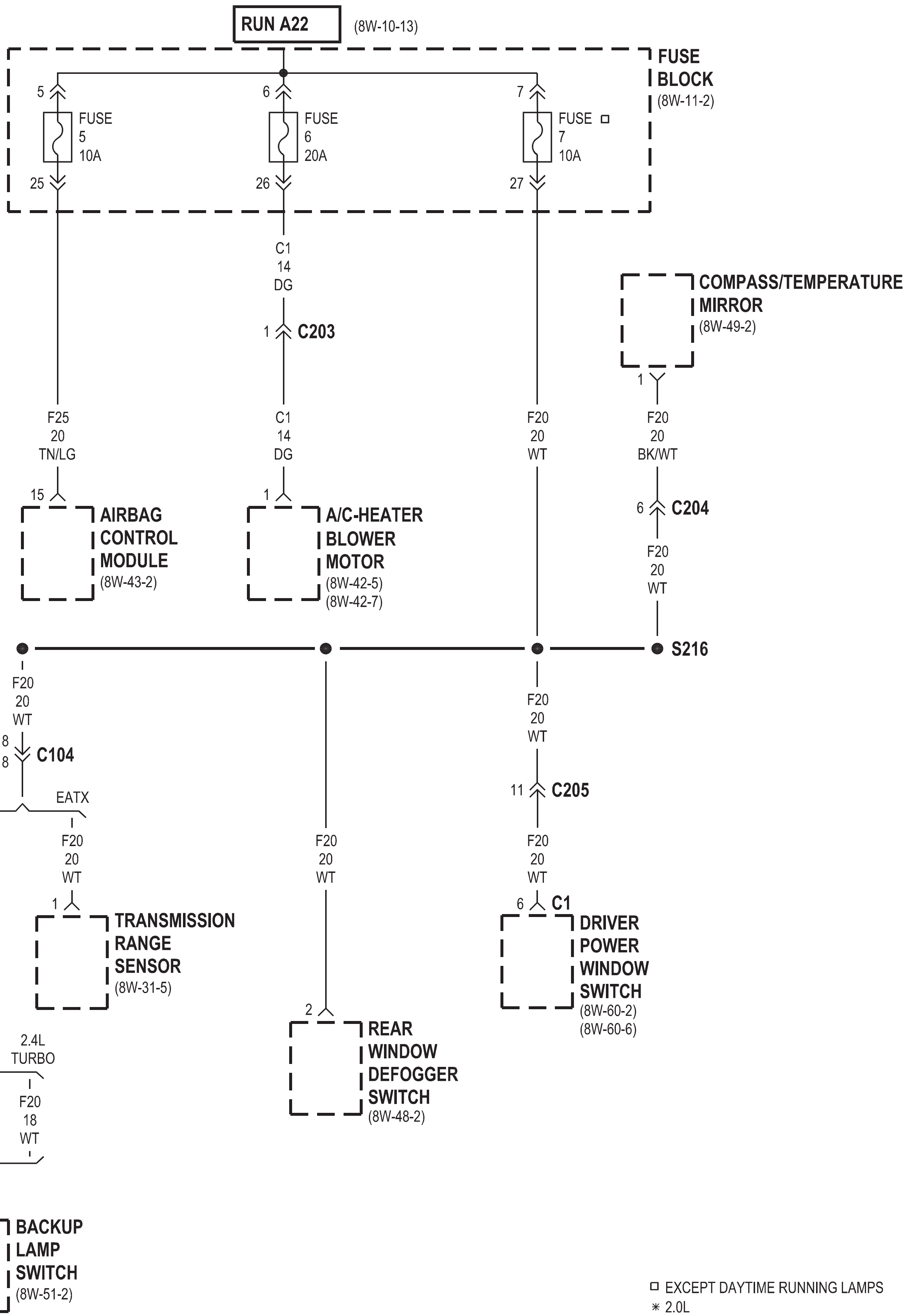
△ POWER OPTIONS
▲▲▲ RKE
●●● AUTOSTICK


RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
1
FUSE
1
10A
21
3
FUSE
3
20A
23
L6
20
RD/WT
20
C205
L6
20
RD/WT
F10
18
YL/RD
4
C204
F10
18
BK/YL
X12
18
RD/WT
2
C1
RADIO
(8W-47-2)
L6
20
RD/WT
EXCEPT
SUNROOF
SUNROOF
F10
18
BK/YL
10
1
POWER
MIRROR
SWITCH
(8W-62-2)
(8W-62-6)
S315
F10
18
BK/YL
F10
18
BK/YL
F10
18
YL/RD
1
C306
F10
18
YL/RD
S351
F10
18
YL/RD
F10
18
YL/RD
3
MULTI-FUNCTION
SWITCH
(8W-52-3)
(8W-52-4)
(8W-52-7)
(8W-52-10)
COMBINATION
FLASHER
7
MAP/READING
LAMPS
(8W-44-3)
1
SUNROOF
SWITCH
(8W-64-3)
E
SUNROOF
CONTROL
MODULE
(8W-64-2)
● LHD
●● RHD

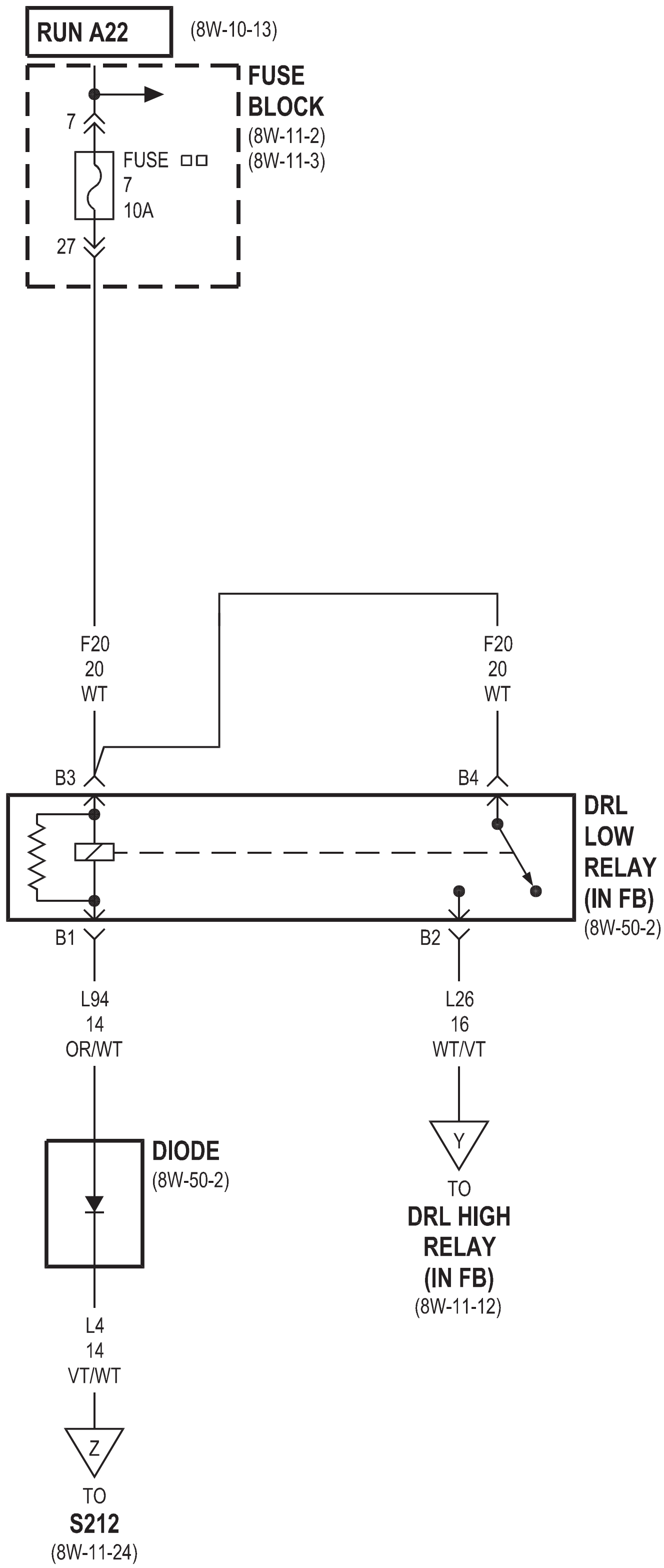

BATT M11
(8W-10-19)
RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
4
FUSE
4
15A
24
2
FUSE
2
20A
22
V6
16
DB
4
C202
M1
18
PK
M11
16
PK/LB
V6
16
DB
V6
16
DB
A
TO
S201
(8W-11-9)
1
C1
RADIO
(8W-47-2)
3
WIPER
MOTOR
(8W-53-3)
4
WIPER/WASHER
SWITCH
(8W-53-2)


DOME
LAMP
(8W-44-2)
DOME
LAMP/INTRUSION
SENSOR
(8W-44-2)
FROM
FUSE
BLOCK
(8W-11-8)
A
2
M1
18
PK
2
M1
18
PK
EXCEPT
EXPORT
EXPORT
1
C301
SIREN
(EXPORT)
(8W-39-16)
EXCEPT
LIGHT
PACKAGE
LIGHT
PACKAGE
M1
18
PK
4
M1
18
PK
S309
M1
18
PK
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-2)
9
M1
18
PK
18
A18
C305
1
CARGO
LAMP
(8W-44-4)
M1
18
PK
M1
18
PK
M1
18
PK
S201
M1
18
PK
M1
18
PK
M1
20
PK
21
INSTRUMENT
CLUSTER
(8W-40-2)
(8W-40-3)
1
C204
M1
20
BK/PK
6
SENTRY
KEY
IMMOBILIZER
MODULE
(8W-39-3)
COMPASS/TEMP
MIRROR
VISOR/VANITY
LAMPS
S251
M1
20
BK/PK
M1
20
PK
M1
20
PK
2
COMPASS/TEMPERATURE
MIRROR
(8W-49-2)
LEFT
VISOR/VANITY
LAMP
(8W-44-4)
RIGHT
VISOR/VANITY
LAMP
(8W-44-4)

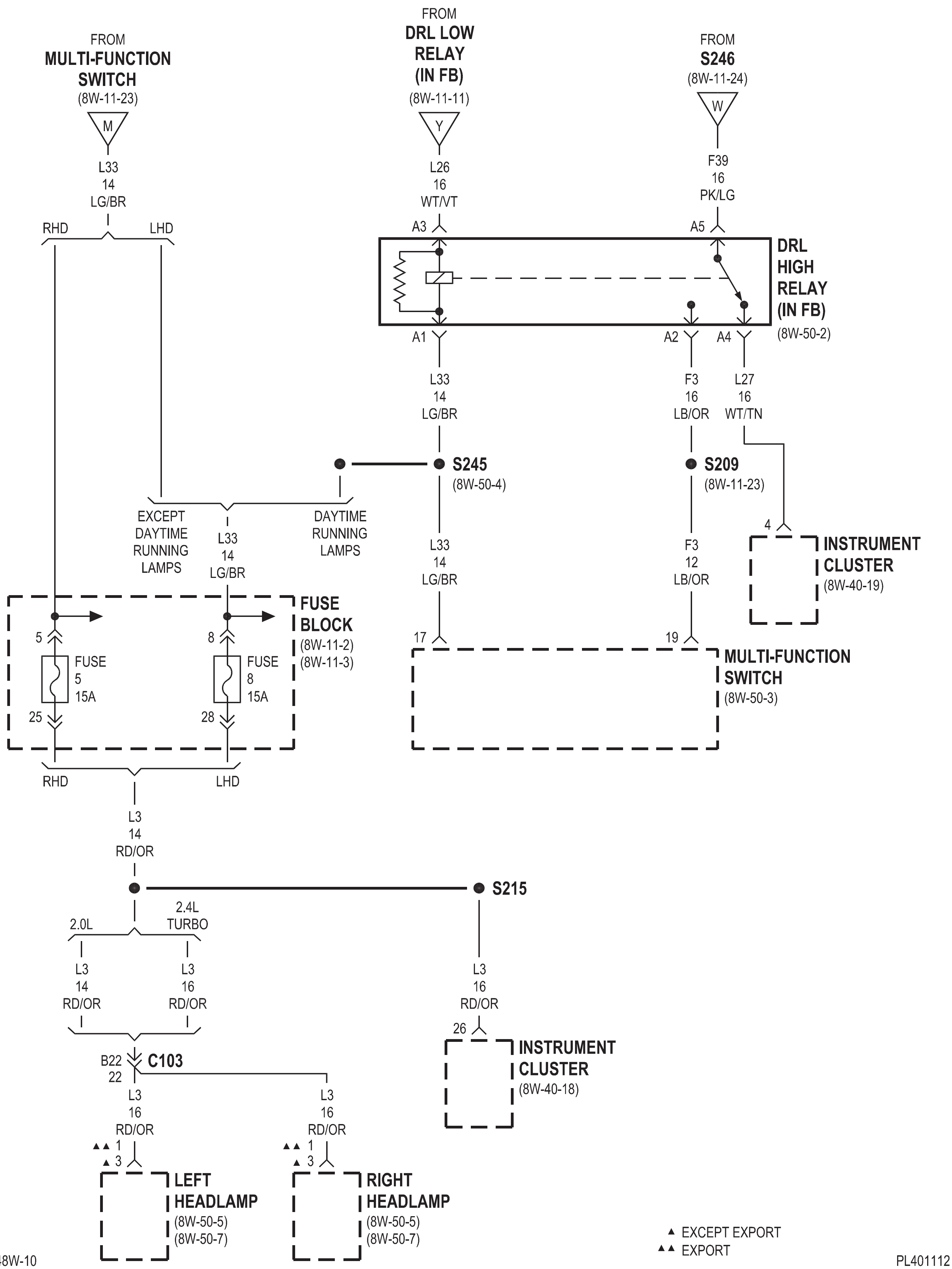
LHD



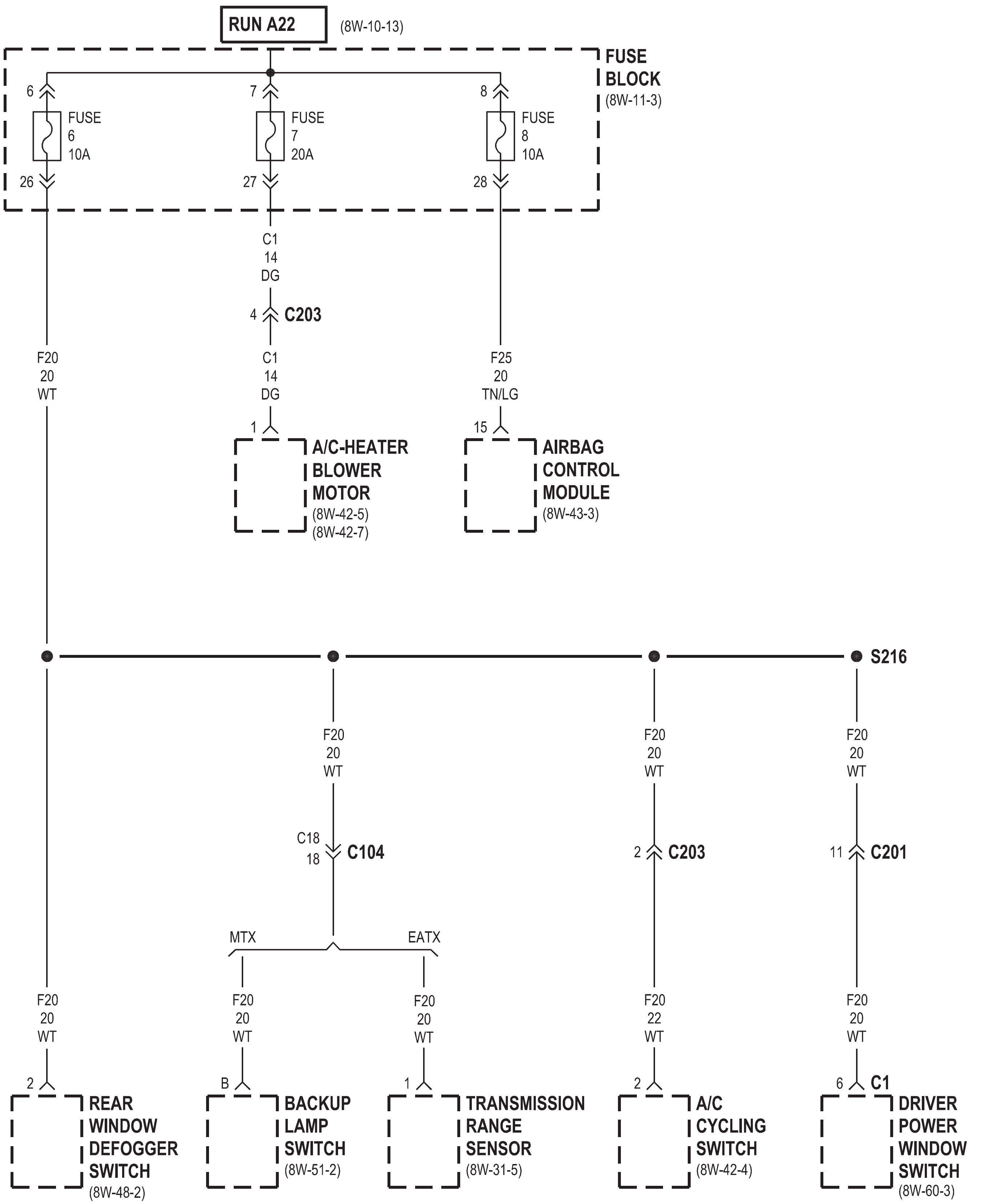
□ EXCEPT DAYTIME RUNNING LAMPS
∗ 2.0L
∗∗ 2.4L TURBO

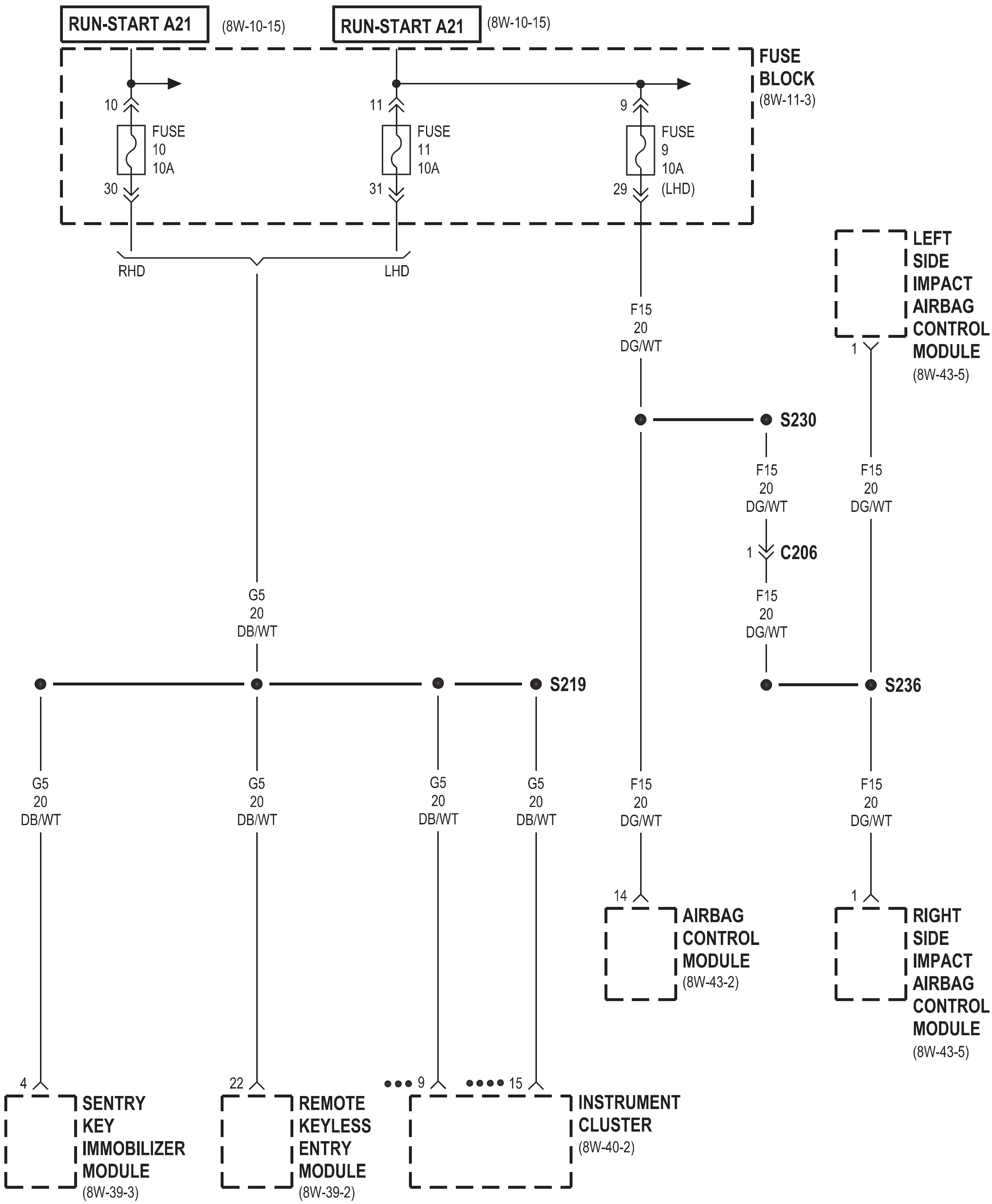


DAYTIME RUNNING LAMPS

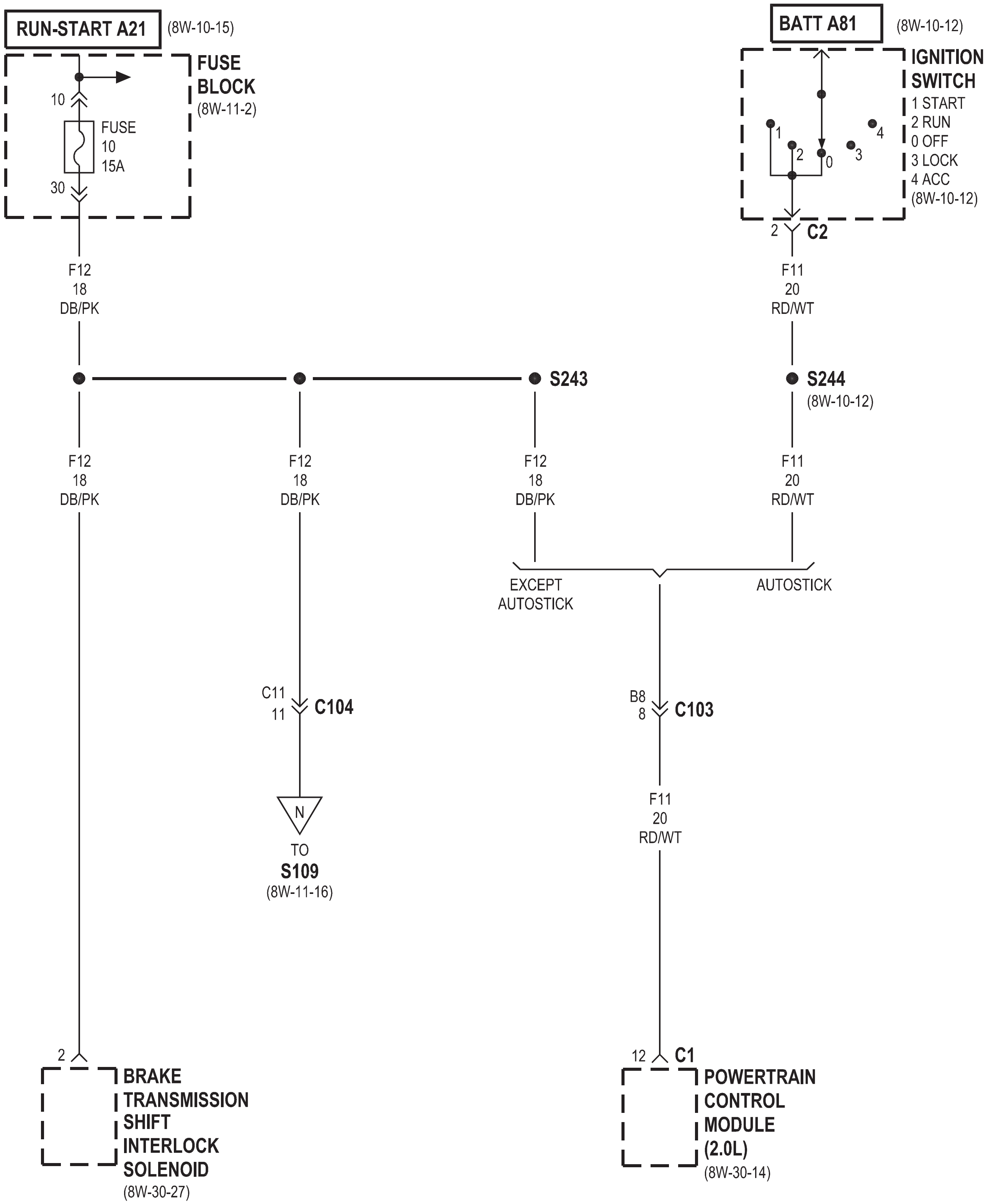

FROM
MULTI-FUNCTION SWITCH
(8W-11-23)
M
L33
14
LG/BR
RHD
LHD
FROM
DRL LOW RELAY (IN FB)
(8W-11-11)
Y
L26
16
WT/VT
FROM
S246
(8W-11-24)
W
F39
16
PK/LG
A3
A5
DRL HIGH RELAY (IN FB)
(8W-50-2)
A1
A2
A4
L33
14
LG/BR
F3
16
LB/OR
L27
16
WT/TN
S245
(8W-50-4)
S209
(8W-11-23)
EXCEPT DAYTIME RUNNING LAMPS
L33
14
LG/BR
DAYTIME RUNNING LAMPS
L33
14
LG/BR
F3
12
LB/OR
4
INSTRUMENT CLUSTER
(8W-40-19)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
5
FUSE
5
15A
25
8
FUSE
8
15A
28
17
19
MULTI-FUNCTION SWITCH
(8W-50-3)
RHD
LHD
L3
14
RD/OR
S215
2.0L
2.4L TURBO
L3
14
RD/OR
L3
16
RD/OR
L3
16
RD/OR
26
INSTRUMENT CLUSTER
(8W-40-18)
B22
22
C103
L3
16
RD/OR
L3
16
RD/OR
▲▲ 1
▲ 3
▲▲ 1
▲ 3
LEFT HEADLAMP
(8W-50-5)
(8W-50-7)
RIGHT HEADLAMP
(8W-50-5)
(8W-50-7)
▲ EXCEPT EXPORT
▲▲ EXPORT

RHD

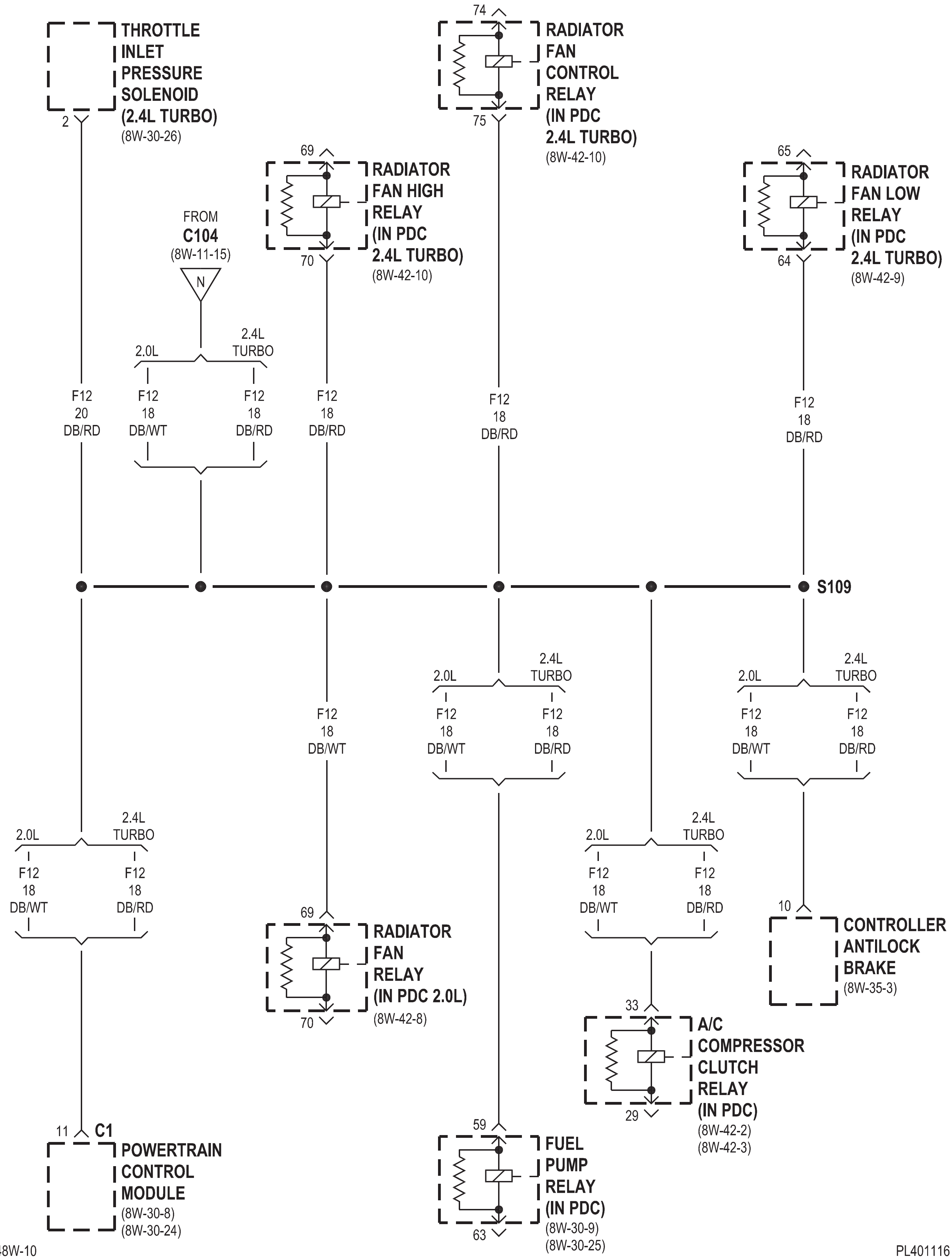

RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-3)
6
7
8
FUSE 6 10A
FUSE 7 20A
FUSE 8 10A
26
27
28
C1 14 DG
4 C203
C1 14 DG
F20 20 WT
F25 20 TN/LG
1
15
A/C-HEATER BLOWER MOTOR
(8W-42-5)
(8W-42-7)
AIRBAG CONTROL MODULE
(8W-43-3)
S216
F20 20 WT
F20 20 WT
F20 20 WT
C18
18
C104
2 C203
11 C201
MTX
EATX
F20 20 WT
F20 20 WT
F20 20 WT
F20 22 WT
F20 20 WT
2
B
1
2
6 C1
REAR WINDOW DEFOGGER SWITCH
(8W-48-2)
BACKUP LAMP SWITCH
(8W-51-2)
TRANSMISSION RANGE SENSOR
(8W-31-5)
A/C CYCLING SWITCH
(8W-42-4)
DRIVER POWER WINDOW SWITCH
(8W-60-3)



••• AUTOSTICK
•••• EXCEPT AUTOSTICK


RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
10
FUSE
10
15A
30
BATT A81
(8W-10-12)
IGNITION
SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-12)
1
2
0
3
4
2
C2
F12
18
DB/PK
F11
20
RD/WT
S243
S244
(8W-10-12)
F12
18
DB/PK
F12
18
DB/PK
F12
18
DB/PK
F11
20
RD/WT
EXCEPT
AUTOSTICK
AUTOSTICK
C11
11
C104
B8
8
C103
N
TO
S109
(8W-11-16)
F11
20
RD/WT
2
BRAKE
TRANSMISSION
SHIFT
INTERLOCK
SOLENOID
(8W-30-27)
12
C1
POWERTRAIN
CONTROL
MODULE
(2.0L)
(8W-30-14)

LHD



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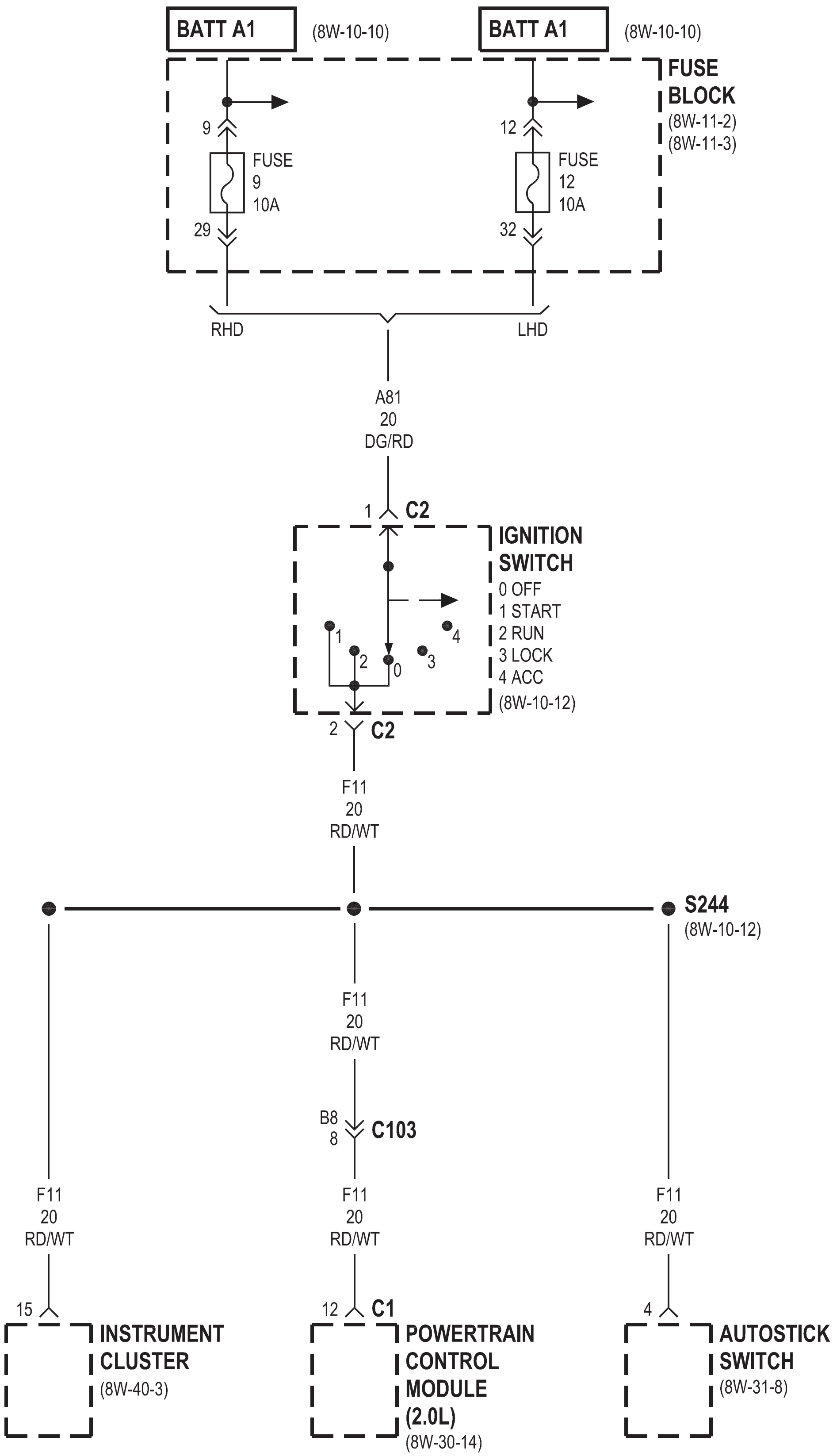
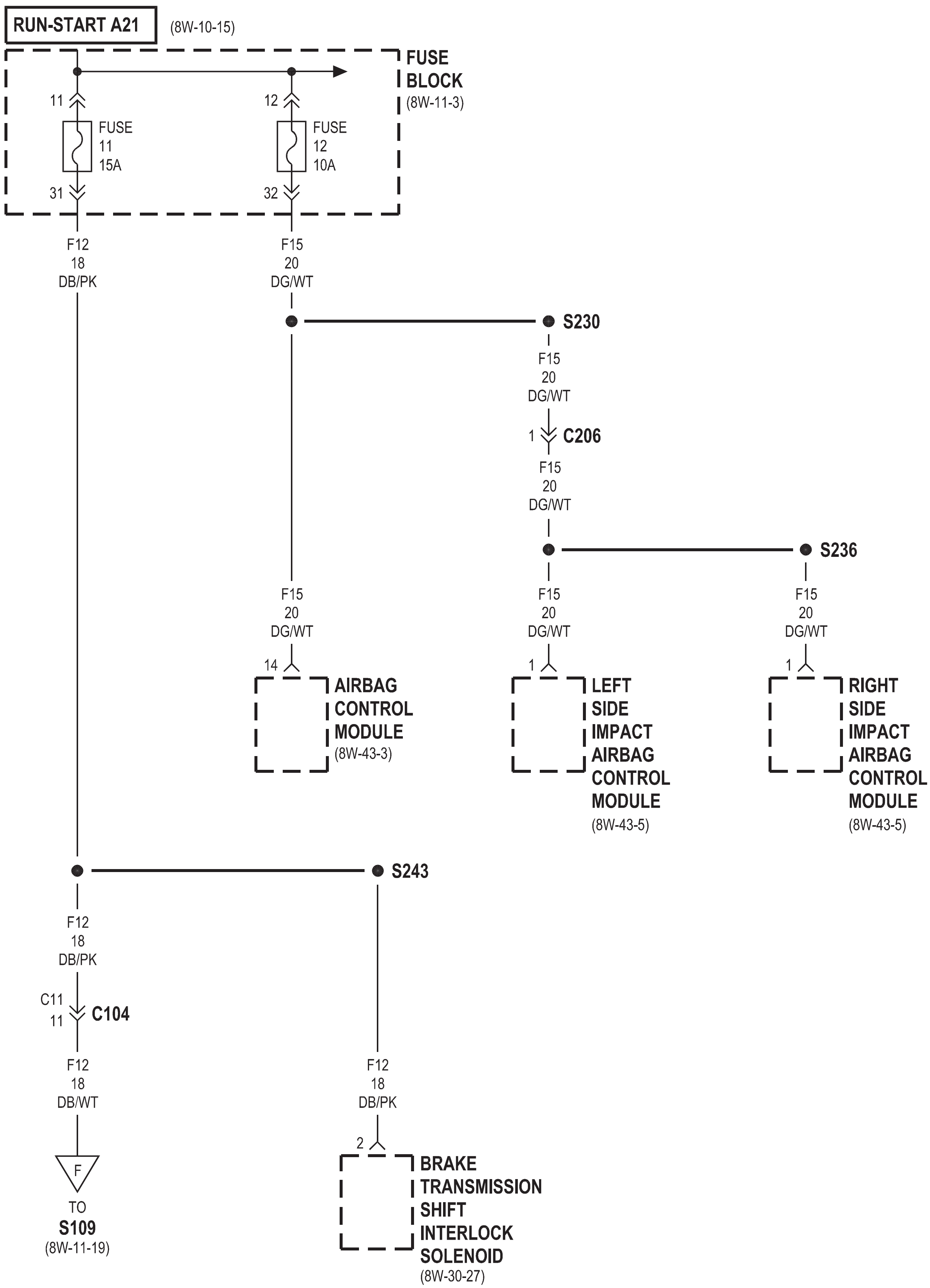
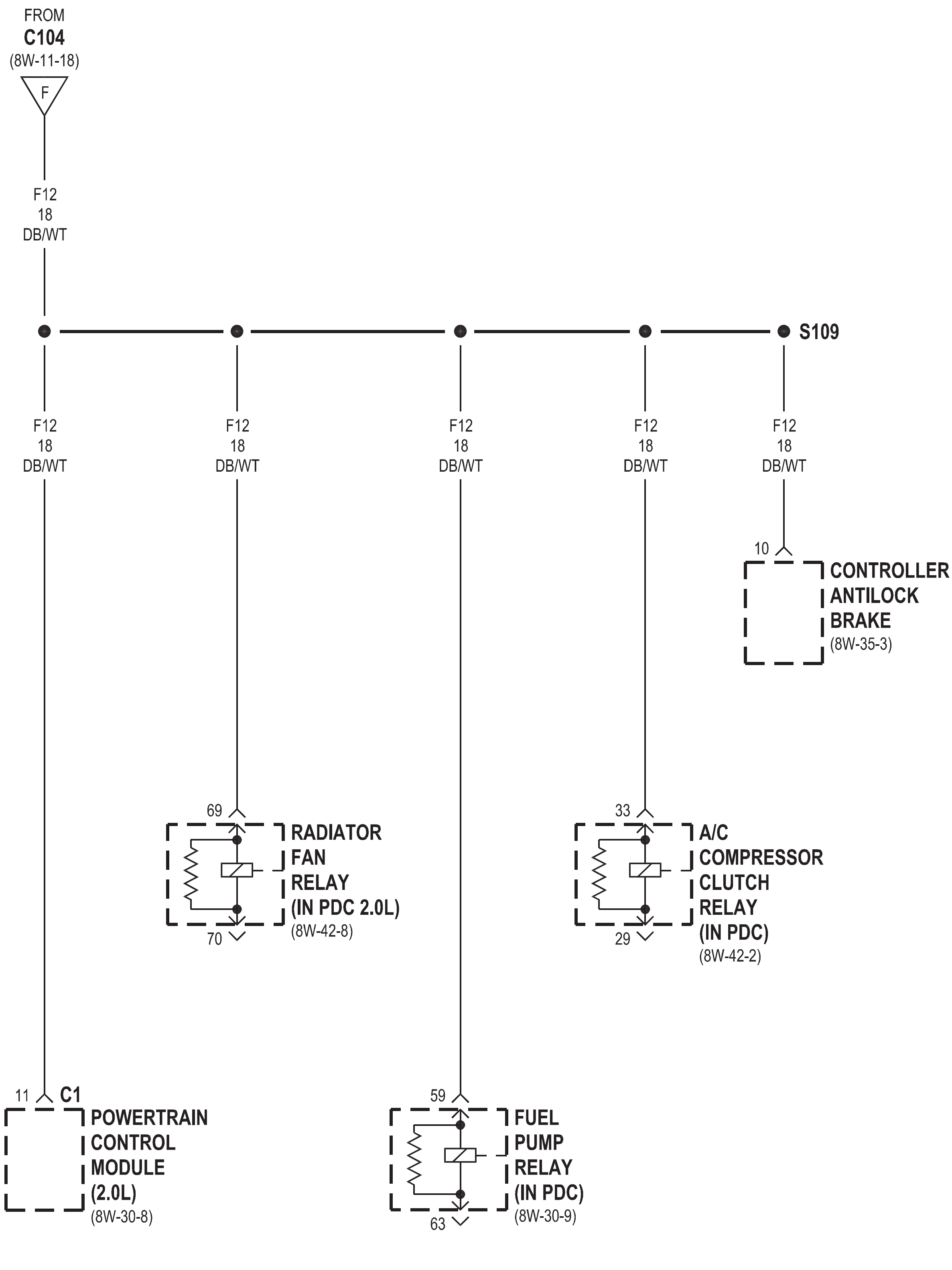
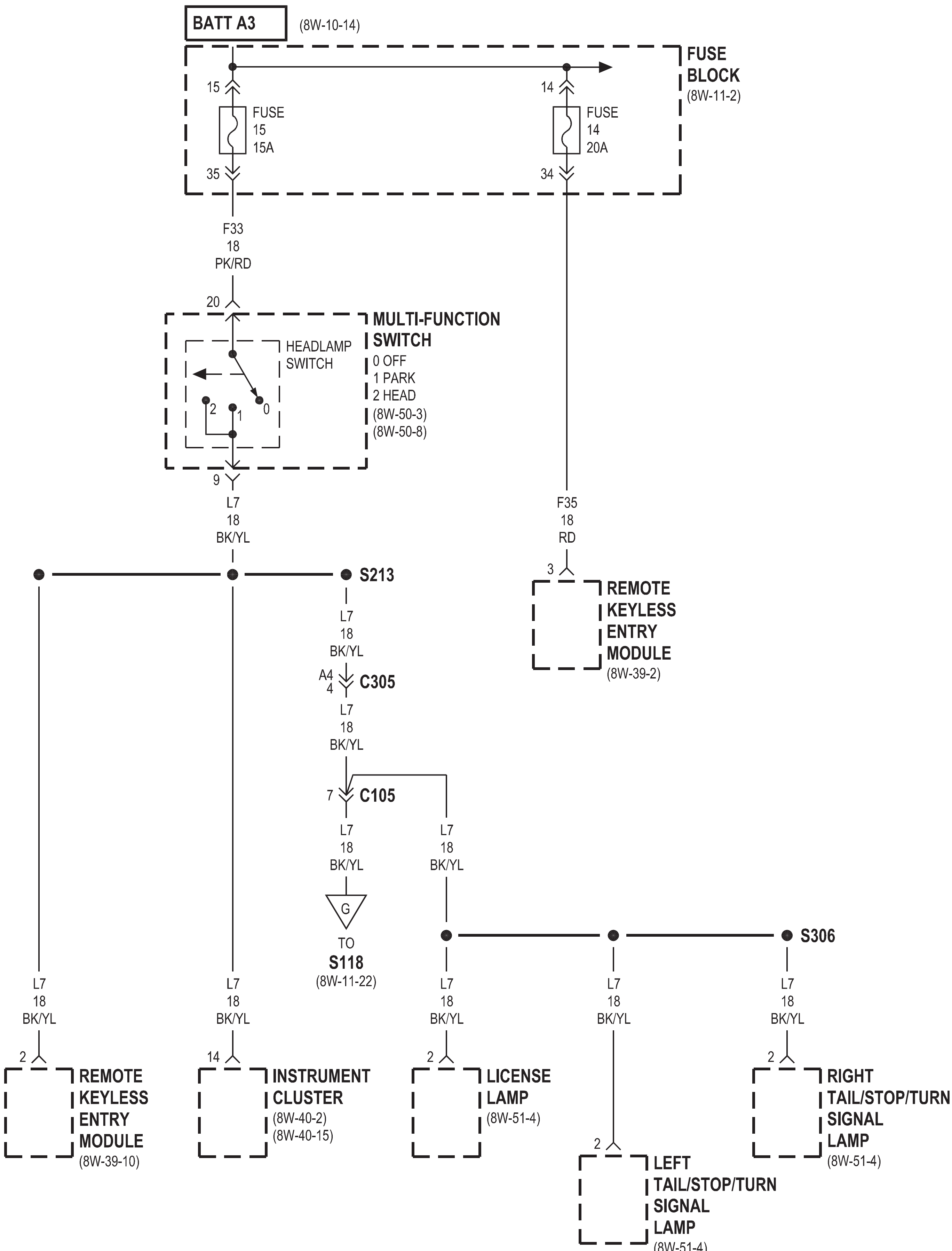
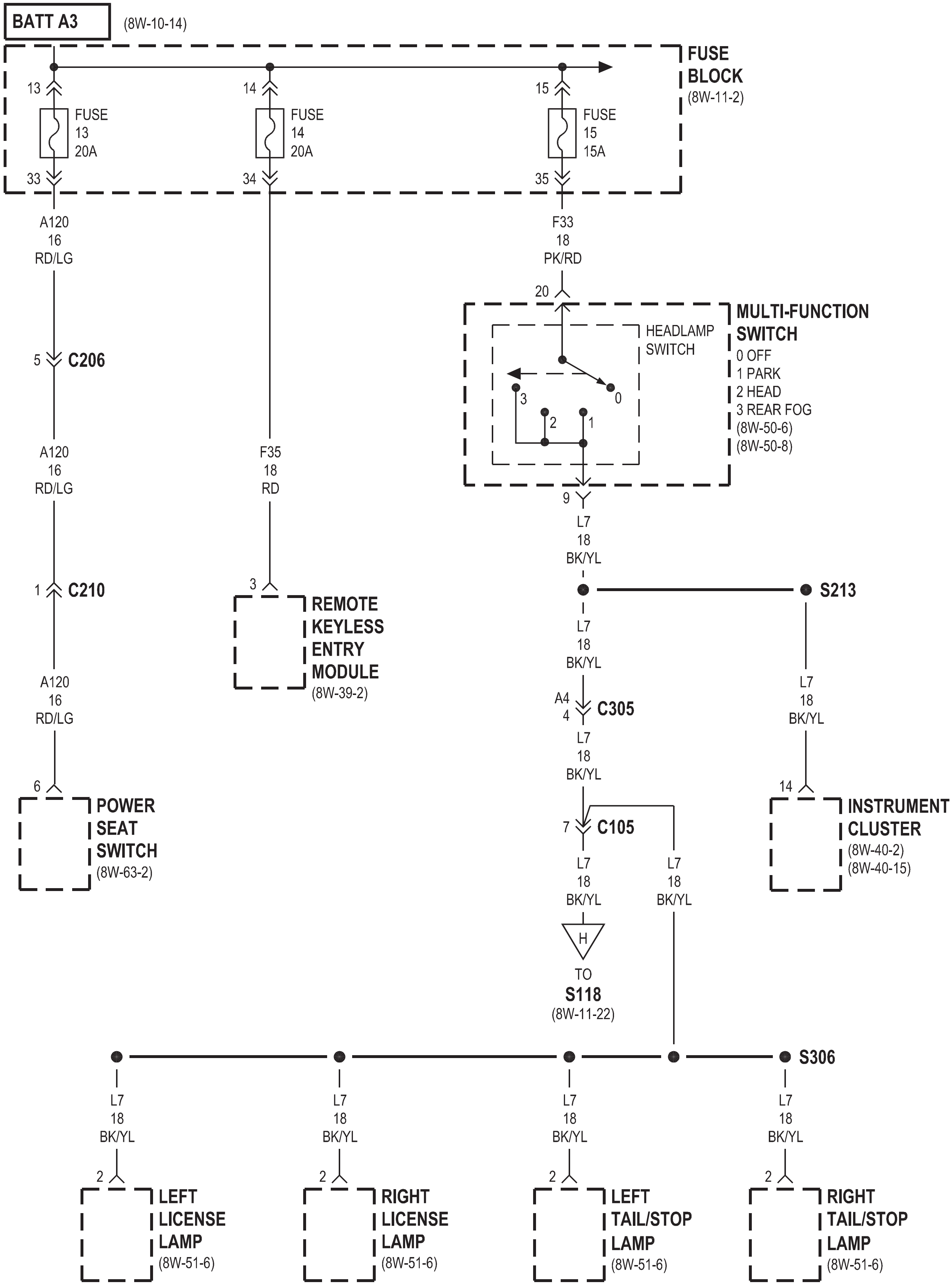
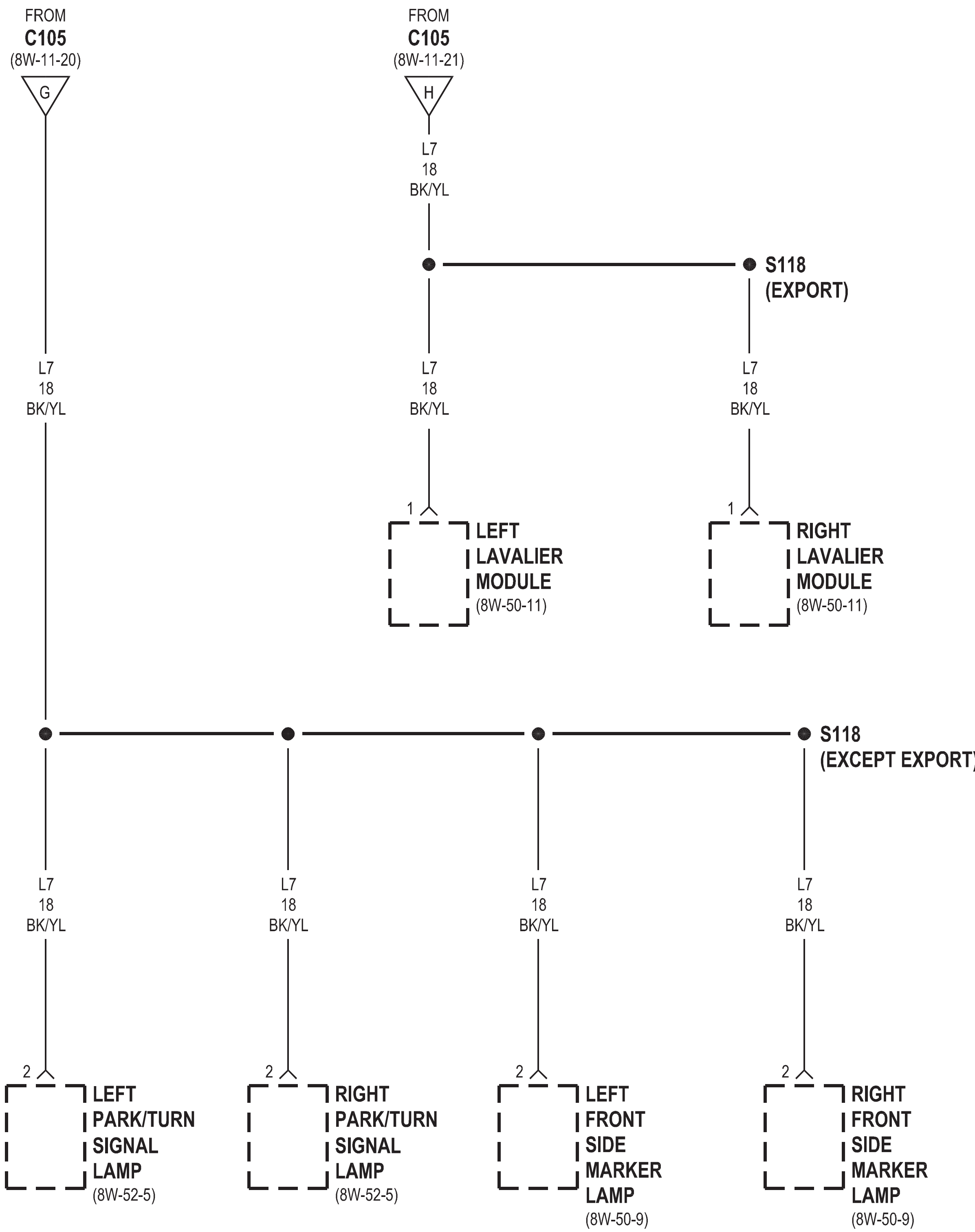

BATT A1
(8W-10-10)
BATT A1
(8W-10-10)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
9
FUSE 9 10A
29
12
FUSE 12 10A
32
RHD
LHD
A81
20
DG/RD
1
C2
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-12)
2
C2
F11
20
RD/WT
S244
(8W-10-12)
F11
20
RD/WT
B8
8
C103
F11
20
RD/WT
F11
20
RD/WT
F11
20
RD/WT
15
INSTRUMENT CLUSTER
(8W-40-3)
12
C1
POWERTRAIN CONTROL MODULE (2.0L)
(8W-30-14)
4
AUTOSTICK SWITCH
(8W-31-8)

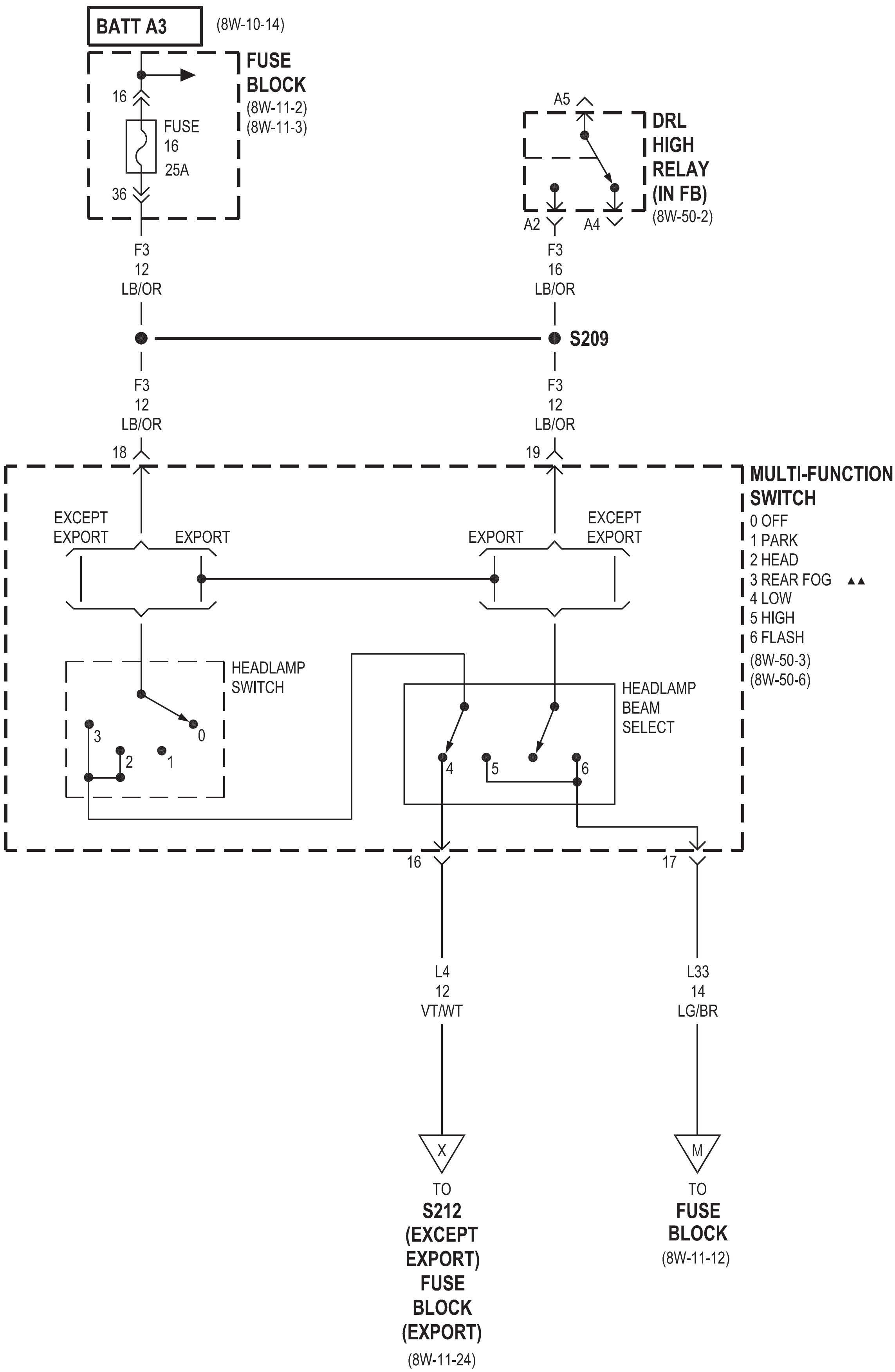

RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-3)
11
12
FUSE 11 15A
FUSE 12 10A
31
32
F12 18 DB/PK
F15 20 DG/WT
S230
F15 20 DG/WT
1 C206
F15 20 DG/WT
S236
F15 20 DG/WT
14
AIRBAG CONTROL MODULE
(8W-43-3)
F15 20 DG/WT
1
LEFT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
F15 20 DG/WT
1
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
S243
F12 18 DB/PK
C11 11 C104
F12 18 DB/WT
F
TO S109
(8W-11-19)
F12 18 DB/PK
2
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID
(8W-30-27)

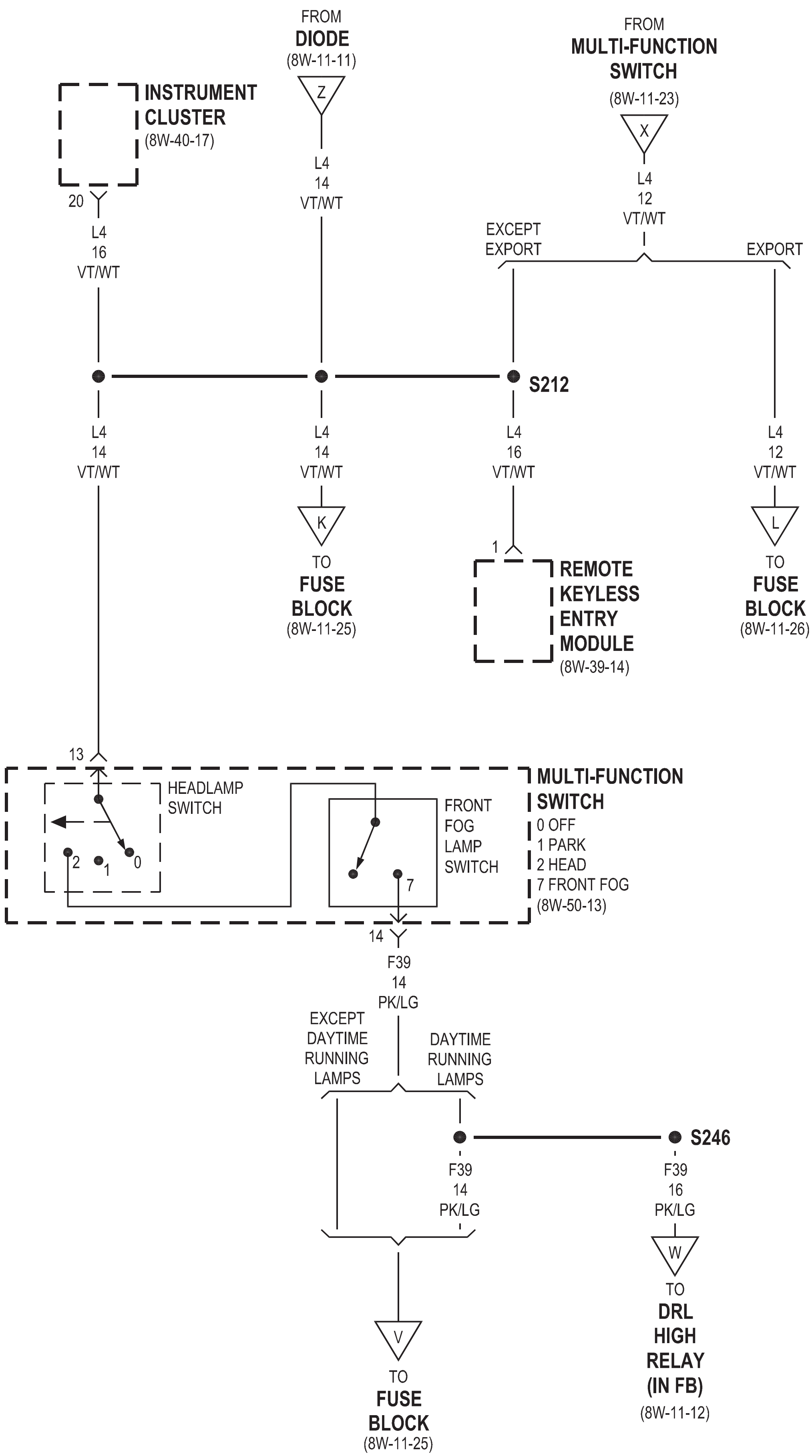

FROM
C104
(8W-11-18)
F
F12
18
DB/WT
S109
F12
18
DB/WT
F12
18
DB/WT
F12
18
DB/WT
F12
18
DB/WT
F12
18
DB/WT
10
CONTROLLER
ANTILOCK
BRAKE
(8W-35-3)
69
70
RADIATOR
FAN
RELAY
(IN PDC 2.0L)
(8W-42-8)
33
29
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
(8W-42-2)
11
C1
POWERTRAIN
CONTROL
MODULE
(2.0L)
(8W-30-8)
59
63
FUEL
PUMP
RELAY
(IN PDC)
(8W-30-9)

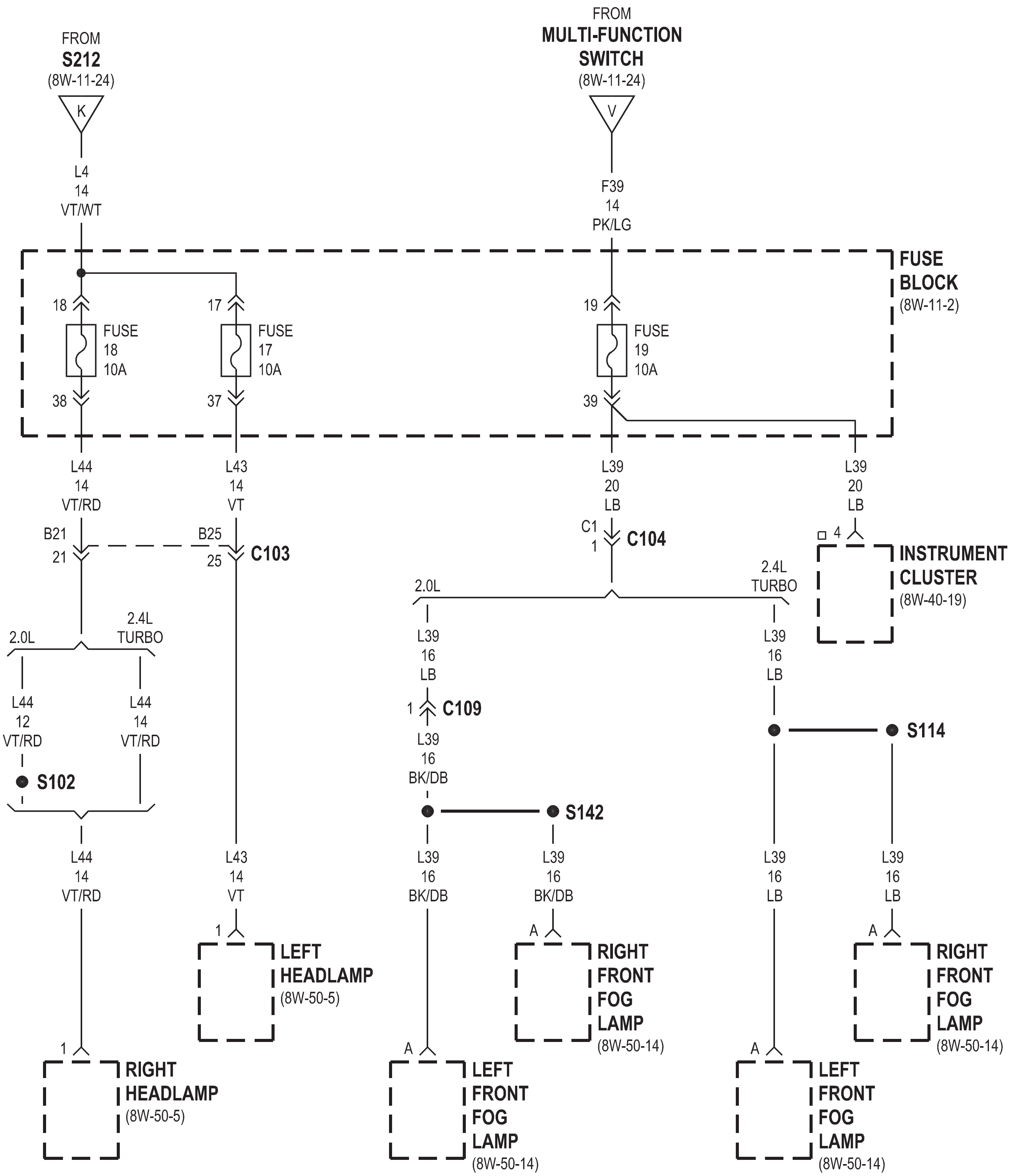

BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
15
FUSE 15 15A
35
14
FUSE 14 20A
34
F33 18 PK/RD
20
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
(8W-50-3)
(8W-50-8)
2 1 0
9
L7 18 BK/YL
F35 18 RD
3
REMOTE KEYLESS ENTRY MODULE
(8W-39-2)
S213
L7 18 BK/YL
A4 4 C305
L7 18 BK/YL
7 C105
L7 18 BK/YL
L7 18 BK/YL
G
TO S118
(8W-11-22)
S306
L7 18 BK/YL
L7 18 BK/YL
L7 18 BK/YL
L7 18 BK/YL
L7 18 BK/YL
L7 18 BK/YL
2
REMOTE KEYLESS ENTRY MODULE
(8W-39-10)
14
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-15)
2
LICENSE LAMP
(8W-51-4)
2
LEFT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
2
RIGHT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)


BATT A3
(8W-10-14)
FUSE
BLOCK
(8W-11-2)
13
FUSE
13
20A
33
14
FUSE
14
20A
34
15
FUSE
15
15A
35
A120
16
RD/LG
5
C206
A120
16
RD/LG
1
C210
A120
16
RD/LG
6
POWER
SEAT
SWITCH
(8W-63-2)
F35
18
RD
3
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-2)
F33
18
PK/RD
20
MULTI-FUNCTION
SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
(8W-50-6)
(8W-50-8)
HEADLAMP
SWITCH
3
0
2
1
9
L7
18
BK/YL
S213
L7
18
BK/YL
A4
4
C305
L7
18
BK/YL
7
C105
L7
18
BK/YL
H
TO
S118
(8W-11-22)
L7
18
BK/YL
14
INSTRUMENT
CLUSTER
(8W-40-2)
(8W-40-15)
S306
L7
18
BK/YL
2
LEFT
LICENSE
LAMP
(8W-51-6)
RIGHT
LICENSE
LAMP
(8W-51-6)
LEFT
TAIL/STOP
LAMP
(8W-51-6)
RIGHT
TAIL/STOP
LAMP
(8W-51-6)

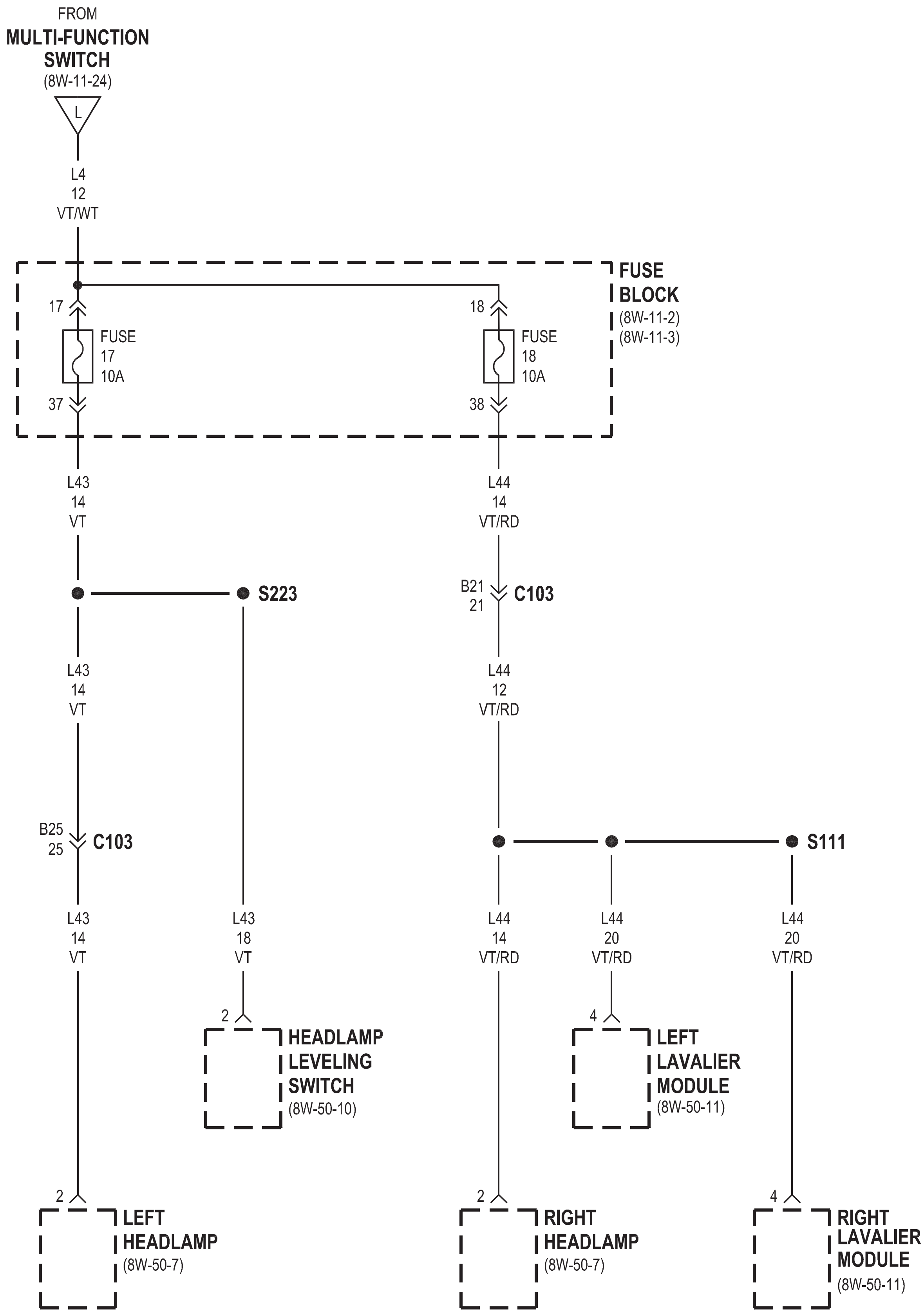

FROM
C105
(8W-11-20)
G
FROM
C105
(8W-11-21)
H
L7
18
BK/YL
S118
(EXPORT)
L7
18
BK/YL
1
LEFT
LAVALIER
MODULE
(8W-50-11)
1
RIGHT
LAVALIER
MODULE
(8W-50-11)
S118
(EXCEPT EXPORT)
2
LEFT
PARK/TURN
SIGNAL
LAMP
(8W-52-5)
2
RIGHT
PARK/TURN
SIGNAL
LAMP
(8W-52-5)
2
LEFT
FRONT
SIDE
MARKER
LAMP
(8W-50-9)
2
RIGHT
FRONT
SIDE
MARKER
LAMP
(8W-50-9)

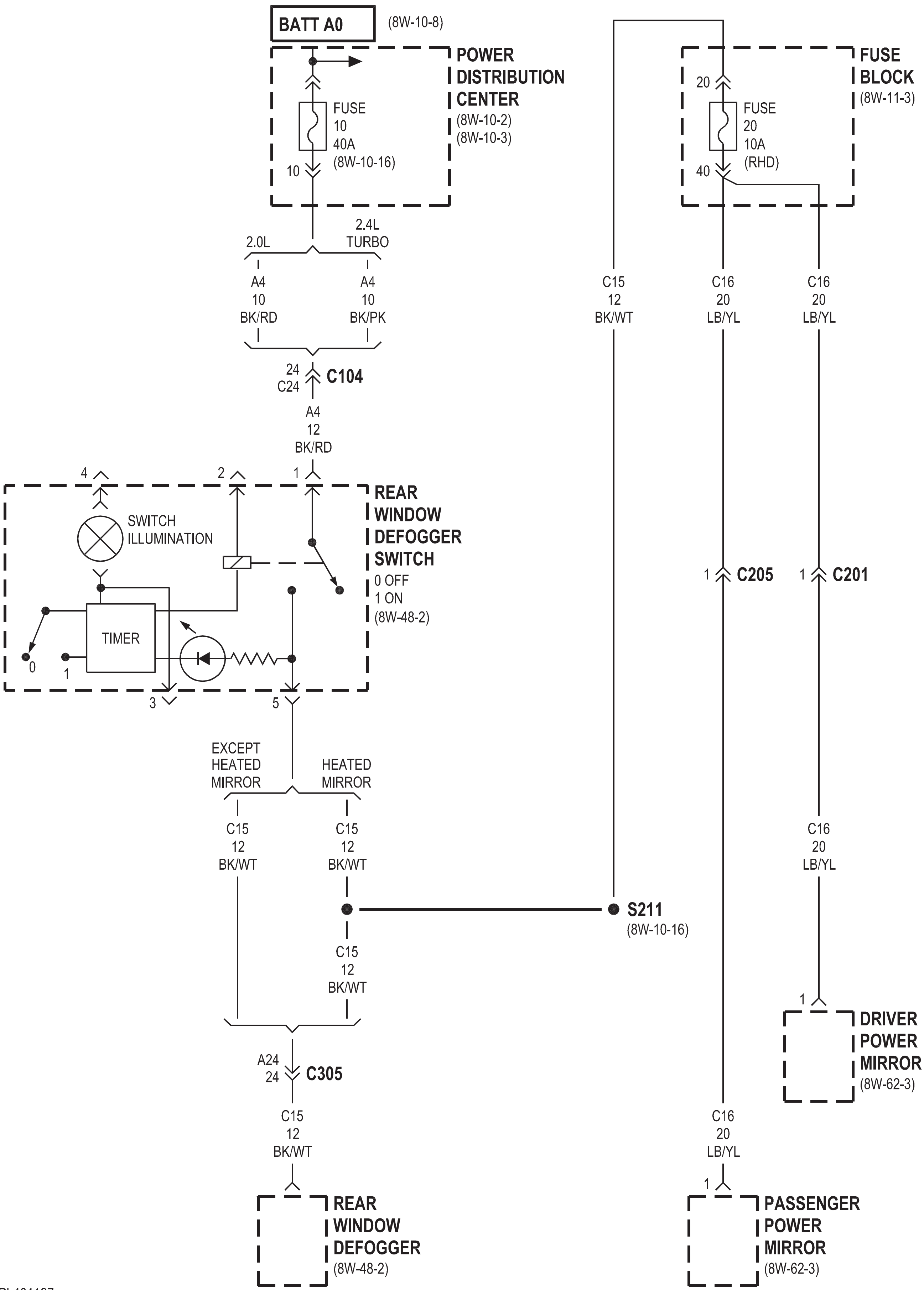

BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
16
FUSE 16 25A
36
DRL HIGH RELAY (IN FB)
(8W-50-2)
A5
A2
A4
F3 12 LB/OR
F3 16 LB/OR
S209
F3 12 LB/OR
F3 12 LB/OR
18
19
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
4 LOW
5 HIGH
6 FLASH
(8W-50-3)
(8W-50-6)
EXCEPT EXPORT
EXPORT
EXPORT
EXCEPT EXPORT
HEADLAMP SWITCH
3
2
1
0
HEADLAMP BEAM SELECT
4
5
6
16
17
L4 12 VT/WT
L33 14 LG/BR
X
M
TO S212 (EXCEPT EXPORT) FUSE BLOCK (EXPORT)
(8W-11-24)
TO FUSE BLOCK
(8W-11-12)
▲▲ EXPORT

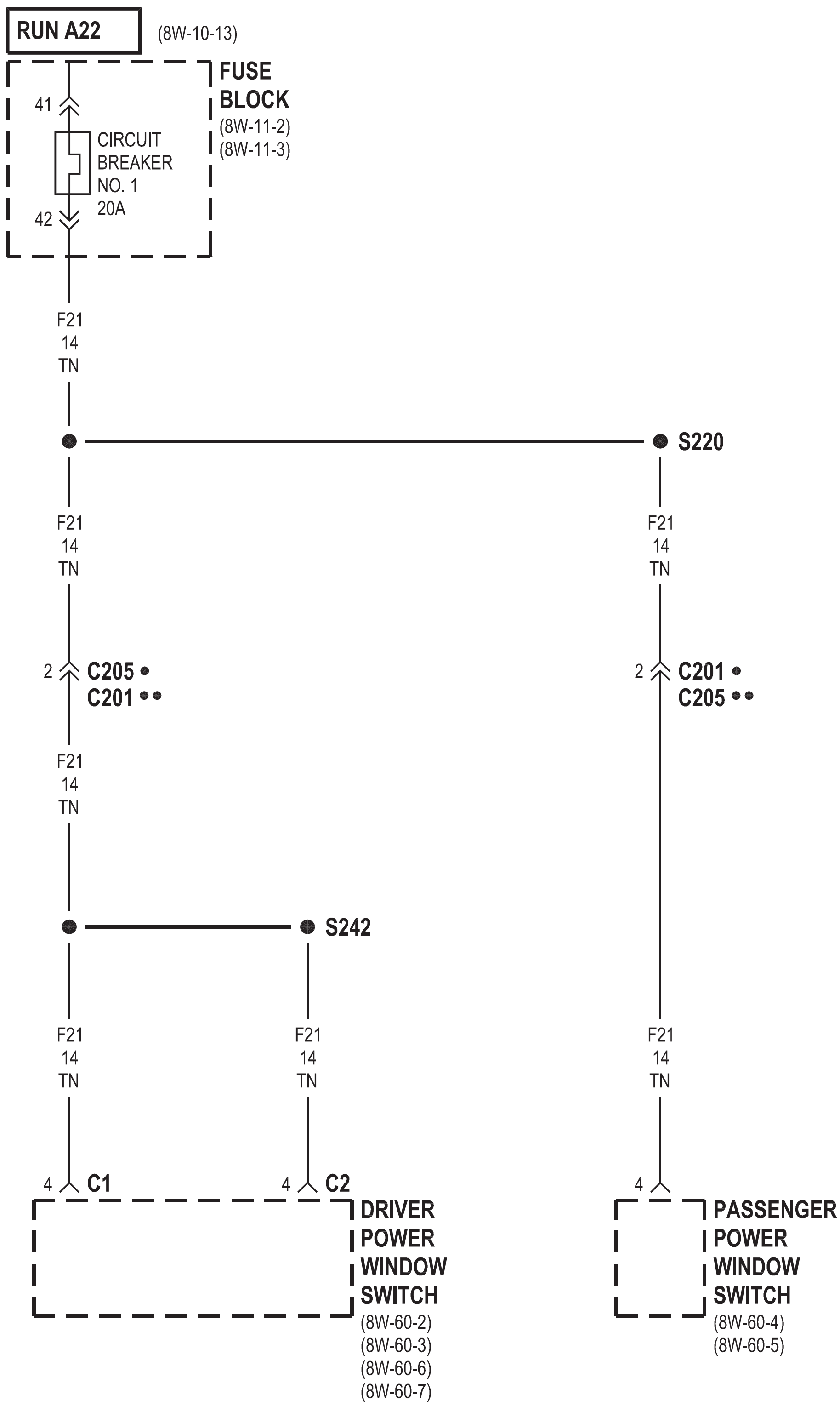

FROM
DIODE
(8W-11-11)
Z
L4
14
VT/WT
FROM
MULTI-FUNCTION
SWITCH
(8W-11-23)
X
L4
12
VT/WT
INSTRUMENT
CLUSTER
(8W-40-17)
20
L4
16
VT/WT
EXCEPT
EXPORT
EXPORT
S212
L4
14
VT/WT
L4
14
VT/WT
K
TO
FUSE
BLOCK
(8W-11-25)
L4
16
VT/WT
1
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-14)
L4
12
VT/WT
L
TO
FUSE
BLOCK
(8W-11-26)
13
HEADLAMP
SWITCH
2
1
0
FRONT
FOG
LAMP
SWITCH
7
MULTI-FUNCTION
SWITCH
0 OFF
1 PARK
2 HEAD
7 FRONT FOG
(8W-50-13)
14
F39
14
PK/LG
EXCEPT
DAYTIME
RUNNING
LAMPS
DAYTIME
RUNNING
LAMPS
S246
F39
14
PK/LG
F39
16
PK/LG
W
TO
DRL
HIGH
RELAY
(IN FB)
(8W-11-12)
V
TO
FUSE
BLOCK
(8W-11-25)



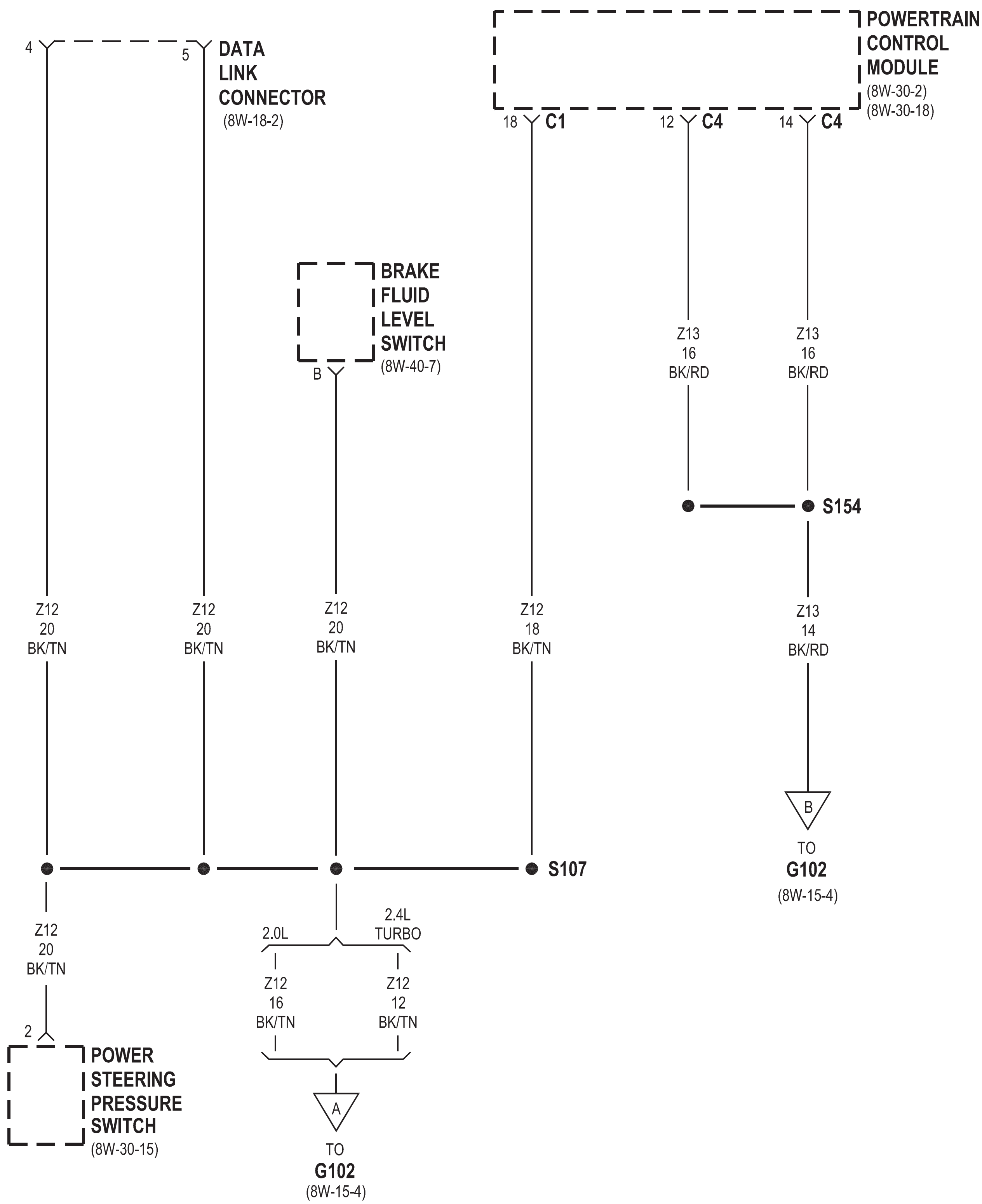
□ EXCEPT DAYTIME RUNNING LAMPS


FROM
MULTI-FUNCTION
SWITCH
(8W-11-24)
L
L4
12
VT/WT
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
17
FUSE
17
10A
37
18
FUSE
18
10A
38
L43
14
VT
L44
14
VT/RD
S223
B21
21
C103
L43
14
VT
L44
12
VT/RD
B25
25
C103
S111
L43
14
VT
L43
18
VT
L44
14
VT/RD
L44
20
VT/RD
L44
20
VT/RD
2
HEADLAMP
LEVELING
SWITCH
(8W-50-10)
4
LEFT
LAVALIER
MODULE
(8W-50-11)
2
LEFT
HEADLAMP
(8W-50-7)
2
RIGHT
HEADLAMP
(8W-50-7)
4
RIGHT
LAVALIER
MODULE
(8W-50-11)

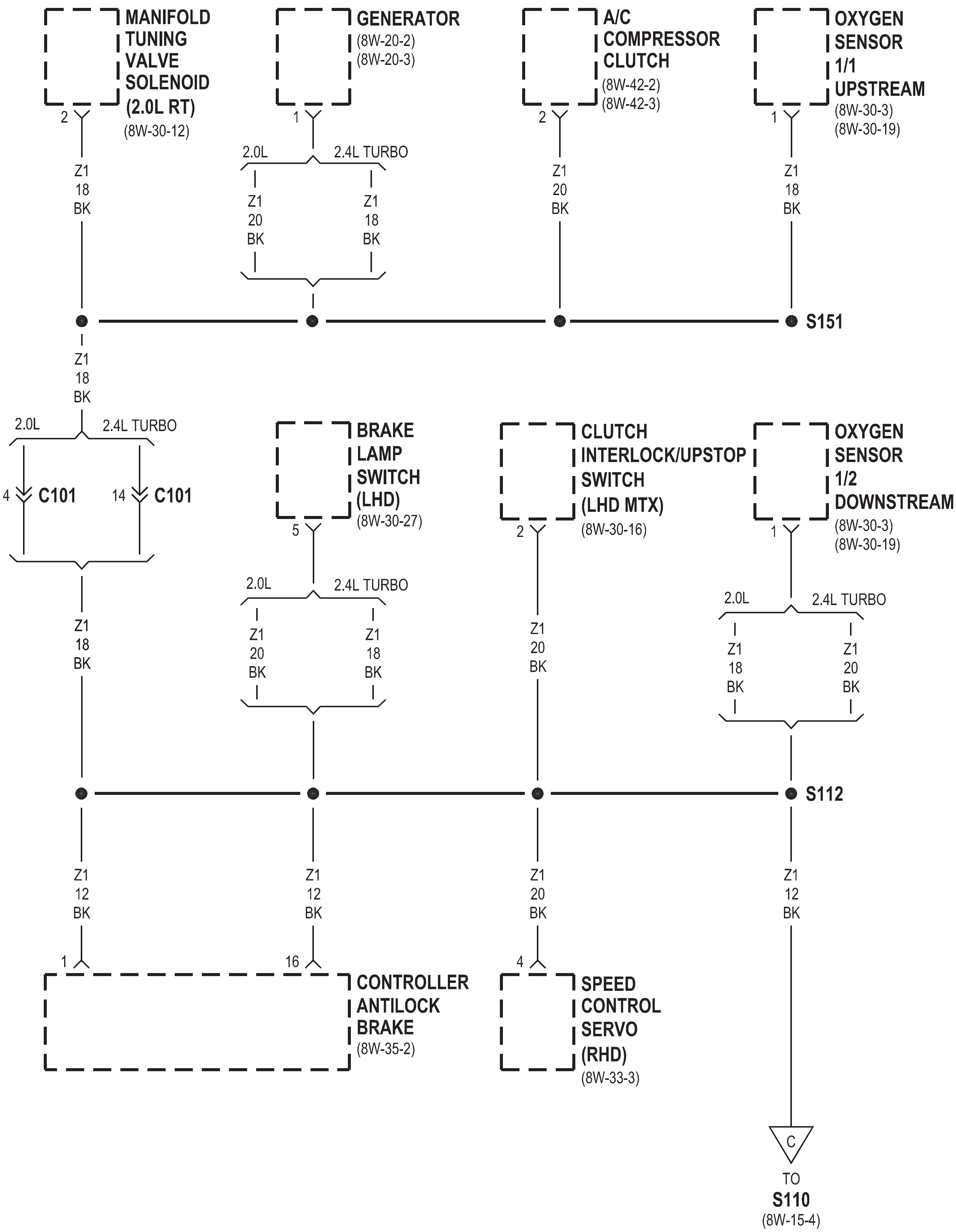

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
10
40A
(8W-10-16)
10
2.0L
2.4L
TURBO
A4
10
BK/RD
A4
10
BK/PK
24
C24
C104
A4
12
BK/RD
4
2
1
REAR
WINDOW
DEFOGGER
SWITCH
0 OFF
1 ON
(8W-48-2)
SWITCH
ILLUMINATION
TIMER
0
1
3
5
EXCEPT
HEATED
MIRROR
HEATED
MIRROR
C15
12
BK/WT
C15
12
BK/WT
S211
(8W-10-16)
C15
12
BK/WT
A24
24
C305
C15
12
BK/WT
REAR
WINDOW
DEFOGGER
(8W-48-2)
FUSE
BLOCK
(8W-11-3)
20
FUSE
20
10A
(RHD)
40
C15
12
BK/WT
C16
20
LB/YL
C16
20
LB/YL
1
C205
1
C201
C16
20
LB/YL
1
DRIVER
POWER
MIRROR
(8W-62-3)
C16
20
LB/YL
1
PASSENGER
POWER
MIRROR
(8W-62-3)

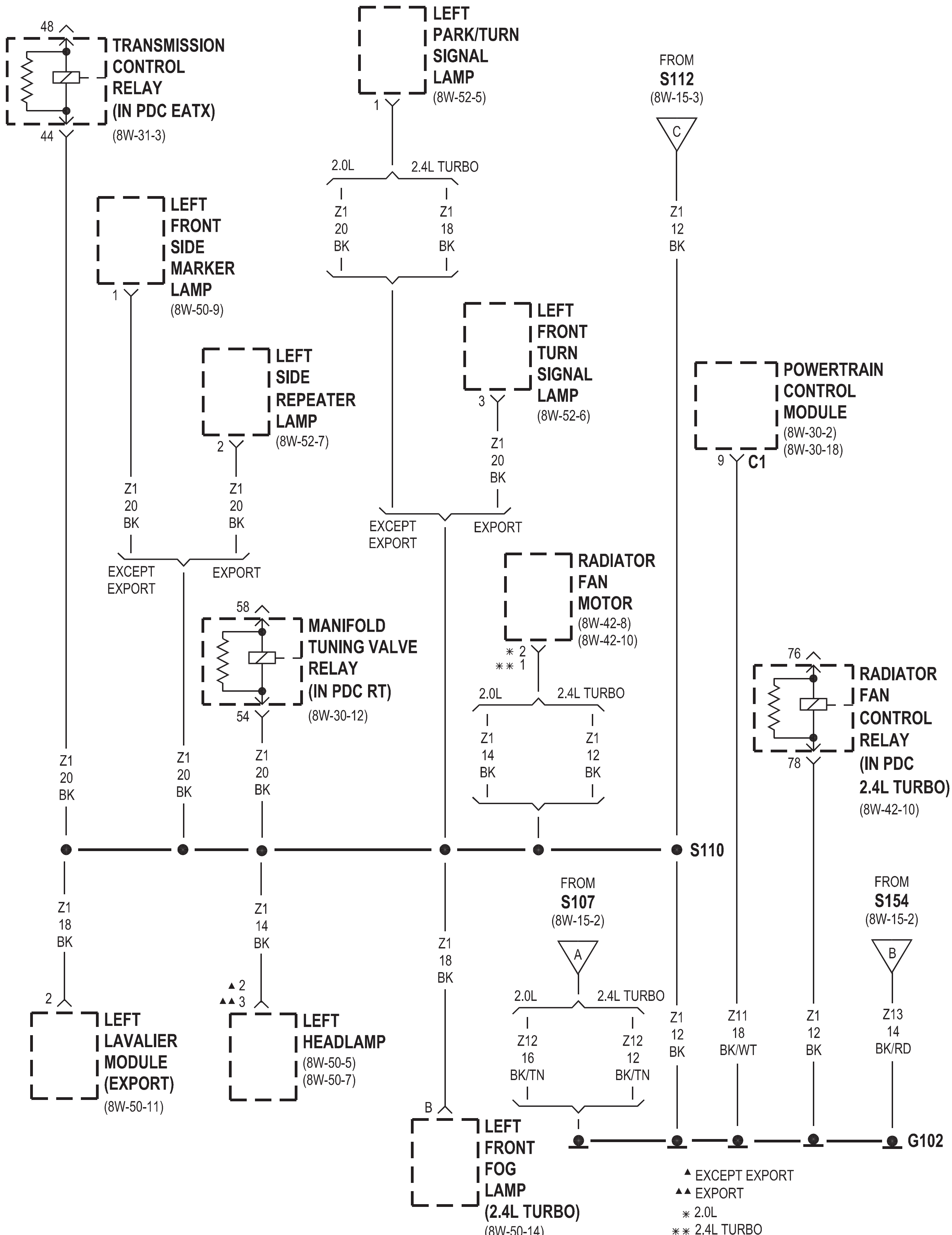

RUN A22
(8W-10-13)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
41
CIRCUIT
BREAKER
NO. 1
20A
42
F21
14
TN
S220
F21
14
TN
F21
14
TN
2
C205 •
C201 ••
2
C201 •
C205 ••
F21
14
TN
S242
F21
14
TN
F21
14
TN
F21
14
TN
4
C1
4
C2
DRIVER
POWER
WINDOW
SWITCH
(8W-60-2)
(8W-60-3)
(8W-60-6)
(8W-60-7)
4
PASSENGER
POWER
WINDOW
SWITCH
(8W-60-4)
(8W-60-5)
• LHD
•• RHD

8W-15 GROUND DISTRIBUTION

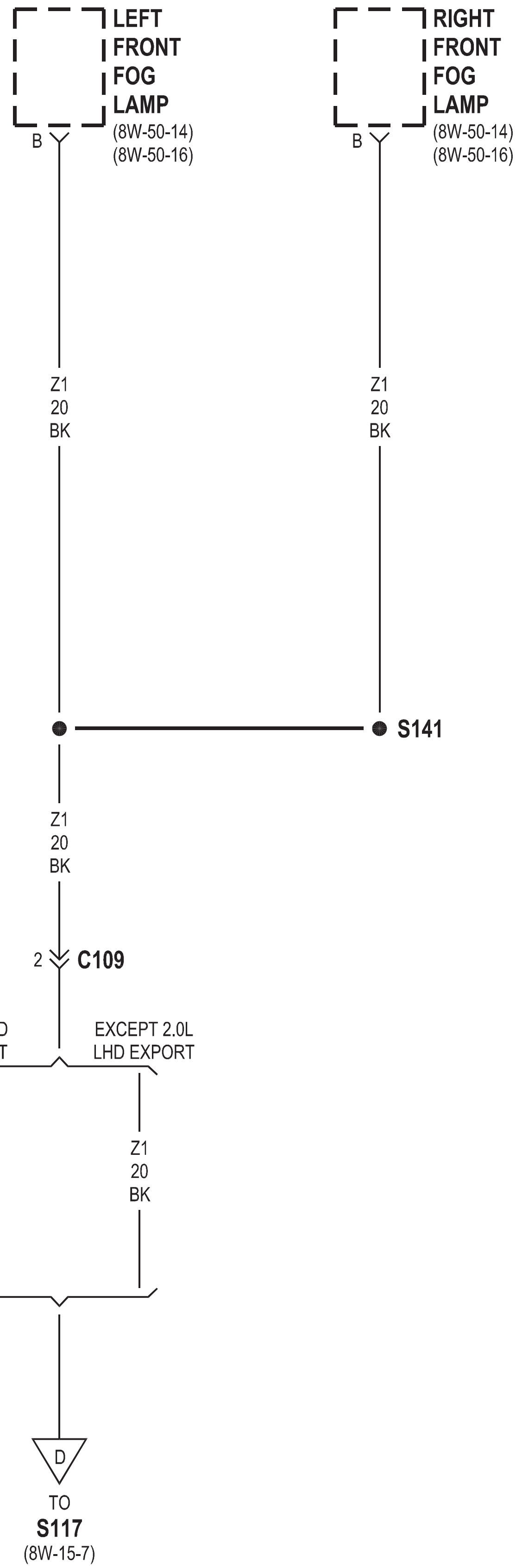


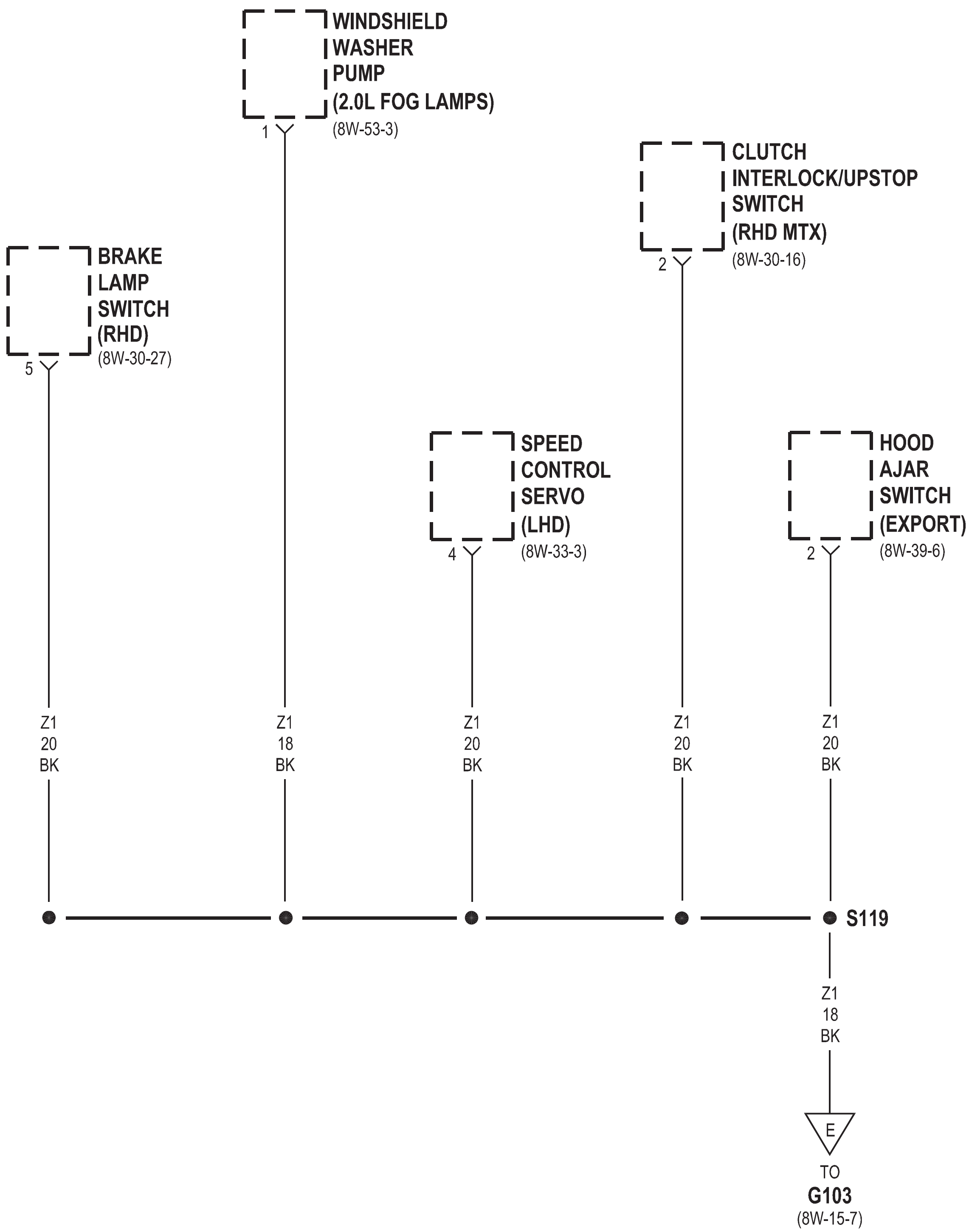
4
5
DATA
LINK
CONNECTOR
(8W-18-2)
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
(8W-30-18)
18 C1
12 C4
14 C4
BRAKE
FLUID
LEVEL
SWITCH
(8W-40-7)
B
Z13
16
BK/RD
Z13
16
BK/RD
S154
Z12
20
BK/TN
Z12
20
BK/TN
Z12
20
BK/TN
Z12
18
BK/TN
Z13
14
BK/RD
B
TO
G102
(8W-15-4)
S107
Z12
20
BK/TN
2.0L
2.4L
TURBO
Z12
16
BK/TN
Z12
12
BK/TN
2
POWER
STEERING
PRESSURE
SWITCH
(8W-30-15)
A
TO
G102
(8W-15-4)

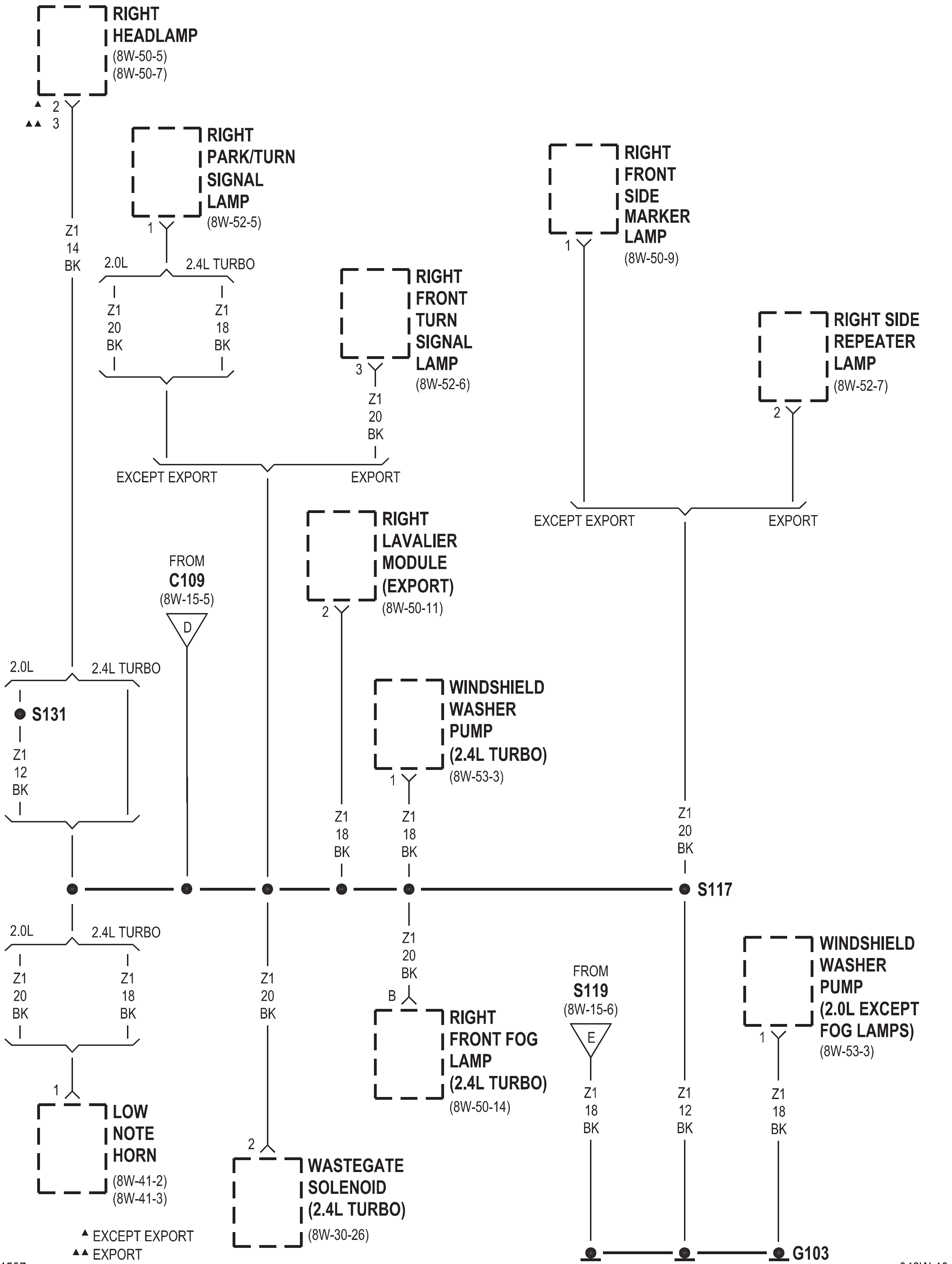

MANIFOLD TUNING VALVE SOLENOID (2.0L RT)
(8W-30-12)
GENERATOR
(8W-20-2)
(8W-20-3)
A/C COMPRESSOR CLUTCH
(8W-42-2)
(8W-42-3)
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-3)
(8W-30-19)
2.0L
2.4L TURBO
Z1 18 BK
Z1 20 BK
S151
C101
BRAKE LAMP SWITCH (LHD)
(8W-30-27)
CLUTCH INTERLOCK/UPSTOP SWITCH (LHD MTX)
(8W-30-16)
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-3)
(8W-30-19)
S112
Z1 12 BK
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
SPEED CONTROL SERVO (RHD)
(8W-33-3)
C
TO
S110
(8W-15-4)

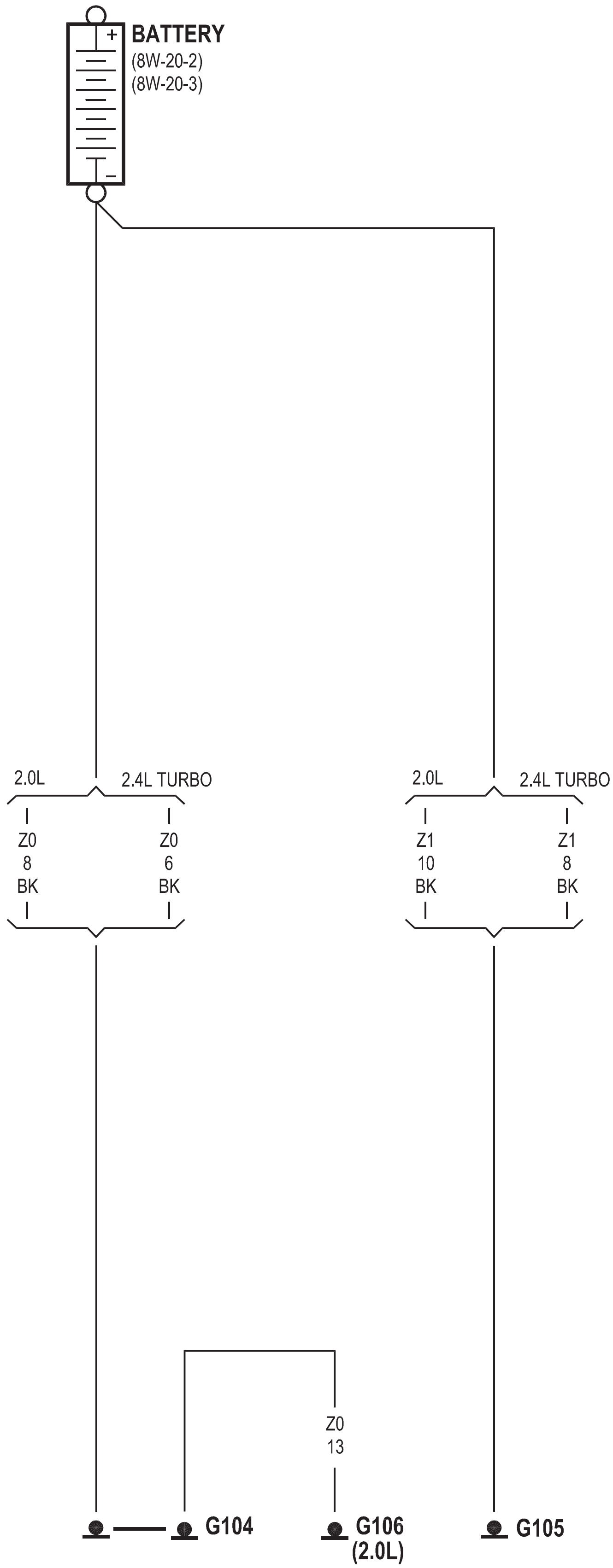

TRANSMISSION CONTROL RELAY (IN PDC EATX)
(8W-31-3)
48
44
LEFT PARK/TURN SIGNAL LAMP
(8W-52-5)
1
2.0L
2.4L TURBO
Z1 20 BK
Z1 18 BK
FROM S112
(8W-15-3)
C
Z1 12 BK
LEFT FRONT SIDE MARKER LAMP
(8W-50-9)
1
LEFT SIDE REPEATER LAMP
(8W-52-7)
2
LEFT FRONT TURN SIGNAL LAMP
(8W-52-6)
3
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-18)
9
C1
Z1 20 BK
EXCEPT EXPORT
EXPORT
RADIATOR FAN MOTOR
(8W-42-8)
(8W-42-10)
⁎ 2
⁎⁎ 1
MANIFOLD TUNING VALVE RELAY (IN PDC RT)
(8W-30-12)
58
54
Z1 14 BK
Z1 12 BK
RADIATOR FAN CONTROL RELAY (IN PDC 2.4L TURBO)
(8W-42-10)
76
78
S110
Z1 18 BK
Z1 14 BK
FROM S107
(8W-15-2)
A
FROM S154
(8W-15-2)
B
Z12 16 BK/TN
Z12 12 BK/TN
Z11 18 BK/WT
Z13 14 BK/RD
LEFT LAVALIER MODULE (EXPORT)
(8W-50-11)
▲ 2
▲▲ 3
LEFT HEADLAMP
(8W-50-5)
(8W-50-7)
LEFT FRONT FOG LAMP (2.4L TURBO)
(8W-50-14)
G102
▲ EXCEPT EXPORT
▲▲ EXPORT
⁎ 2.0L
⁎⁎ 2.4L TURBO

2.0L

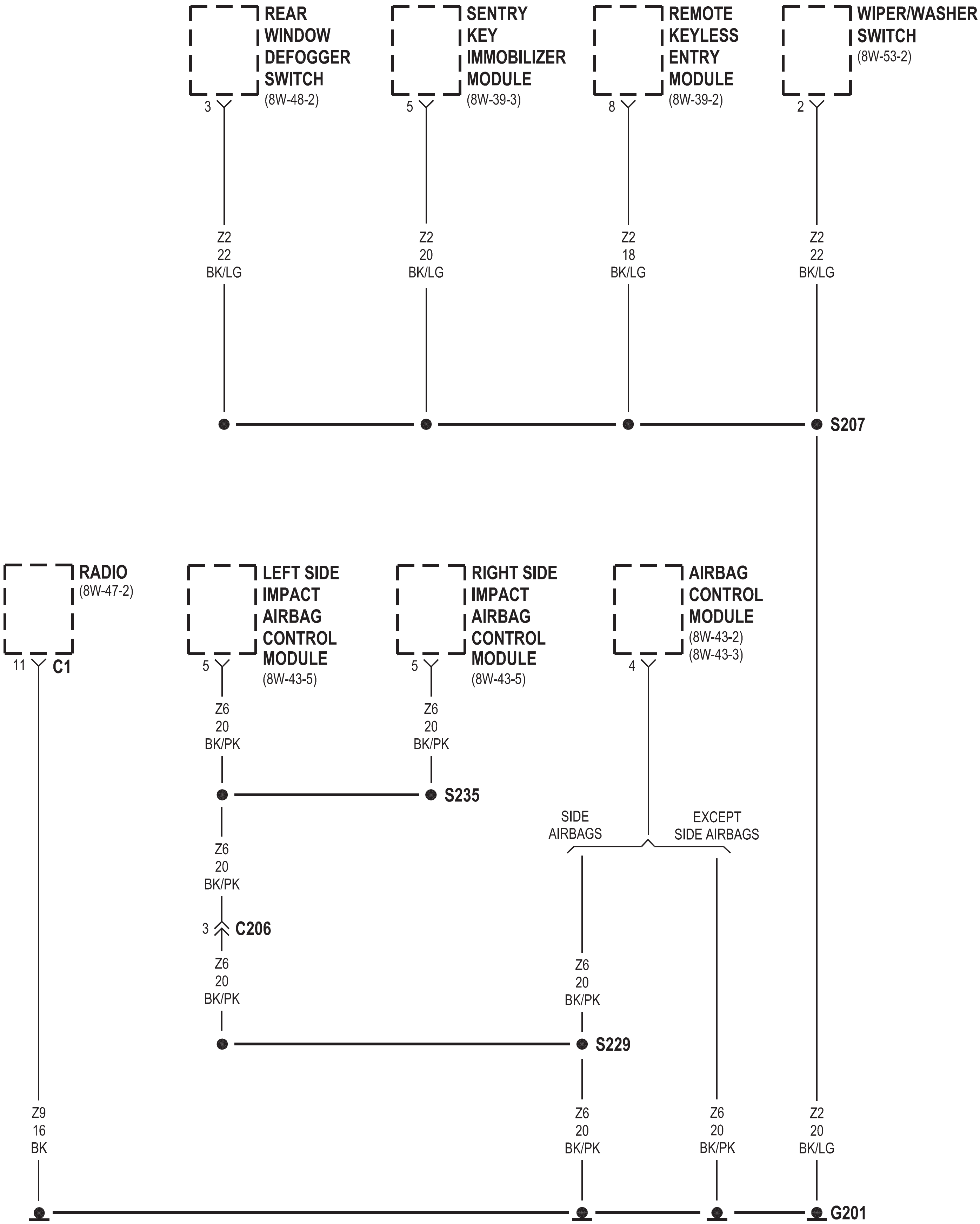

LEFT
FRONT
FOG
LAMP
(8W-50-14)
(8W-50-16)
B
RIGHT
FRONT
FOG
LAMP
(8W-50-14)
(8W-50-16)
B
Z1
20
BK
Z1
20
BK
S141
Z1
20
BK
2
C109
2.0L LHD
EXPORT
EXCEPT 2.0L
LHD EXPORT
Z1
18
BK
Z1
20
BK
D
TO
S117
(8W-15-7)


WINDSHIELD
WASHER
PUMP
(2.0L FOG LAMPS)
(8W-53-3)
1
CLUTCH
INTERLOCK/UPSTOP
SWITCH
(RHD MTX)
(8W-30-16)
2
BRAKE
LAMP
SWITCH
(RHD)
(8W-30-27)
5
SPEED
CONTROL
SERVO
(LHD)
(8W-33-3)
4
HOOD
AJAR
SWITCH
(EXPORT)
(8W-39-6)
2
Z1
20
BK
Z1
18
BK
Z1
20
BK
Z1
20
BK
Z1
20
BK
S119
Z1
18
BK
E
TO
G103
(8W-15-7)

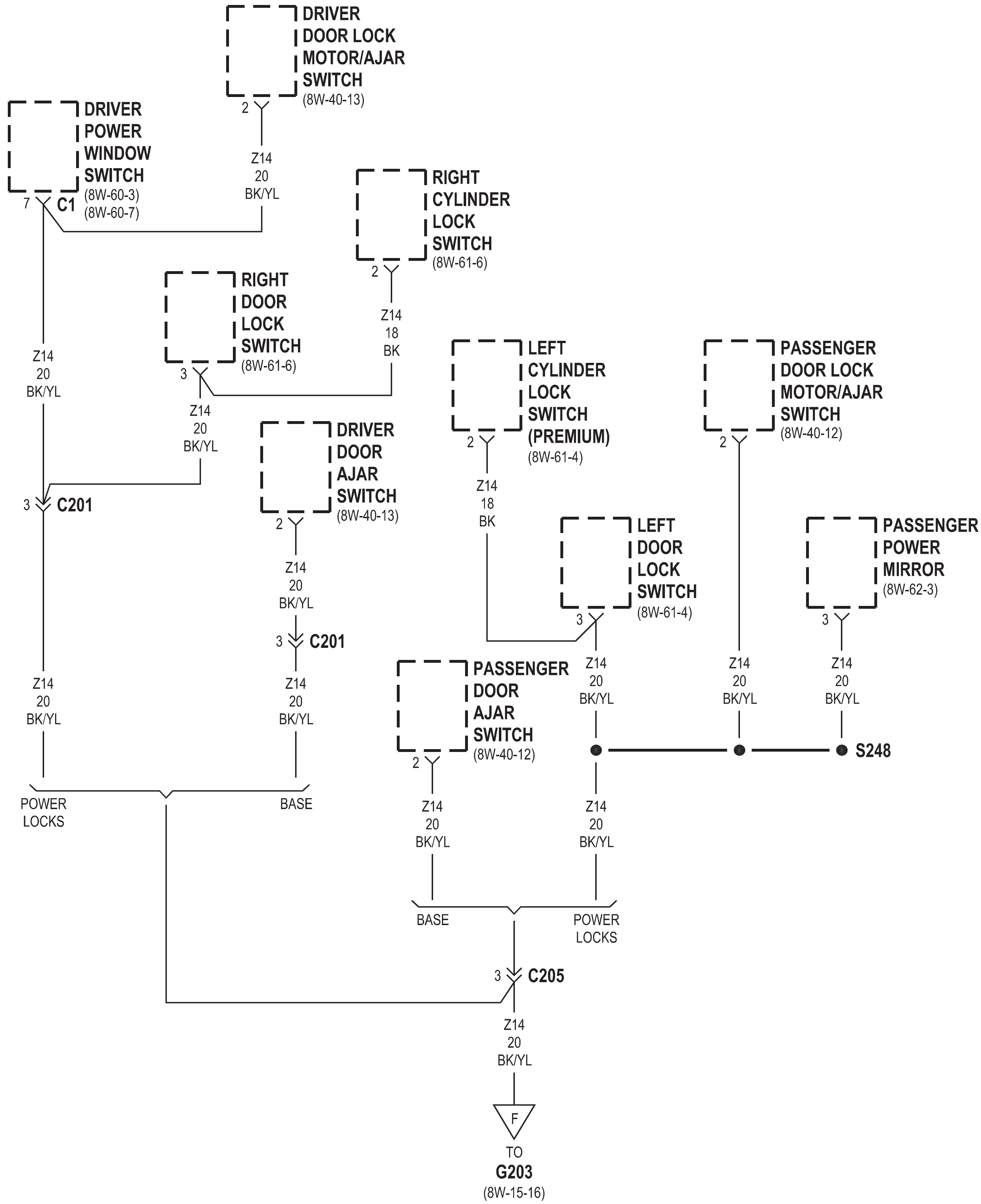

RIGHT HEADLAMP
(8W-50-5)
(8W-50-7)
2
3
Z1 14 BK
RIGHT PARK/TURN SIGNAL LAMP
(8W-52-5)
1
2.0L
2.4L TURBO
Z1 20 BK
Z1 18 BK
RIGHT FRONT TURN SIGNAL LAMP
(8W-52-6)
3
Z1 20 BK
EXCEPT EXPORT
EXPORT
RIGHT FRONT SIDE MARKER LAMP
(8W-50-9)
1
RIGHT SIDE REPEATER LAMP
(8W-52-7)
2
EXCEPT EXPORT
EXPORT
RIGHT LAVALIER MODULE (EXPORT)
(8W-50-11)
2
FROM
C109
(8W-15-5)
D
2.0L
2.4L TURBO
S131
Z1 12 BK
WINDSHIELD WASHER PUMP (2.4L TURBO)
(8W-53-3)
1
Z1 18 BK
Z1 18 BK
Z1 20 BK
S117
2.0L
2.4L TURBO
Z1 20 BK
Z1 18 BK
Z1 20 BK
Z1 20 BK
B
RIGHT FRONT FOG LAMP (2.4L TURBO)
(8W-50-14)
FROM
S119
(8W-15-6)
E
WINDSHIELD WASHER PUMP (2.0L EXCEPT FOG LAMPS)
(8W-53-3)
1
Z1 18 BK
Z1 12 BK
Z1 18 BK
1
LOW NOTE HORN
(8W-41-2)
(8W-41-3)
2
WASTEGATE SOLENOID (2.4L TURBO)
(8W-30-26)
G103
▲ EXCEPT EXPORT
▲▲ EXPORT

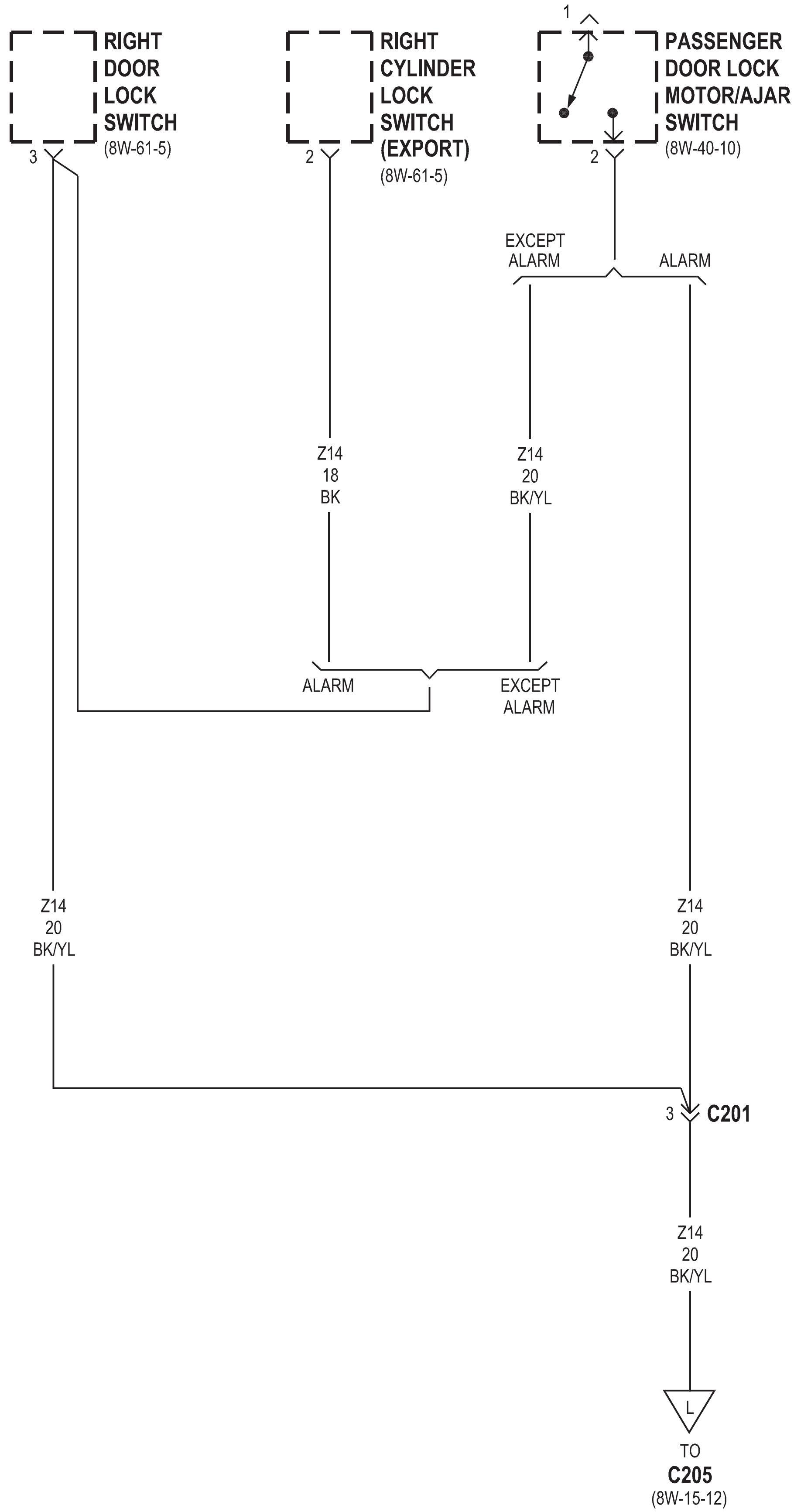


BATTERY
(8W-20-2)
(8W-20-3)
2.0L
2.4L TURBO
Z0
8
BK
Z0
6
BK
2.0L
2.4L TURBO
Z1
10
BK
Z1
8
BK
Z0
13
G104
G106
(2.0L)
G105

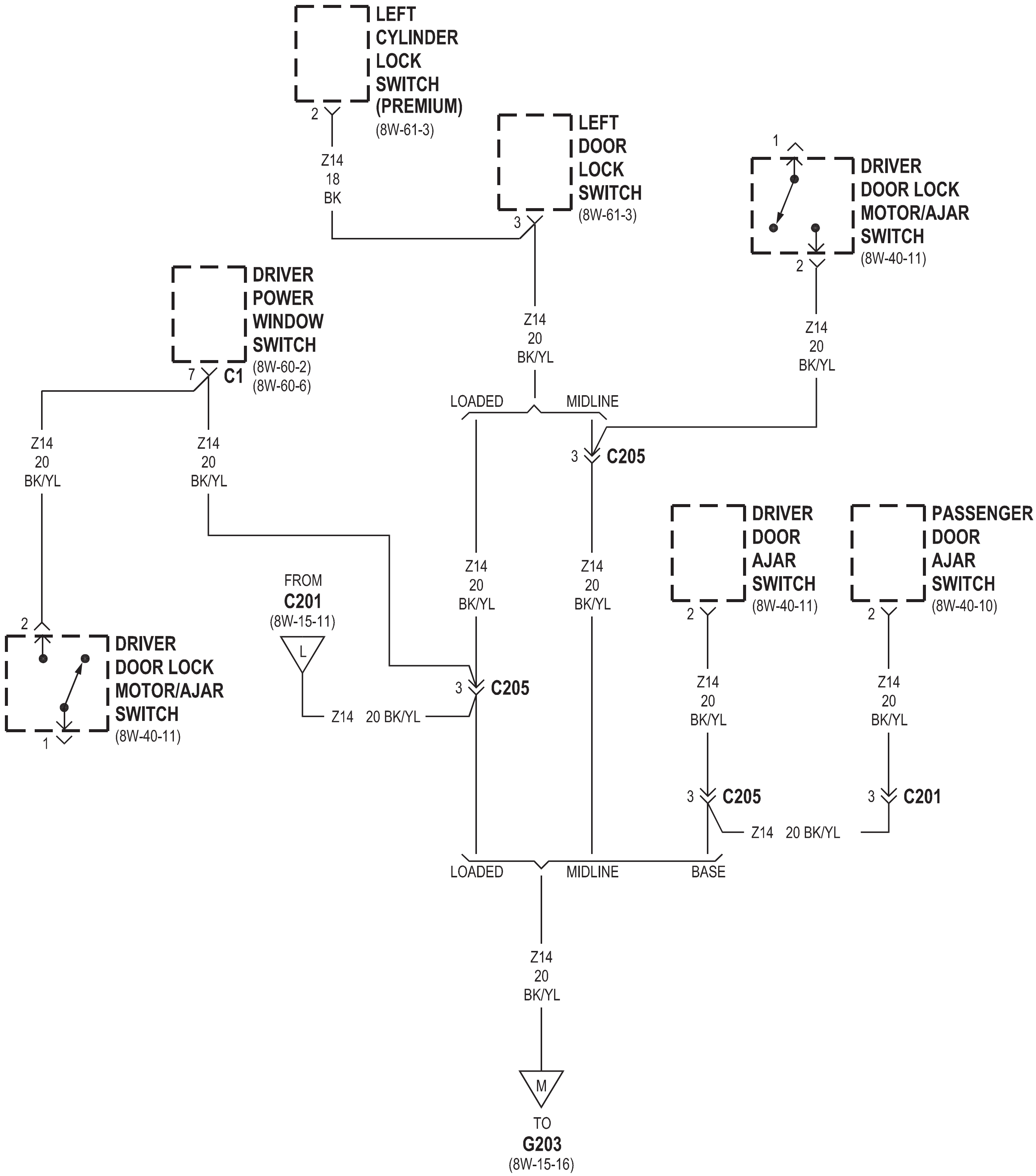

REAR WINDOW DEFOGGER SWITCH
(8W-48-2)
3
SENTRY KEY IMMOBILIZER MODULE
(8W-39-3)
5
REMOTE KEYLESS ENTRY MODULE
(8W-39-2)
8
WIPER/WASHER SWITCH
(8W-53-2)
2
Z2
22
BK/LG
Z2
20
BK/LG
Z2
18
BK/LG
Z2
22
BK/LG
S207
RADIO
(8W-47-2)
11
C1
LEFT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
5
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
5
AIRBAG CONTROL MODULE
(8W-43-2)
(8W-43-3)
4
Z6
20
BK/PK
Z6
20
BK/PK
S235
SIDE AIRBAGS
EXCEPT SIDE AIRBAGS
Z6
20
BK/PK
3
C206
Z6
20
BK/PK
Z6
20
BK/PK
S229
Z9
16
BK
Z6
20
BK/PK
Z6
20
BK/PK
Z2
20
BK/LG
G201

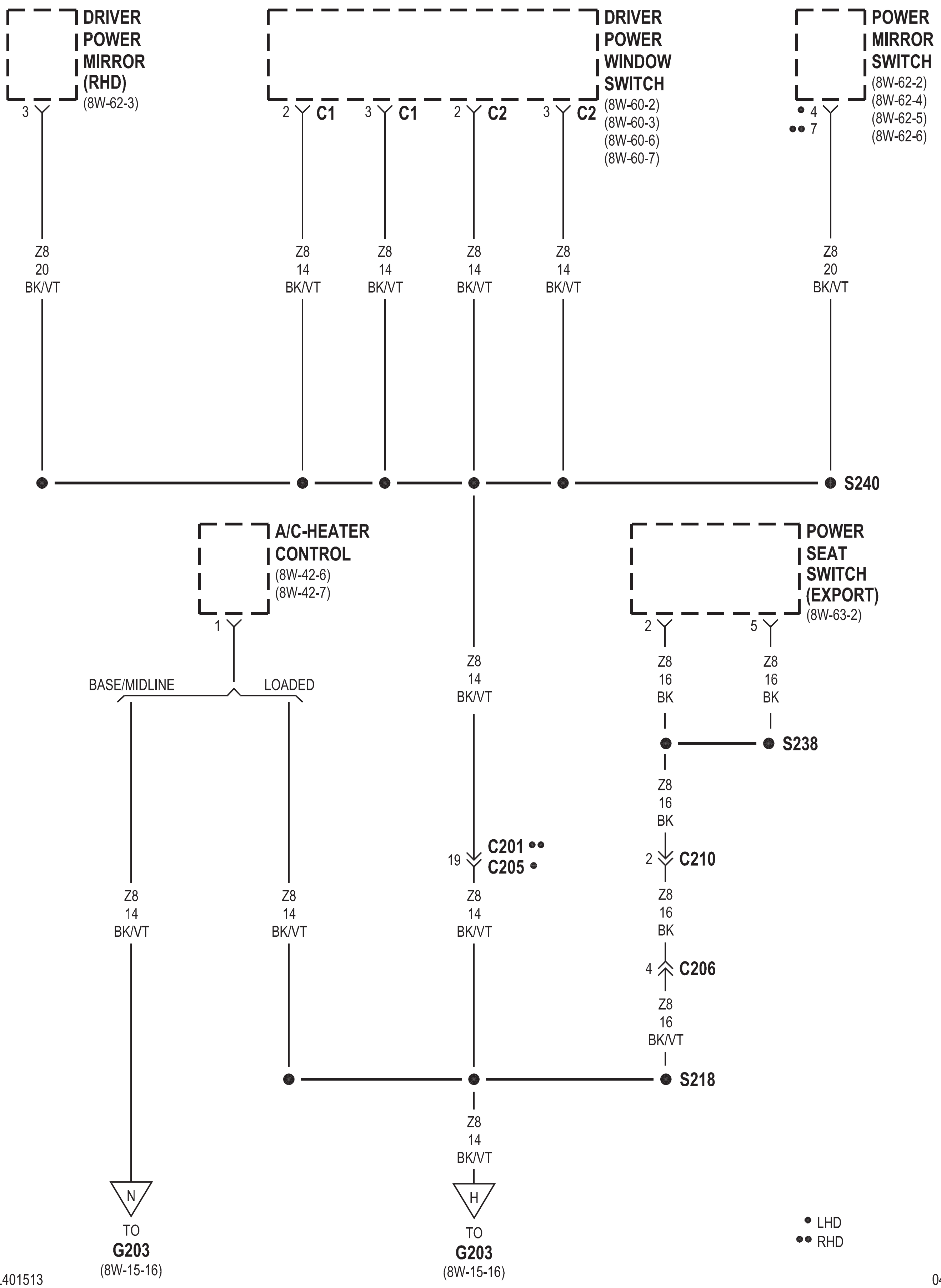
RHD

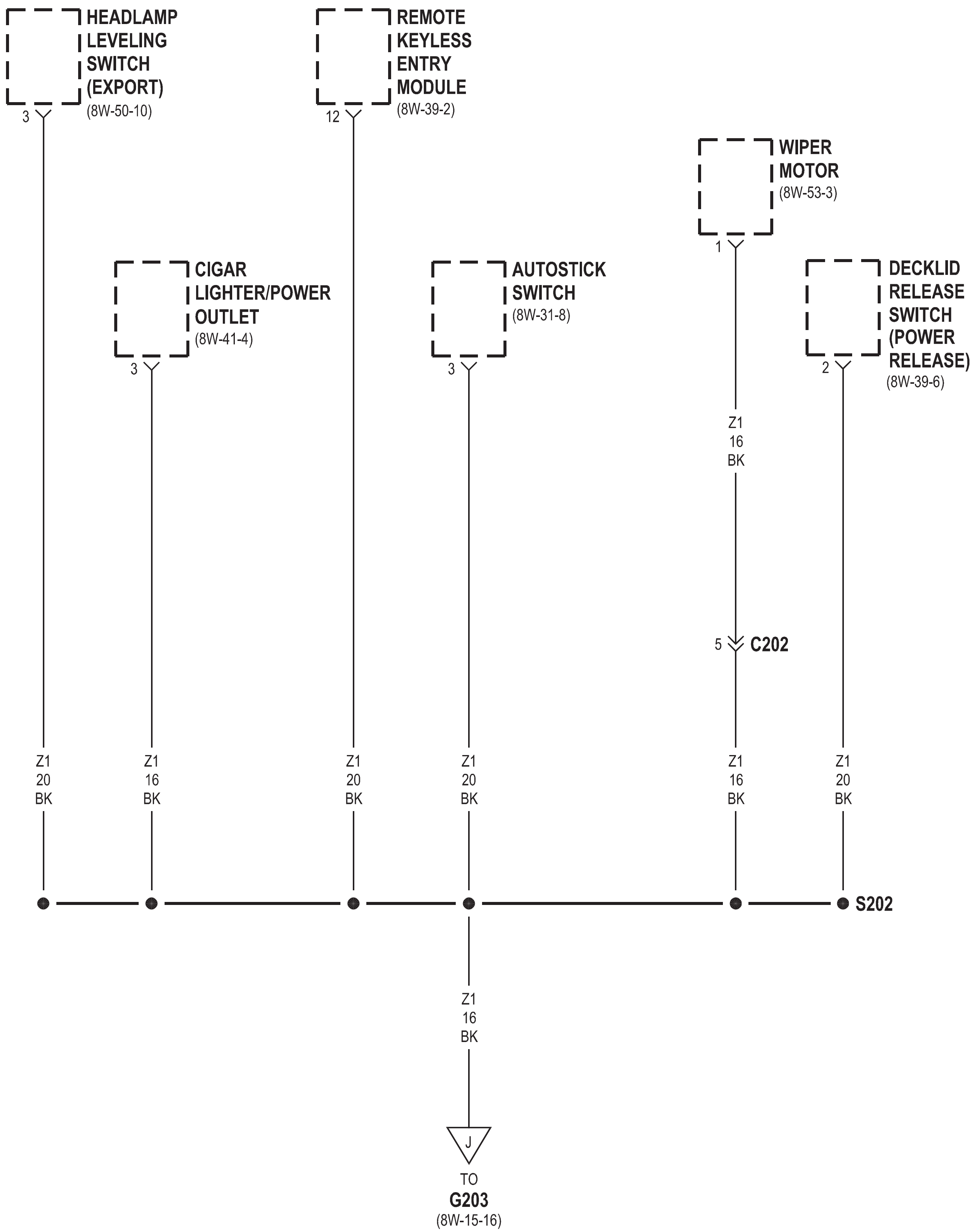

DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-13)
DRIVER POWER WINDOW SWITCH
(8W-60-3)
(8W-60-7)
C1
RIGHT CYLINDER LOCK SWITCH
(8W-61-6)
RIGHT DOOR LOCK SWITCH
(8W-61-6)
LEFT CYLINDER LOCK SWITCH (PREMIUM)
(8W-61-4)
PASSENGER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-12)
DRIVER DOOR AJAR SWITCH
(8W-40-13)
C201
LEFT DOOR LOCK SWITCH
(8W-61-4)
PASSENGER POWER MIRROR
(8W-62-3)
PASSENGER DOOR AJAR SWITCH
(8W-40-12)
S248
Z14 20 BK/YL
Z14 18 BK
POWER LOCKS
BASE
C205
F
TO
G203
(8W-15-16)

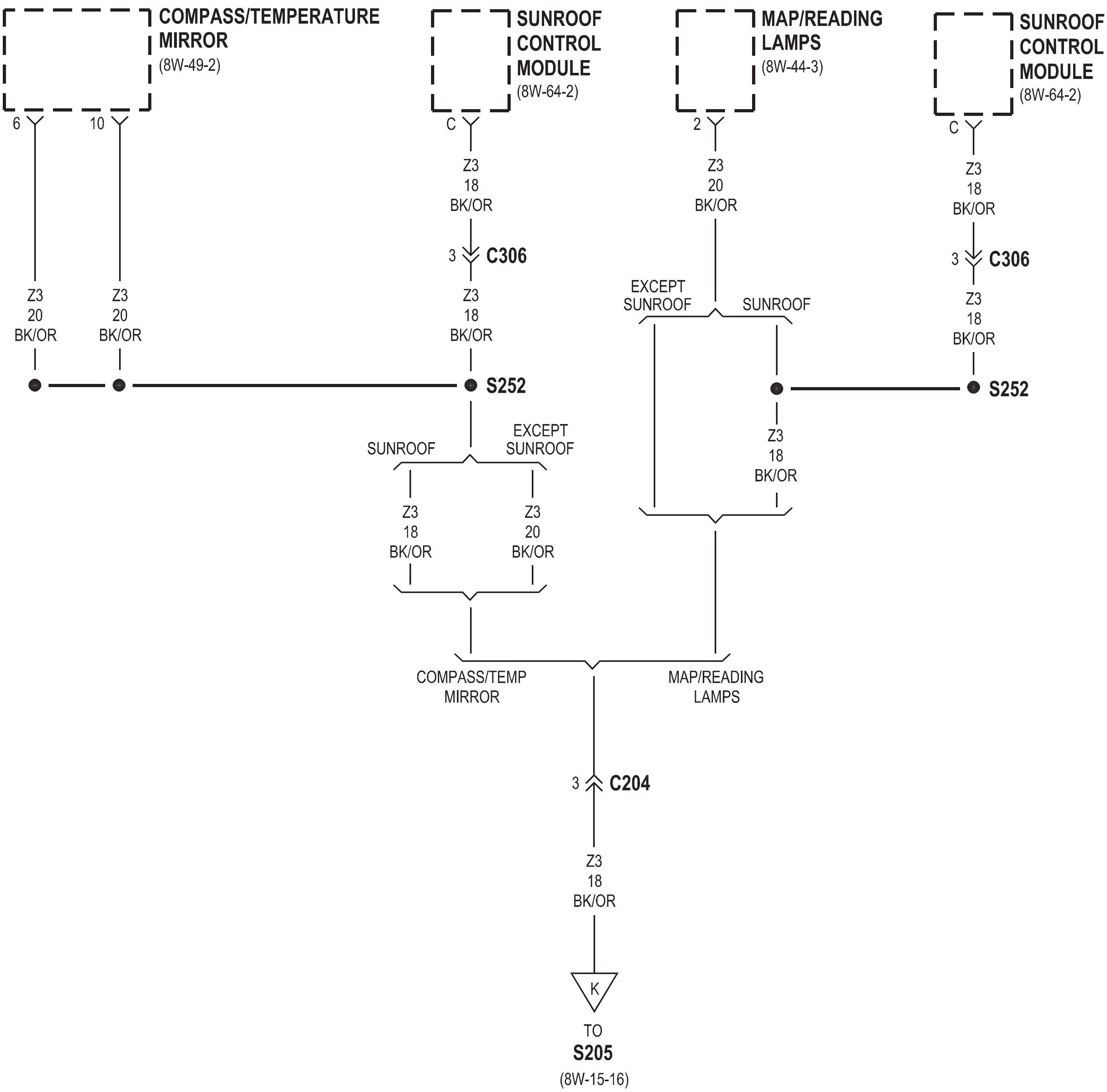

RIGHT
DOOR
LOCK
SWITCH
(8W-61-5)
3
RIGHT
CYLINDER
LOCK
SWITCH
(EXPORT)
(8W-61-5)
2
1
PASSENGER
DOOR LOCK
MOTOR/AJAR
SWITCH
(8W-40-10)
2
EXCEPT
ALARM
ALARM
Z14
18
BK
Z14
20
BK/YL
ALARM
EXCEPT
ALARM
Z14
20
BK/YL
Z14
20
BK/YL
3
C201
Z14
20
BK/YL
L
TO
C205
(8W-15-12)

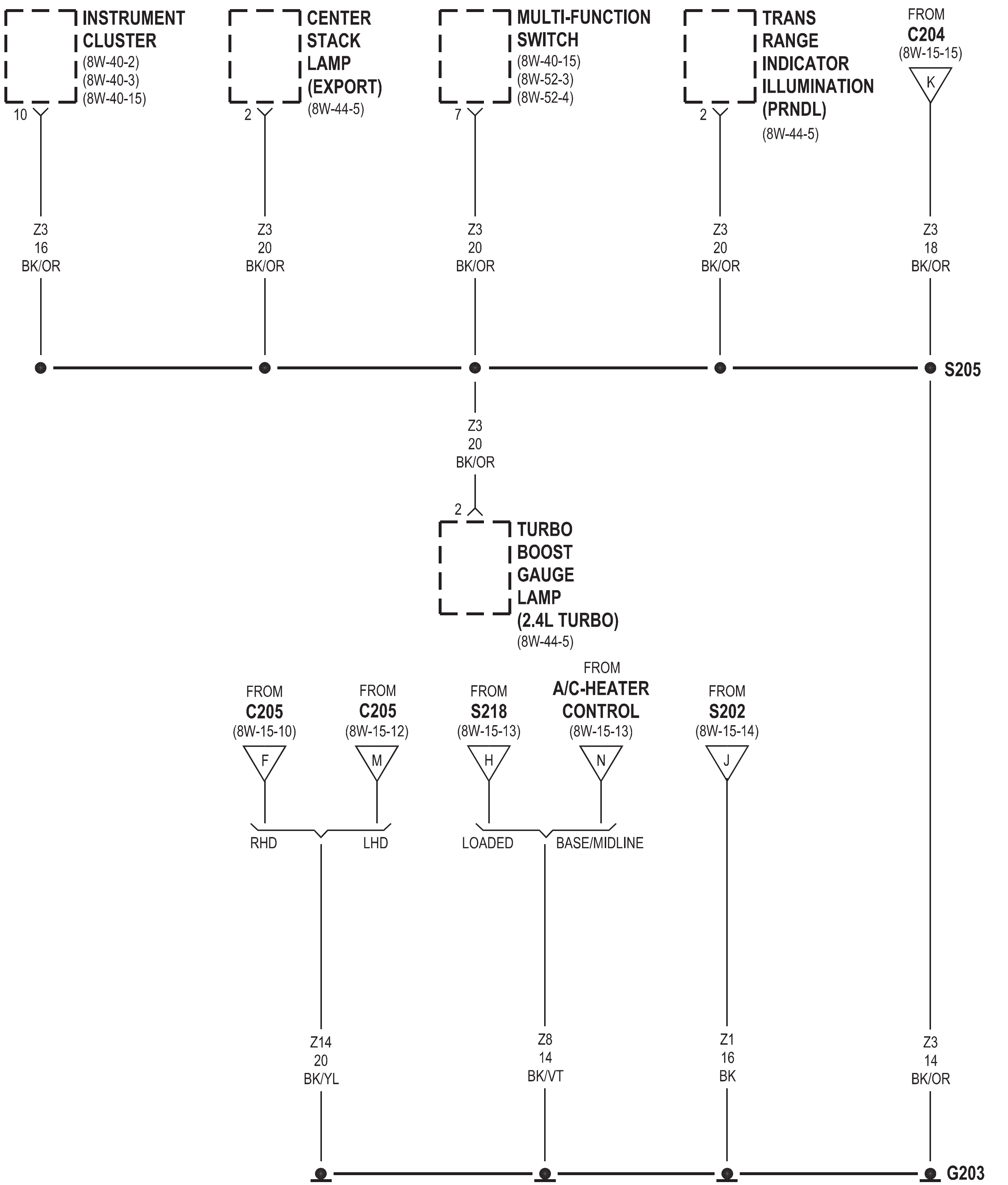
LHD

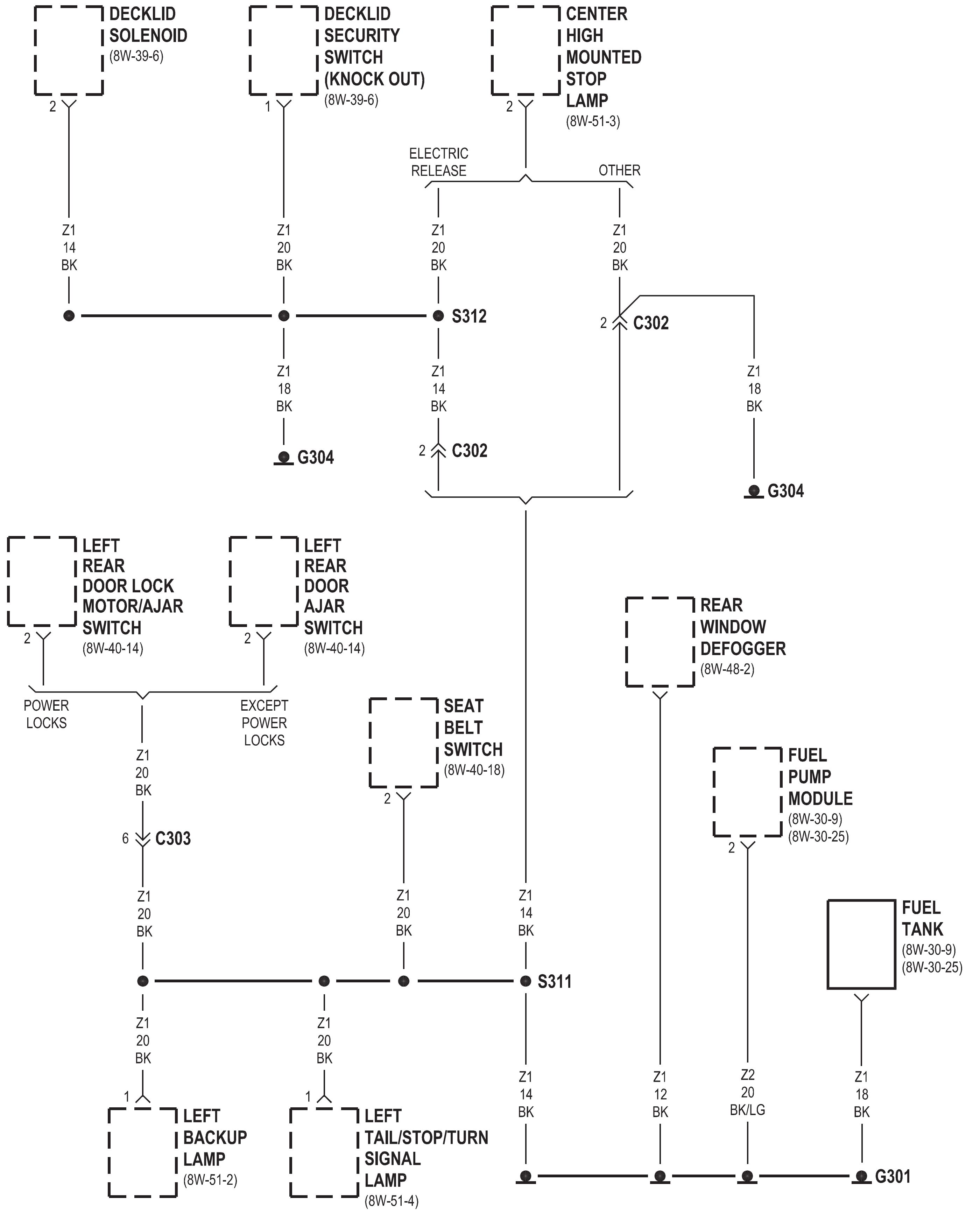

LEFT
CYLINDER
LOCK
SWITCH
(PREMIUM)
(8W-61-3)
2
Z14
18
BK
LEFT
DOOR
LOCK
SWITCH
(8W-61-3)
3
1
DRIVER
DOOR LOCK
MOTOR/AJAR
SWITCH
(8W-40-11)
2
DRIVER
POWER
WINDOW
SWITCH
(8W-60-2)
(8W-60-6)
7
C1
Z14
20
BK/YL
LOADED
MIDLINE
3
C205
Z14
20
BK/YL
DRIVER
DOOR
AJAR
SWITCH
(8W-40-11)
PASSENGER
DOOR
AJAR
SWITCH
(8W-40-10)
FROM
C201
(8W-15-11)
L
2
DRIVER
DOOR LOCK
MOTOR/AJAR
SWITCH
(8W-40-11)
1
Z14 20 BK/YL
3
C205
3
C205
3
C201
Z14 20 BK/YL
LOADED
MIDLINE
BASE
M
TO
G203
(8W-15-16)

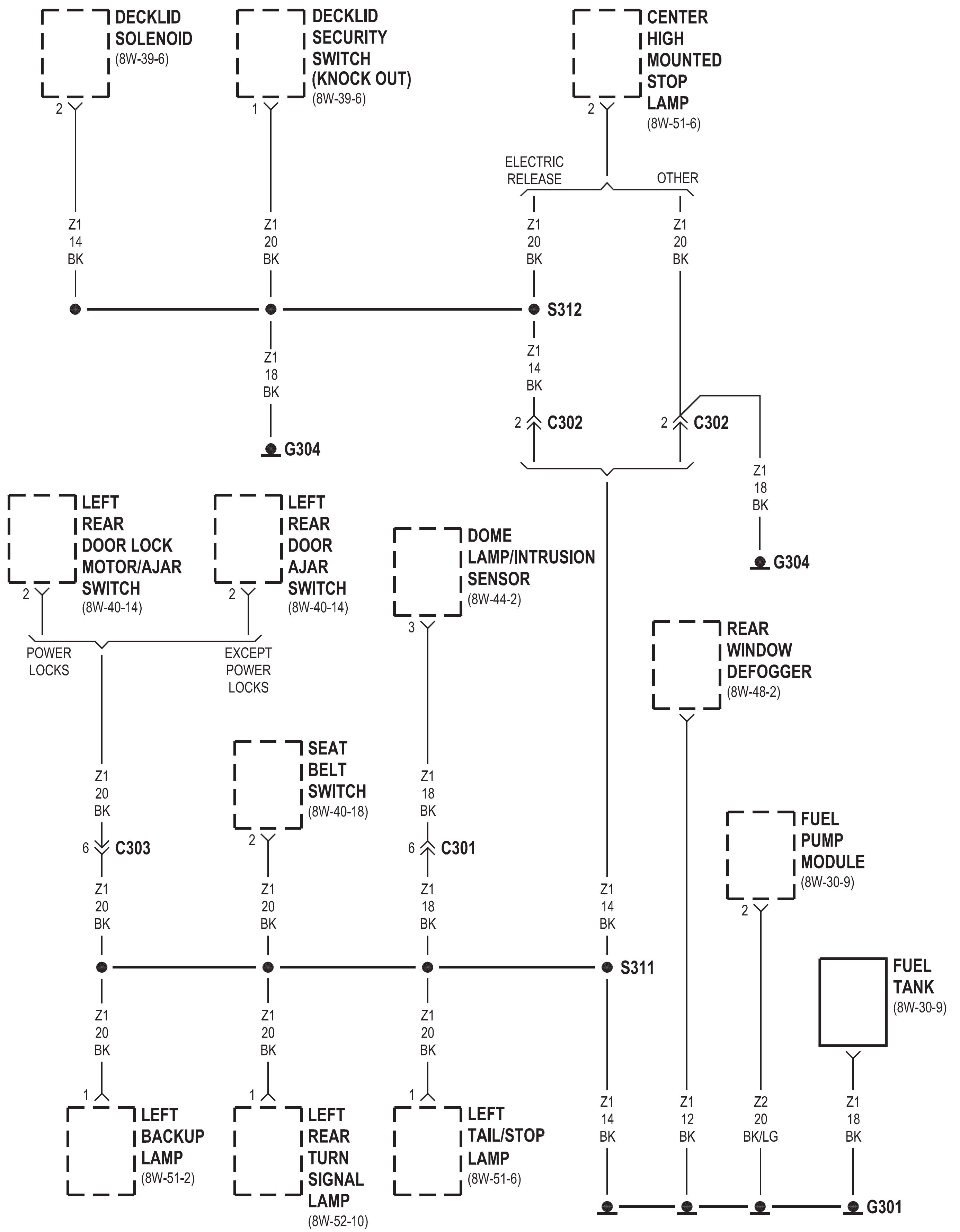

DRIVER POWER MIRROR (RHD)
(8W-62-3)
3
DRIVER POWER WINDOW SWITCH
(8W-60-2)
(8W-60-3)
(8W-60-6)
(8W-60-7)
2 C1
3 C1
2 C2
3 C2
POWER MIRROR SWITCH
(8W-62-2)
(8W-62-4)
(8W-62-5)
(8W-62-6)
• 4
•• 7
Z8 20 BK/VT
Z8 14 BK/VT
Z8 14 BK/VT
Z8 14 BK/VT
Z8 14 BK/VT
Z8 20 BK/VT
S240
A/C-HEATER CONTROL
(8W-42-6)
(8W-42-7)
1
BASE/MIDLINE
LOADED
POWER SEAT SWITCH (EXPORT)
(8W-63-2)
2
5
Z8 14 BK/VT
Z8 16 BK
Z8 16 BK
S238
Z8 16 BK
19
C201 ••
C205 •
2 C210
Z8 14 BK/VT
Z8 14 BK/VT
Z8 14 BK/VT
Z8 16 BK
4 C206
Z8 16 BK/VT
S218
Z8 14 BK/VT
N
TO
G203
(8W-15-16)
H
TO
G203
(8W-15-16)
• LHD
•• RHD

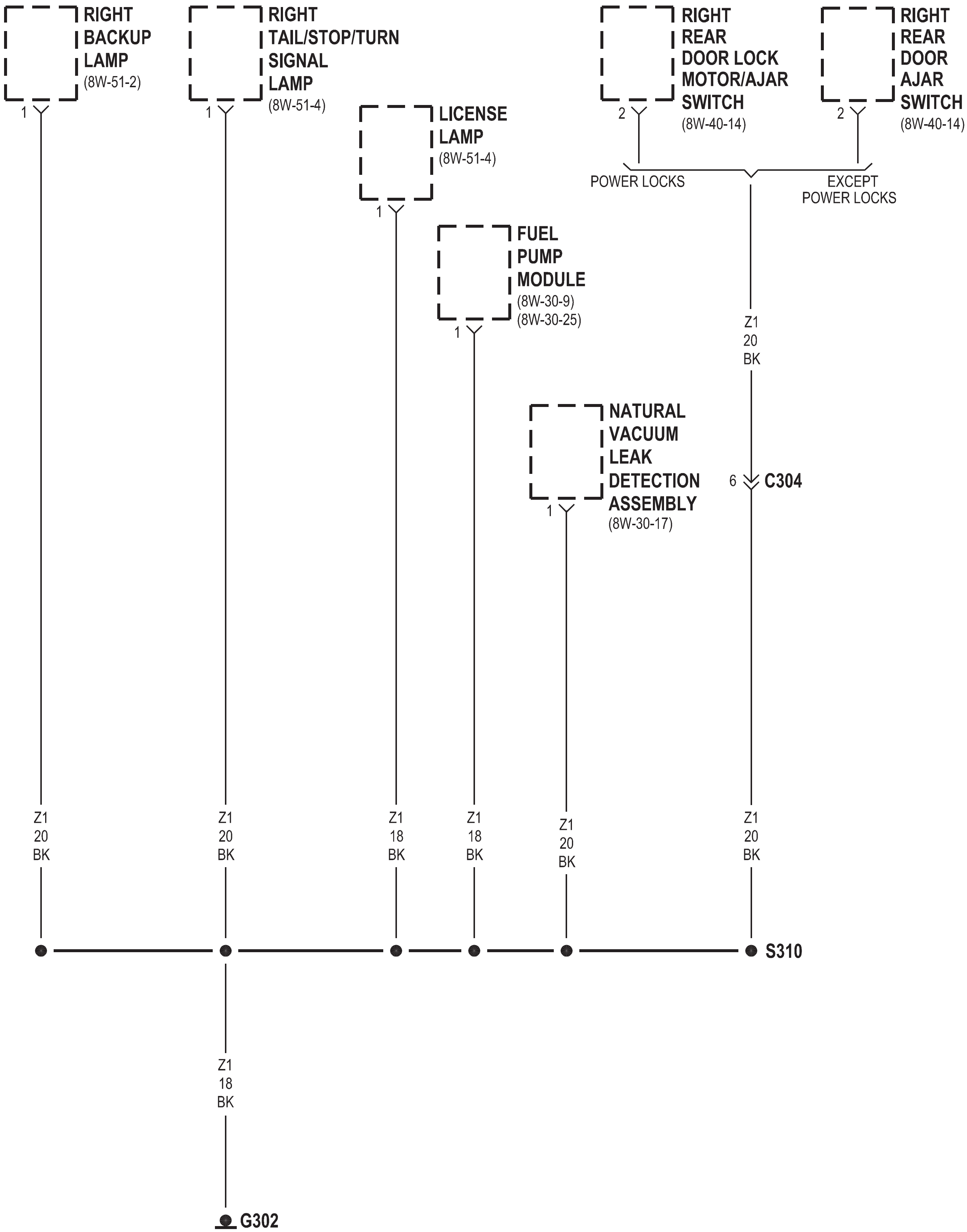

HEADLAMP LEVELING SWITCH (EXPORT)
(8W-50-10)
3
REMOTE KEYLESS ENTRY MODULE
(8W-39-2)
12
WIPER MOTOR
(8W-53-3)
1
CIGAR LIGHTER/POWER OUTLET
(8W-41-4)
3
AUTOSTICK SWITCH
(8W-31-8)
3
DECKLID RELEASE SWITCH (POWER RELEASE)
(8W-39-6)
2
Z1 16 BK
5
C202
Z1 20 BK
Z1 16 BK
Z1 20 BK
Z1 20 BK
Z1 16 BK
Z1 20 BK
S202
Z1 16 BK
J
TO
G203
(8W-15-16)


COMPASS/TEMPERATURE
MIRROR
(8W-49-2)
6
10
SUNROOF
CONTROL
MODULE
(8W-64-2)
C
MAP/READING
LAMPS
(8W-44-3)
2
SUNROOF
CONTROL
MODULE
(8W-64-2)
C
Z3
18
BK/OR
Z3
20
BK/OR
3
C306
EXCEPT
SUNROOF
SUNROOF
S252
Z3
18
BK/OR
COMPASS/TEMP
MIRROR
MAP/READING
LAMPS
3
C204
K
TO
S205
(8W-15-16)

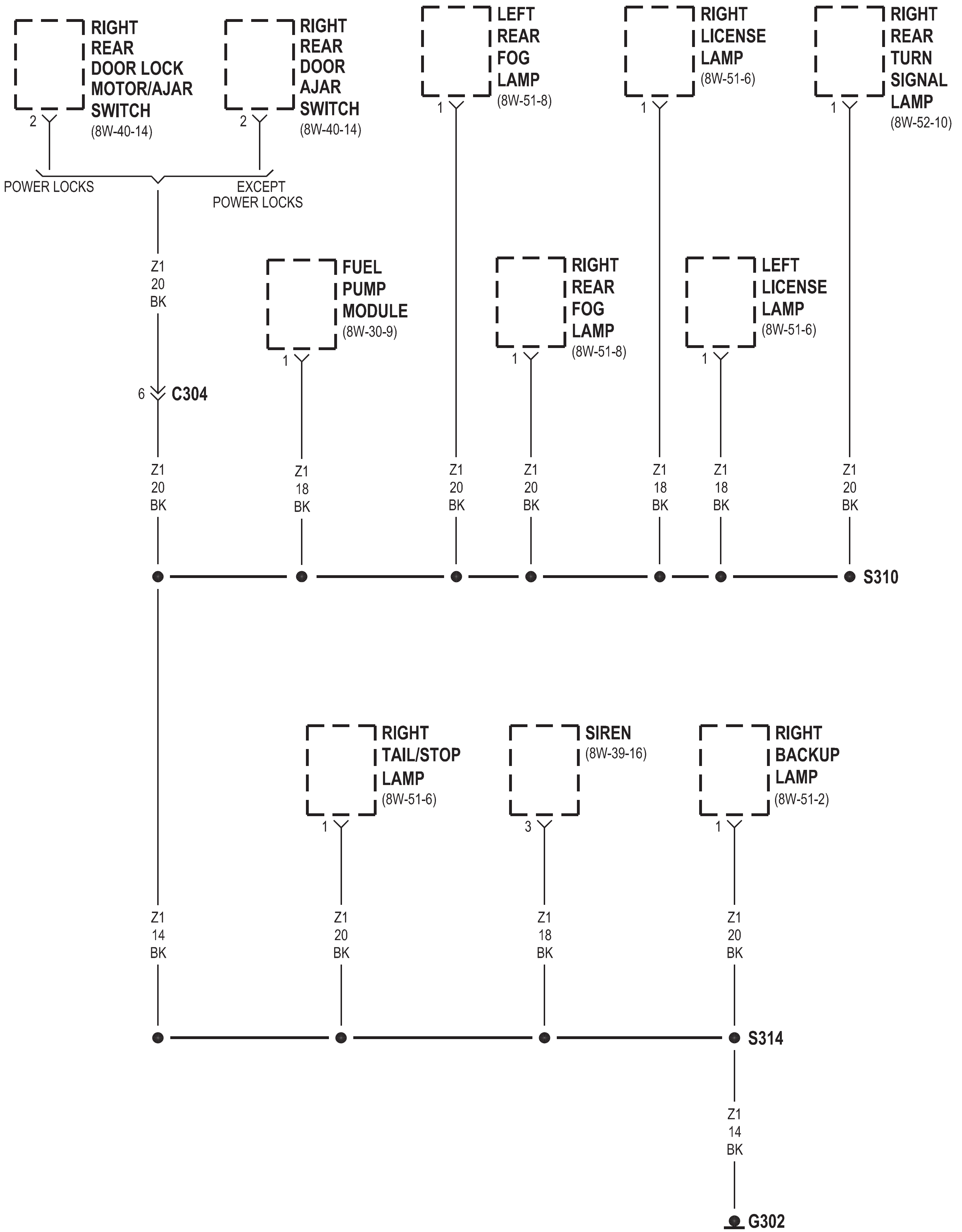

INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-3)
(8W-40-15)
10
CENTER STACK LAMP (EXPORT)
(8W-44-5)
2
MULTI-FUNCTION SWITCH
(8W-40-15)
(8W-52-3)
(8W-52-4)
7
TRANS RANGE INDICATOR ILLUMINATION (PRNDL)
(8W-44-5)
2
FROM
C204
(8W-15-15)
K
Z3
16
BK/OR
Z3
20
BK/OR
Z3
20
BK/OR
Z3
20
BK/OR
Z3
18
BK/OR
S205
Z3
20
BK/OR
2
TURBO BOOST GAUGE LAMP (2.4L TURBO)
(8W-44-5)
FROM
C205
(8W-15-10)
F
FROM
C205
(8W-15-12)
M
FROM
S218
(8W-15-13)
H
FROM
A/C-HEATER CONTROL
(8W-15-13)
N
FROM
S202
(8W-15-14)
J
RHD
LHD
LOADED
BASE/MIDLINE
Z14
20
BK/YL
Z8
14
BK/VT
Z1
16
BK
Z3
14
BK/OR
G203


DECKLID SOLENOID
(8W-39-6)
2
DECKLID SECURITY SWITCH (KNOCK OUT)
(8W-39-6)
1
CENTER HIGH MOUNTED STOP LAMP
(8W-51-3)
2
ELECTRIC RELEASE
OTHER
Z1 14 BK
Z1 20 BK
Z1 20 BK
Z1 20 BK
S312
2 C302
Z1 18 BK
Z1 14 BK
Z1 18 BK
G304
2 C302
G304
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
2
LEFT REAR DOOR AJAR SWITCH
(8W-40-14)
2
POWER LOCKS
EXCEPT POWER LOCKS
Z1 20 BK
6 C303
REAR WINDOW DEFOGGER
(8W-48-2)
SEAT BELT SWITCH
(8W-40-18)
2
FUEL PUMP MODULE
(8W-30-9)
(8W-30-25)
2
FUEL TANK
(8W-30-9)
(8W-30-25)
Z1 20 BK
Z1 20 BK
Z1 14 BK
S311
Z1 20 BK
Z1 20 BK
Z1 14 BK
Z1 12 BK
Z2 20 BK/LG
Z1 18 BK
1
1
LEFT BACKUP LAMP
(8W-51-2)
LEFT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
G301

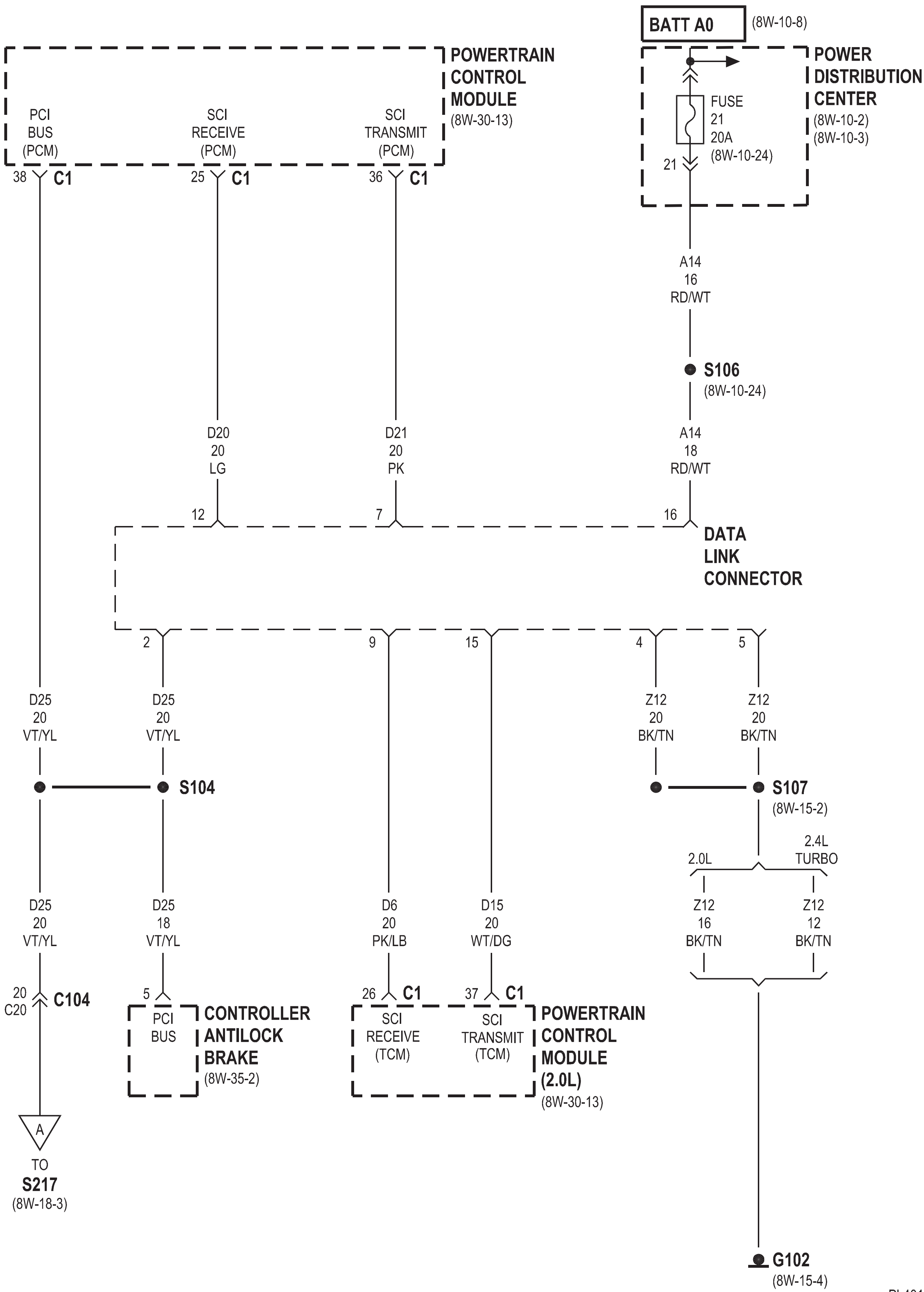

DECKLID SOLENOID
(8W-39-6)
DECKLID SECURITY SWITCH (KNOCK OUT)
(8W-39-6)
CENTER HIGH MOUNTED STOP LAMP
(8W-51-6)
ELECTRIC RELEASE
OTHER
Z1 14 BK
Z1 20 BK
Z1 18 BK
Z1 12 BK
Z2 20 BK/LG
S312
G304
C302
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
LEFT REAR DOOR AJAR SWITCH
(8W-40-14)
POWER LOCKS
EXCEPT POWER LOCKS
DOME LAMP/INTRUSION SENSOR
(8W-44-2)
REAR WINDOW DEFOGGER
(8W-48-2)
SEAT BELT SWITCH
(8W-40-18)
C303
C301
FUEL PUMP MODULE
(8W-30-9)
S311
FUEL TANK
(8W-30-9)
LEFT BACKUP LAMP
(8W-51-2)
LEFT REAR TURN SIGNAL LAMP
(8W-52-10)
LEFT TAIL/STOP LAMP
(8W-51-6)
G301

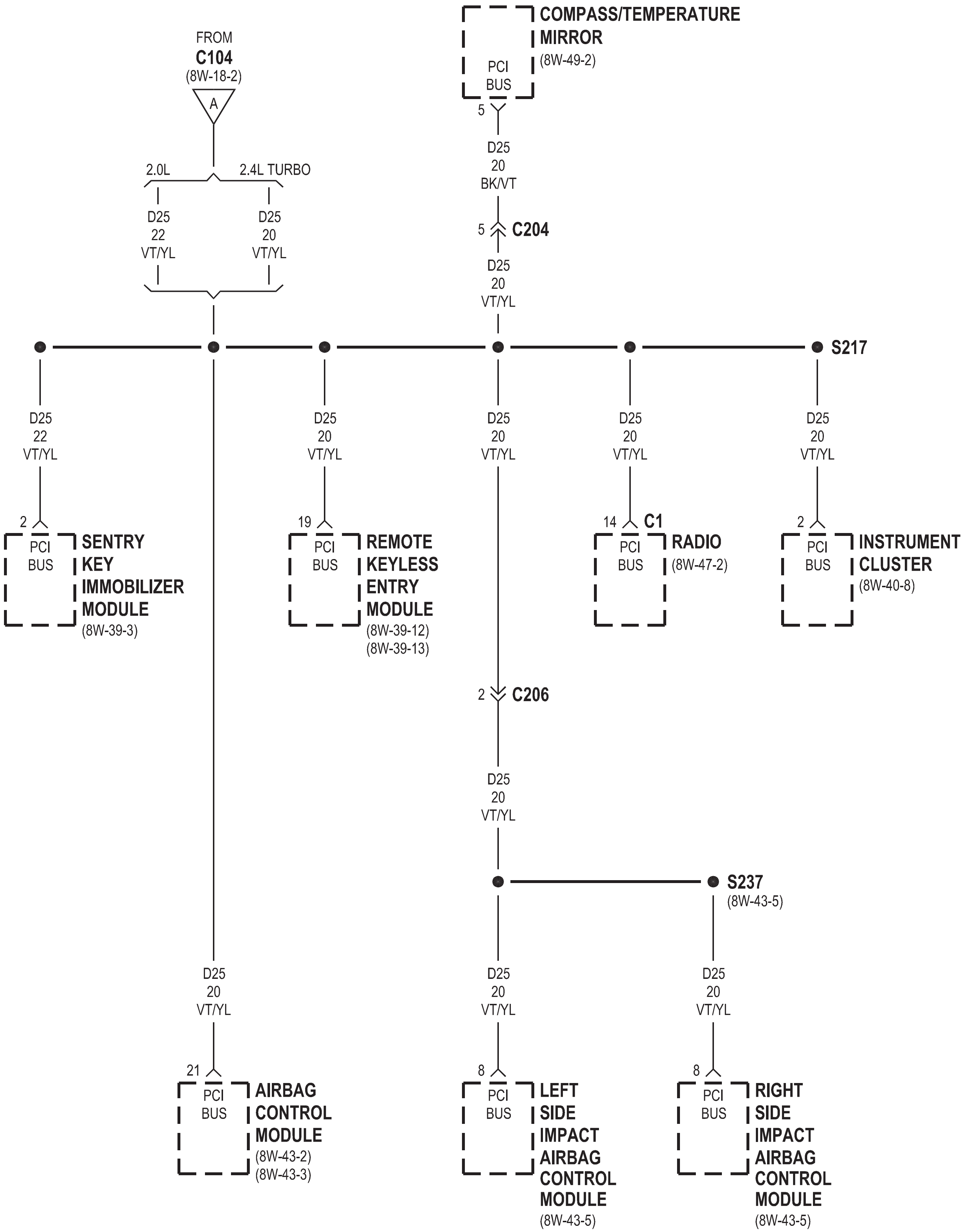

RIGHT BACKUP LAMP
(8W-51-2)
RIGHT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
LICENSE LAMP
(8W-51-4)
FUEL PUMP MODULE
(8W-30-9)
(8W-30-25)
NATURAL VACUUM LEAK DETECTION ASSEMBLY
(8W-30-17)
RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
RIGHT REAR DOOR AJAR SWITCH
(8W-40-14)
POWER LOCKS
EXCEPT POWER LOCKS
1
2
6
C304
Z1
20
BK
18
S310
G302

EXPORT


RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
2
RIGHT REAR DOOR AJAR SWITCH
(8W-40-14)
2
LEFT REAR FOG LAMP
(8W-51-8)
1
RIGHT LICENSE LAMP
(8W-51-6)
1
RIGHT REAR TURN SIGNAL LAMP
(8W-52-10)
1
POWER LOCKS
EXCEPT POWER LOCKS
Z1 20 BK
FUEL PUMP MODULE
(8W-30-9)
1
RIGHT REAR FOG LAMP
(8W-51-8)
1
LEFT LICENSE LAMP
(8W-51-6)
1
6
C304
Z1 20 BK
Z1 18 BK
Z1 20 BK
Z1 20 BK
Z1 18 BK
Z1 18 BK
Z1 20 BK
S310
RIGHT TAIL/STOP LAMP
(8W-51-6)
1
SIREN
(8W-39-16)
3
RIGHT BACKUP LAMP
(8W-51-2)
1
Z1 14 BK
Z1 20 BK
Z1 18 BK
Z1 20 BK
S314
Z1 14 BK
G302

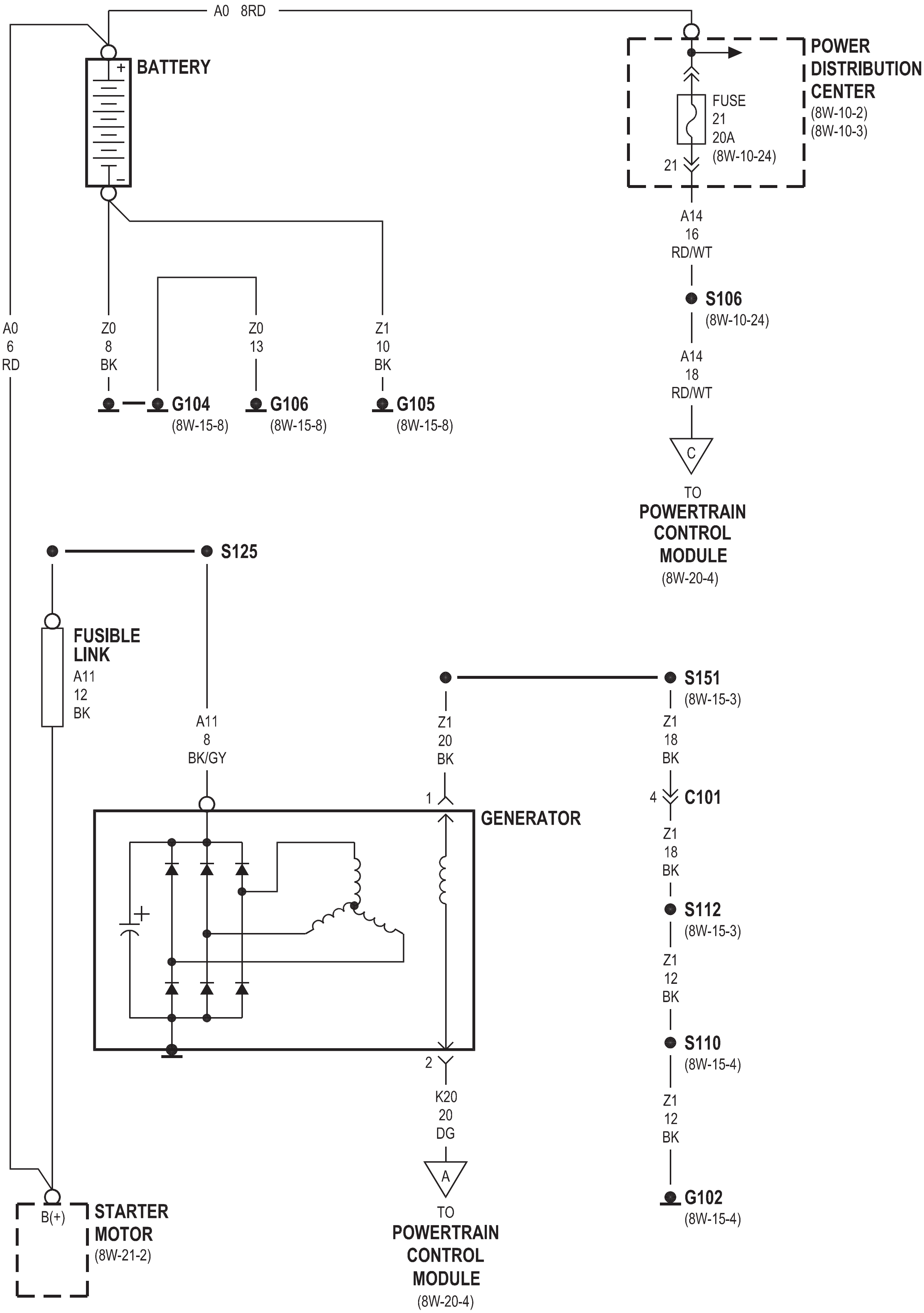
8W-18 BUS COMMUNICATIONS


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 21 20A
(8W-10-24)
21
POWERTRAIN CONTROL MODULE
(8W-30-13)
PCI BUS (PCM)
SCI RECEIVE (PCM)
SCI TRANSMIT (PCM)
38 C1
25 C1
36 C1
A14 16 RD/WT
S106
(8W-10-24)
A14 18 RD/WT
D20 20 LG
D21 20 PK
12
7
16
DATA LINK CONNECTOR
2
9
15
4
5
D25 20 VT/YL
D25 20 VT/YL
Z12 20 BK/TN
Z12 20 BK/TN
S104
S107
(8W-15-2)
2.0L
2.4L TURBO
D25 20 VT/YL
D25 18 VT/YL
D6 20 PK/LB
D15 20 WT/DG
Z12 16 BK/TN
Z12 12 BK/TN
20
C20
C104
5
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
26 C1
37 C1
SCI RECEIVE (TCM)
SCI TRANSMIT (TCM)
POWERTRAIN CONTROL MODULE (2.0L)
(8W-30-13)
A
TO
S217
(8W-18-3)
G102
(8W-15-4)

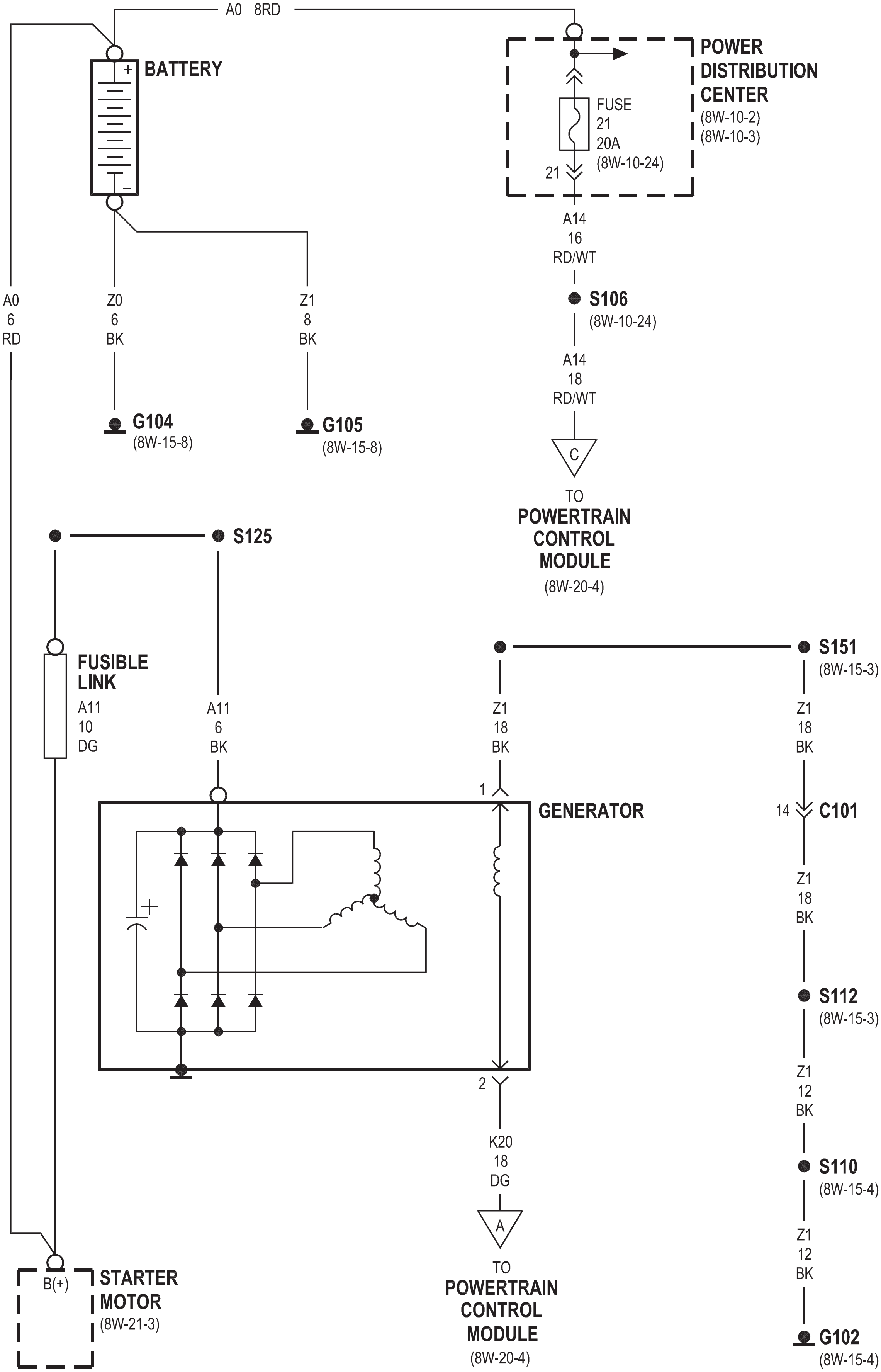

FROM
C104
(8W-18-2)
A
2.0L
2.4L TURBO
D25
22
VT/YL
D25
20
VT/YL
COMPASS/TEMPERATURE
MIRROR
(8W-49-2)
PCI
BUS
5
D25
20
BK/VT
5
C204
D25
20
VT/YL
S217
D25
22
VT/YL
D25
20
VT/YL
2
SENTRY
KEY
IMMOBILIZER
MODULE
(8W-39-3)
19
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-12)
(8W-39-13)
14
C1
RADIO
(8W-47-2)
2
INSTRUMENT
CLUSTER
(8W-40-8)
2
C206
S237
(8W-43-5)
21
AIRBAG
CONTROL
MODULE
(8W-43-2)
(8W-43-3)
8
LEFT
SIDE
IMPACT
AIRBAG
CONTROL
MODULE
(8W-43-5)
8
RIGHT
SIDE
IMPACT
AIRBAG
CONTROL
MODULE
(8W-43-5)

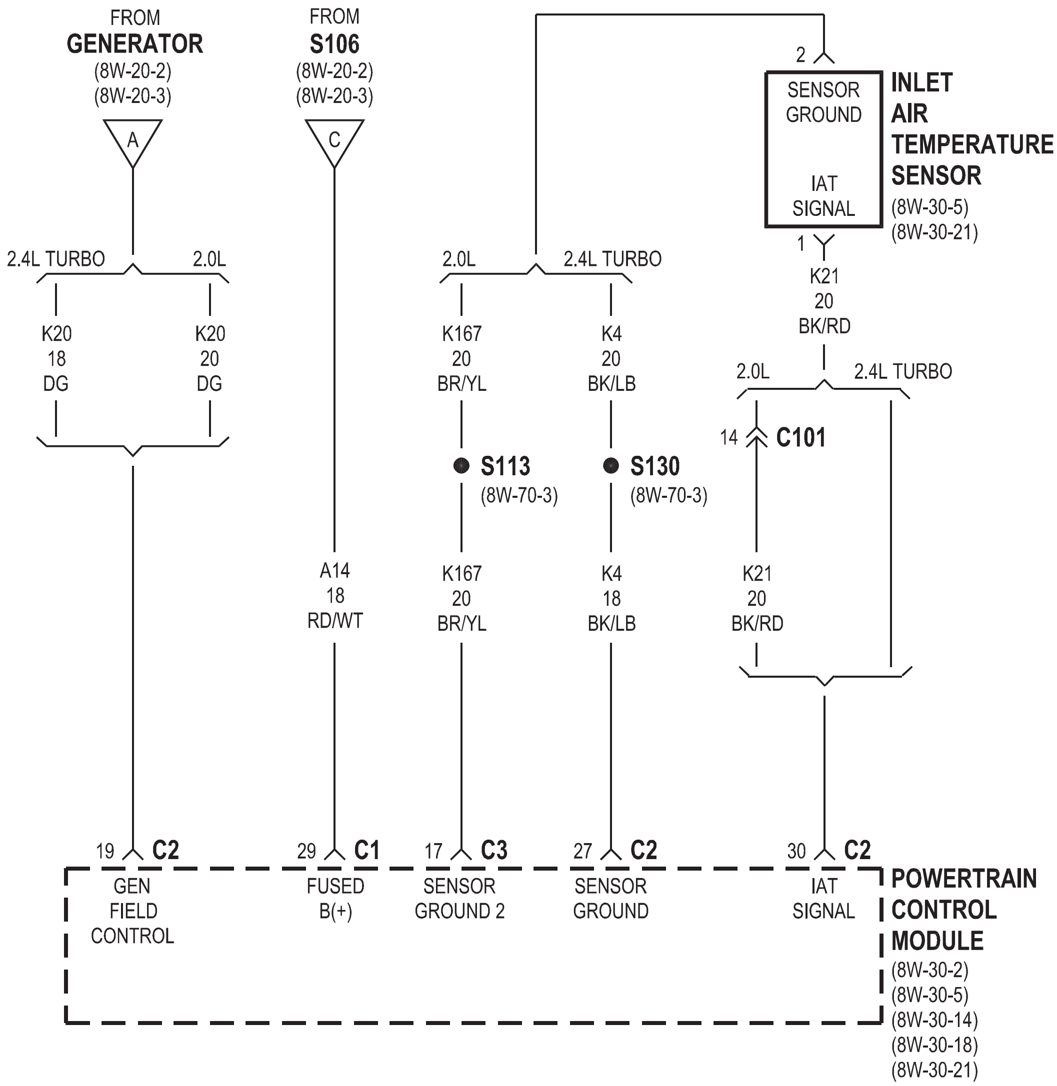
8W-20 CHARGING SYSTEM

2.0L


A0 8RD
BATTERY
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
21
20A
(8W-10-24)
21
A14
16
RD/WT
S106
(8W-10-24)
A14
18
RD/WT
C
TO
POWERTRAIN
CONTROL
MODULE
(8W-20-4)
A0
6
RD
Z0
8
BK
Z0
13
Z1
10
BK
G104
(8W-15-8)
G106
(8W-15-8)
G105
(8W-15-8)
S125
FUSIBLE
LINK
A11
12
BK
A11
8
BK/GY
Z1
20
BK
1
GENERATOR
2
K20
20
DG
A
TO
POWERTRAIN
CONTROL
MODULE
(8W-20-4)
S151
(8W-15-3)
Z1
18
BK
4
C101
Z1
18
BK
S112
(8W-15-3)
Z1
12
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
B(+)
STARTER
MOTOR
(8W-21-2)

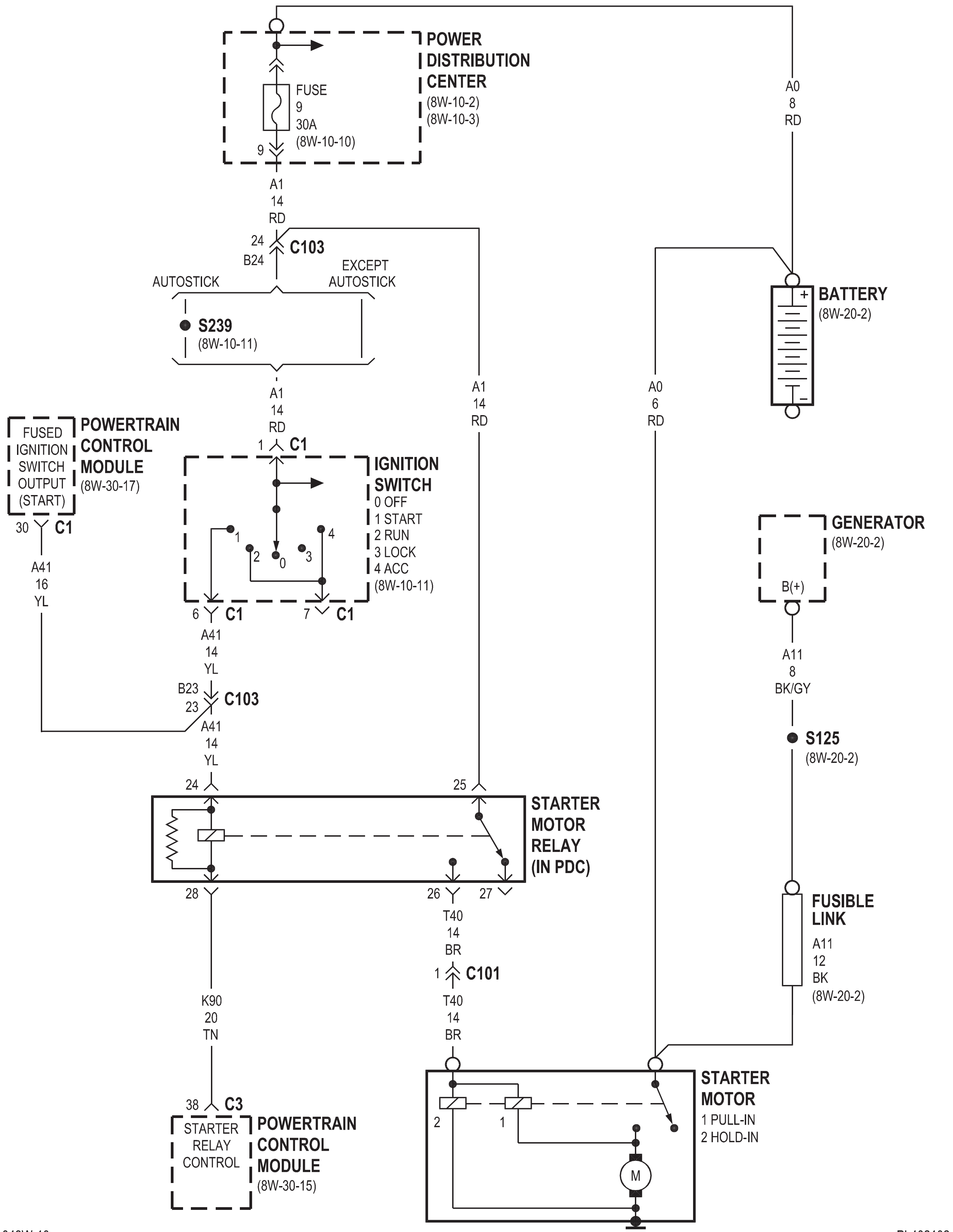
8W-20 CHARGING SYSTEM
2.4L TURBO

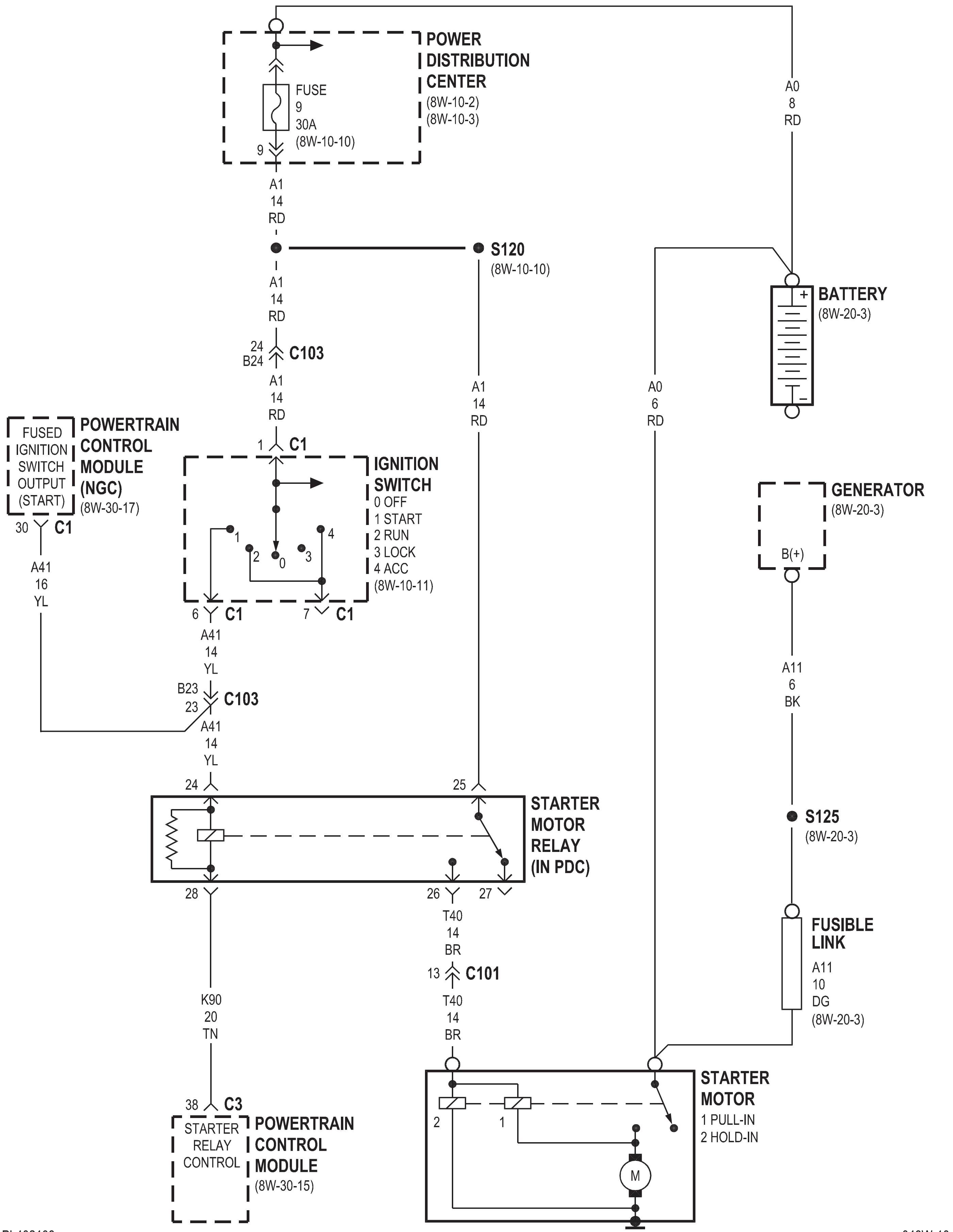



FROM
GENERATOR
(8W-20-2)
(8W-20-3)
A
FROM
S106
(8W-20-2)
(8W-20-3)
C
2
SENSOR GROUND
IAT SIGNAL
1
INLET AIR TEMPERATURE SENSOR
(8W-30-5)
(8W-30-21)
2.4L TURBO
2.0L
K20 18 DG
K20 20 DG
2.0L
2.4L TURBO
K167 20 BR/YL
K4 20 BK/LB
K21 20 BK/RD
2.0L
2.4L TURBO
14
C101
S113
(8W-70-3)
S130
(8W-70-3)
A14 18 RD/WT
K167 20 BR/YL
K4 18 BK/LB
K21 20 BK/RD
19 C2
29 C1
17 C3
27 C2
30 C2
GEN FIELD CONTROL
FUSED B(+)
SENSOR GROUND 2
SENSOR GROUND
IAT SIGNAL
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-5)
(8W-30-14)
(8W-30-18)
(8W-30-21)

8W-21 STARTING SYSTEM

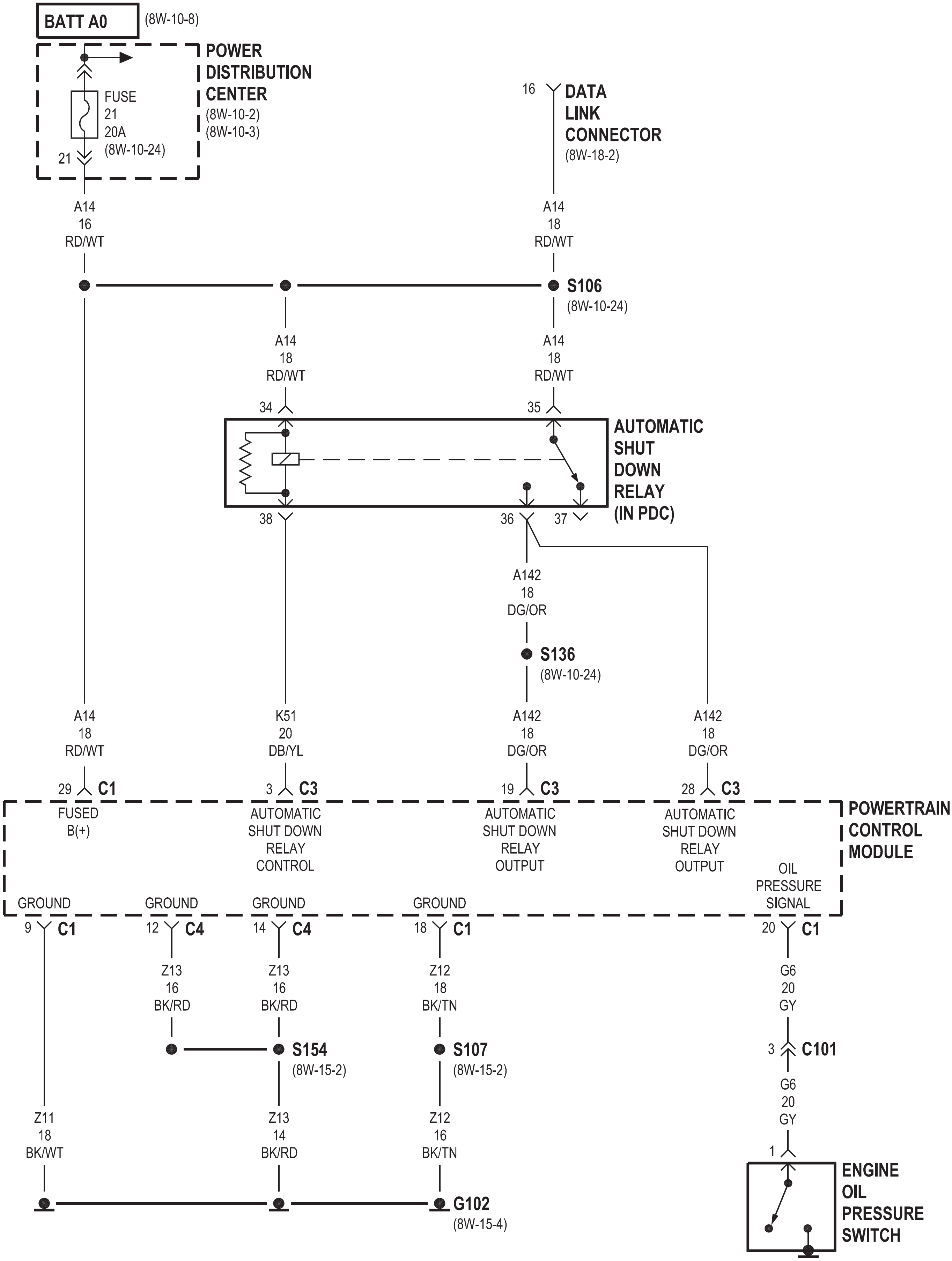
2.0L

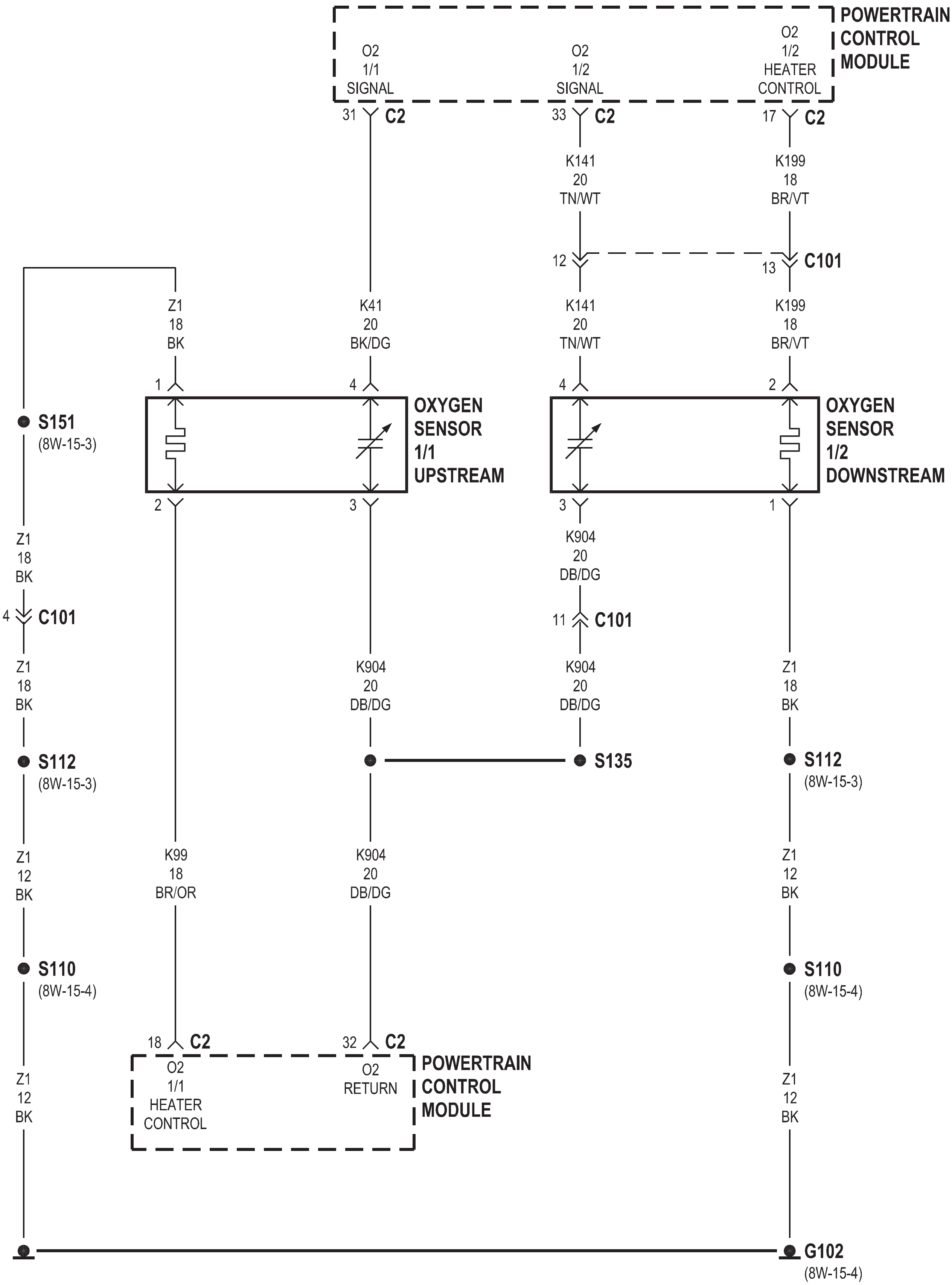

POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 9 30A (8W-10-10)
9
A0 8 RD
A1 14 RD
24 B24 C103
AUTOSTICK
EXCEPT AUTOSTICK
S239 (8W-10-11)
BATTERY (8W-20-2)
A1 14 RD
A0 6 RD
FUSED IGNITION SWITCH OUTPUT (START)
POWERTRAIN CONTROL MODULE (8W-30-17)
30 C1
A41 16 YL
1 C1
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-11)
6 C1
7 C1
A41 14 YL
B23 23 C103
GENERATOR (8W-20-2)
B(+)
A11 8 BK/GY
S125 (8W-20-2)
24
25
STARTER MOTOR RELAY (IN PDC)
28
26
27
T40 14 BR
1 C101
FUSIBLE LINK
A11 12 BK (8W-20-2)
K90 20 TN
38 C3
STARTER RELAY CONTROL
POWERTRAIN CONTROL MODULE (8W-30-15)
STARTER MOTOR
1 PULL-IN
2 HOLD-IN
M

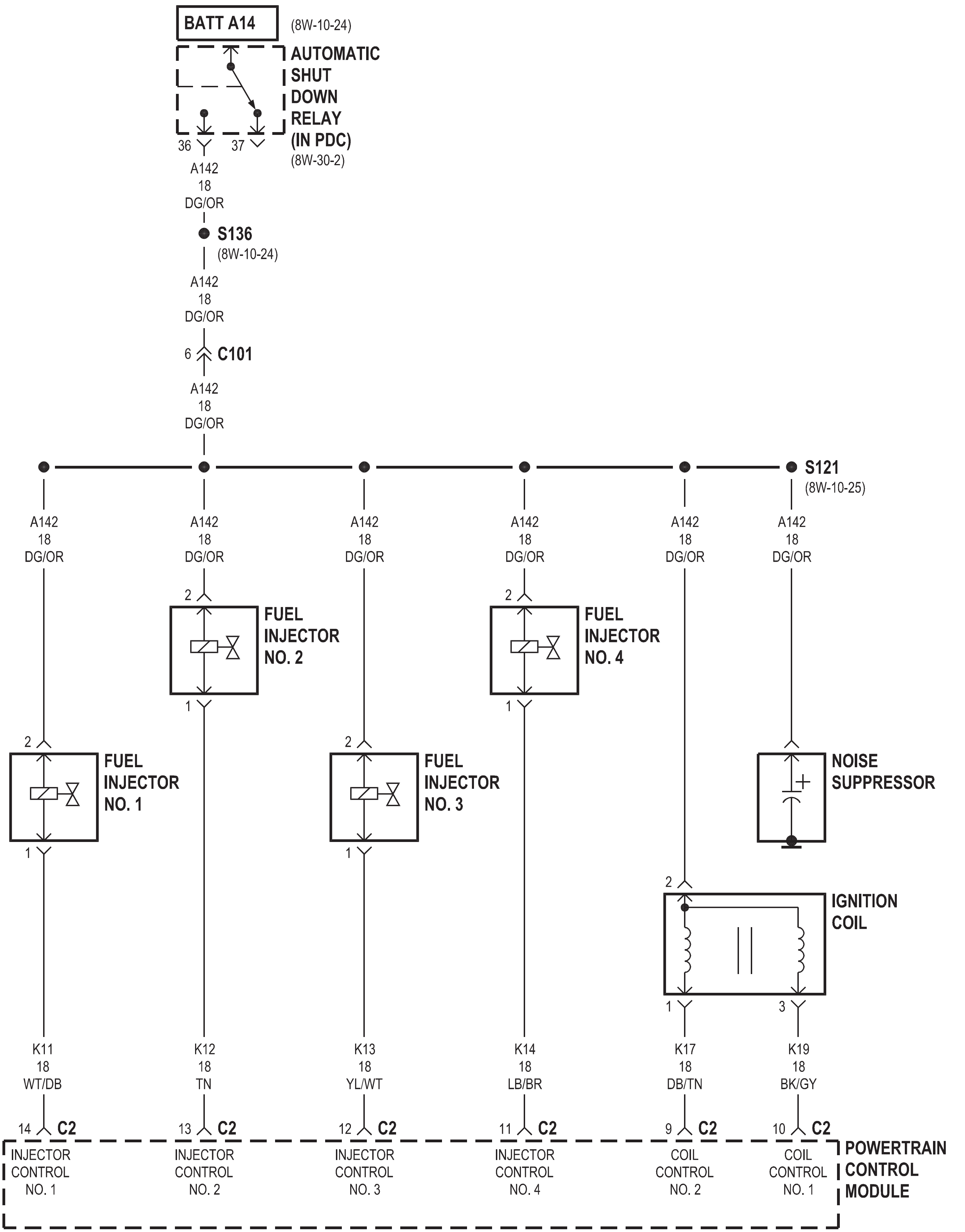

POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
9
30A
(8W-10-10)
9
A0
8
RD
A1
14
RD
S120
(8W-10-10)
BATTERY
(8W-20-3)
24
B24
C103
A1
14
RD
A0
6
RD
FUSED
IGNITION
SWITCH
OUTPUT
(START)
POWERTRAIN
CONTROL
MODULE
(NGC)
(8W-30-17)
30
C1
1
C1
IGNITION
SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-11)
GENERATOR
(8W-20-3)
B(+)
A41
16
YL
6
C1
7
C1
A41
14
YL
A11
6
BK
B23
23
C103
24
25
STARTER
MOTOR
RELAY
(IN PDC)
S125
(8W-20-3)
28
26
27
T40
14
BR
13
C101
FUSIBLE
LINK
A11
10
DG
(8W-20-3)
K90
20
TN
STARTER
MOTOR
1 PULL-IN
2 HOLD-IN
38
C3
STARTER
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
(8W-30-15)
M

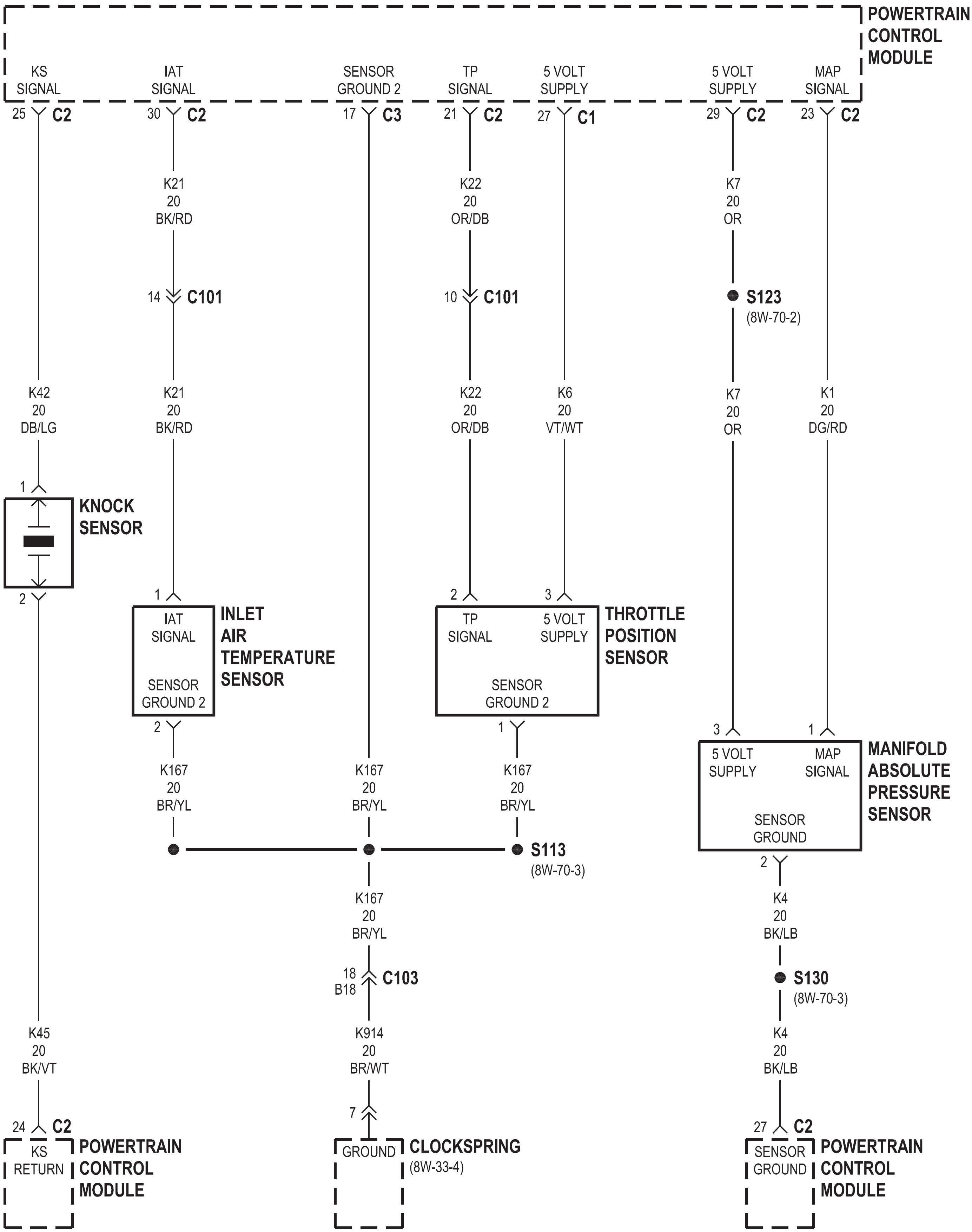
8W-30 FUEL/IGNITION SYSTEM

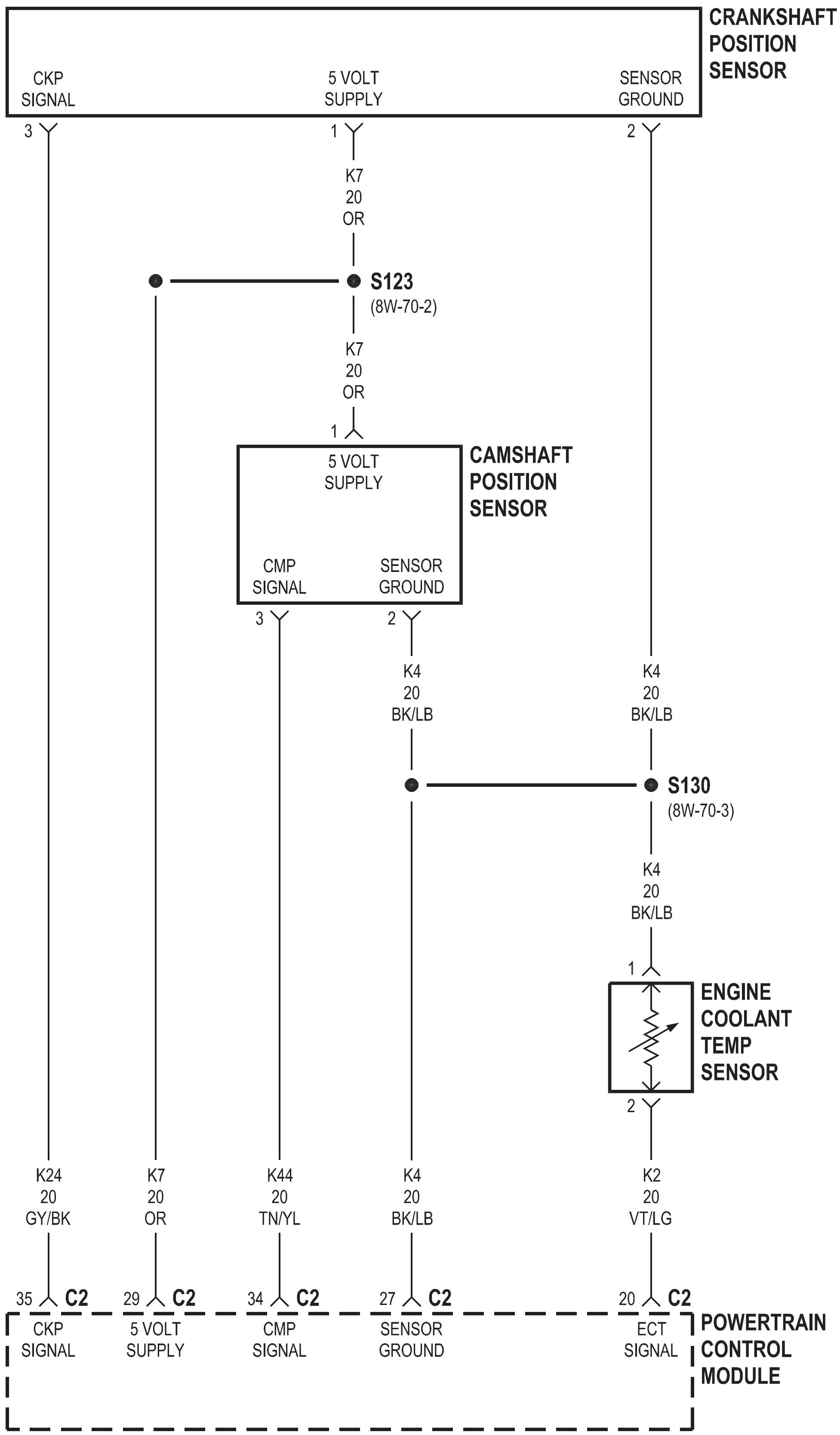
2.0L

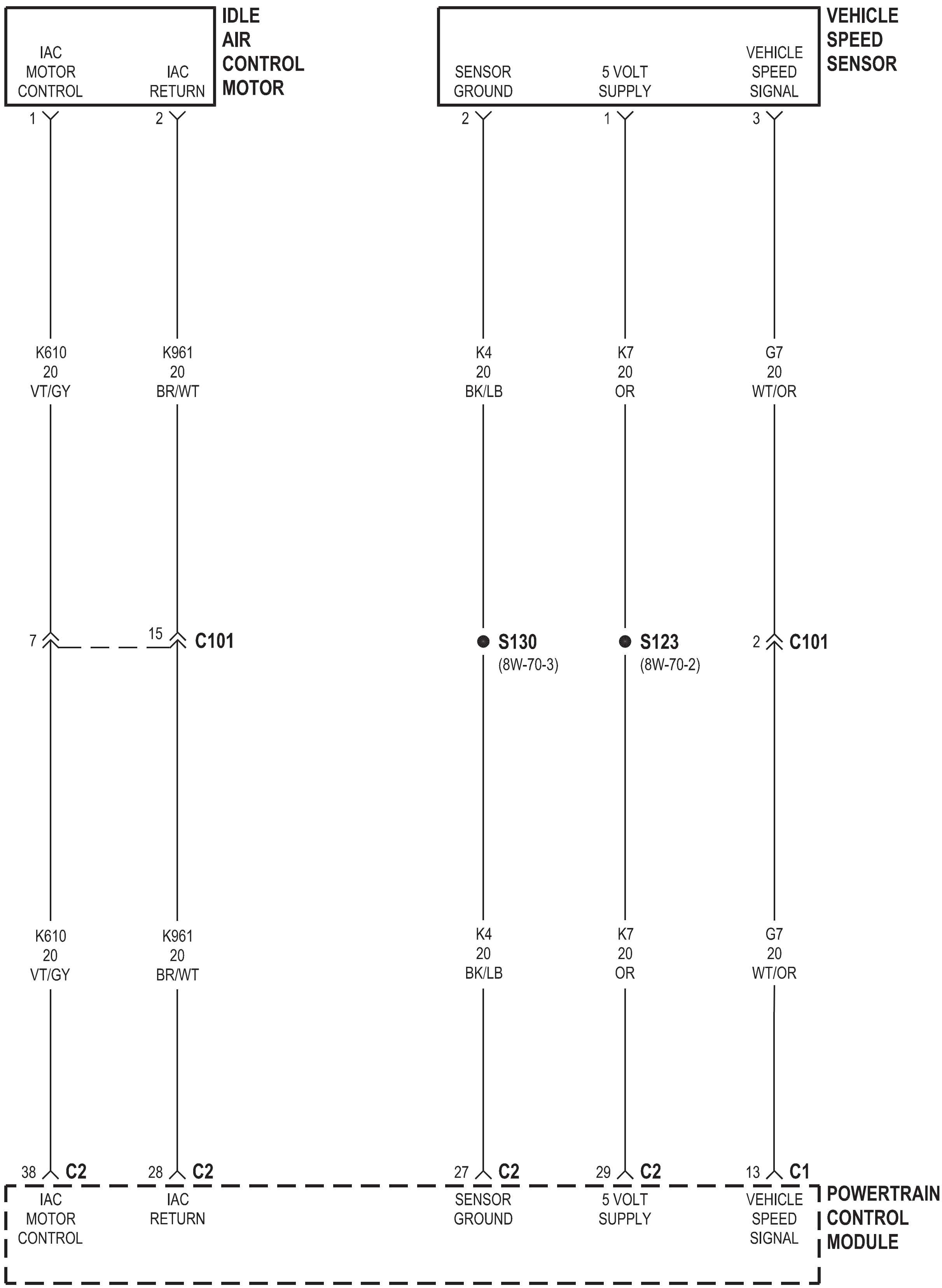

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
21
20A
(8W-10-24)
21
16
DATA
LINK
CONNECTOR
(8W-18-2)
A14
16
RD/WT
A14
18
RD/WT
S106
(8W-10-24)
A14
18
RD/WT
A14
18
RD/WT
34
35
AUTOMATIC
SHUT
DOWN
RELAY
(IN PDC)
38
36
37
A142
18
DG/OR
S136
(8W-10-24)
A14
18
RD/WT
K51
20
DB/YL
A142
18
DG/OR
A142
18
DG/OR
29 C1
3 C3
19 C3
28 C3
FUSED
B(+)
AUTOMATIC
SHUT DOWN
RELAY
CONTROL
AUTOMATIC
SHUT DOWN
RELAY
OUTPUT
AUTOMATIC
SHUT DOWN
RELAY
OUTPUT
POWERTRAIN
CONTROL
MODULE
OIL
PRESSURE
SIGNAL
GROUND
GROUND
GROUND
GROUND
9 C1
12 C4
14 C4
18 C1
20 C1
Z13
16
BK/RD
Z13
16
BK/RD
Z12
18
BK/TN
G6
20
GY
S154
(8W-15-2)
S107
(8W-15-2)
3 C101
G6
20
GY
Z11
18
BK/WT
Z13
14
BK/RD
Z12
16
BK/TN
1
ENGINE
OIL
PRESSURE
SWITCH
G102
(8W-15-4)

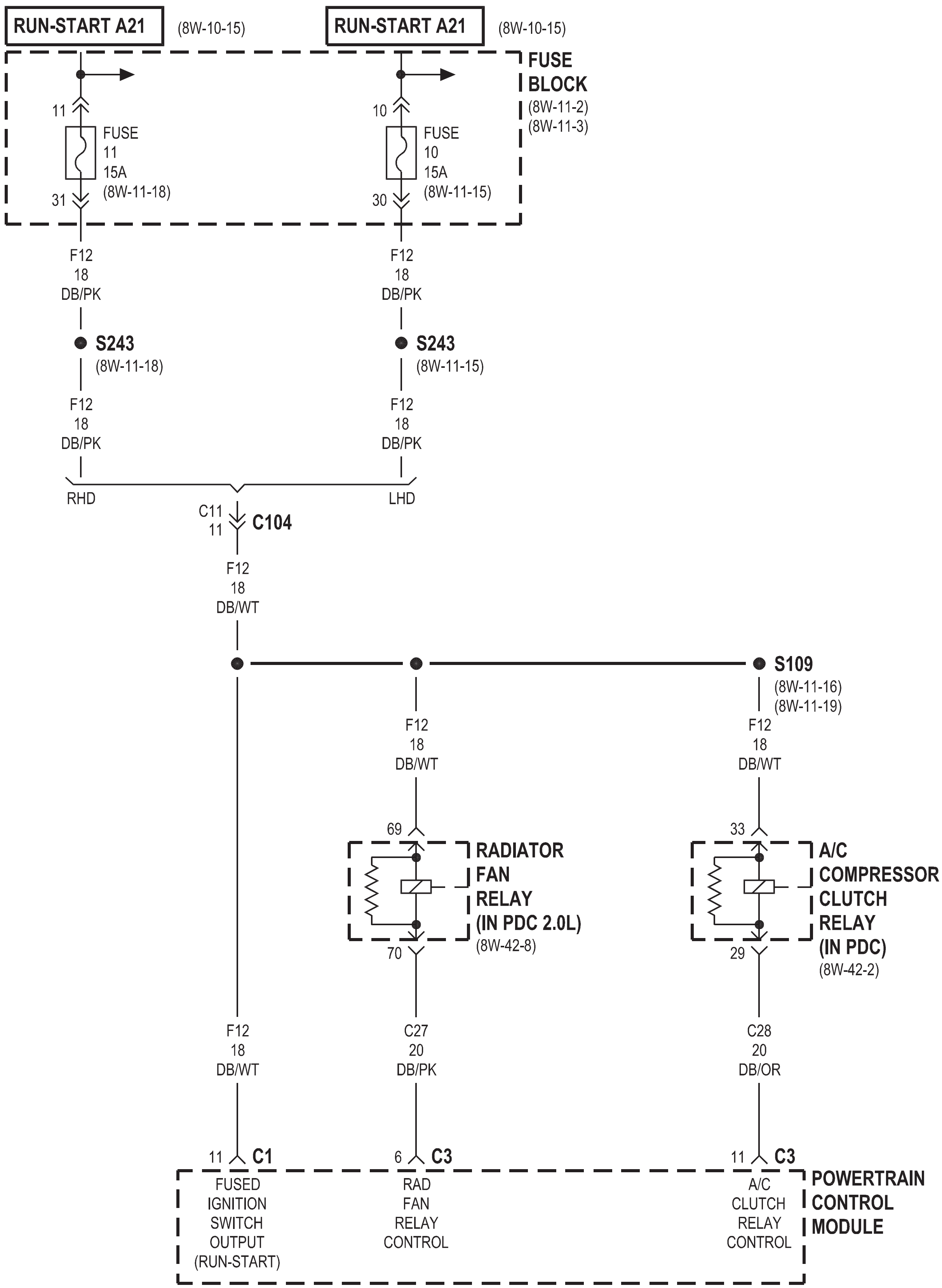

POWERTRAIN CONTROL MODULE
O2 1/1 SIGNAL
O2 1/2 SIGNAL
O2 1/2 HEATER CONTROL
31 C2
33 C2
17 C2
K141 20 TN/WT
K199 18 BR/VT
12
13 C101
Z1 18 BK
K41 20 BK/DG
K141 20 TN/WT
K199 18 BR/VT
S151 (8W-15-3)
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
K904 20 DB/DG
Z1 18 BK
4 C101
11 C101
Z1 18 BK
K904 20 DB/DG
K904 20 DB/DG
Z1 18 BK
S112 (8W-15-3)
S135
S112 (8W-15-3)
Z1 12 BK
K99 18 BR/OR
K904 20 DB/DG
Z1 12 BK
S110 (8W-15-4)
S110 (8W-15-4)
18 C2
32 C2
O2 1/1 HEATER CONTROL
O2 RETURN
POWERTRAIN CONTROL MODULE
Z1 12 BK
Z1 12 BK
G102 (8W-15-4)

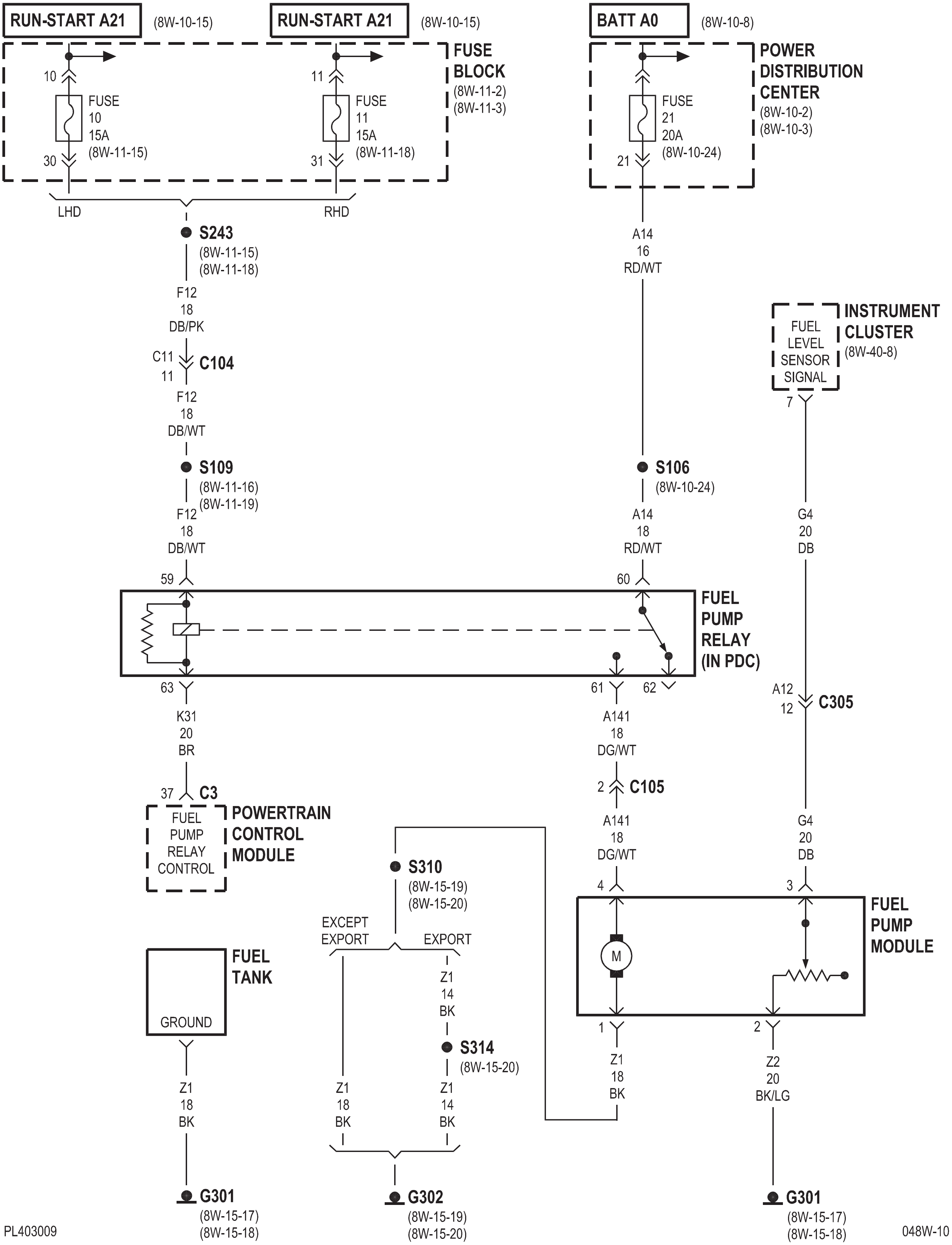

BATT A14
(8W-10-24)
AUTOMATIC SHUT DOWN RELAY (IN PDC)
(8W-30-2)
36
37
A142
18
DG/OR
S136
(8W-10-24)
A142
18
DG/OR
6
C101
A142
18
DG/OR
S121
(8W-10-25)
A142
18
DG/OR
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
NOISE SUPPRESSOR
IGNITION COIL
K11
18
WT/DB
K12
18
TN
K13
18
YL/WT
K14
18
LB/BR
K17
18
DB/TN
K19
18
BK/GY
14 C2
13 C2
12 C2
11 C2
9 C2
10 C2
INJECTOR CONTROL NO. 1
INJECTOR CONTROL NO. 2
INJECTOR CONTROL NO. 3
INJECTOR CONTROL NO. 4
COIL CONTROL NO. 2
COIL CONTROL NO. 1
POWERTRAIN CONTROL MODULE

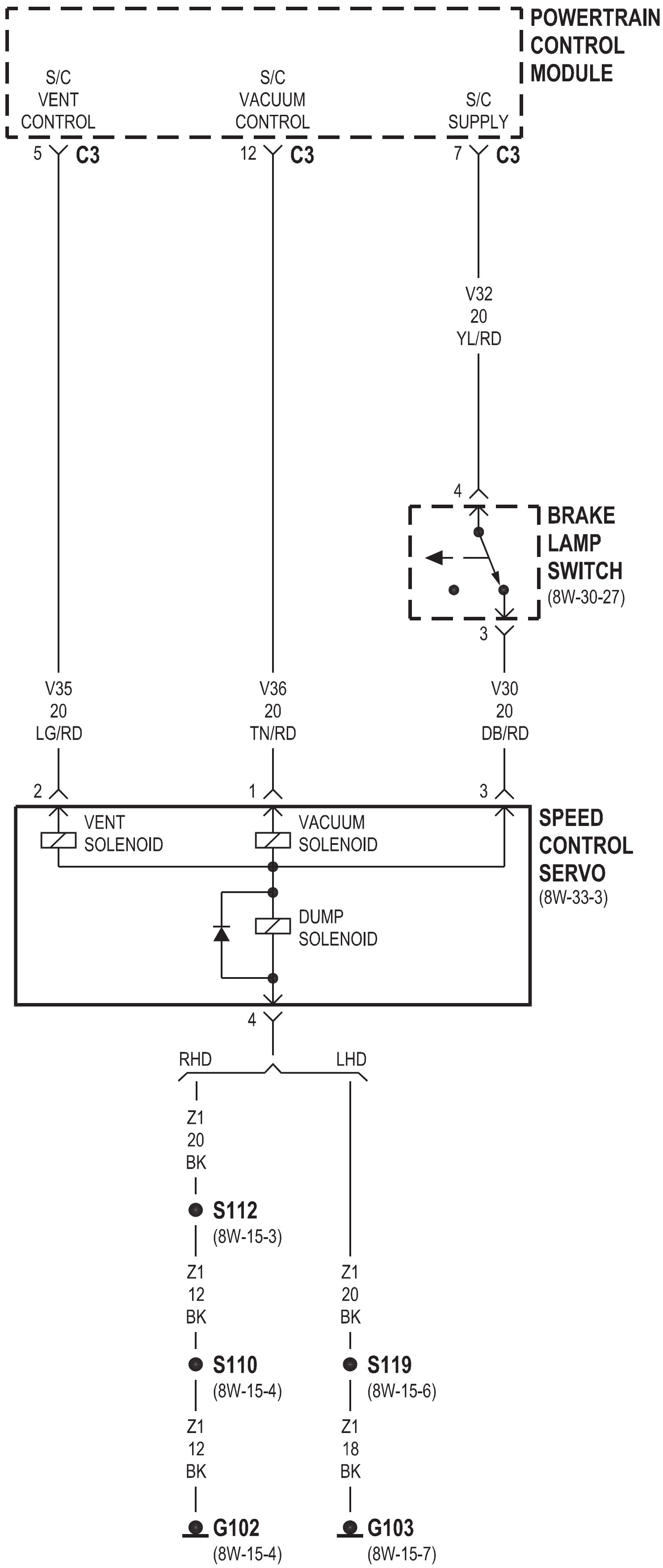

POWERTRAIN CONTROL MODULE
KS SIGNAL
IAT SIGNAL
SENSOR GROUND 2
TP SIGNAL
5 VOLT SUPPLY
5 VOLT SUPPLY
MAP SIGNAL
25 C2
30 C2
17 C3
21 C2
27 C1
29 C2
23 C2
K21 20 BK/RD
K22 20 OR/DB
K7 20 OR
14 C101
10 C101
S123 (8W-70-2)
K42 20 DB/LG
K21 20 BK/RD
K22 20 OR/DB
K6 20 VT/WT
K7 20 OR
K1 20 DG/RD
KNOCK SENSOR
INLET AIR TEMPERATURE SENSOR
IAT SIGNAL
SENSOR GROUND 2
THROTTLE POSITION SENSOR
TP SIGNAL
5 VOLT SUPPLY
SENSOR GROUND 2
MANIFOLD ABSOLUTE PRESSURE SENSOR
5 VOLT SUPPLY
MAP SIGNAL
SENSOR GROUND
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
S113 (8W-70-3)
K167 20 BR/YL
K4 20 BK/LB
18 B18 C103
S130 (8W-70-3)
K45 20 BK/VT
K914 20 BR/WT
K4 20 BK/LB
24 C2
7
27 C2
KS RETURN
POWERTRAIN CONTROL MODULE
GROUND
CLOCKSPRING (8W-33-4)
SENSOR GROUND
POWERTRAIN CONTROL MODULE

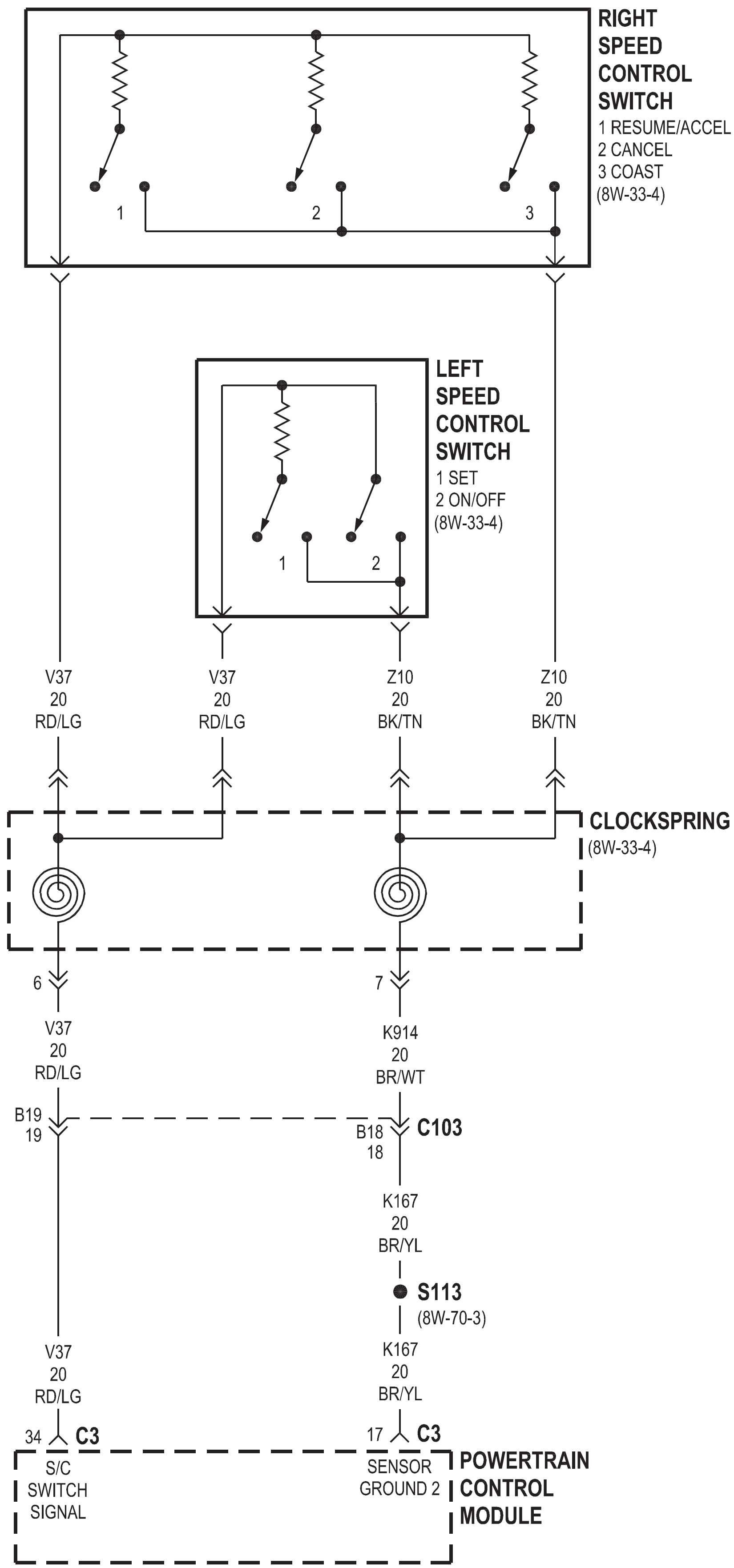

CRANKSHAFT POSITION SENSOR
CKP SIGNAL
5 VOLT SUPPLY
SENSOR GROUND
3
1
2
K7 20 OR
S123
(8W-70-2)
K7 20 OR
1
CAMSHAFT POSITION SENSOR
5 VOLT SUPPLY
CMP SIGNAL
SENSOR GROUND
3
2
K4 20 BK/LB
K4 20 BK/LB
S130
(8W-70-3)
K4 20 BK/LB
1
ENGINE COOLANT TEMP SENSOR
2
K24 20 GY/BK
K7 20 OR
K44 20 TN/YL
K4 20 BK/LB
K2 20 VT/LG
35 C2
29 C2
34 C2
27 C2
20 C2
CKP SIGNAL
5 VOLT SUPPLY
CMP SIGNAL
SENSOR GROUND
ECT SIGNAL
POWERTRAIN CONTROL MODULE

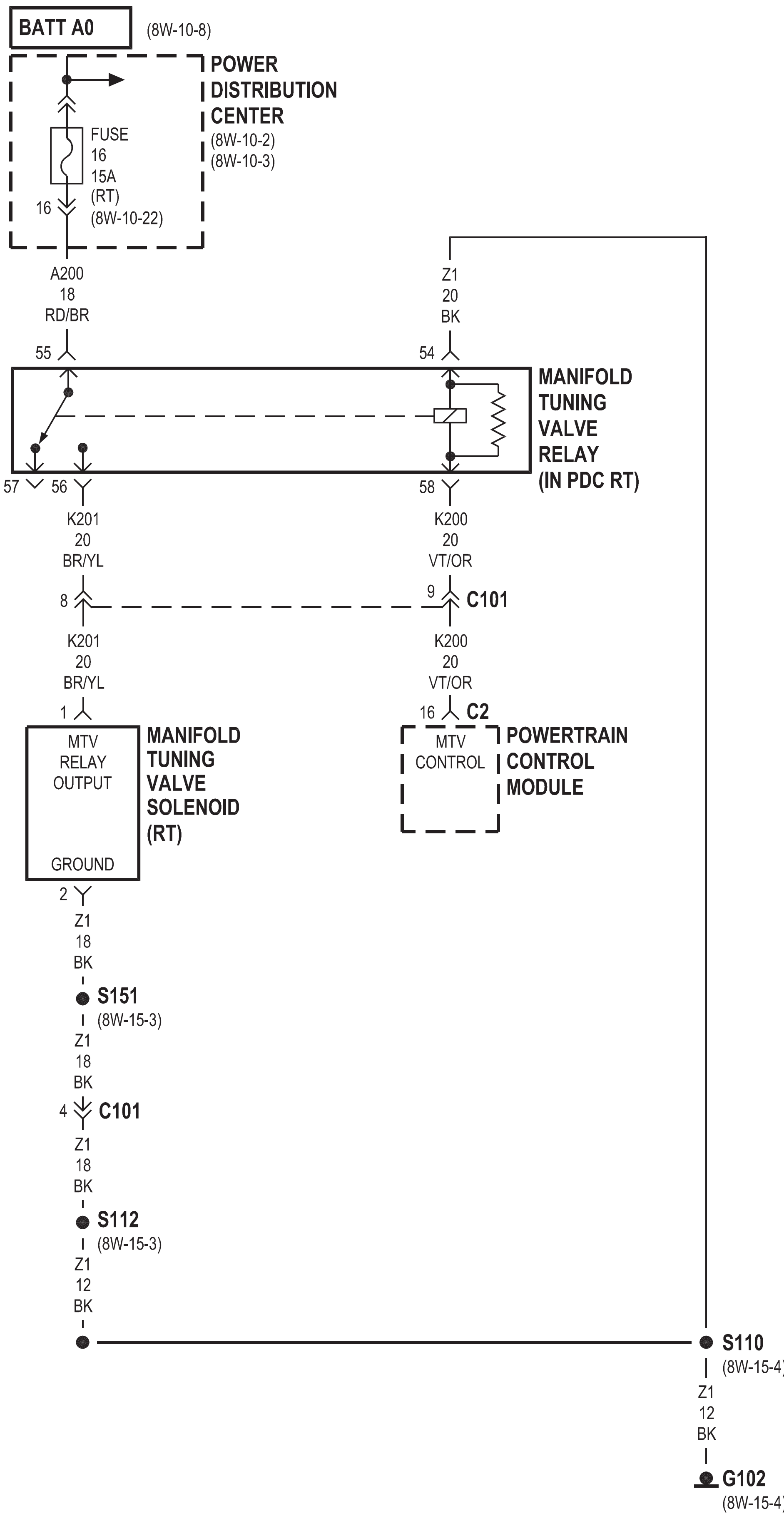

IDLE AIR CONTROL MOTOR
IAC MOTOR CONTROL
IAC RETURN
VEHICLE SPEED SENSOR
SENSOR GROUND
5 VOLT SUPPLY
VEHICLE SPEED SIGNAL
K610 20 VT/GY
K961 20 BR/WT
K4 20 BK/LB
K7 20 OR
G7 20 WT/OR
C101
S130 (8W-70-3)
S123 (8W-70-2)
C2
C1
POWERTRAIN CONTROL MODULE

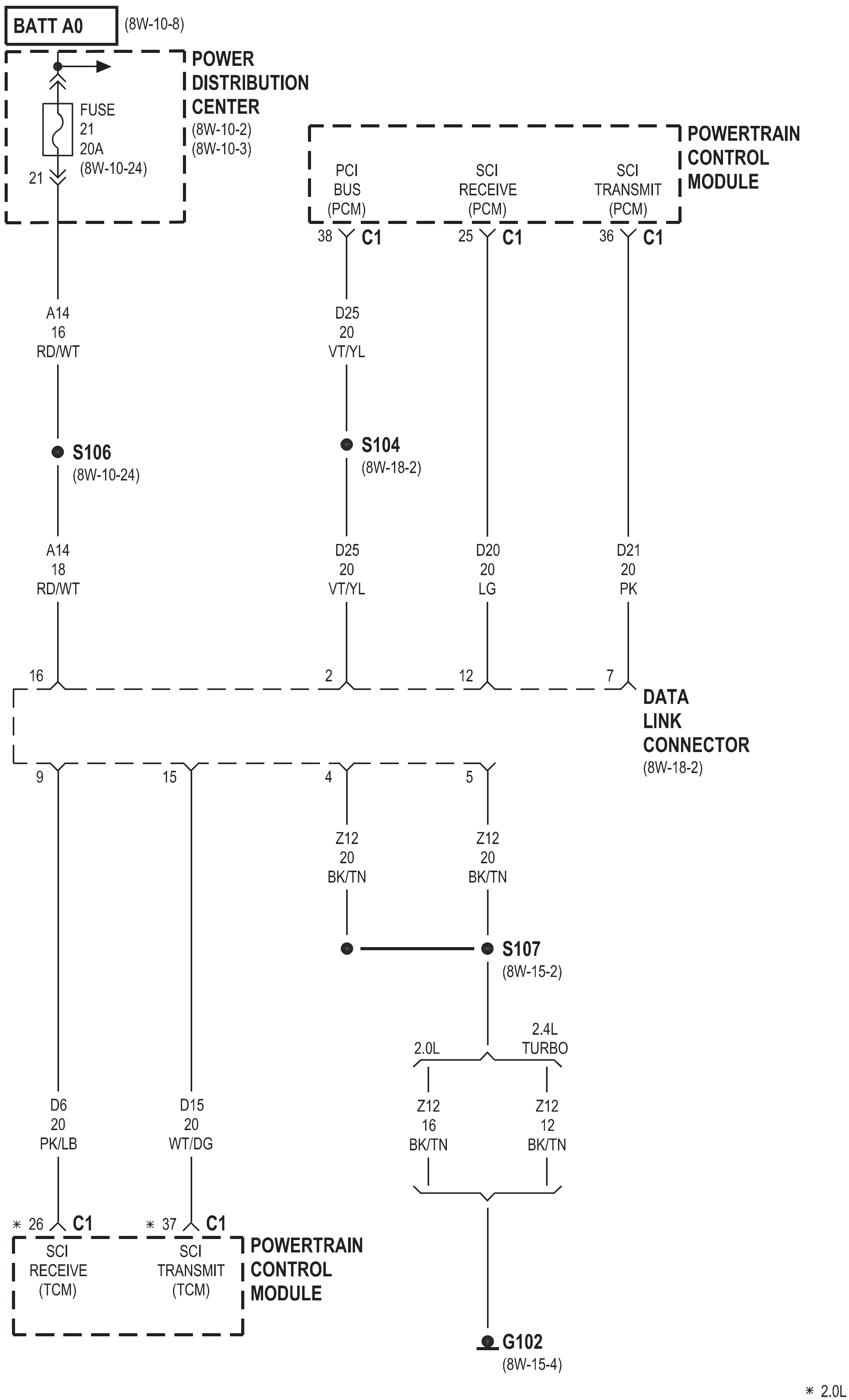

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
11
FUSE 11 15A (8W-11-18)
31
10
FUSE 10 15A (8W-11-15)
30
F12 18 DB/PK
S243
(8W-11-18)
S243
(8W-11-15)
RHD
LHD
C11 11
C104
F12 18 DB/WT
S109
(8W-11-16)
(8W-11-19)
69
RADIATOR FAN RELAY (IN PDC 2.0L)
(8W-42-8)
70
33
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-2)
29
C27 20 DB/PK
C28 20 DB/OR
11 C1
6 C3
11 C3
FUSED IGNITION SWITCH OUTPUT (RUN-START)
RAD FAN RELAY CONTROL
A/C CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE

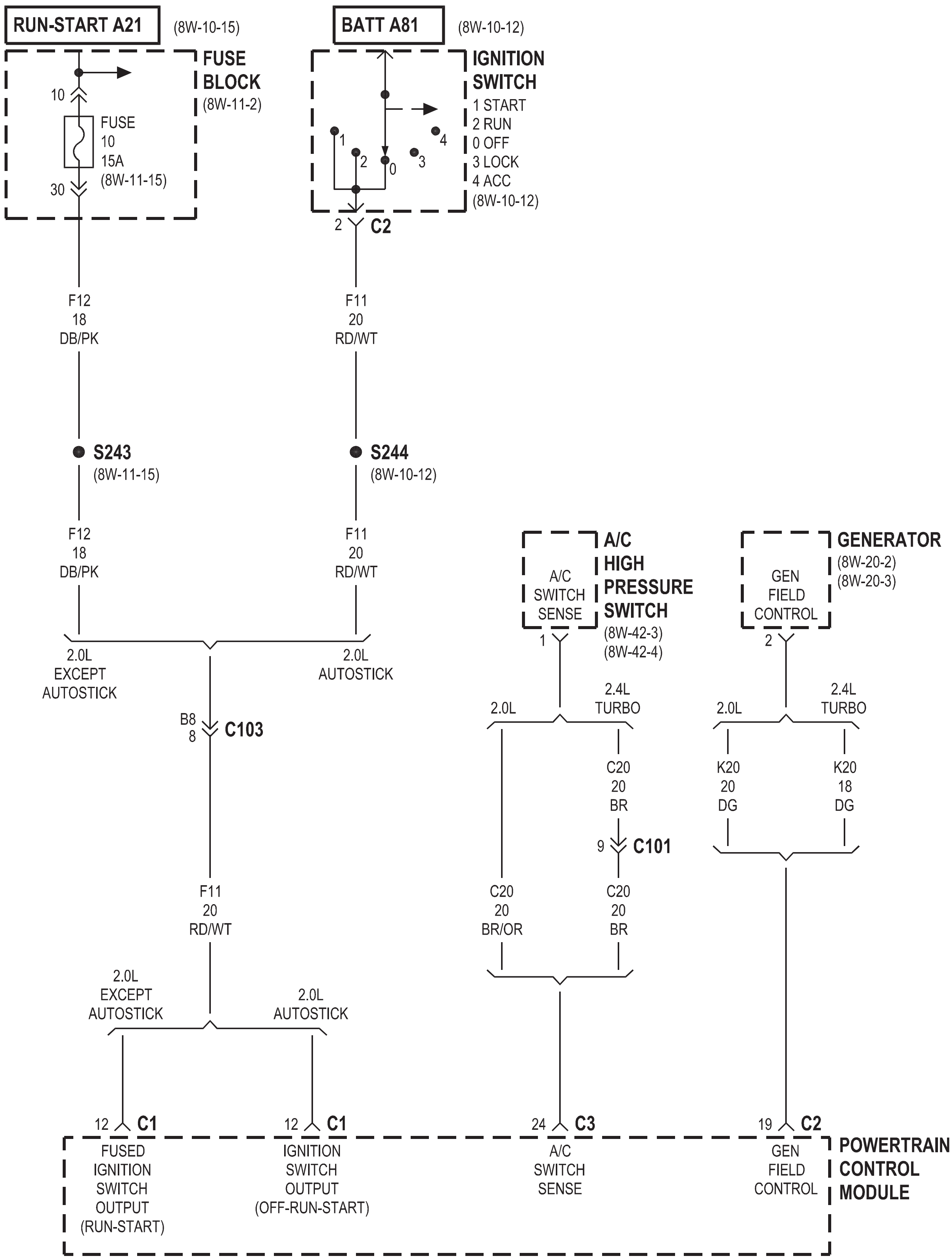

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
BATT A0
(8W-10-8)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE 10 15A (8W-11-15)
30
11
FUSE 11 15A (8W-11-18)
31
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 21 20A (8W-10-24)
21
LHD
RHD
S243
(8W-11-15)
(8W-11-18)
F12
18
DB/PK
C11
11
C104
F12
18
DB/WT
S109
(8W-11-16)
(8W-11-19)
F12
18
DB/WT
A14
16
RD/WT
S106
(8W-10-24)
A14
18
RD/WT
INSTRUMENT CLUSTER
(8W-40-8)
FUEL LEVEL SENSOR SIGNAL
7
G4
20
DB
59
60
FUEL PUMP RELAY (IN PDC)
63
61
62
K31
20
BR
37
C3
FUEL PUMP RELAY CONTROL
POWERTRAIN CONTROL MODULE
A141
18
DG/WT
2
C105
A141
18
DG/WT
A12
12
C305
G4
20
DB
4
3
FUEL PUMP MODULE
M
1
2
S310
(8W-15-19)
(8W-15-20)
EXCEPT EXPORT
EXPORT
Z1
14
BK
S314
(8W-15-20)
Z1
18
BK
Z1
14
BK
FUEL TANK
GROUND
Z1
18
BK
Z1
18
BK
Z2
20
BK/LG
G301
(8W-15-17)
(8W-15-18)
G302
(8W-15-19)
(8W-15-20)
G301
(8W-15-17)
(8W-15-18)

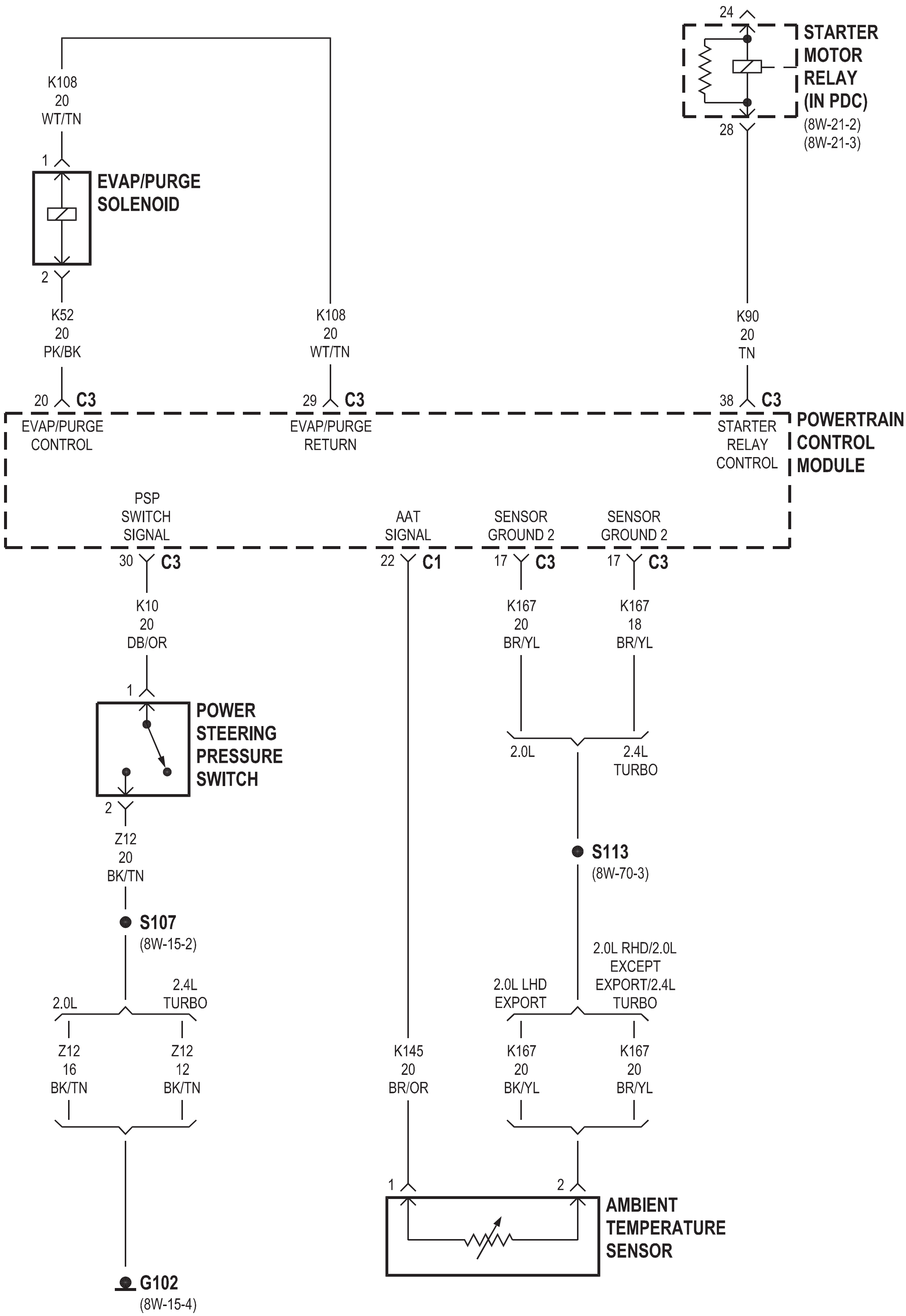

POWERTRAIN
CONTROL
MODULE
S/C
VENT
CONTROL
S/C
VACUUM
CONTROL
S/C
SUPPLY
5
C3
12
C3
7
C3
V32
20
YL/RD
4
BRAKE
LAMP
SWITCH
(8W-30-27)
3
V35
20
LG/RD
V36
20
TN/RD
V30
20
DB/RD
2
1
3
VENT
SOLENOID
VACUUM
SOLENOID
SPEED
CONTROL
SERVO
(8W-33-3)
DUMP
SOLENOID
4
RHD
LHD
Z1
20
BK
S112
(8W-15-3)
Z1
12
BK
Z1
20
BK
S110
(8W-15-4)
S119
(8W-15-6)
Z1
12
BK
Z1
18
BK
G102
(8W-15-4)
G103
(8W-15-7)

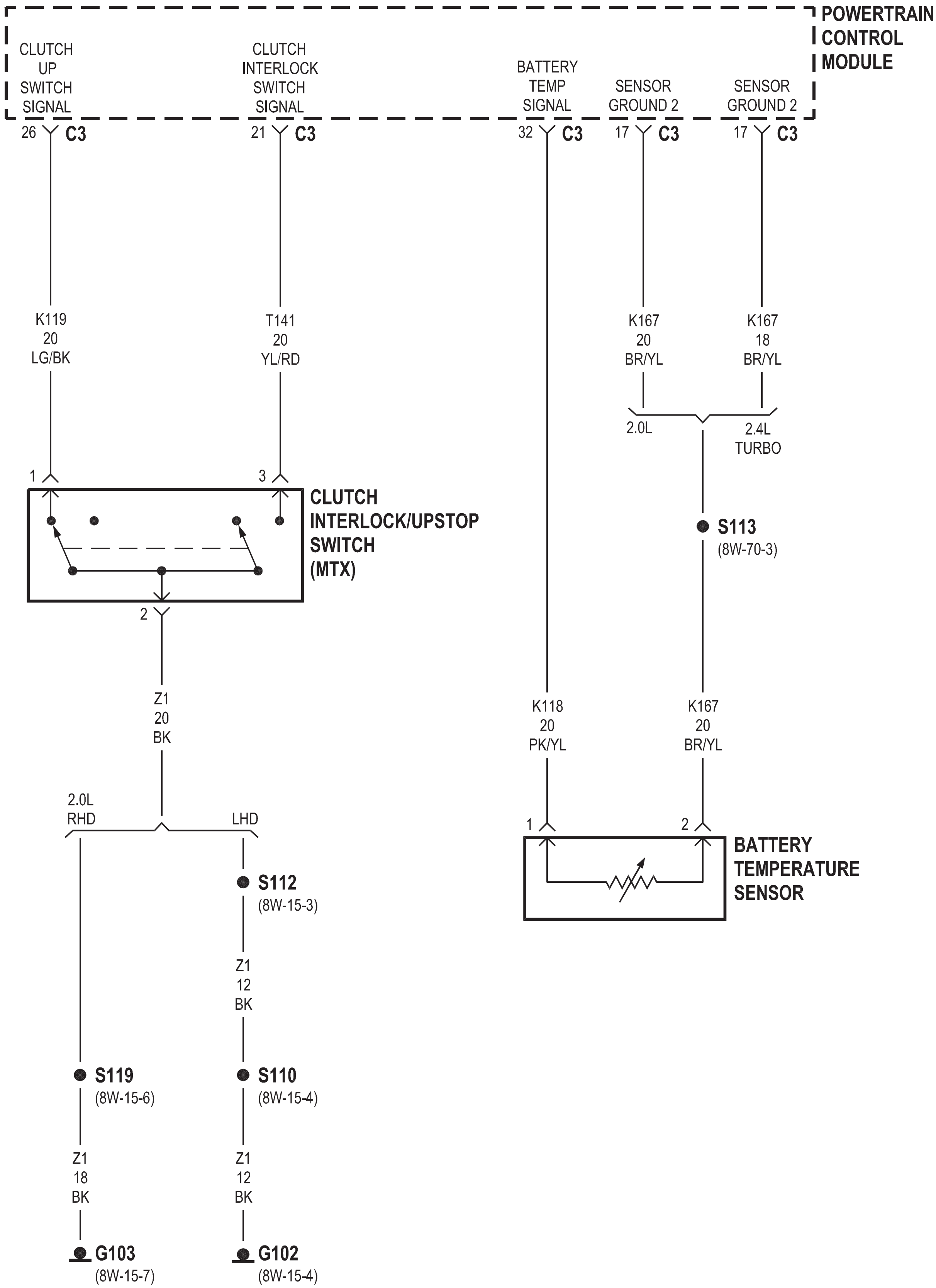

RIGHT
SPEED
CONTROL
SWITCH
1 RESUME/ACCEL
2 CANCEL
3 COAST
(8W-33-4)
1
2
3
LEFT
SPEED
CONTROL
SWITCH
1 SET
2 ON/OFF
(8W-33-4)
1
2
V37
20
RD/LG
V37
20
RD/LG
Z10
20
BK/TN
Z10
20
BK/TN
CLOCKSPRING
(8W-33-4)
6
7
V37
20
RD/LG
K914
20
BR/WT
B19
19
B18
18
C103
K167
20
BR/YL
S113
(8W-70-3)
V37
20
RD/LG
K167
20
BR/YL
34
C3
17
C3
S/C
SWITCH
SIGNAL
SENSOR
GROUND 2
POWERTRAIN
CONTROL
MODULE


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 16 15A (RT) (8W-10-22)
16
A200 18 RD/BR
55
Z1 20 BK
54
MANIFOLD TUNING VALVE RELAY (IN PDC RT)
57
56
58
K201 20 BR/YL
K200 20 VT/OR
8
9
C101
K201 20 BR/YL
K200 20 VT/OR
1
16
C2
MTV RELAY OUTPUT
GROUND
MANIFOLD TUNING VALVE SOLENOID (RT)
MTV CONTROL
POWERTRAIN CONTROL MODULE
2
Z1 18 BK
S151
(8W-15-3)
Z1 18 BK
4
C101
Z1 18 BK
S112
(8W-15-3)
Z1 12 BK
S110
(8W-15-4)
Z1 12 BK
G102
(8W-15-4)

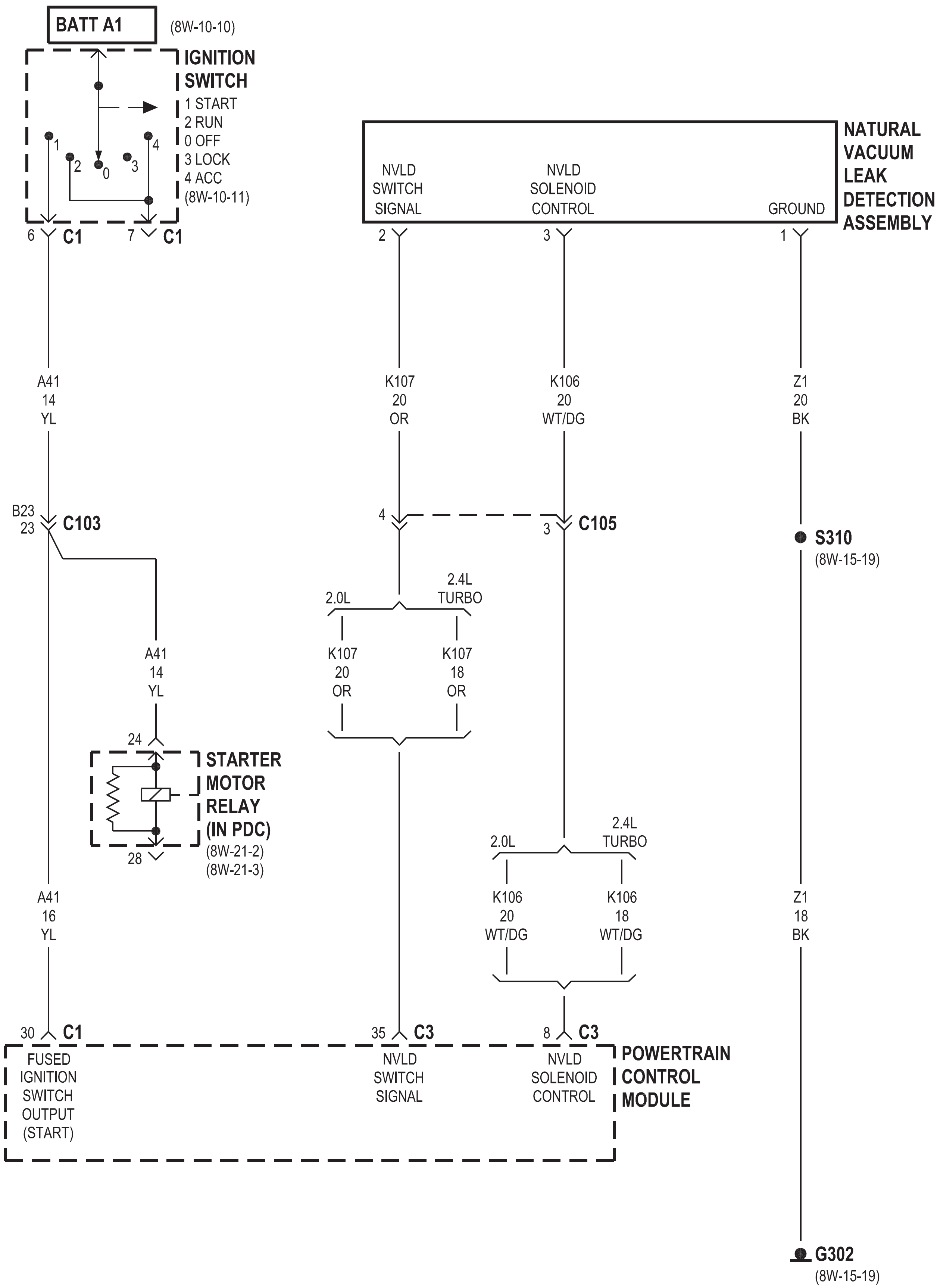

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
21
20A
(8W-10-24)
21
POWERTRAIN
CONTROL
MODULE
PCI
BUS
(PCM)
SCI
RECEIVE
(PCM)
SCI
TRANSMIT
(PCM)
38 C1
25 C1
36 C1
A14
16
RD/WT
D25
20
VT/YL
S106
(8W-10-24)
S104
(8W-18-2)
A14
18
RD/WT
D25
20
VT/YL
D20
20
LG
D21
20
PK
16
2
12
7
DATA
LINK
CONNECTOR
(8W-18-2)
9
15
4
5
Z12
20
BK/TN
Z12
20
BK/TN
S107
(8W-15-2)
2.0L
2.4L
TURBO
D6
20
PK/LB
D15
20
WT/DG
Z12
16
BK/TN
Z12
12
BK/TN
✳ 26 C1
✳ 37 C1
SCI
RECEIVE
(TCM)
SCI
TRANSMIT
(TCM)
POWERTRAIN
CONTROL
MODULE
G102
(8W-15-4)
✳ 2.0L

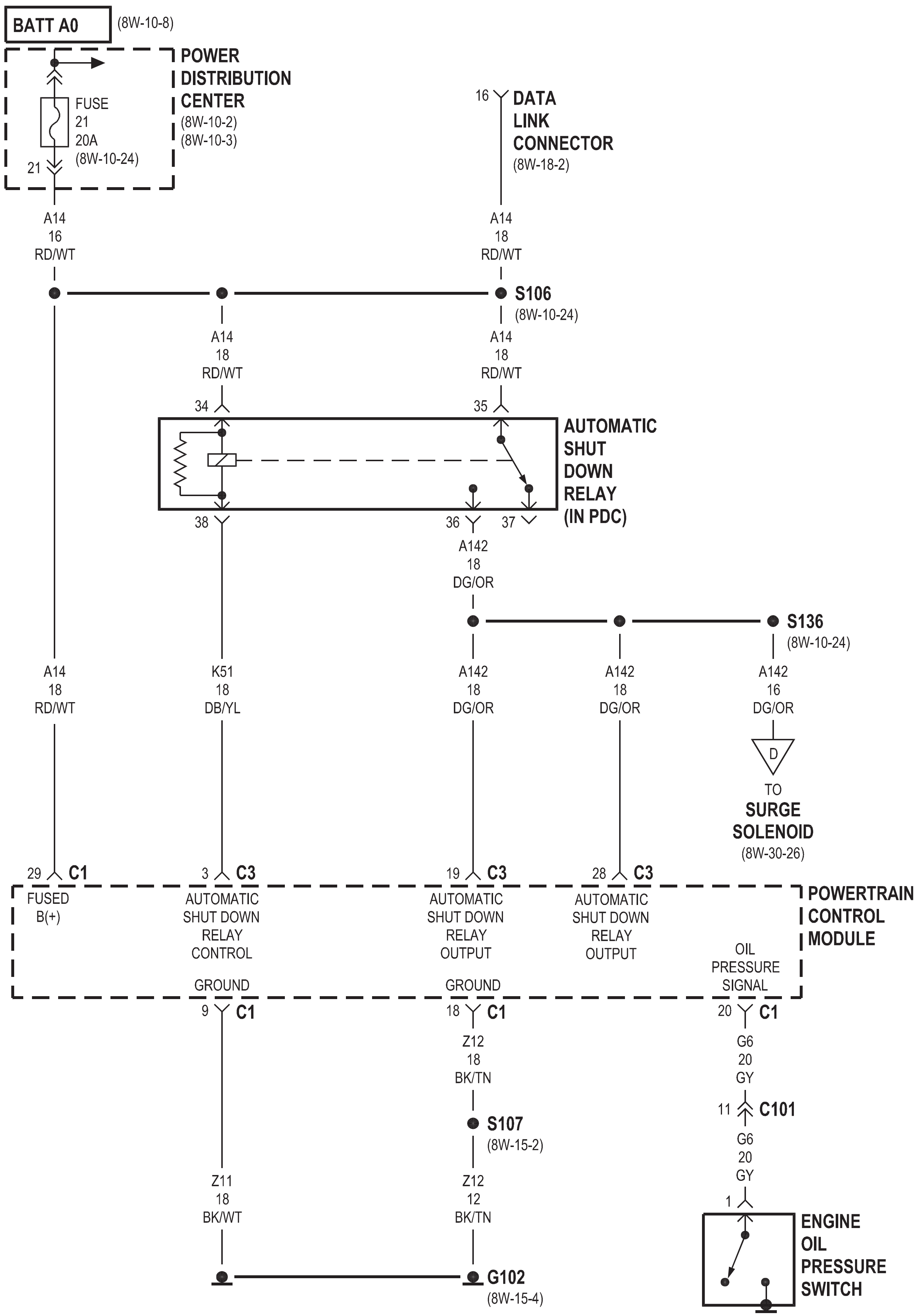

RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
10
FUSE
10
15A
(8W-11-15)
30
BATT A81
(8W-10-12)
IGNITION
SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-12)
1
2
0
3
4
2
C2
F12
18
DB/PK
F11
20
RD/WT
S243
(8W-11-15)
S244
(8W-10-12)
F12
18
DB/PK
F11
20
RD/WT
2.0L
EXCEPT
AUTOSTICK
2.0L
AUTOSTICK
B8
8
C103
F11
20
RD/WT
2.0L
EXCEPT
AUTOSTICK
2.0L
AUTOSTICK
A/C
SWITCH
SENSE
A/C
HIGH
PRESSURE
SWITCH
(8W-42-3)
(8W-42-4)
1
2.0L
2.4L
TURBO
C20
20
BR
9
C101
C20
20
BR/OR
C20
20
BR
GEN
FIELD
CONTROL
GENERATOR
(8W-20-2)
(8W-20-3)
2
2.0L
2.4L
TURBO
K20
20
DG
K20
18
DG
12
C1
12
C1
24
C3
19
C2
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
IGNITION
SWITCH
OUTPUT
(OFF-RUN-START)
A/C
SWITCH
SENSE
GEN
FIELD
CONTROL
POWERTRAIN
CONTROL
MODULE


24
STARTER
MOTOR
RELAY
(IN PDC)
(8W-21-2)
(8W-21-3)
28
K108
20
WT/TN
1
EVAP/PURGE
SOLENOID
2
K52
20
PK/BK
K108
20
WT/TN
K90
20
TN
20 C3
29 C3
38 C3
EVAP/PURGE
CONTROL
EVAP/PURGE
RETURN
STARTER
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
PSP
SWITCH
SIGNAL
AAT
SIGNAL
SENSOR
GROUND 2
SENSOR
GROUND 2
30 C3
22 C1
17 C3
17 C3
K10
20
DB/OR
K167
20
BR/YL
K167
18
BR/YL
1
POWER
STEERING
PRESSURE
SWITCH
2
2.0L
2.4L
TURBO
S113
(8W-70-3)
Z12
20
BK/TN
S107
(8W-15-2)
2.0L RHD/2.0L
EXCEPT
EXPORT/2.4L
TURBO
2.0L LHD
EXPORT
2.0L
2.4L
TURBO
Z12
16
BK/TN
Z12
12
BK/TN
K145
20
BR/OR
K167
20
BK/YL
K167
20
BR/YL
1
2
AMBIENT
TEMPERATURE
SENSOR
G102
(8W-15-4)

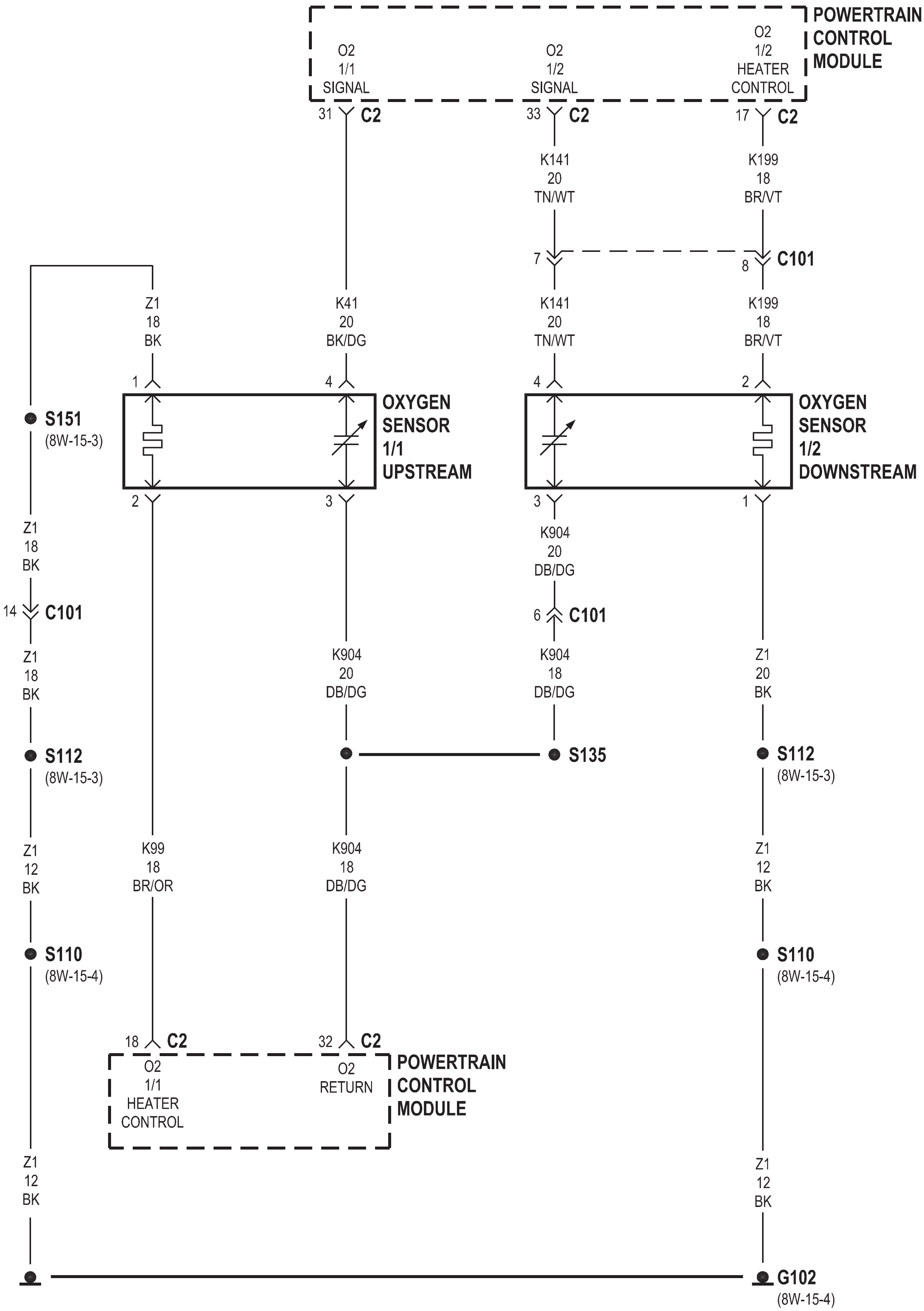

POWERTRAIN CONTROL MODULE
CLUTCH UP SWITCH SIGNAL
CLUTCH INTERLOCK SWITCH SIGNAL
BATTERY TEMP SIGNAL
SENSOR GROUND 2
SENSOR GROUND 2
26 C3
21 C3
32 C3
17 C3
17 C3
K119 20 LG/BK
T141 20 YL/RD
K167 20 BR/YL
K167 18 BR/YL
2.0L
2.4L TURBO
1
3
CLUTCH INTERLOCK/UPSTOP SWITCH (MTX)
2
S113 (8W-70-3)
Z1 20 BK
K118 20 PK/YL
K167 20 BR/YL
2.0L RHD
LHD
1
2
BATTERY TEMPERATURE SENSOR
S112 (8W-15-3)
Z1 12 BK
S119 (8W-15-6)
S110 (8W-15-4)
Z1 18 BK
Z1 12 BK
G103 (8W-15-7)
G102 (8W-15-4)

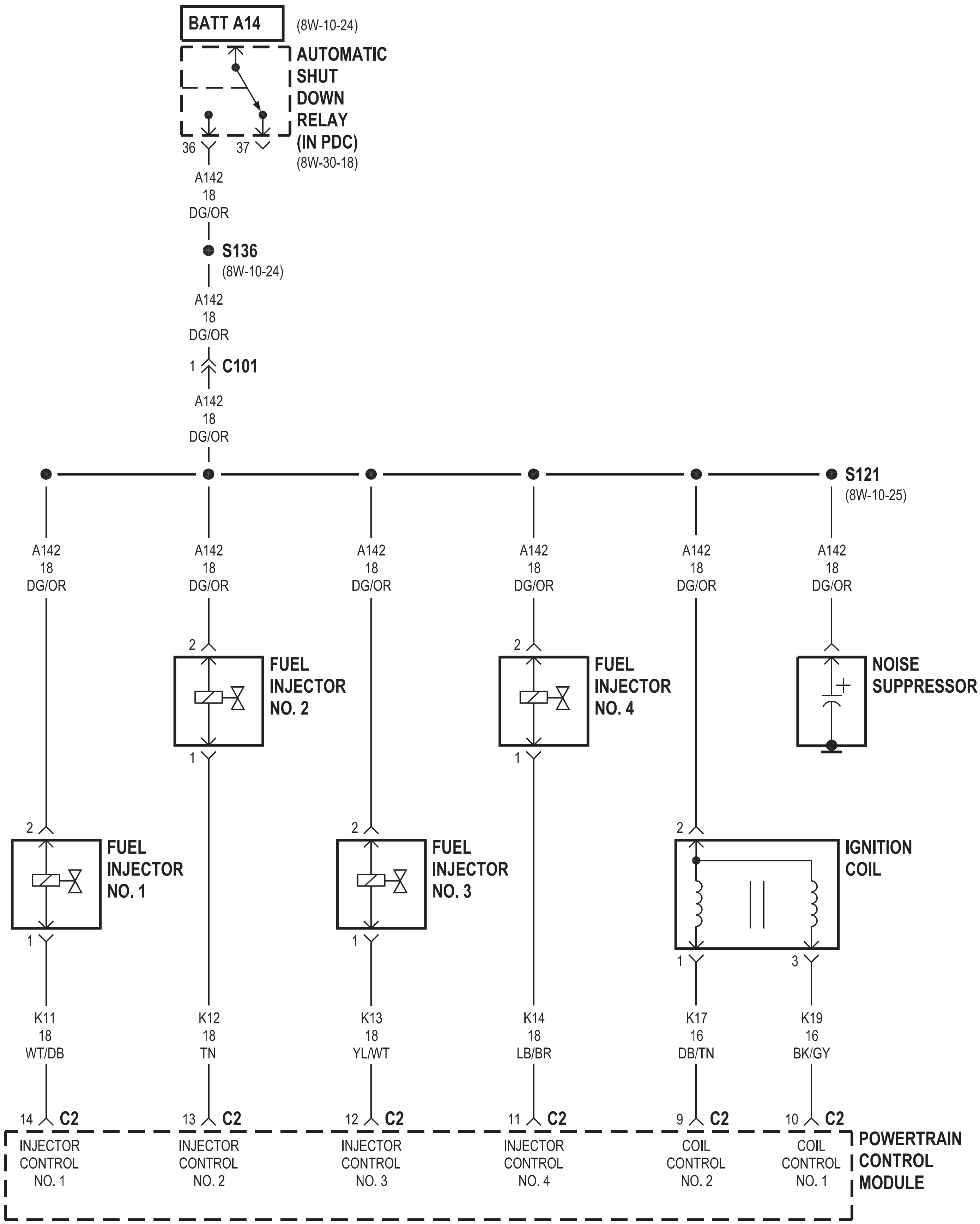
2.0L EXCEPT EXPORT/2.4L TURBO

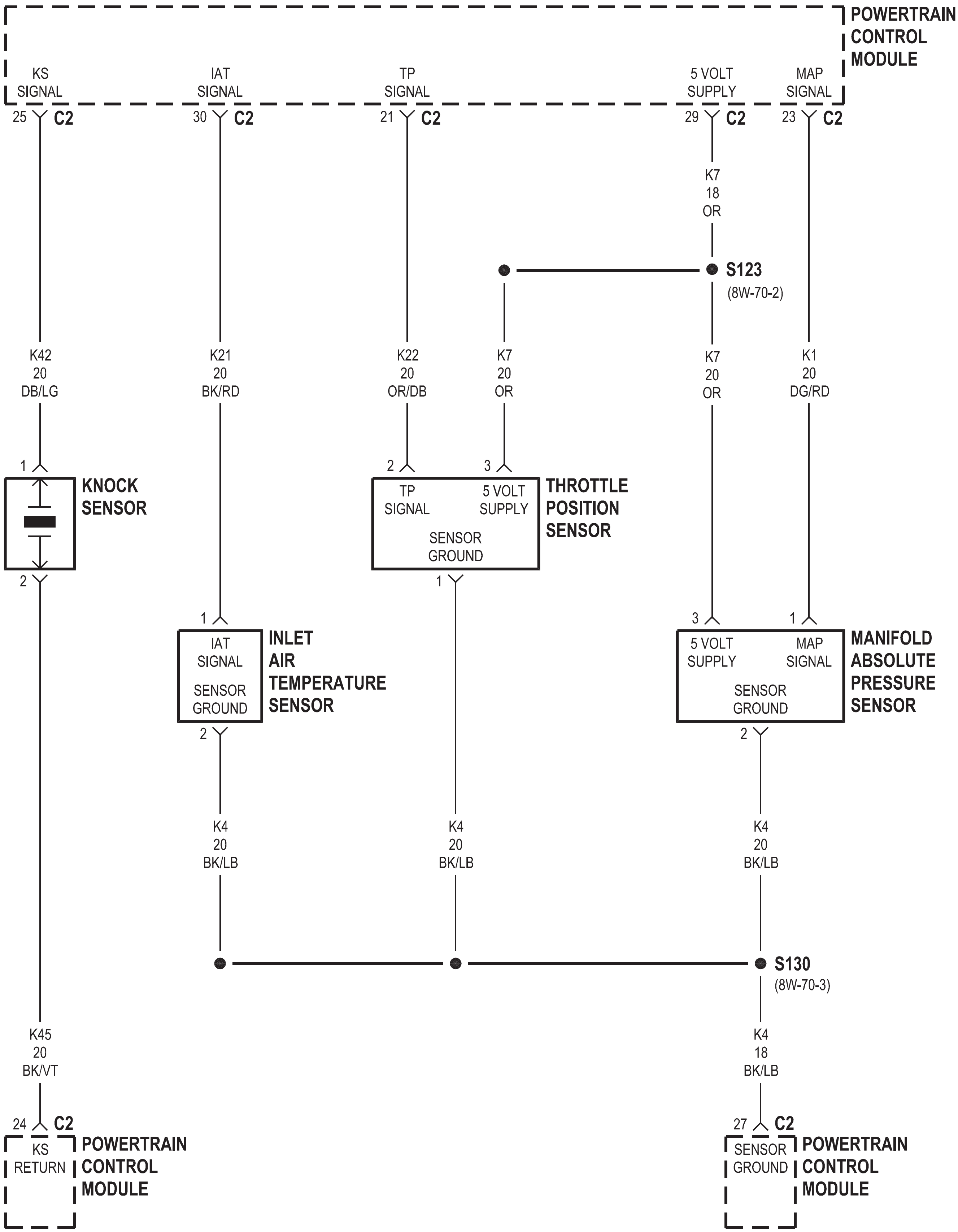


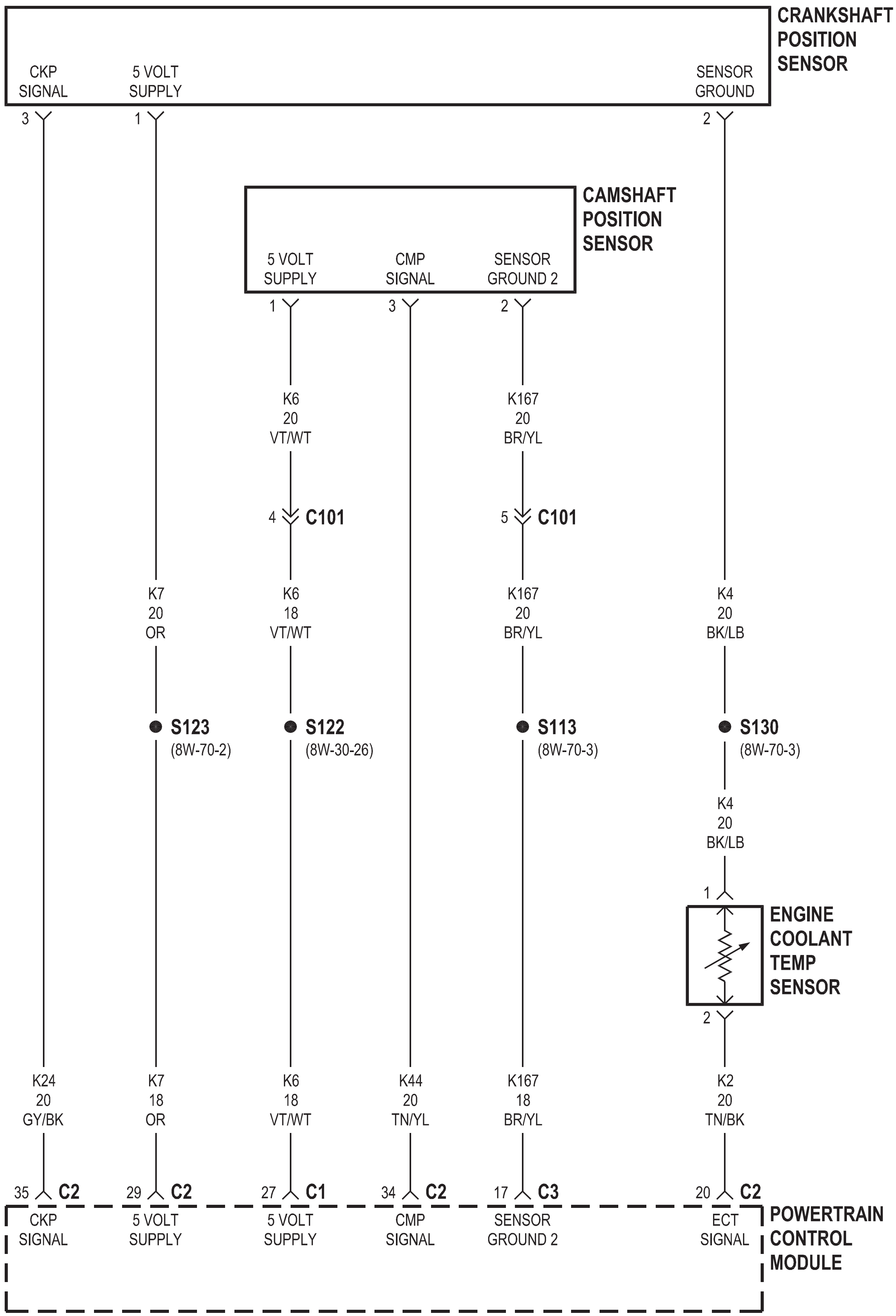

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 21 20A
(8W-10-24)
21
16
DATA LINK CONNECTOR
(8W-18-2)
A14 16 RD/WT
A14 18 RD/WT
S106
(8W-10-24)
34
35
AUTOMATIC SHUT DOWN RELAY (IN PDC)
38
36
37
A142 18 DG/OR
S136
(8W-10-24)
K51 18 DB/YL
A142 16 DG/OR
D
TO SURGE SOLENOID
(8W-30-26)
29 C1
3 C3
19 C3
28 C3
POWERTRAIN CONTROL MODULE
FUSED B(+)
AUTOMATIC SHUT DOWN RELAY CONTROL
AUTOMATIC SHUT DOWN RELAY OUTPUT
OIL PRESSURE SIGNAL
GROUND
9 C1
18 C1
20 C1
Z12 18 BK/TN
G6 20 GY
11 C101
S107
(8W-15-2)
Z11 18 BK/WT
Z12 12 BK/TN
1
ENGINE OIL PRESSURE SWITCH
G102
(8W-15-4)

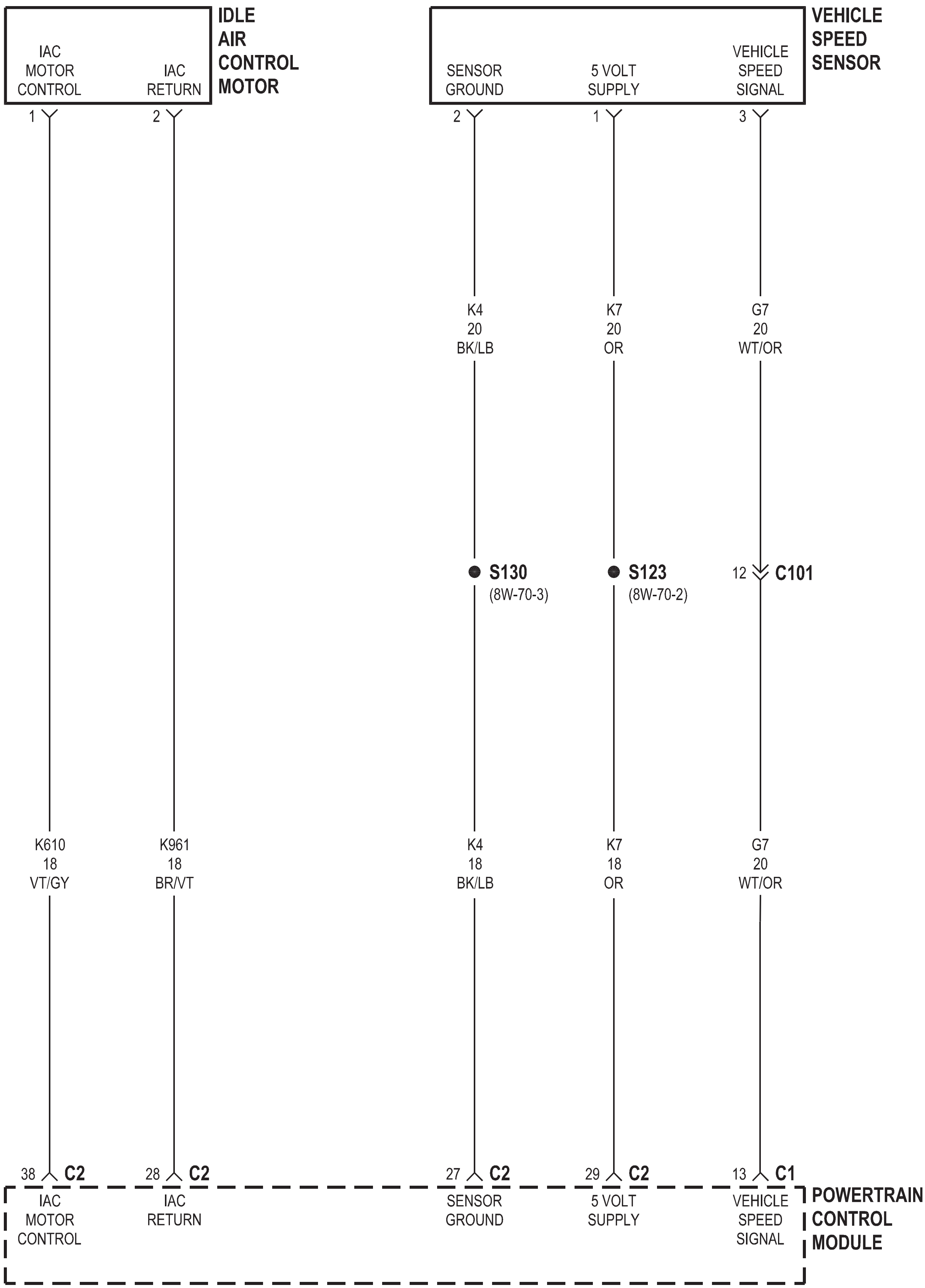
2.4L TURBO

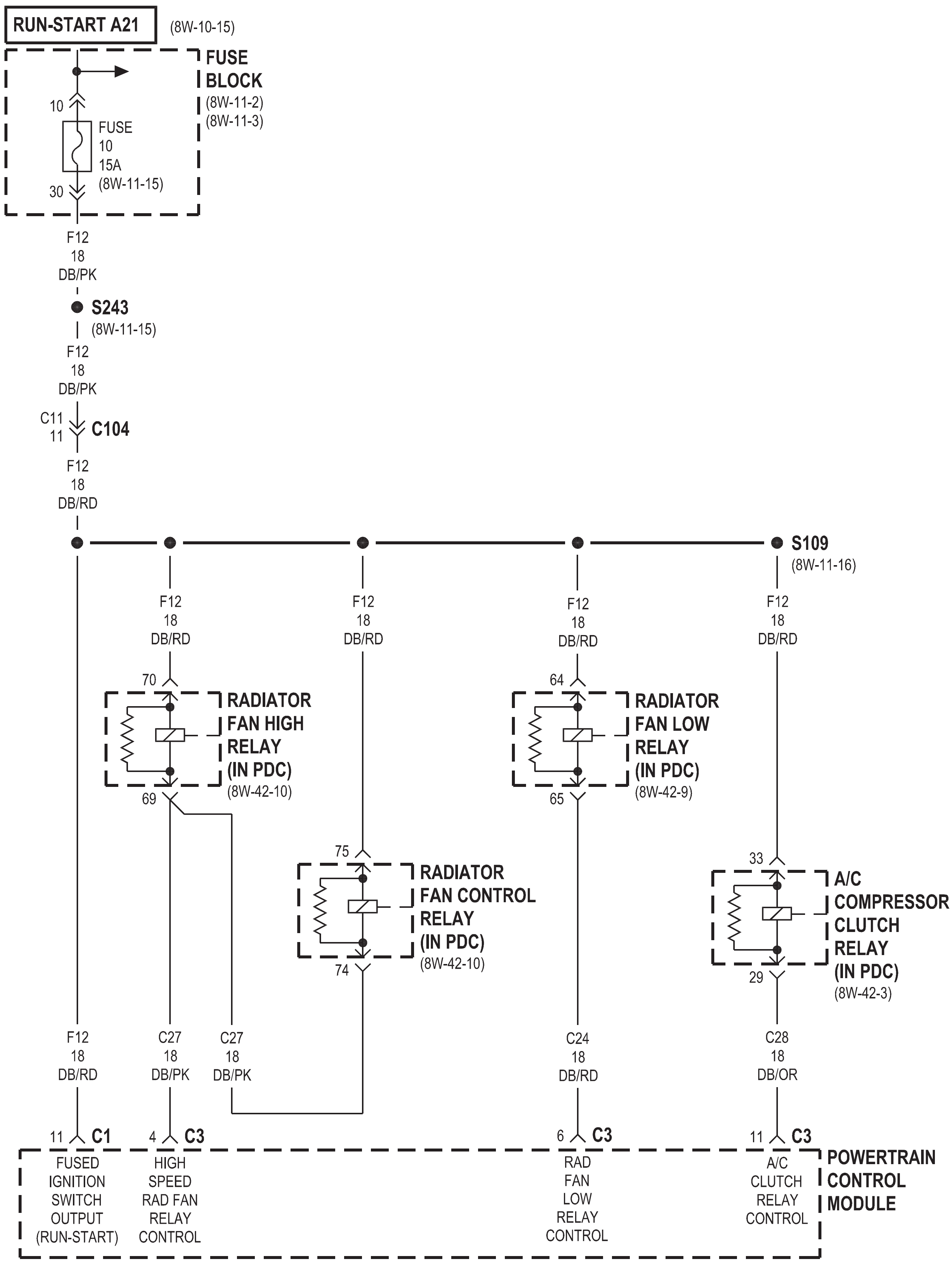

POWERTRAIN CONTROL MODULE
O2 1/1 SIGNAL
O2 1/2 SIGNAL
O2 1/2 HEATER CONTROL
31 C2
33 C2
17 C2
K141 20 TN/WT
K199 18 BR/VT
7
8 C101
Z1 18 BK
K41 20 BK/DG
K141 20 TN/WT
K199 18 BR/VT
1
4
4
2
S151 (8W-15-3)
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
2
3
3
1
Z1 18 BK
K904 20 DB/DG
14 C101
6 C101
Z1 18 BK
K904 20 DB/DG
K904 18 DB/DG
Z1 20 BK
S112 (8W-15-3)
S135
S112 (8W-15-3)
Z1 12 BK
K99 18 BR/OR
K904 18 DB/DG
Z1 12 BK
S110 (8W-15-4)
S110 (8W-15-4)
18 C2
32 C2
O2 1/1 HEATER CONTROL
O2 RETURN
POWERTRAIN CONTROL MODULE
Z1 12 BK
Z1 12 BK
G102 (8W-15-4)

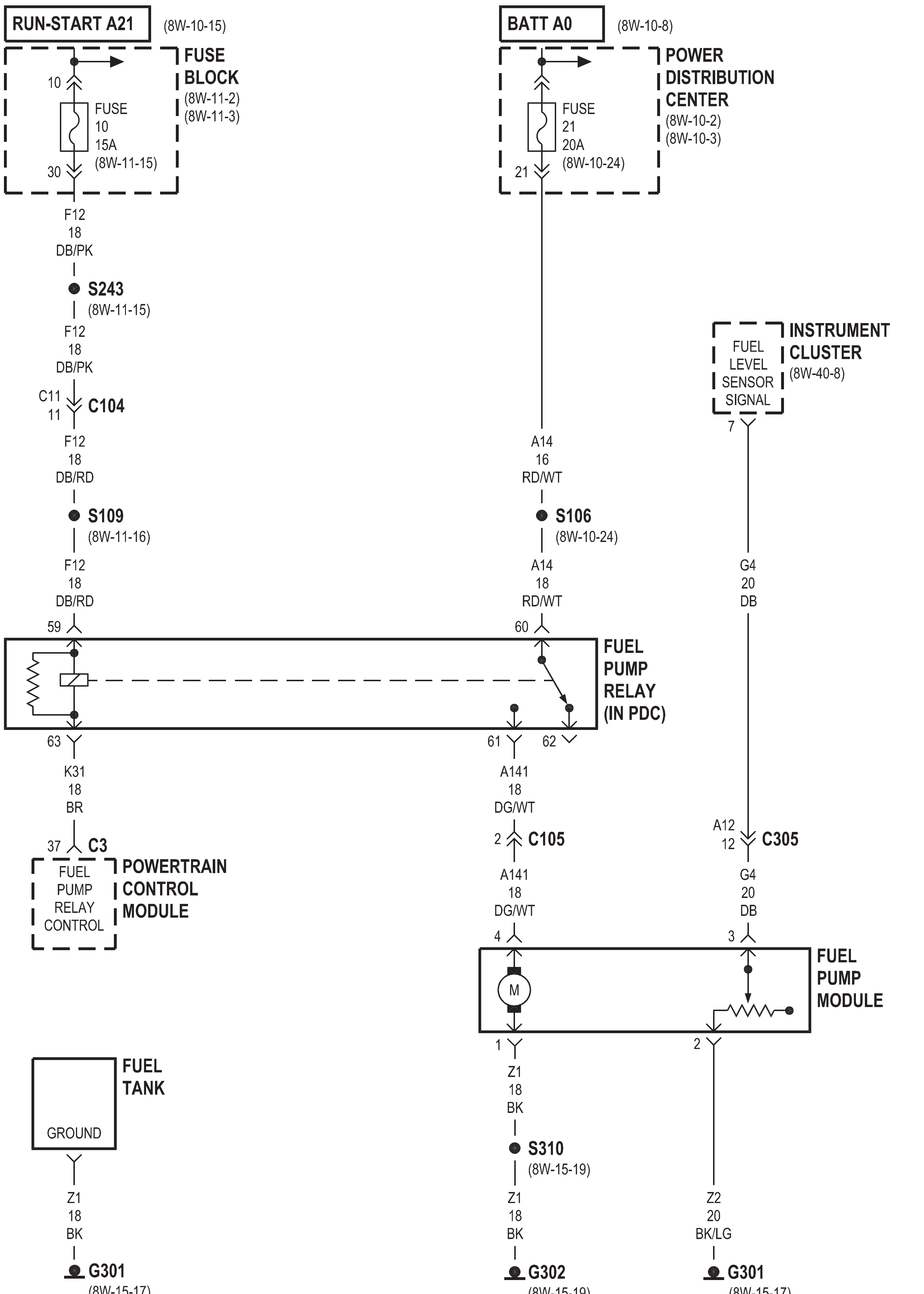

BATT A14
(8W-10-24)
AUTOMATIC SHUT DOWN RELAY (IN PDC)
(8W-30-18)
36
37
A142
18
DG/OR
S136
(8W-10-24)
1
C101
S121
(8W-10-25)
2
1
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
NOISE SUPPRESSOR
IGNITION COIL
3
K11
18
WT/DB
K12
18
TN
K13
18
YL/WT
K14
18
LB/BR
K17
16
DB/TN
K19
16
BK/GY
14 C2
13 C2
12 C2
11 C2
9 C2
10 C2
INJECTOR CONTROL NO. 1
INJECTOR CONTROL NO. 2
INJECTOR CONTROL NO. 3
INJECTOR CONTROL NO. 4
COIL CONTROL NO. 2
COIL CONTROL NO. 1
POWERTRAIN CONTROL MODULE

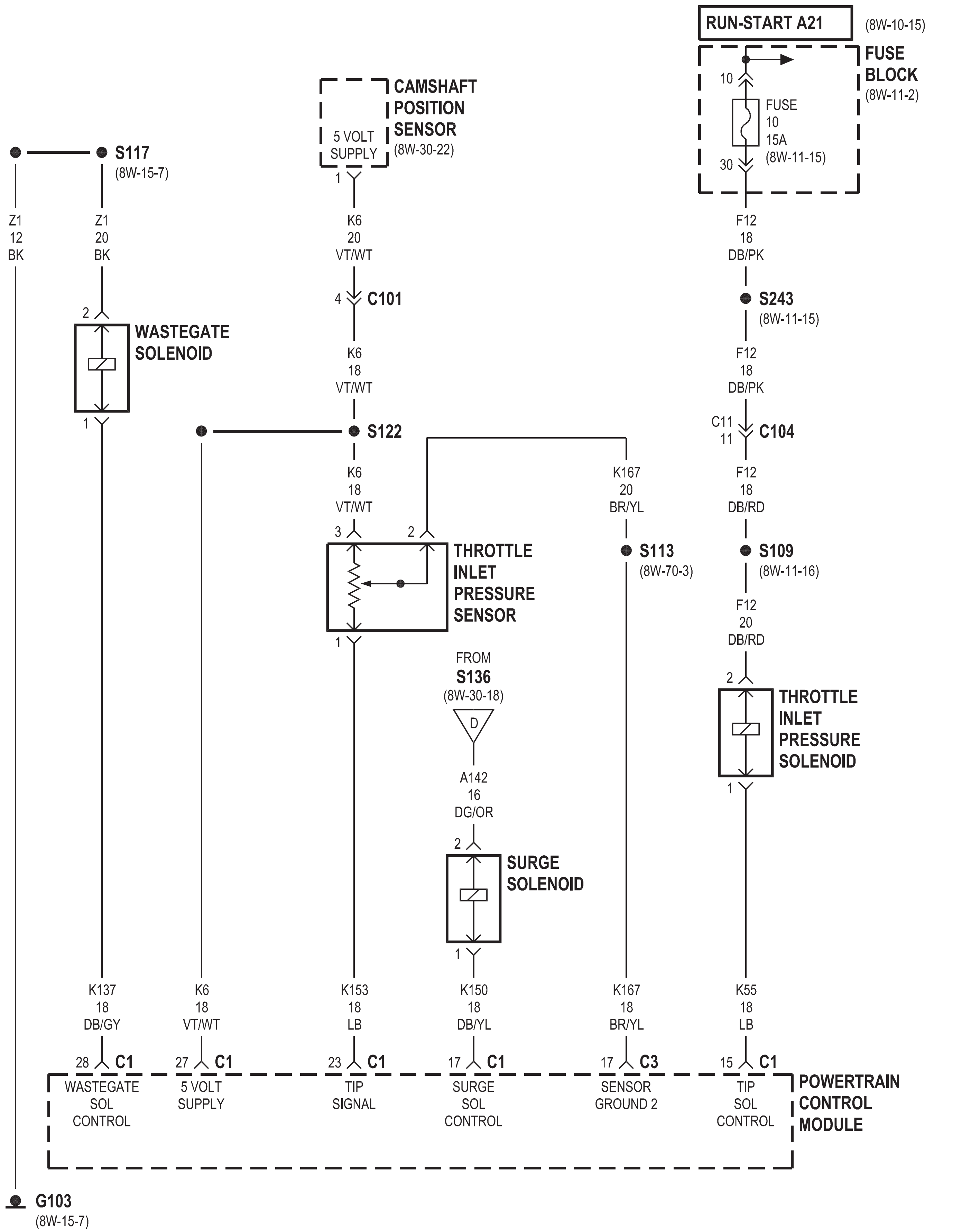

POWERTRAIN
CONTROL
MODULE
KS
SIGNAL
25 C2
IAT
SIGNAL
30 C2
TP
SIGNAL
21 C2
5 VOLT
SUPPLY
29 C2
MAP
SIGNAL
23 C2
K7
18
OR
S123
(8W-70-2)
K42
20
DB/LG
K21
20
BK/RD
K22
20
OR/DB
K7
20
OR
K7
20
OR
K1
20
DG/RD
KNOCK
SENSOR
TP
SIGNAL
5 VOLT
SUPPLY
SENSOR
GROUND
THROTTLE
POSITION
SENSOR
IAT
SIGNAL
SENSOR
GROUND
INLET
AIR
TEMPERATURE
SENSOR
5 VOLT
SUPPLY
MAP
SIGNAL
SENSOR
GROUND
MANIFOLD
ABSOLUTE
PRESSURE
SENSOR
K4
20
BK/LB
K4
20
BK/LB
K4
20
BK/LB
S130
(8W-70-3)
K45
20
BK/VT
K4
18
BK/LB
24 C2
KS
RETURN
POWERTRAIN
CONTROL
MODULE
27 C2
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE

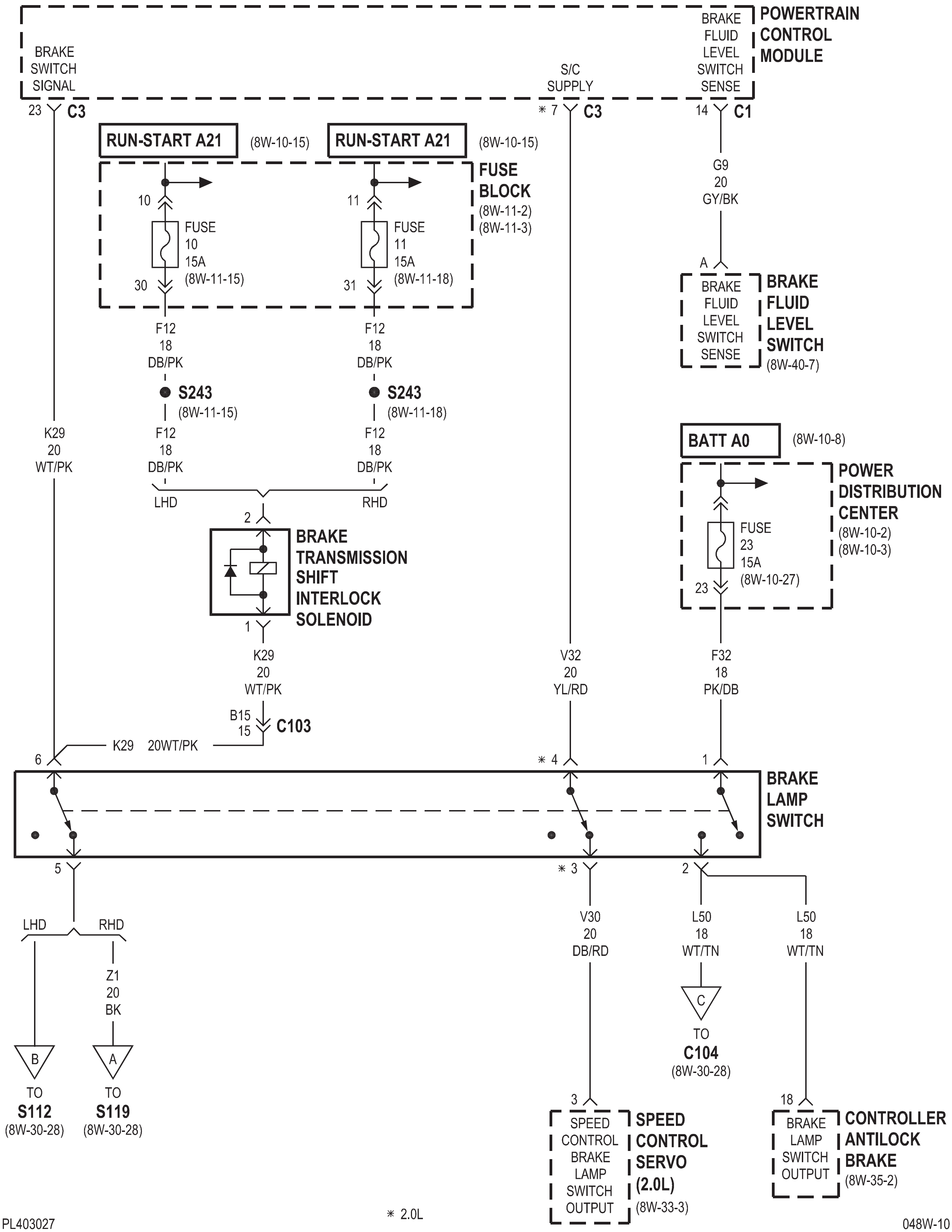

CRANKSHAFT POSITION SENSOR
CKP SIGNAL
5 VOLT SUPPLY
SENSOR GROUND
3
1
2
CAMSHAFT POSITION SENSOR
5 VOLT SUPPLY
CMP SIGNAL
SENSOR GROUND 2
1
3
2
K6 20 VT/WT
K167 20 BR/YL
4 C101
5 C101
K7 20 OR
K6 18 VT/WT
K167 20 BR/YL
K4 20 BK/LB
S123 (8W-70-2)
S122 (8W-30-26)
S113 (8W-70-3)
S130 (8W-70-3)
K4 20 BK/LB
1
ENGINE COOLANT TEMP SENSOR
2
K24 20 GY/BK
K7 18 OR
K6 18 VT/WT
K44 20 TN/YL
K167 18 BR/YL
K2 20 TN/BK
35 C2
29 C2
27 C1
34 C2
17 C3
20 C2
CKP SIGNAL
5 VOLT SUPPLY
5 VOLT SUPPLY
CMP SIGNAL
SENSOR GROUND 2
ECT SIGNAL
POWERTRAIN CONTROL MODULE

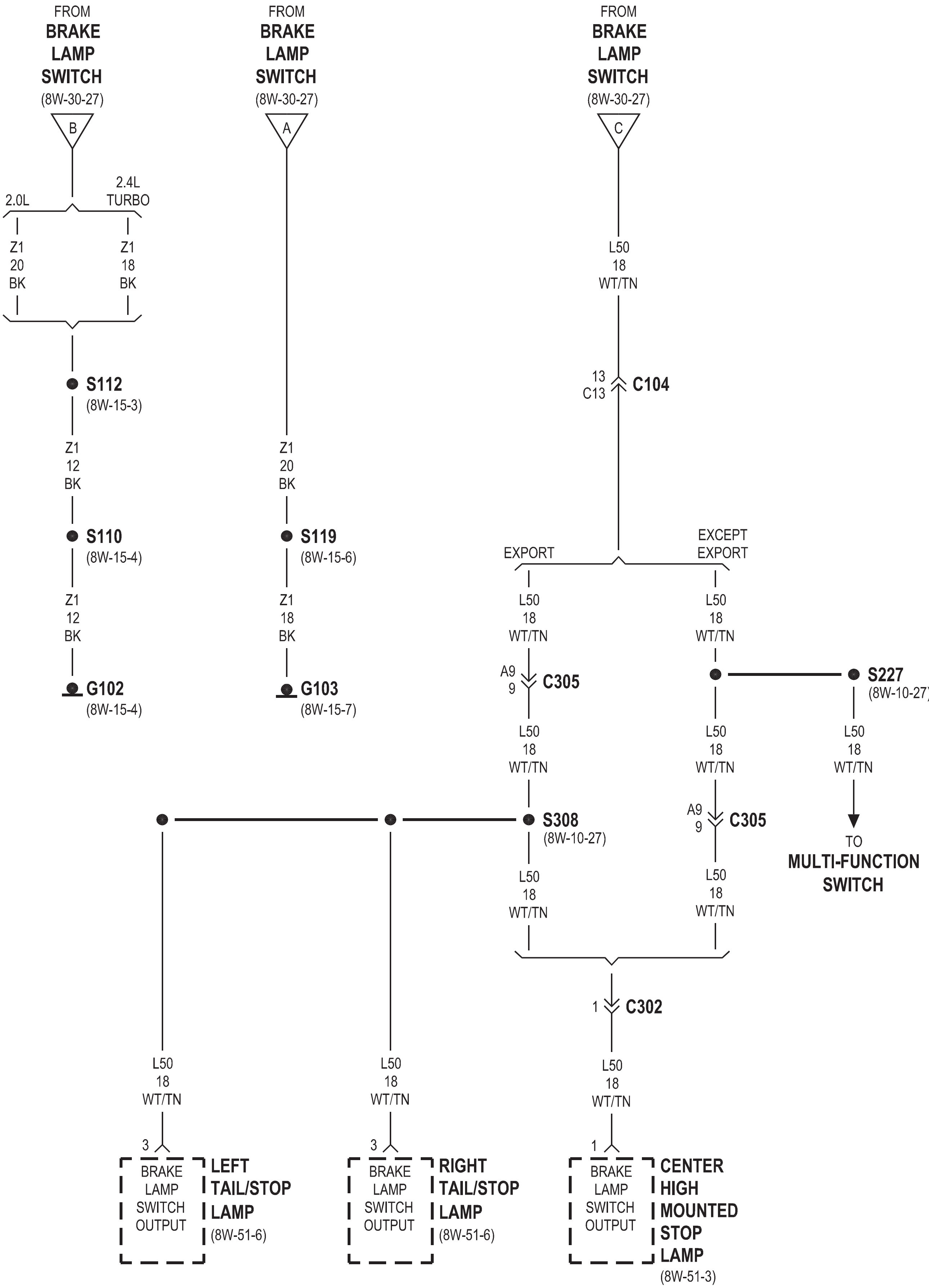

IDLE AIR CONTROL MOTOR
IAC MOTOR CONTROL
IAC RETURN
1
2
VEHICLE SPEED SENSOR
SENSOR GROUND
5 VOLT SUPPLY
VEHICLE SPEED SIGNAL
2
1
3
K4 20 BK/LB
K7 20 OR
G7 20 WT/OR
S130 (8W-70-3)
S123 (8W-70-2)
12 C101
K610 18 VT/GY
K961 18 BR/VT
K4 18 BK/LB
K7 18 OR
G7 20 WT/OR
38 C2
28 C2
27 C2
29 C2
13 C1
IAC MOTOR CONTROL
IAC RETURN
SENSOR GROUND
5 VOLT SUPPLY
VEHICLE SPEED SIGNAL
POWERTRAIN CONTROL MODULE


RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE 10 15A (8W-11-15)
30
F12 18 DB/PK
S243
(8W-11-15)
F12 18 DB/PK
C11
11
C104
F12 18 DB/RD
S109
(8W-11-16)
F12 18 DB/RD
F12 18 DB/RD
F12 18 DB/RD
F12 18 DB/RD
70
RADIATOR FAN HIGH RELAY (IN PDC)
(8W-42-10)
69
64
RADIATOR FAN LOW RELAY (IN PDC)
(8W-42-9)
65
75
RADIATOR FAN CONTROL RELAY (IN PDC)
(8W-42-10)
74
33
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-3)
29
F12 18 DB/RD
C27 18 DB/PK
C27 18 DB/PK
C24 18 DB/RD
C28 18 DB/OR
11 C1
4 C3
6 C3
11 C3
FUSED IGNITION SWITCH OUTPUT (RUN-START)
HIGH SPEED RAD FAN RELAY CONTROL
RAD FAN LOW RELAY CONTROL
A/C CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE


RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE
10
15A
(8W-11-15)
30
F12
18
DB/PK
S243
(8W-11-15)
F12
18
DB/PK
C11
11
C104
F12
18
DB/RD
S109
(8W-11-16)
F12
18
DB/RD
59
BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
21
20A
(8W-10-24)
21
A14
16
RD/WT
S106
(8W-10-24)
A14
18
RD/WT
60
INSTRUMENT CLUSTER
(8W-40-8)
FUEL LEVEL SENSOR SIGNAL
7
G4
20
DB
FUEL PUMP RELAY (IN PDC)
63
61
62
K31
18
BR
37
C3
FUEL PUMP RELAY CONTROL
POWERTRAIN CONTROL MODULE
A141
18
DG/WT
2
C105
A141
18
DG/WT
4
A12
12
C305
G4
20
DB
3
M
FUEL PUMP MODULE
1
2
Z1
18
BK
S310
(8W-15-19)
Z1
18
BK
G302
(8W-15-19)
Z2
20
BK/LG
G301
(8W-15-17)
FUEL TANK
GROUND
Z1
18
BK
G301
(8W-15-17)

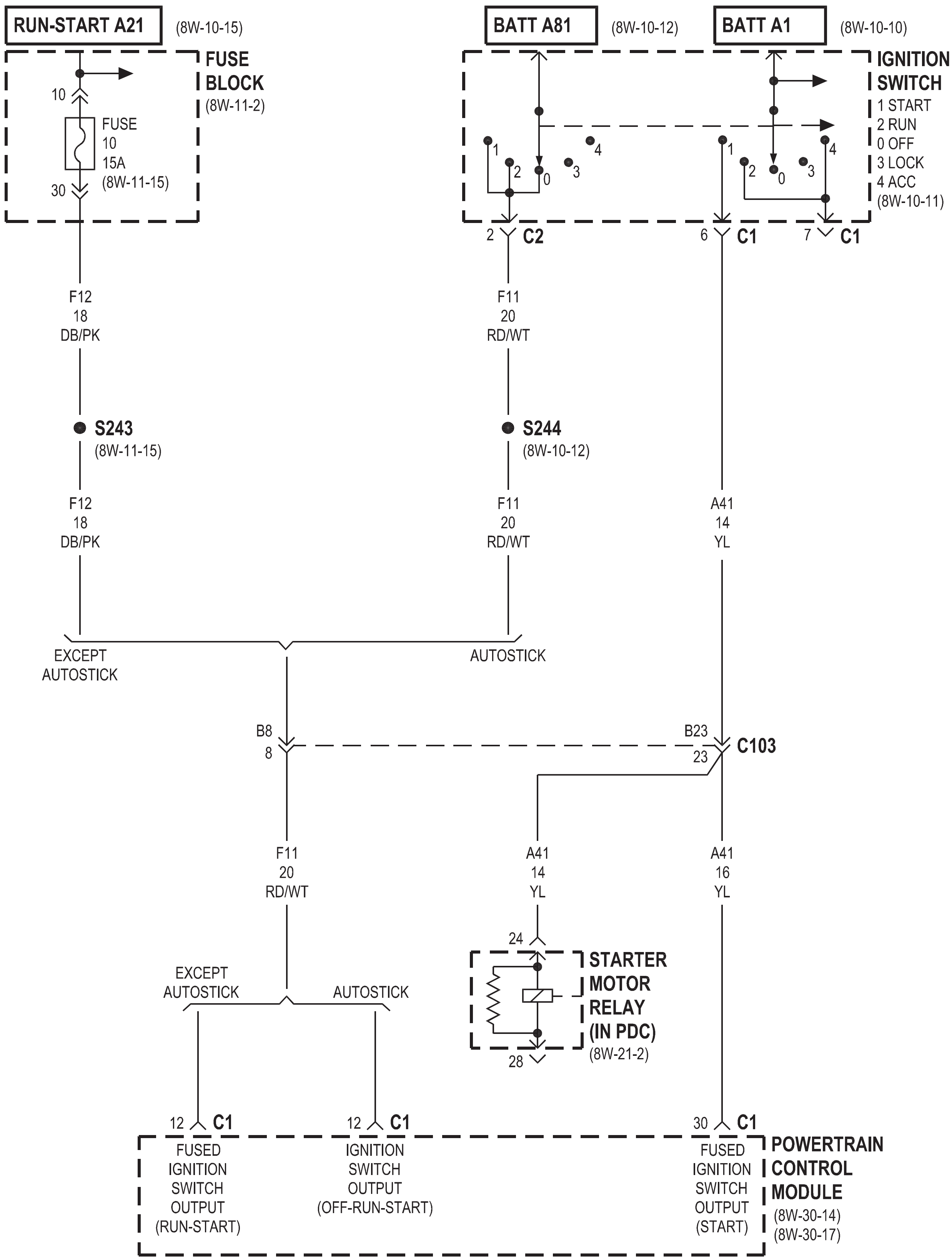

RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
10
FUSE
10
15A
(8W-11-15)
30
CAMSHAFT
POSITION
SENSOR
(8W-30-22)
5 VOLT
SUPPLY
1
S117
(8W-15-7)
Z1
12
BK
Z1
20
BK
K6
20
VT/WT
F12
18
DB/PK
4
C101
S243
(8W-11-15)
2
WASTEGATE
SOLENOID
K6
18
VT/WT
F12
18
DB/PK
1
S122
C11
11
C104
K6
18
VT/WT
K167
20
BR/YL
F12
18
DB/RD
3
2
THROTTLE
INLET
PRESSURE
SENSOR
S113
(8W-70-3)
S109
(8W-11-16)
1
F12
20
DB/RD
FROM
S136
(8W-30-18)
D
2
THROTTLE
INLET
PRESSURE
SOLENOID
1
A142
16
DG/OR
2
SURGE
SOLENOID
1
K137
18
DB/GY
K6
18
VT/WT
K153
18
LB
K150
18
DB/YL
K167
18
BR/YL
K55
18
LB
28 C1
27 C1
23 C1
17 C1
17 C3
15 C1
WASTEGATE
SOL
CONTROL
5 VOLT
SUPPLY
TIP
SIGNAL
SURGE
SOL
CONTROL
SENSOR
GROUND 2
TIP
SOL
CONTROL
POWERTRAIN
CONTROL
MODULE
G103
(8W-15-7)


POWERTRAIN CONTROL MODULE
BRAKE SWITCH SIGNAL
S/C SUPPLY
BRAKE FLUID LEVEL SWITCH SENSE
23 C3
✳ 7 C3
14 C1
RUN-START A21 (8W-10-15)
RUN-START A21 (8W-10-15)
FUSE BLOCK (8W-11-2) (8W-11-3)
10 FUSE 10 15A (8W-11-15) 30
11 FUSE 11 15A (8W-11-18) 31
G9 20 GY/BK
A
BRAKE FLUID LEVEL SWITCH SENSE
BRAKE FLUID LEVEL SWITCH (8W-40-7)
F12 18 DB/PK
F12 18 DB/PK
S243 (8W-11-15)
S243 (8W-11-18)
K29 20 WT/PK
F12 18 DB/PK
F12 18 DB/PK
LHD RHD
BATT A0 (8W-10-8)
POWER DISTRIBUTION CENTER (8W-10-2) (8W-10-3)
FUSE 23 15A (8W-10-27)
23
2
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID
1
K29 20 WT/PK
V32 20 YL/RD
F32 18 PK/DB
B15 15 C103
K29 20WT/PK
6
✳ 4
1
BRAKE LAMP SWITCH
5
✳ 3
2
LHD RHD
Z1 20 BK
V30 20 DB/RD
L50 18 WT/TN
L50 18 WT/TN
C
TO C104 (8W-30-28)
B
A
TO S112 (8W-30-28)
TO S119 (8W-30-28)
3
SPEED CONTROL BRAKE LAMP SWITCH OUTPUT
SPEED CONTROL SERVO (2.0L) (8W-33-3)
18
BRAKE LAMP SWITCH OUTPUT
CONTROLLER ANTILOCK BRAKE (8W-35-2)
✳ 2.0L


FROM
BRAKE LAMP SWITCH
(8W-30-27)
B
2.0L
2.4L TURBO
Z1
20
BK
Z1
18
BK
S112
(8W-15-3)
Z1
12
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
FROM
BRAKE LAMP SWITCH
(8W-30-27)
A
Z1
20
BK
S119
(8W-15-6)
Z1
18
BK
G103
(8W-15-7)
FROM
BRAKE LAMP SWITCH
(8W-30-27)
C
L50
18
WT/TN
13
C13
C104
EXPORT
EXCEPT EXPORT
L50
18
WT/TN
A9
9
C305
S227
(8W-10-27)
S308
(8W-10-27)
TO
MULTI-FUNCTION SWITCH
1
C302
3
BRAKE LAMP SWITCH OUTPUT
LEFT TAIL/STOP LAMP
(8W-51-6)
RIGHT TAIL/STOP LAMP
(8W-51-6)
CENTER HIGH MOUNTED STOP LAMP
(8W-51-3)
(8W-51-6)

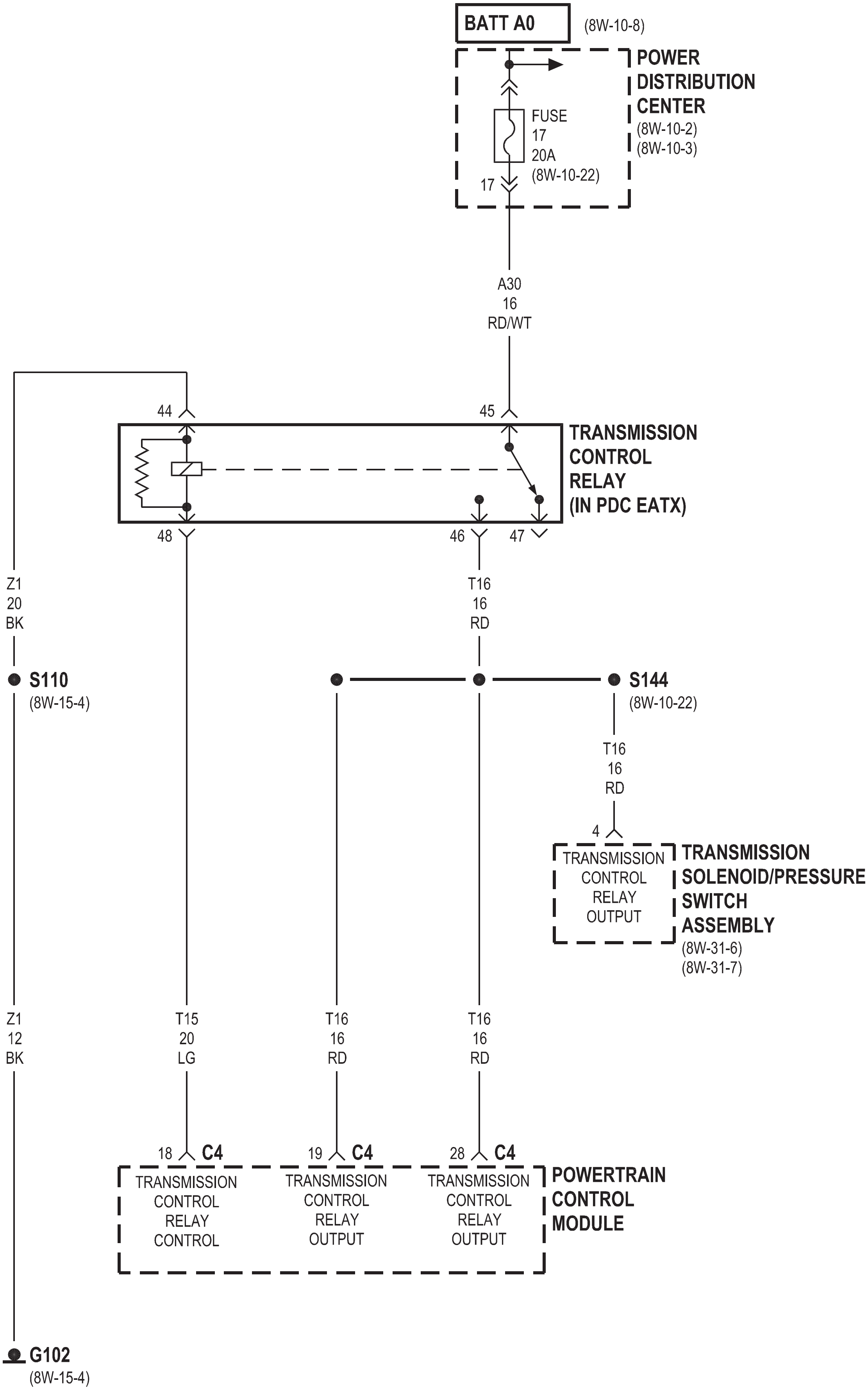
8W-31 TRANSMISSION CONTROL SYSTEM

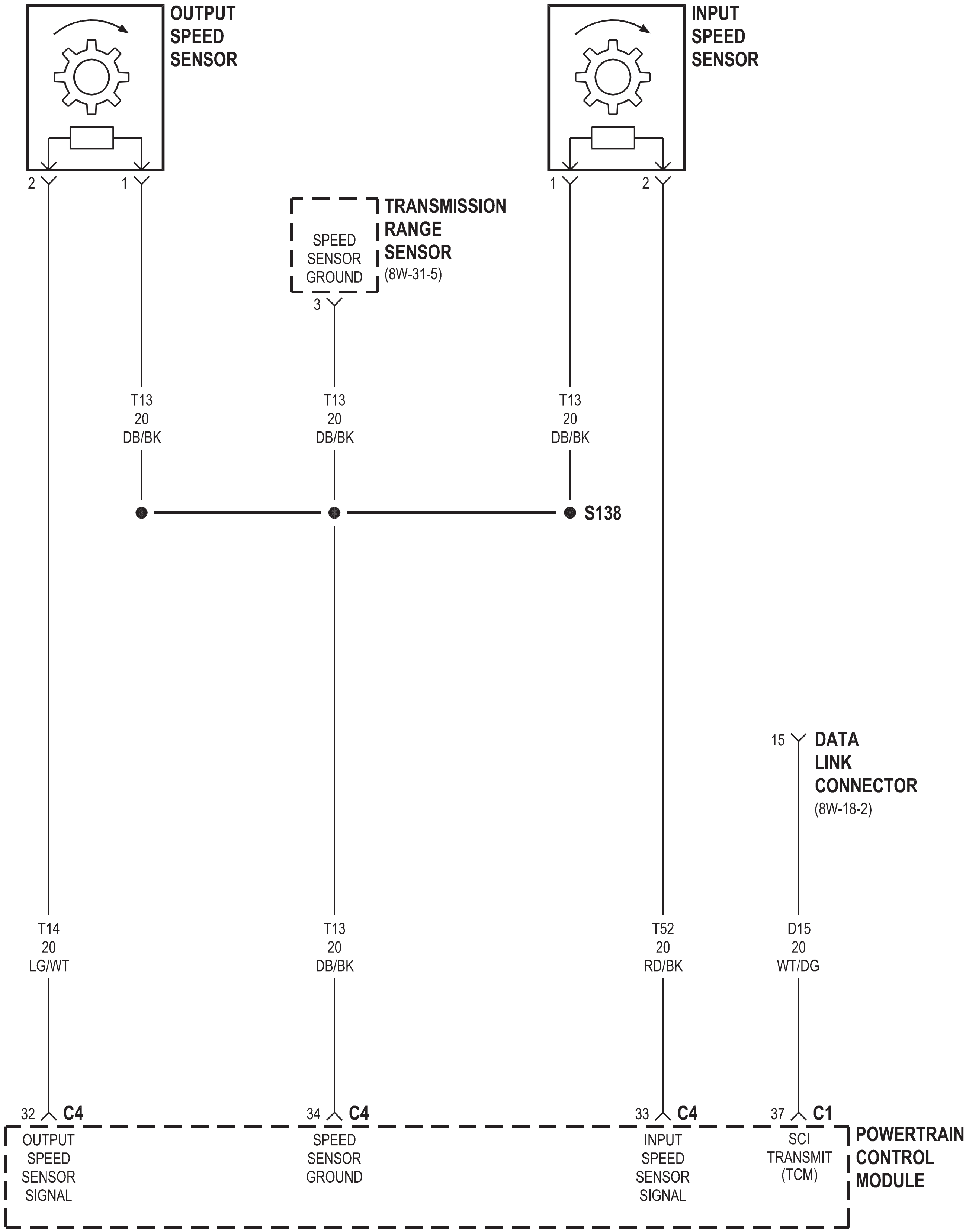
2.0L

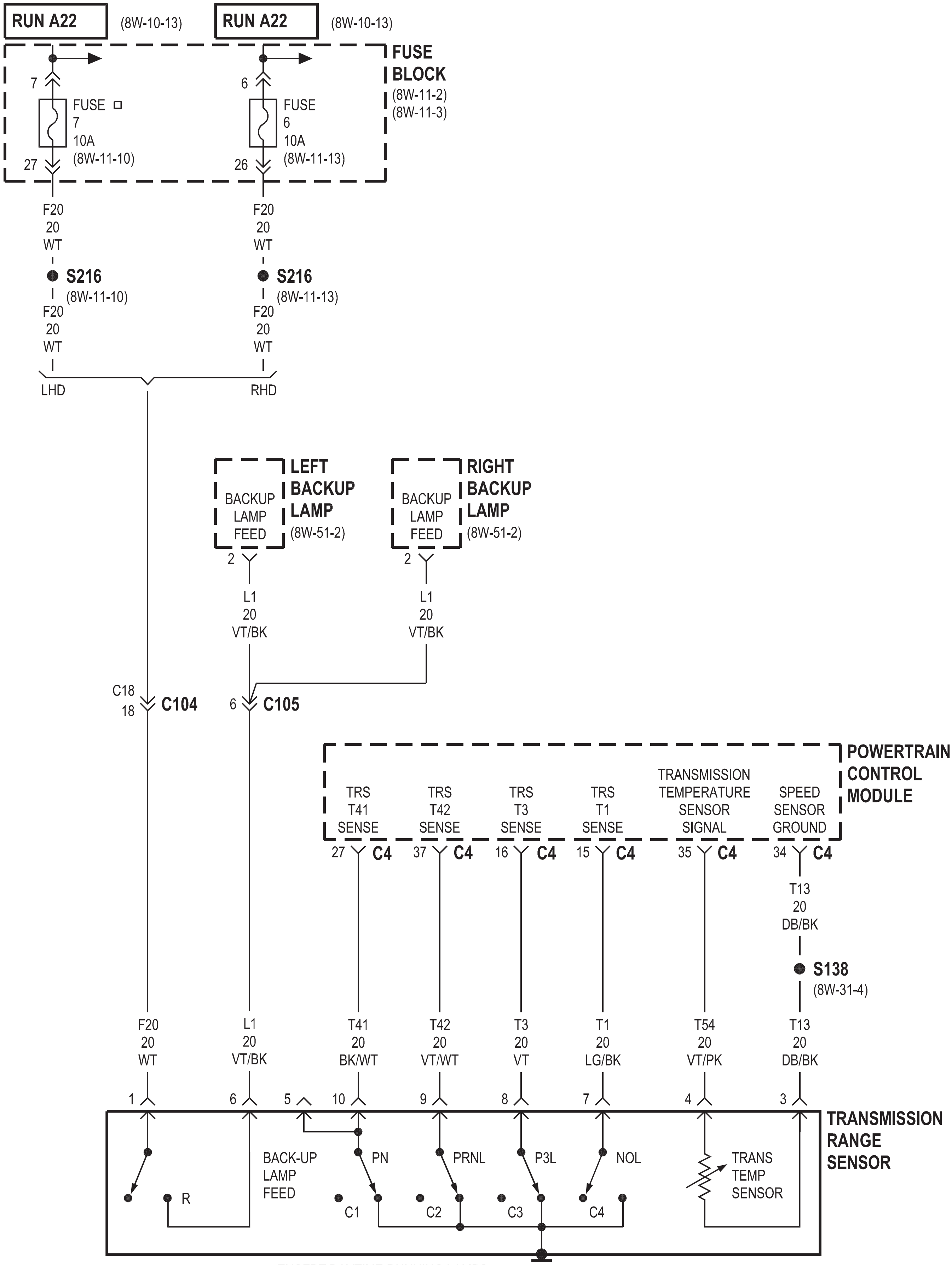


RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
10
FUSE
10
15A
(8W-11-15)
30
BATT A81
(8W-10-12)
BATT A1
(8W-10-10)
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-11)
2 C2
6 C1
7 C1
F12
18
DB/PK
F11
20
RD/WT
S243
(8W-11-15)
S244
(8W-10-12)
A41
14
YL
EXCEPT AUTOSTICK
AUTOSTICK
B8
8
B23
23
C103
F11
20
RD/WT
A41
14
YL
A41
16
YL
24
STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
28
EXCEPT AUTOSTICK
AUTOSTICK
12 C1
12 C1
30 C1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
IGNITION SWITCH OUTPUT (OFF-RUN-START)
FUSED IGNITION SWITCH OUTPUT (START)
POWERTRAIN CONTROL MODULE
(8W-30-14)
(8W-30-17)

2.0L

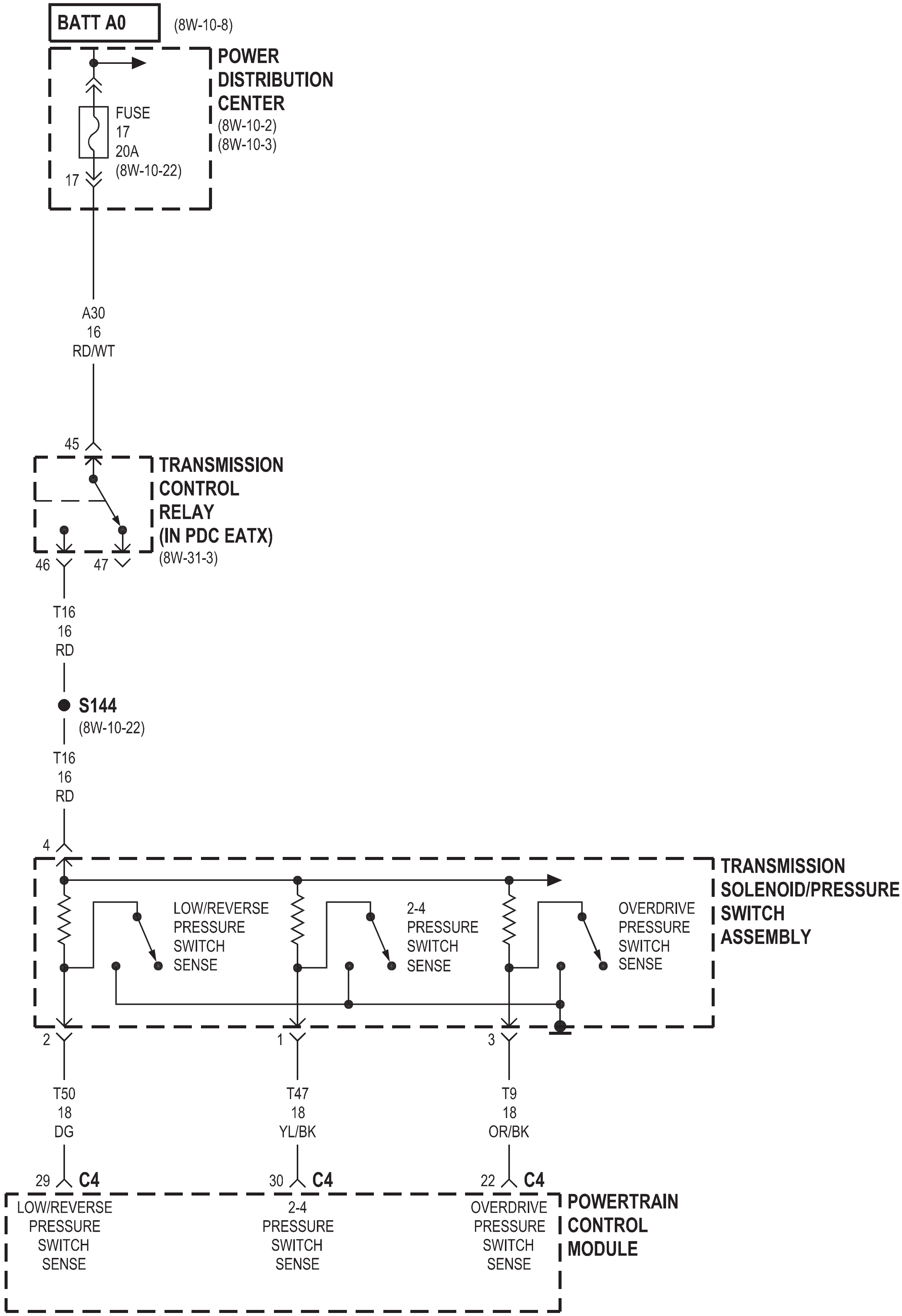

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
17
20A
(8W-10-22)
17
A30
16
RD/WT
44
45
TRANSMISSION
CONTROL
RELAY
(IN PDC EATX)
48
46
47
Z1
20
BK
T16
16
RD
S110
(8W-15-4)
S144
(8W-10-22)
T16
16
RD
4
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
SOLENOID/PRESSURE
SWITCH
ASSEMBLY
(8W-31-6)
(8W-31-7)
Z1
12
BK
T15
20
LG
T16
16
RD
T16
16
RD
18 C4
19 C4
28 C4
TRANSMISSION
CONTROL
RELAY
CONTROL
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
OUTPUT
POWERTRAIN
CONTROL
MODULE
G102
(8W-15-4)


OUTPUT
SPEED
SENSOR
2
1
INPUT
SPEED
SENSOR
1
2
SPEED
SENSOR
GROUND
TRANSMISSION
RANGE
SENSOR
(8W-31-5)
3
T13
20
DB/BK
T13
20
DB/BK
T13
20
DB/BK
S138
15
DATA
LINK
CONNECTOR
(8W-18-2)
T14
20
LG/WT
T13
20
DB/BK
T52
20
RD/BK
D15
20
WT/DG
32 C4
34 C4
33 C4
37 C1
OUTPUT
SPEED
SENSOR
SIGNAL
SPEED
SENSOR
GROUND
INPUT
SPEED
SENSOR
SIGNAL
SCI
TRANSMIT
(TCM)
POWERTRAIN
CONTROL
MODULE

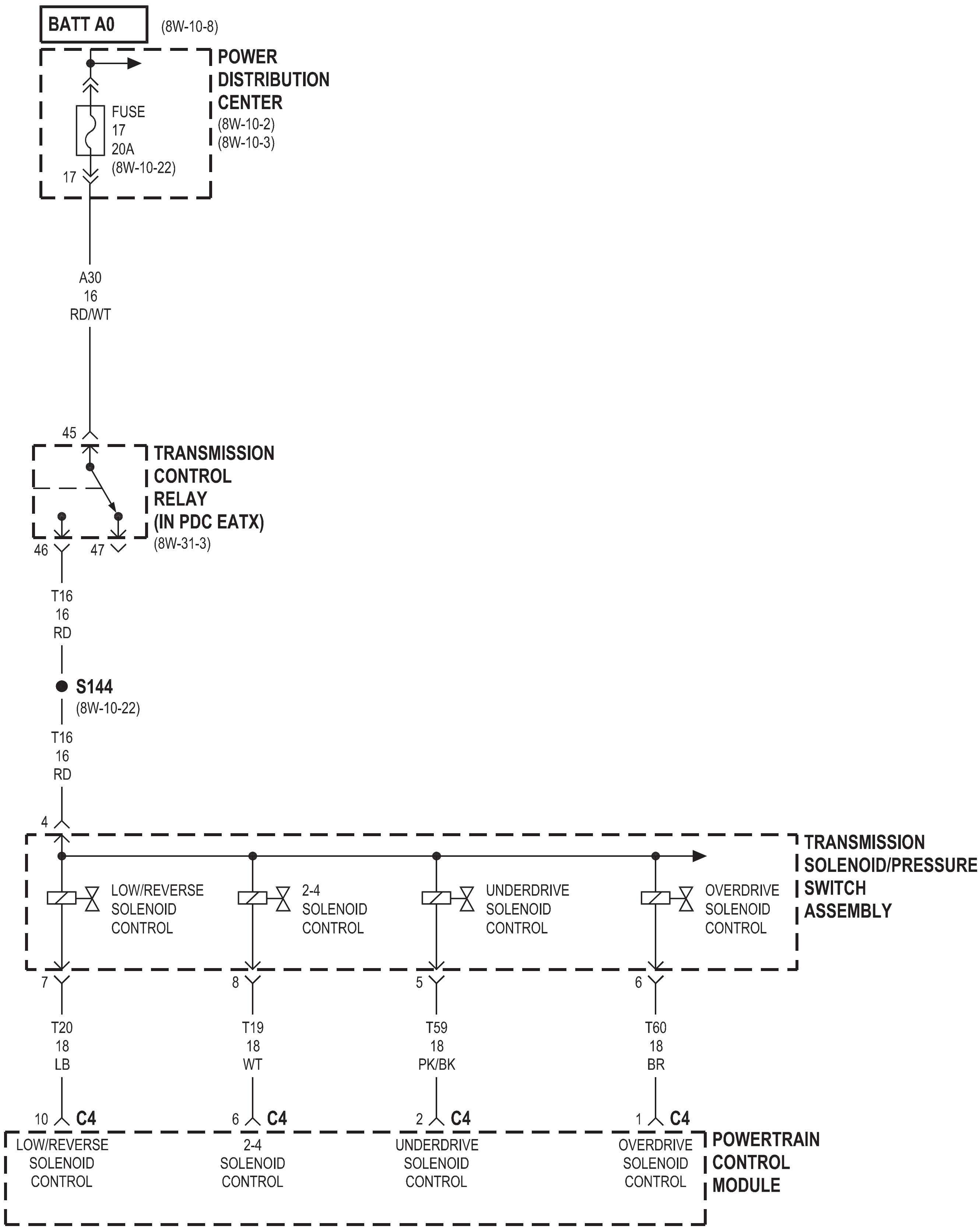


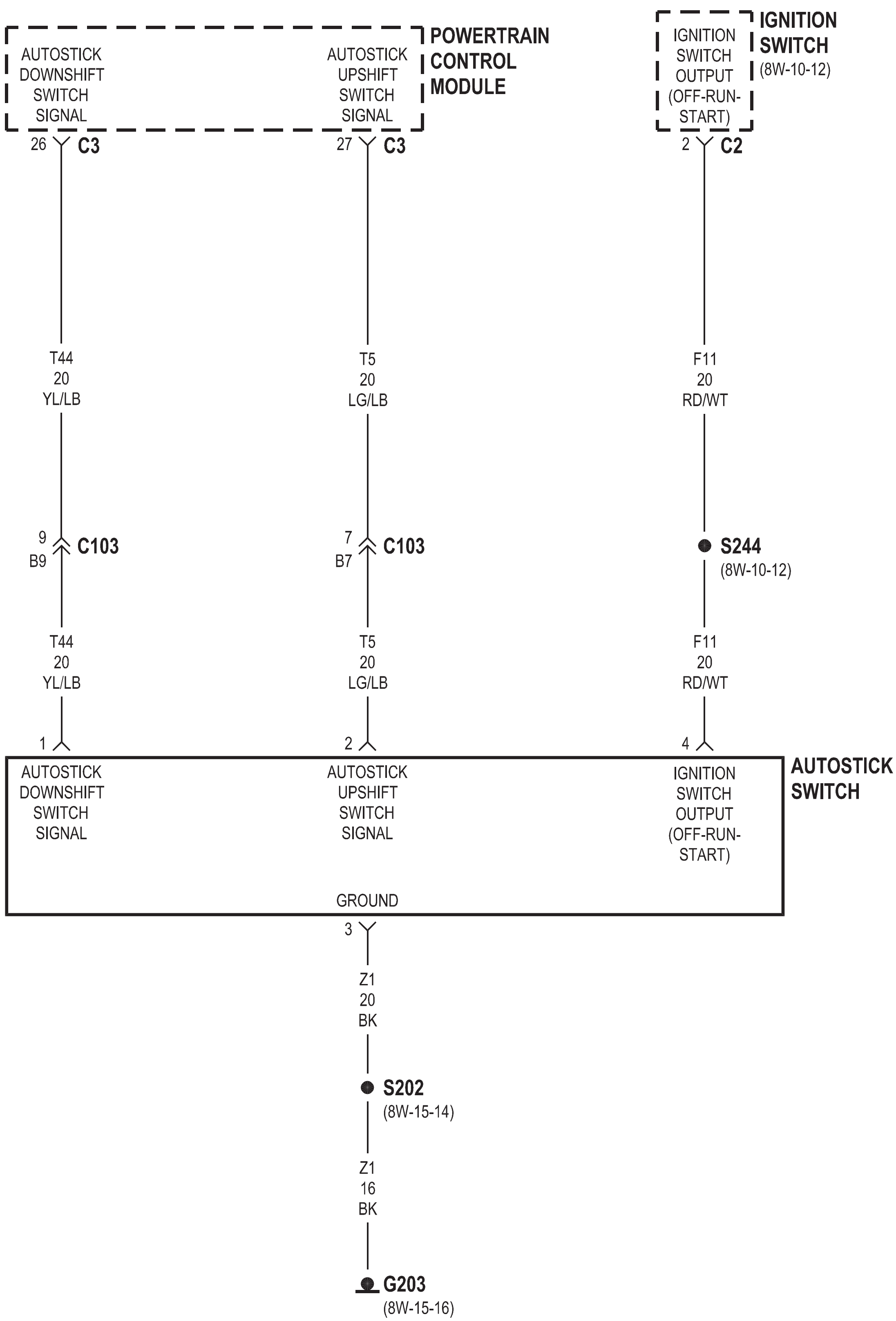
□ EXCEPT DAYTIME RUNNING LAMPS

2.0L

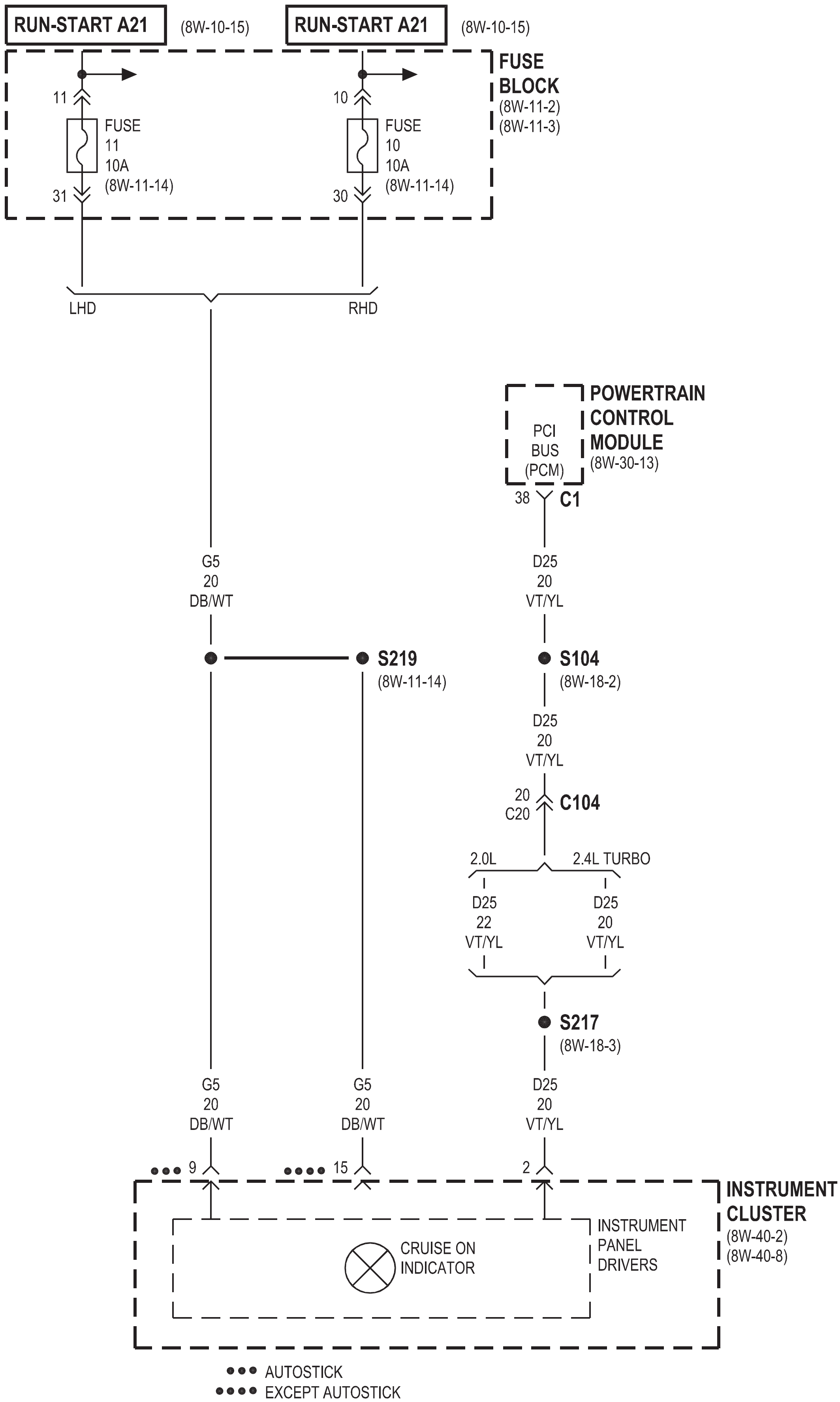


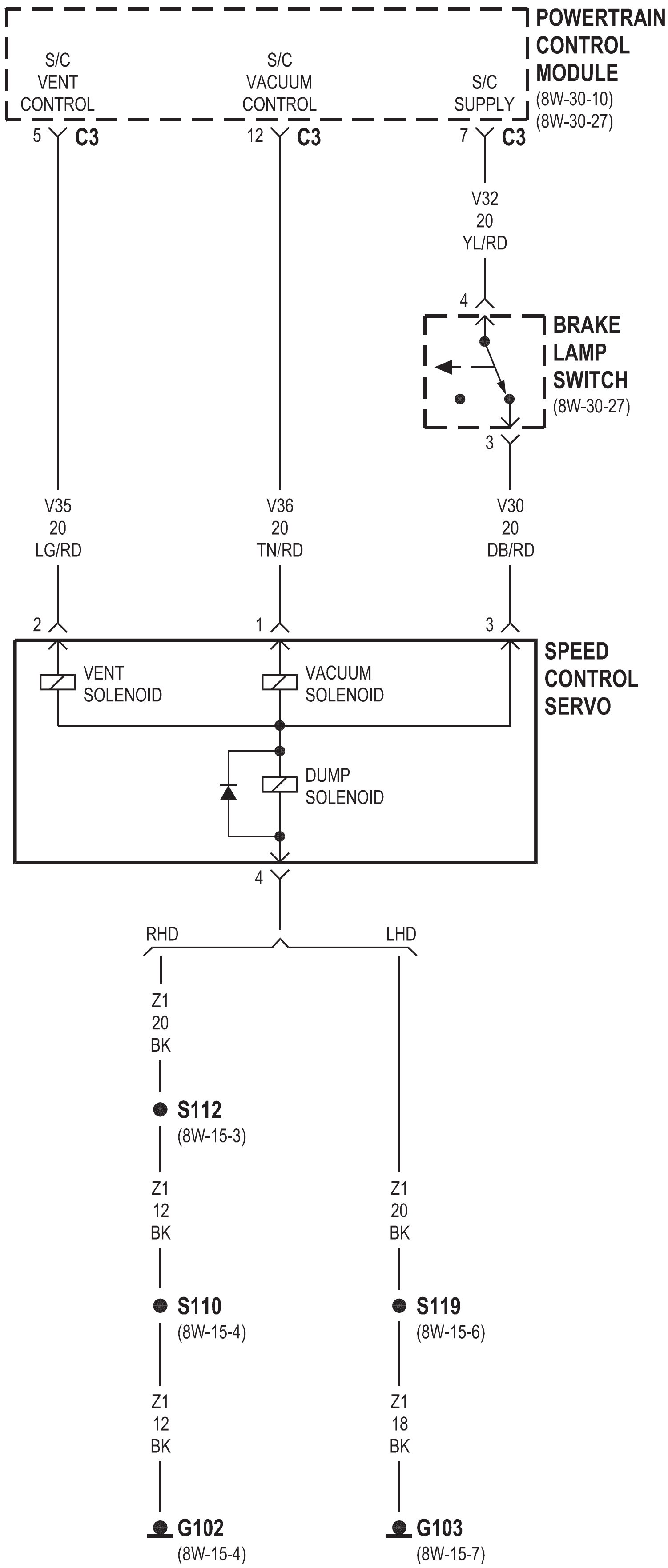
BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
17
20A
(8W-10-22)
17
A30
16
RD/WT
45
TRANSMISSION
CONTROL
RELAY
(IN PDC EATX)
(8W-31-3)
46
47
T16
16
RD
S144
(8W-10-22)
T16
16
RD
4
TRANSMISSION
SOLENOID/PRESSURE
SWITCH
ASSEMBLY
LOW/REVERSE
PRESSURE
SWITCH
SENSE
2-4
PRESSURE
SWITCH
SENSE
OVERDRIVE
PRESSURE
SWITCH
SENSE
2
1
3
T50
18
DG
T47
18
YL/BK
T9
18
OR/BK
29 C4
30 C4
22 C4
POWERTRAIN
CONTROL
MODULE
LOW/REVERSE
PRESSURE
SWITCH
SENSE
2-4
PRESSURE
SWITCH
SENSE
OVERDRIVE
PRESSURE
SWITCH
SENSE

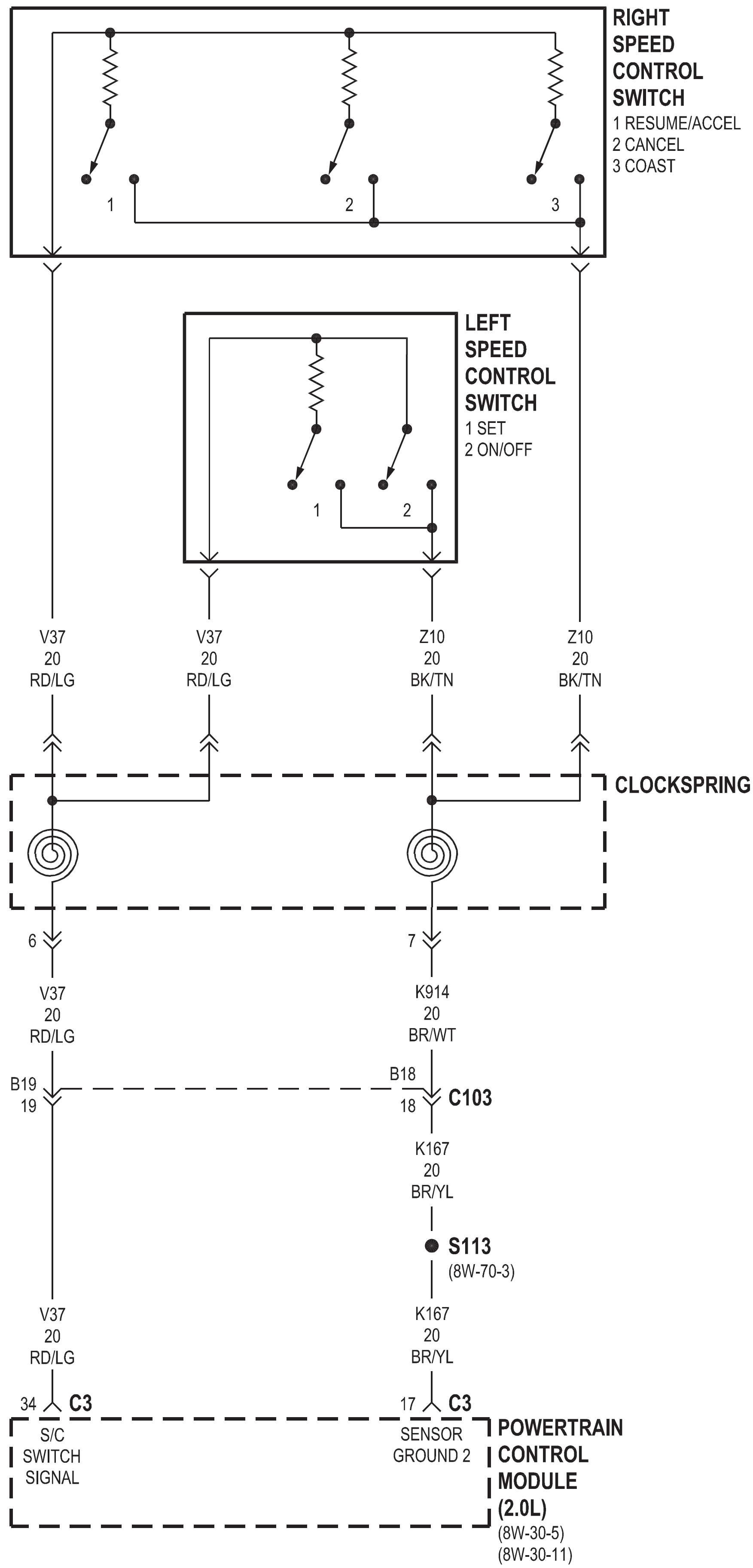

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
17
20A
(8W-10-22)
17
A30
16
RD/WT
45
TRANSMISSION
CONTROL
RELAY
(IN PDC EATX)
(8W-31-3)
46
47
T16
16
RD
S144
(8W-10-22)
T16
16
RD
4
LOW/REVERSE
SOLENOID
CONTROL
2-4
SOLENOID
CONTROL
UNDERDRIVE
SOLENOID
CONTROL
OVERDRIVE
SOLENOID
CONTROL
TRANSMISSION
SOLENOID/PRESSURE
SWITCH
ASSEMBLY
7
8
5
6
T20
18
LB
T19
18
WT
T59
18
PK/BK
T60
18
BR
10 C4
6 C4
2 C4
1 C4
LOW/REVERSE
SOLENOID
CONTROL
2-4
SOLENOID
CONTROL
UNDERDRIVE
SOLENOID
CONTROL
OVERDRIVE
SOLENOID
CONTROL
POWERTRAIN
CONTROL
MODULE


AUTOSTICK DOWNSHIFT SWITCH SIGNAL
AUTOSTICK UPSHIFT SWITCH SIGNAL
POWERTRAIN CONTROL MODULE
IGNITION SWITCH OUTPUT (OFF-RUN-START)
IGNITION SWITCH
(8W-10-12)
26 C3
27 C3
2 C2
T44 20 YL/LB
T5 20 LG/LB
F11 20 RD/WT
9 B9 C103
7 B7 C103
S244
(8W-10-12)
T44 20 YL/LB
T5 20 LG/LB
F11 20 RD/WT
1
2
4
AUTOSTICK DOWNSHIFT SWITCH SIGNAL
AUTOSTICK UPSHIFT SWITCH SIGNAL
IGNITION SWITCH OUTPUT (OFF-RUN-START)
AUTOSTICK SWITCH
GROUND
3
Z1 20 BK
S202
(8W-15-14)
Z1 16 BK
G203
(8W-15-16)

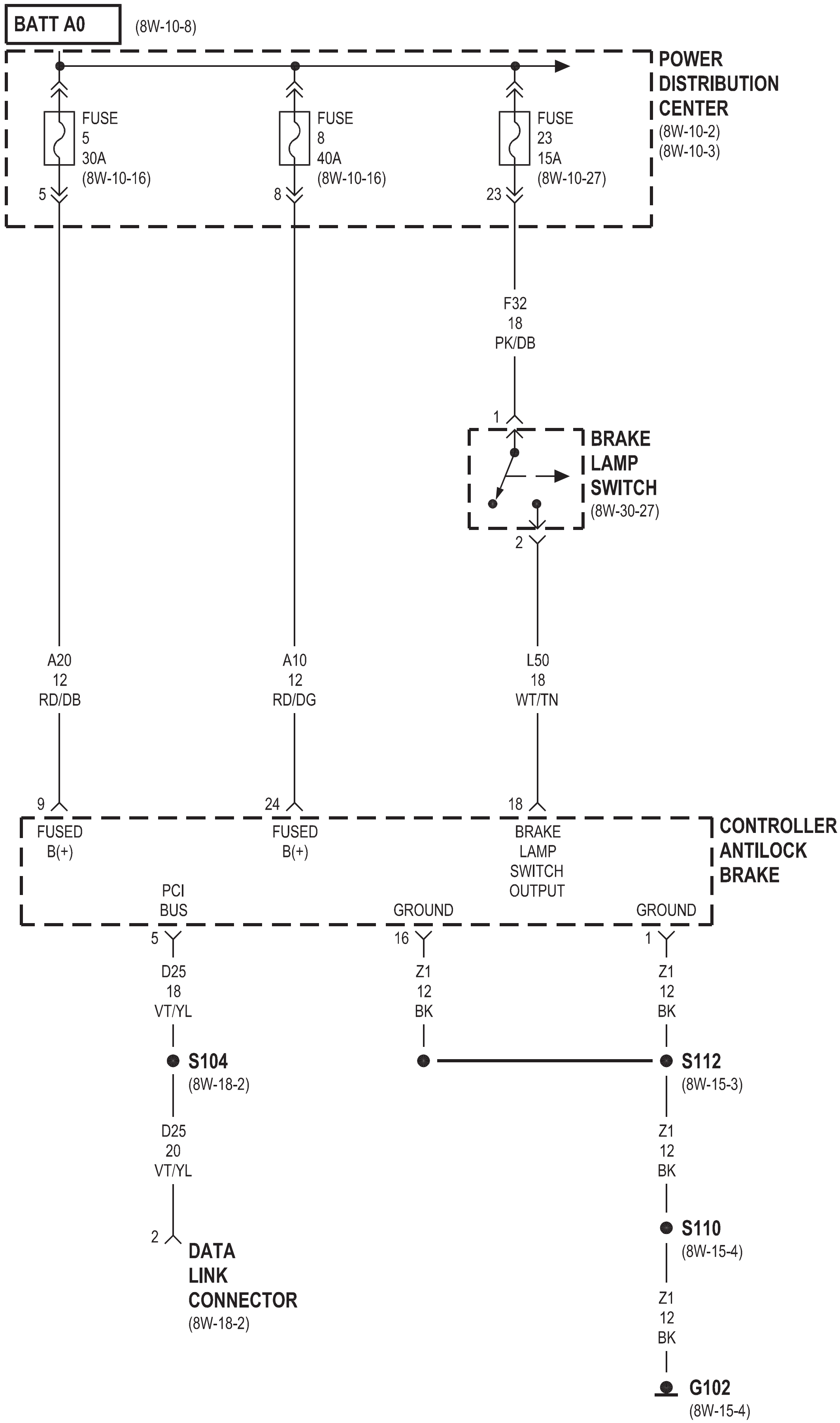
8W-33 VEHICLE SPEED CONTROL

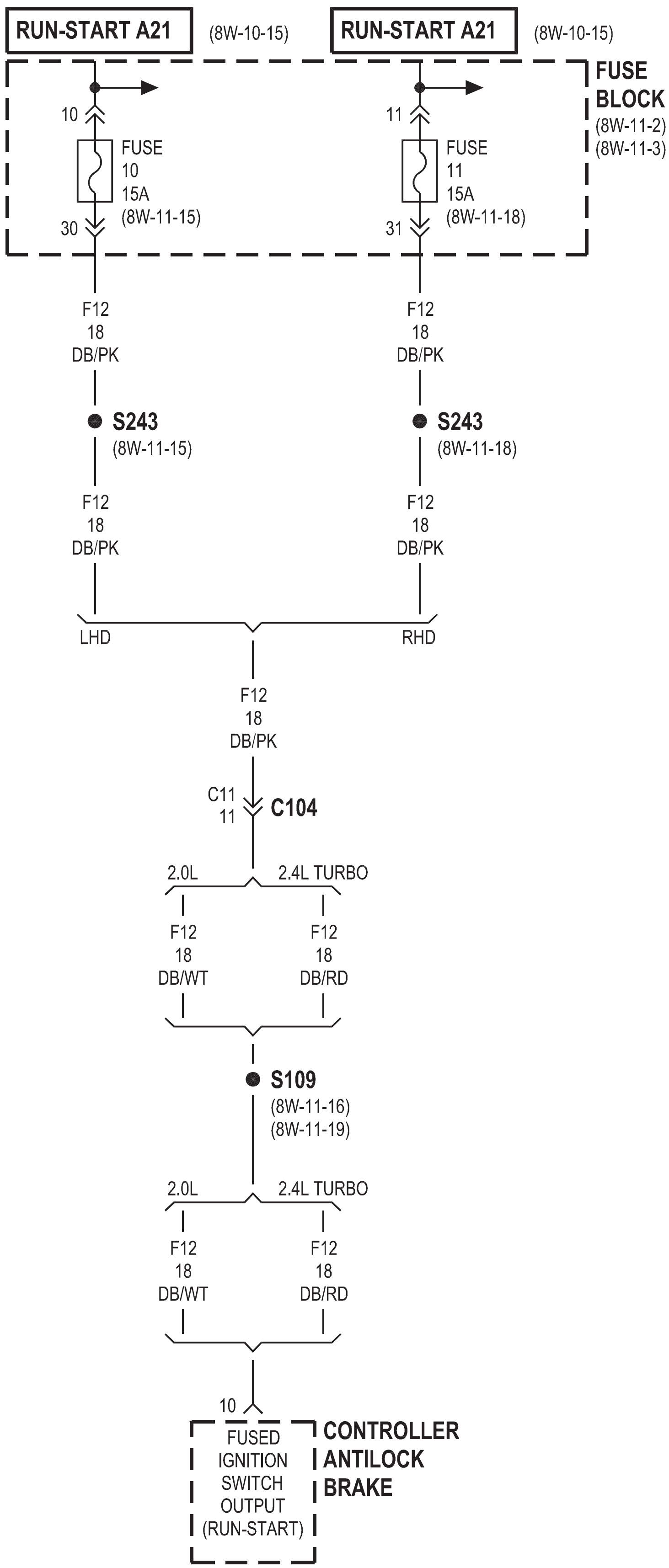

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
11
FUSE
11
10A
(8W-11-14)
31
10
FUSE
10
10A
(8W-11-14)
30
LHD
RHD
POWERTRAIN
CONTROL
MODULE
(8W-30-13)
PCI
BUS
(PCM)
38
C1
G5
20
DB/WT
D25
20
VT/YL
S219
(8W-11-14)
S104
(8W-18-2)
D25
20
VT/YL
20
C20
C104
2.0L
2.4L TURBO
D25
22
VT/YL
D25
20
VT/YL
S217
(8W-18-3)
G5
20
DB/WT
G5
20
DB/WT
D25
20
VT/YL
9
15
2
INSTRUMENT
CLUSTER
(8W-40-2)
(8W-40-8)
INSTRUMENT
PANEL
DRIVERS
CRUISE ON
INDICATOR
••• AUTOSTICK
•••• EXCEPT AUTOSTICK

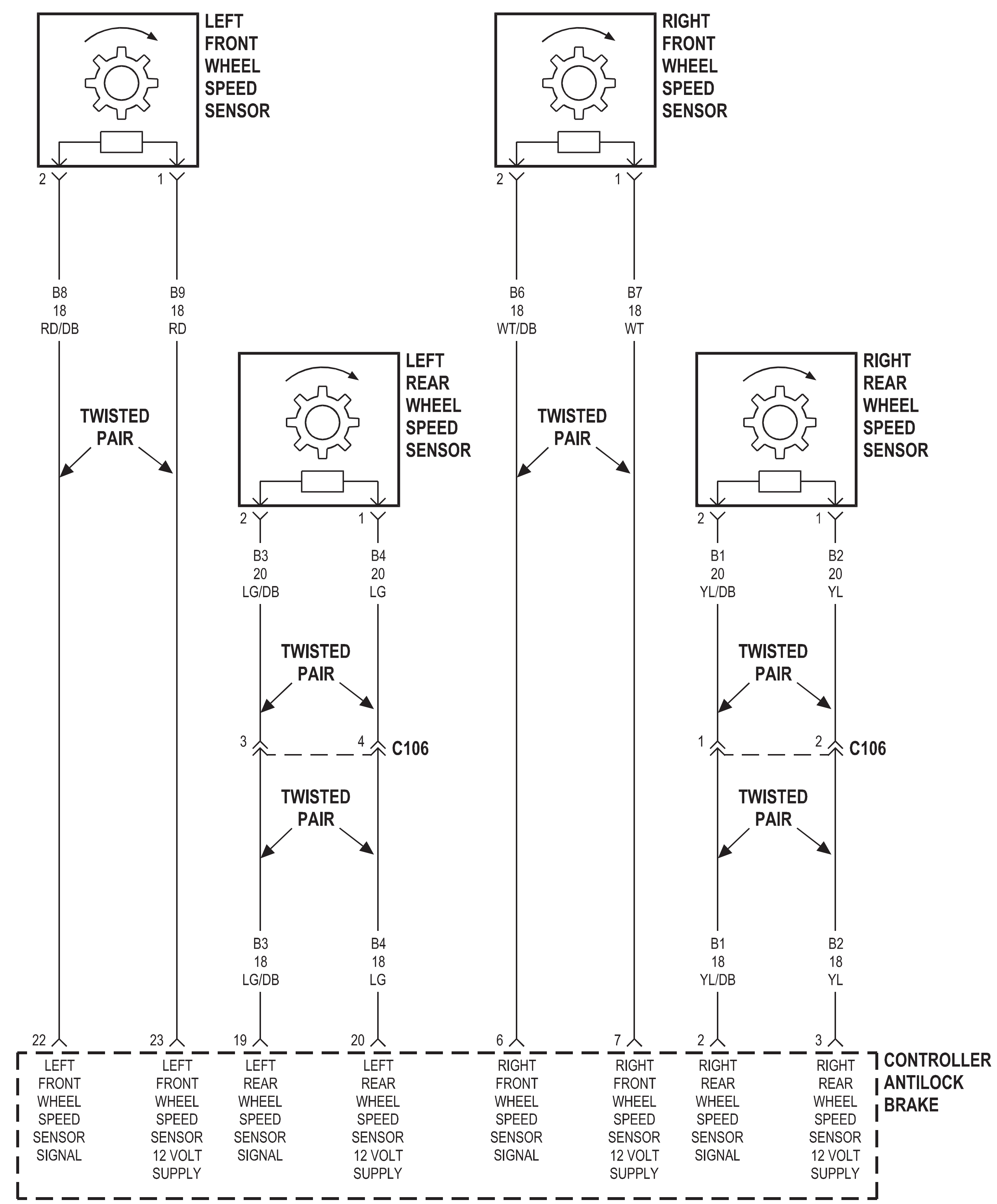

POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-27)
S/C VENT CONTROL
S/C VACUUM CONTROL
S/C SUPPLY
5 C3
12 C3
7 C3
V32 20 YL/RD
4
BRAKE LAMP SWITCH
(8W-30-27)
3
V35 20 LG/RD
V36 20 TN/RD
V30 20 DB/RD
2
1
3
SPEED CONTROL SERVO
VENT SOLENOID
VACUUM SOLENOID
DUMP SOLENOID
4
RHD
LHD
Z1 20 BK
S112
(8W-15-3)
Z1 12 BK
Z1 20 BK
S110
(8W-15-4)
S119
(8W-15-6)
Z1 12 BK
Z1 18 BK
G102
(8W-15-4)
G103
(8W-15-7)


RIGHT SPEED CONTROL SWITCH
1 RESUME/ACCEL
2 CANCEL
3 COAST
1
2
3
LEFT SPEED CONTROL SWITCH
1 SET
2 ON/OFF
1
2
V37 20 RD/LG
V37 20 RD/LG
Z10 20 BK/TN
Z10 20 BK/TN
CLOCKSPRING
6
7
V37 20 RD/LG
K914 20 BR/WT
B19 19
B18 18
C103
K167 20 BR/YL
S113
(8W-70-3)
V37 20 RD/LG
K167 20 BR/YL
34 C3
17 C3
S/C SWITCH SIGNAL
SENSOR GROUND 2
POWERTRAIN CONTROL MODULE (2.0L)
(8W-30-5)
(8W-30-11)

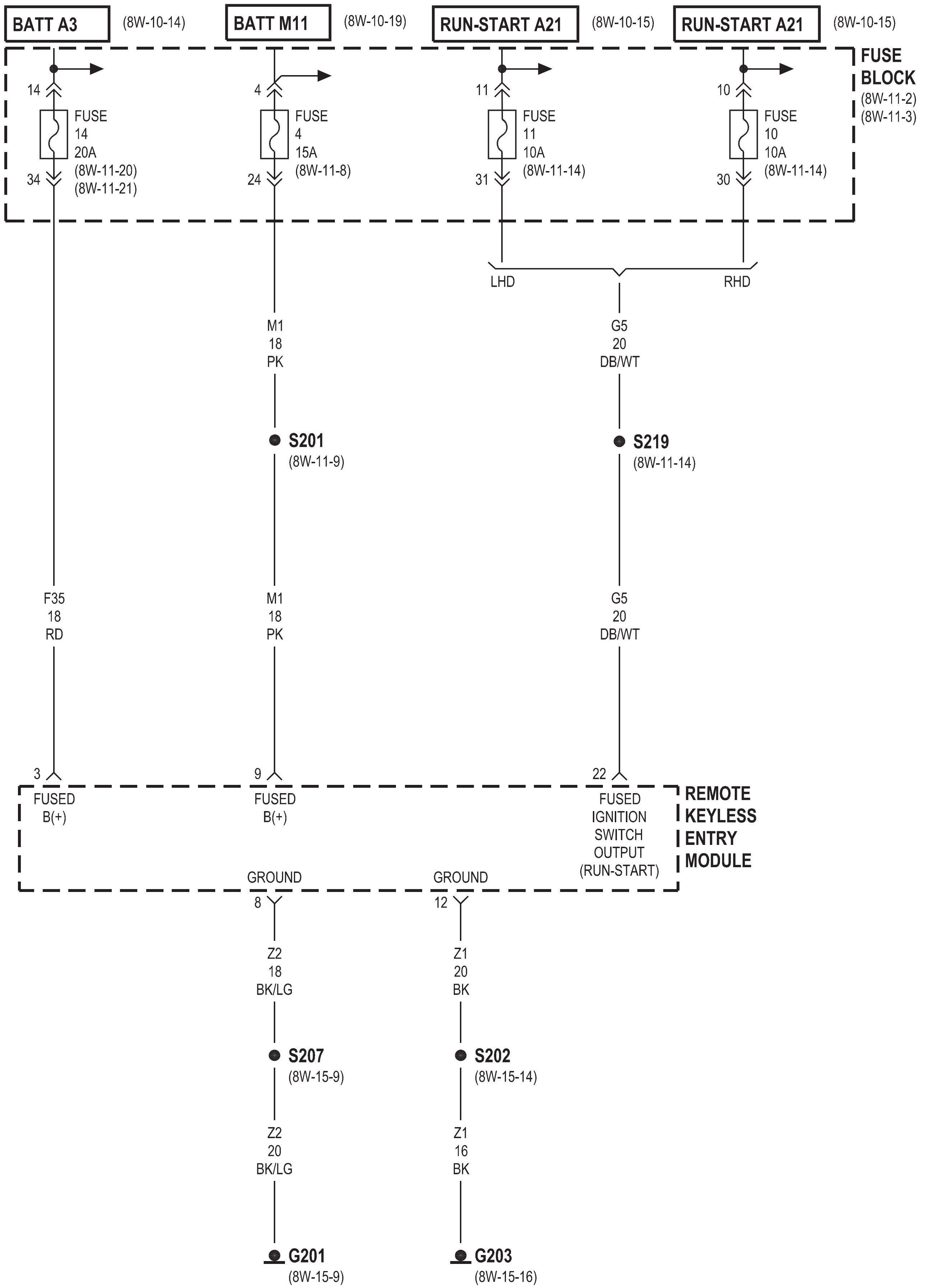
8W-35 ANTILOCK BRAKES


BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
5
30A
(8W-10-16)
5
FUSE
8
40A
(8W-10-16)
8
FUSE
23
15A
(8W-10-27)
23
F32
18
PK/DB
1
BRAKE
LAMP
SWITCH
(8W-30-27)
2
A20
12
RD/DB
A10
12
RD/DG
L50
18
WT/TN
9
24
18
FUSED
B(+)
FUSED
B(+)
BRAKE
LAMP
SWITCH
OUTPUT
CONTROLLER
ANTILOCK
BRAKE
PCI
BUS
GROUND
GROUND
5
16
1
D25
18
VT/YL
Z1
12
BK
Z1
12
BK
S104
(8W-18-2)
S112
(8W-15-3)
D25
20
VT/YL
Z1
12
BK
2
DATA
LINK
CONNECTOR
(8W-18-2)
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)

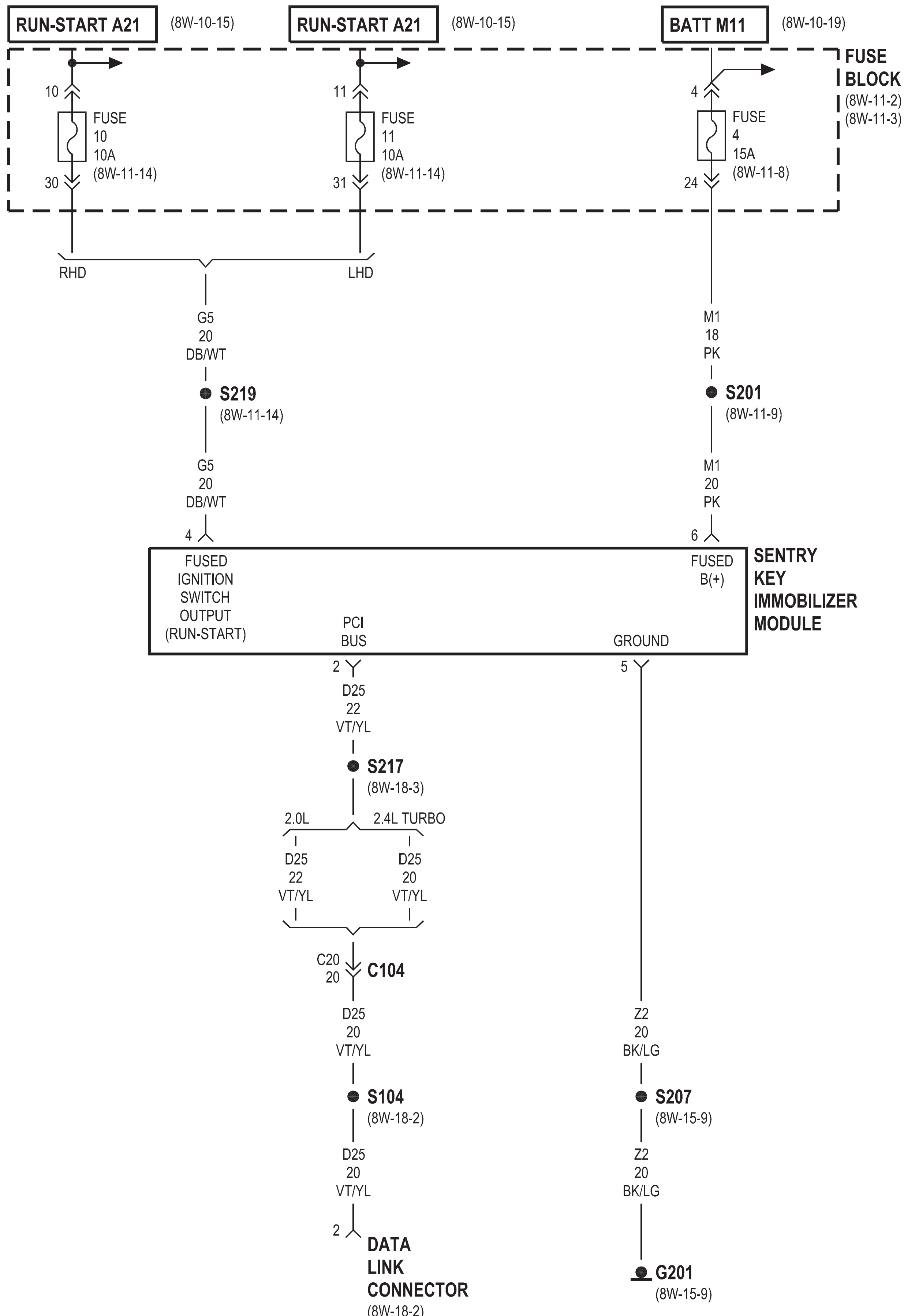

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE
10
15A
(8W-11-15)
30
11
FUSE
11
15A
(8W-11-18)
31
F12
18
DB/PK
S243
(8W-11-15)
S243
(8W-11-18)
LHD
RHD
C11
11
C104
2.0L
2.4L TURBO
DB/WT
DB/RD
S109
(8W-11-16)
(8W-11-19)
10
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
CONTROLLER
ANTILOCK
BRAKE

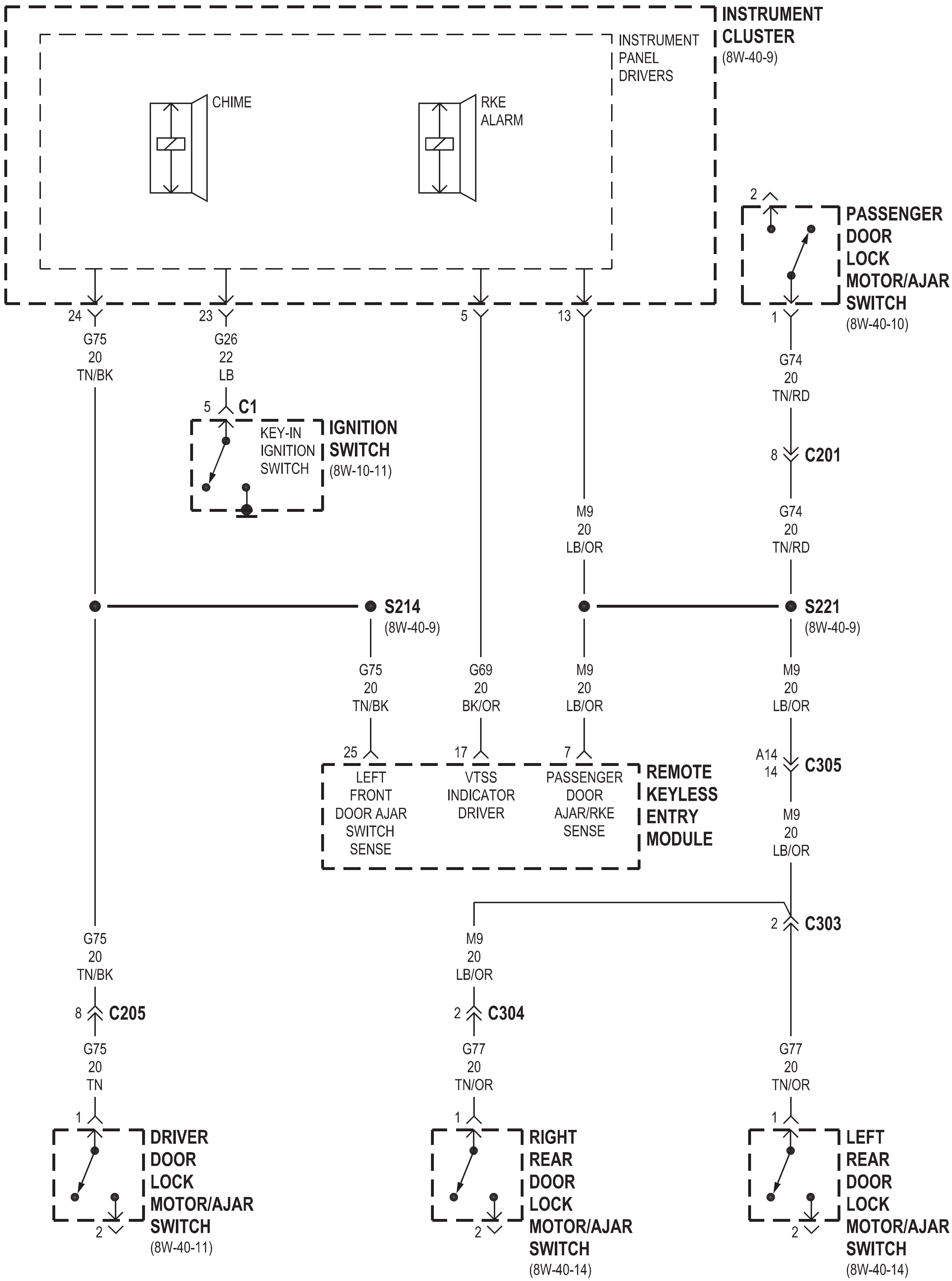

LEFT FRONT WHEEL SPEED SENSOR
RIGHT FRONT WHEEL SPEED SENSOR
2
1
2
1
B8 18 RD/DB
B9 18 RD
B6 18 WT/DB
B7 18 WT
TWISTED PAIR
TWISTED PAIR
LEFT REAR WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
2
1
2
1
B3 20 LG/DB
B4 20 LG
B1 20 YL/DB
B2 20 YL
TWISTED PAIR
TWISTED PAIR
3
4
C106
1
2
C106
TWISTED PAIR
TWISTED PAIR
B3 18 LG/DB
B4 18 LG
B1 18 YL/DB
B2 18 YL
22
23
19
20
6
7
2
3
LEFT FRONT WHEEL SPEED SENSOR SIGNAL
LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
LEFT REAR WHEEL SPEED SENSOR SIGNAL
LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT REAR WHEEL SPEED SENSOR SIGNAL
RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
CONTROLLER ANTILOCK BRAKE

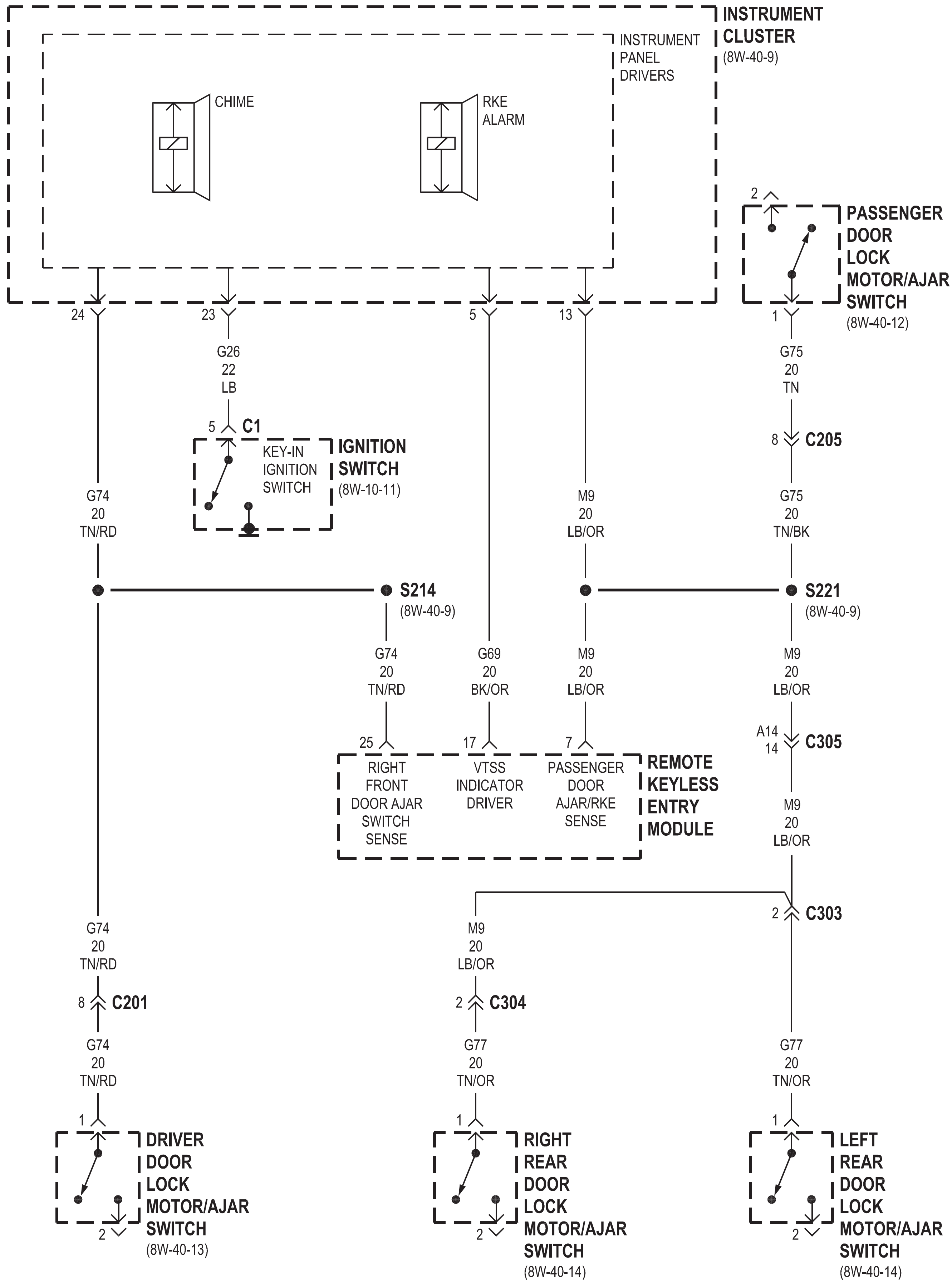
8W-39 VEHICLE THEFT SECURITY SYSTEM

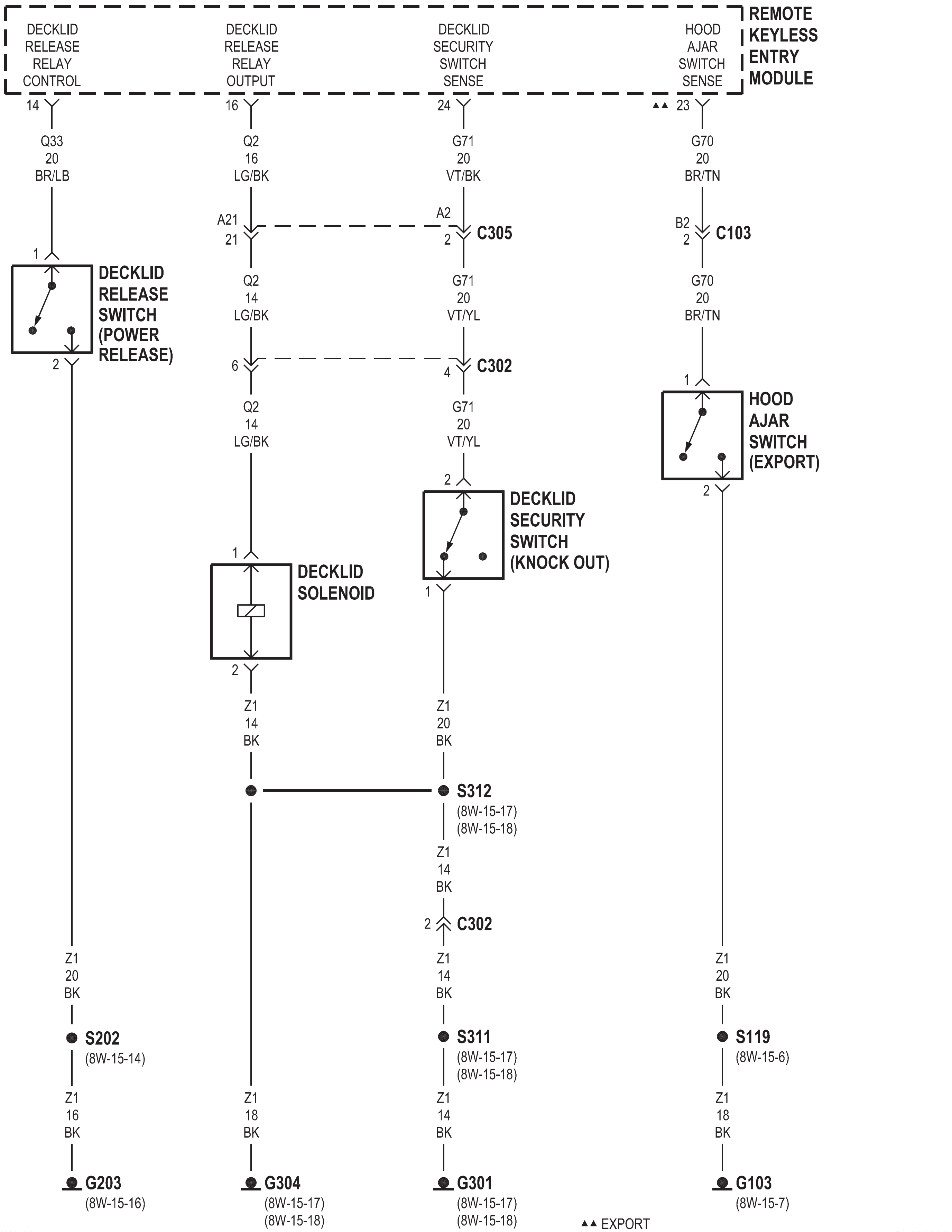


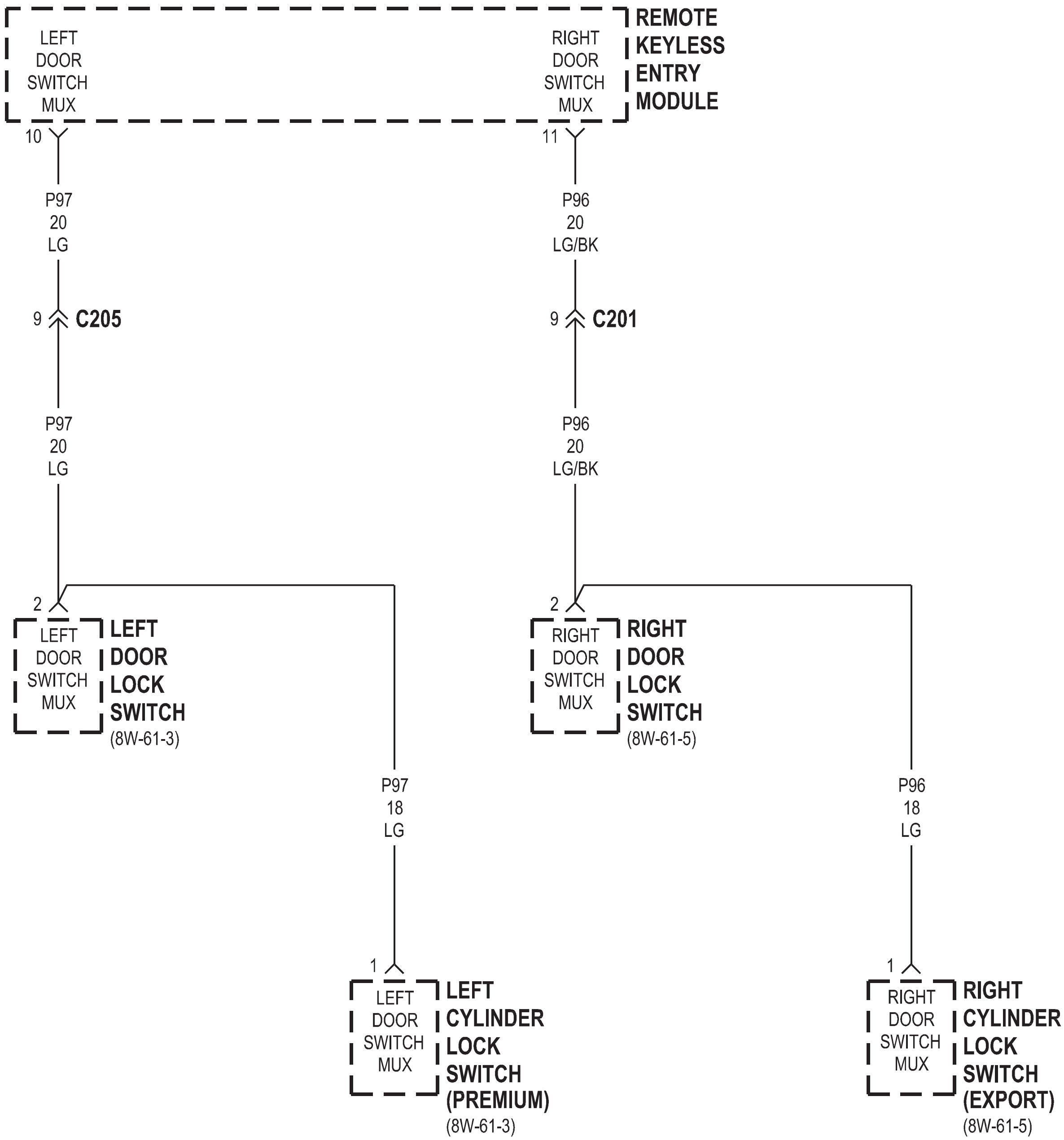
048W-10 PL403902

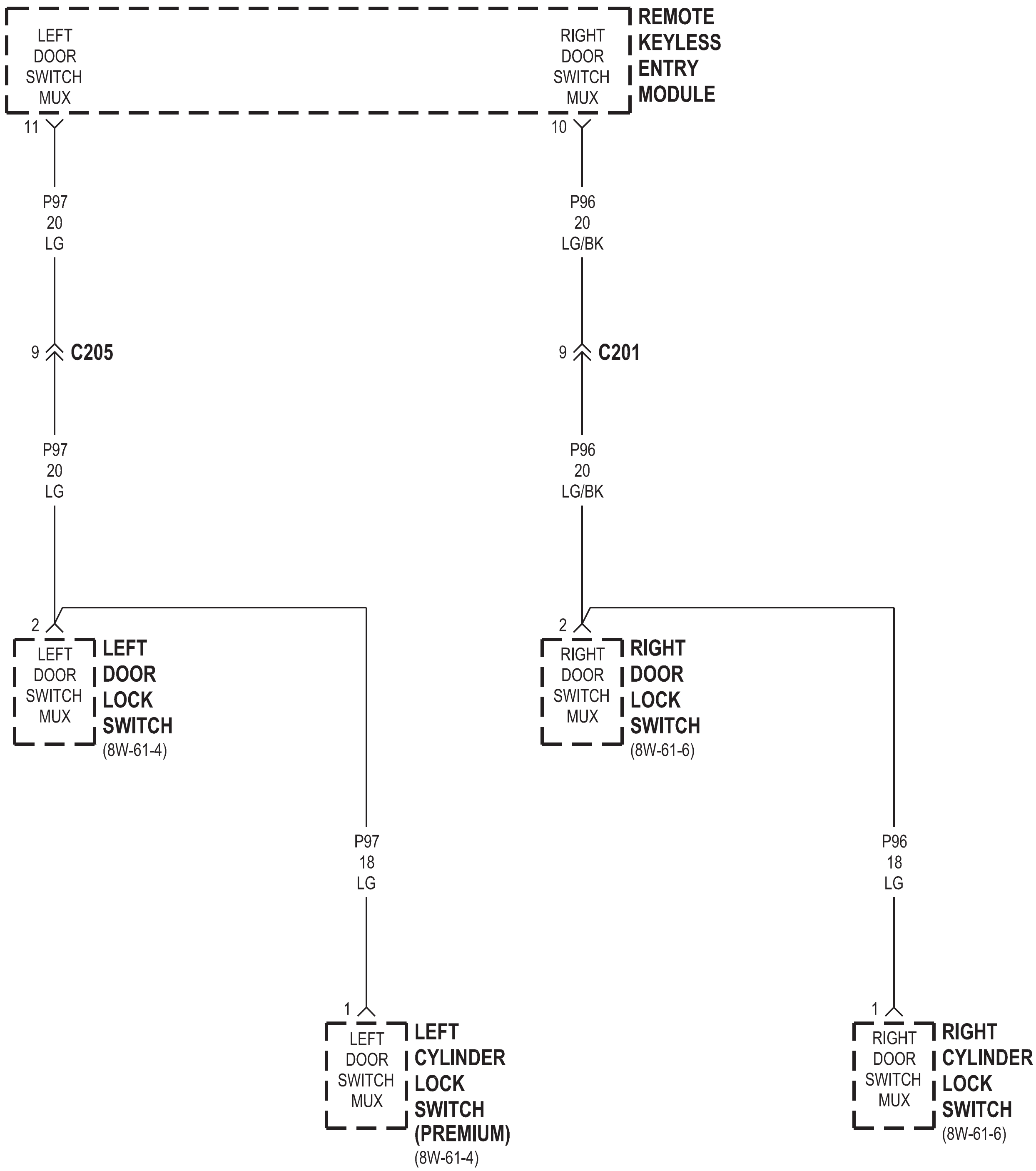

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
BATT M11
(8W-10-19)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE
10
10A
(8W-11-14)
30
11
FUSE
11
10A
(8W-11-14)
31
4
FUSE
4
15A
(8W-11-8)
24
RHD
LHD
G5
20
DB/WT
S219
(8W-11-14)
G5
20
DB/WT
M1
18
PK
S201
(8W-11-9)
M1
20
PK
4
6
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
PCI
BUS
GROUND
FUSED
B(+)
SENTRY
KEY
IMMOBILIZER
MODULE
2
5
D25
22
VT/YL
S217
(8W-18-3)
2.0L
2.4L TURBO
D25
22
VT/YL
D25
20
VT/YL
C20
20
C104
D25
20
VT/YL
S104
(8W-18-2)
D25
20
VT/YL
2
DATA
LINK
CONNECTOR
(8W-18-2)
Z2
20
BK/LG
S207
(8W-15-9)
Z2
20
BK/LG
G201
(8W-15-9)

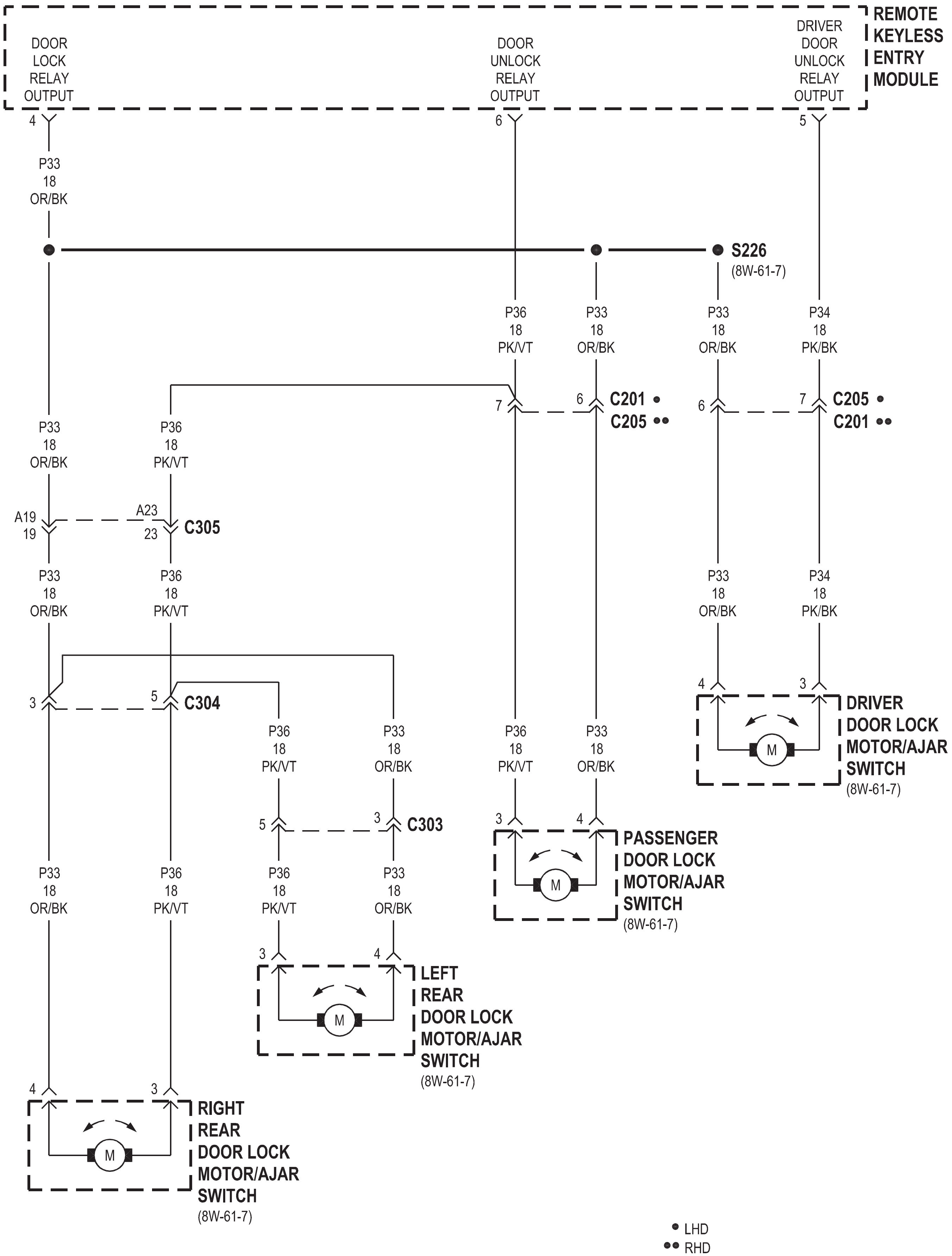

INSTRUMENT CLUSTER
(8W-40-9)
INSTRUMENT PANEL DRIVERS
CHIME
RKE ALARM
24
G75
20
TN/BK
23
G26
22
LB
5
13
5
C1
KEY-IN IGNITION SWITCH
IGNITION SWITCH
(8W-10-11)
M9
20
LB/OR
2
PASSENGER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-10)
1
G74
20
TN/RD
8
C201
G74
20
TN/RD
S214
(8W-40-9)
S221
(8W-40-9)
G75
20
TN/BK
G69
20
BK/OR
M9
20
LB/OR
M9
20
LB/OR
25
17
7
LEFT FRONT DOOR AJAR SWITCH SENSE
VTSS INDICATOR DRIVER
PASSENGER DOOR AJAR/RKE SENSE
REMOTE KEYLESS ENTRY MODULE
A14
14
C305
M9
20
LB/OR
2
C303
G75
20
TN/BK
M9
20
LB/OR
8
C205
2
C304
G75
20
TN
G77
20
TN/OR
G77
20
TN/OR
1
1
1
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-11)
2
RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
2
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
2


INSTRUMENT CLUSTER
(8W-40-9)
INSTRUMENT PANEL DRIVERS
CHIME
RKE ALARM
24
23
5
13
G26
22
LB
5
C1
KEY-IN IGNITION SWITCH
IGNITION SWITCH
(8W-10-11)
G74
20
TN/RD
M9
20
LB/OR
PASSENGER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-12)
2
1
G75
20
TN
8
C205
G75
20
TN/BK
S214
(8W-40-9)
S221
(8W-40-9)
G74
20
TN/RD
G69
20
BK/OR
M9
20
LB/OR
M9
20
LB/OR
25
17
7
RIGHT FRONT DOOR AJAR SWITCH SENSE
VTSS INDICATOR DRIVER
PASSENGER DOOR AJAR/RKE SENSE
REMOTE KEYLESS ENTRY MODULE
A14
14
C305
M9
20
LB/OR
2
C303
M9
20
LB/OR
G74
20
TN/RD
8
C201
2
C304
G74
20
TN/RD
G77
20
TN/OR
G77
20
TN/OR
1
2
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-13)
RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-14)


REMOTE KEYLESS ENTRY MODULE
DECKLID RELEASE RELAY CONTROL
DECKLID RELEASE RELAY OUTPUT
DECKLID SECURITY SWITCH SENSE
HOOD AJAR SWITCH SENSE
14
16
24
▲▲ 23
Q33 20 BR/LB
Q2 16 LG/BK
G71 20 VT/BK
G70 20 BR/TN
A21 21
A2 2
C305
B2 2
C103
1
DECKLID RELEASE SWITCH (POWER RELEASE)
2
Q2 14 LG/BK
G71 20 VT/YL
G70 20 BR/TN
6
4
C302
1
HOOD AJAR SWITCH (EXPORT)
2
Q2 14 LG/BK
G71 20 VT/YL
2
DECKLID SECURITY SWITCH (KNOCK OUT)
1
1
DECKLID SOLENOID
2
Z1 14 BK
Z1 20 BK
S312
(8W-15-17)
(8W-15-18)
Z1 14 BK
2
C302
Z1 20 BK
Z1 14 BK
Z1 20 BK
S202
(8W-15-14)
S311
(8W-15-17)
(8W-15-18)
S119
(8W-15-6)
Z1 16 BK
Z1 18 BK
Z1 14 BK
Z1 18 BK
G203
(8W-15-16)
G304
(8W-15-17)
(8W-15-18)
G301
(8W-15-17)
(8W-15-18)
G103
(8W-15-7)
▲▲ EXPORT


LEFT DOOR SWITCH MUX
RIGHT DOOR SWITCH MUX
REMOTE KEYLESS ENTRY MODULE
10
11
P97 20 LG
P96 20 LG/BK
9
C205
9
C201
P97 20 LG
P96 20 LG/BK
2
LEFT DOOR SWITCH MUX
LEFT DOOR LOCK SWITCH
(8W-61-3)
2
RIGHT DOOR SWITCH MUX
RIGHT DOOR LOCK SWITCH
(8W-61-5)
P97 18 LG
P96 18 LG
1
LEFT DOOR SWITCH MUX
LEFT CYLINDER LOCK SWITCH (PREMIUM)
(8W-61-3)
1
RIGHT DOOR SWITCH MUX
RIGHT CYLINDER LOCK SWITCH (EXPORT)
(8W-61-5)


REMOTE KEYLESS ENTRY MODULE
LEFT DOOR SWITCH MUX
RIGHT DOOR SWITCH MUX
11
10
P97
20
LG
P96
20
LG/BK
9
C205
9
C201
P97
20
LG
P96
20
LG/BK
2
LEFT DOOR SWITCH MUX
LEFT DOOR LOCK SWITCH
(8W-61-4)
2
RIGHT DOOR SWITCH MUX
RIGHT DOOR LOCK SWITCH
(8W-61-6)
P97
18
LG
P96
18
LG
1
LEFT DOOR SWITCH MUX
LEFT CYLINDER LOCK SWITCH (PREMIUM)
(8W-61-4)
1
RIGHT DOOR SWITCH MUX
RIGHT CYLINDER LOCK SWITCH
(8W-61-6)



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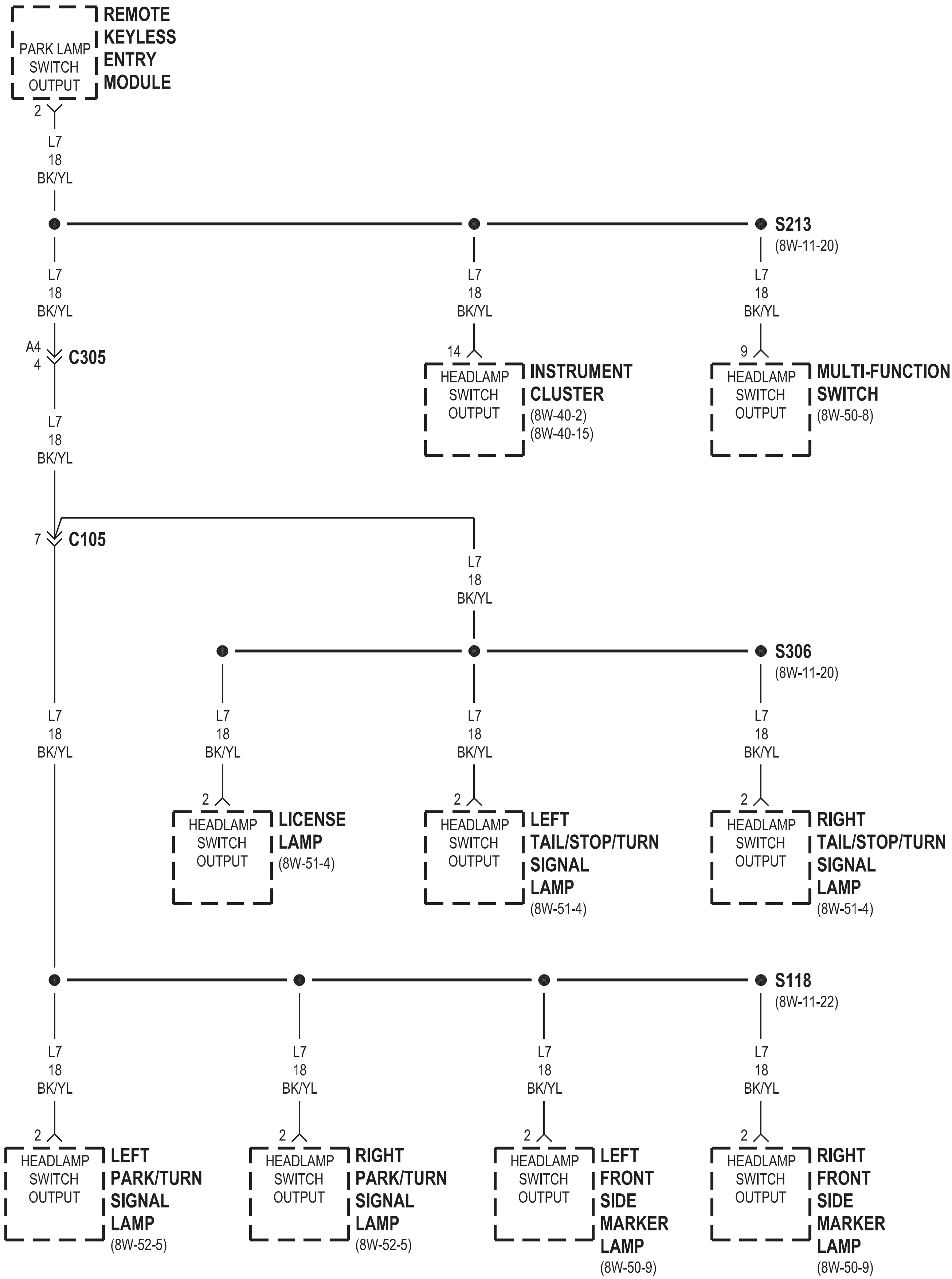
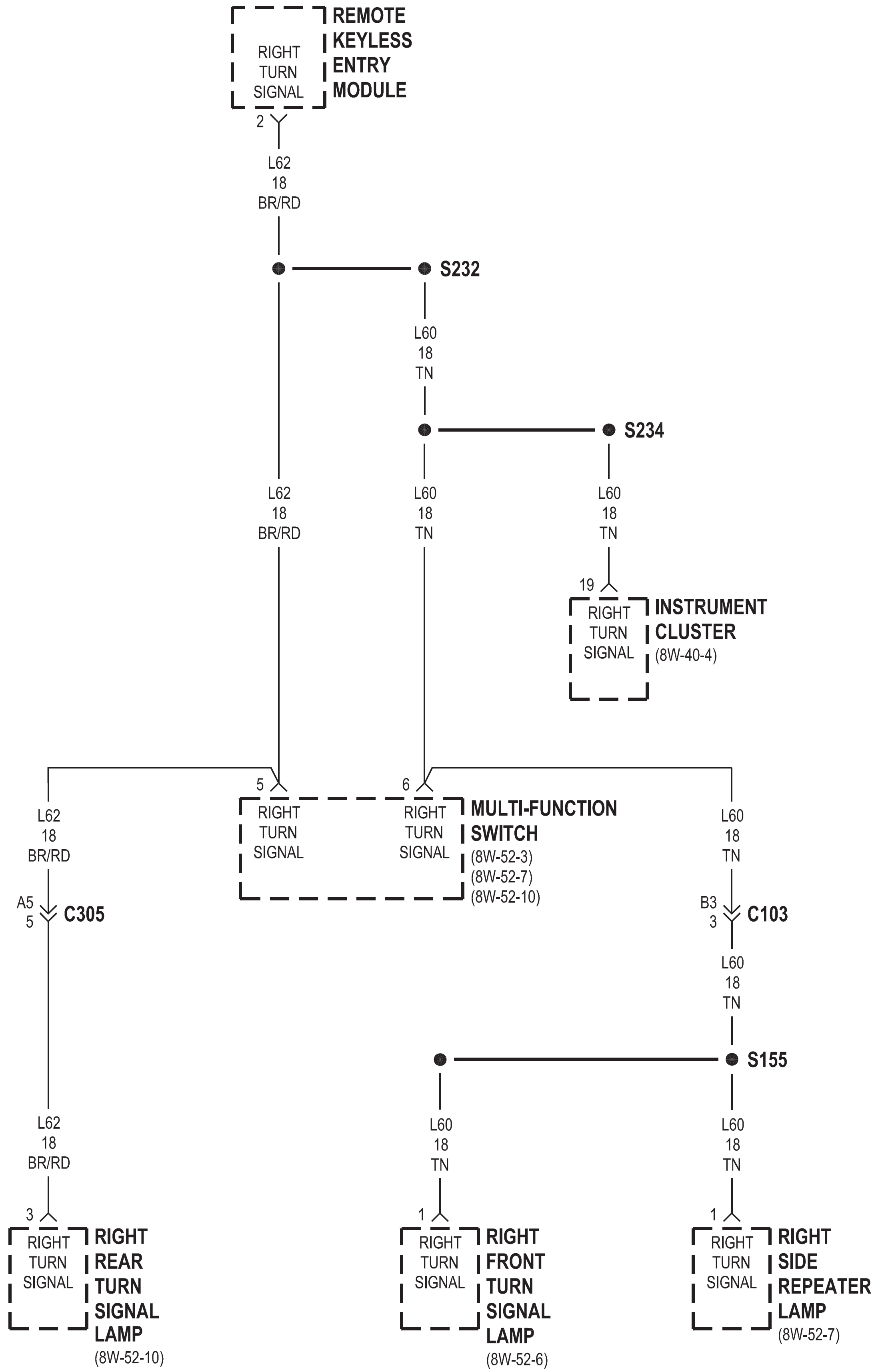
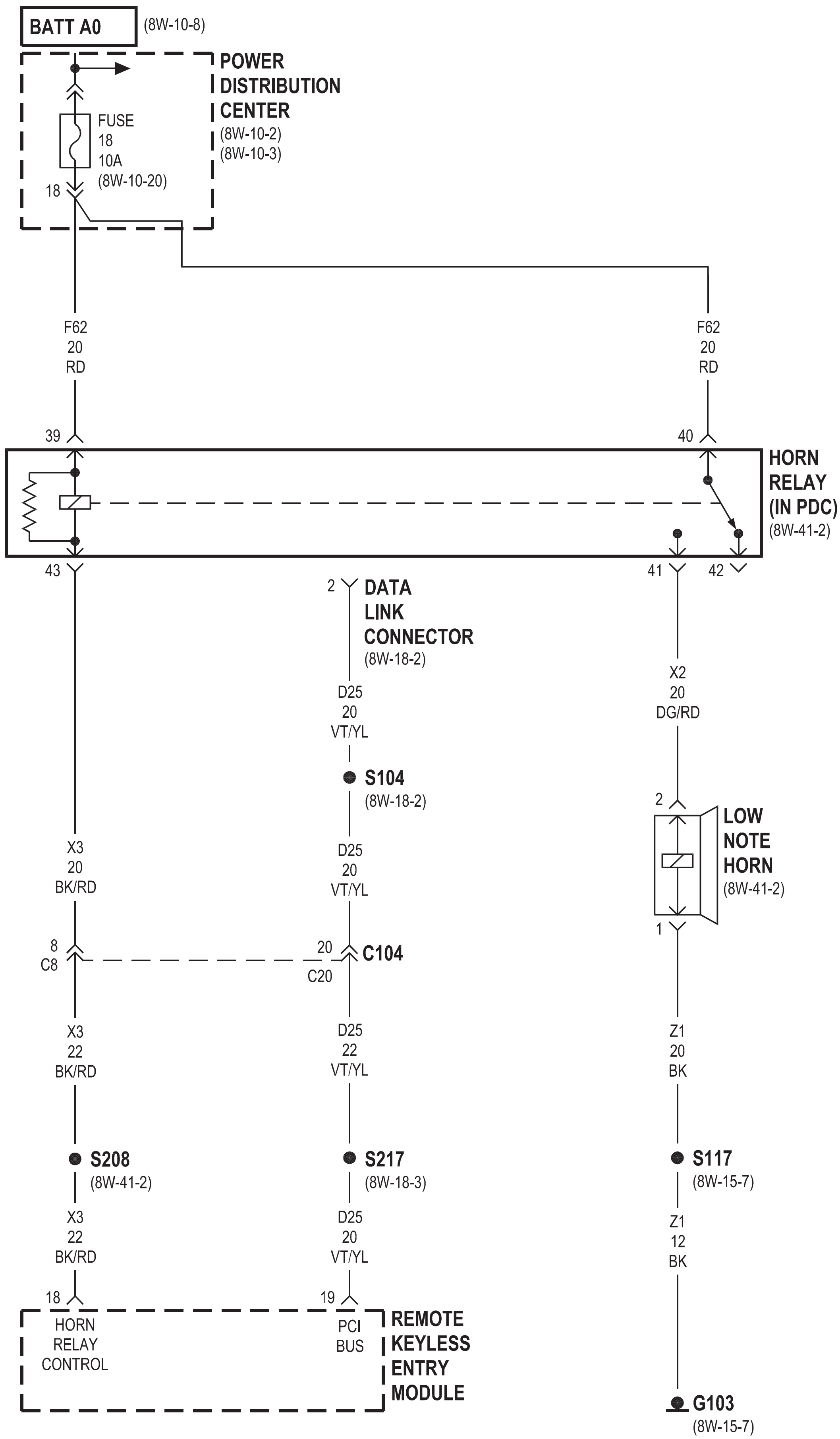
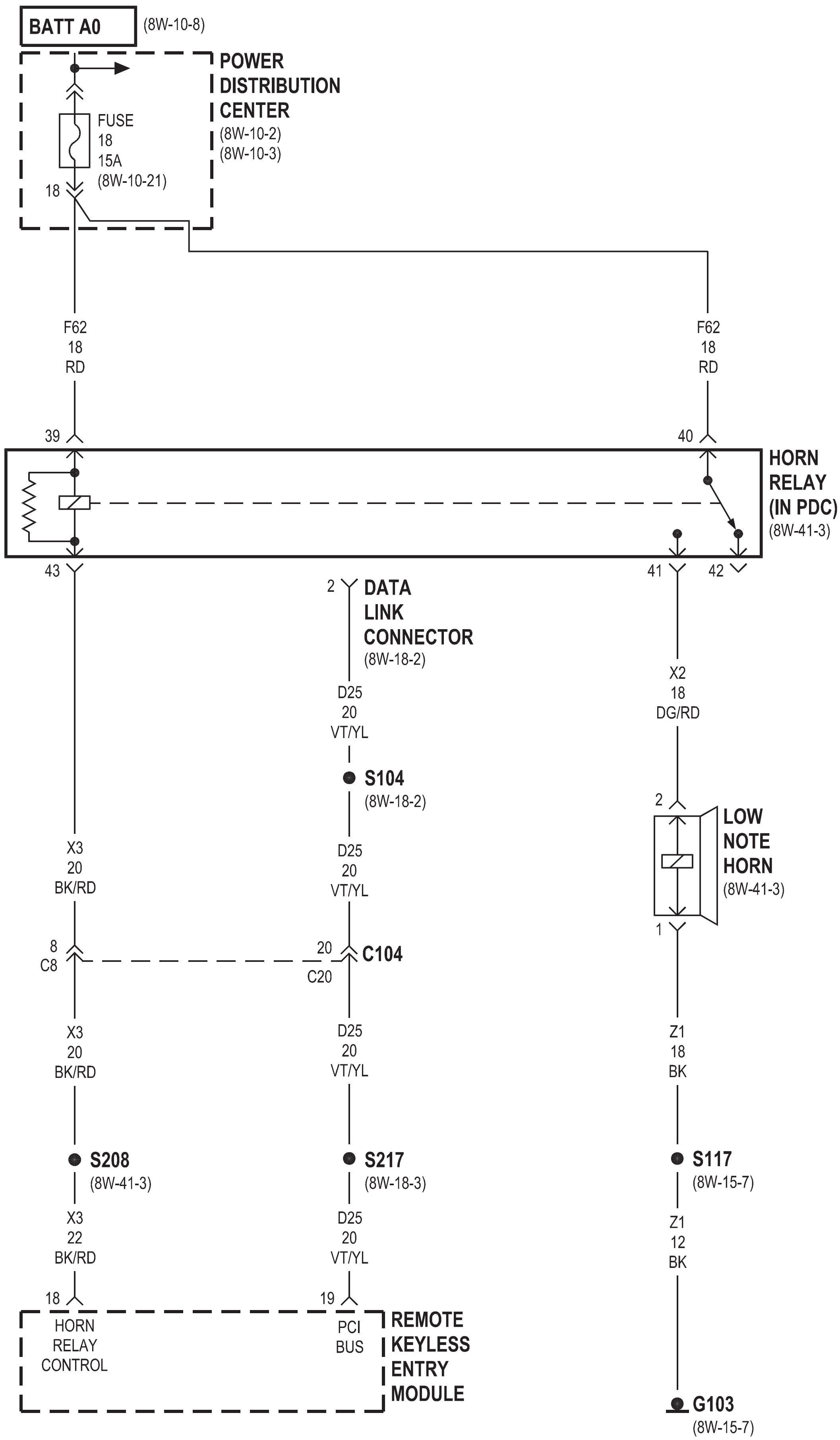

PARK LAMP SWITCH OUTPUT
REMOTE KEYLESS ENTRY MODULE
2
L7 18 BK/YL
S213
(8W-11-20)
L7 18 BK/YL
A4 4
C305
14
HEADLAMP SWITCH OUTPUT
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-15)
9
HEADLAMP SWITCH OUTPUT
MULTI-FUNCTION SWITCH
(8W-50-8)
7
C105
S306
(8W-11-20)
2
HEADLAMP SWITCH OUTPUT
LICENSE LAMP
(8W-51-4)
LEFT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
RIGHT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
S118
(8W-11-22)
LEFT PARK/TURN SIGNAL LAMP
(8W-52-5)
RIGHT PARK/TURN SIGNAL LAMP
(8W-52-5)
LEFT FRONT SIDE MARKER LAMP
(8W-50-9)
RIGHT FRONT SIDE MARKER LAMP
(8W-50-9)

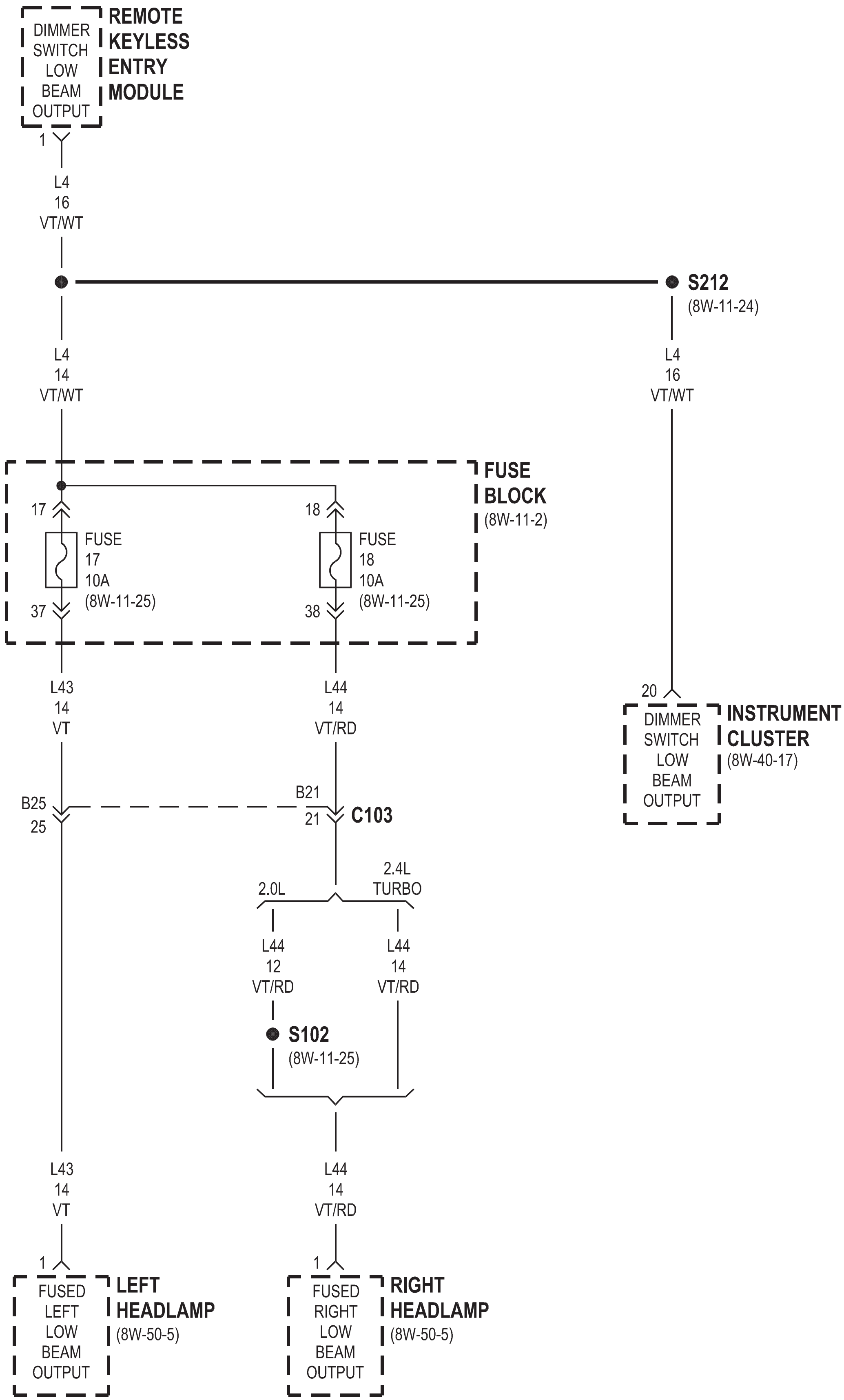

REMOTE KEYLESS ENTRY MODULE
RIGHT TURN SIGNAL
2
L62 18 BR/RD
S232
L60 18 TN
S234
L62 18 BR/RD
L60 18 TN
L60 18 TN
19
RIGHT TURN SIGNAL
INSTRUMENT CLUSTER
(8W-40-4)
5
6
RIGHT TURN SIGNAL
RIGHT TURN SIGNAL
MULTI-FUNCTION SWITCH
(8W-52-3)
(8W-52-7)
(8W-52-10)
L62 18 BR/RD
A5 5
C305
L60 18 TN
B3 3
C103
L60 18 TN
S155
L62 18 BR/RD
L60 18 TN
L60 18 TN
3
RIGHT TURN SIGNAL
RIGHT REAR TURN SIGNAL LAMP
(8W-52-10)
1
RIGHT TURN SIGNAL
RIGHT FRONT TURN SIGNAL LAMP
(8W-52-6)
1
RIGHT TURN SIGNAL
RIGHT SIDE REPEATER LAMP
(8W-52-7)

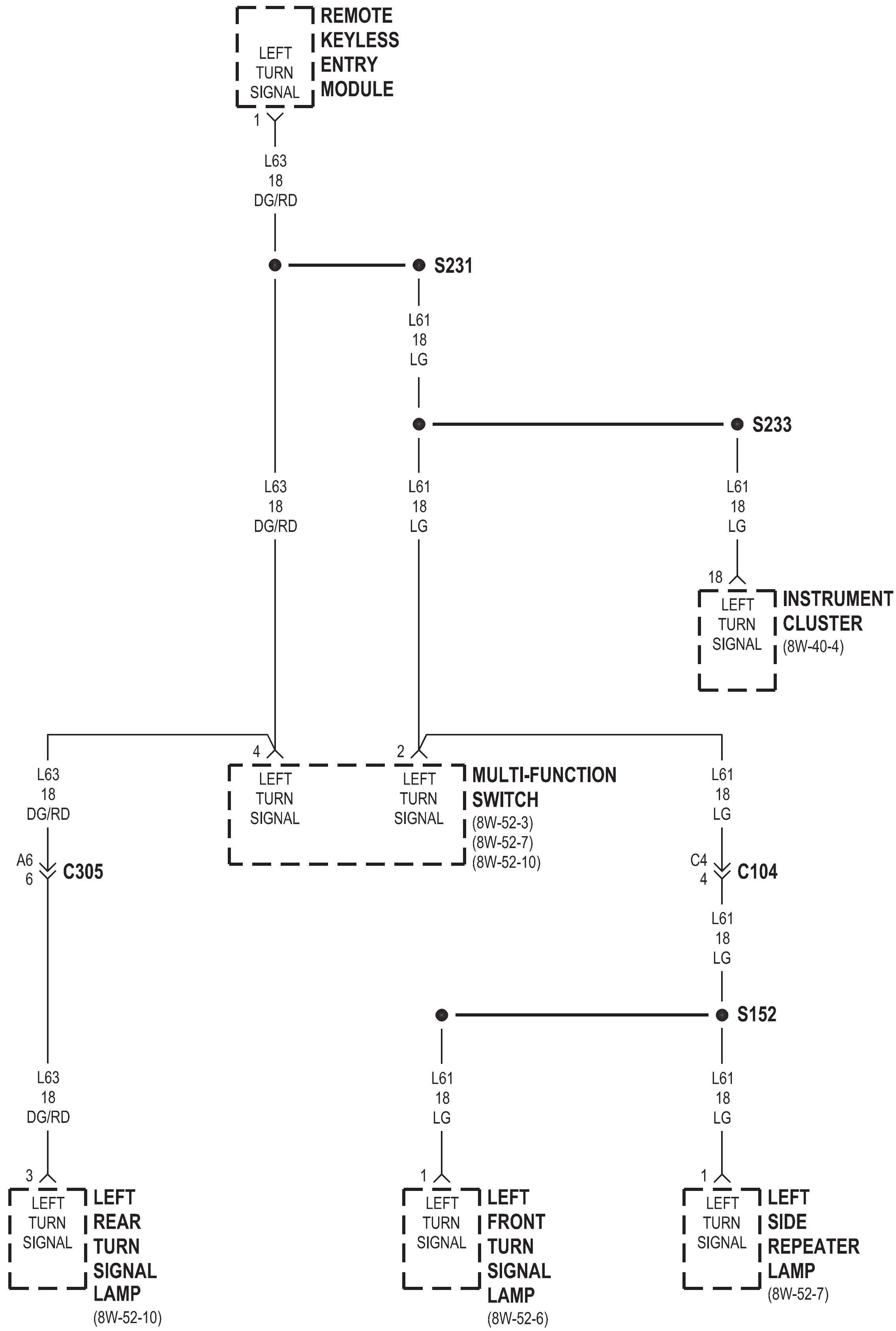

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
18
10A
(8W-10-20)
18
F62
20
RD
F62
20
RD
39
40
HORN
RELAY
(IN PDC)
(8W-41-2)
43
41
42
2
DATA
LINK
CONNECTOR
(8W-18-2)
D25
20
VT/YL
S104
(8W-18-2)
X2
20
DG/RD
2
LOW
NOTE
HORN
(8W-41-2)
1
X3
20
BK/RD
D25
20
VT/YL
8
C8
20
C20
C104
X3
22
BK/RD
D25
22
VT/YL
Z1
20
BK
S208
(8W-41-2)
S217
(8W-18-3)
S117
(8W-15-7)
X3
22
BK/RD
D25
20
VT/YL
Z1
12
BK
18
19
HORN
RELAY
CONTROL
PCI
BUS
REMOTE
KEYLESS
ENTRY
MODULE
G103
(8W-15-7)

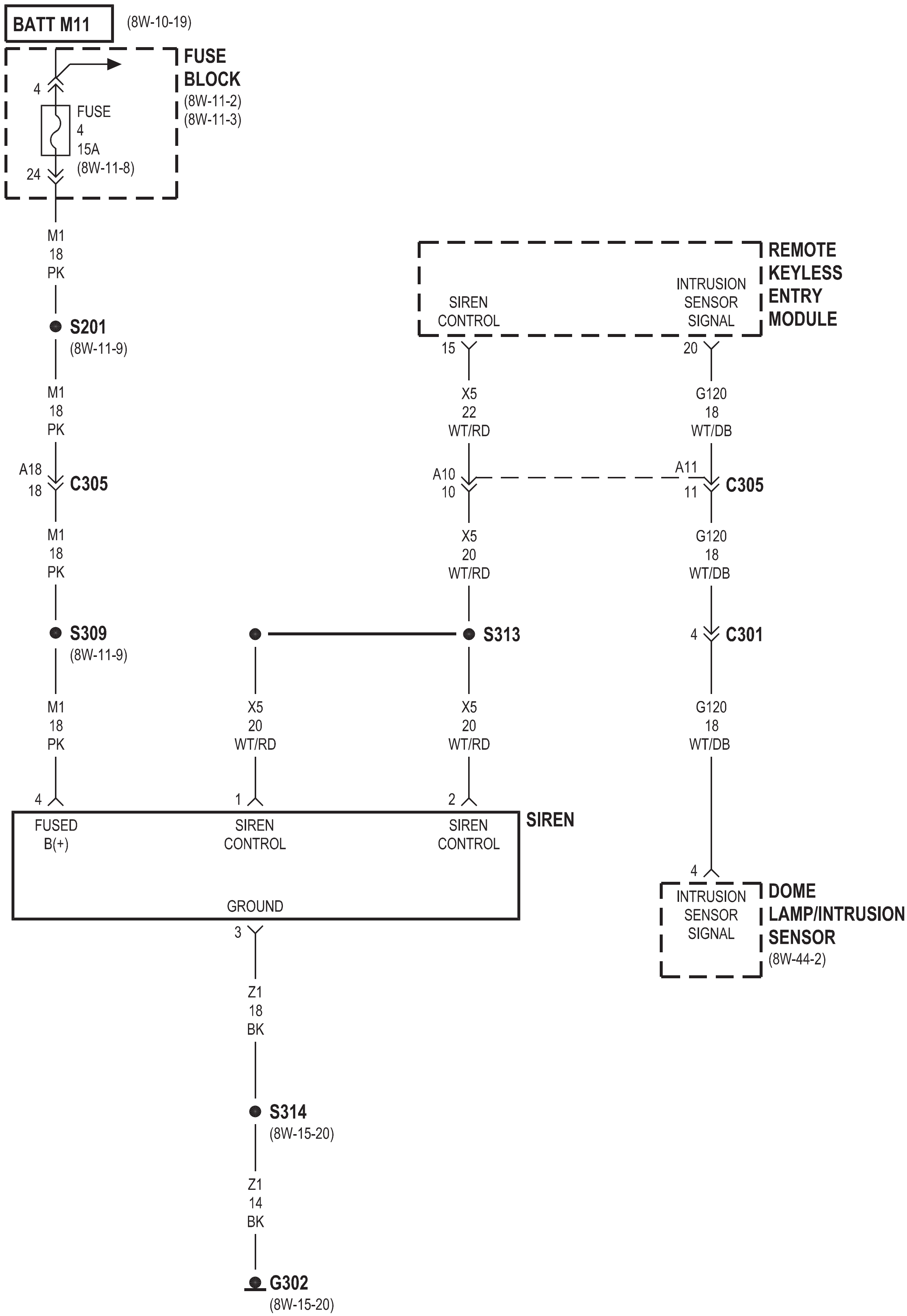
2.4L TURBO



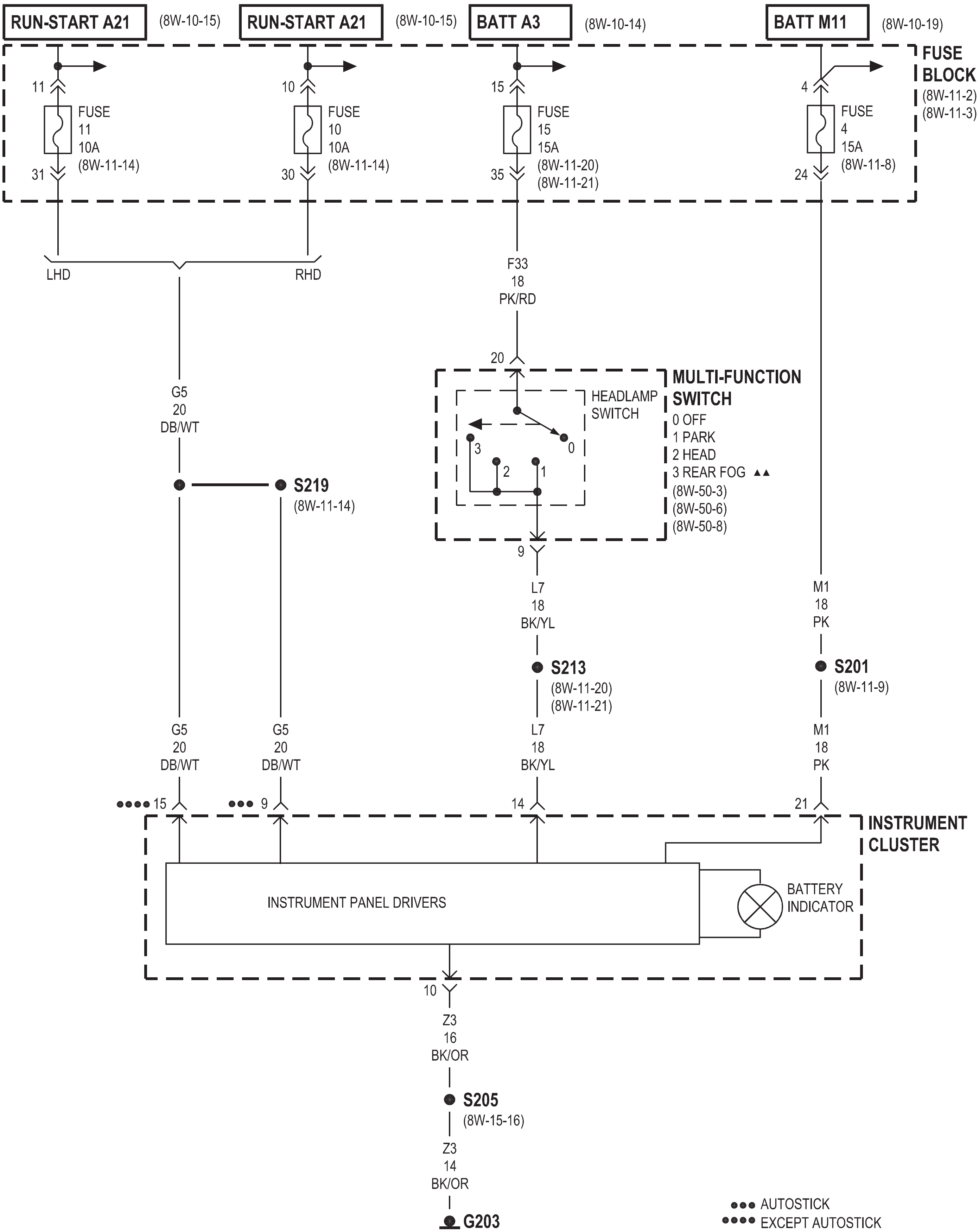
BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 18 15A (8W-10-21)
18
F62 18 RD
F62 18 RD
39
40
HORN RELAY (IN PDC)
(8W-41-3)
43
41
42
2
DATA LINK CONNECTOR
(8W-18-2)
D25 20 VT/YL
S104
(8W-18-2)
X2 18 DG/RD
2
LOW NOTE HORN
(8W-41-3)
1
X3 20 BK/RD
D25 20 VT/YL
8 C8
20 C20
C104
X3 20 BK/RD
D25 20 VT/YL
Z1 18 BK
S208
(8W-41-3)
S217
(8W-18-3)
S117
(8W-15-7)
X3 22 BK/RD
D25 20 VT/YL
Z1 12 BK
18
19
HORN RELAY CONTROL
PCI BUS
REMOTE KEYLESS ENTRY MODULE
G103
(8W-15-7)

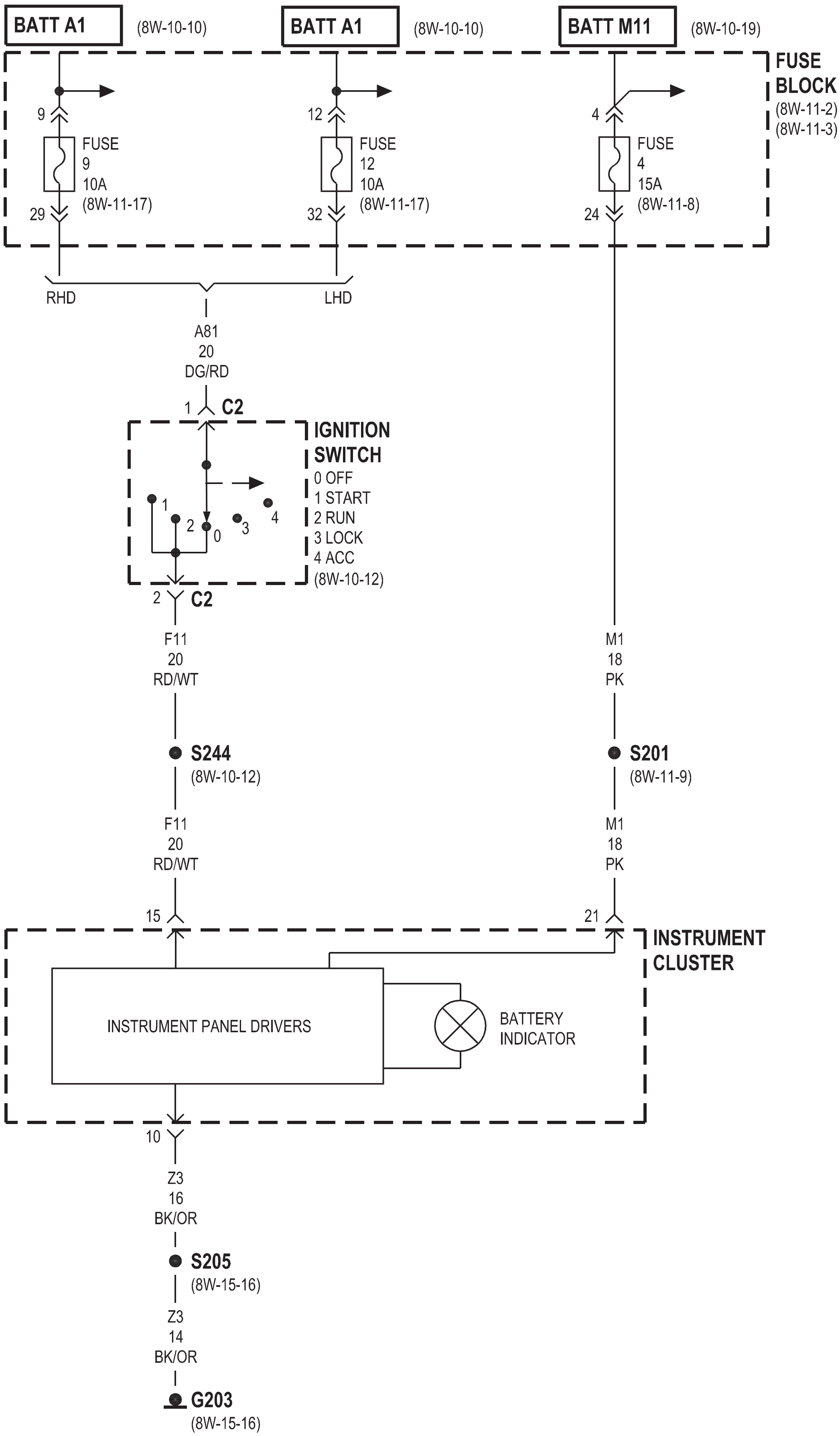

REMOTE KEYLESS ENTRY MODULE
DIMMER SWITCH LOW BEAM OUTPUT
1
L4
16
VT/WT
S212
(8W-11-24)
L4
14
VT/WT
L4
16
VT/WT
FUSE BLOCK
(8W-11-2)
17
18
FUSE
17
10A
(8W-11-25)
FUSE
18
10A
(8W-11-25)
37
38
L43
14
VT
L44
14
VT/RD
20
INSTRUMENT CLUSTER
(8W-40-17)
DIMMER SWITCH LOW BEAM OUTPUT
B25
25
B21
21
C103
2.0L
2.4L TURBO
L44
12
VT/RD
L44
14
VT/RD
S102
(8W-11-25)
L43
14
VT
L44
14
VT/RD
1
1
LEFT HEADLAMP
(8W-50-5)
FUSED LEFT LOW BEAM OUTPUT
RIGHT HEADLAMP
(8W-50-5)
FUSED RIGHT LOW BEAM OUTPUT

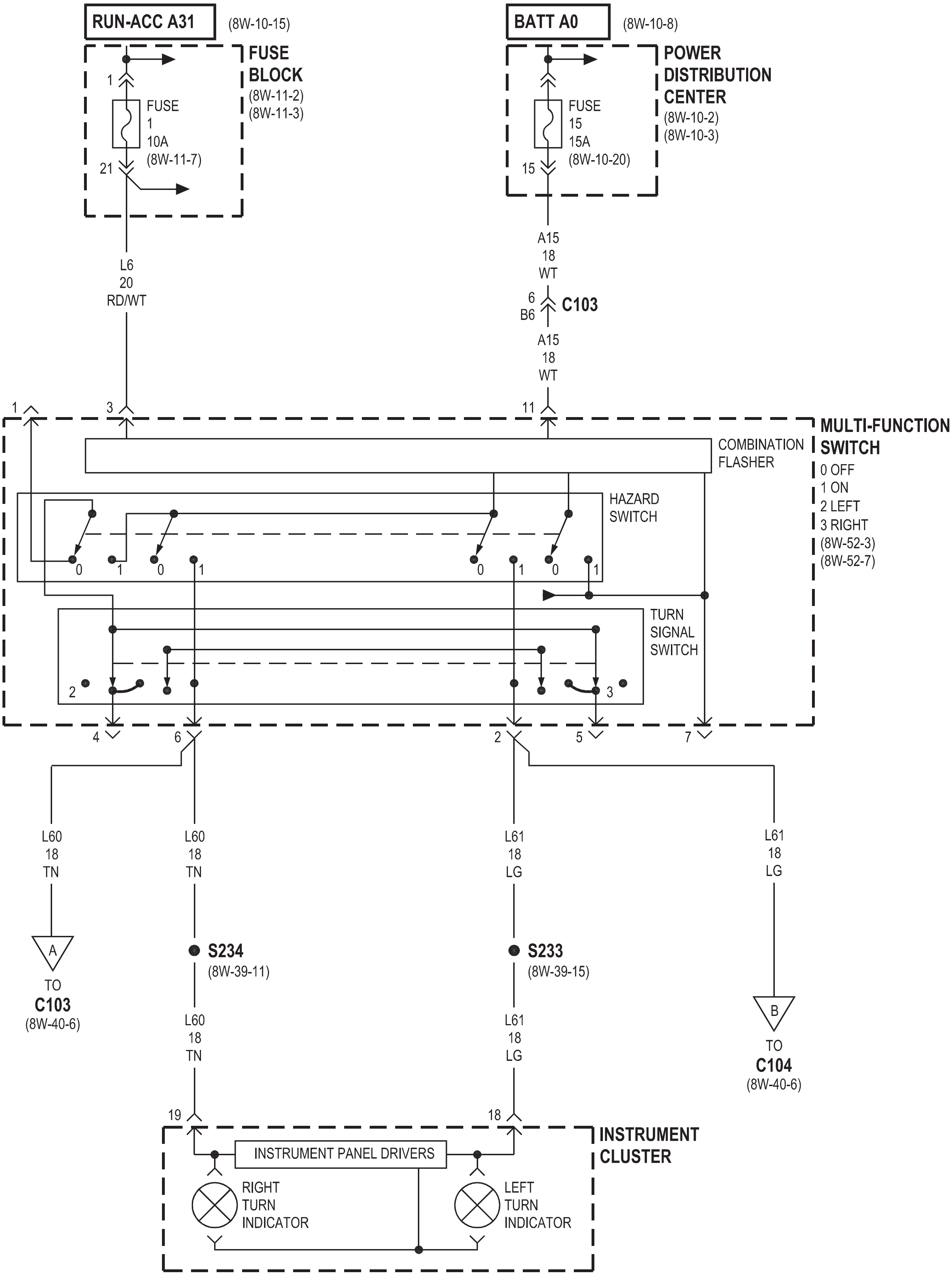

REMOTE KEYLESS ENTRY MODULE
LEFT TURN SIGNAL
1
L63 18 DG/RD
S231
L61 18 LG
S233
L63 18 DG/RD
L61 18 LG
L61 18 LG
18
LEFT TURN SIGNAL
INSTRUMENT CLUSTER
(8W-40-4)
4
2
LEFT TURN SIGNAL
LEFT TURN SIGNAL
MULTI-FUNCTION SWITCH
(8W-52-3)
(8W-52-7)
(8W-52-10)
L63 18 DG/RD
A6
6
C305
L61 18 LG
C4
4
C104
L61 18 LG
S152
L63 18 DG/RD
L61 18 LG
L61 18 LG
3
LEFT TURN SIGNAL
LEFT REAR TURN SIGNAL LAMP
(8W-52-10)
1
LEFT TURN SIGNAL
LEFT FRONT TURN SIGNAL LAMP
(8W-52-6)
1
LEFT TURN SIGNAL
LEFT SIDE REPEATER LAMP
(8W-52-7)

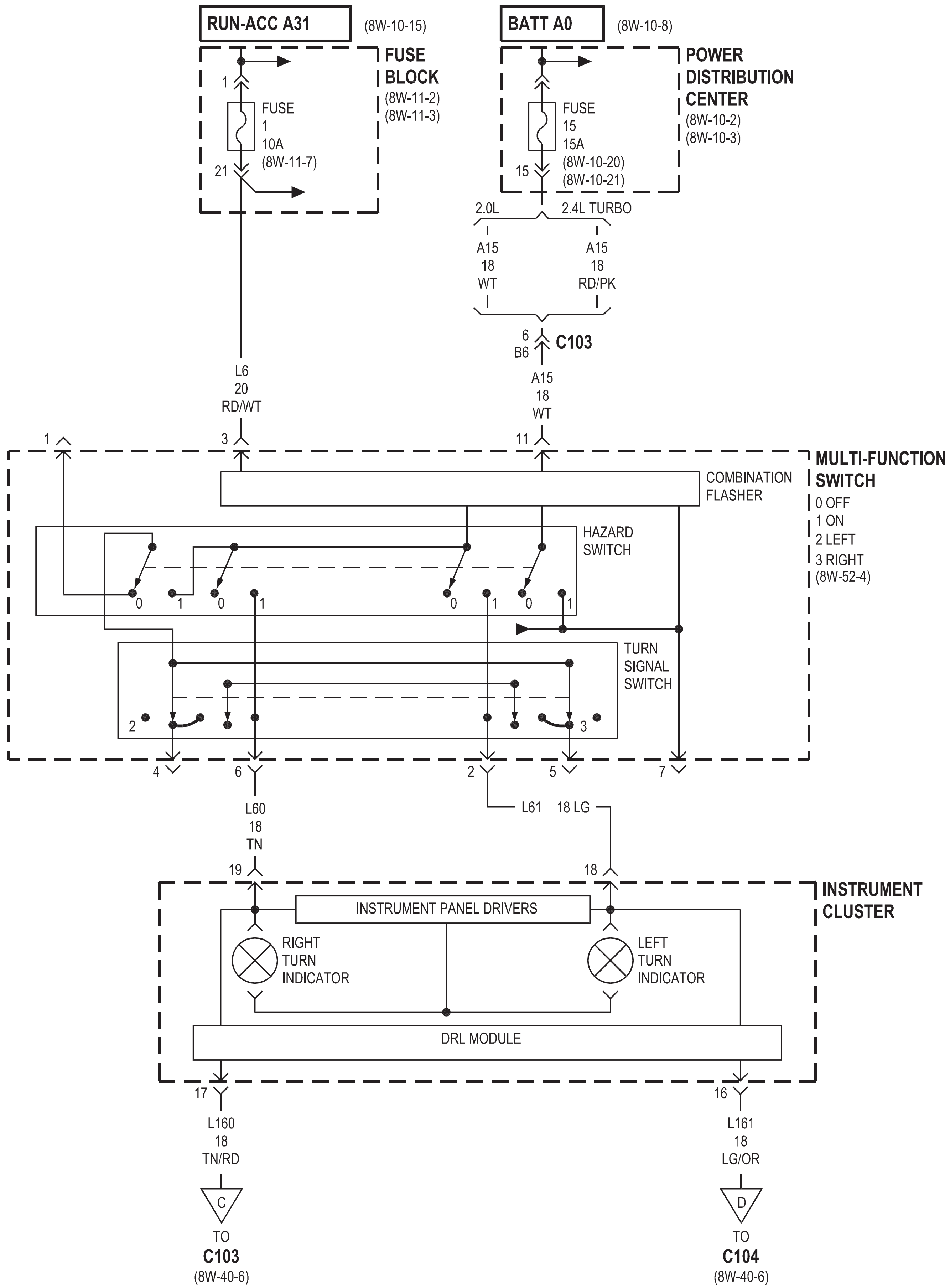

BATT M11
(8W-10-19)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
4
FUSE
4
15A
(8W-11-8)
24
M1
18
PK
S201
(8W-11-9)
M1
18
PK
A18
18
C305
M1
18
PK
S309
(8W-11-9)
M1
18
PK
REMOTE KEYLESS ENTRY MODULE
SIREN CONTROL
INTRUSION SENSOR SIGNAL
15
20
X5
22
WT/RD
G120
18
WT/DB
A10
10
A11
11
C305
X5
20
WT/RD
G120
18
WT/DB
S313
4
C301
X5
20
WT/RD
X5
20
WT/RD
G120
18
WT/DB
4
1
2
SIREN
FUSED B(+)
SIREN CONTROL
SIREN CONTROL
GROUND
3
Z1
18
BK
S314
(8W-15-20)
Z1
14
BK
G302
(8W-15-20)
4
DOME LAMP/INTRUSION SENSOR
INTRUSION SENSOR SIGNAL
(8W-44-2)

8W-40 INSTRUMENT CLUSTER

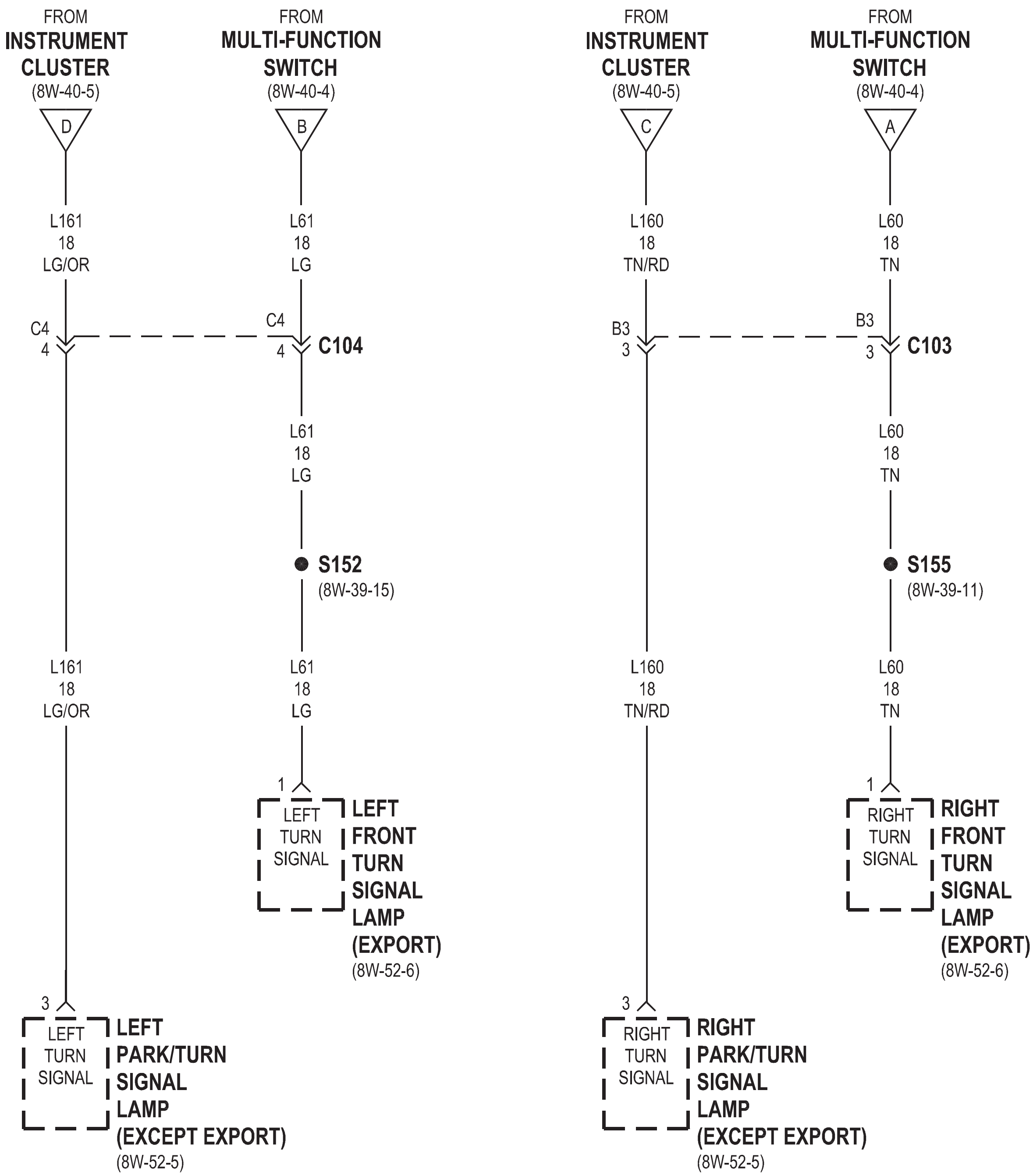

RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
BATT A3
(8W-10-14)
BATT M11
(8W-10-19)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
11
FUSE
11
10A
(8W-11-14)
31
10
FUSE
10
10A
(8W-11-14)
30
15
FUSE
15
15A
(8W-11-20)
(8W-11-21)
35
4
FUSE
4
15A
(8W-11-8)
24
LHD
RHD
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
(8W-50-3)
(8W-50-6)
(8W-50-8)
3
2
1
0
9
G5
20
DB/WT
S219
(8W-11-14)
L7
18
BK/YL
S213
(8W-11-20)
(8W-11-21)
M1
18
PK
S201
(8W-11-9)
G5
20
DB/WT
G5
20
DB/WT
L7
18
BK/YL
M1
18
PK
●●●● 15
●●● 9
14
21
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
BATTERY INDICATOR
10
Z3
16
BK/OR
S205
(8W-15-16)
Z3
14
BK/OR
G203
(8W-15-16)
●●● AUTOSTICK
●●●● EXCEPT AUTOSTICK
▲▲ EXPORT

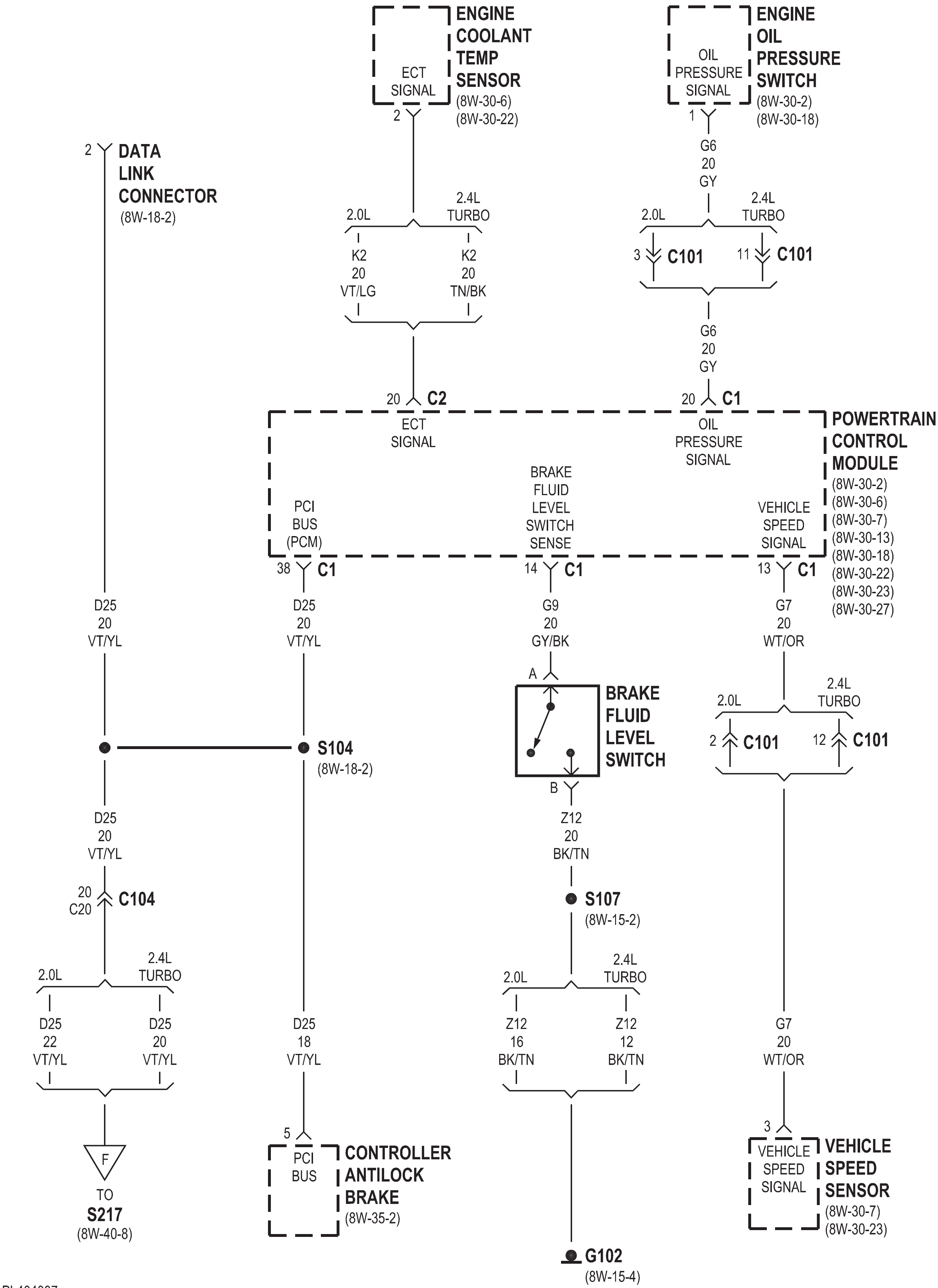

BATT A1
(8W-10-10)
BATT A1
(8W-10-10)
BATT M11
(8W-10-19)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
9
FUSE 9 10A (8W-11-17)
29
12
FUSE 12 10A (8W-11-17)
32
4
FUSE 4 15A (8W-11-8)
24
RHD
LHD
A81 20 DG/RD
1 C2
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-12)
2 C2
F11 20 RD/WT
S244
(8W-10-12)
F11 20 RD/WT
M1 18 PK
S201
(8W-11-9)
M1 18 PK
15
21
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
BATTERY INDICATOR
10
Z3 16 BK/OR
S205
(8W-15-16)
Z3 14 BK/OR
G203
(8W-15-16)

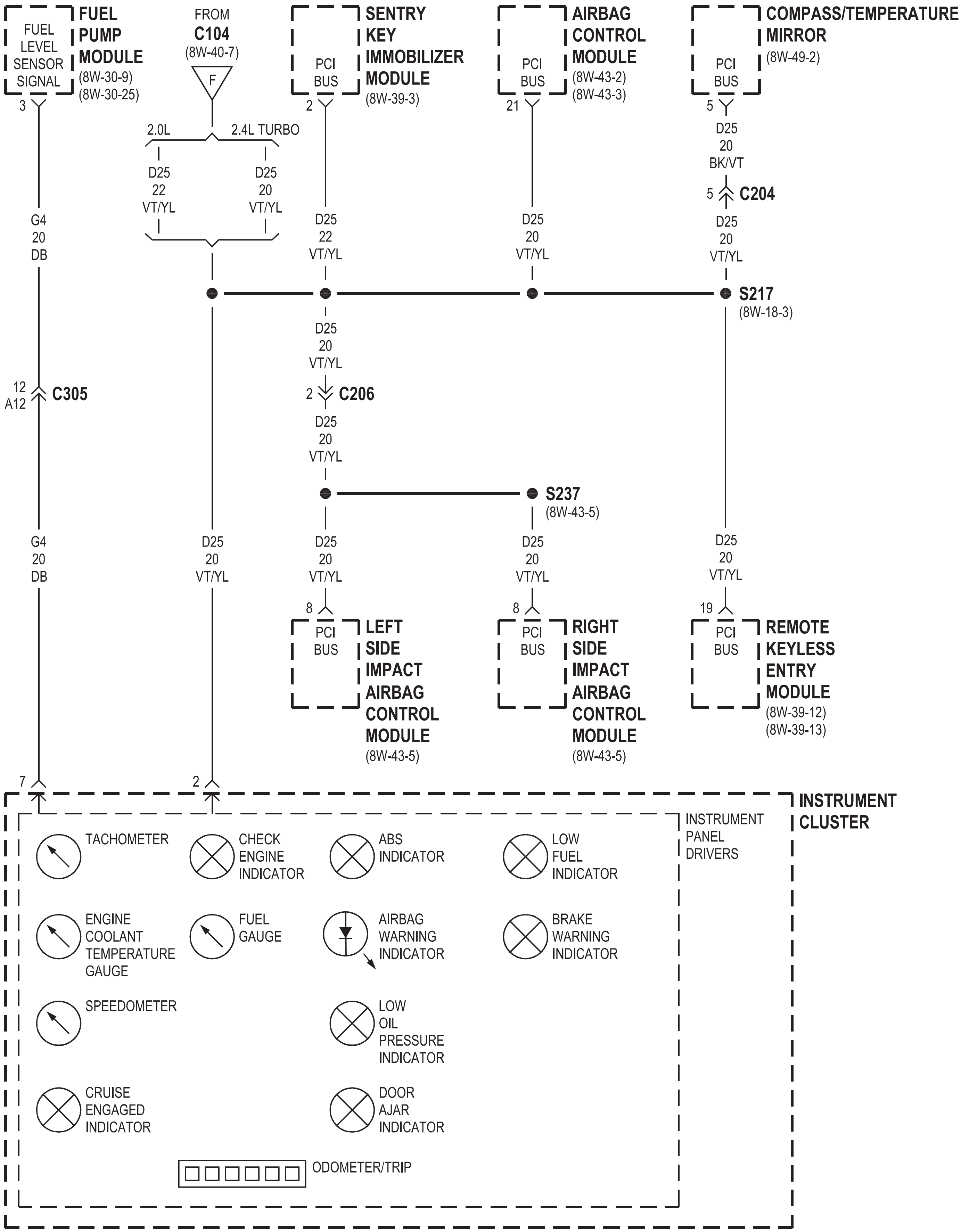

RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
FUSE
1
10A
(8W-11-7)
1
21
L6
20
RD/WT
BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
15
15A
(8W-10-20)
15
A15
18
WT
6
B6
C103
A15
18
WT
1
3
11
MULTI-FUNCTION
SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
(8W-52-3)
(8W-52-7)
COMBINATION
FLASHER
HAZARD
SWITCH
0
1
0
1
0
1
0
1
TURN
SIGNAL
SWITCH
2
3
4
6
2
5
7
L60
18
TN
L60
18
TN
L61
18
LG
L61
18
LG
A
TO
C103
(8W-40-6)
S234
(8W-39-11)
S233
(8W-39-15)
B
TO
C104
(8W-40-6)
L60
18
TN
L61
18
LG
19
18
INSTRUMENT
CLUSTER
INSTRUMENT PANEL DRIVERS
RIGHT
TURN
INDICATOR
LEFT
TURN
INDICATOR

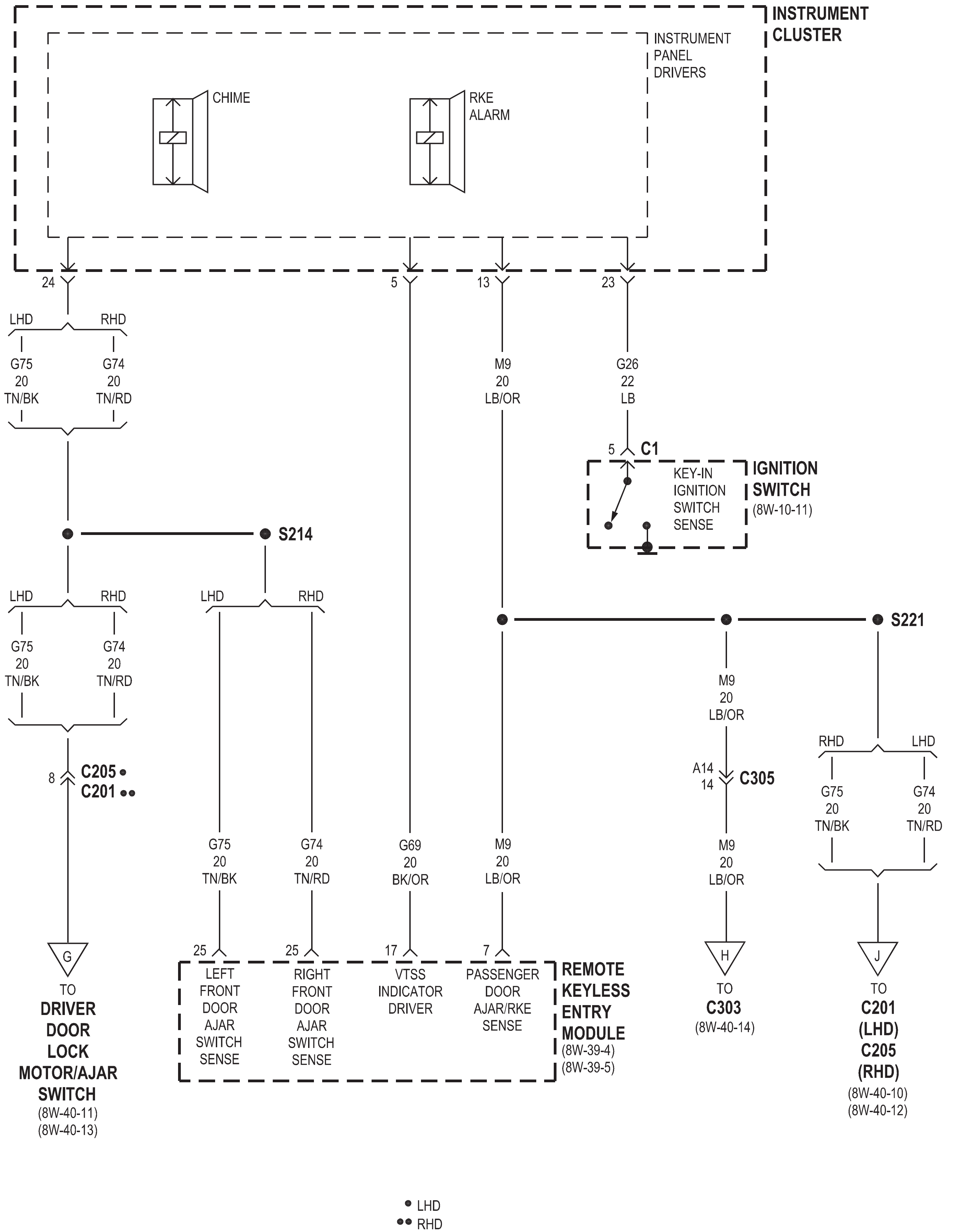


RUN-ACC A31
(8W-10-15)
BATT A0
(8W-10-8)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 1 10A (8W-11-7)
1
21
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 15 15A (8W-10-20) (8W-10-21)
15
2.0L
2.4L TURBO
A15 18 WT
A15 18 RD/PK
6
B6
C103
L6 20 RD/WT
A15 18 WT
1
3
11
MULTI-FUNCTION SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
(8W-52-4)
COMBINATION FLASHER
HAZARD SWITCH
0 1 0 1 0 1 0 1
TURN SIGNAL SWITCH
2
3
4
6
2
5
7
L60 18 TN
L61 18 LG
19
18
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
RIGHT TURN INDICATOR
LEFT TURN INDICATOR
DRL MODULE
17
16
L160 18 TN/RD
L161 18 LG/OR
C
D
TO C103 (8W-40-6)
TO C104 (8W-40-6)

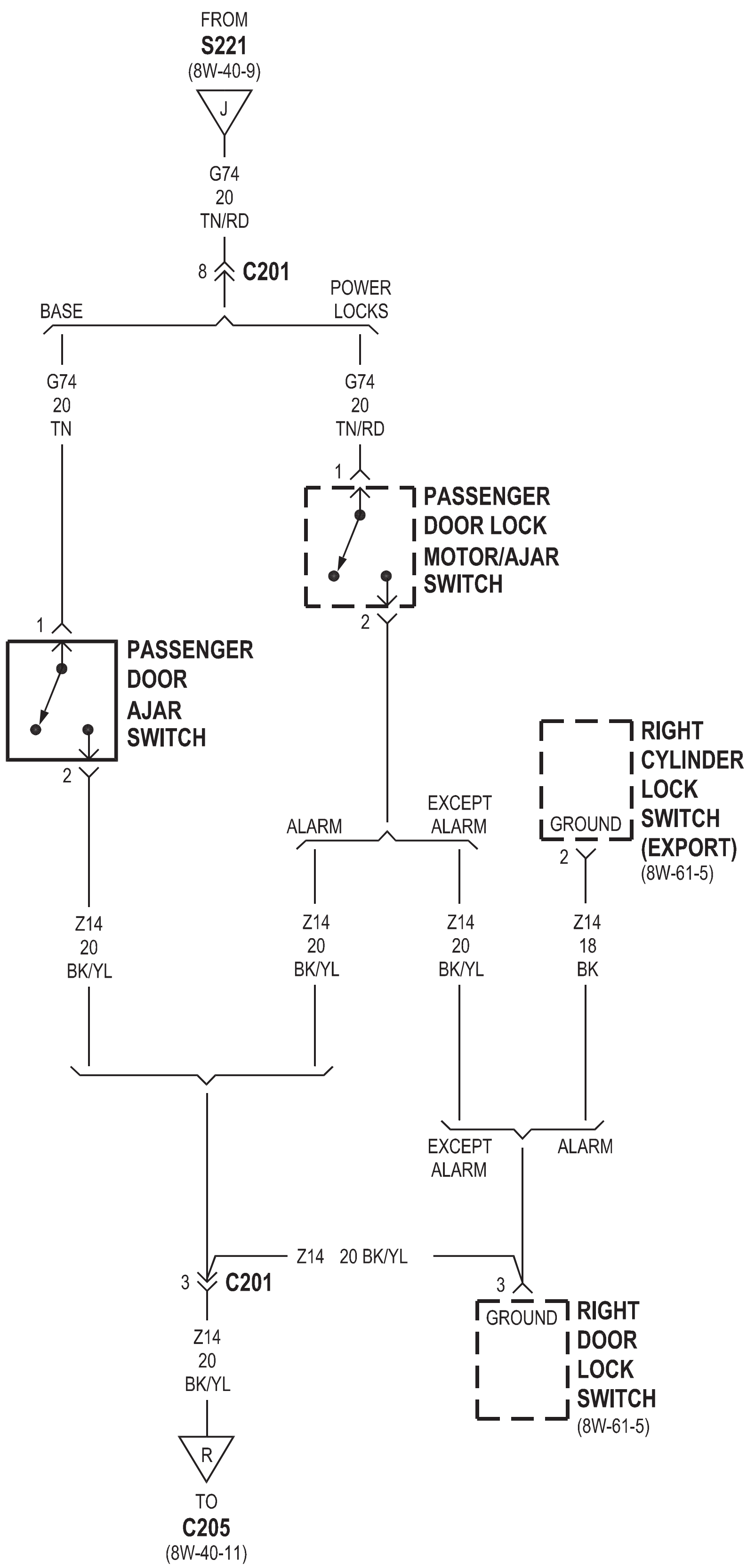

FROM
INSTRUMENT CLUSTER
(8W-40-5)
D
FROM
MULTI-FUNCTION SWITCH
(8W-40-4)
B
FROM
INSTRUMENT CLUSTER
(8W-40-5)
C
FROM
MULTI-FUNCTION SWITCH
(8W-40-4)
A
L161 18 LG/OR
L61 18 LG
L160 18 TN/RD
L60 18 TN
C4 4
C4 4
C104
B3 3
B3 3
C103
L61 18 LG
L60 18 TN
S152
(8W-39-15)
S155
(8W-39-11)
L161 18 LG/OR
L61 18 LG
L160 18 TN/RD
L60 18 TN
1
LEFT TURN SIGNAL
LEFT FRONT TURN SIGNAL LAMP (EXPORT)
(8W-52-6)
1
RIGHT TURN SIGNAL
RIGHT FRONT TURN SIGNAL LAMP (EXPORT)
(8W-52-6)
3
LEFT TURN SIGNAL
LEFT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT)
(8W-52-5)
3
RIGHT TURN SIGNAL
RIGHT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT)
(8W-52-5)

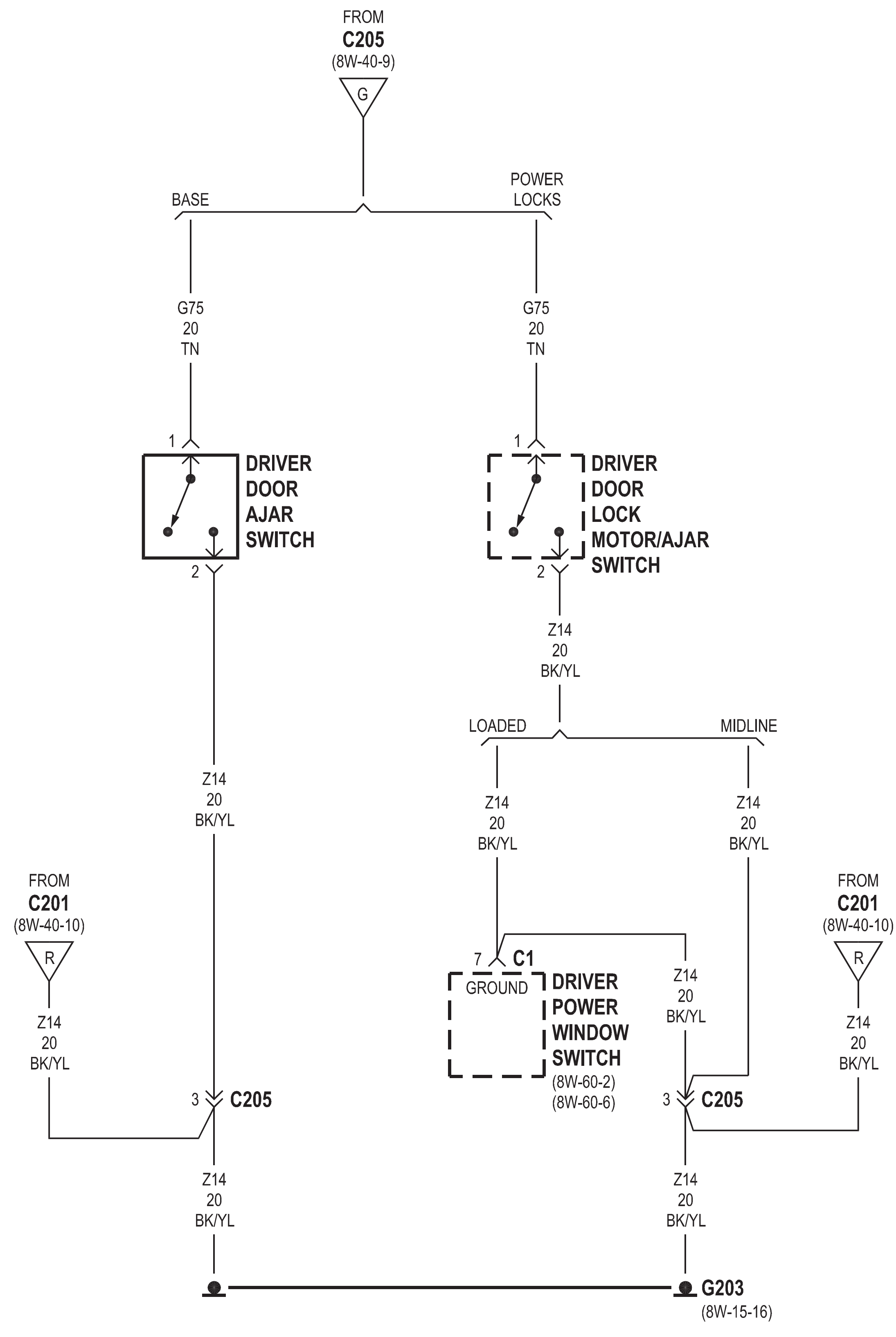

ENGINE COOLANT TEMP SENSOR
(8W-30-6)
(8W-30-22)
ECT SIGNAL
2
ENGINE OIL PRESSURE SWITCH
(8W-30-2)
(8W-30-18)
OIL PRESSURE SIGNAL
1
G6 20 GY
2 DATA LINK CONNECTOR
(8W-18-2)
2.0L
2.4L TURBO
K2 20 VT/LG
K2 20 TN/BK
3 C101
11 C101
20 C2
20 C1
ECT SIGNAL
OIL PRESSURE SIGNAL
BRAKE FLUID LEVEL SWITCH SENSE
PCI BUS (PCM)
VEHICLE SPEED SIGNAL
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-6)
(8W-30-7)
(8W-30-13)
(8W-30-18)
(8W-30-22)
(8W-30-23)
(8W-30-27)
38 C1
14 C1
13 C1
D25 20 VT/YL
G9 20 GY/BK
G7 20 WT/OR
A
B
BRAKE FLUID LEVEL SWITCH
2 C101
12 C101
S104
(8W-18-2)
Z12 20 BK/TN
S107
(8W-15-2)
20 C20 C104
D25 22 VT/YL
D25 20 VT/YL
D25 18 VT/YL
Z12 16 BK/TN
Z12 12 BK/TN
F
TO S217
(8W-40-8)
5
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
G102
(8W-15-4)
3
VEHICLE SPEED SIGNAL
VEHICLE SPEED SENSOR
(8W-30-7)
(8W-30-23)

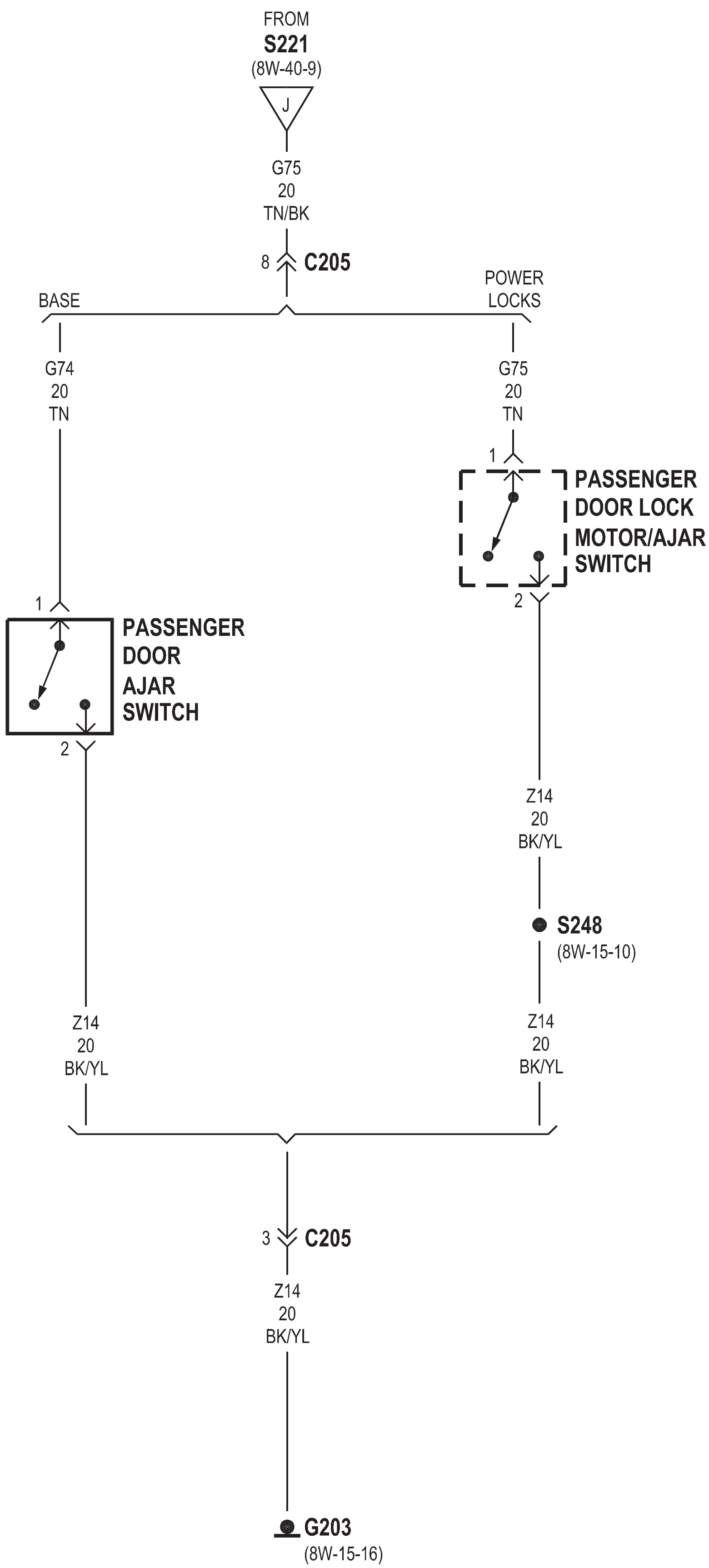

FUEL LEVEL SENSOR SIGNAL
FUEL PUMP MODULE
(8W-30-9)
(8W-30-25)
3
FROM
C104
(8W-40-7)
F
2.0L
2.4L TURBO
D25
22
VT/YL
D25
20
VT/YL
PCI BUS
SENTRY KEY IMMOBILIZER MODULE
(8W-39-3)
2
PCI BUS
AIRBAG CONTROL MODULE
(8W-43-2)
(8W-43-3)
21
PCI BUS
COMPASS/TEMPERATURE MIRROR
(8W-49-2)
5
D25
20
BK/VT
5
C204
G4
20
DB
D25
22
VT/YL
D25
20
VT/YL
D25
20
VT/YL
S217
(8W-18-3)
D25
20
VT/YL
12
A12
C305
2
C206
D25
20
VT/YL
S237
(8W-43-5)
G4
20
DB
D25
20
VT/YL
D25
20
VT/YL
D25
20
VT/YL
D25
20
VT/YL
8
PCI BUS
LEFT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
8
PCI BUS
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE
(8W-43-5)
19
PCI BUS
REMOTE KEYLESS ENTRY MODULE
(8W-39-12)
(8W-39-13)
7
2
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
TACHOMETER
CHECK ENGINE INDICATOR
ABS INDICATOR
LOW FUEL INDICATOR
ENGINE COOLANT TEMPERATURE GAUGE
FUEL GAUGE
AIRBAG WARNING INDICATOR
BRAKE WARNING INDICATOR
SPEEDOMETER
LOW OIL PRESSURE INDICATOR
CRUISE ENGAGED INDICATOR
DOOR AJAR INDICATOR
ODOMETER/TRIP

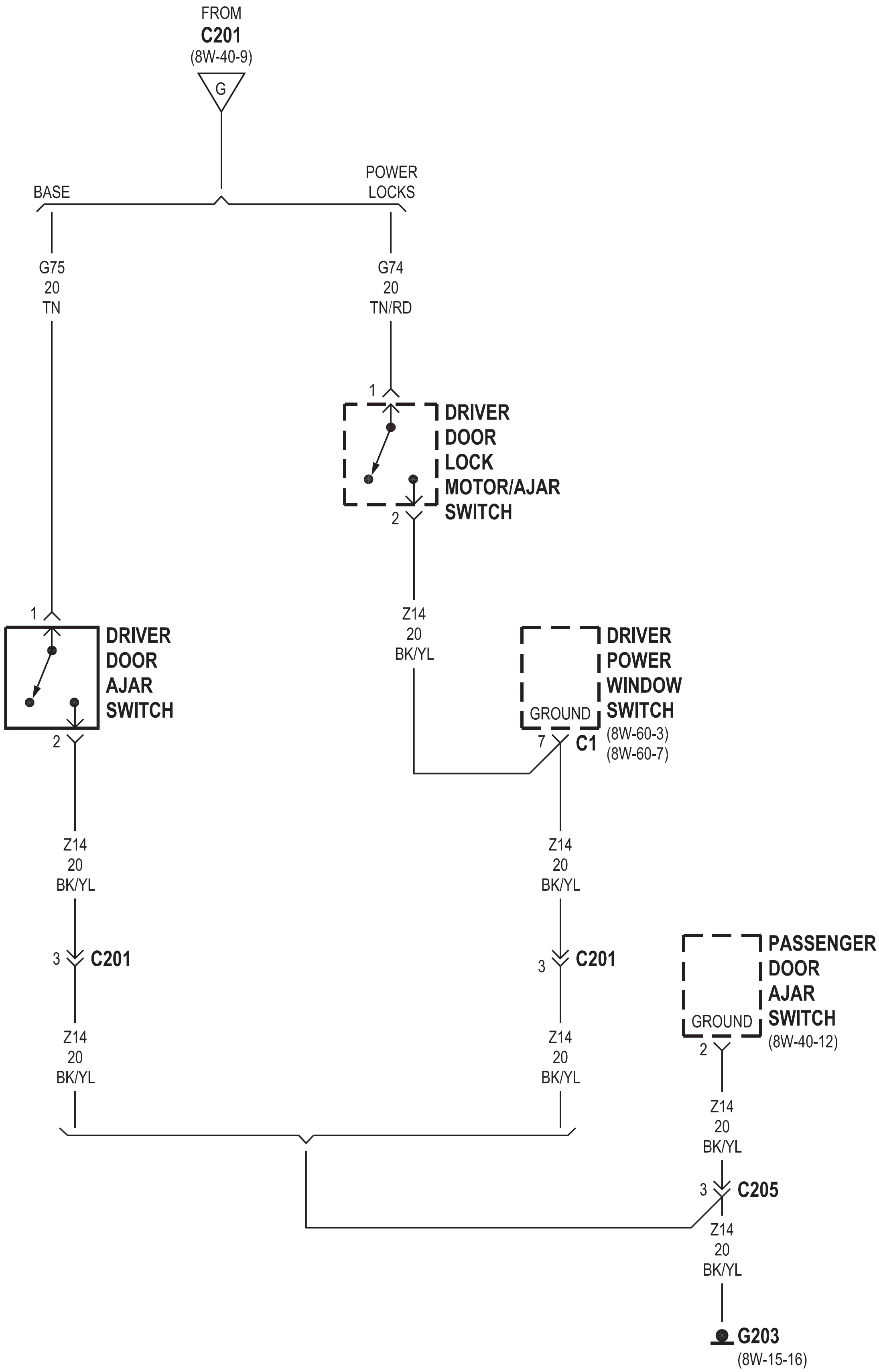

INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
CHIME
RKE ALARM
24
5
13
23
LHD
RHD
G75 20 TN/BK
G74 20 TN/RD
M9 20 LB/OR
G26 22 LB
5 C1
KEY-IN IGNITION SWITCH SENSE
IGNITION SWITCH
(8W-10-11)
S214
S221
G69 20 BK/OR
A14 14 C305
8 C205 •
C201 ••
25
17
7
LEFT FRONT DOOR AJAR SWITCH SENSE
RIGHT FRONT DOOR AJAR SWITCH SENSE
VTSS INDICATOR DRIVER
PASSENGER DOOR AJAR/RKE SENSE
REMOTE KEYLESS ENTRY MODULE
(8W-39-4)
(8W-39-5)
G
TO DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-11)
(8W-40-13)
H
TO C303
(8W-40-14)
J
TO C201 (LHD) C205 (RHD)
(8W-40-10)
(8W-40-12)
• LHD
•• RHD

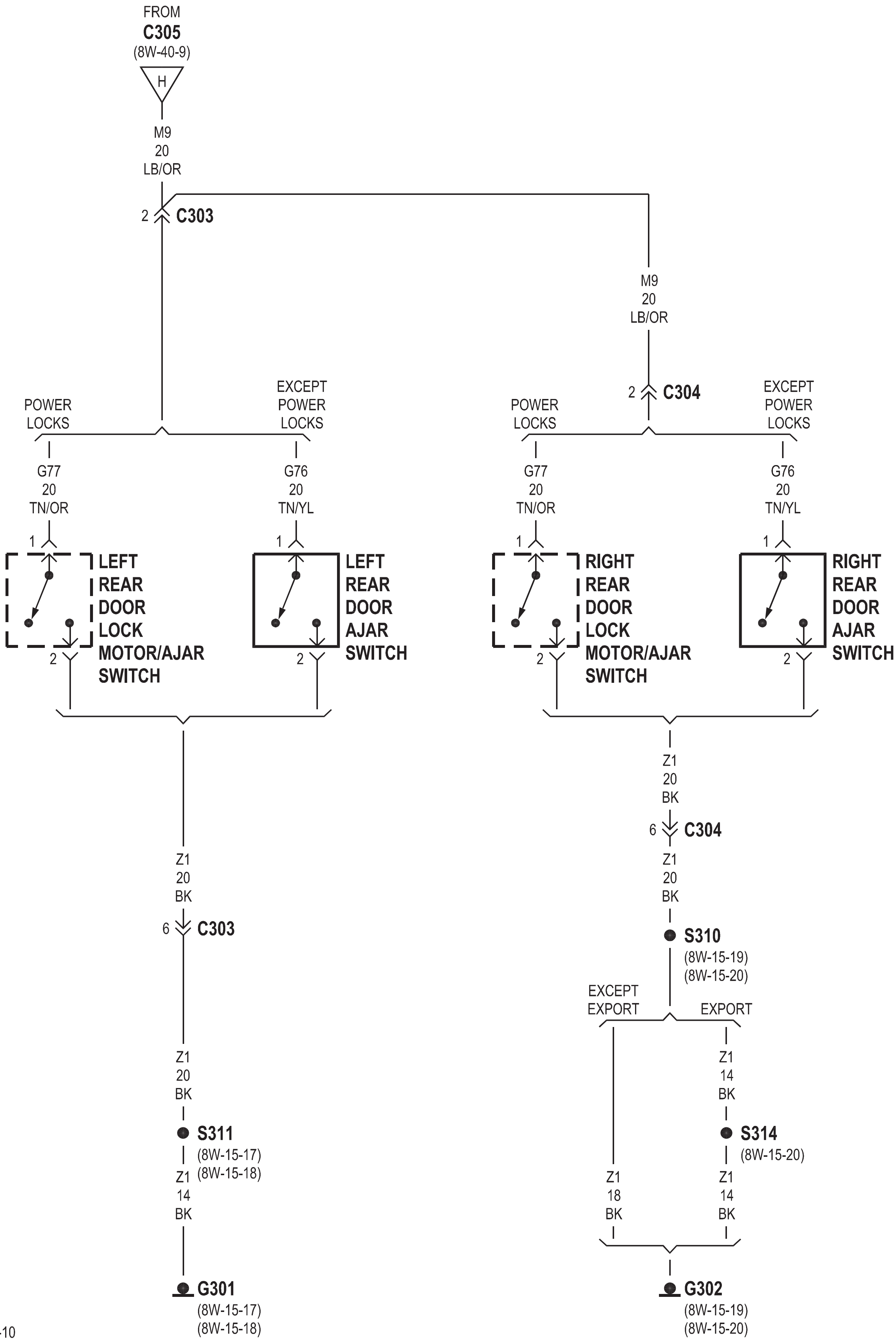
LHD

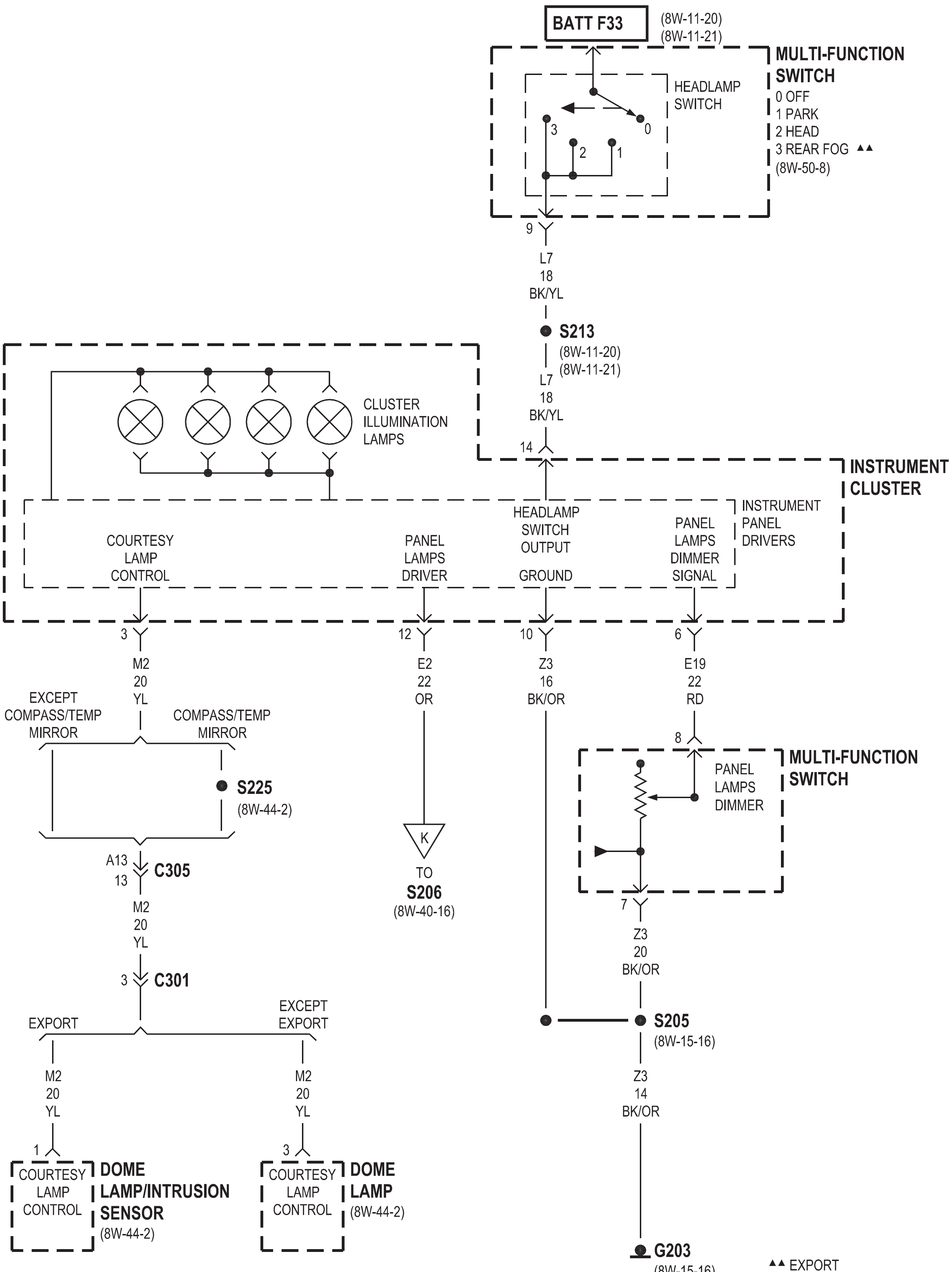

FROM
S221
(8W-40-9)
J
G74
20
TN/RD
8
C201
BASE
POWER
LOCKS
G74
20
TN
G74
20
TN/RD
1
PASSENGER
DOOR LOCK
MOTOR/AJAR
SWITCH
2
1
PASSENGER
DOOR
AJAR
SWITCH
2
RIGHT
CYLINDER
LOCK
SWITCH
(EXPORT)
(8W-61-5)
GROUND
2
ALARM
EXCEPT
ALARM
Z14
20
BK/YL
Z14
20
BK/YL
Z14
20
BK/YL
Z14
18
BK
EXCEPT
ALARM
ALARM
Z14 20 BK/YL
3
C201
3
GROUND
RIGHT
DOOR
LOCK
SWITCH
(8W-61-5)
Z14
20
BK/YL
R
TO
C205
(8W-40-11)

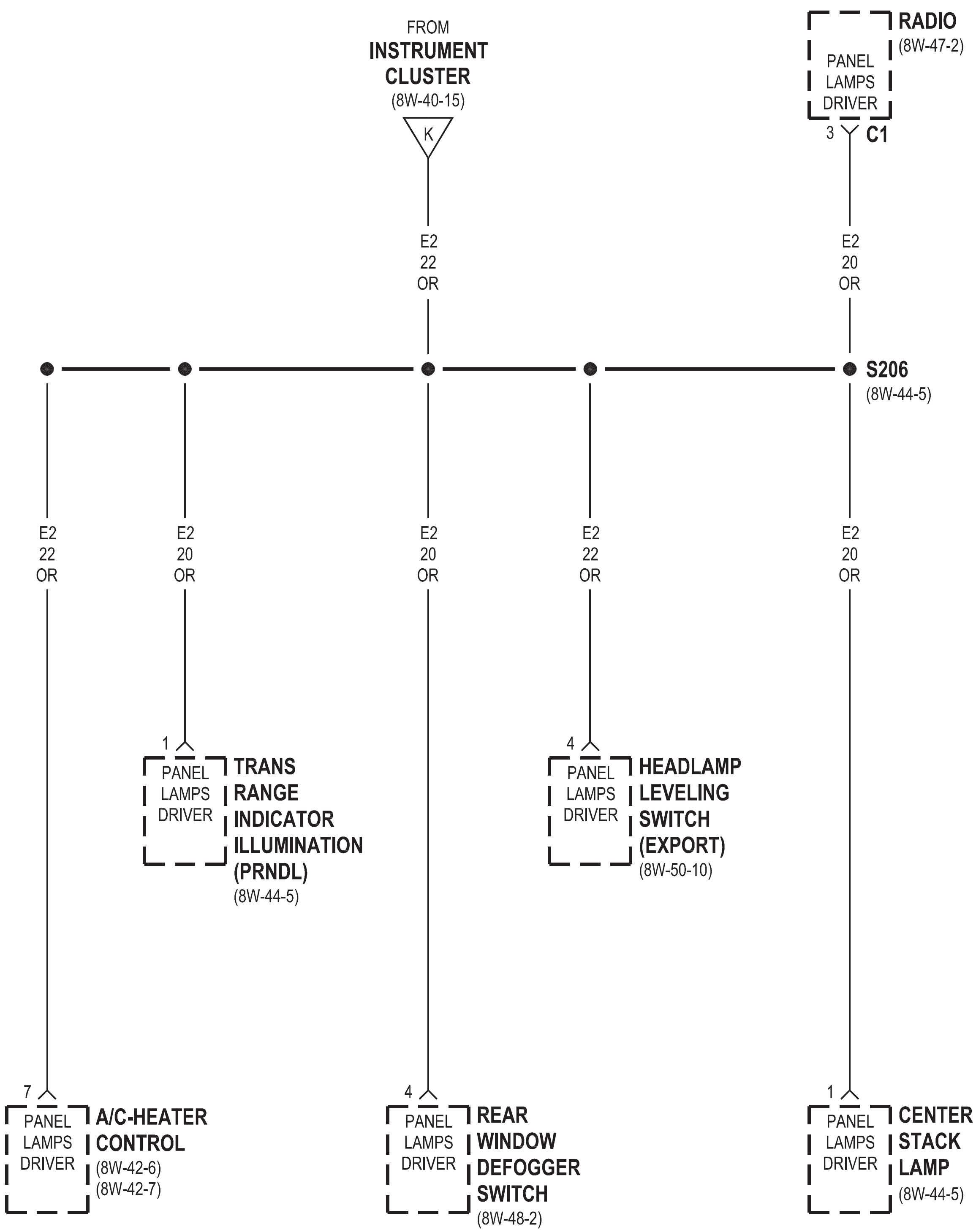

FROM
C205
(8W-40-9)
G
BASE
POWER LOCKS
G75
20
TN
G75
20
TN
1
DRIVER DOOR AJAR SWITCH
2
1
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
2
Z14
20
BK/YL
LOADED
MIDLINE
Z14
20
BK/YL
Z14
20
BK/YL
Z14
20
BK/YL
FROM
C201
(8W-40-10)
R
Z14
20
BK/YL
7
C1
GROUND
DRIVER POWER WINDOW SWITCH
(8W-60-2)
(8W-60-6)
Z14
20
BK/YL
FROM
C201
(8W-40-10)
R
Z14
20
BK/YL
3
C205
3
C205
Z14
20
BK/YL
Z14
20
BK/YL
G203
(8W-15-16)

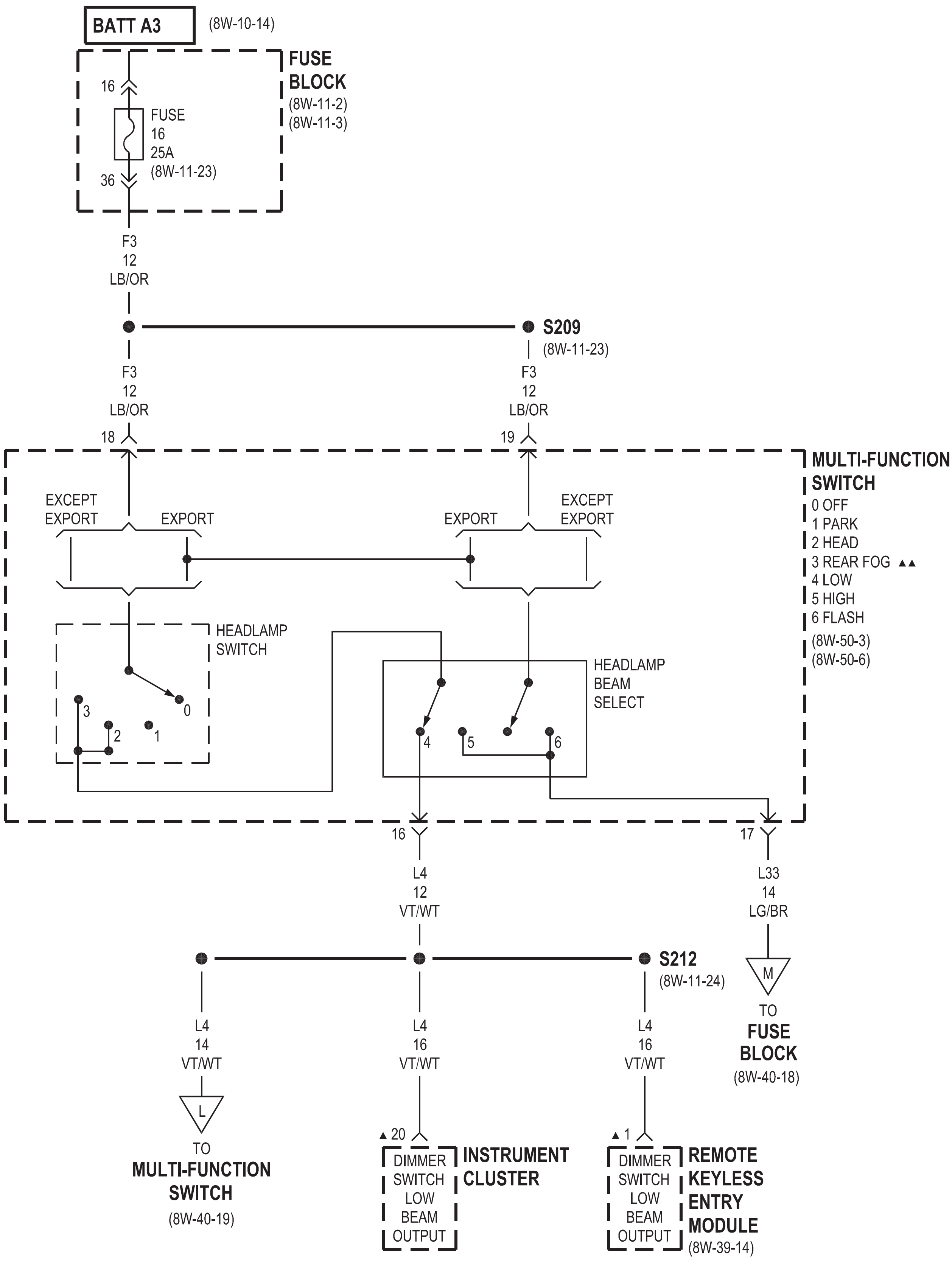

FROM
S221
(8W-40-9)
J
G75
20
TN/BK
8
C205
BASE
POWER
LOCKS
G74
20
TN
G75
20
TN
1
PASSENGER
DOOR LOCK
MOTOR/AJAR
SWITCH
2
1
PASSENGER
DOOR
AJAR
SWITCH
2
Z14
20
BK/YL
S248
(8W-15-10)
Z14
20
BK/YL
Z14
20
BK/YL
3
C205
Z14
20
BK/YL
G203
(8W-15-16)

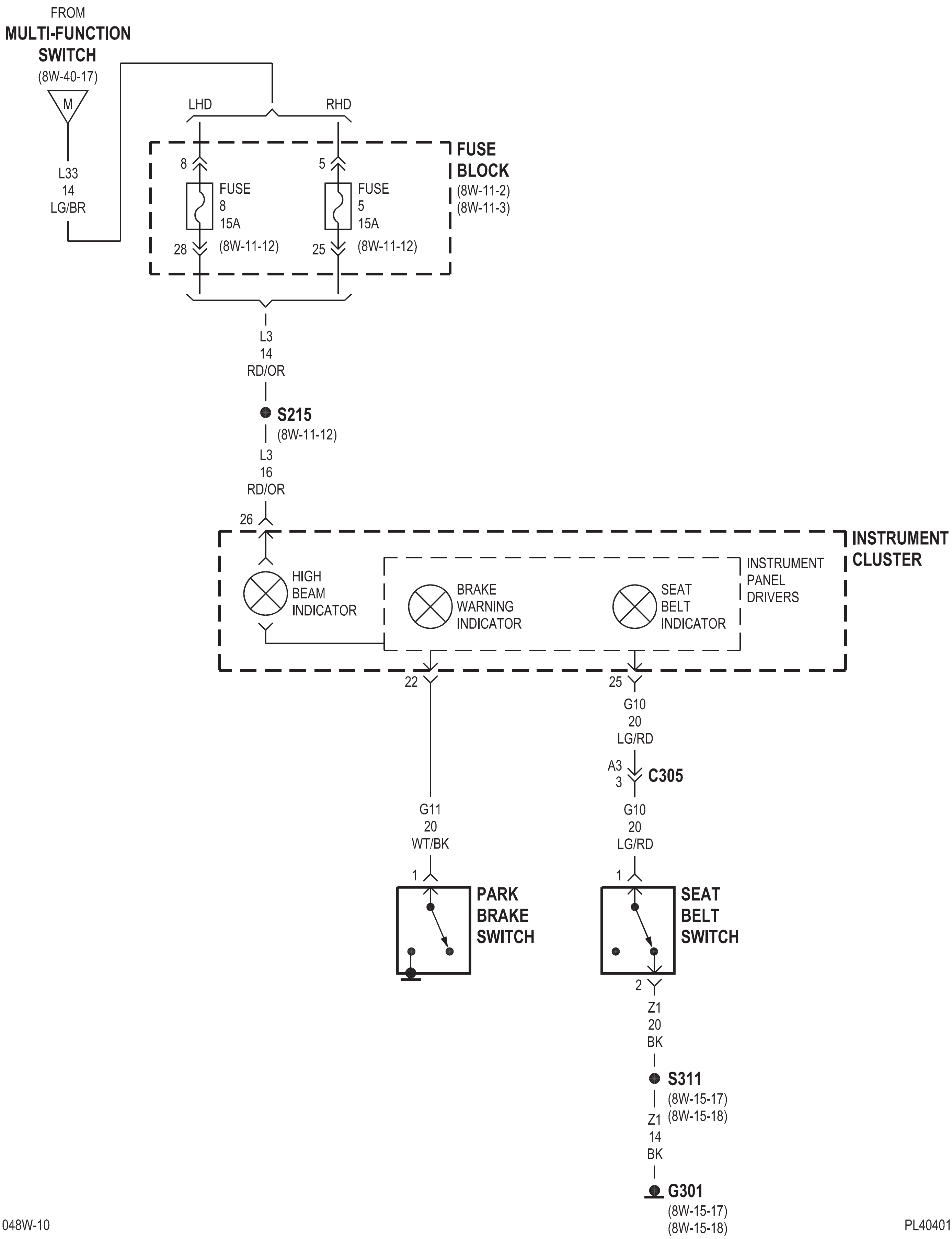

FROM
C201
(8W-40-9)
G
BASE
POWER
LOCKS
G75
20
TN
G74
20
TN/RD
1
DRIVER
DOOR
LOCK
MOTOR/AJAR
SWITCH
2
Z14
20
BK/YL
1
DRIVER
DOOR
AJAR
SWITCH
2
DRIVER
POWER
WINDOW
SWITCH
GROUND
7
C1
(8W-60-3)
(8W-60-7)
Z14
20
BK/YL
3
C201
Z14
20
BK/YL
3
C201
PASSENGER
DOOR
AJAR
SWITCH
GROUND
2
(8W-40-12)
Z14
20
BK/YL
3
C205
Z14
20
BK/YL
G203
(8W-15-16)


FROM
C305
(8W-40-9)
H
M9
20
LB/OR
2
C303
M9
20
LB/OR
2
C304
POWER
LOCKS
EXCEPT
POWER
LOCKS
POWER
LOCKS
EXCEPT
POWER
LOCKS
G77
20
TN/OR
G76
20
TN/YL
G77
20
TN/OR
G76
20
TN/YL
1
LEFT
REAR
DOOR
LOCK
MOTOR/AJAR
SWITCH
2
1
LEFT
REAR
DOOR
AJAR
SWITCH
2
1
RIGHT
REAR
DOOR
LOCK
MOTOR/AJAR
SWITCH
2
1
RIGHT
REAR
DOOR
AJAR
SWITCH
2
Z1
20
BK
6
C304
Z1
20
BK
S310
(8W-15-19)
(8W-15-20)
EXCEPT
EXPORT
EXPORT
Z1
14
BK
S314
(8W-15-20)
Z1
18
BK
Z1
14
BK
G302
(8W-15-19)
(8W-15-20)
Z1
20
BK
6
C303
Z1
20
BK
S311
(8W-15-17)
(8W-15-18)
Z1
14
BK
G301
(8W-15-17)
(8W-15-18)

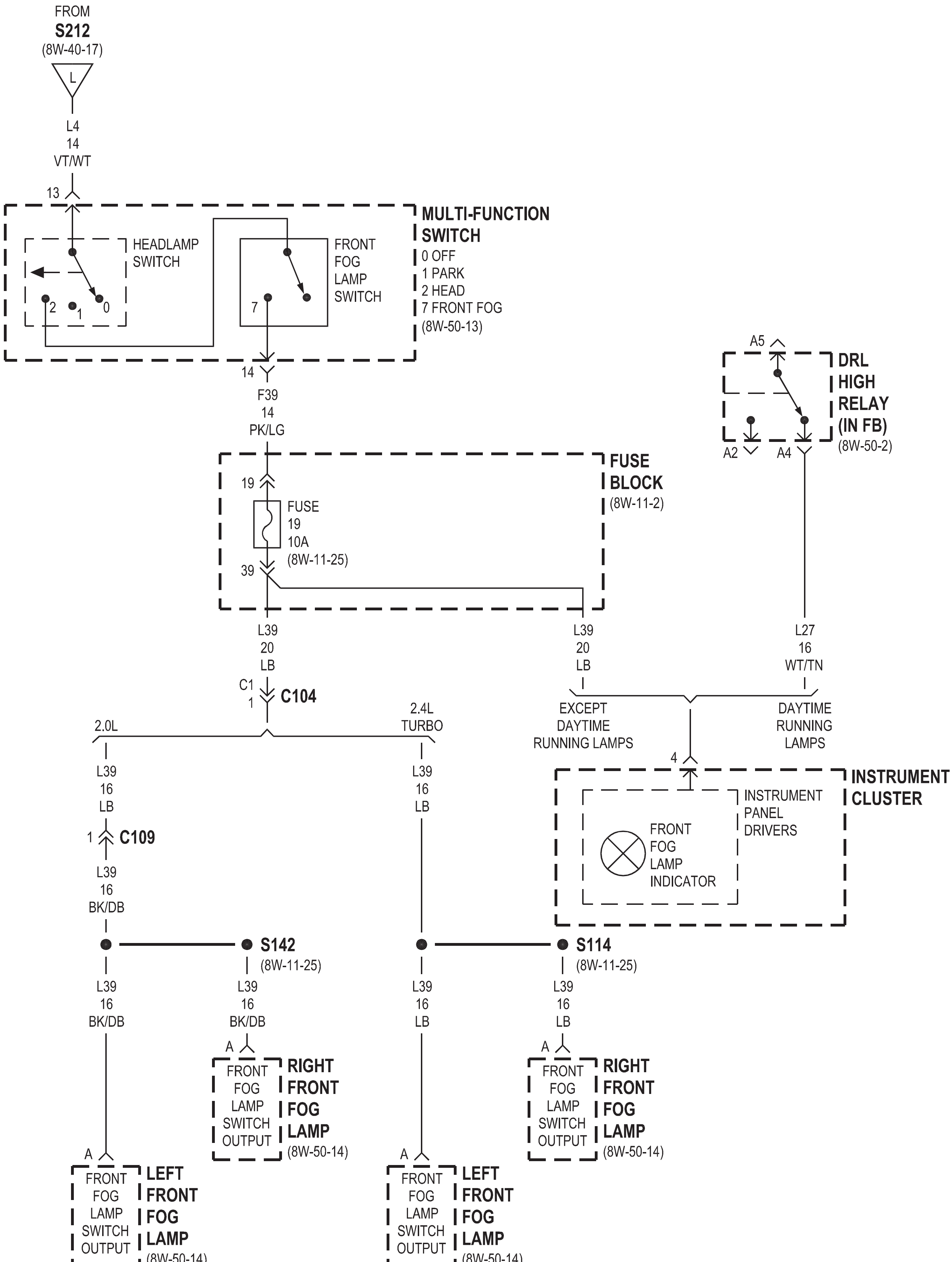

BATT F33
(8W-11-20)
(8W-11-21)
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
(8W-50-8)
3
2
1
0
9
L7
18
BK/YL
S213
(8W-11-20)
(8W-11-21)
L7
18
BK/YL
14
CLUSTER ILLUMINATION LAMPS
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
COURTESY LAMP CONTROL
PANEL LAMPS DRIVER
HEADLAMP SWITCH OUTPUT
GROUND
PANEL LAMPS DIMMER SIGNAL
3
12
10
6
M2
20
YL
E2
22
OR
Z3
16
BK/OR
E19
22
RD
EXCEPT COMPASS/TEMP MIRROR
COMPASS/TEMP MIRROR
S225
(8W-44-2)
K
TO
S206
(8W-40-16)
8
MULTI-FUNCTION SWITCH
PANEL LAMPS DIMMER
7
A13
13
C305
M2
20
YL
3
C301
Z3
20
BK/OR
EXPORT
EXCEPT EXPORT
S205
(8W-15-16)
M2
20
YL
M2
20
YL
Z3
14
BK/OR
1
3
COURTESY LAMP CONTROL
DOME LAMP/INTRUSION SENSOR
(8W-44-2)
COURTESY LAMP CONTROL
DOME LAMP
(8W-44-2)
G203
(8W-15-16)
▲▲ EXPORT

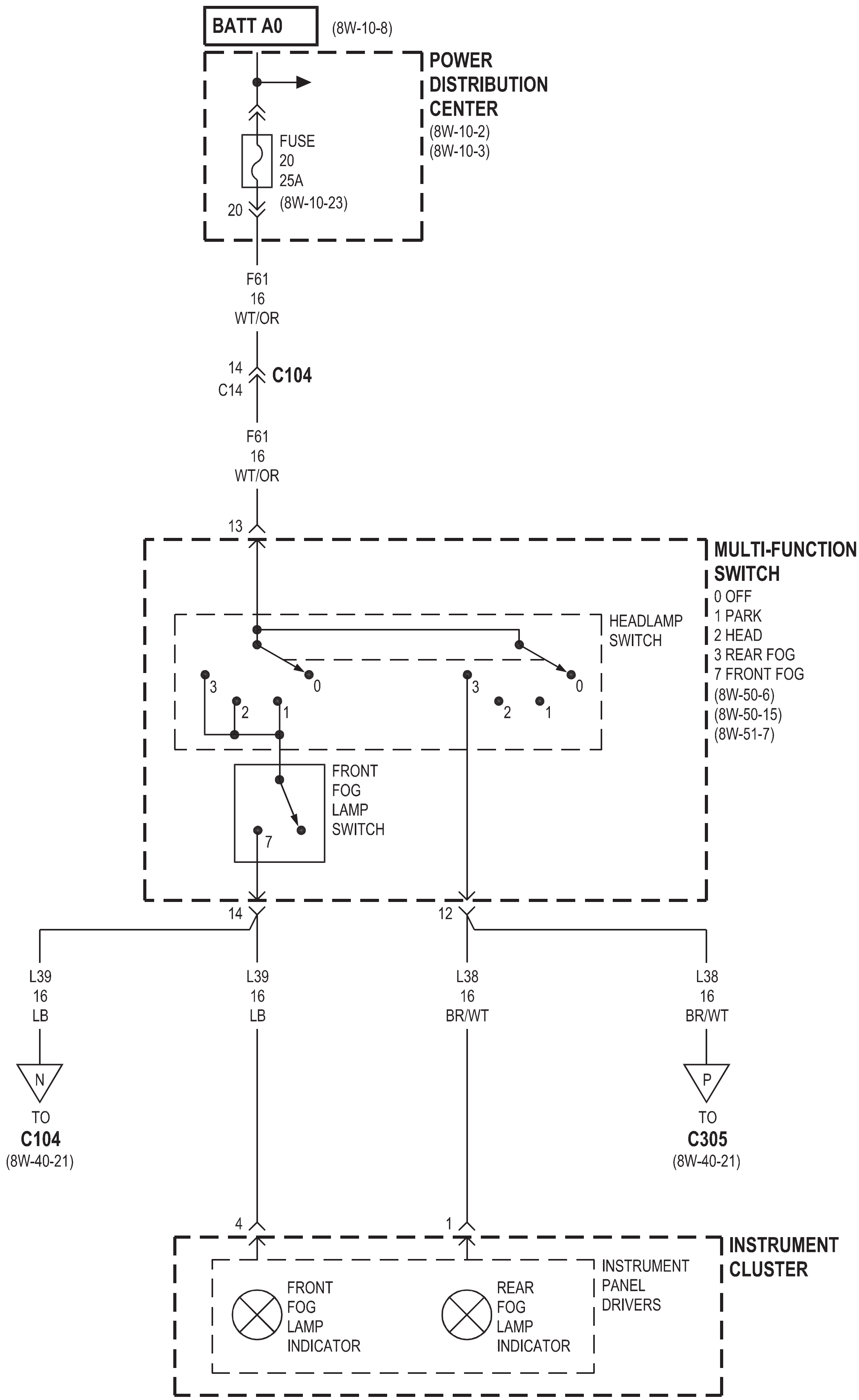

FROM
INSTRUMENT
CLUSTER
(8W-40-15)
K
RADIO
(8W-47-2)
PANEL
LAMPS
DRIVER
3
C1
E2
22
OR
E2
20
OR
S206
(8W-44-5)
E2
22
OR
E2
20
OR
E2
20
OR
E2
22
OR
E2
20
OR
1
PANEL
LAMPS
DRIVER
TRANS
RANGE
INDICATOR
ILLUMINATION
(PRNDL)
(8W-44-5)
4
PANEL
LAMPS
DRIVER
HEADLAMP
LEVELING
SWITCH
(EXPORT)
(8W-50-10)
7
PANEL
LAMPS
DRIVER
A/C-HEATER
CONTROL
(8W-42-6)
(8W-42-7)
4
PANEL
LAMPS
DRIVER
REAR
WINDOW
DEFOGGER
SWITCH
(8W-48-2)
1
PANEL
LAMPS
DRIVER
CENTER
STACK
LAMP
(8W-44-5)

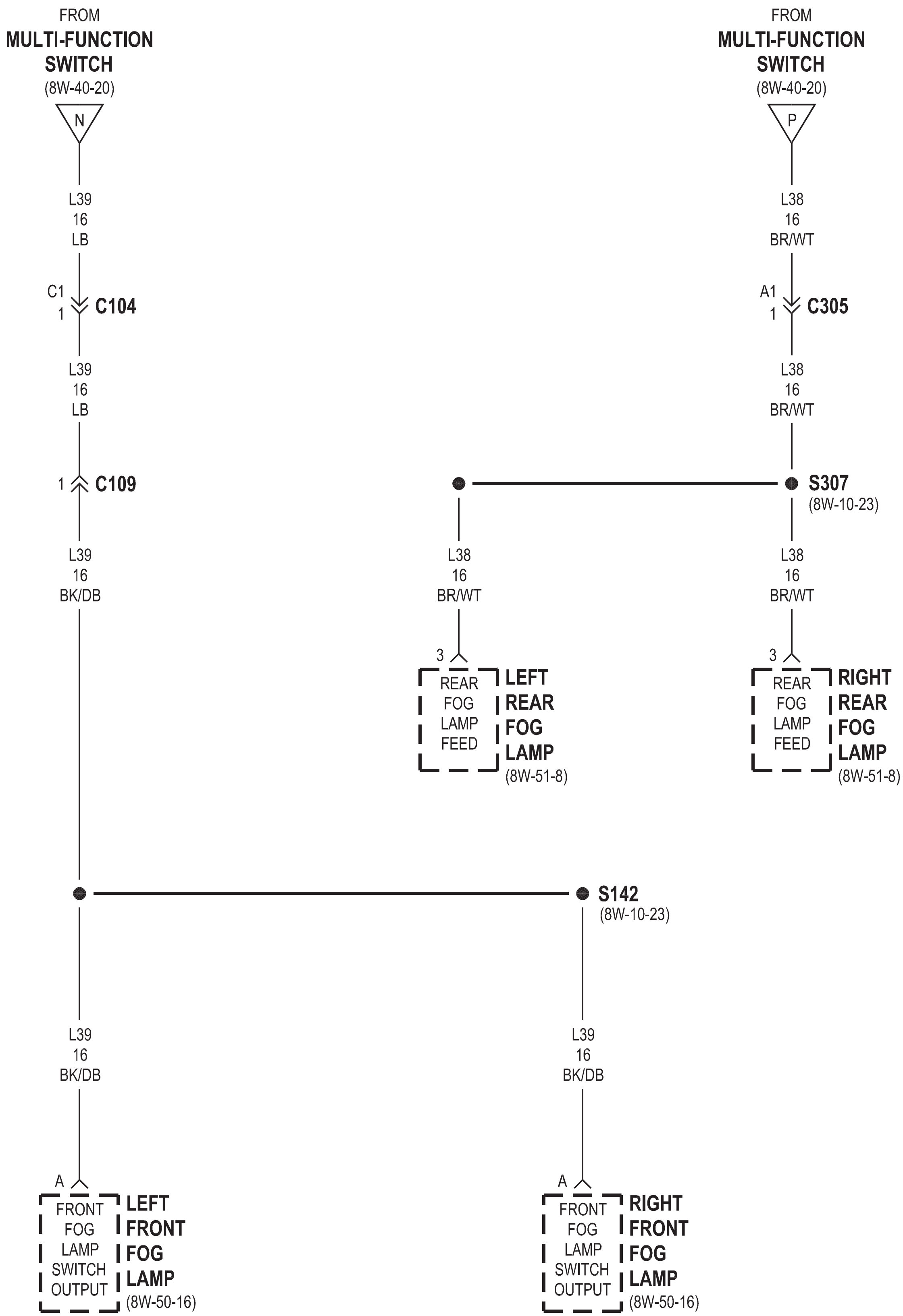

BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
16
FUSE
16
25A
(8W-11-23)
36
F3
12
LB/OR
S209
(8W-11-23)
18
19
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
4 LOW
5 HIGH
6 FLASH
(8W-50-3)
(8W-50-6)
EXCEPT EXPORT
EXPORT
HEADLAMP SWITCH
HEADLAMP BEAM SELECT
16
17
L4
12
VT/WT
L33
14
LG/BR
S212
(8W-11-24)
TO FUSE BLOCK
(8W-40-18)
L4
14
VT/WT
L4
16
VT/WT
TO MULTI-FUNCTION SWITCH
(8W-40-19)
▲ 20
DIMMER SWITCH LOW BEAM OUTPUT
INSTRUMENT CLUSTER
▲ 1
REMOTE KEYLESS ENTRY MODULE
(8W-39-14)
▲ EXCEPT EXPORT
▲▲ EXPORT



FROM
MULTI-FUNCTION SWITCH
(8W-40-17)
M
L33
14
LG/BR
LHD
RHD
8
5
FUSE
8
15A
FUSE
5
15A
28
(8W-11-12)
25
(8W-11-12)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
L3
14
RD/OR
S215
(8W-11-12)
L3
16
RD/OR
26
HIGH BEAM INDICATOR
BRAKE WARNING INDICATOR
SEAT BELT INDICATOR
INSTRUMENT PANEL DRIVERS
INSTRUMENT CLUSTER
22
25
G10
20
LG/RD
A3
3
C305
G11
20
WT/BK
G10
20
LG/RD
1
1
PARK BRAKE SWITCH
SEAT BELT SWITCH
2
Z1
20
BK
S311
(8W-15-17)
(8W-15-18)
Z1
14
BK
G301
(8W-15-17)
(8W-15-18)

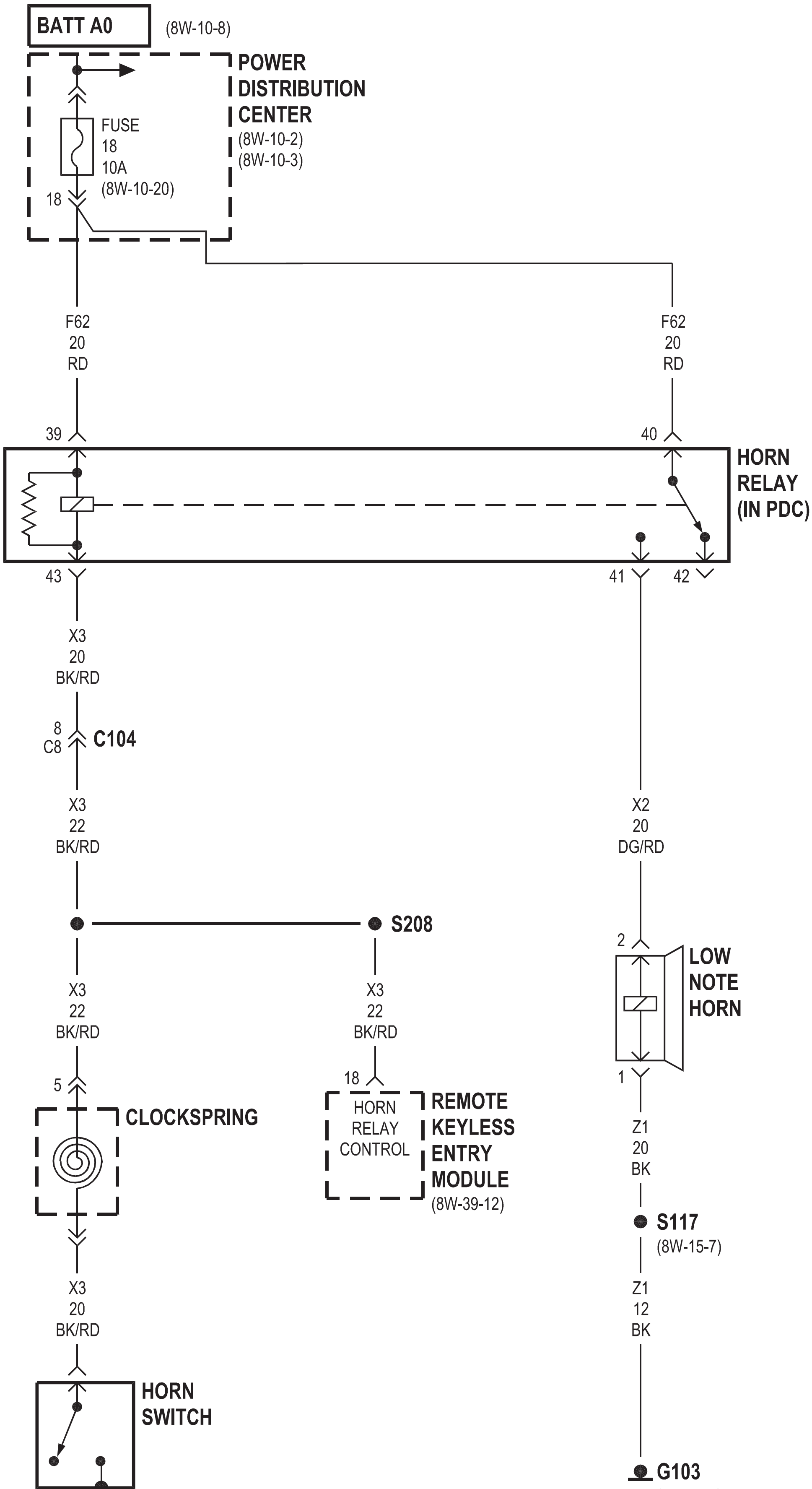

FROM
S212
(8W-40-17)
L
L4
14
VT/WT
13
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
7 FRONT FOG
(8W-50-13)
HEADLAMP SWITCH
2
1
0
FRONT FOG LAMP SWITCH
7
14
F39
14
PK/LG
FUSE BLOCK
(8W-11-2)
19
FUSE
19
10A
(8W-11-25)
39
L39
20
LB
C1
1
C104
2.0L
2.4L TURBO
L39
16
LB
C109
L39
16
BK/DB
S142
(8W-11-25)
L39
16
BK/DB
A
FRONT FOG LAMP SWITCH OUTPUT
RIGHT FRONT FOG LAMP
(8W-50-14)
LEFT FRONT FOG LAMP
(8W-50-14)
S114
(8W-11-25)
L39
16
LB
DRL HIGH RELAY (IN FB)
(8W-50-2)
A5
A2
A4
L27
16
WT/TN
EXCEPT DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS
4
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
FRONT FOG LAMP INDICATOR


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
20
25A
(8W-10-23)
20
F61
16
WT/OR
14
C14
C104
F61
16
WT/OR
13
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
7 FRONT FOG
(8W-50-6)
(8W-50-15)
(8W-51-7)
HEADLAMP SWITCH
3
2
1
0
3
2
1
0
FRONT FOG LAMP SWITCH
7
14
12
L39
16
LB
L39
16
LB
L38
16
BR/WT
L38
16
BR/WT
N
TO
C104
(8W-40-21)
P
TO
C305
(8W-40-21)
4
1
INSTRUMENT CLUSTER
INSTRUMENT PANEL DRIVERS
FRONT FOG LAMP INDICATOR
REAR FOG LAMP INDICATOR

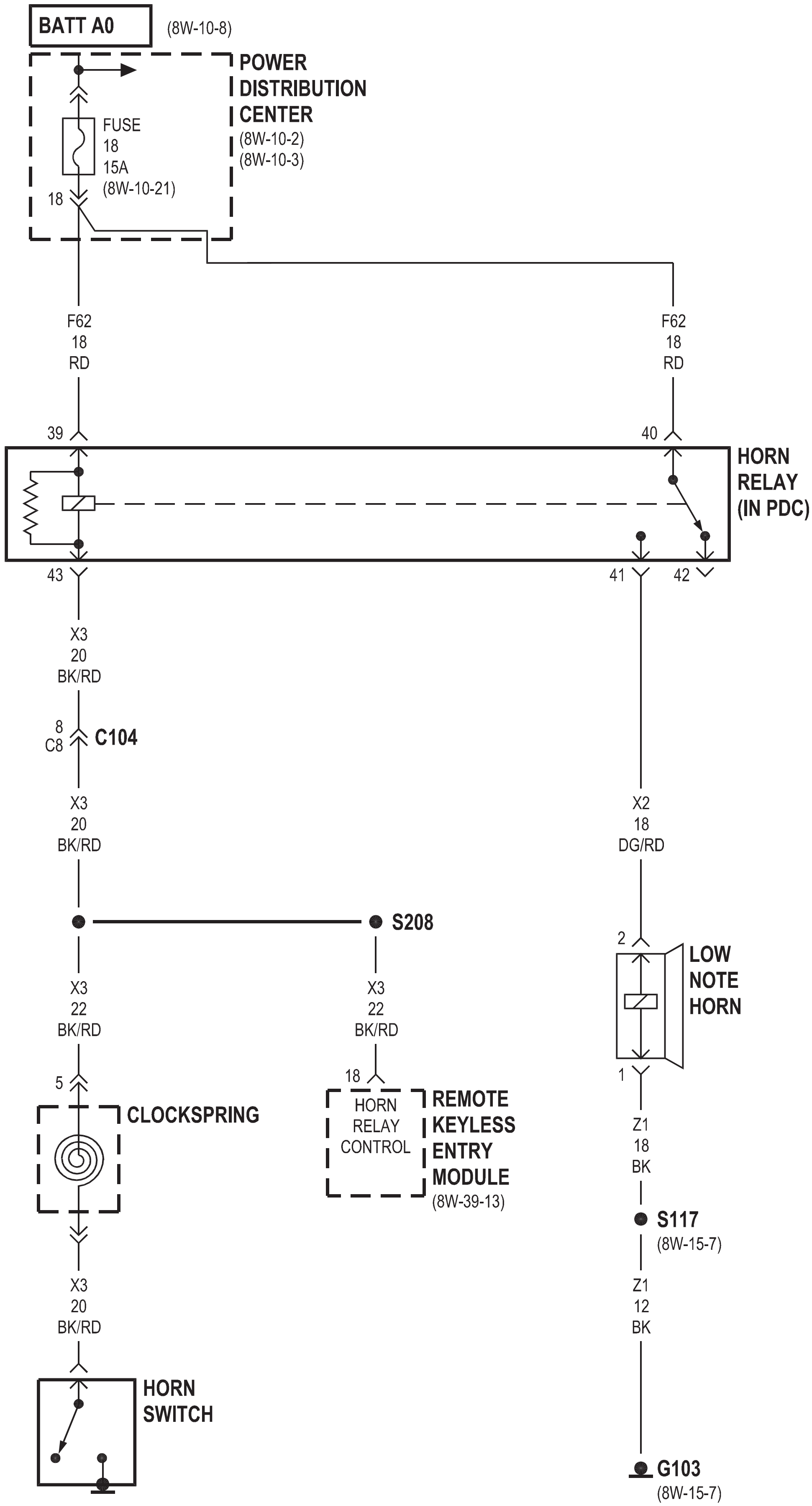

FROM
MULTI-FUNCTION SWITCH
(8W-40-20)
N
L39
16
LB
C1
1
C104
L39
16
LB
1
C109
L39
16
BK/DB
FROM
MULTI-FUNCTION SWITCH
(8W-40-20)
P
L38
16
BR/WT
A1
1
C305
L38
16
BR/WT
S307
(8W-10-23)
L38
16
BR/WT
L38
16
BR/WT
3
REAR FOG LAMP FEED
LEFT REAR FOG LAMP
(8W-51-8)
3
REAR FOG LAMP FEED
RIGHT REAR FOG LAMP
(8W-51-8)
S142
(8W-10-23)
L39
16
BK/DB
L39
16
BK/DB
A
FRONT FOG LAMP SWITCH OUTPUT
LEFT FRONT FOG LAMP
(8W-50-16)
A
FRONT FOG LAMP SWITCH OUTPUT
RIGHT FRONT FOG LAMP
(8W-50-16)

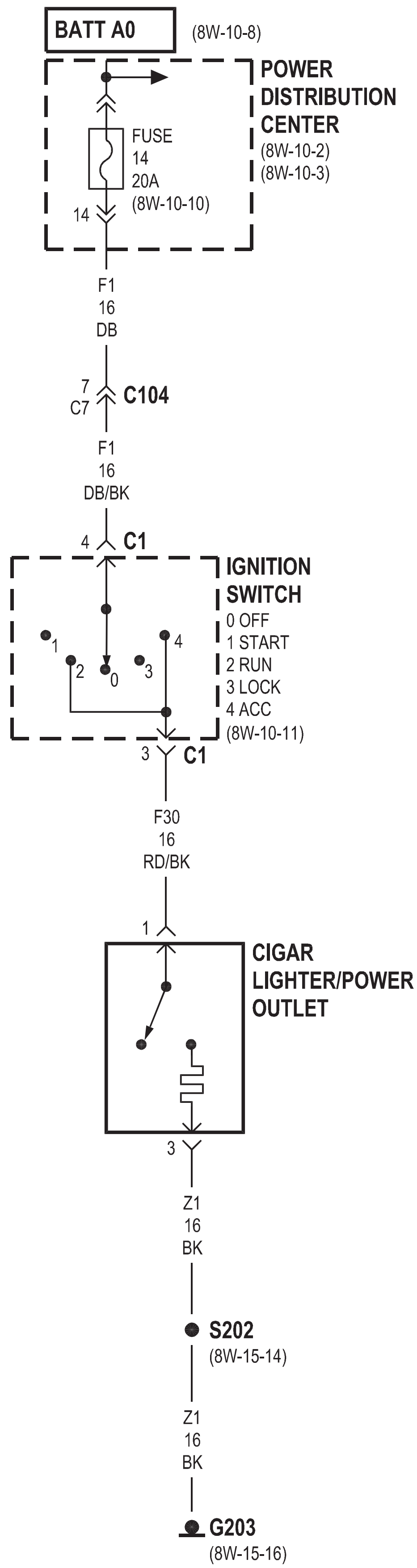
8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

2.0L



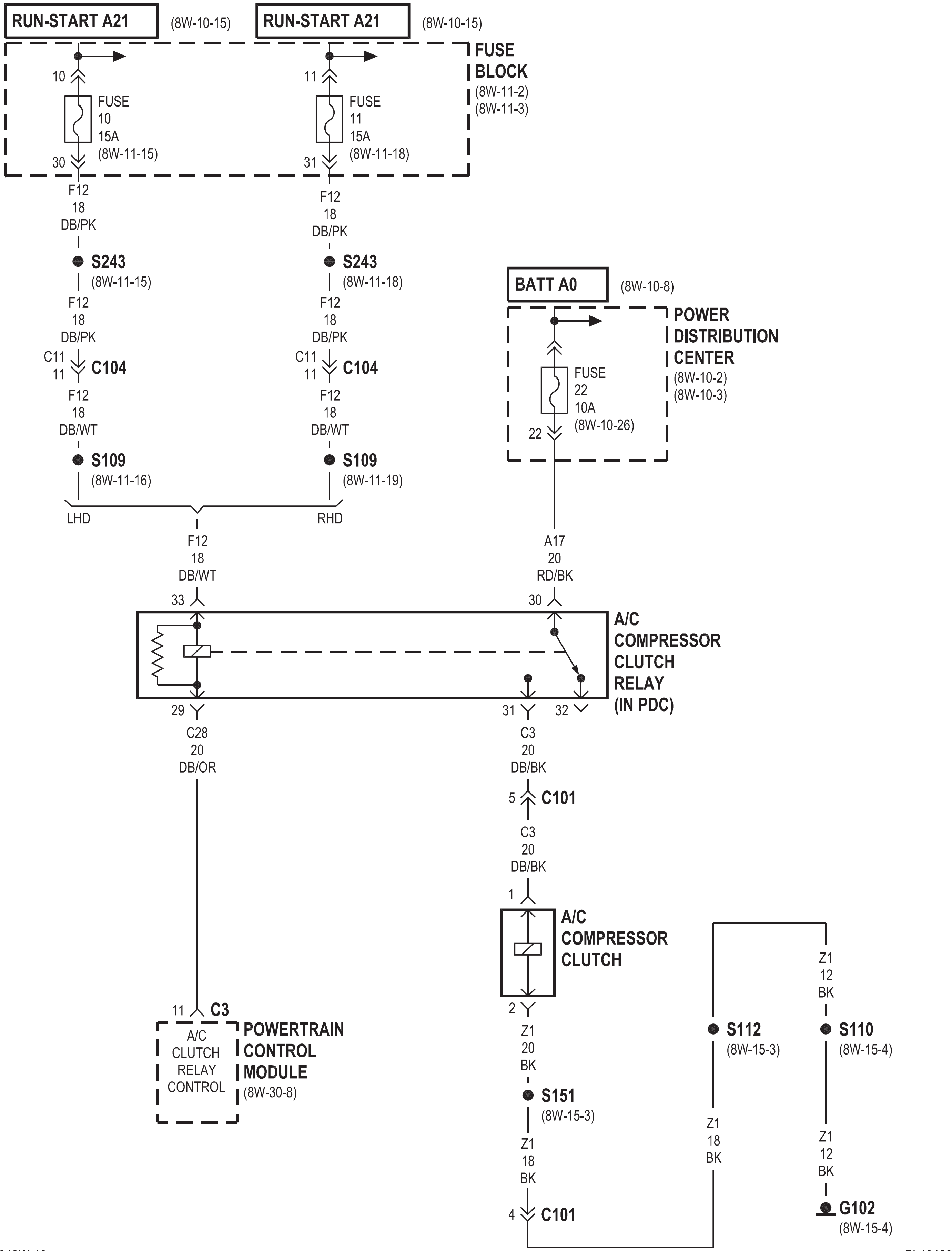
BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
18
10A
(8W-10-20)
18
F62
20
RD
F62
20
RD
39
40
HORN RELAY (IN PDC)
43
41
42
X3
20
BK/RD
8
C8
C104
X3
22
BK/RD
X2
20
DG/RD
S208
X3
22
BK/RD
X3
22
BK/RD
2
LOW NOTE HORN
1
18
5
HORN RELAY CONTROL
REMOTE KEYLESS ENTRY MODULE
(8W-39-12)
CLOCKSPRING
Z1
20
BK
S117
(8W-15-7)
X3
20
BK/RD
Z1
12
BK
HORN SWITCH
G103
(8W-15-7)


BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
18
15A
(8W-10-21)
18
F62
18
RD
F62
18
RD
39
40
HORN
RELAY
(IN PDC)
43
41
42
X3
20
BK/RD
8
C8
C104
X3
20
BK/RD
X2
18
DG/RD
S208
X3
22
BK/RD
X3
22
BK/RD
2
LOW
NOTE
HORN
1
5
CLOCKSPRING
18
HORN
RELAY
CONTROL
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-13)
Z1
18
BK
S117
(8W-15-7)
Z1
12
BK
X3
20
BK/RD
HORN
SWITCH
G103
(8W-15-7)

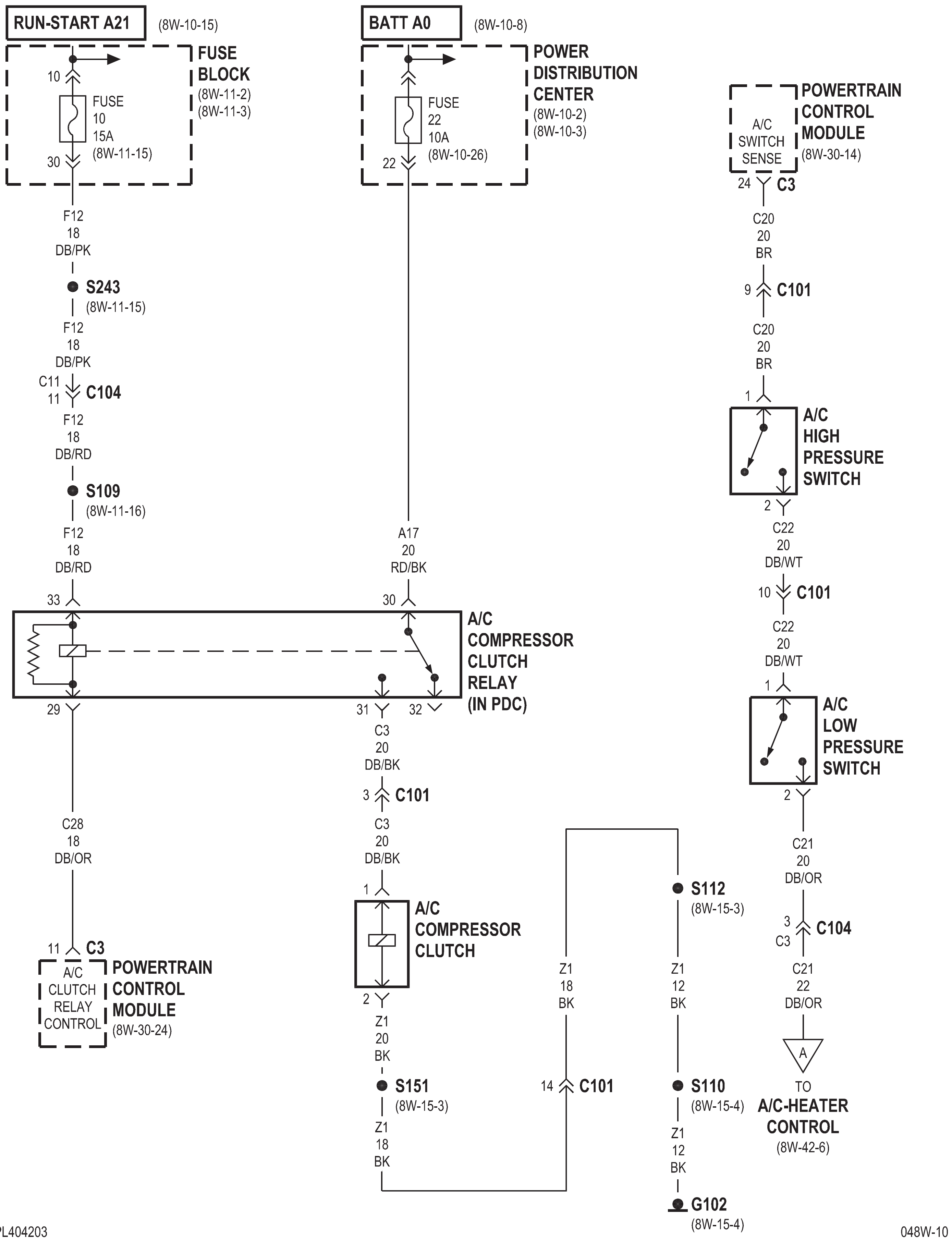

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
14
20A
(8W-10-10)
14
F1
16
DB
7
C7
C104
F1
16
DB/BK
4
C1
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-11)
1
2
0
3
4
3
C1
F30
16
RD/BK
1
CIGAR LIGHTER/POWER OUTLET
3
Z1
16
BK
S202
(8W-15-14)
Z1
16
BK
G203
(8W-15-16)

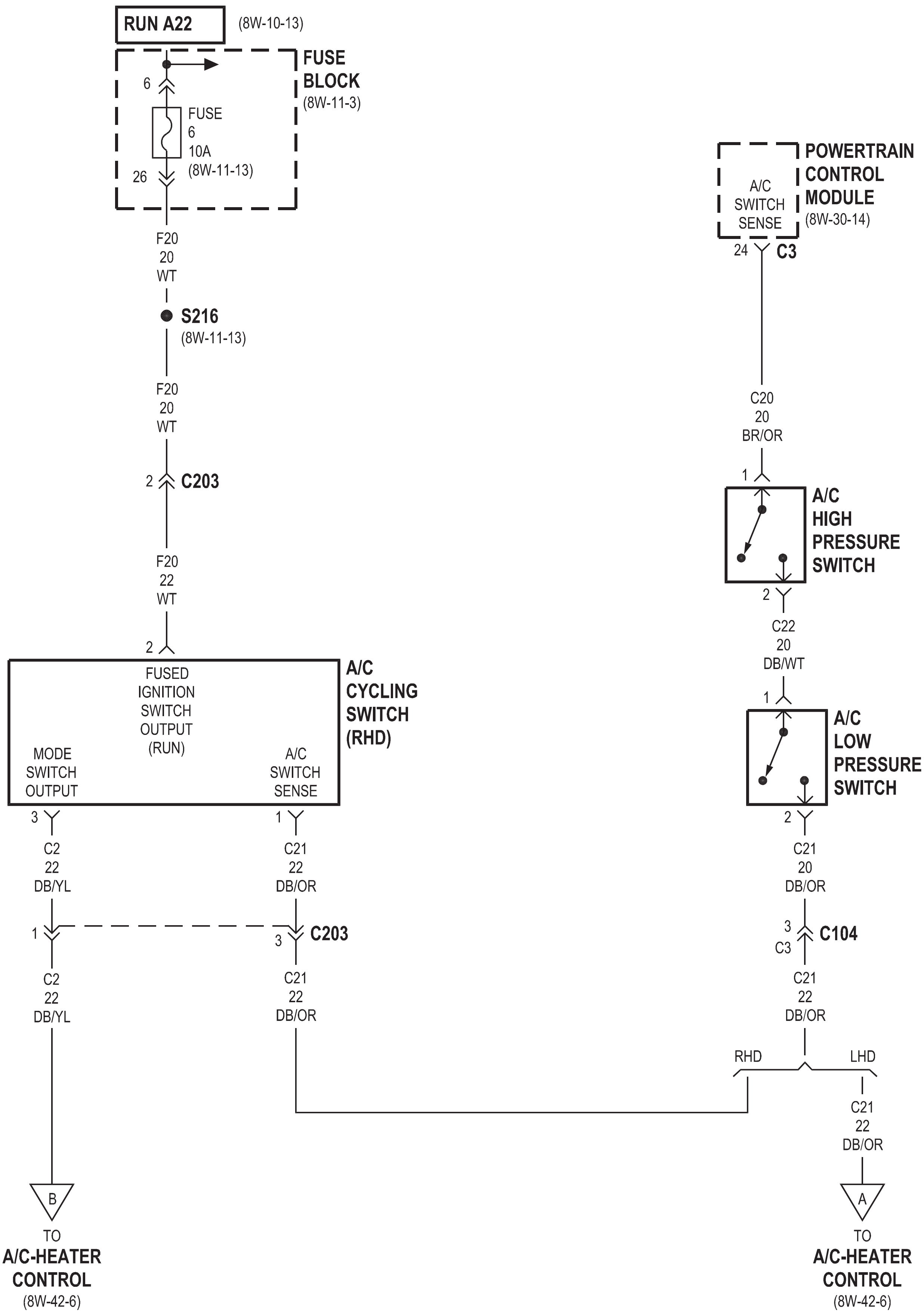
8W-42 AIR CONDITIONING-HEATER

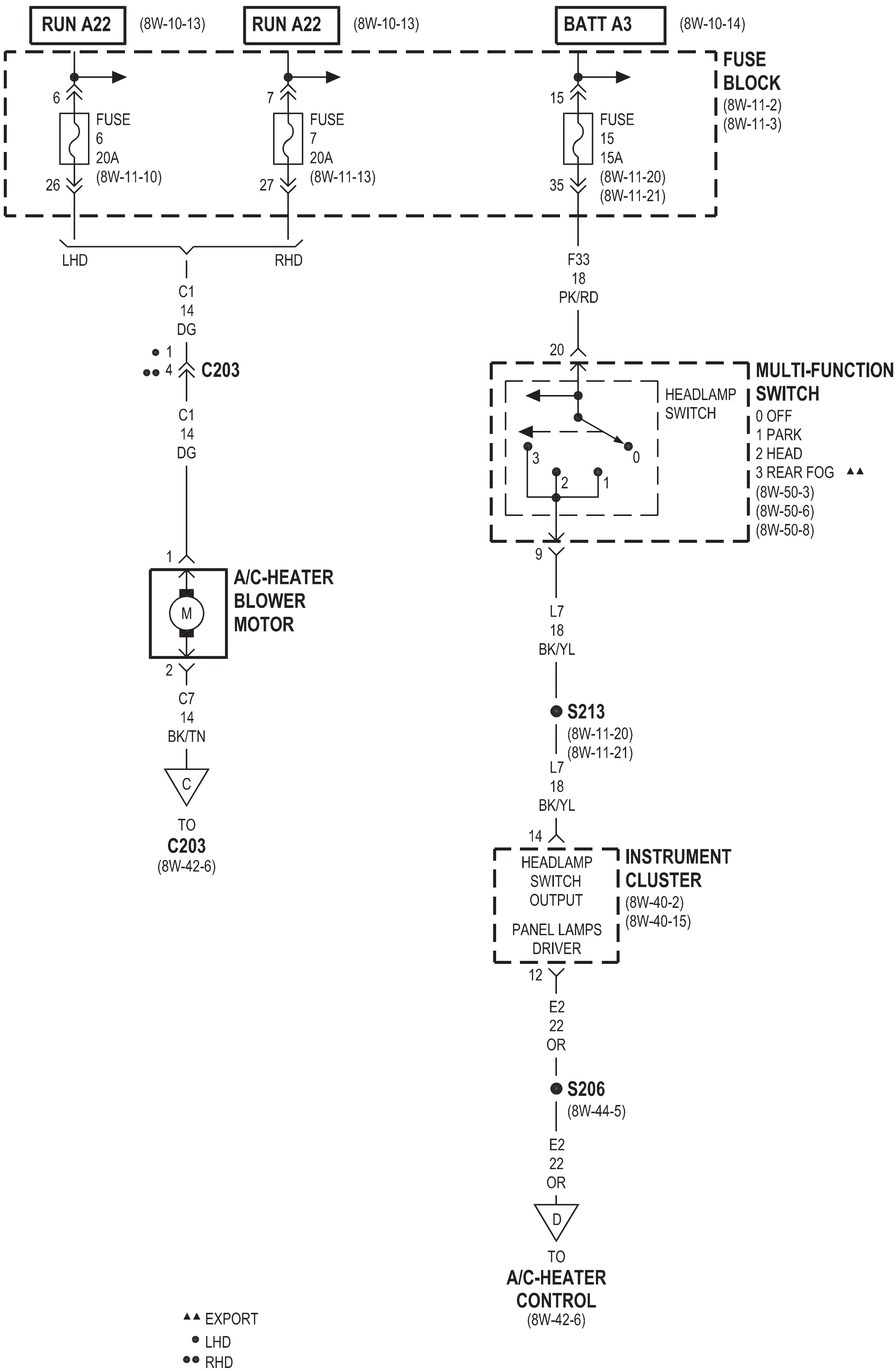
2.0L

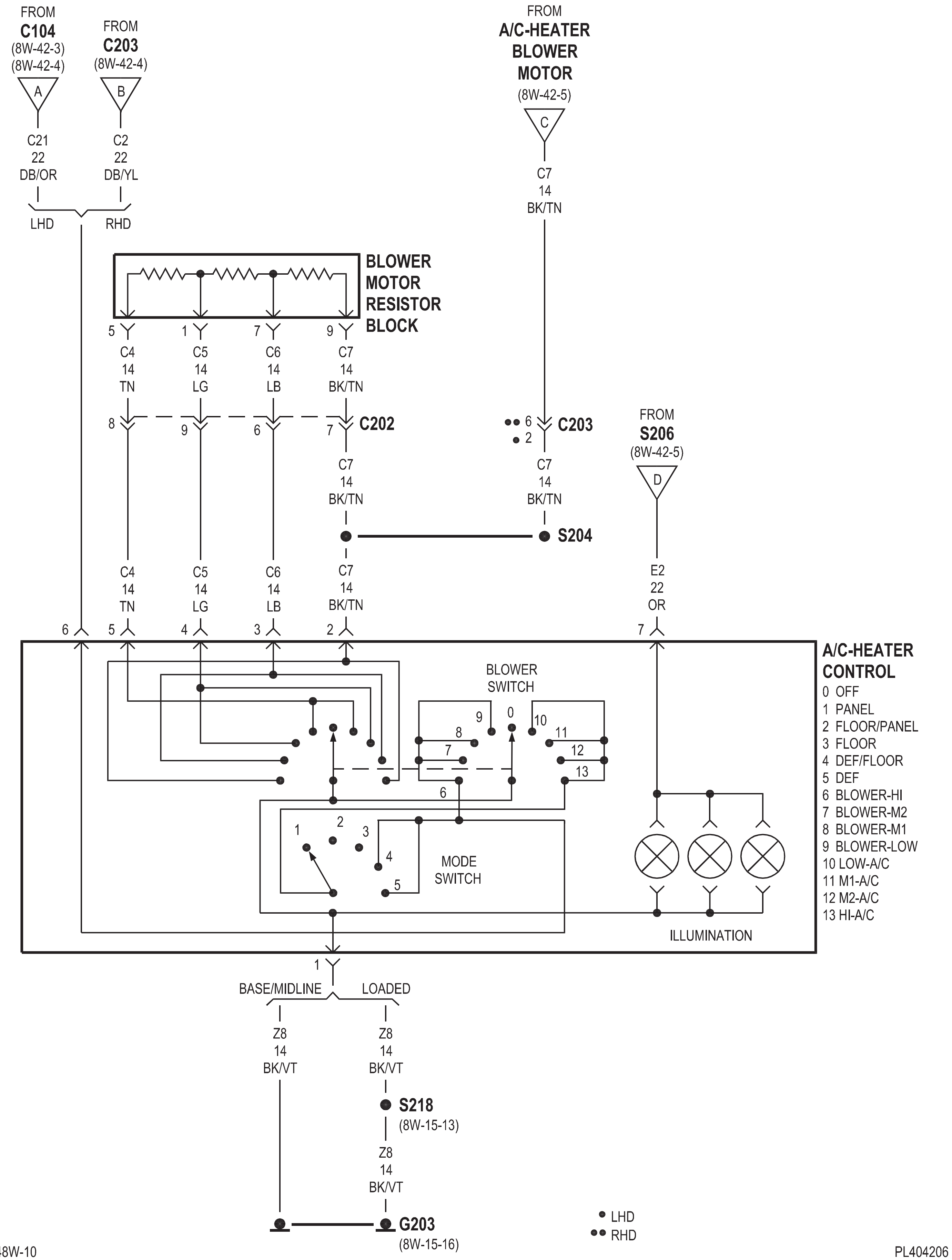


RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE
10
15A
(8W-11-15)
30
11
FUSE
11
15A
(8W-11-18)
31
F12
18
DB/PK
S243
(8W-11-15)
S243
(8W-11-18)
C11
11
C104
F12
18
DB/WT
S109
(8W-11-16)
(8W-11-19)
LHD
RHD
BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
22
10A
(8W-10-26)
22
A17
20
RD/BK
33
30
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
29
31
32
C28
20
DB/OR
C3
20
DB/BK
5
C101
1
A/C
COMPRESSOR
CLUTCH
2
Z1
20
BK
S151
(8W-15-3)
Z1
18
BK
4
C101
11
C3
A/C
CLUTCH
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
(8W-30-8)
Z1
12
BK
S112
(8W-15-3)
S110
(8W-15-4)
G102
(8W-15-4)

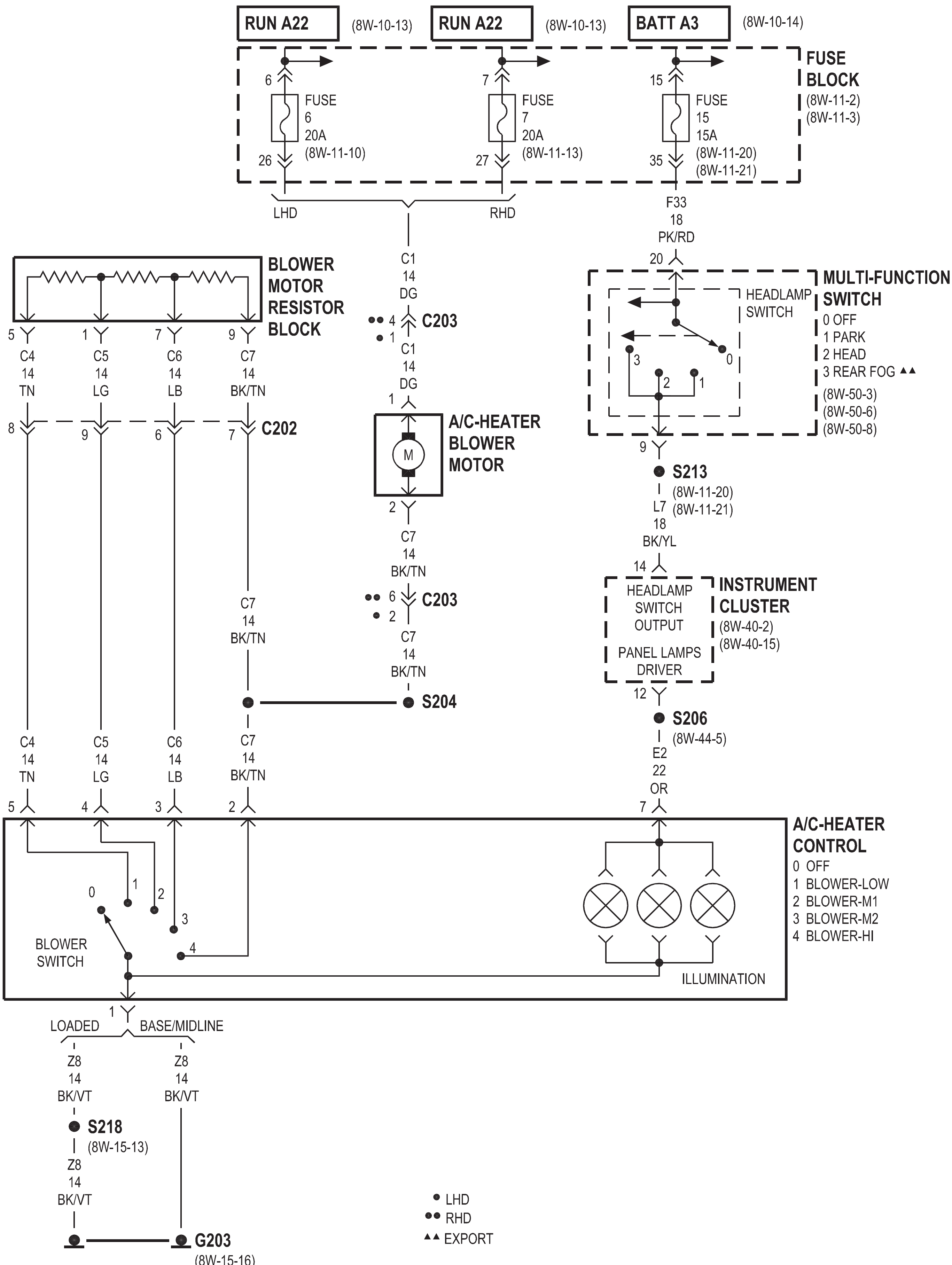

RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE 10 15A (8W-11-15)
30
BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 22 10A (8W-10-26)
22
POWERTRAIN CONTROL MODULE
A/C SWITCH SENSE
(8W-30-14)
24 C3
C20 20 BR
9 C101
C20 20 BR
1
A/C HIGH PRESSURE SWITCH
2
C22 20 DB/WT
10 C101
C22 20 DB/WT
1
A/C LOW PRESSURE SWITCH
2
C21 20 DB/OR
3 C3 C104
C21 22 DB/OR
A
TO A/C-HEATER CONTROL
(8W-42-6)
F12 18 DB/PK
S243
(8W-11-15)
F12 18 DB/PK
C11 11 C104
F12 18 DB/RD
S109
(8W-11-16)
F12 18 DB/RD
33
A17 20 RD/BK
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
29
31
32
C3 20 DB/BK
3 C101
C3 20 DB/BK
1
A/C COMPRESSOR CLUTCH
2
Z1 20 BK
S151
(8W-15-3)
Z1 18 BK
C28 18 DB/OR
11 C3
A/C CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-24)
S112
(8W-15-3)
Z1 18 BK
Z1 12 BK
14 C101
S110
(8W-15-4)
Z1 12 BK
G102
(8W-15-4)


RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-3)
6
FUSE
6
10A
(8W-11-13)
26
F20
20
WT
S216
(8W-11-13)
F20
20
WT
2
C203
F20
22
WT
2
FUSED IGNITION SWITCH OUTPUT (RUN)
MODE SWITCH OUTPUT
A/C SWITCH SENSE
A/C CYCLING SWITCH (RHD)
3
1
C2
22
DB/YL
C21
22
DB/OR
1
3
C203
C2
22
DB/YL
C21
22
DB/OR
B
TO
A/C-HEATER CONTROL
(8W-42-6)
A/C SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-14)
24
C3
C20
20
BR/OR
1
A/C HIGH PRESSURE SWITCH
2
C22
20
DB/WT
1
A/C LOW PRESSURE SWITCH
2
C21
20
DB/OR
3
C3
C104
C21
22
DB/OR
RHD
LHD
C21
22
DB/OR
A
TO
A/C-HEATER CONTROL
(8W-42-6)


RUN A22
(8W-10-13)
RUN A22
(8W-10-13)
BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
6
FUSE
6
20A
(8W-11-10)
26
7
FUSE
7
20A
(8W-11-13)
27
15
FUSE
15
15A
(8W-11-20)
(8W-11-21)
35
LHD
RHD
C1
14
DG
1
4
C203
C1
14
DG
1
A/C-HEATER BLOWER MOTOR
M
2
C7
14
BK/TN
C
TO
C203
(8W-42-6)
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
(8W-50-3)
(8W-50-6)
(8W-50-8)
3
0
2
1
9
L7
18
BK/YL
S213
(8W-11-20)
(8W-11-21)
L7
18
BK/YL
14
HEADLAMP SWITCH OUTPUT
PANEL LAMPS DRIVER
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-15)
12
E2
22
OR
S206
(8W-44-5)
E2
22
OR
D
TO
A/C-HEATER CONTROL
(8W-42-6)
EXPORT
LHD
RHD

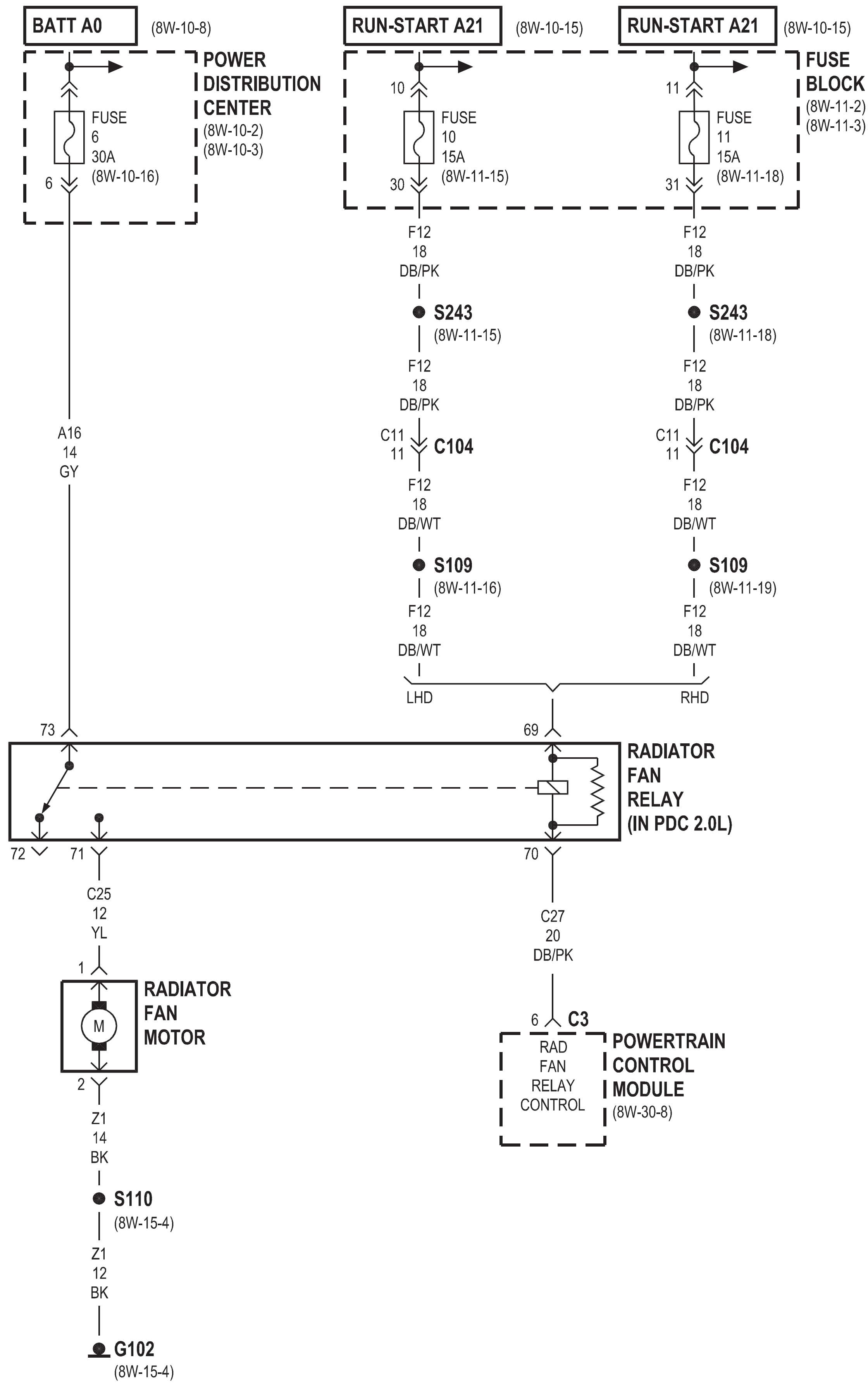

FROM
C104
(8W-42-3)
(8W-42-4)
A
FROM
C203
(8W-42-4)
B
C21
22
DB/OR
C2
22
DB/YL
LHD
RHD
FROM
A/C-HEATER
BLOWER
MOTOR
(8W-42-5)
C
C7
14
BK/TN
BLOWER
MOTOR
RESISTOR
BLOCK
C4 14 TN
C5 14 LG
C6 14 LB
C7 14 BK/TN
C202
C203
FROM
S206
(8W-42-5)
D
S204
E2
22
OR
A/C-HEATER
CONTROL
0 OFF
1 PANEL
2 FLOOR/PANEL
3 FLOOR
4 DEF/FLOOR
5 DEF
6 BLOWER-HI
7 BLOWER-M2
8 BLOWER-M1
9 BLOWER-LOW
10 LOW-A/C
11 M1-A/C
12 M2-A/C
13 HI-A/C
BLOWER
SWITCH
MODE
SWITCH
ILLUMINATION
BASE/MIDLINE
LOADED
Z8
14
BK/VT
S218
(8W-15-13)
G203
(8W-15-16)
LHD
RHD

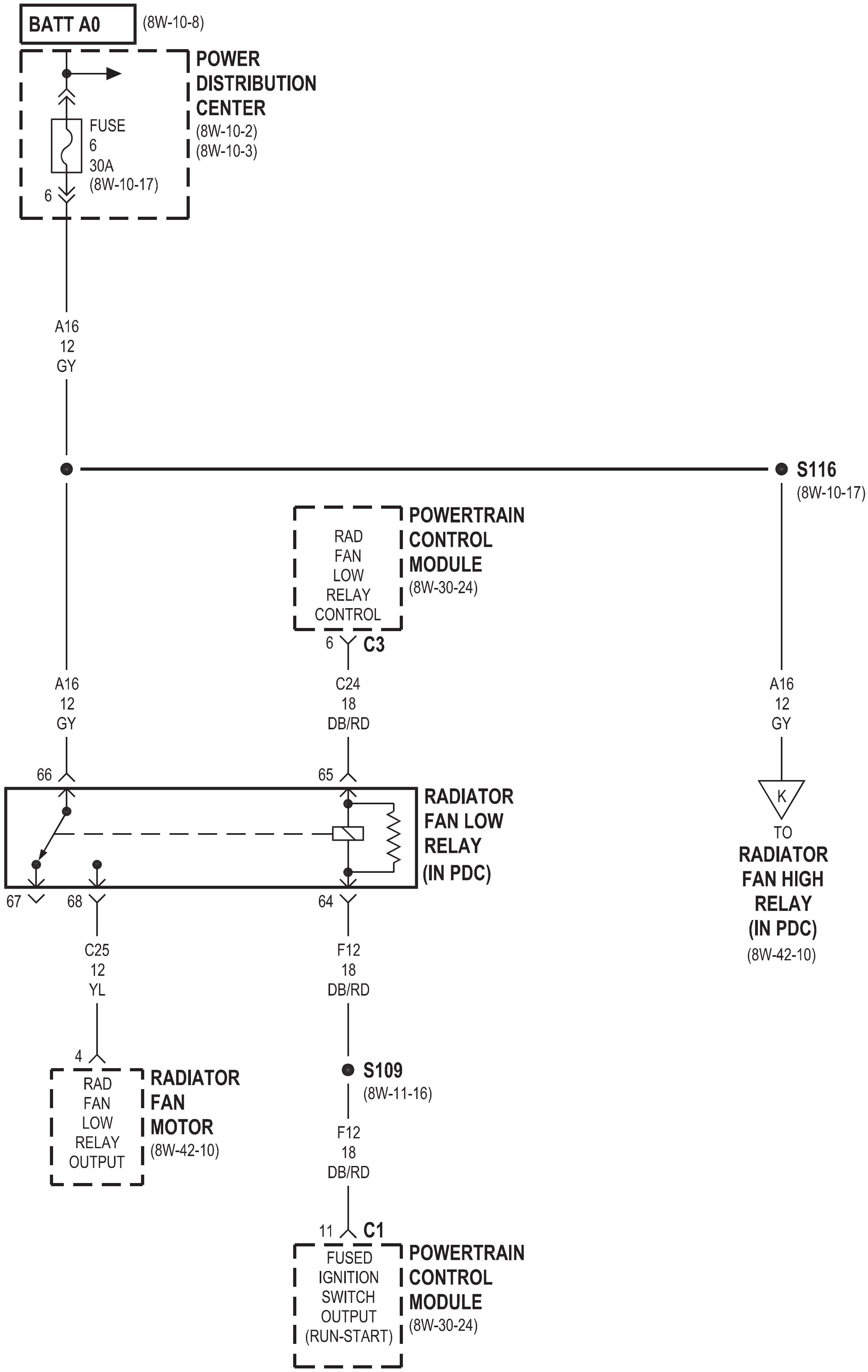
HEATER ONLY

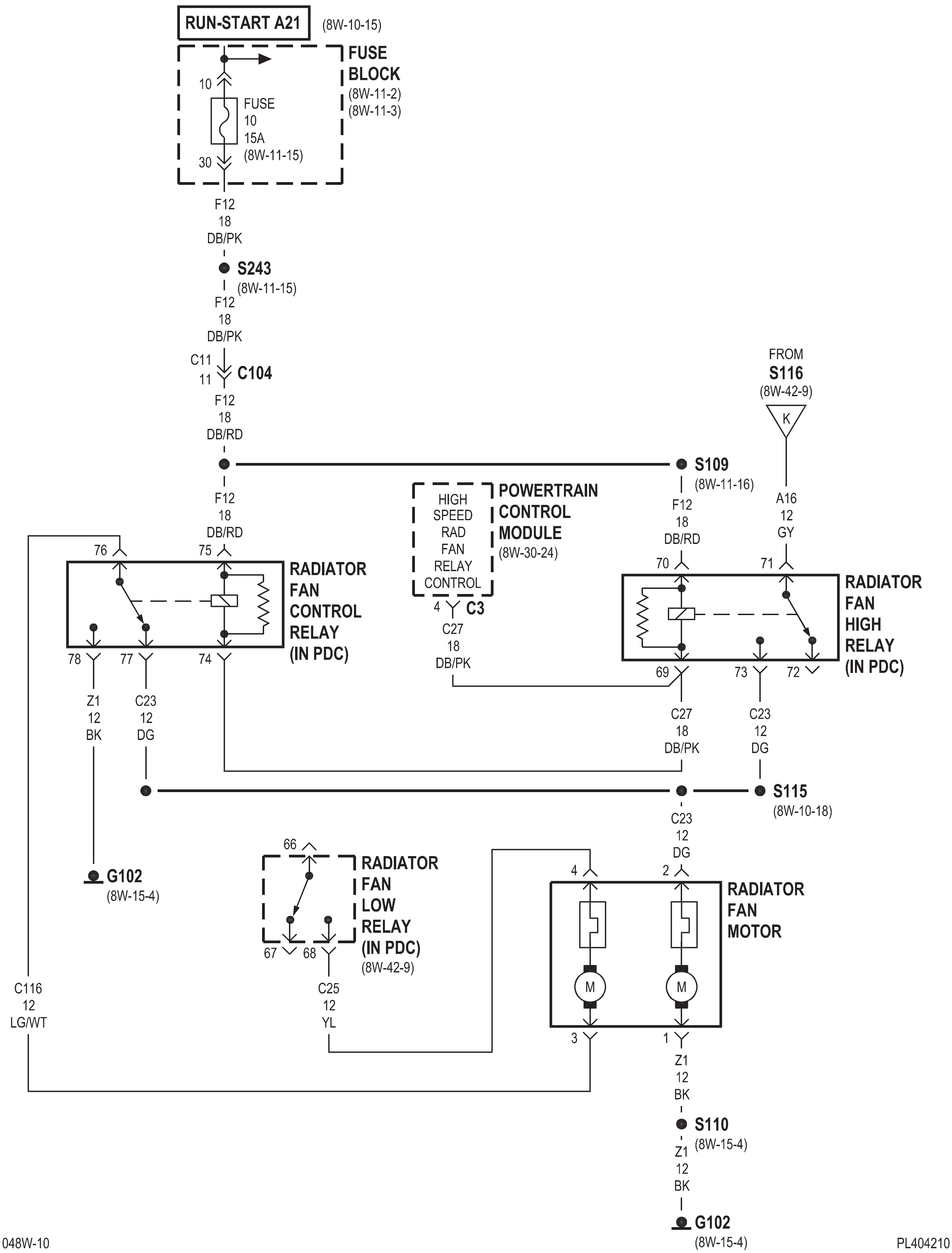


RUN A22
(8W-10-13)
RUN A22
(8W-10-13)
BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 6 20A (8W-11-10)
FUSE 7 20A (8W-11-13)
FUSE 15 15A (8W-11-20) (8W-11-21)
LHD
RHD
F33 18 PK/RD
C1 14 DG
C203
BLOWER MOTOR RESISTOR BLOCK
C4 14 TN
C5 14 LG
C6 14 LB
C7 14 BK/TN
C202
A/C-HEATER BLOWER MOTOR
M
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
(8W-50-3)
(8W-50-6)
(8W-50-8)
S213
(8W-11-20)
(8W-11-21)
L7 18 BK/YL
INSTRUMENT CLUSTER
HEADLAMP SWITCH OUTPUT
PANEL LAMPS DRIVER
(8W-40-2)
(8W-40-15)
S206
(8W-44-5)
E2 22 OR
S204
A/C-HEATER CONTROL
0 OFF
1 BLOWER-LOW
2 BLOWER-M1
3 BLOWER-M2
4 BLOWER-HI
BLOWER SWITCH
ILLUMINATION
LOADED
BASE/MIDLINE
Z8 14 BK/VT
S218
(8W-15-13)
G203
(8W-15-16)
● LHD
●● RHD
▲▲ EXPORT

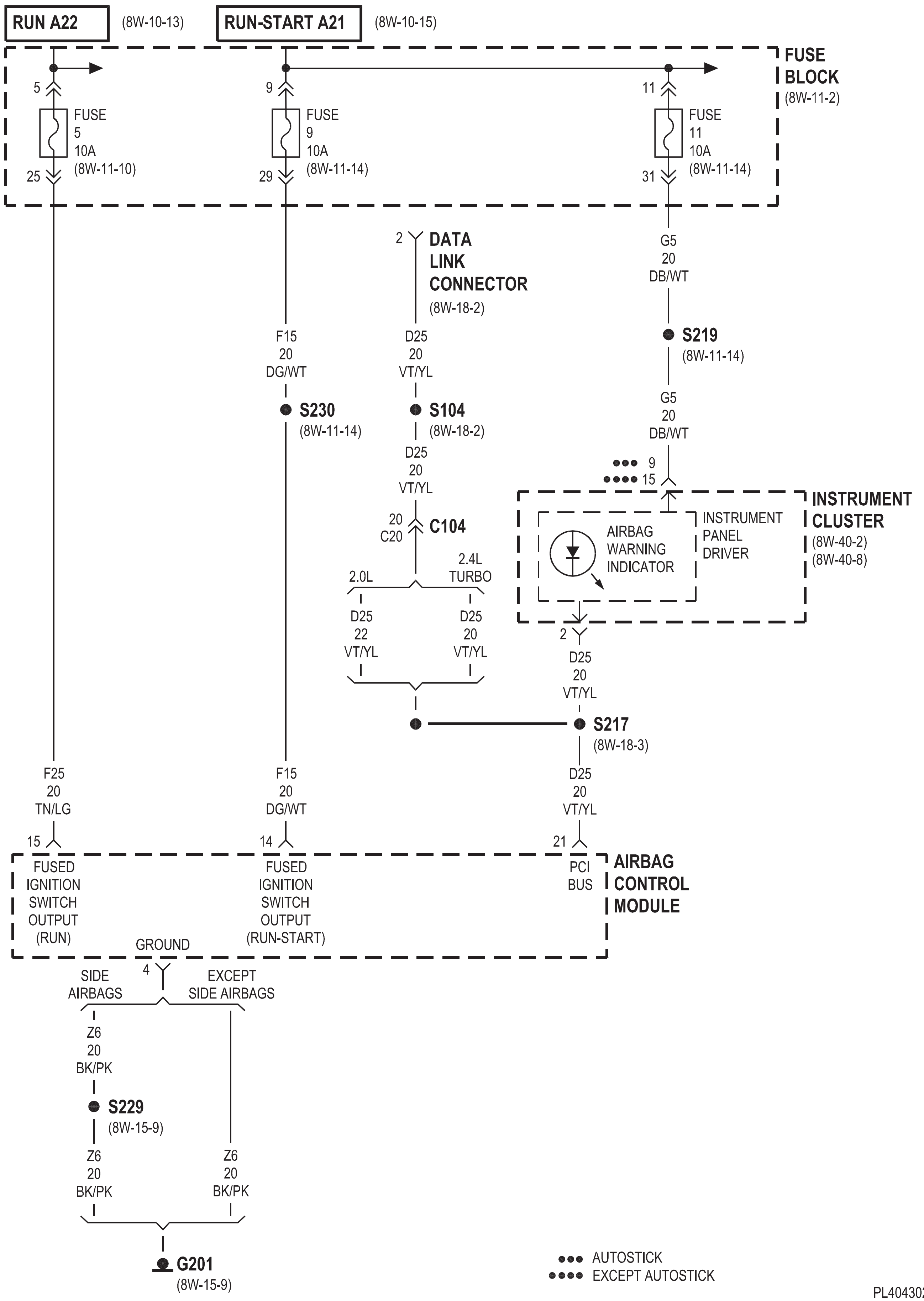
2.0L


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 6 30A (8W-10-16)
6
RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE 10 15A (8W-11-15)
30
11
FUSE 11 15A (8W-11-18)
31
F12 18 DB/PK
S243
(8W-11-15)
S243
(8W-11-18)
F12 18 DB/PK
C11 11
C104
F12 18 DB/WT
S109
(8W-11-16)
S109
(8W-11-19)
F12 18 DB/WT
LHD
RHD
A16 14 GY
73
69
RADIATOR FAN RELAY (IN PDC 2.0L)
72
71
70
C25 12 YL
C27 20 DB/PK
1
RADIATOR FAN MOTOR
M
2
6
C3
RAD FAN RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-8)
Z1 14 BK
S110
(8W-15-4)
Z1 12 BK
G102
(8W-15-4)

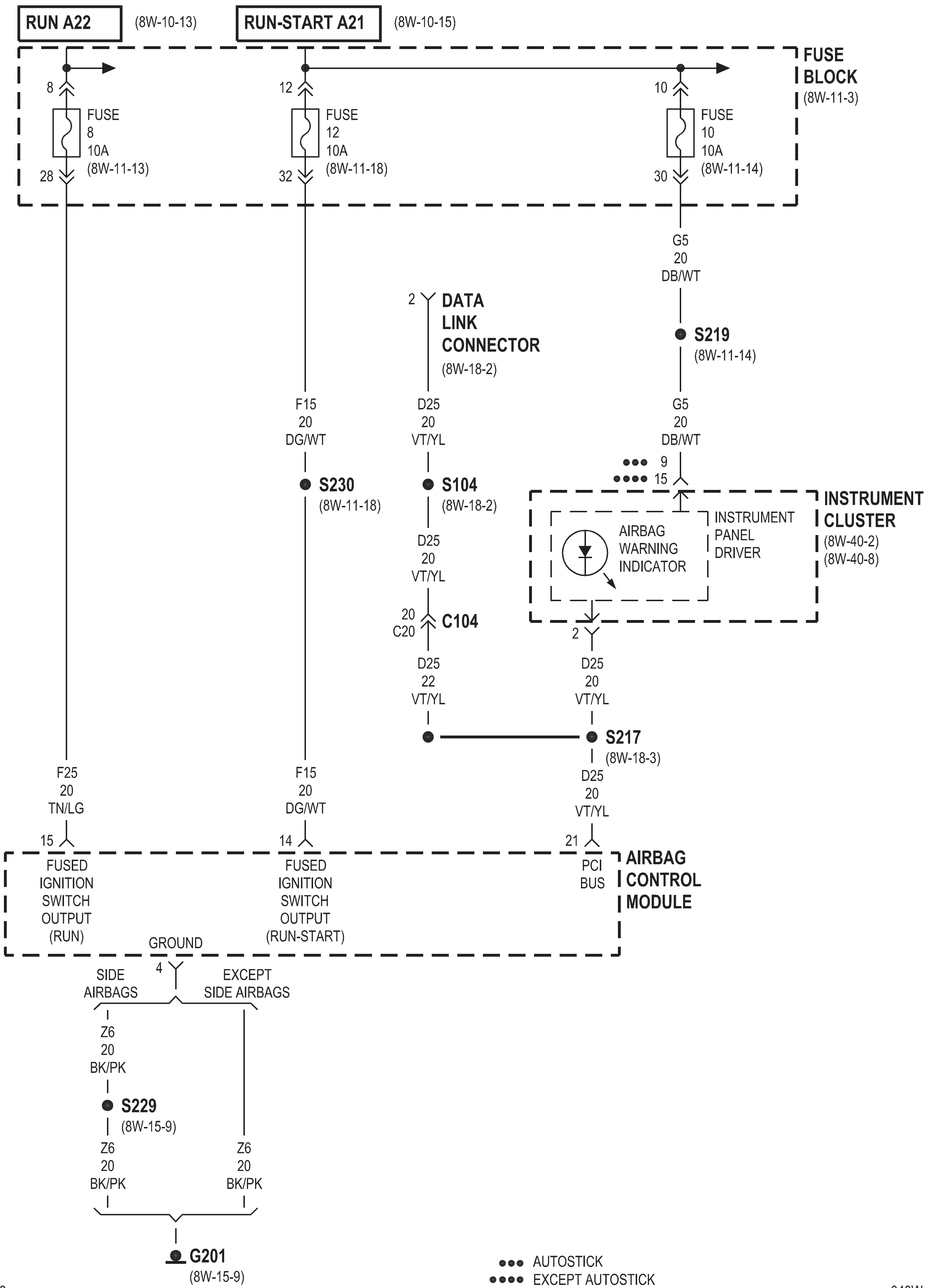

BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
6
30A
(8W-10-17)
6
A16
12
GY
S116
(8W-10-17)
POWERTRAIN
CONTROL
MODULE
(8W-30-24)
RAD
FAN
LOW
RELAY
CONTROL
6
C3
A16
12
GY
C24
18
DB/RD
A16
12
GY
66
65
RADIATOR
FAN LOW
RELAY
(IN PDC)
K
TO
RADIATOR
FAN HIGH
RELAY
(IN PDC)
(8W-42-10)
67
68
64
C25
12
YL
F12
18
DB/RD
4
RAD
FAN
LOW
RELAY
OUTPUT
RADIATOR
FAN
MOTOR
(8W-42-10)
S109
(8W-11-16)
F12
18
DB/RD
11
C1
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
POWERTRAIN
CONTROL
MODULE
(8W-30-24)

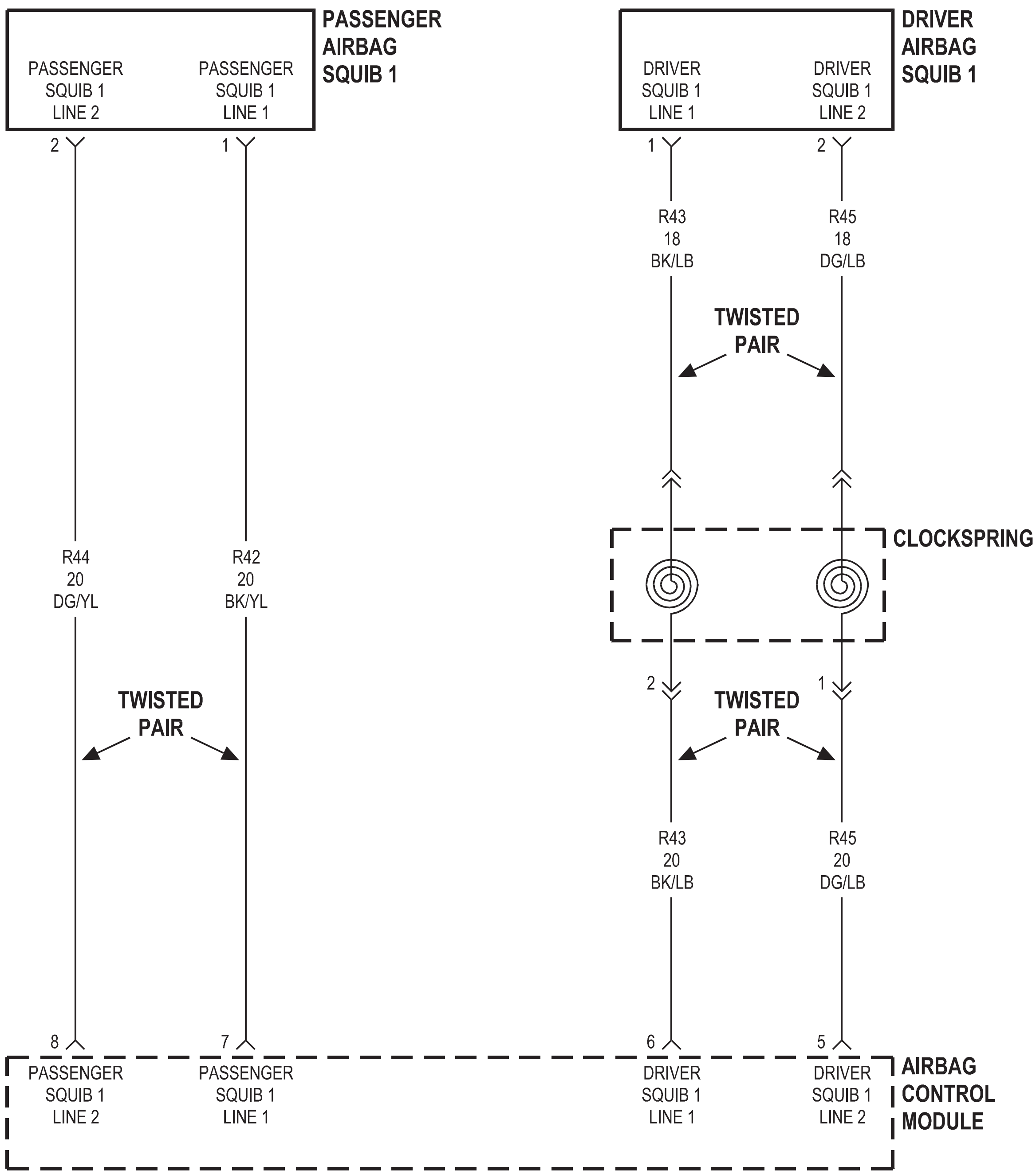

RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
10
FUSE
10
15A
(8W-11-15)
30
F12
18
DB/PK
S243
(8W-11-15)
F12
18
DB/PK
C11
11
C104
F12
18
DB/RD
S109
(8W-11-16)
FROM
S116
(8W-42-9)
K
F12
18
DB/RD
HIGH
SPEED
RAD
FAN
RELAY
CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-24)
4
C3
C27
18
DB/PK
F12
18
DB/RD
A16
12
GY
76
75
RADIATOR FAN CONTROL RELAY (IN PDC)
78
77
74
70
71
RADIATOR FAN HIGH RELAY (IN PDC)
69
73
72
Z1
12
BK
C23
12
DG
C27
18
DB/PK
C23
12
DG
S115
(8W-10-18)
C23
12
DG
66
RADIATOR FAN LOW RELAY (IN PDC)
(8W-42-9)
67
68
G102
(8W-15-4)
4
2
RADIATOR FAN MOTOR
M
M
3
1
C116
12
LG/WT
C25
12
YL
Z1
12
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)

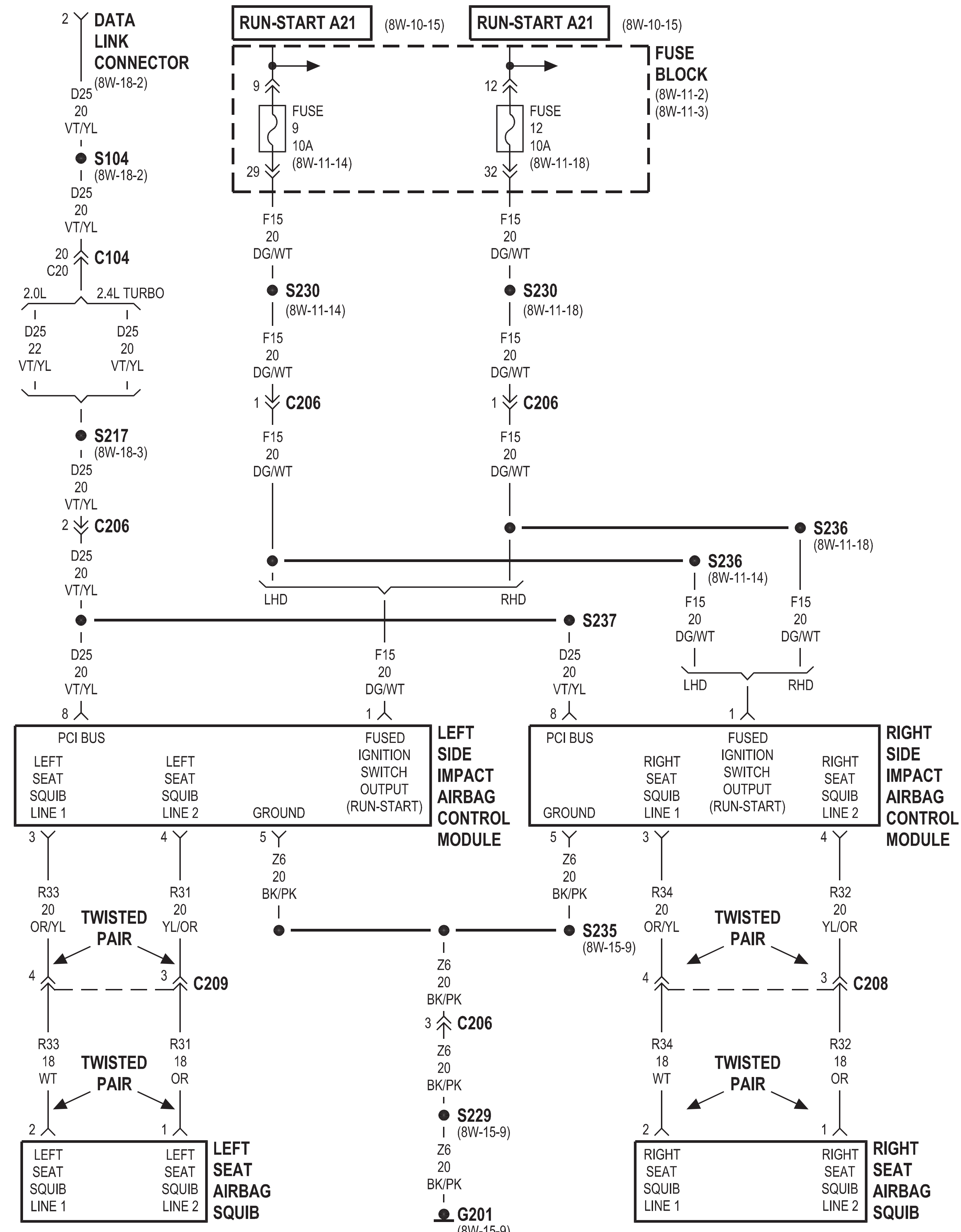
8W-43 AIRBAG SYSTEM


RUN A22
(8W-10-13)
RUN-START A21
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
5
FUSE
5
10A
(8W-11-10)
25
9
FUSE
9
10A
(8W-11-14)
29
11
FUSE
11
10A
(8W-11-14)
31
2
DATA
LINK
CONNECTOR
(8W-18-2)
G5
20
DB/WT
S219
(8W-11-14)
G5
20
DB/WT
F15
20
DG/WT
S230
(8W-11-14)
D25
20
VT/YL
S104
(8W-18-2)
D25
20
VT/YL
9
15
INSTRUMENT
CLUSTER
(8W-40-2)
(8W-40-8)
AIRBAG
WARNING
INDICATOR
INSTRUMENT
PANEL
DRIVER
20
C20
C104
2.0L
2.4L
TURBO
D25
22
VT/YL
D25
20
VT/YL
2
D25
20
VT/YL
S217
(8W-18-3)
F25
20
TN/LG
F15
20
DG/WT
D25
20
VT/YL
15
14
21
FUSED
IGNITION
SWITCH
OUTPUT
(RUN)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
PCI
BUS
AIRBAG
CONTROL
MODULE
GROUND
4
SIDE
AIRBAGS
EXCEPT
SIDE AIRBAGS
Z6
20
BK/PK
S229
(8W-15-9)
Z6
20
BK/PK
Z6
20
BK/PK
G201
(8W-15-9)
••• AUTOSTICK
•••• EXCEPT AUTOSTICK

RHD


RUN A22
(8W-10-13)
RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-3)
FUSE 8 10A
(8W-11-13)
FUSE 12 10A
(8W-11-18)
FUSE 10 10A
(8W-11-14)
G5 20 DB/WT
DATA LINK CONNECTOR
(8W-18-2)
S219
(8W-11-14)
F15 20 DG/WT
D25 20 VT/YL
S230
(8W-11-18)
S104
(8W-18-2)
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-8)
AIRBAG WARNING INDICATOR
INSTRUMENT PANEL DRIVER
C104
C20
D25 22 VT/YL
S217
(8W-18-3)
F25 20 TN/LG
AIRBAG CONTROL MODULE
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
GROUND
SIDE AIRBAGS
EXCEPT SIDE AIRBAGS
Z6 20 BK/PK
S229
(8W-15-9)
G201
(8W-15-9)
AUTOSTICK
EXCEPT AUTOSTICK

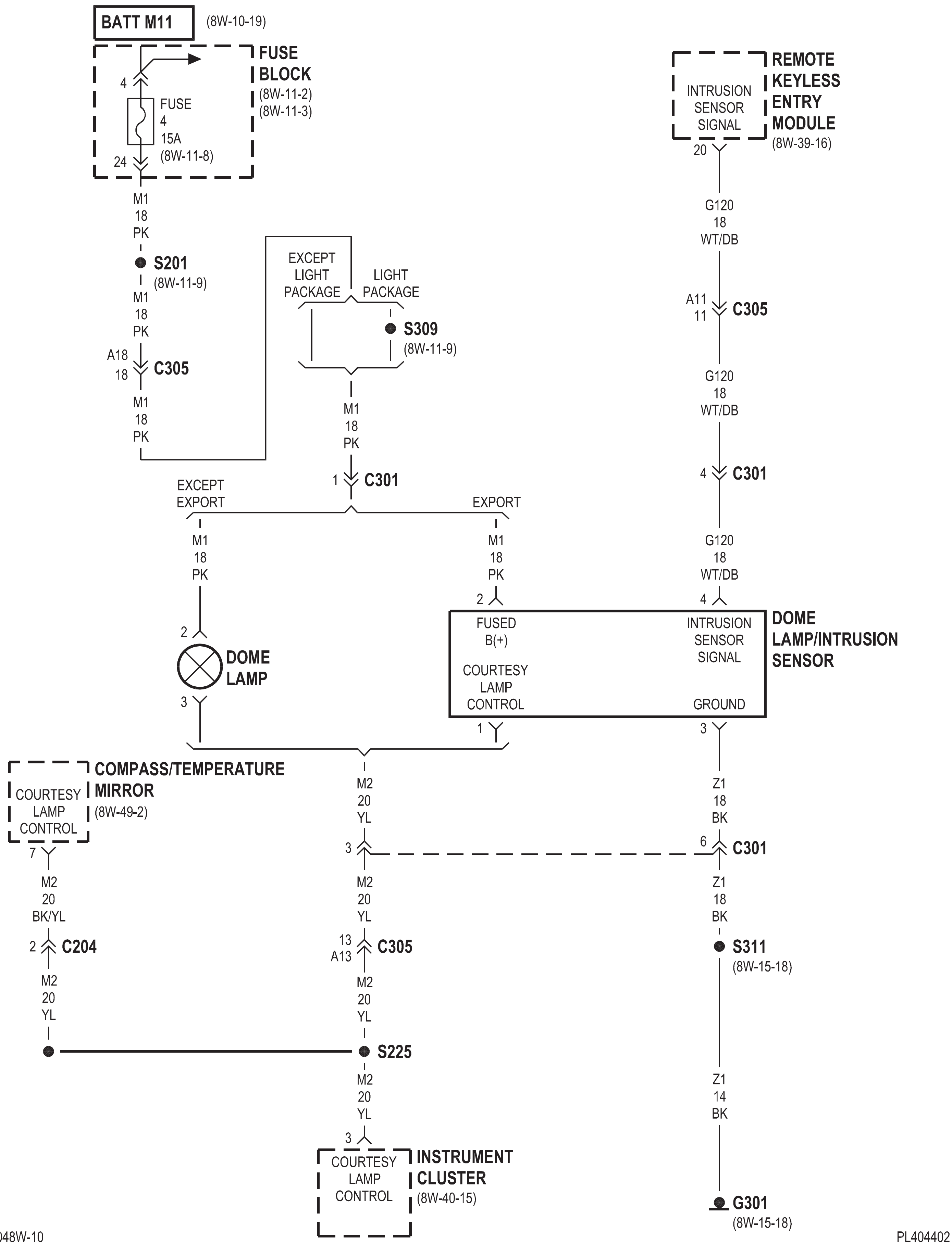

PASSENGER AIRBAG SQUIB 1
PASSENGER SQUIB 1 LINE 2
PASSENGER SQUIB 1 LINE 1
2
1
R44 20 DG/YL
R42 20 BK/YL
TWISTED PAIR
8
7
DRIVER AIRBAG SQUIB 1
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
1
2
R43 18 BK/LB
R45 18 DG/LB
TWISTED PAIR
CLOCKSPRING
2
1
TWISTED PAIR
R43 20 BK/LB
R45 20 DG/LB
6
5
PASSENGER SQUIB 1 LINE 2
PASSENGER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
AIRBAG CONTROL MODULE

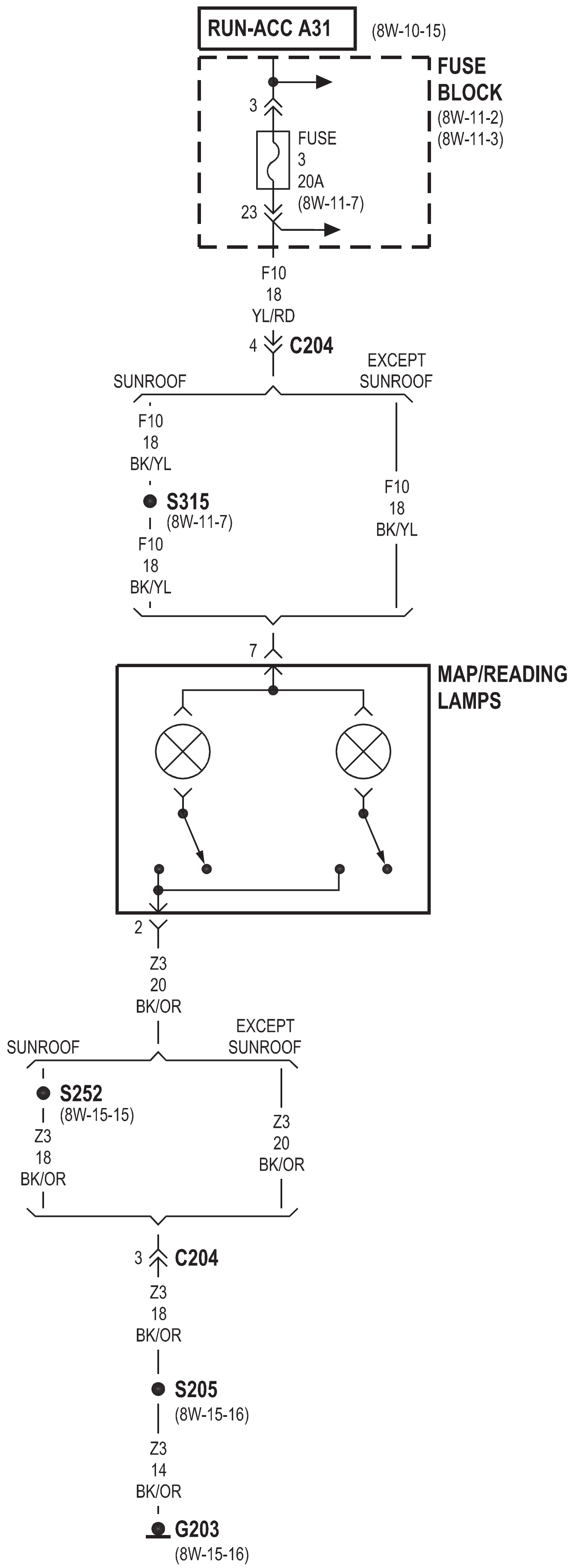


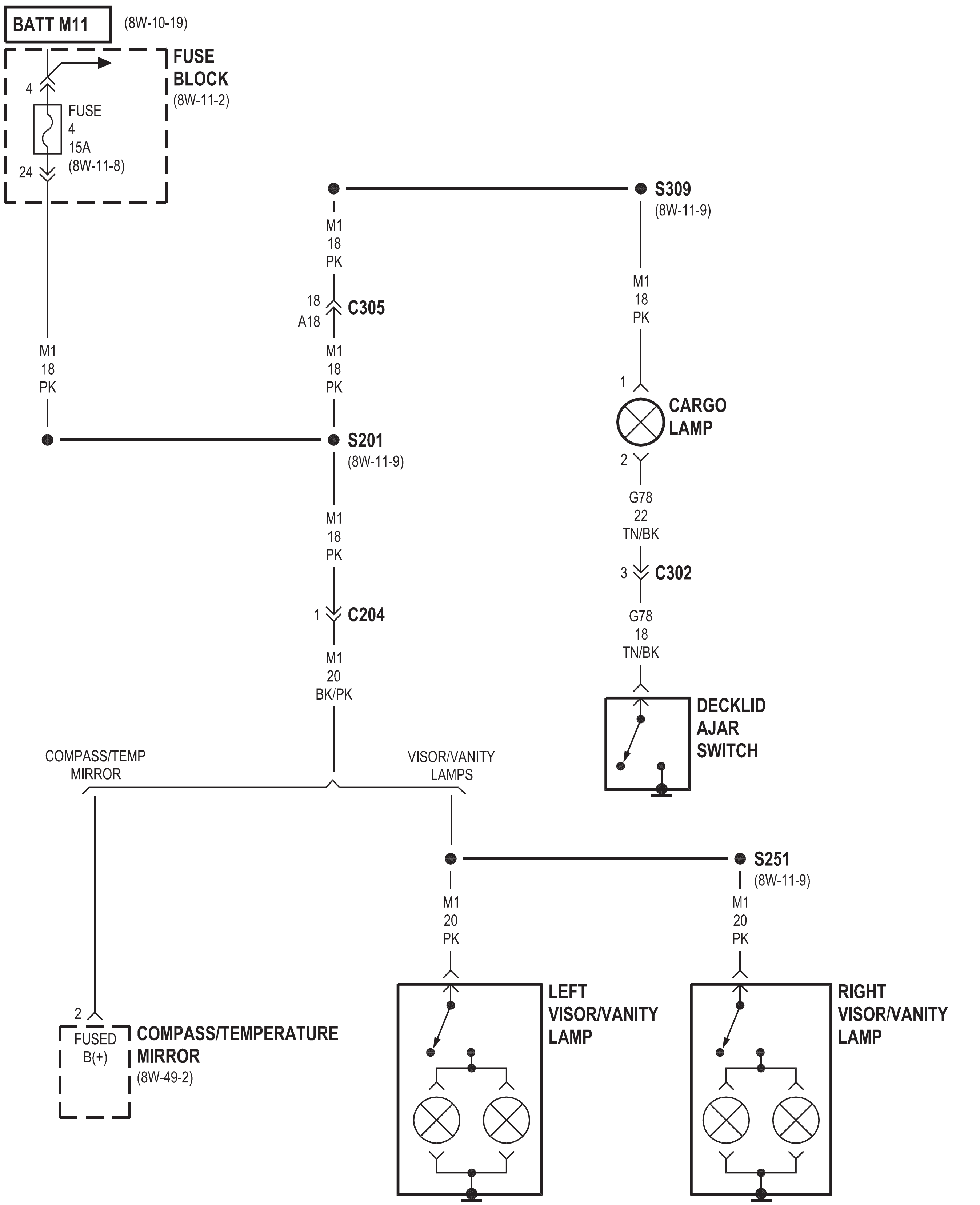
PL404305

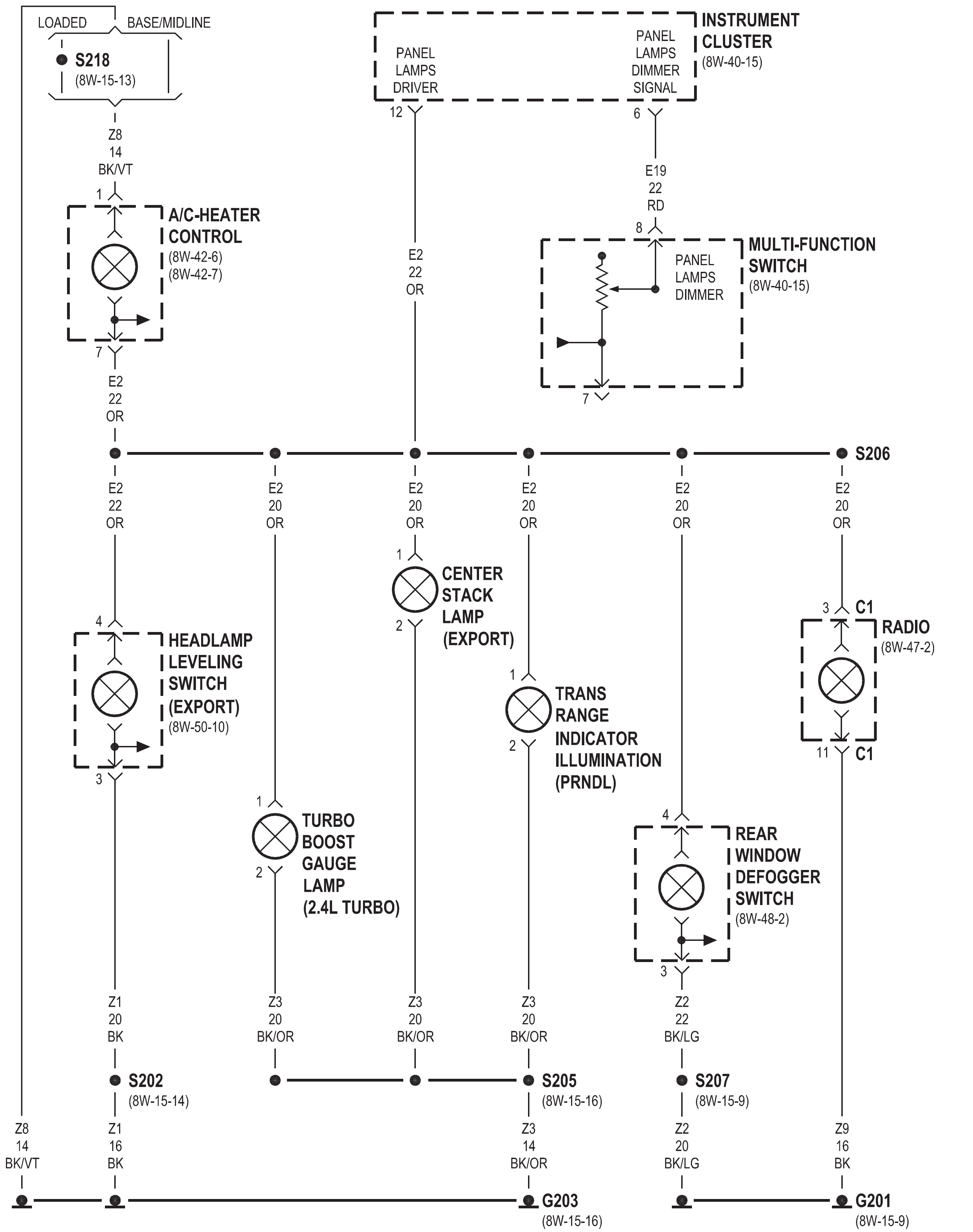
048W-10

8W-44 INTERIOR LIGHTING

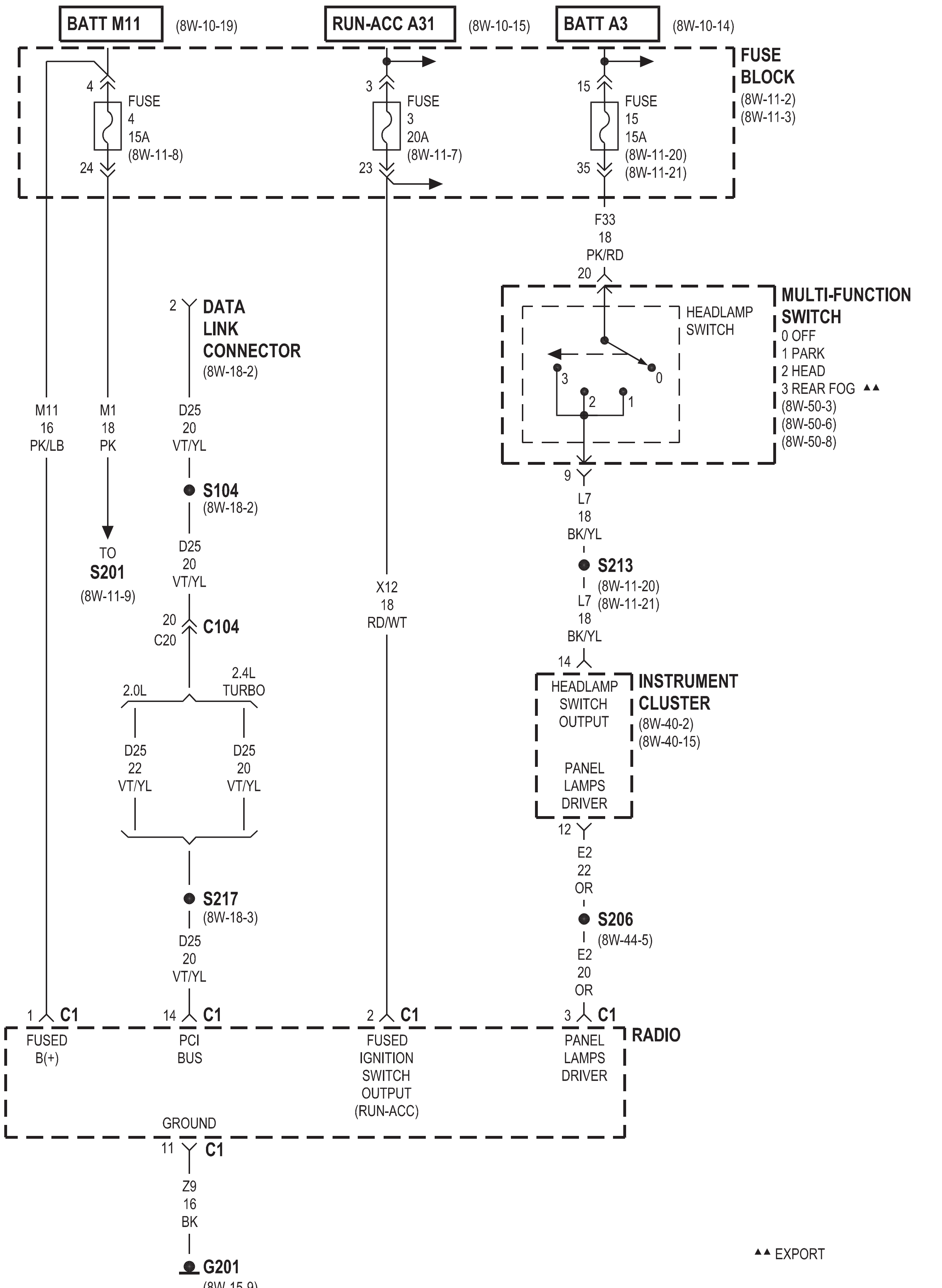

BATT M11
(8W-10-19)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
4
FUSE
4
15A
(8W-11-8)
24
M1
18
PK
S201
(8W-11-9)
M1
18
PK
A18
18
C305
M1
18
PK
EXCEPT LIGHT PACKAGE
LIGHT PACKAGE
S309
(8W-11-9)
M1
18
PK
1
C301
EXCEPT EXPORT
EXPORT
M1
18
PK
M1
18
PK
2
DOME LAMP
3
2
FUSED B(+)
COURTESY LAMP CONTROL
INTRUSION SENSOR SIGNAL
GROUND
1
3
4
DOME LAMP/INTRUSION SENSOR
REMOTE KEYLESS ENTRY MODULE
INTRUSION SENSOR SIGNAL
(8W-39-16)
20
G120
18
WT/DB
A11
11
C305
G120
18
WT/DB
4
C301
G120
18
WT/DB
COMPASS/TEMPERATURE MIRROR
COURTESY LAMP CONTROL
(8W-49-2)
7
M2
20
BK/YL
2
C204
M2
20
YL
M2
20
YL
3
M2
20
YL
13
A13
C305
M2
20
YL
S225
M2
20
YL
3
INSTRUMENT CLUSTER
COURTESY LAMP CONTROL
(8W-40-15)
Z1
18
BK
6
C301
Z1
18
BK
S311
(8W-15-18)
Z1
14
BK
G301
(8W-15-18)

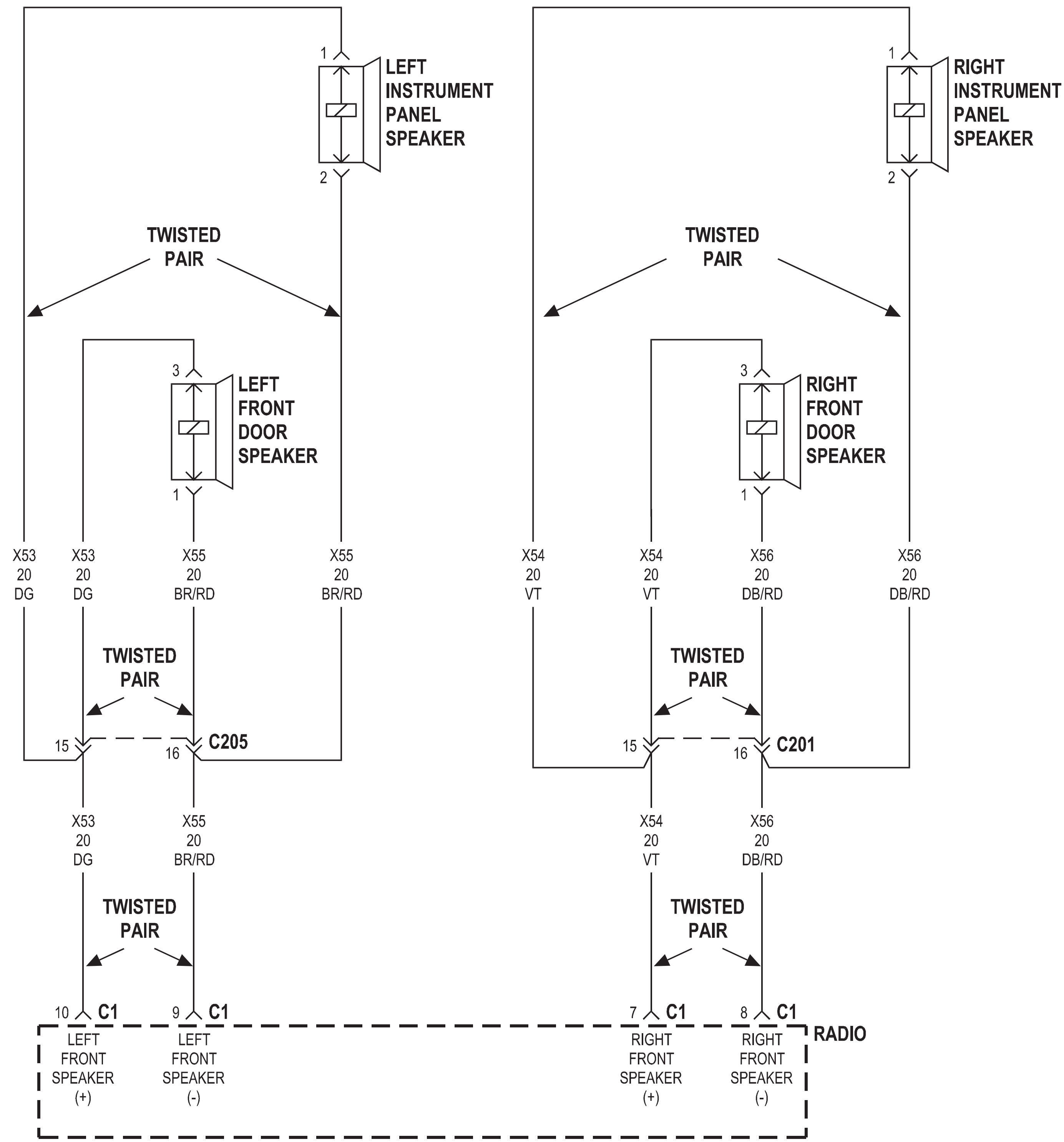

RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
3
FUSE
3
20A
(8W-11-7)
23
F10
18
YL/RD
4
C204
SUNROOF
EXCEPT
SUNROOF
F10
18
BK/YL
S315
(8W-11-7)
F10
18
BK/YL
F10
18
BK/YL
7
MAP/READING
LAMPS
2
Z3
20
BK/OR
SUNROOF
EXCEPT
SUNROOF
S252
(8W-15-15)
Z3
18
BK/OR
Z3
20
BK/OR
3
C204
Z3
18
BK/OR
S205
(8W-15-16)
Z3
14
BK/OR
G203
(8W-15-16)

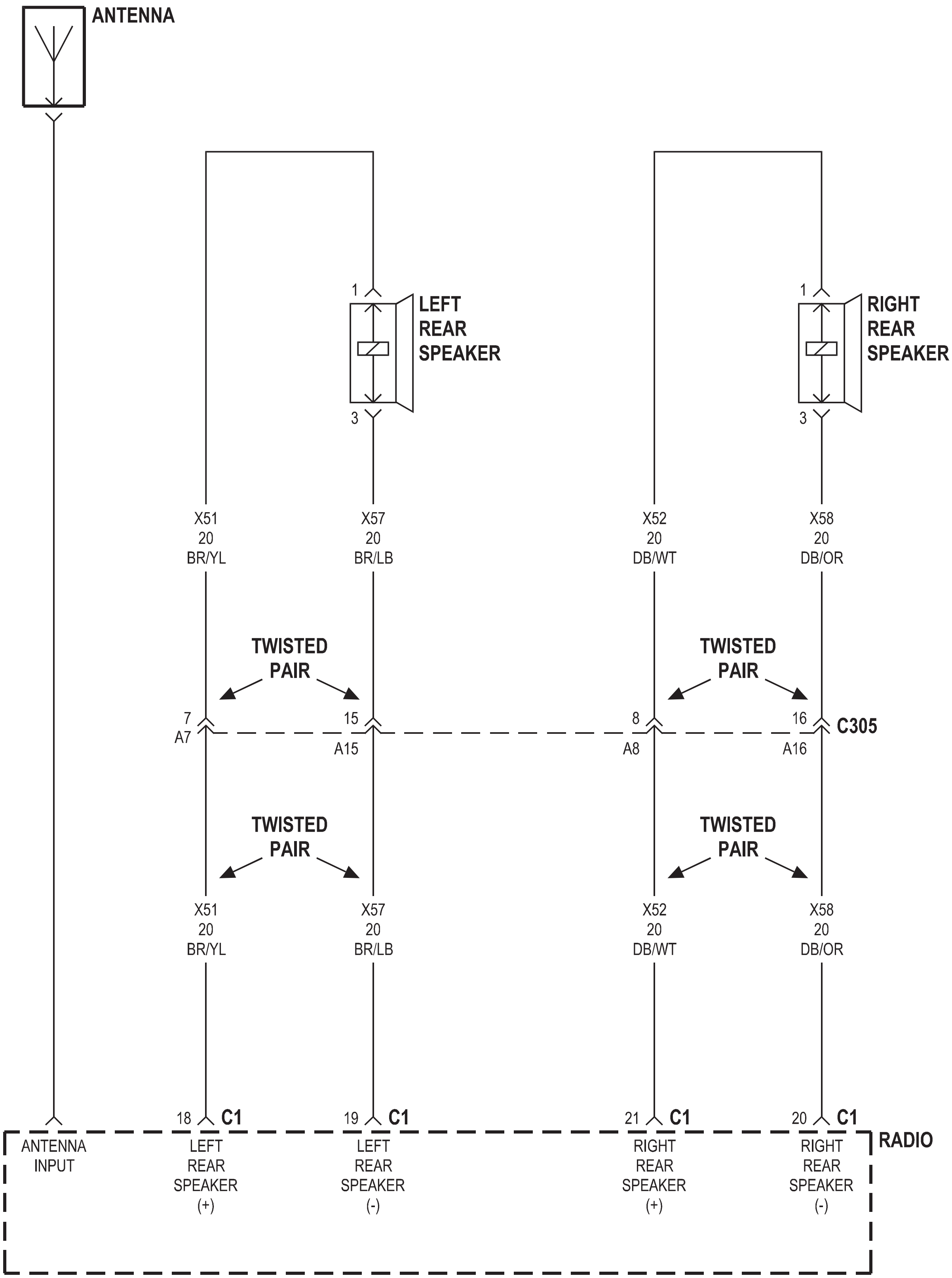

BATT M11
(8W-10-19)
FUSE
BLOCK
(8W-11-2)
4
FUSE
4
15A
(8W-11-8)
24
M1
18
PK
S201
(8W-11-9)
M1
18
PK
18
A18
C305
M1
18
PK
S309
(8W-11-9)
M1
18
PK
1
CARGO
LAMP
2
G78
22
TN/BK
3
C302
G78
18
TN/BK
DECKLID
AJAR
SWITCH
M1
18
PK
1
C204
M1
20
BK/PK
COMPASS/TEMP
MIRROR
VISOR/VANITY
LAMPS
S251
(8W-11-9)
M1
20
PK
M1
20
PK
2
FUSED
B(+)
COMPASS/TEMPERATURE
MIRROR
(8W-49-2)
LEFT
VISOR/VANITY
LAMP
RIGHT
VISOR/VANITY
LAMP

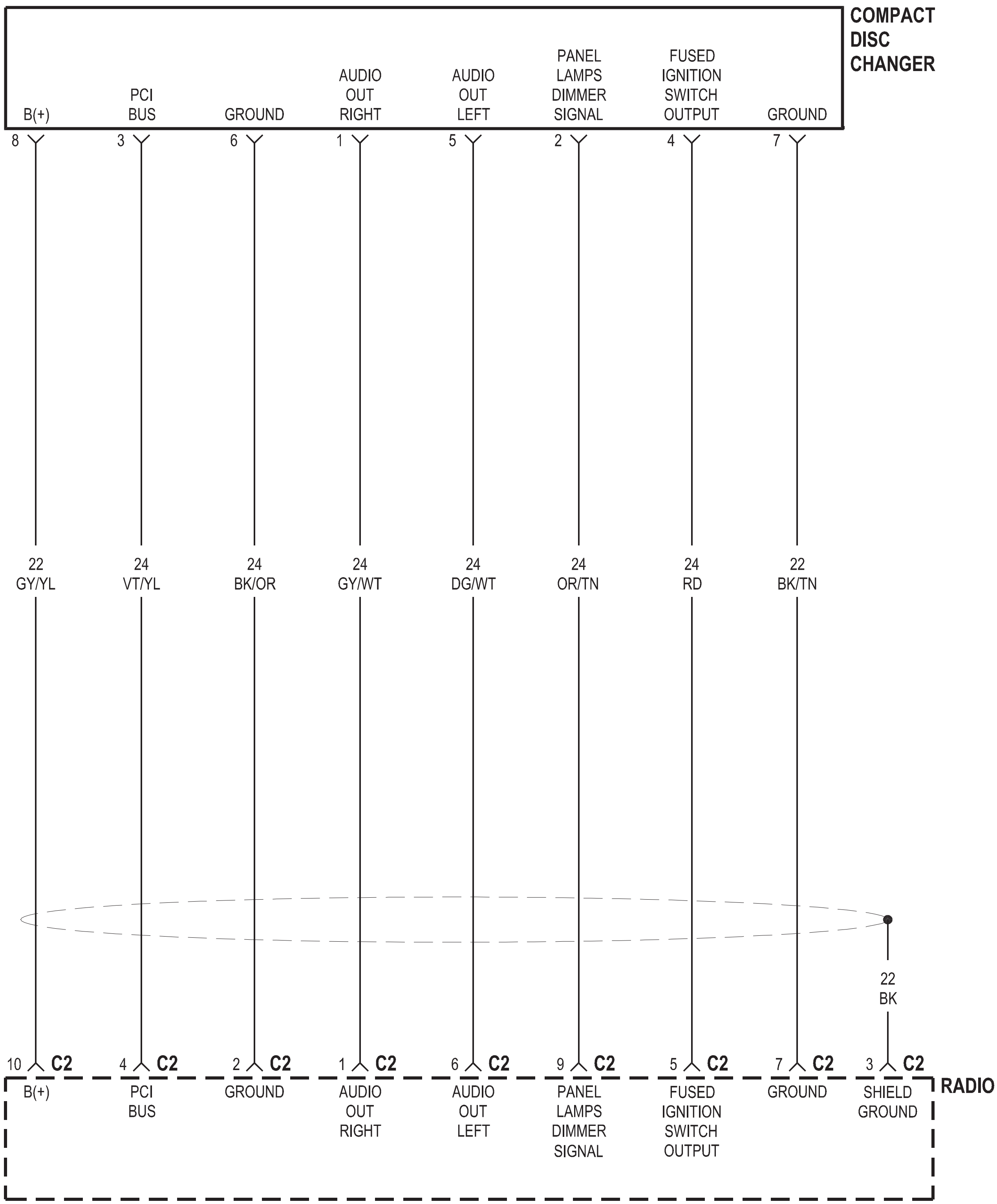

LOADED
BASE/MIDLINE
S218
(8W-15-13)
Z8
14
BK/VT
INSTRUMENT CLUSTER
(8W-40-15)
PANEL LAMPS DRIVER
PANEL LAMPS DIMMER SIGNAL
12
6
E19
22
RD
8
MULTI-FUNCTION SWITCH
(8W-40-15)
PANEL LAMPS DIMMER
7
1
A/C-HEATER CONTROL
(8W-42-6)
(8W-42-7)
7
E2
22
OR
S206
E2
20
OR
CENTER STACK LAMP (EXPORT)
HEADLAMP LEVELING SWITCH (EXPORT)
(8W-50-10)
TRANS RANGE INDICATOR ILLUMINATION (PRNDL)
C1
RADIO
(8W-47-2)
TURBO BOOST GAUGE LAMP (2.4L TURBO)
REAR WINDOW DEFOGGER SWITCH
(8W-48-2)
Z1
20
BK
Z3
20
BK/OR
Z2
22
BK/LG
S202
(8W-15-14)
S205
(8W-15-16)
S207
(8W-15-9)
Z1
16
BK
Z3
14
BK/OR
Z2
20
BK/LG
Z9
16
BK
G203
(8W-15-16)
G201
(8W-15-9)

8W-47 AUDIO SYSTEM

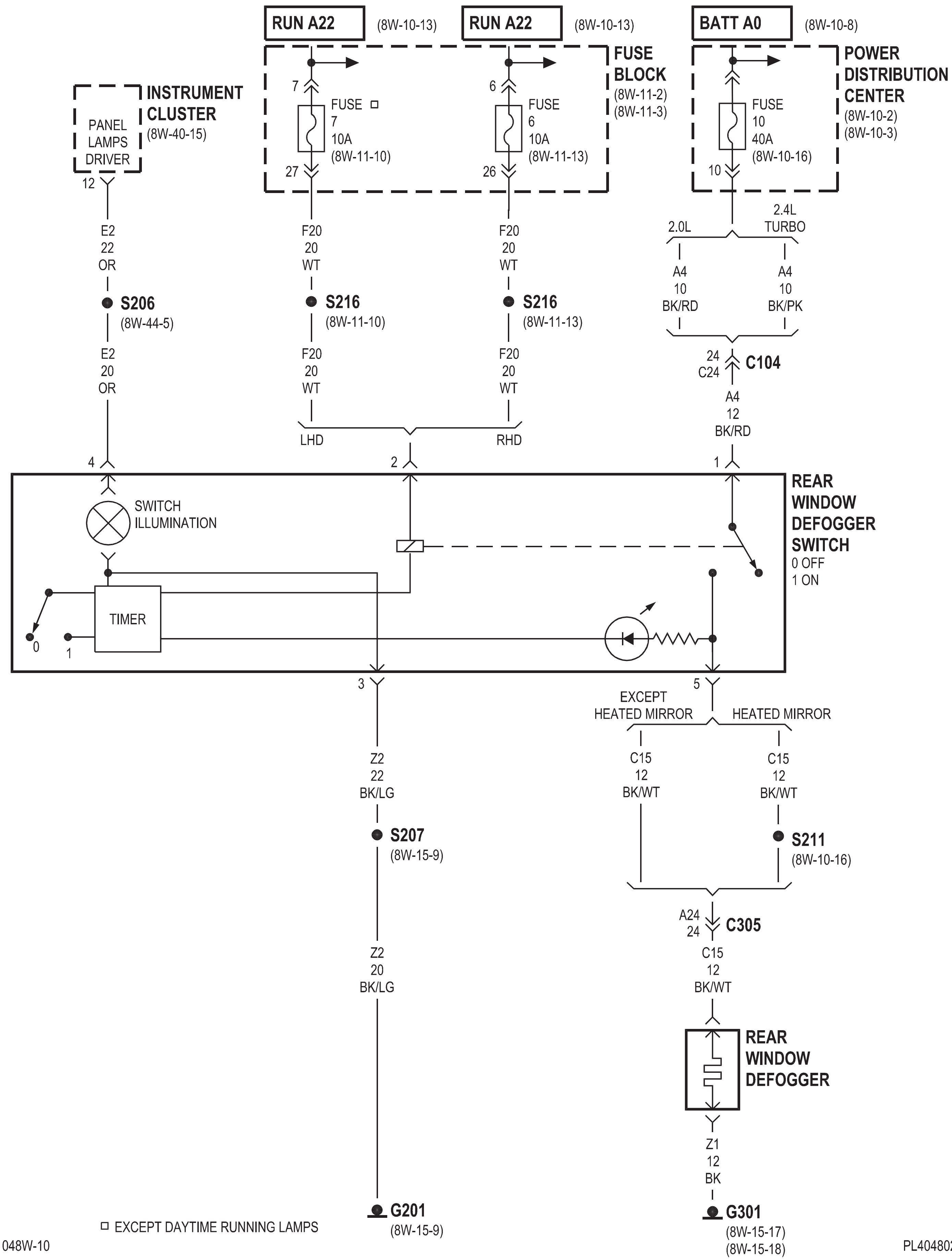

BATT M11
(8W-10-19)
RUN-ACC A31
(8W-10-15)
BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 4 15A (8W-11-8)
FUSE 3 20A (8W-11-7)
FUSE 15 15A (8W-11-20) (8W-11-21)
F33 18 PK/RD
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▲▲
(8W-50-3)
(8W-50-6)
(8W-50-8)
DATA LINK CONNECTOR
(8W-18-2)
M11 16 PK/LB
M1 18 PK
D25 20 VT/YL
S104
(8W-18-2)
TO S201
(8W-11-9)
L7 18 BK/YL
S213
(8W-11-20)
(8W-11-21)
X12 18 RD/WT
C104
C20
2.0L
2.4L TURBO
D25 22 VT/YL
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-15)
HEADLAMP SWITCH OUTPUT
PANEL LAMPS DRIVER
E2 22 OR
S206
(8W-44-5)
E2 20 OR
S217
(8W-18-3)
C1
RADIO
FUSED B(+)
PCI BUS
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
GROUND
Z9 16 BK
G201
(8W-15-9)
▲▲ EXPORT


LEFT
INSTRUMENT
PANEL
SPEAKER
RIGHT
INSTRUMENT
PANEL
SPEAKER
TWISTED
PAIR
LEFT
FRONT
DOOR
SPEAKER
RIGHT
FRONT
DOOR
SPEAKER
X53
20
DG
X55
20
BR/RD
X54
20
VT
X56
20
DB/RD
C205
C201
C1
LEFT
FRONT
SPEAKER
(+)
LEFT
FRONT
SPEAKER
(-)
RIGHT
FRONT
SPEAKER
(+)
RIGHT
FRONT
SPEAKER
(-)
RADIO


ANTENNA
LEFT REAR SPEAKER
RIGHT REAR SPEAKER
1
3
1
3
X51 20 BR/YL
X57 20 BR/LB
X52 20 DB/WT
X58 20 DB/OR
TWISTED PAIR
TWISTED PAIR
7 A7
15 A15
8 A8
16 A16
C305
TWISTED PAIR
TWISTED PAIR
X51 20 BR/YL
X57 20 BR/LB
X52 20 DB/WT
X58 20 DB/OR
18 C1
19 C1
21 C1
20 C1
RADIO
ANTENNA INPUT
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)


COMPACT
DISC
CHANGER
B(+)
PCI
BUS
GROUND
AUDIO
OUT
RIGHT
AUDIO
OUT
LEFT
PANEL
LAMPS
DIMMER
SIGNAL
FUSED
IGNITION
SWITCH
OUTPUT
GROUND
8
3
6
1
5
2
4
7
22
GY/YL
24
VT/YL
24
BK/OR
24
GY/WT
24
DG/WT
24
OR/TN
24
RD
22
BK/TN
22
BK
10 C2
4 C2
2 C2
1 C2
6 C2
9 C2
5 C2
7 C2
3 C2
RADIO
B(+)
PCI
BUS
GROUND
AUDIO
OUT
RIGHT
AUDIO
OUT
LEFT
PANEL
LAMPS
DIMMER
SIGNAL
FUSED
IGNITION
SWITCH
OUTPUT
GROUND
SHIELD
GROUND

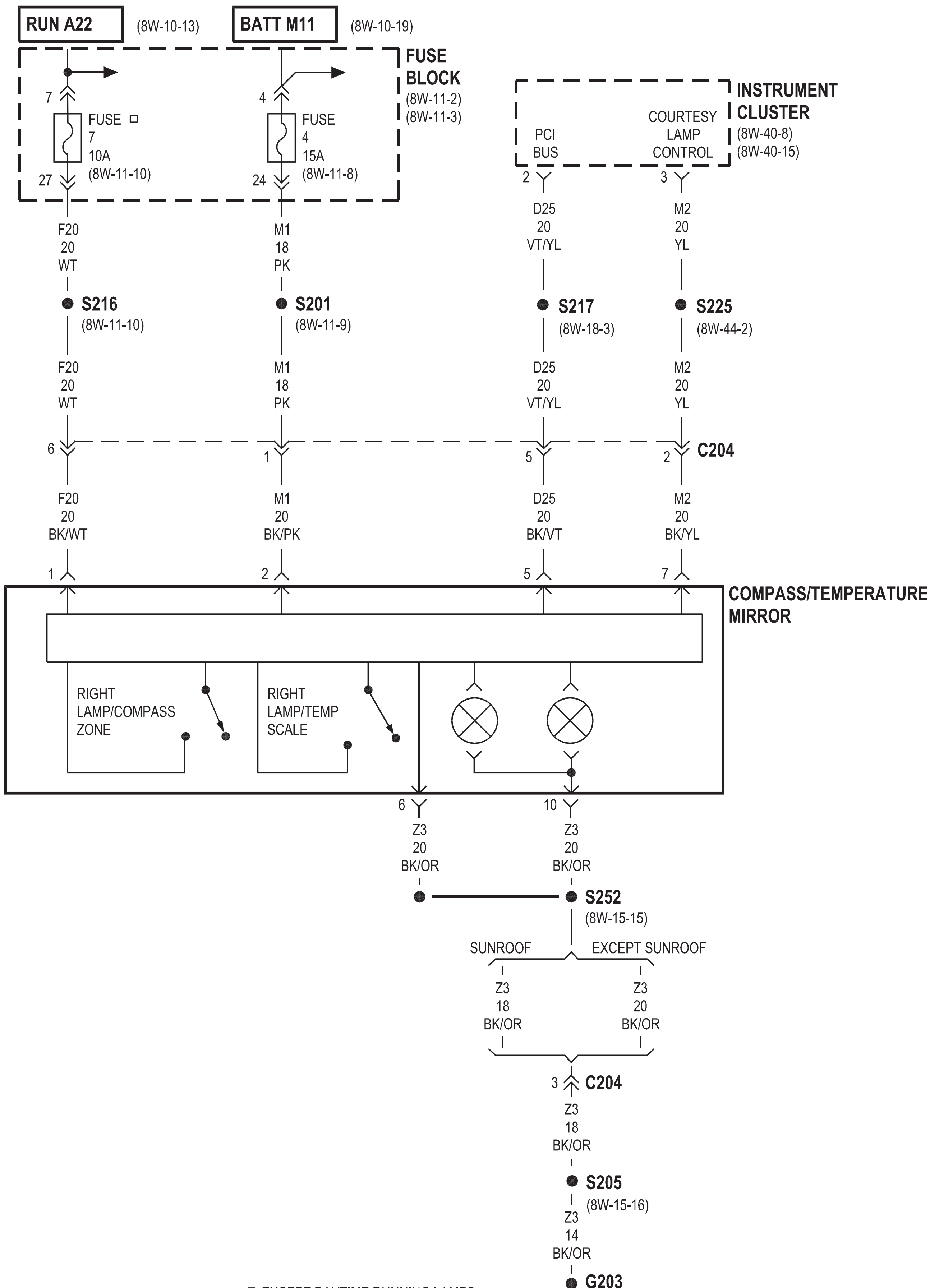
8W-48 REAR WINDOW DEFOGGER



□ EXCEPT DAYTIME RUNNING LAMPS

8W-49 OVERHEAD CONSOLE

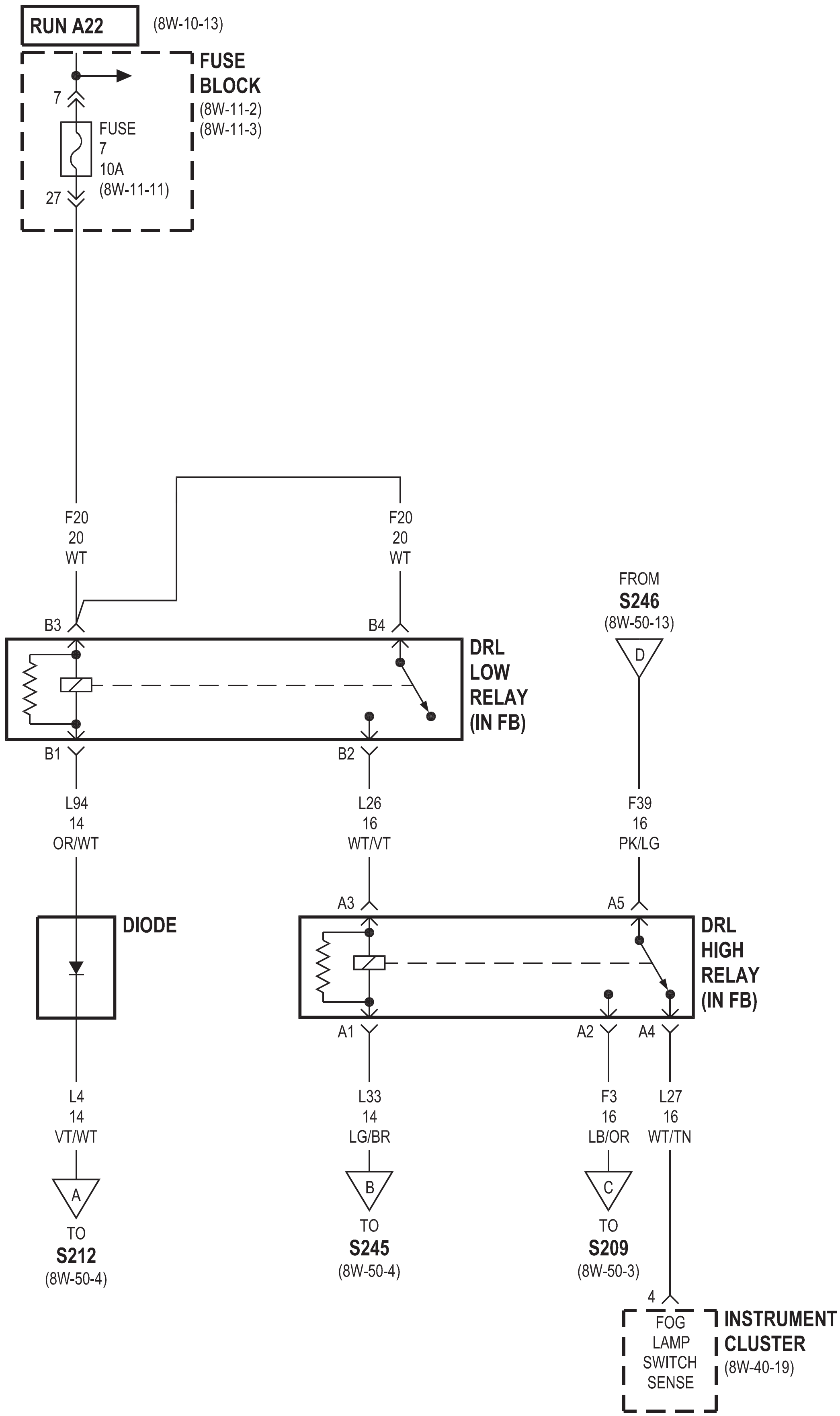
2.0L

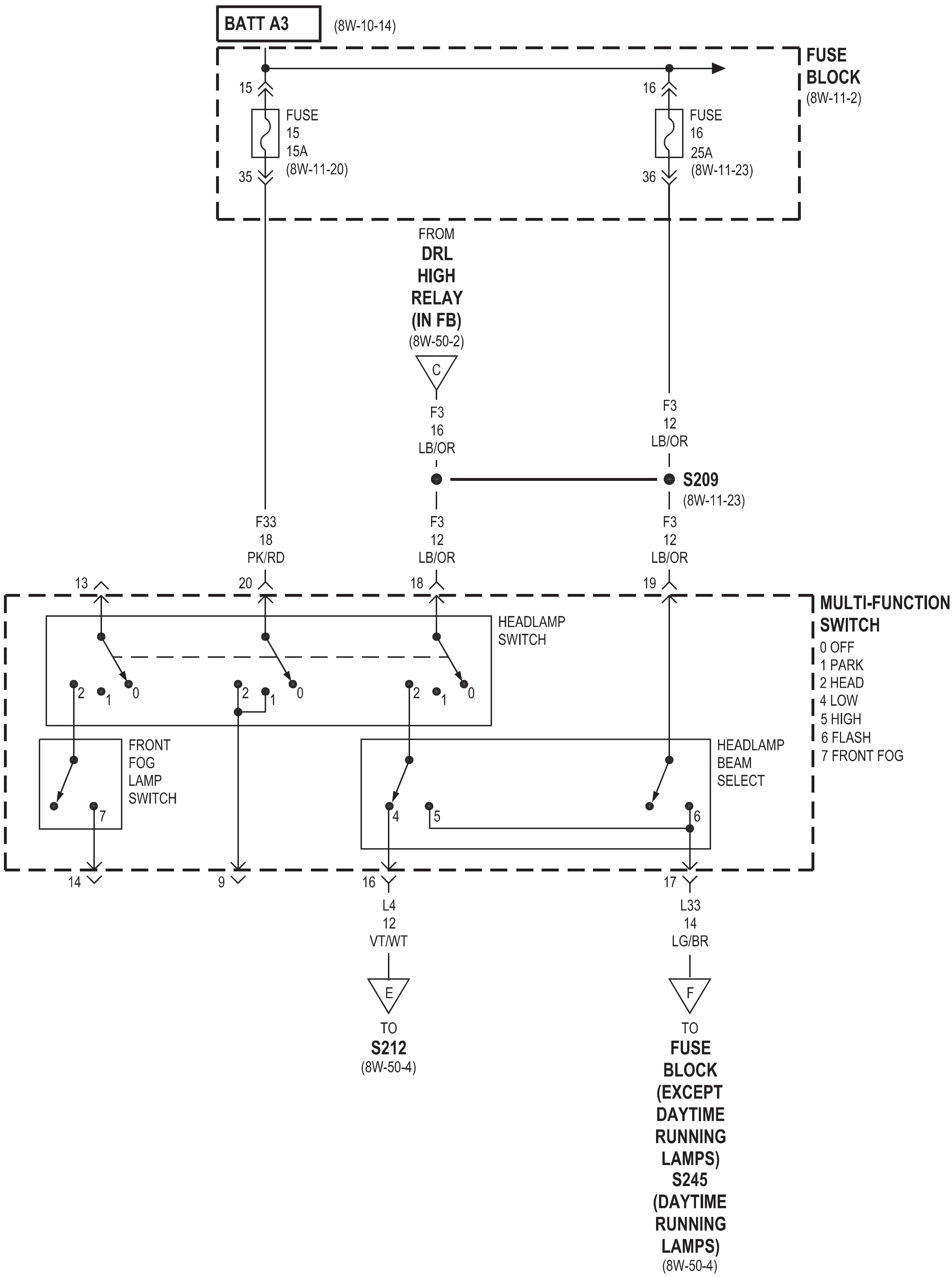


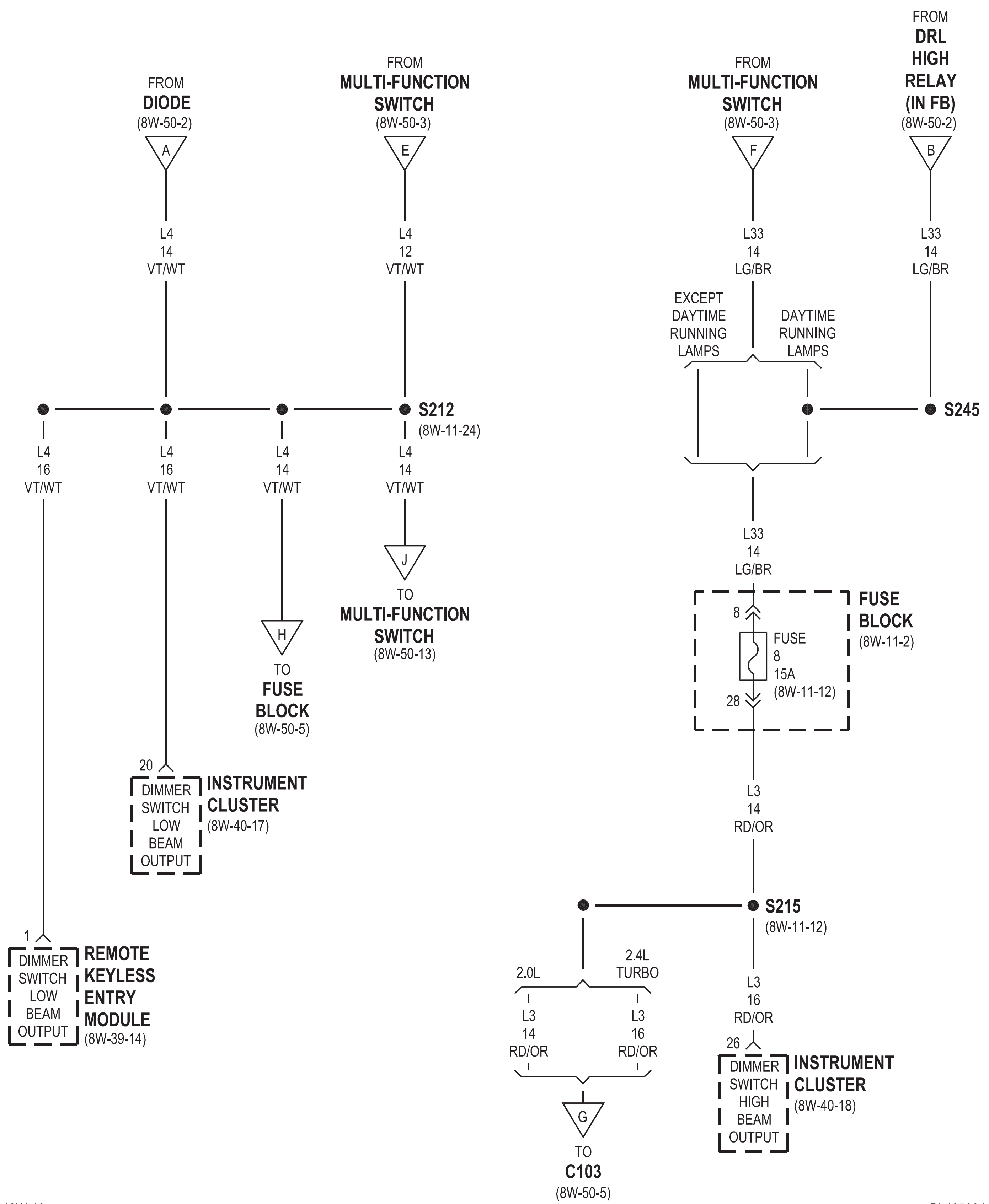
□ EXCEPT DAYTIME RUNNING LAMPS

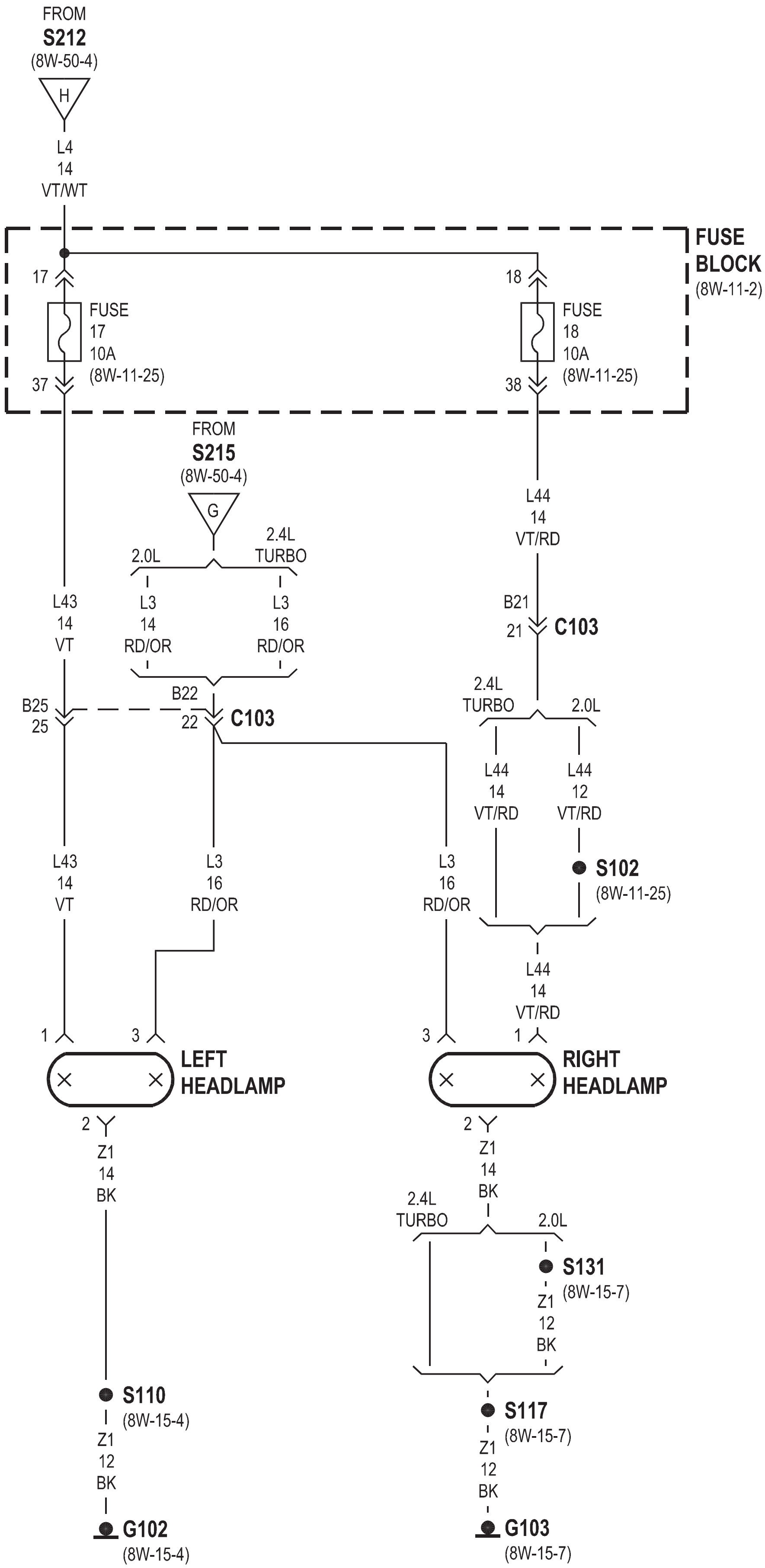
8W-50 FRONT LIGHTING

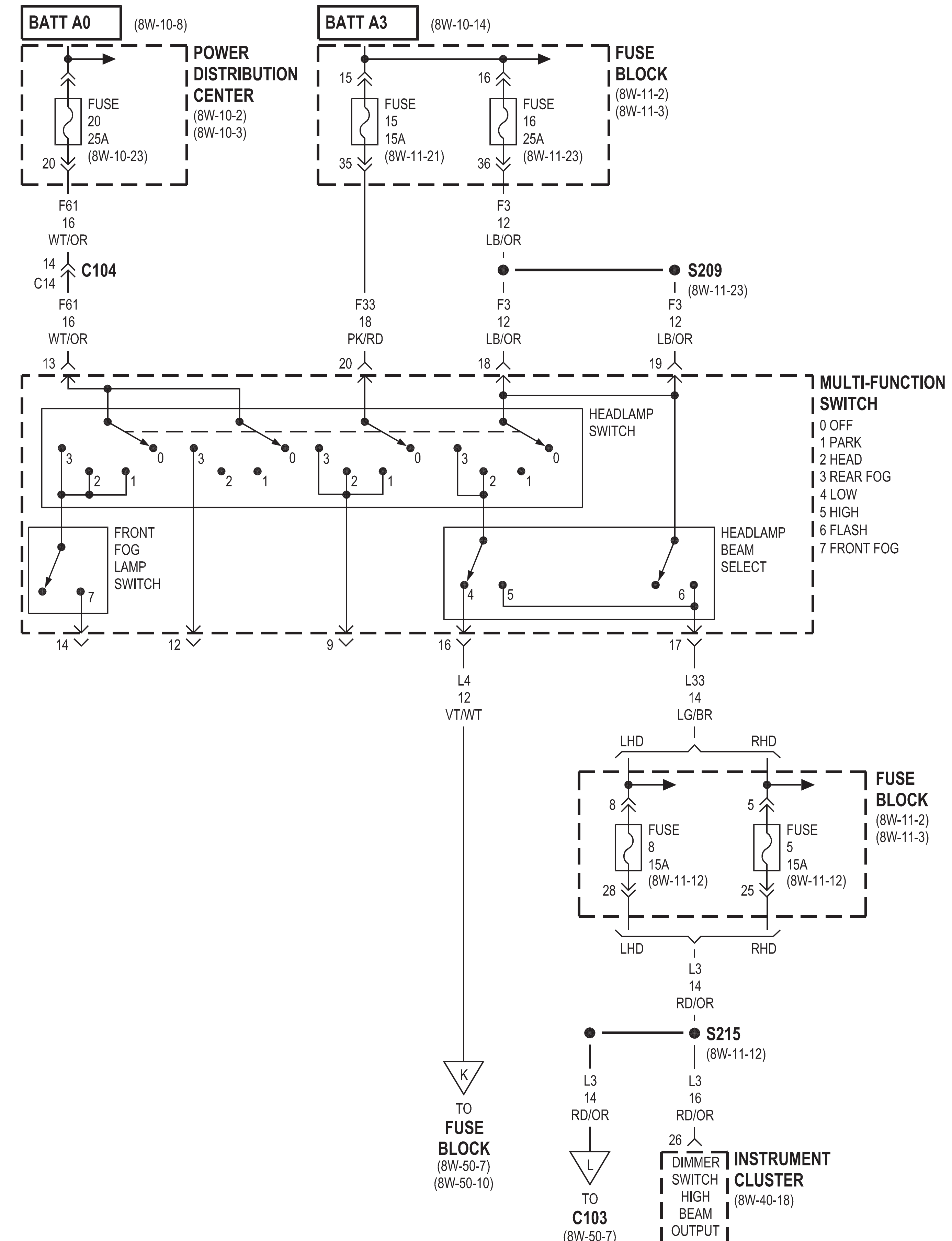
DAYTIME RUNNING LAMPS

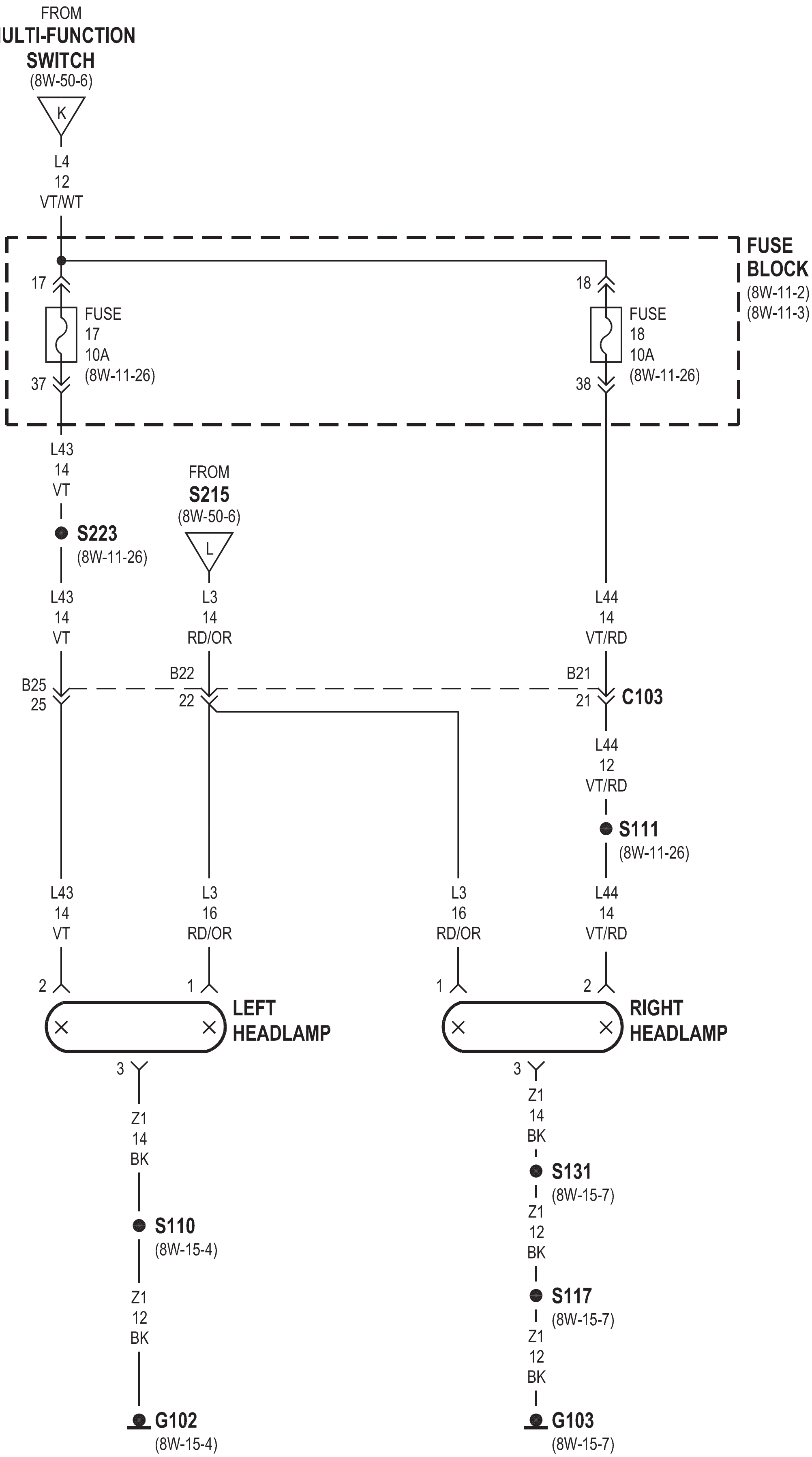


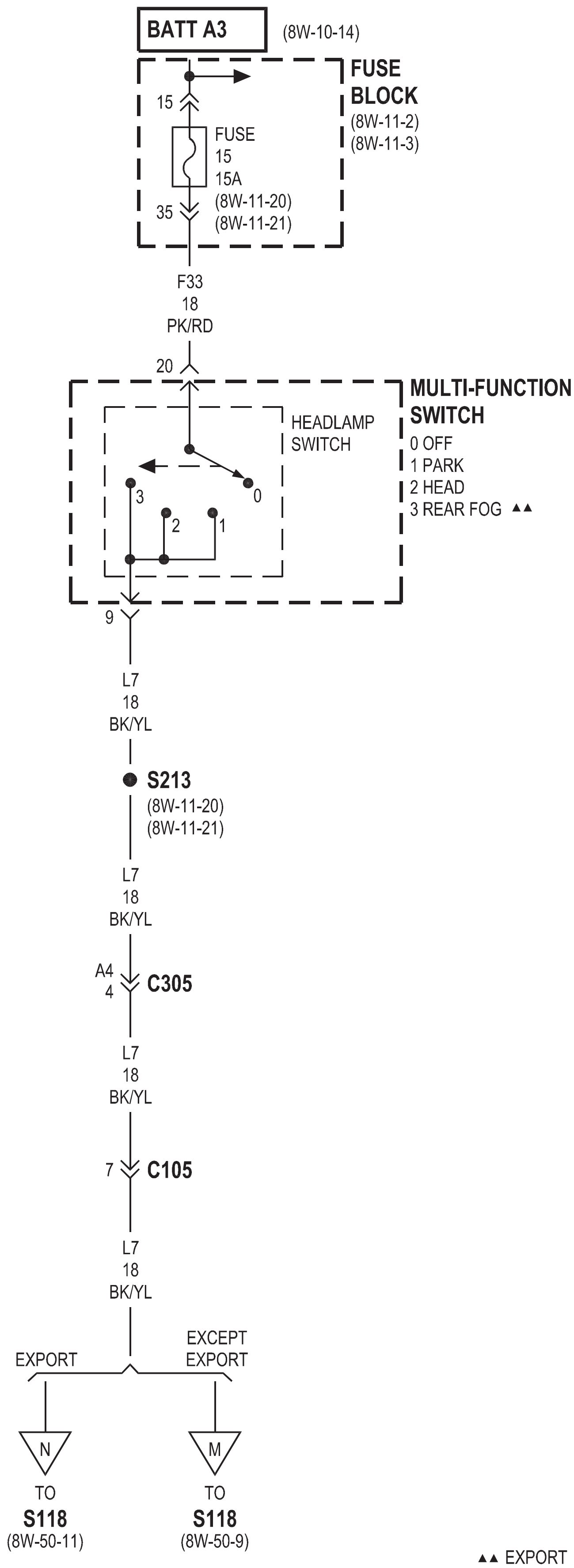

BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
15
16
FUSE 15 15A (8W-11-20)
FUSE 16 25A (8W-11-23)
35
36
FROM DRL HIGH RELAY (IN FB)
(8W-50-2)
C
F3 16 LB/OR
F3 12 LB/OR
S209
(8W-11-23)
F33 18 PK/RD
F3 12 LB/OR
F3 12 LB/OR
13
20
18
19
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
4 LOW
5 HIGH
6 FLASH
7 FRONT FOG
HEADLAMP SWITCH
FRONT FOG LAMP SWITCH
HEADLAMP BEAM SELECT
14
9
16
17
L4 12 VT/WT
L33 14 LG/BR
E
F
TO S212
(8W-50-4)
TO FUSE BLOCK (EXCEPT DAYTIME RUNNING LAMPS) S245 (DAYTIME RUNNING LAMPS)
(8W-50-4)

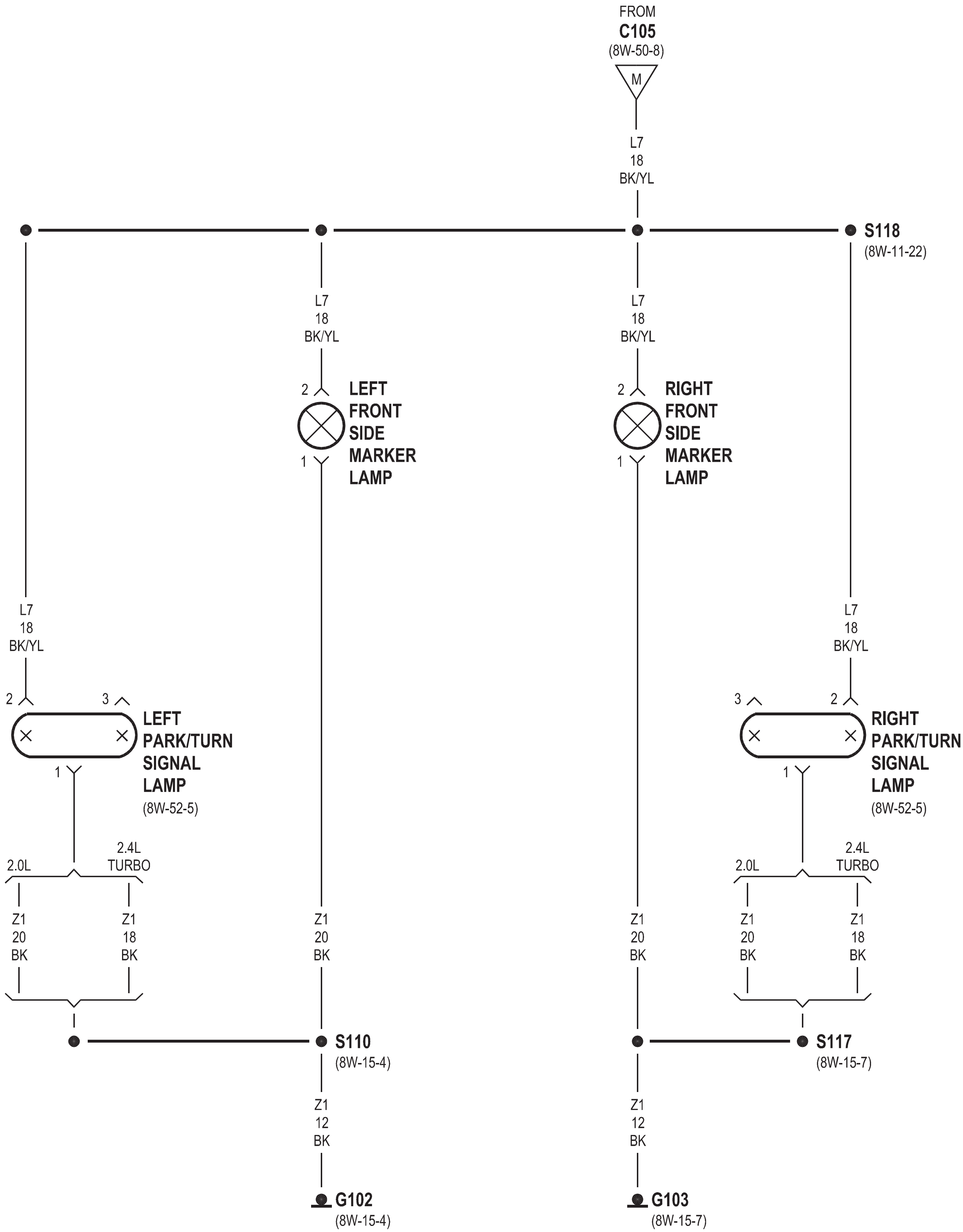

FROM
DIODE
(8W-50-2)
A
L4
14
VT/WT
FROM
MULTI-FUNCTION
SWITCH
(8W-50-3)
E
L4
12
VT/WT
S212
(8W-11-24)
L4
16
VT/WT
L4
16
VT/WT
L4
14
VT/WT
L4
14
VT/WT
J
TO
MULTI-FUNCTION
SWITCH
(8W-50-13)
H
TO
FUSE
BLOCK
(8W-50-5)
20
DIMMER
SWITCH
LOW
BEAM
OUTPUT
INSTRUMENT
CLUSTER
(8W-40-17)
1
DIMMER
SWITCH
LOW
BEAM
OUTPUT
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-14)
FROM
MULTI-FUNCTION
SWITCH
(8W-50-3)
F
L33
14
LG/BR
FROM
DRL
HIGH
RELAY
(IN FB)
(8W-50-2)
B
L33
14
LG/BR
EXCEPT
DAYTIME
RUNNING
LAMPS
DAYTIME
RUNNING
LAMPS
S245
L33
14
LG/BR
8
FUSE
8
15A
(8W-11-12)
28
FUSE
BLOCK
(8W-11-2)
L3
14
RD/OR
S215
(8W-11-12)
2.0L
2.4L
TURBO
L3
14
RD/OR
L3
16
RD/OR
G
TO
C103
(8W-50-5)
L3
16
RD/OR
26
DIMMER
SWITCH
HIGH
BEAM
OUTPUT
INSTRUMENT
CLUSTER
(8W-40-18)

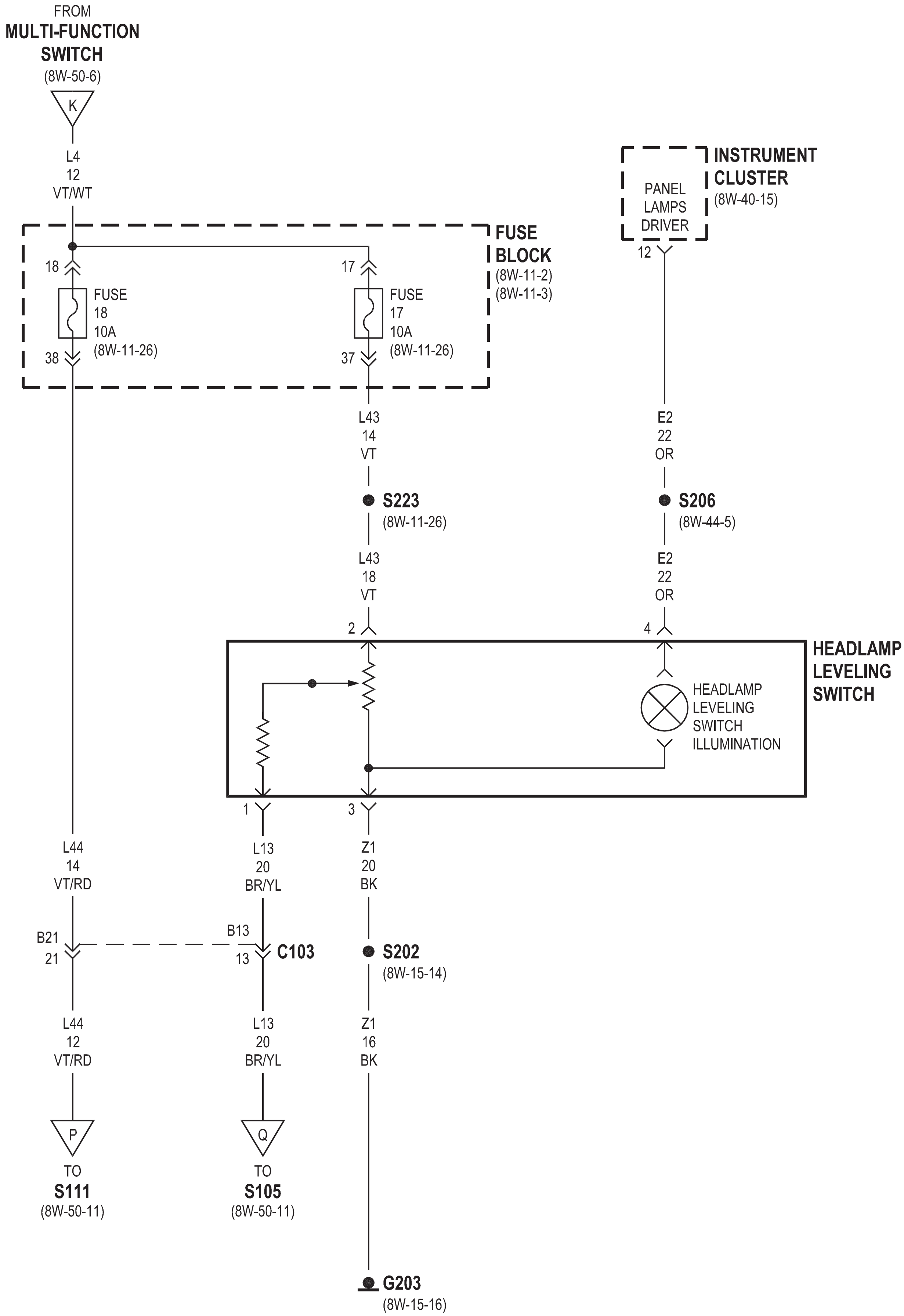

FROM
S212
(8W-50-4)
H
L4
14
VT/WT
FUSE
BLOCK
(8W-11-2)
17
FUSE
17
10A
(8W-11-25)
37
18
FUSE
18
10A
(8W-11-25)
38
FROM
S215
(8W-50-4)
G
2.0L
2.4L
TURBO
L43
14
VT
L3
14
RD/OR
L3
16
RD/OR
L44
14
VT/RD
B21
21
C103
B25
25
B22
22
C103
2.4L
TURBO
2.0L
L44
14
VT/RD
L44
12
VT/RD
S102
(8W-11-25)
L43
14
VT
L3
16
RD/OR
L3
16
RD/OR
L44
14
VT/RD
1
3
LEFT
HEADLAMP
3
1
RIGHT
HEADLAMP
2
Z1
14
BK
2
Z1
14
BK
2.4L
TURBO
2.0L
S131
(8W-15-7)
Z1
12
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

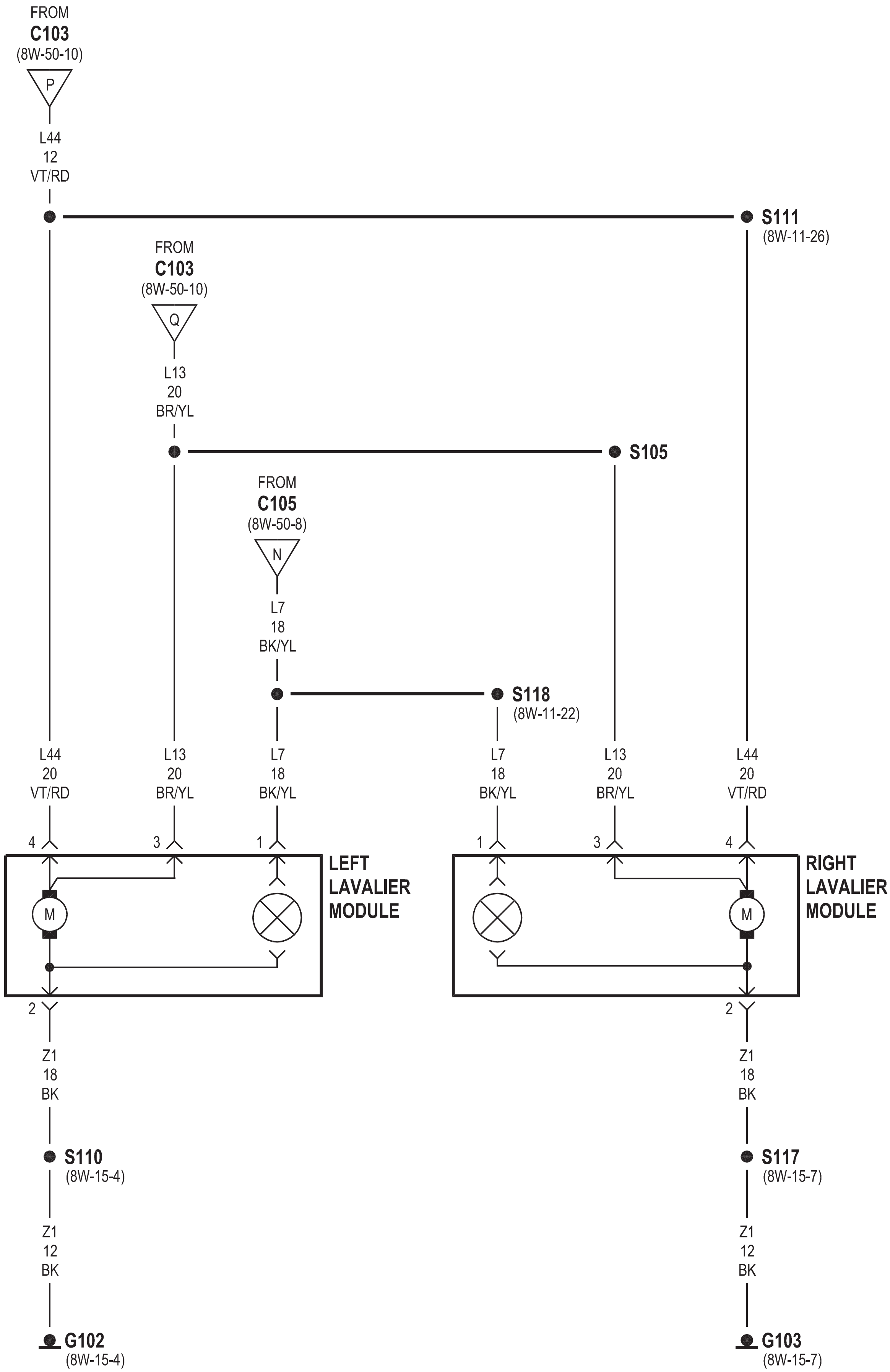

BATT A0
(8W-10-8)
BATT A3
(8W-10-14)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 20 25A (8W-10-23)
20
FUSE BLOCK
(8W-11-2)
(8W-11-3)
15
16
FUSE 15 15A (8W-11-21)
FUSE 16 25A (8W-11-23)
35
36
F61 16 WT/OR
14
C14
C104
F61 16 WT/OR
F3 12 LB/OR
S209
(8W-11-23)
F33 18 PK/RD
F3 12 LB/OR
F3 12 LB/OR
13
20
18
19
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
4 LOW
5 HIGH
6 FLASH
7 FRONT FOG
HEADLAMP SWITCH
0
3
2
1
FRONT FOG LAMP SWITCH
7
HEADLAMP BEAM SELECT
4
5
6
14
12
9
16
17
L4 12 VT/WT
L33 14 LG/BR
LHD
RHD
FUSE BLOCK
(8W-11-2)
(8W-11-3)
8
5
FUSE 8 15A (8W-11-12)
FUSE 5 15A (8W-11-12)
28
25
LHD
RHD
L3 14 RD/OR
S215
(8W-11-12)
L3 14 RD/OR
L3 16 RD/OR
K
TO FUSE BLOCK
(8W-50-7)
(8W-50-10)
L
TO C103
(8W-50-7)
26
DIMMER SWITCH HIGH BEAM OUTPUT
INSTRUMENT CLUSTER
(8W-40-18)

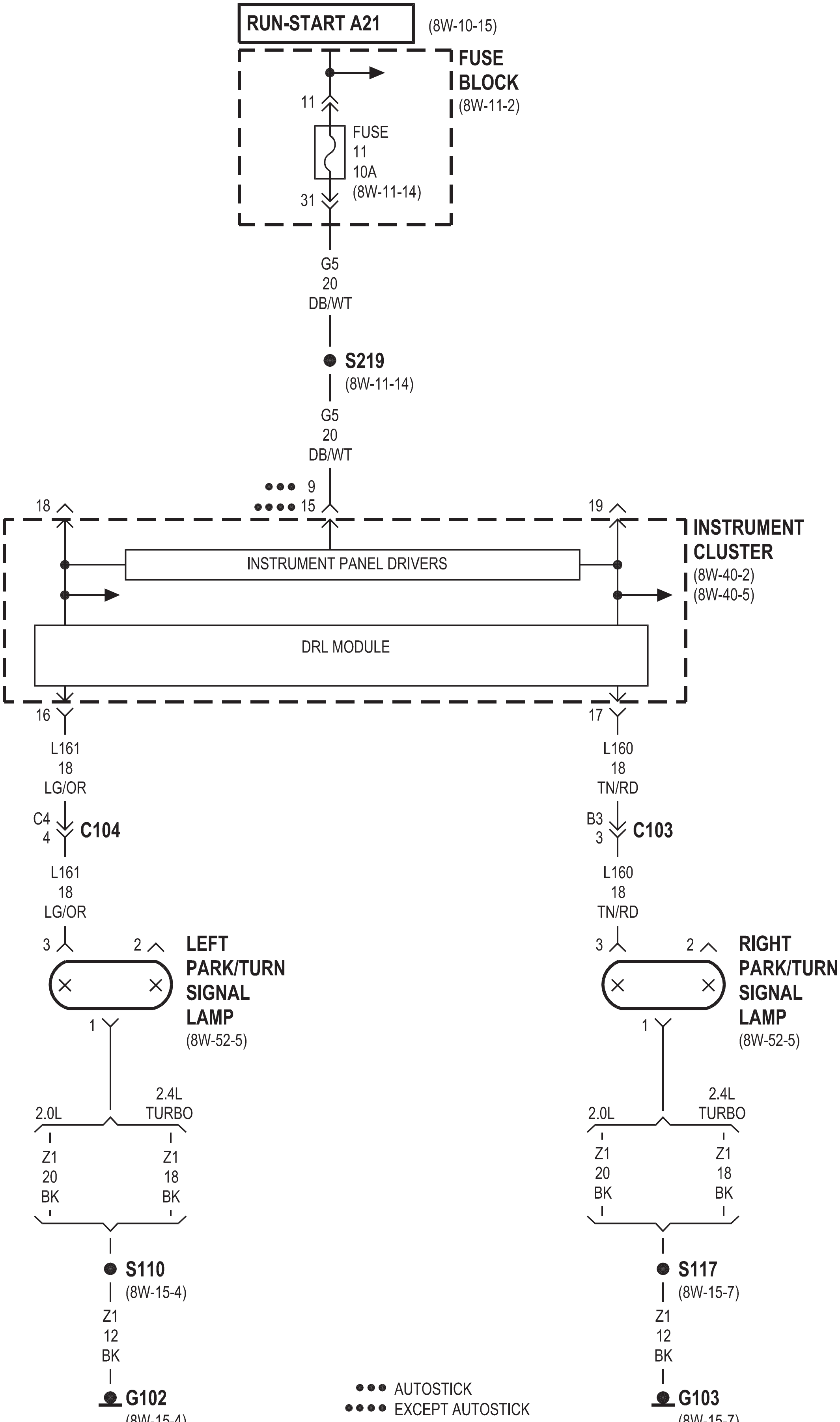

FROM
MULTI-FUNCTION
SWITCH
(8W-50-6)
K
L4
12
VT/WT
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
17
FUSE
17
10A
(8W-11-26)
37
18
FUSE
18
10A
(8W-11-26)
38
L43
14
VT
S223
(8W-11-26)
FROM
S215
(8W-50-6)
L
L3
14
RD/OR
L44
14
VT/RD
B25
25
B22
22
B21
21
C103
L44
12
VT/RD
S111
(8W-11-26)
L43
14
VT
L3
16
RD/OR
L3
16
RD/OR
L44
14
VT/RD
2
1
LEFT
HEADLAMP
1
2
RIGHT
HEADLAMP
3
Z1
14
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
3
Z1
14
BK
S131
(8W-15-7)
Z1
12
BK
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

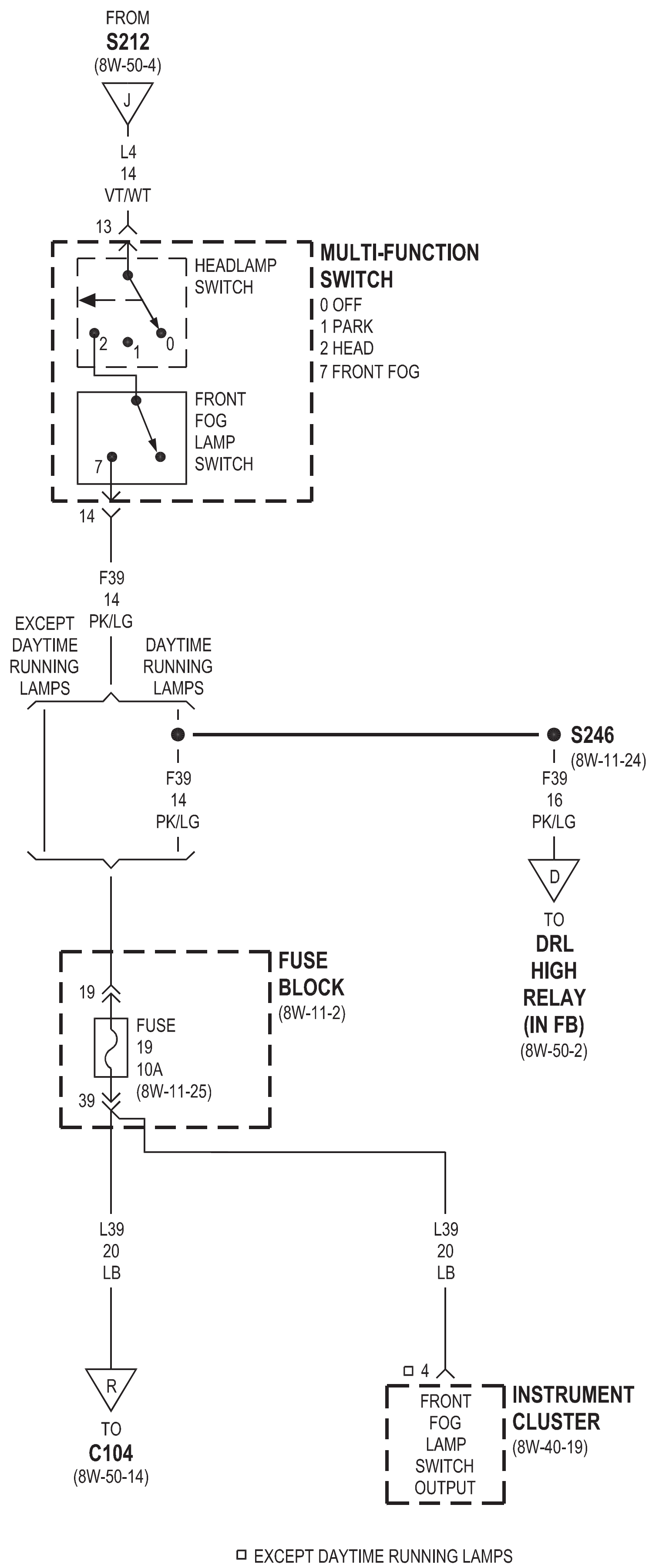

BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
15
FUSE
15
15A
(8W-11-20)
(8W-11-21)
35
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG ▴▴
HEADLAMP SWITCH
3
0
2
1
9
L7
18
BK/YL
S213
(8W-11-20)
(8W-11-21)
L7
18
BK/YL
A4
4
C305
L7
18
BK/YL
7
C105
L7
18
BK/YL
EXPORT
EXCEPT EXPORT
N
M
TO
S118
(8W-50-11)
TO
S118
(8W-50-9)
▴▴ EXPORT

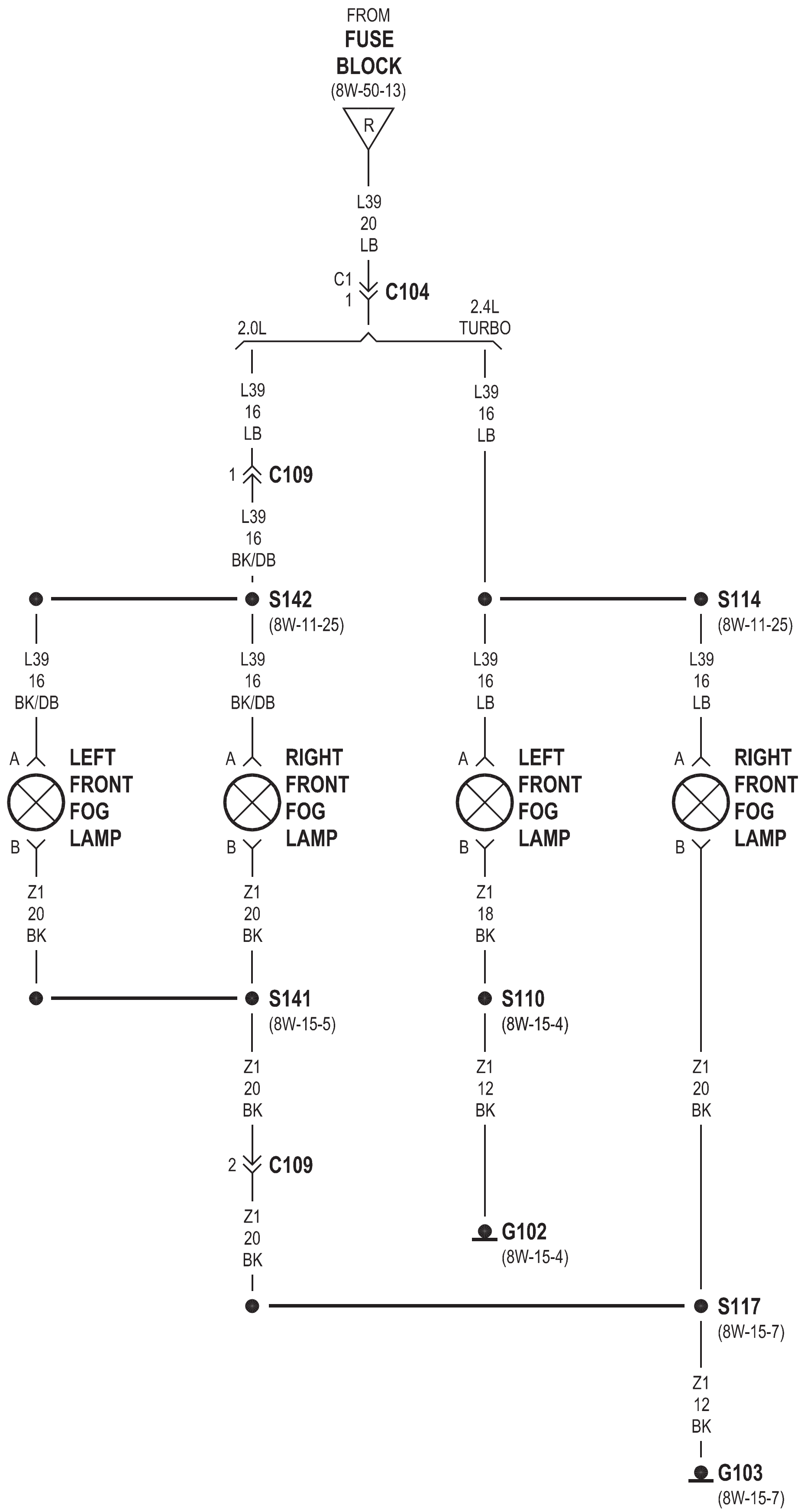

FROM
C105
(8W-50-8)
M
L7
18
BK/YL
S118
(8W-11-22)
L7
18
BK/YL
LEFT FRONT SIDE MARKER LAMP
RIGHT FRONT SIDE MARKER LAMP
LEFT PARK/TURN SIGNAL LAMP
(8W-52-5)
RIGHT PARK/TURN SIGNAL LAMP
(8W-52-5)
2.0L
2.4L TURBO
Z1
20
BK
Z1
18
BK
S110
(8W-15-4)
S117
(8W-15-7)
Z1
12
BK
G102
(8W-15-4)
G103
(8W-15-7)

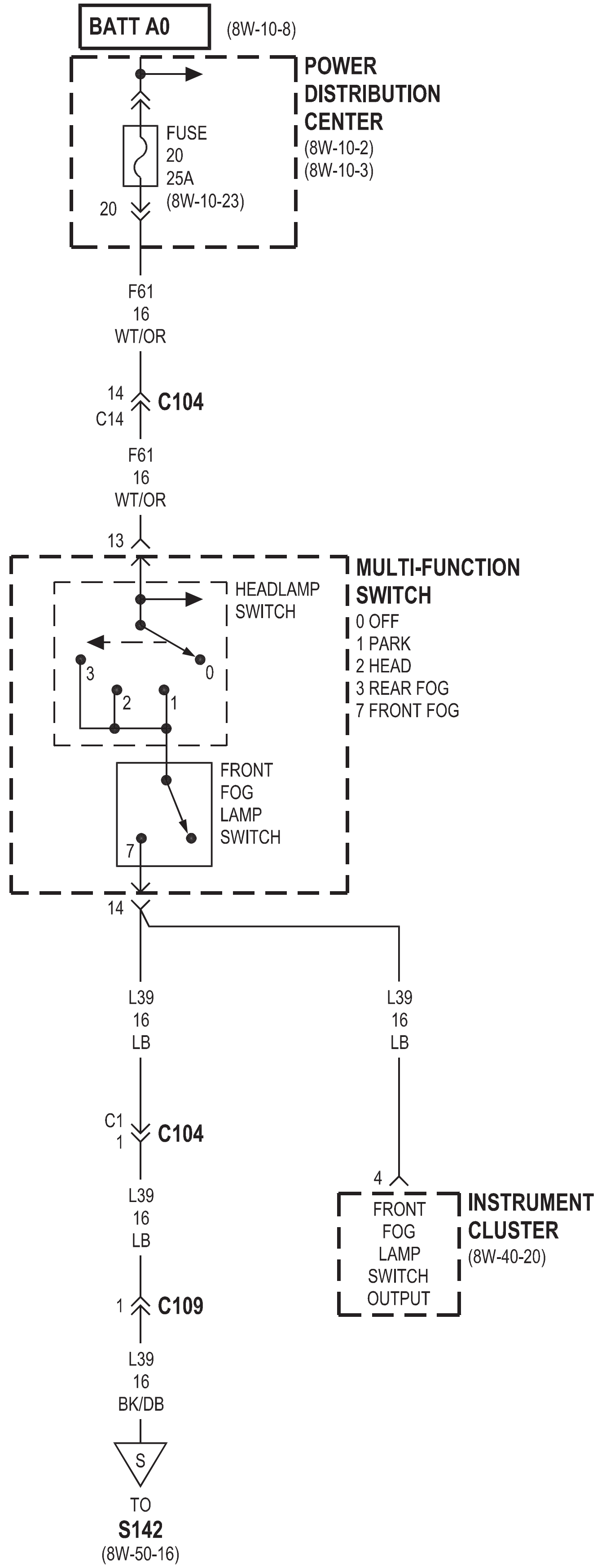

FROM
MULTI-FUNCTION SWITCH
(8W-50-6)
K
L4
12
VT/WT
INSTRUMENT CLUSTER
(8W-40-15)
PANEL LAMPS DRIVER
12
FUSE BLOCK
(8W-11-2)
(8W-11-3)
18
FUSE
18
10A
(8W-11-26)
38
17
FUSE
17
10A
(8W-11-26)
37
L43
14
VT
S223
(8W-11-26)
L43
18
VT
E2
22
OR
S206
(8W-44-5)
E2
22
OR
2
4
HEADLAMP LEVELING SWITCH
HEADLAMP LEVELING SWITCH ILLUMINATION
1
3
L44
14
VT/RD
L13
20
BR/YL
Z1
20
BK
B21
21
B13
13
C103
S202
(8W-15-14)
L44
12
VT/RD
L13
20
BR/YL
Z1
16
BK
P
TO
S111
(8W-50-11)
Q
TO
S105
(8W-50-11)
G203
(8W-15-16)


FROM
C103
(8W-50-10)
P
L44
12
VT/RD
S111
(8W-11-26)
FROM
C103
(8W-50-10)
Q
L13
20
BR/YL
S105
FROM
C105
(8W-50-8)
N
L7
18
BK/YL
S118
(8W-11-22)
L44
20
VT/RD
L13
20
BR/YL
L7
18
BK/YL
L7
18
BK/YL
L13
20
BR/YL
L44
20
VT/RD
LEFT
LAVALIER
MODULE
RIGHT
LAVALIER
MODULE
M
M
Z1
18
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
Z1
18
BK
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

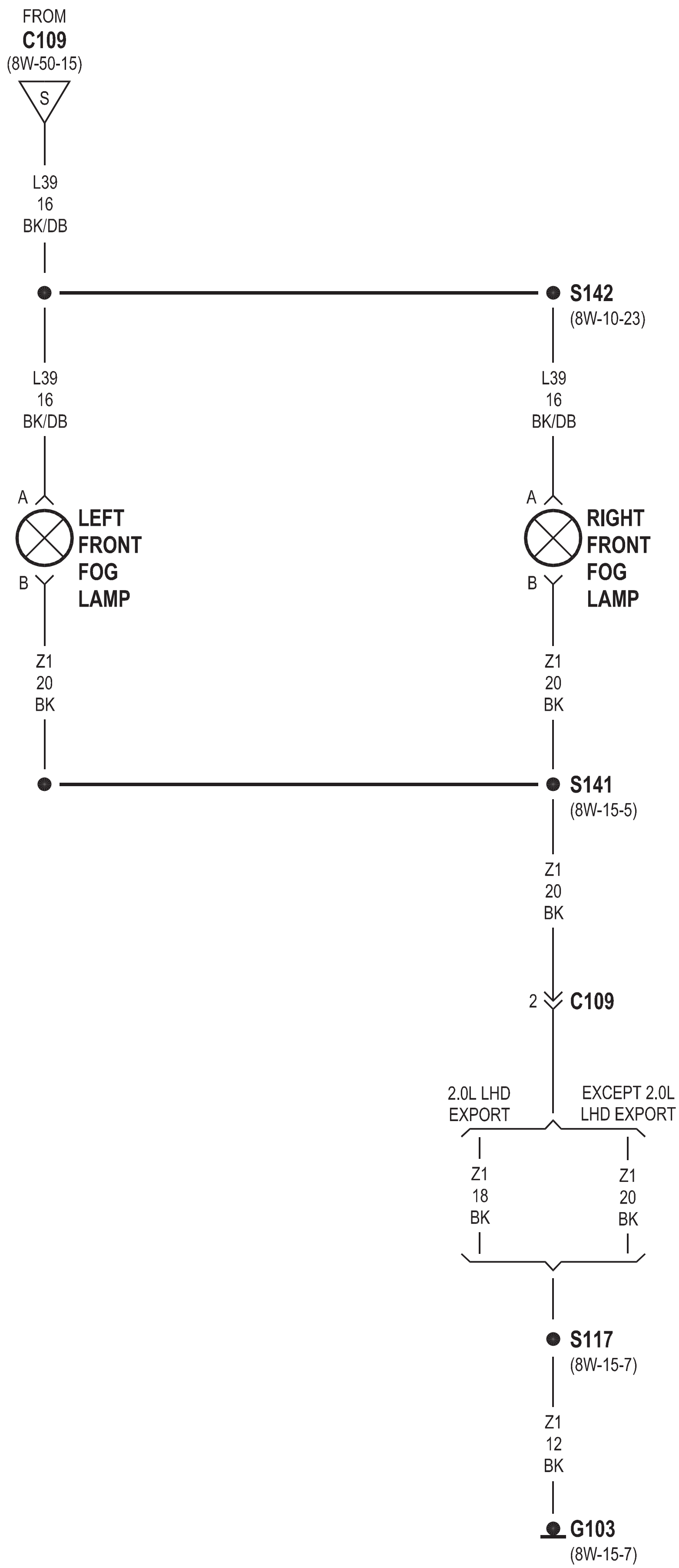

RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
11
FUSE 11 10A (8W-11-14)
31
G5 20 DB/WT
S219
(8W-11-14)
G5 20 DB/WT
9
15
18
19
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-5)
INSTRUMENT PANEL DRIVERS
DRL MODULE
16
17
L161 18 LG/OR
L160 18 TN/RD
C4 4 C104
B3 3 C103
L161 18 LG/OR
L160 18 TN/RD
3
2
LEFT PARK/TURN SIGNAL LAMP
(8W-52-5)
RIGHT PARK/TURN SIGNAL LAMP
(8W-52-5)
1
2.0L
2.4L TURBO
Z1 20 BK
Z1 18 BK
S110
(8W-15-4)
S117
(8W-15-7)
Z1 12 BK
G102
(8W-15-4)
G103
(8W-15-7)
••• AUTOSTICK
•••• EXCEPT AUTOSTICK


FROM
S212
(8W-50-4)
J
L4
14
VT/WT
13
MULTI-FUNCTION
SWITCH
0 OFF
1 PARK
2 HEAD
7 FRONT FOG
HEADLAMP
SWITCH
2
1
0
FRONT
FOG
LAMP
SWITCH
7
14
F39
14
PK/LG
EXCEPT
DAYTIME
RUNNING
LAMPS
DAYTIME
RUNNING
LAMPS
S246
(8W-11-24)
F39
14
PK/LG
F39
16
PK/LG
D
TO
DRL
HIGH
RELAY
(IN FB)
(8W-50-2)
FUSE
BLOCK
(8W-11-2)
19
FUSE
19
10A
(8W-11-25)
39
L39
20
LB
L39
20
LB
R
TO
C104
(8W-50-14)
4
INSTRUMENT
CLUSTER
(8W-40-19)
FRONT
FOG
LAMP
SWITCH
OUTPUT
EXCEPT DAYTIME RUNNING LAMPS

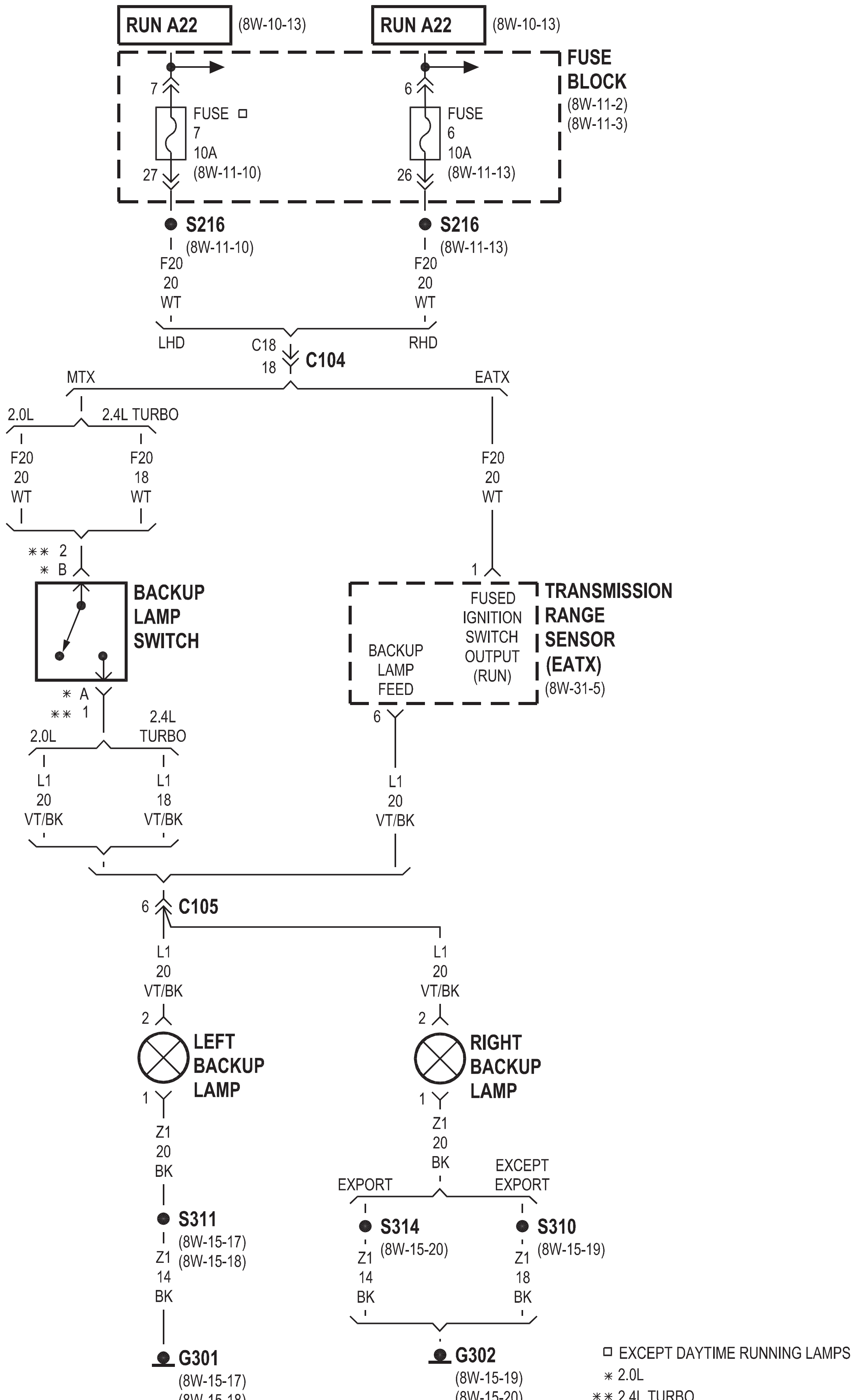

FROM
FUSE BLOCK
(8W-50-13)
R
L39
20
LB
C1
1
C104
2.0L
2.4L TURBO
L39
16
LB
L39
16
LB
1
C109
L39
16
BK/DB
S142
(8W-11-25)
S114
(8W-11-25)
L39
16
BK/DB
L39
16
BK/DB
L39
16
LB
L39
16
LB
A
LEFT FRONT FOG LAMP
B
A
RIGHT FRONT FOG LAMP
B
A
LEFT FRONT FOG LAMP
B
A
RIGHT FRONT FOG LAMP
B
Z1
20
BK
Z1
20
BK
Z1
18
BK
S141
(8W-15-5)
S110
(8W-15-4)
Z1
20
BK
Z1
12
BK
Z1
20
BK
2
C109
Z1
20
BK
G102
(8W-15-4)
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

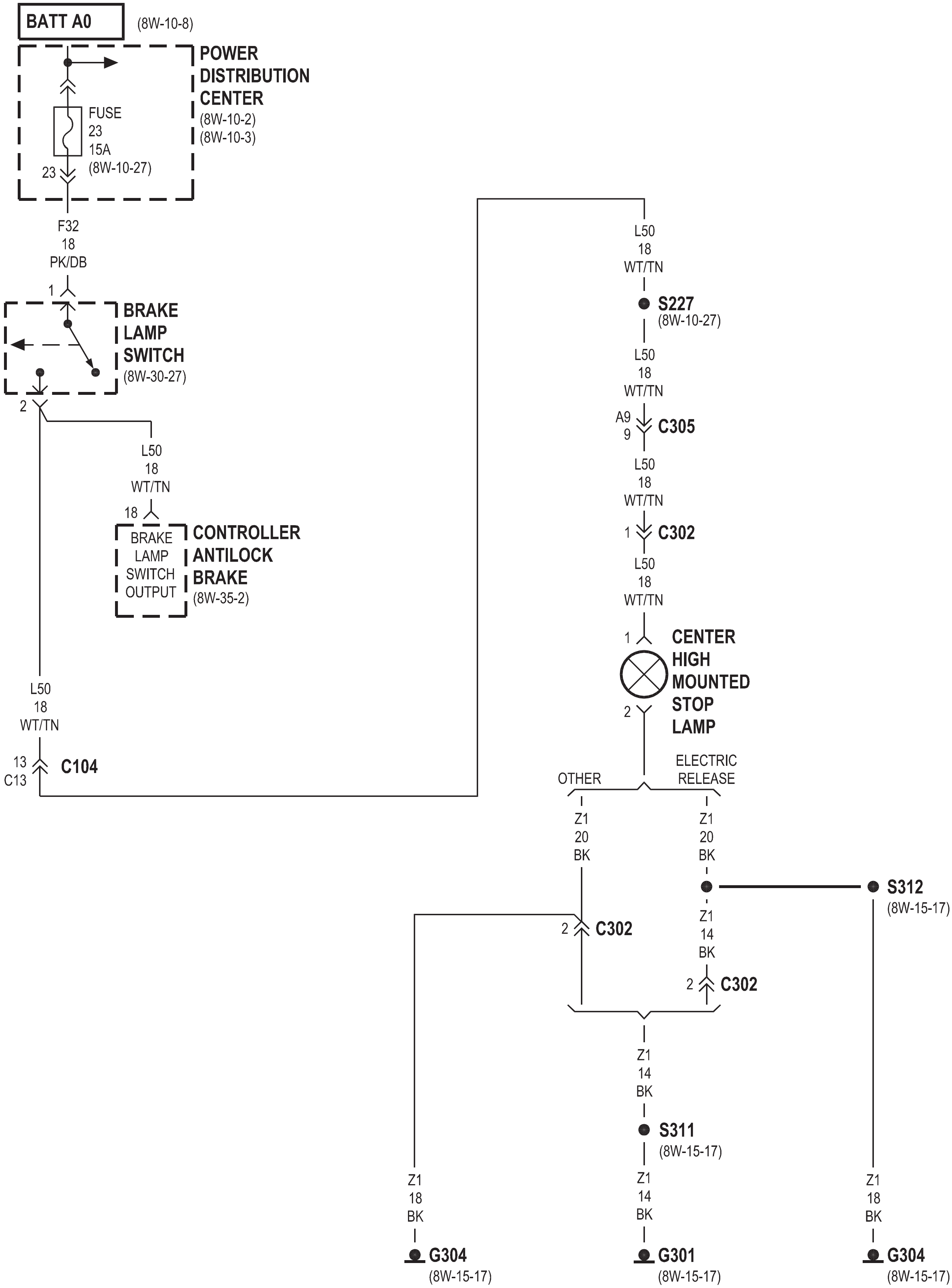

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
20
25A
(8W-10-23)
20
F61
16
WT/OR
14
C14
C104
F61
16
WT/OR
13
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
7 FRONT FOG
HEADLAMP SWITCH
3
0
2
1
FRONT FOG LAMP SWITCH
7
14
L39
16
LB
L39
16
LB
C1
1
C104
L39
16
LB
1
C109
L39
16
BK/DB
S
TO
S142
(8W-50-16)
4
FRONT FOG LAMP SWITCH OUTPUT
INSTRUMENT CLUSTER
(8W-40-20)

EXPORT

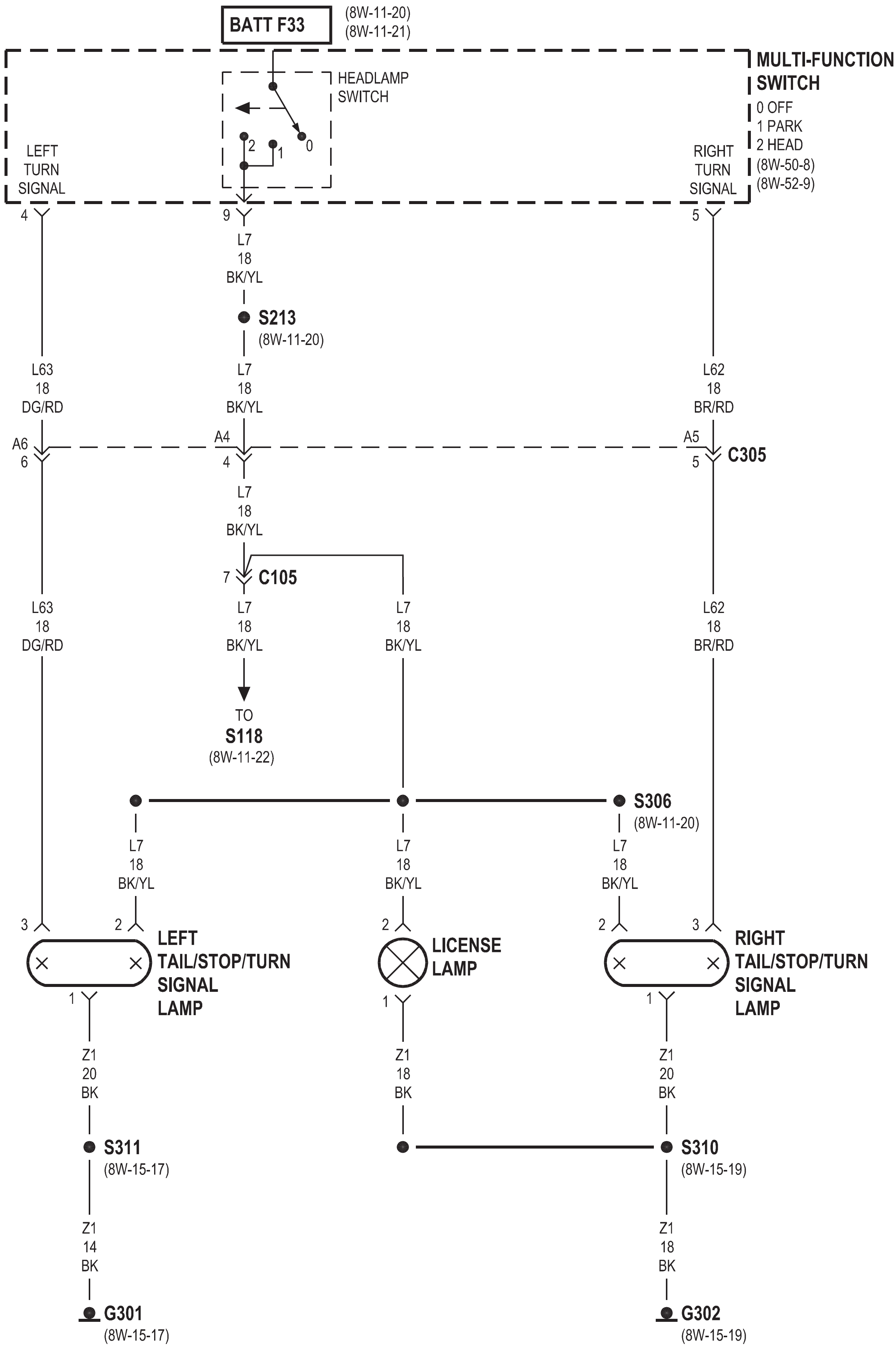

FROM
C109
(8W-50-15)
S
L39
16
BK/DB
S142
(8W-10-23)
L39
16
BK/DB
L39
16
BK/DB
A
LEFT FRONT FOG LAMP
B
A
RIGHT FRONT FOG LAMP
B
Z1
20
BK
Z1
20
BK
S141
(8W-15-5)
Z1
20
BK
2
C109
2.0L LHD EXPORT
EXCEPT 2.0L LHD EXPORT
Z1
18
BK
Z1
20
BK
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

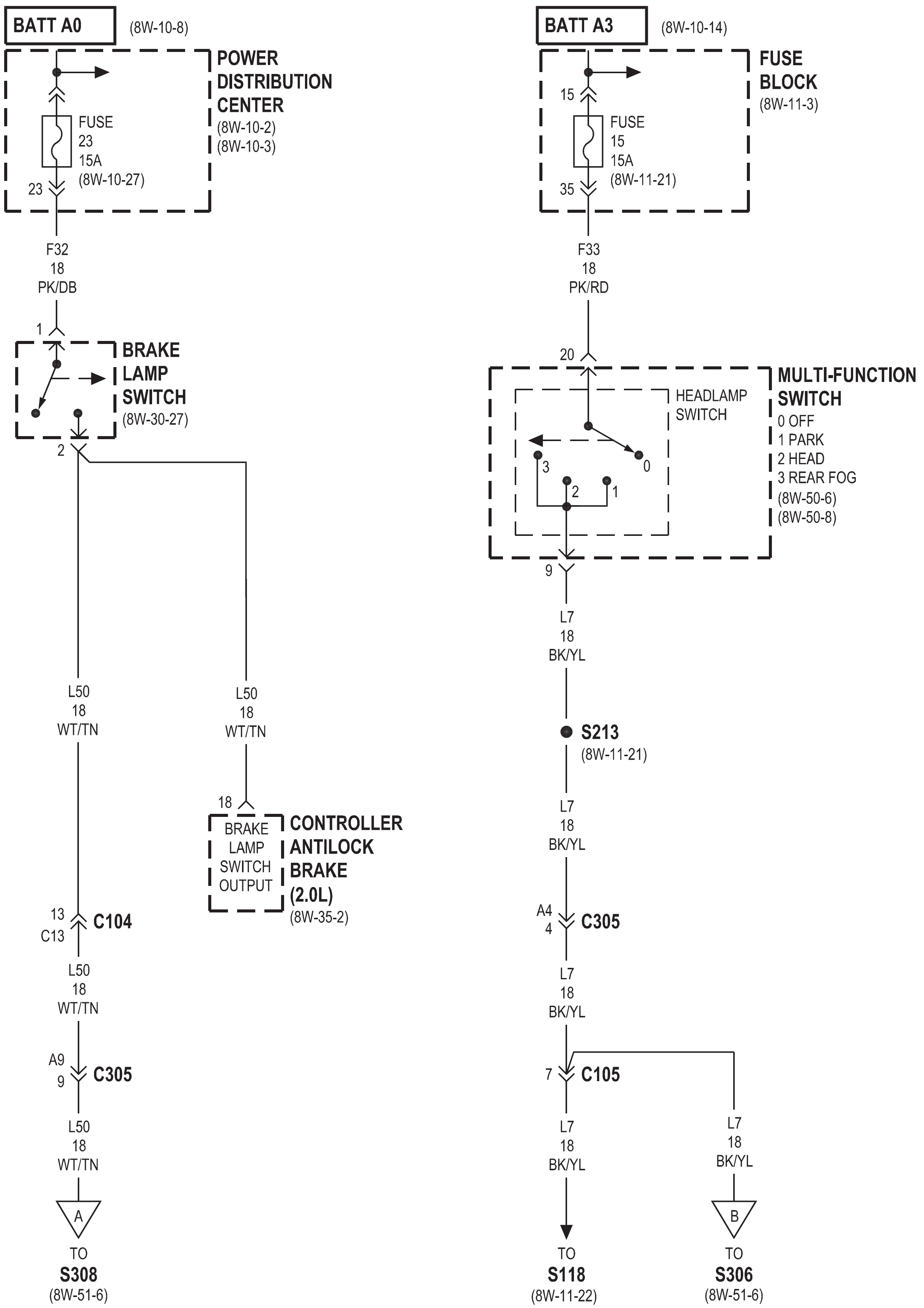
8W-51 REAR LIGHTING

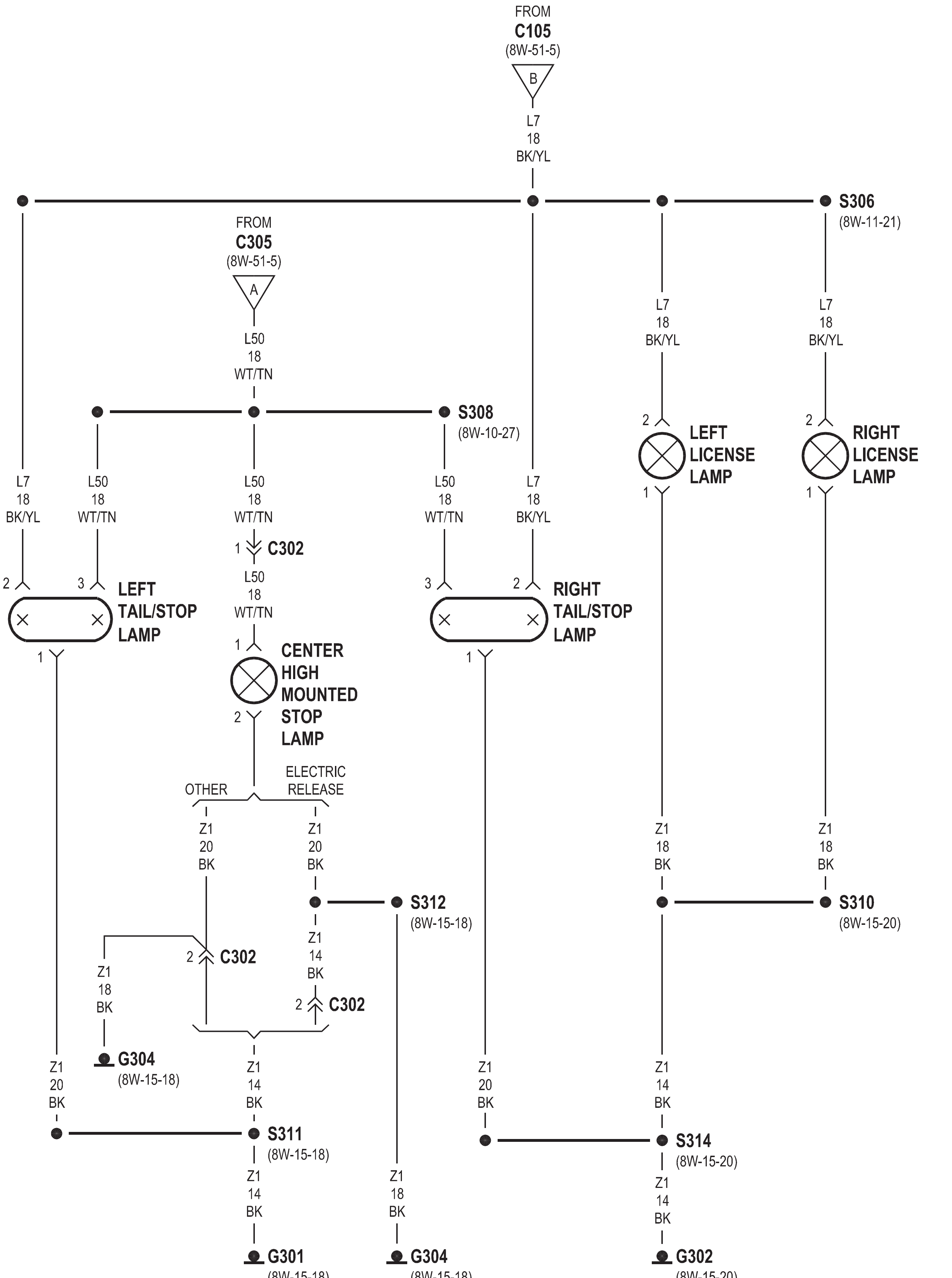

RUN A22
(8W-10-13)
RUN A22
(8W-10-13)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
7
FUSE □
7
10A
(8W-11-10)
27
6
FUSE
6
10A
(8W-11-13)
26
S216
(8W-11-10)
S216
(8W-11-13)
F20
20
WT
LHD
RHD
C18
18
C104
MTX
EATX
2.0L
2.4L TURBO
F20
20
WT
F20
18
WT
∗∗ 2
∗ B
BACKUP
LAMP
SWITCH
∗ A
∗∗ 1
1
TRANSMISSION
RANGE
SENSOR
(EATX)
(8W-31-5)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN)
BACKUP
LAMP
FEED
6
2.0L
2.4L
TURBO
L1
20
VT/BK
L1
18
VT/BK
6
C105
LEFT
BACKUP
LAMP
RIGHT
BACKUP
LAMP
2
1
Z1
20
BK
EXPORT
EXCEPT
EXPORT
S311
(8W-15-17)
(8W-15-18)
Z1
14
BK
S314
(8W-15-20)
S310
(8W-15-19)
Z1
18
BK
G301
(8W-15-17)
(8W-15-18)
G302
(8W-15-19)
(8W-15-20)
□ EXCEPT DAYTIME RUNNING LAMPS
∗ 2.0L
∗∗ 2.4L TURBO

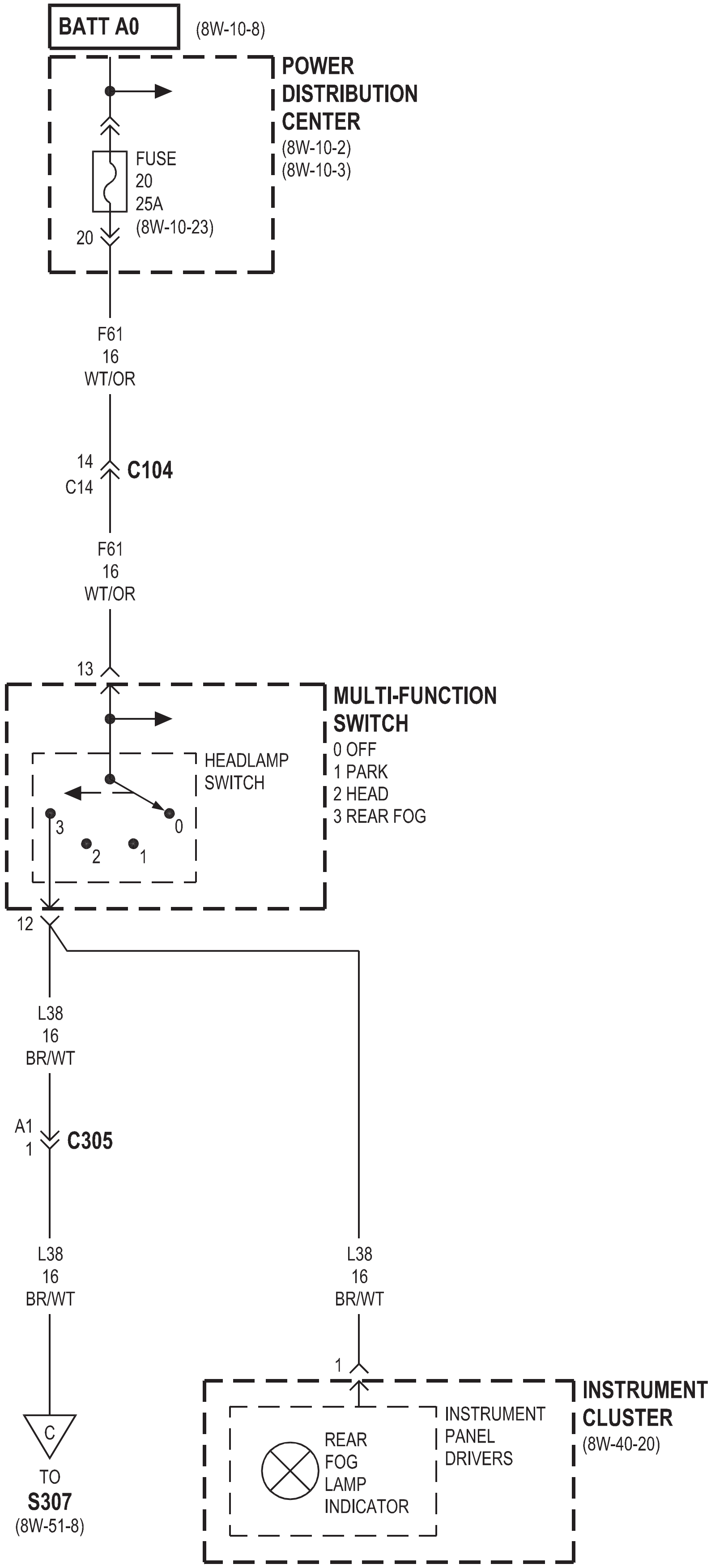

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 23 15A
(8W-10-27)
23
F32 18 PK/DB
1
BRAKE LAMP SWITCH
(8W-30-27)
2
L50 18 WT/TN
18
BRAKE LAMP SWITCH OUTPUT
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
L50 18 WT/TN
13 C13
C104
L50 18 WT/TN
S227
(8W-10-27)
L50 18 WT/TN
A9 9
C305
L50 18 WT/TN
1
C302
L50 18 WT/TN
1
CENTER HIGH MOUNTED STOP LAMP
2
OTHER
ELECTRIC RELEASE
Z1 20 BK
Z1 20 BK
S312
(8W-15-17)
2
C302
Z1 14 BK
2
C302
Z1 14 BK
S311
(8W-15-17)
Z1 18 BK
Z1 14 BK
Z1 18 BK
G304
(8W-15-17)
G301
(8W-15-17)
G304
(8W-15-17)

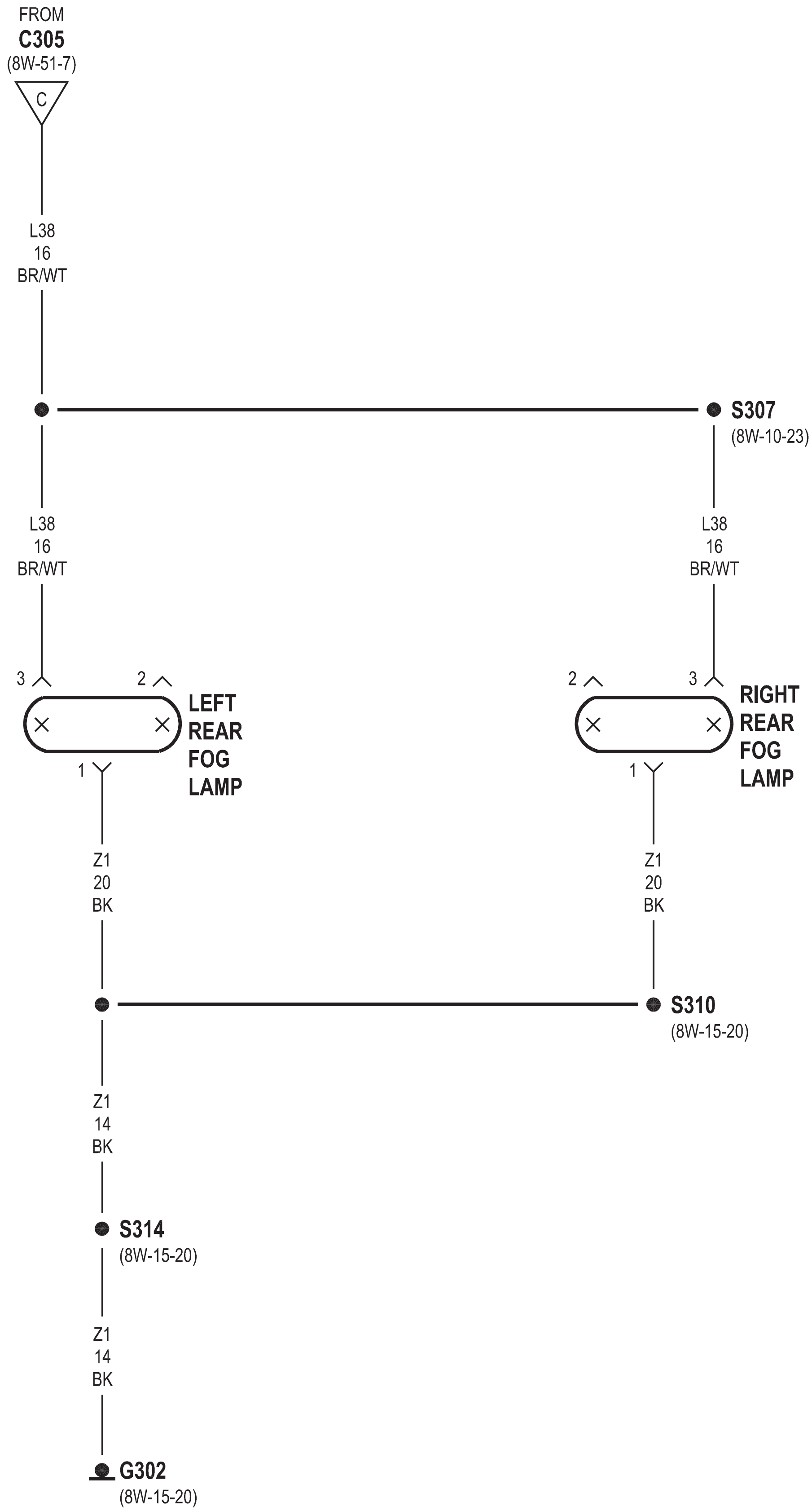
EXCEPT EXPORT



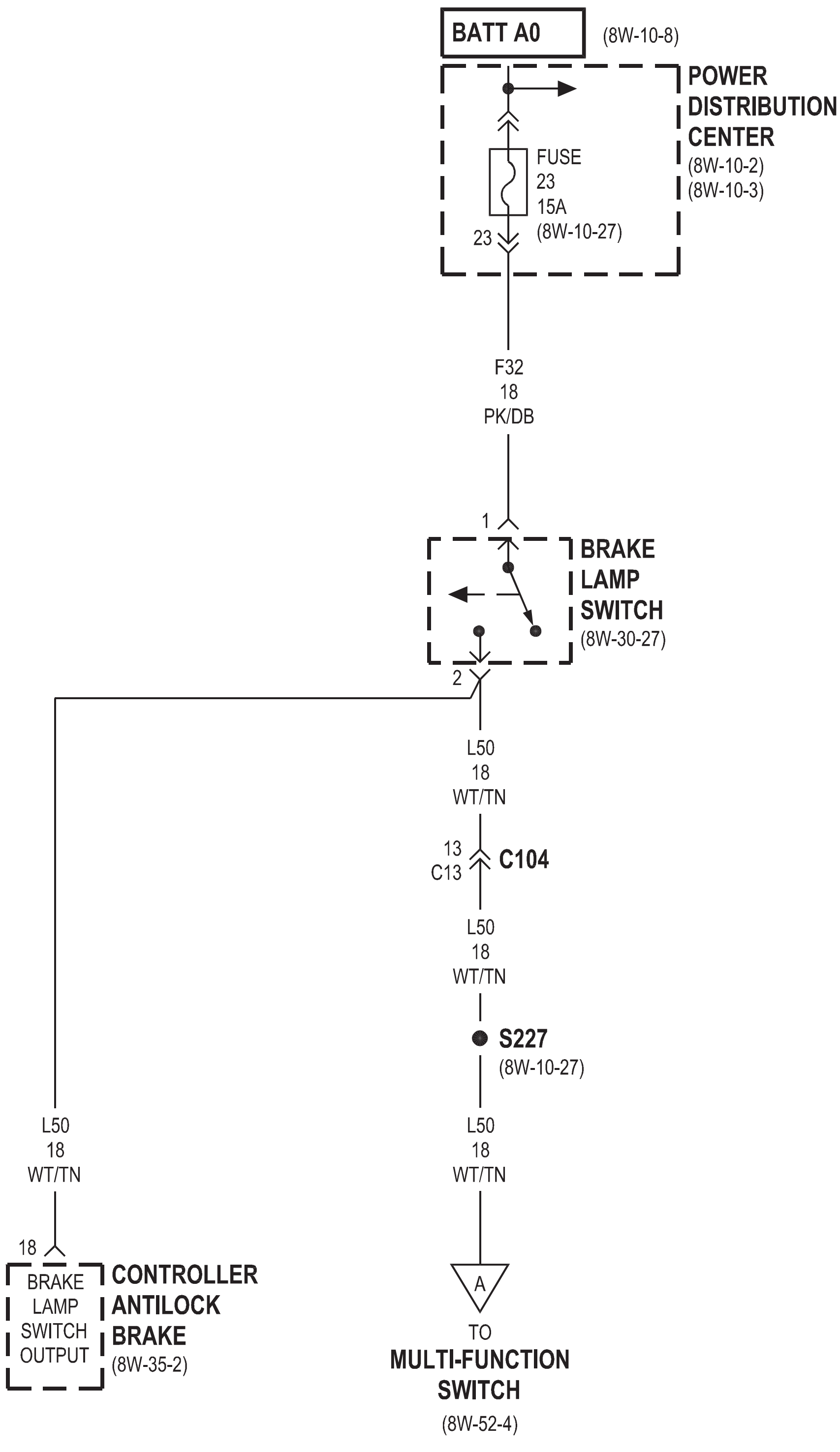

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 23 15A (8W-10-27)
23
F32
18
PK/DB
1
BRAKE LAMP SWITCH
(8W-30-27)
2
L50
18
WT/TN
L50
18
WT/TN
18
BRAKE LAMP SWITCH OUTPUT
CONTROLLER ANTILOCK BRAKE (2.0L)
(8W-35-2)
13
C13
C104
L50
18
WT/TN
A9
9
C305
L50
18
WT/TN
A
TO
S308
(8W-51-6)
BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-3)
15
FUSE 15 15A (8W-11-21)
35
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
(8W-50-6)
(8W-50-8)
3
2
1
0
9
L7
18
BK/YL
S213
(8W-11-21)
L7
18
BK/YL
A4
4
C305
L7
18
BK/YL
7
C105
L7
18
BK/YL
L7
18
BK/YL
B
TO
S118
(8W-11-22)
TO
S306
(8W-51-6)

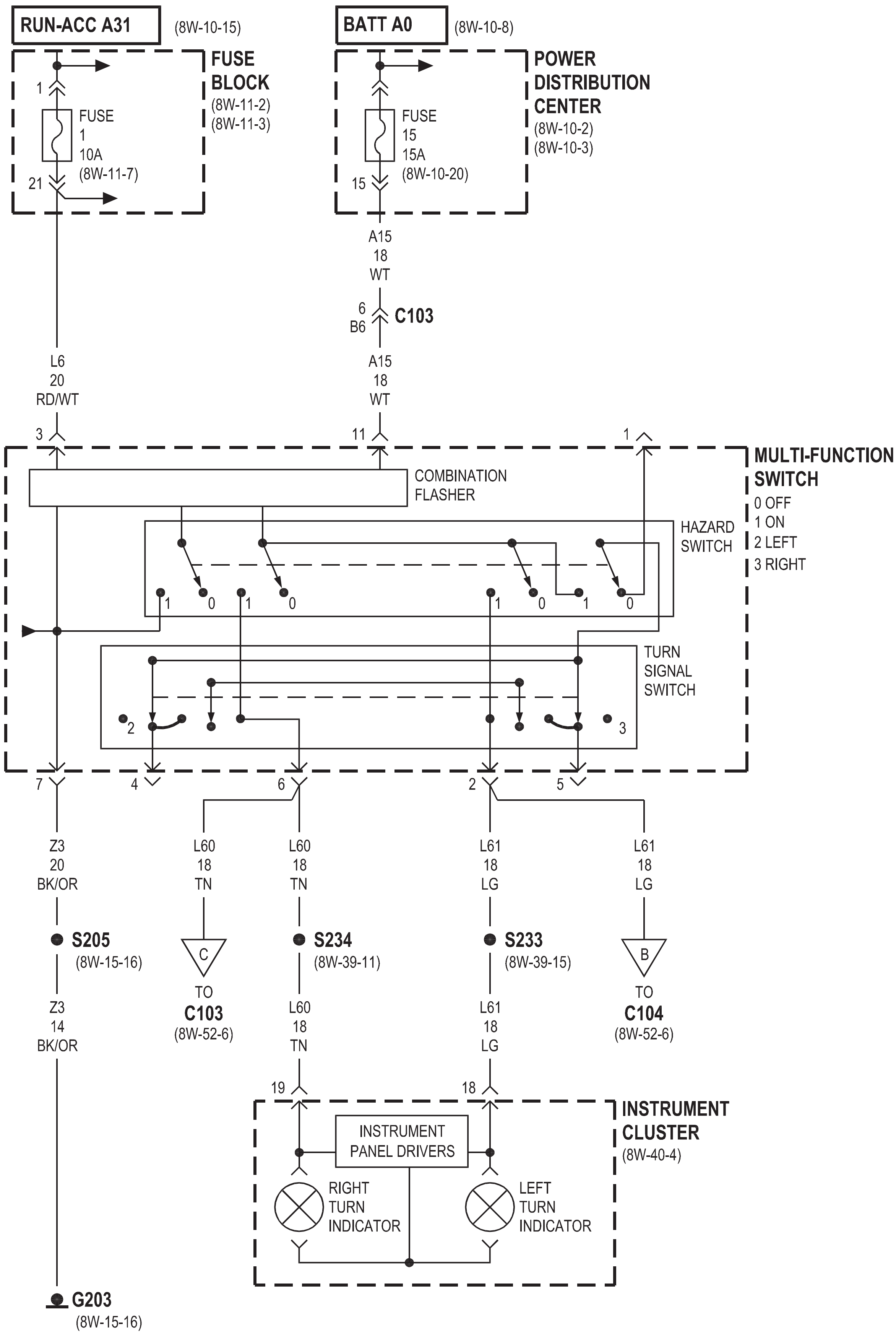

FROM
C105
(8W-51-5)
B
L7
18
BK/YL
S306
(8W-11-21)
FROM
C305
(8W-51-5)
A
L50
18
WT/TN
S308
(8W-10-27)
L7
18
BK/YL
LEFT LICENSE LAMP
RIGHT LICENSE LAMP
L50
18
WT/TN
C302
LEFT TAIL/STOP LAMP
RIGHT TAIL/STOP LAMP
CENTER HIGH MOUNTED STOP LAMP
OTHER
ELECTRIC RELEASE
Z1
20
BK
Z1
18
BK
S312
(8W-15-18)
S310
(8W-15-20)
Z1
14
BK
G304
(8W-15-18)
S311
(8W-15-18)
S314
(8W-15-20)
G301
(8W-15-18)
G302
(8W-15-20)


BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
20
25A
(8W-10-23)
20
F61
16
WT/OR
14
C14
C104
F61
16
WT/OR
13
MULTI-FUNCTION
SWITCH
0 OFF
1 PARK
2 HEAD
3 REAR FOG
HEADLAMP
SWITCH
3
0
2
1
12
L38
16
BR/WT
A1
1
C305
L38
16
BR/WT
L38
16
BR/WT
1
C
TO
S307
(8W-51-8)
INSTRUMENT
CLUSTER
(8W-40-20)
INSTRUMENT
PANEL
DRIVERS
REAR
FOG
LAMP
INDICATOR

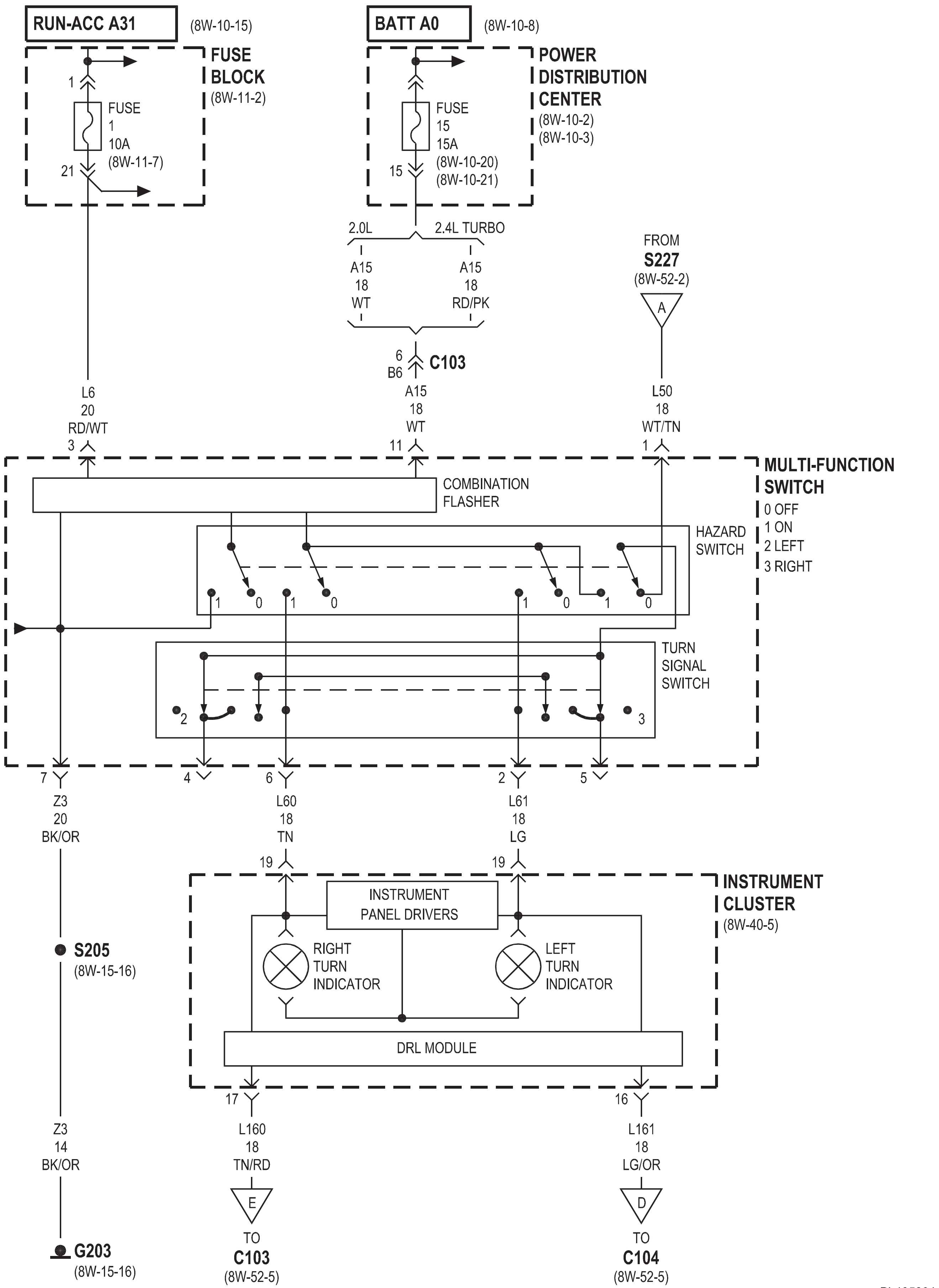

FROM
C305
(8W-51-7)
C
L38
16
BR/WT
S307
(8W-10-23)
L38
16
BR/WT
L38
16
BR/WT
3
2
LEFT REAR FOG LAMP
1
2
3
RIGHT REAR FOG LAMP
1
Z1
20
BK
Z1
20
BK
S310
(8W-15-20)
Z1
14
BK
S314
(8W-15-20)
Z1
14
BK
G302
(8W-15-20)

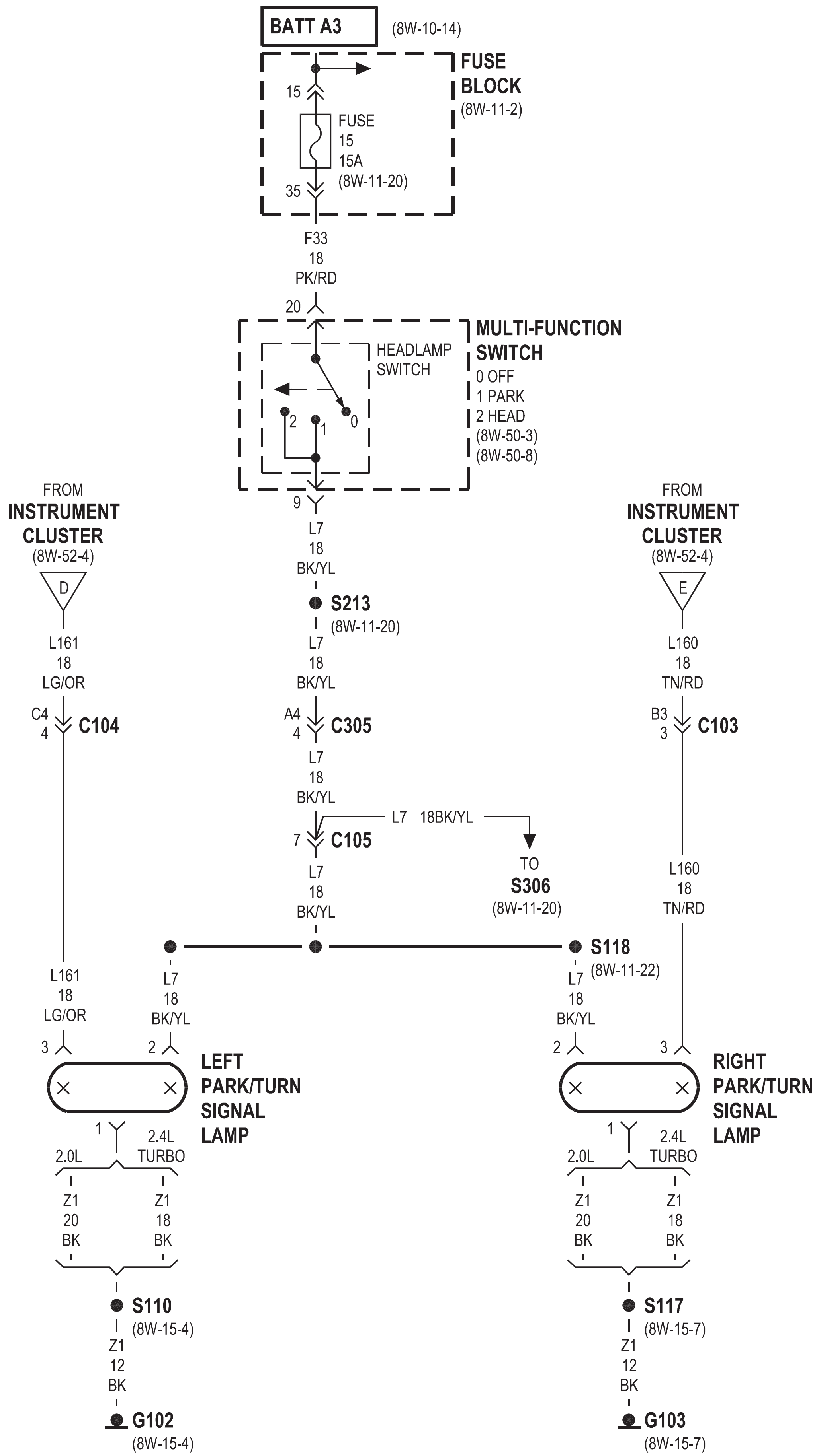
8W-52 TURN SIGNALS


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
23
15A
(8W-10-27)
23
F32
18
PK/DB
1
BRAKE LAMP SWITCH
(8W-30-27)
2
L50
18
WT/TN
13
C13
C104
L50
18
WT/TN
S227
(8W-10-27)
L50
18
WT/TN
L50
18
WT/TN
18
BRAKE LAMP SWITCH OUTPUT
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
A
TO
MULTI-FUNCTION SWITCH
(8W-52-4)

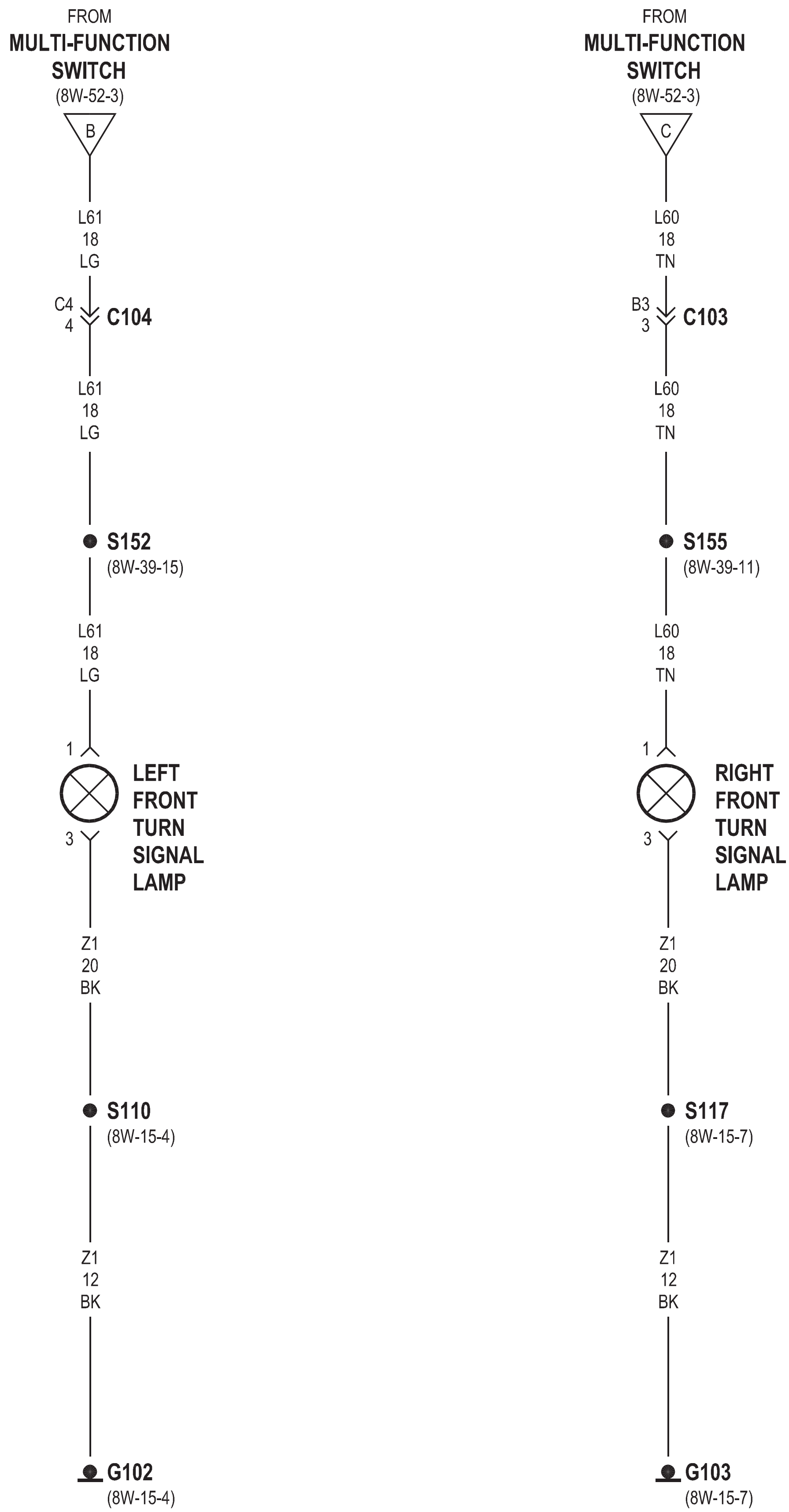

RUN-ACC A31
(8W-10-15)
BATT A0
(8W-10-8)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 1 10A (8W-11-7)
1
21
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 15 15A (8W-10-20)
15
A15 18 WT
6 B6 C103
A15 18 WT
L6 20 RD/WT
3
11
1
MULTI-FUNCTION SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
COMBINATION FLASHER
HAZARD SWITCH
1 0 1 0 1 0 1 0
TURN SIGNAL SWITCH
2
3
7
4
6
2
5
Z3 20 BK/OR
L60 18 TN
L60 18 TN
L61 18 LG
L61 18 LG
S205
(8W-15-16)
C
TO C103
(8W-52-6)
S234
(8W-39-11)
S233
(8W-39-15)
B
TO C104
(8W-52-6)
Z3 14 BK/OR
L60 18 TN
L61 18 LG
19
18
INSTRUMENT CLUSTER
(8W-40-4)
INSTRUMENT PANEL DRIVERS
RIGHT TURN INDICATOR
LEFT TURN INDICATOR
G203
(8W-15-16)

EXCEPT EXPORT

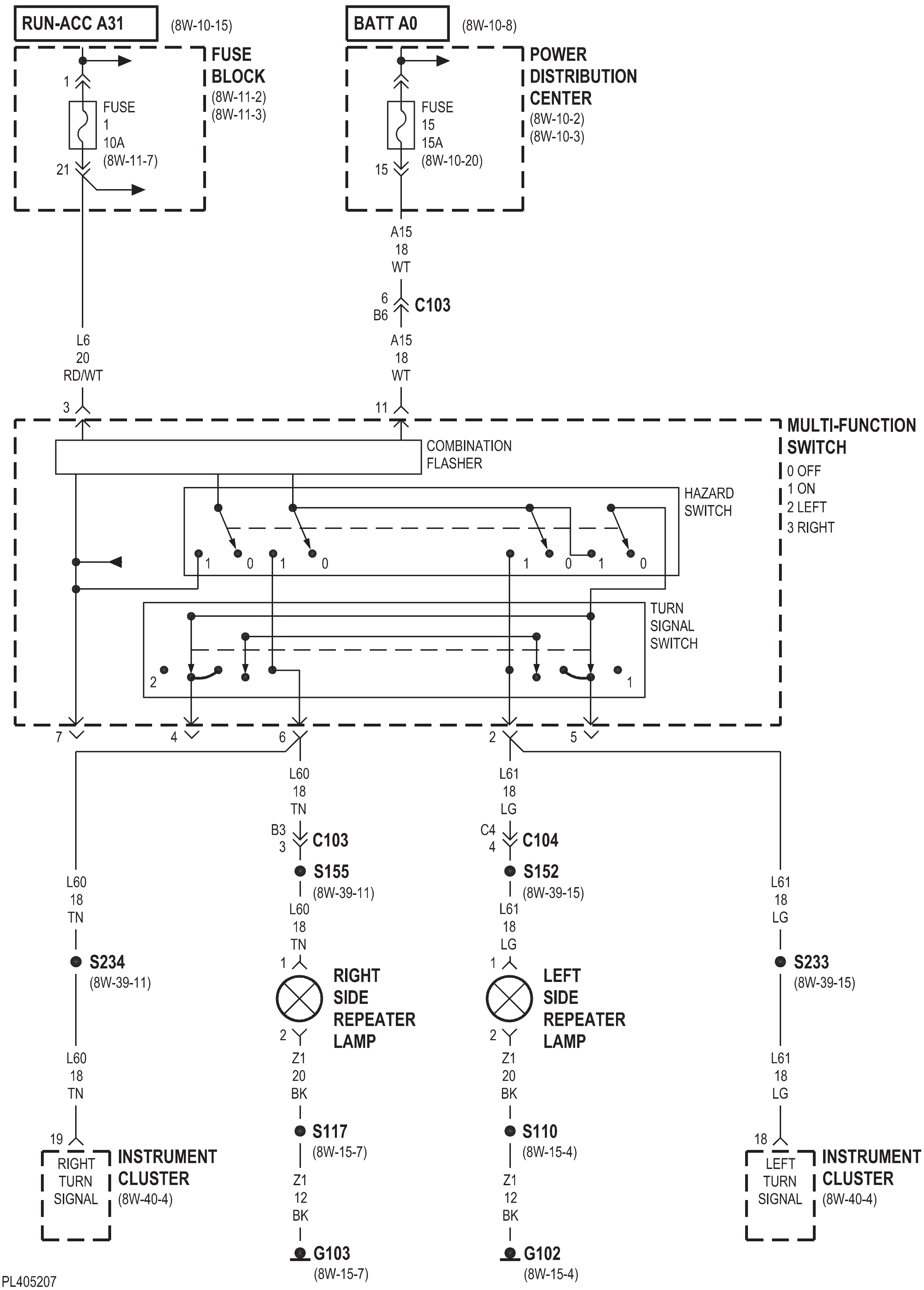


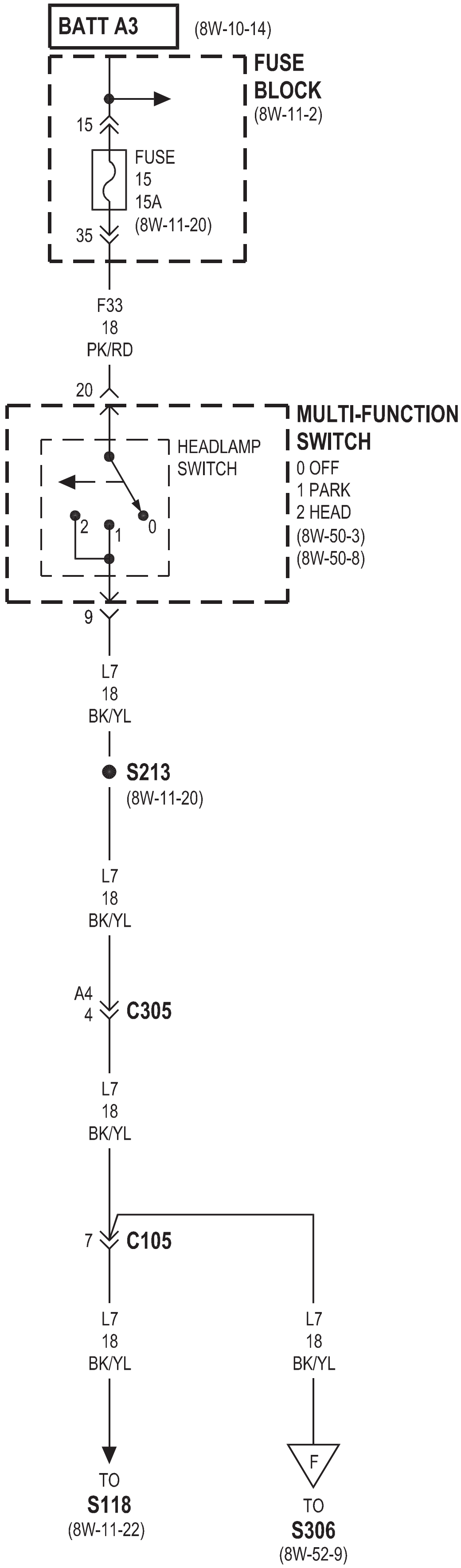


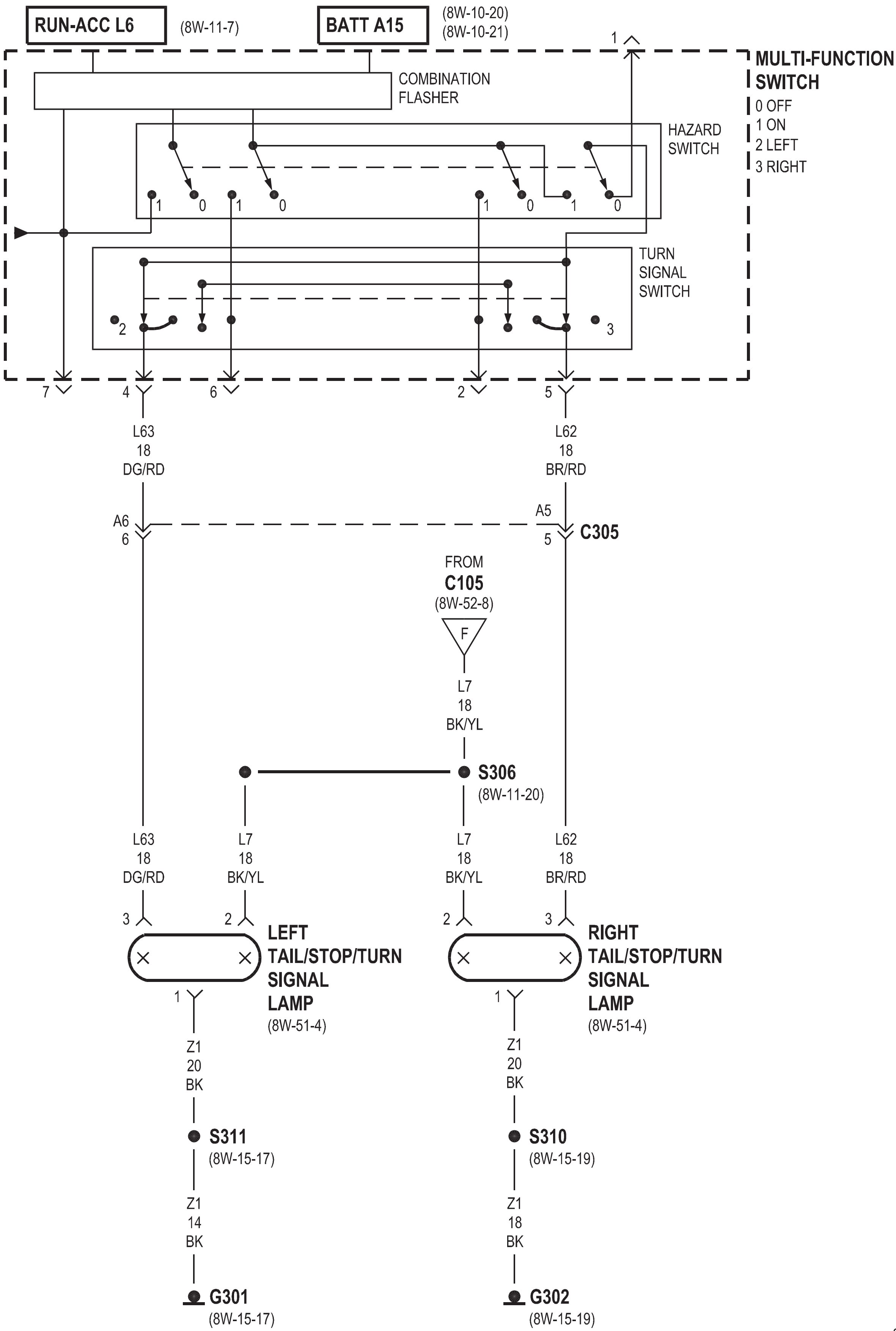
BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
15
FUSE
15
15A
(8W-11-20)
35
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
(8W-50-3)
(8W-50-8)
HEADLAMP SWITCH
2
1
0
9
L7
18
BK/YL
S213
(8W-11-20)
FROM INSTRUMENT CLUSTER
(8W-52-4)
D
L161
18
LG/OR
C4
4
C104
A4
4
C305
FROM INSTRUMENT CLUSTER
(8W-52-4)
E
L160
18
TN/RD
B3
3
C103
7
C105
L7 18BK/YL
TO S306
(8W-11-20)
S118
(8W-11-22)
3
2
LEFT PARK/TURN SIGNAL LAMP
RIGHT PARK/TURN SIGNAL LAMP
1
2.0L
2.4L TURBO
Z1
20
BK
Z1
18
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
S117
(8W-15-7)
G103
(8W-15-7)


FROM
MULTI-FUNCTION SWITCH
(8W-52-3)
B
L61
18
LG
C4
4
C104
L61
18
LG
S152
(8W-39-15)
L61
18
LG
1
LEFT FRONT TURN SIGNAL LAMP
3
Z1
20
BK
S110
(8W-15-4)
Z1
12
BK
G102
(8W-15-4)
FROM
MULTI-FUNCTION SWITCH
(8W-52-3)
C
L60
18
TN
B3
3
C103
L60
18
TN
S155
(8W-39-11)
L60
18
TN
1
RIGHT FRONT TURN SIGNAL LAMP
3
Z1
20
BK
S117
(8W-15-7)
Z1
12
BK
G103
(8W-15-7)

EXPORT

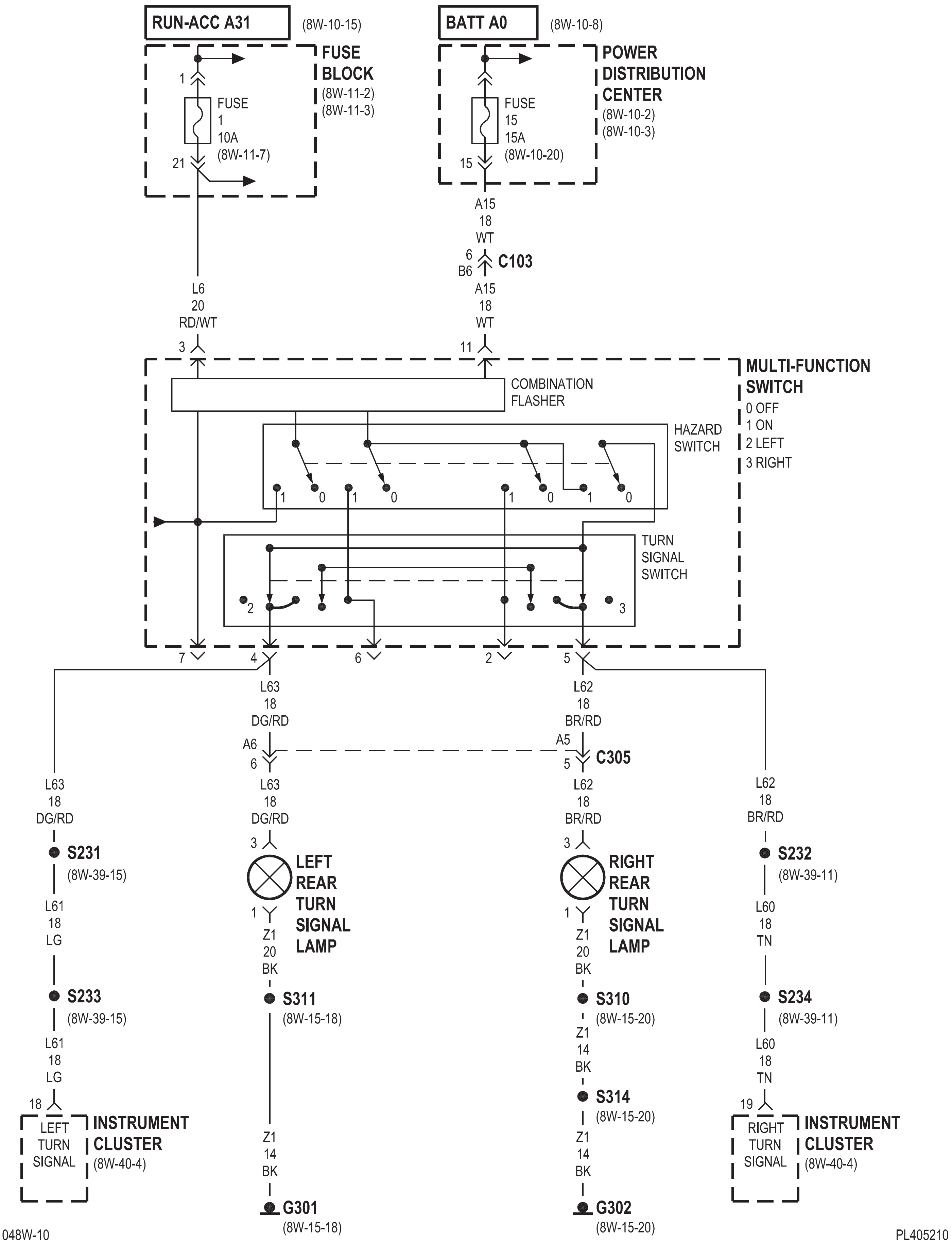

RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
FUSE
1
10A
(8W-11-7)
BATT A0
(8W-10-8)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
15
15A
(8W-10-20)
A15
18
WT
C103
L6
20
RD/WT
MULTI-FUNCTION
SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
COMBINATION
FLASHER
HAZARD
SWITCH
TURN
SIGNAL
SWITCH
L60
18
TN
C103
S155
(8W-39-11)
L61
18
LG
C104
S152
(8W-39-15)
S234
(8W-39-11)
S233
(8W-39-15)
RIGHT
SIDE
REPEATER
LAMP
LEFT
SIDE
REPEATER
LAMP
Z1
20
BK
S117
(8W-15-7)
S110
(8W-15-4)
Z1
12
BK
G103
(8W-15-7)
G102
(8W-15-4)
RIGHT
TURN
SIGNAL
INSTRUMENT
CLUSTER
(8W-40-4)
LEFT
TURN
SIGNAL
INSTRUMENT
CLUSTER
(8W-40-4)


BATT A3
(8W-10-14)
FUSE BLOCK
(8W-11-2)
15
FUSE
15
15A
(8W-11-20)
35
F33
18
PK/RD
20
MULTI-FUNCTION SWITCH
0 OFF
1 PARK
2 HEAD
(8W-50-3)
(8W-50-8)
HEADLAMP SWITCH
2
1
0
9
L7
18
BK/YL
S213
(8W-11-20)
L7
18
BK/YL
A4
4
C305
L7
18
BK/YL
7
C105
L7
18
BK/YL
L7
18
BK/YL
F
TO
S118
(8W-11-22)
TO
S306
(8W-52-9)

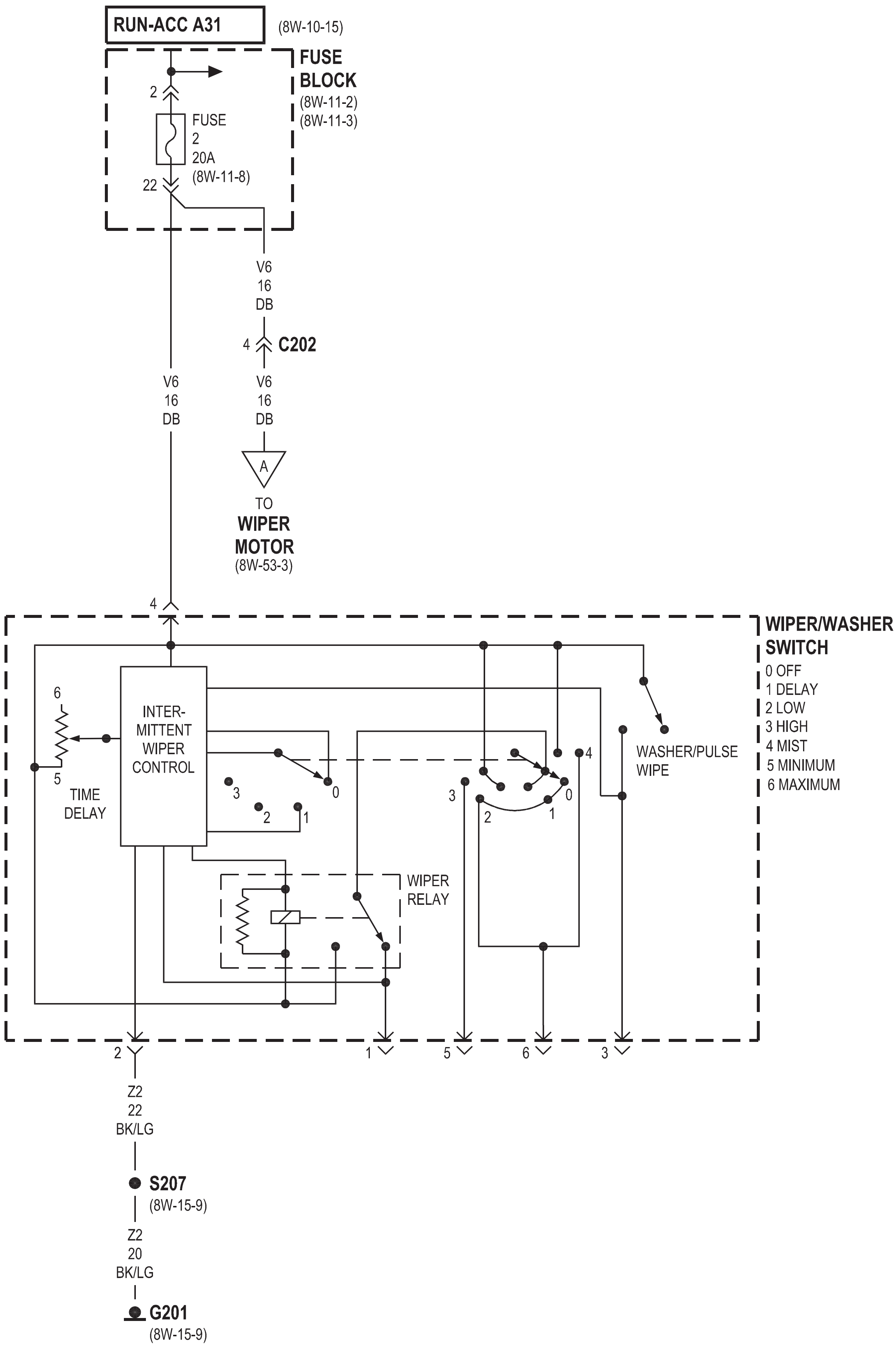


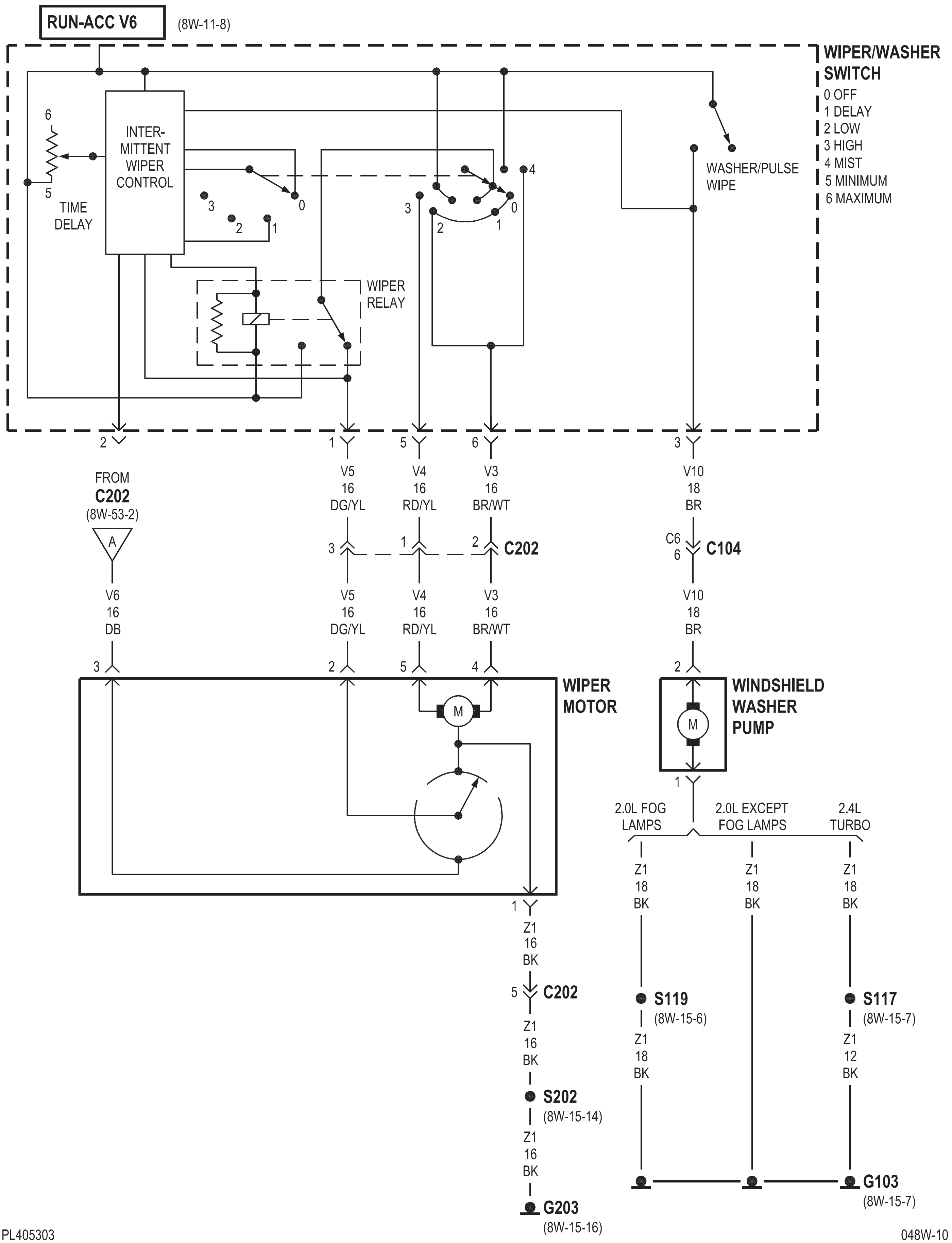
RUN-ACC L6
(8W-11-7)
BATT A15
(8W-10-20)
(8W-10-21)
MULTI-FUNCTION SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
COMBINATION FLASHER
HAZARD SWITCH
TURN SIGNAL SWITCH
L63
18
DG/RD
L62
18
BR/RD
A6
6
A5
5
C305
FROM
C105
(8W-52-8)
F
L7
18
BK/YL
S306
(8W-11-20)
LEFT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
RIGHT TAIL/STOP/TURN SIGNAL LAMP
(8W-51-4)
Z1
20
BK
S311
(8W-15-17)
S310
(8W-15-19)
Z1
14
BK
Z1
18
BK
G301
(8W-15-17)
G302
(8W-15-19)

EXPORT


RUN-ACC A31
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
FUSE 1 10A (8W-11-7)
1
21
BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 15 15A (8W-10-20)
15
A15 18 WT
6 B6 C103
A15 18 WT
L6 20 RD/WT
3
11
MULTI-FUNCTION SWITCH
0 OFF
1 ON
2 LEFT
3 RIGHT
COMBINATION FLASHER
HAZARD SWITCH
TURN SIGNAL SWITCH
7
4
6
2
5
L63 18 DG/RD
L62 18 BR/RD
A6 6
A5 5 C305
L63 18 DG/RD
L62 18 BR/RD
L63 18 DG/RD
L62 18 BR/RD
S231 (8W-39-15)
S232 (8W-39-11)
3
LEFT REAR TURN SIGNAL LAMP
1
RIGHT REAR TURN SIGNAL LAMP
L61 18 LG
L60 18 TN
Z1 20 BK
S233 (8W-39-15)
S311 (8W-15-18)
S310 (8W-15-20)
S234 (8W-39-11)
L61 18 LG
Z1 14 BK
S314 (8W-15-20)
L60 18 TN
18
LEFT TURN SIGNAL
INSTRUMENT CLUSTER (8W-40-4)
19
RIGHT TURN SIGNAL
INSTRUMENT CLUSTER (8W-40-4)
Z1 14 BK
G301 (8W-15-18)
G302 (8W-15-20)
048W-10
PL405210

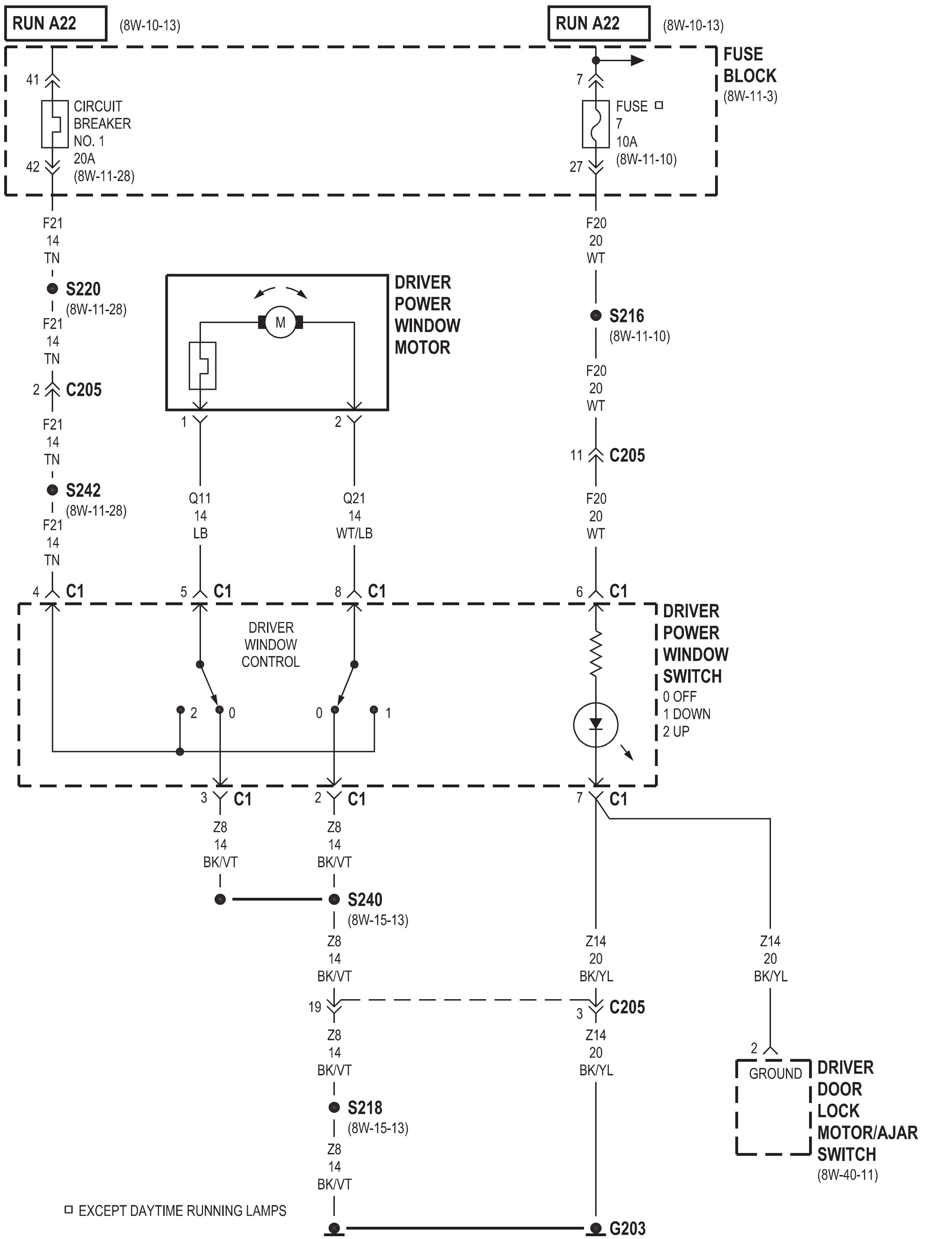
8W-53 WIPERS


RUN-ACC A31
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
2
FUSE
2
20A
(8W-11-8)
22
V6
16
DB
4
C202
V6
16
DB
V6
16
DB
A
TO
WIPER MOTOR
(8W-53-3)
4
WIPER/WASHER SWITCH
0 OFF
1 DELAY
2 LOW
3 HIGH
4 MIST
5 MINIMUM
6 MAXIMUM
6
5
TIME DELAY
INTER-MITTENT WIPER CONTROL
3
2
1
0
3
2
1
0
4
WASHER/PULSE WIPE
WIPER RELAY
2
1
5
6
3
Z2
22
BK/LG
S207
(8W-15-9)
Z2
20
BK/LG
G201
(8W-15-9)

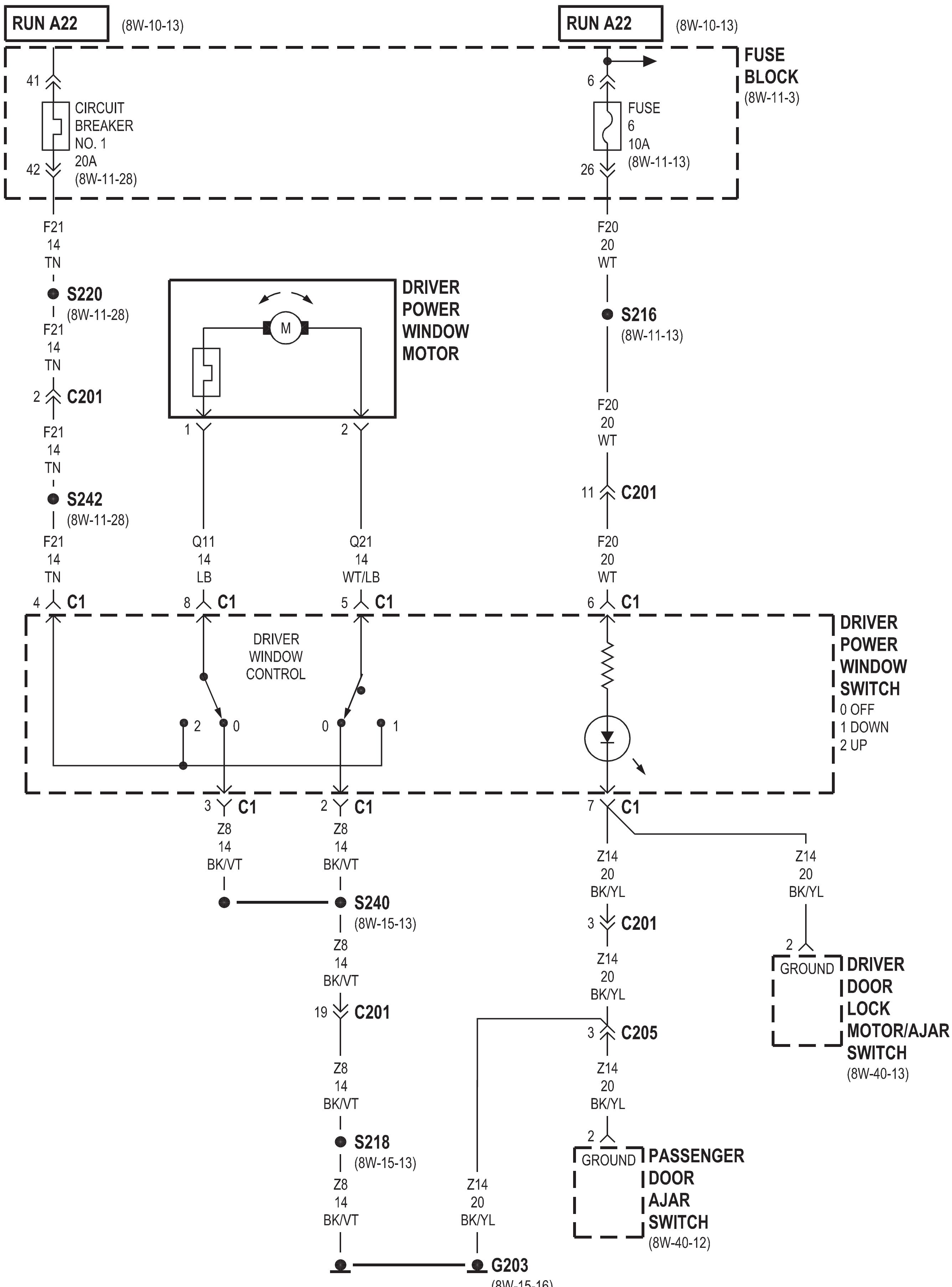

RUN-ACC V6
(8W-11-8)
WIPER/WASHER SWITCH
0 OFF
1 DELAY
2 LOW
3 HIGH
4 MIST
5 MINIMUM
6 MAXIMUM
INTER-MITTENT WIPER CONTROL
TIME DELAY
WIPER RELAY
WASHER/PULSE WIPE
FROM C202 (8W-53-2)
A
V6 16 DB
V5 16 DG/YL
V4 16 RD/YL
V3 16 BR/WT
V10 18 BR
C202
C104
C6
WIPER MOTOR
M
WINDSHIELD WASHER PUMP
2.0L FOG LAMPS
2.0L EXCEPT FOG LAMPS
2.4L TURBO
Z1 18 BK
Z1 16 BK
Z1 12 BK
S119
(8W-15-6)
S117
(8W-15-7)
S202
(8W-15-14)
G203
(8W-15-16)
G103
(8W-15-7)

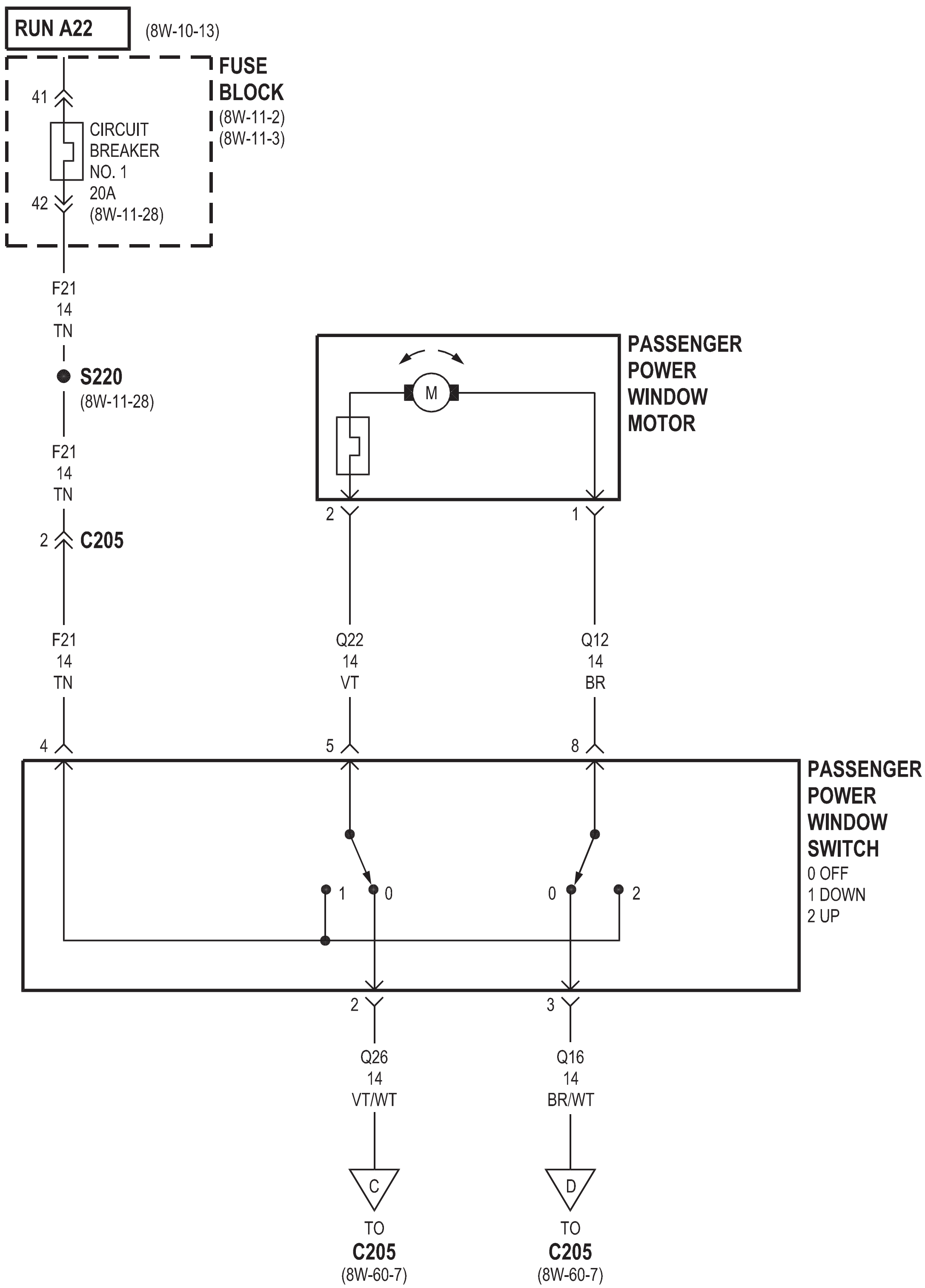
8W-60 POWER WINDOWS

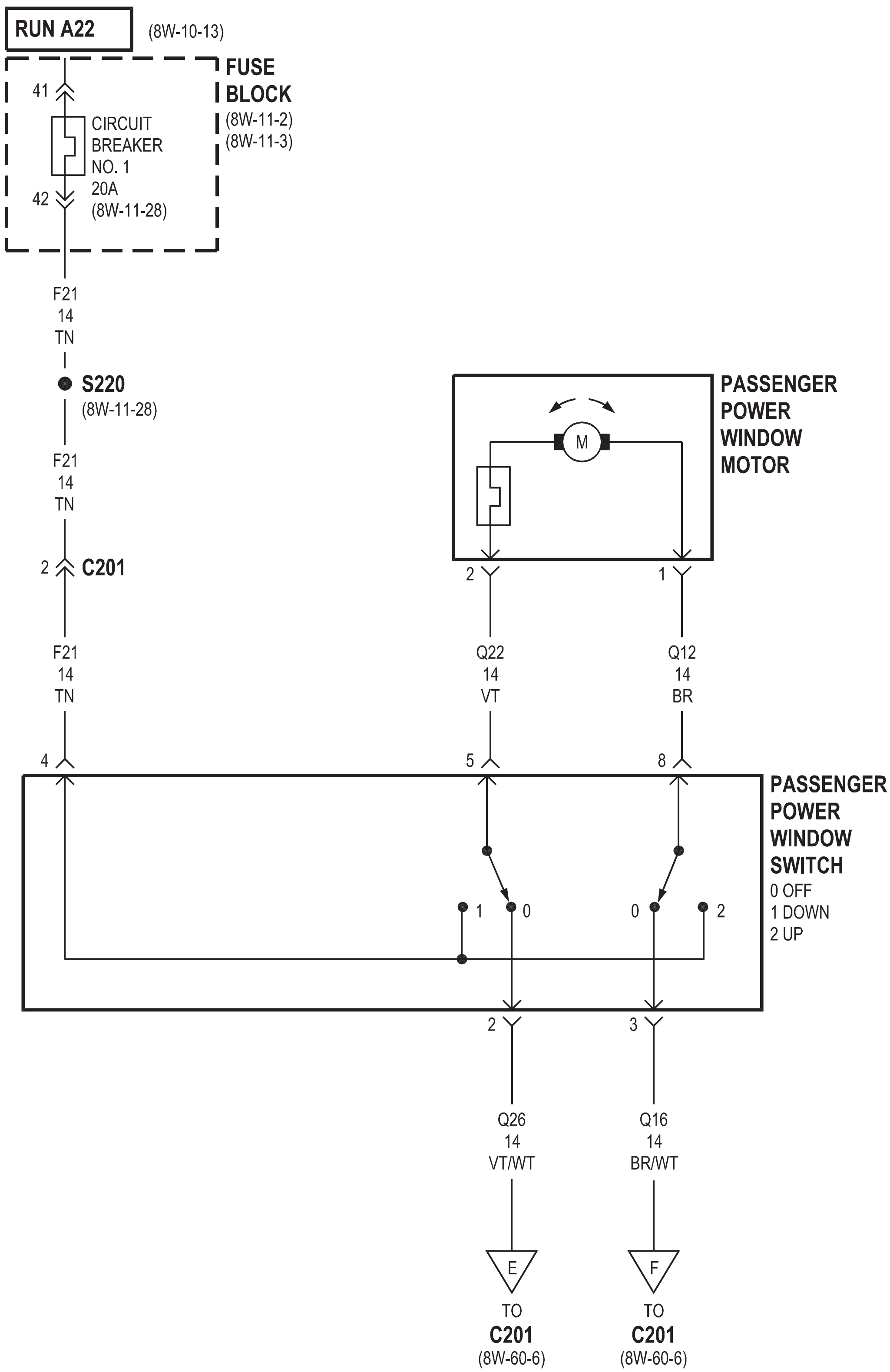
LHD



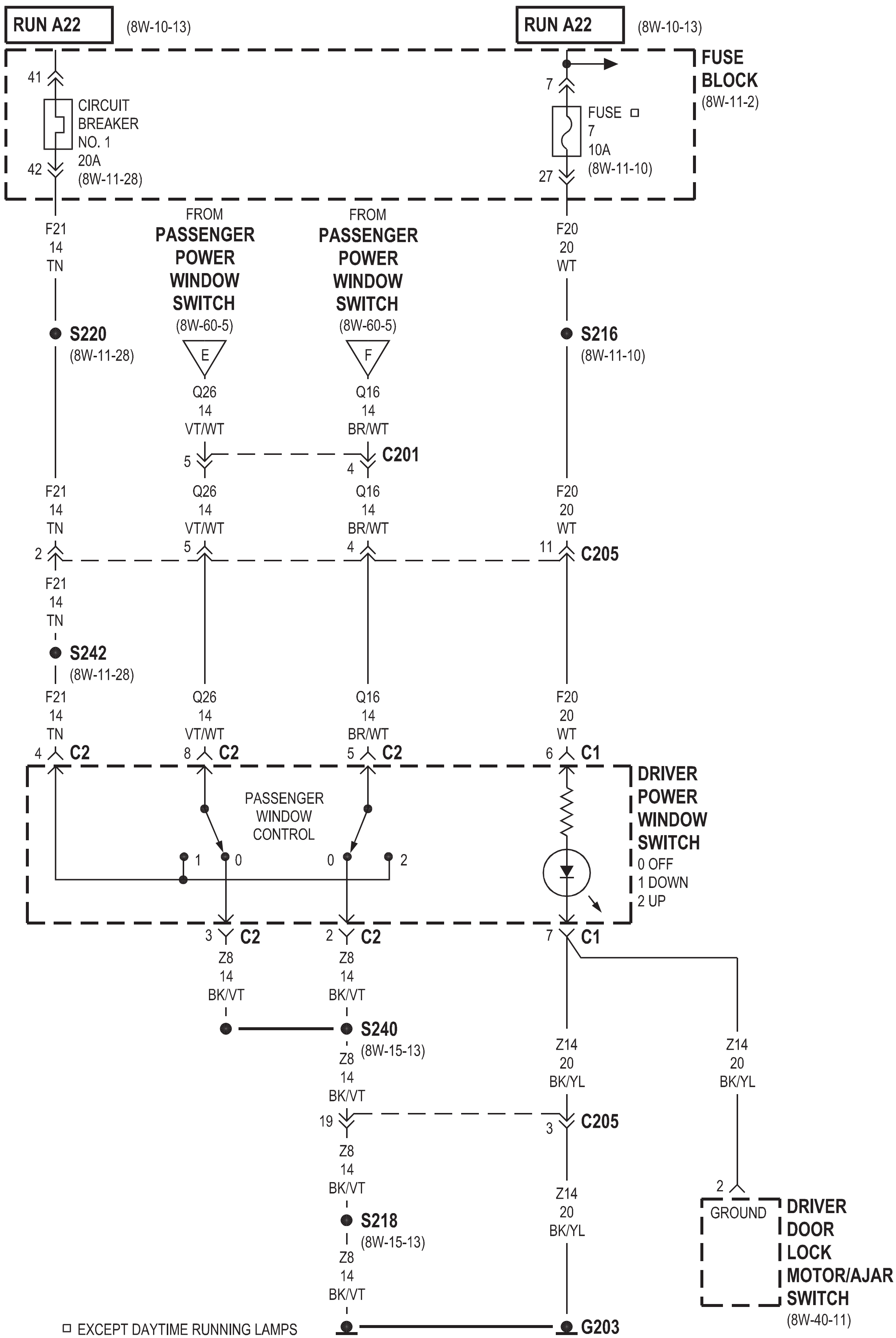
RUN A22
(8W-10-13)
RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-3)
41
CIRCUIT BREAKER NO. 1
20A
(8W-11-28)
42
7
FUSE □
7
10A
(8W-11-10)
27
F21
14
TN
S220
(8W-11-28)
C205
S242
(8W-11-28)
DRIVER POWER WINDOW MOTOR
M
Q11
14
LB
Q21
14
WT/LB
F20
20
WT
S216
(8W-11-10)
11 C205
4 C1
5 C1
8 C1
6 C1
DRIVER WINDOW CONTROL
DRIVER POWER WINDOW SWITCH
0 OFF
1 DOWN
2 UP
3 C1
2 C1
7 C1
Z8
14
BK/VT
S240
(8W-15-13)
Z14
20
BK/YL
19
3 C205
S218
(8W-15-13)
2
GROUND
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-11)
□ EXCEPT DAYTIME RUNNING LAMPS
G203
(8W-15-16)


RUN A22
(8W-10-13)
RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-3)
41
42
CIRCUIT BREAKER NO. 1
20A
(8W-11-28)
6
26
FUSE
6
10A
(8W-11-13)
F21
14
TN
S220
(8W-11-28)
C201
S242
(8W-11-28)
DRIVER POWER WINDOW MOTOR
M
Q11
14
LB
Q21
14
WT/LB
F20
20
WT
S216
(8W-11-13)
C201
C1
DRIVER WINDOW CONTROL
DRIVER POWER WINDOW SWITCH
0 OFF
1 DOWN
2 UP
Z8
14
BK/VT
S240
(8W-15-13)
C201
S218
(8W-15-13)
Z14
20
BK/YL
C201
C205
GROUND
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-13)
PASSENGER DOOR AJAR SWITCH
(8W-40-12)
G203
(8W-15-16)

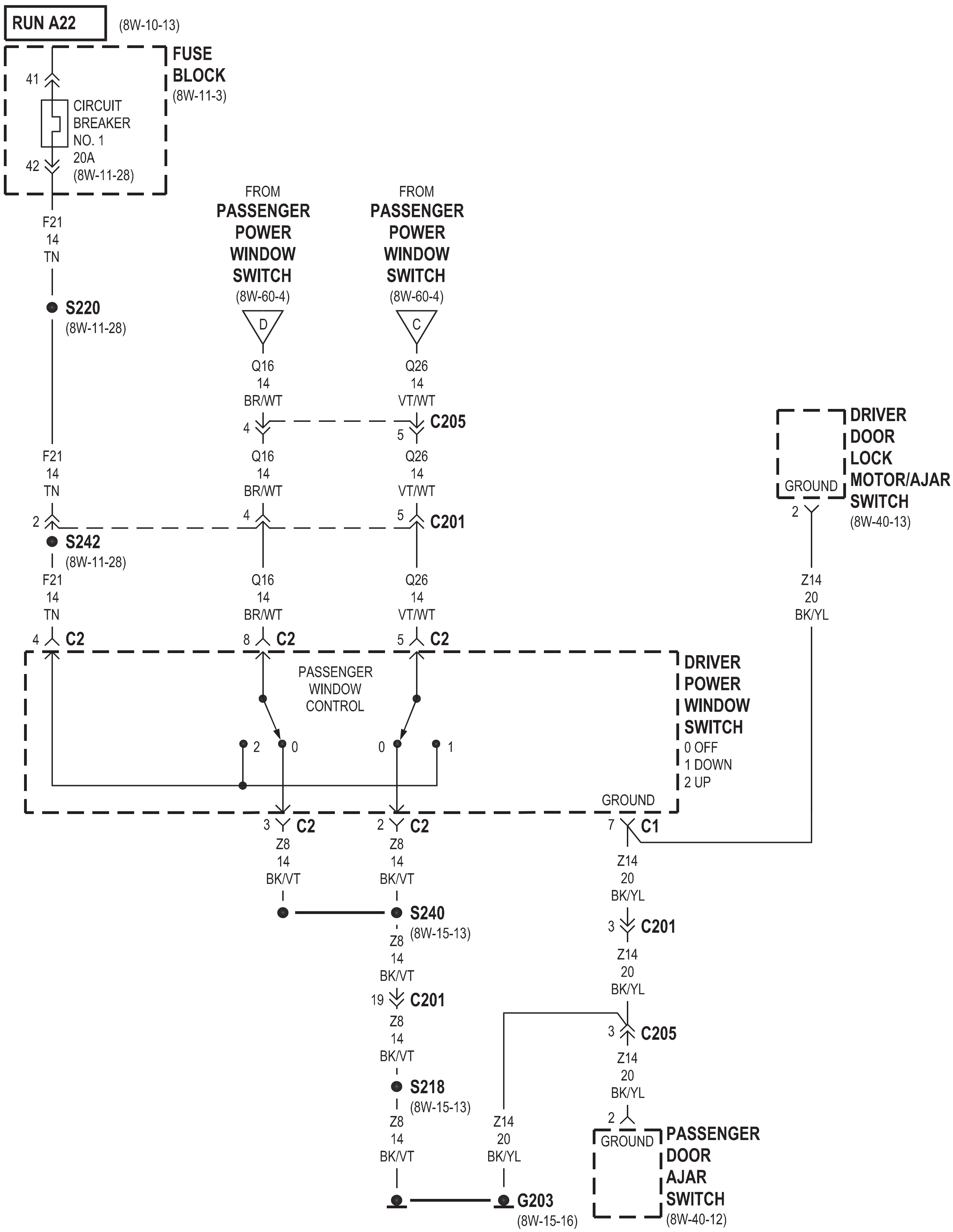

RUN A22
(8W-10-13)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
41
CIRCUIT
BREAKER
NO. 1
20A
(8W-11-28)
42
F21
14
TN
S220
(8W-11-28)
F21
14
TN
2
C205
F21
14
TN
PASSENGER
POWER
WINDOW
MOTOR
M
2
1
Q22
14
VT
Q12
14
BR
4
5
8
PASSENGER
POWER
WINDOW
SWITCH
0 OFF
1 DOWN
2 UP
1
0
0
2
2
3
Q26
14
VT/WT
Q16
14
BR/WT
C
D
TO
C205
(8W-60-7)
TO
C205
(8W-60-7)


RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
41
CIRCUIT BREAKER NO. 1 20A (8W-11-28)
42
F21 14 TN
S220
(8W-11-28)
F21 14 TN
2
C201
F21 14 TN
PASSENGER POWER WINDOW MOTOR
M
2
1
Q22 14 VT
Q12 14 BR
4
5
8
PASSENGER POWER WINDOW SWITCH
0 OFF
1 DOWN
2 UP
1
0
0
2
2
3
Q26 14 VT/WT
Q16 14 BR/WT
E
F
TO C201 (8W-60-6)
TO C201 (8W-60-6)

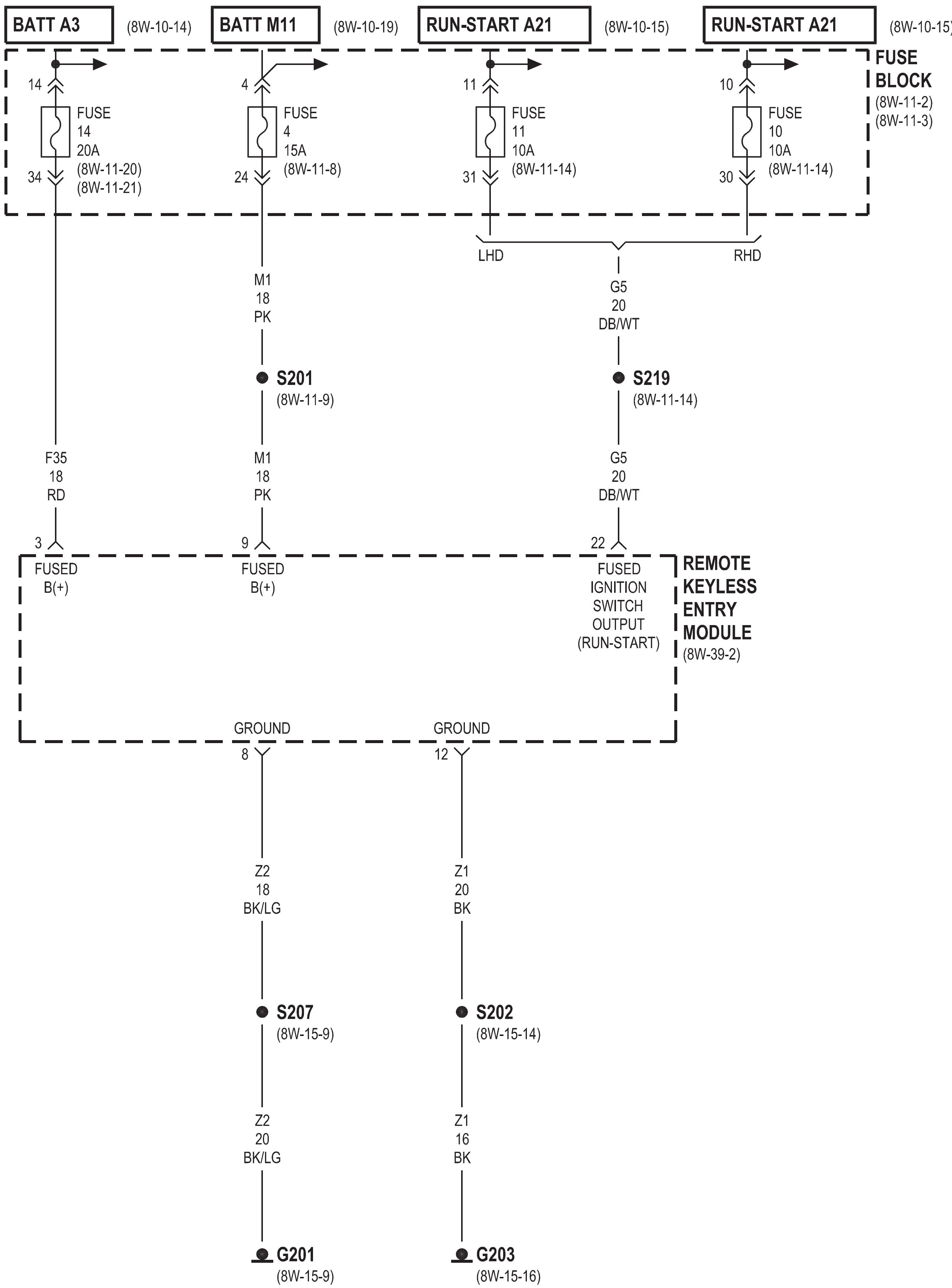
LHD

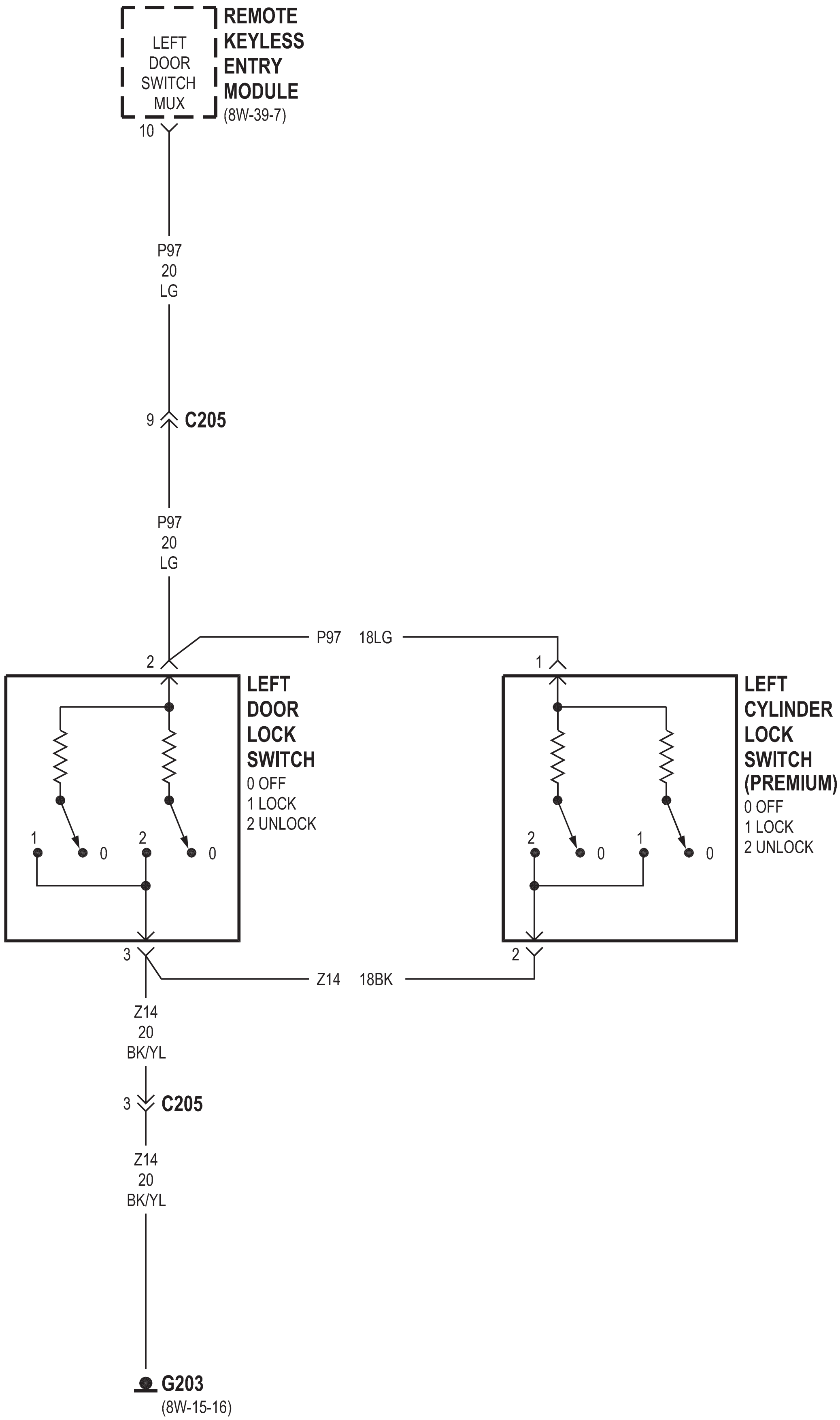


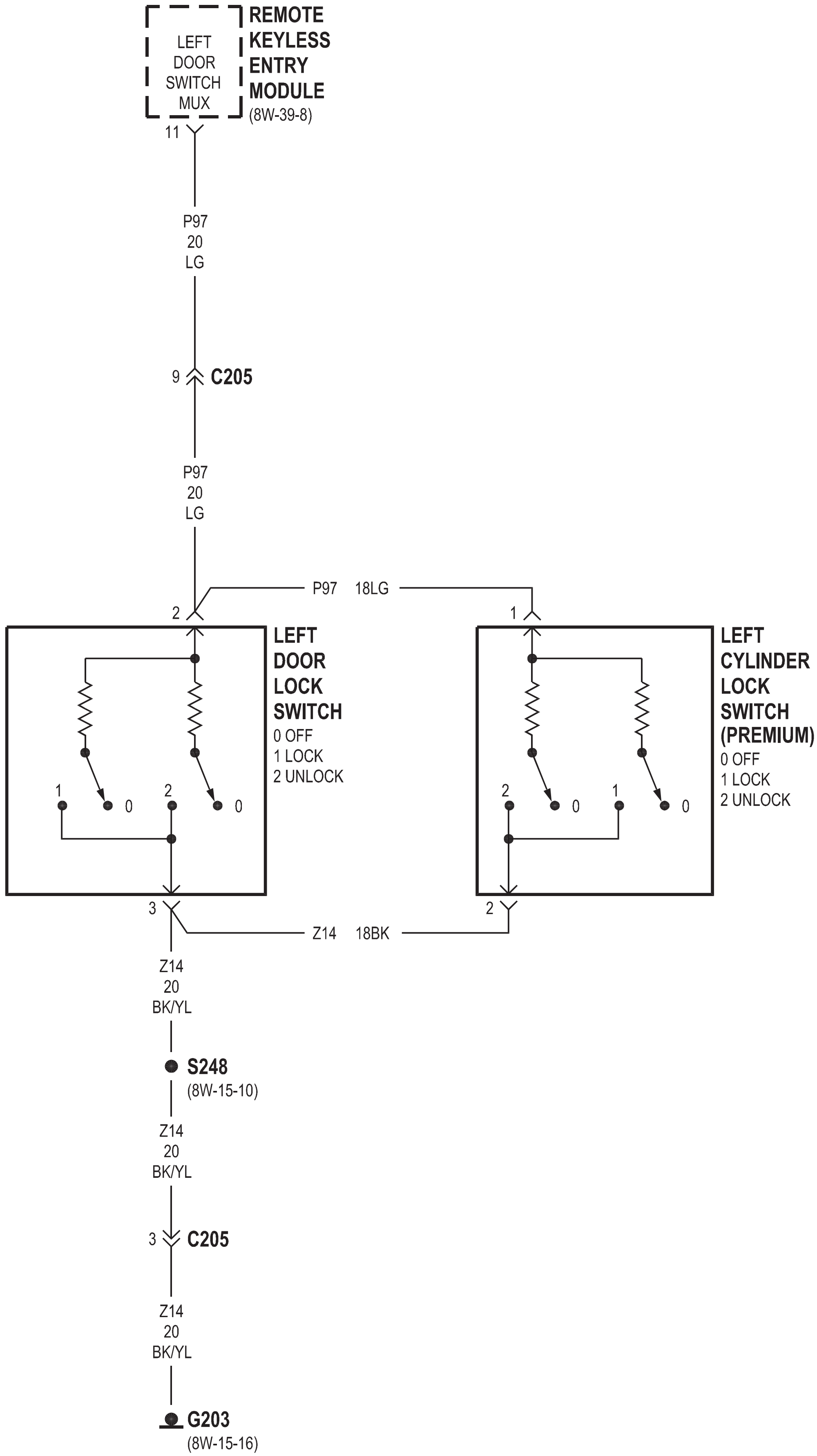
□ EXCEPT DAYTIME RUNNING LAMPS

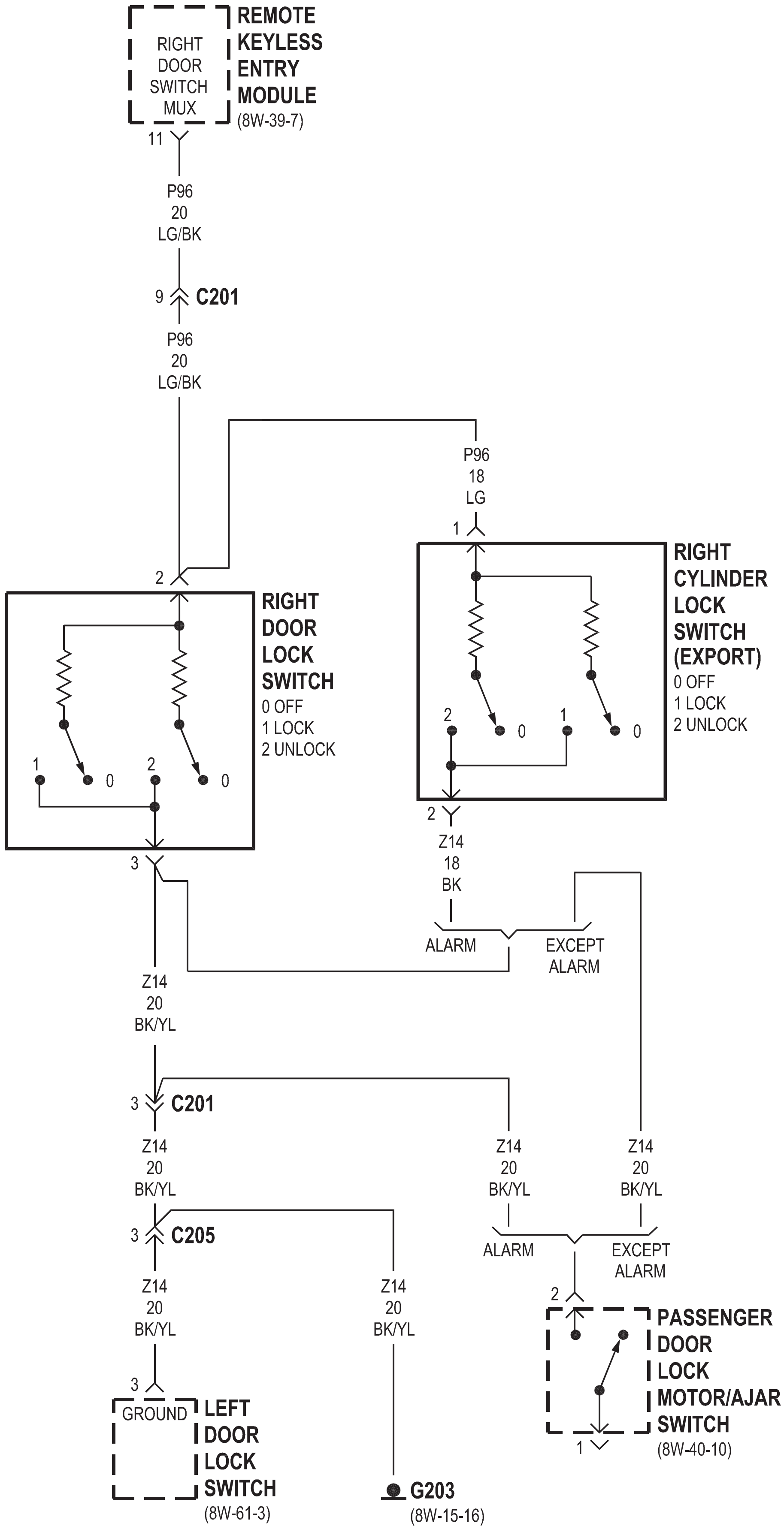

RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-3)
41
CIRCUIT BREAKER NO. 1 20A (8W-11-28)
42
F21 14 TN
S220
(8W-11-28)
FROM PASSENGER POWER WINDOW SWITCH
(8W-60-4)
D
Q16 14 BR/WT
FROM PASSENGER POWER WINDOW SWITCH
(8W-60-4)
C
Q26 14 VT/WT
4
5
C205
Q16 14 BR/WT
Q26 14 VT/WT
F21 14 TN
2
4
5
C201
S242
(8W-11-28)
F21 14 TN
Q16 14 BR/WT
Q26 14 VT/WT
4 C2
8 C2
5 C2
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
GROUND
2
(8W-40-13)
Z14 20 BK/YL
PASSENGER WINDOW CONTROL
2
0
0
1
DRIVER POWER WINDOW SWITCH
0 OFF
1 DOWN
2 UP
GROUND
3 C2
2 C2
7 C1
Z8 14 BK/VT
Z8 14 BK/VT
Z14 20 BK/YL
S240
(8W-15-13)
Z8 14 BK/VT
3 C201
Z14 20 BK/YL
19 C201
Z8 14 BK/VT
3 C205
Z14 20 BK/YL
S218
(8W-15-13)
Z8 14 BK/VT
Z14 20 BK/YL
2
GROUND
PASSENGER DOOR AJAR SWITCH
(8W-40-12)
G203
(8W-15-16)

8W-61 POWER DOOR LOCKS

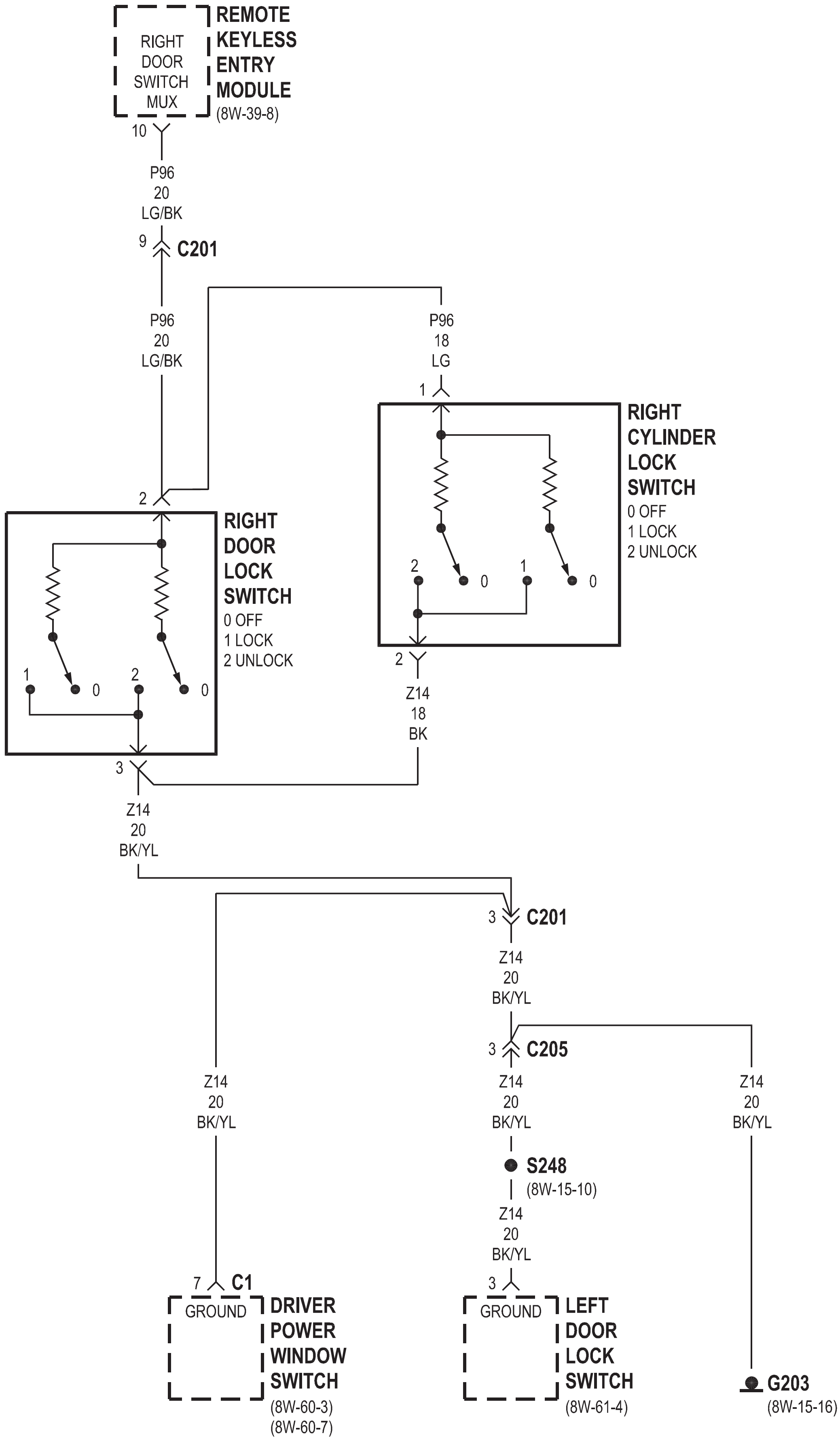

BATT A3
(8W-10-14)
BATT M11
(8W-10-19)
RUN-START A21
(8W-10-15)
RUN-START A21
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
14
FUSE 14 20A
(8W-11-20)
(8W-11-21)
34
4
FUSE 4 15A
(8W-11-8)
24
11
FUSE 11 10A
(8W-11-14)
31
10
FUSE 10 10A
(8W-11-14)
30
LHD
RHD
M1 18 PK
G5 20 DB/WT
S201
(8W-11-9)
S219
(8W-11-14)
F35 18 RD
M1 18 PK
G5 20 DB/WT
3
9
22
FUSED B(+)
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
REMOTE KEYLESS ENTRY MODULE
(8W-39-2)
GROUND
GROUND
8
12
Z2 18 BK/LG
Z1 20 BK
S207
(8W-15-9)
S202
(8W-15-14)
Z2 20 BK/LG
Z1 16 BK
G201
(8W-15-9)
G203
(8W-15-16)

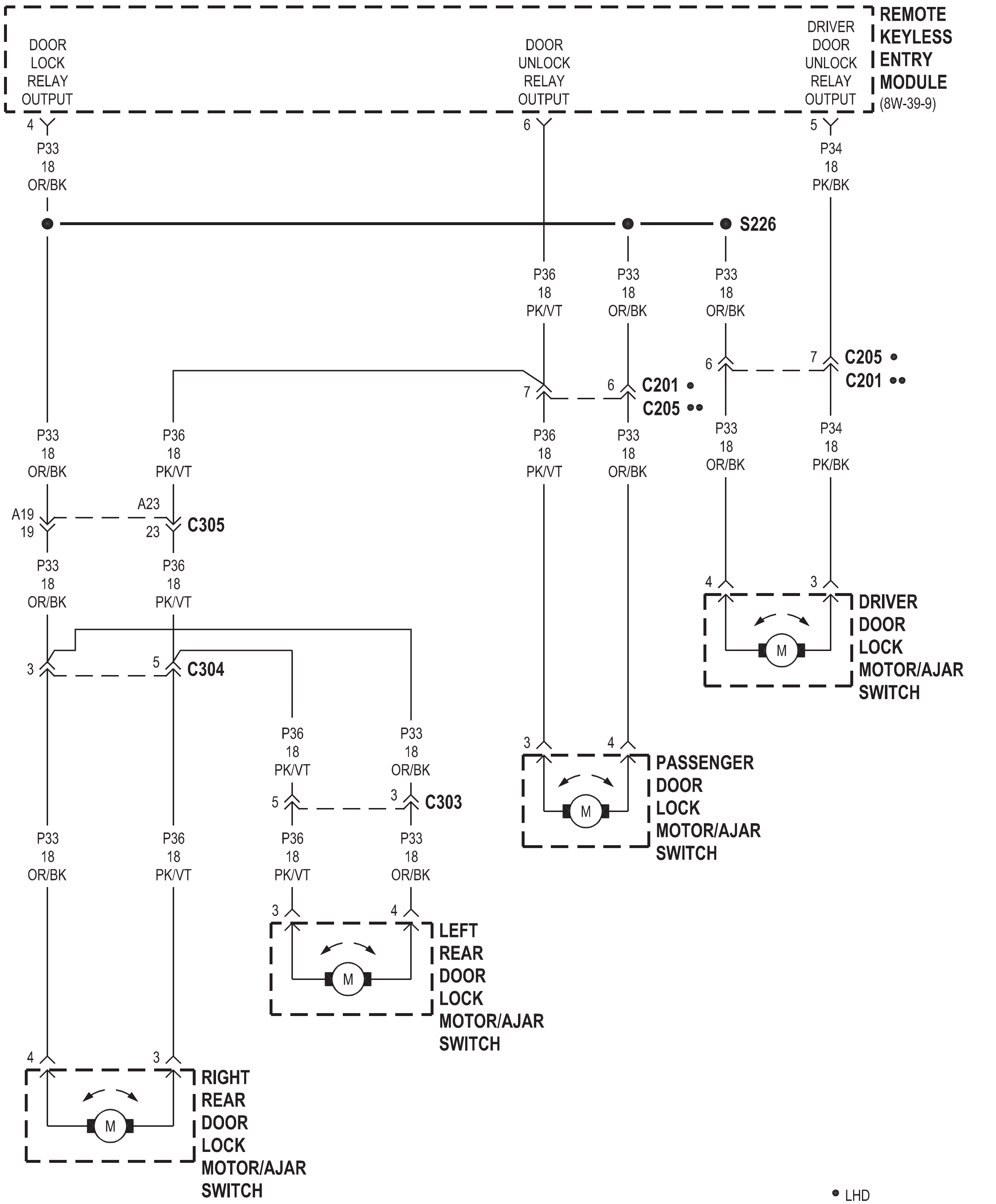

LEFT
DOOR
SWITCH
MUX
REMOTE
KEYLESS
ENTRY
MODULE
(8W-39-7)
10
P97
20
LG
9
C205
P97
20
LG
2
P97 18LG
1
LEFT
DOOR
LOCK
SWITCH
0 OFF
1 LOCK
2 UNLOCK
1
0
2
0
LEFT
CYLINDER
LOCK
SWITCH
(PREMIUM)
0 OFF
1 LOCK
2 UNLOCK
2
0
1
0
3
Z14 18BK
2
Z14
20
BK/YL
3
C205
Z14
20
BK/YL
G203
(8W-15-16)


LEFT DOOR SWITCH MUX
REMOTE KEYLESS ENTRY MODULE
(8W-39-8)
11
P97
20
LG
9
C205
P97
20
LG
P97 18LG
2
1
LEFT DOOR LOCK SWITCH
0 OFF
1 LOCK
2 UNLOCK
LEFT CYLINDER LOCK SWITCH (PREMIUM)
0 OFF
1 LOCK
2 UNLOCK
3
2
Z14 18BK
Z14
20
BK/YL
S248
(8W-15-10)
Z14
20
BK/YL
3
C205
Z14
20
BK/YL
G203
(8W-15-16)

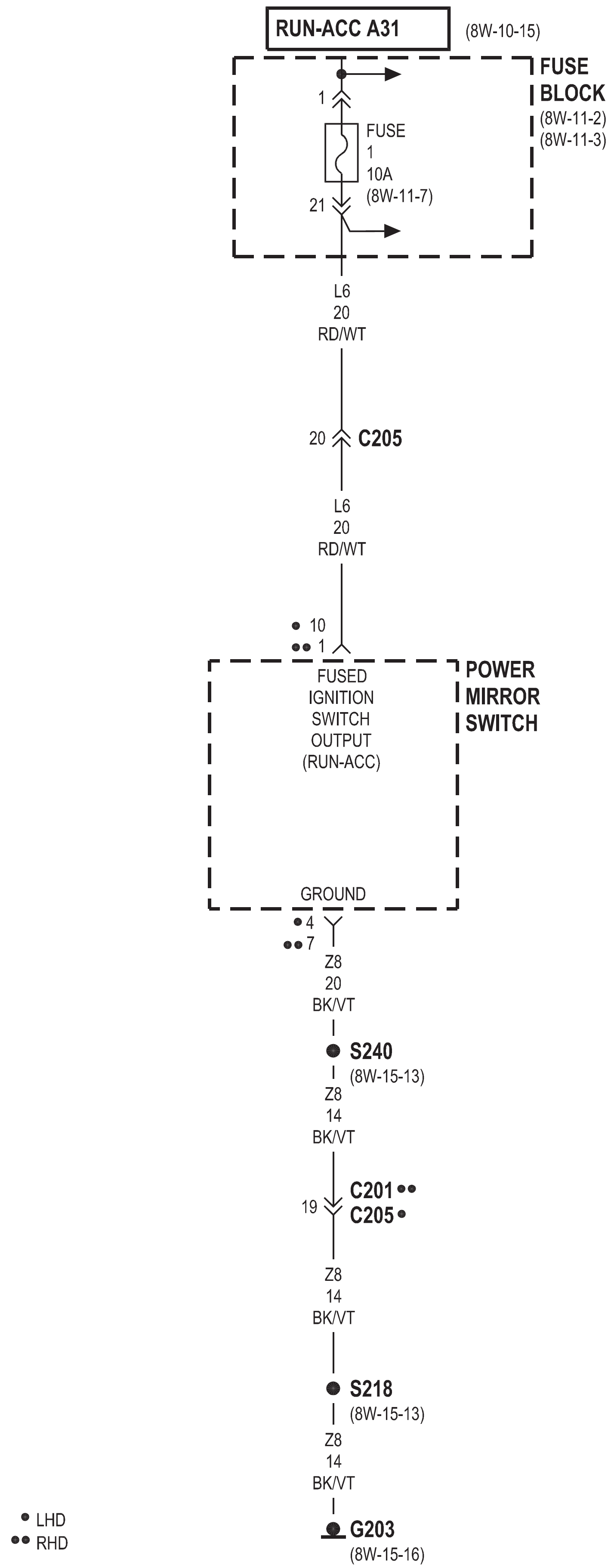

REMOTE KEYLESS ENTRY MODULE
RIGHT DOOR SWITCH MUX
(8W-39-7)
11
P96 20 LG/BK
9
C201
P96 20 LG/BK
P96 18 LG
1
2
RIGHT DOOR LOCK SWITCH
0 OFF
1 LOCK
2 UNLOCK
1 0 2 0
3
RIGHT CYLINDER LOCK SWITCH (EXPORT)
0 OFF
1 LOCK
2 UNLOCK
2 0 1 0
2
Z14 18 BK
ALARM
EXCEPT ALARM
Z14 20 BK/YL
3
C201
Z14 20 BK/YL
Z14 20 BK/YL
Z14 20 BK/YL
3
C205
ALARM
EXCEPT ALARM
Z14 20 BK/YL
Z14 20 BK/YL
2
PASSENGER DOOR LOCK MOTOR/AJAR SWITCH
(8W-40-10)
1
3
GROUND
LEFT DOOR LOCK SWITCH
(8W-61-3)
G203
(8W-15-16)

RHD

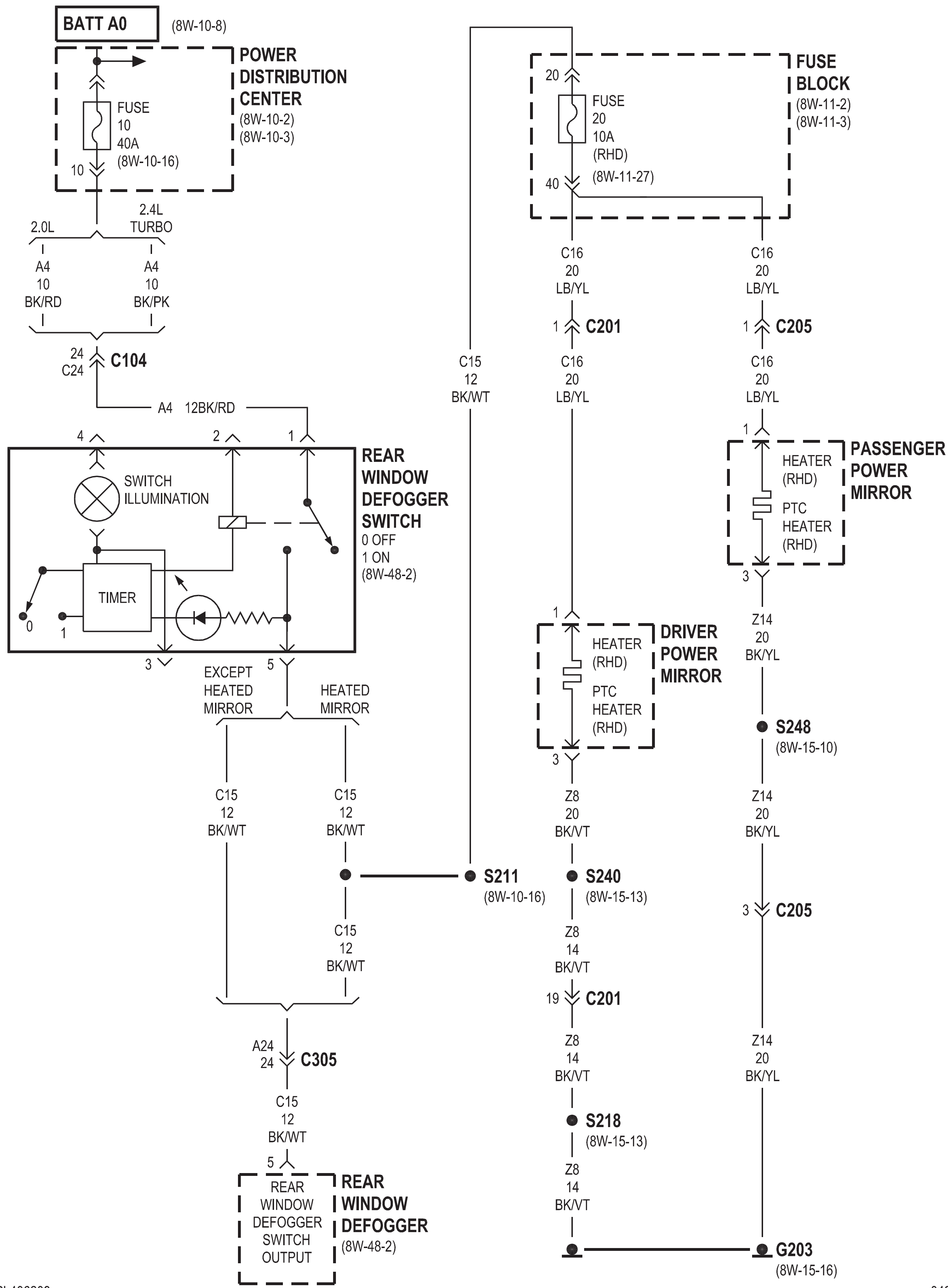

REMOTE KEYLESS ENTRY MODULE
(8W-39-8)
RIGHT DOOR SWITCH MUX
10
P96
20
LG/BK
9
C201
P96
20
LG/BK
P96
18
LG
1
RIGHT CYLINDER LOCK SWITCH
0 OFF
1 LOCK
2 UNLOCK
2
RIGHT DOOR LOCK SWITCH
0 OFF
1 LOCK
2 UNLOCK
Z14
18
BK
3
Z14
20
BK/YL
3
C201
Z14
20
BK/YL
3
C205
S248
(8W-15-10)
7
C1
GROUND
DRIVER POWER WINDOW SWITCH
(8W-60-3)
(8W-60-7)
GROUND
LEFT DOOR LOCK SWITCH
(8W-61-4)
G203
(8W-15-16)

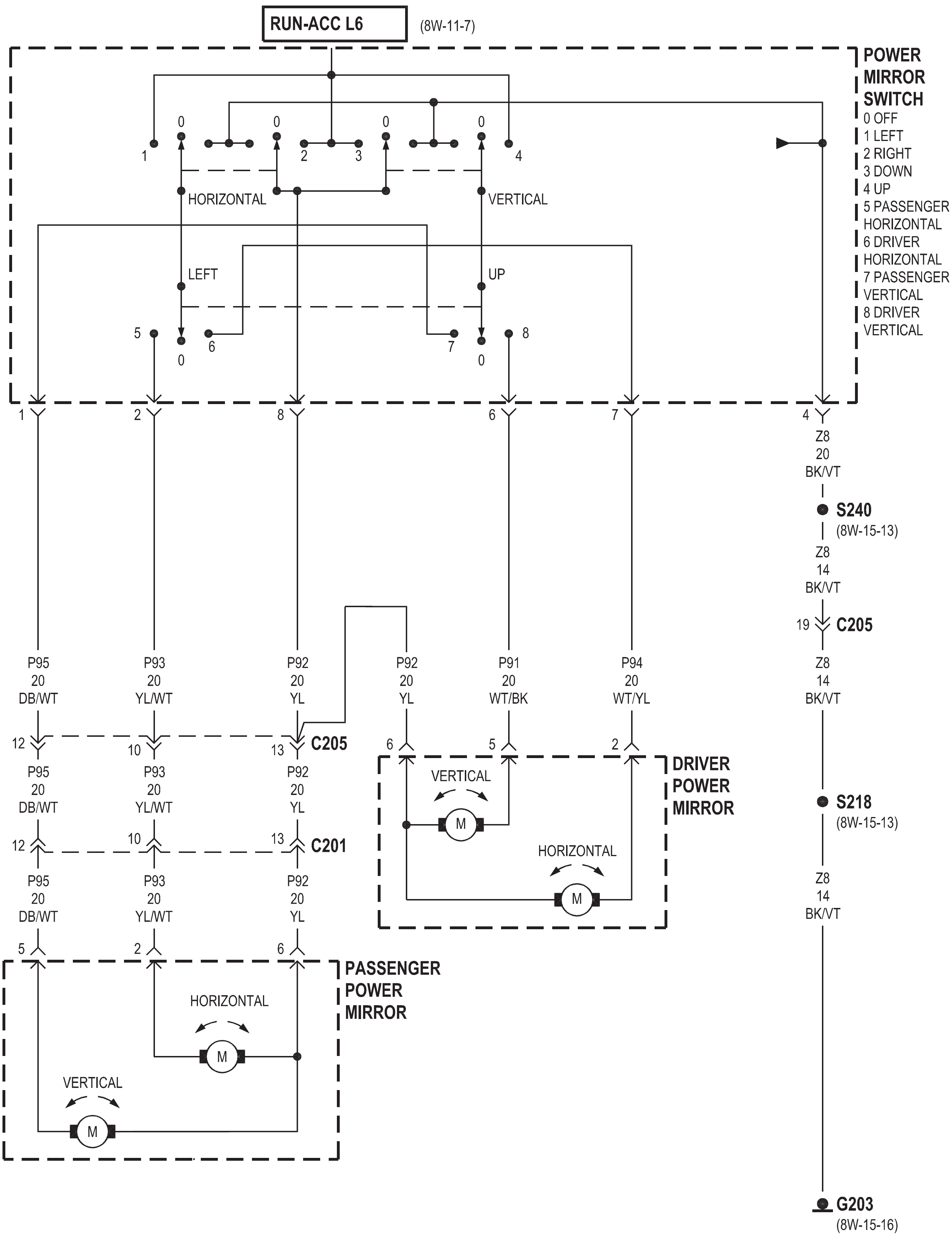

REMOTE KEYLESS ENTRY MODULE
(8W-39-9)
DOOR LOCK RELAY OUTPUT
DOOR UNLOCK RELAY OUTPUT
DRIVER DOOR UNLOCK RELAY OUTPUT
4
6
5
P33 18 OR/BK
P34 18 PK/BK
S226
P36 18 PK/VT
P33 18 OR/BK
C205 •
C201 ••
C201 •
C205 ••
7
6
A19
19
A23
23
C305
C304
3
5
C303
DRIVER DOOR LOCK MOTOR/AJAR SWITCH
PASSENGER DOOR LOCK MOTOR/AJAR SWITCH
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH
RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH
M
• LHD
•• RHD

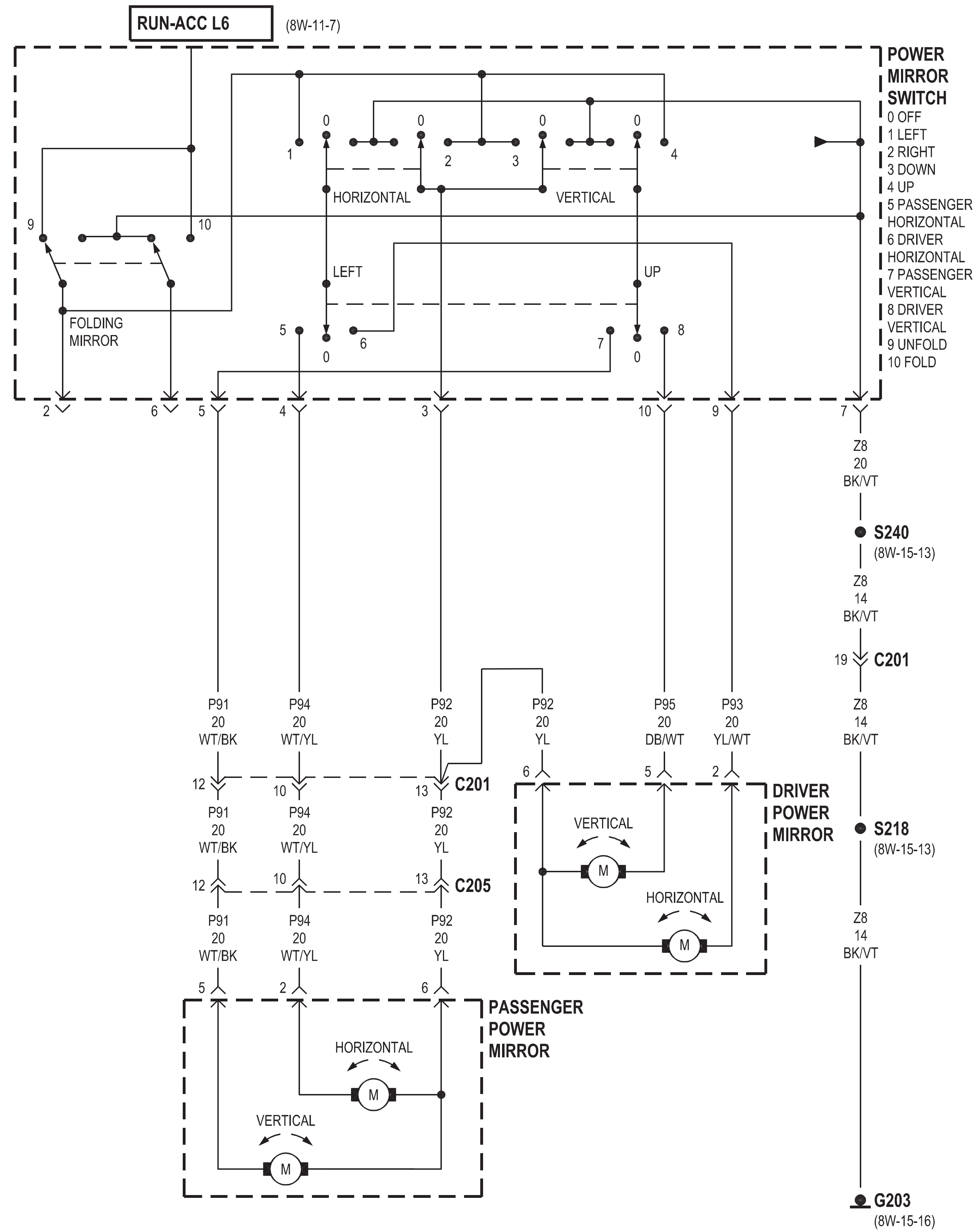
8W-62 POWER MIRRORS

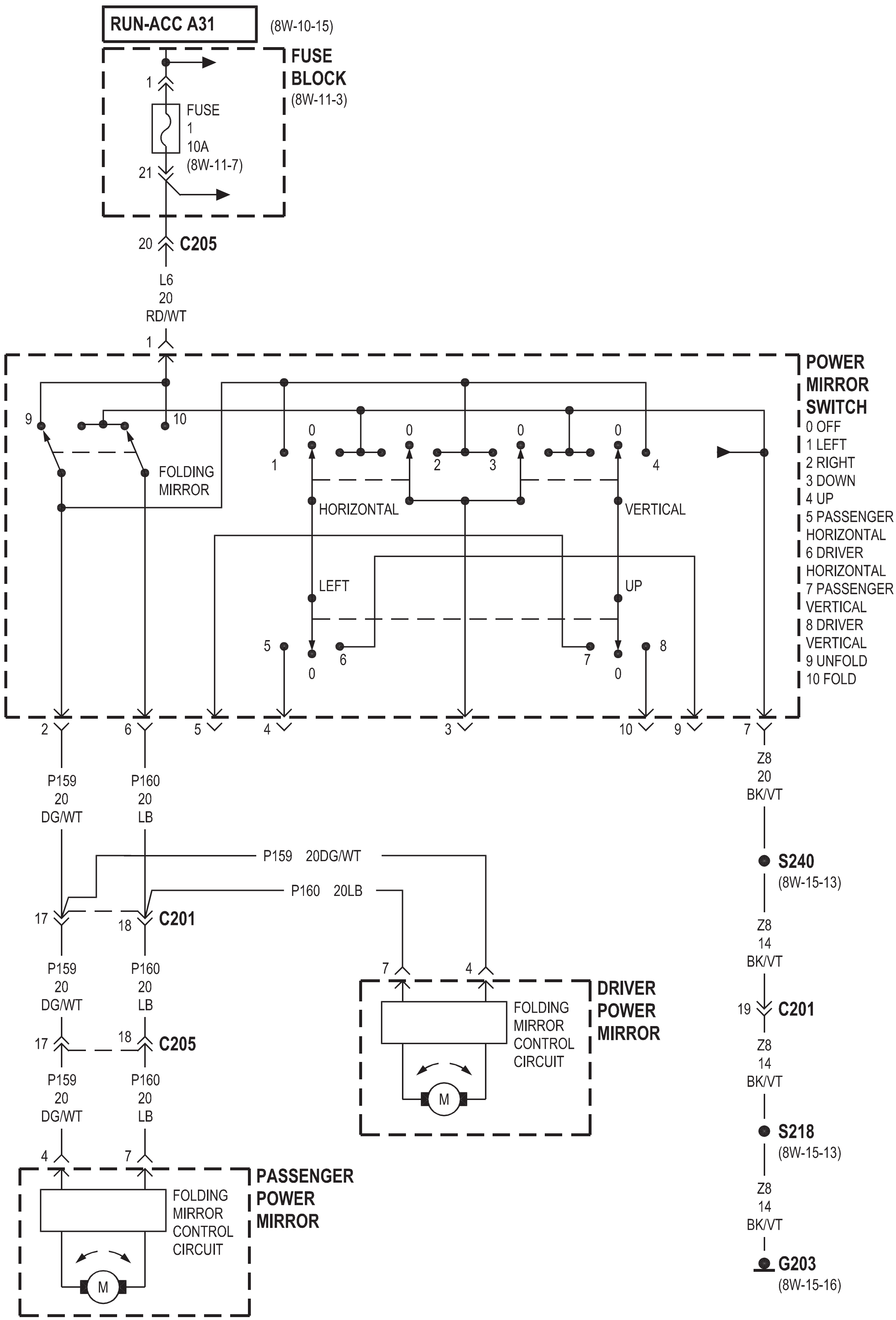


RUN-ACC A31
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
1
FUSE
1
10A
(8W-11-7)
21
L6
20
RD/WT
20
C205
L6
20
RD/WT
10
1
POWER MIRROR SWITCH
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
GROUND
4
7
Z8
20
BK/VT
S240
(8W-15-13)
Z8
14
BK/VT
19
C201
C205
Z8
14
BK/VT
S218
(8W-15-13)
Z8
14
BK/VT
G203
(8W-15-16)
LHD
RHD

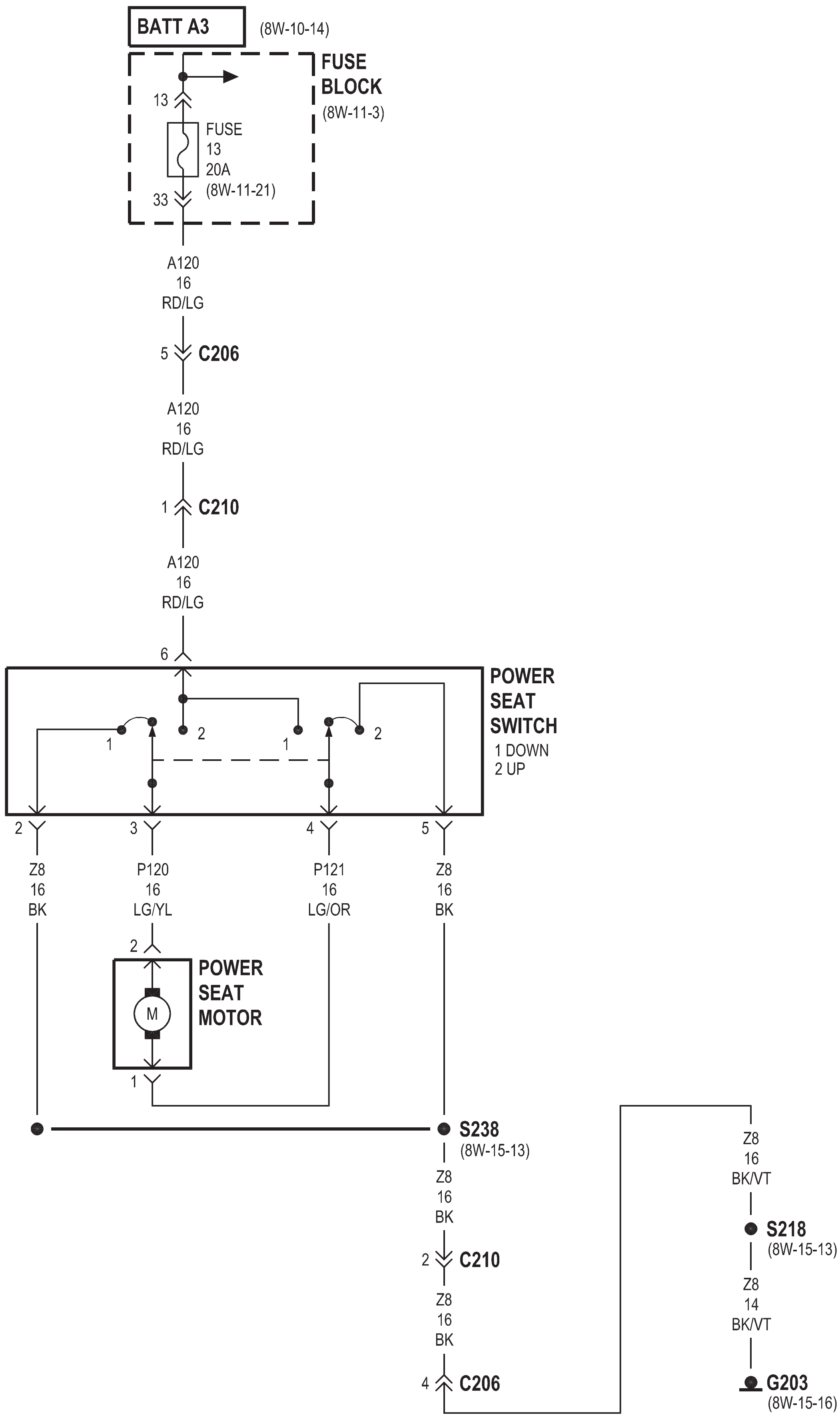

BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 10 40A (8W-10-16)
10
2.0L
2.4L TURBO
A4 10 BK/RD
A4 10 BK/PK
24 C24 C104
A4 12BK/RD
4
2
1
REAR WINDOW DEFOGGER SWITCH
0 OFF
1 ON
(8W-48-2)
SWITCH ILLUMINATION
TIMER
0
1
3
5
EXCEPT HEATED MIRROR
HEATED MIRROR
C15 12 BK/WT
C15 12 BK/WT
C15 12 BK/WT
C15 12 BK/WT
A24 24 C305
C15 12 BK/WT
5
REAR WINDOW DEFOGGER SWITCH OUTPUT
REAR WINDOW DEFOGGER
(8W-48-2)
S211
(8W-10-16)
C15 12 BK/WT
FUSE BLOCK
(8W-11-2)
(8W-11-3)
20
FUSE 20 10A (RHD)
(8W-11-27)
40
C16 20 LB/YL
1 C201
C16 20 LB/YL
C16 20 LB/YL
1 C205
C16 20 LB/YL
1
PASSENGER POWER MIRROR
HEATER (RHD)
PTC HEATER (RHD)
3
Z14 20 BK/YL
S248
(8W-15-10)
Z14 20 BK/YL
3 C205
Z14 20 BK/YL
1
DRIVER POWER MIRROR
HEATER (RHD)
PTC HEATER (RHD)
3
Z8 20 BK/VT
S240
(8W-15-13)
Z8 14 BK/VT
19 C201
Z8 14 BK/VT
S218
(8W-15-13)
Z8 14 BK/VT
G203
(8W-15-16)


RUN-ACC L6
(8W-11-7)
POWER
MIRROR
SWITCH
0 OFF
1 LEFT
2 RIGHT
3 DOWN
4 UP
5 PASSENGER
HORIZONTAL
6 DRIVER
HORIZONTAL
7 PASSENGER
VERTICAL
8 DRIVER
VERTICAL
HORIZONTAL
VERTICAL
LEFT
UP
Z8
20
BK/VT
S240
(8W-15-13)
Z8
14
BK/VT
C205
P95
20
DB/WT
P93
20
YL/WT
P92
20
YL
P91
20
WT/BK
P94
20
WT/YL
C205
C201
DRIVER
POWER
MIRROR
PASSENGER
POWER
MIRROR
M
S218
(8W-15-13)
G203
(8W-15-16)

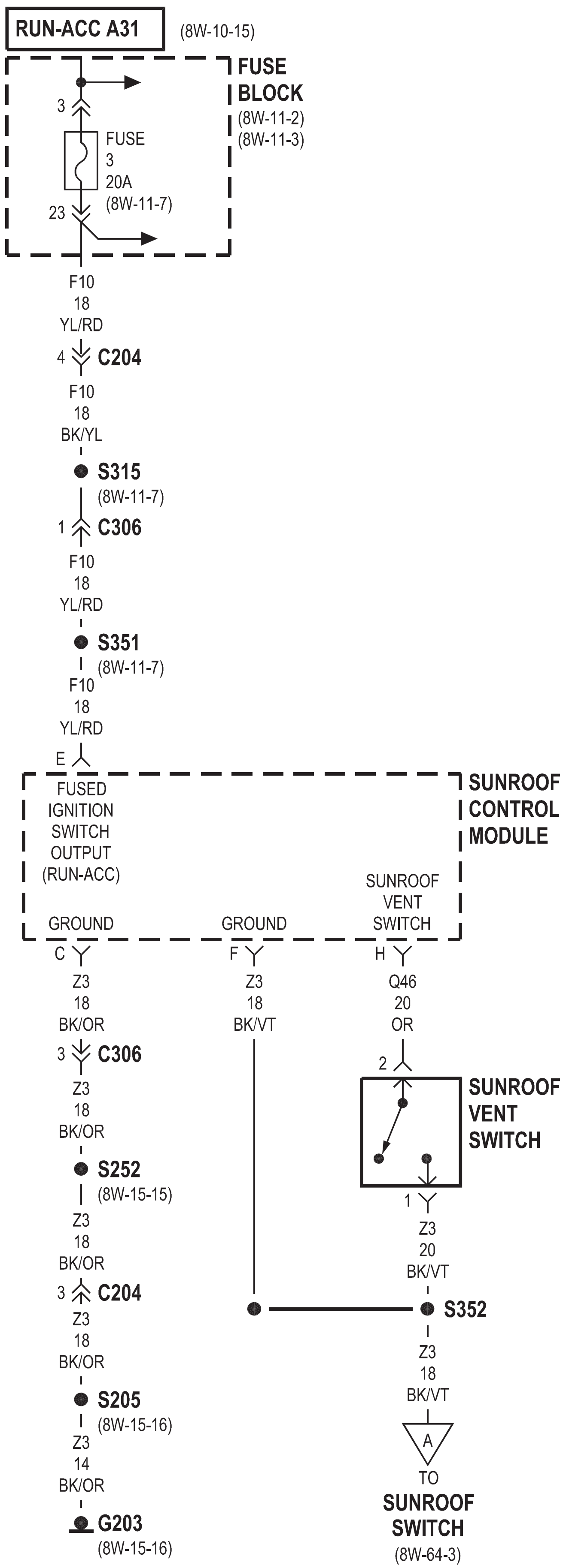

RUN-ACC L6
(8W-11-7)
POWER MIRROR SWITCH
0 OFF
1 LEFT
2 RIGHT
3 DOWN
4 UP
5 PASSENGER HORIZONTAL
6 DRIVER HORIZONTAL
7 PASSENGER VERTICAL
8 DRIVER VERTICAL
9 UNFOLD
10 FOLD
HORIZONTAL
VERTICAL
LEFT
UP
FOLDING MIRROR
Z8 20 BK/VT
S240
(8W-15-13)
Z8 14 BK/VT
C201
S218
(8W-15-13)
G203
(8W-15-16)
P91 20 WT/BK
P94 20 WT/YL
P92 20 YL
P95 20 DB/WT
P93 20 YL/WT
C205
DRIVER POWER MIRROR
PASSENGER POWER MIRROR
M

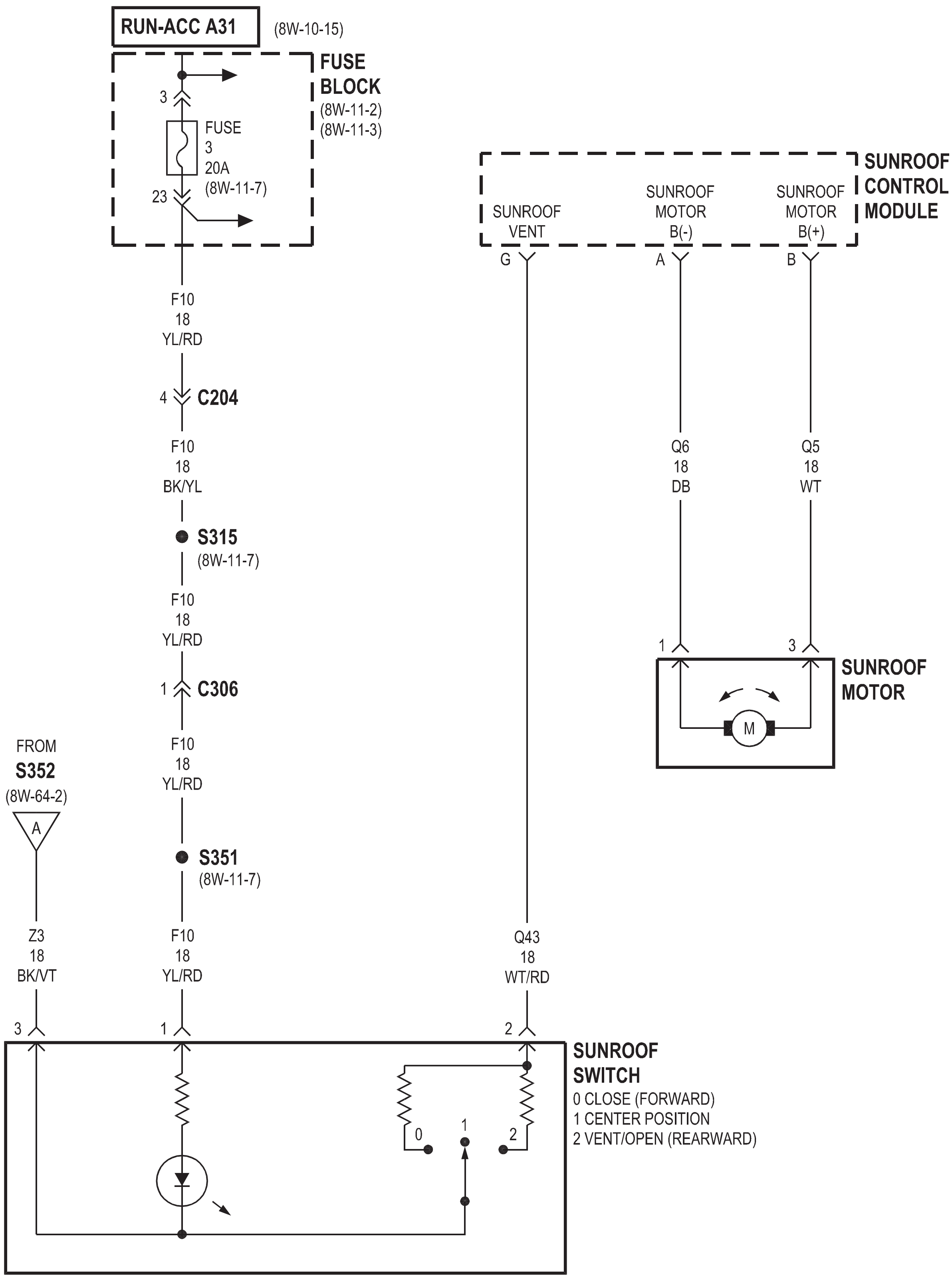

RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-3)
FUSE
1
10A
(8W-11-7)
C205
L6
20
RD/WT
POWER
MIRROR
SWITCH
0 OFF
1 LEFT
2 RIGHT
3 DOWN
4 UP
5 PASSENGER
HORIZONTAL
6 DRIVER
HORIZONTAL
7 PASSENGER
VERTICAL
8 DRIVER
VERTICAL
9 UNFOLD
10 FOLD
FOLDING
MIRROR
HORIZONTAL
VERTICAL
LEFT
UP
P159
20
DG/WT
P160
20
LB
Z8
20
BK/VT
S240
(8W-15-13)
P159 20DG/WT
P160 20LB
C201
Z8
14
BK/VT
DRIVER
POWER
MIRROR
FOLDING
MIRROR
CONTROL
CIRCUIT
M
S218
(8W-15-13)
PASSENGER
POWER
MIRROR
G203
(8W-15-16)

8W-63 POWER SEAT

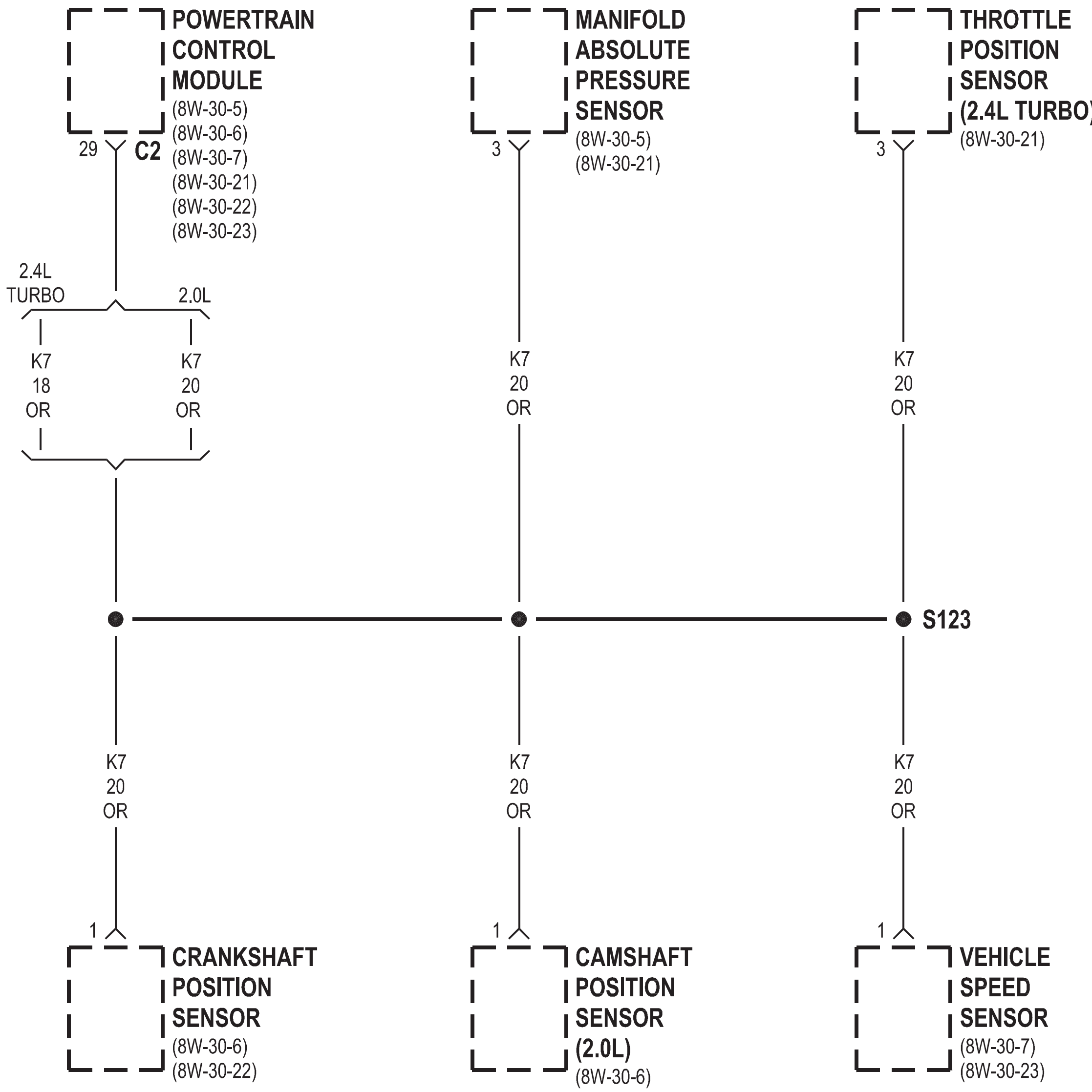

BATT A3
(8W-10-14)
FUSE
BLOCK
(8W-11-3)
13
FUSE
13
20A
(8W-11-21)
33
A120
16
RD/LG
5
C206
A120
16
RD/LG
1
C210
A120
16
RD/LG
6
POWER
SEAT
SWITCH
1 DOWN
2 UP
1
2
1
2
2
3
4
5
Z8
16
BK
P120
16
LG/YL
P121
16
LG/OR
Z8
16
BK
2
POWER
SEAT
MOTOR
M
1
S238
(8W-15-13)
Z8
16
BK
2
C210
Z8
16
BK
4
C206
Z8
16
BK/VT
S218
(8W-15-13)
Z8
14
BK/VT
G203
(8W-15-16)

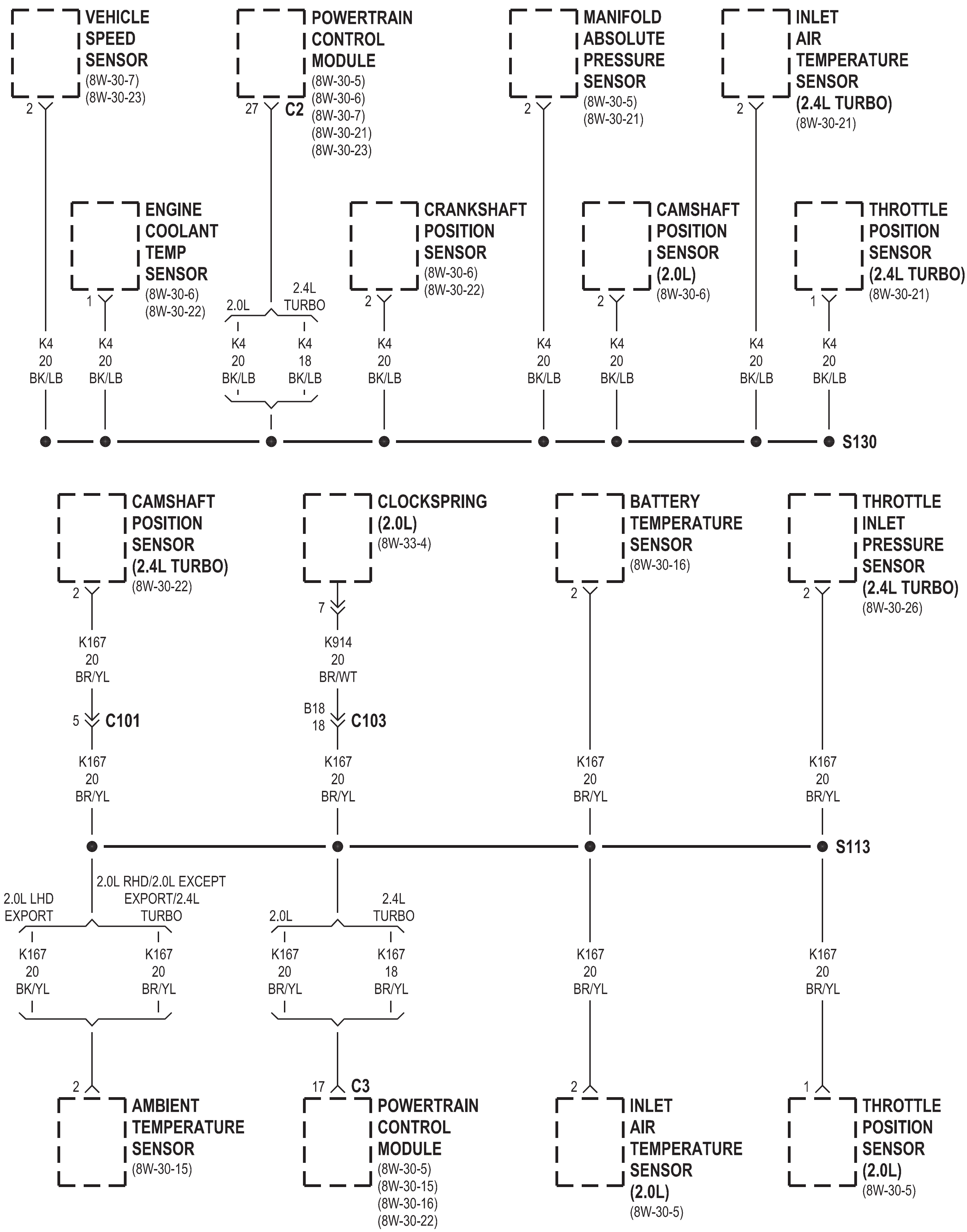
8W-64 POWER SUNROOF


RUN-ACC A31
(8W-10-15)
FUSE
BLOCK
(8W-11-2)
(8W-11-3)
3
FUSE
3
20A
(8W-11-7)
23
F10
18
YL/RD
4
C204
F10
18
BK/YL
S315
(8W-11-7)
1
C306
F10
18
YL/RD
S351
(8W-11-7)
F10
18
YL/RD
E
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-ACC)
SUNROOF
CONTROL
MODULE
SUNROOF
VENT
SWITCH
GROUND
GROUND
C
F
H
Z3
18
BK/OR
Z3
18
BK/VT
Q46
20
OR
3
C306
2
SUNROOF
VENT
SWITCH
Z3
18
BK/OR
S252
(8W-15-15)
1
Z3
20
BK/VT
Z3
18
BK/OR
3
C204
S352
Z3
18
BK/OR
Z3
18
BK/VT
S205
(8W-15-16)
A
TO
SUNROOF
SWITCH
(8W-64-3)
Z3
14
BK/OR
G203
(8W-15-16)


RUN-ACC A31
(8W-10-15)
FUSE BLOCK
(8W-11-2)
(8W-11-3)
3
FUSE
3
20A
(8W-11-7)
23
F10
18
YL/RD
4
C204
F10
18
BK/YL
S315
(8W-11-7)
F10
18
YL/RD
1
C306
F10
18
YL/RD
S351
(8W-11-7)
F10
18
YL/RD
FROM
S352
(8W-64-2)
A
Z3
18
BK/VT
SUNROOF CONTROL MODULE
SUNROOF VENT
SUNROOF MOTOR B(-)
SUNROOF MOTOR B(+)
G
A
B
Q6
18
DB
Q5
18
WT
1
3
SUNROOF MOTOR
M
Q43
18
WT/RD
3
1
2
SUNROOF SWITCH
0 CLOSE (FORWARD)
1 CENTER POSITION
2 VENT/OPEN (REARWARD)
0
1
2

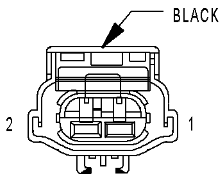
8W-70 SPLICE INFORMATION


POWERTRAIN CONTROL MODULE
(8W-30-5)
(8W-30-6)
(8W-30-7)
(8W-30-21)
(8W-30-22)
(8W-30-23)
29
C2
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-5)
(8W-30-21)
3
THROTTLE POSITION SENSOR (2.4L TURBO)
(8W-30-21)
3
2.4L TURBO
2.0L
K7 18 OR
K7 20 OR
K7 20 OR
K7 20 OR
S123
K7 20 OR
K7 20 OR
K7 20 OR
1
CRANKSHAFT POSITION SENSOR
(8W-30-6)
(8W-30-22)
1
CAMSHAFT POSITION SENSOR (2.0L)
(8W-30-6)
1
VEHICLE SPEED SENSOR
(8W-30-7)
(8W-30-23)



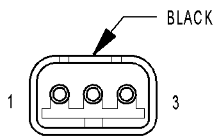
PL407003 048W-10

8W-80 CONNECTOR PIN-OUTS



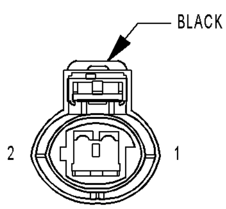
A/C COMPRESSOR CLUTCH - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C3 20DB/BK	A/C CLUTCH RELAY OUTPUT
2	Z1 20BK	GROUND



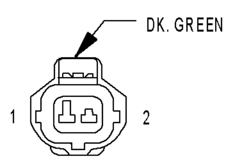
A/C CYCLING SWITCH (RHD) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	C21 22DB/OR	A/C SWITCH SENSE
2	F20 22WT	FUSED IGNITION SWITCH OUTPUT (RUN)
3	C2 22DB/YL	MODE SWITCH OUTPUT



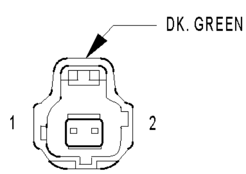
A/C HIGH PRESSURE SWITCH - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C20 20BR/OR (2.0L)	A/C SWITCH SENSE
1	C20 20BR (2.4L TURBO)	A/C SWITCH SENSE
2	C22 20DB/WT	PRESSURE SWITCH OUTPUT



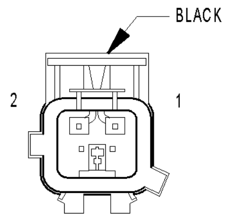
A/C LOW PRESSURE SWITCH (2.0L LHD) - DK. GREEN 2 WAY

CAV	CIRCUIT	FUNCTION
1	C22 20DB/WT	PRESSURE SWITCH OUTPUT
2	C21 20DB/OR	A/C SWITCH SENSE



A/C LOW PRESSURE SWITCH (2.4L TURBO) - DK. GREEN 2 WAY

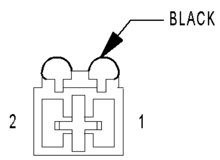
CAV	CIRCUIT	FUNCTION
1	C22 20DB/WT	PRESSURE SWITCH OUTPUT
2	C21 20DB/OR	A/C SWITCH SENSE



A/C LOW PRESSURE SWITCH (RHD)

A/C LOW PRESSURE SWITCH (RHD) - BLACK 2 WAY

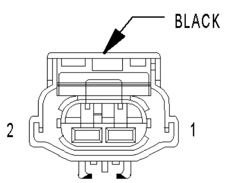
CAV	CIRCUIT	FUNCTION
1	C22 20DB/WT	PRESSURE SWITCH OUTPUT
2	C21 20DB/OR	A/C SWITCH SENSE



A/C-HEATER BLOWER MOTOR (LHD)

A/C-HEATER BLOWER MOTOR (LHD) - BLACK 2 WAY

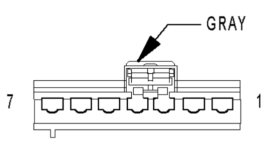
CAV	CIRCUIT	FUNCTION
1	C1 14DG	FUSED IGNITION SWITCH OUTPUT (RUN)
2	C7 14BK/TN	BLOWER MOTOR HIGH DRIVER



A/C-HEATER BLOWER MOTOR (RHD)

A/C-HEATER BLOWER MOTOR (RHD) - BLACK 2 WAY

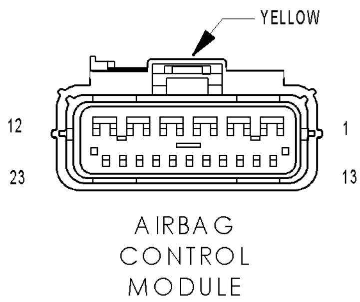
CAV	CIRCUIT	FUNCTION
1	C1 14DG	FUSED IGNITION SWITCH OUTPUT (RUN)
2	C7 14BK/TN	BLOWER MOTOR HIGH DRIVER



A/C-HEATER CONTROL

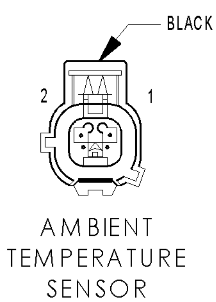
A/C-HEATER CONTROL - GRAY 7 WAY

CAV	CIRCUIT	FUNCTION
1	Z8 14BK/VT	GROUND
2	C7 14BK/TN	BLOWER MOTOR HIGH DRIVER
3	C6 14LB	BLOWER MOTOR M2 DRIVER
4	C5 14LG	BLOWER MOTOR M1 DRIVER
5	C4 14TN	BLOWER MOTOR LOW DRIVER
6	C21 22DB/OR (LHD)	A/C SWITCH SENSE
6	C2 22DB/YL (RHD)	MODE SWITCH OUTPUT
7	E2 22OR	PANEL LAMPS DRIVER



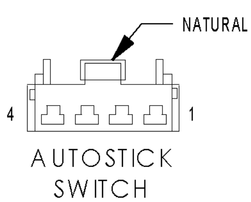
AIRBAG CONTROL MODULE - YELLOW 23 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Z6 20BK/PK	GROUND
5	R45 20DG/LB	DRIVER SQUIB 1 LINE 2
6	R43 20BK/LB	DRIVER SQUIB 1 LINE 1
7	R42 20BK/YL	PASSENGER SQUIB 1 LINE 1
8	R44 20DG/YL	PASSENGER SQUIB 1 LINE 2
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	F15 20DG/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
15	F25 20TN/LG	FUSED IGNITION SWITCH OUTPUT (RUN)
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	D25 20VT/YL	PCI BUS
22	-	-
23	-	-



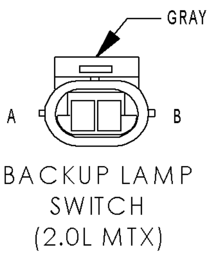
AMBIENT TEMPERATURE SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K145 20BR/OR	AAT SIGNAL
2	K167 20BK/YL (2.0L LHD EXPORT)	SENSOR GROUND 2
2	K167 20BR/YL (2.0L RHD/EXCEPT EXPORT)	SENSOR GROUND 2
2	K167 20BR/YL (2.4L TURBO)	SENSOR GROUND 2



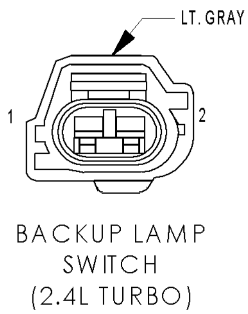
AUTOSTICK SWITCH - NATURAL 4 WAY

CAV	CIRCUIT	FUNCTION
1	T44 20YL/LB	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
2	T5 20LG/LB	AUTOSTICK UPSHIFT SWITCH SIGNAL
3	Z1 20BK	GROUND
4	F11 20RD/WT	IGNITION SWITCH OUTPUT (OFF-RUN-START)



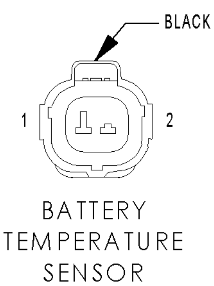
BACKUP LAMP SWITCH (2.0L MTX) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
A	L1 20VT/BK	BACKUP LAMP FEED
B	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)



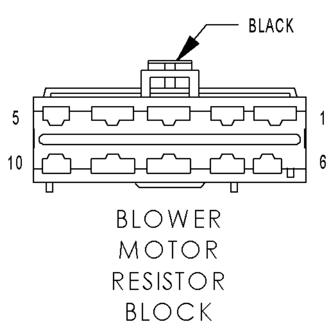
BACKUP LAMP SWITCH (2.4L TURBO) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	L1 18VT/BK	BACKUP LAMP FEED
2	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)



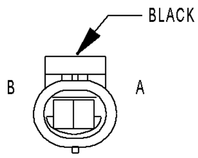
BATTERY TEMPERATURE SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K118 20PK/YL	BATTERY TEMP SIGNAL
2	K167 20BR/YL (2.0L)	SENSOR GROUND 2
2	K167 20BR/YL (2.4L TURBO)	SENSOR GROUND 2



BLOWER MOTOR RESISTOR BLOCK - BLACK 10 WAY

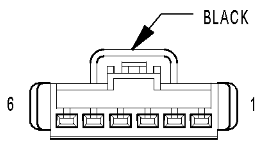
CAV	CIRCUIT	FUNCTION
1	C5 14LG	BLOWER MOTOR M1 DRIVER
2	-	-
3	-	-
4	-	-
5	C4 14TN	BLOWER MOTOR LOW DRIVER
6	-	-
7	C6 14LB	BLOWER MOTOR M2 DRIVER
8	-	-
9	C7 14BK/TN	BLOWER MOTOR HIGH DRIVER
10	-	-



BRAKE FLUID LEVEL SWITCH

BRAKE FLUID LEVEL SWITCH - BLACK 2 WAY

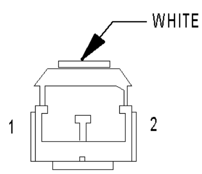
CAV	CIRCUIT	FUNCTION
A	G9 20GY/BK	BRAKE FLUID LEVEL SWITCH SENSE
B	Z12 20BK/TN	GROUND



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH - BLACK 6 WAY

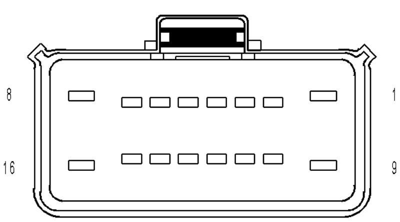
CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
3	V30 20DB/RD (2.0L)	SPEED CONTROL BRAKE LAMP SWITCH OUTPUT
4	V32 20YL/RD (2.0L)	S/C SUPPLY
5	Z1 20BK (2.0L)	GROUND
5	Z1 18BK (2.4L TURBO)	GROUND
6	K29 20WT/PK	BRAKE SWITCH SIGNAL
6	K29 20WT/PK (2.0L)	BRAKE SWITCH SIGNAL



BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID (2.0L)

BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID (2.0L) - WHITE 2 WAY

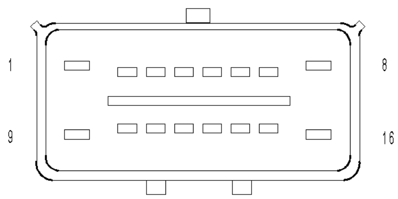
CAV	CIRCUIT	FUNCTION
1	K29 20WT/PK	BRAKE SWITCH SIGNAL
2	F12 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN-START)



C101 (2.0L)

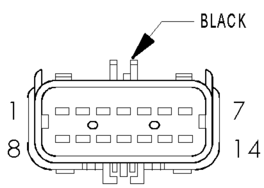
C101 (2.0L) - (ENGINE SIDE)

CAV	CIRCUIT
1	T40 14BR
2	G7 20WT/OR
3	G6 20GY
4	Z1 18BK
5	C3 20DB/BK
6	A142 18DG/OR
7	K610 20VT/GY
8	K201 20BR/YL (RT PACKAGE)
9	K200 20VT/OR (RT PACKAGE)
10	K22 20OR/DB
11	K904 20DB/DG
12	K141 20TN/WT
13	K199 18BR/VT
14	K21 20BK/RD
15	K961 20BR/WT
16	-



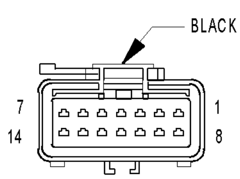
C101 (2.0L) - (HD/LP & DASH SIDE)

CAV	CIRCUIT
1	T40 14BR
2	G7 20WT/OR
3	G6 20GY
4	Z1 18BK
5	C3 20DB/BK
6	A142 18DG/OR
7	K610 20VT/GY
8	K201 20BR/YL (RT PACKAGE)
9	K200 20VT/OR (RT PACKAGE)
10	K22 20OR/DB
11	K904 20DB/DG
12	K141 20TN/WT
13	K199 18BR/VT
14	K21 20BK/RD
15	K961 20BR/WT
16	-



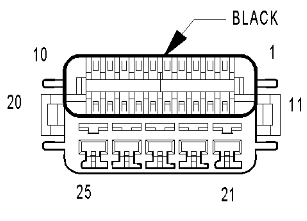
C101 (2.4L TURBO) - BLACK (ENGINE SIDE)

CAV	CIRCUIT
1	A142 18DG/OR
2	-
3	C3 20DB/BK
4	K6 20VT/WT
5	K167 20BR/YL
6	K904 18DB/DG
7	K141 20TN/WT
8	K199 18BR/VT
9	C20 20BR
10	C22 20DB/WT
11	G6 20GY
12	G7 20WT/OR
13	T40 14BR
14	Z1 18BK



C101 (2.4L TURBO) - BLACK (HD/LP & DASH SIDE)

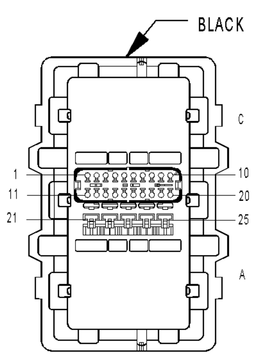
CAV	CIRCUIT
1	A142 18DG/OR
2	-
3	C3 20DB/BK
4	K6 18VT/WT
5	K167 20BR/YL
6	K904 20DB/DG
7	K141 20TN/WT
8	K199 18BR/VT
9	C20 20BR
10	C22 20DB/WT
11	G6 20GY
12	G7 20WT/OR
13	T40 14BR
14	Z1 18BK



C103

C103 - BLACK (HD/LP & DASH SIDE)

CAV	CIRCUIT
1	-
2	G70 20BR/TN (2.0L)
3	L160 18TN/RD (EXCEPT EXPORT)
3	L60 18TN (EXPORT)
4	-
5	M11 16PK/LB
6	A15 18WT (2.0L)
6	A15 18RD/PK (2.4L TURBO)
7	T5 20LG/LB (2.0L)
8	F11 20RD/WT (2.0L)
9	T44 20YL/LB
10	-
11	-
12	-
13	L13 20BR/YL (EXPORT)
14	-
15	K29 20WT/PK (2.0L)
16	-
17	-
18	K167 20BR/YL (2.0L)
19	V37 20RD/LG (2.0L)
20	-
21	L44 12VT/RD (2.0L)
21	L44 14VT/RD (2.4L TURBO)
22	L3 16RD/OR
22	L3 16RD/OR
23	A41 14YL
23	A41 16YL
24	A1 14RD
24	A1 14RD (2.0L)
25	L43 14VT



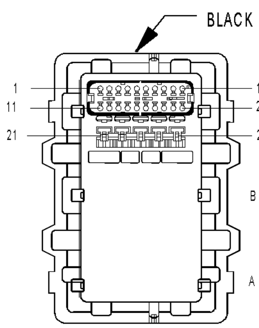
C103

C103 - BLACK (I/P SIDE)

CAV	CIRCUIT
B1	-
B2	G70 20BR/TN (2.0L RKE)
B3	L160 18TN/RD (EXCEPT EXPORT)
B3	L60 18TN (EXPORT)
B4	-
B5	M11 16PK/LB
B6	A15 18WT
B7	T5 20LG/LB (AUTOSTICK)
B8	F11 20RD/WT (AUTOSTICK)
B8	F12 18DB/PK (EXCEPT AUTOSTICK)
B9	T44 20YL/LB (AUTOSTICK)
B10	-
B11	-
B12	-
B13	L13 20BR/YL (EXPORT)
B14	-
B15	K29 20WT/PK (2.0L)
B16	-
B17	-

C103 - BLACK (I/P SIDE)

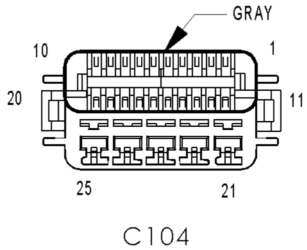
CAV	CIRCUIT
B18	K914 20BR/WT (2.0L)
B19	V37 20RD/LG (2.0L)
B20	-
B21	L44 14VT/RD
B22	L3 14RD/OR (2.0L)
B22	L3 16RD/OR (2.4L TURBO)
B23	A41 14YL
B24	A1 14RD
B25	L43 14VT



C104

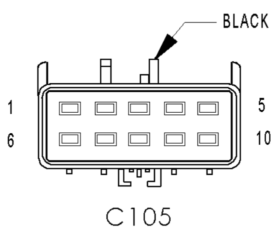
C104 - BLACK (I/P SIDE)

CAV	CIRCUIT
C1	L39 20LB (EXCEPT EXPORT)
C1	L39 16LB (EXPORT)
C2	-
C3	C21 22DB/OR
C4	L161 18LG/OR (EXCEPT EXPORT)
C4	L61 18LG (EXPORT)
C5	-
C6	V10 18BR
C7	F1 16DB/BK
C8	X3 22BK/RD (2.0L)
C8	X3 20BK/RD (2.4L TURBO)
C9	-
C10	-
C11	F12 18DB/PK
C12	-
C13	L50 18WT/TN
C14	F61 16WT/OR (EXPORT)
C15	-
C16	-
C17	-
C18	F20 20WT
C19	-
C20	D25 22VT/YL (2.0L)
C20	D25 20VT/YL (2.4L TURBO)
C21	-
C22	A2 12PK/BK
C23	A3 12RD/WT
C24	A4 12BK/RD
C25	-



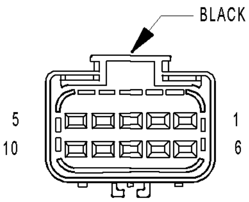
C104 - GRAY (HD/LP & DASH SIDE)

CAV	CIRCUIT
1	L39 16LB
2	-
3	C21 20DB/OR
4	L161 18LG/OR (EXCEPT EXPORT)
4	L61 18LG (EXPORT)
5	-
6	V10 18BR
7	F1 16DB
8	X3 20BK/RD
9	-
10	-
11	F12 18DB/WT (2.0L)
11	F12 18DB/RD (2.4L TURBO)
12	-
13	L50 18WT/TN
14	F61 16WT/OR (EXPORT)
15	-
16	-
17	-
18	F20 20WT (2.0L)
18	F20 20WT (2.0L)
18	F20 18WT (2.4L TURBO)
19	-
20	D25 20VT/YL
21	-
22	A2 12PK/BK
23	A3 12RD/WT
24	A4 10BK/RD (2.0L)
24	A4 10BK/PK (2.4L TURBO)
25	-



C105 - BLACK (UNIBODY SIDE)

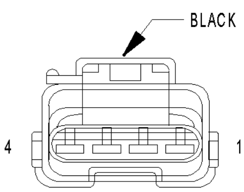
CAV	CIRCUIT
1	-
2	A141 18DG/WT
3	K106 20WT/DG (LEAK DETECTION PUMP)
4	K107 20OR (LEAK DETECTION PUMP)
5	-
6	L1 20VT/BK
6	L1 20VT/BK
7	L7 18BK/YL
7	L7 18BK/YL
8	-
9	-
10	-



C105

C105 - BLACK (HD/LP & DASH SIDE)

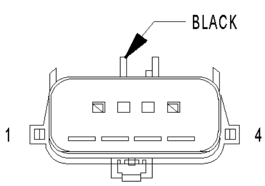
CAV	CIRCUIT
1	-
2	A141 18DG/WT
3	K106 18WT/DG (2.4L TURBO)
3	K106 20WT/DG (LEAK DETECTION PUMP)
4	K107 18OR (2.4L TURBO)
4	K107 20OR (LEAK DETECTION PUMP)
5	-
6	L1 20VT/BK (2.0L MTX)
6	L1 20VT/BK (2.0L)
6	L1 18VT/BK (2.4L TURBO)
7	L7 18BK/YL
8	-
9	-
10	-



C106

C106 - BLACK (ABS SENSOR SIDE)

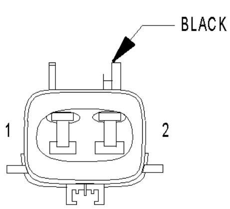
CAV	CIRCUIT
1	B1 20YL/DB
2	B2 20YL
3	B3 20LG/DB
4	B4 20LG



C106

C106 - BLACK (HD/LP & DASH SIDE)

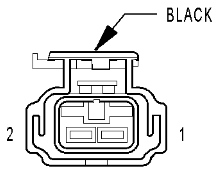
CAV	CIRCUIT
1	B1 18YL/DB
2	B2 18YL
3	B3 18LG/DB
4	B4 18LG



C109

C109 - BLACK (FOG LAMP JUMPER SIDE)

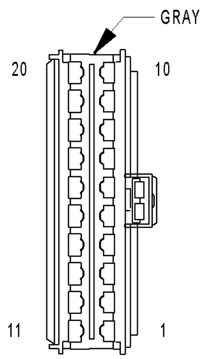
CAV	CIRCUIT
1	L39 16BK/DB
2	Z1 20BK



C109

C109 - BLACK (HD/LP & DASH SIDE)

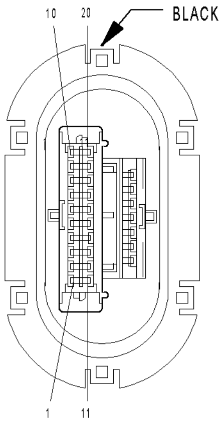
CAV	CIRCUIT
1	L39 16LB
2	Z1 18BK (2.0L LHD EXPORT)
2	Z1 20BK (EXCEPT 2.0L LHD EXPORT)



C201

C201 - GRAY (I/P SIDE)

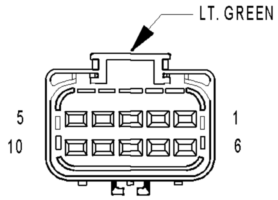
CAV	CIRCUIT
1	C16 20LB/YL (RHD)
2	F21 14TN (POWER MIRRORS/WIN-DOWS)
3	Z14 20BK/YL
4	Q16 14BR/WT (POWER MIRRORS/WIN-DOWS)
5	Q26 14VT/WT (POWER MIRRORS/WIN-DOWS)
6	P33 18OR/BK (POWER MIRRORS/WIN-DOWS)
7	P36 18PK/VT (LHD)
7	P36 18PK/VT (LHD)
7	P34 18PK/BK (RHD)
8	G74 20TN/RD
9	P96 20LG/BK
10	P93 20YL/WT (LHD)
10	P94 20WT/YL (RHD)
11	F20 20WT (2.0L/POWER MIRRORS/ WINDOWS/LOCKS)
12	P95 20DB/WT (LHD POWER MIRRORS/ WINDOWS)
12	P91 20WT/BK (RHD POWER MIRRORS/ WINDOWS)
13	P92 20YL (POWER MIRRORS/WIN-DOWS)
14	-
15	X54 20VT
15	X54 20VT
16	X56 20DB/RD
16	X56 20DB/RD
17	P159 20DG/WT (RHD)
18	P160 20LB (RHD)
19	Z8 14BK/VT (RHD)
20	L6 20RD/WT (RHD)



C201

C201 - BLACK (RT FRONT DOOR SIDE)

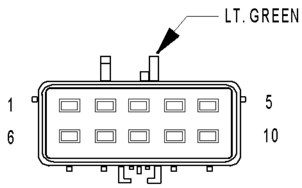
CAV	CIRCUIT
1	C16 20LB/YL (RHD POWER MIRRORS/ WINDOWS)
2	F21 14TN (POWER MIRRORS/WIN- DOWS)
3	Z14 20BK/YL
3	Z14 20BK/YL (POWER LOCKS)
4	Q16 14BR/WT (POWER MIRRORS/WIN- DOWS)
5	Q26 14VT/WT (POWER MIRRORS/WIN- DOWS)
6	P33 18OR/BK
7	P36 18PK/VT (LHD POWER LOCKS)
7	P34 18PK/BK (RHD)
8	G74 20TN/RD
8	G75 20TN (BASE)
9	P96 20LG/BK (POWER LOCKS)
10	P93 20YL/WT (LHD POWER MIRRORS/ WINDOWS)
10	P94 20WT/YL (RHD POWER MIRRORS/ WINDOWS)
11	F20 20WT (RHD POWER MIRRORS/ WINDOWS/LOCKS)
12	P95 20DB/WT (LHD POWER MIRRORS/ WINDOWS)
12	P91 20WT/BK (RHD POWER MIRRORS/ WINDOWS)
13	P92 20YL (POWER MIRRORS/WIN- DOWS)
13	P92 20YL (RHD)
14	-
15	X54 20VT
16	X56 20DB/RD
17	P159 20DG/WT (RHD POWER MIR- RORS/WINDOWS)
17	P159 20DG/WT (RHD)
18	P160 20LB (RHD POWER MIRRORS/ WINDOWS)
18	P160 20LB (RHD)
19	Z8 14BK/VT (RHD)
20	L6 20RD/WT (RHD)



C202

C202 - LT. GREEN (I/P SIDE)

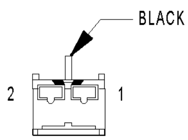
CAV	CIRCUIT
1	V4 16RD/YL
2	V3 16BR/WT
3	V5 16DG/YL
4	V6 16DB
5	Z1 16BK
6	C6 14LB
7	C7 14BK/TN
8	C4 14TN
9	C5 14LG
10	-



C202

C202 - LT. GREEN (PLENUM SIDE)

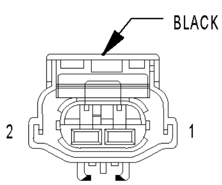
CAV	CIRCUIT
1	V4 16RD/YL
2	V3 16BR/WT
3	V5 16DG/YL
4	V6 16DB
5	Z1 16BK
6	C6 14LB
7	C7 14BK/TN
8	C4 14TN
9	C5 14LG
10	-



C203
(2.0L LHD)

C203 (2.0L LHD) - BLACK (I/P SIDE)

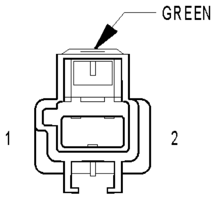
CAV	CIRCUIT
1	C1 14DG
2	C7 14BK/TN



C203
(2.4L TURBO LHD)

C203 (2.4L TURBO LHD) - BLACK (I/P SIDE)

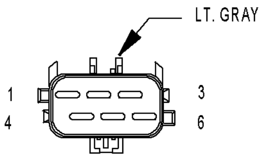
CAV	CIRCUIT
1	C1 14DG
2	C7 14BK/TN



C203
(LHD)

C203 (LHD) - GREEN (HVAC SIDE)

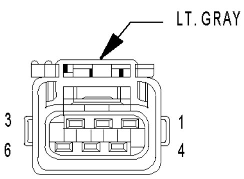
CAV	CIRCUIT
1	C1 14DG
2	C7 14BK/TN



C203
(RHD)

C203 (RHD) - LT. GRAY (HVAC SIDE)

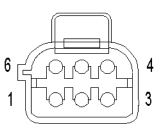
CAV	CIRCUIT
1	C2 22DB/YL
2	F20 22WT
3	C21 22DB/OR
4	C1 14DG
5	-
6	C7 14BK/TN



C203
(RHD)

C203 (RHD) - LT. GRAY (I/P SIDE)

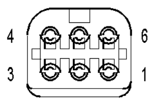
CAV	CIRCUIT
1	C2 22DB/YL
2	F20 20WT
3	C21 22DB/OR
4	C1 14DG
5	-
6	C7 14BK/TN



C204

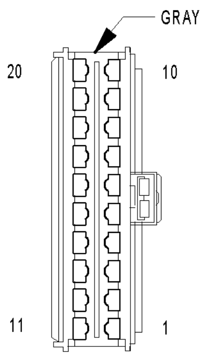
C204 - (I/P SIDE)

CAV	CIRCUIT
1	M1 18PK
2	M2 20YL
3	Z3 18BK/OR
4	F10 18YL/RD
5	D25 20VT/YL
6	F20 20WT



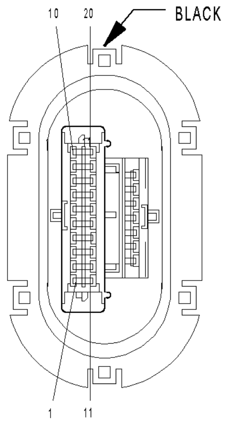
C204 - (VISOR VANITY SIDE)

CAV	CIRCUIT
1	M1 20BK/PK
2	M2 20BK/YL
3	Z3 20BK/OR
3	Z3 18BK/OR (SUNROOF)
4	F10 18BK/YL
4	F10 18YL/RD (COMPASS/TEMP MIRROR W/ SUNROOF)
5	D25 20BK/VT
6	F20 20BK/WT



C205 - GRAY (I/P SIDE)

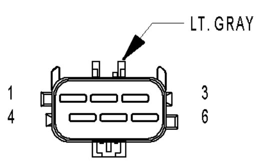
CAV	CIRCUIT
1	C16 20LB/YL (RHD)
2	F21 14TN (POWER MIRRORS/WINDOWS)
3	Z14 20BK/YL
3	Z14 20BK/YL
4	Q16 14BR/WT (POWER MIRRORS/WINDOWS)
5	Q26 14VT/WT (POWER MIRRORS/WINDOWS)
6	P33 18OR/BK (POWER MIRRORS/WINDOWS)
7	P34 18PK/BK (LHD)
7	P36 18PK/VT (RHD)
7	P36 18PK/VT (RHD)
8	G75 20TN/BK
9	P97 20LG
10	P93 20YL/WT (LHD POWER MIRRORS/WINDOWS)
10	P94 20WT/YL (RHD POWER MIRRORS/WINDOWS)
11	F20 20WT (LHD POWER MIRRORS/WINDOWS/LOCKS)
12	P95 20DB/WT (LHD POWER MIRRORS/WINDOWS)
12	P91 20WT/BK (RHD POWER MIRRORS/WINDOWS)
13	P92 20YL (POWER MIRRORS/WINDOWS)
14	-
15	X53 20DG
15	X53 20DG
16	X55 20BR/RD
16	X55 20BR/RD
17	P159 20DG/WT (RHD)
18	P160 20LB (RHD)
19	Z8 14BK/VT (LHD POWER MIRRORS/WINDOWS)
20	L6 20RD/WT (LHD POWER MIRRORS/WINDOWS)



C205

C205 - BLACK (LT FRONT DOOR SIDE)

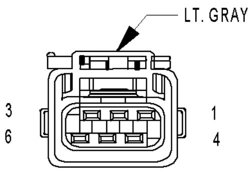
CAV	CIRCUIT
1	C16 20LB/YL (RHD POWER MIRRORS/ WINDOWS)
2	F21 14TN (POWER MIRRORS/WIN- DOWS)
3	Z14 20BK/YL (LHD POWER LOCKS)
3	Z14 20BK/YL (POWER LOCKS)
4	Q16 14BR/WT (POWER MIRRORS/WIN- DOWS)
5	Q26 14VT/WT (POWER MIRRORS/WIN- DOWS)
6	P33 18OR/BK (POWER LOCKS)
7	P34 18PK/BK (LHD)
7	P36 18PK/VT (RHD)
8	G75 20TN
9	P97 20LG (POWER LOCKS)
10	P93 20YL/WT (LHD POWER MIRRORS/ WINDOWS)
10	P94 20WT/YL (RHD POWER MIRRORS/ WINDOWS)
11	F20 20WT (LHD POWER MIRRORS/ WINDOWS/LOCKS)
12	P95 20DB/WT (LHD POWER MIRRORS/ WINDOWS)
12	P91 20WT/BK (RHD POWER MIRRORS/ WINDOWS)
13	P92 20YL (LHD POWER MIRRORS/ WINDOWS)
13	P92 20YL (POWER MIRRORS/WIN- DOWS)
14	-
15	X53 20DG
16	X55 20BR/RD
17	P159 20DG/WT (RHD)
18	P160 20LB (RHD)
19	Z8 14BK/VT (LHD POWER MIRRORS/ WINDOWS)
20	L6 20RD/WT (LHD POWER MIRRORS/ WINDOWS)



C206

C206 - LT. GRAY (I/P SIDE)

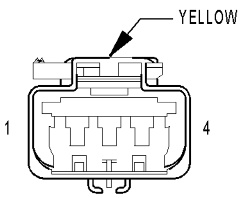
CAV	CIRCUIT
1	F15 20DG/WT (SIDE AIRBAG)
2	D25 20VT/YL (SIDE AIRBAG)
3	Z6 20BK/PK (SIDE AIRBAG)
4	Z8 16BK/VT (2.0L)
5	A120 16RD/LG (2.0L)
6	-



C206

C206 - LT. GRAY (SIDE AIRBAG JUMPER SIDE)

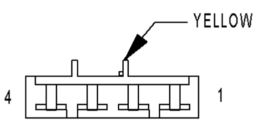
CAV	CIRCUIT
1	F15 20DG/WT (SIDE AIRBAG)
2	D25 20VT/YL (SIDE AIRBAG)
3	Z6 20BK/PK (SIDE AIRBAG)
4	Z8 16BK (2.0L)
5	A120 16RD/LG (2.0L)
6	-



C208

C208 - YELLOW (SEAT SIDE)

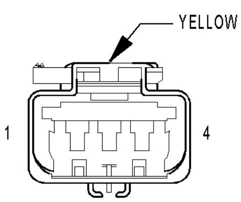
CAV	CIRCUIT
1	-
2	-
3	R32 18OR
4	R34 18WT



C208

C208 - YELLOW (SIDE IMPACT AIRBAG JUMPER SIDE)

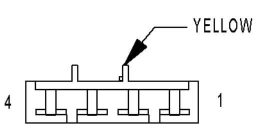
CAV	CIRCUIT
1	-
2	-
3	R32 20YL/OR
4	R34 20OR/YL



C209

C209 - YELLOW (SEAT SIDE)

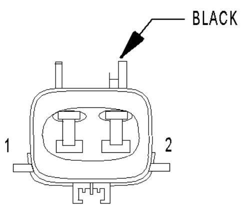
CAV	CIRCUIT
1	-
2	-
3	R31 18OR
4	R33 18WT



C209

C209 - YELLOW (SIDE IMPACT AIRBAG JUMPER SIDE)

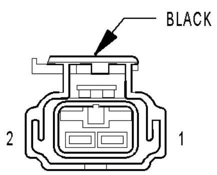
CAV	CIRCUIT
1	-
2	-
3	R31 20YL/OR
4	R33 20OR/YL



C210
(EXPORT)

C210 (EXPORT) - BLACK (POWER SEAT SIDE)

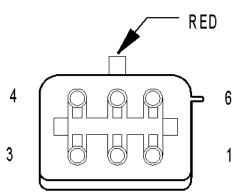
CAV	CIRCUIT
1	A120 16RD/LG
2	Z8 16BK



C210
(EXPORT)

C210 (EXPORT) - BLACK (SIDE IMPACT AIRBAG JUMPER SIDE)

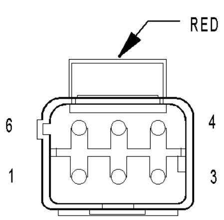
CAV	CIRCUIT
1	A120 16RD/LG
2	Z8 16BK



C301

C301 - RED (DOME LAMP SIDE)

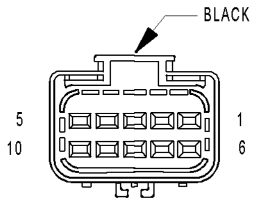
CAV	CIRCUIT
1	M1 18PK
2	-
3	M2 20YL
4	G120 18WT/DB (EXPORT)
5	-
6	Z1 18BK (EXPORT)



C301

C301 - RED (UNIBODY SIDE)

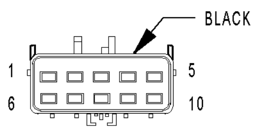
CAV	CIRCUIT
1	M1 18PK
2	-
3	M2 20YL
4	G120 18WT/DB (EXPORT)
5	-
6	Z1 18BK (EXPORT)



C302

C302 - BLACK (DECKLID SIDE)

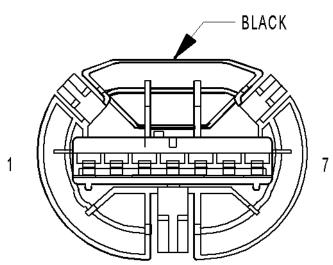
CAV	CIRCUIT
1	L50 18WT/TN
2	Z1 14BK (ELECTRIC RELEASE)
2	Z1 18BK (EXCEPT ELECTRIC RELEASE)
2	Z1 20BK (EXCEPT ELECTRIC RELEASE)
3	G78 18TN/BK (CARGO LAMP)
4	G71 20VT/YL (ELECTRIC RELEASE)
5	-
6	Q2 14LG/BK (ELECTRIC RELEASE)
7	-
8	-
9	-
10	-



C302

C302 - BLACK (UNIBODY SIDE)

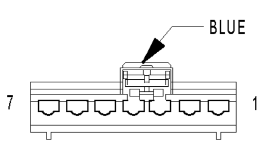
CAV	CIRCUIT
1	L50 18WT/TN
2	Z1 14BK
3	G78 22TN/BK (CARGO LAMP)
4	G71 20VT/YL (ELECTRIC RELEASE)
5	-
6	Q2 14LG/BK (ELECTRIC RELEASE)
7	-
8	-
9	-
10	-



C303

C303 - BLACK (REAR DOOR SIDE)

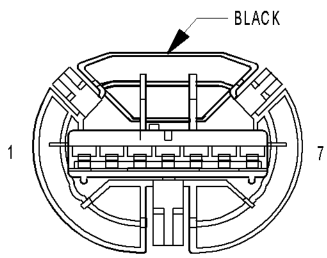
CAV	CIRCUIT
1	-
2	G76 20TN/YL
2	G77 20TN/OR (POWER LOCKS)
3	P33 18OR/BK (POWER LOCKS)
4	-
5	P36 18PK/VT (POWER LOCKS)
6	Z1 20BK
7	-



C303

C303 - BLUE (UNIBODY SIDE)

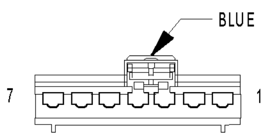
CAV	CIRCUIT
1	-
2	M9 20LB/OR
2	M9 20LB/OR
3	P33 18OR/BK (POWER LOCKS)
4	-
5	P36 18PK/VT (POWER LOCKS)
6	Z1 20BK
7	-



C304

C304 - BLACK (REAR DOOR SIDE)

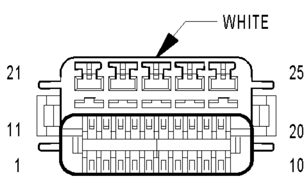
CAV	CIRCUIT
1	-
2	G76 20TN/YL
2	G77 20TN/OR (POWER LOCKS)
3	P33 18OR/BK (POWER LOCKS)
4	-
5	P36 18PK/VT (POWER LOCKS)
6	Z1 20BK
7	-



C304

C304 - BLUE (UNIBODY SIDE)

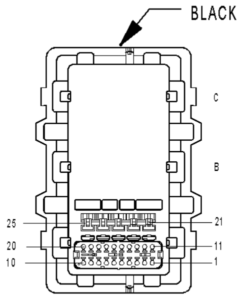
CAV	CIRCUIT
1	-
2	M9 20LB/OR
3	P33 18OR/BK (POWER LOCKS)
3	P33 18OR/BK (POWER LOCKS)
4	-
5	P36 18PK/VT (POWER LOCKS)
5	P36 18PK/VT (POWER LOCKS)
6	Z1 20BK
7	-



C305

C305 - WHITE (UNIBODY SIDE)

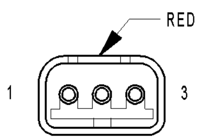
CAV	CIRCUIT
1	L38 16BR/WT (EXPORT)
2	G71 20VT/YL (POWER LOCKS)
3	G10 20LG/RD
4	L7 18BK/YL
5	L62 18BR/RD
6	L63 18DG/RD
7	X51 20BR/YL
8	X52 20DB/WT
9	L50 18WT/TN
10	X5 20WT/RD (EXPORT)
11	G120 18WT/DB (EXPORT)
12	G4 20DB
13	M2 20YL
14	M9 20LB/OR
15	X57 20BR/LB
16	X58 20DB/OR
17	-
18	M1 18PK
19	P33 18OR/BK (POWER LOCKS)
20	-
21	Q2 14LG/BK
22	-
23	P36 18PK/VT (POWER LOCKS)
24	C15 12BK/WT
25	-



C305

C305 - BLACK (I/P SIDE)

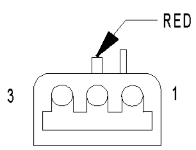
CAV	CIRCUIT
A1	L38 16BR/WT (EXPORT)
A2	G71 20VT/BK (RKE)
A3	G10 20LG/RD
A4	L7 18BK/YL
A5	L62 18BR/RD
A6	L63 18DG/RD
A7	X51 20BR/YL
A8	X52 20DB/WT
A9	L50 18WT/TN
A10	X5 22WT/RD (EXPORT)
A11	G120 18WT/DB (EXPORT)
A12	G4 20DB
A13	M2 20YL
A14	M9 20LB/OR
A15	X57 20BR/LB
A16	X58 20DB/OR
A17	-
A18	M1 18PK
A19	P33 18OR/BK (RKE)
A20	-
A21	Q2 16LG/BK (RKE)
A22	-
A23	P36 18PK/VT (RKE)
A24	C15 12BK/WT
A25	-



C306

C306 - RED (SUNROOF SIDE)

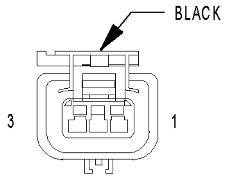
CAV	CIRCUIT
1	F10 18YL/RD
2	-
3	Z3 18BK/OR



C306

C306 - RED (VISOR VANITY SIDE)

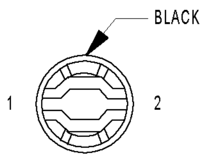
CAV	CIRCUIT
1	F10 18YL/RD
2	-
3	Z3 18BK/OR



CAMSHAFT POSITION SENSOR

CAMSHAFT POSITION SENSOR - BLACK 3 WAY

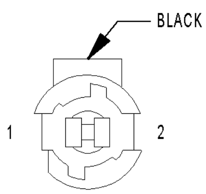
CAV	CIRCUIT	FUNCTION
1	K7 20OR (2.0L)	5 VOLT SUPPLY
1	K6 20VT/WT (2.4L TURBO)	5 VOLT SUPPLY
2	K4 20BK/LB (2.0L)	SENSOR GROUND
2	K167 20BR/YL (2.4L TURBO)	SENSOR GROUND 2
3	K44 20TN/YL	CMP SIGNAL



CARGO LAMP

CARGO LAMP - BLACK 2 WAY

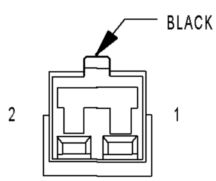
CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	G78 22TN/BK	DECKLID AJAR SWITCH SENSE



CENTER HIGH MOUNTED STOP LAMP

CENTER HIGH MOUNTED STOP LAMP - BLACK 2 WAY

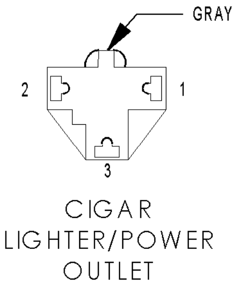
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND



CENTER STACK LAMP (LIGHT PACKAGE/EXPORT)

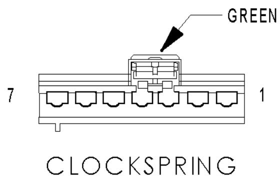
CENTER STACK LAMP (LIGHT PACKAGE/EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z3 20BK/OR	GROUND



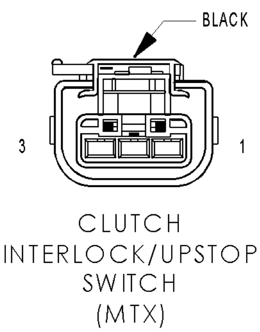
CIGAR LIGHTER/POWER OUTLET - GRAY 3 WAY

CAV	CIRCUIT	FUNCTION
1	F30 16RD/BK	IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-
3	Z1 16BK	GROUND



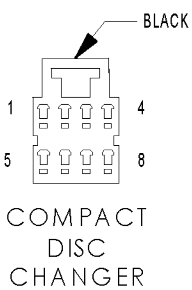
CLOCKSPRING - GREEN 7 WAY

CAV	CIRCUIT	FUNCTION
1	R45 20DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 20BK/LB	DRIVER SQUIB 1 LINE 1
3	-	-
4	-	-
5	X3 22BK/RD	HORN RELAY CONTROL
6	V37 20RD/LG (2.0L SPEED CONTROL)	S/C SWITCH SIGNAL
7	K914 20BR/WT (2.0L SPEED CON- TROL)	GROUND



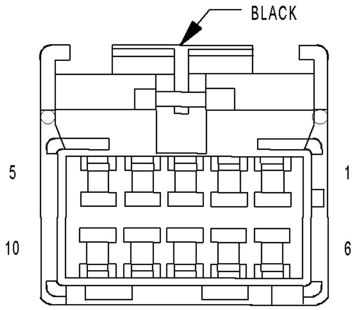
CLUTCH INTERLOCK/UPSTOP SWITCH (MTX) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K119 20LG/BK	CLUTCH UP SWITCH SIGNAL
2	Z1 20BK	GROUND
3	T141 20YL/RD	CLUTCH INTERLOCK SWITCH SIGNAL



COMPACT DISC CHANGER - BLACK 8 WAY

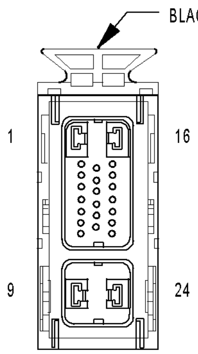
CAV	CIRCUIT	FUNCTION
1	24GY/WT	AUDIO OUT RIGHT
2	24OR/YL	PANEL LAMPS DIMMER SIGNAL
3	24VT/YL	PCI BUS
4	24RD	FUSED IGNITION SWITCH OUTPUT
5	24DG/WT	AUDIO OUT LEFT
6	24BK/OR	GROUND
7	22BK/YL	GROUND
8	22GY/YL	B(+)



COMPASS/TEMPERATURE MIRROR

COMPASS/TEMPERATURE MIRROR - BLACK 10 WAY

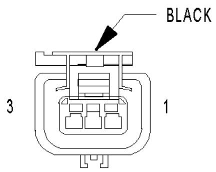
CAV	CIRCUIT	FUNCTION
1	F20 20BK/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	M1 20BK/PK	FUSED B(+)
3	-	-
4	-	-
5	D25 20BK/VT	PCI BUS
6	Z3 20BK/OR	GROUND
7	M2 20BK/YL	COURTESY LAMP CONTROL
8	-	-
9	-	-
10	Z3 20BK/OR	GROUND



CONTROLLER ANTILOCK BRAKE

CONTROLLER ANTILOCK BRAKE - BLACK 24 WAY

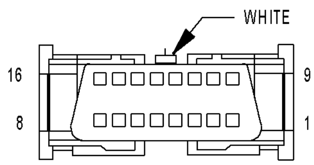
CAV	CIRCUIT	FUNCTION
1	Z1 12BK	GROUND
2	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
3	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
4	-	-
5	D25 18VT/YL	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	-	-
9	A20 12RD/DB	FUSED B(+)
10	F12 18DB/WT (2.0L)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
10	F12 18DB/RD (2.4L TURBO)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	Z1 12BK	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL
20	B4 18LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUP-PLY
24	A10 12RD/DG	FUSED B(+)



CRANKSHAFT POSITION SENSOR

CRANKSHAFT POSITION SENSOR - BLACK 3 WAY

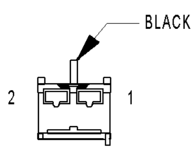
CAV	CIRCUIT	FUNCTION
1	K7 20OR	5 VOLT SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	K24 20GY/BK	CKP SIGNAL



DATA LINK CONNECTOR

DATA LINK CONNECTOR - WHITE 16 WAY

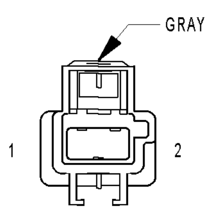
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS (PCM)
3	-	-
4	Z12 20BK/TN	GROUND
5	Z12 20BK/TN	GROUND
6	-	-
7	D21 20PK	SCI TRANSMIT (PCM)
8	-	-
9	D6 20PK/LB (2.0L)	SCI RECEIVE (TCM)
10	-	-
11	-	-
12	D20 20LG	SCI RECEIVE (PCM)
13	-	-
14	-	-
15	D15 20WT/DG (2.0L)	SCI TRANSMIT (TCM)
16	A14 18RD/WT	FUSED B(+)



DECKLID RELEASE SWITCH (POWER RELEASE)

DECKLID RELEASE SWITCH (POWER RELEASE) - BLACK 2 WAY

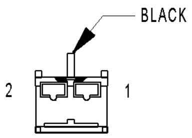
CAV	CIRCUIT	FUNCTION
1	Q33 20BR/LB	DECKLID RELEASE RELAY CONTROL
2	Z1 20BK	GROUND



DECKLID SECURITY SWITCH (KNOCK OUT)

DECKLID SECURITY SWITCH (KNOCK OUT) - GRAY 2 WAY

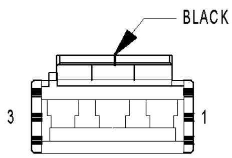
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G71 20VT/YL	DECKLID SECURITY SWITCH SENSE



DECKLID SOLENOID

DECKLID SOLENOID - BLACK 2 WAY

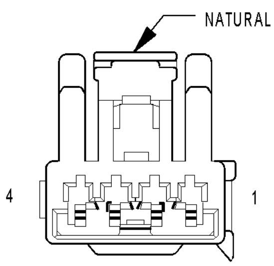
CAV	CIRCUIT	FUNCTION
1	Q2 14LG/BK	DECKLID RELEASE RELAY OUTPUT
2	Z1 14BK	GROUND



DOME LAMP (EXCEPT EXPORT)

DOME LAMP (EXCEPT EXPORT) - BLACK 3 WAY

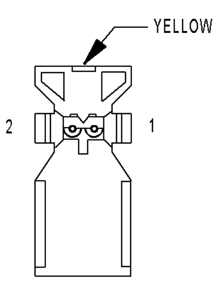
CAV	CIRCUIT	FUNCTION
1	-	-
2	M1 18PK	FUSED B(+)
3	M2 20YL	COURTESY LAMP CONTROL



DOME LAMP/INTRUSION SENSOR (EXPORT)

DOME LAMP/INTRUSION SENSOR (EXPORT) - NATURAL 4 WAY

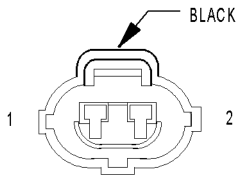
CAV	CIRCUIT	FUNCTION
1	M2 20YL	COURTESY LAMP CONTROL
2	M1 18PK	FUSED B(+)
3	Z1 18BK	GROUND
4	G120 18WT/DB	INTRUSION SENSOR SIGNAL



DRIVER AIRBAG SQUIB 1

DRIVER AIRBAG SQUIB 1 - YELLOW 2 WAY

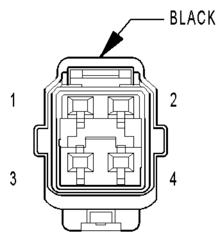
CAV	CIRCUIT	FUNCTION
1	R43 18BK/LB	DRIVER SQUIB 1 LINE 1
2	R45 18DG/LB	DRIVER SQUIB 1 LINE 2



DRIVER DOOR AJAR SWITCH

DRIVER DOOR AJAR SWITCH - BLACK 2 WAY

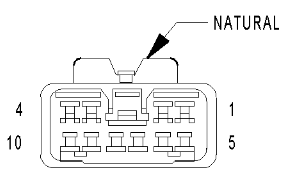
CAV	CIRCUIT	FUNCTION
1	G75 20TN	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z14 20BK/YL	GROUND



DRIVER DOOR LOCK MOTOR/AJAR SWITCH

DRIVER DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

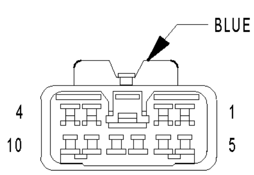
CAV	CIRCUIT	FUNCTION
1	G75 20TN (LHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
1	G74 20TN/RD (RHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z14 20BK/YL	GROUND
3	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	DOOR LOCK RELAY OUTPUT



DRIVER POWER MIRROR (LHD)

DRIVER POWER MIRROR (LHD) - NATURAL 10 WAY

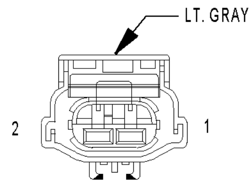
CAV	CIRCUIT	FUNCTION
1	-	-
2	P94 20WT/YL	MIRROR HORIZONTAL
3	-	-
4	-	-
5	P91 20WT/BK	MIRROR VERTICAL
6	P92 20YL	MIRROR COMMON
7	-	-
8	-	-
9	-	-
10	-	-



DRIVER POWER MIRROR (RHD)

DRIVER POWER MIRROR (RHD) - BLUE 10 WAY

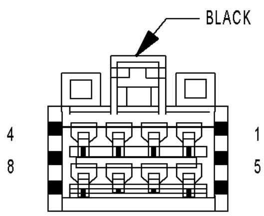
CAV	CIRCUIT	FUNCTION
1	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER SWITCH OUTPUT
2	P93 20YL/WT	MIRROR HORIZONTAL
3	Z8 20BK/VT	GROUND
4	P159 20DG/WT	MIRROR UNFOLD
5	P95 20DB/WT	MIRROR VERTICAL
6	P92 20YL	MIRROR COMMON
7	P160 20LB	MIRROR FOLD
8	-	-
9	-	-
10	-	-



DRIVER POWER WINDOW MOTOR

DRIVER POWER WINDOW MOTOR - LT. GRAY 2 WAY

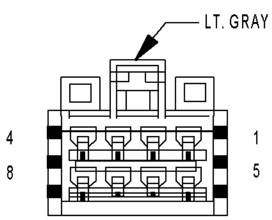
CAV	CIRCUIT	FUNCTION
1	Q11 14LB	DRIVER WINDOW DRIVER UP
2	Q21 14WT/LB	DRIVER WINDOW DRIVER DOWN



DRIVER POWER WINDOW SWITCH C1

DRIVER POWER WINDOW SWITCH C1 - BLACK 8 WAY

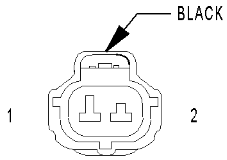
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z8 14BK/VT	GROUND
3	Z8 14BK/VT	GROUND
4	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
5	Q11 14LB (LHD)	DRIVER WINDOW DRIVER UP
5	Q21 14WT/LB (RHD)	DRIVER WINDOW DRIVER DOWN
6	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
7	Z14 20BK/YL	GROUND
7	Z14 20BK/YL	GROUND
8	Q21 14WT/LB (LHD)	DRIVER WINDOW DRIVER DOWN
8	Q11 14LB (RHD)	DRIVER WINDOW DRIVER UP



DRIVER POWER WINDOW SWITCH C2

DRIVER POWER WINDOW SWITCH C2 - LT. GRAY 8 WAY

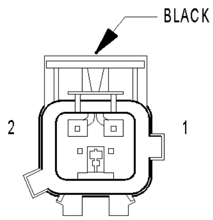
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z8 14BK/VT	GROUND
3	Z8 14BK/VT	GROUND
4	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
5	Q16 14BR/WT (LHD)	MASTER WINDOW SWITCH RIGHT FRONT UP
5	Q26 14VT/WT (RHD)	MASTER WINDOW SWITCH RIGHT FRONT DOWN
6	-	-
7	-	-
8	Q26 14VT/WT (LHD)	MASTER WINDOW SWITCH RIGHT FRONT DOWN
8	Q16 14BR/WT (RHD)	MASTER WINDOW SWITCH RIGHT FRONT UP



ENGINE COOLANT TEMP SENSOR (2.0L)

ENGINE COOLANT TEMP SENSOR (2.0L) - BLACK 2 WAY

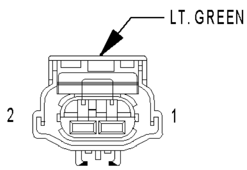
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K2 20VT/LG	ECT SIGNAL



ENGINE COOLANT TEMP SENSOR (2.4L TURBO)

ENGINE COOLANT TEMP SENSOR (2.4L TURBO) - BLACK 2 WAY

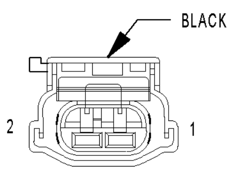
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K2 20TN/BK	ECT SIGNAL



ENGINE OIL PRESSURE SWITCH

ENGINE OIL PRESSURE SWITCH - LT. GREEN 2 WAY

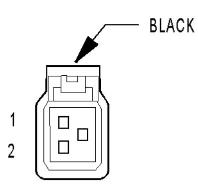
CAV	CIRCUIT	FUNCTION
1	G6 20GY	OIL PRESSURE SIGNAL
2	-	-



EVAP/PURGE SOLENOID

EVAP/PURGE SOLENOID - BLACK 2 WAY

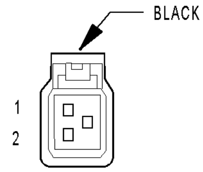
CAV	CIRCUIT	FUNCTION
1	K108 20WT/TN	EVAP/PURGE RETURN
2	K52 20PK/BK	EVAP/PURGE CONTROL



FUEL INJECTOR NO. 1

FUEL INJECTOR NO. 1 - BLACK 2 WAY

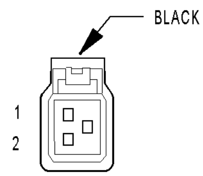
CAV	CIRCUIT	FUNCTION
1	K11 18WT/DB	INJECTOR CONTROL NO. 1
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 2

FUEL INJECTOR NO. 2 - BLACK 2 WAY

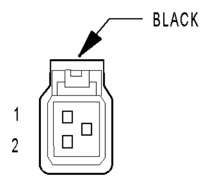
CAV	CIRCUIT	FUNCTION
1	K12 18TN	INJECTOR CONTROL NO. 2
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 3

FUEL INJECTOR NO. 3 - BLACK 2 WAY

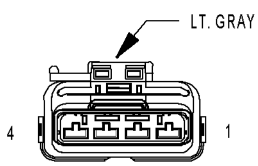
CAV	CIRCUIT	FUNCTION
1	K13 18YL/WT	INJECTOR CONTROL NO. 3
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 4

FUEL INJECTOR NO. 4 - BLACK 2 WAY

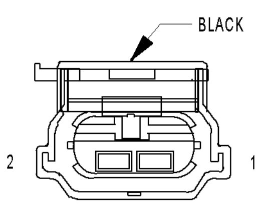
CAV	CIRCUIT	FUNCTION
1	K14 18LB/BR	INJECTOR CONTROL NO. 4
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



FUEL PUMP MODULE

FUEL PUMP MODULE - LT. GRAY 4 WAY

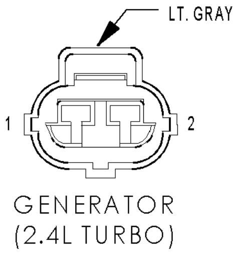
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	Z2 20BK/LG	GROUND
3	G4 20DB	FUEL LEVEL SENSOR SIGNAL
4	A141 18DG/WT	FUEL PUMP RELAY OUTPUT



GENERATOR (2.0L)

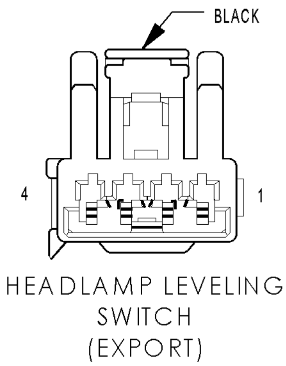
GENERATOR (2.0L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	K20 20DG	GEN FIELD CONTROL



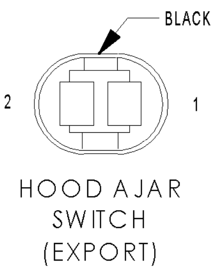
GENERATOR (2.4L TURBO) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	K20 18DG	GEN FIELD CONTROL



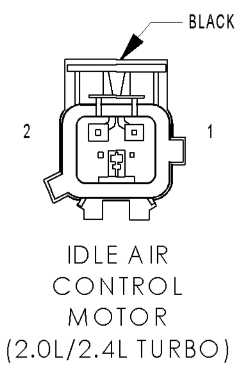
HEADLAMP LEVELING SWITCH (EXPORT) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	L13 20BR/YL	HEADLAMP ADJUST SIGNAL
2	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
3	Z1 20BK	GROUND
4	E2 22OR	PANEL LAMPS DRIVER



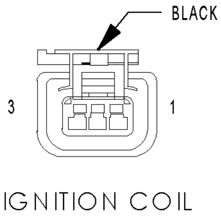
HOOD AJAR SWITCH (EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G70 20BR/TN	HOOD AJAR SWITCH SENSE
2	Z1 20BK	GROUND



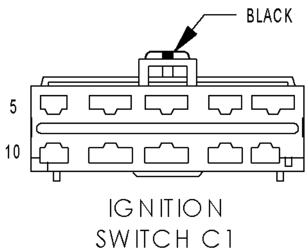
IDLE AIR CONTROL MOTOR (2.0L/2.4L TURBO) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K610 20VT/GY (2.0L)	IAC MOTOR CONTROL
1	K610 18VT/GY (2.4L TURBO)	IAC MOTOR CONTROL
2	K961 20BR/WT (2.0L)	IAC RETURN
2	K961 18BR/VT (2.4L TURBO)	IAC RETURN



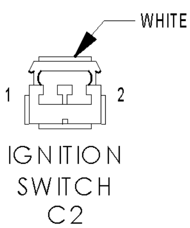
IGNITION COIL - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K17 18DB/TN (2.0L)	COIL CONTROL NO. 2
1	K17 16DB/TN (2.4L TURBO)	COIL CONTROL NO. 2
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K19 18BK/GY (2.0L)	COIL CONTROL NO. 1
3	K19 16BK/GY (2.4L TURBO)	COIL CONTROL NO. 1



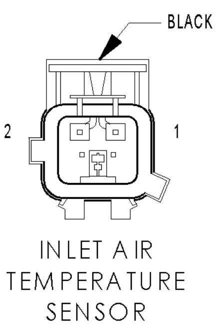
IGNITION SWITCH C1 - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	A1 14RD	FUSED B(+)
2	A21 14DB	IGNITION SWITCH OUTPUT (RUN-START)
3	F30 16RD/BK	IGNITION SWITCH OUTPUT (RUN-ACC)
4	F1 16DB/BK	FUSED B(+)
5	G26 22LB	KEY-IN IGNITION SWITCH SENSE
6	A41 14YL	IGNITION SWITCH OUTPUT (START)
7	A31 14BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
8	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
9	A2 12PK/BK	FUSED B(+)
10	-	-



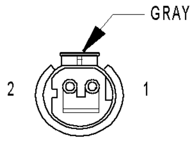
IGNITION SWITCH C2 - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	A81 20DG/RD	FUSED B(+)
2	F11 20RD/WT (AUTOSTICK)	IGNITION SWITCH OUTPUT (OFF-RUN-START)



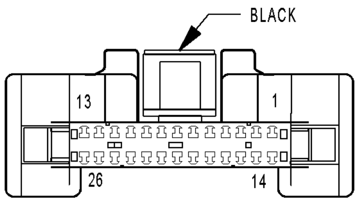
INLET AIR TEMPERATURE SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K21 20BK/RD	IAT SIGNAL
2	K167 20BR/YL (2.0L)	SENSOR GROUND 2
2	K4 20BK/LB (2.4L TURBO)	SENSOR GROUND



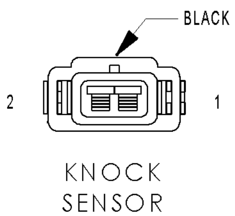
INPUT SPEED SENSOR - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	T13 20DB/BK	SPEED SENSOR GROUND
2	T52 20RD/BK	INPUT SPEED SENSOR SIGNAL



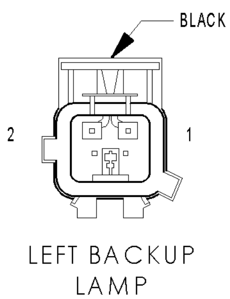
INSTRUMENT CLUSTER - BLACK 26 WAY

CAV	CIRCUIT	FUNCTION
1	L38 16BR/WT (EXPORT)	REAR FOG LAMP FEED
2	D25 20VT/YL	PCI BUS
3	M2 20YL	COURTESY LAMP CONTROL
4	L27 16WT/TN (DAYTIME RUNNING LAMPS)	FOG LAMP SWITCH SENSE
4	L39 20LB (EXCEPT EXPORT/EXCEPT DAYTIME RUNNING LAMPS)	FRONT FOG LAMP SWITCH OUTPUT
4	L39 16LB (EXPORT)	FRONT FOG LAMP SWITCH OUTPUT
5	G69 20BK/OR	VTSS INDICATOR DRIVER
6	E19 22RD	PANEL LAMPS DIMMER SIGNAL
7	G4 20DB	FUEL LEVEL SENSOR SIGNAL
8	-	-
9	G5 20DB/WT (AUTOSTICK)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
10	Z3 16BK/OR	GROUND
11	-	-
12	E2 22OR	PANEL LAMPS DRIVER
13	M9 20LB/OR	PASSENGER DOOR AJAR/RKE SENSE
14	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
15	F11 20RD/WT (AUTOSTICK)	IGNITION SWITCH OUTPUT (OFF-RUN-START)
15	G5 20DB/WT (EXCEPT AUTOSTICK)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	L161 18LG/OR (EXCEPT EXPORT)	LEFT TURN SIGNAL
17	L160 18TN/RD (EXCEPT EXPORT)	RIGHT TURN SIGNAL
18	L61 18LG	LEFT TURN SIGNAL
19	L60 18TN	RIGHT TURN SIGNAL
20	L4 16VT/WT (EXCEPT EXPORT)	DIMMER SWITCH LOW BEAM OUTPUT
21	M1 18PK	FUSED B(+)
22	G11 20WT/BK	RED BRAKE WARNING INDICATOR DRIVER
23	G26 22LB	KEY-IN IGNITION SWITCH SENSE
24	G75 20TN/BK (LHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
24	G74 20TN/RD (RHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
25	G10 20LG/RD	SEAT BELT SWITCH SENSE
26	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT



KNOCK SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K42 20DB/LG	KS SIGNAL
2	K45 20BK/VT	KS RETURN

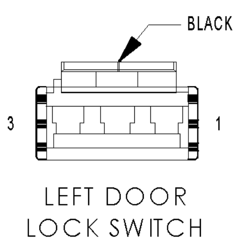


LEFT BACKUP LAMP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L1 20VT/BK	BACKUP LAMP FEED

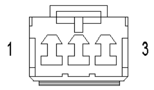
LEFT CYLINDER LOCK SWITCH (PREMIUM) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	P97 18LG	LEFT DOOR SWITCH MUX
2	Z14 18BK	GROUND



LEFT DOOR LOCK SWITCH - BLACK 3 WAY

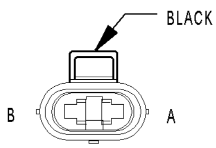
CAV	CIRCUIT	FUNCTION
1	-	-
2	P97 20LG	LEFT DOOR SWITCH MUX
2	P97 18LG (PREMIUM)	LEFT DOOR SWITCH MUX
3	Z14 20BK/YL	GROUND
3	Z14 18BK (PREMIUM)	GROUND



LEFT FRONT DOOR SPEAKER

LEFT FRONT DOOR SPEAKER - 3 WAY

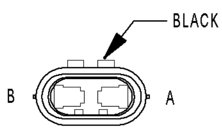
CAV	CIRCUIT	FUNCTION
1	X55 20BR/RD	LEFT FRONT SPEAKER (-)
2	-	-
3	X53 20DG	LEFT FRONT SPEAKER (+)



LEFT FRONT FOG LAMP (2.0L EXCEPT EXPORT/2.4L TURBO)

LEFT FRONT FOG LAMP (2.0L EXCEPT EXPORT/2.4L TURBO) - BLACK 2 WAY

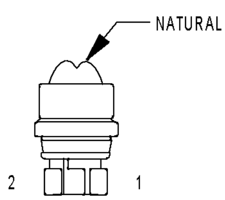
CAV	CIRCUIT	FUNCTION
A	L39 16BK/DB (2.0L)	FRONT FOG LAMP SWITCH OUTPUT
A	L39 16LB (2.4L TURBO)	FRONT FOG LAMP SWITCH OUTPUT
B	Z1 20BK (2.0L)	GROUND
B	Z1 18BK (2.4L TURBO)	GROUND



LEFT FRONT FOG LAMP (EXPORT)

LEFT FRONT FOG LAMP (EXPORT) - BLACK 2 WAY

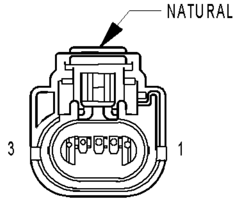
CAV	CIRCUIT	FUNCTION
A	L39 16BK/DB	FRONT FOG LAMP SWITCH OUTPUT
B	Z1 20BK	GROUND



LEFT FRONT SIDE MARKER LAMP (EXCEPT EXPORT)

LEFT FRONT SIDE MARKER LAMP (EXCEPT EXPORT) - NATURAL 2 WAY

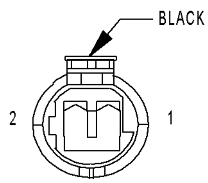
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



LEFT FRONT TURN SIGNAL LAMP (EXPORT)

LEFT FRONT TURN SIGNAL LAMP (EXPORT) - NATURAL 3 WAY

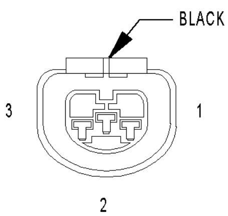
CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	-	-
3	Z1 20BK	GROUND



LEFT FRONT WHEEL SPEED SENSOR

LEFT FRONT WHEEL SPEED SENSOR - BLACK 2 WAY

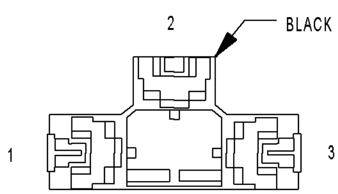
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



LEFT HEADLAMP (EXCEPT EXPORT)

LEFT HEADLAMP (EXCEPT EXPORT) - BLACK 3 WAY

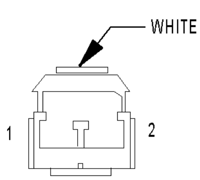
CAV	CIRCUIT	FUNCTION
1	L43 14VT	FUSED LEFT LOW BEAM OUTPUT
2	Z1 14BK	GROUND
3	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT



LEFT HEADLAMP (EXPORT)

LEFT HEADLAMP (EXPORT) - BLACK 3 WAY

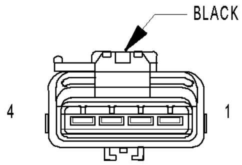
CAV	CIRCUIT	FUNCTION
1	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
2	L43 14VT	FUSED LEFT LOW BEAM OUTPUT
3	Z1 14BK	GROUND



LEFT INSTRUMENT PANEL SPEAKER

LEFT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

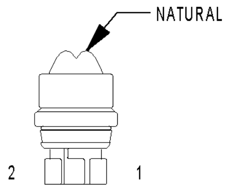
CAV	CIRCUIT	FUNCTION
1	X53 20DG	LEFT FRONT SPEAKER (+)
2	X55 20BR/RD	LEFT FRONT SPEAKER (-)



LEFT LAVALIER MODULE (EXPORT)

LEFT LAVALIER MODULE (EXPORT) - BLACK 4 WAY

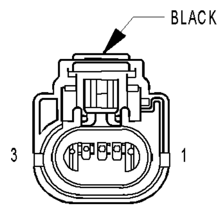
CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
2	Z1 18BK	GROUND
3	L13 20BR/YL	HEADLAMP ADJUST SIGNAL
4	L44 20VT/RD	FUSED RIGHT LOW BEAM OUTPUT



LEFT LICENSE LAMP (EXPORT)

LEFT LICENSE LAMP (EXPORT) - NATURAL 2 WAY

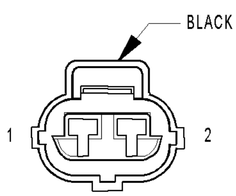
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



LEFT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT)

LEFT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT) - BLACK 3 WAY

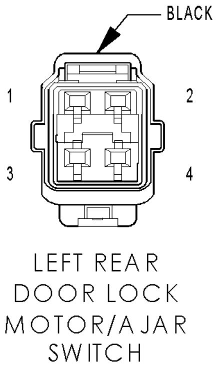
CAV	CIRCUIT	FUNCTION
1	Z1 20BK (2.0L)	GROUND
1	Z1 18BK (2.4L TURBO)	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L161 18LG/OR	LEFT TURN SIGNAL



LEFT REAR DOOR AJAR SWITCH

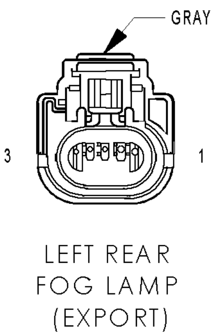
LEFT REAR DOOR AJAR SWITCH - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G76 20TN/YL	PASSENGER DOOR AJAR/RKE SENSE
2	Z1 20BK	GROUND



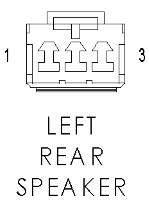
LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	G77 20TN/OR	PASSENGER DOOR AJAR/RKE SENSE
2	Z1 20BK	GROUND
3	P36 18PK/VT	DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	DOOR LOCK RELAY OUTPUT



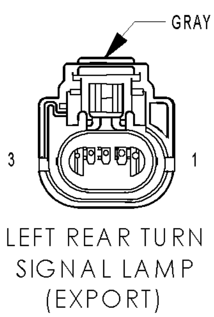
LEFT REAR FOG LAMP (EXPORT) - GRAY 3 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	-	-
3	L38 16BR/WT	REAR FOG LAMP FEED



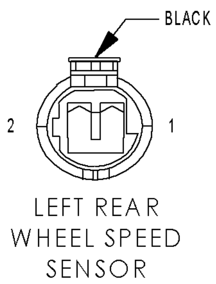
LEFT REAR SPEAKER - 3 WAY

CAV	CIRCUIT	FUNCTION
1	X51 20BR/YL	LEFT REAR SPEAKER (+)
2	-	-
3	X57 20BR/LB	LEFT REAR SPEAKER (-)



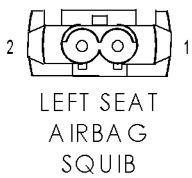
LEFT REAR TURN SIGNAL LAMP (EXPORT) - GRAY 3 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	-	-
3	L63 18DG/RD	LEFT TURN SIGNAL



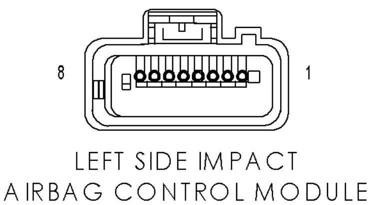
LEFT REAR WHEEL SPEED SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B4 20LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL



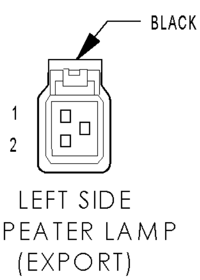
LEFT SEAT AIRBAG SQUIB - 2 WAY

CAV	CIRCUIT	FUNCTION
1	R31 18OR	LEFT SEAT SQUIB LINE 2
2	R33 18WT	LEFT SEAT SQUIB LINE 1



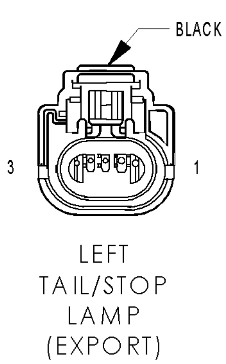
LEFT SIDE IMPACT AIRBAG CONTROL MODULE - 8 WAY

CAV	CIRCUIT	FUNCTION
1	F15 20DG/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R33 20OR/YL	LEFT SEAT SQUIB LINE 1
4	R31 20YL/OR	LEFT SEAT SQUIB LINE 2
5	Z6 20BK/PK	GROUND
6	-	-
7	-	-
8	D25 20VT/YL	PCI BUS



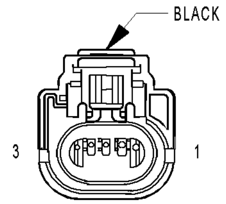
LEFT SIDE REPEATER LAMP (EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	Z1 20BK	GROUND



LEFT TAIL/STOP LAMP (EXPORT) - BLACK 3 WAY

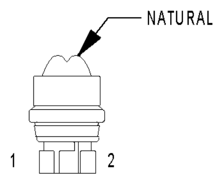
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT



LEFT TAIL/STOP/TURN SIGNAL LAMP (EXCEPT EXPORT)

LEFT TAIL/STOP/TURN SIGNAL LAMP (EXCEPT EXPORT) - BLACK 3 WAY

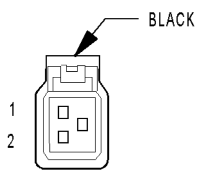
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L63 18DG/RD	LEFT TURN SIGNAL



LICENSE LAMP (EXCEPT EXPORT)

LICENSE LAMP (EXCEPT EXPORT) - NATURAL 2 WAY

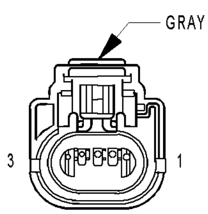
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



LOW NOTE HORN

LOW NOTE HORN - BLACK 2 WAY

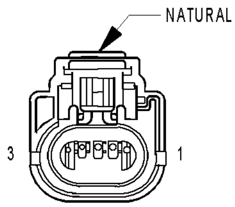
CAV	CIRCUIT	FUNCTION
1	Z1 20BK (2.0L)	GROUND
1	Z1 18BK (2.4L TURBO)	GROUND
2	X2 20DG/RD (2.0L)	HORN RELAY OUTPUT
2	X2 18DG/RD (2.4L TURBO)	HORN RELAY OUTPUT



MANIFOLD ABSOLUTE PRESSURE SENSOR (2.0L)

MANIFOLD ABSOLUTE PRESSURE SENSOR (2.0L) - GRAY 3 WAY

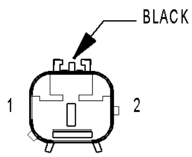
CAV	CIRCUIT	FUNCTION
1	K1 20DG/RD	MAP SIGNAL
2	K4 20BK/LB	SENSOR GROUND
3	K7 20OR	5 VOLT SUPPLY



MANIFOLD ABSOLUTE PRESSURE SENSOR (2.4L TURBO)

MANIFOLD ABSOLUTE PRESSURE SENSOR (2.4L TURBO) - NATURAL 3 WAY

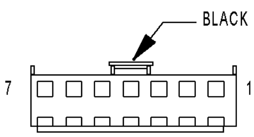
CAV	CIRCUIT	FUNCTION
1	K1 20DG/RD	MAP SIGNAL
2	K4 20BK/LB	SENSOR GROUND
3	K7 20OR	5 VOLT SUPPLY



MANIFOLD TUNING VALVE SOLENOID (RT)

MANIFOLD TUNING VALVE SOLENOID (RT) - BLACK 2 WAY

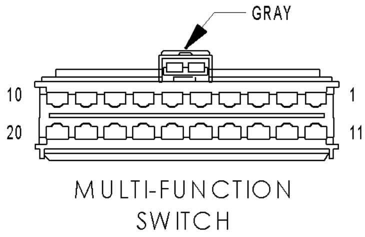
CAV	CIRCUIT	FUNCTION
1	K201 20BR/YL	MTV RELAY OUTPUT
2	Z1 18BK	GROUND



MAP/READING LAMPS

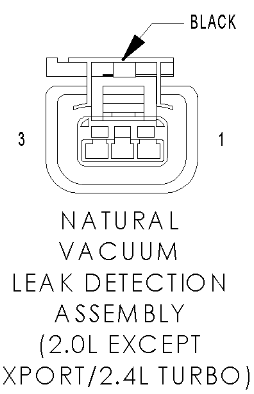
MAP/READING LAMPS - BLACK 7 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z3 20BK/OR	GROUND
3	-	-
4	-	-
5	-	-
6	-	-
7	F10 18BK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



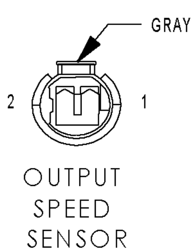
MULTI-FUNCTION SWITCH - GRAY 20 WAY

CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN (EXCEPT EXPORT)	BRAKE LAMP SWITCH OUTPUT
2	L61 18LG	LEFT TURN SIGNAL
2	L61 18LG (EXPORT)	LEFT TURN SIGNAL
3	L6 20RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	L63 18DG/RD	LEFT TURN SIGNAL
4	L63 18DG/RD (EXPORT)	LEFT TURN SIGNAL
5	L62 18BR/RD	RIGHT TURN SIGNAL
5	L62 18BR/RD (EXPORT)	RIGHT TURN SIGNAL
6	L60 18TN	RIGHT TURN SIGNAL
6	L60 18TN (EXPORT)	RIGHT TURN SIGNAL
7	Z3 20BK/OR	GROUND
8	E19 22RD	PANEL LAMPS DIMMER SIGNAL
9	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
10	-	-
11	A15 18WT	FUSED B(+)
12	L38 16BR/WT (EXPORT)	REAR FOG LAMP FEED
12	L38 16BR/WT (EXPORT)	REAR FOG LAMP FEED
13	L4 14VT/WT (EXCEPT EXPORT)	DIMMER SWITCH LOW BEAM OUTPUT
13	F61 16WT/OR (EXPORT)	FUSED B(+)
14	F39 14PK/LG (EXCEPT EXPORT)	FRONT FOG LAMP SWITCH OUTPUT
14	L39 16LB (EXPORT)	FRONT FOG LAMP SWITCH OUTPUT
14	L39 16LB (EXPORT)	FRONT FOG LAMP SWITCH OUTPUT
15	-	-
16	L4 12VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
17	L33 14LG/BR	DIMMER SWITCH HIGH BEAM OUTPUT
18	F3 12LB/OR	FUSED B(+)
19	F3 12LB/OR	FUSED B(+)
20	F33 18PK/RD	FUSED B(+)



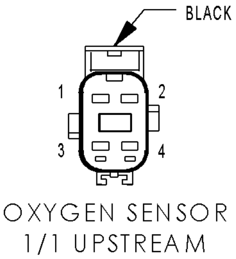
NATURAL VACUUM LEAK DETECTION ASSEMBLY (2.0L EXCEPT EXPORT/2.4L TURBO) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	K107 20OR	NVLD SWITCH SIGNAL
3	K106 20WT/DG	NVLD SOLENOID CONTROL



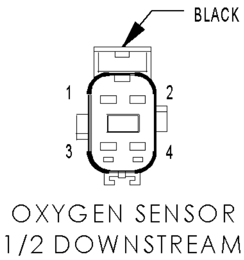
OUTPUT SPEED SENSOR - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	T13 20DB/BK	SPEED SENSOR GROUND
2	T14 20LG/WT	OUTPUT SPEED SENSOR SIGNAL



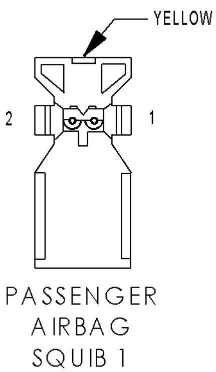
OXYGEN SENSOR 1/1 UPSTREAM - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	K99 18BR/OR	O2 1/1 HEATER CONTROL
3	K904 20DB/DG	O2 RETURN
4	K41 20BK/DG	O2 1/1 SIGNAL



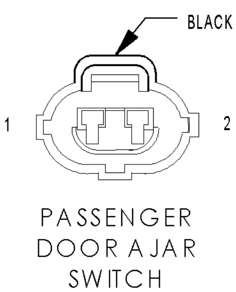
OXYGEN SENSOR 1/2 DOWNSTREAM - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 18BK (2.0L)	GROUND
1	Z1 20BK (2.4L TURBO)	GROUND
2	K199 18BR/VT	O2 1/2 HEATER CONTROL
3	K904 20DB/DG	O2 RETURN
4	K141 20TN/WT	O2 1/2 SIGNAL



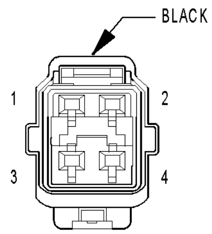
PASSENGER AIRBAG SQUIB 1 - YELLOW 2 WAY

CAV	CIRCUIT	FUNCTION
1	R42 20BK/YL	PASSENGER SQUIB 1 LINE 1
2	R44 20DG/YL	PASSENGER SQUIB 1 LINE 2



PASSENGER DOOR AJAR SWITCH - BLACK 2 WAY

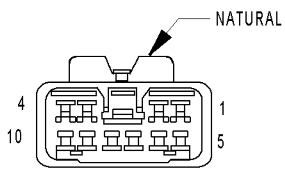
CAV	CIRCUIT	FUNCTION
1	G74 20TN	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z14 20BK/YL	GROUND



PASSENGER
DOOR LOCK
MOTOR/AJAR
SWITCH

PASSENGER DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

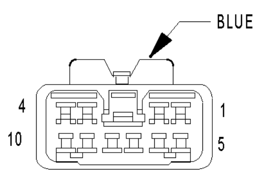
CAV	CIRCUIT	FUNCTION
1	G74 20TN/RD (LHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
1	G75 20TN (RHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z14 20BK/YL	GROUND
3	P36 18PK/VT	DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	DOOR LOCK RELAY OUTPUT



PASSENGER
POWER MIRROR
(LHD)

PASSENGER POWER MIRROR (LHD) - NATURAL 10 WAY

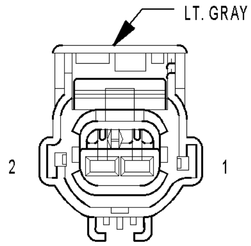
CAV	CIRCUIT	FUNCTION
1	-	-
2	P93 20YL/WT	MIRROR HORIZONTAL
3	-	-
4	-	-
5	P95 20DB/WT	MIRROR VERTICAL
6	P92 20YL	MIRROR COMMON
7	-	-
8	-	-
9	-	-
10	-	-



PASSENGER
POWER MIRROR
(RHD)

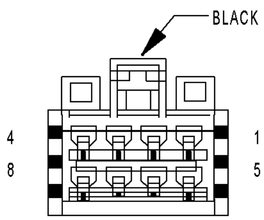
PASSENGER POWER MIRROR (RHD) - BLUE 10 WAY

CAV	CIRCUIT	FUNCTION
1	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER SWITCH OUTPUT
2	P94 20WT/YL	MIRROR HORIZONTAL
3	Z14 20BK/YL	GROUND
4	P159 20DG/WT	MIRROR UNFOLD
5	P91 20WT/BK	MIRROR VERTICAL
6	P92 20YL	MIRROR COMMON
7	P160 20LB	MIRROR FOLD
8	-	-
9	-	-
10	-	-



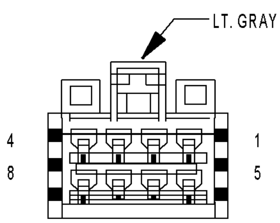
PASSENGER POWER WINDOW MOTOR - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q12 14BR	PASSENGER WINDOW DRIVER (UP)
2	Q22 14VT	PASSENGER WINDOW DRIVER (DOWN)



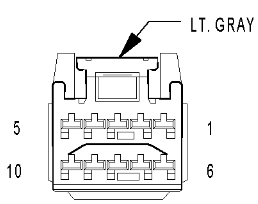
PASSENGER POWER WINDOW SWITCH (LHD) - BLACK 8 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Q26 14VT/WT	MASTER WINDOW SWITCH RIGHT FRONT DOWN
3	Q16 14BR/WT	MASTER WINDOW SWITCH RIGHT FRONT UP
4	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
5	Q22 14VT	PASSENGER WINDOW DRIVER (DOWN)
6	-	-
7	-	-
8	Q12 14BR	PASSENGER WINDOW DRIVER (UP)



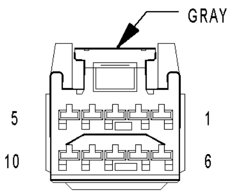
PASSENGER POWER WINDOW SWITCH (RHD) - LT. GRAY 8 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Q26 14VT/WT	MASTER WINDOW SWITCH RIGHT FRONT DOWN
3	Q16 14BR/WT	MASTER WINDOW SWITCH RIGHT FRONT UP
4	F21 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
5	Q22 14VT	PASSENGER WINDOW DRIVER (DOWN)
6	-	-
7	-	-
8	Q12 14BR	PASSENGER WINDOW DRIVER (UP)



POWER MIRROR SWITCH (LHD) - LT. GRAY 10 WAY

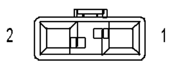
CAV	CIRCUIT	FUNCTION
1	P95 20DB/WT	MIRROR VERTICAL
2	P93 20YL/WT	MIRROR HORIZONTAL
3	-	-
4	Z8 20BK/VT	GROUND
5	-	-
6	P91 20WT/BK	MIRROR VERTICAL
7	P94 20WT/YL	MIRROR HORIZONTAL
8	P92 20YL	MIRROR COMMON
9	-	-
10	L6 20RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



POWER MIRROR SWITCH (RHD)

POWER MIRROR SWITCH (RHD) - GRAY 10 WAY

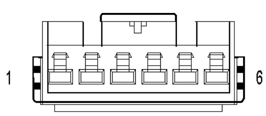
CAV	CIRCUIT	FUNCTION
1	L6 20RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	P159 20DG/WT	MIRROR UNFOLD
3	P92 20YL	MIRROR COMMON
4	P94 20WT/YL	MIRROR HORIZONTAL
5	P91 20WT/BK	MIRROR VERTICAL
6	P160 20LB	MIRROR FOLD
7	Z8 20BK/VT	GROUND
8	-	-
9	P93 20YL/WT	MIRROR HORIZONTAL
10	P95 20DB/WT	MIRROR VERTICAL



POWER SEAT MOTOR (EXPORT)

POWER SEAT MOTOR (EXPORT) - 2 WAY

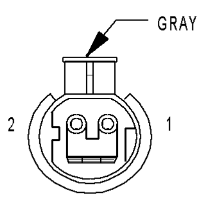
CAV	CIRCUIT	FUNCTION
1	P121 16LG/OR	SEAT DOWN DRIVER
2	P120 16LG/YL	SEAT UP DRIVER



POWER SEAT SWITCH (EXPORT)

POWER SEAT SWITCH (EXPORT) - 6 WAY

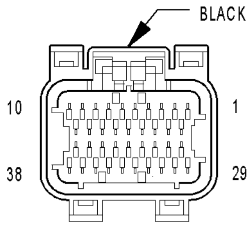
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z8 16BK	GROUND
3	P120 16LG/YL	SEAT UP DRIVER
4	P121 16LG/OR	SEAT DOWN DRIVER
5	Z8 16BK	GROUND
6	A120 16RD/LG	FUSED B(+)



POWER STEERING PRESSURE SWITCH

POWER STEERING PRESSURE SWITCH - GRAY 2 WAY

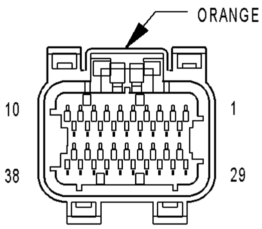
CAV	CIRCUIT	FUNCTION
1	K10 20DB/OR	PSP SWITCH SIGNAL
2	Z12 20BK/TN	GROUND



POWERTRAIN CONTROL MODULE C1

POWERTRAIN CONTROL MODULE C1 - BLACK 38 WAY

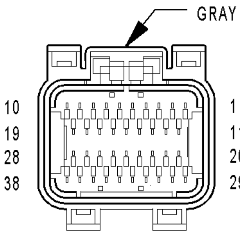
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	Z11 18BK/WT	GROUND
10	-	-
11	F12 18DB/WT (2.0L)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	F12 18DB/RD (2.4L TURBO)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	F11 20RD/WT (2.0L AUTOSTICK)	IGNITION SWITCH OUTPUT (OFF-RUN-START)
12	F11 20RD/WT (2.0L EXCEPT AUTO-STICK)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
13	G7 20WT/OR	VEHICLE SPEED SIGNAL
14	G9 20GY/BK	BRAKE FLUID LEVEL SWITCH SENSE
15	K55 18LB (2.4L TURBO)	TIP SOL CONTROL
16	-	-
17	K150 18DB/YL (2.4L TURBO)	SURGE SOL CONTROL
18	Z12 18BK/TN	GROUND
19	-	-
20	G6 20GY	OIL PRESSURE SIGNAL
21	-	-
22	K145 20BR/OR	AAT SIGNAL
23	K153 18LB (2.4L TURBO)	TIP SIGNAL
24	-	-
25	D20 20LG	SCI RECEIVE (PCM)
26	D6 20PK/LB (2.0L)	SCI RECEIVE (TCM)
27	K6 20VT/WT (2.0L)	5 VOLT SUPPLY
27	K6 18VT/WT (2.4L TURBO)	5 VOLT SUPPLY
28	K137 18DB/GY (2.4L TURBO)	WASTEGATE SOL CONTROL
29	A14 18RD/WT	FUSED B(+)
30	A41 16YL	FUSED IGNITION SWITCH OUTPUT (START)
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	D21 20PK	SCI TRANSMIT (PCM)
37	D15 20WT/DG (2.0L)	SCI TRANSMIT (TCM)
38	D25 20VT/YL	PCI BUS (PCM)



POWERTRAIN CONTROL MODULE C2 (2.0L)

POWERTRAIN CONTROL MODULE C2 (2.0L) - ORANGE 38 WAY

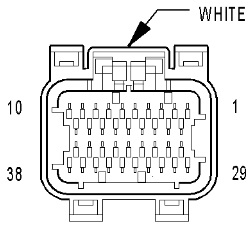
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	K17 18DB/TN	COIL CONTROL NO. 2
10	K19 18BK/GY	COIL CONTROL NO. 1
11	K14 18LB/BR	INJECTOR CONTROL NO. 4
12	K13 18YL/WT	INJECTOR CONTROL NO. 3
13	K12 18TN	INJECTOR CONTROL NO. 2
14	K11 18WT/DB	INJECTOR CONTROL NO. 1
15	-	-
16	K200 20VT/OR (RT)	MTV CONTROL
17	K199 18BR/VT	O2 1/2 HEATER CONTROL
18	K99 18BR/OR	O2 1/1 HEATER CONTROL
19	K20 20DG	GEN FIELD CONTROL
20	K2 20VT/LG	ECT SIGNAL
21	K22 20OR/DB	TP SIGNAL
22	-	-
23	K1 20DG/RD	MAP SIGNAL
24	K45 20BK/VT	KS RETURN
25	K42 20DB/LG	KS SIGNAL
26	-	-
27	K4 20BK/LB	SENSOR GROUND
28	K961 20BR/WT	IAC RETURN
29	K7 20OR	5 VOLT SUPPLY
30	K21 20BK/RD	IAT SIGNAL
31	K41 20BK/DG	O2 1/1 SIGNAL
32	K904 20DB/DG	O2 RETURN
33	K141 20TN/WT	O2 1/2 SIGNAL
34	K44 20TN/YL	CMP SIGNAL
35	K24 20GY/BK	CKP SIGNAL
36	-	-
37	-	-
38	K610 20VT/GY	IAC MOTOR CONTROL



POWERTRAIN CONTROL MODULE C2 (2.4L TURBO)

POWERTRAIN CONTROL MODULE C2 (2.4L TURBO) - GRAY 38 WAY

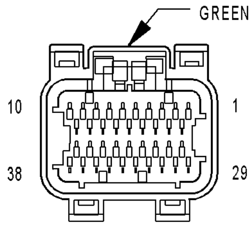
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	K17 16DB/TN	COIL CONTROL NO. 2
10	K19 16BK/GY	COIL CONTROL NO. 1
11	K14 18LB/BR	INJECTOR CONTROL NO. 4
12	K13 18YL/WT	INJECTOR CONTROL NO. 3
13	K12 18TN	INJECTOR CONTROL NO. 2
14	K11 18WT/DB	INJECTOR CONTROL NO. 1
15	-	-
16	-	-
17	K199 18BR/VT	O2 1/2 HEATER CONTROL
18	K99 18BR/OR	O2 1/1 HEATER CONTROL
19	K20 18DG	GEN FIELD CONTROL
20	K2 20TN/BK	ECT SIGNAL
21	K22 20OR/DB	TP SIGNAL
22	-	-
23	K1 20DG/RD	MAP SIGNAL
24	K45 20BK/VT	KS RETURN
25	K42 20DB/LG	KS SIGNAL
26	-	-
27	K4 18BK/LB	SENSOR GROUND
28	K961 18BR/VT	IAC RETURN
29	K7 18OR	5 VOLT SUPPLY
30	K21 20BK/RD	IAT SIGNAL
31	K41 20BK/DG	O2 1/1 SIGNAL
32	K904 18DB/DG	O2 RETURN
33	K141 20TN/WT	O2 1/2 SIGNAL
34	K44 20TN/YL	CMP SIGNAL
35	K24 20GY/BK	CKP SIGNAL
36	-	-
37	-	-
38	K610 18VT/GY	IAC MOTOR CONTROL



POWERTRAIN CONTROL MODULE C3

POWERTRAIN CONTROL MODULE C3 - WHITE 38 WAY

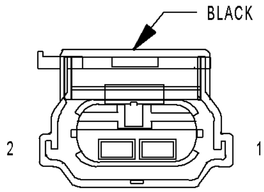
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K51 20DB/YL (2.0L)	AUTOMATIC SHUT DOWN RELAY CONTROL
3	K51 18DB/YL (2.4L TURBO)	AUTOMATIC SHUT DOWN RELAY CONTROL
4	C27 18DB/PK (2.4L TURBO)	HIGH SPEED RAD FAN RELAY CONTROL
5	V35 20LG/RD (2.0L)	S/C VENT CONTROL
6	C27 20DB/PK (2.0L)	RAD FAN RELAY CONTROL
6	C24 18DB/RD (2.4L TURBO)	RAD FAN LOW RELAY CONTROL
7	V32 20YL/RD (2.0L)	S/C SUPPLY
8	K106 20WT/DG (2.0L)	NVLD SOLENOID CONTROL
8	K106 18WT/DG (2.4L TURBO)	NVLD SOLENOID CONTROL
9	-	-
10	-	-
11	C28 20DB/OR (2.0L)	A/C CLUTCH RELAY CONTROL
11	C28 18DB/OR (2.4L TURBO)	A/C CLUTCH RELAY CONTROL
12	V36 20TN/RD (2.0L)	S/C VACUUM CONTROL
13	-	-
14	-	-
15	-	-
16	-	-
17	K167 20BR/YL (2.0L)	SENSOR GROUND 2
17	K167 18BR/YL (2.4L TURBO)	SENSOR GROUND 2
18	-	-
19	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
20	K52 20PK/BK	EVAP/PURGE CONTROL
21	T141 20YL/RD	CLUTCH INTERLOCK SWITCH SIGNAL
22	-	-
23	K29 20WT/PK	BRAKE SWITCH SIGNAL
24	C20 20BR/OR (2.0L)	A/C SWITCH SENSE
24	C20 20BR (2.4L TURBO)	A/C SWITCH SENSE
25	-	-
26	T44 20YL/LB (2.0L EATX)	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
26	K119 20LG/BK (2.0L MTX/2.4L TURBO)	CLUTCH UP SWITCH SIGNAL
27	T5 20LG/LB (2.0L)	AUTOSTICK UPSHIFT SWITCH SIGNAL
28	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
29	K108 20WT/TN	EVAP/PURGE RETURN
30	K10 20DB/OR	PSP SWITCH SIGNAL
31	-	-
32	K118 20PK/YL	BATTERY TEMP SIGNAL
33	-	-
34	V37 20RD/LG (2.0L)	S/C SWITCH SIGNAL
35	K107 20OR (2.0L)	NVLD SWITCH SIGNAL
35	K107 18OR (2.4L TURBO)	NVLD SWITCH SIGNAL
36	-	-
37	K31 20BR (2.0L)	FUEL PUMP RELAY CONTROL
37	K31 18BR (2.4L TURBO)	FUEL PUMP RELAY CONTROL
38	K90 20TN	STARTER RELAY CONTROL



POWERTRAIN CONTROL MODULE C4

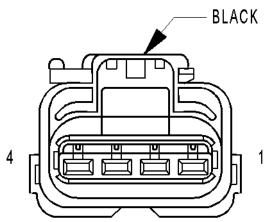
POWERTRAIN CONTROL MODULE C4 - GREEN 38 WAY

CAV	CIRCUIT	FUNCTION
1	T60 18BR	OVERDRIVE SOLENOID CONTROL
2	T59 18PK/BK	UNDERDRIVE SOLENOID CONTROL
3	-	-
4	-	-
5	-	-
6	T19 18WT	2-4 SOLENOID CONTROL
7	-	-
8	-	-
9	-	-
10	T20 18LB	LOW/REVERSE SOLENOID CONTROL
11	-	-
12	Z13 16BK/RD	GROUND
13	-	-
14	Z13 16BK/RD	GROUND
15	T1 20LG/BK	TRS T1 SENSE
16	T3 20VT	TRS T3 SENSE
17	-	-
18	T15 20LG	TRANSMISSION CONTROL RELAY CONTROL
19	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
20	-	-
21	-	-
22	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
23	-	-
24	-	-
25	-	-
26	-	-
27	T41 20BK/WT	TRS T41 SENSE
28	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
29	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
30	T47 18YL/BK	2-4 PRESSURE SWITCH SENSE
31	-	-
32	T14 20LG/WT	OUTPUT SPEED SENSOR SIGNAL
33	T52 20RD/BK	INPUT SPEED SENSOR SIGNAL
34	T13 20DB/BK	SPEED SENSOR GROUND
35	T54 20VT/PK	TRANSMISSION TEMPERATURE SENSOR SIGNAL
36	-	-
37	T42 20VT/WT	TRS T42 SENSE
38	-	-



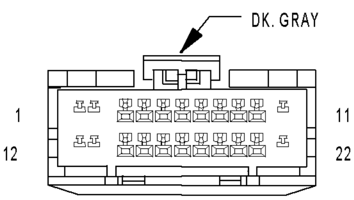
RADIATOR FAN MOTOR (2.0L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C25 12YL	RAD FAN HIGH RELAY OUTPUT
2	Z1 14BK	GROUND



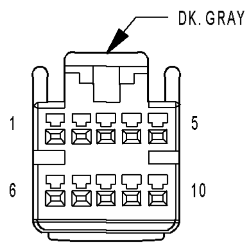
RADIATOR FAN MOTOR (2.4L TURBO) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 12BK	GROUND
2	C23 12DG	RAD FAN CONTROL/HIGH RELAY OUTPUT
3	C116 12LG/WT	RAD FAN HIGH/LOW FEED
4	C25 12YL	RAD FAN LOW RELAY OUTPUT



RADIO C1 - DK. GRAY 22 WAY

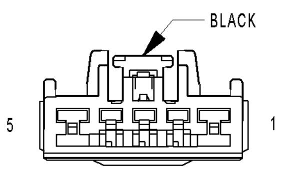
CAV	CIRCUIT	FUNCTION
1	M11 16PK/LB	FUSED B(+)
2	X12 18RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	E2 20OR	PANEL LAMPS DRIVER
4	-	-
5	-	-
6	-	-
7	X54 20VT	RIGHT FRONT SPEAKER (+)
8	X56 20DB/RD	RIGHT FRONT SPEAKER (-)
9	X55 20BR/RD	LEFT FRONT SPEAKER (-)
10	X53 20DG	LEFT FRONT SPEAKER (+)
11	Z9 16BK	GROUND
12	-	-
13	-	-
14	D25 20VT/YL	PCI BUS
15	-	-
16	-	-
17	-	-
18	X51 20BR/YL	LEFT REAR SPEAKER (+)
19	X57 20BR/LB	LEFT REAR SPEAKER (-)
20	X58 20DB/OR	RIGHT REAR SPEAKER (-)
21	X52 20DB/WT	RIGHT REAR SPEAKER (+)
22	-	-



RADIO C2
(COMPACT DISC CHANGER)

RADIO C2 (COMPACT DISC CHANGER) - DK. GRAY 10 WAY

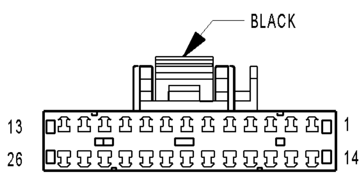
CAV	CIRCUIT	FUNCTION
1	24GY/WT	AUDIO OUT RIGHT
2	24BK/OR	GROUND
3	22BK	SHIELD GROUND
4	24VT/YL	PCI BUS
5	24RD	FUSED IGNITION SWITCH OUTPUT
6	24DG/WT	AUDIO OUT LEFT
7	22BK/YL	GROUND
8	-	-
9	24OR/YL	PANEL LAMPS DIMMER SIGNAL
10	22GY/YL	B(+)



REAR WINDOW
DEFOGGER
SWITCH

REAR WINDOW DEFOGGER SWITCH - BLACK 5 WAY

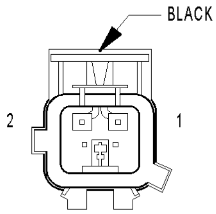
CAV	CIRCUIT	FUNCTION
1	A4 12BK/RD	FUSED B(+)
2	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
3	Z2 22BK/LG	GROUND
4	E2 20OR	PANEL LAMPS DRIVER
5	C15 12BK/WT	REAR WINDOW DEFOGGER SWITCH OUTPUT



REMOTE KEYLESS
ENTRY MODULE

REMOTE KEYLESS ENTRY MODULE - BLACK 26 WAY

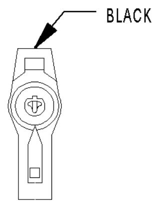
CAV	CIRCUIT	FUNCTION
1	L4 16VT/WT (EXCEPT EXPORT)	DIMMER SWITCH LOW BEAM OUTPUT
1	L63 18DG/RD (EXPORT)	LEFT TURN SIGNAL
2	L7 18BK/YL (EXCEPT EXPORT)	PARK LAMP SWITCH OUTPUT
2	L62 18BR/RD (EXPORT)	RIGHT TURN SIGNAL
3	F35 18RD	FUSED B(+)
4	P33 18OR/BK	DOOR LOCK RELAY OUTPUT
5	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
6	P36 18PK/VT	DOOR UNLOCK RELAY OUTPUT
7	M9 20LB/OR	PASSENGER DOOR AJAR/RKE SENSE
8	Z2 18BK/LG	GROUND
9	M1 18PK	FUSED B(+)
10	P97 20LG (LHD)	LEFT DOOR SWITCH MUX
10	P96 20LG/BK (RHD)	RIGHT DOOR SWITCH MUX
11	P96 20LG/BK (LHD)	RIGHT DOOR SWITCH MUX
11	P97 20LG (RHD)	LEFT DOOR SWITCH MUX
12	Z1 20BK	GROUND
13	-	-
14	Q33 20BR/LB	DECKLID RELEASE RELAY CONTROL
15	X5 22WT/RD (EXPORT)	SIREN CONTROL
16	Q2 16LG/BK	DECKLID RELEASE RELAY OUTPUT
17	G69 20BK/OR	VTSS INDICATOR DRIVER
18	X3 22BK/RD	HORN RELAY CONTROL
19	D25 20VT/YL	PCI BUS
20	G120 18WT/DB (EXPORT)	INTRUSION SENSOR SIGNAL
21	-	-
22	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	G70 20BR/TN (EXPORT)	HOOD AJAR SWITCH SENSE
24	G71 20VT/BK	DECKLID SECURITY SWITCH SENSE
25	G75 20TN/BK (LHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
25	G74 20TN/RD (RHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
26	-	-



RIGHT BACKUP LAMP

RIGHT BACKUP LAMP - BLACK 2 WAY

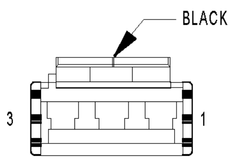
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L1 20VT/BK	BACKUP LAMP FEED



RIGHT CYLINDER LOCK SWITCH (EXPORT)

RIGHT CYLINDER LOCK SWITCH (EXPORT) - BLACK 2 WAY

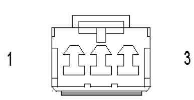
CAV	CIRCUIT	FUNCTION
1	P96 18LG	RIGHT DOOR SWITCH MUX
2	Z14 18BK	GROUND



RIGHT DOOR LOCK SWITCH

RIGHT DOOR LOCK SWITCH - BLACK 3 WAY

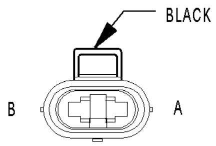
CAV	CIRCUIT	FUNCTION
1	-	-
2	P96 20LG/BK	RIGHT DOOR SWITCH MUX
2	P96 18LG (ALARM)	RIGHT DOOR SWITCH MUX
3	Z14 20BK/YL	GROUND
3	Z14 18BK (ALARM)	GROUND
3	Z14 20BK/YL (EXCEPT ALARM)	GROUND



RIGHT FRONT DOOR SPEAKER

RIGHT FRONT DOOR SPEAKER - 3 WAY

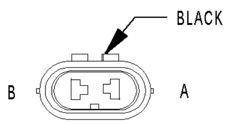
CAV	CIRCUIT	FUNCTION
1	X56 20DB/RD	RIGHT FRONT SPEAKER (-)
2	-	-
3	X54 20VT	RIGHT FRONT SPEAKER (+)



RIGHT FRONT FOG LAMP (2.0L EXCEPT EXPORT/2.4L TURBO)

RIGHT FRONT FOG LAMP (2.0L EXCEPT EXPORT/2.4L TURBO) - BLACK 2 WAY

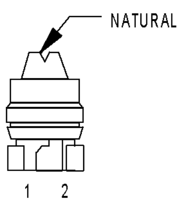
CAV	CIRCUIT	FUNCTION
A	L39 16BK/DB (2.0L)	FRONT FOG LAMP SWITCH OUTPUT
A	L39 16LB (2.4L TURBO)	FRONT FOG LAMP SWITCH OUTPUT
B	Z1 20BK	GROUND



RIGHT FRONT FOG LAMP (EXPORT)

RIGHT FRONT FOG LAMP (EXPORT) - BLACK 2 WAY

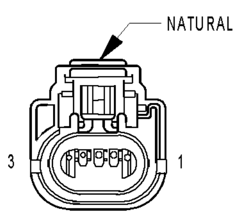
CAV	CIRCUIT	FUNCTION
A	L39 16BK/DB	FRONT FOG LAMP SWITCH OUTPUT
B	Z1 20BK	GROUND



RIGHT FRONT SIDE MARKER LAMP (EXCEPT EXPORT)

RIGHT FRONT SIDE MARKER LAMP (EXCEPT EXPORT) - NATURAL 2 WAY

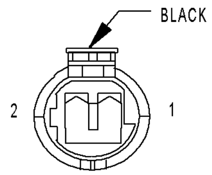
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



RIGHT FRONT TURN SIGNAL LAMP (EXPORT)

RIGHT FRONT TURN SIGNAL LAMP (EXPORT) - NATURAL 3 WAY

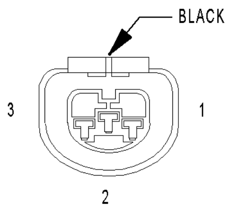
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	-	-
3	Z1 20BK	GROUND



RIGHT FRONT WHEEL SPEED SENSOR

RIGHT FRONT WHEEL SPEED SENSOR - BLACK 2 WAY

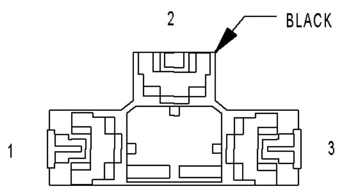
CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



RIGHT HEADLAMP (EXCEPT EXPORT)

RIGHT HEADLAMP (EXCEPT EXPORT) - BLACK 3 WAY

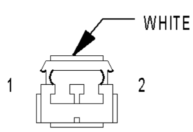
CAV	CIRCUIT	FUNCTION
1	L44 14VT/RD	FUSED RIGHT LOW BEAM OUTPUT
2	Z1 14BK	GROUND
3	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT



RIGHT HEADLAMP (EXPORT)

RIGHT HEADLAMP (EXPORT) - BLACK 3 WAY

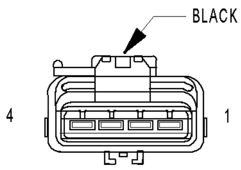
CAV	CIRCUIT	FUNCTION
1	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
2	L44 14VT/RD	FUSED RIGHT LOW BEAM OUTPUT
3	Z1 14BK	GROUND



RIGHT INSTRUMENT PANEL SPEAKER

RIGHT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

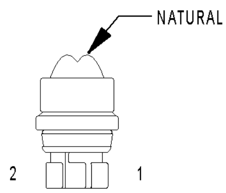
CAV	CIRCUIT	FUNCTION
1	X54 20VT	RIGHT FRONT SPEAKER (+)
2	X56 20DB/RD	RIGHT FRONT SPEAKER (-)



RIGHT LAVALIER MODULE (EXPORT)

RIGHT LAVALIER MODULE (EXPORT) - BLACK 4 WAY

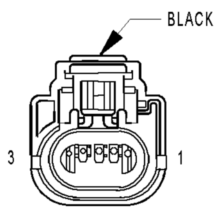
CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
2	Z1 18BK	GROUND
3	L13 20BR/YL	HEADLAMP ADJUST SIGNAL
4	L44 20VT/RD	FUSED RIGHT LOW BEAM OUTPUT



RIGHT LICENSE LAMP (EXPORT)

RIGHT LICENSE LAMP (EXPORT) - NATURAL 2 WAY

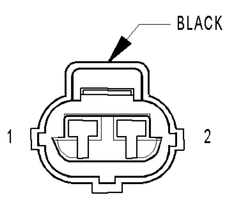
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



RIGHT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT)

RIGHT PARK/TURN SIGNAL LAMP (EXCEPT EXPORT) - BLACK 3 WAY

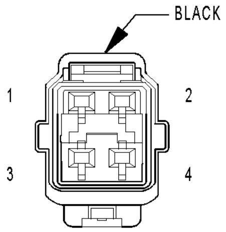
CAV	CIRCUIT	FUNCTION
1	Z1 20BK (2.0L)	GROUND
1	Z1 18BK (2.4L TURBO)	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L160 18TN/RD	RIGHT TURN SIGNAL



RIGHT REAR DOOR AJAR SWITCH

RIGHT REAR DOOR AJAR SWITCH - BLACK 2 WAY

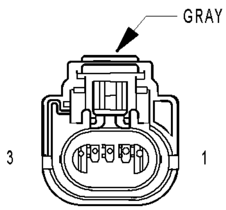
CAV	CIRCUIT	FUNCTION
1	G76 20TN/YL	PASSENGER DOOR AJAR/RKE SENSE
2	Z1 20BK	GROUND



RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH

RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

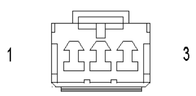
CAV	CIRCUIT	FUNCTION
1	G77 20TN/OR	PASSENGER DOOR AJAR/RKE SENSE
2	Z1 20BK	GROUND
3	P36 18PK/VT	DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	DOOR LOCK RELAY OUTPUT



RIGHT REAR FOG LAMP (EXPORT)

RIGHT REAR FOG LAMP (EXPORT) - GRAY 3 WAY

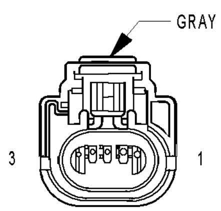
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	-	-
3	L38 16BR/WT	REAR FOG LAMP FEED



RIGHT REAR SPEAKER

RIGHT REAR SPEAKER - 3 WAY

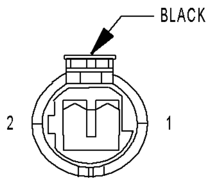
CAV	CIRCUIT	FUNCTION
1	X52 20DB/WT	RIGHT REAR SPEAKER (+)
2	-	-
3	X58 20DB/OR	RIGHT REAR SPEAKER (-)



RIGHT REAR TURN SIGNAL LAMP (EXPORT)

RIGHT REAR TURN SIGNAL LAMP (EXPORT) - GRAY 3 WAY

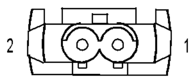
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	-	-
3	L62 18BR/RD	RIGHT TURN SIGNAL



RIGHT REAR
WHEEL SPEED
SENSOR

RIGHT REAR WHEEL SPEED SENSOR - BLACK 2 WAY

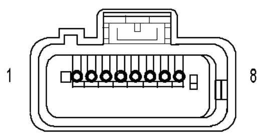
CAV	CIRCUIT	FUNCTION
1	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL



RIGHT SEAT
AIRBAG
SQUIB

RIGHT SEAT AIRBAG SQUIB - 2 WAY

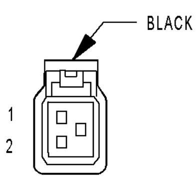
CAV	CIRCUIT	FUNCTION
1	R32 18OR	RIGHT SEAT SQUIB LINE 2
2	R34 18WT	RIGHT SEAT SQUIB LINE 1



RIGHT SIDE IMPACT
AIRBAG CONTROL MODULE

RIGHT SIDE IMPACT AIRBAG CONTROL MODULE - 8 WAY

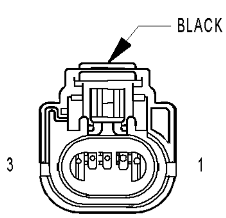
CAV	CIRCUIT	FUNCTION
1	F15 20DG/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R34 20OR/YL	RIGHT SEAT SQUIB LINE 1
4	R32 20YL/OR	RIGHT SEAT SQUIB LINE 2
5	Z6 20BK/PK	GROUND
6	-	-
7	-	-
8	D25 20VT/YL	PCI BUS



RIGHT SIDE
REPEATER LAMP
(EXPORT)

RIGHT SIDE REPEATER LAMP (EXPORT) - BLACK 2 WAY

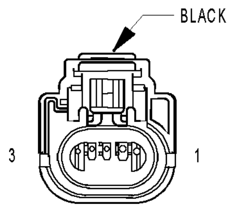
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	Z1 20BK	GROUND



RIGHT
TAIL/STOP
LAMP
(EXPORT)

RIGHT TAIL/STOP LAMP (EXPORT) - BLACK 3 WAY

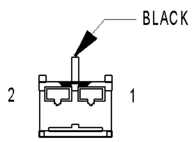
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT



RIGHT
TAIL/STOP/TURN
SIGNAL LAMP
(EXCEPT EXPORT)

RIGHT TAIL/STOP/TURN SIGNAL LAMP (EXCEPT EXPORT) - BLACK 3 WAY

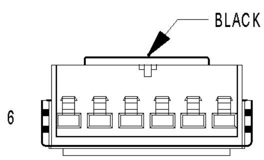
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
3	L62 18BR/RD	RIGHT TURN SIGNAL



SEAT BELT SWITCH

SEAT BELT SWITCH - BLACK 2 WAY

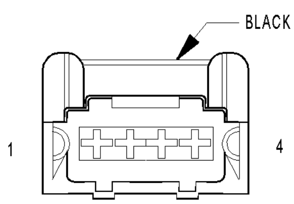
CAV	CIRCUIT	FUNCTION
1	G10 20LG/RD	SEAT BELT SWITCH SENSE
2	Z1 20BK	GROUND



SENTRY KEY
IMMOBILIZER
MODULE

SENTRY KEY IMMOBILIZER MODULE - BLACK 6 WAY

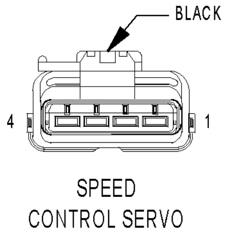
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 22VT/YL	PCI BUS
3	-	-
4	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	Z2 20BK/LG	GROUND
6	M1 20PK	FUSED B(+)



SIREN
(EXPORT)

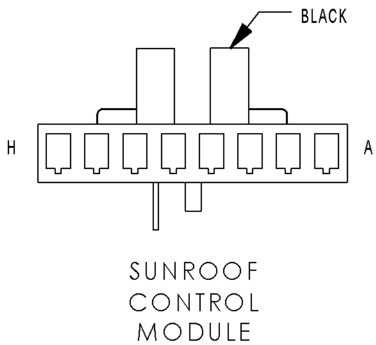
SIREN (EXPORT) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	X5 20WT/RD	SIREN CONTROL
2	X5 20WT/RD	SIREN CONTROL
3	Z1 18BK	GROUND
4	M1 18PK	FUSED B(+)



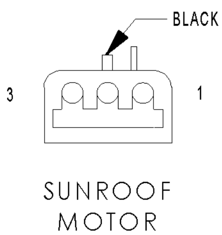
SPEED CONTROL SERVO - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	V36 20TN/RD	S/C VACUUM CONTROL
2	V35 20LG/RD	S/C VENT CONTROL
3	V30 20DB/RD	SPEED CONTROL BRAKE LAMP SWITCH OUTPUT
4	Z1 20BK	GROUND



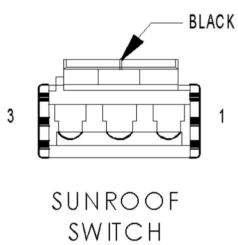
SUNROOF CONTROL MODULE - BLACK 8 WAY

CAV	CIRCUIT	FUNCTION
A	Q6 18DB	SUNROOF MOTOR B(-)
B	Q5 18WT	SUNROOF MOTOR B(+)
C	Z3 18BK/OR	GROUND
D	-	-
E	F10 18YL/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
F	Z3 18BK/VT	GROUND
G	Q43 18WT/RD	SUNROOF VENT
H	Q46 20OR	SUNROOF VENT SWITCH



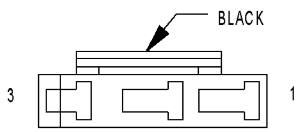
SUNROOF MOTOR - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	Q6 18DB	SUNROOF MOTOR B(-)
2	-	-
3	Q5 18WT	SUNROOF MOTOR B(+)



SUNROOF SWITCH - BLACK 3 WAY

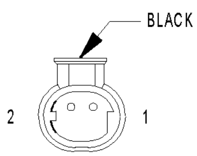
CAV	CIRCUIT	FUNCTION
1	F10 18YL/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	Q43 18WT/RD	SUNROOF VENT
3	Z3 18BK/VT	GROUND



SUNROOF VENT SWITCH

SUNROOF VENT SWITCH - BLACK 3 WAY

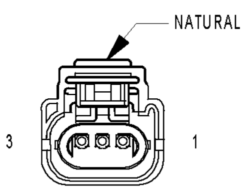
CAV	CIRCUIT	FUNCTION
1	Z3 20BK/VT	GROUND
2	Q46 20OR	SUNROOF VENT SWITCH
3	-	-



SURGE SOLENOID (2.4L TURBO)

SURGE SOLENOID (2.4L TURBO) - BLACK 2 WAY

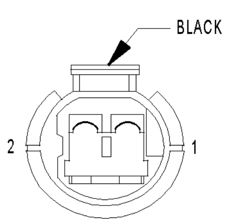
CAV	CIRCUIT	FUNCTION
1	K150 18DB/YL	SURGE SOL CONTROL
2	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



THROTTLE INLET PRESSURE SENSOR (2.4L TURBO)

THROTTLE INLET PRESSURE SENSOR (2.4L TURBO) - NATURAL 3 WAY

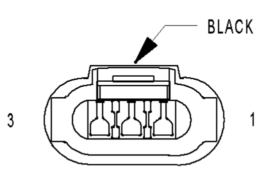
CAV	CIRCUIT	FUNCTION
1	K153 18LB	TIP SIGNAL
2	K167 20BR/YL	SENSOR GROUND 2
3	K6 18VT/WT	5 VOLT SUPPLY



THROTTLE INLET PRESSURE SOLENOID (2.4L TURBO)

THROTTLE INLET PRESSURE SOLENOID (2.4L TURBO) - BLACK 2 WAY

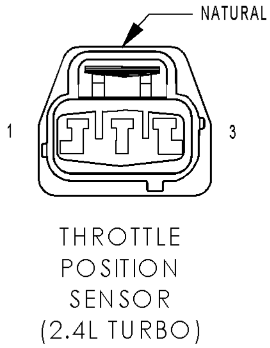
CAV	CIRCUIT	FUNCTION
1	K55 18LB	TIP SOL CONTROL
2	F12 20DB/RD	FUSED IGNITION SWITCH OUTPUT (RUN-START)



THROTTLE POSITION SENSOR (2.0L)

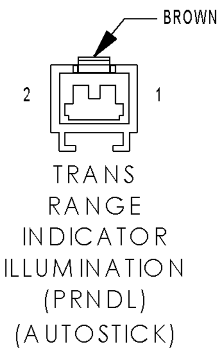
THROTTLE POSITION SENSOR (2.0L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND 2
2	K22 20OR/DB	TP SIGNAL
3	K6 20VT/WT	5 VOLT SUPPLY



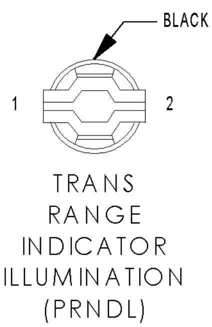
THROTTLE POSITION SENSOR (2.4L TURBO) - NATURAL 3 WAY

CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K22 20OR/DB	TP SIGNAL
3	K7 20OR	5 VOLT SUPPLY



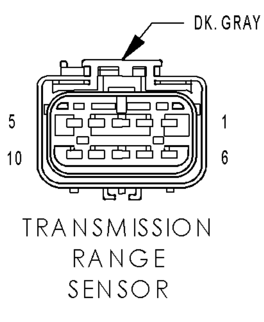
TRANS RANGE INDICATOR ILLUMINATION (PRNDL) (AUTOSTICK) - BROWN 2 WAY

CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z3 20BK/OR	GROUND



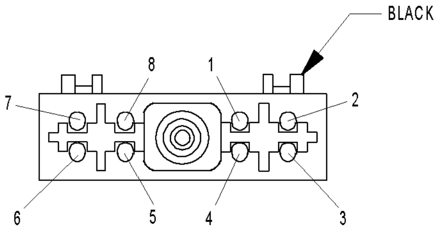
TRANS RANGE INDICATOR ILLUMINATION (PRNDL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z3 20BK/OR	GROUND



TRANSMISSION RANGE SENSOR - DK. GRAY 10 WAY

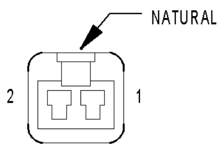
CAV	CIRCUIT	FUNCTION
1	F20 20WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-
3	T13 20DB/BK	SPEED SENSOR GROUND
4	T54 20VT/PK	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	-	-
6	L1 20VT/BK	BACKUP LAMP FEED
7	T1 20LG/BK	TRS T1 SENSE
8	T3 20VT	TRS T3 SENSE
9	T42 20VT/WT	TRS T42 SENSE
10	T41 20BK/WT	TRS T41 SENSE



TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY

TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY - BLACK 8 WAY

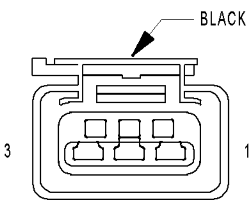
CAV	CIRCUIT	FUNCTION
1	T47 18YL/BK	2-4 PRESSURE SWITCH SENSE
2	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
3	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
4	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
5	T59 18PK/BK	UNDERDRIVE SOLENOID CONTROL
6	T60 18BR	OVERDRIVE SOLENOID CONTROL
7	T20 18LB	LOW/REVERSE SOLENOID CONTROL
8	T19 18WT	2-4 SOLENOID CONTROL



TURBO BOOST GAUGE LAMP (2.4L TURBO)

TURBO BOOST GAUGE LAMP (2.4L TURBO) - NATURAL 2 WAY

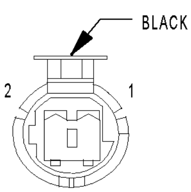
CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z3 20BK/OR	GROUND



VEHICLE SPEED SENSOR

VEHICLE SPEED SENSOR - BLACK 3 WAY

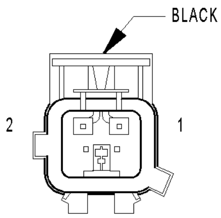
CAV	CIRCUIT	FUNCTION
1	K7 20OR	5 VOLT SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	G7 20WT/OR	VEHICLE SPEED SIGNAL



WASTEGATE SOLENOID (2.4L TURBO)

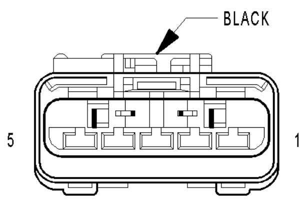
WASTEGATE SOLENOID (2.4L TURBO) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K137 18DB/GY	WASTEGATE SOL CONTROL
2	Z1 20BK	GROUND



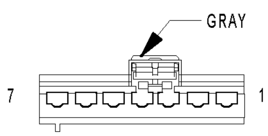
WINDSHIELD WASHER PUMP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	V10 18BR	WASHER PUMP CONTROL SWITCH OUTPUT



WIPER MOTOR - BLACK 5 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	V5 16DG/YL	WIPER PARK SWITCH SENSE
3	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	V3 16BR/WT	WIPER LOW SPEED OUTPUT
5	V4 16RD/YL	WIPER HIGH SPEED OUTPUT



WIPER/WASHER SWITCH - GRAY 7 WAY

CAV	CIRCUIT	FUNCTION
1	V5 16DG/YL	WIPER PARK SWITCH SENSE
2	Z2 22BK/LG	GROUND
3	V10 18BR	WASHER PUMP CONTROL SWITCH OUTPUT
4	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	V4 16RD/YL	WIPER HIGH SPEED OUTPUT
6	V3 16BR/WT	WIPER LOW SPEED OUTPUT
7	-	-

8W-91 CONNECTOR/GROUND/SPLICE LOCATION

TABLE OF CONTENTS

CONNECTOR/GROUND/SPLICE LOCATION

DESCRIPTION

DESCRIPTION - LHD

This section provides illustrations identifying connector, ground and splice locations in the vehicle. Connector, ground and splice indexes are provided. Use the wiring diagrams in each section for connector, ground and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS - LHD

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
A/C Compressor Clutch	BK	Right Front of Engine Compartment	1, 5, 15, 16, 13
A/C Cycling Switch	BK	Right Center of Instrument Panel	N/S
A/C-Heater Blower Motor	BK	Right Side of Instrument Panel	N/S
A/C-Heater Control	GY	Center of Instrument Panel	21
A/C High Pressure Switch	BK	Front Center of Engine Compartment	1, 2, 5, 15
A/C Low Pressure Switch	BK	Right Rear of Engine Compartment	1, 5
Airbag Control Module	YL	Center Console Behind Shift Lever	19, 25
Ambient Temperature Sensor	BK	Near T/O for Left Front Side Marker Lamp	1, 4
Autostick Switch	NAT	Near Shift Lever	19, 25
Backup Lamp Switch (2.0L MTX)	GY	Left Front of Engine Compartment	3
Backup Lamp Switch (2.4L Turbo)	LT GY	Left Engine Compartment	4
Battery		Left Side of Engine Compartment	8
Battery Temperature Sensor	BK	Left Front Engine Compartment	3, 4
Blower Motor Resistor Block	BK	In Plenum	7
Brake Fluid Level Switch	BK	Near Left Front Strut Tower	2, 4
Brake Lamp Switch	BK	Top of Brake Pedal	3, 4
Brake Transmission Shift Interlock Solenoid	WT	Left Side of Instrument Panel	19
C101 (2.0L)	BK	Left Rear of Engine Compartment	2, 10, 11
C101 (2.4L Turbo)	BK	Left Rear of Engine Compartment	4, 15, 16

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
C103	BK	Left Side of Instrument Panel	3, 4, 19, 22
C104	GY	Left Side of Instrument Panel	3, 4, 19, 22
C105	BK	At Left Kick Panel Area	2, 26
C106	BK	Left Rear of Engine Compartment	2, 4
C109	BK	Lower Right Front Facia	1, 6
C201	GY	Right Side of Instrument Panel	19, 31
C202	LT GN	Right Upper Instrument Panel	19, 21
C203	LT GY	Right Upper Instrument Panel	19, 21
C204	RD	Left Upper Instrument Panel	19, 22
C205	GY	Left Lower Instrument Panel	19, 22, 30
C206	LT GY	Rear of Center Console	19, 25
C208	YL	Below Right Front Seat	N/S
C209	YL	Below Left Front Seat	25
C210 (Export)	BK	Below Left Front Seat	25
C301	RD	Right C-Pillar	27
C302	BK	Inner Left Rear Quarter Panel	27
C303	BL/BK	Left B-Pillar at Rear Door	26, 32
C304	BL/BK	Right B-Pillar at Rear Door	29, 32
C305	NAT	Left Side of Instrument Panel	19, 22, 26
C306	BK	Center of Headliner	24
Camshaft Position Sensor (2.0L)	BK	Left of Engine	N/S
Camshaft Position Sensor (2.4L Turbo)	BK	Left of Engine	15
Cargo Lamp	BK	Under Parcel Shelf	27
Center High Mounted Stop Lamp	BK	Decklid	33
Center Stack Lamp	BK	Center of Instrument Panel	21
Cigar Lighter/Power Outlet	RD	Center of Instrument Panel	21
Clockspring	GR	Rear of Steering Wheel	19
Clutch Interlock /Upstop Switch (MTX)	BK	Top of Clutch Pedal	3, 4
Compact Disk Changer	BK	Center Instrument Panel	N/S
Compass/Temperature Mirror	BK	At Mirror	24
Controller Antilock Brake	BK	Near Left Strut Tower	3, 4
Crankshaft Position Sensor (2.0L)	BK	Right Rear of Engine	12
Crankshaft Position Sensor (2.4L Turbo)	BK	Right Rear of Engine	15
Data Link Connector	BK	At Left Kick Panel Area	2, 4
Decklid Release Switch	BK	In Glove Box	19, 21
Decklid Security Switch	GY	On Decklid	33
Decklid Solenoid	BK	On Decklid	33

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Diode	-	Front Right Side of Engine Compartment	5
Dome Lamp	BK	Center Roof	N/S
Dome Lamp/Intrusion Sensor (Built-Up-Export)	NAT	Center Roof	N/S
Driver Airbag	YL	Front of Steering Wheel	N/S
Driver Door Ajar Switch	BK	Left B-Pillar	N/S
Driver Door Lock Motor/Ajar Switch	BK	At Driver Door	30
Driver Power Mirror	GY	At Driver Door	30
Driver Power Window Motor	BK	At Driver Door	30
Driver Power Window Switch C1	BK	At Driver Door	30
Driver Power Window Switch C2	GY	At Driver Door	30
Engine Coolant Temperature Sensor (2.0L)	BK	Left of Engine	12
Engine Coolant Temperature Sensor (2.4L Turbo)	BK	Left of Engine	15
Engine Oil Pressure Switch	GN	Left Rear of Engine	11, 15
Evap/Purge Solenoid	BK	Left Rear of Engine	3, 4
Fuel Injector NO. 1 (2.0L)	BK	Top of Engine	10
Fuel Injector NO. 1 (2.4L Turbo)	BK	Top of Engine	15, 17
Fuel Injector NO. 2 (2.0L)	BK	Top of Engine	10
Fuel Injector NO. 2 (2.4L Turbo)	BK	Top of Engine	15, 17
Fuel Injector NO. 3 (2.0L)	BK	Top of Engine	10
Fuel Injector NO. 3 (2.4L Turbo)	BK	Top of Engine	15, 17
Fuel Injector NO. 4 (2.0L)	BK	Top of Engine	10
Fuel Injector NO. 4 (2.4L Turbo)	BK	Top of Engine	15, 17
Fuel Pump Module	LT GY	At Fuel Tank	N/S
Fuse Block		Left Side of I/P	19
Generator (2.0L)	BK	Right Rear of Engine	11
Generator (2.4L Turbo)	BK	Right Rear of Engine	16, 18
Generator Feed		Right Rear of Engine	18
Headlamp Leveling Switch (Export)	BK	Center of Instrument Panel	21
Hood Ajar Switch	BK	Right Side of Engine Compartment	1
Horn Switch	BK	Steering Column	N/S
Idle Air Control Motor (2.0L)	BK	On Throttle Body	2

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Idle Air Control Motor (2.4L Turbo)	BK	On Throttle Body	15
Idle Air Control Motor (2.0L)	BK	On Throttle Body	2
Ignition Coil	BK	Top of Valve Cover	11, 15
Ignition Switch C1	BK	Right Side of Steering Column	19
Ignition Switch C2	WT	Near Ignition Switch C1	19
Inlet Air Temperature Sensor	BK	Left Front of Engine Compartment	3, 8, 15
Input Speed Sensor (EATX)	GY	Lower Left of Engine Compartment	3
Instrument Cluster	BK	Left Upper Instrument Panel	19
Knock Sensor (2.0L)	BK	Right Front of Engine	12
Knock Sensor (2.4L Turbo)	BK	Right Front of Engine	17
Left Backup Lamp	BK	Left Rear Fascia	27
Left Cylinder Lock Switch	BK	At Driver Door	30
Left Door Lock Switch	BK	At Driver Door	30
Left Front Door Speaker	BK	At Drivers Door	30
Left Front Fog Lamp (2.0L)	BK	Lower Left Facia	6
Left Front Fog Lamp (2.4L Turbo)	BK	Lower Left Facia	6
Left Front Side Marker Lamp	NAT	Left Front Side Fender	1
Left Front Turn Signal Lamp (Export)	NAT	Left Front Facia	3
Left Front Wheel Speed Sensor	BK	At Left Front Wheel Opening	2, 4
Left Headlamp	BK	Left Headlamp Opening	3, 4
Left Instrument Panel Speaker	BK	Left Upper Instrument Panel	19
Left Lavalier Module (Export)	BK	Left Front of Engine Compartment in T/O for Left Headlamp	N/S
Left License Lamp (Export)	NAT	Center Rear Fascia	28
Left Park/Turn Signal Lamp (Except Export)	BK	Lower Left Facia	3, 4
Left Rear Door Ajar Switch	BK	Rear of Left Rear Door	32
Left Rear Door Lock Motor/Ajar Switch	BK	Rear of Left Rear Door	32
Left Rear Fog Lamp (Export)	GY	Left Rear Bumper	N/S
Left Rear Speaker	BK	Left Side Package Tray	27
Left Rear Turn Signal Lamp (Export)	GY	Left Rear Facia	27
Left Rear Wheel Speed Sensor	BL	At Left Rear Wheel Opening	N/S
Left Seat Airbag	YL	Left Side of Seat	N/S
Left Side Impact Airbag Control Module		Left Side of Passenger Compartment	25, 26

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Left Side Repeater Lamp (Export)	BK	Behind Left Wheel Well	1
Left Tail/Stop Lamp (Export)	BK	Left Rear of Vehicle	27
Left Tail/Stop/Turn Signal Lamp (Except Export)	BK	Left Rear of Vehicle	27
Left Visor/Vanity Lamp	BK	Left Header Panel	24
License Lamp (Except Export)	NAT	Lower Center of Rear Fascia	28
Low Note Horn	BK	Right Front Wheel Opening	1
Manifold Absolute Pressure Sensor (2.0L)	GY	Front of Engine	13
Manifold Absolute Pressure Sensor (2.4L Turbo)	NAT	Front of Engine	15, 17
Manifold Tuning Valve Solenoid (RT)	BK	Left Front Engine	13
Map/Reading Lamps	BK	Front of Headliner	24
Multi-Function Switch	GY	Left Side of Instrument Panel	19
Natural Vacuum Leak Detection Assembly	BK	Near Left Rear Fender	28
Negative Battery Terminal		Left Side of Engine Compartment	8, 9
Noise Suppressor		Top of Engine	11, 15
Output Speed Sensor (EATX)	GY	Left Lower Front of Engine Compartment	3
Oxygen Sensor 1/1 Upstream (2.0L)	GY	Left Rear of Engine	11
Oxygen Sensor 1/1 Upstream (2.4L Turbo)	GY	Left Rear of Engine	16, 18
Oxygen Sensor 1/2 Downstream (2.0L)	BK	Left Rear of Engine	3, 11
Oxygen Sensor 1/2 Downstream (2.4L Turbo)	BK	Left Rear of Engine	4
Park Brake Switch	BK	On Parking Brake Lever	19, 25
Park/Neutral Position Switch (ATX)	BK	Left Side of Transmission	N/S
Passenger Airbag	YL	Right Side of Instrument Panel	19
Passenger Door Ajar Switch	BK	Right B-Pillar	29
Passenger Door Lock Motor/Ajar Switch	BK	Passenger Door	31
Passenger Power Mirror	GY	At Passenger Door	31
Passenger Power Window Motor	BK	At Passenger Door	31
Passenger Power Window Switch	GY	At Passenger Door	31
Positive Battery Terminal		Left Side of Engine Compartment	8, 9
Power Distribution Center		Left Front of Engine Compartment	2, 8

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Power Mirror Switch	GY	At Driver Door	30
Power Seat Motor (Export)		Inside Left Front Seat	N/S
Power Seat Switch (Export)		Side of Driver Seat	N/S
Power Steering Pressure Switch	GY	Left Rear of Engine Compartment	2, 4
Powertrain Control Module C1 (2.0L)	BK	Left Fender Side Shield	2
Powertrain Control Module C1 (2.4L Turbo)	BK	Left Front Engine Compartment	4
Powertrain Control Module C2 (2.0L)	OR	Left Fender Side Shield	10
Powertrain Control Module C2 (2.4L Turbo)	GY	Left Fender Side Shield	4, 15
Powertrain Control Module C3 (2.0L)	WT	Left Fender Side Shield	2
Powertrain Control Module C3 (2.4L Turbo)	WT	Left Fender Side Shield	2
Powertrain Control Module C4 (2.0L)	GN	Left Fender Side Shield	2
PVC Heater (2.0L)	BK	Left Rear Engine Compartment	N/S
Radiator Fan Motor (2.0L)	BK	Front of Engine Compartment	1, 2
Radiator Fan Motor (2.4L Turbo)	BK	Front of Engine Compartment	1, 4
Radio C1	BK	Rear of Radio	21
Radio C2 (CD Changer)	BK	Rear of Radio	21
Radio Antenna		Rear of Radio	21
Rear Window Defogger Feed	NAT	Right Side of Rear Window	N/S
Rear Window Defogger Ground	NAT	Left Side of Rear Window	27
Rear Window Defogger Switch	BK	Lower Center of Instrument Panel	21
Remote Keyless Entry Module	BK	Upper Center of Instrument Panel	19, 21
Right Backup Lamp	BK	Right Rear Luggage Compartment	29
Right Cylinder Lock Switch	BK	At Passenger Door	31
Right Door Lock Switch	BK	At Passenger Door	31
Right Front Door Speaker	BK	At Passenger Door	31
Right Front Fog Lamp (2.0L)	BK	Lower Right Facia	6
Right Front Fog Lamp (2.4L Turbo)	BK	Lower Right Facia	6
Right Front Side Marker Lamp	NAT	Lower Right Fascia	1
Right Front Turn Signal Lamp (Export)	NAT	Lower Right Fascia	5

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Right Front Wheel Speed Sensor	BK	At Right Front Wheel Opening	1, 5
Right Headlamp (Export)	BK	Right Headlamp Opening	5
Right Headlamp (Except Export)	BK	Right Headlamp Opening	5
Right Instrument Panel Speaker	BK	Right Upper Instrument Panel	19, 21
Right Lavalier Module (Export)	BK	Right Headlamp Opening	N/S
Right License Lamp (Export)	NAT	Rear of Vehicle	28
Right Park/Turn Signal Lamp (Except Export)	BK	Lower Right Fascia	5
Right Rear Door Ajar Switch	BK	Rear of Right Rear Door	32
Right Rear Door Lock Motor/Ajar Switch	BK	Right Rear Door	32
Right Rear Fog Lamp (Export)	GY	Rear Bumper	28
Right Rear Speaker	BK	Right Side Package Tray	27
Right Rear Turn Signal Lamp (Export)	GY	Right Rear Luggage Compartment	29
Right Rear Wheel Speed Sensor	BK	At Right Rear Wheel Opening	N/S
Right Seat Airbag	YL	Right Side of Seat	N/S
Right Side Impact Airbag Control Module		Base of Right ″B″ Pillar	26
Right Side Repeater Lamp (Export)	BK	Behind Right Wheel Well	1
Right Tail/Stop Lamp (Export)	BK	Right Rear Luggage Compartment	29
Right Tail/Stop/ Turn Signal Lamp (Except Export)	BK	Right Rear Luggage Compartment	N/S
Right Visor/Vanity Lamp	BK	Right Header Panel	24
RKE Antenna	BK	Center of Instrument Panel	19
Seat Belt Switch	BK	Under Driver Seat	26
Sentry Key Immobilizer Module	BK	Left Center Lower Instrument Panel	19
Siren (Export)	BK	Behind Right Rear Fender	N/S
Speed Control Servo	BK	Right Rear of Engine Compartment	1, 5
Starter Motor	-	Left Front Engine	12
Sunroof Control Module	BK	Center Roof Support Bracket	N/S
Sunroof Motor	BK	Center Roof Support Bracket	N/S
Sunroof Switch	BK	Near Sunroof Opening	N/S
Sunroof Vent Switch	BK	Near Sunroof Opening	N/S
Surge Solenoid (2.4L Turbo)	BK	Left Front Engine	4
Throttle Inlet Pressure Sensor (2.4L Turbo)	NAT	Left Front Engine Compartment	4

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Throttle Inlet Pressure Solenoid (2.4L Turbo)	BK	Left Front Engine	4
Throttle Position Sensor (2.0L)	BK	On Throttle Body	3
Throttle Position Sensor (2.4L Turbo)	NAT	Lower Right Engine	15
Trans Range Indicator Illumination (PRNDL)	BK	At Shift Lever	19, 25
Transmission Range Sensor (EATX)	DK GY	Lower Left Front Engine Compartment	3
Transmission Solenoid/ Pressure Switch Assembly (EATX)	BK	Lower Left Engine Compartment	2
Turbo Boost Gauge Lamp (2.4L Turbo)	NAT		
Vehicle Speed Sensor (2.0L)	BK	On Transmission	11
Vehicle Speed Sensor (2.4L Turbo)	BK	On Transmission	15, 16
Wastegate Solenoid 2.4L Turbo)	BK	Left Front Engine	4
Windshield Washer Pump	RD	Right Rear Engine Compartment	1
Wiper/Washer Switch	GY	Lower Center of Instrument Panel	19
Wiper Motor	BK	Left Rear of Engine Compartment	7

GROUNDS - LHD

GROUND	LOCATION	FIG.
G102	Left Front of Engine Compartment	2, 4
G103	Right Front of Engine Compartment	5, 10
G104	Near Engine Starter Motor	14
G105	Near Negative Battery Terminal	9
G106 (2.0L)	Left Front of Engine Compartment	N/S
G201	Lower Center of Instrument Panel	21, 22
G203	Lower Center of Instrument Panel	21, 22
G301	Inner Left Rear Quarter Panel	27
G302	Inner Right Rear Quarter Panel	29
G304	At Decklid	33

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICES - LHD

SPLICE	LOCATION	FIG.
S102 (Except Export)	Near Right Headlamp	5
S104	Near Data Link Connector T/O	2
S105 (Export)	Near Inline C105 T/O	3
S106	Inside Power Distribution Center	2, 4
S107	Near Evap Purge Solenoid T/O	2
S108	Near A/C Low Pressure Switch T/O	3
S109	Near Power Distribution Center	2
S110	Near Left Front Side Marker Lamp	2
S111 (Export)	Near Right Headlamp	5
S112	Near Power Distribution Center	3
S113 (2.0L)	Near Throttle Position Sensor T/O	3
S114	Left Front of Engine Compartment	2,4
S115	In PDC	2, 4
S116	In PDC	2, 4
S117	Near A/C Compressor Clutch T/O	5
S118	Near Powertrain Control Module - C2	3
S119	Near Radiator Fan Motor T/O	3
S120	In PDC	2
S121 (2.0L)	In Powertrain Control Module C2 T/O	10
S121 (2.4L Turbo)	In Powertrain Control Module C2 T/O	15
S122 (2.0L)	Near Noise Suppressor T/O	11
S122 (2.4L Turbo)	Near Noise Suppressor T/O	15
S123	In Generator T/O	11, 15
S125	Near Starter Motor T/O	10, 18
S130	Near Ignition Coil T/O	10, 11, 15
S131	Near Right Headlamp	5
S135	In Oxygen Sensor 1/1 Upstream T/O	11, 15
S136	Near Inline C101 T/O	2, 11
S138	Near Transmission Range Sensor T/O	2, 3
S141	In Left Front Fog Lamp T/O	6
S142	In Right Front Fog Lamp T/O	6
S144	In T/O for Transmission Solenoid/Pressure Switch Assembly	3
S151	Near T/O for Engine Oil Pressure Switch	11, 15
S152 (Export)	Near Left Headlamp	2
S154	Near T/O for Transmission Range Sensor	3
S155	Front of Engine Compartment Near Radiator Fan Motor	2
S201	Near Right Instrument Panel Speaker T/O	20
S202	Near Right Instrument Panel Speaker T/O	21
S204	Near Inline C202 T/O	20
S205	Near Passenger Airbag T/O	21
S206	Top Center of Instrument Panel	21

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE	LOCATION	FIG.
S207	Top Center of Instrument Panel	21
S208	Near A/C-Heater Control T/O	21
S209	Left Center Instrument Panel Near Brake Transmission Shift Interlock Solenoid	N/S
S211	Near Fuse Block T/O	23
S212 (Except Export)	Near Fuse Block T/O	23
S213	Near Fuse Block T/O	23
S214	Near Fuse Block T/O	23
S215	Near Fuse Block T/O	23
S216	Near Fuse Block T/O	23
S217	Near Fuse Block T/O	23
S218	Near Fuse Block T/O	23
S219	Near Fuse Block T/O	23
S220	Near Inline C204 T/O	22
S221	Top Center of Instrument Panel Near S213	21, 22
S222	Near Fuse Block T/O	22
S223	Near Inline C204 T/O	22
S225	Near Left Instrument Panel Speaker T/O	22
S226	Near Left Instrument Panel Speaker T/O	22
S227 (Except Export)	Near Inline C103/C104/C105	22
S229	Near Airbag Control Module T/O	20, 25
S230	Near Transmission Range Indicator Illumination (PRNDL)	20, 25
S231	Left Center Instrument Panel Near Sentry Key Immobilizer T/O	20
S232	Left Center Instrument Panel Near Sentry Key Immobilizer T/O	20
S233	Left Center Instrument Panel Near Brake Transmission Shift Interlock Solenoid	N/S
S234	Left Center Instrument Panel Near G201	N/S
S235	Below Left Front Seat	25
S236	Below Left Front Seat	25
S237	Below Left Front Seat	25
S238	Near Power Seat Switch T/O	N/S
S239	Top Center of Instrument Panel Near S206	N/S
S240	Near Driver Power Mirror T/O	30, 31
S242	Near Driver Power Mirror T/O	30, 31
S243	Near Inline C204 T/O	22
S244	Top Center I/P	21
S251	Near Inline C204	24
S252	Near Left Visor/Vanity Mirror Lamp T/O	24
S306	Near License Lamp T/O	28
S307	Near Siren (Export) T/O	26
S308	Below Left Rear Door Ajar Switch T/O	26
S309	Near Left Rear Door Ajar Switch T/O	27
S310	Near Right Tail Stop/Turn Signal Lamp T/O	29

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE	LOCATION	FIG.
S311	Near Siren T/O	27, 29
S312	Near Decklid Switch T/O	33
S313 (Export)	Near Siren T/O	29
S314 (Export)	Near Siren T/O	29
S315	Near Left Visor/Vanity Lamp T/O	24
S351	Near Sunroof Motor T/O	N/S
S352	Near Sunroof Switch T/O	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

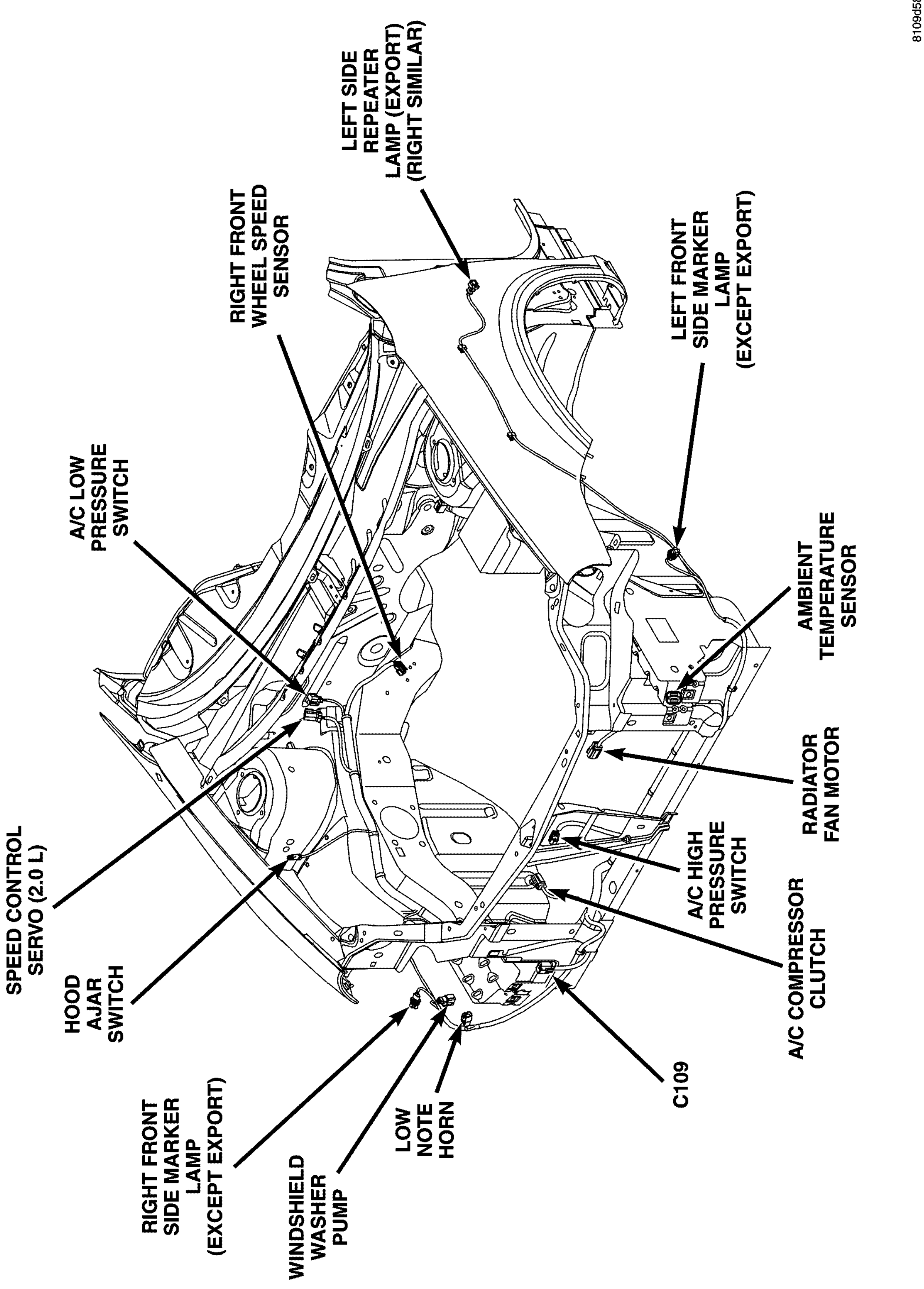


Fig. 1 ENGINE COMPARTMENT - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

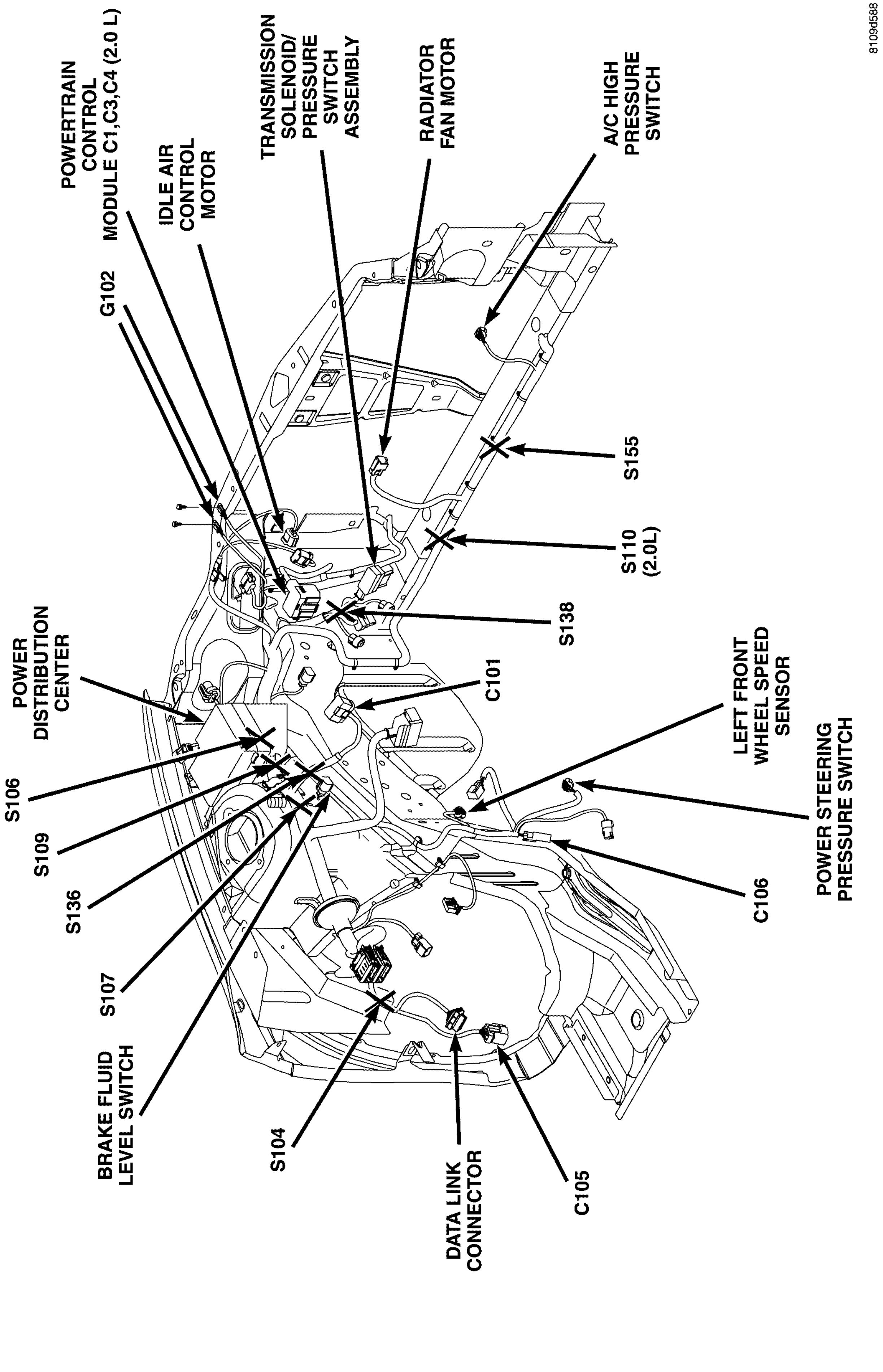


Fig. 2 ENGINE COMPARTMENT (LEFT SIDE) (1.6L/2.0L) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

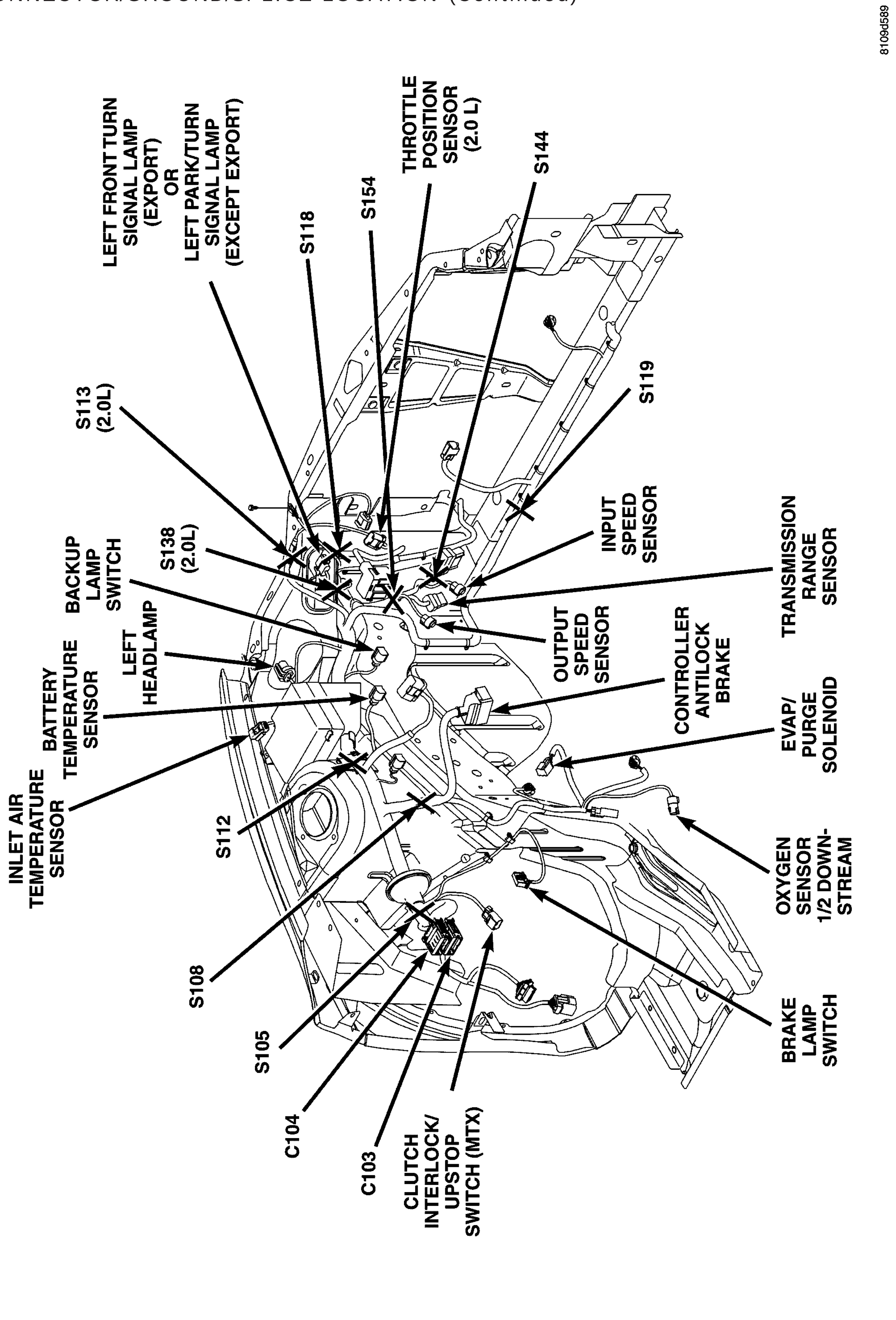


Fig. 3 ENGINE COMPARTMENT (LEFT SIDE) (1.6L/2.0L) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

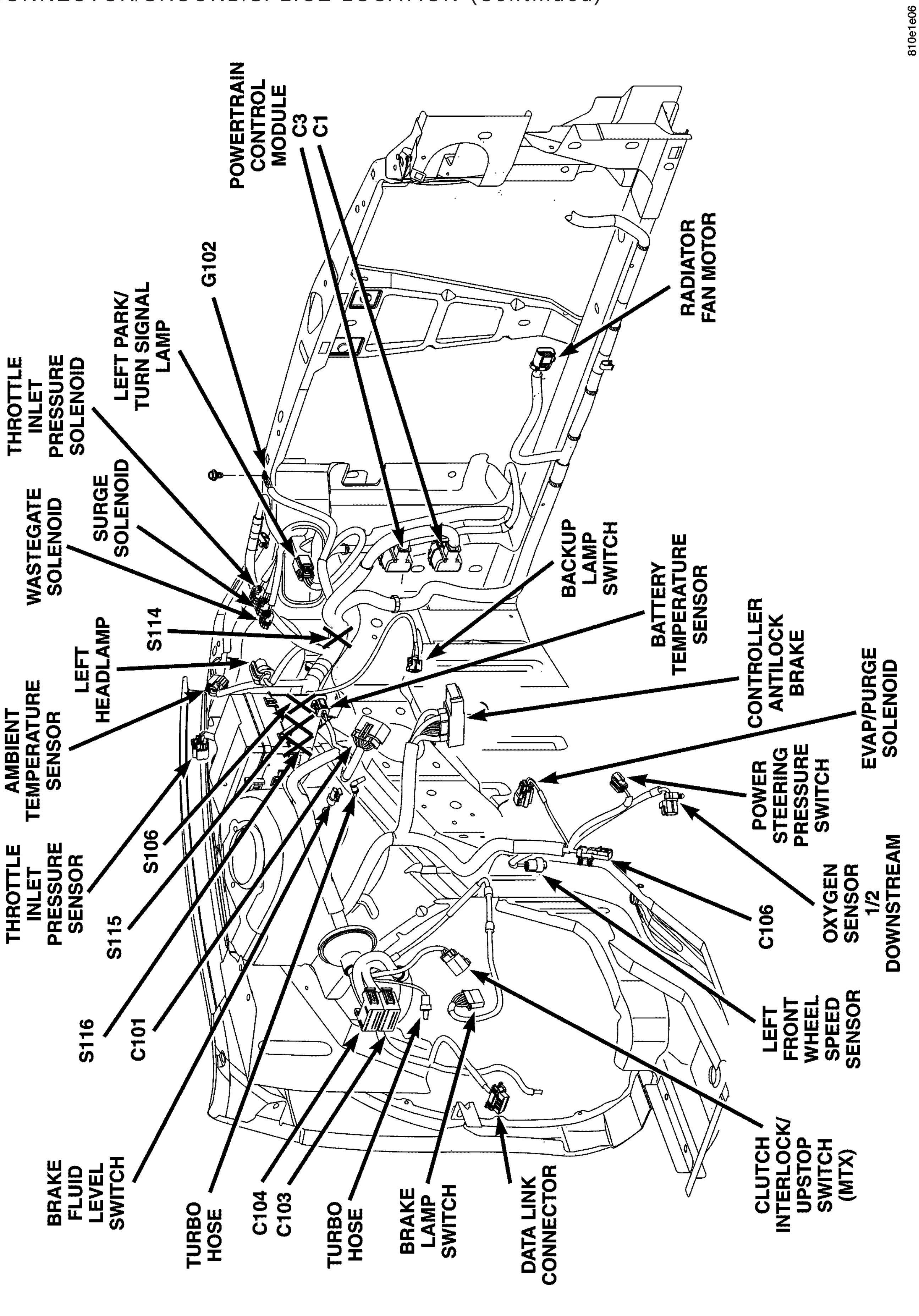


Fig. 4 ENGINE COMPARTMENT (2.4L TURBO) — LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

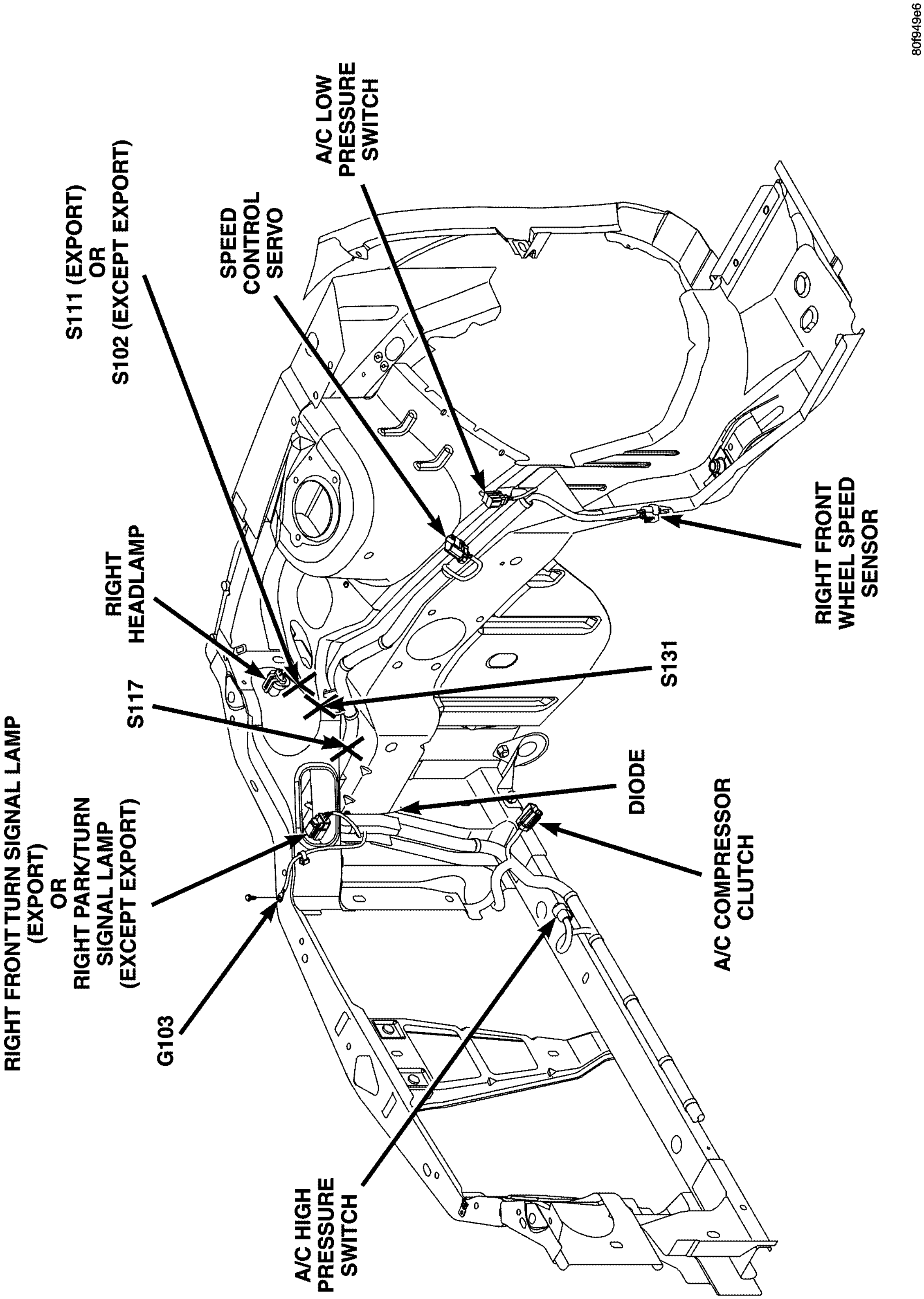


Fig. 5 ENGINE COMPARTMENT (RIGHT SIDE) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

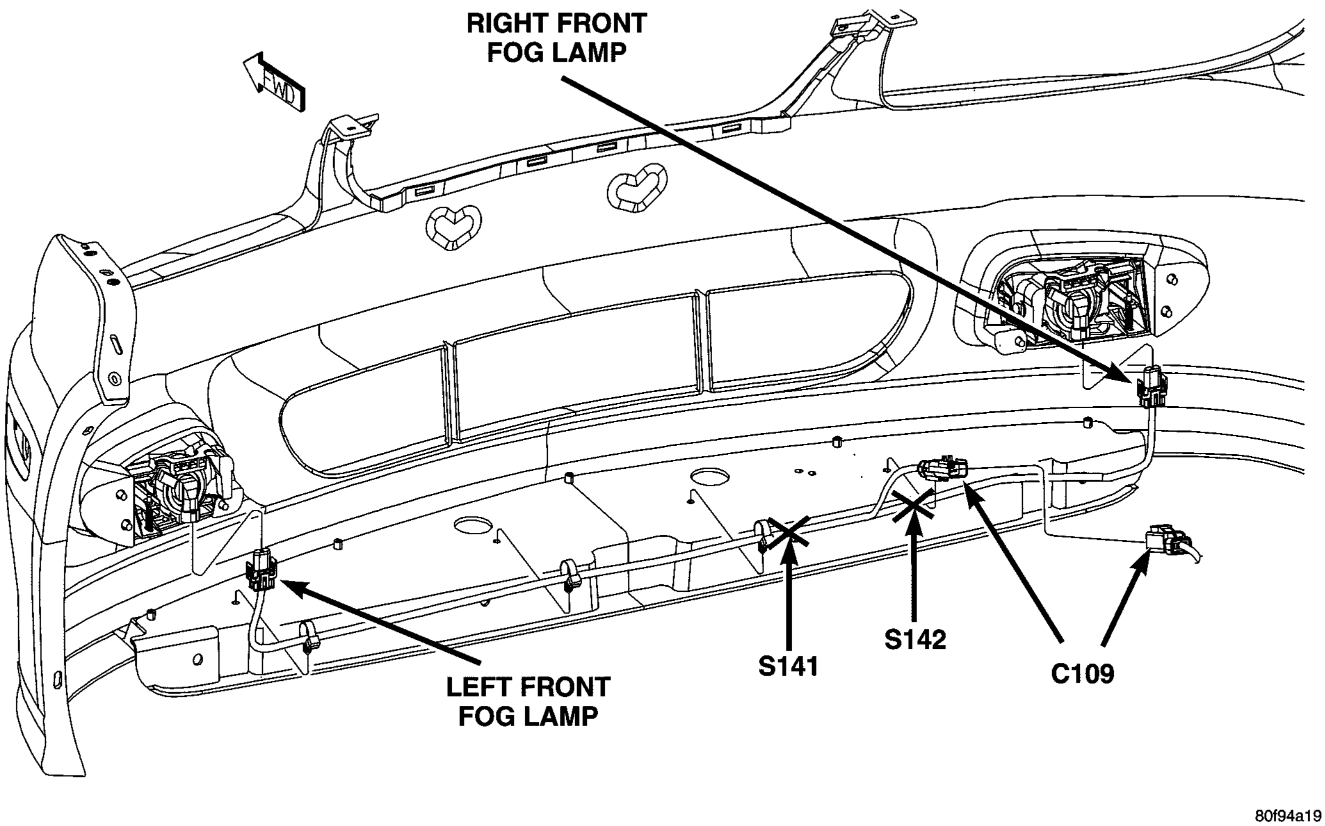


Fig. 6 FRONT FOG LAMPS - LHD

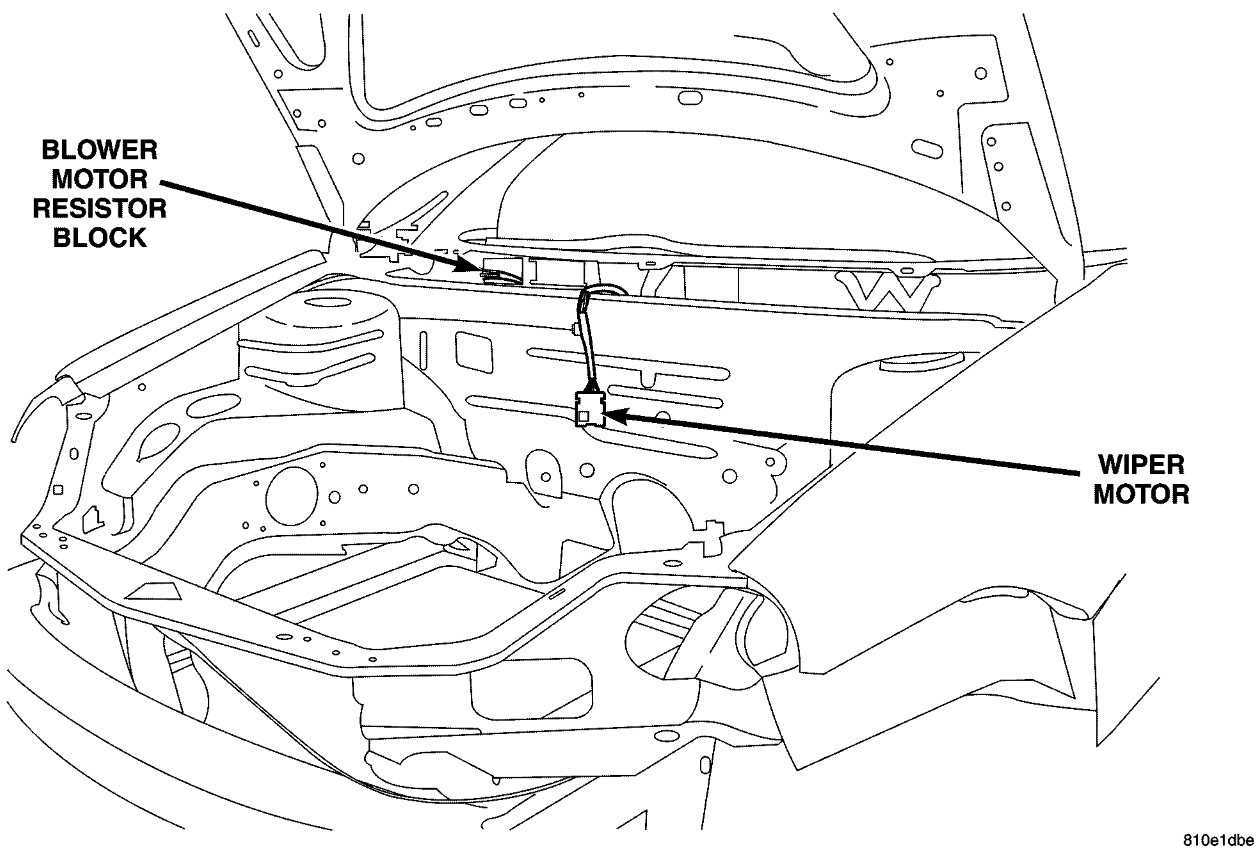


Fig. 7 REAR ENGINE COMPARTMENT - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

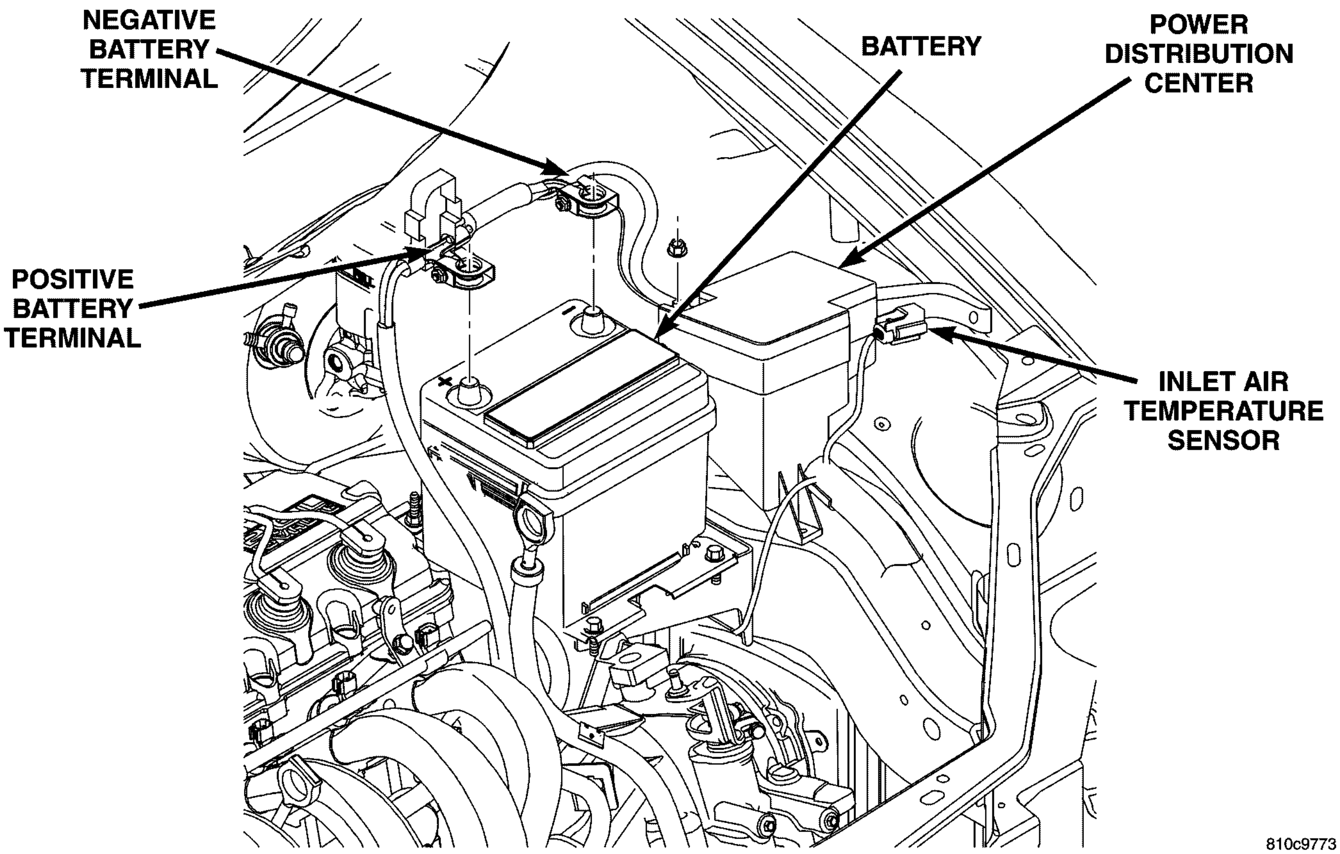


Fig. 8 ENGINE COMPARTMENT (LEFT SIDE) — LHD

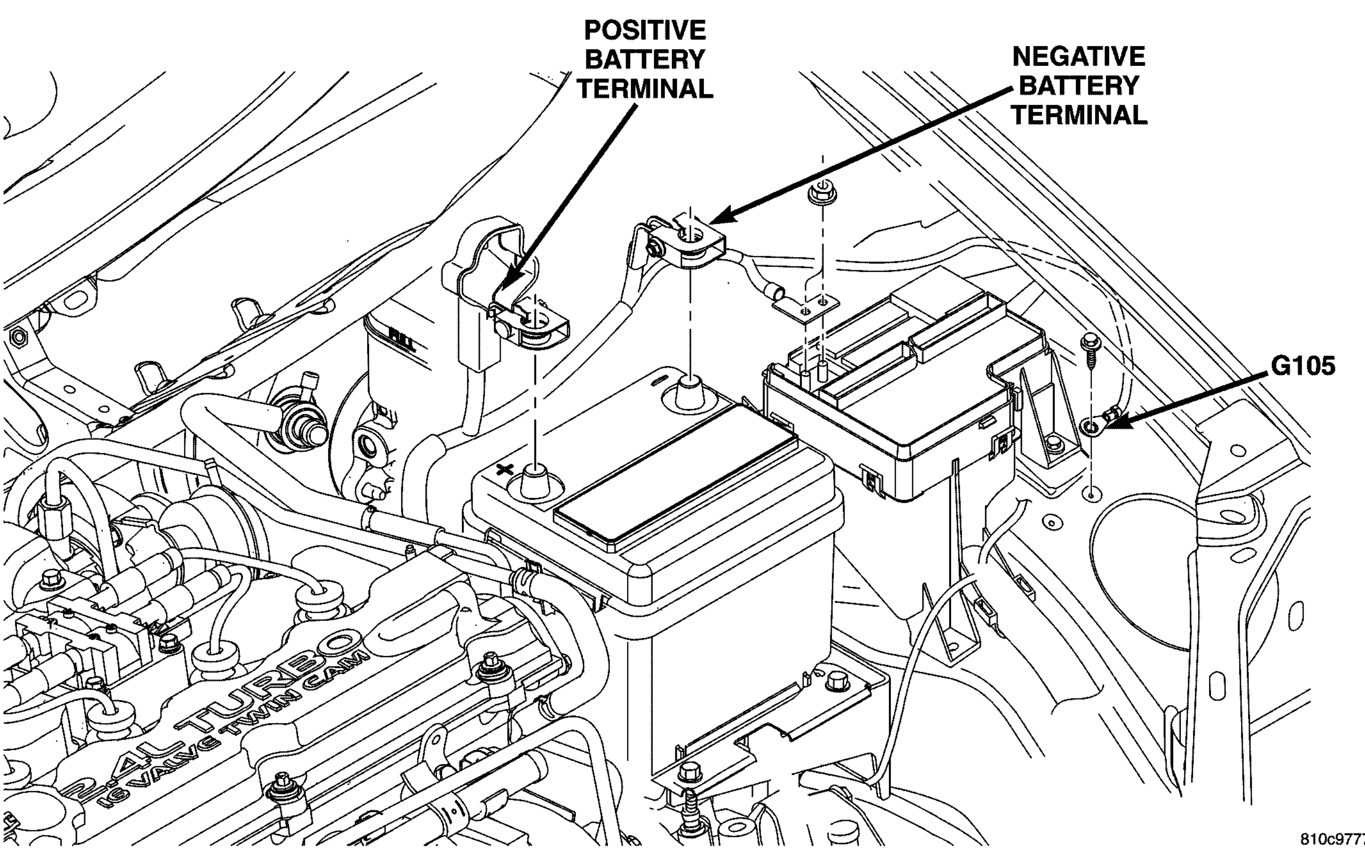


Fig. 9 ENGINE COMPARTMENT (LEFT SIDE) (2.4L TURBO) — LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

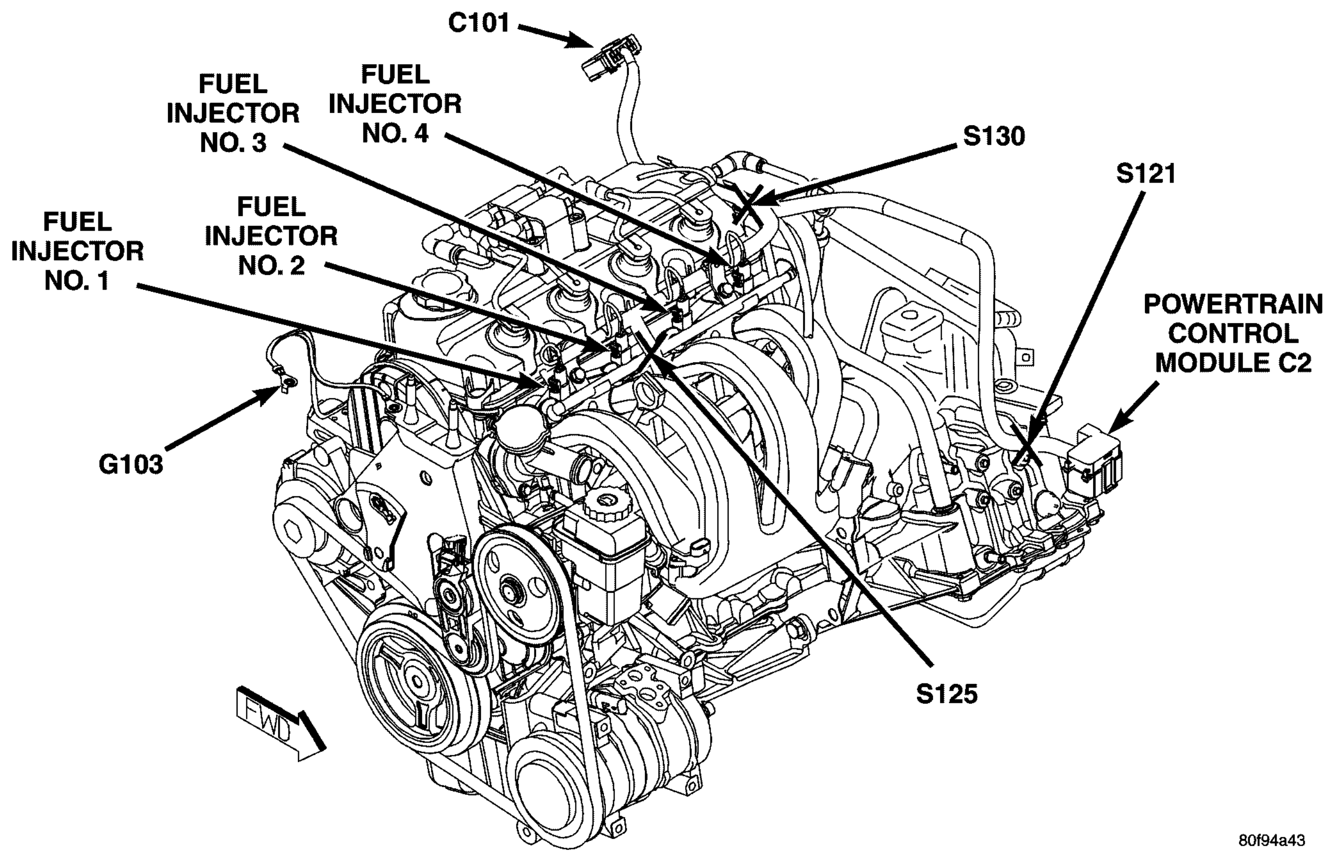


Fig. 10 ENGINE (RIGHT FRONT) (2.0L) - LHD

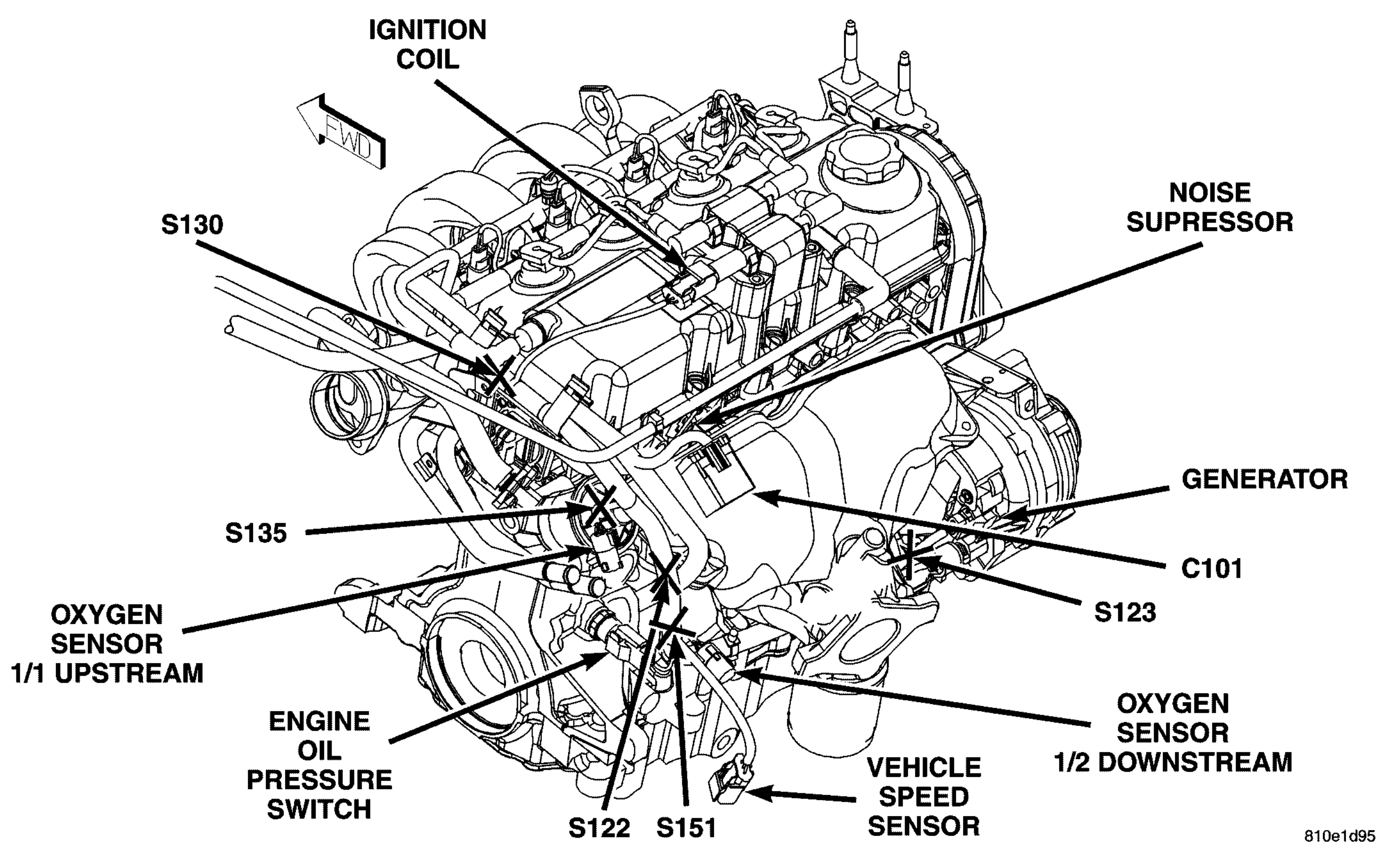


Fig. 11 ENGINE (LEFT REAR) (2.0L) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

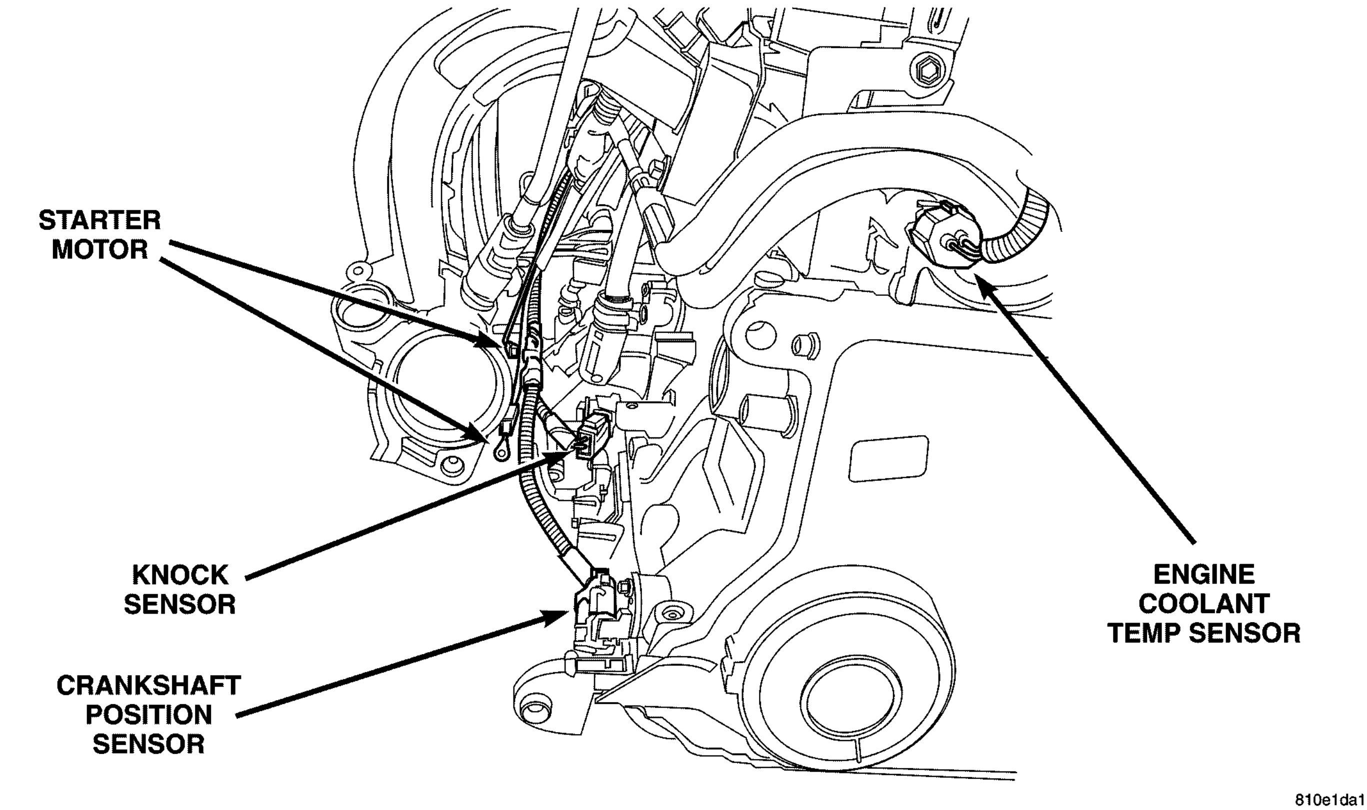


Fig. 12 ENGINE (LEFT FRONT) (2.0L) - LHD

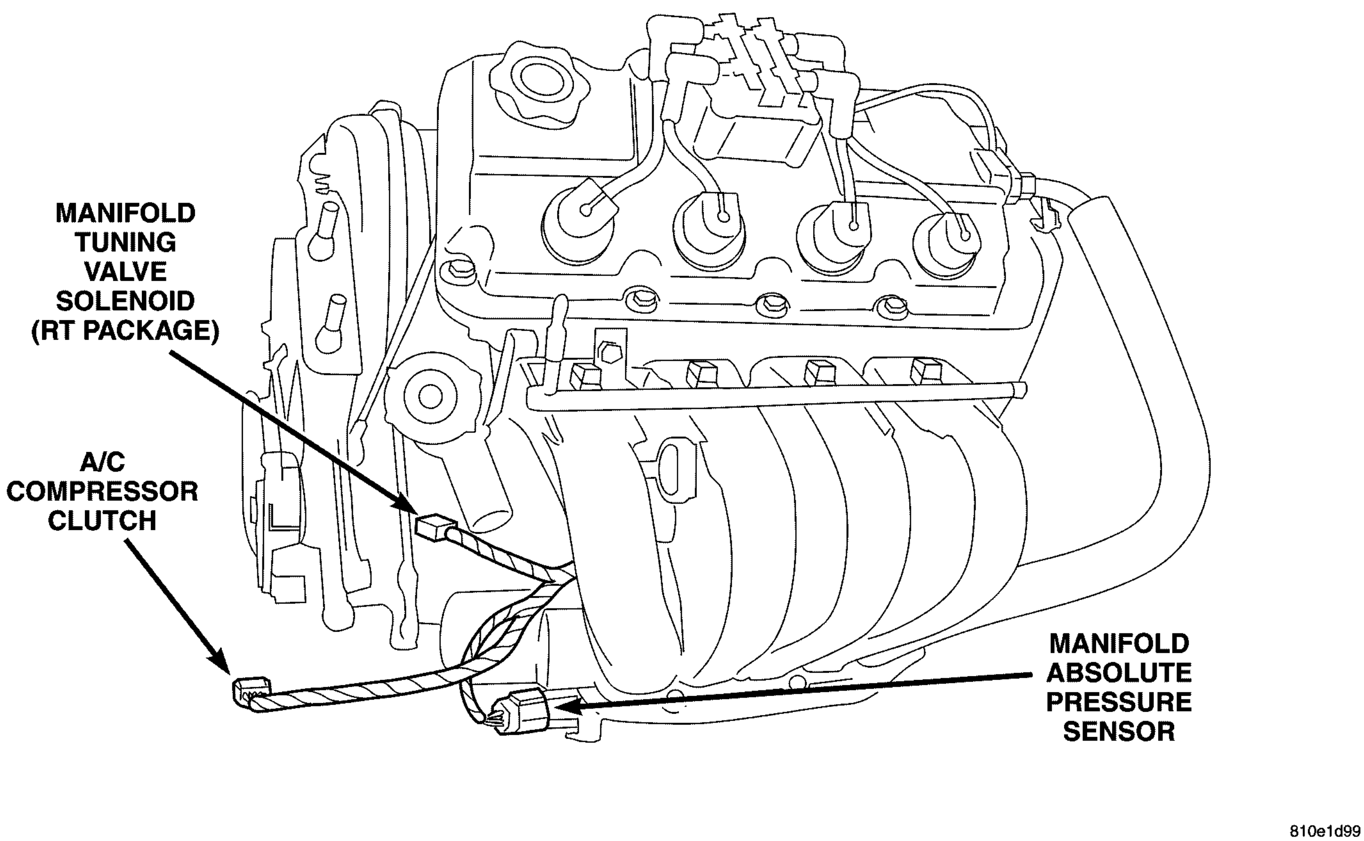


Fig. 13 ENGINE (TOP) (2.0L) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

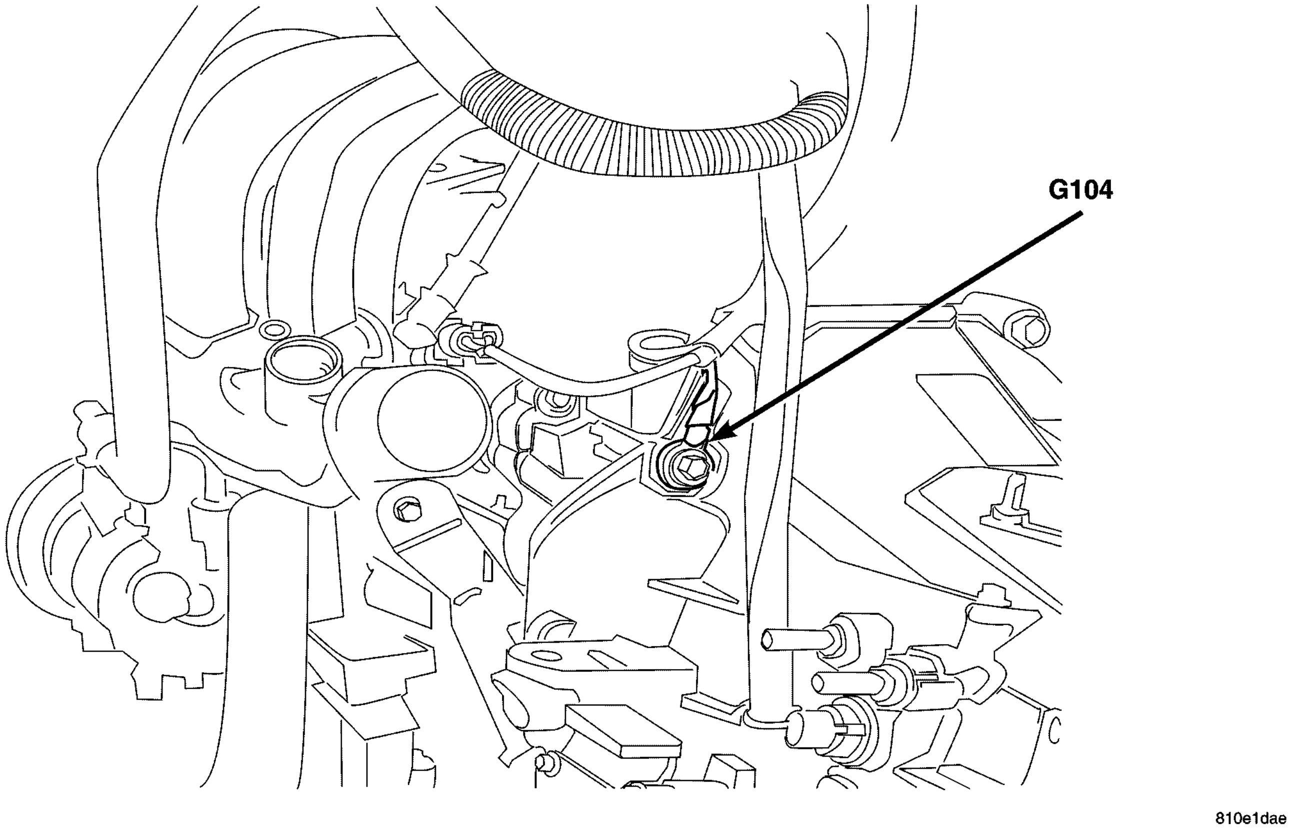


Fig. 14 ENGINE (FRONT) (2.0L) - LHD

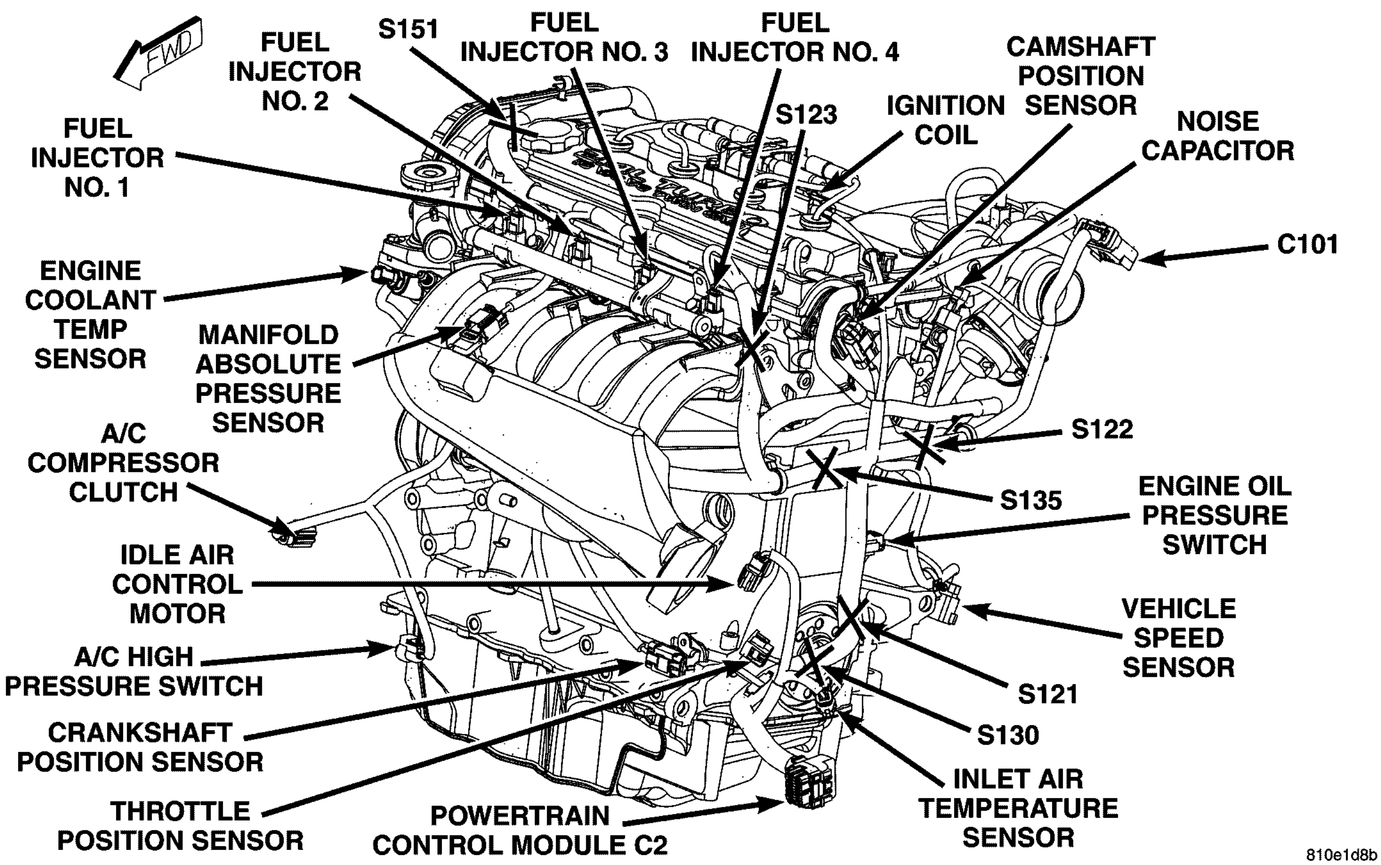


Fig. 15 ENGINE (LEFT FRONT) (2.4L TURBO) — LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

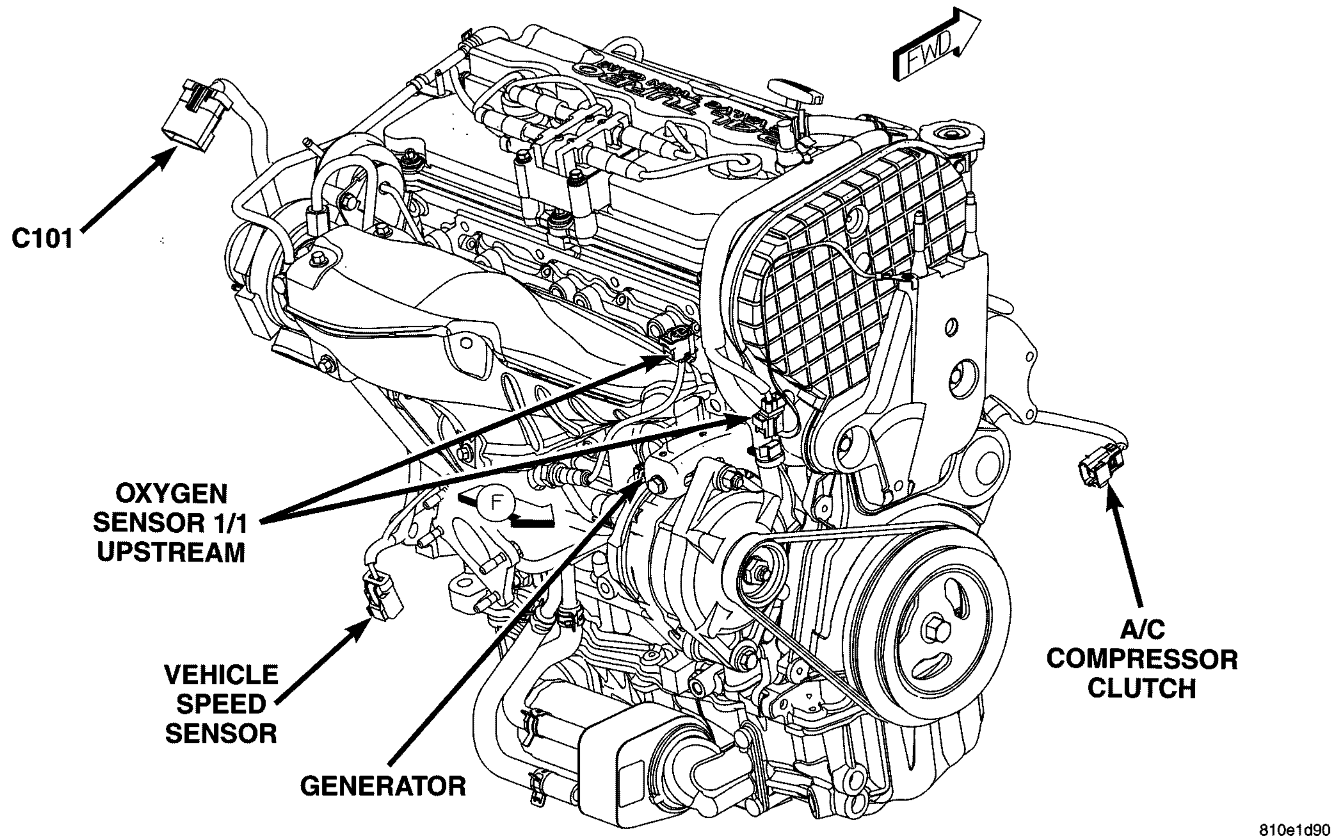


Fig. 16 ENGINE (REAR) (2.4L TURBO) — LHD

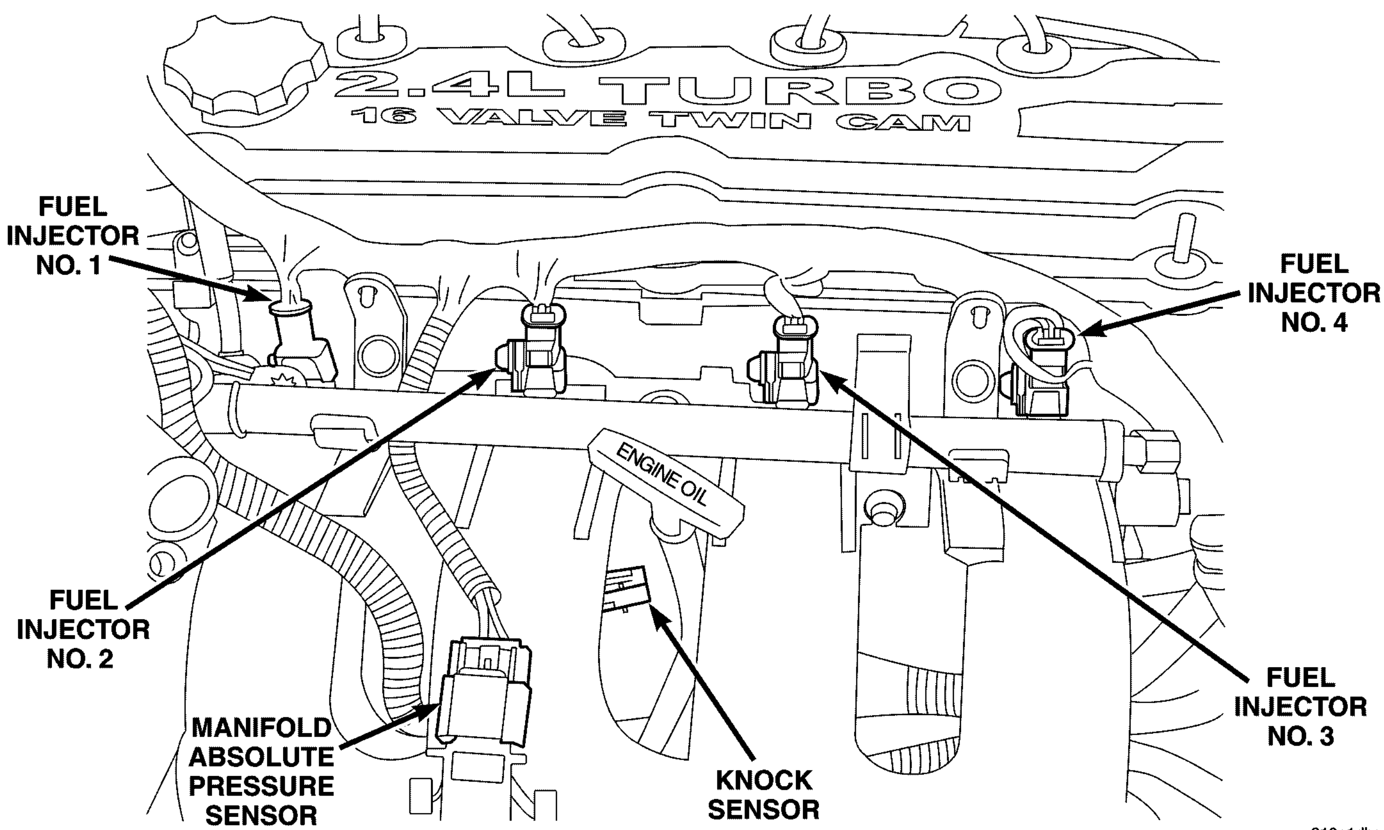


Fig. 17 ENGINE (TOP) (2.4L TURBO) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

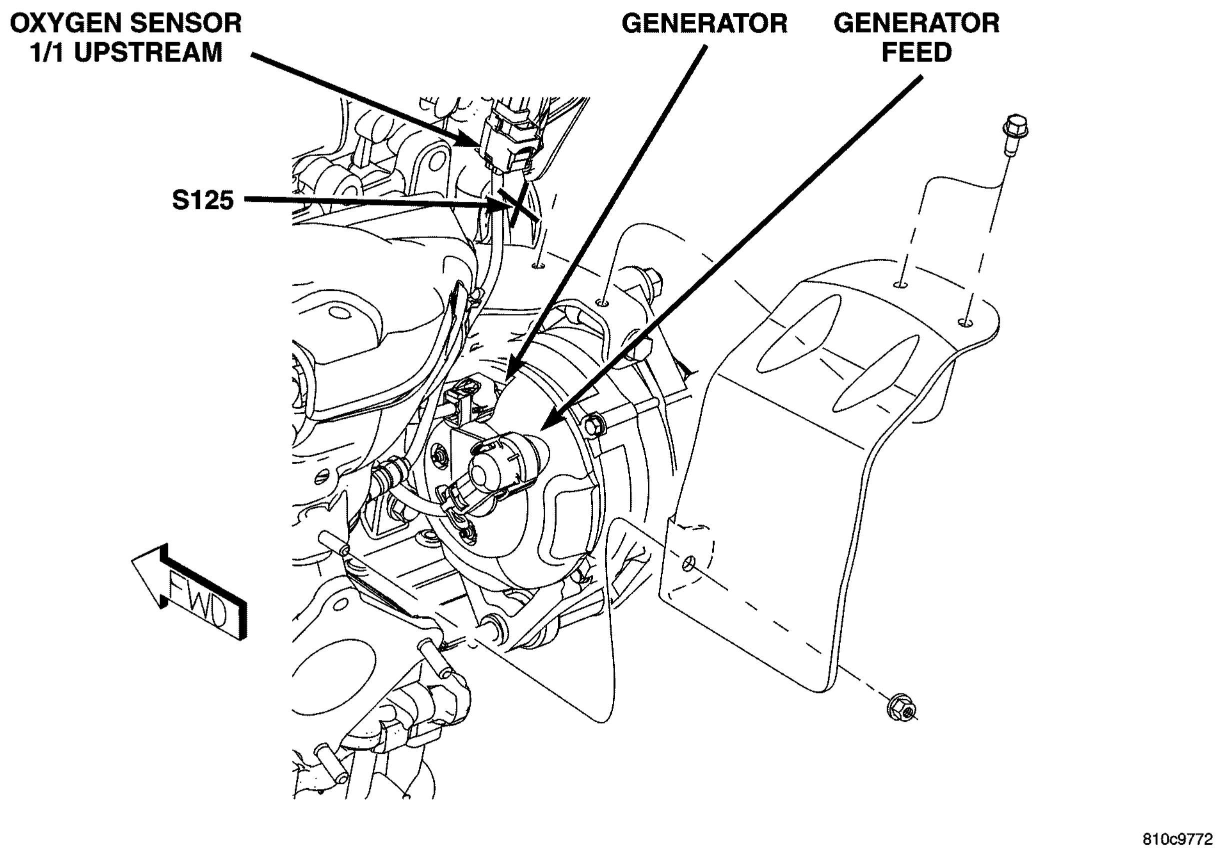


Fig. 18 ENGINE (REAR) (2.4L TURBO) — LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

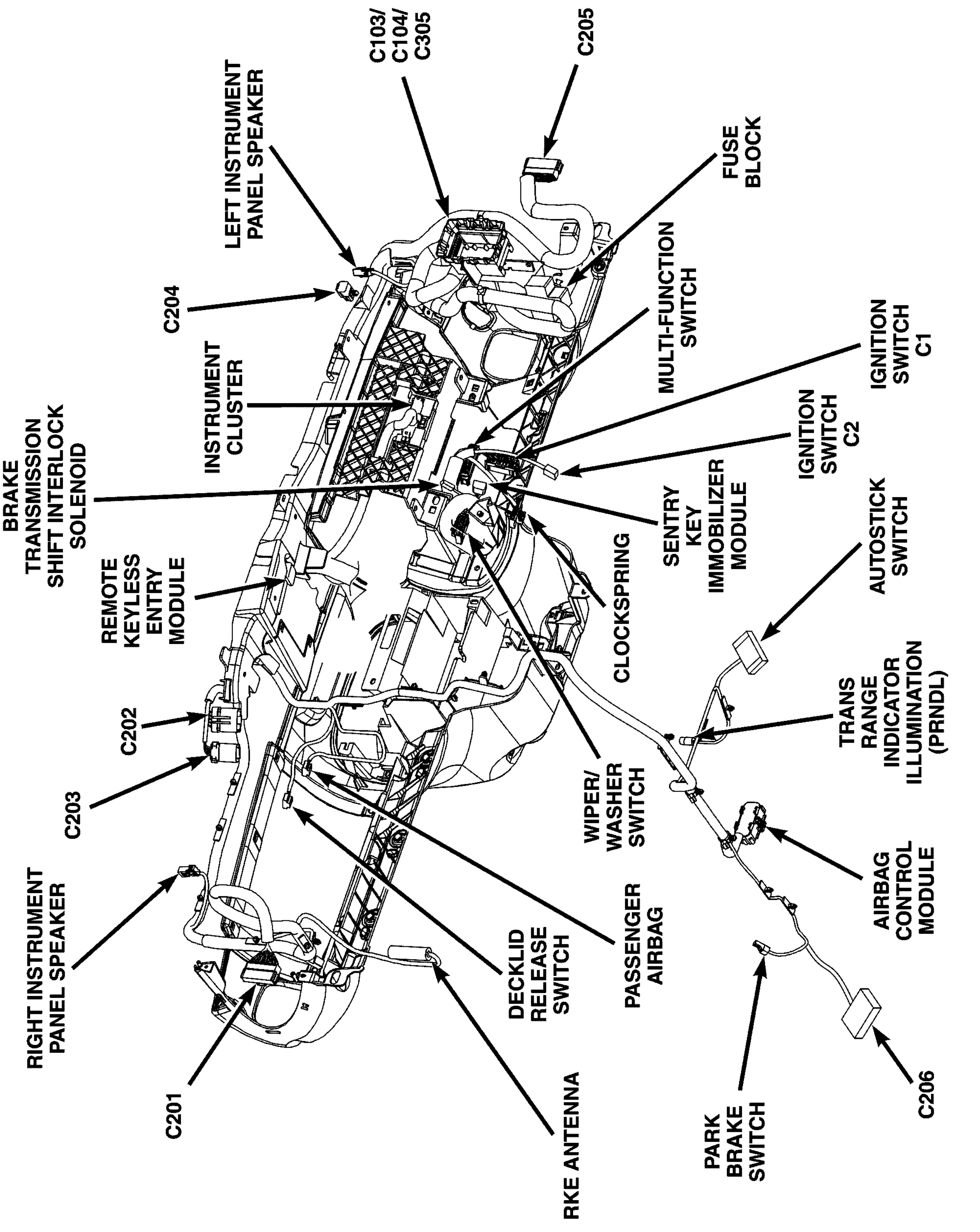


Fig. 19 INSTRUMENT PANEL - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

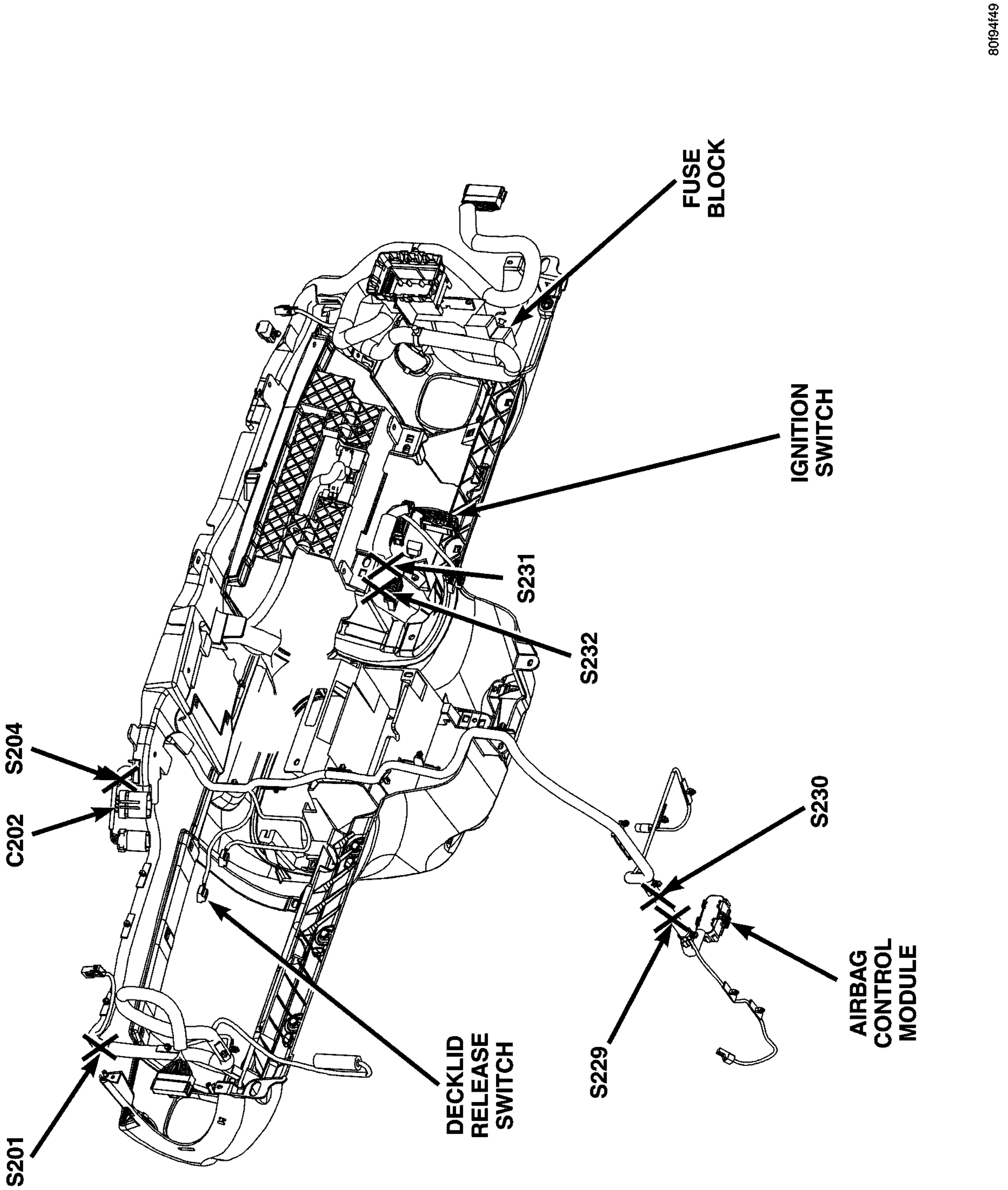


Fig. 20 INSTRUMENT PANEL SPLICES (BOTTOM REAR) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

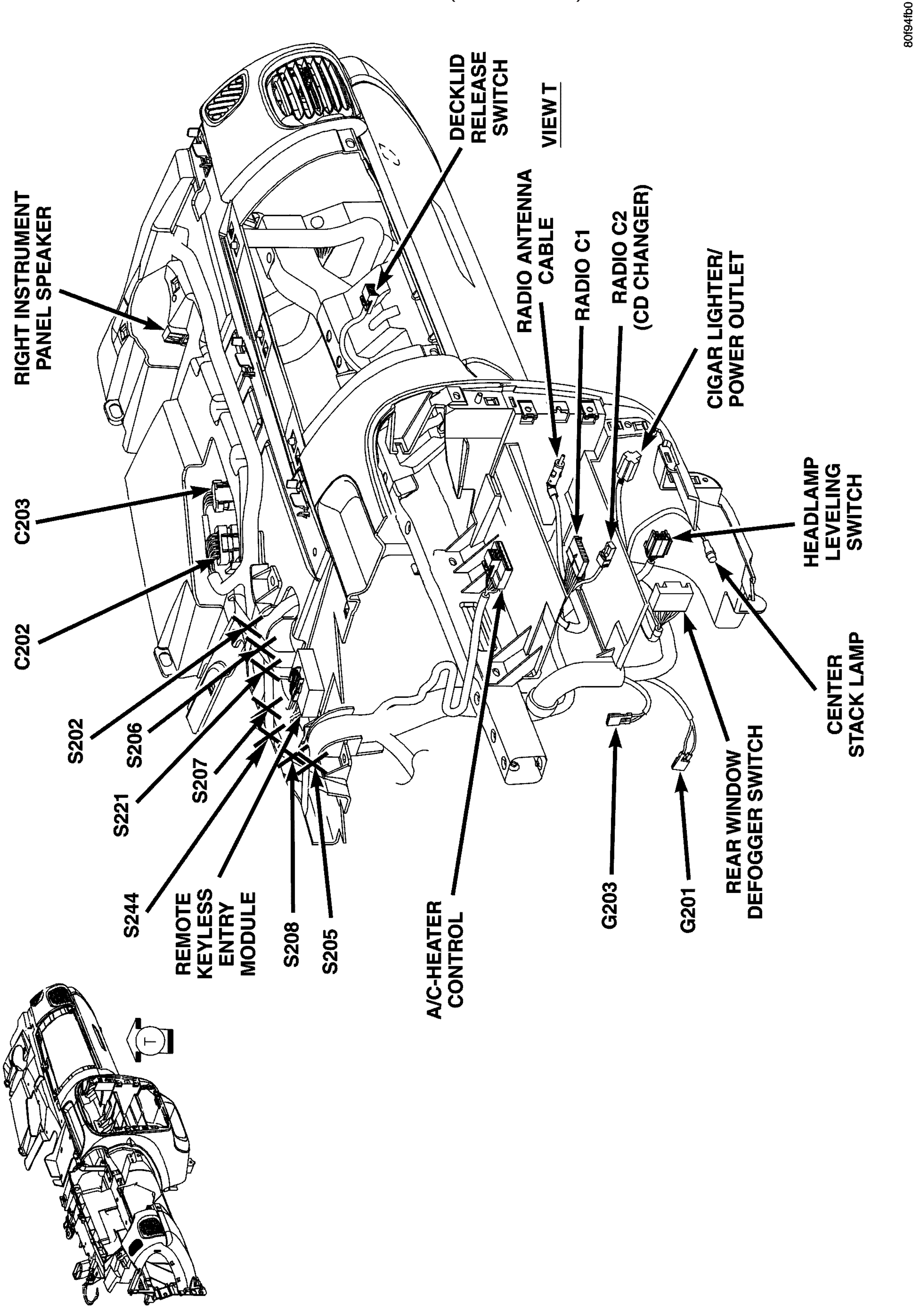


Fig. 21 INSTRUMENT PANEL (RIGHT SIDE) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

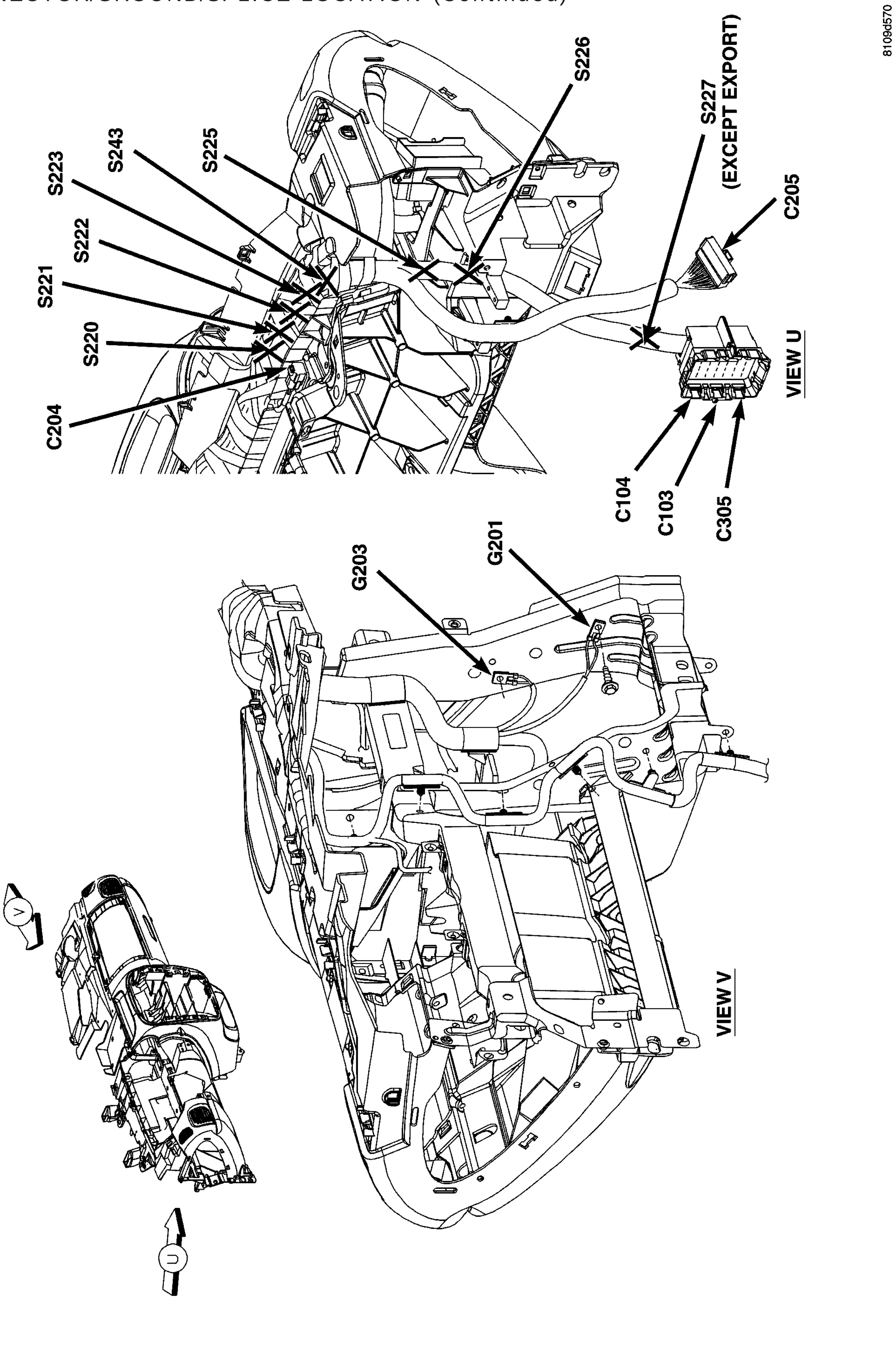


Fig. 22 INSTRUMENT PANEL SIDES - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

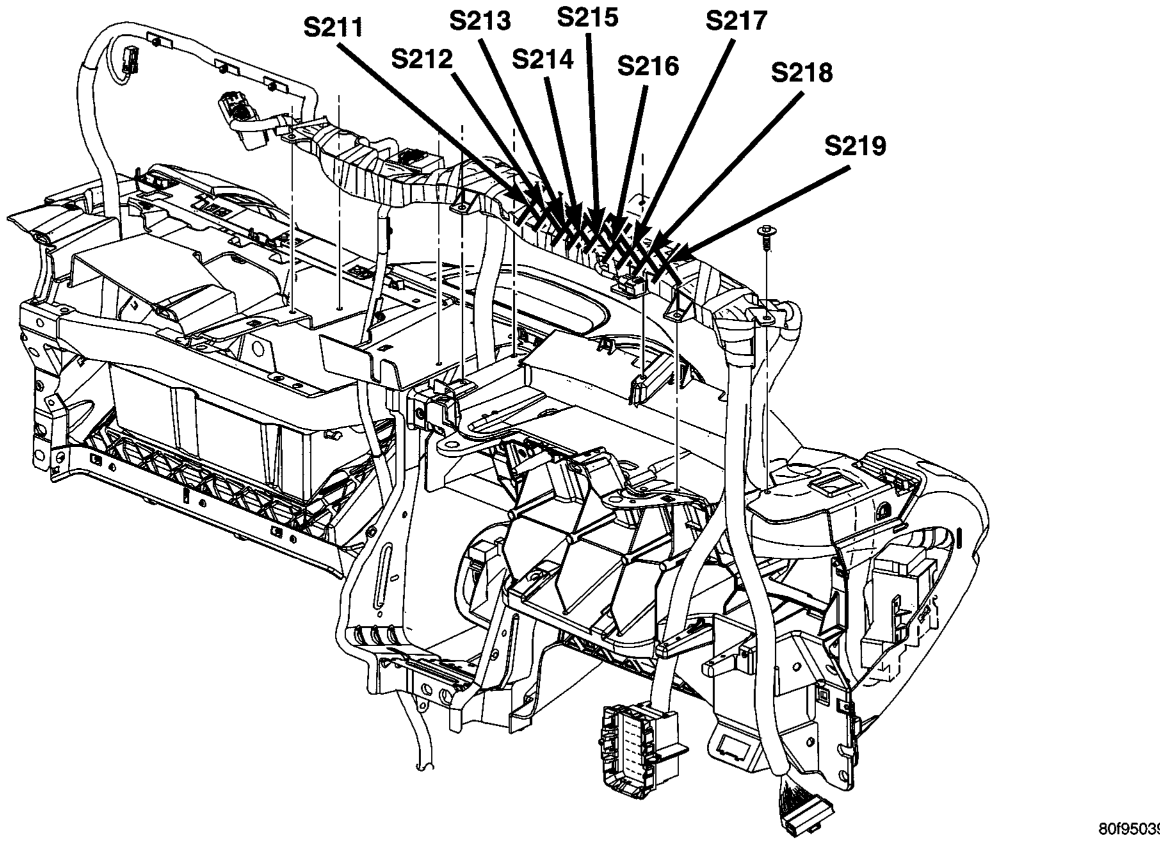


Fig. 23 INSTRUMENT PANEL SPLICES (TOP REAR) - LHD

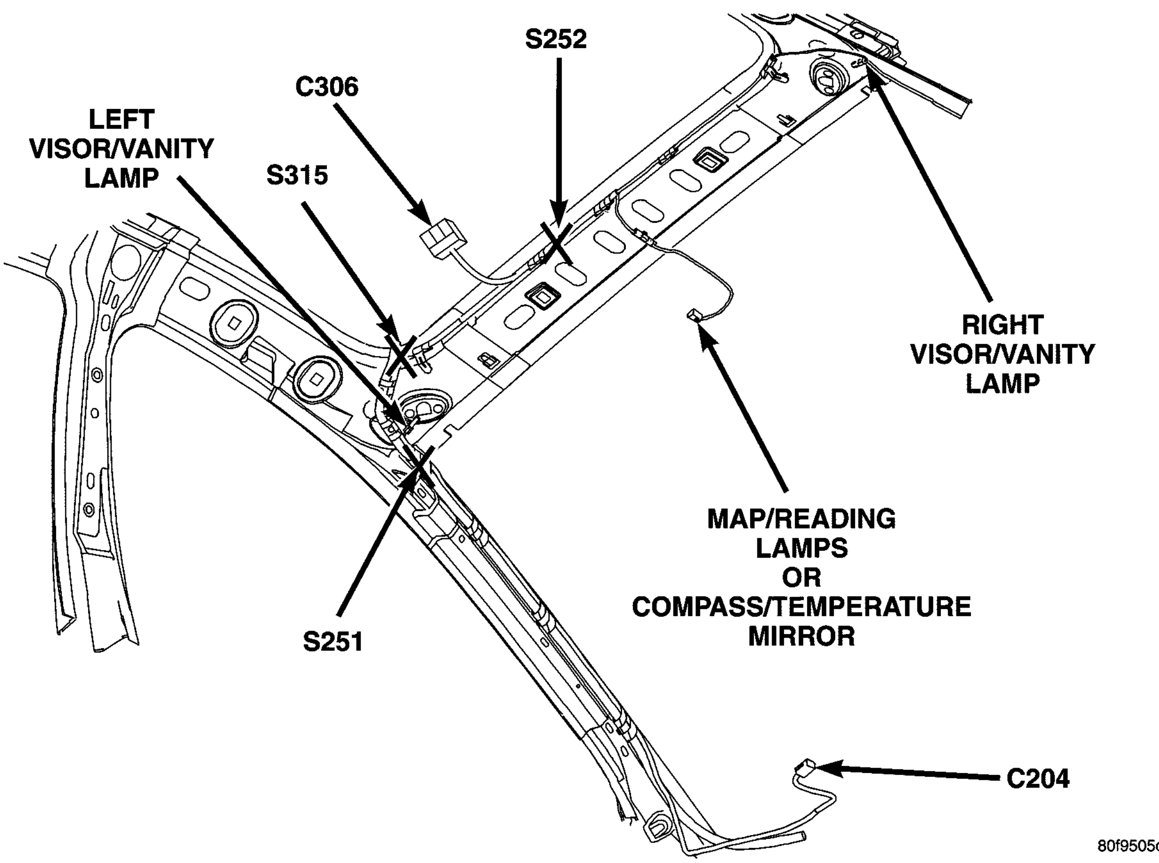


Fig. 24 ROOF - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

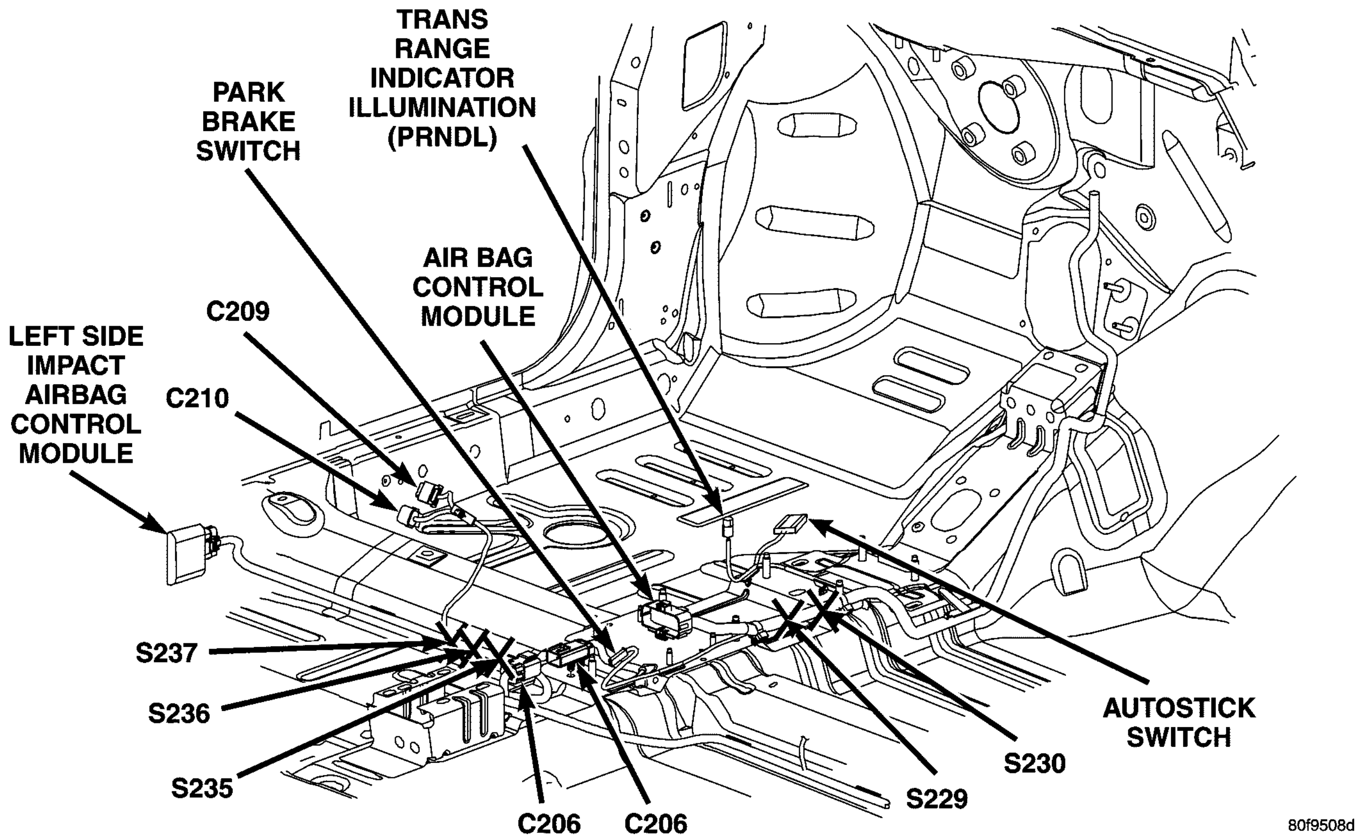


Fig. 25 CENTER CONSOLE - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

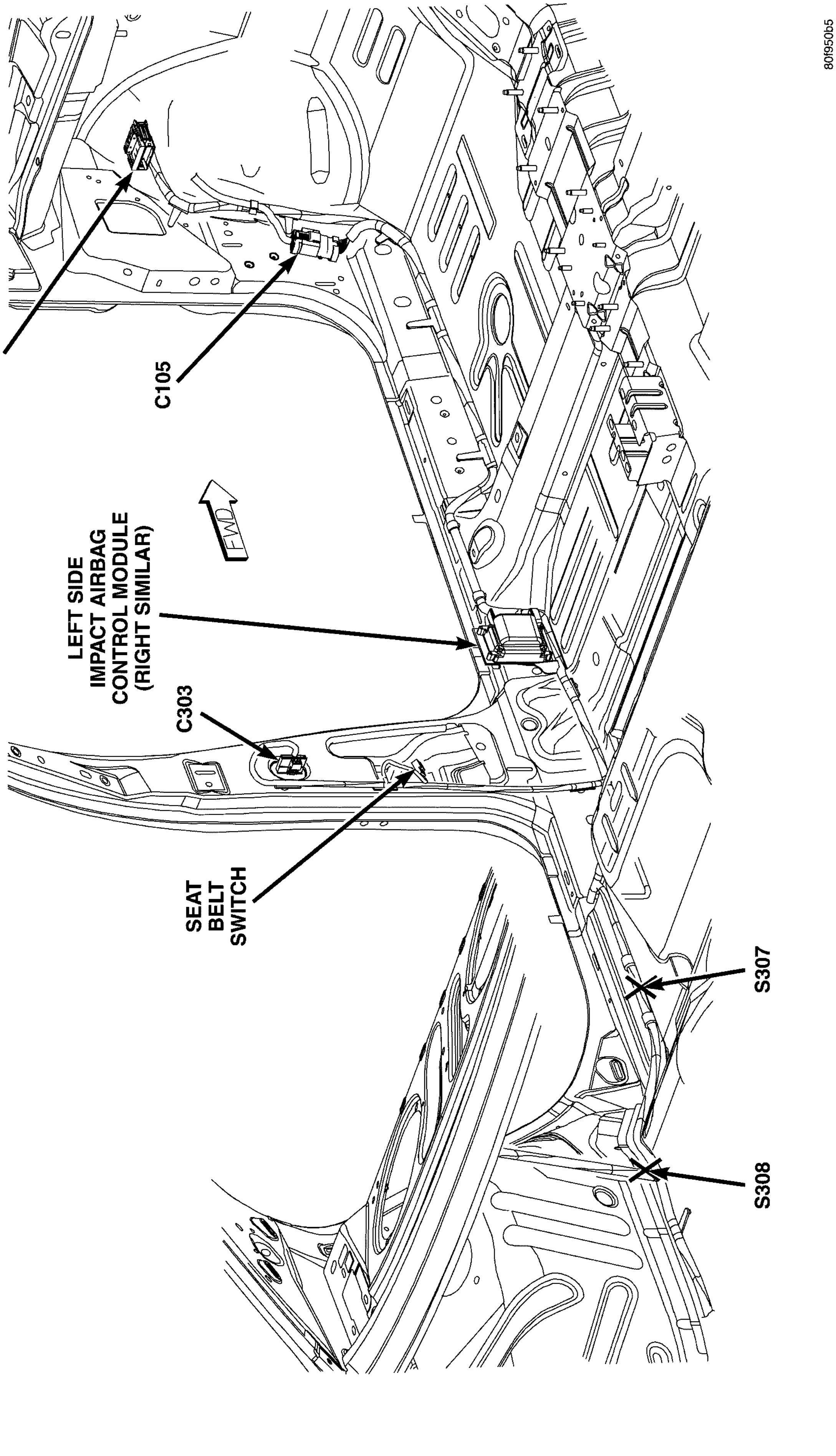


Fig. 26 BODY (LEFT FRONT) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

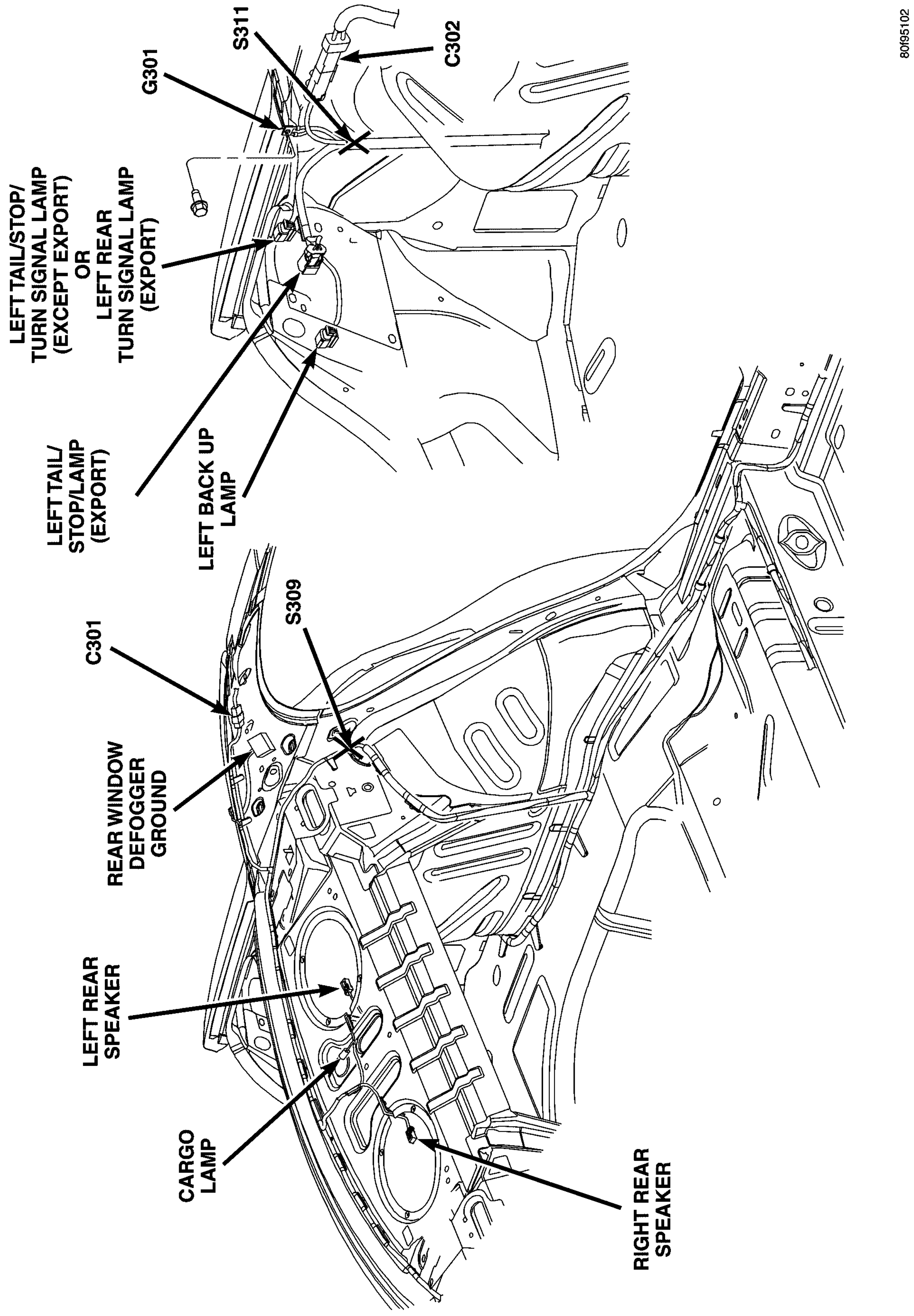


Fig. 27 BODY (LEFT REAR) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

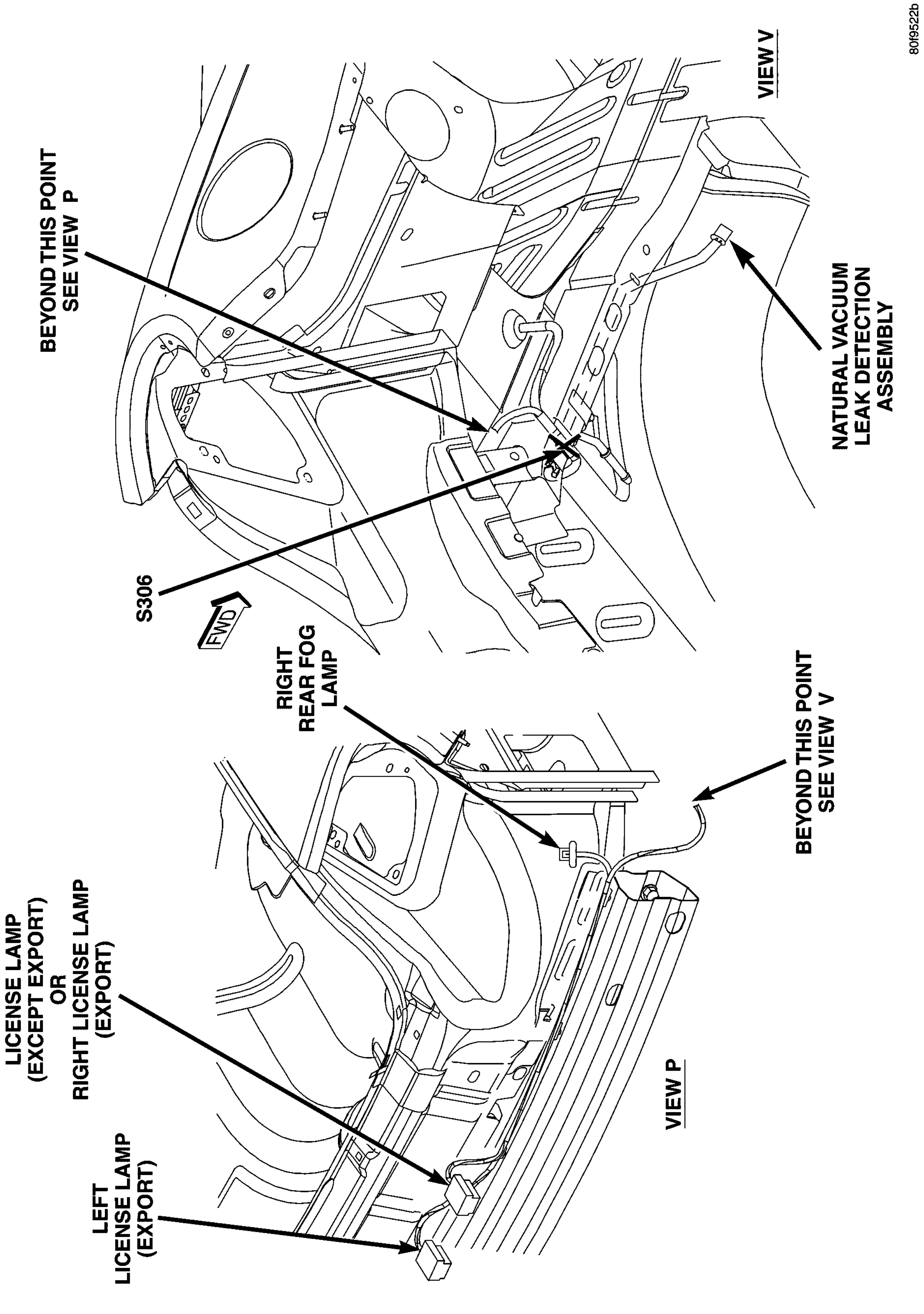


Fig. 28 BODY (REAR) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

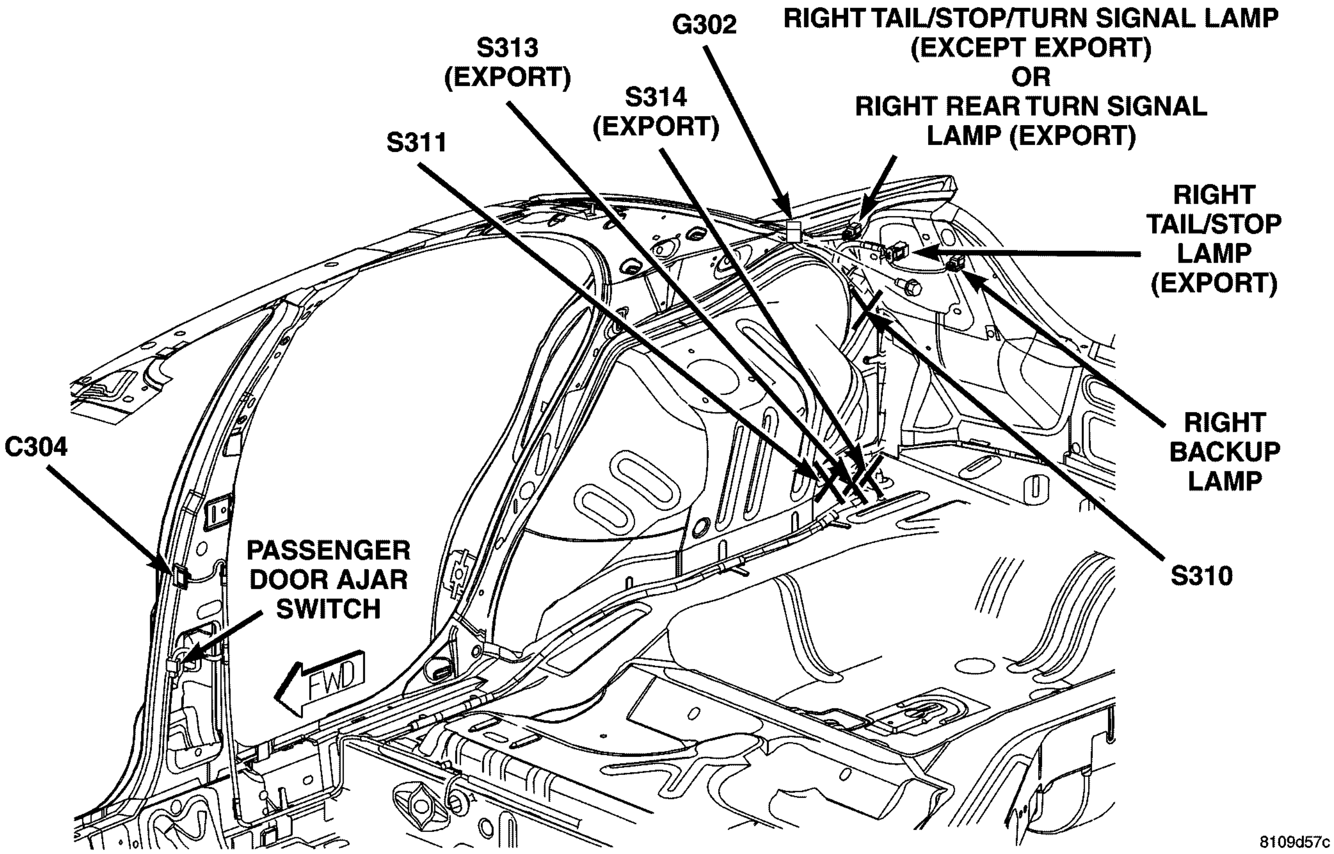


Fig. 29 BODY (RIGHT REAR) - LHD

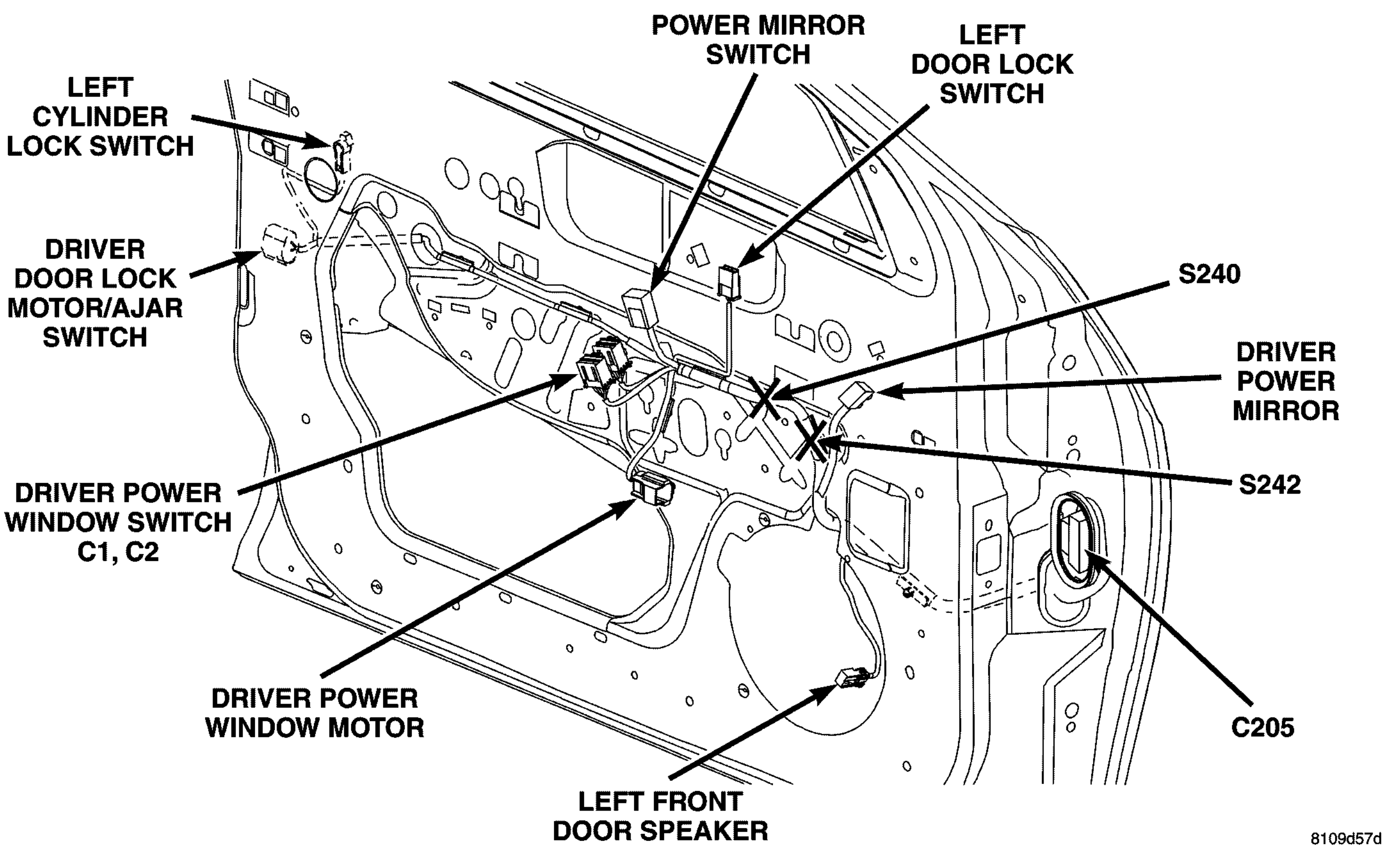


Fig. 30 DOOR (DRIVER) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

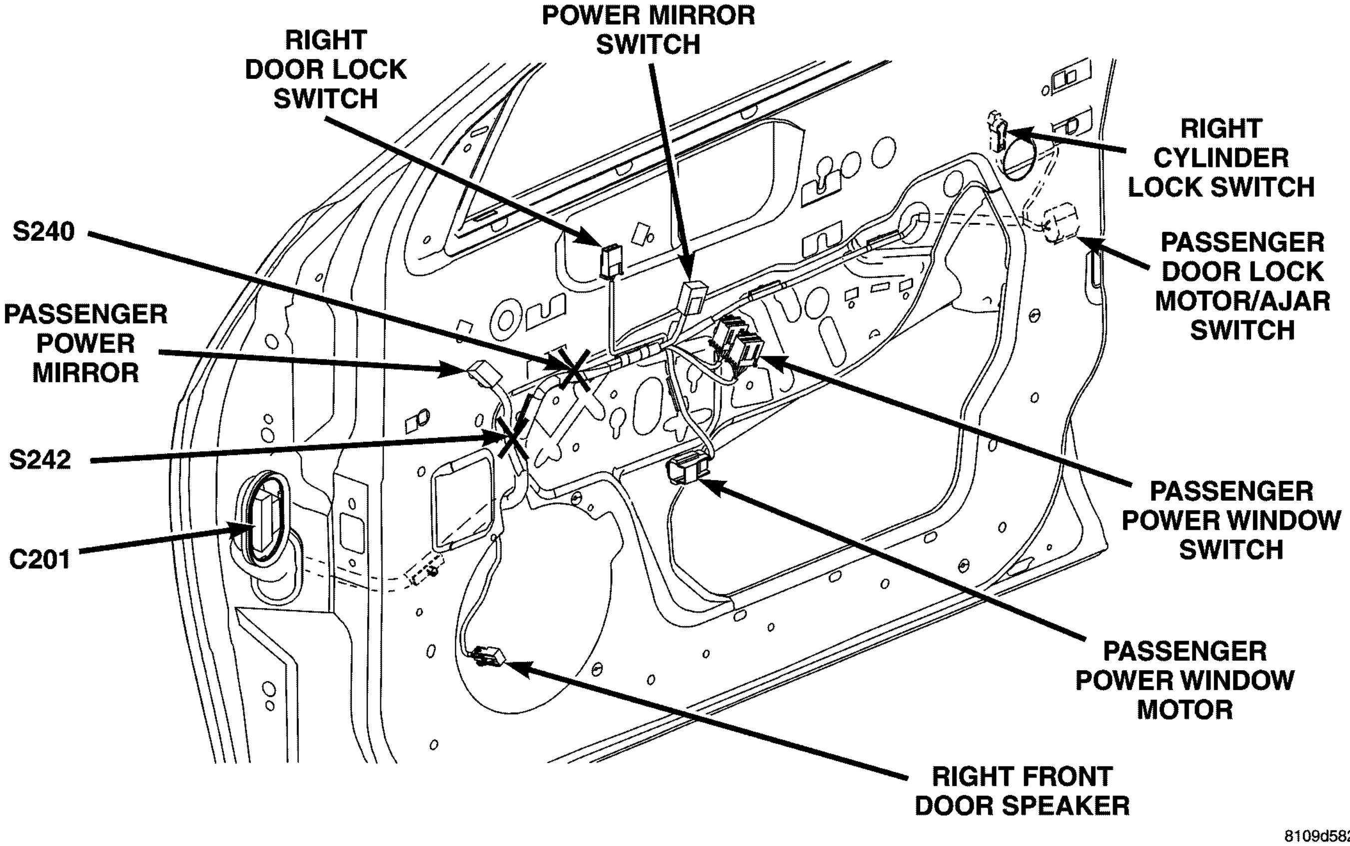


Fig. 31 DOOR (PASSENGER) - LHD

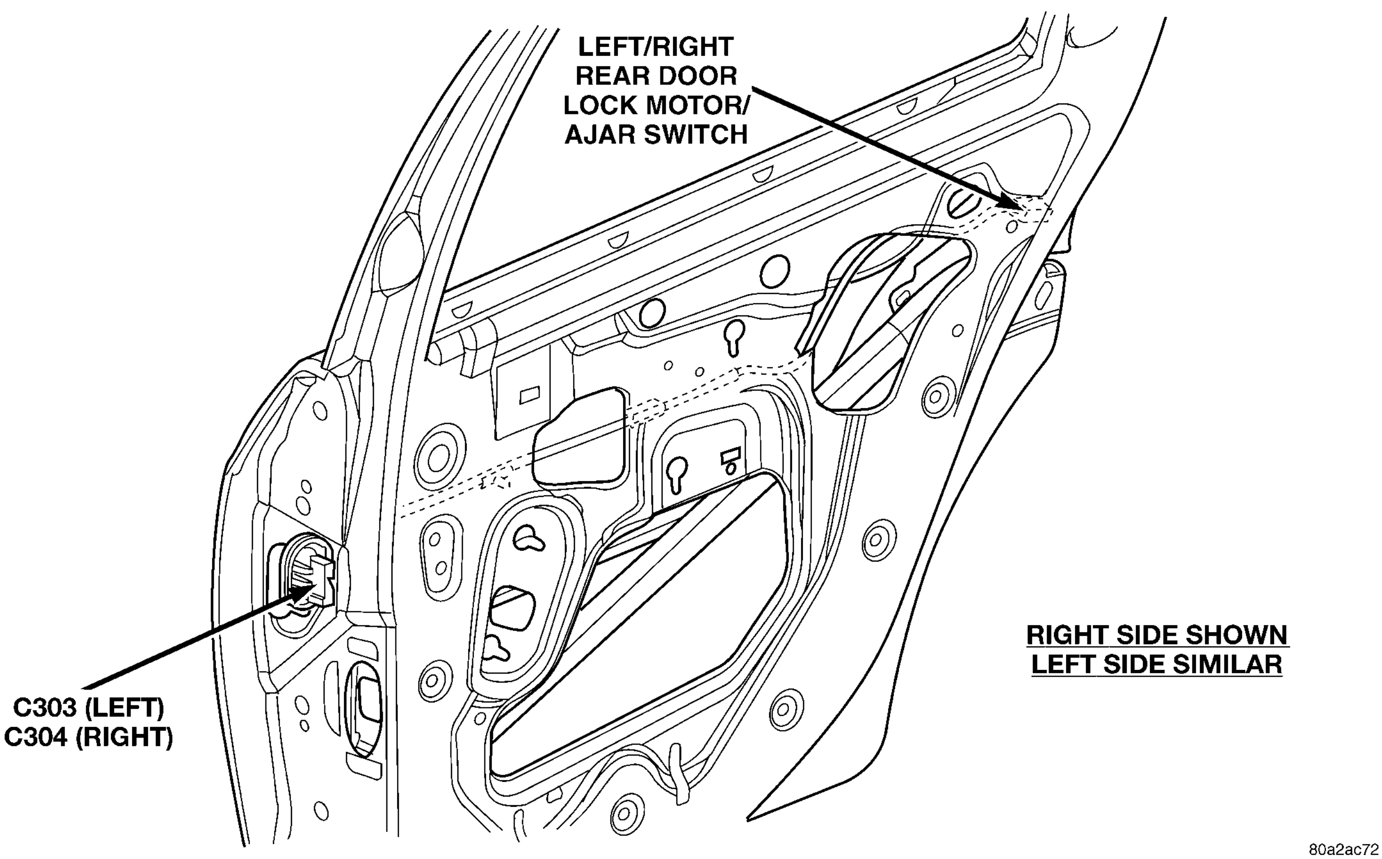


Fig. 32 DOOR (REAR) - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

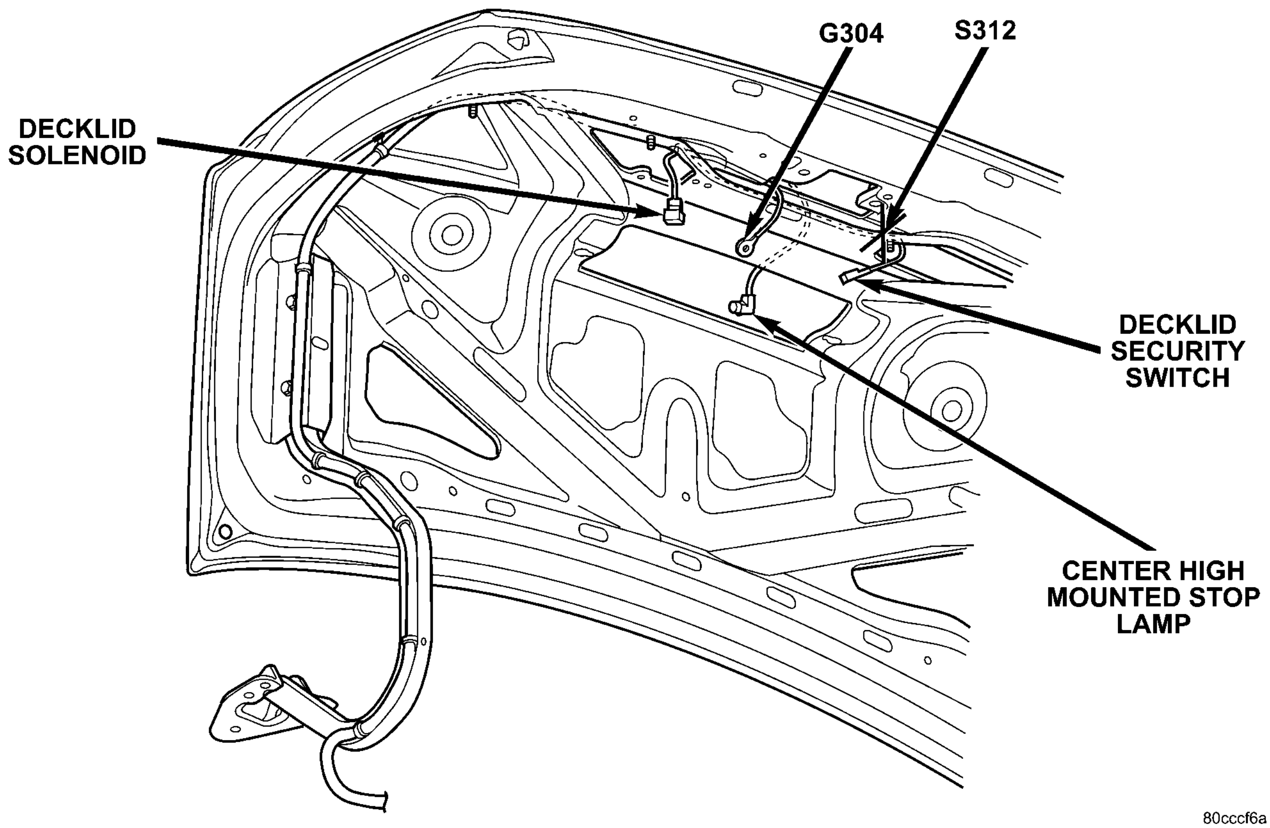


Fig. 33 DECKLID - LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

DESCRIPTION - RHD

This section provides illustrations identifying connector, ground and splice locations in the vehicle. Connector, ground and splice indexes are provided. Use the wiring diagrams in each section for connector, ground and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS - RHD

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
A/C Compressor Clutch	BK	Right Front of Engine Compartment	34, 42
A/C Cycling Switch	BK	Left Center of Instrument Panel	N/S
A/C-Heater Blower Motor	BK	Left Side of Instrument Panel	N/S
A/C-Heater Control	GY	Center of Instrument Panel	46
A/C High Pressure Switch	BK	Front Center of Engine Compartment	34, 38, 37
A/C Low Pressure Switch	BK	Left Rear of Engine Compartment	36
Airbag Control Module	YL	Center Console Behind Shift Lever	47, 51
Ambient Temperature Sensor	BK	Left Front Engine Compartment	34
Autostick Switch	NAT	Near Shift Lever	47
Backup Lamp Switch (MTX)	GY	Left Front of Engine Compartment	37
Battery	-	Left Side of Engine Compartment	44
Battery Temperature Sensor	BK	Left Front Engine Compartment	37
Blower Motor Resistor Block	BK	In Plenum	45
Brake Fluid Level Switch	BK	Near Right Front Strut Tower	36
Brake Lamp Switch		Top of Brake Pedal	37, 45
Brake Transmission Shift Interlock Solenoid	WT	Right Side of Instrument Panel Near Sentry Key Immobilizer Module T/O	47
C101	BK	Left Rear of Engine Compartment	36, 39, 40
C103	BK	Right Side of Instrument Panel	37, 45, 47, 48
C104	GY	Right Side of Instrument Panel	37, 45, 47, 48
C105	BK	At Right Kick Panel Area	37, 45, 52
C106	BK	Left Rear of Engine Compartment	36, 37
C109	BK	Lower Right Front Facia	34
C201	GY	Left Side of Instrument Panel	47, 56
C202	LT GN	Left Upper Instrument Panel	45, 46, 47
C203	LT GY	Left Upper Instrument Panel	46, 47
C204	RD	Left Upper Instrument Panel	46, 47, 50
C205	GY	Right Lower Instrument Panel	47, 48, 57
C206	LT GY	Rear of Center Console	51
C208	YL	Below Right Front Seat	51
C209	YL	Below Left Front Seat	N/S
C210	BK	Below Left Front Seat	N/S
C301	RD	Left C-Pillar	53
C302	BK	Inner Left Rear Quarter Panel	53
C303	BL/BK	Left B-Pillar at Rear Door	58

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
C304	BL/BK	Right B-Pillar at Rear Door	52, 55, 58
C305	NAT	Right Side of Instrument Panel	47, 48, 52
C306	BK	Center of Headliner	50
Camshaft Position Sensor	BK	Rear of Engine	N/S
Cargo Lamp	BK	Under Parcel Shelf	53
Center High Mounted Stop Lamp	BK	Decklid	59
Center Stack Lamp	BK	Center of Instrument Panel	46
Cigar Lighter/Power Outlet	RD	Center of Instrument Panel	46
Clockspring	GR	Rear of Steering Wheel	47
Clutch Interlock/Upstop Switch (MTX)	BK	Top of Clutch Pedal	37, 45
Compass/ Temperature Mirror	BK	At Mirror	50
Controller Antilock Brake	BK	Near Left Strut Tower	36, 37
Crankshaft Position Sensor	BK	Right Rear of Engine	41
Data Link Connector	BK	At Right Kick Panel Area	37, 45
Decklid Release Switch	BK	In Glove Box	46, 47
Decklid Security Switch	GY	On Decklid	59
Decklid Solenoid	BK	On Decklid	59
Diode	-	Front Right Side of Engine Compartment	N/S
Dome Lamp/Intrusion Sensor	NAT	Center Roof	N/S
Driver Airbag	YL	Front of Steering Wheel	N/S
Driver Door Ajar Switch		Right B-Pillar	55
Driver Door Lock Motor/Ajar Switch	BK	At Driver Door	57
Driver Power Mirror	GY	At Driver Door	57
Driver Power Window Motor	BK	At Driver Door	57
Driver Power Window Switch C1	BK	At Driver Door	57
Driver Power Window Switch C2	GY	At Driver Door	57
Engine Coolant Temp Sensor	BK	Left Front of Engine	41
Engine Oil Pressure Switch	GN	Left Rear of Engine	40
Evap/Purge Solenoid	BK	Left Rear of Engine	36, 37
Fuel Injector NO. 1	BK	Top of Engine	39
Fuel Injector NO. 2	BK	Top of Engine	39
Fuel Injector NO. 3	BK	Top of Engine	39
Fuel Injector NO. 4	BK	Top of Engine	39
Fuel Pump Module	LT GY	At Fuel Tank	N/S
Fuse Block		Right Side of I/P	49
Generator	BK	Right Rear of Engine	40
Headlamp Leveling Switch	BK	Center of Instrument Panel	46

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Hood Ajar Switch	BK	Right Side of Engine Compartment	34, 38
Horn Switch	BK	Steering Column	N/S
Idle Air Control Motor	BK	On Throttle Body	34
Ignition Coil	BK	Top of Valve Cover	40
Ignition Switch C1	BK	Right Side of Steering Column	47
Ignition Switch C2	WT	Near Ignition Switch C1	47
Inlet Air Temperature Sensor		Left Front of Engine Compartment	37, 44
Input Speed Sensor (EATX)	GY	Lower Left of Engine Compartment	37
Instrument Cluster	BK	Right Upper Instrument Panel	47
Knock Sensor	BK	Right Front of Engine	41
Left Backup Lamp	BK	Left Rear Fascia	53
Left Cylinder Lock Switch	BK	At Passenger Door	56
Left Door Lock Switch	BK	At Passenger Door	56
Left Front Door Speaker	BK	At Passenger Door	56
Left Front Fog Lamp	BK	Lower Left Facia	N/S
Left Front Side Marker Lamp	NAT	Left Front Side Fender	N/S
Left Front Turn Signal Lamp	NAT	Left Front Facia	34, 36, 37
Left Front Wheel Speed Sensor	BK	At Left Front Wheel Opening	36, 37
Left Headlamp		Left Headlamp Opening	34, 36, 37
Left Instrument Panel Speaker	BK	Left Upper Instrument Panel	46, 47
Left Lavalier Module	BK	Left Front of Engine Compartment	36
Left License Lamp	NAT	Center Rear Fascia	54
Left Rear Door Ajar Switch		Rear of Left Rear Door	58
Left Rear Door Lock Motor/Ajar Switch	BK	Rear of Left Rear Door Opening	58
Left Rear Fog Lamp	GY	Left Rear Bumper	N/S
Left Rear Speaker	BK	Left Side Package Tray	53
Left Rear Turn Signal Lamp	GY	Left Rear Facia	53
Left Rear Wheel Speed Sensor	BK	At Left Rear Wheel Opening	N/S
Left Seat Airbag		Left Side of Seat	N/S
Left Side Impact Airbag Control Module		Left Side of Passenger Compartment	N/S
Left Side Repeater Lamp	BK	Behind Left Wheel Well	34
Left Tail/Stop Lamp	BK	Left Rear of Vehicle	53
Left Visor/Vanity Lamp	BK	Left Header Panel	50
Low Note Horn	BK	Right Front Wheel Opening	34
Manifold Absolute Pressure Sensor		Front of Engine	42
Manifold Tuning Valve Solenoid (RT)	BK	Left Front Engine	42

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Map/Reading Lamps	BK	Front of Headliner	50
Multi-Function Switch	GY	Right Side of Instrument Panel	47
Natural Vacuum Leak Detection Assembly	BK	Near Left Rear Fender	54
Negative Battery Terminal		Left Side of Engine Compartment	44
Noise Supressor		Top of Engine	40
Output Speed Sensor (EATX)	GY	Lower Left Front of Engine Compartment	37
Oxygen Sensor 1/1 Upstream	GY	Left Rear of Engine	40
Oxygen Sensor 1/2 Downstream	BK	Left Rear of Engine	36, 37, 40
Park Brake Switch	BK	On Parking Brake Lever	47, 51
Park/Neutral Position Switch (ATX)	BK	Left Side of Transmission	N/S
Passenger Airbag	YL	Left Side of Instrument Panel	47
Passenger Door Ajar Switch		Left B-Pillar	N/S
Passenger Door Lock Motor/Ajar Switch	BK	Passenger Door	56
Passenger Power Mirror	GY	At Passenger Door	56
Passenger Power Window Motor	BK	At Passenger Door	56
Passenger Power Window Switch	GY	At Passenger Door	56
Positive Battery Terminal		Left Side of Engine Compartment	44
Power Distribution Center		Left Front of Engine Compartment	36, 37, 44
Power Mirror Switch	GY	At Driver Door	57
Power Seat Motor		Inside Right Front Seat	N/S
Power Seat Switch		Side of Driver Seat	N/S
Power Steering Pressure Switch	GY	Right Rear of Engine Compartment	34, 38
Powertrain Control Module C1	BK	Left Fender Side Shield	37, 39
Powertrain Control Module C2	BK	Left Fender Side Shield	39
Powertrain Control Module C3	BK	Left Fender Side Shield	37
Powertrain Control Module C4	BK	Left Fender Side Shield	37
PVC Heater	BK	Left Rear Engine Compartment	N/S
Radiator Fan Motor	BK	Front of Engine Compartment	34, 38, 37
Radio C1	BK	Rear of Radio	46
Radio C2 (CD Changer)	GY	Rear of Radio	46
Radio Antenna		Rear of Glove Box	47
Radio Antenna Cable		Center of Instrument Panel	46

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Rear Window Defogger Feed	NAT	Right Side of Rear Window	53
Rear Window Defogger Ground		Left Side of Rear Window	53
Rear Window Defogger Switch	BK	Lower Center of Instrument Panel	46
Remote Keyless Entry Module	BK	Upper Center of Instrument Panel	46, 47
Right Backup Lamp	BK	Right Rear Luggage Compartment	55
Right Cylinder Lock Switch	BK	At Driver Door	57
Right Door Lock Switch	BK	At Driver Door	57
Right Front Door Speaker	BK	At Driver Door	57
Right Front Fog Lamp	BK	Lower Right Facia	N/S
Right Front Side Marker Lamp	NAT	Lower Right Fascia	N/S
Right Front Turn Signal Lamp	NAT	Lower Right Fascia	34, 38
Right Front Wheel Speed Sensor	BK	At Right Front Wheel Opening	34, 38
Right Headlamp		Right Headlamp Opening	34, 38
Right Instrument Panel Speaker	BK	Right Upper Instrument Panel	47
Right Lavalier Module	BK	Right Headlamp Opening	38
Right License Lamp	NAT	Rear of Vehicle	54
Right Rear Door Ajar Switch		Rear of Right Rear Door	58
Right Rear Door Lock Motor/Ajar Switch	BK	Right Rear Door	58
Right Rear Fog Lamp	GY	Rear Bumper	54
Right Rear Speaker	BK	Right Side Package Tray	53
Right Rear Turn Signal Lamp	GY	Right Rear Luggage Compartment	55
Right Rear Wheel Speed Sensor	BK	At Right Rear Wheel Opening	N/S
Right Seat Airbag		Right Side of Seat	N/S
Right Side Impact Airbag Control Module		Base of Right ″B″ Pillar	51, 52
Right Side Repeater Lamp	BK	Right Fascia	34
Right Tail/Stop Lamp	BK	Right Rear Luggage Compartment	55
Right Visor/Vanity Lamp	BK	Right Header Panel	50
RKE Antenna	BK	Near RKE Module	N/S
Seat Belt Switch	BK	Under Driver Seat	52
Sentry Key Immobilizer Module	BK	Left Center Lower Instrument Panel	47
Siren		Behind Right Rear Fender	N/S
Speed Control Servo	BK	Left Rear of Engine Compartment	36
Sunroof Control Module		Center Roof Support Bracket	N/S
Starter Motor	-	Left Front Engine	41

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sunroof Motor	BK	Center Roof Support Bracket	N/S
Sunroof Switch	BK	Near Sunroof Opening	N/S
Sunroof Vent Switch		Near Sunroof Opening	N/S
Throttle Position Sensor	BK	On Throttle Body	34
Trans Range Indicator Illumination (PRNDL)	BK	At Shift Lever	47, 51
Transmission Range Sensor (EATX)	DK GY	Lower Left Front Engine Compartment	37
Transmission Solenoid/ Pressure Switch Assembly (EATX)	BK	Lower Left Engine Compartment	37
Vehicle Speed Sensor	BK	Right Front Wheel Opening	40
Windshield Washer Pump	RD	Right Rear Engine Compartment	34
Wiper/Washer Switch	GY	Lower Center of Instrument Panel	47
Wiper Motor	BK	Left Rear of Engine Compartment	45

GROUNDS - RHD

GROUND	LOCATION	FIG.
G102	Left Front of Engine Compartment	37
G103	Right Front of Engine Compartment	38, 39
G104	Near Engine Starter Motor	43
G105	Near Negative Battery Terminal	N/S
G106	Left Front of Engine Compartment	N/S
G201	Lower Center of Instrument Panel	46, 48
G203	Lower Center of Instrument Panel	46, 48
G301	Inner Left Rear Quarter Panel	53
G302	Inner Right Rear Quarter Panel	55
G303	Inner Left Rear Quarter Panel	N/S
G304	At Decklid	59

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICES - RHD

SPLICE	LOCATION	FIG.
S102	Near Right Headlamp	38
S104	In Data Link Connector T/O	37, 45
S105	Near Grommet to Engine Compartment	37, 45
S106	Inside Power Distribution Center	36
S107	Near Brake Fluid Level Switch T/O	35
S108	Near Inline C112 (1.6L) T/O	36
S109	Near Power Distribution Center	36
S110	In T/O for PCM C2	N/S
S111	Near Right Headlamp	38
S112	Near Brake Fluid Level Switch T/O	35
S113	Near Throttle Position Sensor T/O	35
S117	Near A/C Compressor Clutch T/O	38
S118	Near Ambient Temperature Sensor	34
S119	Near Radiator Fan Motor T/O	35
S121	In Powertrain Control Module C2 T/O	39
S122	Near Noise Suppressor T/O	40
S123	Near vehicle Speed Sensor T/O	40
S124	Near Powertrain Control Module-C1 T/O	39
S125	Near Starter Motor T/O	39
S130	Near Ignition Coil T/O	40
S131	Near Right Headlamp	38
S135	Near Crankshaft Position Sensor T/O	40
S136	Near Inline C101 T/O	36
S138	Near Transmission Range Sensor T/O	37
S141	Near High Note Horn T/O	N/S
S142	Near High Note Horn T/O	N/S
S144	In T/O for Transmission Solenoid/Pressure Switch Assembly	37
S151	Near Engine Oil Switch T/O	40
S152	Near Left Headlamp	36
S154	Left Front Facia	35
S155	Near T/O for C109	34
S201	Near Right Instrument Panel Speaker T/O	46
S202	Near C202 T/O	49
S204	Near Inline C202 T/O	47, 49
S205	Near Remote Keyless Entry Module T/O	49
S206	Near Remote Keyless Entry Module T/O	49
S207	Near Instrument Cluster T/O	49
S208	Near Instrument Cluster T/O	49
S209	Near G201	48
S211	In Inline C103/C104/C305 T/O	48
S212	Near Instrument Cluster T/O	49

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE	LOCATION	FIG.
S213	Near Instrument Cluster T/O	49
S215	Near Fuse Block T/O	49
S216	Near Instrument Cluster T/O	49
S217	Near Fuse Block T/O	49
S218	Near Fuse Block T/O	49
S219	Near Fuse Block T/O	49
S220	Near Fuse Block T/O	49
S221	Center Instrument Panel	49
S222	Near Fuse Block T/O	49
S223	Near Fuse Block T/O	49
S225	Near Instrument Cluster T/O	49
S226	Near Inline C205 T/O	49
S229	Near Transmission Range Indicator Illumination (PRNDL)	47, 51
S230	Near Transmission Range Indicator Illumination (PRNDL)	47, 51
S231	Near Sentry Key Immobilizer Module T/O	47, 49
S232	Near Sentry Key Immobilizer Module T/O	47, 49
S233	Near G201	48
S234	Near G201	48
S235	Below Left Seat	N/S
S236	Below Left Seat	N/S
S237	Below Left Seat	N/S
S238	Near Power Seat Switch T/O	N/S
S239	Left Center Instrument Panel	49
S240	Near Driver Power Mirror T/O	56, 57
S241	Near Power Mirror Switch T/O	56, 57
S242	Near Driver Power Mirror T/O	56, 57
S243	Right Upper Instrument Panel	49
S244	Near RKE Module T/O	49
S251	Near Inline C204	50
S252	Near Left Visor/Vanity Lamp T/O	50
S306	Near Rear Lighting T/O	52, 55
S307	Near Fuel Pump Module T/O	52
S308	Body Below Left Rear Door Opening	53
S309	Body Rear of Left Rear Door Opening	53
S310	Near Ground Point G302 T/O	55
S311	Near Inline C302 T/O	53, 55
S312	Near Decklid Switch T/O	59
S313	Near Rear Lighting T/O	52, 55
S314	Near G302 T/O	55
S315	Near Left Visor/Vanity Lamp T/O	50
S351	Near Sunroof Motor T/O	N/S
S352	Near Sunroof Switch T/O	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

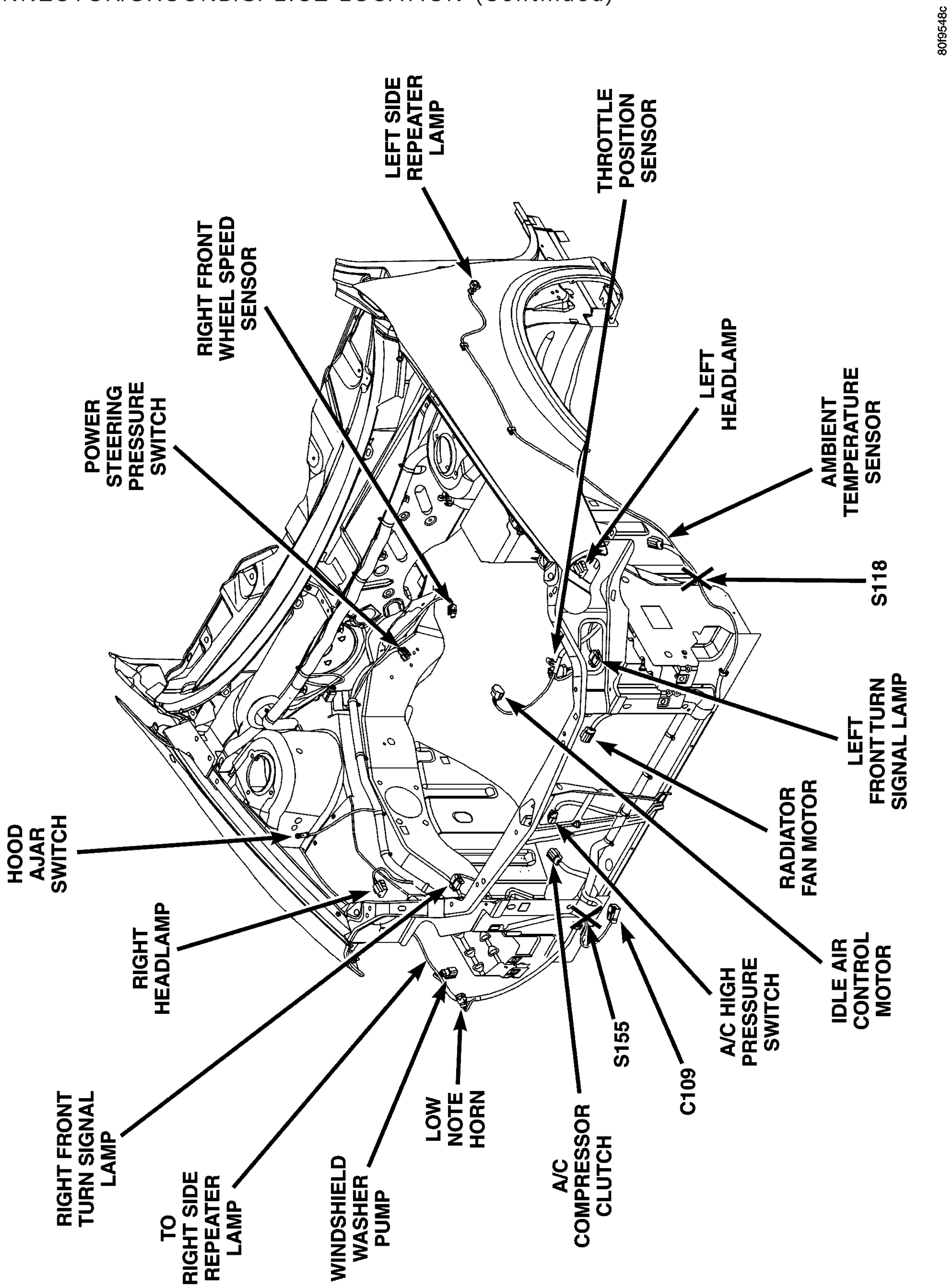


Fig. 34 ENGINE COMPARTMENT - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

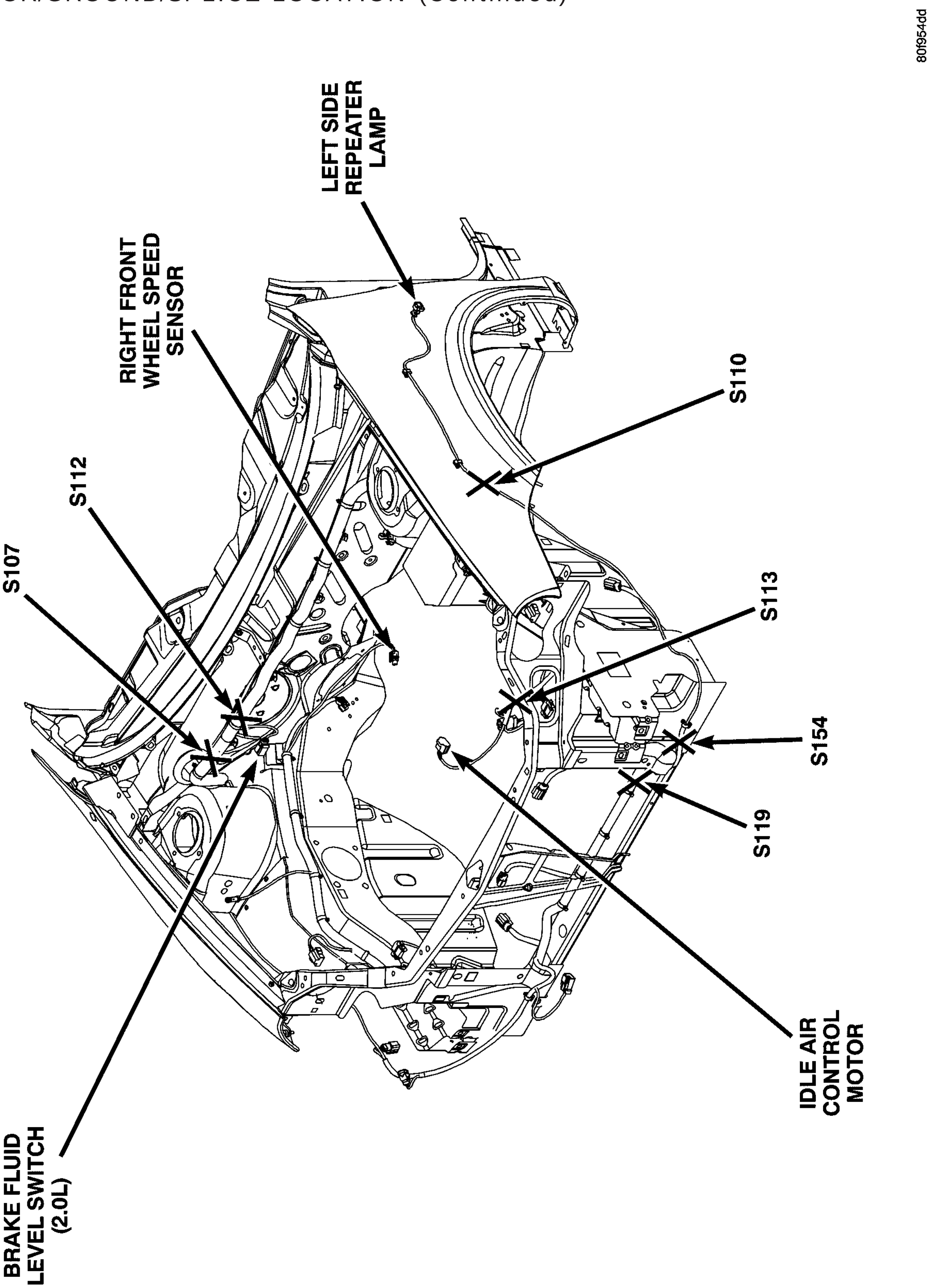


Fig. 35 ENGINE COMPARTMENT - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

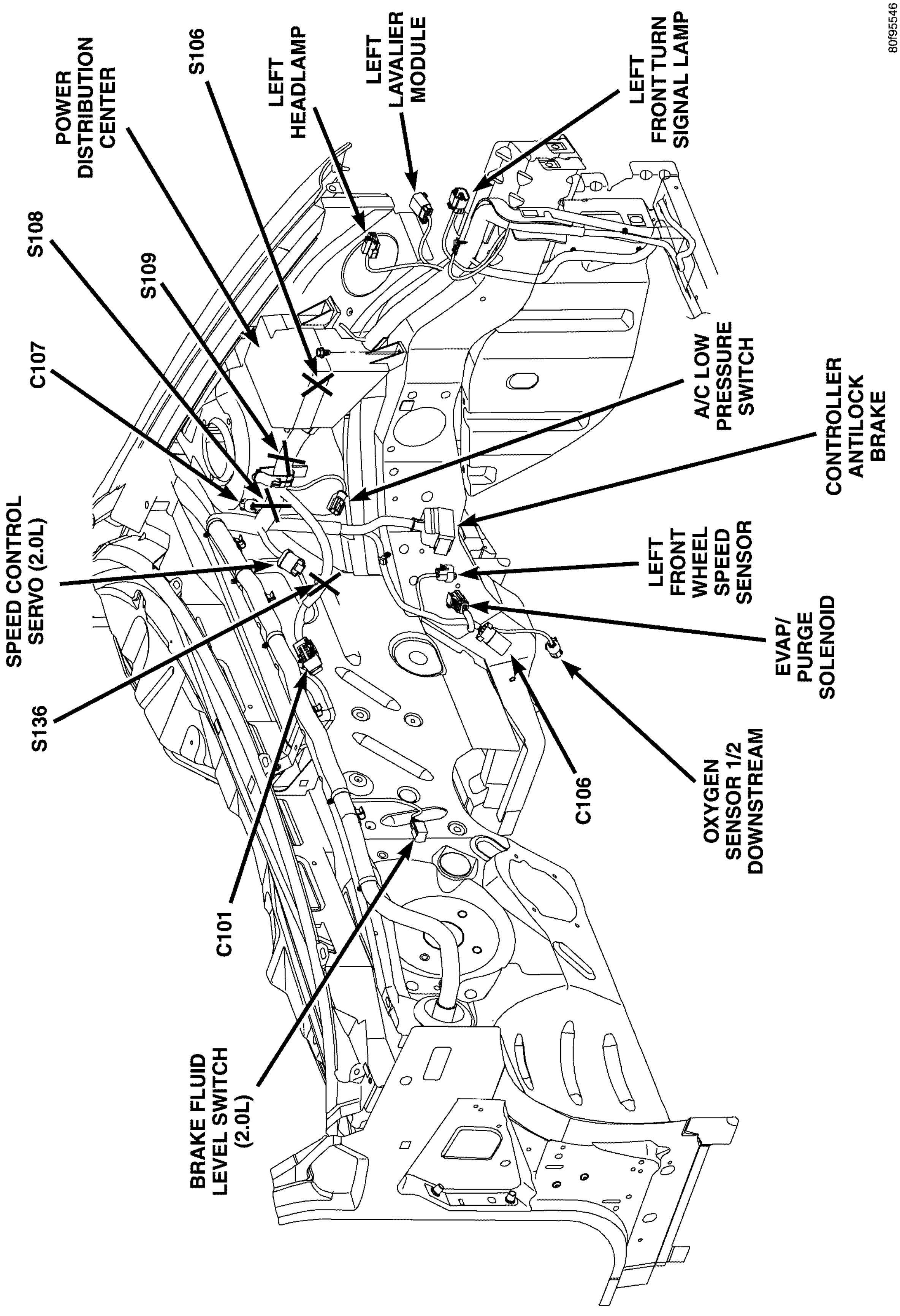


Fig. 36 ENGINE COMPARTMENT (LEFT) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

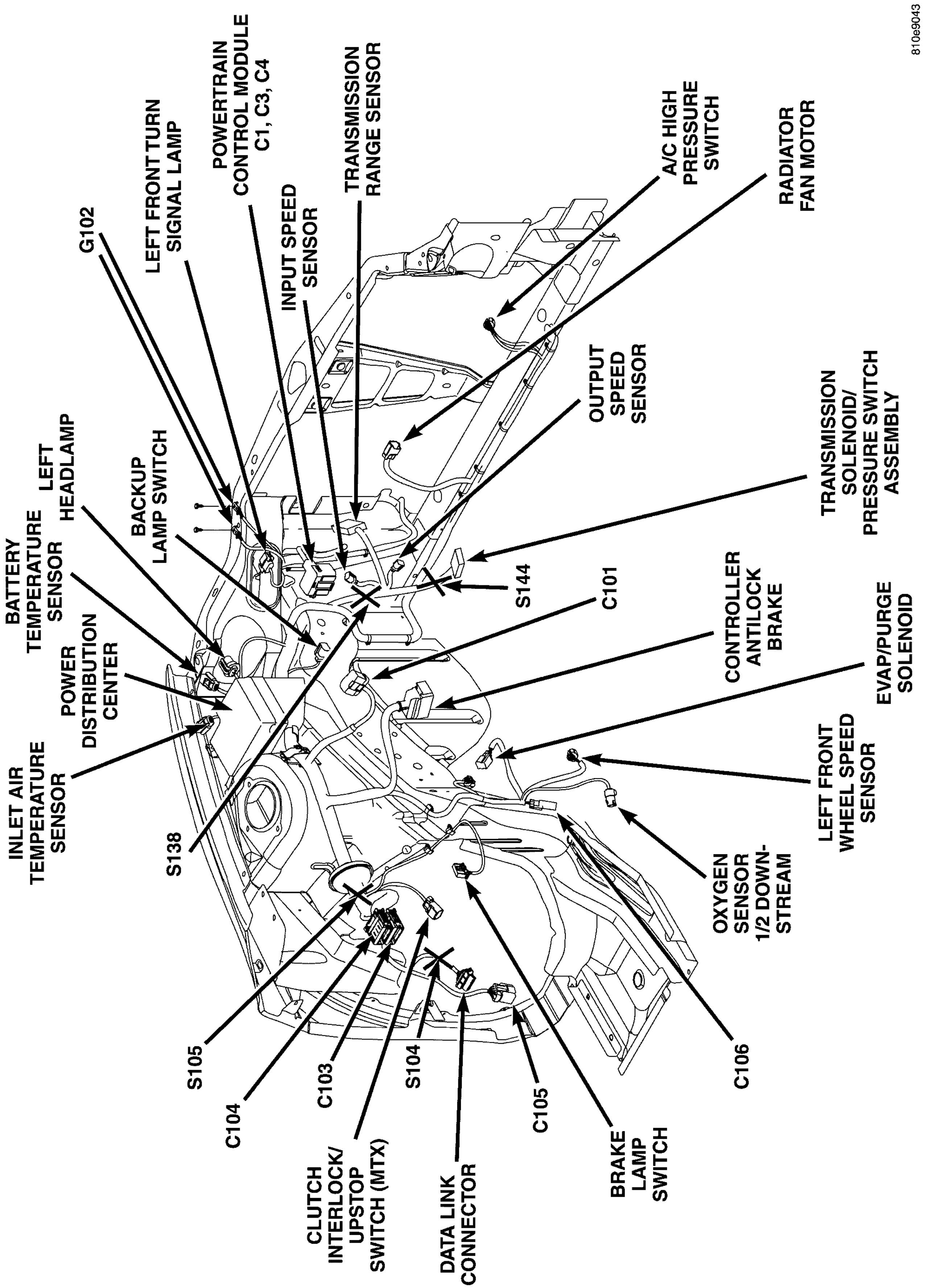


Fig. 37 ENGINE COMPARTMENT (LEFT FRONT) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

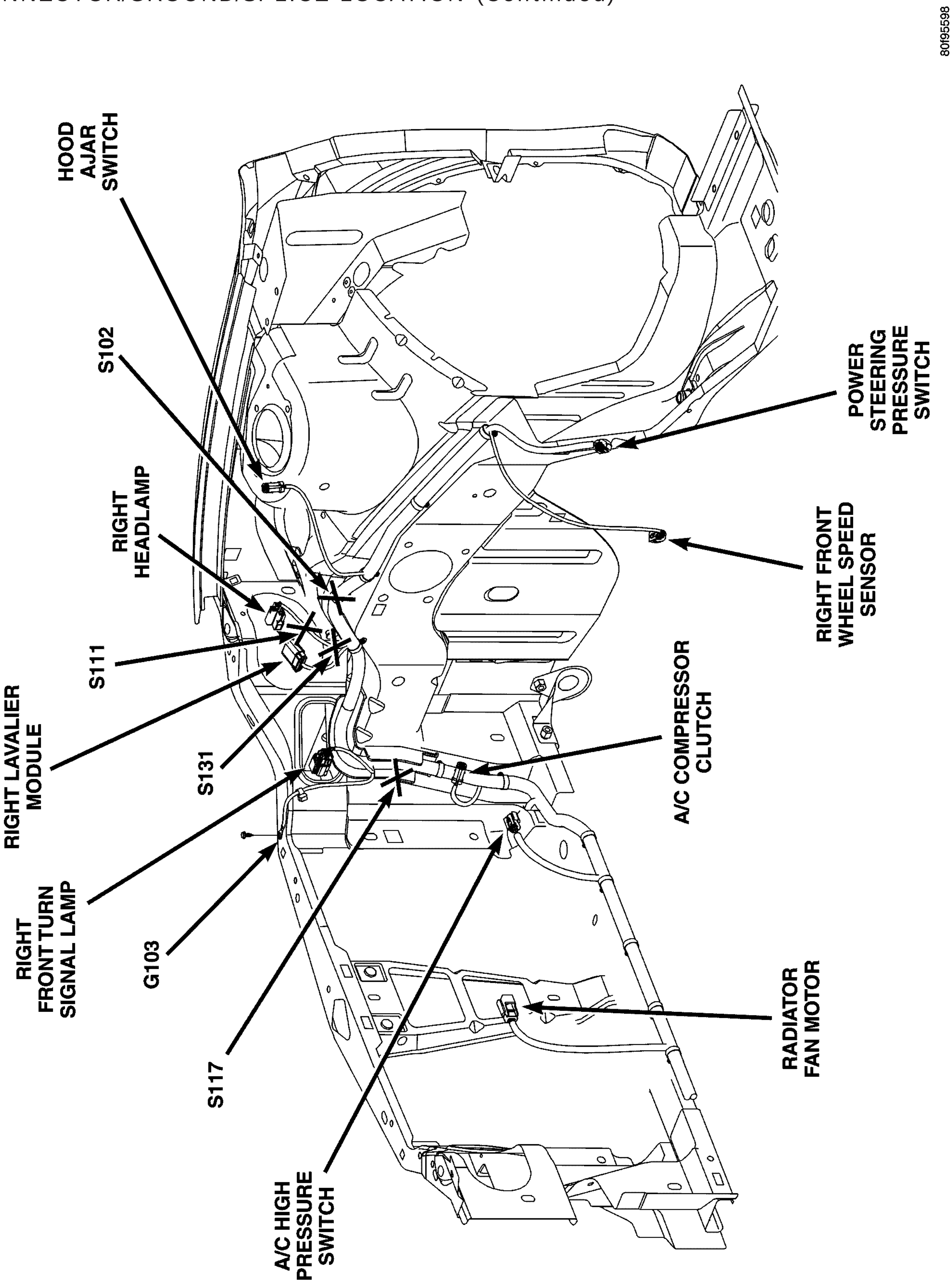


Fig. 38 ENGINE COMPARTMENT (RIGHT SIDE) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

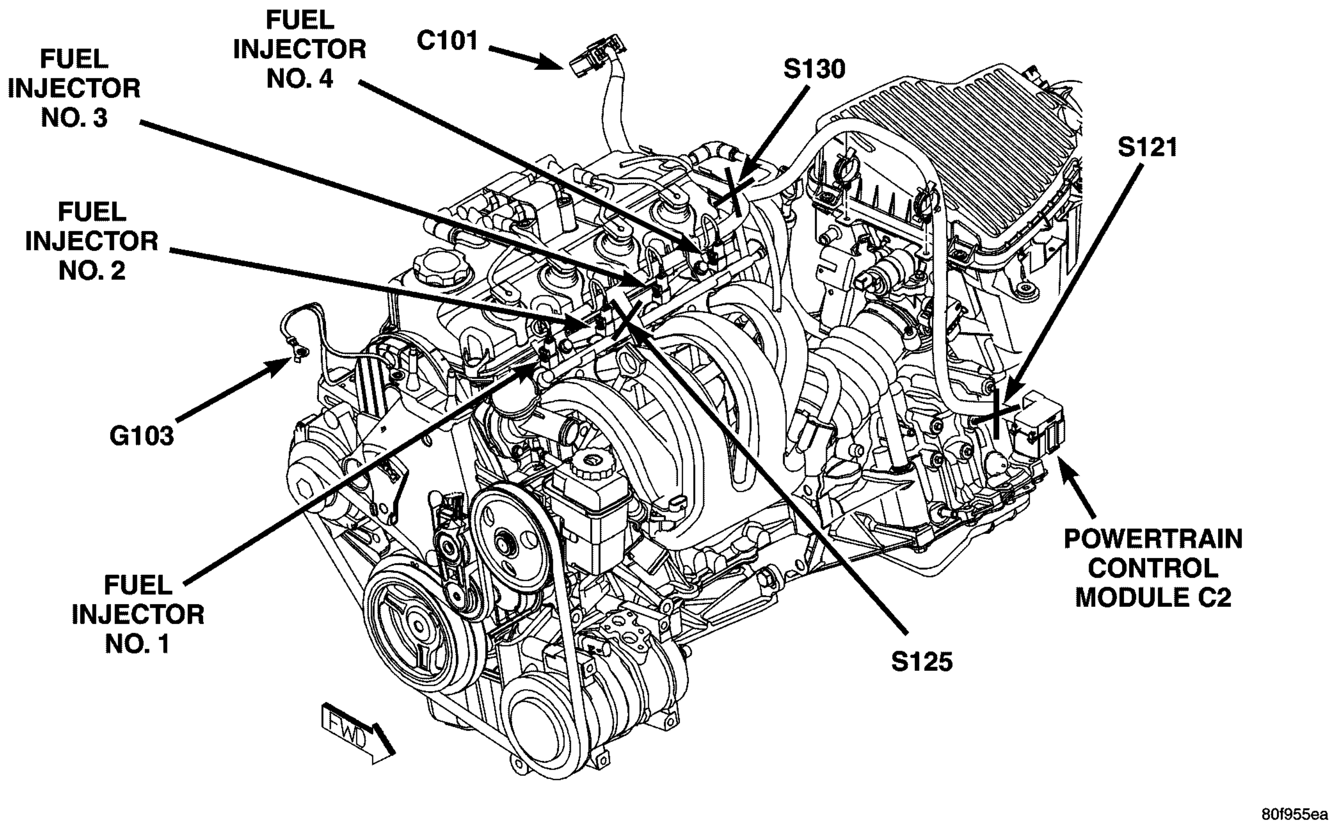


Fig. 39 ENGINE (RIGHT FRONT) - RHD

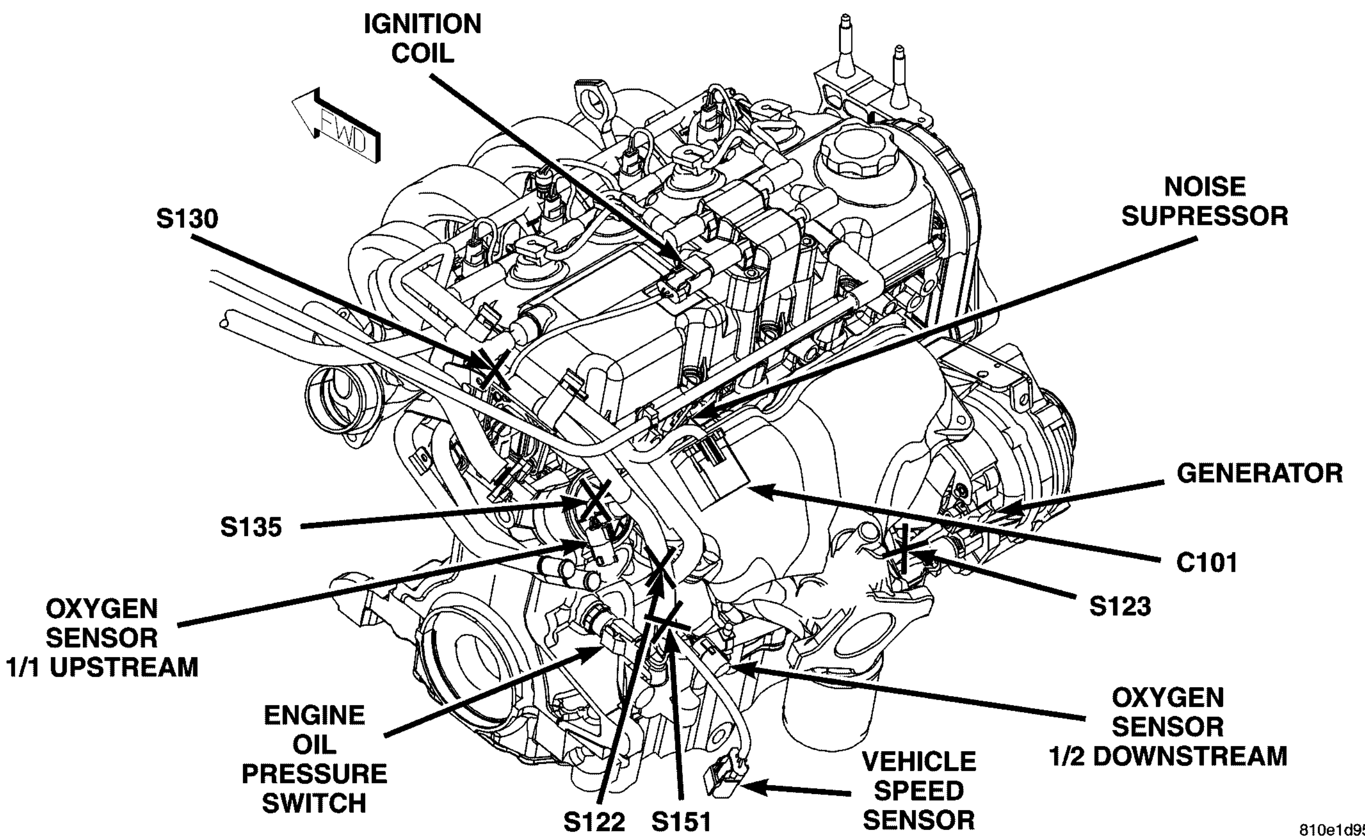


Fig. 40 ENGINE (LEFT REAR) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

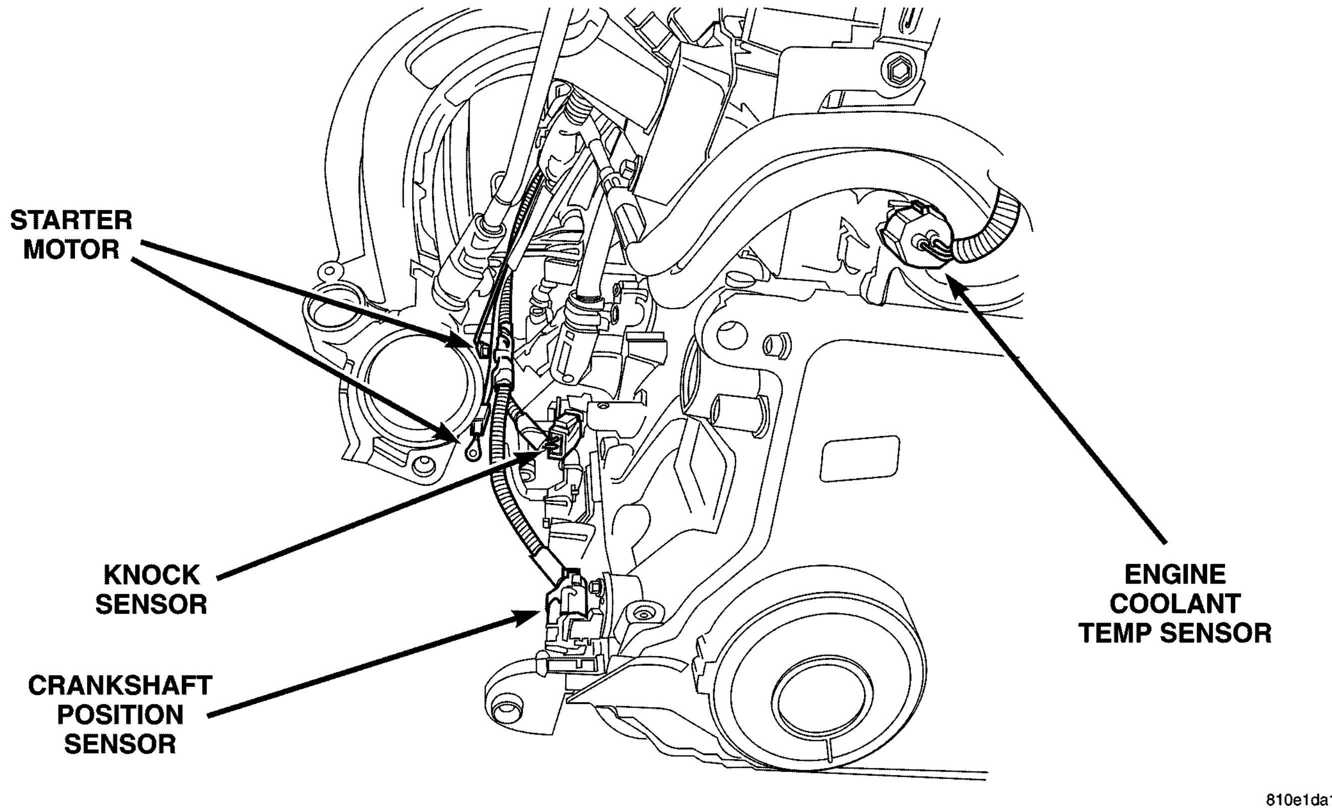


Fig. 41 ENGINE (LEFT FRONT) - RHD

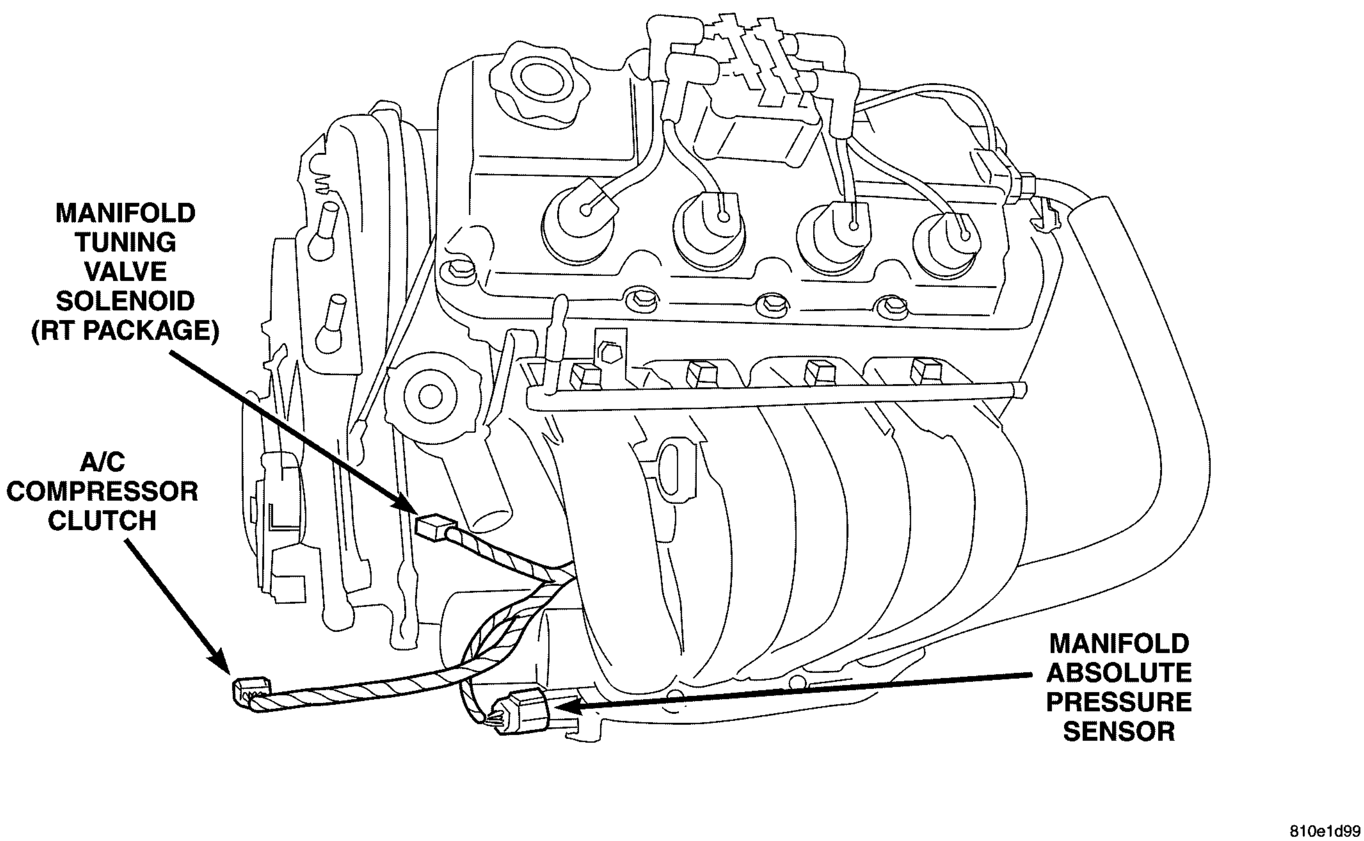


Fig. 42 ENGINE (TOP) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

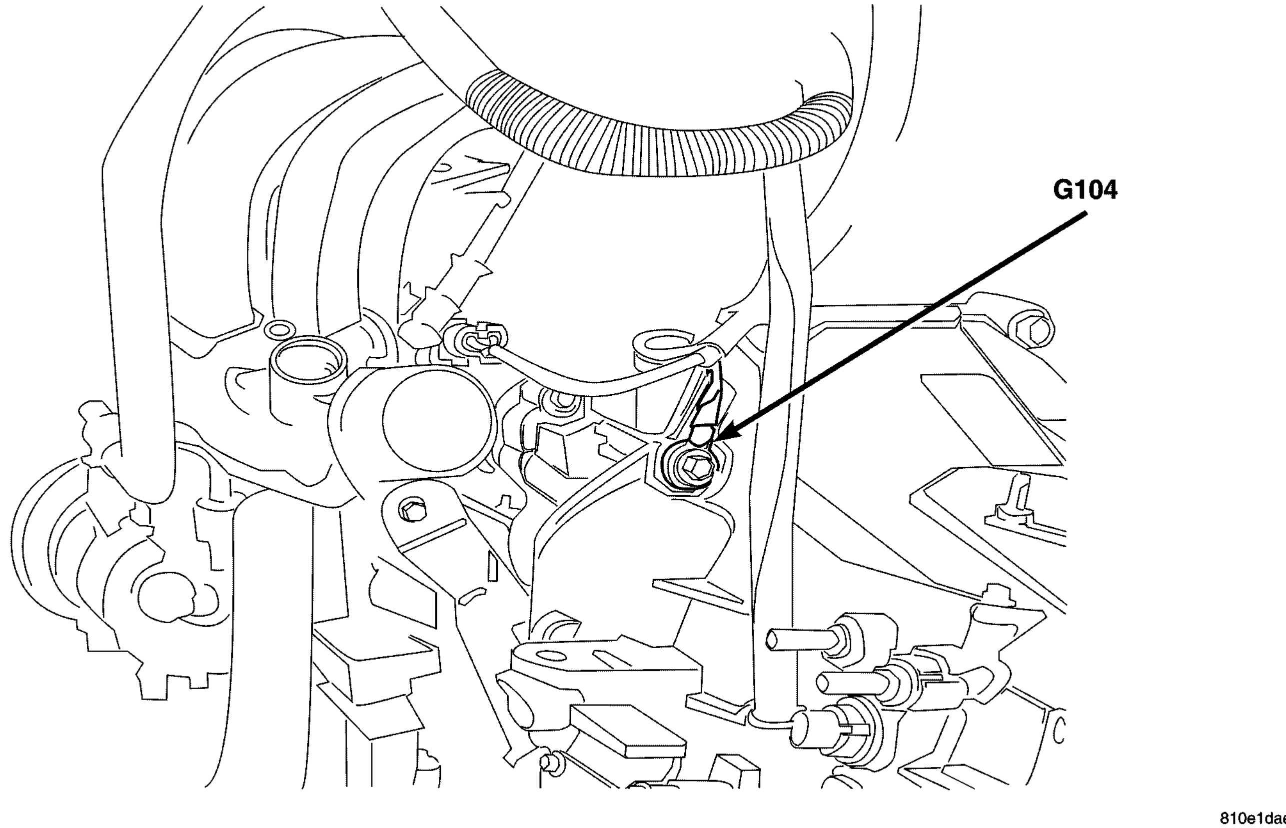


Fig. 43 ENGINE (FRONT) -RHD

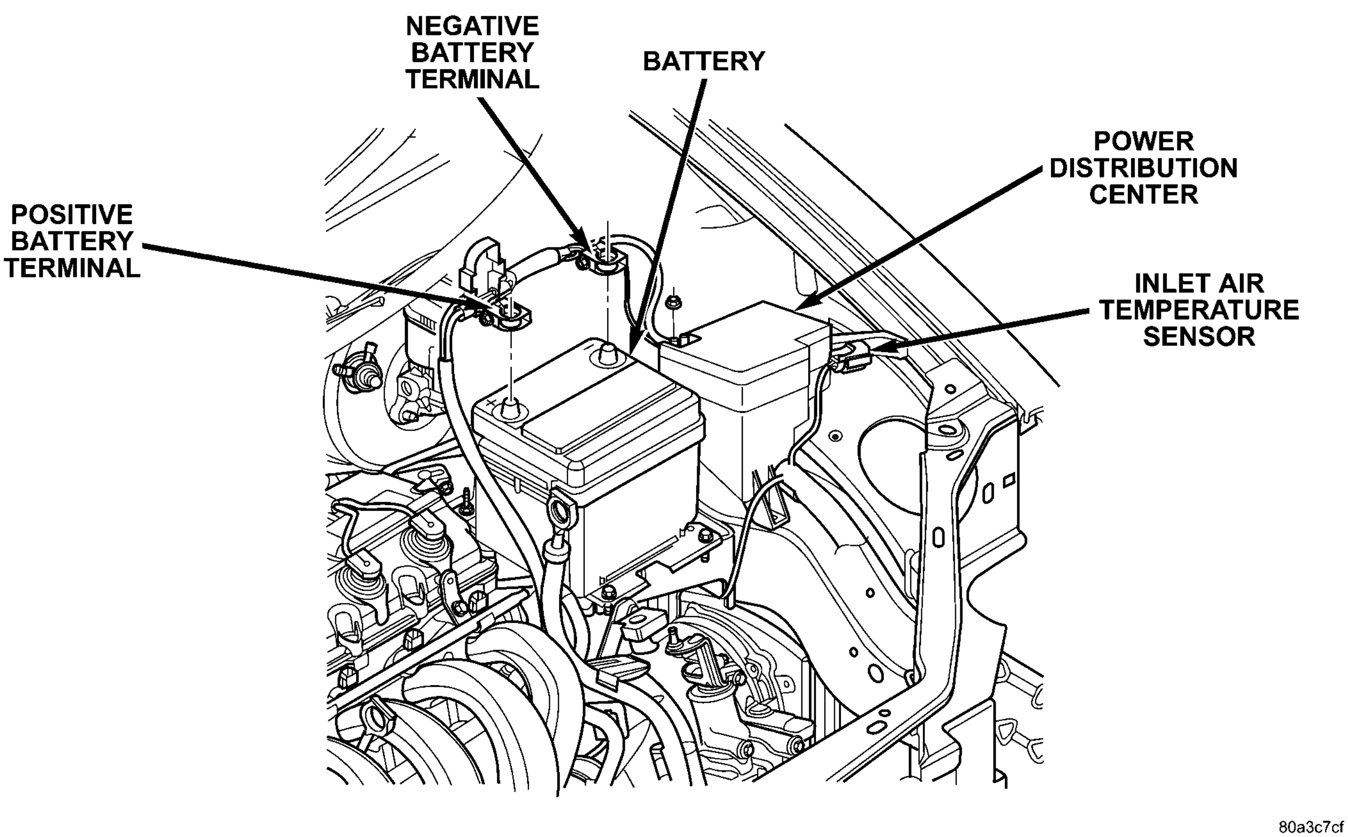


Fig. 44 LEFT SIDE ENGINE - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

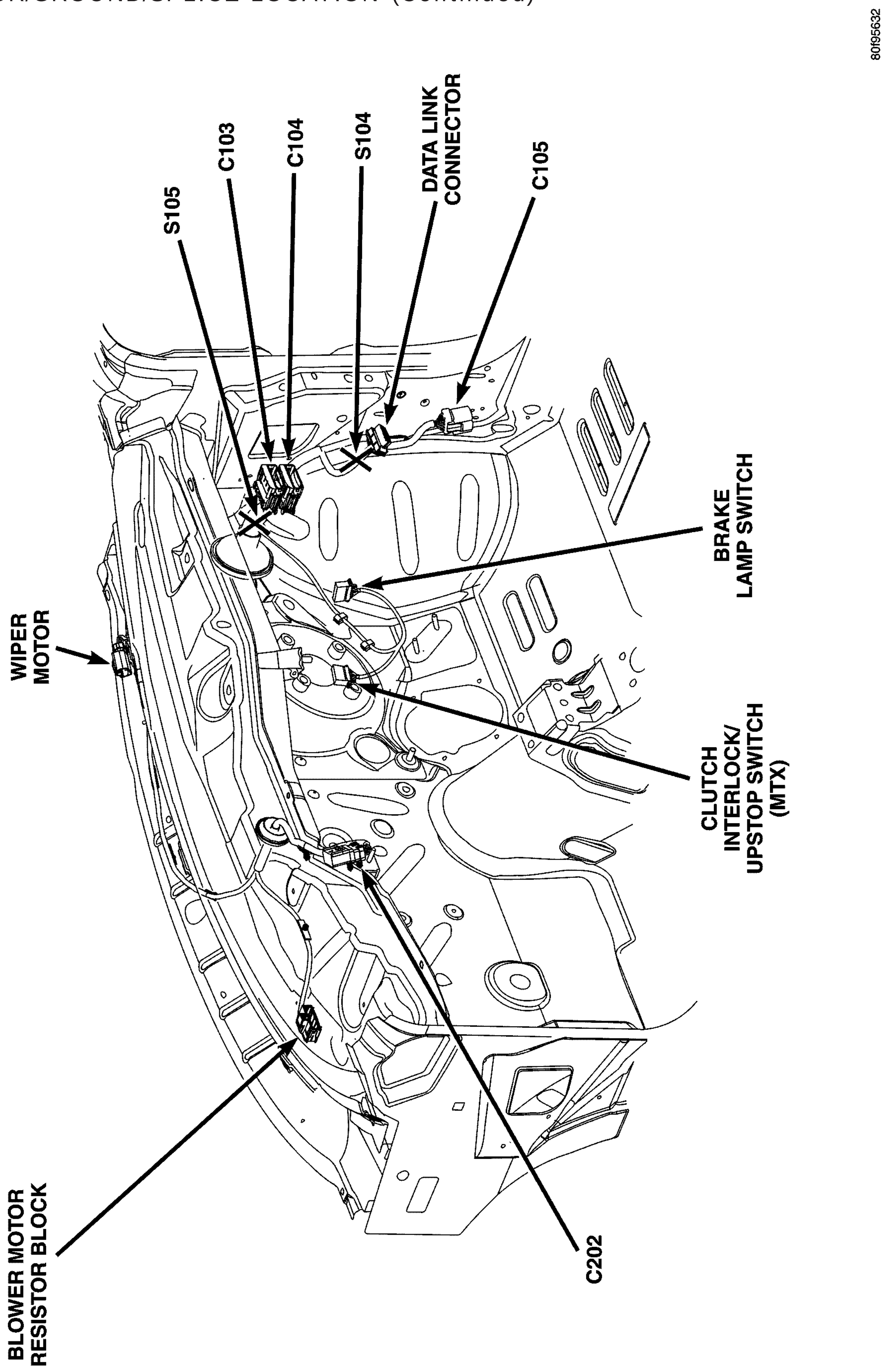


Fig. 45 DASH PANEL/PLENUM - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

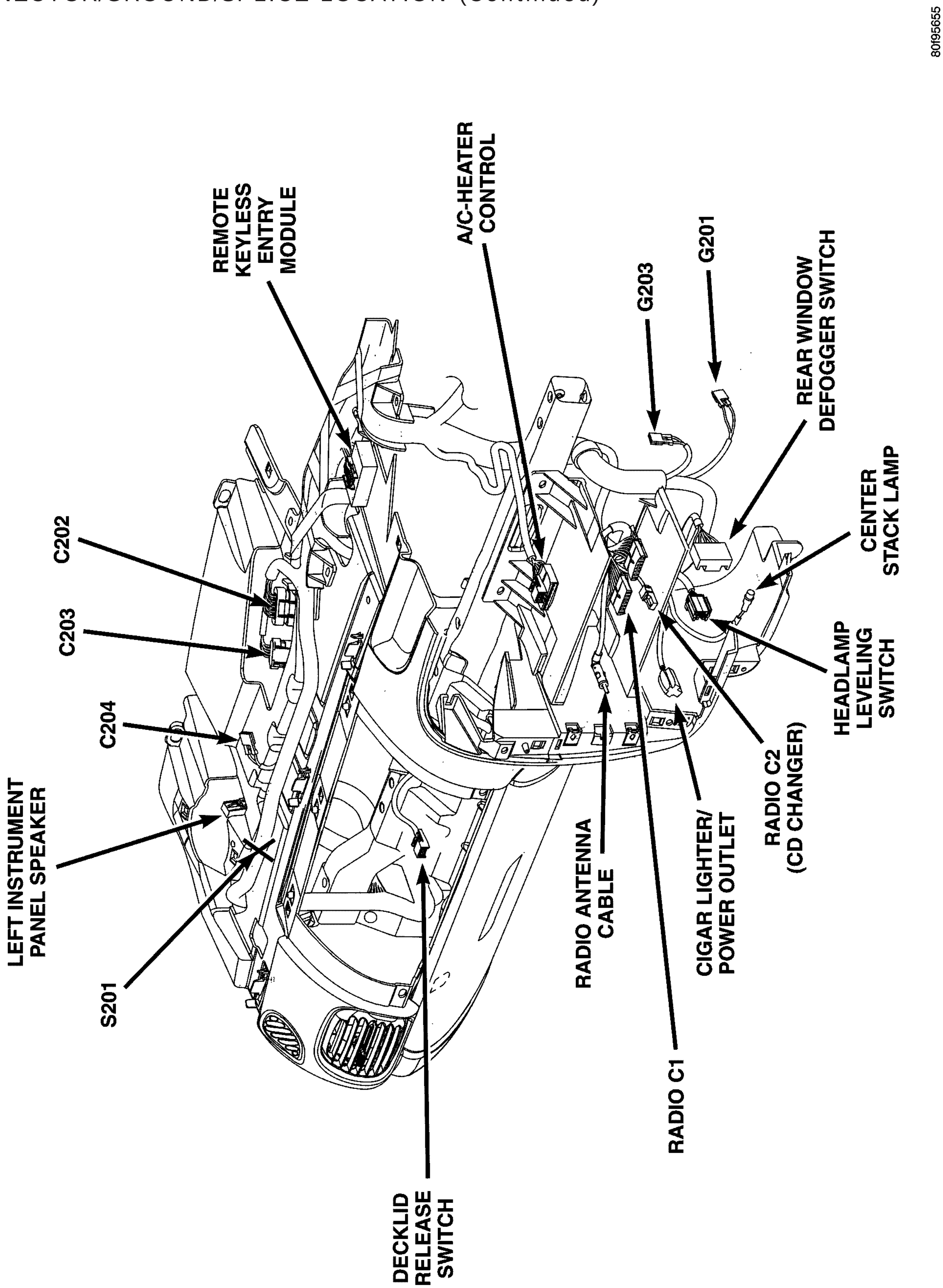


Fig. 46 INSTRUMENT PANEL (LEFT) -RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

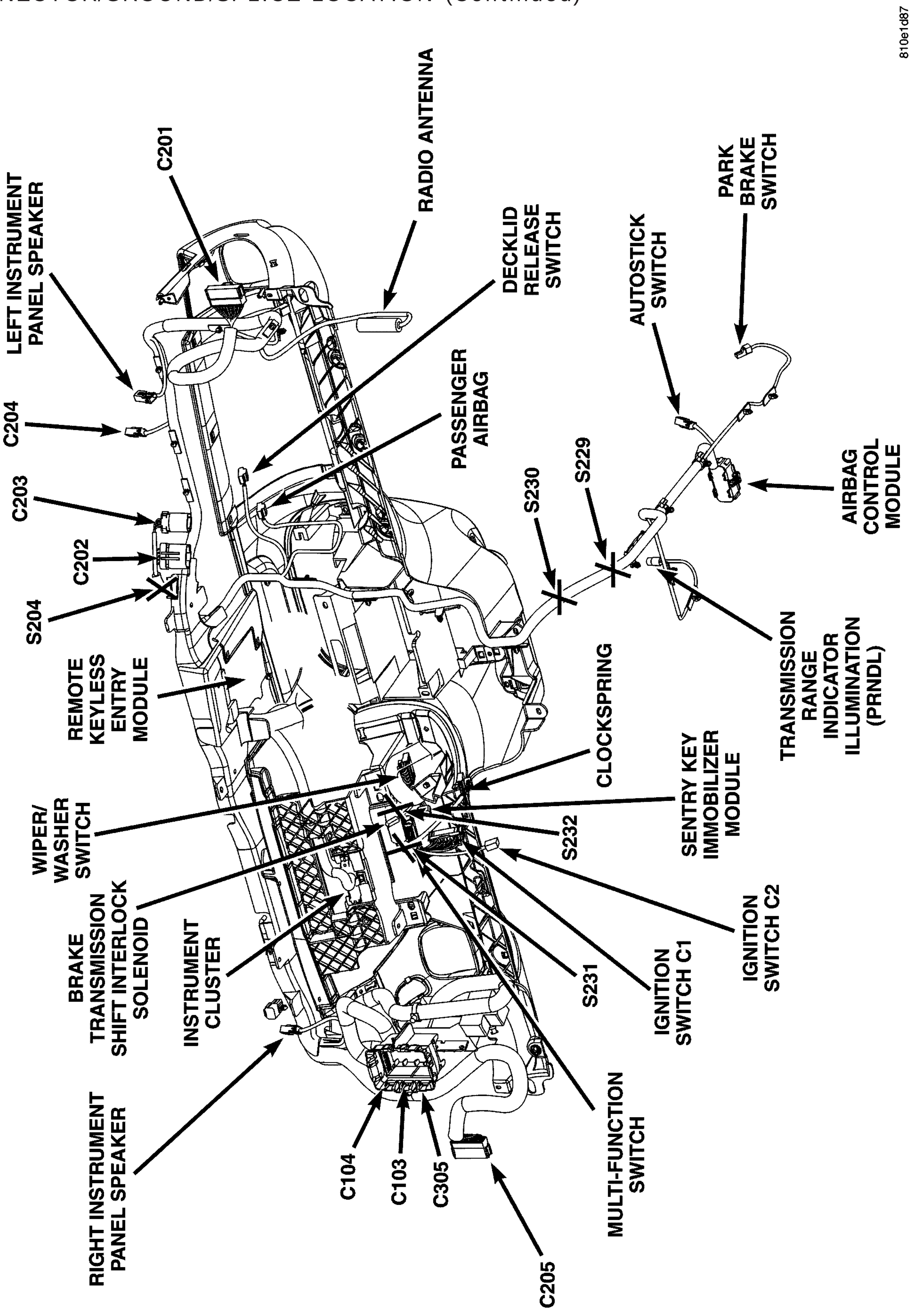


Fig. 47 INSTRUMENT PANEL -RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

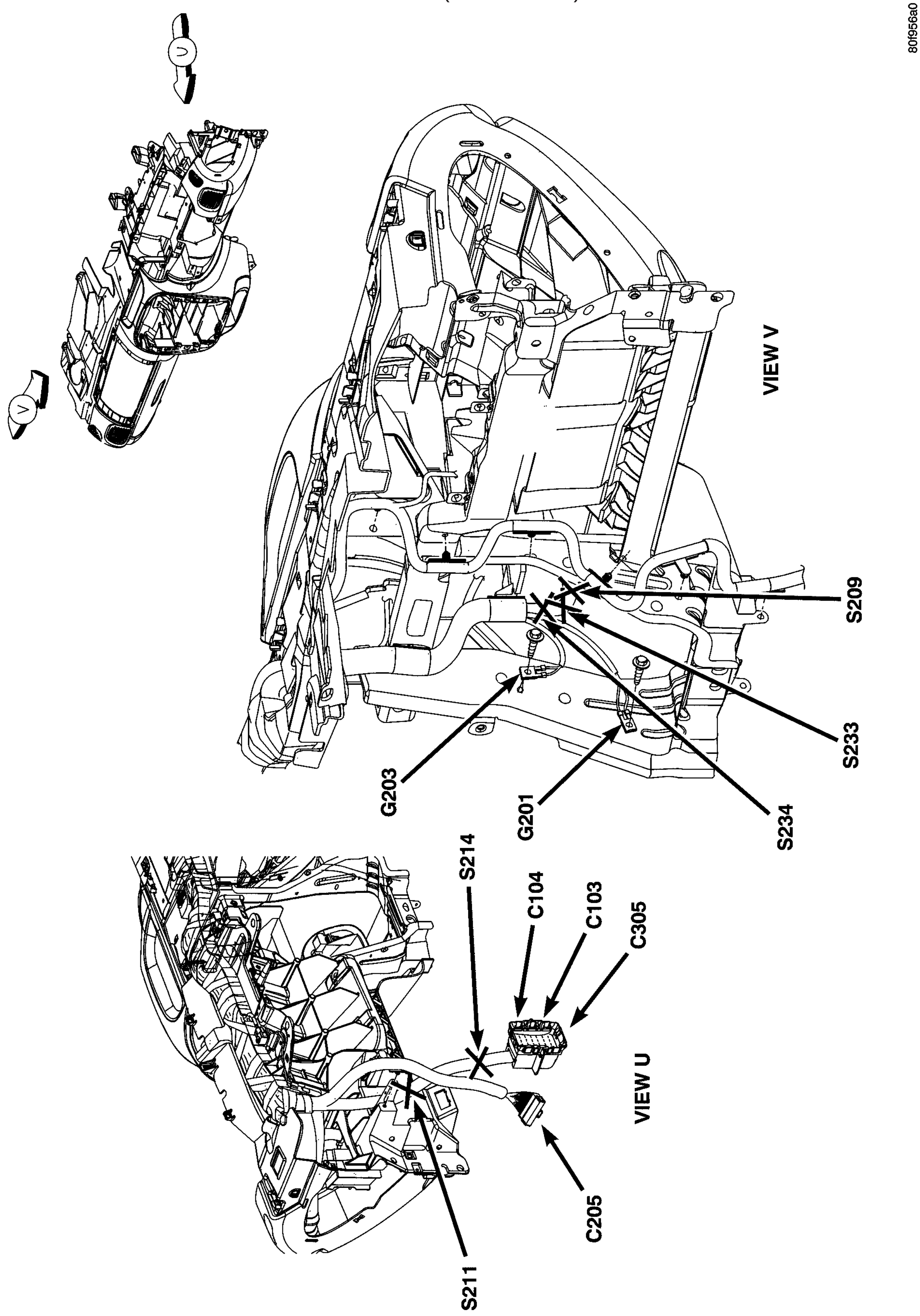


Fig. 48 INSTRUMENT PANEL (SIDES) -RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

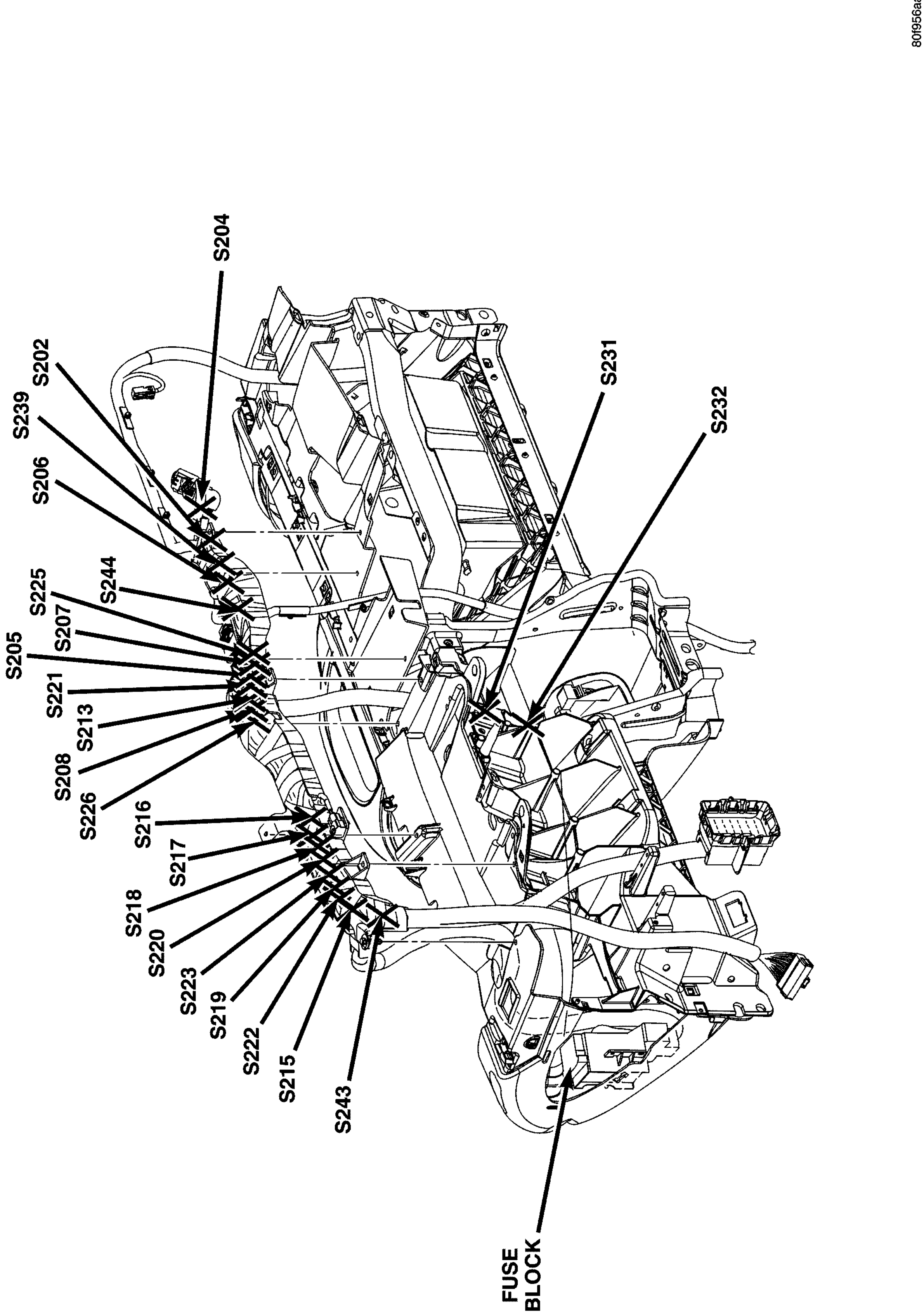


Fig. 49 INSTRUMENT PANEL SPLICES -RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

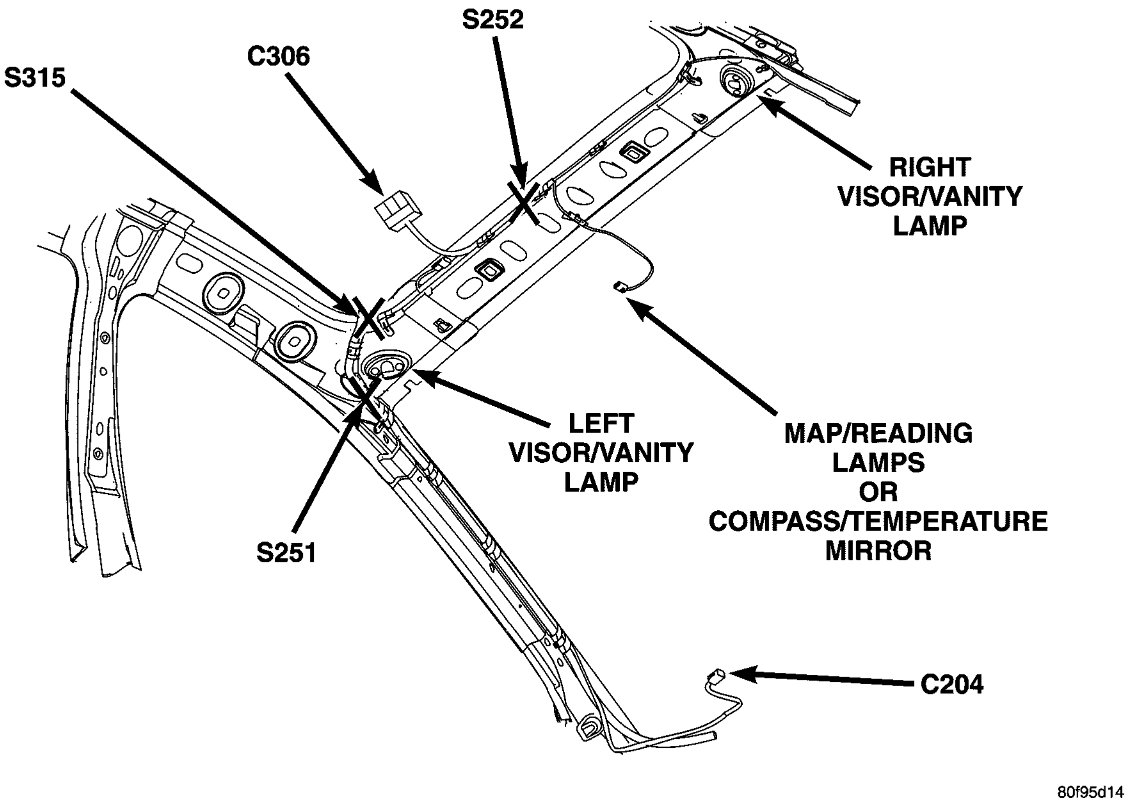


Fig. 50 ROOF - RHD

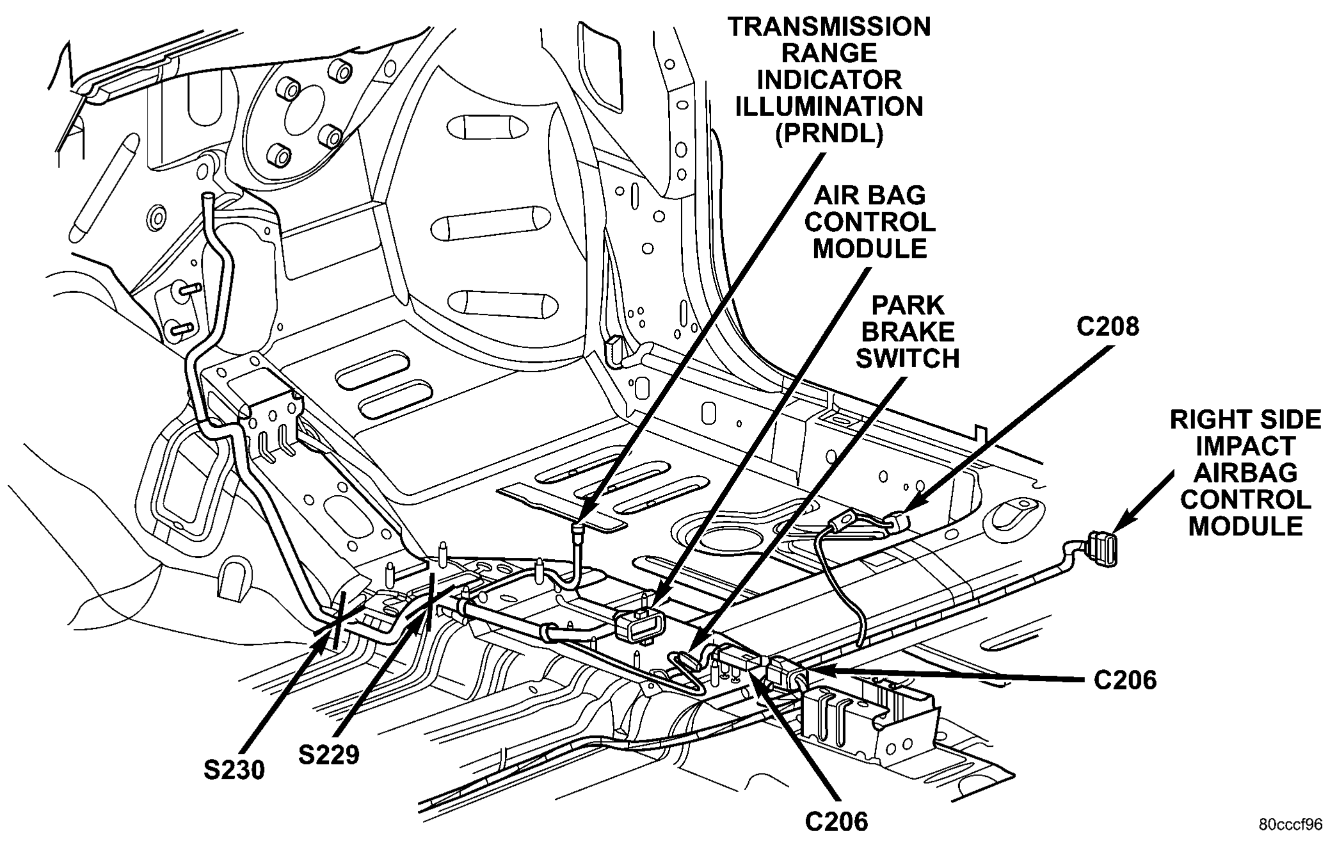


Fig. 51 CENTER CONSOLE - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

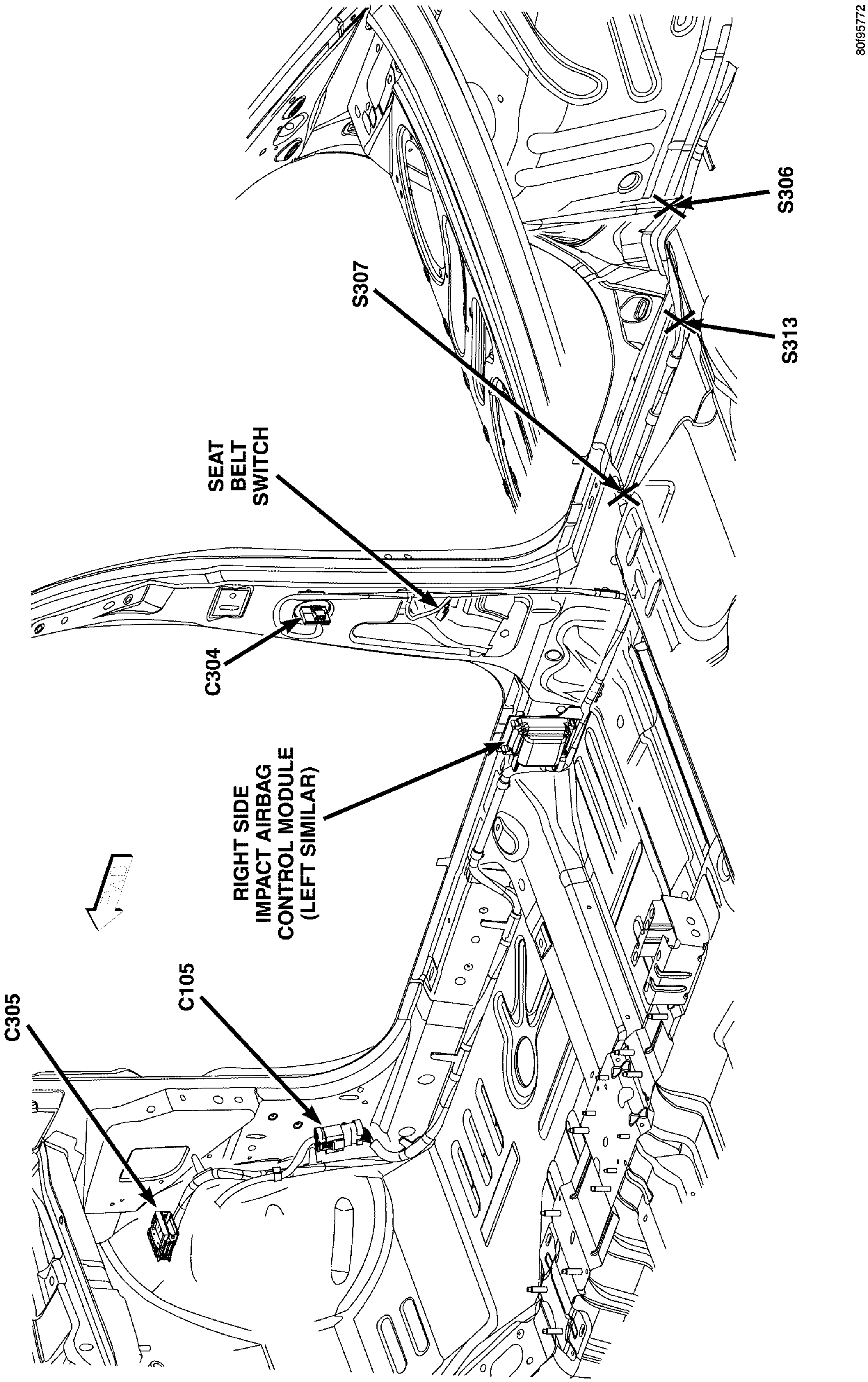


Fig. 52 BODY (RIGHT) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

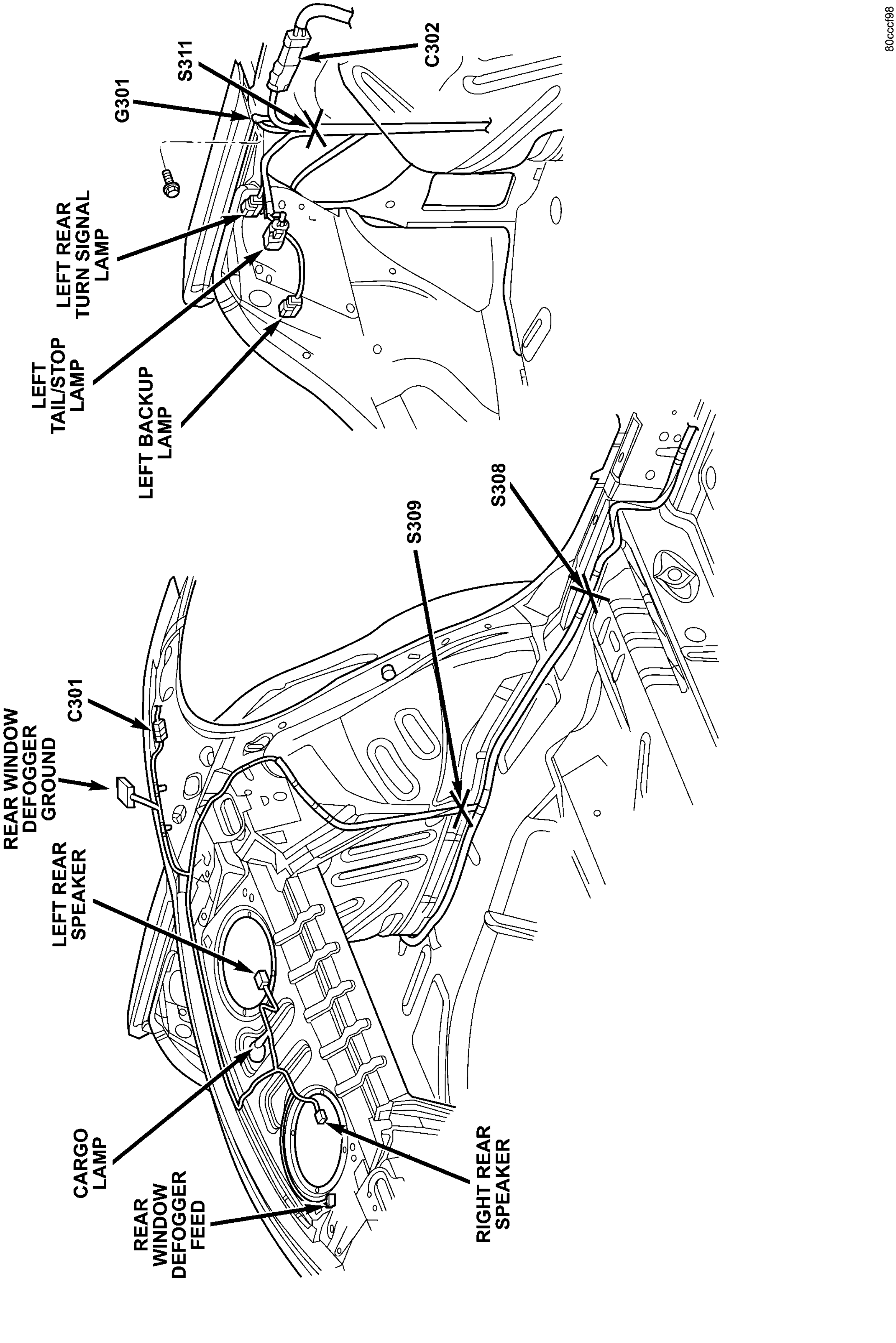


Fig. 53 BODY (LEFT REAR) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

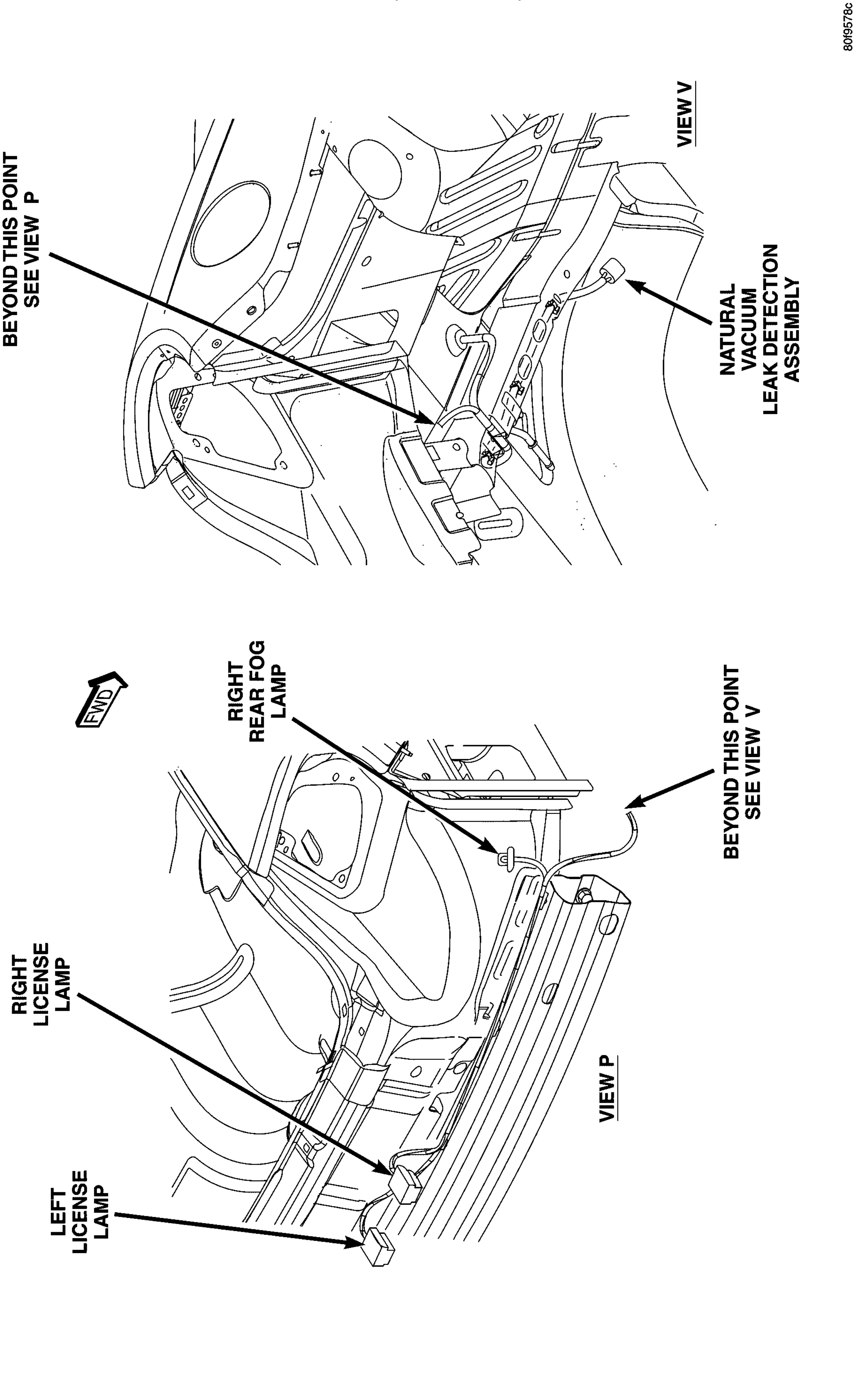


Fig. 54 BODY (REAR) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

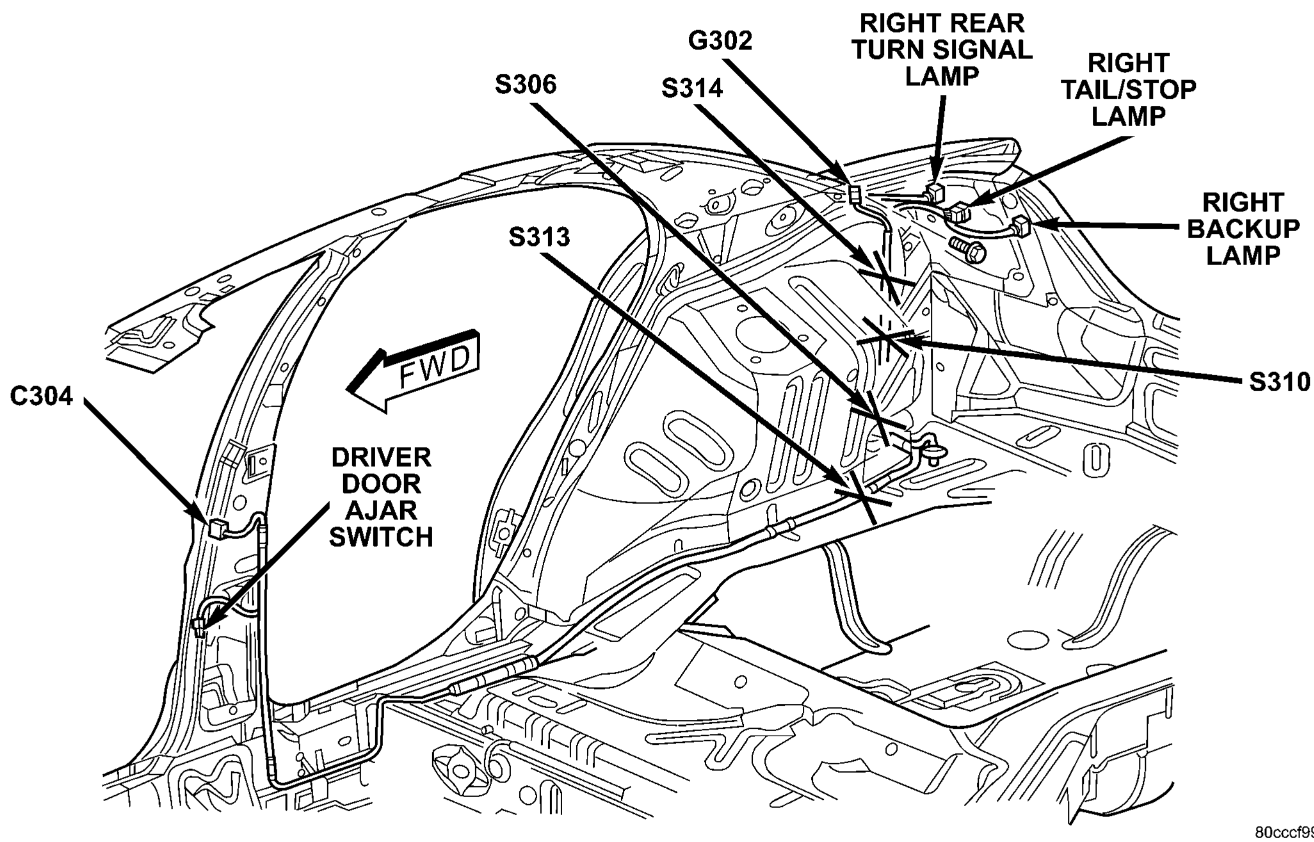


Fig. 55 BODY (RIGHT REAR) - RHD

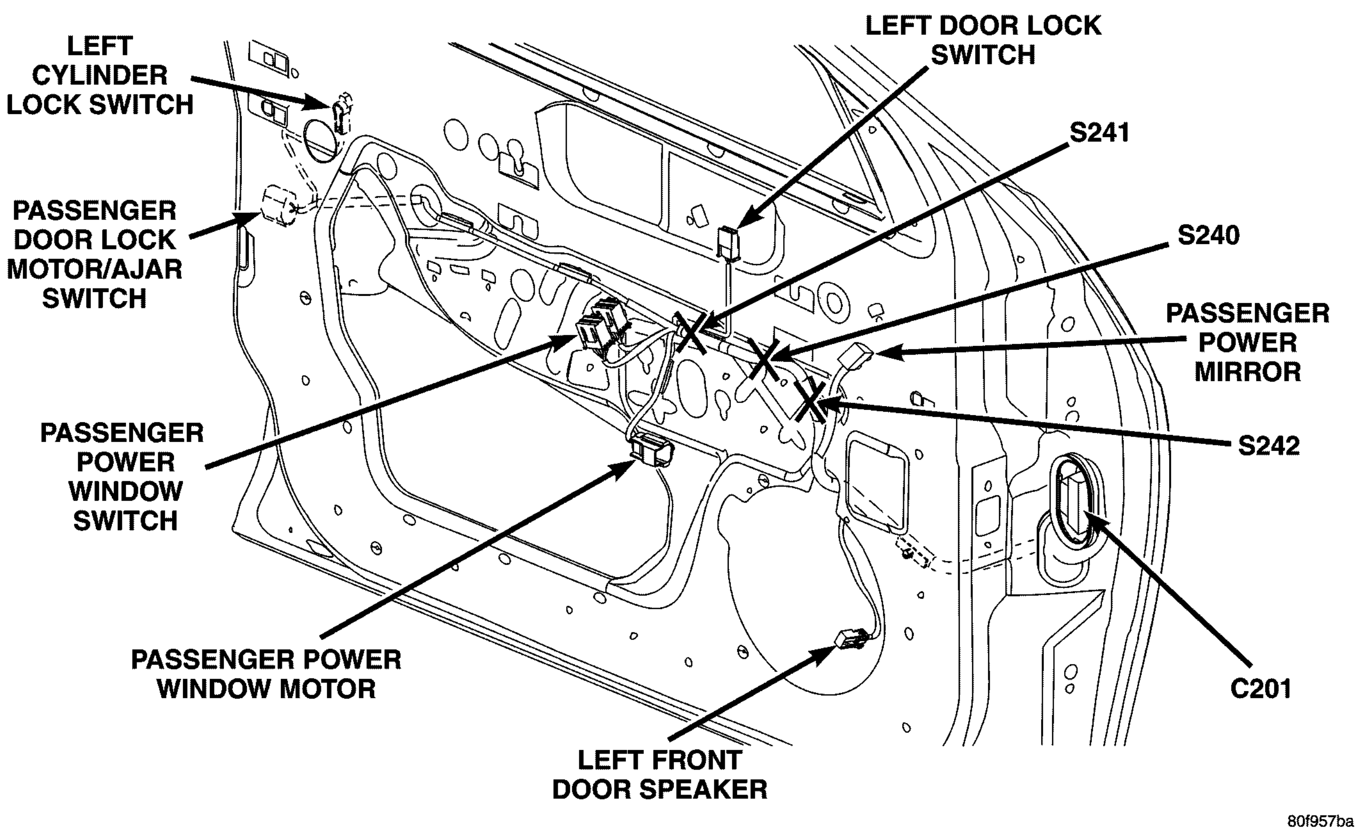


Fig. 56 DOOR (PASSENGER) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

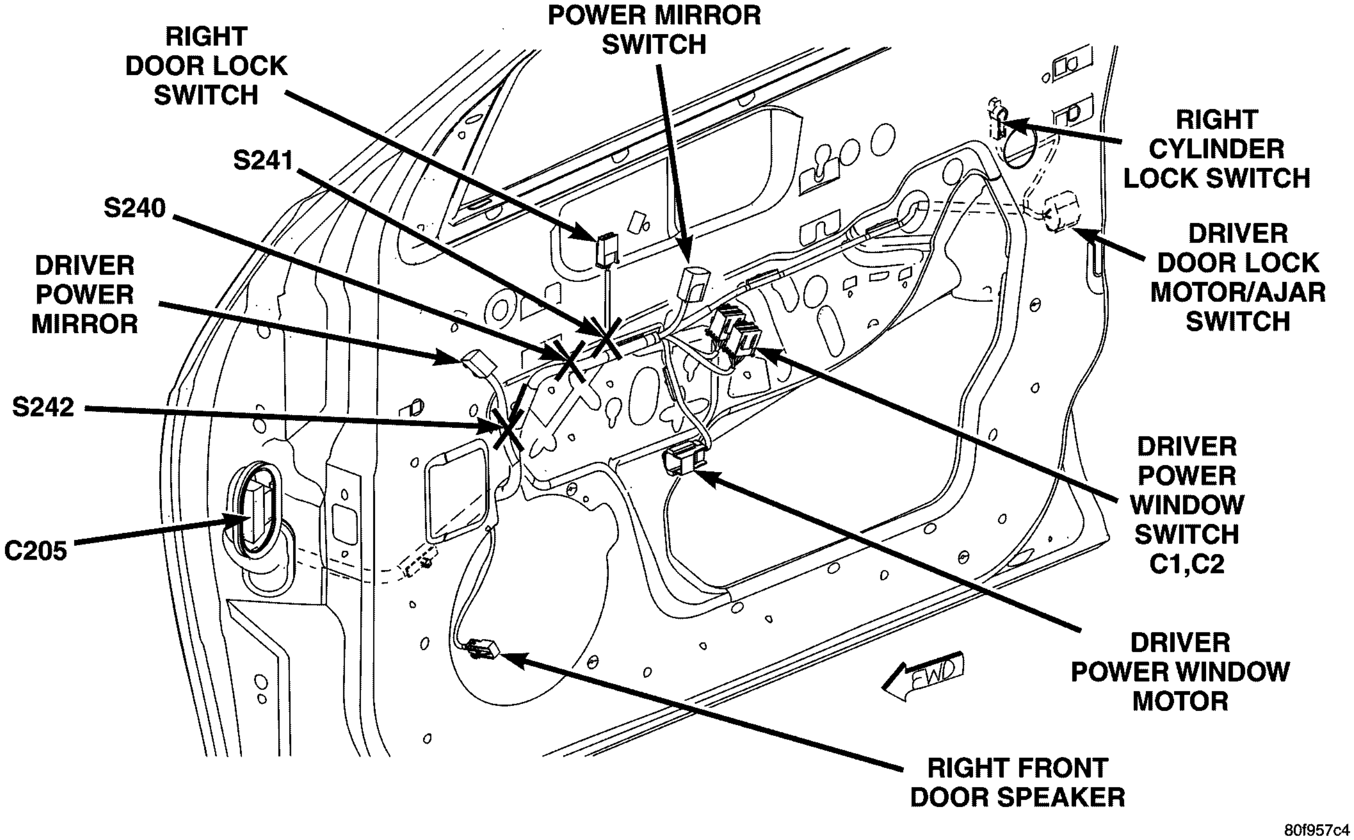


Fig. 57 DOOR (DRIVER) - RHD

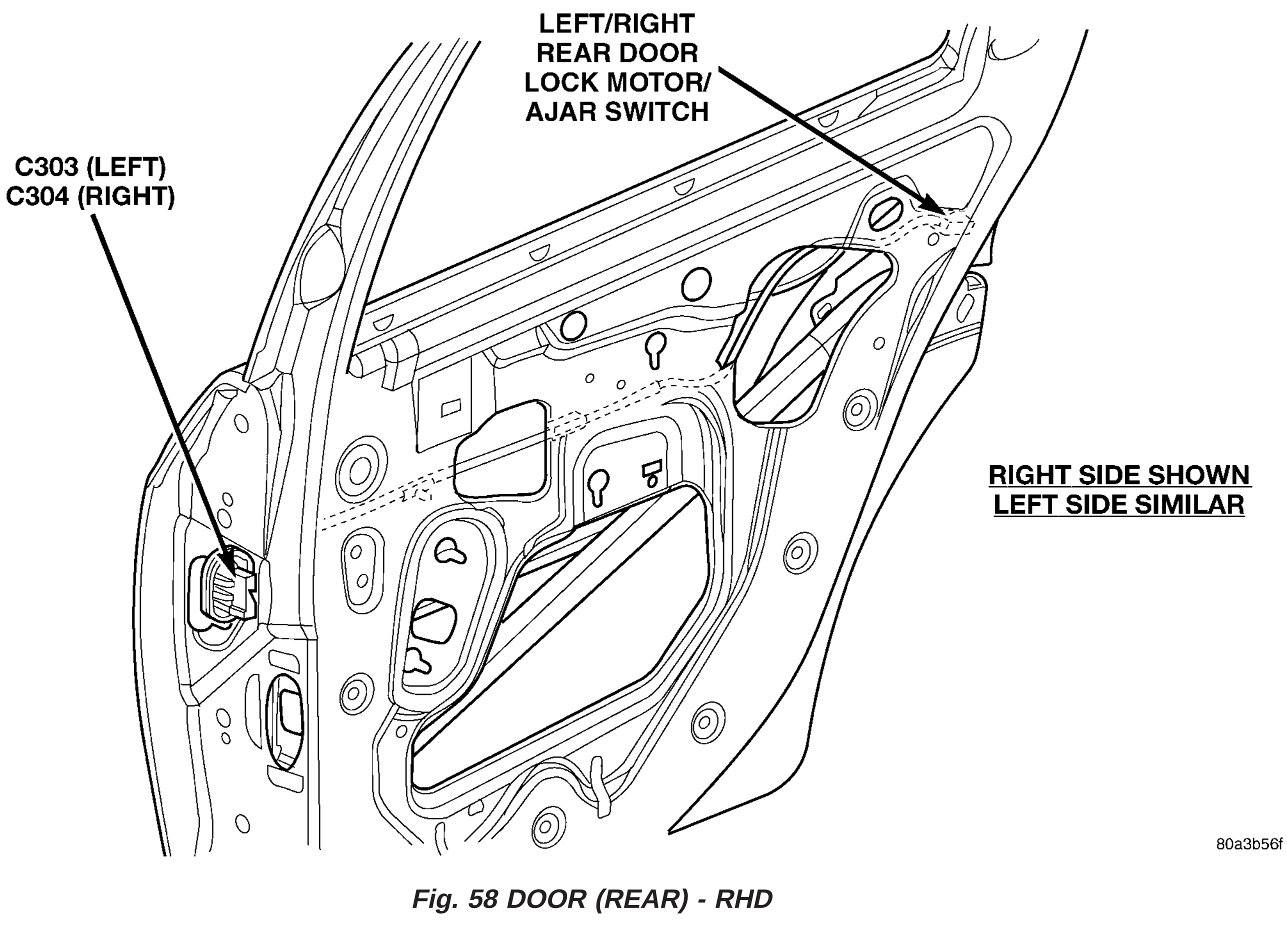


Fig. 58 DOOR (REAR) - RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

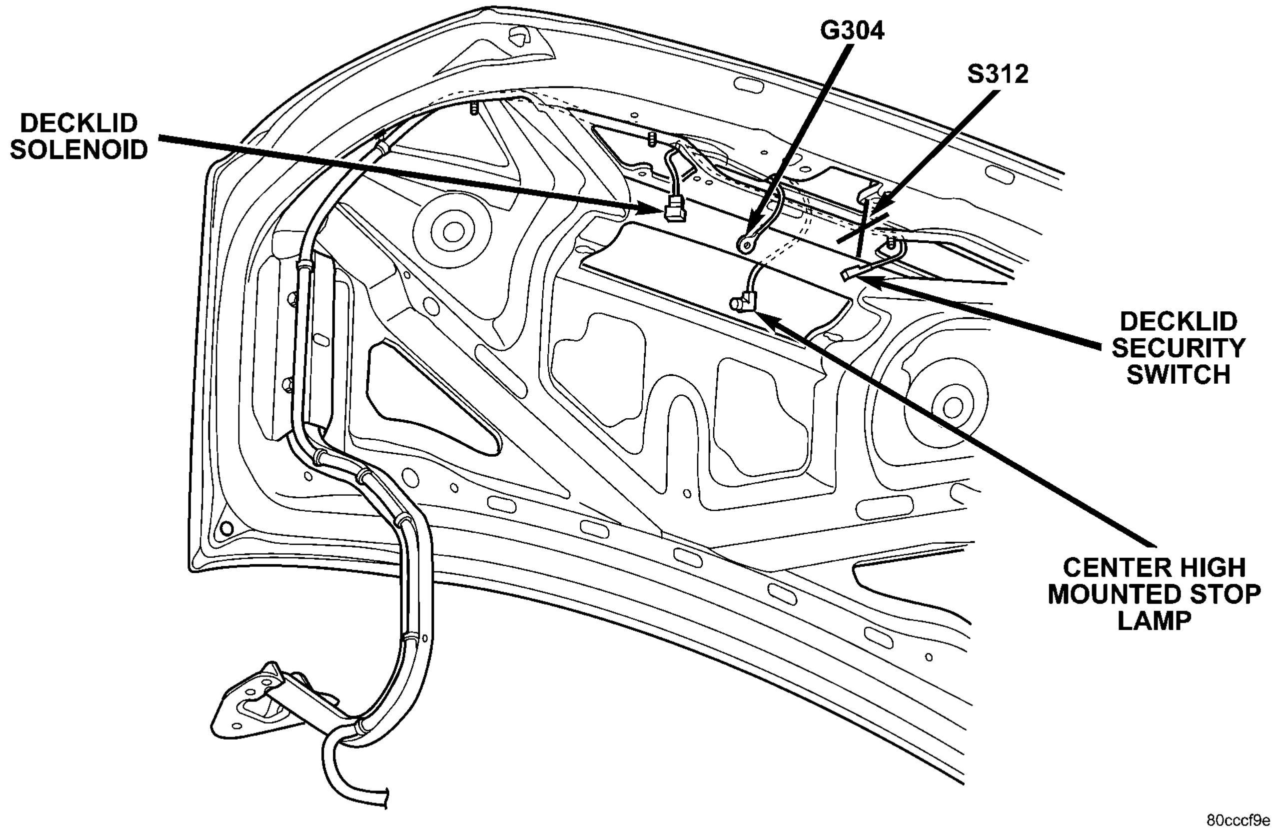


Fig. 59 DECKLID - RHD

8W-97 POWER DISTRIBUTION

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CIGAR LIGHTER OUTLET

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Look inside and note position of the retaining bosses (Fig. 1).

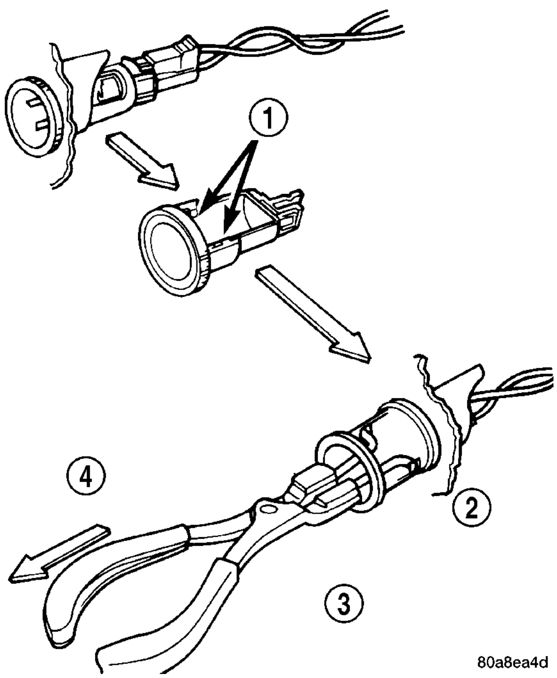

Fig. 1 CIGAR LIGHTER/POWER OUTLET BASE REMOVAL

1 - RETAINING BOSSES ENGAGE PLIERS HERE
2 - PARTIALLY REMOVED
3 - EXTERNAL SNAP-RING PLIERS
4 - PULL BASE OUT THROUGH MOUNTING RING

(3) Using external snap ring pliers with 90 degree tips. Insert pliers with tips against bosses and squeeze forcing bosses out of base.

(4) Pull out the base through mounting ring by gently rocking pliers. A tool can be made to do the same (Fig. 2).

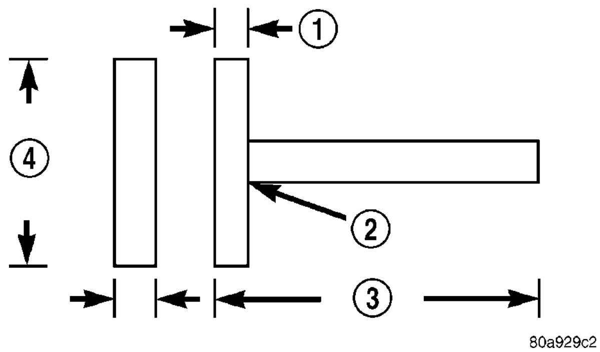

Fig. 2 CIGAR LIGHTER/POWER OUTLET BASE REMOVAL

1 - 2.5 mm (3/32 inches)
2 - WELD
3 - 100 mm (4 inches)
4 - 22.25 TO 22.45 mm (7/8 TO 57/64 inches)

(5) Disconnect the base wires.

(6) Set base aside and remove base mount ring.

INSTALLATION

(1) Position mount ring to the instrument panel and feed the wires through ring. Index the cap and the mount ring with the index tab at 9 o'clock to the key in the instrument panel. Install the ring.

(2) Connect wires to base. Orient base alignment rib at 11 o'clock to mate the groove in mount ring at the same location

(3) Push base into the bezel till it locks.

(4) Install cigar lighter cap and check operation of element.

(5) Connect the battery negative cable.

FUSE BLOCK

DESCRIPTION

An electrical Fuse Block is located in the left end of the instrument panel. It serves to simplify and centralize numerous electrical components, as well as to distribute electrical current to many of the accessory systems in the vehicle.

The Fuse Block is positioned on a mounting bracket up and under the left instrument panel. It is secured by two screws. The fuse block is concealed behind the left instrument panel end cap. The left end cap is a snap-fit access cover that conceals the fuse block fuses. A fuse layout placard is on the back of the end cap to ensure proper fuse identification.

OPERATION

The fuse block houses blade-type fuses and automatic resetting circuit breakers. Internal connection of all the fuse block circuits is accomplished by an intricate network of hard wiring and bus bars.

The fuses and circuit breakers are available for service replacement. The fuse block unit cannot be repaired and is only serviced as an assembly. If any circuit or the fuse block housing is faulty or damaged, the entire fuse block and instrument panel wire harness assembly must be replaced.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY 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.

The Fuse Block is serviced with the instrument panel wire harness. If service is required to the fuse block, the entire instrument panel harness must be replaced.

(1) Remove the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(2) With the instrument panel removed, disassemble the instrument panel enough to gain access to all screws and connectors.

(3) Remove instrument panel wire harness with fuse block.

INSTALLATION

(1) Install the instrument panel wire harness to the instrument panel.

(2) Install all items removed from the instrument panel to gain access to the wire harness.

(3) Install the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

POWER DISTRIBUTION CENTER

DESCRIPTION

The Power Distribution system for this vehicle provides a safe, reliable, centralized and convenient means to access distribution of the electrical current required to operate all of the electrical systems. At the same time, these systems were designed to provide centralized locations for conducting diagnosis of faulty circuits, and for sourcing the additional current requirements of many aftermarket vehicle accessory and convenience items.

The power distribution system for this vehicle consist of the following components:

- Fuses
- Fuse cartridges
- Fusible links
- Automatic resetting circuit breakers
- Relays
- Flashers
- Timers
- Circuit splice blocks
- Power Distribution Center (PDC)

All of the electrical current distributed throughout this vehicle is directed through the Power Distribution Center (PDC). The molded plastic PDC housing is located in the left front corner of the engine compartment, just rearward of the air cleaner housing and left of the battery.

All of the current from the generator cable connection goes to the battery through a 140 ampere fusible link that is secured with a nut to the positive battery cable terminal. The PDC houses up to ten cartridge fuses, which replace all in-line fusible links. The PDC also houses up to twelve mini fuses (blade-type), up to three full International Standards Organization (ISO) relays, and up to eight mini International Standards Organization (ISO) relays. Internal connection of all the PDC circuits is accomplished by an intricate network of hard wiring and bus bars. For complete circuit diagrams, refer to the appropriate wiring information.

POWER DISTRIBUTION CENTER (Continued)

REMOVAL

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the battery.

(3) Remove the air cleaner fasteners and position it away from the PDC.

(4) Remove PDC mounting fasteners and remove bottom cover.

(5) **Note the location of the fuses and relays.** Remove all the fuses and relays from the PDC.

(6) Remove the terminals from the cavities in the PDC.

INSTALLATION

(1) Insert terminals into the PDC.

(2) Install fuses and relays.

(3) Install bottom cover and install PDC mounting fasteners.

(4) Position air cleaner into place and install mounting fasteners.

(5) Install battery.

(6) Connect battery negative cable.

ENGINE

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ENGINE 2.0L SOHC

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ENGINE 2.0L SOHC

DESCRIPTION

The 2.0 Liter (122 cu. in.) in-line four cylinder engine is a single over head camshaft with hydraulic lash adjusters and four valves per cylinder design (Fig. 1). The engine does not have provisions for a free wheeling valve train.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the left side of the engine block at the bedplate/engine block parting line near the crankshaft position sensor (Fig. 2).

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

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 Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

ENGINE 2.0L SOHC (Continued)

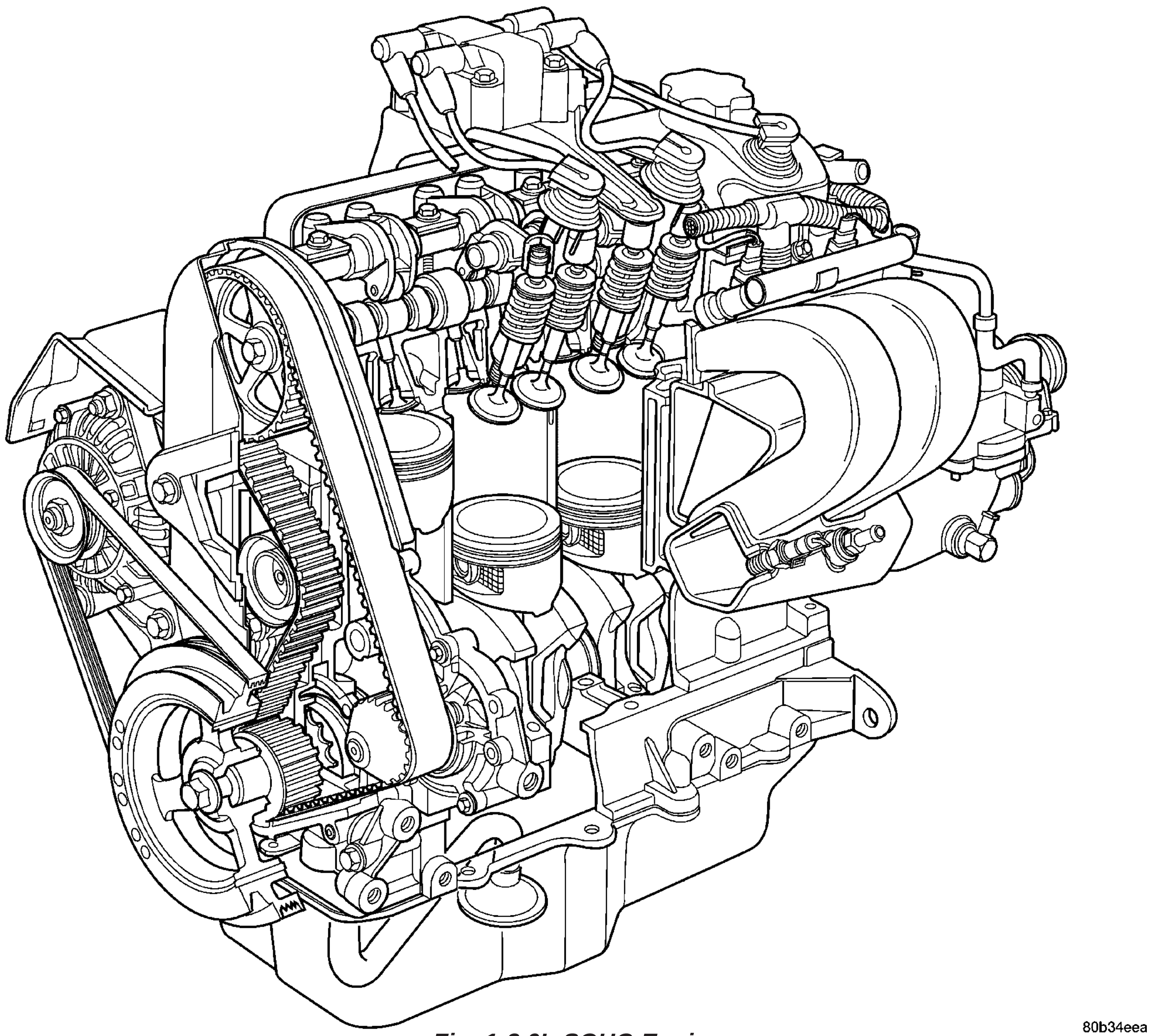


Fig. 1 2.0L SOHC Engine

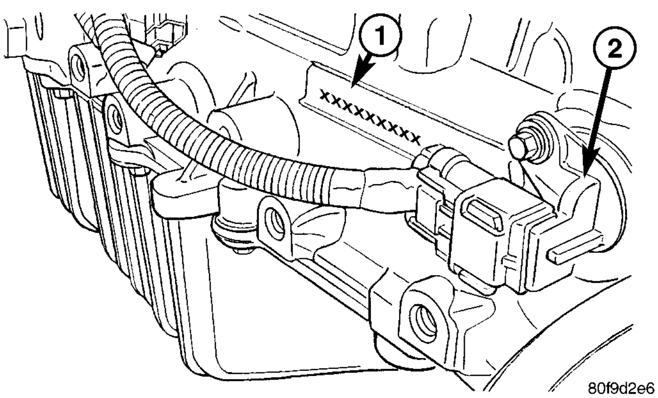


Fig. 2 Engine Identification

1 - ENGINE IDENTIFICATION LOCATION
2 - CRANKSHAFT POSITION SENSOR

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

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
- Hydraulic Lash Adjuster Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE 2.0L SOHC (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

ENGINE 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE 2.0L SOHC (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Dirt in tappets/lash adjusters.	5. Replace rocker arm/hydraulic lash adjuster assembly.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn tappets/lash adjusters.	7. Install new rocker arm/hydraulic lash adjuster assembly.
	8. Worn valve guides.	8. Ream guides and install new valves with oversize stems.
	9. Excessive runout of valve seats on valve faces.	9. Grind valve seats and valves.
	10. Missing adjuster pivot.	10. Replace rocker arm/hydraulic lash adjuster assembly.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	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. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Misaligned connecting rods.	7. Replace bent connecting rods.

ENGINE 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	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. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. 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 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. Oil pump relief valve stuck.	7. Remove valve and inspect, clean, or replace.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	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 as necessary.

ENGINE 2.0L SOHC (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Ream guide(s) and replace valve(s) with oversize valve(s) and seal(s).
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

DIAGNOSIS AND TESTING - 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 PRESSURE 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 pressure 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, with 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 coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

DIAGNOSIS AND TESTING - 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) Remove the Auto Shutdown (ASD) relay from the PDC.

(5) Be sure throttle blade is fully open during the compression check.

(6) Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure

ENGINE 2.0L SOHC (Continued)

transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

(7) Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.

(8) Repeat the previous step for all remaining cylinders.

(9) Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.

(10) If one or more cylinders have abnormally low compression pressures, repeat the compression test.

(11) 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.**

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching 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 center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

STANDARD PROCEDURE - HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the 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 re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the 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) Install a new oil filter.

(11) Fill engine with specified amount of approved oil.

(12) Connect negative battery cable.

(13) Start engine and check for any leaks.

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **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 which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce

ENGINE 2.0L SOHC (Continued)

tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

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 material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material 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 towel. 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 material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush (Fig. 3)

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (Fig. 3)
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (Fig. 3)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

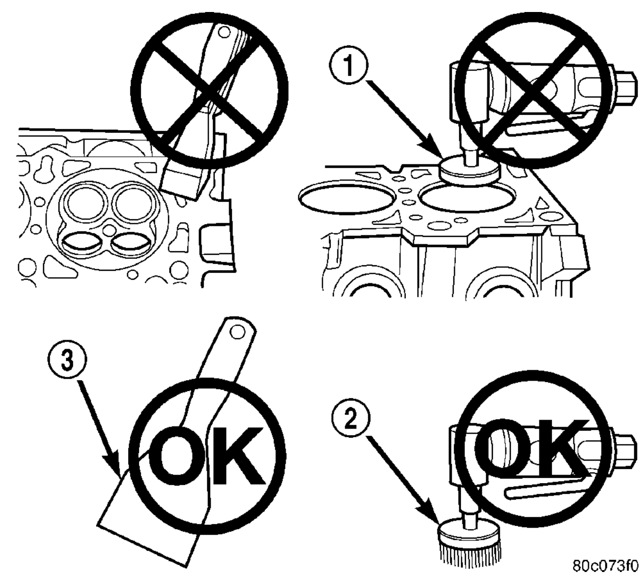


Fig. 3 Proper Tool Usage For Surface Preparation

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

ENGINE 2.0L SOHC (Continued)

STANDARD PROCEDURE - MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

(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. 4). (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.

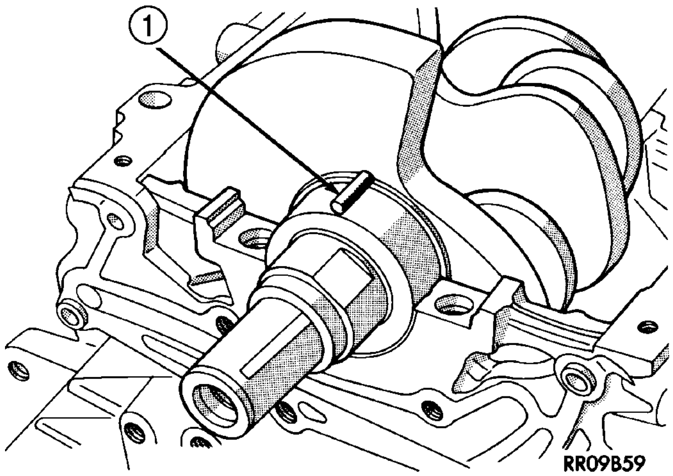


Fig. 4 Plastigage Placed in Lower Shell—Typical

1 - PLASTIGAGE

(3) Remove the bearing cap and compare the width of the flattened Plastigage 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. Compare clearance measurements to specs found in engine specifications (Refer to 9 - 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.

(4) Install the proper crankshaft bearings to achieve the specified bearing clearances.

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 5).

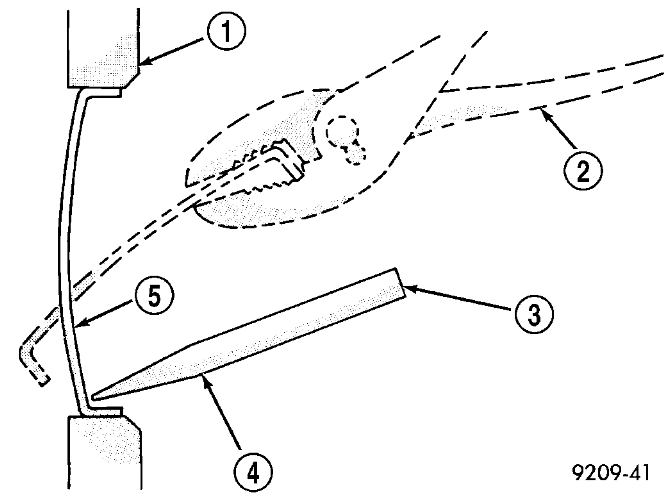


Fig. 5 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly 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 Mopar® Stud and Bearing Mount. 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 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

REMOVAL - ENGINE ASSEMBLY

(1) Perform fuel pressure release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE). Remove fuel line to fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/ QUICK CONNECT FITTING - STANDARD PROCEDURE).

(2) Disconnect and remove battery and tray.

(3) Drain cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).

ENGINE 2.0L SOHC (Continued)

(4) Discharge air conditioning system (if equipped) (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(5) Disconnect the following:

(a) Air intake duct at intake manifold

(b) Throttle cables

(c) Electrical connectors from throttle body

(6) Remove air cleaner housing assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(7) Remove radiator upper hose.

(8) Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(9) Remove radiator lower hose.

(10) **Automatic Transmission equipped vehicles:**

(a) Using a blade or suitable hose cutter, cut transaxle oil cooler lines off flush with transmission fittings. Plug lines and fittings to prevent debris from entering transaxle or cooler circuit. A service splice kit will be installed upon reassembly.

(b) Disconnect transmission electrical connectors.

(c) Disconnect transmission shift linkage.

(11) **Manual Transmission equipped vehicles:**

(a) Using Special Tool 6638A, disconnect clutch hydraulic line.

(b) Disconnect transmission shift linkage.

(c) Disconnect transmission electrical connectors.

(12) Disconnect engine wiring harness.

(13) Disconnect and remove powertrain control module (PCM).

(14) Disconnect positive cable from power distribution center (PDC) and ground wire from vehicle body.

(15) Disconnect the body-to-engine ground wire at the right side strut tower.

(16) Disconnect heater hoses.

(17) Disconnect vacuum hose from brake booster.

(18) Disconnect coolant reserve/recovery hose.

(19) Remove power steering pump drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(20) Siphon as much fluid as possible from the power steering fluid reservoir.

(21) Disconnect power steering lines from power steering pump. Remove the power steering pump/reservoir.

(22) Disconnect lines and remove air conditioning compressor (if equipped) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).

(23) Hoist vehicle.

(24) Remove front wheels.

(25) Remove accessory drive belt splash shield.

(26) Remove generator drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(27) Drain engine oil.

(28) Remove axle shafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).

(29) Remove screws attaching power steering cooler (if equipped) and relocate cooler to provide engine removal clearance.

(30) Disconnect downstream oxygen sensor connector.

(31) Disconnect exhaust system from exhaust manifold.

(32) Disconnect exhaust system isolators and move exhaust rearward.

(33) Remove lower engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(34) Remove generator, lower bracket, and upper mounting bolt.

(35) Remove structural collar, intake support bracket, and dust cover (Fig. 6) (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).

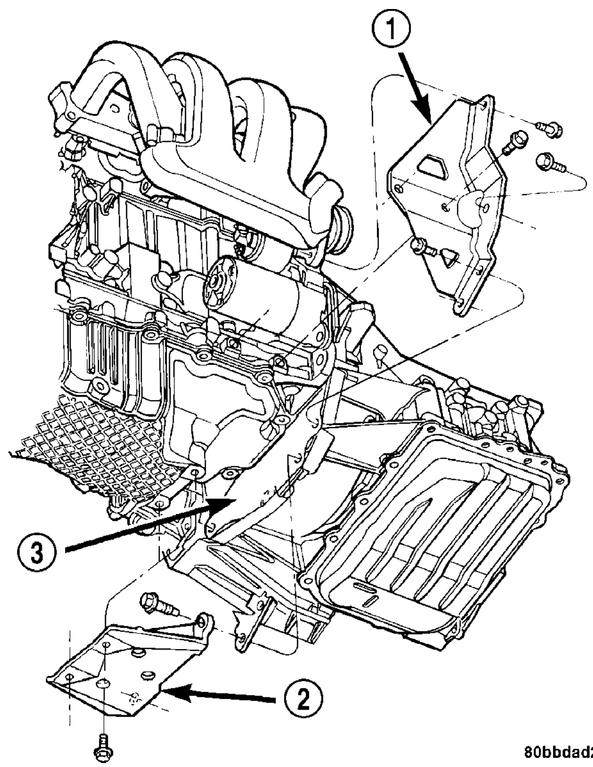


Fig. 6 Manifold Support Bracket, Structural Collar, and Dust Cover

1 - SUPPORT BRACKET
2 - STRUCTURAL COLLAR
3 - DUST COVER

(36) **Automatic Transmission equipped vehicles:**

ENGINE 2.0L SOHC (Continued)

(a) Remove torque converter bolts and mark converter to flex plate orientation for reassembly.

(37) **Manual Transmission equipped vehicles:**

(a) Remove drive plate to clutch module bolts.

(38) Remove bolt securing power steering line to engine block. Reposition power steering line to allow for engine removal.

(39) Lower vehicle.

(40) Raise vehicle enough to allow engine dolly and cradle, Special Tools 6135 and 6710 to be installed under vehicle.

(41) Loosen engine support posts to allow movement for positioning onto engine locating holes and flange on the engine bedplate. Lower vehicle and position cradle until the engine is resting on support posts (Fig. 9). Tighten mounts to cradle frame. This will keep support posts from moving when removing or installing engine and transmission.

(42) Install safety straps around the engine to cradle (Fig. 9). Tighten straps and lock them into position.

WARNING: Safety straps MUST be used to secure engine to the dolly fixture.

(43) Raise vehicle enough to see if straps are tight enough to hold cradle assembly to engine.

(44) Lower vehicle so weight of the engine and transmission ONLY is on the cradle assembly.

(45) Remove upper engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(46) Remove right and left engine and transaxle mount through bolts (Fig. 7) and (Fig. 8).

(47) Continue raising vehicle slowly until engine/transaxle assembly clears engine compartment. It may be necessary to move the engine/transmission assembly with the cradle to allow for removal around body flanges.

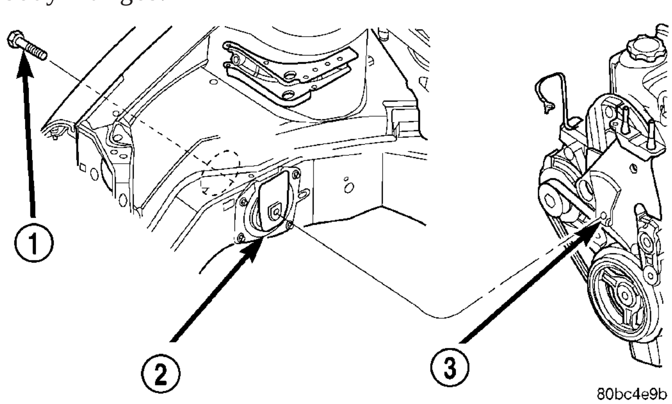


Fig. 7 Right Mount

1 - THROUGH BOLT
2 - RIGHT ENGINE MOUNT
3 - ENGINE MOUNT BRACKET

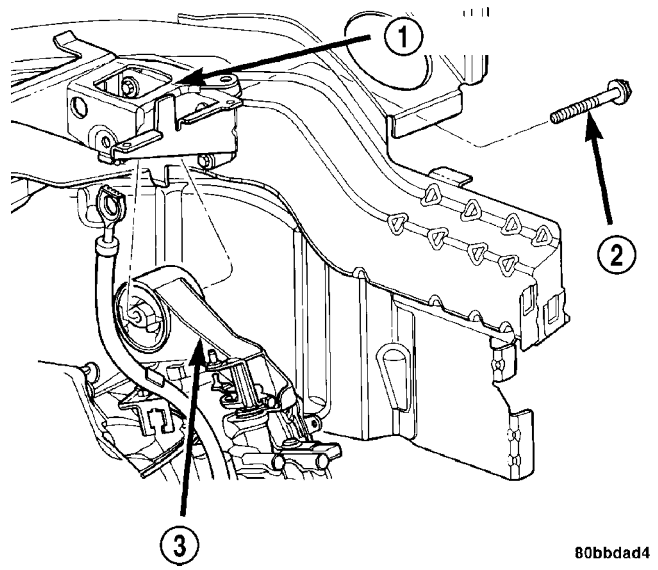


Fig. 8 Left Mount Through Bolt

1 - MOUNT BRACKET
2 - BOLT
3 - MOUNT

INSTALLATION - ENGINE ASSEMBLY

(1) Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.

(2) Continue lowering vehicle until engine/transaxle aligns to mounting locations. Install mounting bolts at the right and left engine/transaxle mounts (Fig. 7) and (Fig. 8). Tighten bolts to 118 N·m (87 ft. lbs.).

(3) Install upper engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(4) Remove safety straps from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly and cradle.

(5) Raise vehicle on hoist.

(6) Install generator, lower bracket, and adjusting bolt.

(7) Install axle shafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).

(8) **Automatic Transmission equipped vehicles:**

(a) Install torque converter bolts.

(9) **Manual Transmission equipped vehicles:**

(a) Install drive plate to clutch module bolts.

(10) Install bolt securing power steering line to engine block.

(11) Install screws for power steering cooler (if equipped).

(12) Install dust shield, intake manifold support bracket, and structural collar (Fig. 6)(Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).

ENGINE 2.0L SOHC (Continued)

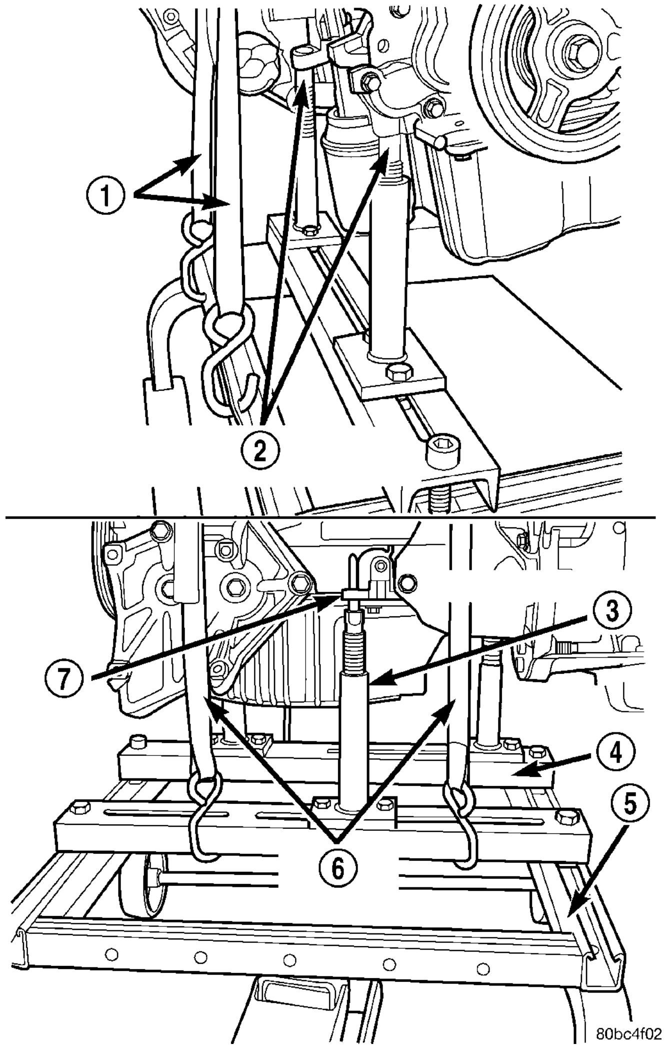


Fig. 9 Positioning Engine Cradle Support Post

1 - SAFETY STRAPS
2 - PLACE REAR POSTS INTO LOCATING HOLES
3 - SPECIAL TOOL 6848
4 - SPECIAL TOOL 6710
5 - SPECIAL TOOL 6135
6 - SAFETY STRAPS
7 - PLACE FRONT POST UNDER BLOCK FLANGE

(13) Install lower engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(14) Connect exhaust system isolators and catalytic converter to exhaust manifold. Torque exhaust fasteners to 28 N·m (250 in. lbs.).

(15) Connect downstream oxygen sensor.

(16) Install A/C compressor and lines (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

(17) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(18) Ensure oil pan drain plug is tight. Install new oil filter.

(19) Install accessory drive belt splash shield.

(20) Install front wheels and lower vehicle.

(21) Install power steering pump and reservoir. Connect power steering lines.

(22) **Manual Transmission equipped vehicles:**

(a) Connect clutch hydraulic line.

(b) Connect transmission shift linkage.

(c) Connect transmission electrical connectors.

NOTE: It is not necessary to bleed the clutch hydraulic system. The quick-connect fittings close immediately after disconnection; allowing no fluid to escape.

(23) **Automatic Transmission equipped vehicles:**

(a) Connect transmission oil cooler lines using service splice kit. Refer to instructions provided with kit.

(b) Connect transmission electrical connectors.

(c) Connect transmission shift linkage.

(24) Connect fuel line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(25) Connect heater hoses.

(26) Connect all ground straps.

(27) Install and connect powertrain control module (PCM).

(28) Connect engine wiring harness.

(29) Connect lower radiator hose.

(30) Install radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(31) Install upper radiator hose.

(32) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(33) Install battery tray and battery.

(34) Install air cleaner housing assembly and connect intake duct to intake manifold (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(35) Connect all throttle body electrical connectors and linkage.

(36) Fill engine crankcase with proper oil to correct level.

(37) Fill power steering fluid reservoir with proper fluid to correct level.

(38) Evacuate and recharge Air Conditioning system (if equipped)(Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(39) Start engine and run until operating temperature is reached.

(40) Ensure engine is properly positioned by performing torque strut adjustment (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(41) Adjust transmission linkage, if necessary.

ENGINE 2.0L SOHC (Continued)

SPECIFICATIONS

2.0L DOHC ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, DOHC	
Number of Cylinders	4	
Displacement	2.0 Liters	122 cu. in.
Bore	87.5 mm	3.445 in.
Stroke	83.0 mm	3.268 in.
Compression Ratio	9.4:1	
Firing Order	1-3-4-2	
Compression Pressure	1172-1551 kPa	170-225 psi
Max. Variation Between Cylinders	25%	

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
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

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter	87.463-87.481 mm	3.4434-3.4441 in.
Clearance @ 17.5 mm (11/16 in.) from bottom of skirt	0.018-0.050 mm	0.0007-0.0020 in.
Weight	340-350 grams	11.99-12.34 oz.
Land Clearance (Diametrical)	0.740-0.803 mm	0.029-0.031 in.
Piston Length	64.8 mm	2.551 in.
Piston Ring Groove Depth No. 1	3.983-4.132 mm	0.157-0.163 in.
Piston Ring Groove Depth No. 2	4.456-4.605 mm	0.175-0.181 in.
Piston Ring Groove Depth No. 3	3.841-4.075 mm	0.151-0.160 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance in Piston	0.008-0.020 mm	0.0003-0.0008 in.
Clearance in Connecting Rod	Interference	
Diameter	20.998-21.003 mm	0.8267-0.8269 in.
End Play	None	
Length	74.75-75.25 mm	2.943-2.963 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap-Top Compression Ring	0.23-0.52 mm	0.009-0.020 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-2nd Compression Ring	0.49-0.78 mm	0.019-0.031 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-Oil Control Steel Rails	0.23-0.66 mm	0.009-0.026 in.
Wear Limit	1.0 mm	0.039 in.
Ring Side Clearance-Compression Rings	0.025-0.065 mm	0.0010-0.0026 in.
Wear Limit	0.10 mm	0.004 in.

ENGINE 2.0L SOHC (Continued)

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Side Clearance-Oil Ring Pack	0.004-0.178 mm	0.0002-0.0070 in.
Ring Width-Compression Rings	1.47-1.50 mm	0.057-0.059 in.
Ring Width-Oil Ring Pack	2.854-3.008 mm	0.1124-0.1184 in.

CONNECTING ROD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.026-0.059 mm	0.001-0.0023 in.
Wear Limit	0.075 mm	0.003 in.
Bore Diameter-Piston Pin	20.96-20.98 mm	0.8252-0.8260 in.
Bore Diameter-Crankshaft End	50.991-51.005 mm	2.0075-2.0081 in.
Side Clearance	0.13-0.38 mm	0.005-0.015 in.
Wear Limit	0.40 mm	0.016 in.
Weight-Total (Less Bearing)	548.8 grams	19.36 oz.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	47.9924-48.0076 mm	1.8894-1.8900 in.
Main Bearing Journal Diameter	51.9924-52.0076 mm	2.0469-2.0475 in.
Journal Out-of-Round (Max.)	0.0035 mm	0.0001 in.
Journal Taper (Max.)	0.0038 mm	0.0001 in.
End Play	0.09-0.27 mm	0.0035-0.0106 in.
Wear Limit	0.37 mm	0.015 in.
Main Bearing Diametrical Clearance	0.022-0.062 mm	0.0008-0.0024 in.

HYDRAULIC LASH ADJUSTER

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	15.901-15.913 mm	0.626-0.6264 in.
Plunger Travel Minimum (Dry)	3.0 mm	0.118 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journals No.1-6	26.020-26.041 mm	1.024-1.025 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journal Diameter No. 1-6	25.951-25.970 mm	1.021-1.022 in.
Bearing Clearance-Diametrical	0.069-0.071 mm	0.0027-0.003 in.
End Play	0.05-0.15 mm	0.002-0.006 in.
Lift (Zero Lash)		
Intake	8.65 mm	0.340 in.
Exhaust	7.95 mm	0.312 in.
Intake Valve Timing*		
Closes (ABDC)	33.6°	
Opens (BTDC)	3.8°	
Duration	212.8°	
Exhaust Valve Timing*		
Closes (BTDC)	1°	
Opens (BBDC)	41.8°	
Duration	220.8°	
Valve Overlap	0°	
*All readings in crankshaft degrees, at 0.5 mm (0.019 in.) of valve lift.		

ENGINE 2.0L SOHC (Continued)

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Gasket Thickness (Compressed)	0.71 mm	0.028 in.

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Angle	44.5°- 45°	
Seat Diameter-Intake	34.37- 4.63mm	1.353-1.363in.
Seat Diameter-Exhaust	27.06- 7.32mm	1.065-1.075in.
Runout (Max.)	0.05 mm	0.002 in.
Valve Seat Width-Intake and Exhaust	0.9-1.3 mm	0.035-0.051 in.
Service Limit-Intake	2.0 mm	0.079 in.
Service Limit-Exhaust	2.5 mm	0.098 in.

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter I.D.	5.975-6.000 mm	0.235-0.236 in.
Guide Bore Diameter	11.0-11.02 mm	0.4330-0.4338 in.
Guide Height (spring seat to guide tip)	13.25-13.75 mm	0.521-0.541 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle-Intake and Exhaust	44.5-45°	
Head Diameter-Intake	34.67-34.93 mm	1.364-1.375 in.
Head Diameter-Exhaust	28.32-28.52 mm	1.114-1.122 in.
Valve Length (Overall)		
-Intake	112.76-113.32 mm	4.439-4.461 in.
-Exhaust	110.89-111.69 mm	4.365-4.397 in.
Valve Stem Diameter		
-Intake	5.934-5.952 mm	0.2337-0.2344 in.
-Exhaust	5.906-5.924 mm	0.2326-0.2333 in.

VALVE MARGIN

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	1.200-1.700 mm	0.047-0.066
Service Limit	0.95 mm	1/32 in.
Exhaust	0.985-1.315 mm	0.038-0.051 in.
Service Limit	1.05 mm	3/64 in.

VALVE STEM TIP HEIGHT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	48.04 mm	1.891 in.
Exhaust	47.99 mm	1.889 in.

ENGINE 2.0L SOHC (Continued)

VALVE STEM TO GUIDE CLEARANCE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.048-0.066 mm	0.0018-0.0025 in.
Max. Allowable	0.076 mm	0.003 in.
Exhaust	0.0736-0.094 mm	0.0029-0.0037 in.
Max. Allowable	0.101 mm	0.004 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length (Approx.)	49.2 mm	1.937 in.
Nominal Force (Valve Closed)	334 N @ 38.0 mm	75 lbs. @ 1.496 in.
Nominal Force (Valve Open)	598 N @ 29.75 mm	134 lbs. @ 1.172 in.
Installed Height	38.00 mm	1.496 in.
Number of Coils	6.9	
Wire Diameter	3.61 mm	0.142 in.

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Over Rotors (Max.)	0.10 mm	0.004 in.
Cover Out-of-Flat (Max.)	0.076 mm	0.003 in.
Inner Rotor Thickness (Min.)	7.64 mm	0.301 in.
Outer Rotor Thickness (Min.)	7.64 mm	0.301 in.
Outer Rotor Clearance (Max.)	0.039 mm	0.015 in.
Outer Rotor Diameter (Min.)	79.95 mm	3.148 in.
Tip Clearance Between Rotors (Max.)	0.20 mm	0.008 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed*	25 kPa	4 psi
At 3000 rpm	170-550 kPa	25-80 psi
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 rpm.		

TORQUE

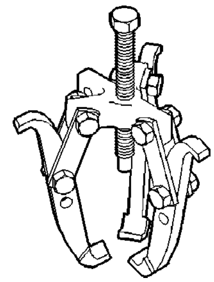
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft Sensor-Bolts	(Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)		
Camshaft Sprocket-Bolt	115	85	-
Connecting Rod Cap-Bolts	27 +¼ turn	20 +¼ turn	-
Structural Collar-Bolts	(Refer to 9 - ENGINE/ ENGINE BLOCK/ STRUCTURAL COVER - INSTALLATION)		
Crankshaft Main Bearing Cap/Bedplate			
-M8 Bolts	34	25	-
-M11 Bolts	81	60	-
Crankshaft Damper	136	100	-
Crankshaft Target Ring	13	-	110
Cylinder Head-Bolts	(Refer to 9 - ENGINE/ CYLINDER HEAD - INSTALLATION)		
Cylinder Head Cover-Bolts	12	-	105
Engine Mount Bracket Right-Bolts	61	45	-
Engine Mounting	Refer to Procedure		
Exhaust Manifold to Cylinder Head-Bolts	23	-	200
Exhaust Manifold Support Bracket (Federal and LEV)			
-M8 Nut	28	-	250
-M10 Bolt	61	45	-

ENGINE 2.0L SOHC (Continued)

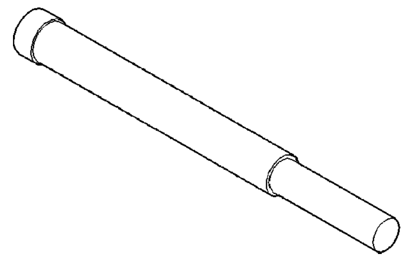
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Exhaust Manifold Support Bracket (ULEV)	54	40	-
Engine Torque Strut Bracket to Engine-Bolts	61	45	-
Flex Plate to Crankshaft	95	70	-
Intake Manifold-Bolts	12	-	105
Powertrain Bending Strut-Front			
-Long Bolts	101	75	-
-Short Bolts	61	45	-
Oil Filter Adaptor	80	60	-
Oil Filter	11	8	-
Oil Pan—Bolts	12	-	105
Oil Pan Drain—Plug	27	20	-
Oil Pump to Block	28	-	250
Oil Pump Cover Plate-Bolts	12	-	105
Oil Pump Pick-up Tube-Bolt	28	-	250
Oil Pump Relief Valve-Cap	41	30	-
PCV Valve	5.6	-	50
Rocker Arm Shaft-Bolts	28	-	250
Spark Plugs	(Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)		
Timing Belt Cover-Bolts	12	-	105
Timing Belt Tensioner Bracket-Mounting Bolts	31	23	-
Timing Belt Tensioner Lock Nut	30	22	-
Water Pump-Bolts	(Refer to 7 - COOLING - SPECIFICATIONS)		

SPECIAL TOOLS

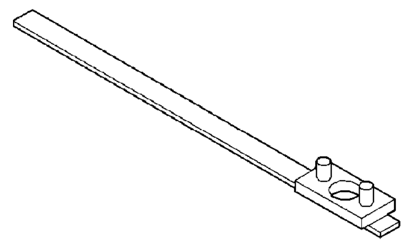
2.0L SOHC ENGINE



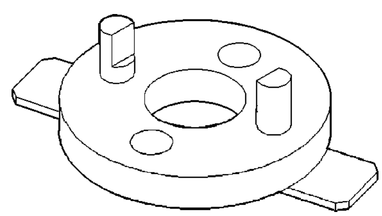
Puller 1026



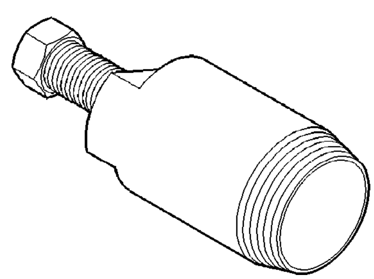
Crankshaft Damper Removal Insert 6827A



Camshaft Sprocket Remover/Installer C-4687

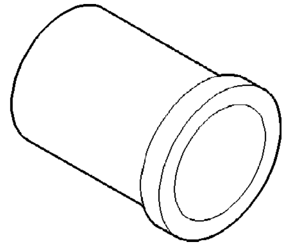


Camshaft Sprocket Remover/Installer Adapter C-4687-1

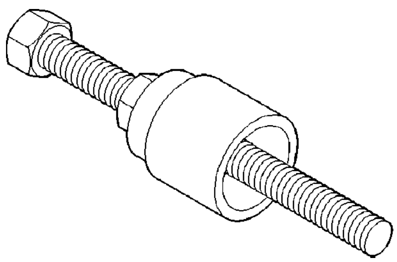


Camshaft Seal Remover C-4679-A

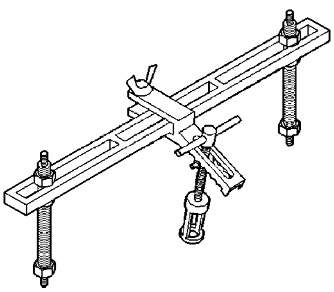
ENGINE 2.0L SOHC (Continued)



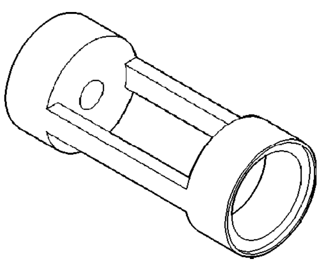
Camshaft Seal Installer MD-998306



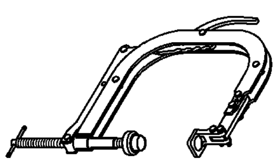
Crankshaft Damper/Sprocket Installer 6792



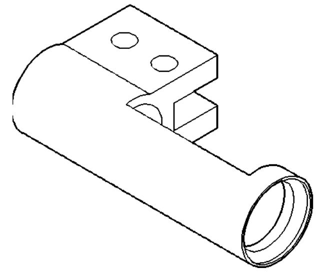
Valve Spring Compressor MD-998772-A



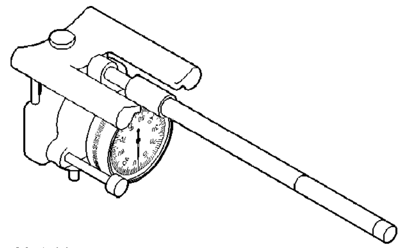
Spring Compressor Adapter 6779



Valve Spring Compressor C-3422-D

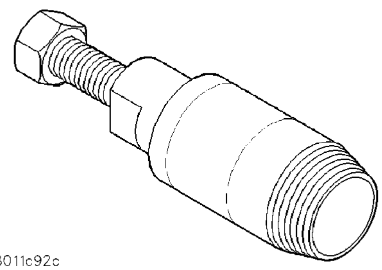


Spring Compressor Adapter 6526



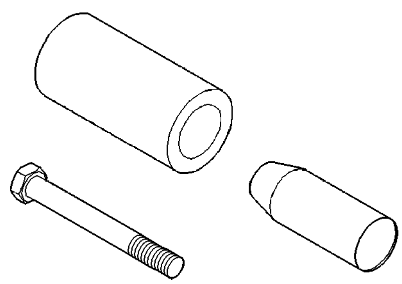
8011c9fa

Cylinder Bore Indicator C-119

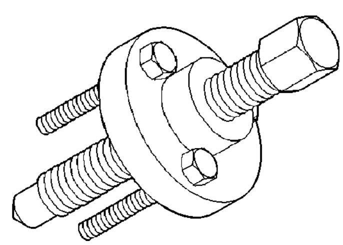


3011c92c

Front Crankshaft Seal Remover 6771

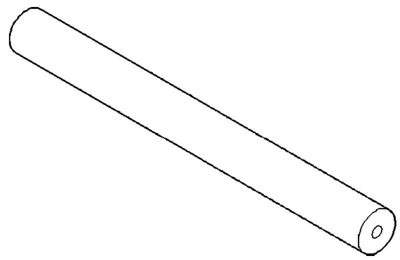


Front Crankshaft Seal Installer 6780

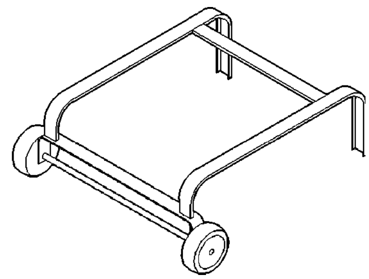


Crankshaft Sprocket Remover 6793

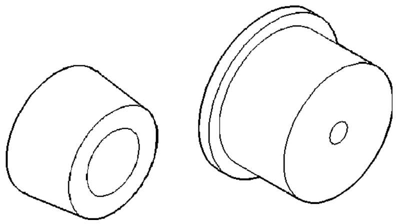
ENGINE 2.0L SOHC (Continued)



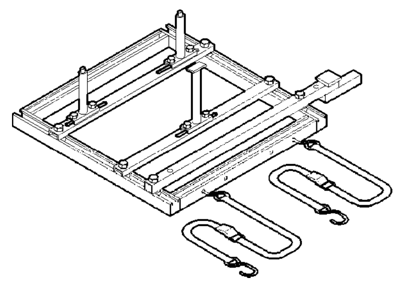
Crankshaft Sprocket Remover Insert C-4685-C2



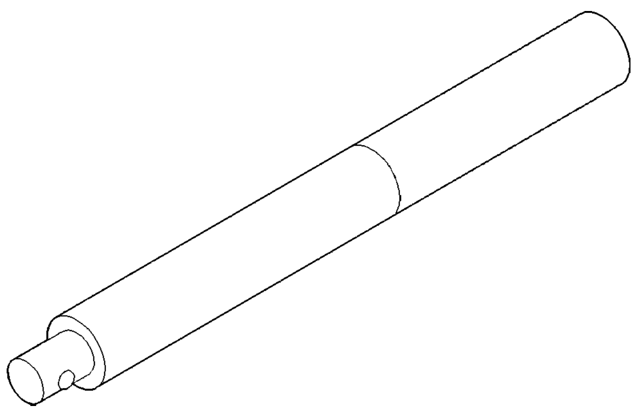
Dolly 6135



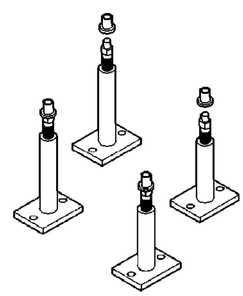
Rear Crankshaft Seal Guide and Installer 6926-1 and 6926-2



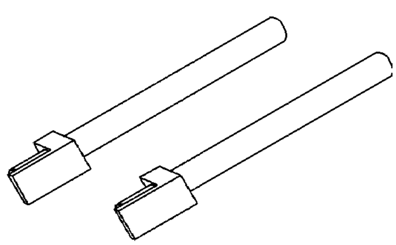
Cradle 6710



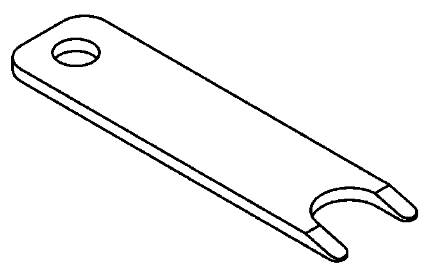
Driver Handle C-4171



Post Kit Engine Cradle 6848

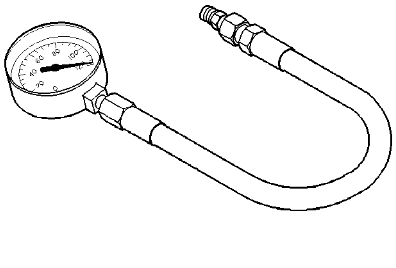


Connecting Rod Guides 8189

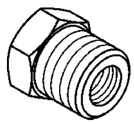


Clutch Line Disconnect 6638A

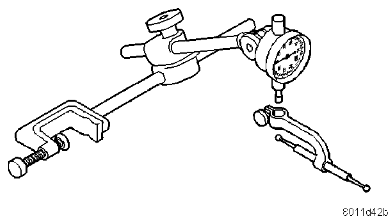
ENGINE 2.0L SOHC (Continued)



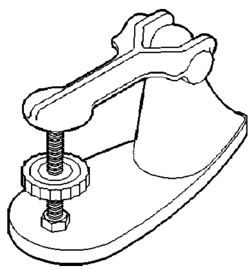
Pressure Gauge C-3292



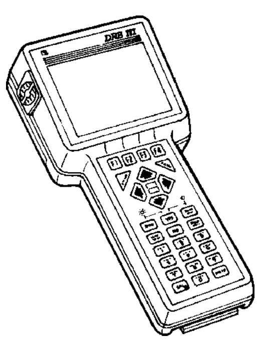
Adapter 8406



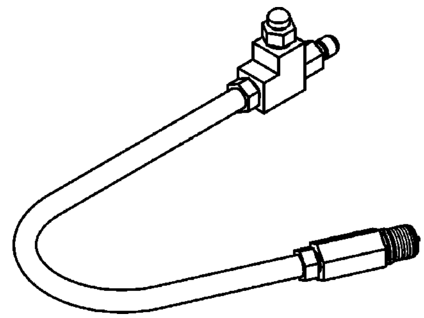
Dial Indicator C-3339



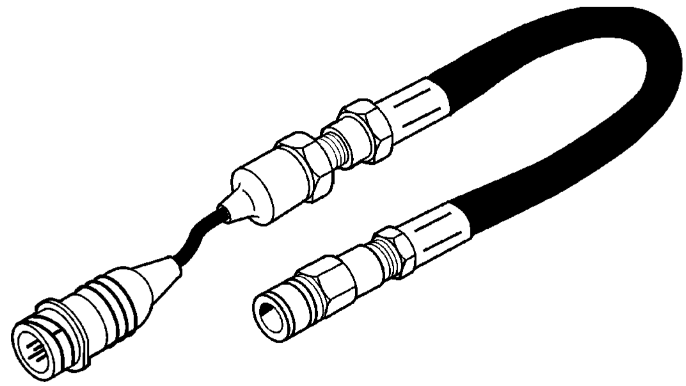
Valve Spring Tester C-647



DRB III® with PEP Module – OT-CH6010A



Cylinder Compression Pressure Adaptor 8116



Pressure Transducer CH7059

AIR CLEANER ELEMENT

REMOVAL

(1) Unlatch 2 clips and rotate the lid upward and off of the air cleaner box (Fig. 10).

(2) Remove the air filter element (Fig. 10).

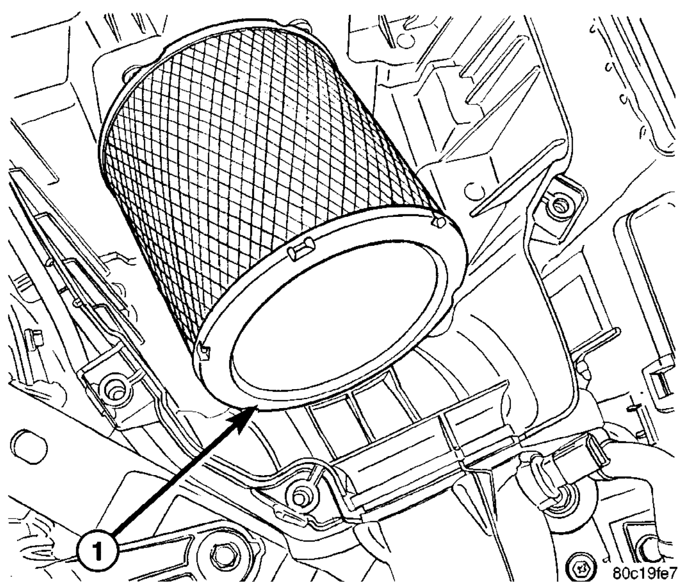


Fig. 10 Air Cleaner Element

1 - Lip for Element

AIR CLEANER ELEMENT (Continued)

INSTALLATION

(1) Install the air filter element on locator (Fig. 11) and then make sure that the element is locked in at the lip in the air cleaner box (Fig. 11).

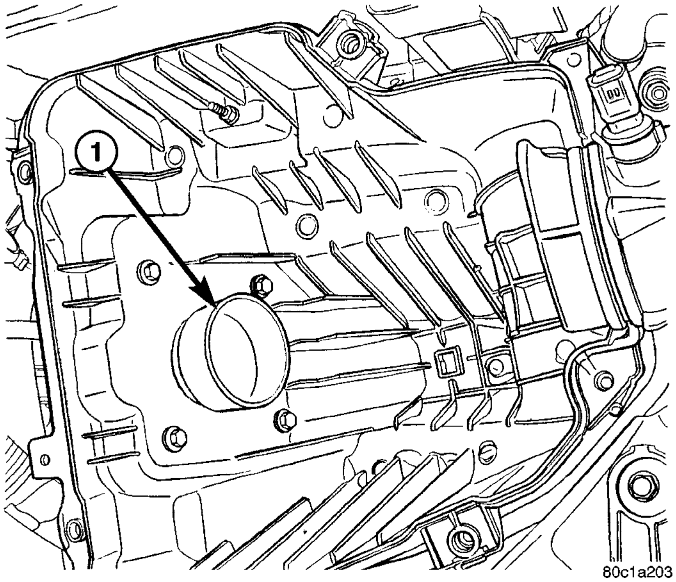


Fig. 11 Element Locator

1 - Element Locator

(2) Install the air cleaner housing lid.

(3) Clip the 2 latches for the air cleaner housing lid (Fig. 11).

AIR CLEANER HOUSING

REMOVAL

(1) Unlatch 2 clips and rotate the lid upward and off of the air cleaner box.

(2) Pull air filter up and out of air cleaner box (Fig. 12).

(3) Remove the 4 bolts from the air cleaner box to throttle body.

(4) Remove the make-up air hose from the air cleaner box.

(5) Remove the bolt and nut from the air cleaner box.

(6) Remove wiring harness from the clips on the side of the air cleaner box.

(7) Remove the wiring clip from the front of the air cleaner box.

(8) Disconnect the vacuum harness from the throttle body and body harness.

(9) Pull air cleaner box up and off of stud and battery tray and remove from vehicle.

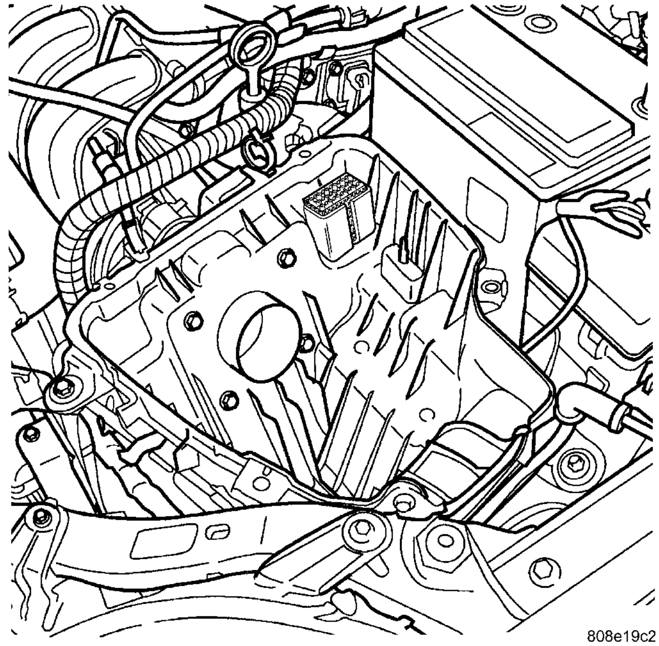


Fig. 12 Air Cleaner Box

INSTALLATION

(1) Install air cleaner box. Make sure that it is on the battery tray tab in the back and on the stud on the side.

(2) Install the bolts to the throttle body and tighten.

(3) Connect the make-up air hose to the air cleaner box.

(4) Connect the vacuum harness to the throttle body and body harness.

(5) Install the wiring clip in the front of the air cleaner box.

(6) Install the wiring harness into the clips on the side of the air cleaner box.

(7) Install the nut and bolt for air cleaner box and tighten to 7.3 N·m (65 in. lbs.).

(8) Install inlet elbow to air cleaner box and fender.

(9) Install air filter element on to throttle body and push towards the throttle body and past lip in air cleaner box bottom (Fig. 13).

(10) Install lid and latch the 2 clips.

AIR CLEANER HOUSING (Continued)

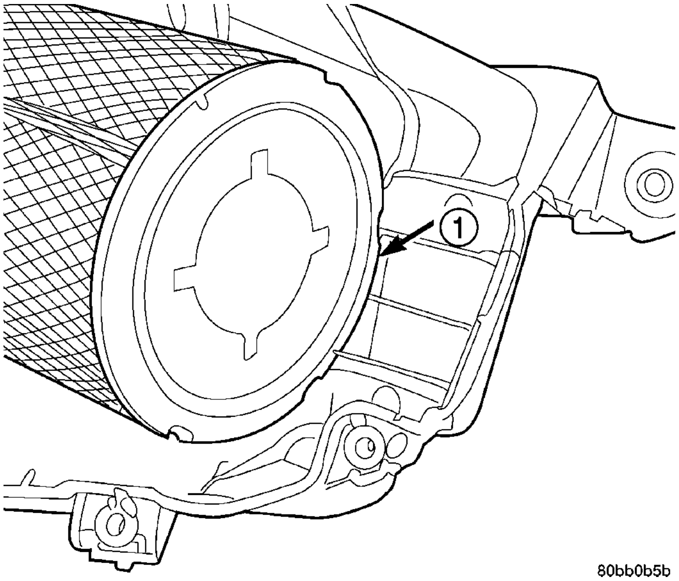


Fig. 13 Air Cleaner Box Lip

1 - LIP

CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains a single over head camshaft with four valves per cylinder (Fig. 14). The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a head gasket and retaining bolts.

The rocker arm shafts mount directly to the cylinder head. The rocker arms shafts are hollow, providing lubrication passages to the hydraulic lash adjusters, camshaft, and valve mechanisms.

DIAGNOSIS AND TESTING—CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

(1) Perform fuel system pressure release procedure **before attempting any repairs** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(2) Disconnect negative battery cable.

(3) Remove power steering/air conditioning drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(4) Raise vehicle on hoist.

CYLINDER HEAD (Continued)

(5) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(6) Disconnect exhaust pipe from exhaust manifold.

(7) Remove right front wheel.

(8) Remove accessory drive belt splash shield.

(9) Remove generator belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(10) Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(11) Remove lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(12) Lower vehicle and remove upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(13) Remove ground strap and power steering hose support clip from engine mount bracket.

(14) Remove power steering pump assembly and set aside.

(15) Support engine from beneath with a suitable jack.

(16) Remove right side engine mount to bracket through bolt.

(17) Remove the lower engine mount bracket bolt. Raise engine slightly and remove the upper engine mount bracket bolts.

(18) Remove the engine mount bracket. This procedure may require additional raising/lowering of engine until bracket will clear engine components (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - REMOVAL).

(19) Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(20) Rotate engine until timing marks are aligned.

(21) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(22) Remove timing belt tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - REMOVAL).

(23) Remove camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(24) Remove rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(25) Disconnect fuel line at fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(26) Remove coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL).

(27) Remove ground strap to cylinder head.

(28) Remove upper radiator hose.

(29) Remove intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

(30) Disconnect ignition coil electrical connector.

(31) Remove ignition coil and spark plug cables from engine.

(32) Remove make-up air hose from cylinder head cover.

(33) Disconnect cam sensor and engine coolant temperature (ECT) sensor electrical connectors.

(34) Remove heater tube to cylinder head attaching fasteners.

(35) Remove heater hose from thermostat housing connector.

(36) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(37) Remove cylinder head bolts.

(38) Remove cylinder head and gasket (Fig. 14).

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

INSPECTION

(1) Cylinder head must be flat within 0.1 mm (0.004 in.) (Fig. 15).

(2) Inspect camshaft bearing journals for scoring.

(3) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(4) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (Fig. 16). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.

(5) Check valve guide height (Fig. 17).

CYLINDER HEAD (Continued)

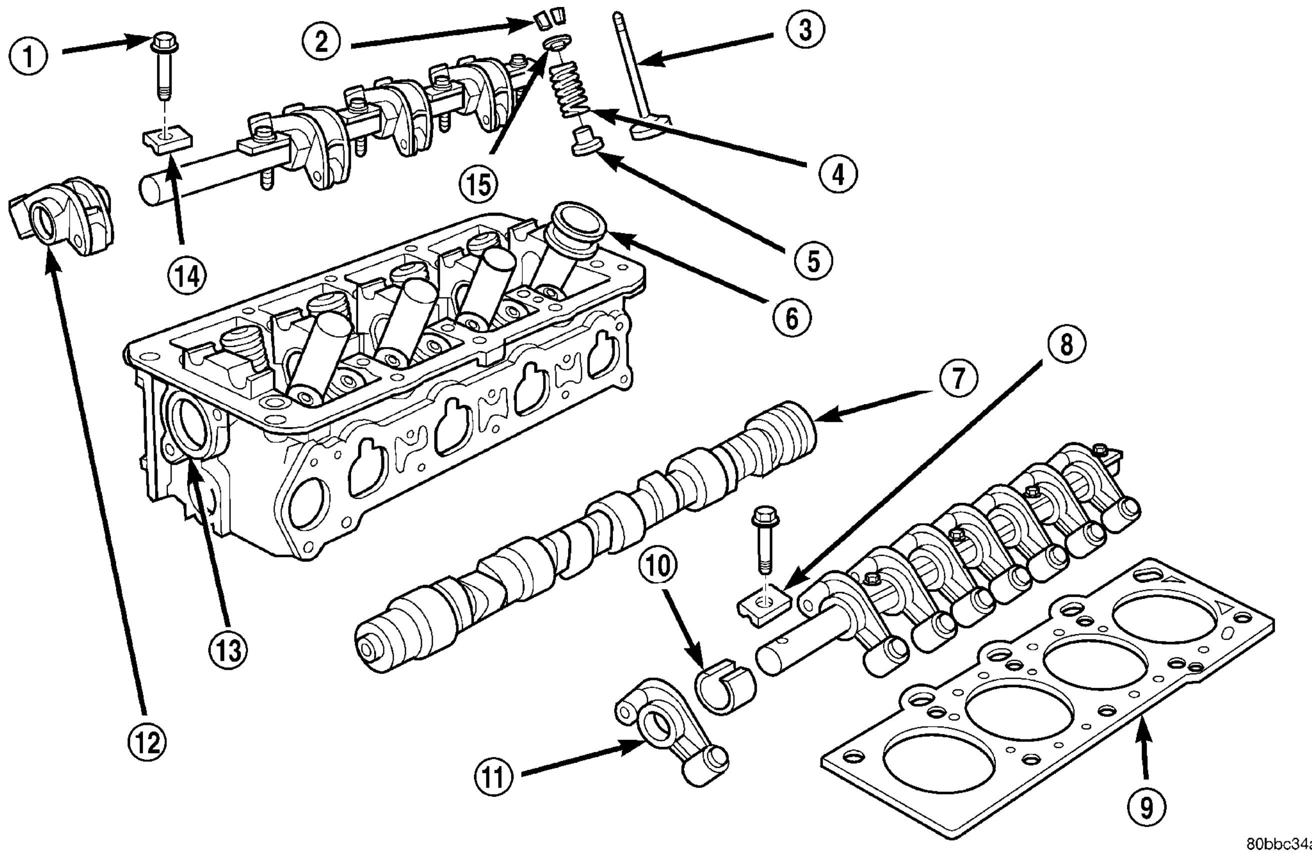


Fig. 14 Cylinder Head Assembly

1 - ROCKER SHAFT RETAINING BOLT
2 - VALVE RETAINING LOCKS
3 - VALVE
4 - VALVE SPRING
5 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY
6 - SPARK PLUG TUBE SEAL
7 - CAMSHAFT
8 - ROCKER ARM SHAFT RETAINER SPACER
9 - GASKET
10 - SPACER
11 - INTAKE ROCKER ARM/HYDRAULIC LASH ADJUSTER ASSEMBLY
12 - EXHAUST ROCKER ARM/HYDRAULIC LASH ADJUSTER ASSEMBLY
13 - CAMSHAFT SEAL
14 - RETAINER SPACER
15 - VALVE SPRING RETAINER

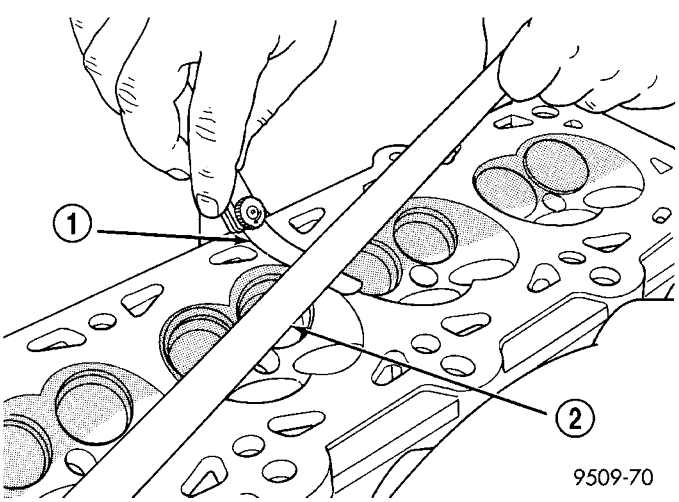


Fig. 15 Checking Cylinder Head Flatness

1 - FEELER GAUGE
2 - STRAIGHT EDGE

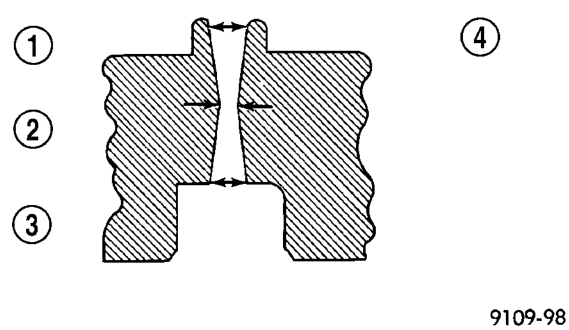


Fig. 16 Checking Wear on Valve Guide—Typical

1 - TOP
2 - MIDDLE
3 - BOTTOM
4 - CUT AWAY VIEW OF VALVE GUIDE MEASUREMENT LOCATIONS

CYLINDER HEAD (Continued)

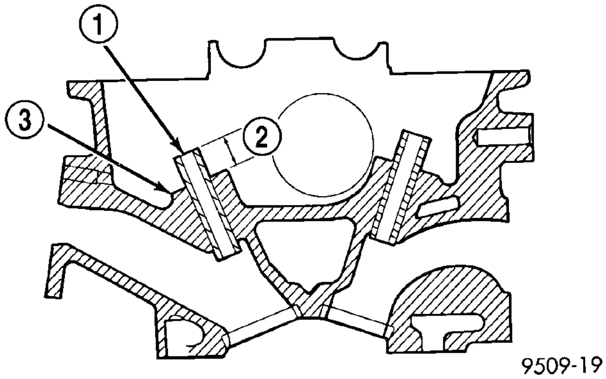


Fig. 17 Valve Guide Height

1 - VALVE GUIDE
2 - 13.25 - 13.75 MM (0.521 - 0.541 IN.)
3 - SPRING SEAT

INSTALLATION - CYLINDER HEAD

EXAMINING CYLINDER HEAD BOLTS

NOTE: The cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolt(s) should be replaced (Fig. 18).

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(s) should be replaced.

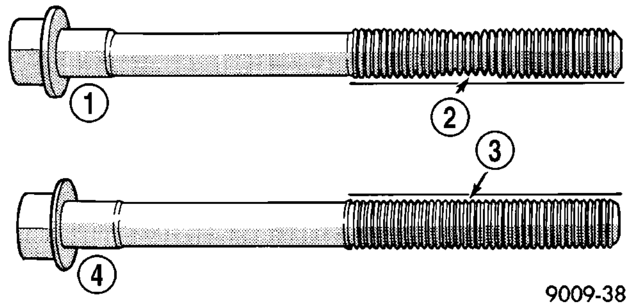


Fig. 18 Checking Bolts for Stretching (Necking)

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

(1) Clean the cylinder head and cylinder block sealing surfaces (Refer to 9 - ENGINE/CYLINDER HEAD - CLEANING).

(2) Apply Mopar® Gasket Sealant (aerosol can) to both sides of the new cylinder head gasket.

(3) Position a new cylinder head gasket on the locating dowels.

(4) Position crankshaft sprocket to TDC, then rotate crankshaft until mark is three teeth before TDC (Fig. 19). This will ensure that no piston-to-valve contact occurs upon installation of cylinder head in the event of camshaft rotation.

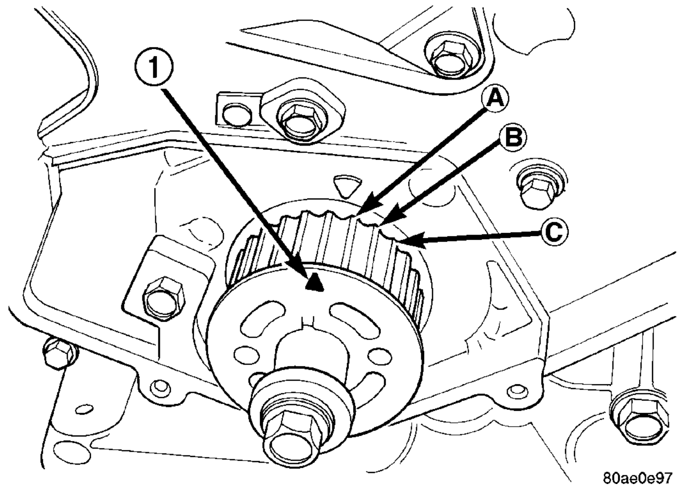


Fig. 19 Crankshaft Sprocket Position

1 - TDC MARK

(5) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

(6) Before installing cylinder head bolts, the threads should be oiled with engine oil. The 4 shorter bolts 164 mm (6.45 in.), are to be installed in positions 7, 8, 9, and 10 (Fig. 20).

(7) Tighten the cylinder head bolts in the sequence shown in (Fig. 20). Using the 4 step torque turn method, tighten according to the following values:

First:
- All bolts to 34 N·m (25 ft. lbs.)

Second:
- Bolts 1–6 to 68 N·m (50 ft. lbs.)
- Bolts 7–10 to 49 N·m (35 ft. lbs.)

Third:
- Bolts 1–6 to 68 N·m (50 ft. lbs.)
- Bolts 7–10 to 49 N·m (35 ft. lbs.)

CAUTION: Do not use a torque wrench for the Fourth step.

Fourth:
- **Tighten all bolts in the specified sequence an additional 90° (1/4 Turn)**

(8) Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(9) Install heater hose to thermostat housing connector.

(10) Install heater tube to cylinder head attaching fasteners.

(11) Connect cam sensor and engine coolant temperature (ECT) sensor electrical connectors.

CYLINDER HEAD (Continued)

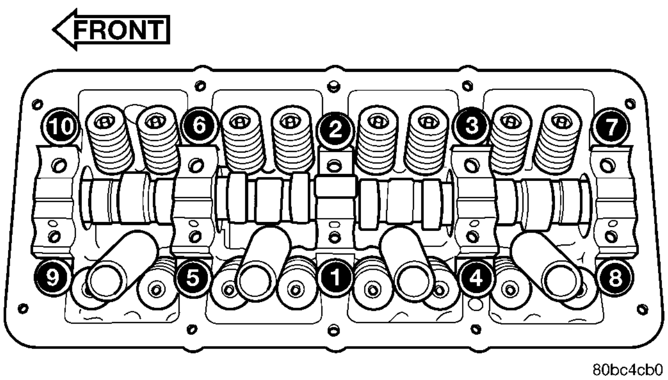


Fig. 20 Cylinder Head Tightening Sequence

(12) Connect make-up air hose to cylinder head cover.

(13) Install ignition coil and spark plug cables. Connect coil electrical connector.

(14) Install intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(15) Install upper radiator hose.

(16) Install ground strap to cylinder head.

(17) Install coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION).

(18) Connect fuel line to fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(19) Install rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(20) Install timing belt tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - INSTALLATION).

(21) Install camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(22) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(23) Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(24) Install engine mount bracket (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - INSTALLATION).

(25) Position engine and install right side engine mount to engine mount bracket through bolt. Tighten bolt to 118 N·m (87 ft. lbs.). Remove jack from beneath engine.

(26) Install power steering pump assembly.

(27) Install power steering hose support clip and ground strap to engine mount bracket.

(28) Install upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(29) Raise vehicle on hoist.

(30) Install lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(31) Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(32) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(33) Install accessory drive belt splash shield and front wheel.

(34) Connect exhaust pipe to exhaust manifold. Tighten fasteners to 23 N·m (200 in. lbs.).

(35) Lower vehicle and fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(36) Connect negative cable to battery.

(37) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

CYLINDER HEAD COVER

REMOVAL

(1) Disconnect make-up air (Fig. 21) and PCV (Fig. 22) hoses from cylinder head cover.

(2) Remove ignition coil and spark plug cables (Fig. 23).

(3) Remove cylinder head cover bolts.

(4) Remove cylinder head cover.

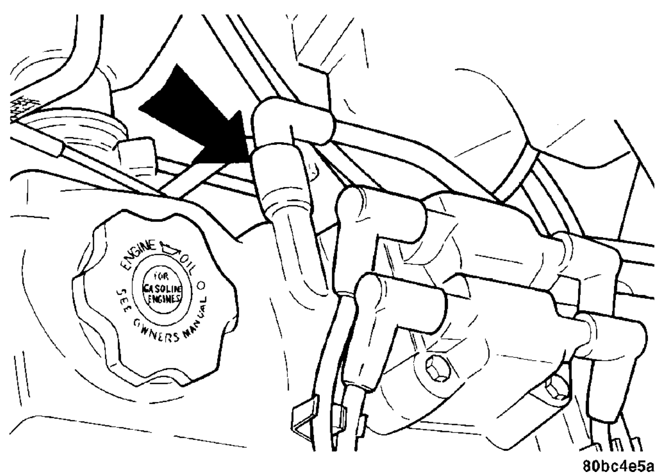


Fig. 21 Make-up Air Hose

CYLINDER HEAD COVER (Continued)

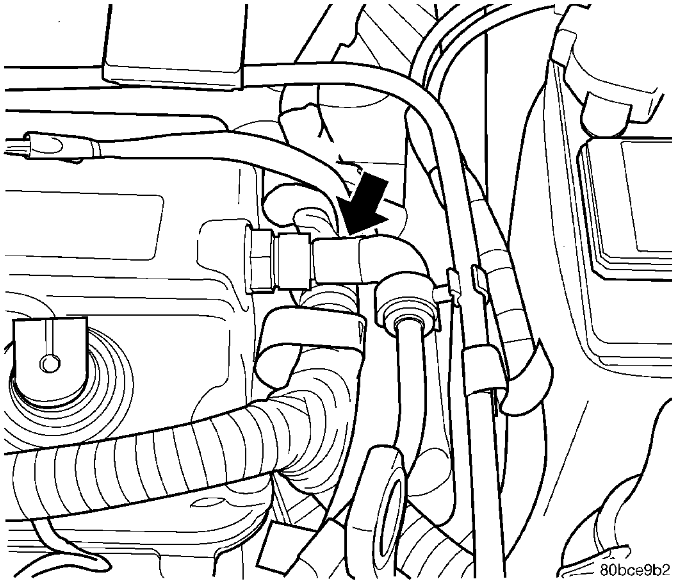


Fig. 22 PCV Valve Hose

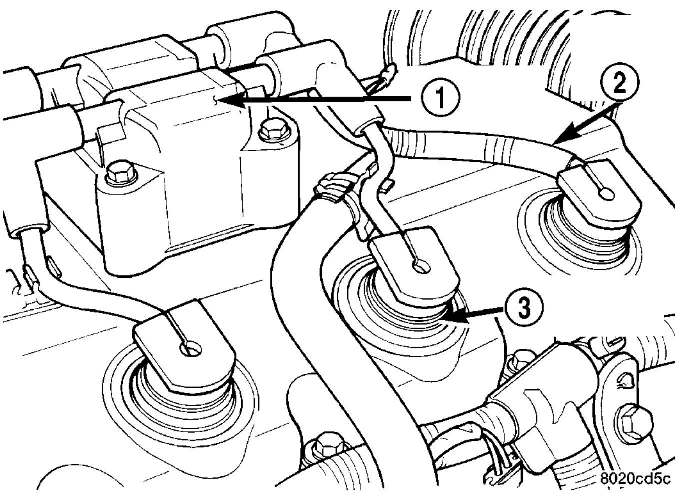


Fig. 23 Ignition Coil and Spark Plug Cables

1 - IGNITION COILS
2 - SPARK PLUG CABLE
3 - SPARK PLUG INSULATOR

CLEANING

Clean cylinder head and cover mating surfaces using a suitable solvent.

INSPECTION

Inspect cover rails for flatness.

INSTALLATION

(1) Inspect gasket and seals (Fig. 24). Replace as necessary. For replacement of spark plug tube seals, (Refer to 9 - ENGINE/CYLINDER HEAD/SPARK PLUG TUBE SEAL - INSTALLATION).

CAUTION: Do not attempt to loosen or remove baffle plate attaching screws. The screws are self-tapping, and in the attempt to retighten, thread damage (stripping) will result.

(2) Install cylinder head cover and gasket. Tighten bolts to 12 N·m (105 in. lbs.).

(3) Install ignition coil and spark plug cables (Fig. 23). Tighten ignition coil fasteners to 12 N·m (105 in. lbs.).

(4) Connect make-up air (Fig. 21) and PCV (Fig. 22)hoses.

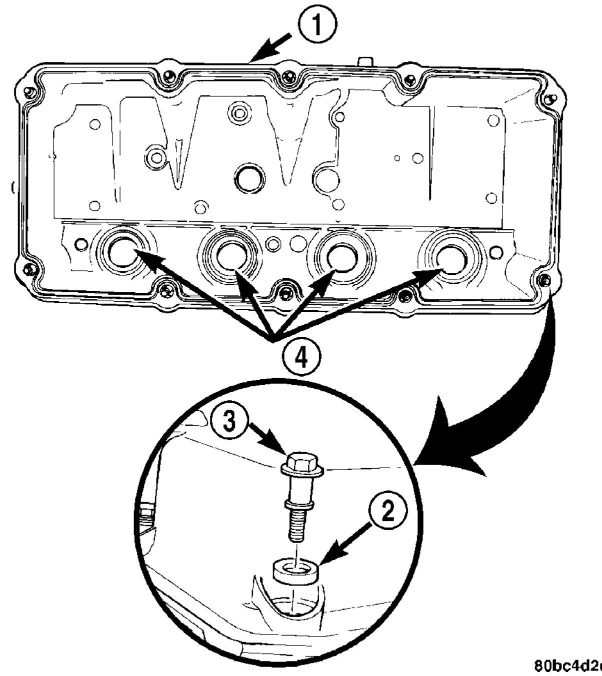


Fig. 24 Cylinder Head Cover Gasket and Seals

1 - CYLINDER HEAD COVER GASKET
2 - SEAL
3 - BOLT
4 - SPARK PLUG TUBE SEALS

ROCKER ARM / HYDRAULIC LASH ADJUSTER ASSEMBLY

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER 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.

ROCKER ARM / HYDRAULIC LASH ADJUSTER ASSEMBLY (Continued)

(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 (integral to the head gasket) in 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) Missing swivel foot on lash adjuster.

(9) Incorrect rocker shaft installation.

(10) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(11) Faulty lash adjuster.

- 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.
- Remove suspected lash adjusters, and replace as necessary.

REMOVAL

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Identify the rocker arm shaft assemblies before removal.

(3) Loosen the attaching fasteners. Remove rocker arm shaft assemblies from cylinder head.

(4) Identify the rocker arms spacers and retainers for reassembly. Disassemble the rocker arm assemblies by removing the attaching bolts from the shaft (Fig. 25).

(5) Slide the rocker arms and spacers off the shaft. Keep the spacers and rocker arms in the same location for reassembly.

INSPECTION

(1) Inspect the rocker arm for scoring, wear on the roller or damage to the rocker arm (Fig. 26). Replace as necessary.

(2) Check the location where the rocker arms mount to the shafts for wear or damage. Replace if damaged or worn.

(3) The rocker arm shaft is hollow and is used as a lubrication oil duct. Check oil holes for clogging with small wire, clean as required.

INSTALLATION

CAUTION: Set crankshaft to 3 notches before TDC before installing rocker arm shafts. Refer to Timing Belt System and Camshaft Seal Service of this section for procedure.

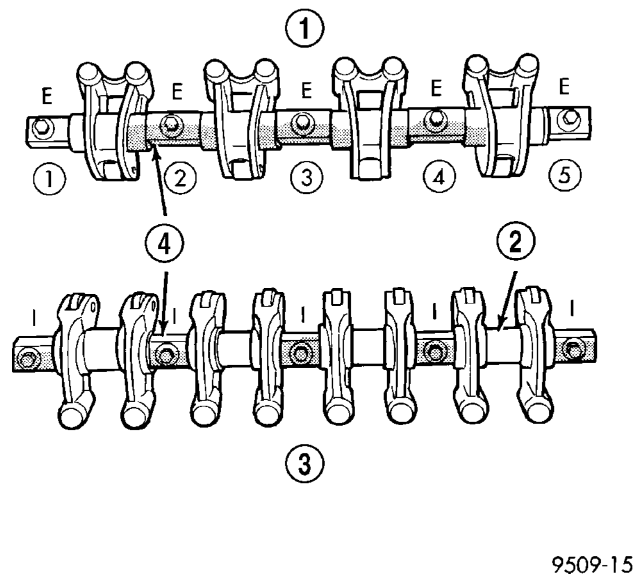


Fig. 25 Rocker Arm Shaft Assemblies

1 - EXHAUST ROCKER ARM ASSEMBLY
2 - PLASTIC SHAFT SPACERS
3 - INTAKE ROCKER ARM ASSEMBLY
4 - ROCKER ARM SHAFT RETAINERS

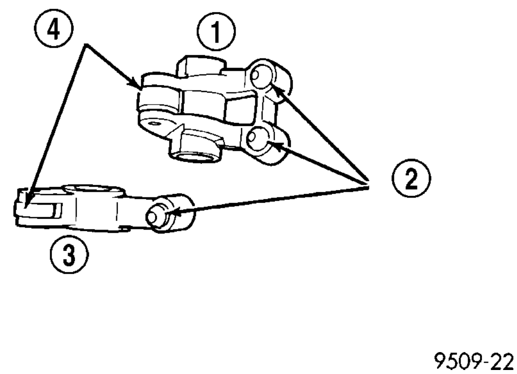


Fig. 26 Rocker Arm Assemblies

1 - EXHAUST ROCKER ARM
2 - HYDRAULIC LASH ADJUSTERS
3 - INTAKE ROCKER ARM
4 - ROLLERS

(1) Lubricate the rocker arms and spacers. Install onto shafts in their original position (Fig. 25).

(2) Install rocker arm/hydraulic lash adjuster assembly making sure that adjusters are at least partially full of oil. This is indicated by little or no plunger travel when the lash adjuster is depressed. If there is excessive plunger travel. Place the rocker arm assembly into clean engine oil and pump the plunger until the lash adjuster travel is taken up. If travel is not reduced, replace the assembly. Hydraulic lash adjuster and rocker arm are serviced as an assembly.

ROCKER ARM / HYDRAULIC LASH ADJUSTER ASSEMBLY (Continued)

(3) Install rocker arm and shaft assemblies with NOTCH in the rocker arm shafts pointing up and toward the timing belt side of the engine (Fig. 27). Install the retainers in their original positions on the exhaust and intake shafts (Fig. 25).

CAUTION: When installing the intake rocker arm shaft assembly be sure that the plastic spacers do not interfere with the spark plug tubes. If the spacers do interfere rotate until they are at the proper angle. To avoid damaging the spark plug tubes, do not attempt rotating the spacers by forcing down the shaft assembly.

(4) Verify that hydraulic lash adjuster swivel feet are still in place.

(5) Tighten bolts to 28 N·m (250 in. lbs.) in sequence shown in (Fig. 28).

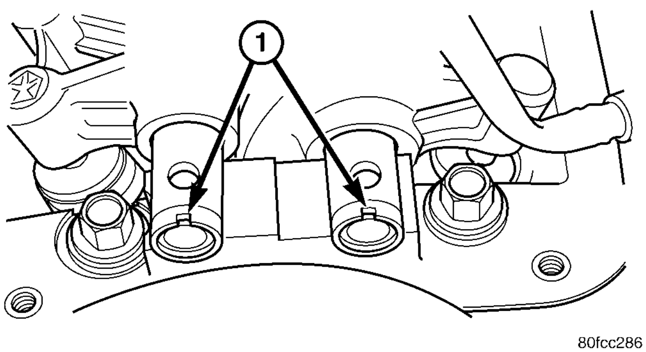


Fig. 27 Rocker Arm Shaft Notches

1 - NOTCHES FACING UP AND TOWARD THE TIMING BELT SIDE OF THE ENGINE

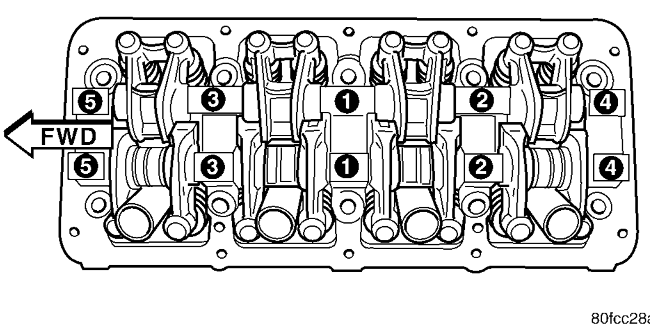


Fig. 28 Rocker Arm Shaft Tightening Sequence

(6) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

CAMSHAFT

DESCRIPTION

The camshaft is made of nodular iron with five bearing journal surfaces and three cam lobes per cylinder. Provision for a cam position sensor is provided on the rear of the camshaft. The camshaft position sensor bolts to the rear of the cylinder head and also controls camshaft thrust. A hydrodynamic oil seal is used for oil control at the front of the camshaft.

OPERATION

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE - CAMSHAFT END-PLAY

(1) Measure camshaft end play using the following procedure:

(a) Mount dial indicator C-3339 or equivalent, to a stationary point on cylinder head (Fig. 29).

(b) Using a suitable tool, move camshaft to rearward limits of travel.

(c) Zero the dial indicator.

(d) Move camshaft forward to limits of travel and read dial indicator.

(e) End play travel: 0.13–0.33 mm (0.005–0.013 in.).

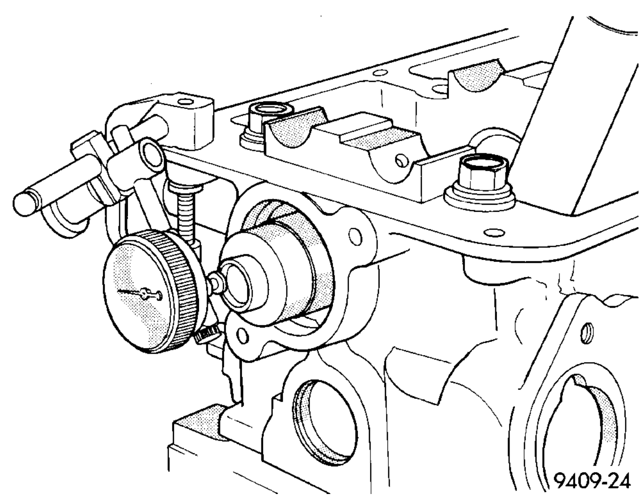


Fig. 29 Camshaft End Play

REMOVAL

(1) Disconnect and isolate negative battery cable.

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

CAMSHAFT (Continued)

(3) Disconnect the IAT sensor electrical connector (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/INLET AIR TEMPERATURE SENSOR - DESCRIPTION) .

(4) Disconnect the following:
- Air intake duct at throttle body
- Throttle cables
- TPS and IAC connectors
- Make-up air hose at air cleaner housing

(5) Remove the air cleaner housing assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

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

(7) Remove the front timing belt cover, timing belt, and tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(8) Remove the camshaft sprocket and rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(9) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(10) Mark rocker arm shaft assemblies so that they are installed in their original positions.

(11) Remove rocker arm and shaft assemblies (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).

(12) Drain cooling system below heater hose level.

(13) Disconnect the ECT sensor electrical connector.

(14) Disconnect hoses from heater supply and return tubes.

(15) Remove heater tube support bracket bolts at rear of cylinder head.

(16) Remove PDC attaching screws and reposition for camshaft removal clearance.

(17) Remove camshaft sensor and camshaft target magnet (Refer to 8 - ELECTRICAL/IGNITION CONTROL/CAMSHAFT POSITION SENSOR - REMOVAL).

(18) Carefully remove camshaft from the rear of cylinder head. Reposition heater tubes and PDC for camshaft clearance (Fig. 30).

(19) Remove the camshaft seal (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT OIL SEAL(S) - REMOVAL).

CLEANING

Clean camshaft with a suitable solvent.

INSPECTION

(1) Inspect camshaft bearing journals for damage and binding (Fig. 31). If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.

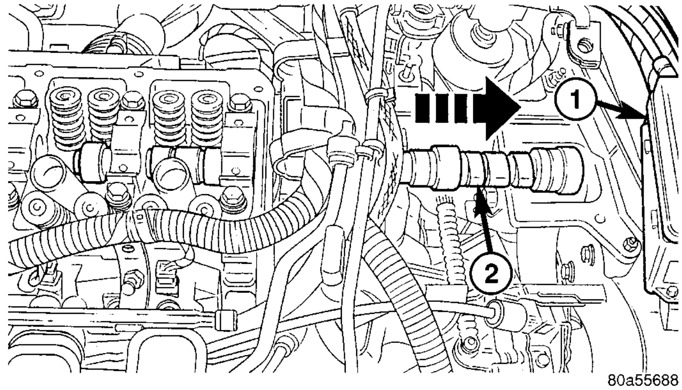


Fig. 30 Camshaft Removal

1 - POWER DISTRIBUTION CENTER (PDC)
2 - CAMSHAFT

(2) Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the rocker arms.

(3) Measure the lobe actual wear (unworn area - wear zone = actual wear) (Fig. 31) and replace camshaft if out of limit. Standard value is 0.0254 mm (0.001 in.), wear **limit** is 0.254 mm (0.010 in.).

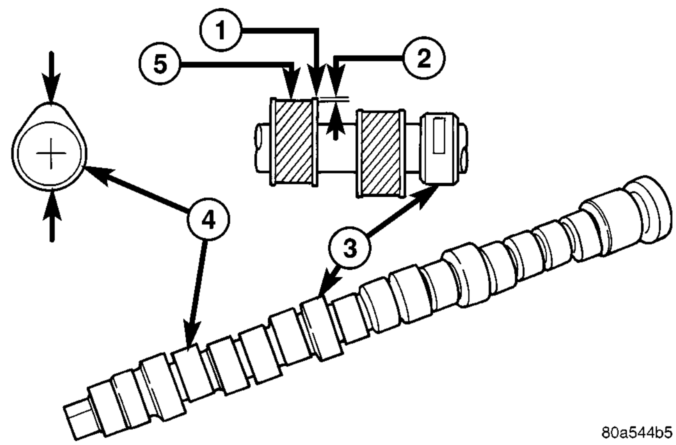


Fig. 31 Checking Camshaft(s) for Wear

1 - UNWORN AREA
2 - ACTUAL WEAR
3 - BEARING JOURNAL
4 - LOBE
5 - WEAR ZONE

INSTALLATION

(1) Lubricate the camshaft journals with oil.

(2) Carefully install the camshaft into the cylinder head. Reposition the PDC and heater tubes for clearance (Fig. 30).

(3) Install camshaft target magnet into the end of the camshaft. Tighten mounting screw to 3.4 N·m (30 in. lbs.).

CAMSHAFT (Continued)

(4) Install camshaft position sensor (Refer to 8 - ELECTRICAL/IGNITION CONTROL/CAMSHAFT POSITION SENSOR - INSTALLATION).

(5) Measure camshaft end-play (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT - STANDARD PROCEDURE).

NOTE: Camshaft must be installed before installation of the camshaft seal.

(6) Install camshaft seal (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT OIL SEAL - INSTALLATION).

(7) Install rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(8) Install the camshaft sprocket on the camshaft.

CAUTION: DO NOT use an impact wrench (or any other air operated tool) for tightening the camshaft sprocket bolt. Damage to the camshaft timing pin can result. ONLY use a hand wrench while holding camshaft sprocket with Special Tool.

(9) Install camshaft sprocket retaining bolt. While holding sprocket with Special Tools C-4687 and modified Adaptor C-4687-1, tighten attaching bolt to 115 N·m (85 ft. lbs.).

(10) Install timing belt and tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(11) Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(12) Install rocker arm and shaft assemblies in correct order as removed (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / HYDRAULIC LASH ADJUSTER ASSEMBLY - INSTALLATION).

(13) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(14) Install ignition coil and spark plug cables. Tighten ignition coil fasteners to 12 N·m (105 in. lbs.).

(15) Install the heater tube bracket attaching bolt.

(16) Connect the heater hoses to the heater tubes.

(17) Connect the ECT electrical connector.

(18) Install the PDC attaching screws.

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

(20) Install the air cleaner housing assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(21) Connect the following:

- Air intake duct at throttle body
- Throttle cables
- TPS and IAC connectors
- Make-up air hose at air cleaner housing

(22) Connect the IAT sensor.

(23) Install battery. Connect positive battery cable (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

(24) Connect negative battery cable.

(25) Refill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

CAMSHAFT OIL SEAL

REMOVAL

(1) Disconnect and isolate negative battery cable.

(2) Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(3) Remove timing belt and tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

CAUTION: Do Not Rotate the camshaft or crankshaft when timing belt is removed damage to the engine may occur.

(4) Hold camshaft sprocket with Special Tools C-4687 and modified C-4687-1 as shown in (Fig. 32), while removing attaching bolt.

(5) Remove sprocket from camshaft.

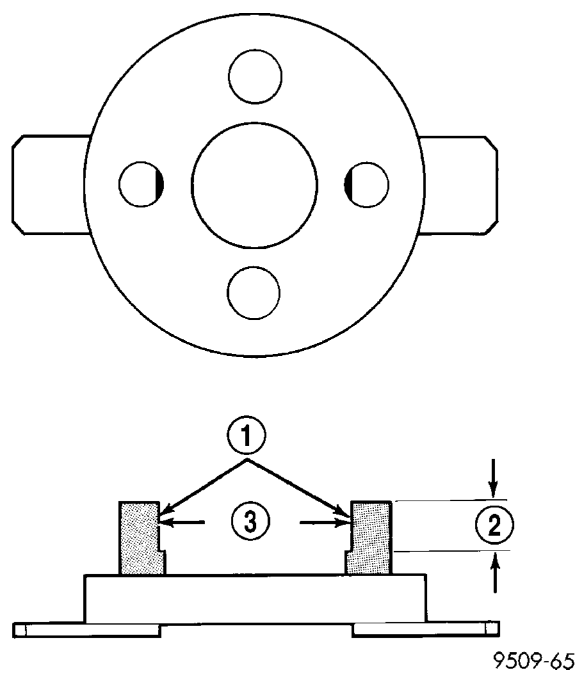


Fig. 32 Modification to Special Tool

1 - GRIND LOCATION
2 - 12.7 MM (1/2 IN.)
3 - 50.8 MM (2 IN.)

CAMSHAFT OIL SEAL (Continued)

(6) Remove rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(7) Remove camshaft seal by carefully using a suitable pry tool. Be careful not to nick or damage the camshaft seal surface or cylinder head seal retaining bore.

CAUTION: Do not nick shaft seal surface or seal bore.

(8) Shaft seal lip surface must be free of varnish, dirt or nicks. Polish with 400 grit paper, if necessary.

INSTALLATION

(1) Install camshaft seal flush with cylinder head using Special Tool MD998306 (Fig. 33).

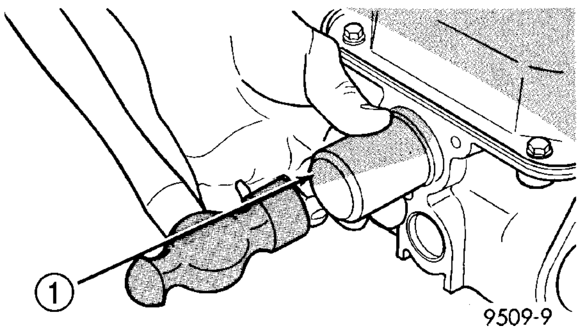


Fig. 33 Camshaft Oil Seal - Installation

1 - SPECIAL TOOL MD 998306

(2) Install rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(3) Install the camshaft sprocket on the camshaft.

CAUTION: DO NOT use an impact wrench (or any other air operated tool) for tightening the camshaft sprocket bolt. Damage to the camshaft timing pin can result. ONLY use a hand wrench while holding camshaft sprocket with Special Tool.

(4) Install camshaft sprocket retaining bolt. Hold camshaft sprocket with Special Tools C-4687 and modified C-4687-1 (Fig. 32) and tighten bolt to 115 N·m (85 ft. lbs.).

(5) Install timing belt and tensioner/bracket assembly(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(6) Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(7) Connect negative battery cable.

SPARK PLUG TUBE

REMOVAL

(1) Remove the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Using locking pliers, remove the tube from the cylinder head (Fig. 34). Discard old tube.

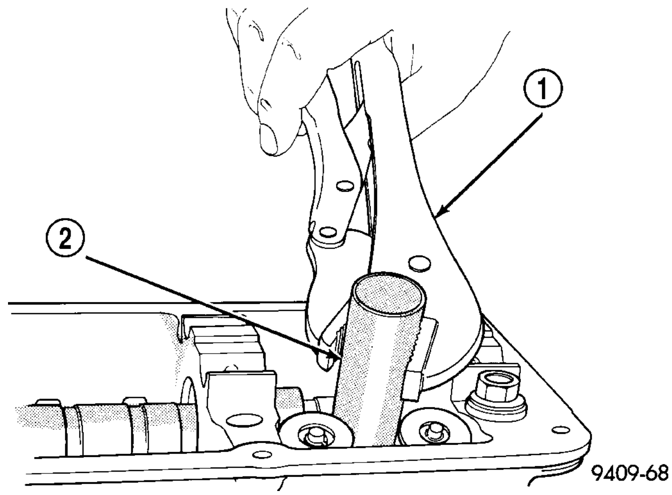


Fig. 34 Spark Plug Tube - Removal

1 - LOCKING PLIERS
2 - SPARK PLUG TUBE

INSTALLATION

(1) Clean area around spark plug with Mopar® parts cleaner or equivalent.

(2) Apply Mopar® Stud and Bearing Mount or equivalent to a new tube approximately 1 mm (0.039 in.) from the end in a 3 mm (0.118 in.) wide area.

(3) Install sealer end of tube into the cylinder head. Then carefully install the tube using a hardwood block and mallet until the tube is seated into the bottom of the bore.

(4) Install the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

SPARK PLUG TUBE - SEAL

DESCRIPTION

The spark plug tube seals are located in the cylinder head cover (Fig. 35). These seals are pressed into the cylinder head cover to seal the outside perimeter of the spark plug tubes. If these seals show signs of hardness and/or cracking, they should be replaced.

SPARK PLUG TUBE - SEAL (Continued)

REMOVAL

(1) Remove the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Using an appropriate tool, carefully remove spark plug tube seals. Care should be taken not to damage cylinder head cover sealing surfaces.

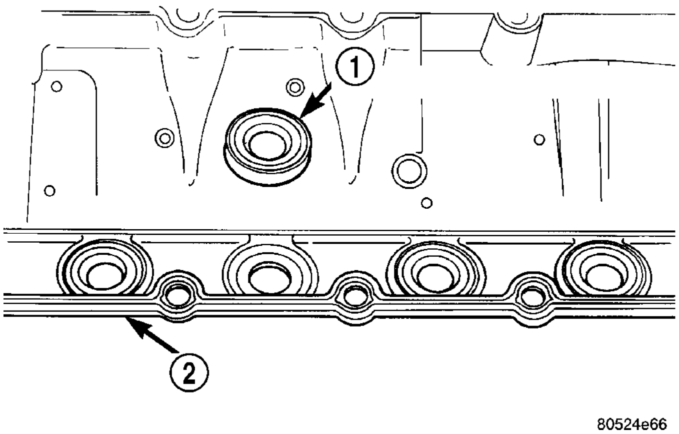


Fig. 35 Spark Plug Tube Seal

1 - SPARK PLUG TUBE SEAL
2 - CYLINDER HEAD COVER

INSTALLATION

(1) Clean all sealing surfaces.

NOTE: Position seal with the concave side facing the installation tool (Fig. 36).

(2) Install seals using Special Tool MB-998306 (Fig. 36). Only hand pressure on tool is needed to install new seals.

(3) Install the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

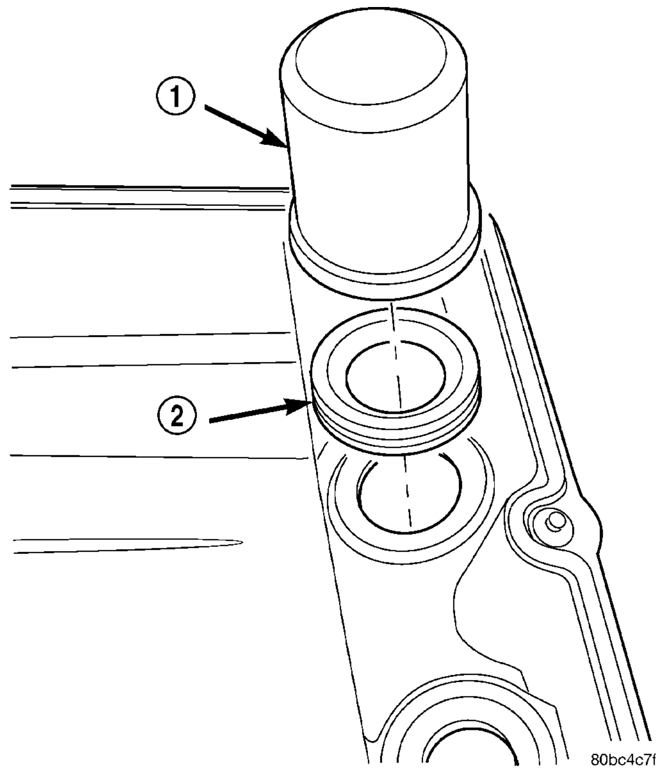


Fig. 36 Spark Plug Tube Seal Installation

1 - SPECIAL TOOL MD-998306
2 - SPARK PLUG TUBE SEAL

VALVE SPRINGS

REMOVAL

REMOVAL - CYLINDER HEAD OFF

(1) Using Special Tool C-3422–D (valve spring compressor) with Adapter 6526 compress valve spring and remove valve retaining locks. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

(2) Slowly release valve spring compressor.Remove valve spring retainer and valve spring.

(3) Remove valve stem seal assembly (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - REMOVAL).

REMOVAL - CYLINDER HEAD ON

(1) Remove the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Remove rocker arm shafts assemblies. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL)

(3) Rotate crankshaft until piston is at TDC on compression stroke.

(4) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.

(5) Using Special Tool MD-998772A with adapter 6779 (Fig. 37)compress valve springs and remove valve locks.

(6) Remove the valve spring.

(7) Remove the valve stem seal. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - REMOVAL)

VALVE SPRINGS (Continued)

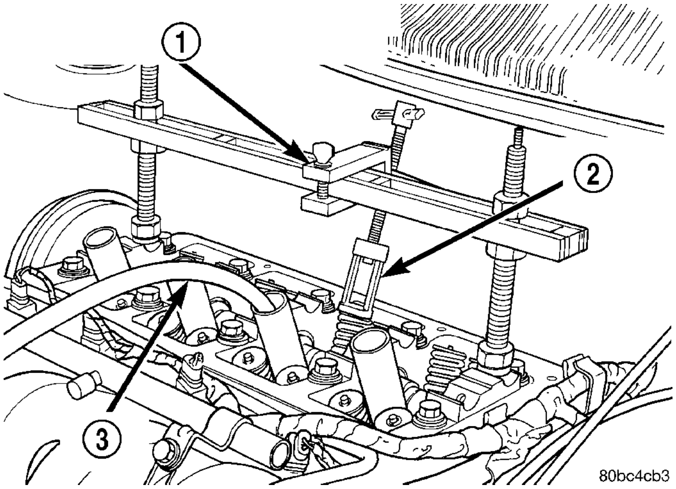


Fig. 37 Valve Spring - Removal/Installation

1 - VALVE SPRING COMPRESSOR SPECIAL TOOL MD-998772A
2 - ADAPTER 6779
3 - AIR HOSE

INSPECTION

When valves have been removed for inspection, reconditioning or replacement, valve springs should be tested (Fig. 38). **As an example;** the compression length of the spring to be tested is 38.00 mm (1.496 in.). Turn table of Tool C-647 until surface is in line with the 38.00 mm (1.496 inches.) mark on the threaded stud and the zero mark on the front. Place spring over stud on the table and lift compressing lever to set tone device. Pull on torque wrench until ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Engine Specifications to obtain specified height and allowable tensions (Refer to 9 - ENGINE - SPECIFICATIONS). Replace springs that do not meet specifications.

INSTALLATION

INSTALLATION - CYLINDER HEAD OFF

(1) Coat valve stems with clean engine oil and insert in cylinder head.

(2) Install new valve stem seals (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - INSTALLATION).

CAUTION: If oversize valves are used, there is only one oversize valve available. The same stem seal is used on both the standard and oversize valve.

NOTE: On the high output R/T engine, the valve spring MUST be oriented properly when installed.

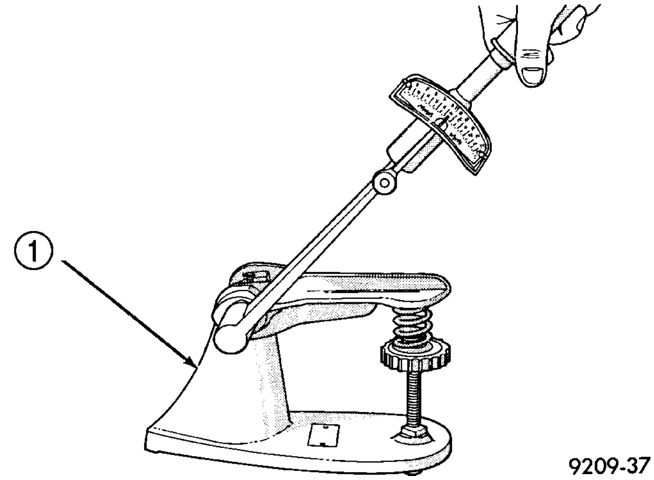


Fig. 38 Testing Valve Spring

1 - SPECIAL TOOL C-647

The closely spaced spring coils should be positioned toward the cylinder head (spring seat) (Fig. 41).

(3) Position valve spring and retainer on spring seat (Fig. 40) or (Fig. 41).

(4) 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.

(5) Check the valve spring installed height after refacing the valve and seat (measurement B) (Fig. 39). Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 40.18 mm (1.58 in.), install a 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.

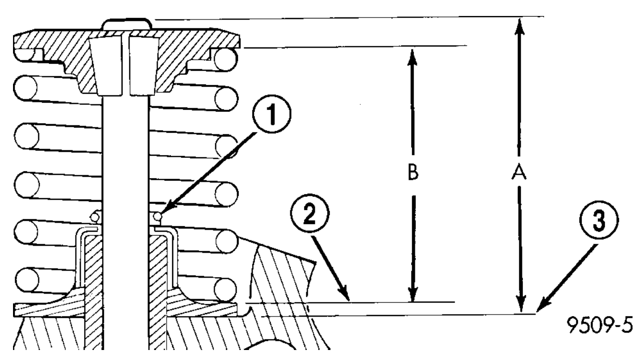


Fig. 39 Spring Installed Height

1 - GARTER SPRING
2 - VALVE SPRING SEAT
3 - CYLINDER HEAD SURFACE

VALVE SPRINGS (Continued)

(6) Install rocker arms and shafts. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION)

(7) Checking dry lash. Dry lash is the amount of clearance that exists between the base circle of an installed cam and the rocker arm roller when the adjuster is drained of oil and completely collapsed. Specified dry lash is 1.00 mm (0.039 in.) for intake and 1.40 mm (0.055 in.) for exhaust. After performing dry lash check, refill adjuster with oil and allow 10 minutes for adjuster(s) to bleed down before rotating cam.

INSTALLATION - CYLINDER HEAD ON

(1) Install valve stem seal assembly. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - INSTALLATION)

NOTE: On the high output R/T engine, the valve spring MUST be oriented properly when installed. The closely spaced spring coils should be positioned toward the cylinder head (spring seat) (Fig. 41).

(2) Position valve spring and retainer on spring seat (Fig. 40) or (Fig. 41).

(3) With air pressure applied in cylinder and piston at TDC, use Special Tool MD-998772A to compress valve springs, only enough to install the locks. Correct alignment of tool is necessary to avoid nicking valve stems.

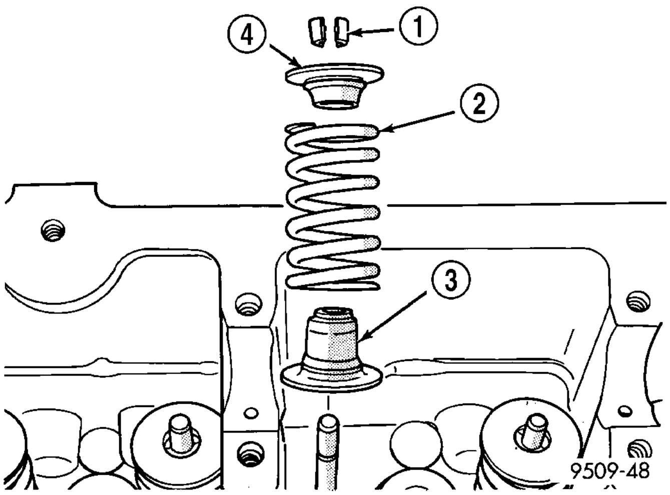


Fig. 40 Valve Spring Assembly

1 - VALVE RETAINING LOCKS
2 - VALVE SPRING
3 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY
4 - VALVE SPRING RETAINER

(4) Install the rocker arm shaft assemblies. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION)

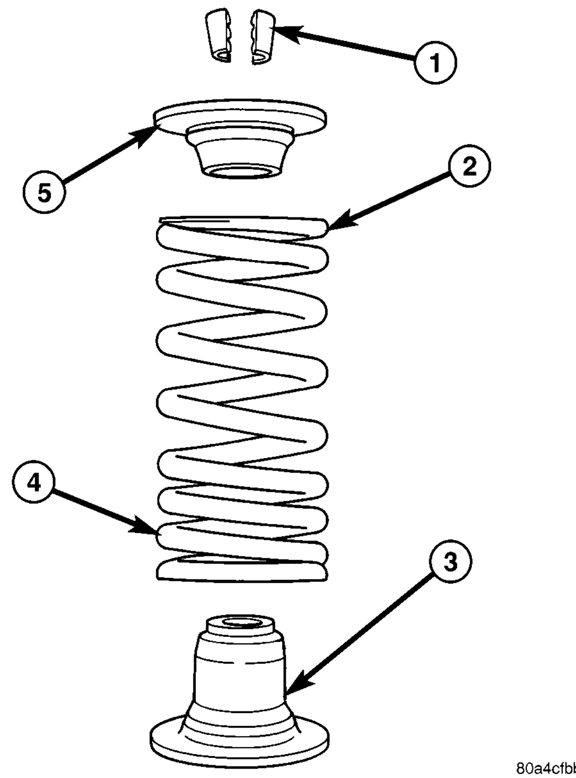


Fig. 41 VALVE SPRING - R/T ENGINE

1 - VALVE LOCKS
2 - VALVE SPRING - TOP
3 - VALVE SEAL AND SPRING SEAT ASSEMBLY
4 - VALVE SPRING - BOTTOM (CLOSER SPACED SPRING COILS)
5 - VALVE SPRING RETAINER

(5) Install the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

VALVE STEM SEALS

REMOVAL

(1) Remove valve spring. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - REMOVAL)

(2) Remove valve stem seals by using a valve stem seal tool (Fig. 42).

INSTALLATION

(1) The valve stem seal/valve spring seat should be pushed firmly and squarely over the valve guide using the valve stem as guide. **Do Not Force** seal against top of guide. When installing the valve retainer locks, compress the spring **only enough** to install the locks.

CAUTION: Do not remove garter spring around the seal at the top of the valve stem seal (Fig. 43).

VALVE STEM SEALS (Continued)

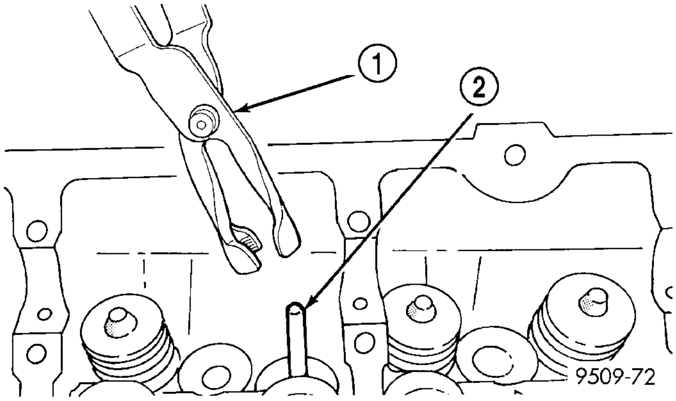


Fig. 42 Valve Stem Seal - Removal

1 - VALVE SEAL TOOL
2 - VALVE STEM

(2) Install valve spring. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSTALLATION)

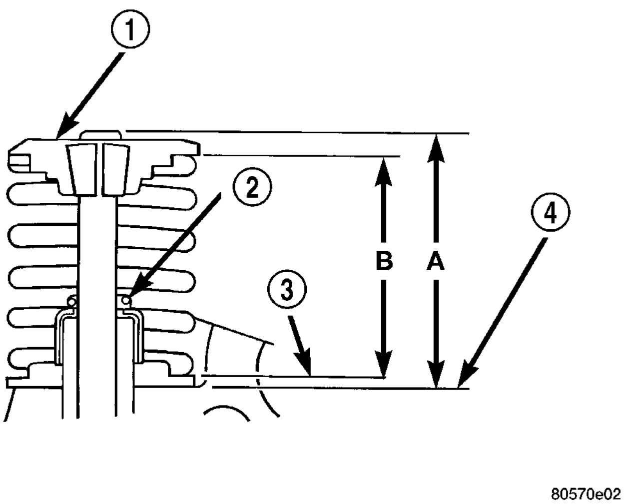


Fig. 43 Checking Valve Tip Height and Valve Spring Installed Height

1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The four valves per cylinder are opened by using roller rocker arms with hydraulic lash adjusters which pivot on the rocker shafts. The valves have chrome plated valve stems. Viton rubber valve stem seals are integral with the spring seats.

The valve springs, spring retainers, and locks are 3-bead design.

STANDARD PROCEDURE - VALVE AND VALVE SEAT REFACING

For all applicable valve and seat dimensions and angles (Refer to 9 - ENGINE - SPECIFICATIONS).

(1) Reface valves using a suitable valve refacing machine.

(2) Inspect the remaining margin after the valves are refaced (Fig. 44). Intake valves with less than 0.79 mm (0.0312 in.) margin and exhaust valves with less than 1.19 mm (0.0469 in.) margin should be replaced.

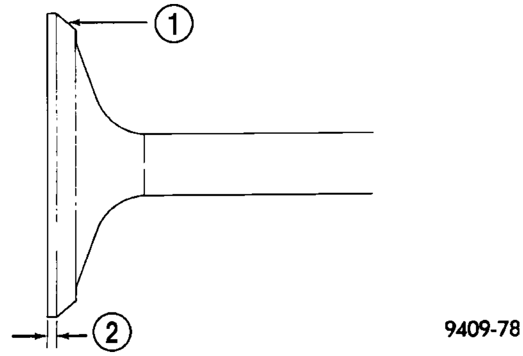


Fig. 44 Intake and Exhaust Valve Refacing

1 - VALVE FACE
2 - VALVE MARGIN

(3) Valve seats which are worn or burned can be reworked, provided that correct angle and seat width are maintained. The intake valve seat must be serviced when the valve seat width is 2.0 mm (0.079 in.) or greater. The exhaust valve seat must be serviced when the valve seat width is 2.5 mm (0.098 in.) or greater. Otherwise the cylinder head must be replaced.

(4) Reface valve seats using a suitable valve seat machine

(5) When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones or cutter. A true and complete surface must be obtained.

(6) Measure the concentricity of valve seat and valve guide using a valve seat runout dial indicator. Total runout should not exceed. 0.051 mm (0.002 in.) (total indicator reading).

(7) 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/cutter. If the blue is transferred to the bottom edge of valve face raise valve seat with a 65 degrees stone/cutter.

INTAKE/EXHAUST VALVES & SEATS (Continued)

(8) When seat is properly positioned the width of intake and exhaust seats should be 0.75–1.25 mm (0.030–0.049 in.) (Fig. 45).

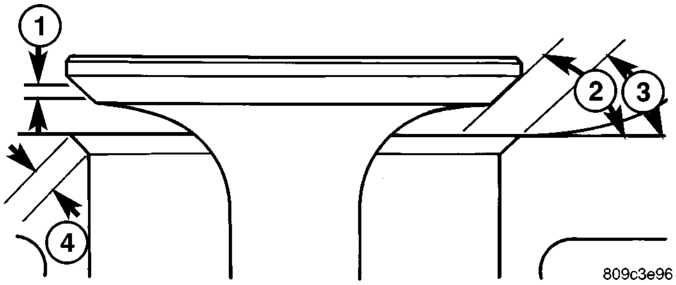


Fig. 45 Valve Face and Seat

1 - SEAT WIDTH
2 - FACE ANGLE
3 - SEAT ANGLE
4 - SEAT CONTACT AREA

(9) Check valve tip to spring seat dimensions A after machining the valve seats or faces. Grind valve tip until within specifications. Measure from valve tip to spring seat when installed in the head (measurement A) (Fig. 46). For valve tip specifications, (Refer to 9 - ENGINE - SPECIFICATIONS). The valve tip chamfer is needed to be reground to prevent seal damage when the valve is installed.

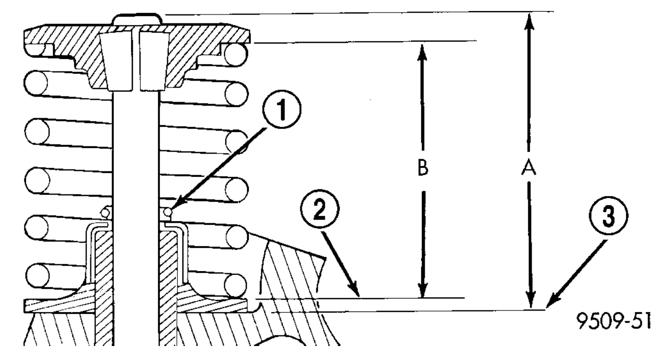


Fig. 46 Spring Installed

1 - GARTER SPRING
2 - VALVE SPRING SEAT
3 - CYLINDER HEAD SURFACE

REMOVAL

(1) Remove valve spring. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - REMOVAL)

(2) Before removing valve, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves to insure installation in original location.

(3) Remove valve(s) from cylinder head.

CLEANING

(1) Clean all valves thoroughly and discard burned, warped and cracked valves.

INSPECTION

VALVES

(1) Measure valve stems for wear (Fig. 47) approximately 60 mm (2.36 in.) below the valve lock grooves. For valve specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

NOTE: Valve stems are chrome plated and should not be polished (Fig. 47).

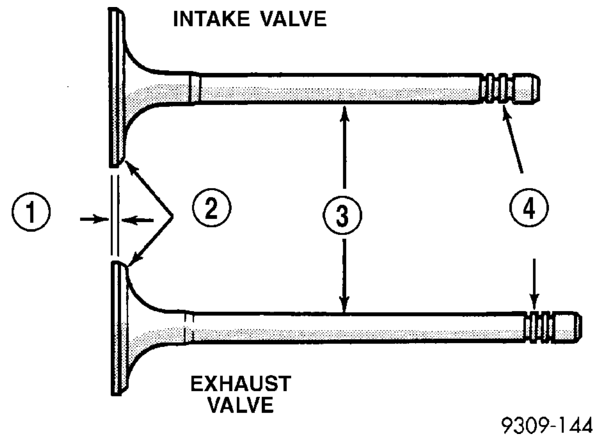


Fig. 47 Intake and Exhaust Valves

1 - MARGIN
2 - FACE
3 - STEM
4 - VALVE SPRING RETAINER LOCK GROOVES

VALVE GUIDES

NOTE: Replace cylinder head if stem-to-guide clearance exceeds specifications, or if guide is loose in cylinder head.

(1) Measure valve stem-to-guide clearance as follows:

(2) Install valve into cylinder head so it is 15 mm (0.590 in.) off the valve seat. A small piece of hose may be used to hold valve in place.

(3) Attach dial indicator Tool C-3339 to cylinder head and set it at right angle of valve stem being measured (Fig. 48).

(4) Move valve to and from the indicator. (Refer to 9 - ENGINE - SPECIFICATIONS)

(5) Check valve guide height (Fig. 49).

INSTALLATION

(1) Coat valve stems with clean engine oil.

(2) Install valve in cylinder head.

(3) Install valve seal. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - INSTALLATION)

INTAKE/EXHAUST VALVES & SEATS (Continued)

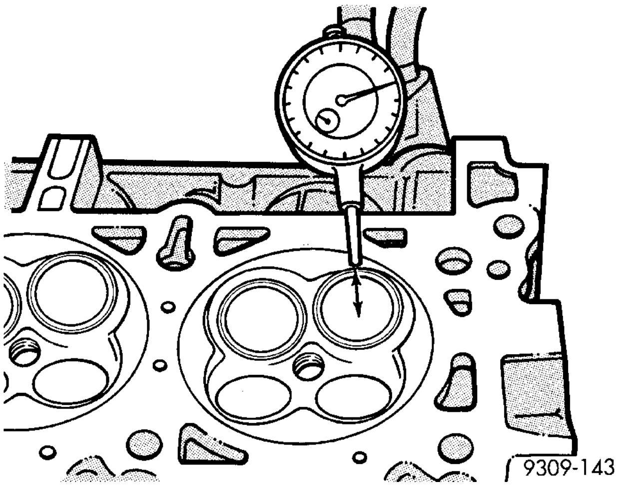


Fig. 48 Measuring Valve Guide

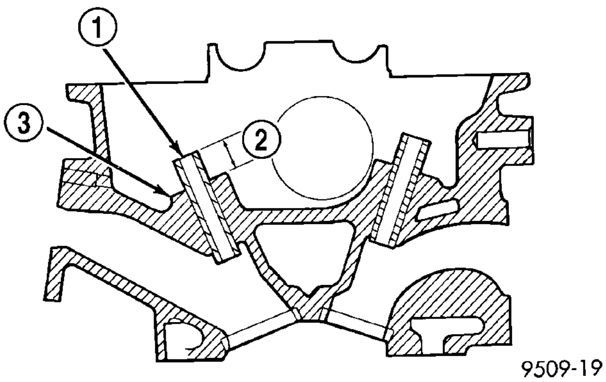


Fig. 49 Valve Guide Height

1 - VALVE GUIDE
2 - 13.25 - 13.75 MM (0.521 - 0.541 IN.)
3 - SPRING SEAT

(4) Install valve springs. (Refer to 9 - ENGINE/ CYLINDER HEAD/VALVE SPRINGS - INSTALLATION)

ENGINE BLOCK

DESCRIPTION

The cast iron cylinder block is a two-piece assembly, consisting of the cylinder block and bed plate (Fig. 50). The bed plate incorporates the main bearing caps and bolts to the cylinder block. This design offers a much stronger lower end and increased cylinder block rigidity. The rear oil seal retainer is integral with the block. The bed plate and block are serviced as an assembly.

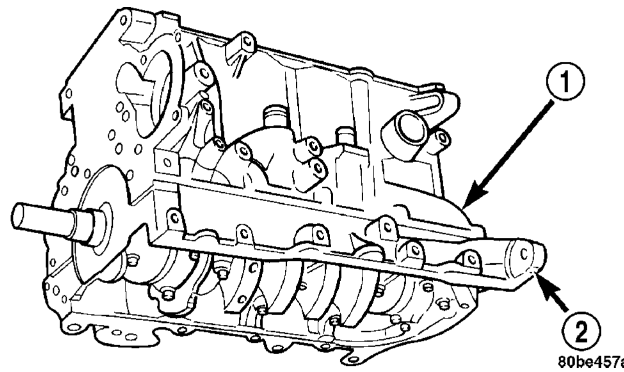


Fig. 50 Cylinder Block and Bed plate

1 - CYLINDER BLOCK
2 - BED PLATE

STANDARD PROCEDURE - CYLINDER BORE HONING

(1) Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, equipped with 220 grit stones, is the best tool for this honing procedure. 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, recommended tool C-3501 or equivalent, 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. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.

(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 40-60 degrees, the cross hatch angle is most satisfactory for proper seating of rings (Fig. 51).

(4) A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 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.

ENGINE BLOCK (Continued)

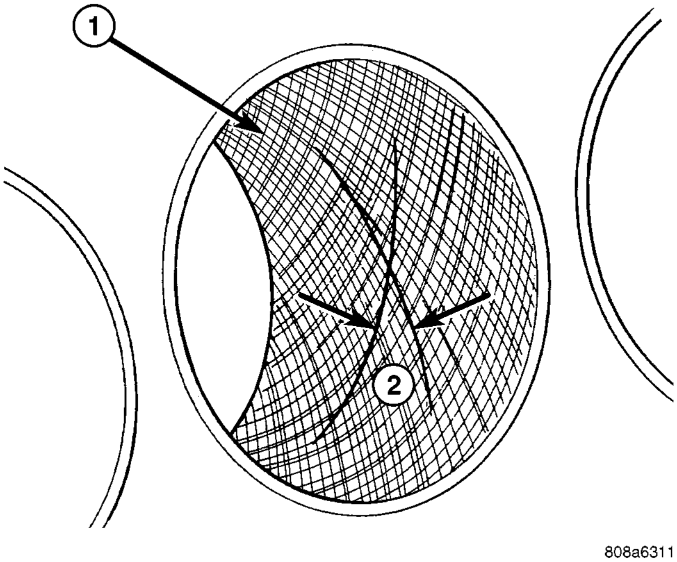


Fig. 51 Cylinder Bore Cross-Hatch Pattern

1 - CROSS-HATCH PATTERN
2 - 40°–60°

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

ENGINE BLOCK

(1) Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.

(2) If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).

(3) Examine block and cylinder bores for cracks or fractures.

(4) Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Fig. 52) (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

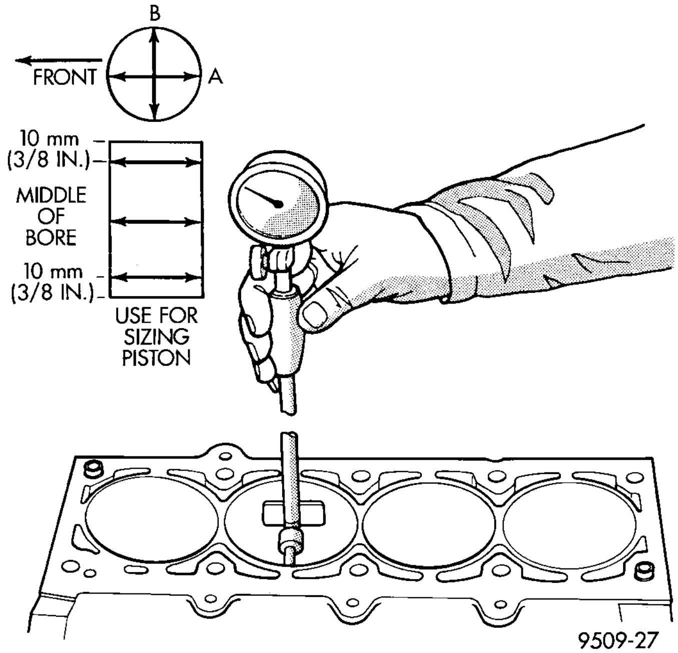


Fig. 52 Checking Cylinder Bore Size

Measure the cylinder bore at three levels in directions A and B (Fig. 52). 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 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT

STANDARD PROCEDURE - CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine, locating probe on nose of the crankshaft (Fig. 53).

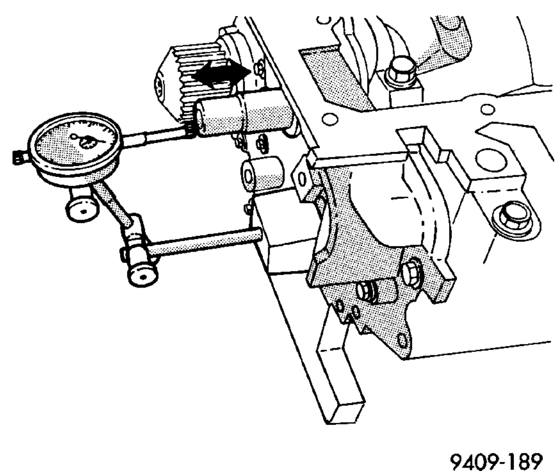


Fig. 53 Checking Crankshaft End Play - Typical

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

CRANKSHAFT (Continued)

(4) Move crankshaft all the way to the front of its travel and read the dial indicator. For crankshaft specifications (Refer to 9 - ENGINE - SPECIFICATIONS)

REMOVAL - CRANKSHAFT

(1) Remove engine assembly from vehicle (Refer to 9 - ENGINE - REMOVAL).

(2) Separate transaxle from engine.

(3) Remove drive plate/flexplate.

(4) Remove crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

(5) Mount engine on a suitable repair stand.

(6) Drain engine oil.

(7) Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(8) Remove front timing belt cover, front engine mount bracket, and timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(9) Remove the timing belt tensioner and pulley bracket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - REMOVAL).

(10) Remove camshaft sprocket and rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(11) Remove crankshaft sprocket (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - REMOVAL).

(12) Remove oil filter and adapter (Fig. 54).

(13) Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(14) Remove oil pump pick-up tube.

(15) Remove oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

(16) Remove crankshaft position sensor (Fig. 54).

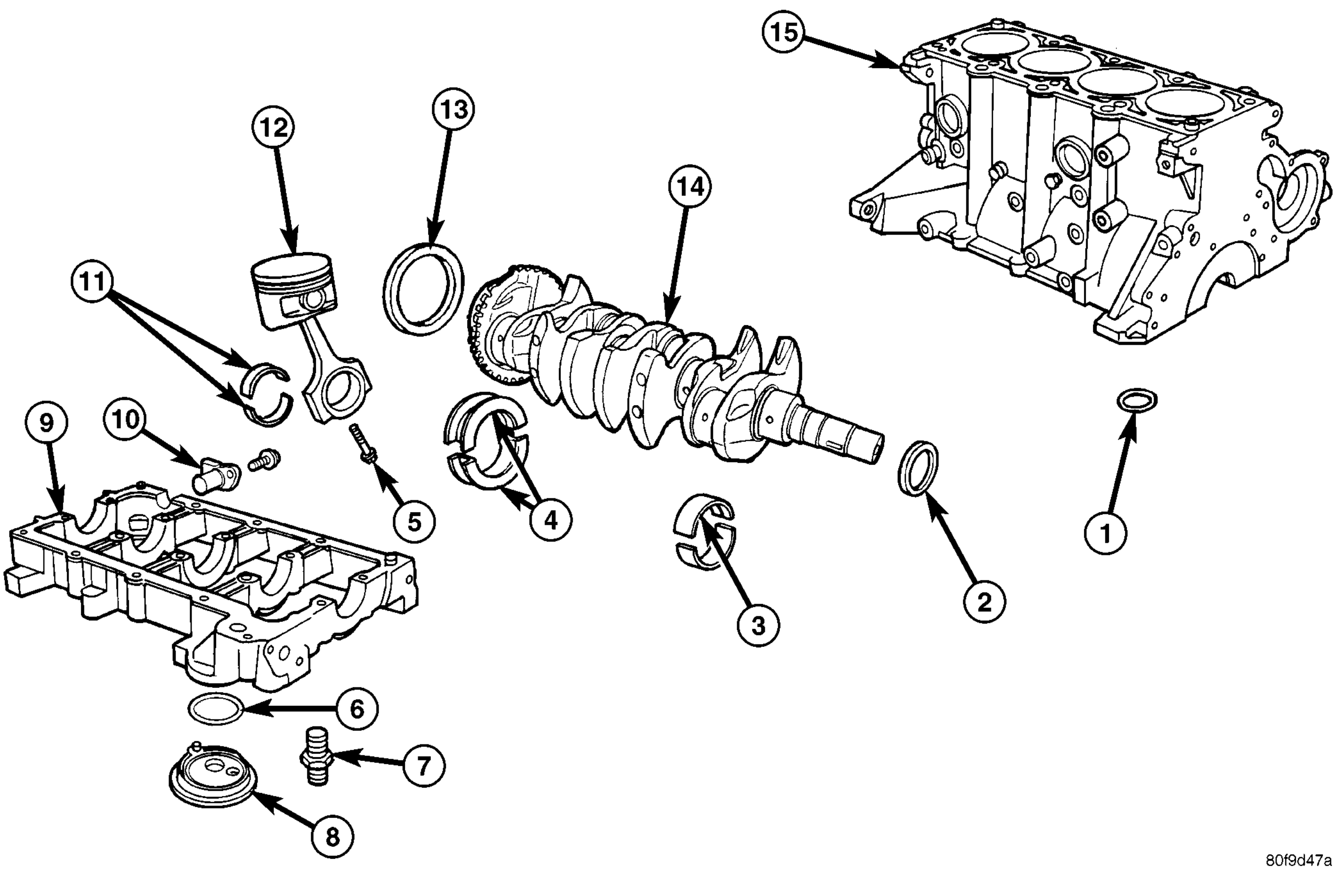


Fig. 54 Engine Block and Components

1 - OIL PASSAGE O-RING
2 - FRONT CRANKSHAFT SEAL
3 - UPPER BEARING (GROOVED)
4 - THRUST BEARINGS
5 - BOLT
6 - O-RING
7 - NIPPLE
8 - OIL FILTER ADAPTER
9 - BEDPLATE
10 - CRANKSHAFT POSITION SENSOR
11 - CONNECTING ROD BEARINGS
12 - PISTON AND CONNECTING ROD ASSEMBLY
13 - REAR CRANKSHAFT SEAL
14 - CRANKSHAFT
15 - ENGINE BLOCK

CRANKSHAFT (Continued)

(17) Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap (Fig. 55).

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

(18) Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

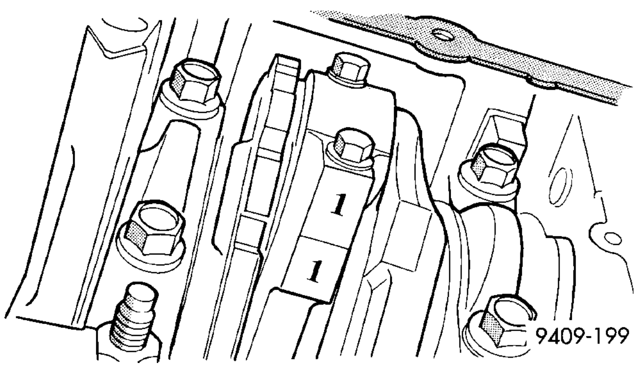


Fig. 55 Identify Connecting Rod to Cylinder - Typical

(19) Remove all bed plate bolts from the engine block (Fig. 56).

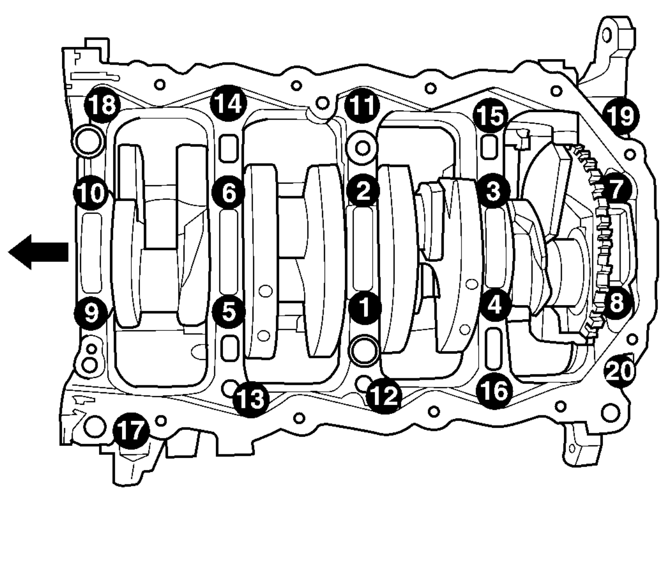


Fig. 56 Main Bearing Caps/Bed Plate Bolt Removal Sequence

(20) Using a mallet tap the bed plate loose from the engine block dowel pins.

CAUTION: Do not pry up on one side of the bed plate. Damage may occur to cylinder block to bed plate alignment and thrust bearing.

(21) Bedplate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mis-handled.

(22) Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

(23) Remove the target ring mounting screws and discard.

(24) Remove the target ring from the crankshaft.

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring (Fig. 57). Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 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, it is important that the final paper or cloth polish be in the same direction as normal rotation in the engine.

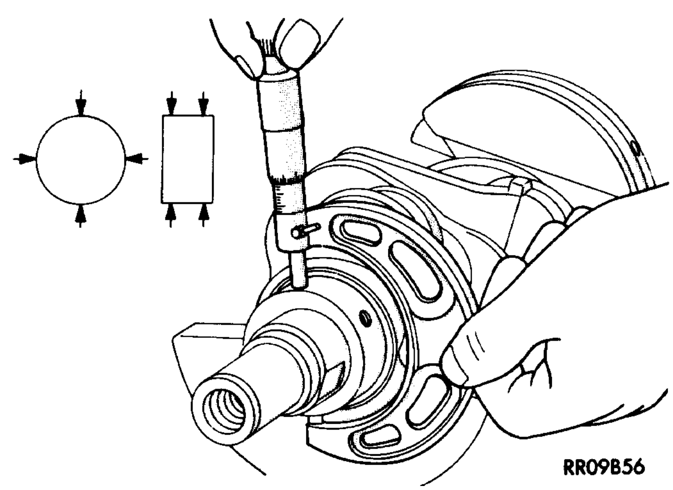


Fig. 57 Crankshaft Journal Measurements - Typical

CRANKSHAFT (Continued)

INSTALLATION - CRANKSHAFT

CRANKSHAFT MAIN BEARING LOCATION

The crankshaft is supported in five main bearings. All upper bearing shells in the crankcase have oil grooves and holes. All lower bearing shells installed in the (bedplate) main bearing cap are plain. Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal (Fig. 58).

NOTE: The upper and lower main Bearing shells are Not interchangeable. The lower shell locating tabs prevent improper installation.

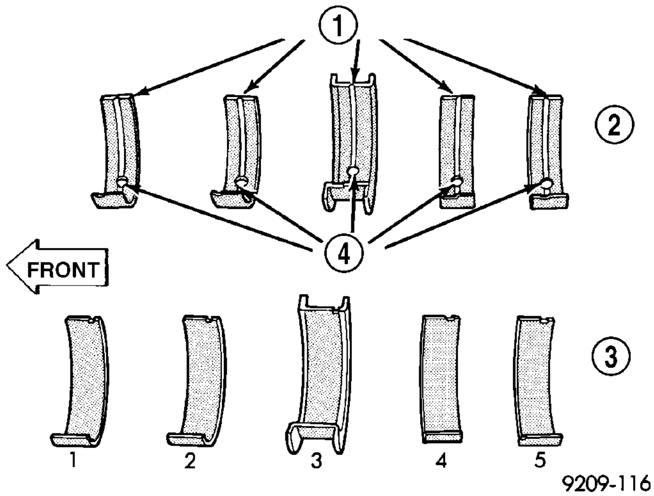


Fig. 58 Main Bearing Identification

1 - OIL GROOVES
2 - UPPER BEARINGS
3 - LOWER BEARINGS
4 - OIL HOLES

(1) Install the main bearing upper shells with the lubrication groove and oil hole in the engine block. Install O-ring into recess in the block (Fig. 59).

(2) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

NOTE: If the crankshaft is sent out for machine work, it must be balenced as an assembly with the target ring installed.

(3) Clean crankshaft and target ring with MOPAR® brake parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

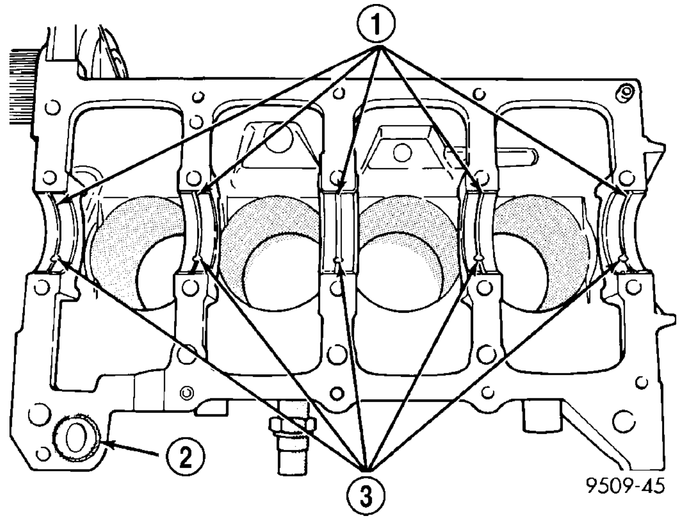


Fig. 59 Installing Main Bearing Upper Shell

1 - LUBRICATION GROOVES
2 - O-RING
3 - OIL HOLES

(4) Install **NEW** mounting screws finger tight starting with the #1 location. (Fig. 60) Make sure engagment occurs with the shoulder of the screw and mounting hole before starting all other screws.

(5) Torque all mounting screws with T30 torx bit to 13 N·m (110 in-lbs) following the torque sequence.

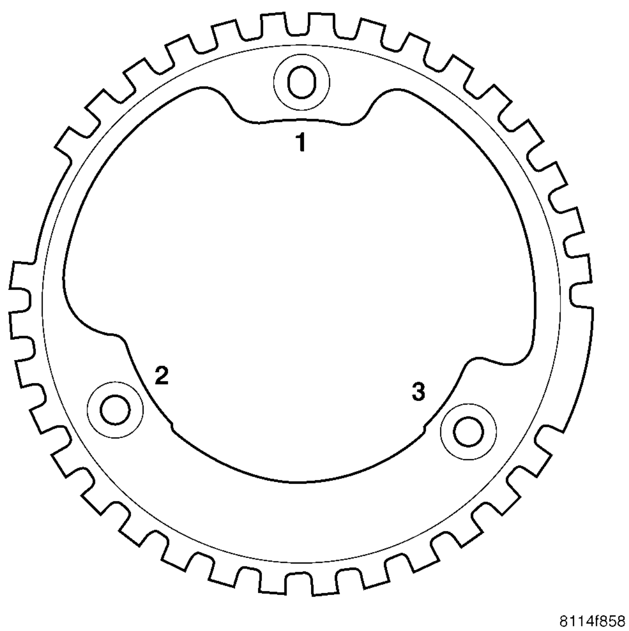


Fig. 60 Target Ring Torque Sequence

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mis-handled.

CRANKSHAFT (Continued)

CAUTION: Do Not get oil on the bed plate mating surface. It will affect the ability of the sealer to seal the bed plate to cylinder block.

(6) Oil the bearings and journals and install crankshaft in engine the block.

CAUTION: Use only Mopar® Bed Plate Sealant on the bed plate or damage may occur to the engine.

(7) Install lower main bearings into main bearing cap/bed plate. Make certain the bearing tabs are seated into the bed plate slots and apply oil.

(8) Apply a 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar® Bed Plate Sealant to cylinder block as shown in (Fig. 61).Install the main bearing/bed plate into the engine block.

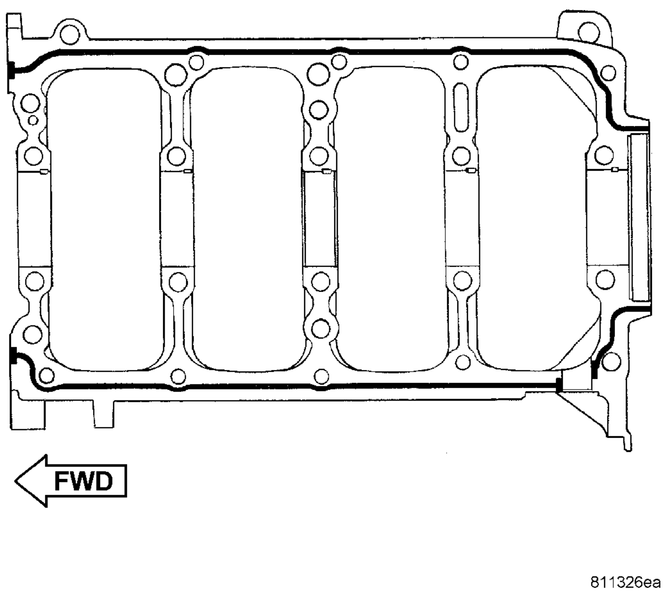


Fig. 61 Bed plate Sealing

(9) Before installing the bolts oil threads with clean engine oil, wipe off any excess oil.

(10) Install main bearing bed plate to engine block bolts 11, 17 and 20 finger tight. Tighten these bolts down together until the bed plate contacts the cylinder block (Fig. 62).

(11) To ensure correct thrust bearing alignment, perform the following steps:

• Step 1: Rotate crankshaft until number 4 piston is at TDC.

• Step 2: Move crankshaft rearward to limits of travel.

• Step 3: Then, move crankshaft forward to limits of travel.

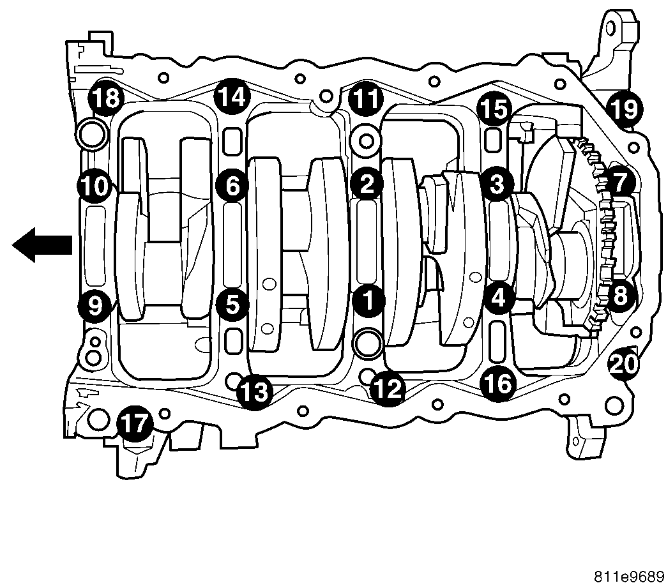


Fig. 62 Main Bearing Caps/Bed Plate Bolt Torque Sequence

• Step 4: Wedge an appropriate tool between the rear of the cylinder block **(NOT BED PLATE)** and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.

• Step 5: Install and tighten bolts (1–10) in sequence shown in (Fig. 62) to 41 N·m (30 ft. lbs.).

• Step 6: Remove wedge tool used to hold crankshaft.

(12) Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) in sequence shown in (Fig. 62).

(13) Install main bearing bed plate to engine block bolts (11–20), with baffle studs in positions 12, 13 and 16 and torque each bolt to 34 N·m (25 ft. lbs.) in sequence shown in (Fig. 62).

(14) Tighten bolts (1–10) to 81 N·m (60 ft. lbs.) in sequence shown in (Fig. 62).

(15) Tighten bolts (11–20) again to 34 N·m (25 ft. lbs.) in sequence shown in (Fig. 62).

(16) After the main bearing bed plate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

(17) Check crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).

NOTE: The connecting rod cap bolts should not be reused.

(18) Before installing **NEW** bolts, lubricate the threads with clean engine oil.

(19) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

CRANKSHAFT (Continued)

(20) Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

(21) Install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).

(22) Install oil pump pick-up tube. Torque fastener to 23 N·m (200 in. lbs.).

(23) Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(24) Install oil filter adapter and oil filter (Fig. 54) (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER ADAPTER - INSTALLATION).

(25) Install rear timing belt cover and camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(26) Install front crankshaft oil seal and crankshaft sprocket (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - INSTALLATION).

(27) Install the timing belt tensioner and pulley bracket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - INSTALLATION).

(28) Install the timing belt, front engine mount bracket, and front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(29) Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(30) Install crankshaft position sensor (Fig. 54).

(31) Install **NEW** oil filter.

(32) Remove engine from repair stand and position on Special Tools 6135 and 6710 Engine Dolly and Cradle. Install safety straps around the engine to cradle and tighten and lock them into position.

(33) Install the crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).

(34) Install drive plate/flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).

(35) Attach transaxle to engine. Tighten attaching bolts to 101 N·m (75 ft. lbs.).

(36) Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

(1) Remove the accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)

(2) Remove the crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(3) Remove the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(4) Remove the crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 63).

(5) Remove the crankshaft sprocket key from crankshaft (Fig. 64).

CAUTION: Do not nick shaft seal surface or seal bore.

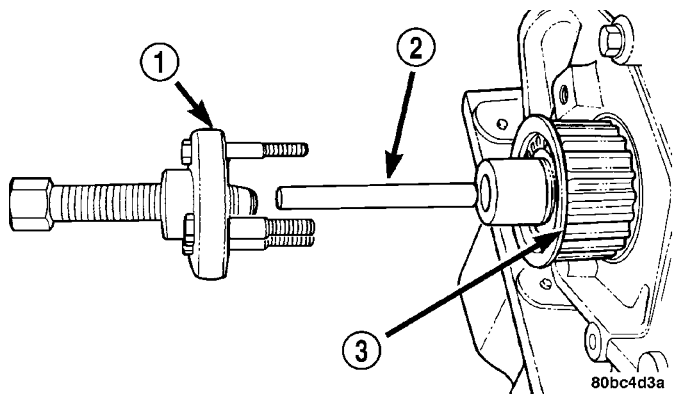


Fig. 63 Crankshaft Sprocket—Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

(6) Using Special Tool 6771, remove front crankshaft oil seal (Fig. 65). Do not damage the seal contact area on the crankshaft.

INSTALLATION

(1) Position seal into opening with seal spring towards the inside of engine. Using Special Tool 6780-1 (Fig. 66), install seal until flush with cover.

(2) Install the crankshaft sprocket key (Fig. 64).

(3) Install the crankshaft sprocket (Fig. 67) using Special Tool 6792.

NOTE: Make sure the word “front” on the sprocket is facing outward.

CRANKSHAFT OIL SEAL - FRONT (Continued)

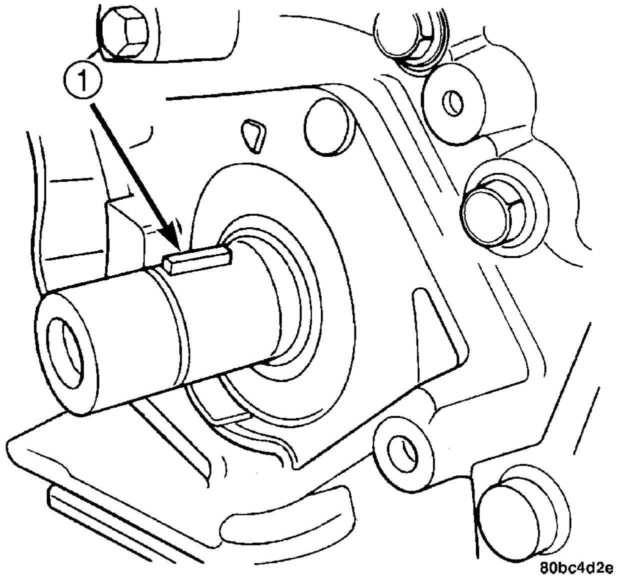


Fig. 64 Crankshaft Key

1 - CRANKSHAFT KEY

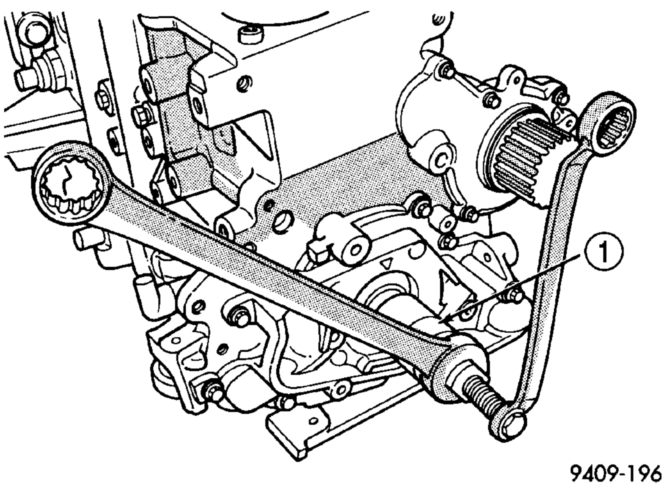


Fig. 65 Front Crankshaft Oil Seal—Removal

1 - SPECIAL TOOL 6771

CAUTION: Use of Special Tool 6792 is required to install the crankshaft sprocket to the proper depth. Failure to use this tool will cause improper timing belt tracking.

(4) Install the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(5) Install crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

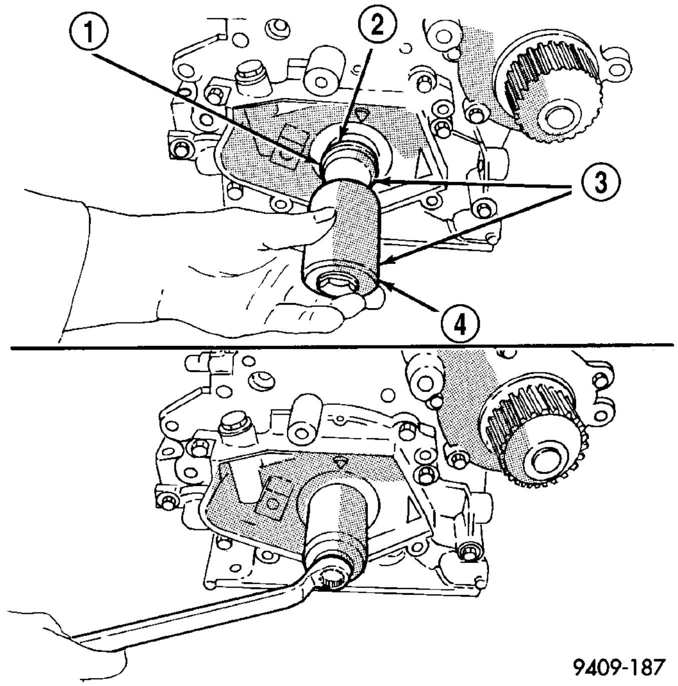


Fig. 66 Front Crankshaft Oil Seal - Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780–1
4 - INSTALLER

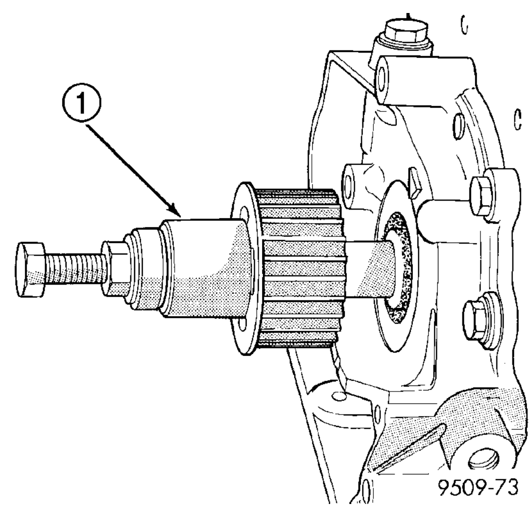


Fig. 67 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792

(6) Install accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

CRANKSHAFT OIL SEAL - REAR

REMOVAL

(1) Remove the transaxle. (Refer to 21 - TRANSAXLE - REMOVAL) for procedure.

(2) Remove the flex plate. (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL)

(3) Insert a 3/16 flat bladed screwdriver between the dust lip and the metal case of the crankshaft seal. Angle the screwdriver (Fig. 68)through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

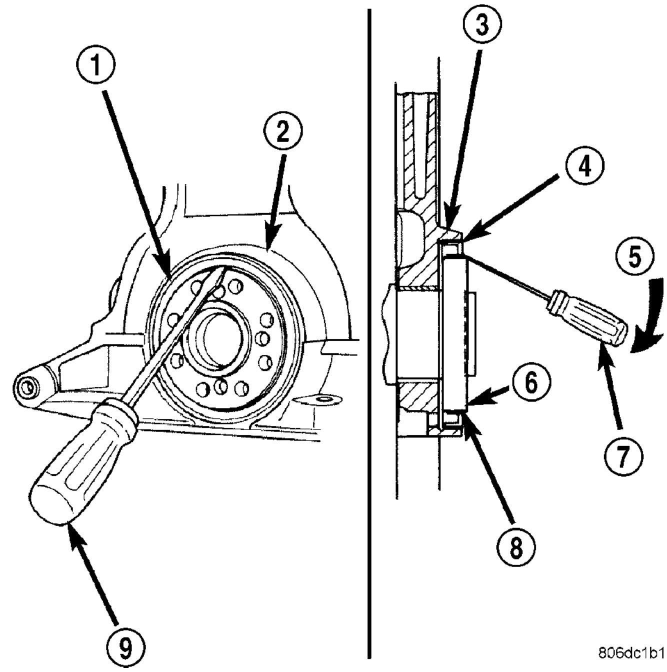


Fig. 68 Rear Crankshaft Oil Seal—Removal

1 - REAR CRANKSHAFT SEAL
2 - ENGINE BLOCK
3 - ENGINE BLOCK
4 - REAR CRANKSHAFT SEAL METAL CASE
5 - PRY IN THIS DIRECTION
6 - CRANKSHAFT
7 - SCREWDRIVER
8 - REAR CRANKSHAFT SEAL DUST LIP
9 - SCREWDRIVER

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. 69).

(2) Position seal over pilot tool. Make sure you can read the words **THIS SIDE OUT** on seal (Fig. 69). 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. 70) until the tool bottoms out against the block (Fig. 71).

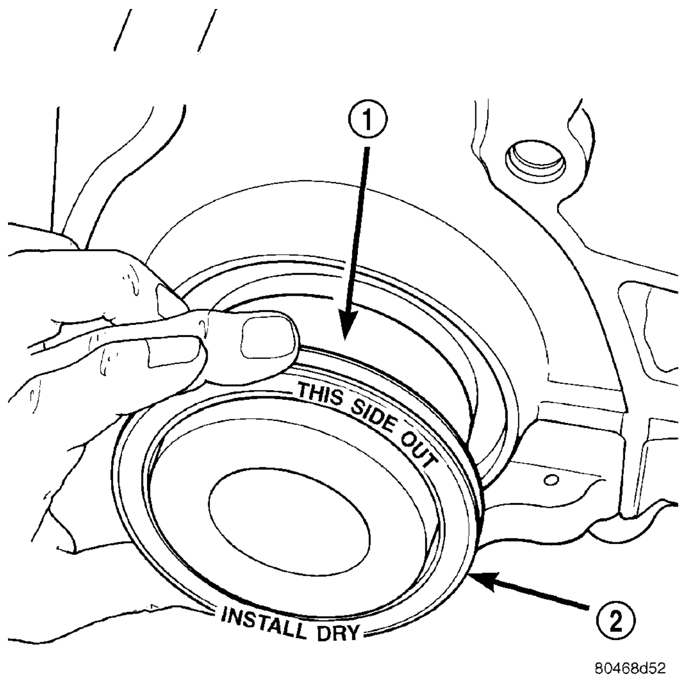


Fig. 69 Crankshaft Rear Seal and Special Tool 6926-1

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL

(4) Install the flex plate. (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - INSTALLATION)

(5) Install the transaxle. (Refer to 21 - TRANSAXLE - INSTALLATION)

CRANKSHAFT OIL SEAL - REAR (Continued)

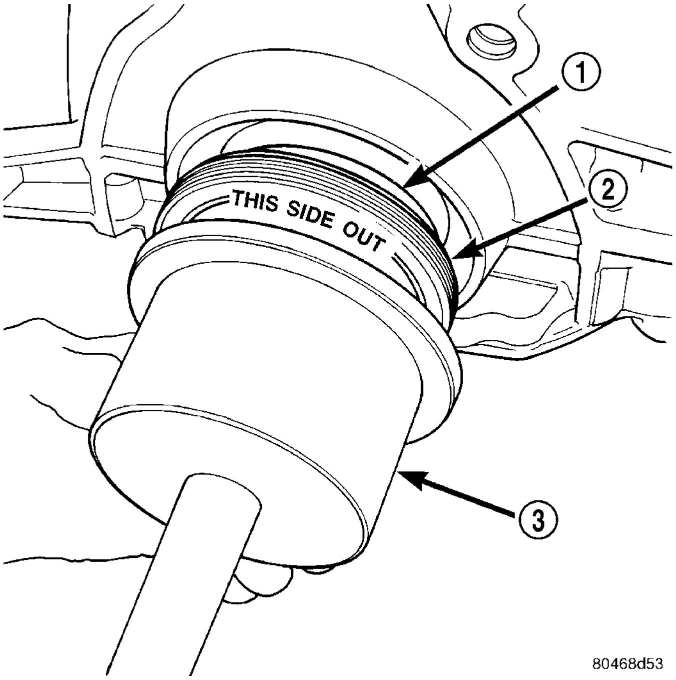


Fig. 70 Crankshaft Seal Special Tool 6926-2

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL
3 - SPECIAL TOOL 6926–2 INSTALLER

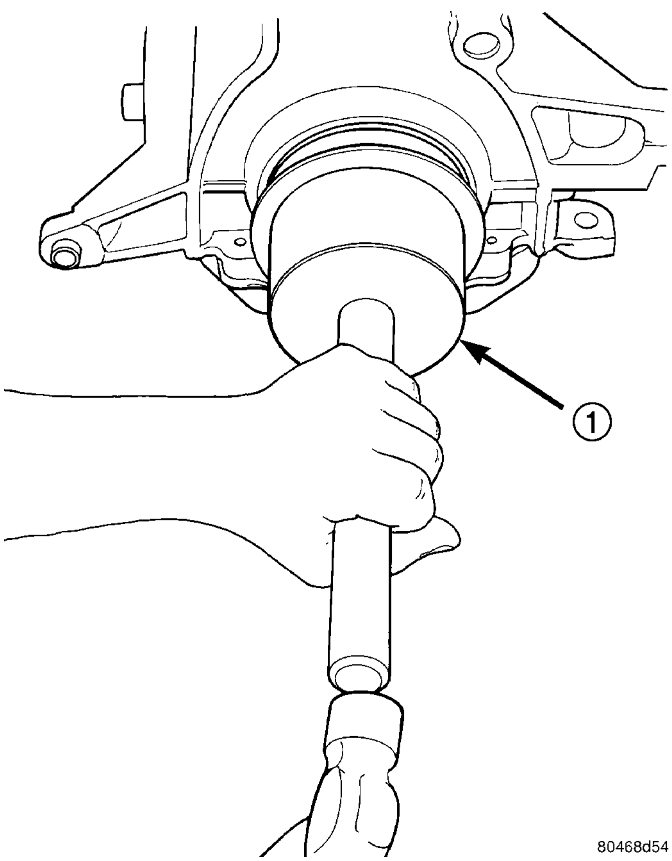


Fig. 71 Crankshaft Rear Oil Seal - Installation

1 - SPECIAL TOOL 6926–2 INSTALLER

PISTON & CONNECTING ROD

DESCRIPTION

NOTE: The engine DOES NOT have provisions for a free wheeling valve train. Non free wheeling valve train means, in the event of a broken timing belt, pistons will contact the valves.

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged powdered metal connecting rods. The pistons pin is offset 1 mm (0.0394 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. Hex head cap screws are used to provide alignment and durability in the assembly. The pistons and connecting rods are serviced as an assembly.

STANDARD PROCEDURE - CYLINDER BORE AND PISTON - FITTING

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. 73). Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in (Fig. 72). (Refer to 9 - ENGINE - SPECIFICATIONS) Correct piston to bore clearance must be established in order to assure quiet and economical operation.

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).

REMOVAL

(1) Remove the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(2) Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(3) 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. 74).

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

(4) Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap (Fig. 75).

(5) Pistons will have a stamping in the approximate location shown in (Fig. 74). These stamps will

PISTON & CONNECTING ROD (Continued)

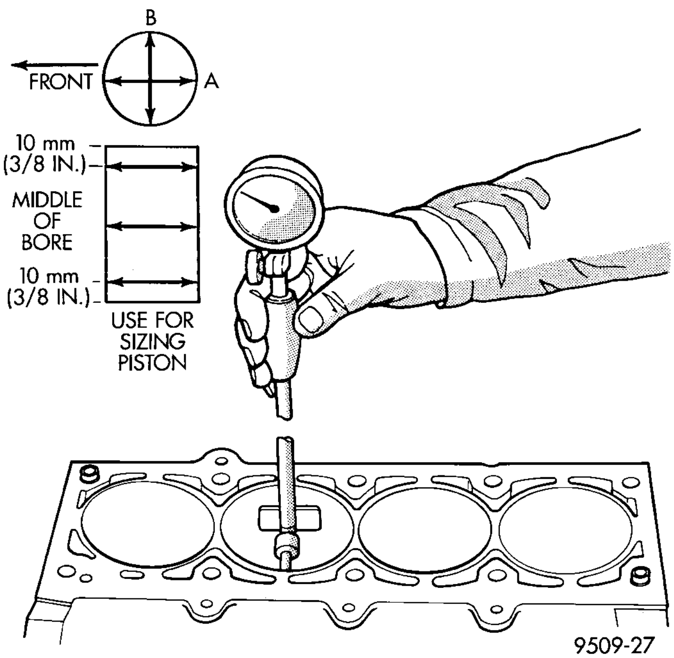


Fig. 72 Checking Cylinder Bore

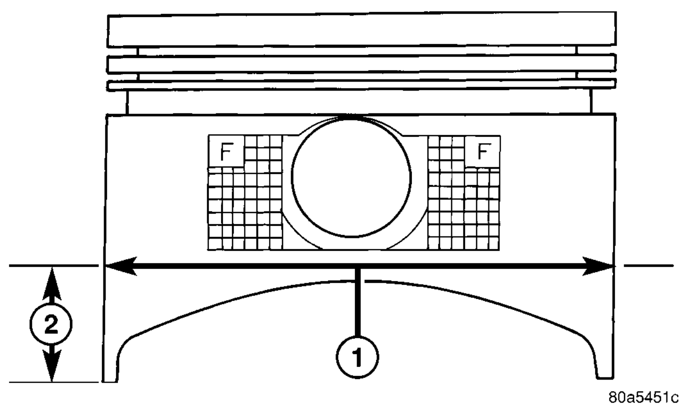


Fig. 73 Piston Measurement Location

1 - PISTON DIAMETER
2 - 14 mm (9/16 in.)

be either a directional arrow or a weight identification for the assembly. L is for light and H is for heavy. These assemblies should all be the same weight class. Service piston assemblies are marked with a S and can be used with either L or H production assemblies. The weight designation stamps should face toward the timing belt side of the engine.

(6) Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centered in cylinder bore.

(7) Remove connecting rod bolts and cap. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

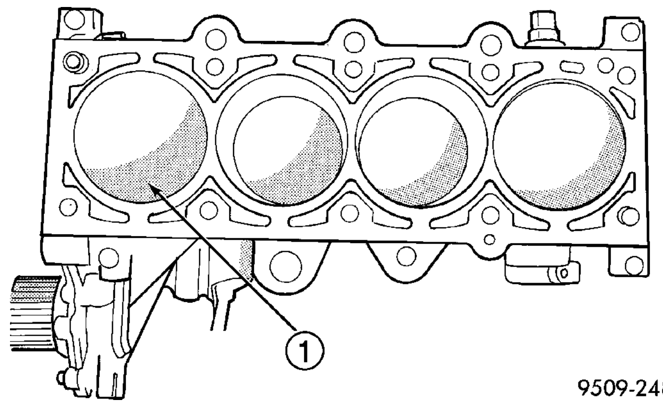


Fig. 74 Piston Markings

1 - WEIGHT DESIGNATION AND DIRECTIONAL ARROW WILL BE IMPRINTED IN THIS AREA

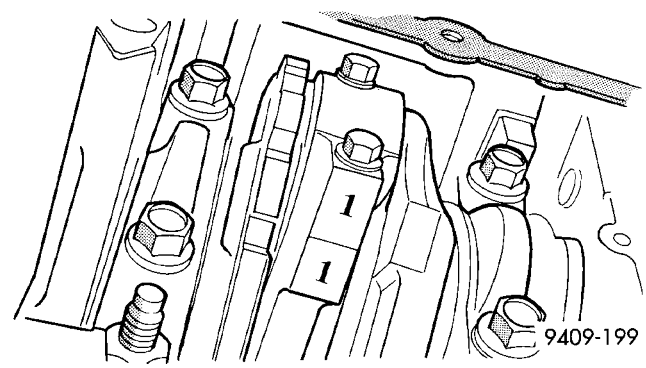


Fig. 75 Identify Connecting Rod to Cylinder - Typical

CAUTION: Care must be taken not to damage the fractured rod and cap joint surfaces, as engine damage many occur.

(8) To protect crankshaft journal and fractured rod surfaces, install Special Tool 8189, connecting rod guides onto connecting rod (Fig. 76). Carefully push each piston and rod assembly out of cylinder bore.

(9) Remove Special Tool 8189, connecting rod guides and re-install bearing cap on the mating rod.

NOTE: Piston and rods are serviced as an assembly.

(10) Repeat procedure for each piston and connecting rod assembly.

(11) Remove piston rings (Refer to 9 - ENGINE/ ENGINE BLOCK/PISTON RINGS - REMOVAL).

INSTALLATION

(1) Install piston rings on piston (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - INSTALLATION).

PISTON & CONNECTING ROD (Continued)

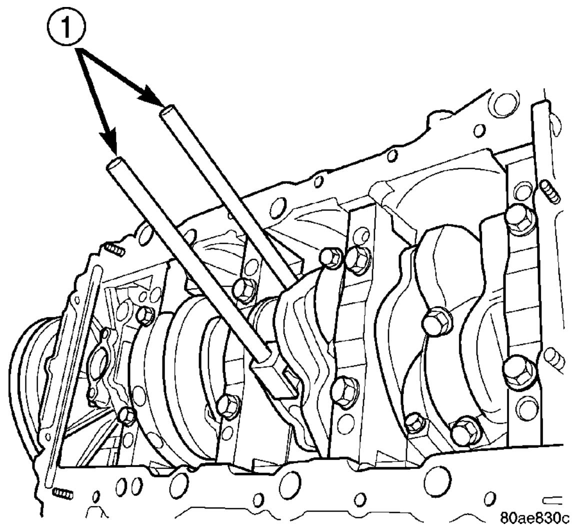


Fig. 76 Connecting Rod Guides—Typical

1 - SPECIAL TOOL 8189 CONNECTING ROD GUIDES

(2) Before installing pistons and connecting rod assemblies into the bore, ensure the compression ring gaps are staggered, and neither is in line with the oil ring rail gap (Fig. 84).

(3) Before installing the ring compressor, ensure the oil ring expander ends are butted and the rail gaps are located as shown in (Fig. 84). As viewed from top.

(4) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston (Fig. 77). **Be sure position of rings does not change during this operation**.

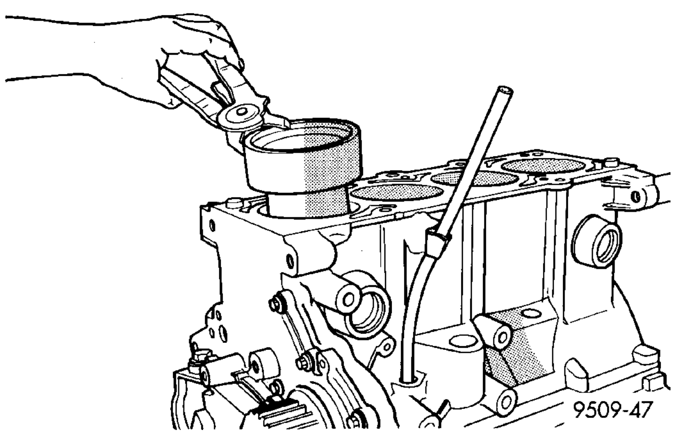


Fig. 77 Installing Piston

(5) The weight stamp designation L or H will be in the front half of the piston should face toward the front of the engine (Fig. 74).

(6) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

(7) Install connecting rod upper bearing half into connecting rod. Install Special Tool 8189, connecting rod guides onto connecting rod (Fig. 76).

(8) Insert rod and piston assembly into cylinder bore and carefully guide rod over the crankshaft journal.

(9) Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

(10) Remove Special Tool 8189, connecting rod guides.

NOTE: The connecting rod cap bolts should not be reused.

(11) Before installing the **NEW** bolts, the threads should be coated with clean engine oil.

(12) Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.

(13) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

(14) Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

(15) Using a feeler gauge, check connecting rod side clearance (Fig. 78). (Refer to 9 - ENGINE - SPECIFICATIONS) for connecting rod side clearance.

(16) Install the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

(17) Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

CONNECTING ROD BEARINGS

STANDARD PROCEDURE

CONNECTING ROD - FITTING

(1) For measuring connecting rod bearing clearance procedure and use of Plastigage(Refer to 9 - ENGINE - STANDARD PROCEDURE). For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS)

NOTE: The rod bearing bolts should not be reused.

(2) Before installing the **NEW** bolts the threads should be oiled with clean engine oil.

(3) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

CONNECTING ROD BEARINGS (Continued)

(4) Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

(5) Using a feeler gauge, check connecting rod side clearance (Fig. 78). Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

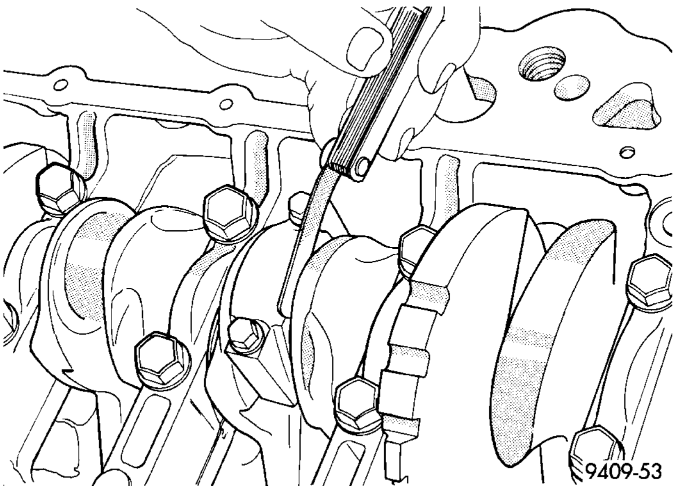


Fig. 78 Connecting Rod Side Clearance - Typical

PISTON RINGS

STANDARD PROCEDURE - PISTON RING - FITTING

(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 positioned below normal ring travel in the cylinder bore. Check gap with feeler gauge (Fig. 79). For piston ring specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

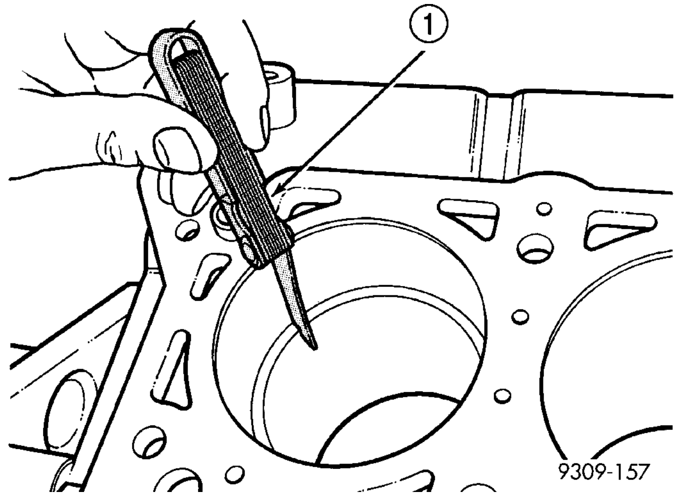


Fig. 79 Piston Ring Gap

1 - FEELER GAUGE

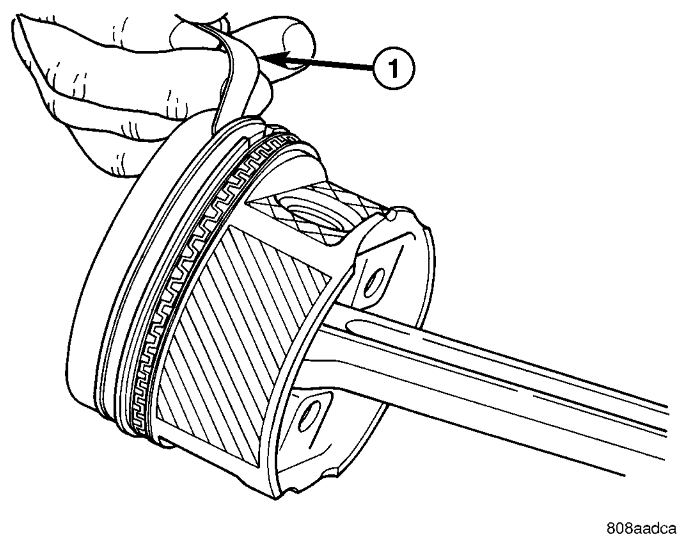


Fig. 80 Piston Ring Side Clearance

1 - FEELER GAUGE

(2) Check piston ring to groove side clearance (Fig. 80). For piston ring specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

PISTON RINGS (Continued)

REMOVAL

(1) Using a suitable ring expander, remove upper and intermediate piston rings (Fig. 81).

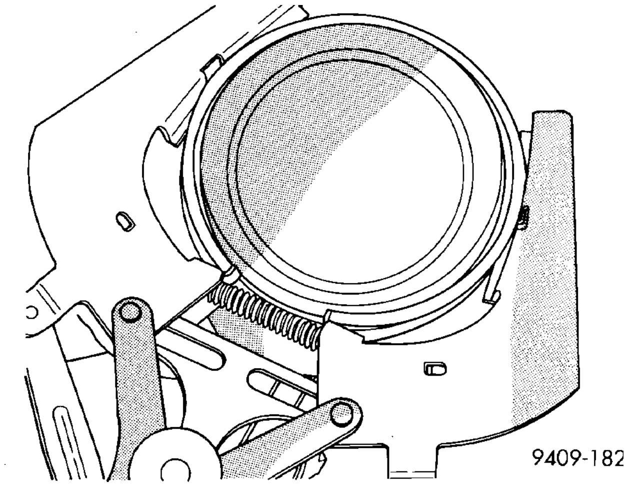


Fig. 81 Piston Rings—Removing and Installing

(2) Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.

(3) Clean ring grooves of any carbon deposits.

INSTALLATION

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.

Install rings with manufacturers identification mark facing up, to the top of the piston (Fig. 82).

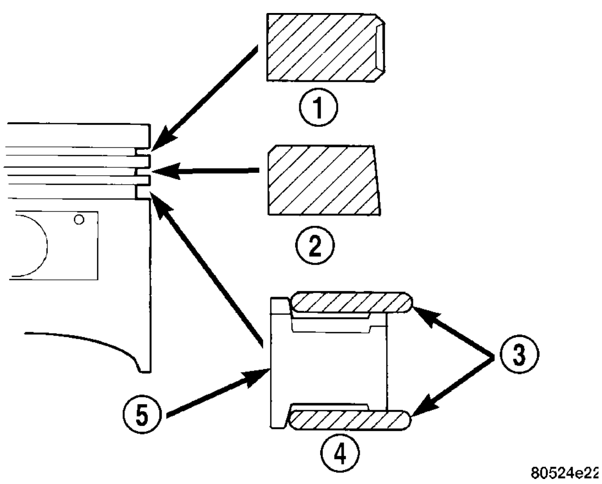


Fig. 82 Piston Ring Installation

1 - NO. 1 PISTON RING
2 - NO. 2 PISTON RING
3 - SIDE RAIL
4 - OIL RING
5 - SPACER EXPANDER

CAUTION: Install piston rings in the following order:

1. Oil ring expander.
2. Upper oil ring side rail.
3. Lower oil ring side rail.
4. No. 2 Intermediate piston ring.
5. No. 1 Upper piston ring.

(1) Install oil ring expander (Fig. 82).

(2) Install upper side rail first and then the lower side rail. Install the side rails by placing one end between the piston ring groove and the oil ring 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. 83).**

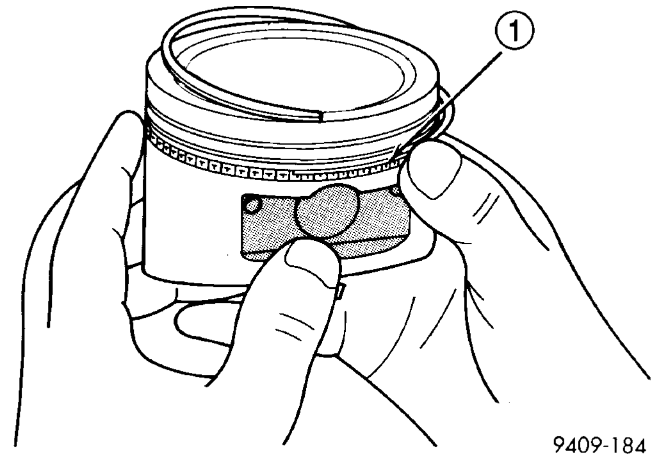


Fig. 83 Installing Side Rail

1 - SIDE RAIL END

(3) Install No. 2 piston ring and then No. 1 piston ring (Fig. 82).

(4) Position piston ring end gaps as shown in (Fig. 84).

(5) 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.

STRUCTURAL COLLAR

REMOVAL

(1) Raise vehicle on hoist.

NOTE: To remove transaxle dust cover, the front bending strut must be removed.

(2) Remove structural collar from oil pan to transaxle (Fig. 85).

INSTALLATION

CAUTION: The torque procedure for the structural collar must be followed, as damage to oil pan or collar could occur.

STRUCTURAL COLLAR (Continued)

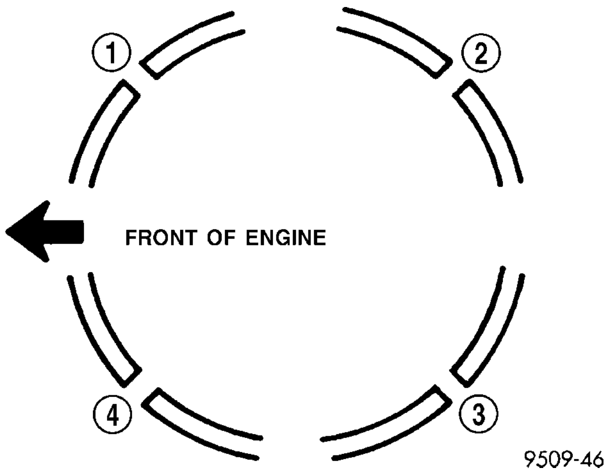


Fig. 84 Piston Ring End Gap Position

1 - GAP OF LOWER SIDE RAIL
2 - NO. 1 RING GAP
3 - GAP OF UPPER SIDE RAIL
4 - NO. 2 RING GAP AND SPACER EXPANDER GAP

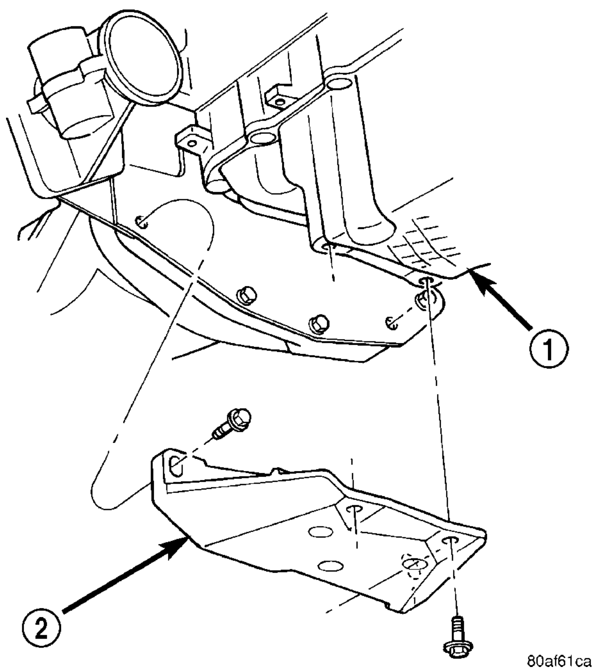


Fig. 85 Structural Collar - Removal/Installation

1 - OIL PAN
2 - STRUCTURAL COLLAR

(1) Install the structural collar (Fig. 85) using the following 3 step torque sequence:

• Step 1: Install the collar to oil pan bolts and tighten to 3 N·m (30 in. lbs.).

• Step 2: Install collar to transaxle bolts and tighten to 108 N·m (80 ft. lbs.).

• Step 3: Final torque the collar to oil pan bolts to 54 N·m (40 ft. lbs.).

(2) Lower vehicle.

FLEX PLATE

REMOVAL

(1) Remove the transaxle. Refer to 21 - TRANSAXLE for procedure.

(2) Remove the flex plate attaching bolts (Fig. 86).

(3) Remove the flex plate (Fig. 86).

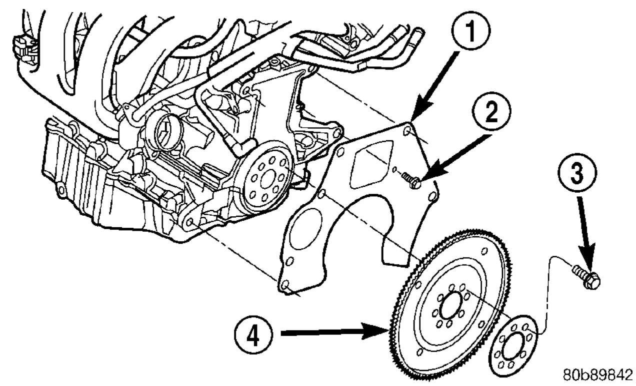


Fig. 86 Flex Plate

1 - ADAPTOR PLATE
2 - BOLT
3 - BOLT (QTY. 8)
4 - FLEX PLATE

INSTALLATION

(1) Position the drive plate on crankshaft (Fig. 86).

(2) Apply Mopar® Lock & Seal Adhesive to flex plate bolt threads.

(3) Install the flex plate bolts and tighten to 95 N·m (70 ft. lbs.) (Fig. 86).

(4) Install the transaxle. Refer to 21 - TRANSAXLE for procedure.

VIBRATION DAMPER

REMOVAL

(1) Raise vehicle on a hoist and remove accessory drive belt splash shield.

(2) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove crankshaft vibration damper bolt. Remove damper using the large side of Special Tool 1026 and insert 6827-A (Fig. 87).

INSTALLATION

NOTE: Lubricate the threads of the M12 1.75 x 150 mm bolt using Mopar® Nickel Anti-seize Compound or equivalent, before beginning to press the damper on.

VIBRATION DAMPER (Continued)

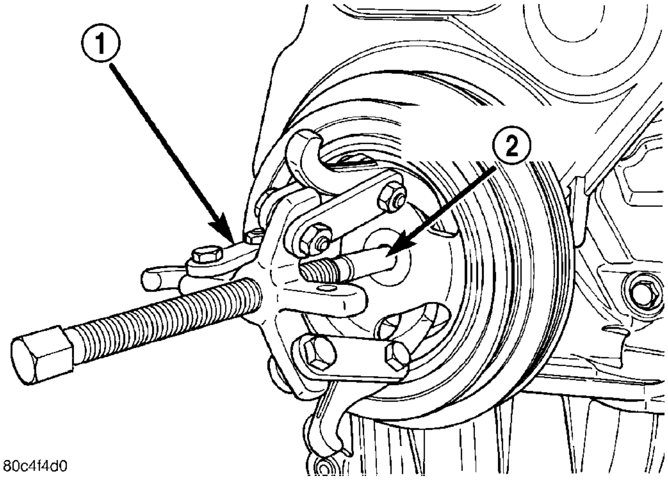


Fig. 87 Crankshaft Damper—Removal

1 - SPECIAL TOOL 1026 3 - JAW PULLER
2 - SPECIAL TOOL 6827A INSERT

(1) Install crankshaft vibration damper using M12–1.75 x 150 mm bolt, washer, thrust bearing and nut from Special Tool 6792 (Fig. 88).

(2) Apply Mopar® Lock & Seal Adhesive (Medium Strength Threadlocker) to vibration damper bolt. Tighten vibration damper bolt to 136 N·m (100 ft. lbs.).

(3) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Install the accessory drive belt splash shield and lower vehicle.

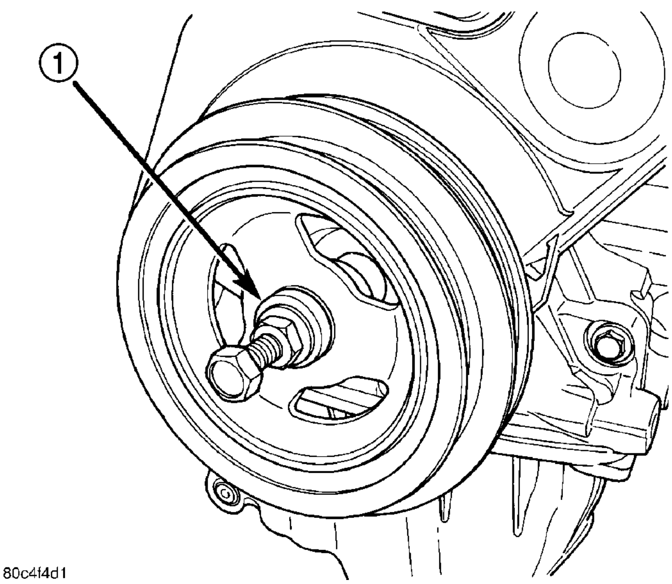


Fig. 88 Crankshaft Damper—Installation

1 - SPECIAL TOOL 6792

ENGINE MOUNTING

DESCRIPTION

The engine mounting system (Fig. 89) and (Fig. 90) consist of a four-point system utilizing two load-carrying mounts and two torque struts. The load-carrying mounts are located on each frame rail. The right mount is a hydro-elastic mount and left mount is a conventional elastomeric isolator. The two torque controlling struts are attached at the front of the engine, straddling the right side load-carrying mount. The upper torque strut connects to the suspension strut tower and the lower torque strut connects to the suspension crossmember.

LEFT MOUNT

REMOVAL

(1) Raise vehicle approximately 30.5 cm (12 in.) on hoist

(2) Remove air cleaner assembly (Fig. 91).

(3) Remove battery and tray.

(4) Support transaxle with a suitable jack.

(5) Remove left front wheel.

(6) Remove left splash shield.

(7) Remove through bolt access plug at left side outer frame rail.

(8) Remove mount through bolt (Fig. 92).

(9) Disconnect transaxle shift cable from left mount and transaxle linkage.

(10) Remove left mount bracket to body frame rail fasteners (Fig. 93).

(11) Remove mount attaching bolts (Fig. 94) or (Fig. 95).

(12) Remove mount.

INSTALLATION

(1) Install mount and attaching bolts (Fig. 94)or (Fig. 95). Tighten bolts to 68 N·m (50 ft. lbs.).

(2) Install engine mount bracket to body frame rail and tighten fasteners to 28 N·m (250 in. lbs.) (Fig. 93).

(3) Position engine/transaxle for installation of through bolt. Install and tighten through bolt to 118 N·m (87 ft. lbs.) (Fig. 92).

(4) Remove jack from under transaxle.

(5) Install through bolt access plug at left side outer frame rail.

(6) Install left splash shield and wheel.

(7) Connect transaxle shift cable to engine mount and transaxle linkage.

LEFT MOUNT (Continued)

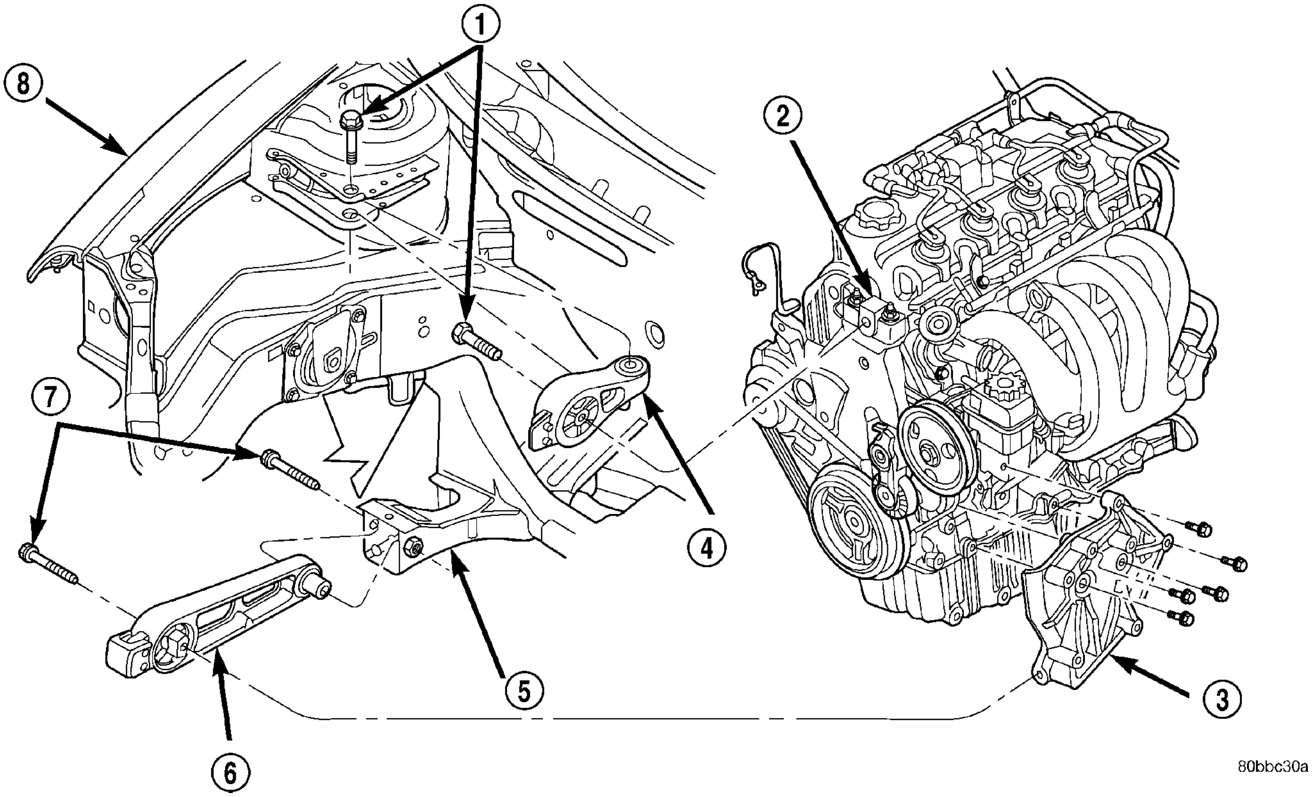


Fig. 89 Engine Mounting - Right Side

1 - BOLTS
2 - ENGINE MOUNT BRACKET
3 - TORQUE STRUT BRACKET
4 - UPPER TORQUE STRUT
5 - CROSSMEMBER
6 - LOWER TORQUE STRUT
7 - BOLTS
8 - RIGHT FENDER

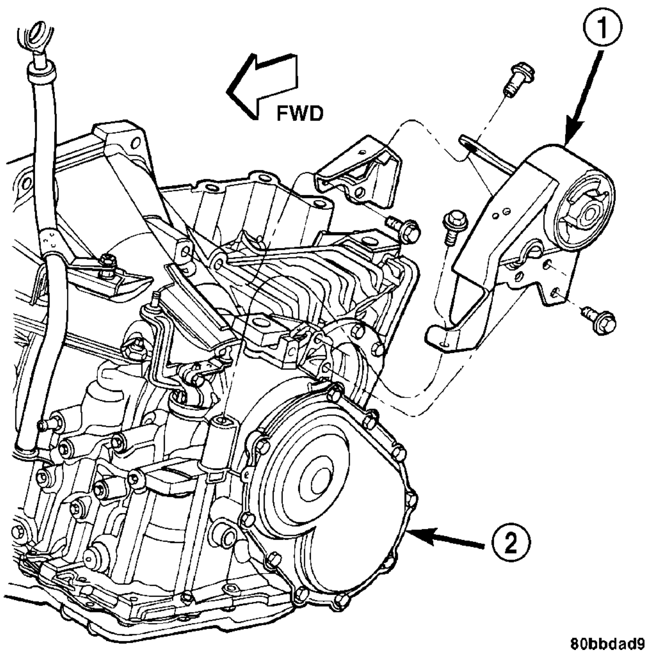


Fig. 90 Engine Mounting - Left Side

1 - MOUNT
2 - TRANSAXLE

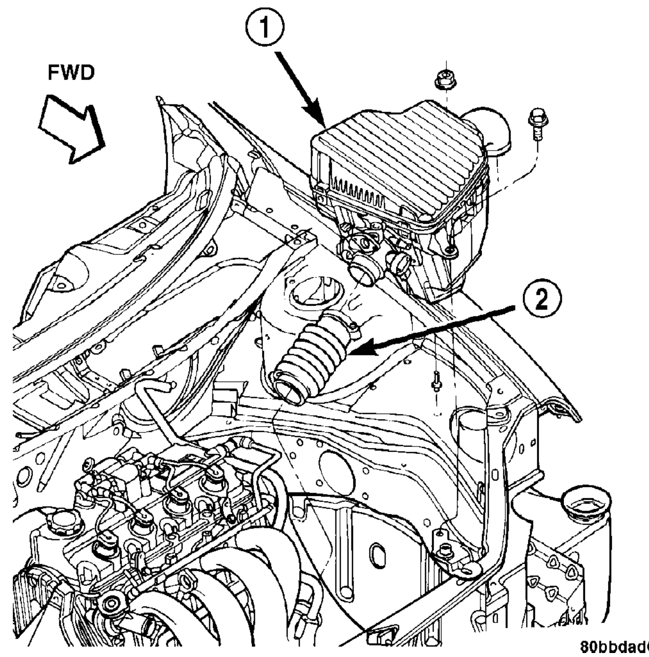


Fig. 91 Air Cleaner Assembly

1 - AIR CLEANER ASSY.
2 - THROTTLE BODY DUCT

LEFT MOUNT (Continued)

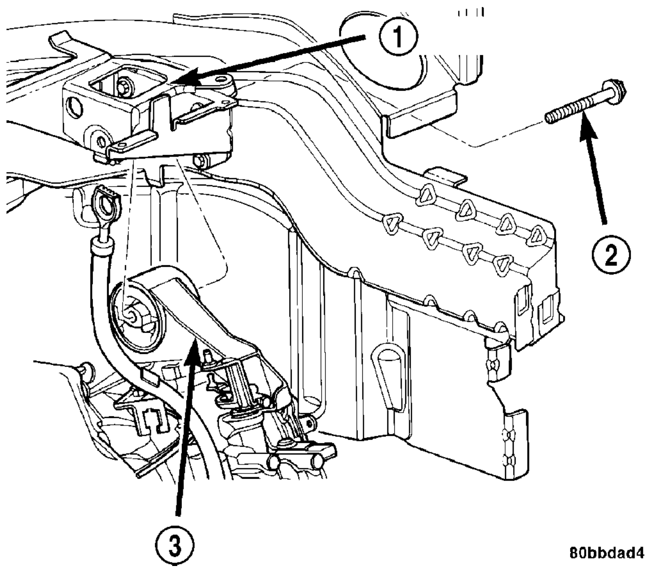


Fig. 92 Left Mount Through Bolt

1 - MOUNT BRACKET
2 - BOLT
3 - MOUNT

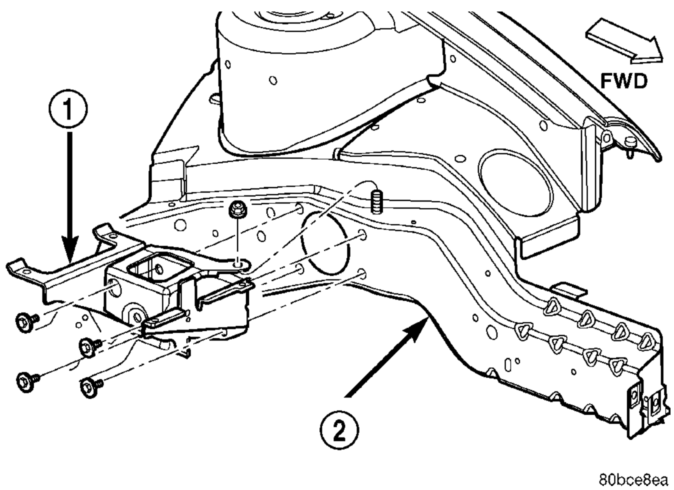


Fig. 93 Left Mount Bracket

1 - MOUNT BRACKET
2 - BODY FRAME RAIL

(8) Install battery tray and battery.
(9) Install air cleaner assembly (Fig. 91).
(10) Lower vehicle.

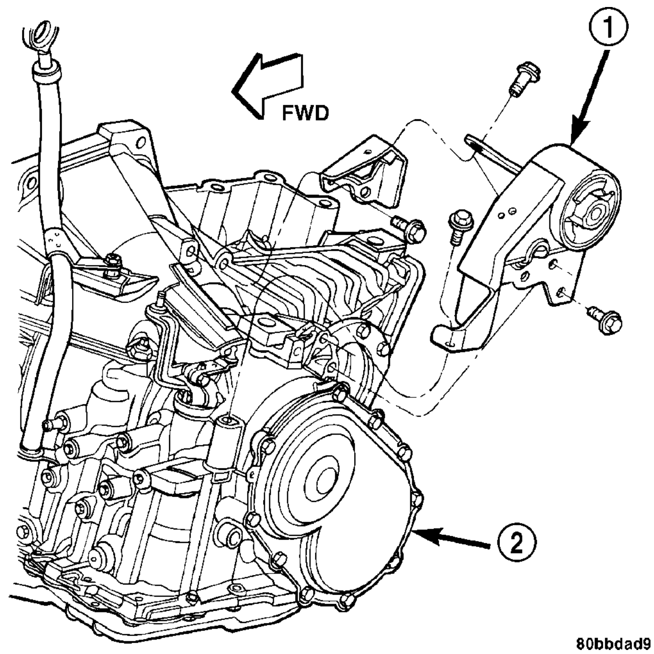


Fig. 94 Left Mount (Automatic Transaxle)

1 - MOUNT
2 - TRANSAXLE

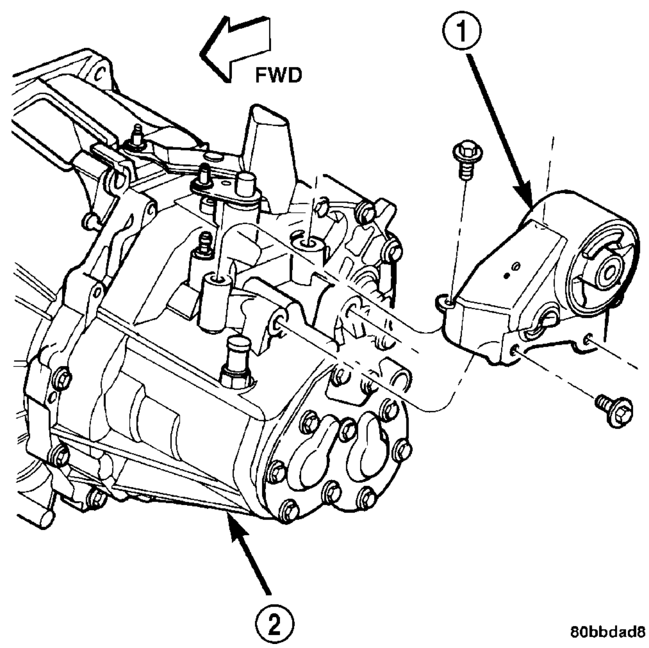


Fig. 95 Left Mount (Manual Transaxle)

1 - MOUNT
2 - TRANSAXLE

ENGINE MOUNT BRACKET

REMOVAL

(1) Disconnect negative battery cable.
(2) Remove fastener securing ground strap to engine mount bracket.
(3) Remove upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).
(4) Remove power steering/air conditioning compressor drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(5) Raise vehicle on hoist.
(6) Remove accessory drive belt splash shield (Fig. 96).

ENGINE MOUNT BRACKET (Continued)

(7) Remove lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(8) Lower vehicle.

(9) Position a jack under engine. Raise jack enough to support engine weight.

(10) Remove engine mount through bolt access plug (Fig. 96)

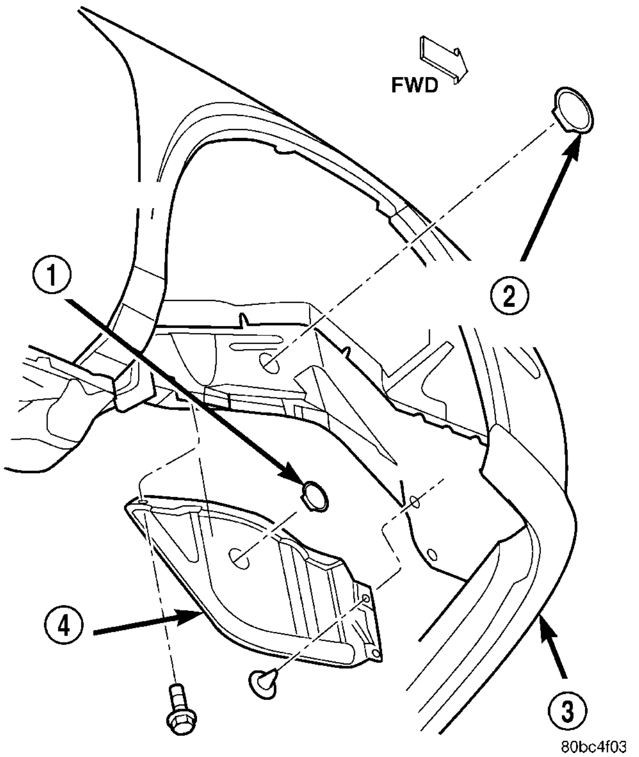


Fig. 96 Engine Mount Bolt Access Plug

1 - CRANKSHAFT BOLT ACCESS PLUG
2 - RIGHT MOUNT BOLT ACCESS PLUG
3 - FASCIA
4 - SPLASH SHIELD

(11) Remove right engine mount to engine mount bracket through bolt (Fig. 97).

(12) Lower engine enough with jack to remove lower engine mount bracket bolt (Fig. 98).

(13) Raise engine with jack to allow engine-to-body clearance for engine mount bracket removal.

(14) Remove fasteners securing power steering pump to engine mount bracket. **Do Not** disconnect lines from pump.

(15) Remove the two remaining bolts securing engine mount bracket to engine. Remove engine mount bracket (Fig. 98).

INSTALLATION

(1) Position engine mount bracket to its mounting location. Hand start the upper two bolts of the engine mount bracket (Fig. 98).

(2) Lower engine with jack.

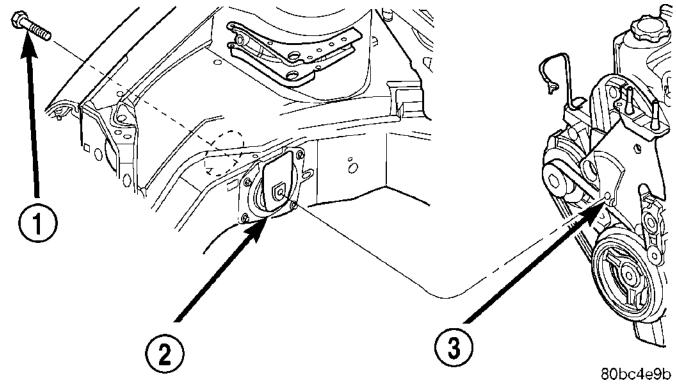


Fig. 97 Engine Mount to Bracket

1 - THROUGH BOLT
2 - RIGHT ENGINE MOUNT
3 - ENGINE MOUNT BRACKET

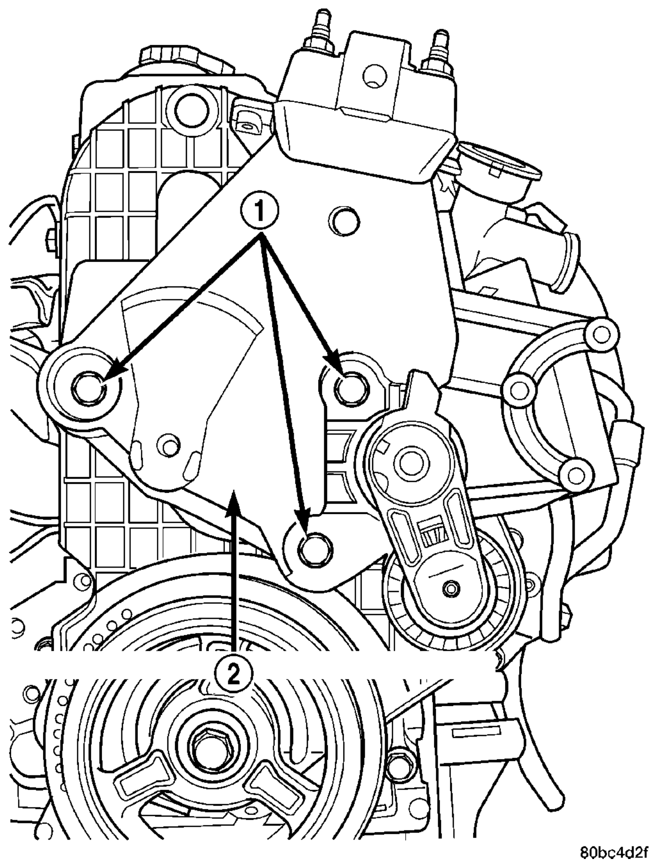


Fig. 98 Engine Mount Bracket Assembly

1 - BOLTS
2 - ENGINE MOUNT BRACKET ASSEMBLY

(3) Install lower engine mount bracket bolt. Tighten bolt to 61 N·m (45 ft. lbs.) (Fig. 98).

(4) Raise engine with jack.

(5) Tighten upper engine mount bracket bolts to 61 N·m (45 ft. lbs.) (Fig. 98).

(6) Install power steering pump fasteners.

(7) Lower engine with jack.

ENGINE MOUNT BRACKET (Continued)

(8) Install right engine mount to engine mount bracket through bolt. Tighten bolt to 118 N·m (87 ft. lbs.) (Fig. 97).

(9) Install mount bolt access plug (Fig. 96).

(10) Remove jack from under engine.

(11) Raise vehicle on hoist.

(12) Install lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(13) Install power steering/air conditioning compressor drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(14) Install accessory drive belt splash shield (Fig. 96).

(15) Lower vehicle.

(16) Install upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(17) Install fastener securing ground strap to engine mount bracket.

(18) Connect negative battery cable.

(19) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

RIGHT MOUNT

REMOVAL

(1) Remove engine mount bracket (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - REMOVAL).

NOTE: The right engine mount attaching holes are slightly oversize to compensate for manufacturing tolerances. The mount has been set at the manufacturing plant for proper powertrain alignment. Therefore, it is necessary to mark the position of the mount before the attaching bolts are loosened.

(2) Using a permanent ink marker or equivalent, mark the position of engine mount to the body frame rail.

(3) Remove bolts attaching mount to body (Fig. 99).

(4) Lower engine with jack.

(5) Postion right engine mount into timing belt cover hole (Fig. 100).

(6) Raise engine with jack.

(7) Remove mount between engine and body frame rail. Mount removal may require engine position to be raised or lowered to allow mount removal clearance.

INSTALLATION

(1) Postion right engine mount into timing belt cover hole (Fig. 100).

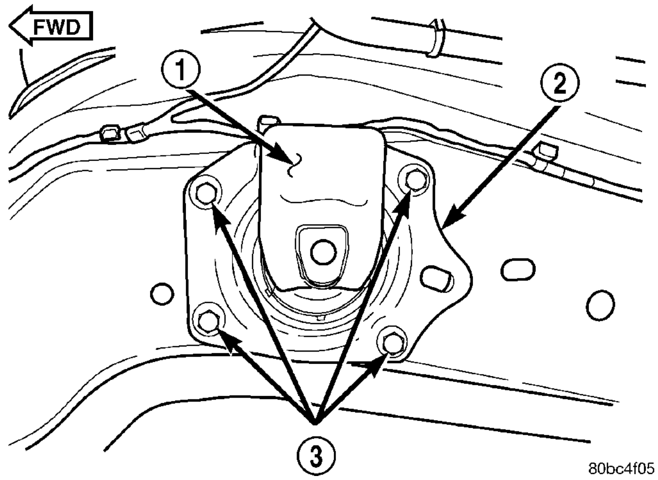


Fig. 99 Engine Mount—Right

1 - SNUBBER PAD
2 - RIGHT ENGINE MOUNT
3 - BOLTS

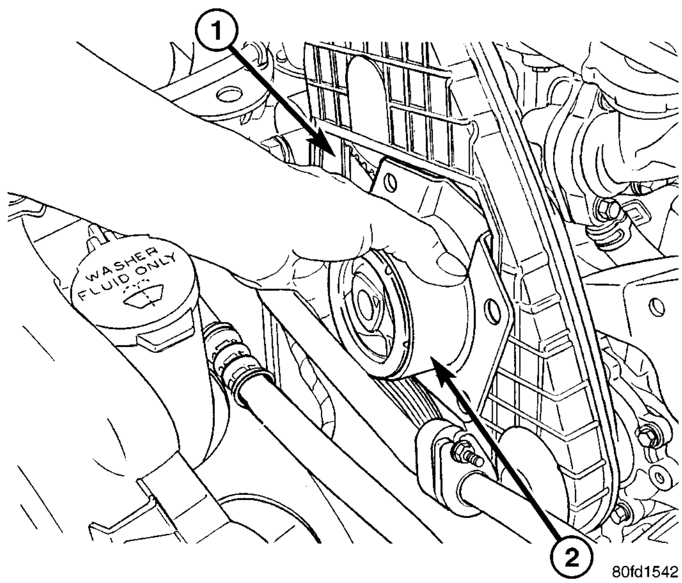


Fig. 100 Right Engine Mount - Removal/Installation

1 - TIMING BELT COVER HOLE
2 - RIGHT ENGINE MOUNT

(2) Lower engine with jack.

(3) Position the mount into the original position on body frame rail (Fig. 99).

NOTE: Engine mount must be installed in the original position on body frame rail. If mount was not marked or frame rail was replaced, perform the following procedure.

(4) Perform the following procedure if mount position was not previously marked or the frame rail was replaced:

(a) Insert the new mount loosely in frame rail.

RIGHT MOUNT (Continued)

(b) Align the four holes in the mount with the mating holes in the rail such that the holes are concentric (frame rail holes centered in the mount holes).

(c) Using a permanent ink marker or equivalent, mark the position of engine mount to the body frame rail while maintaining mounting hole concentricity.

(5) Ensure the mount maintains originally marked position and install mount bolts. Tighten bolts to 28 N·m (250 in. lbs.) (Fig. 99).

(6) Raise engine with jack.

(7) Install the engine mount bracket (Refer to 9 - ENGINE/ENGINE MOUNTING/ENGINE MOUNT BRACKET - INSTALLATION).

(8) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

TORQUE STRUT

REMOVAL

UPPER TORQUE STRUT

(1) Remove bolts attaching strut to shock tower bracket and engine mount bracket (Fig. 102).

(2) Remove the upper torque strut.

LOWER TORQUE STRUT

(1) Raise vehicle on hoist.

(2) Remove accessory drive belt splash shield.

(3) Remove pencil strut (Fig. 101).

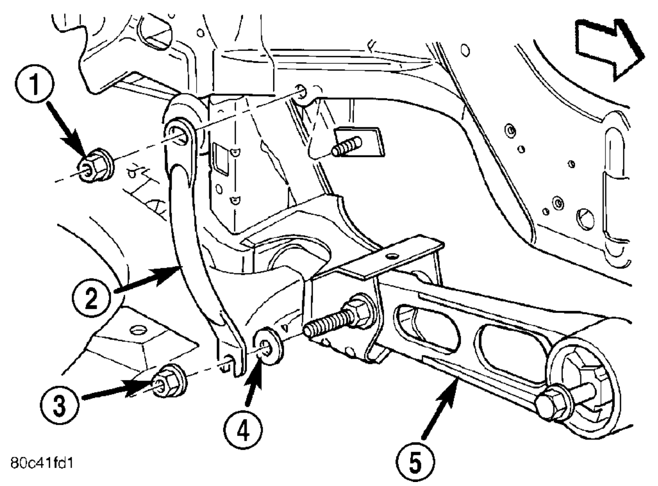


Fig. 101 Pencil Strut

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

(4) Remove bolts attaching lower strut to crossmember and strut bracket (Fig. 102).

(5) Remove lower torque strut.

INSTALLATION

UPPER TORQUE STRUT

(1) Position the upper torque strut into mounting locations (Fig. 102).

(2) Install the mounting bolts and perform the torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

LOWER TORQUE STRUT

(1) Position lower torque strut into mounting locations (Fig. 102).

(2) Install mounting bolts and perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(3) Install pencil stut (Fig. 101).

(4) Install accessory drive belt splash shield and lower vehicle.

ADJUSTMENTS

ENGINE TORQUE STRUT ADJUSTMENT

The upper and lower torque struts need to be adjusted together to assure proper engine positioning and engine mount loading. Whenever a torque strut bolt(s) is loosened, this procedure must be performed.

(1) Loosen the upper and lower torque strut attaching bolt at the suspension crossmember and shock tower bracket.

(2) The engine position may now be adjusted by positioning a suitable floor jack on the forward edge of the transmission bell housing (Fig. 103).

NOTE: The floor jack must be positioned as shown in (Fig. 103) to prevent minimal upward lifting of the engine.

(3) With the engine supported, remove the upper and lower torque strut attachment bolt(s) at shock tower bracket and suspension crossmember (Fig. 102). Verify that the torque struts are free to move within the shock tower bracket and crossmember. Reinstall the torque strut bolt(s), but do not tighten.

(4) Carefully apply upward force, allowing the upper engine to rotate rearward until the distance between the center of the rearmost attaching stud on the engine mount bracket (point “A”) and the center of the hole for the washer hose clip on the shock tower bracket (point “B”) is 119 mm (4.70 in.) (Fig. 104).

TORQUE STRUT (Continued)

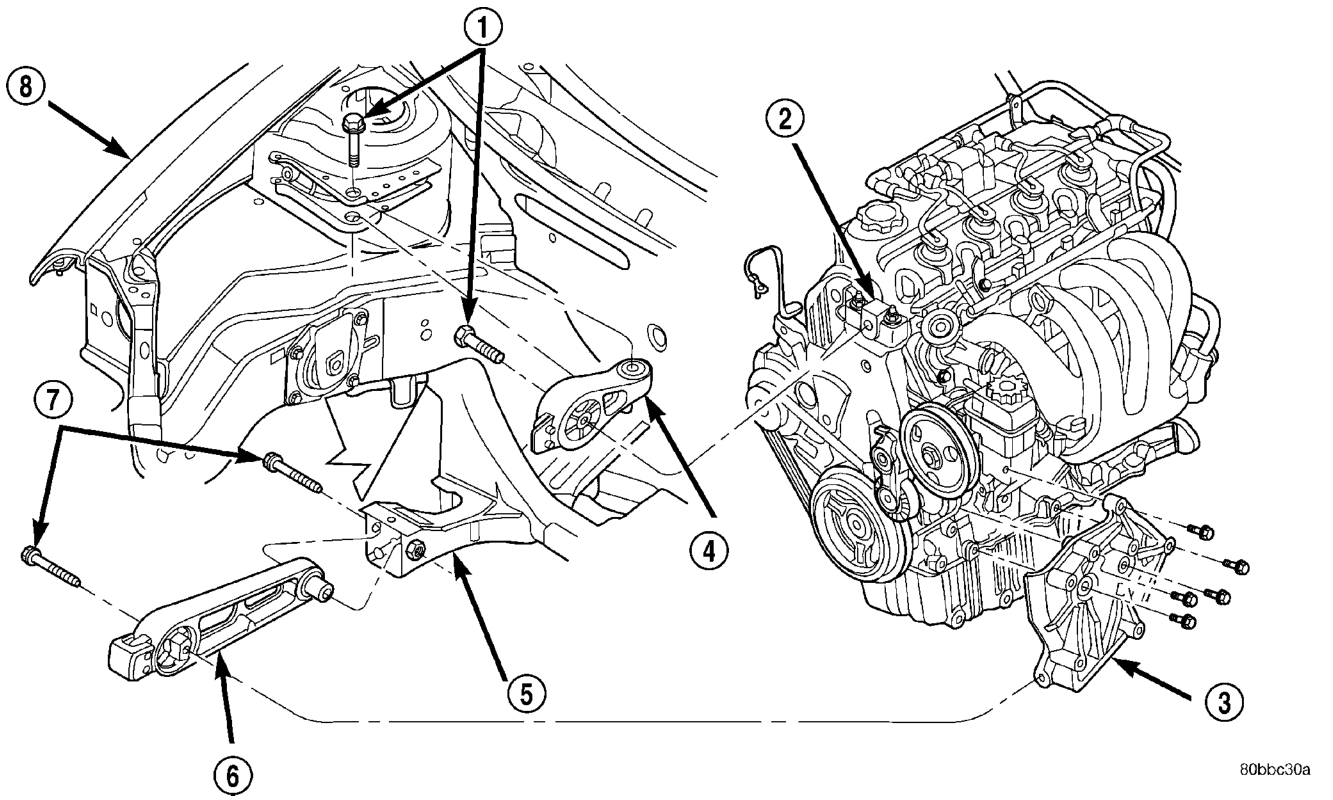


Fig. 102 Torque Struts - Upper / Lower

1 - BOLTS
2 - ENGINE MOUNT BRACKET
3 - TORQUE STRUT BRACKET
4 - UPPER TORQUE STRUT
5 - CROSSMEMBER
6 - LOWER TORQUE STRUT
7 - BOLTS
8 - RIGHT FENDER

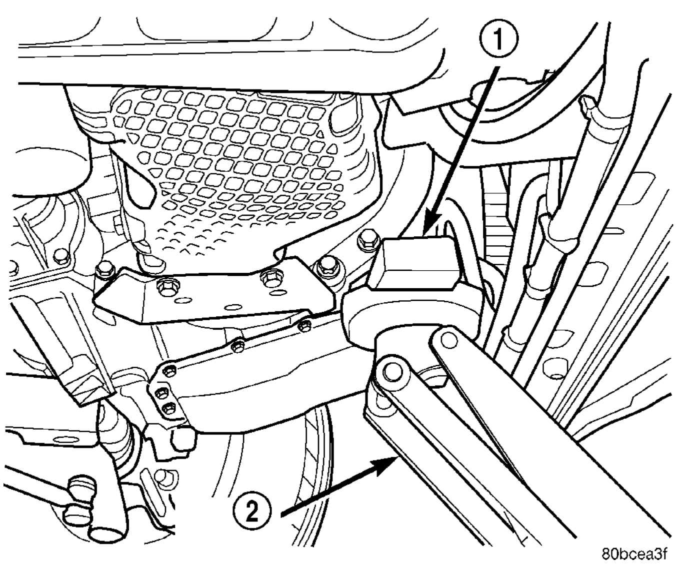


Fig. 103 Floor Jack Positioning

1 - WOOD BLOCK
2 - FLOOR JACK

(5) With the engine held at the proper position, tighten both the upper and lower torque strut bolts to 118 N·m (87 ft. lbs.) (Fig. 102).

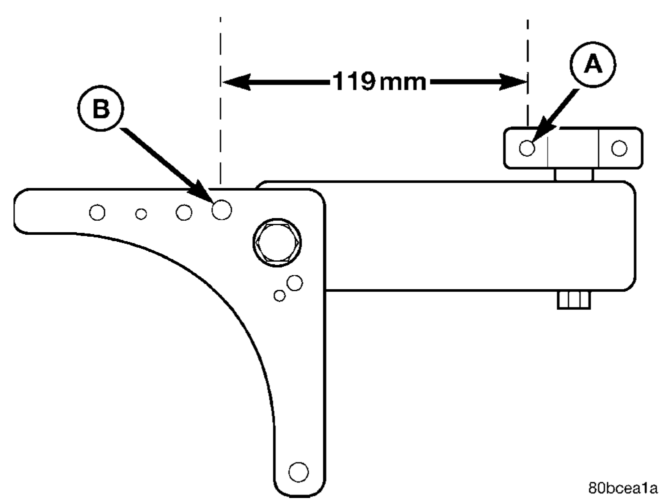


Fig. 104 Engine Position Measurement

(6) Remove the floor jack.

LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump (Fig. 105) is mounted in the front engine cover and driven by the crankshaft.

OPERATION

Refer to (Fig. 106) for lubrication system flow. Engine oil is drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from the main bearing journals to the connecting rod journals. A vertical hole at the number five bulkhead routes pressurized oil through a restrictor up into the cylinder head. The restrictor that is integral to the cylinder head gasket, provides increased oil flow to the main gallery. The rocker shafts route oil to the rocker arms/hydraulic lash adjusters. Oil returning to the oil pan from the pressurized components supplies lubrication to the valve stems. The cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collar.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE OIL LEAK INSPECTION

Begin with a thorough 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.

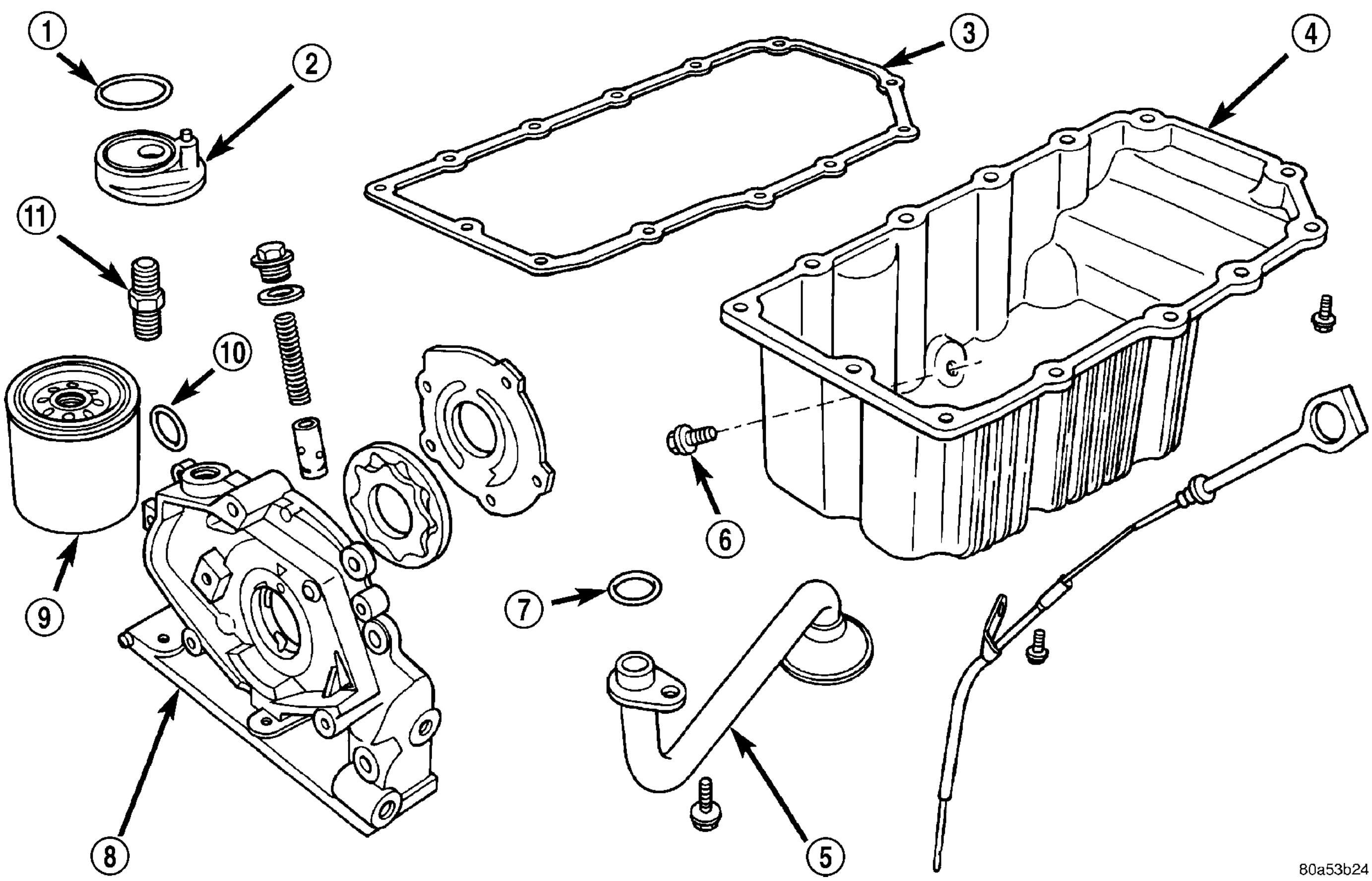


Fig. 105 Engine Lubrication Components

1 - O-RING
2 - OIL FILTER ADAPTER
3 - OIL PAN GASKET
4 - OIL PAN
5 - OIL PICK-UP TUBE
6 - DRAIN PLUG
7 - O-RING
8 - OIL PUMP BODY
9 - FILTER
10 - O-RING
11 - NIPPLE

LUBRICATION (Continued)

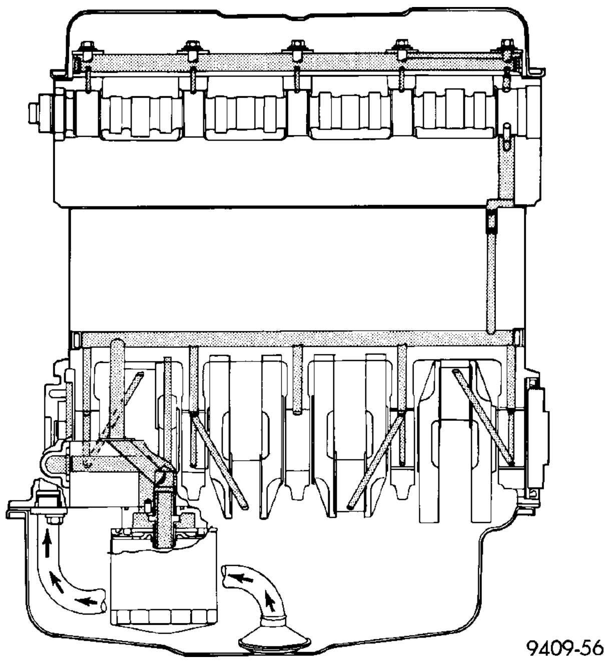


Fig. 106 Engine Lubrication System

(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 as necessary.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24 km (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:

• Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.

• Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.

• 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.

• 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 provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

• If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.

(7) 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.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

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 gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.

(4) If no leaks are detected, pressurize the crankcase as previously described.

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.

LUBRICATION (Continued)

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, replace component(s) as necessary.

DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

Check oil pressure using a gauge at oil pressure switch location.

(1) Remove the oil pressure switch (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).

(2) Install oil pressure test gauge, Special Tool C-3292 with Adapter 8406. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM.

(3) Warm engine to normal operating temperature.

(4) Monitor gauge readings at idle and 3000 rpm. For specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

OIL

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE OIL LEVEL CHECK

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. Remove dipstick (Fig. 107)and observe oil level. Add oil only when the level is at or below the ADD mark (Fig. 108).

STANDARD PROCEDURE - ENGINE OIL AND FILTER CHANGE

Change engine oil at mileage and time intervals described in the Maintenance Schedule. (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)

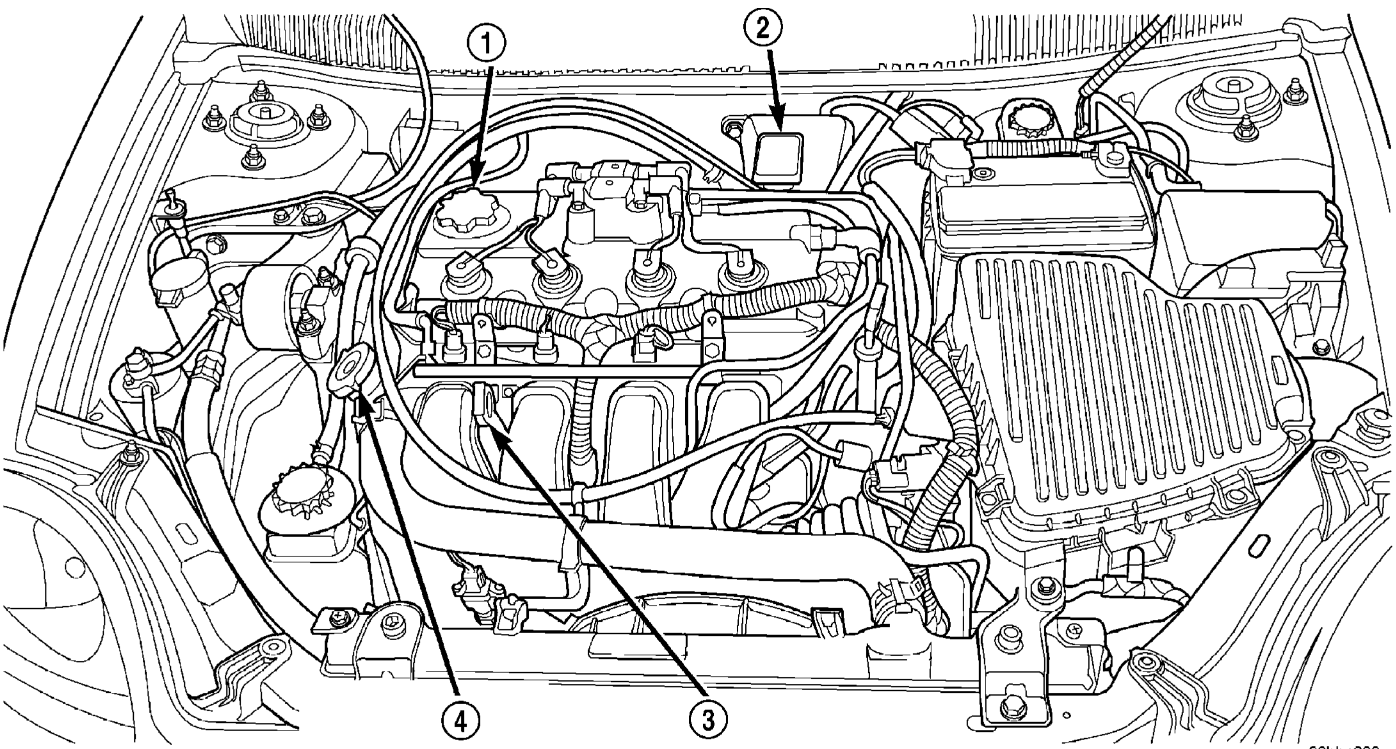


Fig. 107 Dipstick and Engine Oil Fill Locations

1 - ENGINE OIL FILL
2 - ENGINE COOLANT RECOVERY CONTAINER
3 - ENGINE OIL DIPSTICK
4 - COOLING SYSTEM PRESSURE CAP

OIL (Continued)

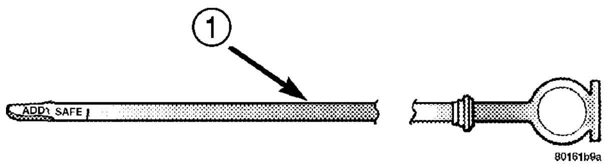


Fig. 108 Oil Level

1 - ENGINE OIL LEVEL DIPSTICK

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.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Remove oil fill cap (Fig. 107).

(3) Raise vehicle on hoist.

(4) Place a suitable oil collecting container under oil pan drain plug (Fig. 109).

(5) Remove oil pan drain plug and allow oil to drain into collecting container. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.

(6) Remove oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(7) Install and tighten oil pan drain plug to 27 N·m (20 ft. lbs.).

(8) Install new oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).

(9) Lower vehicle and fill crankcase with specified type and amount of engine oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).

(10) Install oil fill cap.

(11) Start engine and inspect for leaks.

(12) Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

OIL FILTER

REMOVAL

CAUTION: When servicing the oil filter (Fig. 109), avoid deforming the filter. Use an appropriate oil filter removing tool. Position filter wrench strap close the seam at the base of the filter. The oil filter seam that joins the can to the base, is reinforced by the base plate.

(1) Turn filter counterclockwise to remove (Fig. 109).

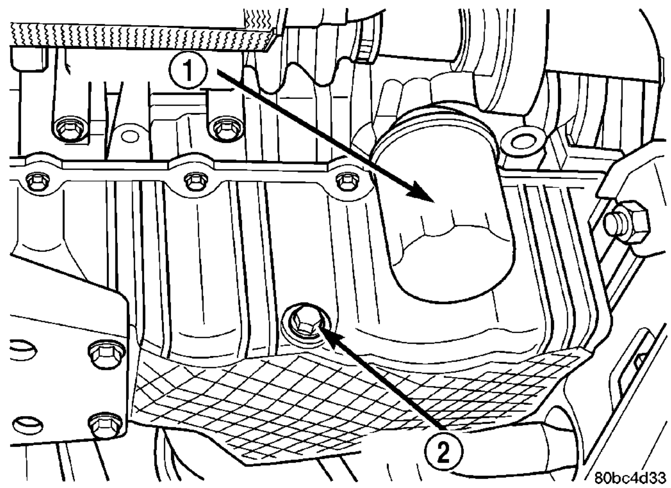


Fig. 109 Engine Oil Filter

1 - OIL FILTER
2 - DRAIN PLUG

INSTALLATION

(1) Clean and check the filter mounting surface. The surface must be smooth, flat and free of debris or old pieces of rubber.

(2) Lubricate new filter gasket.

(3) Screw filter on until gasket contacts base (Fig. 109). Tighten to 11 N·m (8 ft. lbs.).

OIL PAN

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise vehicle on hoist.

(3) Drain engine oil and remove oil filter.

(4) Remove oil filter adaptor from engine block (Fig. 110) (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER ADAPTER - REMOVAL).

(5) Remove structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).

(6) Remove intake manifold support bracket attaching bolts (Fig. 111).

OIL PAN (Continued)

(7) Remove intake manifold support bracket (Fig. 111).

(8) Remove transaxle dust cover (Fig. 111).

(9) Remove oil pan bolts.

(10) Remove oil pan.

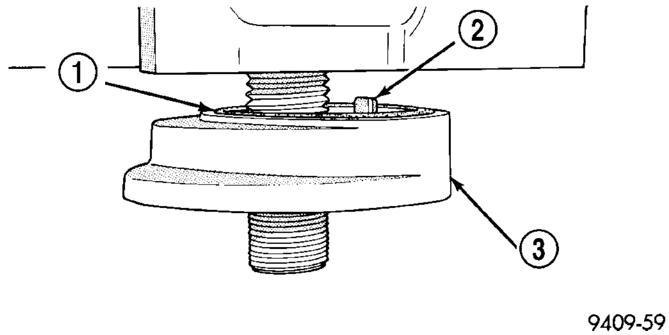


Fig. 110 Oil Filter Adaptor

1 - O-RING
2 - LOCATING ROLL PIN
3 - OIL FILTER ADAPTER

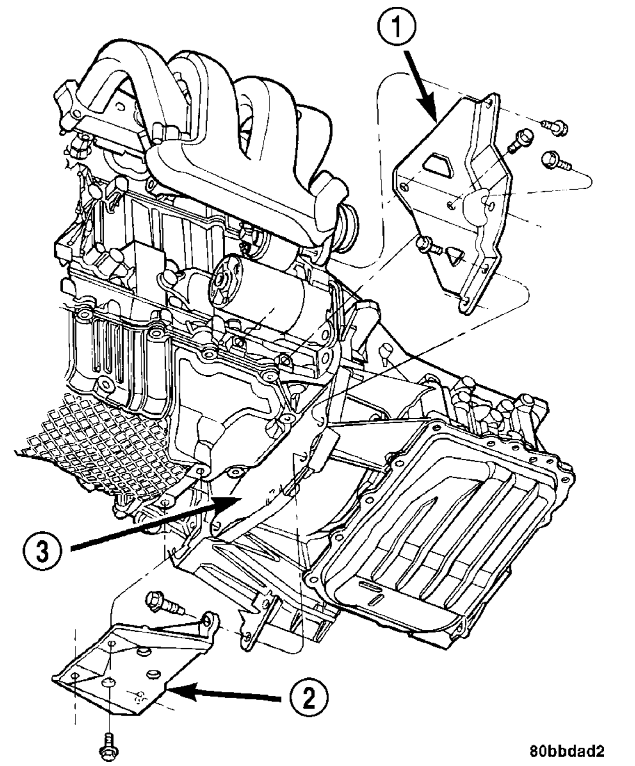


Fig. 111 Manifold Support Bracket, Structural Collar, and Dust Cover

1 - SUPPORT BRACKET
2 - STRUCTURAL COLLAR
3 - DUST COVER

INSTALLATION

(1) Clean oil pan and all sealing surfaces.

(2) Apply Mopar® Silicone Rubber Adhesive Sealant at the oil pump to engine block parting line (Fig. 112).

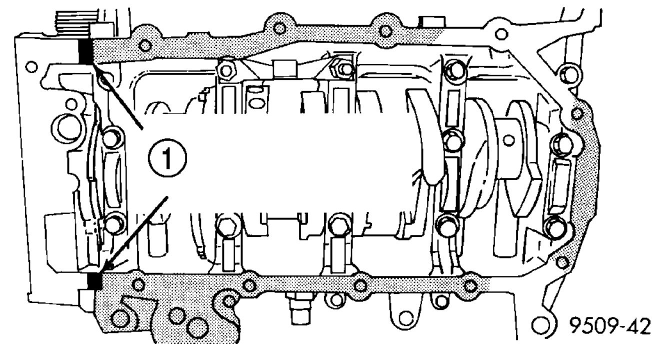


Fig. 112 Oil Pan Sealing

1 - PLACE A 1/8 INCH BEAD OF SEALER AT THE PARTING LINE OF THE OIL PUMP TO ENGINE BLOCK

(3) Position a new oil pan gasket onto pan.

(4) Install oil pan and tighten screws to 12 N·m (105 in. lbs.).

(5) Install transaxle dust cover (Fig. 111).

(6) Install intake manifold support bracket (Fig. 111).

(7) Install structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).

(8) Install oil filter adaptor (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER ADAPTER - INSTALLATION).

(9) Install oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).

(10) Lower vehicle and fill engine crankcase with proper oil to correct level.

OIL PRESSURE SENSOR/SWITCH

DESCRIPTION

The oil pressure switch is located on the right rear side of the engine block (Fig. 113). The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

OPERATION

The oil pressure switch is normally “Closed.” The switch changes from a ″Closed″ circuit to an ″Open″ circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an ″Open″ circuit to a ″Closed″ circuit, on decreasing pressure, between 2 psig and 4 psig.

REMOVAL

(1) Raise vehicle.

OIL PRESSURE SENSOR/SWITCH (Continued)

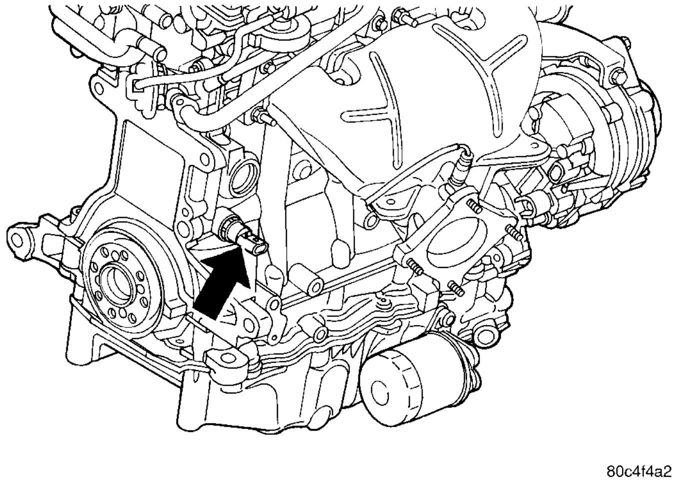


Fig. 113 Oil Pressure Switch

(2) Position oil collecting container under pressure switch location.

(3) Disconnect oil pressure switch electrical connector and remove switch (Fig. 114).

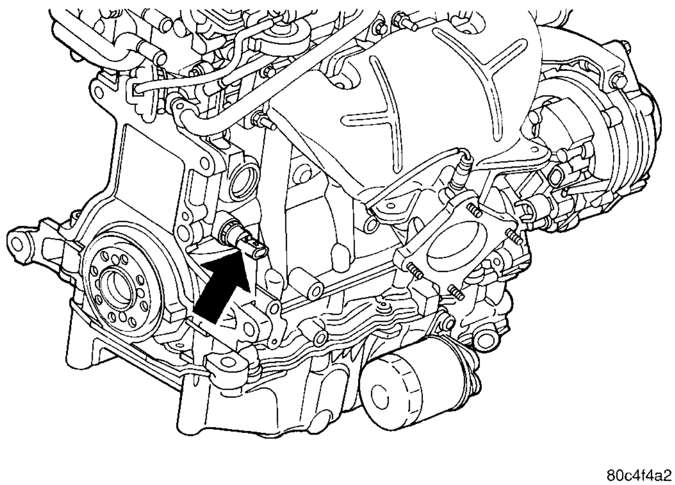


Fig. 114 Engine Oil Pressure Switch

INSTALLATION

(1) Install oil pressure switch and connect electrical connector (Fig. 114).

(2) Lower vehicle.

(3) Start engine and allow to run a minimum of 2 minutes.

(4) Shut engine off and check engine oil level. Adjust level as necessary.

OIL PUMP

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(3) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(4) Remove timing belt tensioner assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER ASSEMBLY - REMOVAL).

(5) Remove the camshaft sprocket and the rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(6) Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(7) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 115).

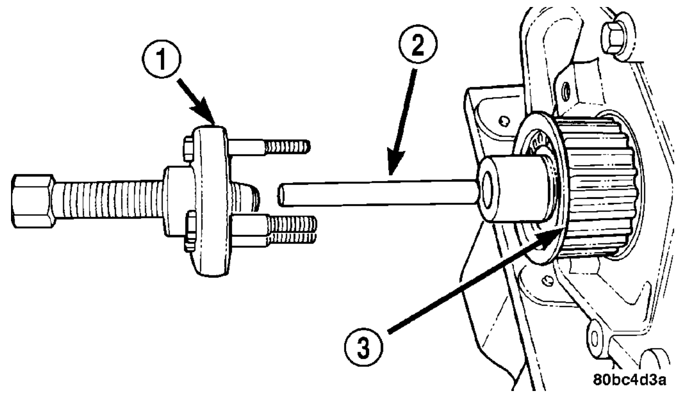


Fig. 115 Crankshaft Sprocket—Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

(8) Remove the oil pick-up tube.

(9) Remove fasteners securing oil pump to engine block. Remove oil pump (Fig. 116) and front crankshaft seal.

DISASSEMBLY

(1) To remove the relief valve, proceed as follows:

(2) Remove the threaded plug and gasket from the oil pump (Fig. 117).

CAUTION: Oil pump pressure relief valve must be installed as shown in (Fig. 117) or serious damage may occur.

(3) Remove spring and relief valve (Fig. 117).

(4) Remove oil pump cover screws, and lift off cover.

(5) Remove pump rotors.

(6) Wash all parts in a suitable solvent and inspect carefully for damage or wear (Fig. 118).

INSPECTION

(1) Clean all parts thoroughly. Mating surface of the oil pump should be smooth. Replace pump cover if scratched or grooved.

OIL PUMP (Continued)

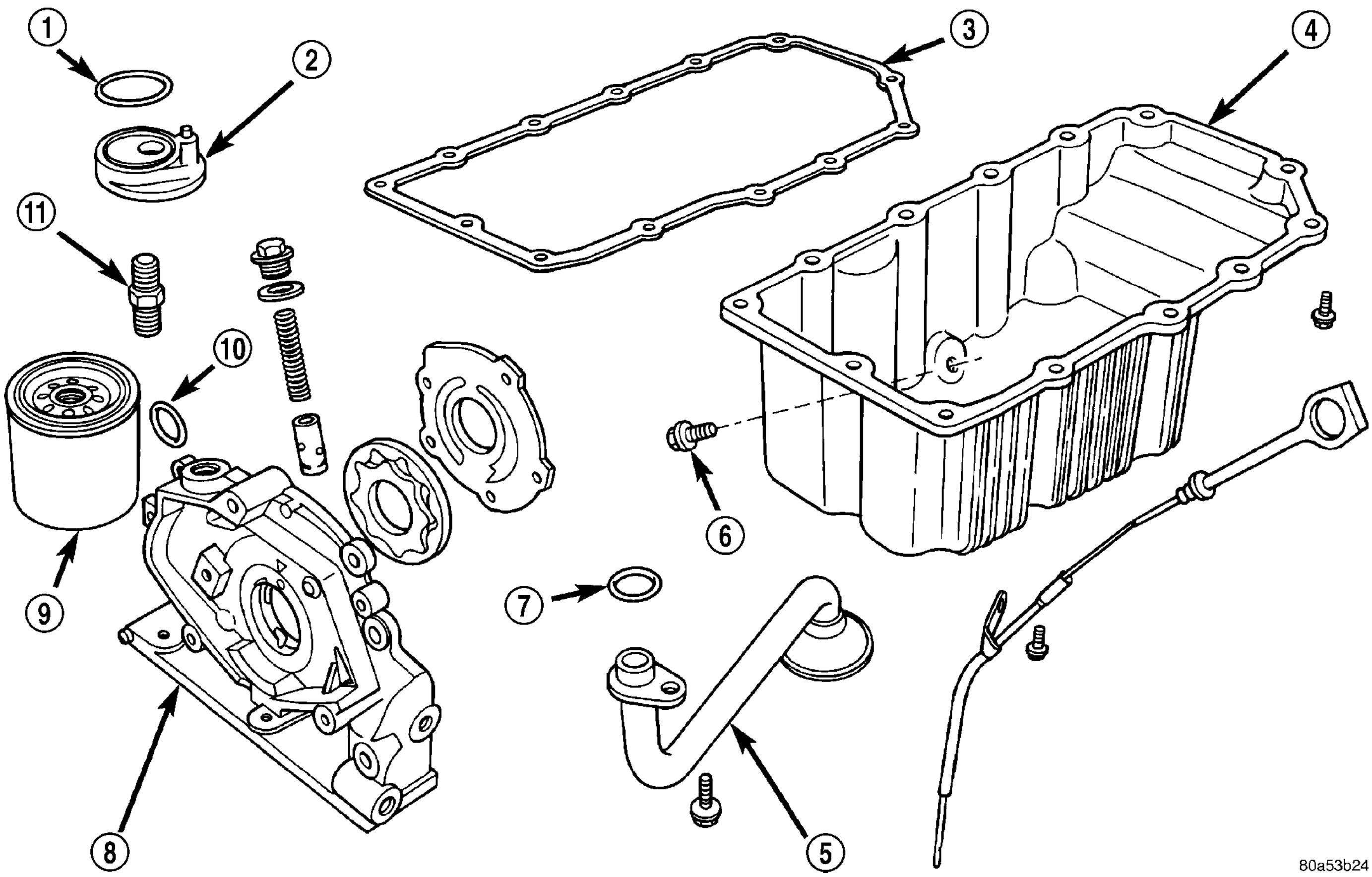


Fig. 116 Oil Pump and Tube

1 - O-RING
2 - OIL FILTER ADAPTER
3 - OIL PAN GASKET
4 - OIL PAN
5 - OIL PICK-UP TUBE
6 - DRAIN PLUG
7 - O-RING
8 - OIL PUMP BODY
9 - FILTER
10 - O-RING
11 - NIPPLE

(2) Lay a straightedge across the pump cover surface (Fig. 119). If a 0.076 mm (0.003 in.) 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 7.64 mm (0.301 in.) or less (Fig. 120), or if the diameter is 79.95 mm (3.148 in.) or less, replace outer rotor.

(4) If inner rotor measures 7.64 mm (0.301 in) or less replace inner rotor (Fig. 121).

(5) Slide outer rotor into pump housing, press to one side with fingers and measure clearance between rotor and housing (Fig. 122). If measurement is 0.39 mm (0.015 in.) 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. 123) is 0.203 mm (0.008 in.) or more, replace both rotors.

(7) Place a straightedge across the face of the pump housing, between bolt holes. If a feeler gauge of 0.102 mm (0.004 inch) or more can be inserted between rotors and the straightedge, replace pump assembly (Fig. 124). **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 in.) it should test between 18 and 19 pounds when compressed to 40.5 mm (1.60 in.). Replace spring that fails to meet specifications.

(10) If oil pressure is low and pump is within specifications, inspect for worn engine bearings, damaged or missing oil pick-up tube O-ring, clogged oil pick-up tube screen, clogged oil filter and stuck open pressure relief valve or other reasons for oil pressure loss.

ASSEMBLY

(1) Install oil pump rotors (Fig. 118).

OIL PUMP (Continued)

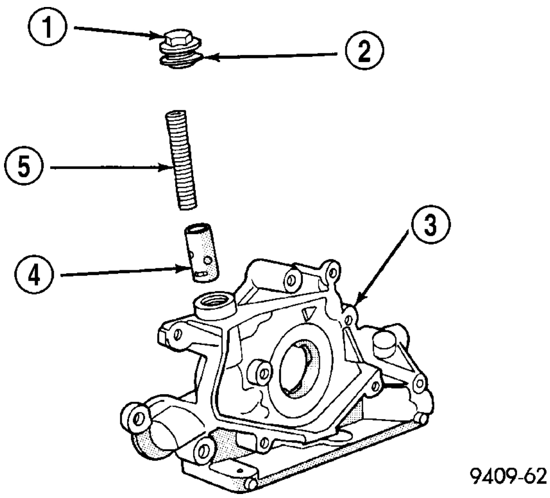


Fig. 117 Oil Pressure Relief Valve

1 - RETAINER CAP
2 - GASKET
3 - OIL PUMP BODY
4 - RELIEF VALVE
5 - SPRING

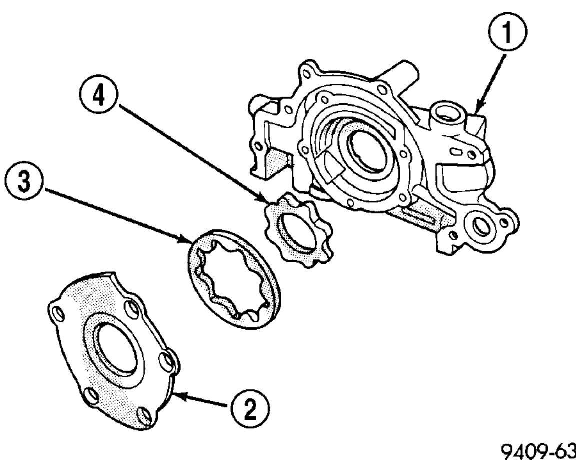


Fig. 118 Oil Pump

1 - OIL PUMP BODY
2 - OIL PUMP COVER
3 - OUTER ROTOR
4 - INNER ROTOR

(2) Install oil pump cover and screws (Fig. 118). Tighten screws to 12 N·m (105 in. lbs.).

CAUTION: Oil pump pressure relief valve must be installed as shown in (Fig. 117) or serious damage may occur.

(3) Install spring and relief valve (Fig. 117).
(4) Install threaded plug and gasket to the oil pump (Fig. 117). Tighten plug to 41 N·m (30 ft. lbs.).

INSTALLATION

(1) Make sure all surfaces are clean and free of oil and dirt.

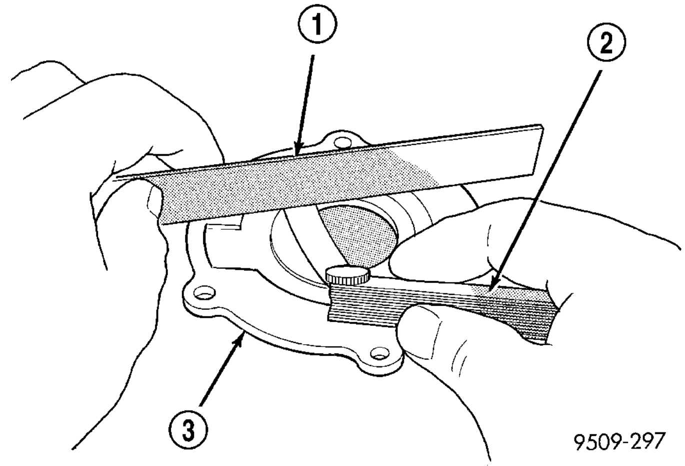


Fig. 119 Checking Oil Pump Cover Flatness

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

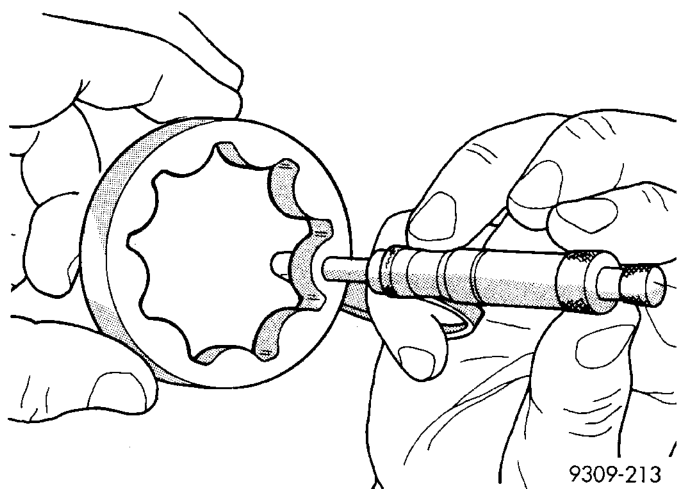


Fig. 120 Measuring Outer Rotor Thickness

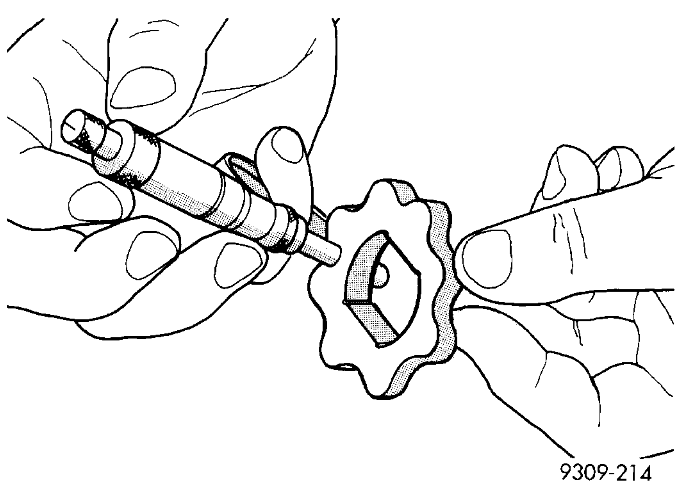


Fig. 121 Measuring Inner Rotor Thickness

OIL PUMP (Continued)

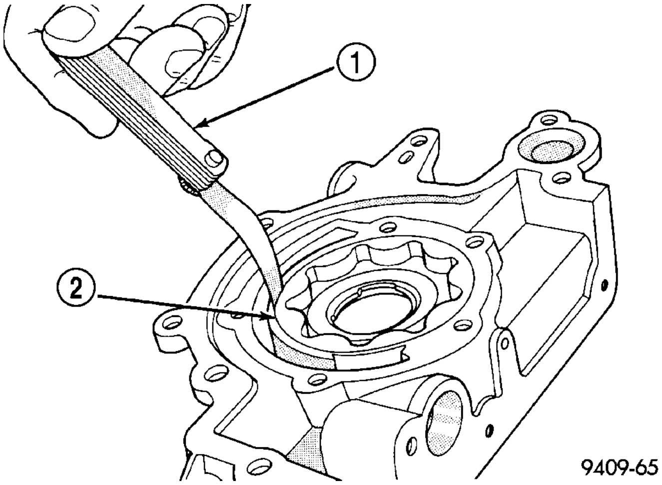


Fig. 122 Measuring Outer Rotor Clearance in Housing

1 - FEELER GAUGE
2 - OUTER ROTOR

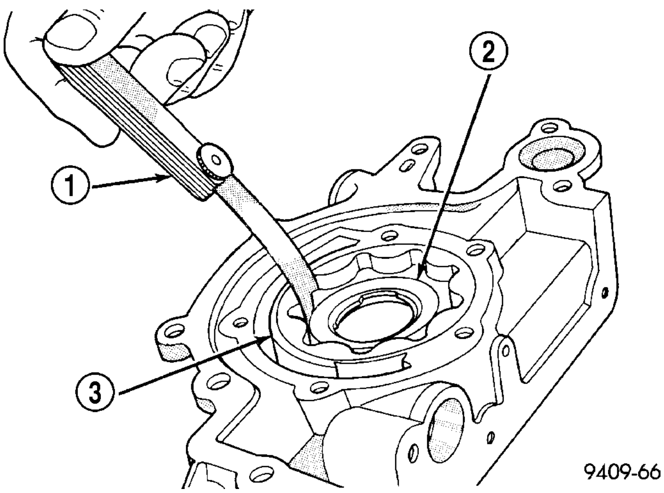


Fig. 123 Measuring Clearance Between Rotors

1 - FEELER GAUGE
2 - INNER ROTOR
3 - OUTER ROTOR

(2) Apply Mopar® Gasket Maker to oil pump as shown in (Fig. 125). Install o-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) Torque all oil pump attaching bolts to 28 N·m (250 in. lbs.).

(6) Install new front crankshaft seal using Special Tool 6780 (Fig. 126).

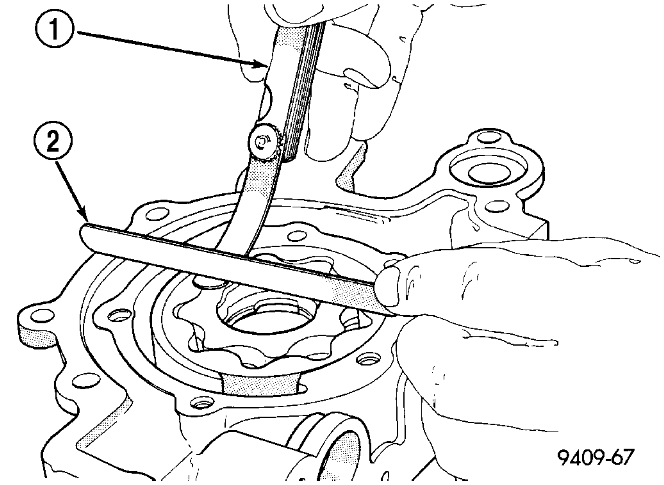


Fig. 124 Measuring Clearance Over Rotors

1 - FEELER GAUGE
2 - STRAIGHT EDGE

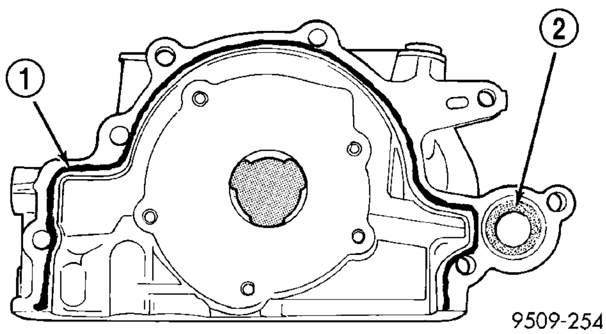


Fig. 125 Oil Pump Sealing

1 - APPLY GASKET MAKER TO OIL PUMP BODY FLANGE
2 - O-RING

NOTE: Make sure the word “front” on the crankshaft sprocket is facing outward.

CAUTION: Use of Special Tool 6792 is required to install the crankshaft sprocket to the proper depth. Failure to use this tool will cause improper timing belt tracking.

(7) Install crankshaft sprocket, using Special Tool 6792 (Fig. 127).

(8) Install oil pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(9) Install timing belt rear cover and camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(10) Install timing belt tensioner assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER ASSEMBLY - INSTALLATION).

OIL PUMP (Continued)

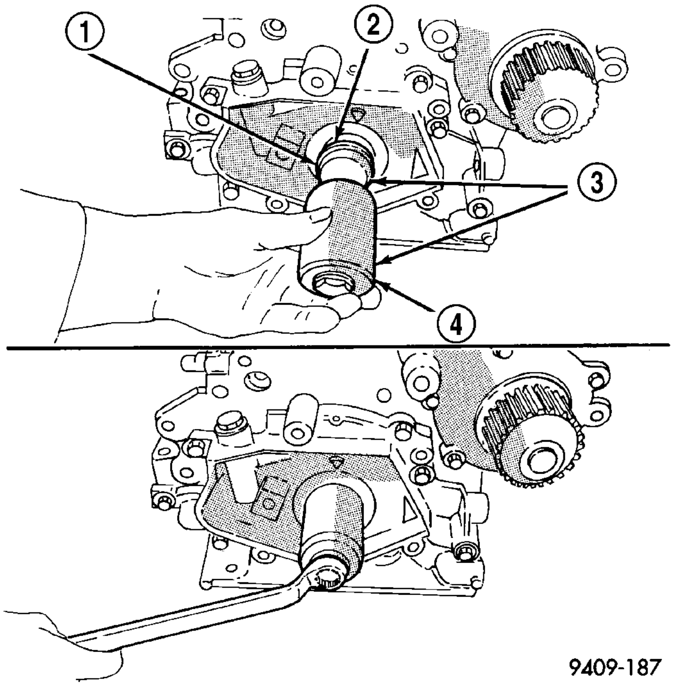


Fig. 126 Front Crankshaft Seal—Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780–1
4 - INSTALLER

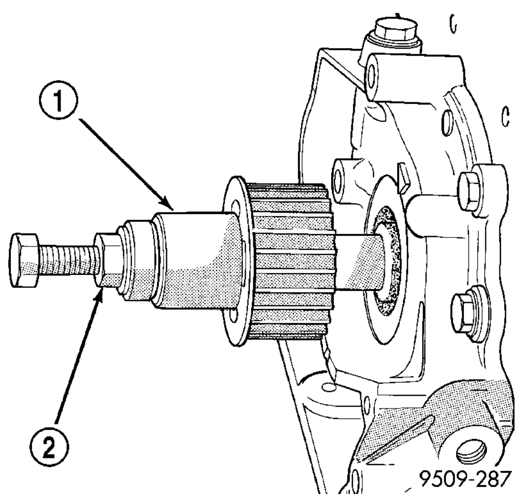


Fig. 127 Crankshaft Sprocket—Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

(11) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(12) Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(13) Fill engine crankcase with proper oil to correct level.

(14) Connect negative cable to battery.

OIL FILTER ADAPTER

REMOVAL

(1) Remove the oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(2) Remove assembly by unscrewing adaptor fitting (Fig. 128).

(3) Remove O-ring seal.

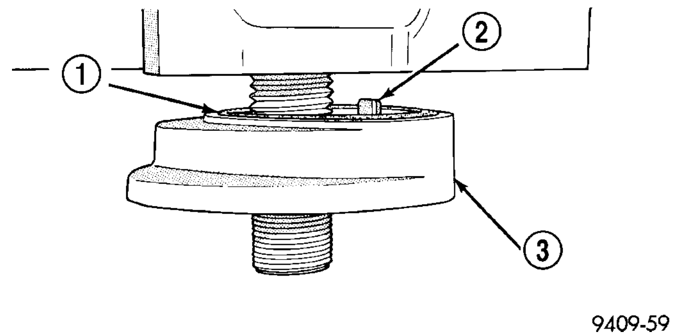


Fig. 128 Engine Oil Filter Adapter to Engine Block

1 - O-RING
2 - LOCATING ROLL PIN
3 - OIL FILTER ADAPTER

INSTALLATION

(1) Position O-ring in the groove on adapter.

(2) Align roll pin into engine block and tighten assembly to 80 N·m (60 ft. lbs.) (Fig. 128).

(3) Install oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is a molded plastic composition, attached to the cylinder head with fasteners. The manifold is a long branch design to enhance low and mid-range torque.

OPERATION

The intake manifold delivers air to the combustion chambers. This air allows the fuel delivered by the fuel injectors to ignite when the spark plugs fire.

INTAKE MANIFOLD (Continued)

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS

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 engine RPM'S change, the area of the suspected leak has been found.
(4) Repair as required.

REMOVAL

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) Perform fuel system pressure release procedure **before attempting any repairs** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
(2) Disconnect negative cable from battery.
(3) Remove the inlet air duct from intake manifold to throttle body.

WARNING: WRAP SHOP TOWELS AROUND FUEL HOSE TO CATCH ANY GASOLINE SPILLAGE

(4) Disconnect fuel supply line quick connect at the fuel tube assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
(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

(6) Disconnect brake booster hose (Fig. 129) and PCV hose (Fig. 130) from intake manifold.
(7) Disconnect Manifold Absolute Pressure (MAP) sensor electrical connector (Fig. 131).
(8) Disconnect knock sensor electrical connector (Fig. 132).

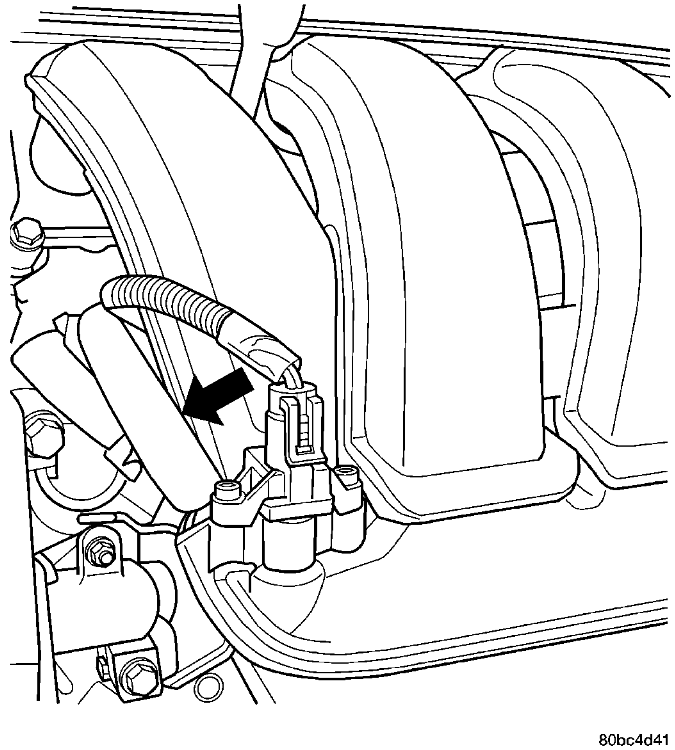


Fig. 129 Brake Booster Hose

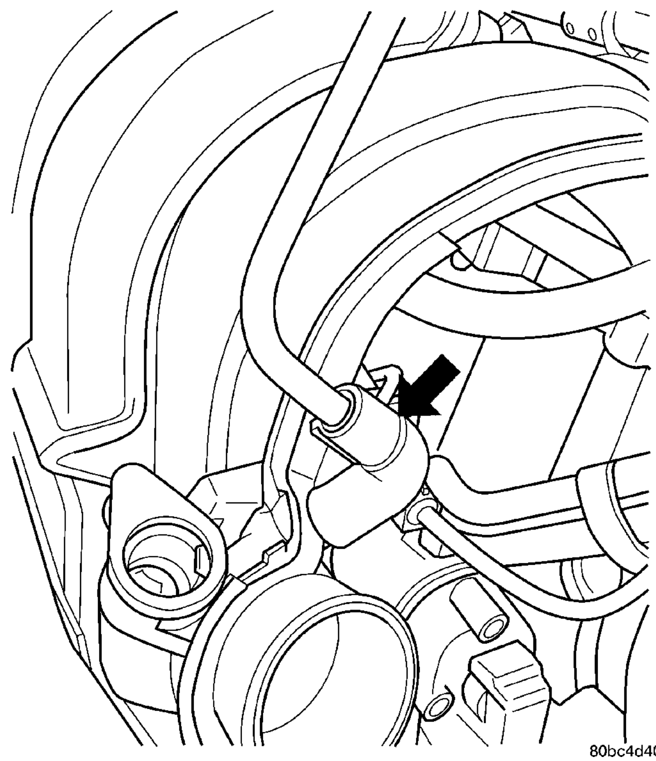


Fig. 130 PCV Hose

INTAKE MANIFOLD (Continued)

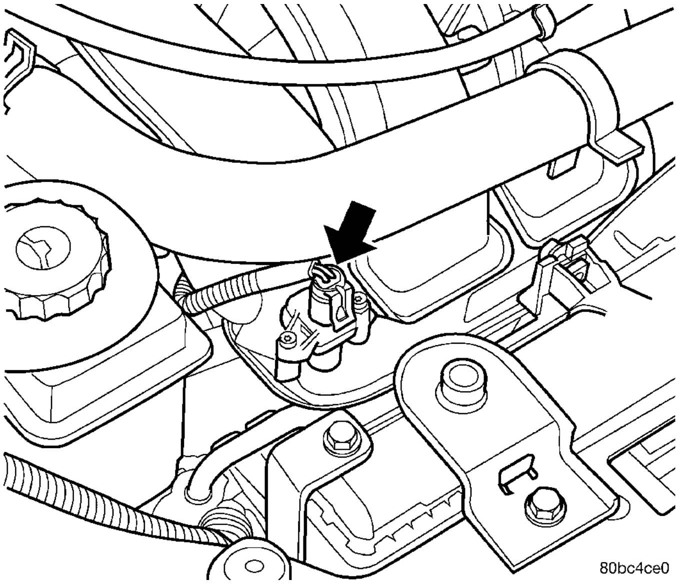


Fig. 131 MAP Sensor

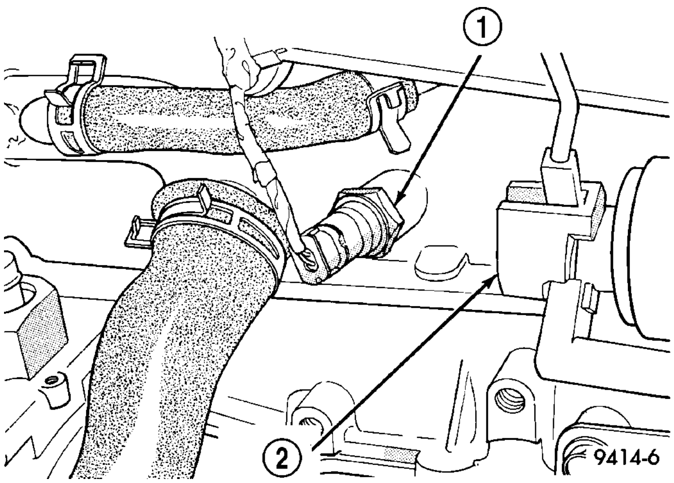


Fig. 132 Knock Sensor

1 - KNOCK SENSOR
2 - STARTER MOTOR

(9) Disconnect wiring at starter.

(10) Remove the intake manifold to lower support bracket bolts (Fig. 133).

(11) Remove intake manifold screws and washers. Discard the fasteners. Remove intake manifold.

INSPECTION

- Inspect manifold for cracks or distortions.
- Check for torn or missing O-rings at the mating surface of the manifold (Fig. 134).

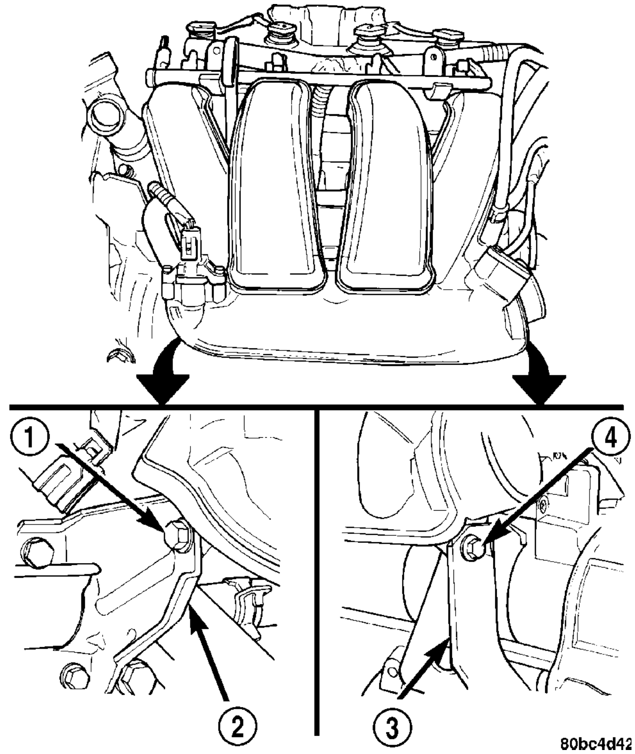


Fig. 133 Intake Manifold Lower Supports

1 - BOLT
2 - BRACKET
3 - BRACKET
4 - BOLT

INSTALLATION

Before installing manifold. Clean all mating surfaces. Replace all O-ring gaskets with new gaskets (Fig. 134). All intake manifold fasteners and washers are to be discarded and **NEW** fasteners and washers are to be used.

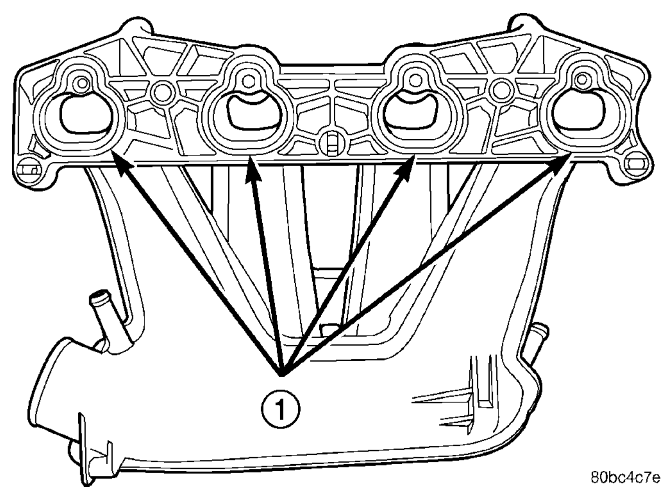


Fig. 134 Intake Manifold Gaskets

1 - INTAKE MANIFOLD O-RING GASKETS

INTAKE MANIFOLD (Continued)

(1) Install intake manifold onto cylinder head and tighten fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 135).

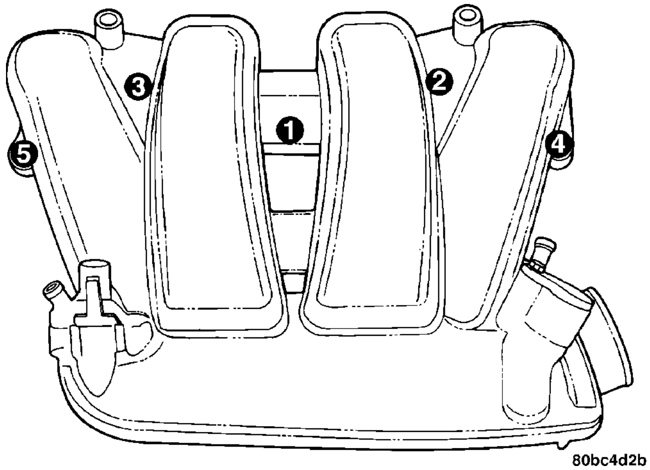


Fig. 135 Intake Manifold Tightening Sequence

(2) Install intake manifold to lower support bracket bolts (Fig. 133). Tighten bolts to 11 N·m (95 in. lbs.).

(3) 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.).

(4) Connect PCV and brake booster hoses.

(5) Inspect quick connect fittings for damage, replace if necessary (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE). Apply a light amount of clean engine oil to fuel inlet tube. Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.

(6) Connect Manifold Absolute Pressure (MAP) Sensor wiring connector (Fig. 131).

(7) Connect knock sensor connector, and wiring at starter.

(8) Install inlet air duct to intake manifold and throttle body. Tighten clamp to 3 N·m (30 in. lbs.).

(9) Connect negative cable to battery.

(10) 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.

INTAKE MANIFOLD - HIGH OUTPUT

DESCRIPTION

The intake manifold is a two piece cast aluminum design. The lower manifold section houses an electronic controlled manifold tuning valve for increased engine performance.

OPERATION

The intake manifold meters and delivers air to the combustion chambers. This air allows the fuel delivered by the fuel injectors to ignite; producing power.

The manifold tuning valve (MTV) allows additional flow volumes under certain engine operating conditions for increase engine performance.

REMOVAL - HIGH OUTPUT ENGINE

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 battery.

(2) Perform fuel system pressure release procedure **before attempting any repairs.** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE)

WARNING: WRAP SHOP TOWELS AROUND FUEL HOSE TO CATCH ANY GASOLINE SPILLAGE

(3) Disconnect fuel supply line quick connect at the fuel tube assembly. (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE)

(4) Disconnect fuel injector connector and harness from injectors and fuel rail.

(5) Disconnect PCV hose from manifold (Fig. 137).

(6) Remove the inlet air duct from intake manifold to throttle body.

(7) Remove bolt attaching lower intake manifold to support bracket (Fig. 136).

(8) Remove engine oil dipstick from housing.

(9) Disconnect electrical connectors from MAP sensor and MTV actuator (Fig. 137).

(10) Remove bolts attaching intake manifold to cylinder head.

(11) Move manifold forward for access to wiring connections (Fig. 139).

(12) Disconnect the knock sensor (Fig. 138).

(13) Disconnect brake booster hose (Fig. 139).

(14) Remove intake manifold.

INTAKE MANIFOLD - HIGH OUTPUT (Continued)

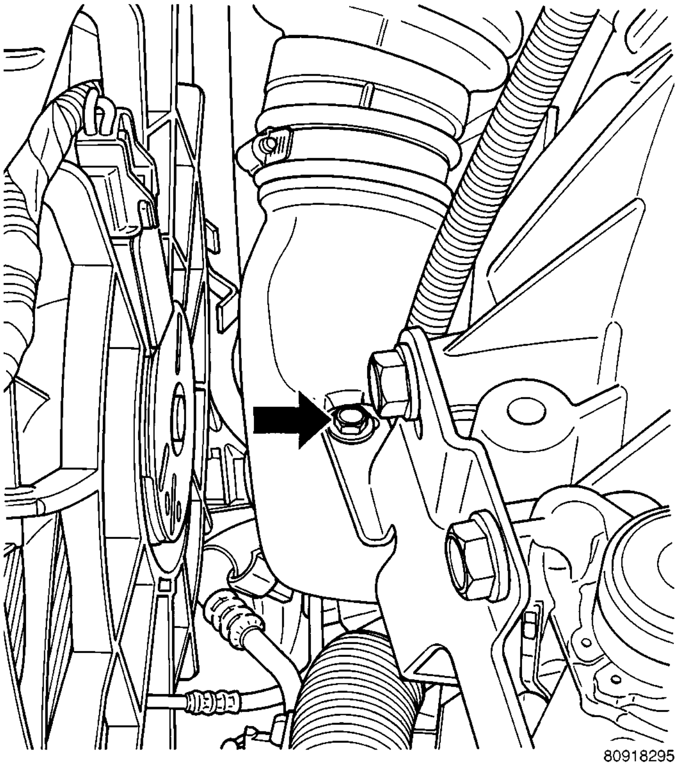


Fig. 136 Lower Manifold Support Bolt - (Under-body View)

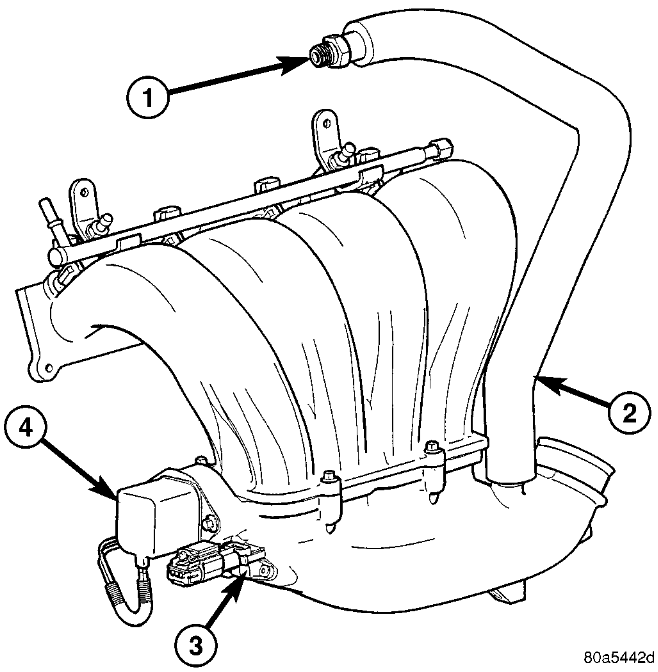


Fig. 137 MAP, MTV & PCV Locations

1 - PCV VALVE (SCREWS INTO CYLINDER HEAD COVER)
2 - PCV HOSE (WITH INSULATED SLEEVE)
3 - MAP SENSOR
4 - MTV ACTUATOR

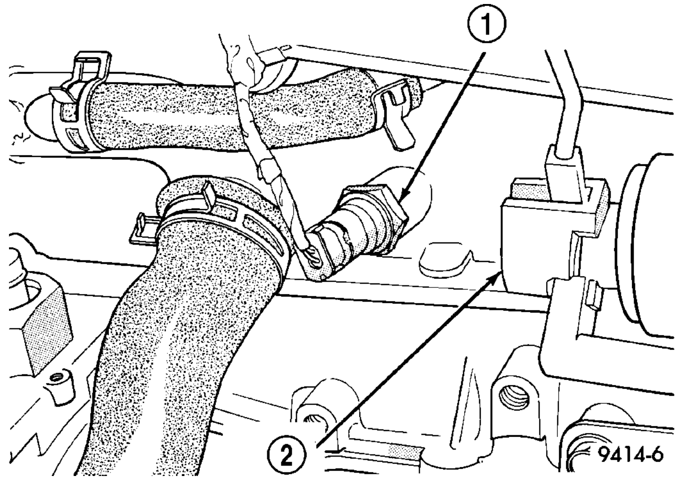


Fig. 138 Knock Sensor

1 - KNOCK SENSOR
2 - STARTER MOTOR

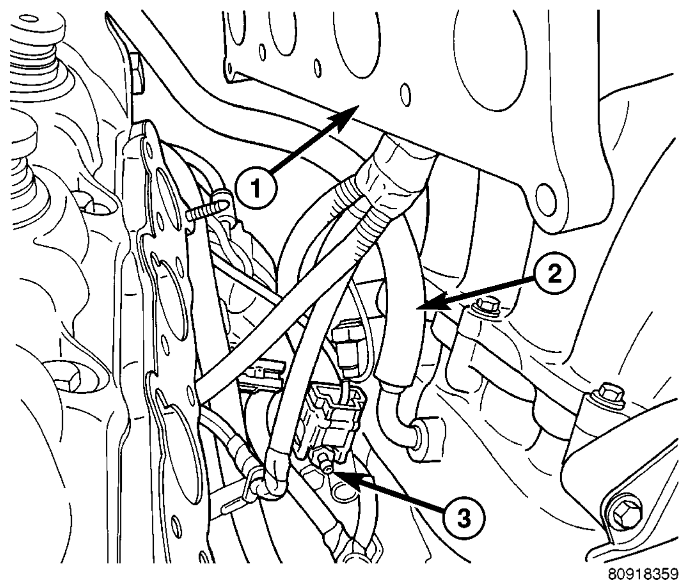


Fig. 139 Brake Booster Hose

1 - INTAKE MANIFOLD
2 - BRAKE BOOSTER HOSE
3 - STARTER WIRING

INSTALLATION - HIGH OUTPUT ENGINE

(1) Clean manifold sealing surfaces.

(2) If separated, install lower to upper manifold gasket and tighten bolt in sequence shown in (Fig. 140) to 12 N·m (105 in. lbs.).

(3) Position new manifold gasket on cylinder head mounting surface, piloting on the 2 attaching studs.

(4) Loosely position manifold in engine compartment.

(5) Insert engine wiring harness between middle intake runners.

(6) Connect the knock sensor (Fig. 138).

(7) Connect brake booster hose (Fig. 139).

INTAKE MANIFOLD - HIGH OUTPUT (Continued)

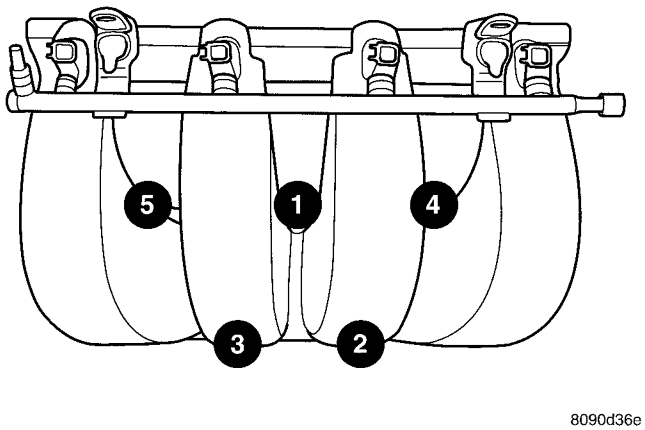


Fig. 140 LOWER INTAKE MANIFOLD TIGHTENING

(8) Position manifold to cylinder head and install fasteners. Tighten fasteners in sequence shown in (Fig. 141) to 12 N·m (105 in. lbs.).

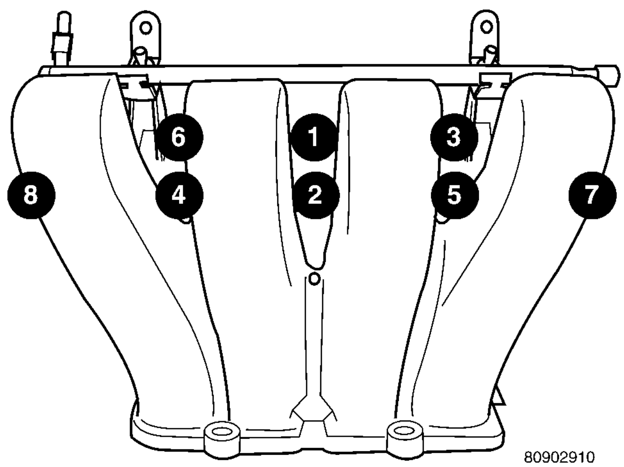


Fig. 141 Upper Intake Manifold Tightening Sequence

(9) Install bolt securing lower manifold to bracket (Fig. 136). Tighten bolt to 28 N·m (250 in. lbs.).

(10) Connect MAP sensor and MTV actuator electrical connection (Fig. 137).

(11) Install engine oil dipstick

(12) Connect inlet air duct to manifold and throttle body.

(13) Connect PCV hose to manifold (Fig. 137).

(14) Connect fuel injector connectors and harness to fuel rail.

(15) Connect fuel supply line to fuel rail. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE)

(16) Connect negative cable to battery.

EXHAUST MANIFOLD

DESCRIPTION

The exhaust manifold is made of nodular cast iron for strength and high temperatures. The manifold attaches to the cylinder head.

OPERATION

The exhaust manifold collects the exhaust gasses exiting the combustion chambers. Then it channels the exhaust gasses to the exhaust pipe attached to the manifold.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise vehicle on hoist.

(3) Remove bolt attaching the wire harness heat shield to the exhaust manifold support bracket (Fig. 142).

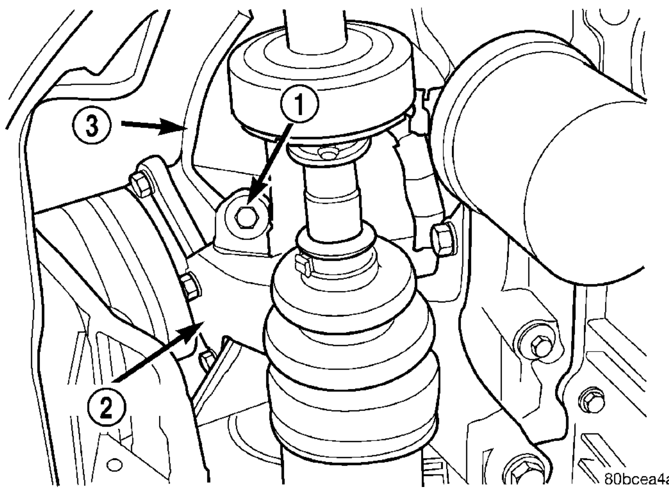


Fig. 142 Wire Harness Heat Shield Bolt

1 - BOLT
2 - BRACKET
3 - HEAT SHIELD

EXHAUST MANIFOLD (Continued)

(4) Remove exhaust manifold support bracket (Fig. 143).

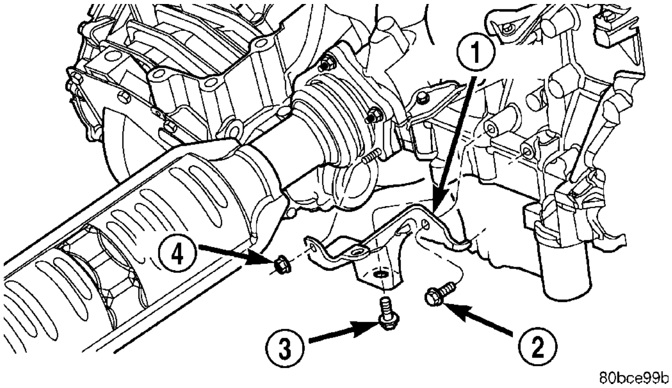


Fig. 143 Exhaust Manifold Support Bracket

1 - BRACKET
2 - BOLT (M10) - 54 N·m (40 ft. lbs.)
3 - BOLT (M12) - 95 N·m (70 ft. lbs.)
4 - NUT - 28 N·m (250 in. lbs.)

(5) Remove fasteners attaching exhaust system flex joint to exhaust manifold flange. Move exhaust system rearward to clear flange studs.

(6) Lower vehicle.

(7) Disconnect make-up air hose from rear of cylinder head cover.

(8) Disconnect oxygen sensor connector and harness clip.

(9) Remove heat shield attaching bolts (Fig. 144).

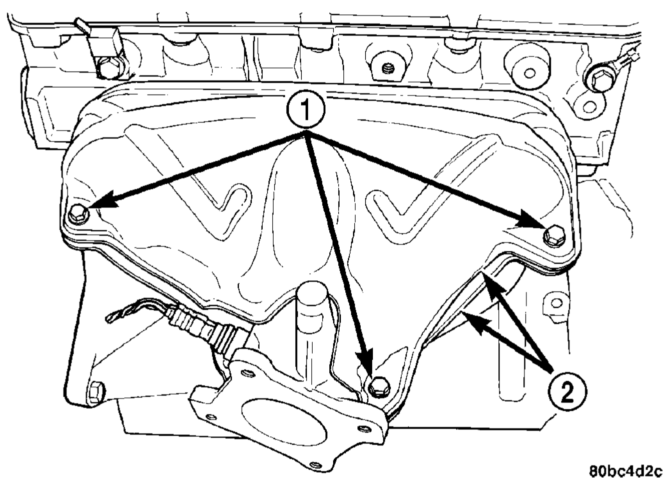


Fig. 144 Exhaust Manifold Heat Shields

1 - BOLTS
2 - HEAT SHIELDS

(10) Remove upper heat shield for access to manifold bolts.

(11) Remove exhaust manifold bolts.

(12) Remove exhaust manifold from top of vehicle, between the cylinder head and cowl.

CLEANING

(1) Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

(1) Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.

(2) Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

(1) Position exhaust manifold and gasket in place.

(2) Install exhaust manifold bolts and tighten in sequence shown in (Fig. 145) to 23 N·m (200 in. lbs.).

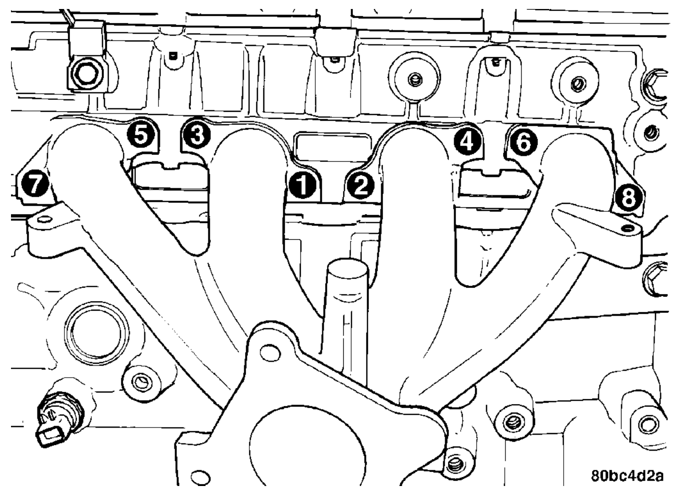


Fig. 145 Exhaust Manifold Tightening Sequence-Typical

(3) Position lower and upper heat shield on exhaust manifold. Install heat shield bolts and tighten to 11 N·m (95 in. lbs.) (Fig. 144).

(4) Connect oxygen sensor electrical connector and harness clip.

(5) Connect make-up air hose on cylinder head cover port.

(6) Raise vehicle.

(7) Install new flex joint to manifold flange gasket.

(8) Attach exhaust system to manifold flange and tighten fasteners to 28 N·m (250 in. lbs.).

(9) Install exhaust manifold support bracket and tighten fasteners (Fig. 143).

(10) Install bolt attaching wire harness heat shield to support bracket (Fig. 142).

(11) Lower vehicle.

(12) Connect negative cable to battery.

EXHAUST MANIFOLD - HIGH OUTPUT

DESCRIPTION

The exhaust manifold (Fig. 146) is a welded construction using lightweight tubular steel with stamped plate steel mounting flanges. The manifold attaches to the cylinder head.

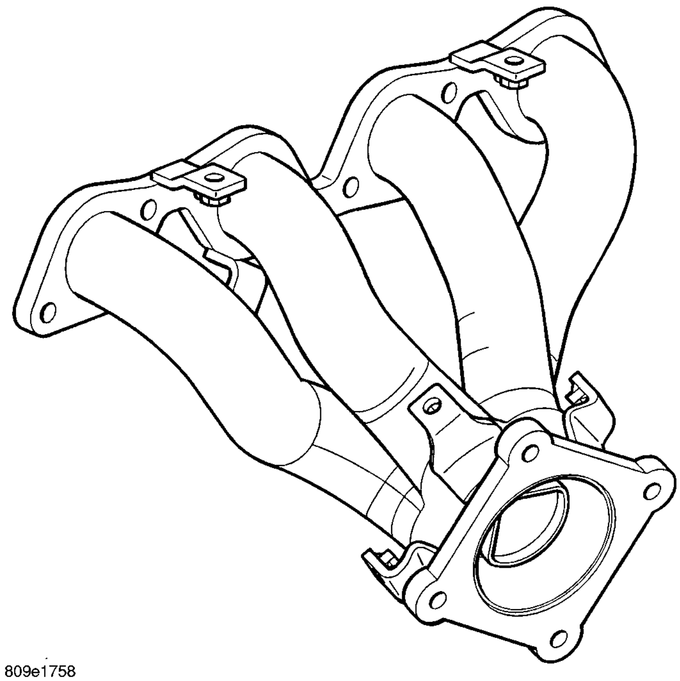


Fig. 146 EXHAUST MANIFOLD - HIGH OUTPUT ENGINE

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise vehicle on hoist.

(3) Remove bolt attaching the wire harness heat shield to the exhaust manifold support bracket (Fig. 147)

(4) Remove exhaust manifold support bracket (Fig. 148).

(5) Remove fasteners attaching exhaust system flex joint to exhaust manifold flange. Move exhaust system rearward to clear flange studs.

(6) Lower vehicle.

(7) Disconnect make-up air hose from rear of cylinder head cover.

(8) Disconnect oxygen sensor connector and harness clip.

(9) Remove heat shield attaching bolts.

(10) Remove upper heat shield for access to manifold bolts.

(11) Remove exhaust manifold bolts.

(12) Remove exhaust manifold from top of vehicle, between the cylinder head and cowl.

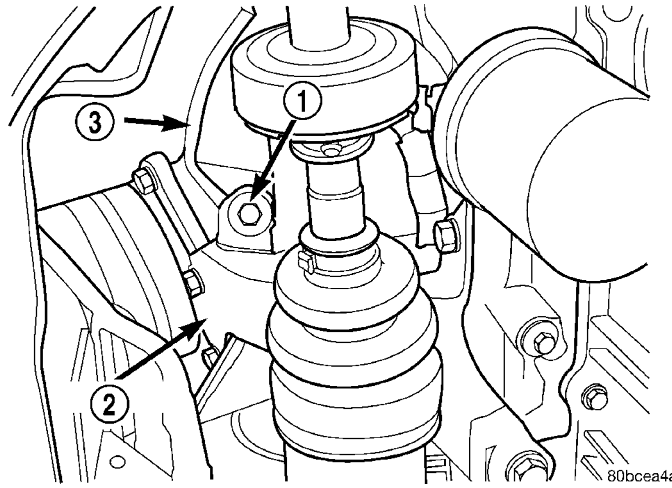


Fig. 147 Wire Harness Heat Shield Bolt

1 - BOLT
2 - BRACKET
3 - HEAT SHIELD

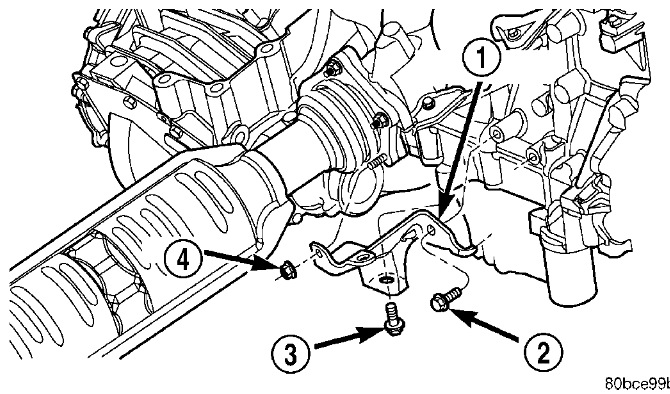


Fig. 148 Exhaust Manifold Support Bracket

1 - BRACKET
2 - BOLT (M10) - 54 N·m (40 ft. lbs.)
3 - BOLT (M12) - 95 N·m (70 ft. lbs.)
4 - NUT - 28 N·m (250 in. lbs.)

INSTALLATION

(1) Position exhaust manifold and gasket in place.

(2) Install exhaust manifold bolts and tighten in sequence shown in (Fig. 149) to 23 N·m (200 in. lbs.).

(3) Position lower and upper heat shield on exhaust manifold. Install heat shield bolts and tighten to 11 N·m (95 in. lbs.).

(4) Connect oxygen sensor electrical connector and harness clip.

(5) Connect make-up air hose on cylinder head cover port.

(6) Raise vehicle.

(7) Install new flex joint to manifold flange gasket.

(8) Attach exhaust system to manifold flange and tighten fasteners to 28 N·m (250 in. lbs.).

(9) Install exhaust manifold support bracket and tighten fasteners (Fig. 148).

EXHAUST MANIFOLD - HIGH OUTPUT (Continued)

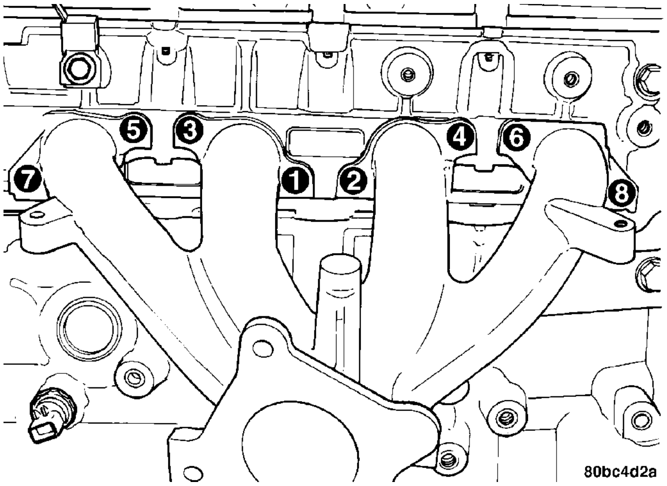


Fig. 149 Exhaust Manifold Tightening Sequence-Typical

(10) Install bolt attaching wire harness heat shield to support bracket (Fig. 147).

(11) Lower vehicle.

(12) Connect negative cable to battery.

VALVE TIMING

STANDARD PROCEDURE - VALVE TIMING VERIFICATION

(1) Remove number one spark plug.

(2) Using a dial indicator, set number one cylinder to TDC on the compression stroke.

(3) Remove the access plug from the front timing belt cover (Fig. 153).

(4) Check the timing mark on the camshaft sprocket. Mark should align with the arrow on the timing belt rear cover (Fig. 150).

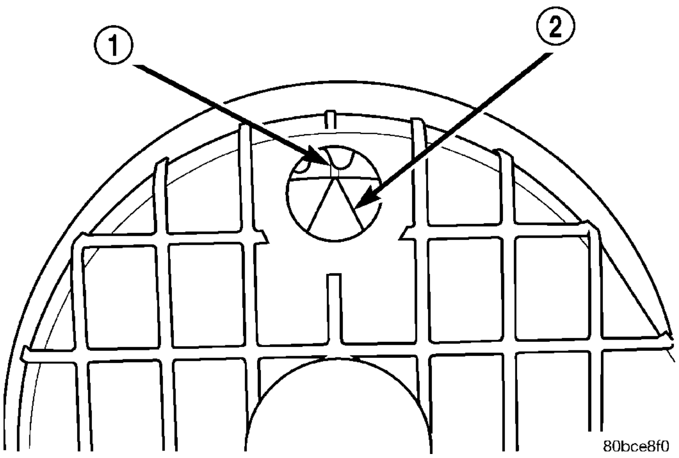


Fig. 150 Camshaft Timing Marks

1 - CAM SPROCKET TIMING MARK
2 - ARROW ON REAR COVER

TIMING BELT COVER(S)

REMOVAL

FRONT COVER

(1) Disconnect negative battery cable.

(2) Remove fastener securing ground strap to engine mount bracket.

(3) Remove upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(4) Remove power steering/air conditioning compressor drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(5) Raise vehicle on hoist.

(6) Remove accessory drive belt splash shield.

(7) Remove generator drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(8) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(9) Remove lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(10) Lower vehicle.

(11) Position a jack under engine. Raise jack enough to support engine weight.

(12) Remove right engine mount to engine mount bracket through bolt (Fig. 151).

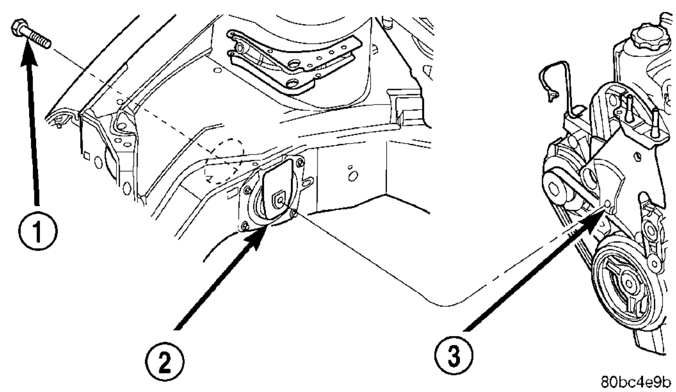


Fig. 151 Right Engine Mount to Bracket

1 - THROUGH BOLT
2 - RIGHT ENGINE MOUNT
3 - ENGINE MOUNT BRACKET

(13) Lower engine enough with jack to remove lower engine mount bracket bolt (Fig. 152).

(14) Raise engine with jack to allow engine-to-body clearance for engine mount bracket removal.

(15) Remove power steering pump assembly and set aside. **Do Not** disconnect lines from pump.

TIMING BELT COVER(S) (Continued)

(16) Remove the two remaining bolts securing engine mount bracket to engine. Remove engine mount bracket (Fig. 152).

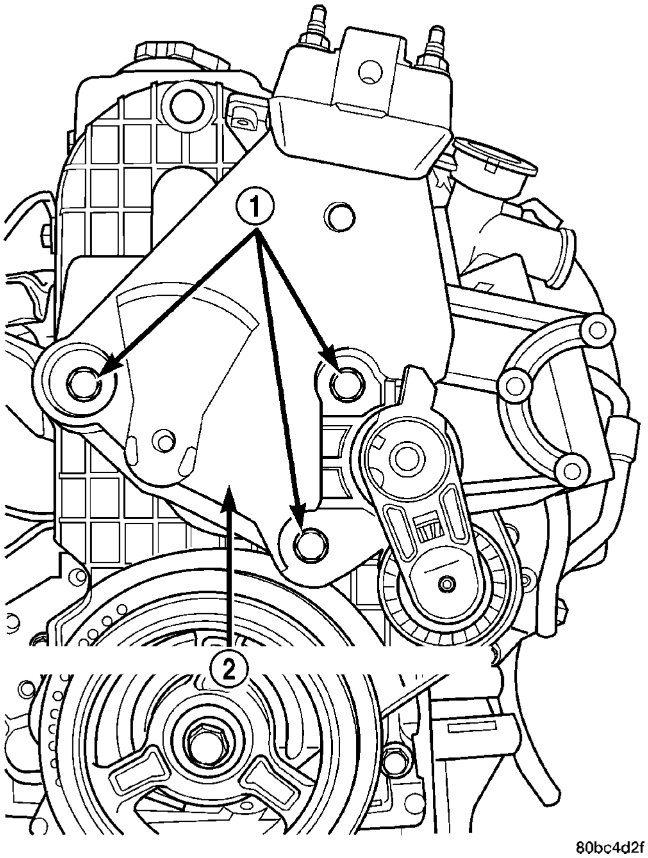


Fig. 152 Engine Mount Bracket

1 - BOLTS
2 - ENGINE MOUNT BRACKET ASSEMBLY

(17) Remove the front timing belt cover fasteners. Remove front timing belt cover (Fig. 153).

REAR COVER

(1) Remove front timing belt cover. Refer to FRONT COVER.

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(3) Remove timing belt tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER ASSEMBLY - REMOVAL).

(4) Hold camshaft sprocket with Special Tools C-4687 and modified Adaptor C-4687-1 (Fig. 154), while removing attaching bolt.

NOTE: For Special Tool Identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

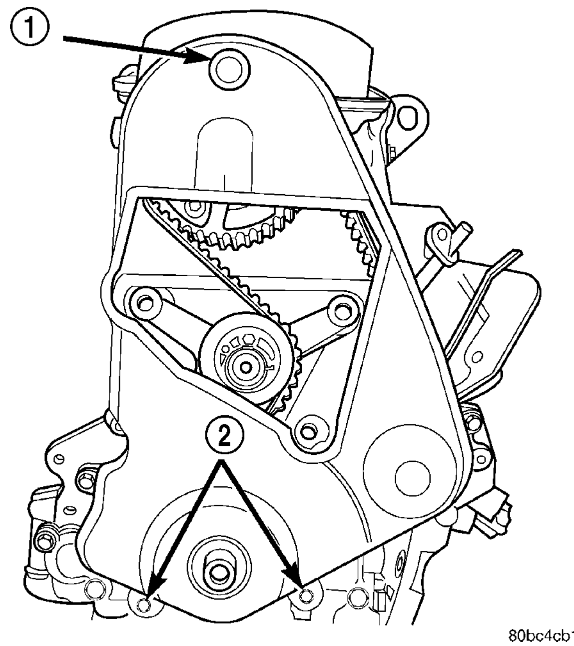


Fig. 153 Front Timing Belt Cover

1 - ACCESS PLUG
2 - BOLTS

(5) Remove camshaft sprocket.

(6) Remove rear cover attaching bolts (Fig. 155).

(7) Remove rear cover (Fig. 155).

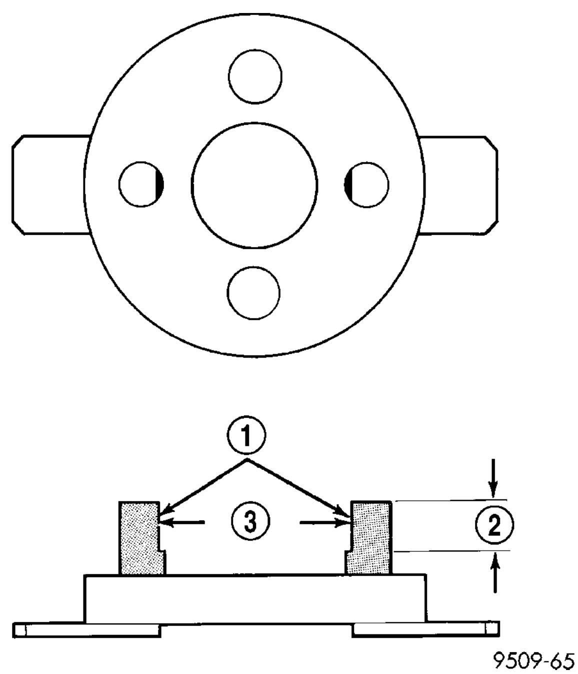


Fig. 154 Modification to Special Tool C-4687-1

1 - GRIND LOCATION
2 - 12.7 MM (1/2 IN.)
3 - 50.8 MM (2 IN.)

TIMING BELT COVER(S) (Continued)

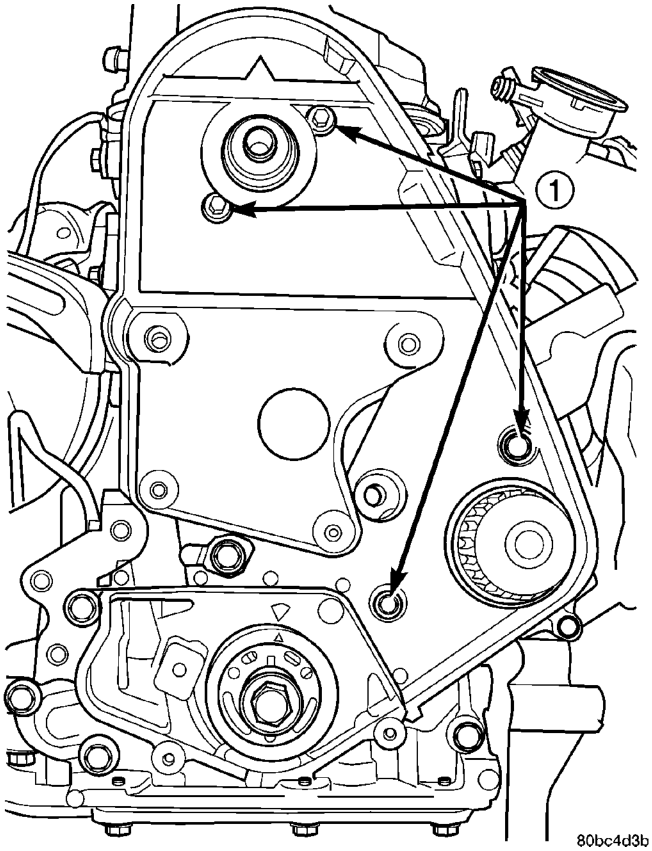


Fig. 155 Rear Timing Belt Cover

1 - BOLTS

INSTALLATION

REAR COVER

(1) Install rear cover and tighten bolts to 12 N·m (105 in. lbs.) (Fig. 155).

(2) Install the camshaft sprocket on the camshaft.

CAUTION: DO NOT use an impact wrench (or any other air operated tool) for tightening the camshaft sprocket bolt. Damage to the camshaft timing pin can result. ONLY use a hand wrench while holding camshaft sprocket with Special Tool.

(3) Install camshaft sprocket retaining bolt. While holding sprocket with Special Tools C-4687 and modified Adaptor C-4687-1, tighten attaching bolt to 115 N·m (85 ft. lbs.).

(4) Install timing belt tensioner/bracket assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER ASSEMBLY - INSTALLATION).

(5) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(6) Install front timing belt cover. Refer to FRONT COVER

FRONT COVER

(1) Install front cover and tighten bolts to 12 N·m (105 in. lbs.) (Fig. 153).

(2) Position engine mount bracket to its mounting location. Hand start the upper two bolts of the engine mount bracket (Fig. 152).

(3) Lower engine with jack.

(4) Install lower engine mount bracket bolt. Tighten bolt to 61 N·m (45 ft. lbs.) (Fig. 152).

(5) Raise engine with jack.

(6) Tighten upper engine mount bracket bolts to 61 N·m (45 ft. lbs.) (Fig. 152).

(7) Install power steering pump assembly.

(8) Lower engine with jack.

(9) Install right engine mount to engine mount bracket through bolt. Tighten bolt to 118 N·m (87 ft. lbs.) (Fig. 151).

(10) Remove jack from under engine.

(11) Raise vehicle on hoist.

(12) Install lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(13) Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(14) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(15) Install accessory drive belt splash shield.

(16) Lower vehicle.

(17) Install upper torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(18) Install fastener securing ground strap to engine mount bracket.

(19) Connect negative battery cable.

(20) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

TIMING BELT AND SPROCKETS

REMOVAL

REMOVAL - TIMING BELT

(1) Remove front timing belt cover (Fig. 156) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(2) Remove spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - REMOVAL).

CAUTION: Align camshaft and crankshaft timing marks before removing the timing belt by rotating the engine CLOCKWISE with the crankshaft (Fig. 166).

(3) Loosen timing belt tensioner lock nut (Fig. 157).

(4) Insert a 6 mm Allen wrench into the hexagon opening located on the top plate of the belt tensioner pulley. Rotate the top plate **CLOCKWISE** until there is enough slack in timing belt to allow for removal (Fig. 157).

(5) Remove timing belt.

CAUTION: Do not rotate the camshaft once the timing belt has been removed or damage to valve components may occur.

REMOVAL - CAMSHAFT SPROCKET

(1) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(2) Hold camshaft sprocket with Special Tools C-4687 and modified Adaptor C-4687-1 (Fig. 158), while removing attaching bolt.

NOTE: For Special Tool Identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

(3) Remove camshaft sprocket.

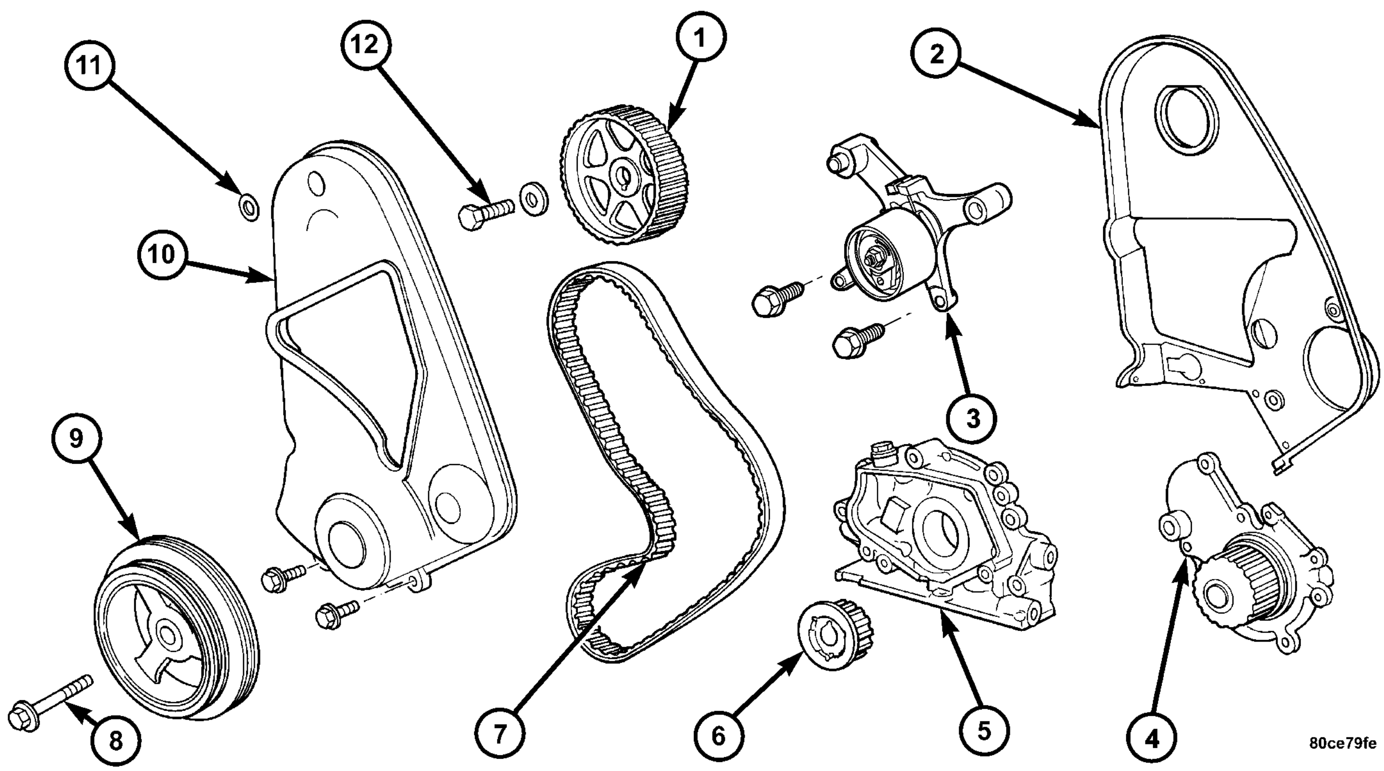


Fig. 156 Timing Belt System - Mechanical Tensioner

1 - CAMSHAFT SPROCKET
2 - REAR TIMING BELT COVER
3 - MECHANICAL TIMING BELT TENSIONER ASSEMBLY
4 - WATER PUMP
5 - OIL PUMP BODY
6 - CRANKSHAFT SPROCKET
7 - TIMING BELT
8 - BOLT
9 - CRANKSHAFT DAMPER
10 - FRONT TIMING BELT COVER
11 - ACCESS PLUG
12 - CAMSHAFT BOLT AND WASHER

TIMING BELT AND SPROCKETS (Continued)

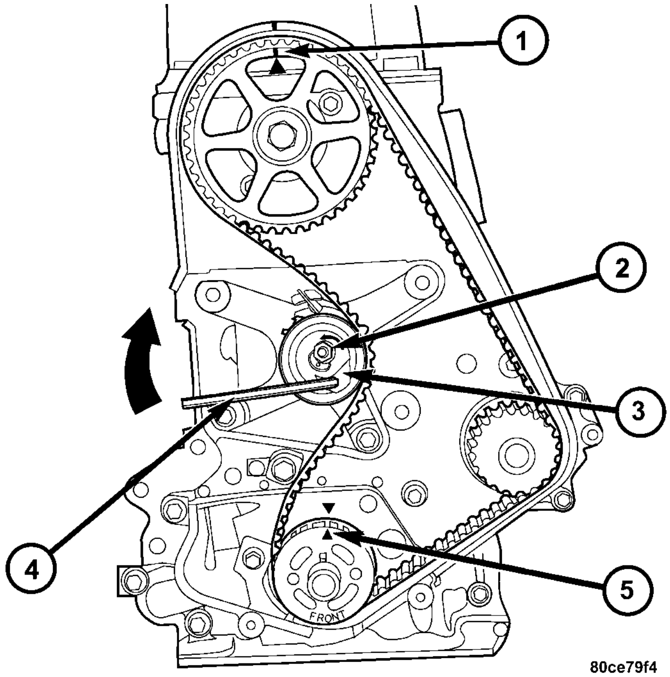


Fig. 157 Timing Belt Removal

1 - CAMSHAFT TIMING MARKS
2 - LOCK NUT
3 - TOP PLATE
4 - 6mm ALLEN WRENCH
5 - CRANKSHAFT TIMING MARKS

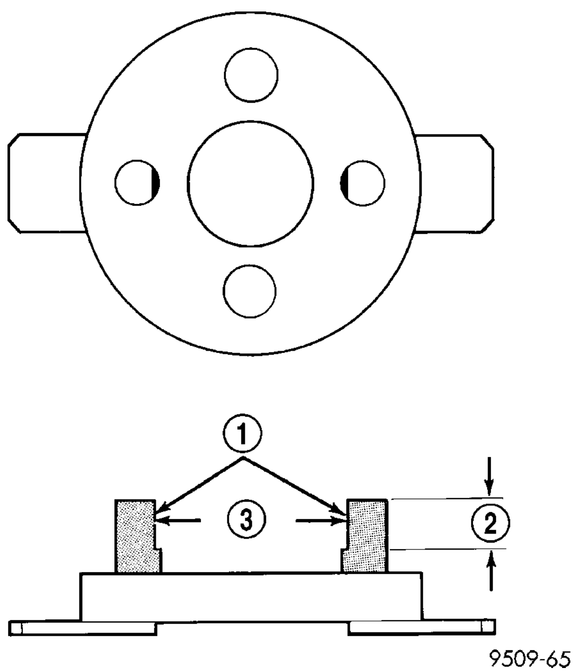


Fig. 158 Modification to Special Tool C-4687-1

1 - GRIND LOCATION
2 - 12.7 MM (1/2 IN.)
3 - 50.8 MM (2 IN.)

REMOVAL - CRANKSHAFT SPROCKET

(1) Remove timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL)

(2) Remove the crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 159).

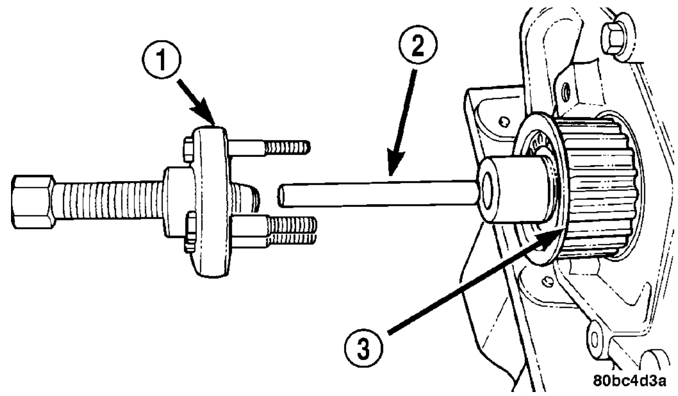


Fig. 159 Crankshaft Sprocket Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

INSTALLATION

INSTALLATION - CRANKSHAFT SPROCKET

NOTE: Make sure the word “front” on the sprocket is facing outward.

CAUTION: Use of Special Tool 6792 is required to install the crankshaft sprocket to the proper depth. Failure to use this tool will cause improper timing belt tracking.

(1) Install the crankshaft sprocket (Fig. 160) using Special Tool 6792.

INSTALLATION - CAMSHAFT SPROCKET

(1) Install camshaft sprocket. While holding sprockets with Special Tools C-4687 and modified Adaptor C-4687-1, tighten attaching bolt to 115 N·m (85 ft. lbs.).

(2) Install timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

INSTALLATION - TIMING BELT

(1) Set crankshaft sprocket to TDC by aligning the sprocket with the arrow on the oil pump housing, then back off to 3 notches before TDC (Fig. 161).

(2) Set camshaft to TDC by aligning mark on sprocket with the arrow on the rear timing belt cover (Fig. 162).

TIMING BELT AND SPROCKETS (Continued)

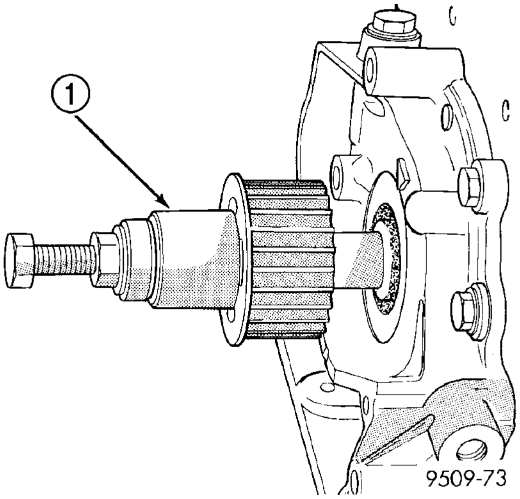


Fig. 160 Crankshaft Sprocket Installation

1 - SPECIAL TOOL 6792

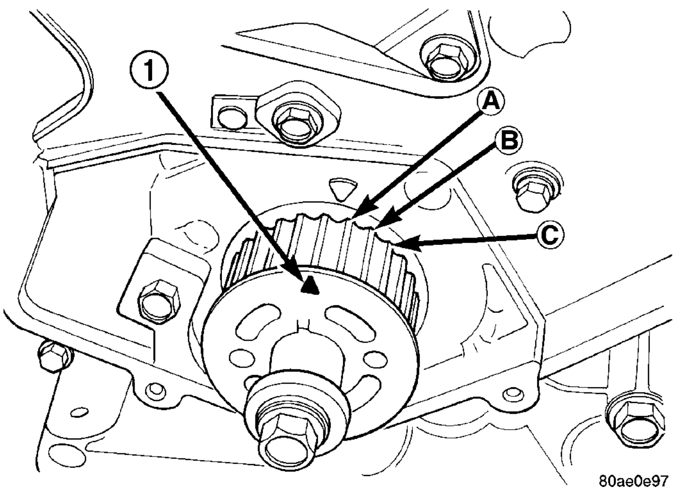


Fig. 161 Crankshaft Sprocket Timing

1 - TDC MARK

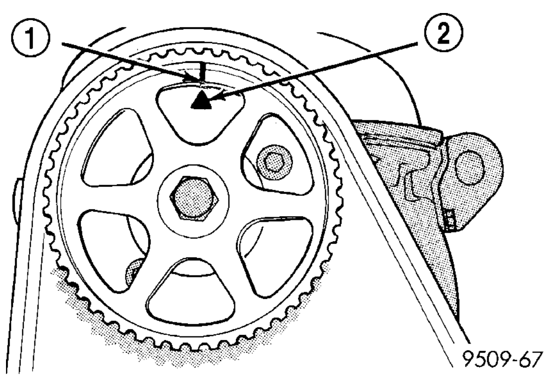


Fig. 162 Camshaft Timing Mark

1 - CAM SPROCKET TIMING MARK
2 - ARROW ON REAR COVER

(3) Move crankshaft to 1/2 mark before TDC (Fig. 163) for belt installation.

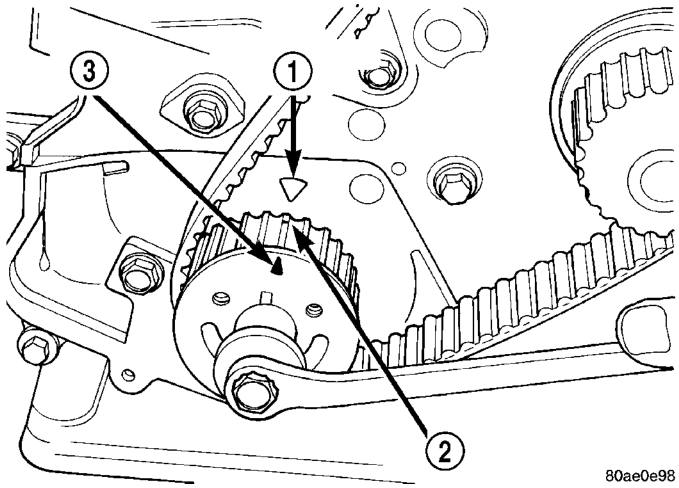


Fig. 163 Adjusting Crankshaft Sprocket for Timing Belt

1 - TDC REFERENCE MARK
2 - 1/2 NOTCH LOCATION
3 - TDC MARK

(4) Install the timing belt. Starting at the crankshaft, go around the water pump sprocket, then around the camshaft sprocket, and finally route the back side of the timing belt around the timing belt tensioner pulley.

(5) Move crankshaft sprocket to TDC to take up belt slack.

(6) Insert a 6 mm Allen wrench into the hexagon opening located on the top plate of the belt tensioner pulley. Rotate the top plate **COUNTERCLOCKWISE**. The tensioner pulley will move against the belt and the tensioner setting notch will eventually start to move clockwise. Watching the movement of the setting notch, continue rotating the top plate counterclockwise until the setting notch is aligned with the spring tang (Fig. 164). Using the allen wrench to prevent the top plate from moving, torque the tensioner lock nut to 30 N·m (22 ft. lbs.). Setting notch and spring tang should remain aligned after lock nut is torqued.

(7) Remove allen wrench and torque wrench.

NOTE: Repositioning the crankshaft to the TDC position must be done only during the CLOCKWISE rotation movement. If TDC is missed, rotate a further two revolutions until TDC is achieved. DO NOT rotate crankshaft counterclockwise as this will make verification of proper tensioner setting impossible.

(8) Rotate the crankshaft CLOCKWISE two complete revolutions manually for seating of the belt, until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position (Fig. 166).

TIMING BELT AND SPROCKETS (Continued)

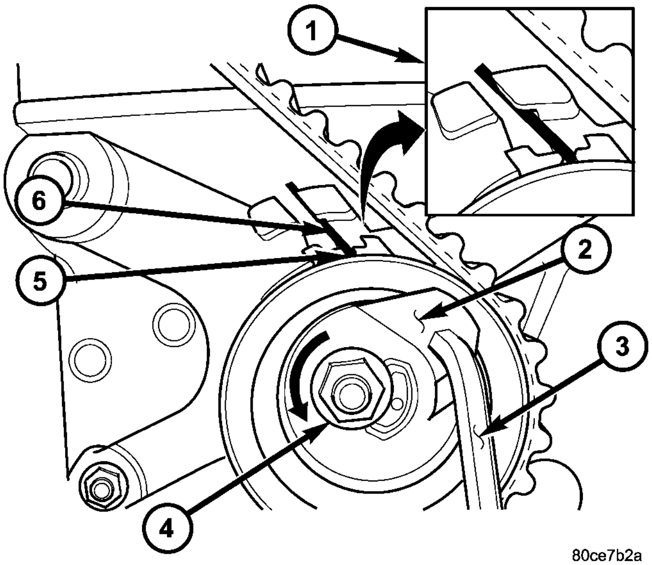


Fig. 164 Timing Belt Tension Adjustment

1 - ALIGN SETTING NOTCH WITH SPRING TANG
2 - TOP PLATE
3 - 6mm ALLEN WRENCH
4 - LOCK NUT
5 - SETTING NOTCH
6 - SPRING TANG

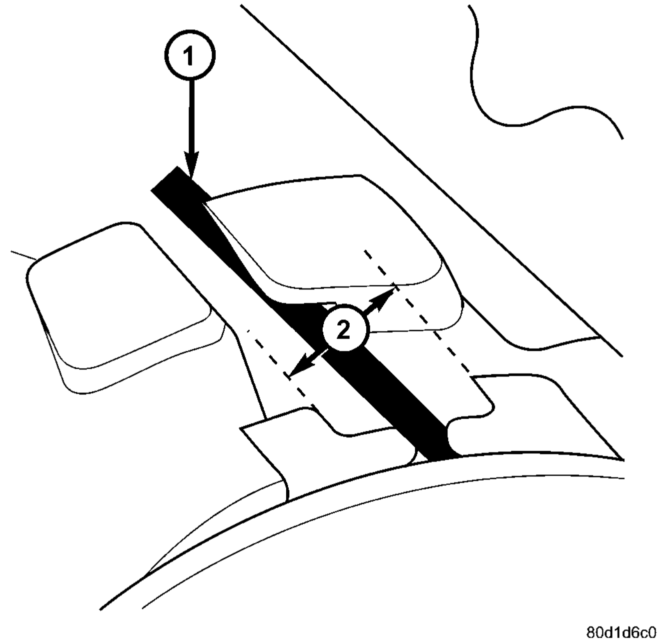


Fig. 165 Timing Belt Tension Verification

1 - SPRING TANG
2 - TOLERANCE WINDOW

(9) Check if the spring tang is within the tolerance window (Fig. 165). If the spring tang is within the tolerance window, the installation process is complete and nothing further is required. If the spring tang is not within the tolerance window, repeat Steps 6 through 8.

(10) Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(11) Install spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - INSTALLATION).

(12) Perform camshaft and crankshaft timing relearn procedure as follows:

- Connect the DRB III® 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.
- Turn the ignition switch on.
- Access "Engine" diagnostics.
- Select "Miscellaneous" option.
- Select "ReLearn Cam Crank" option and follow directions on DRBIII® screen.

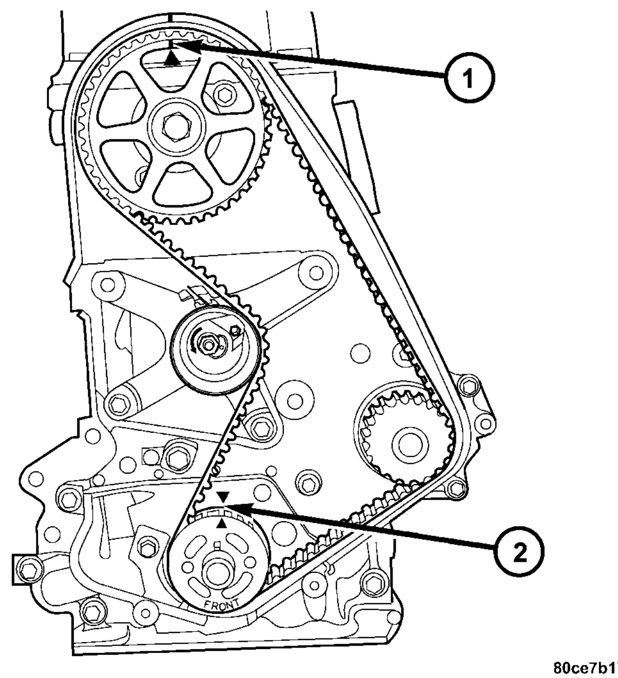


Fig. 166 Crankshaft and Camshaft Timing

1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT AT TDC

TIMING BELT TENSIONER ASSEMBLY

REMOVAL - WITH MECHANICAL TENSIONER

(1) Remove timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(2) Remove bolts attaching the timing belt tensioner assembly to engine.

(3) Remove timing belt tensioner assembly (Fig. 167).

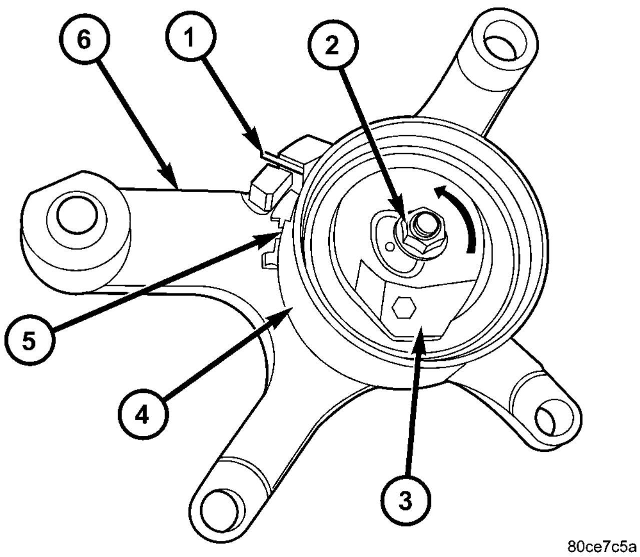


Fig. 167 Timing Belt Tensioner Assembly

1 - SPRING TANG
2 - LOCK NUT
3 - TOP PLATE
4 - PULLEY
5 - SETTING NOTCH
6 - BRACKET

INSTALLATION - WITH MECHANICAL TENSIONER

(1) Position timing belt tensioner assembly to the engine. To ensure proper alignment of tensioner to engine block, temporarily install the engine mount bracket bolts into the upper holes of the timing belt tensioner. Install timing belt tensioner lower mounting bolts. Tighten lower mounting bolts to 31 N·m (23 ft. lbs.). Remove temporarily installed engine mount bracket bolts.

(2) Install timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

ENGINE 2.4L DOHC

TABLE OF CONTENTS

ENGINE 2.4L DOHC

DESCRIPTION

The 2.4 Liter (148 cu. in.) in-line four cylinder engine is a double over head camshaft with hydraulic lash adjusters and four valve per cylinder design. The engine is free-wheeling; meaning it has provisions for piston-to-valve clearance. However valve-to-valve interference can occur, if camshafts are rotated independently.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the rear of the cylinder block (Fig. 1).

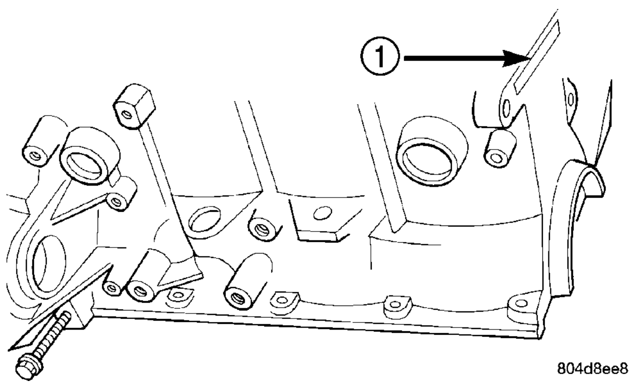


Fig. 1 Engine Identification

1 - ENGINE IDENTIFICATION LOCATION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

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 Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

For turbocharger diagnosis, (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM - DIAGNOSIS AND TESTING).

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
- Hydraulic Lash Adjuster Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE 2.4L DOHC (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

ENGINE 2.4L DOHC (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE 2.4L DOHC (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Dirt in tappets/lash adjusters.	5. Replace rocker arm/hydraulic lash adjuster assembly.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn tappets/lash adjusters.	7. Install new rocker arm/hydraulic lash adjuster assembly.
	8. Worn valve guides.	8. Ream guides and install new valves with oversize stems.
	9. Excessive runout of valve seats on valve faces.	9. Grind valve seats and valves.
	10. Missing adjuster pivot.	10. Replace rocker arm/hydraulic lash adjuster assembly.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	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. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Misaligned connecting rods.	7. Replace bent connecting rods.

ENGINE 2.4L DOHC (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	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. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. 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 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. Oil pump relief valve stuck.	7. Remove valve and inspect, clean, or replace.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	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 as necessary.

ENGINE 2.4L DOHC (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Ream guide(s) and replace valve(s) with oversize valve(s) and seal(s).
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

DIAGNOSIS AND TESTING - 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 PRESSURE 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 pressure 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, with 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 coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

DIAGNOSIS AND TESTING - 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) Remove the Auto Shutdown (ASD) relay from the PDC.

(5) Be sure throttle blade is fully open during the compression check.

ENGINE 2.4L DOHC (Continued)

(6) Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

(7) Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.

(8) Repeat the previous step for all remaining cylinders.

(9) Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.

(10) If one or more cylinders have abnormally low compression pressures, repeat the compression test.

(11) 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.**

DIAGNOSIS AND TESTING - ENGINE OIL LEAK INSPECTION

Begin with a thorough 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.

(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 as necessary.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24 km (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:

- Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
- Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
- 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.

- 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 provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
- If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.

(7) 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.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

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 gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.

(4) If no leaks are detected, pressurize the crankcase as previously described.

ENGINE 2.4L DOHC (Continued)

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, replace component(s) as necessary.

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching 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 center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

STANDARD PROCEDURE - HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the 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 re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the 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) Install a new oil filter.

(11) Fill engine with specified amount of approved oil.

(12) Connect negative battery cable.

(13) Start engine and check for any leaks.

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **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 which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce

ENGINE 2.4L DOHC (Continued)

tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

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 material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material 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 towel. 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 material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush (Fig. 2)

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (Fig. 2)
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (Fig. 2)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

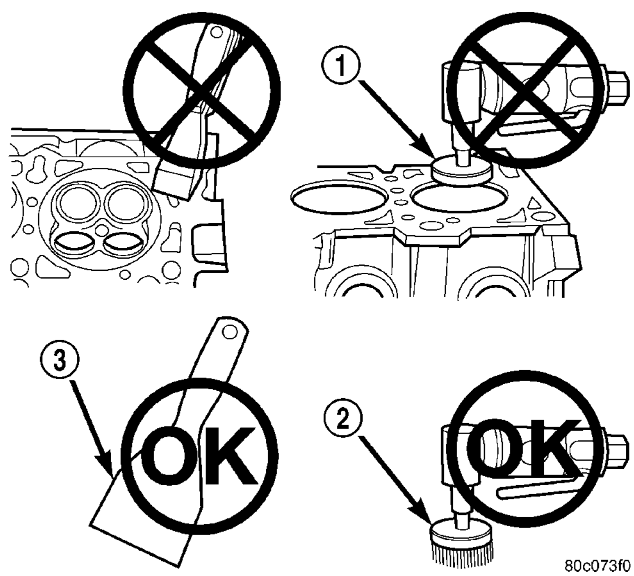


Fig. 2 Proper Tool Usage For Surface Preparation

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

ENGINE 2.4L DOHC (Continued)

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 3).

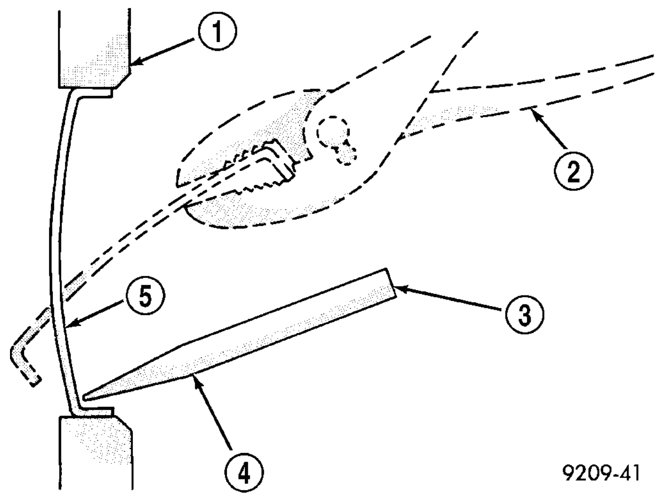


Fig. 3 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly 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 Mopar® Stud and Bearing Mount. 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 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

STANDARD PROCEDURE - MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

(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. 4). (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.

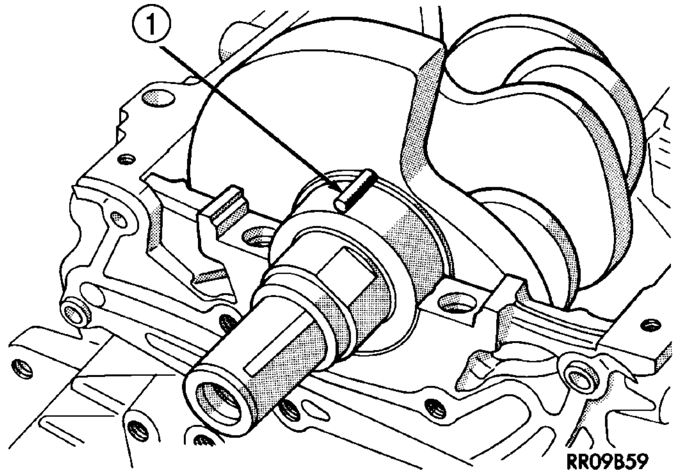


Fig. 4 Plastigage Placed in Lower Shell—Typical

1 - PLASTIGAGE

(3) Remove the bearing cap and compare the width of the flattened Plastigage 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. Compare clearance measurements to specs found in engine specifications (Refer to 9 - 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.

(4) Install the proper crankshaft bearings to achieve the specified bearing clearances.

REMOVAL - ENGINE ASSEMBLY

(1) Perform fuel pressure release procedure, then disconnect and remove fuel line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(2) Remove air cleaner housing assembly and clean air hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Disconnect both cables from battery.

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

(5) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

ENGINE 2.4L DOHC (Continued)

(6) Discharge air conditioning system, if equipped (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(7) Disconnect throttle and speed control cables from throttle body.

(8) Disconnect engine wiring harness at Powertrain Control Module (PCM).

(9) Disconnect positive cable from Power Distribution Center (PDC) and ground wire from vehicle body. Remove bolts attaching PDC and set aside.

(10) Disconnect wiring connectors at lower battery tray support.

(11) Disconnect ground wire from the vehicle body-to-engine at the right side strut tower.

(12) Disconnect brake booster vacuum hose from intake manifold.

(13) Disconnect the proportional purge hose from throttle body.

(14) Disconnect coolant reserve/recovery hose from coolant outlet connector.

(15) Disconnect heater hoses.

(16) Remove upper radiator hose.

(17) Remove lower radiator hose.

(18) Disconnect upper A/C line from A/C condenser.

(19) Disconnect A/C lines at junction near upper torque strut.

(20) Using Special Tool 6638A, disconnect clutch hydraulic line (Fig. 5) and (Fig. 6).

(a) Disconnect transmission shift linkage.

(b) Disconnect transmission electrical connectors.

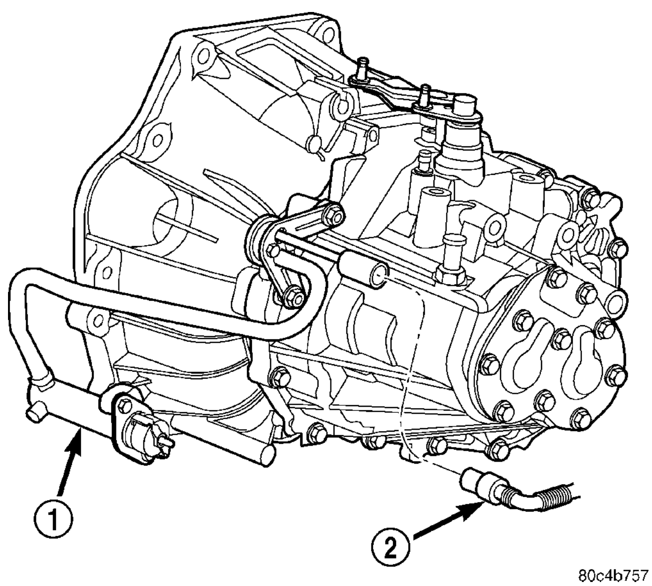


Fig. 5 Clutch Hydraulic Line to Slave Cylinder

1 - SLAVE CYLINDER
2 - HYDRAULIC TUBE

(21) Disconnect power steering hoses from radiator.

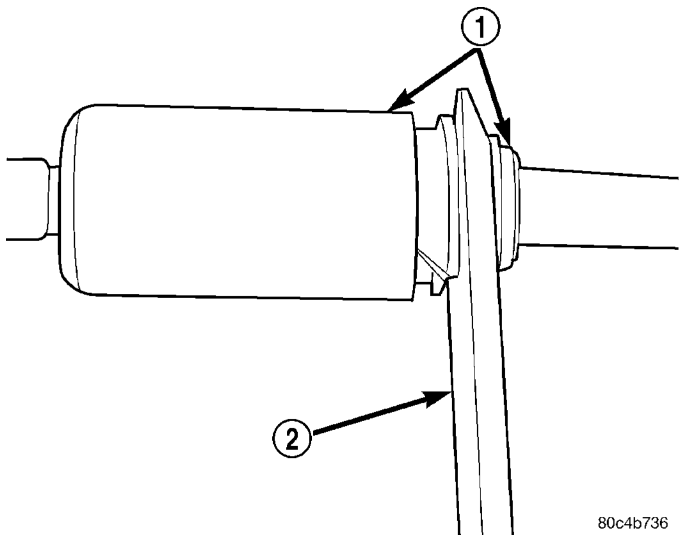


Fig. 6 Disconnecting Clutch Hydraulic Line

1 - QUICK CONNECT FITTING
2 - TOOL 6638A

(22) Disconnect radiator fan electrical connector and remove cooling module assembly.

(23) Hoist vehicle and remove front wheels.

(24) Remove right inner splash shield.

(25) Remove axle shafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).

(26) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(27) Remove generator and support brackets.

(28) Remove charge air cooler hoses (Fig. 7).

(29) Drain engine oil.

(30) Disconnect the downstream oxygen sensor connector.

(31) Disconnect exhaust system from manifold (Fig. 8).

(32) Disconnect both power steering hoses from steering gear (Fig. 9).

(33) Remove upper and lower heat shields, elbow support bracket, turbocharger support bracket, and elbow (Fig. 10).

(34) Remove structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COLLAR - REMOVAL).

(35) Mark for orientation and remove drive plate to clutch module bolts.

(36) Remove lower engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(37) Lower vehicle and remove A/C compressor.

(38) Disconnect power steering lines from power steering pump.

(39) Remove power steering pump.

ENGINE 2.4L DOHC (Continued)

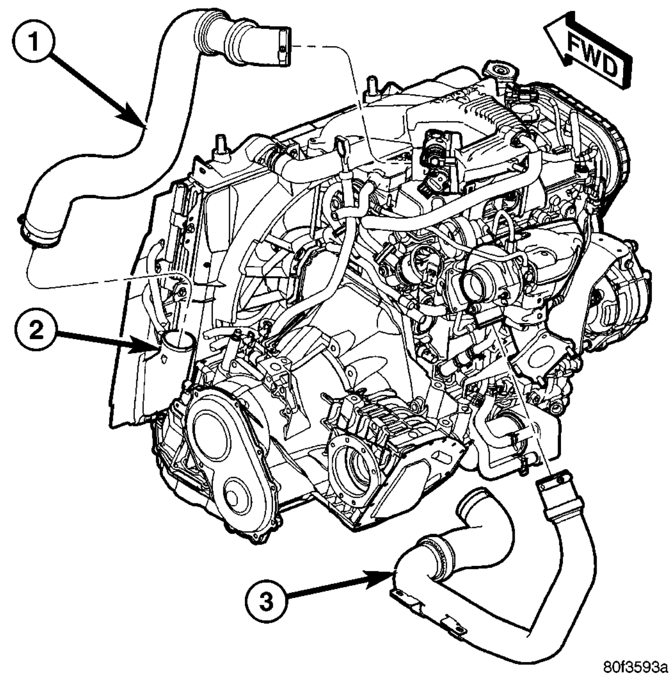


Fig. 7 Charge Air Cooler Hoses

1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
2 - CHARGE AIR COOLER
3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER

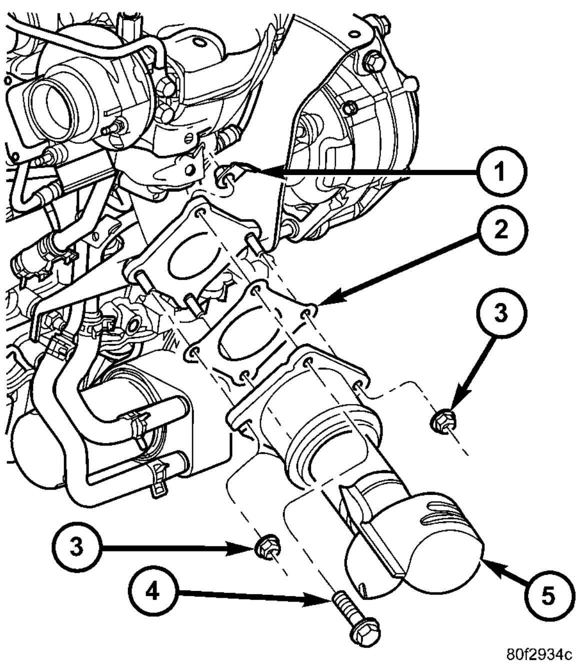


Fig. 8 Converter to Exhaust Manifold Connection - 2.4L Turbo

1 - FLAG NUT
2 - GASKET
3 - NUT
4 - BOLT
5 - CATALYTIC CONVERTER

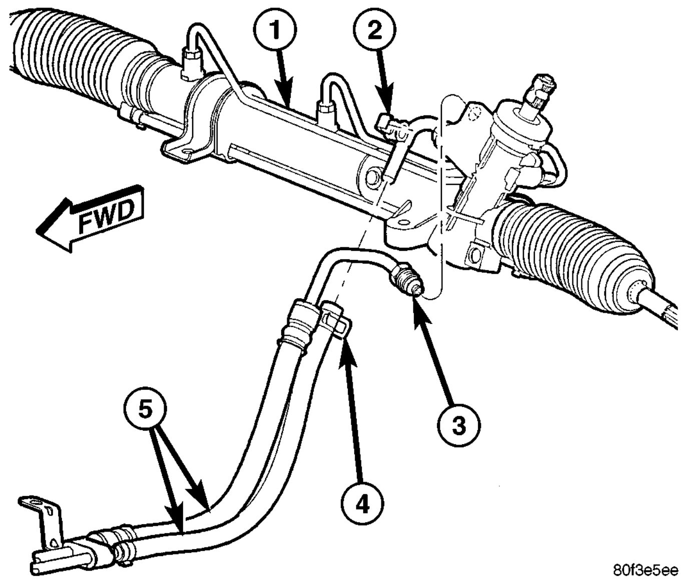


Fig. 9 Hoses At Power Steering Gear - 2.4L Turbo

1 - POWER STEERING GEAR
2 - ROUTING CLIP
3 - PRESSURE HOSE TUBE NUT
4 - RETURN HOSE CLAMP
5 - PRESSURE/RETURN HOSE ASSEMBLY

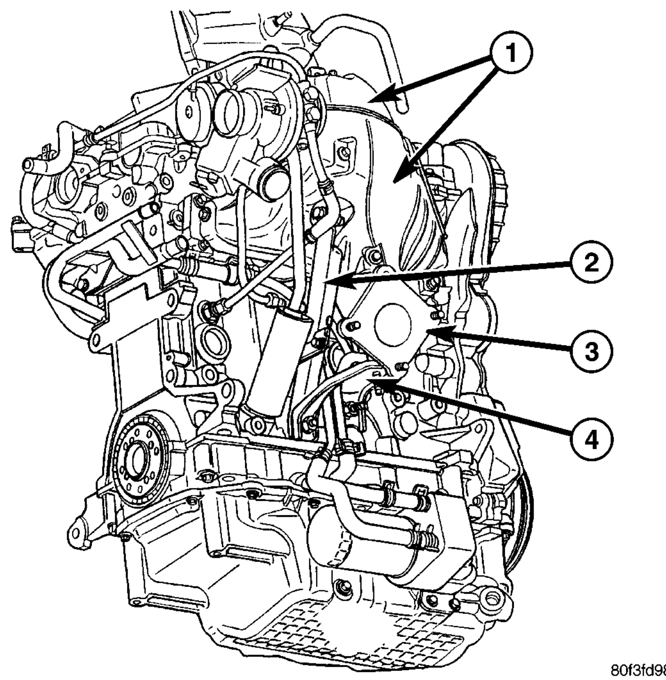


Fig. 10 Turbocharger Brackets and Heat Shields

1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET

ENGINE 2.4L DOHC (Continued)

(40) Raise vehicle enough to allow engine dolly, cradle, and posts, (Special Tools 6135, 6710, and 6848) to be installed under vehicle. For Special Tool identification (Refer to 9 - ENGINE - SPECIAL TOOLS).

(41) Loosen engine support posts to allow movement for positioning onto engine locating holes and flange on the engine bedplate. Lower vehicle and position cradle until the engine is resting on support posts (Fig. 13). Tighten mounts to cradle frame. This will keep support posts from moving when removing or installing engine and transmission.

(42) Install safety straps around the engine to cradle (Fig. 13). Tighten straps and lock them into position.

WARNING: Safety straps MUST be used.

(43) Raise vehicle enough to determine if straps are secure enough to hold cradle assembly to engine.

(44) Lower vehicle so weight of the engine and transmission ONLY is on the cradle assembly.

(45) Remove the upper engine torque strut.

(46) Remove right mount through bolt (Fig. 11) and left mount attaching bolts (Fig. 12).

(47) Raise vehicle slowly until engine/transaxle assembly clears engine compartment. It may be necessary to move the engine/transmission assembly with the cradle to allow for removal around body flanges.

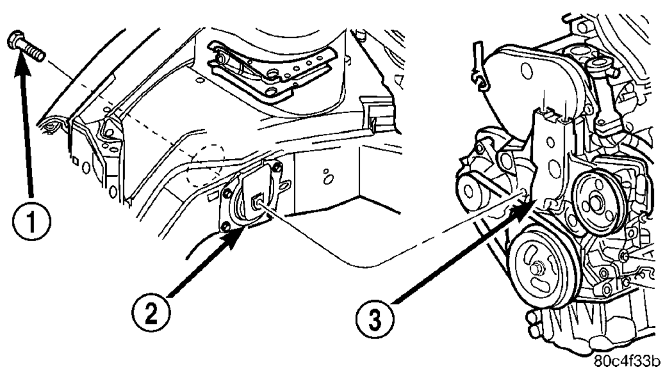


Fig. 11 Right Mount Through Bolt

1 - BOLT
2 - RIGHT ENGINE MOUNT
3 - ENGINE MOUNT BRACKET

INSTALLATION - ENGINE ASSEMBLY

(1) Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.

(2) Continue lowering vehicle until engine/transaxle aligns to mounting locations. Install mounting bolts at the right and left engine/transaxle mounts (Fig. 11) and (Fig. 12). Tighten bolts to 118 N·m (87 ft. lbs.).

(3) Install upper engine torque strut.

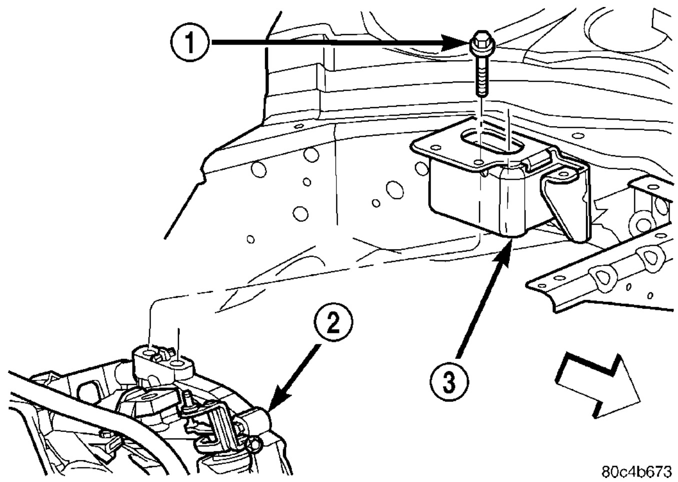


Fig. 12 Left Mount Bolts

1 - BOLT
2 - TRANSAXLE
3 - LEFT MOUNT

(4) Remove safety straps from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly and cradle.

(5) Install power steering pump.

(6) Connect power steering lines to power steering pump.

(7) Install A/C compressor.

(8) Install lower engine torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(9) Install drive plate to clutch module bolts.

(10) Install structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COLLAR - INSTALLATION).

NOTE: The upper shield must be installed first to prevent fatiguing the lower shield.

(11) Install elbow, turbocharger support bracket, elbow support bracket, and upper and lower heat shields (Fig. 10).

(12) Connect both power steering hoses to steering gear (Fig. 9).

(13) Connect exhaust system to manifold (Fig. 8).

(14) Connect the downstream oxygen sensor.

(15) Install charge air cooler hoses (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/CHARGE AIR COOLER AND PLUMBING - INSTALLATION).

(16) Install generator and mounting brackets (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).

(17) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

ENGINE 2.4L DOHC (Continued)

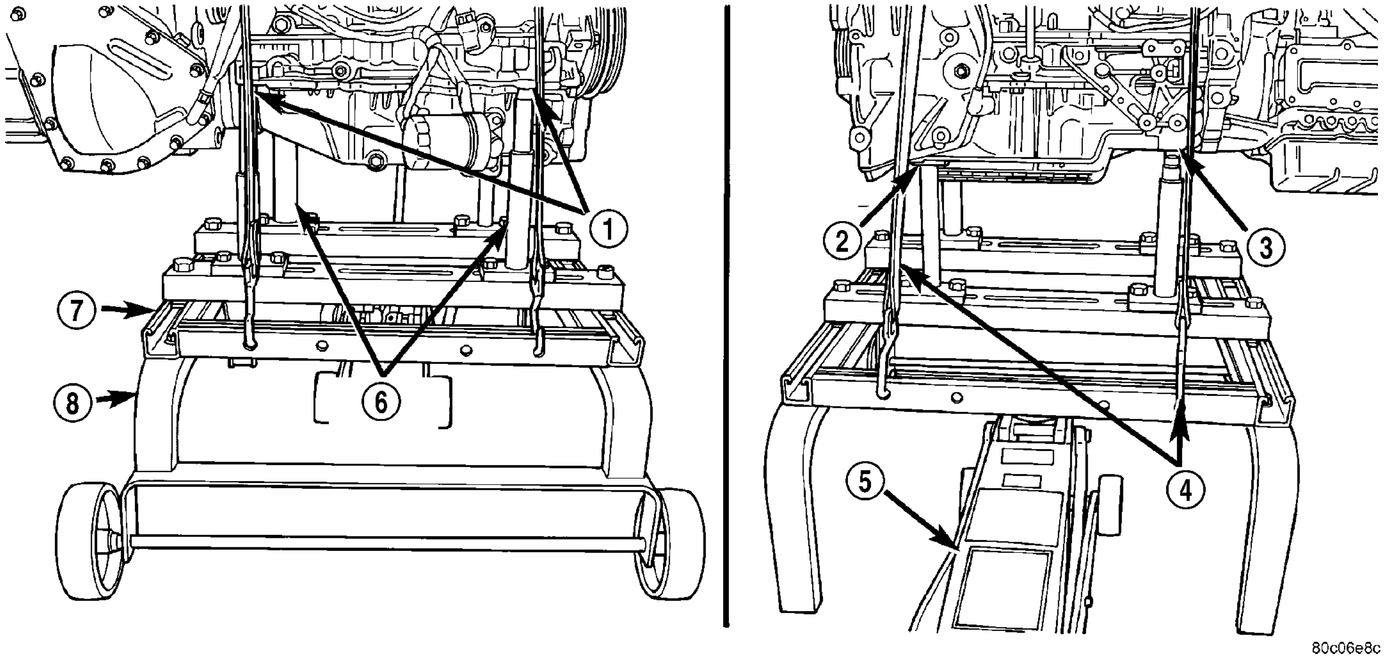


Fig. 13 Positioning Engine Cradle Support Post

1 - POST LOCATING HOLES IN BLOCK
2 - POST POSITIONED UNDER BRACKET
3 - POST LOCATING HOLE IN STRUT
4 - SAFETY STRAPS
5 - FLOOR JACK
6 - SPECIAL TOOL 6848
7 - SPECIAL TOOL 6135
8 - SPECIAL TOOL 6710

(18) Install axle shafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).

(19) Install right inner splash shield.

(20) Install wheels and lower vehicle.

(21) Install cooling module assembly, and connect radiator fan electrical connector.

(22) Connect power steering hoses to radiator.

(23) Connect clutch hydraulic line (Fig. 5).

(24) Connect transmission shift linkage.

(25) Connect transmission electrical connectors.

NOTE: It is not necessary to bleed the clutch hydraulic system. The quick-connect fittings close immediately after disconnection; allowing no fluid to escape.

(26) Connect A/C lines at junction near upper torque strut.

(27) Connect upper A/C line to A/C condenser.

(28) Install upper and lower radiator hoses.

(29) Connect fuel line and heater hoses.

(30) Connect coolant reserve/recovery hose to coolant outlet connector.

(31) Connect brake booster vacuum hose to intake manifold.

(32) Connect the proportional purge hose to throttle body.

(33) Install all ground straps and connect engine wiring harness.

(34) Position PDC and install bolts.

(35) Connect positive battery cable to PDC and ground wire to vehicle body.

(36) Connect engine wiring harness at Powertrain Control Module (PCM).

(37) Connect throttle and speed control cables.

(38) Install battery tray and battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

(39) Connect cables to battery.

(40) Install air cleaner housing assembly and connect clean air hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(41) Install oil filter. Fill engine crankcase with proper oil to correct level.

(42) Fill power steering system.

(43) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(44) Evacuate and recharge A/C system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(45) Start engine and run until operating temperature is reached.

(46) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(47) Adjust transmission linkage, if necessary.

ENGINE 2.4L DOHC (Continued)

SPECIFICATIONS

2.4L ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, DOHC	
Number of Cylinders	4	
Firing Order	1-3-4-2	
Compression Ratio		
Non-Turbo	9.5:1	
Turbo	8.1:1	
Max. Variation Between Cylinders	25%	
Displacement	2.4 Liters	148 cu. in.
Bore	87.5 mm	3.445 in.
Stroke	101.0 mm	3.976 in.
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
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

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter		
Non-Turbo	87.463-87.481 mm	3.4434-3.4441 in.
Turbo	87.436-87.454 mm	3.4424-3.4431 in.
Clearance @ 14 mm (0.551 in.) from bottom of skirt (Non-Turbo)	0.024-0.057 mm	0.0009-0.0022 in.
Clearance @ 22 mm (0.866 in.) from bottom of skirt (Turbo)	0.046-0.064 mm	0.0018-0.0025 in.
Weight	331-339 grams	11.67-11.95 oz.
Land Clearance (Diametrical)		
Non-Turbo	0.614-0.664 mm	0.024-0.026 in.
Turbo	0.556-0.674 mm	0.021-0.027 in.
Piston Length		
Non-Turbo	66.25 mm	2.608 in.
Turbo	61.43 mm	2.419 in.
Piston Ring Groove Depth No. 1		
Non-Turbo	4.640-4.784 mm	0.182-0.188 in.
Turbo	3.713-3.882 mm	0.146-0.153 in.
Piston Ring Groove Depth No. 2		
Non-Turbo	4.575-4.719 mm	0.180-0.185 in.
Turbo	4.118-4.297 mm	0.162-0.169 in.
Piston Ring Groove Depth No. 3		
Non-Turbo	4.097-4.236 mm	0.161-0.166 in.
Turbo	2.818-2.967 mm	0.110-0.116 in.

ENGINE 2.4L DOHC (Continued)

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Clearance in Piston		
Non-Turbo	0.005-0.018 mm	0.0002-0.0008 in.
Turbo	0.004-0.014 mm	0.0001-0.0005 in.
Clearance in Connecting Rod		
Non-Turbo	Interference	
Turbo	0.007-0.018 mm	0.0002-0.0007 in.
Diameter		
Non-Turbo	21.99822.003 mm	0.8660-0.8662 in.
Turbo	21.997-22.000 mm	0.8660-0.8661 in.
End Play		
Non-Turbo	None	
Turbo	0.34-1.44 mm	0.0133-0.0566 in.
Length		
Non-Turbo	72.75-73.25 mm	2.864-2.883 in.
Turbo	65.41-65.85 mm	2.575-2.592 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Ring Gap-Top Compression Ring		
Non-Turbo	0.25-0.51 mm	0.0098-0.020 in.
Turbo	0.20-0.40 mm	0.0078-0.0157 in.
Wear Limit	0.8 mm	0.031 in.

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Ring Gap-2nd Compression Ring		
Non-Turbo	0.23-0.48 mm	0.009-0.018 in.
Turbo	0.20-0.40 mm	0.007-0.015 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-Oil Control Steel Rails		
Non-Turbo	0.25-0.64 mm	0.009-0.025 in.
Turbo	0.15-0.66 mm	0.005-0.025 in.
Wear Limit	1.0 mm	0.039 in.
Ring Side Clearance-Compression Rings		
Non-Turbo	0.030-0.080 mm	0.0011-0.0031 in.
Turbo	0.035-0.085 mm	0.001-0.003 in.
Wear Limit	0.10 mm	0.004 in.
Ring Side Clearance-Oil Ring Pack		
Non-Turbo	0.012-0.178 mm	0.0004-0.0070 in.
Turbo	0.027-0.176 mm	0.001-0.006 in.
Ring Width-Compression Rings		
Non-Turbo	1.47-1.50 mm	0.057-0.059 in.
Turbo Top Ring	1.17-1.19 mm	0.0460-0.0468 in.
Turbo 2nd Ring	1.472-1.49 mm	0.057-0.058 in.
Ring Width-Oil Ring Pack		
Non-Turbo	2.72–2.88 mm	0.107–0.1133 in.
Turbo	2.64-2.89 mm	0.103-0.113 in.

ENGINE 2.4L DOHC (Continued)

CONNECTING ROD

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Bearing Clearance	0.025–0.071 mm	0.0009–0.0027 in.
Wear Limit	0.075 mm	0.003 in.
Bore Diameter-Piston Pin		
Non-Turbo	20.96–20.98 mm	0.8252–0.8260 in.
Turbo	22.007-22.015 mm	0.8664-0.8667 in.
Bore Diameter-Crankshaft End		
Non-Turbo	52.993-53.007 mm	2.0863-2.0868 in.
Turbo	52.992-53.008 mm	2.0862-2.0869 in.
Side Clearance	0.13–0.38 mm	0.005–0.015 in.
Wear Limit	0.40 mm	0.016 in.
Weight-Total (Less Bearing)		
Non-Turbo	565.8 grams	19.96 oz.
Turbo	663.5 grams	23.4 oz.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Connecting Rod Journal Diameter	49.984 - 50.000 mm	1.968 - 1.9685 in.
Main Bearing Journal Diameter	59.992 - 60.008 mm	2.362 - 2.3625 in.
Journal Out-of-Round (Max.)	0.0035 mm	0.0003 in.
Journal Taper (Max.)	0.007 mm	0.0001 in.
End Play	0.09 - 0.24 mm	0.0035 - 0.0094 in.
Wear Limit	0.38 mm	0.015 in.
Main Bearing Diametrical Clearance	0.018 - 0.062 mm	0.0007 - 0.0024 in.

HYDRAULIC LASH ADJUSTER

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Body Diameter	15.901 - 15.913 mm	0.626 - 0.6264 in.
Plunger Travel Minimum (Dry)	3.0 mm	0.118 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DSECRIPTION	SPECIFICATION	
	Metric	**Standard**
Journals No.1 - 6	26.020 - 26.041 mm	1.024 - 1.025 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Journal Diameter No. 1–6	25.951 - 25.970 mm	1.021 - 1.022 in.
Bearing Clearance - Diametrical	0.069 - 0.071 mm	0.0027 - 0.003 in.
End Play	0.05 - 0.17 mm	0.0019 - 0.0066 in.
Lift (Zero Lash)		
Intake	8.25 mm	(0.324 in.)
Exhaust	6.60 mm	(0.259 mm)
Intake Valve Timing*		
Closes (ABDC)	51°	
Opens (BTDC)	1°	
Duration	232°	
Exhaust Valve Timing*		
Closes (ATDC)	7°	
Opens (BBDC)	47°	
Duration	234°	
Valve Overlap	8°	
* All reading in degrees. Timing points @4° from top of ramp.		

ENGINE 2.4L DOHC (Continued)

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Gasket Thickness (Compressed)	0.71 mm	0.028 in.

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Angle	44.5 - 45°	
Seat Diameter - Intake	34.37 - 34.63 mm	1.353 - 1.363 in.
Seat Diameter - Exhaust	27.06 - 27.32 mm	1.065 - 1.075 in.
Runout (Max.)	0.05 mm	0.002 in.
Valve Seat Width - Intake and Exhaust	0.9 - 1.3 mm	0.035 - 0.051 in.
Service Limit - Intake	2.0 mm	0.079 in.
Service Limit - Exhaust	2.5 mm	0.098 in.

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter I.D.	5.975 - 6.000 mm	0.235 - 0.236 in.
Guide Bore Diameter	11.0 - 11.02 mm	0.4330 - 0.4338 in.
Guide Height (spring seat to guide tip)	13.25 - 13.75 mm	0.521 - 0.541 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle - Intake and Exhaust	44.5 - 45°	
Head Diameter - Intake	34.67 - 34.93 mm	1.364 - 1.375 in.)
Head Diameter - Exhaust	28.32 - 28.52 mm	1.114 - 1.122 in.
Valve Length (Overall)		
Intake	112.76 - 113.32 mm	4.439 - 4.461 in.
Exhaust	110.89 - 111.69 mm	4.365 - 4.397 in.
Valve Stem Diameter		
Intake	5.934 - 5.952 mm	0.2337 - 0.2344 in.
Exhaust	5.906 - 5.924 mm	0.2326 - 0.2333 in.

VALVE MARGIN

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	1.2 - 1.7 mm	0.047 - 0.066 in.
Service Limit	0.95 mm	(.0037 in.)
Exhaust	0.985 - 1.315 mm	0.038 - 0.051 in.
Service Limit	1.05 mm	.039 in.

VALVE STEM TIP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	48.04 mm	1.891 in.
Exhaust	47.99 mm	1.889 in.

ENGINE 2.4L DOHC (Continued)

VALVE STEM TO GUIDE CLEARANCE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.048 - 0.066 mm	0.0018 - 0.0025 in.
Max. Allowable	0.076 mm	0.003 in.
Service Limit	0.25 mm	0.010 in.
Exhaust	0.0736 - 0.094 mm	0.0029 - 0.0037 in.
Max. Allowable	0.101 mm	0.004 in.
Service Limit	0.25 mm	0.010 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length (Approx.)	49.2 mm	1.937 in.
Nominal Force (Valve Closed)	334 N @ 38.0 mm	75 lbs. @ 1.496 in.
Nominal Force (Valve Open)	598 N @ 29.75 mm	134 lbs. @ 1.172 in.
Installed Height	38.00 mm	1.496 in.
Number of Coils	6.9	
Wire Diameter	3.61 mm	0.142 in

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
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 Thickness (Min.)	9.40 mm	0.370 in.
Outer Rotor Clearance (Max.)	0.039 mm	0.015 in.
Outer Rotor Diameter (Min.)	79.95 mm	3.148 in.
Tip Clearance Between Rotors (Max.)	0.20 mm	0.008 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed*	25 kPa	4 psi
At 3000 rpm	170 - 550 kPa	25 - 80 psi
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 rpm.		

TORQUE

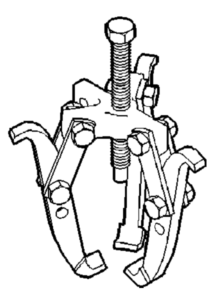
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Balance Shaft Carrier to Block-Bolts	54	40	-
Balance Shaft Gear Cover-Double Ended Fastener	12	-	105
Balance Shaft Sprocket-Bolt	28	-	250
Balance Shaft Chain Tensioner-Bolts	12	-	105
Balance Shaft Carrier Cover-Bolts	12	-	105
Camshaft Sprocket-Bolt	115	85	-
Connecting Rod Cap-Bolts	27 +¼ turn	20 +¼ turn	-
Crankshaft Main Bearing Cap/Bedplate			
-M8 Bolts	28	-	250
-M11 Bolts	75	55	-
Crankshaft Damper-Bolt	136	100	-
Crankshaft Target Ring	13	-	110
Cylinder Head-Bolts	Refer to Procedure		
Cylinder Head Cover-Bolts	12	-	105
Flex Plate to Crankshaft-Bolts	95	70	-

ENGINE 2.4L DOHC (Continued)

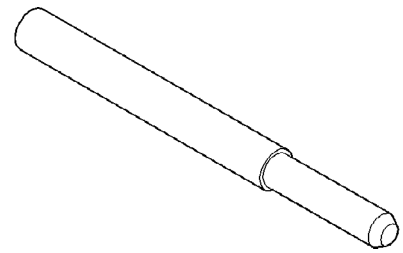
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Engine Support Bracket-Bolts	61	45	-
Intake Manifold-Bolts	23	-	200
Intake Manifold Support Bracket	28	20	-
Oil Cooler Connector Bolt	55	41	-
Oil Filter	14	10	-
Oil Filter Adapter-Bolts	12	-	105
Oil Jet Fastener	12	-	105
Oil Pan-Bolts	12	-	105
Oil Pan Drain-Plug	28	20	-
Oil Pump to Block-Bolts	28	20	-
Oil Pump Cover Plate-Bolts	13	-	118
Oil Pump Pick-up Tube-Bolt	23	-	200
PCV Valve	8	-	70
Spark Plugs	18	13	-
Timing Belt Cover - Front Upper and Lower-Bolts	6	-	50
Timing Belt Cover - Rear			
-M6 Bolts	12	-	105
-M8 Bolts	28	-	250
Timing Belt Idler Pulley	61	45	-
Timing Belt Tensioner Lock Bolt	25	-	220
Timing Belt Tensioner Assembly-Bolts	61	45	-

SPECIAL TOOLS

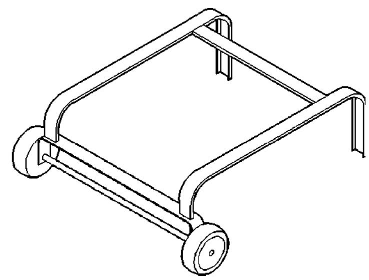
2.4L ENGINE



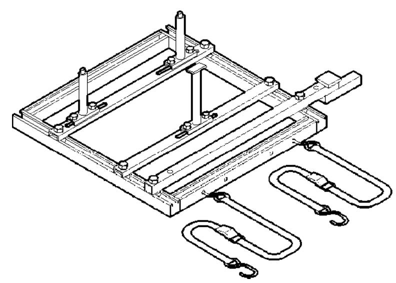
Puller 1026



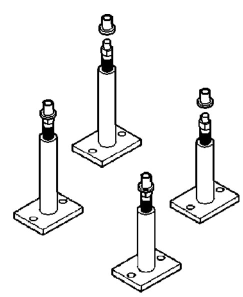
Crankshaft Damper Removal Insert 6827A



Dolly 6135

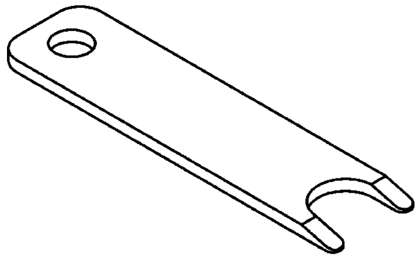


Cradle 6710

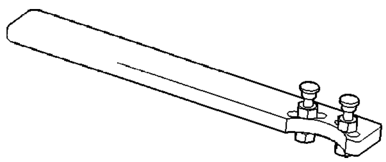


Post Kit Engine Cradle 6848

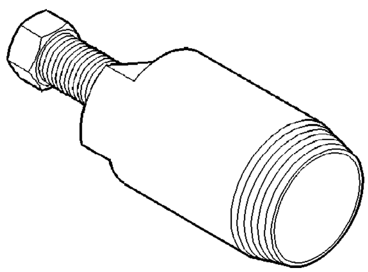
ENGINE 2.4L DOHC (Continued)



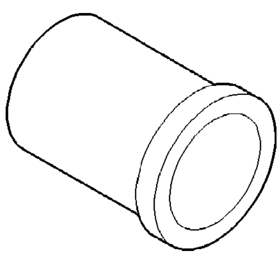
Clutch Line Disconnect 6638A



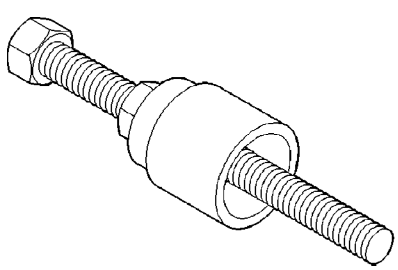
Camshaft Sprocket Holder 6847



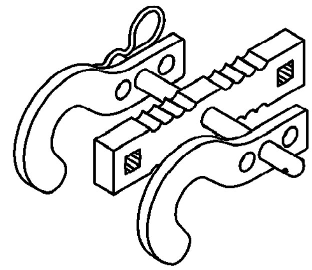
Camshaft Seal Remover C-4679-A



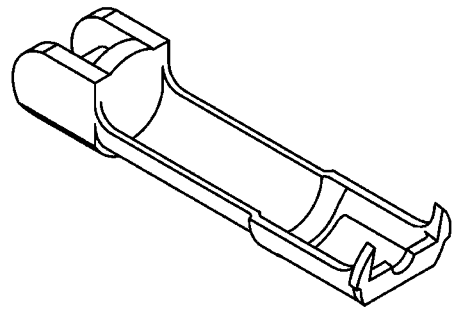
Camshaft Seal Installer MD-998306



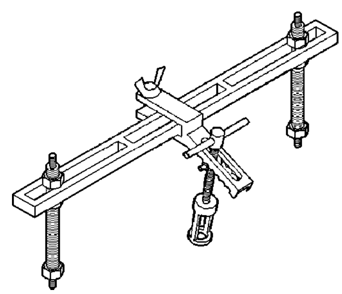
Crankshaft Damper/Sprocket Installer 6792



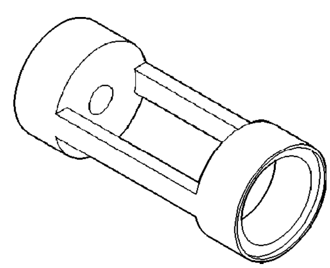
Valve Spring Compressor 8215-A



Adaptor 8436

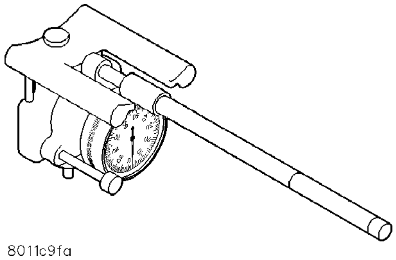


Valve Spring Compressor MD-998772-A

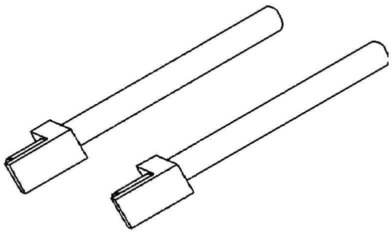


Valve Spring Compressor Adapter 6779

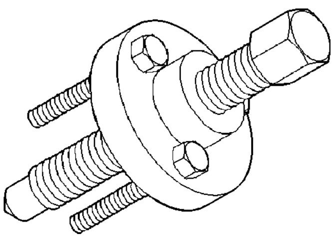
ENGINE 2.4L DOHC (Continued)



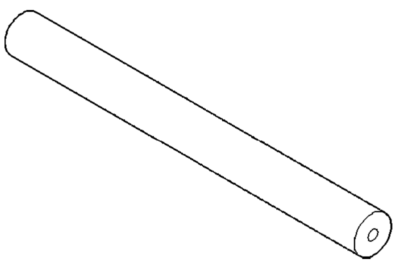
Cylinder Bore Gage C-119



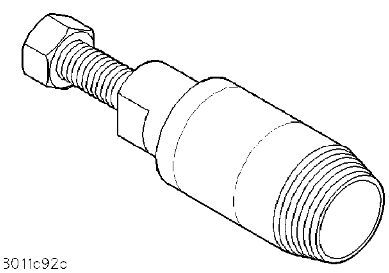
Connecting Rod Guides 8189



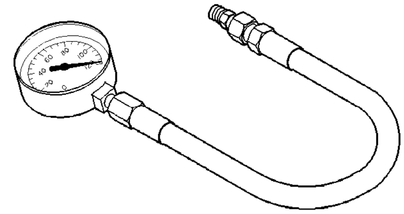
Crankshaft Sprocket Remover 6793



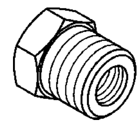
Crankshaft Sprocket Remover Insert C-4685-C2



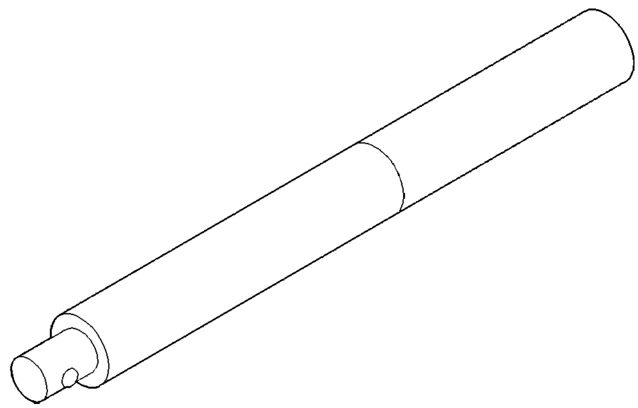
Crankshaft Front Seal Remover 6771



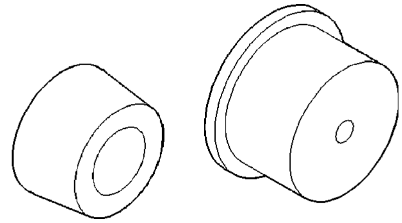
Oil Pressure Gage C-3292



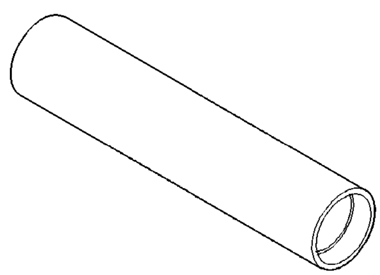
Adaptor 8406



Driver Handle C-4171

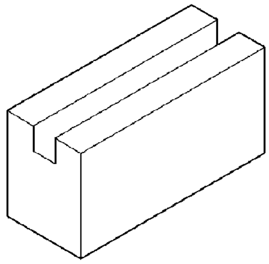


Rear Crankshaft Seal Guide and Installer 6926-1 and 6926-2

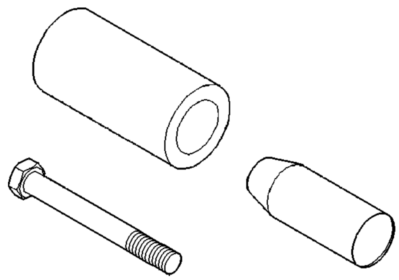


Balance Shaft Sprocket Installer 6052

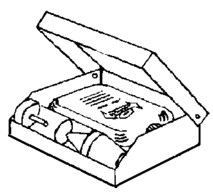
ENGINE 2.4L DOHC (Continued)



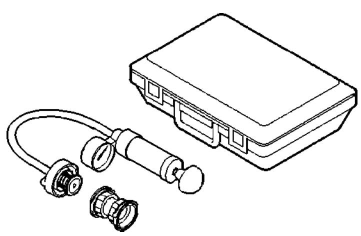
Post Adapter 8130



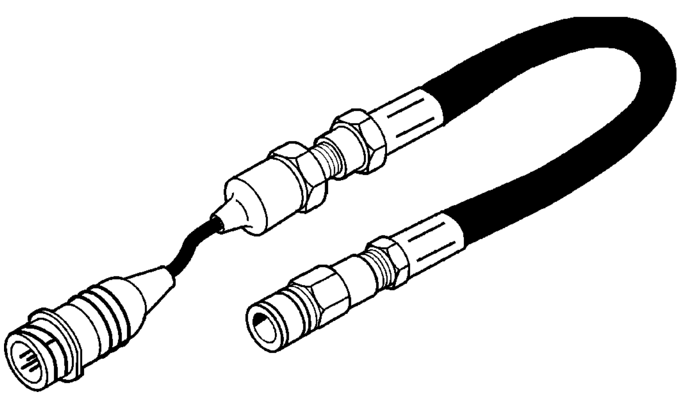
Front Crankshaft Oil Seal Installer 6780



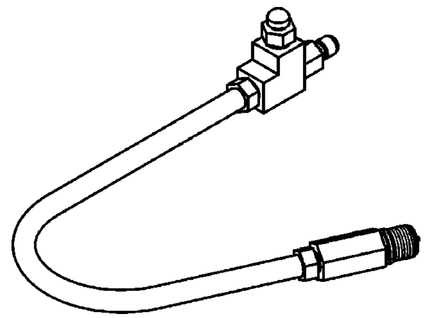
Combustion Leak Tester C-3685-A



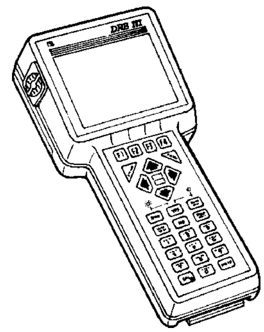
Cooling System Tester 7700



Pressure Transducer CH7059



Cylinder Compression Pressure Adaptor 8116



DRB III® with PEP Module OT-CH6010A

AIR CLEANER ELEMENT

REMOVAL

(1) Remove the air cleaner housing cover screws (Fig. 14).

(2) Partially raise air cleaner housing cover.

(3) Remove air cleaner element.

(4) If necessary, clean the inside of the air cleaner housing.

INSTALLATION

(1) Install the air filter element on locator (Fig. 15) and then make sure that the element is locked in at the lip in the air cleaner housing (Fig. 16).

(2) Lower air cleaner housing cover until properly seated.

(3) Install the air cleaner housing cover screws (Fig. 14).

AIR CLEANER ELEMENT (Continued)

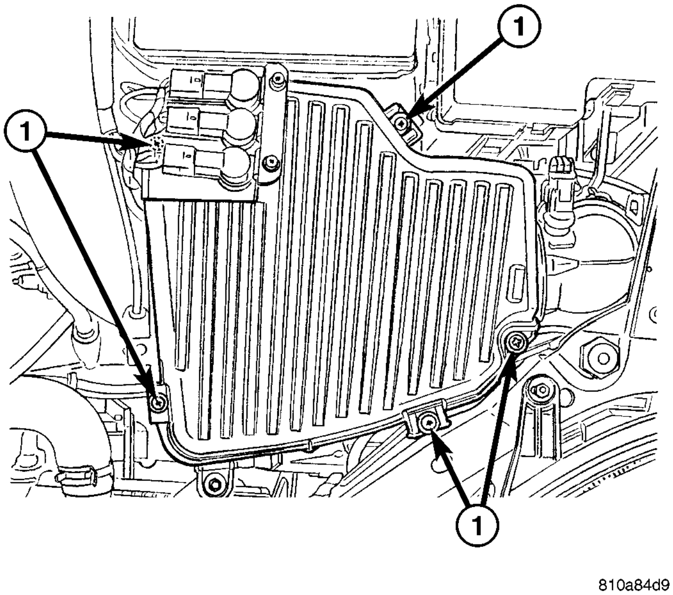


Fig. 14 Air Cleaner Housing Cover

1 - AIR CLEANER HOUSING COVER SCREWS (5)

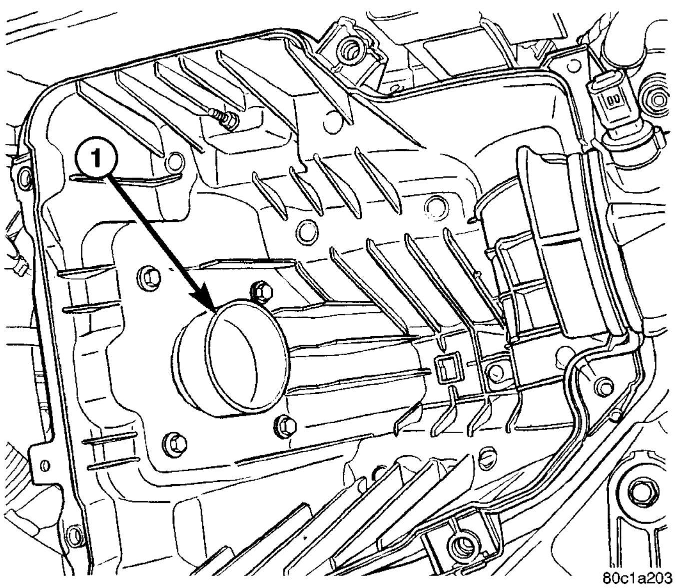


Fig. 15 Element Locator

1 - ELEMENT LOCATOR

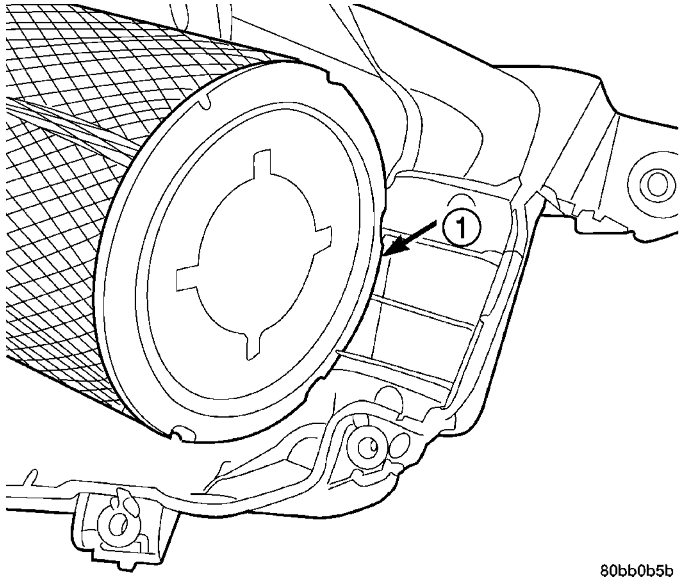


Fig. 16 Air Cleaner Housing Lip

1 - LIP

AIR CLEANER HOUSING

REMOVAL

(1) Disconnect clean air hose from air cleaner housing (Fig. 17).

(2) Disconnect ambient air temperature sensor (Fig. 17).

(3) Remove turbocharger solenoid bracket mounting screws (Fig. 17). Reposition turbocharger solenoid bracket.

(4) Disconnect make-up air hose from the side of air cleaner housing.

(5) Dislodge wiring harness clips on the side of the air cleaner housing.

(6) Remove air cleaner housing mounting screw and nut (Fig. 17).

(7) Pull air cleaner housing straight up to remove.

INSTALLATION

(1) Install air cleaner housing. Make sure that it is on the battery tray tab in the back and on the stud on the side.

(2) Install the nut and screw for air cleaner housing (Fig. 17). Tighten fasteners to 7.3 N·m (65 in. lbs.).

(3) Insert wiring harness clips on the side of the air cleaner housing.

(4) Connect make-up air hose to the side of air cleaner housing.

(5) Install turbocharger solenoid bracket mounting screws (Fig. 17).

(6) Connect ambient air temperature sensor (Fig. 17).

AIR CLEANER HOUSING (Continued)

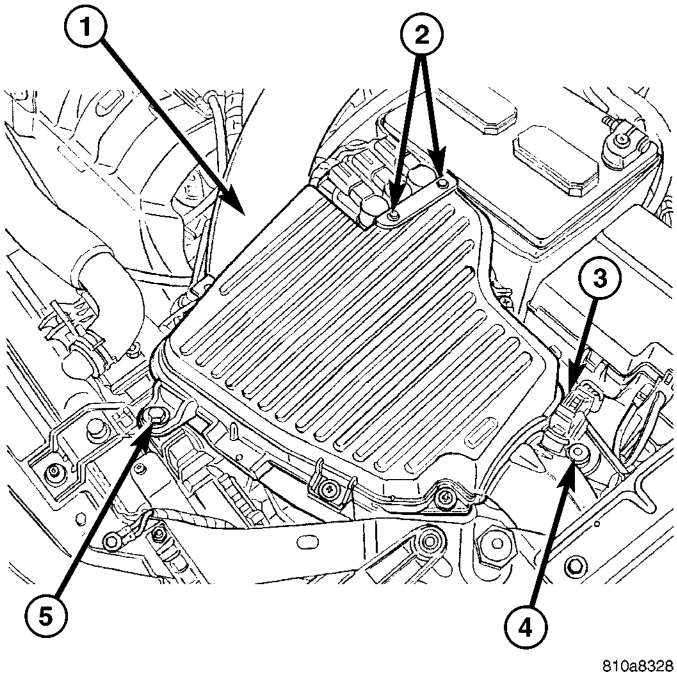


Fig. 17 Air Cleaner Housing Mounting

1 - CLEAN AIR HOSE
2 - SOLENOID MOUNTING BRACKET SCREWS
3 - AMBIENT AIR TEMPERATURE SENSOR
4 - AIR CLEANER HOUSING MOUNTING NUT
5 - AIR CLEANER HOUSING MOUNTING SCREW

(7) Connect clean air hose to air cleaner housing (Fig. 17).

CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains dual over-head camshafts with four valves per cylinder (Fig. 18). The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries provide lubrication passages to the hydraulic lash adjusters, camshafts, and valve mechanisms.

DIAGNOSIS AND TESTING—CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power

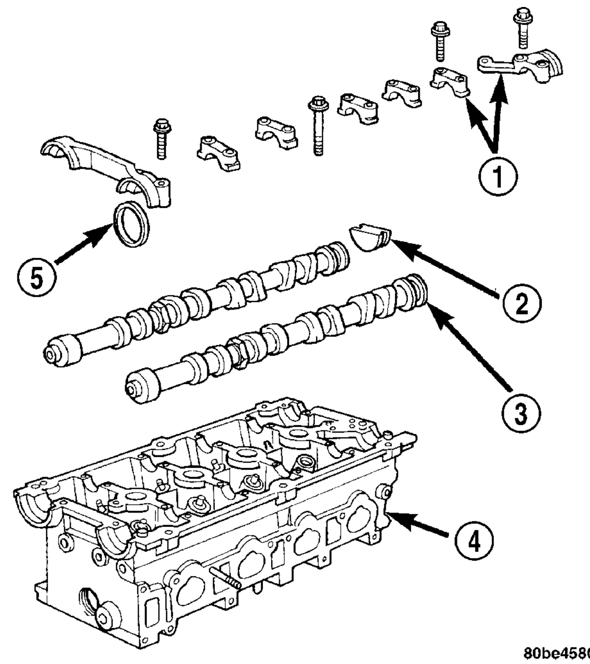


Fig. 18 Cylinder Head and Camshafts

1 - CAMSHAFT BEARING CAPS
2 - PLUG
3 - CAMSHAFT
4 - CYLINDER HEAD
5 - CAMSHAFT OIL SEAL

- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

CYLINDER HEAD (Continued)

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

(1) Perform fuel system pressure release procedure **before attempting any repairs (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).**

(2) Disconnect negative cable from battery.

(3) Remove clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(4) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(5) Disconnect the fuel supply line quick-connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(6) Remove heater tube support bracket from cylinder head.

(7) Remove upper radiator hose. Disconnect heater hoses from thermostat housing.

(8) Disconnect engine coolant temperature sensor connector.

(9) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(10) Disconnect exhaust pipe from manifold.

(11) Remove turbocharger heat shields (Fig. 19)

(12) Remove elbow support bracket (Fig. 19)

(13) Remove turbocharger support bracket (Fig. 19)

(14) Remove elbow (Fig. 19)

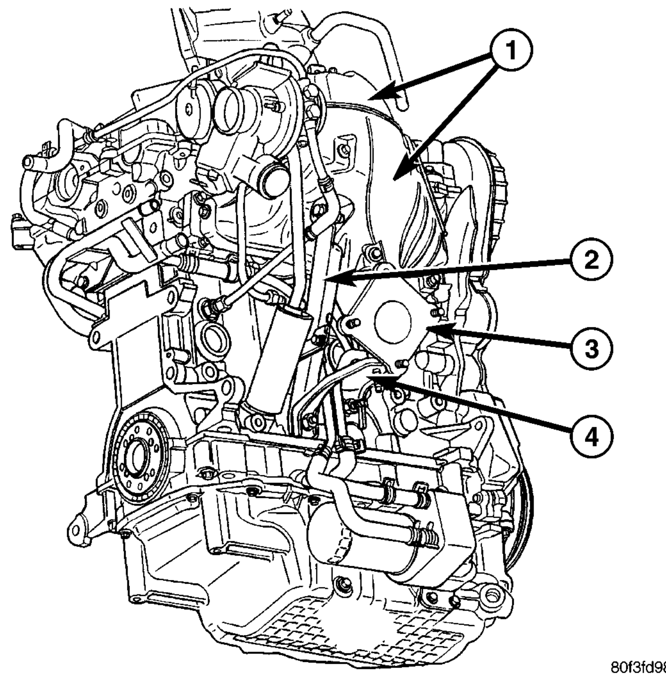


Fig. 19 Turbocharger Brackets and Heat Shields

1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET

(15) Remove oil return tube (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/LINES AND HOSES - REMOVAL) (Fig. 20).

(16) Remove oil supply line (Fig. 20).

(17) Remove coolant supply line (Fig. 20).

(18) Remove coolant return line (Fig. 20).

(19) Disconnect ignition coil wiring connector. Remove ignition coil and plug wires from engine.

(20) Disconnect camshaft position sensor wiring connector.

(21) Remove timing belt and camshaft sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(22) Remove timing belt idler pulley and rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(23) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - REMOVAL).

(24) Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

(25) Remove rocker arms.

(26) Remove cylinder head bolts in the reverse sequence of tightening (Fig. 26).

(27) Remove cylinder head from engine block.

(28) Inspect and clean cylinder head and block sealing surfaces. Refer to Cleaning and Inspection in this section for procedures.

CYLINDER HEAD (Continued)

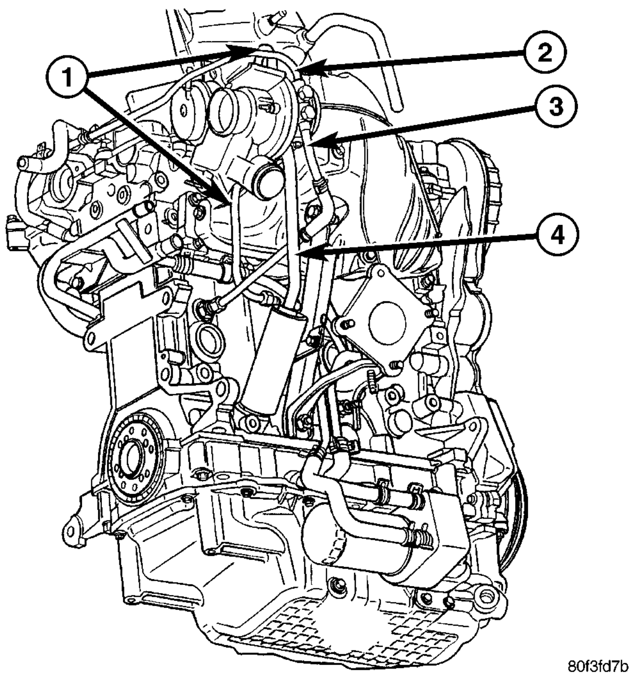


Fig. 20 Turbocharger Lines and Hoses

1 - OIL SUPPLY LINE
2 - COOLANT RETURN LINE
3 - COOLANT SUPPLY LINE
4 - OIL RETURN TUBE

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

INSPECTION

(1) Cylinder head must be flat within 0.1 mm (0.004 in.) (Fig. 21).

(2) Inspect camshaft bearing journals for scoring.

(3) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

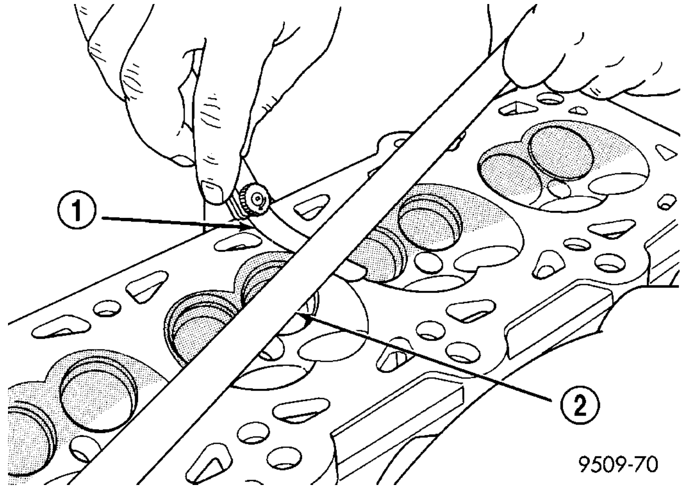


Fig. 21 Checking Cylinder Head Flatness

1 - FEELER GAUGE
2 - STRAIGHT EDGE

(4) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (Fig. 22). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.

(5) Check valve guide height (Fig. 23).

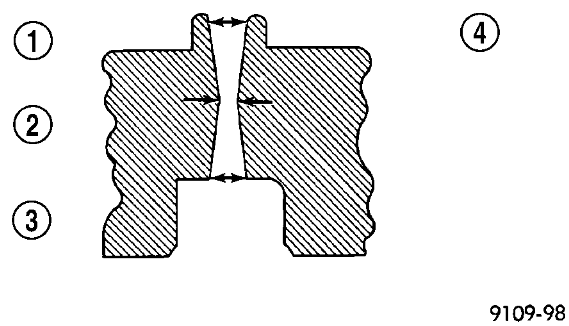


Fig. 22 Checking Wear on Valve Guide—Typical

1 - TOP
2 - MIDDLE
3 - BOTTOM
4 - CUT AWAY VIEW OF VALVE GUIDE MEASUREMENT LOCATIONS

INSTALLATION - CYLINDER HEAD

NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced (Fig. 24).

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.

NOTE: Head gaskets for Non-Turbo and Turbo applications are NOT interchangeable.

CYLINDER HEAD (Continued)

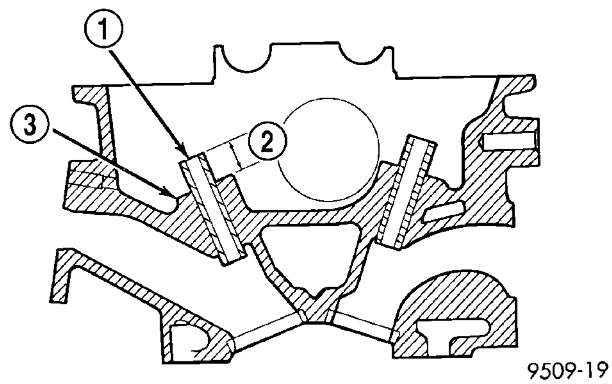


Fig. 23 Valve Guide Height

1 - VALVE GUIDE
2 - 13.25 - 13.75 MM (0.521 - 0.541 IN.)
3 - SPRING SEAT

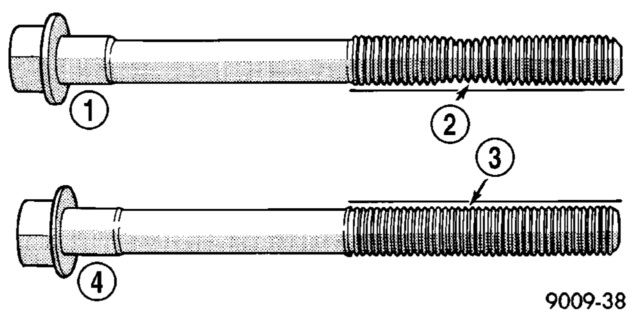


Fig. 24 Checking Bolts for Stretching (Necking)

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

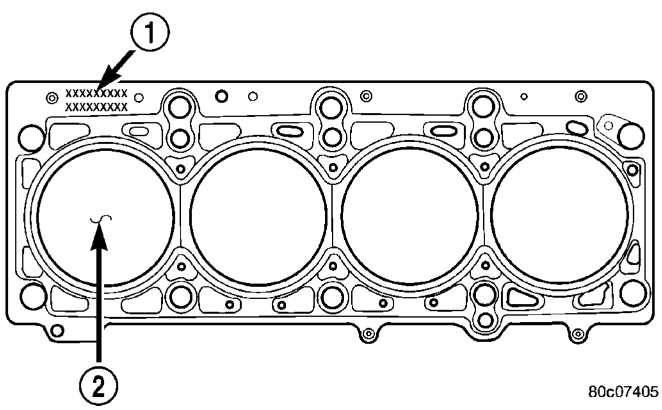


Fig. 25 Cylinder Head Gasket Positioning

1 - PART NUMBER FACES UP
2 - NO. 1 CYLINDER

(1) Position the new cylinder head gasket on engine block with the part number facing up (Fig. 25). Ensure gasket is seated over the locating dowels in block.

(2) Position cylinder head onto engine block.

(3) Before installing the bolts, the threads should be lightly coated with engine oil.

(4) Tighten the cylinder head bolts in the sequence shown in (Fig. 26). 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 Fourth step.

- **Fourth: Turn all bolts an additional 1/4 Turn**

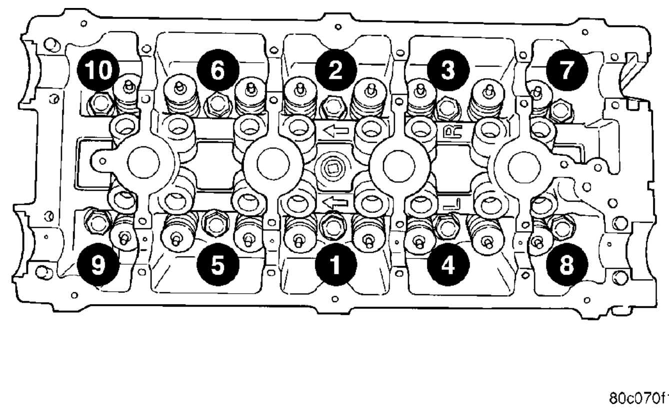


Fig. 26 Cylinder Head Tightening Sequence

(5) Install rocker arms and camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

(6) Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).

(7) Install rear timing belt cover and timing belt idler pulley (Refer to 9 - ENGINE/VALVE TIMING/ TIMING BELT COVER(S) - INSTALLATION).

(8) Install camshaft sprockets and timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(9) Connect cam sensor wiring connector.

(10) Install ignition coil and plug wires. Connect ignition coil wiring connector.

(11) Install coolant return line (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/ LINES AND HOSES - INSTALLATION) (Fig. 20)

(12) Install coolant supply line (Fig. 20).

(13) Install oil supply line (Fig. 20).

(14) Install oil return tube (Fig. 20).

(15) Install exhaust elbow (Fig. 19)

(16) Install turbocharger support bracket (Fig. 19)

(17) Install elbow support bracket (Fig. 19)

(18) Install turbocharger heat shields (Fig. 19)

(19) Install exhaust pipe to manifold. Tighten fasteners to 28 N·m (20 ft. lbs.) (Fig. 19).

CYLINDER HEAD (Continued)

(20) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(21) Connect engine coolant temperature sensor connector.

(22) Connect upper radiator hose. Connect heater hoses to thermostat housing.

(23) Install heater tube support bracket to cylinder head.

(24) Install lower intake manifold support bracket (Fig. 19).

(25) Connect fuel supply line quick-connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(26) Fill cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).

(27) Install clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(28) Connect negative cable to battery.

CAMSHAFT OIL SEAL(S)

REMOVAL

(1) Remove timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(2) Hold each camshaft sprocket with Special Tool 6847 while removing center bolt (Fig. 27).

(3) Remove camshaft sprockets.

(4) Remove rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(5) Remove camshaft seal using Special Tool C-4679A (Fig. 28).

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 seals into cylinder head using Special Tool MD-998306 until flush with head (Fig. 29).

(3) Install timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

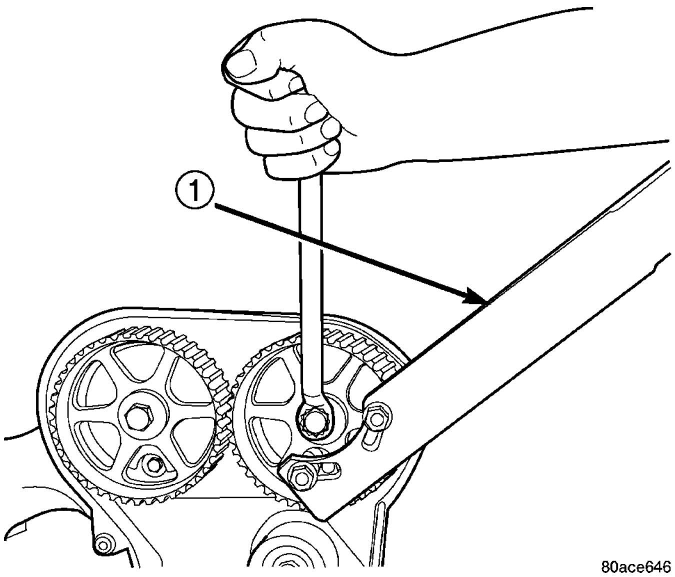


Fig. 27 Camshaft Sprocket - Removal/Installation

1 - SPECIAL TOOL 6847

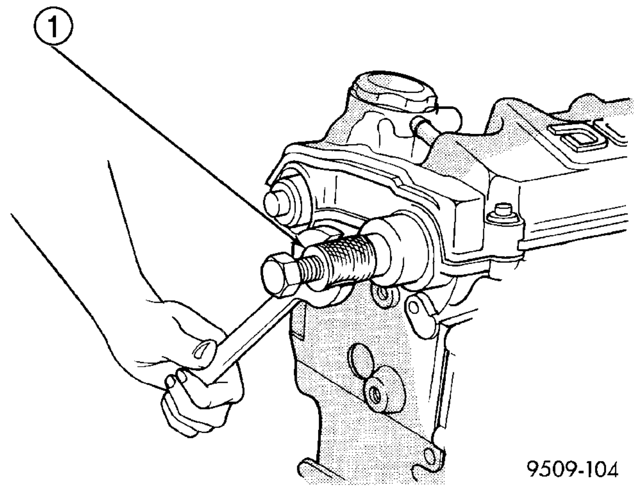


Fig. 28 Camshaft Oil Seal - Removal With C-4679A

1 - SPECIAL TOOL C-4679

(4) Install camshaft sprockets. Hold each sprocket with Special Tool 6847 and tighten center bolt to 115 N·m (85 ft. lbs.) (Fig. 27).

(5) Install timing belt and front covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

CAMSHAFT OIL SEAL(S) (Continued)

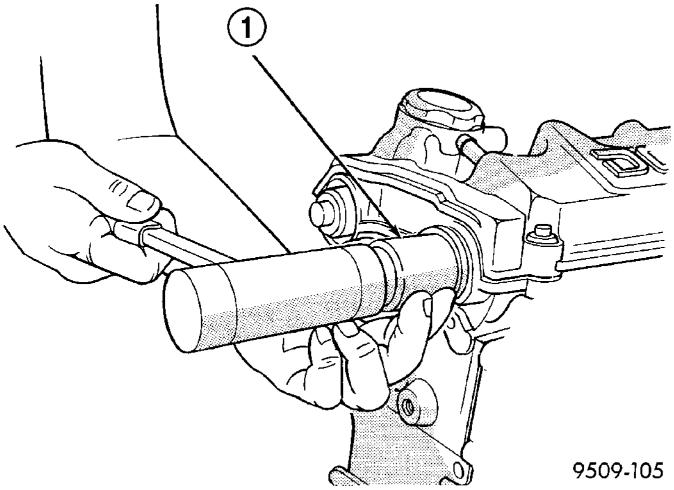


Fig. 29 Camshaft Seal - Installation

1 - SPECIAL TOOL MD-998306

CAMSHAFT(S)

DESCRIPTION

Both camshafts have six bearing journal surfaces and two cam lobes per cylinder (Fig. 30). Flanges at the rear journals control camshaft end play. Provision for a cam position sensor is located on the intake camshaft on the rear of the cylinder head. A hydrodynamic oil seal is used for oil control at the front of the camshaft.

OPERATION

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE - MEASURING CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft **WITHOUT** rocker arms. 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. 31).

(4) Move camshaft as far forward as it will go.

(5) Record reading on dial indicator. For end play specification, (Refer to 9 - ENGINE - SPECIFICATIONS).

(6) If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

REMOVAL

(1) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - REMOVAL).

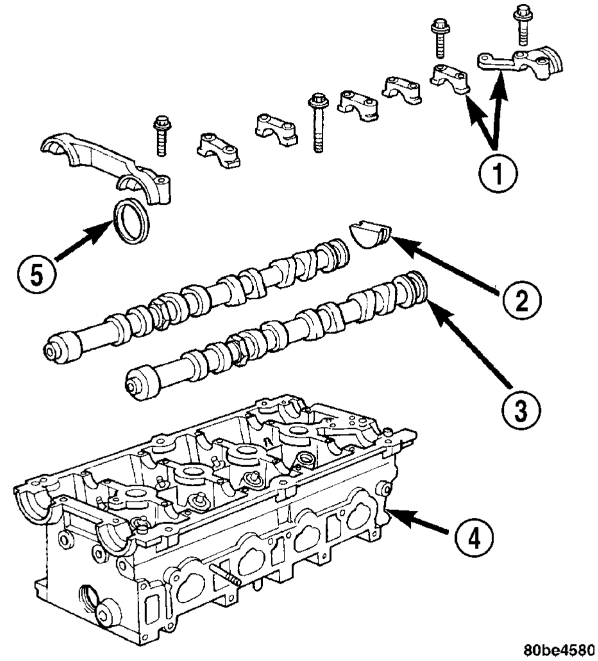


Fig. 30 Camshafts

1 - CAMSHAFT BEARING CAPS
2 - PLUG
3 - CAMSHAFT
4 - CYLINDER HEAD
5 - CAMSHAFT OIL SEAL

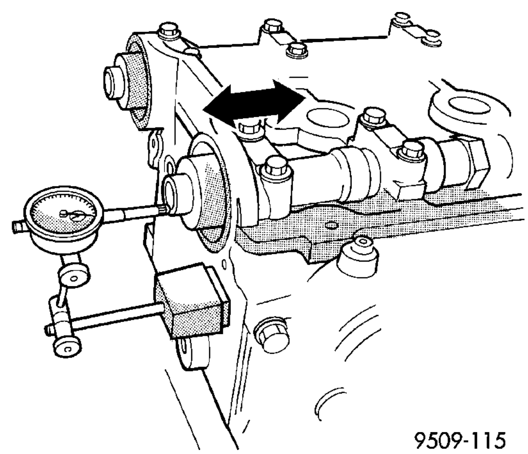


Fig. 31 Camshaft End Play - Typical

(2) Remove camshaft position sensor and camshaft target magnet (Refer to 8 - ELECTRICAL/IGNITION CONTROL/CAMSHAFT POSITION SENSOR - REMOVAL).

(3) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(4) Remove camshaft sprockets and timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(5) Bearing caps are identified for location. Remove the outside bearing caps first (Fig. 32).

CAMSHAFT(S) (Continued)

(6) Loosen the camshaft bearing cap attaching fasteners in sequence shown (Fig. 33) one camshaft at a time.

CAUTION: Camshafts are not interchangeable. The intake cam number 6 thrust bearing face spacing is wider.

(7) Identify the camshafts before removing from the head. The camshafts are not interchangeable.
(8) Remove camshafts from cylinder head.

NOTE: If removing rocker arms, identify for reinstallation in the original position.

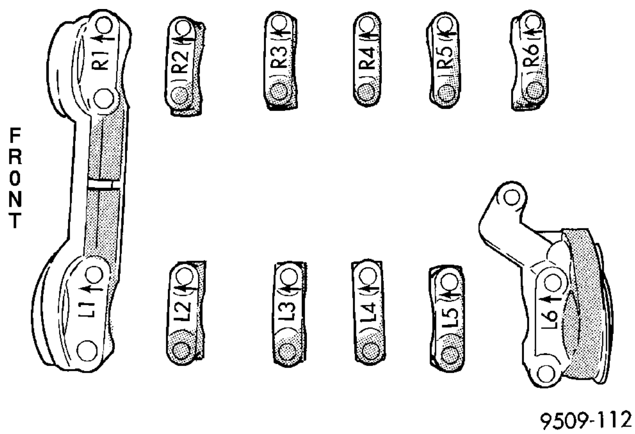


Fig. 32 Camshaft Bearing Cap Identification

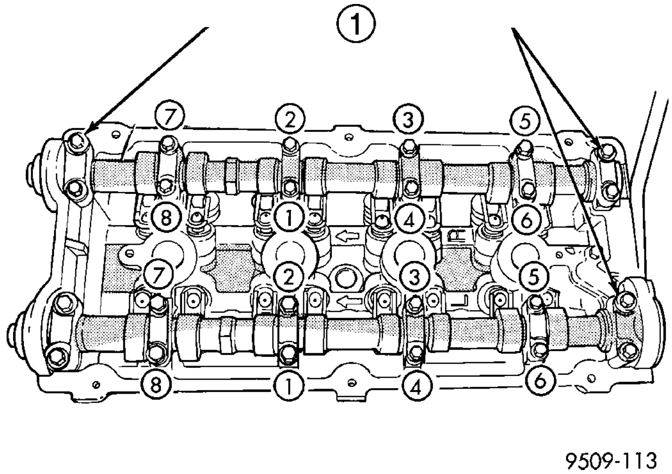


Fig. 33 Camshaft Bearing Cap - Removal

1 - REMOVE OUTSIDE BEARING CAPS FIRST

CLEANING

Clean camshaft with a suitable solvent.

INSPECTION

(1) Inspect camshaft bearing journals for damage and binding (Fig. 34). If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.

(2) Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the rocker arms.

(3) Measure the lobe actual wear (unworn area - wear zone = actual wear) (Fig. 34) and replace camshaft if out of limit. Standard value is 0.0254 mm (0.001 in.), wear **limit** is 0.254 mm (0.010 in.).

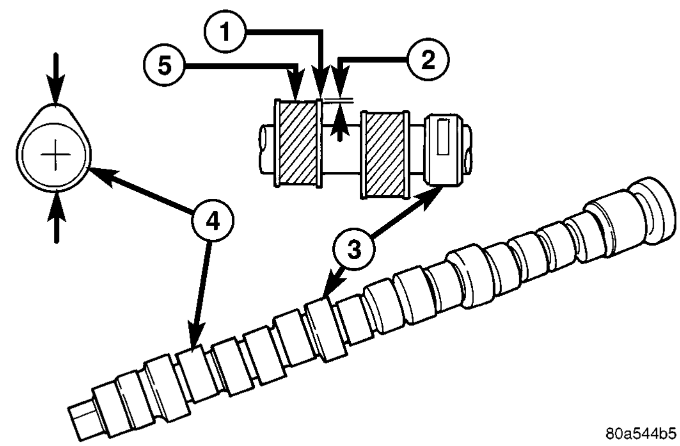


Fig. 34 Checking Camshaft(s) for Wear

1 - UNWORN AREA
2 - ACTUAL WEAR
3 - BEARING JOURNAL
4 - LOBE
5 - WEAR ZONE

INSTALLATION

CAUTION: Ensure that NONE of the pistons are at top dead center when installing the camshafts.

(1) Lubricate all camshaft bearing journals, rocker arms and camshaft lobes.
(2) Install all rocker arms in original positions, if reused.
(3) Position camshafts on cylinder head bearing journals. Install right and left camshaft bearing caps No. 2 – 5 and right No. 6. Tighten M6 fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 35).
(4) Apply Mopar® Gasket Maker to No. 1 and No. 6 bearing caps (Fig. 36). Install bearing caps and tighten M8 fasteners to 28 N·m (250 in. lbs.).

NOTE: Bearing end caps must be installed before seals can be installed.

(5) Install camshaft oil seals (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT OIL SEAL(S) - INSTALLATION).
(6) Install camshaft target magnet and camshaft position sensor.

CAMSHAFT(S) (Continued)

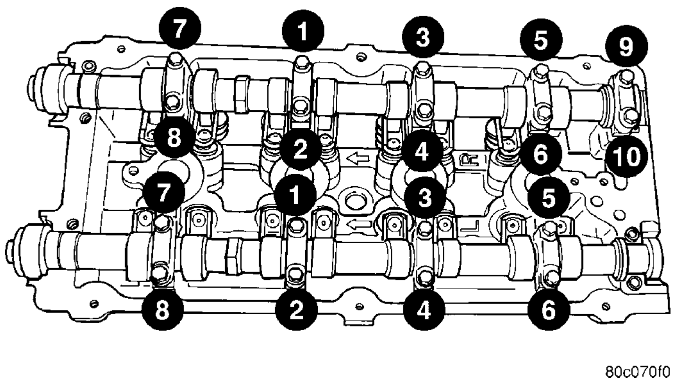


Fig. 35 Camshaft Bearing Cap Tightening Sequence

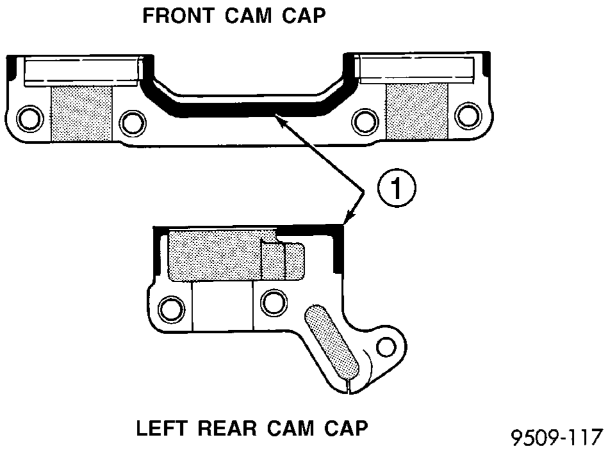


Fig. 36 Camshaft Bearing Cap Sealing

1 - 1.5 mm (.060 in.) DIAMETER BEAD OF MOPAR GASKET MAKER

(7) Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).

(8) Install timing belt rear cover and camshaft sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(9) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

CYLINDER HEAD COVER

REMOVAL

(1) Disconnect negative battery cable.

(2) Disconnect ignition coil connector.

(3) Disconnect spark plug wires and remove ignition coil (Fig. 37).

(4) Disconnect PCV and make-up air hoses from cylinder head cover (Fig. 37).

(5) Unclip wiring harness from cylinder head cover studs (Fig. 37).

(6) Remove nut securing coolant return line bracket to cylinder head cover stud (Fig. 38).

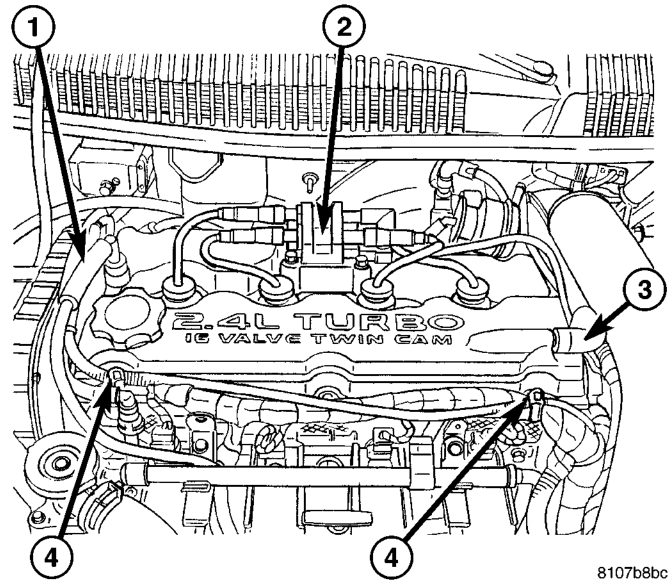


Fig. 37 PCV/Make-up Air Hoses & Ignition Coil

1 - PCV HOSE
2 - IGNITION COIL
3 - MAKE-UP AIR HOSE
4 - WIRING HARNESS CLIPS

NOTE: For reassembly purposes, note location of double ended studs.

(7) Remove cylinder head cover fasteners.

(8) Remove cylinder head cover from cylinder head.

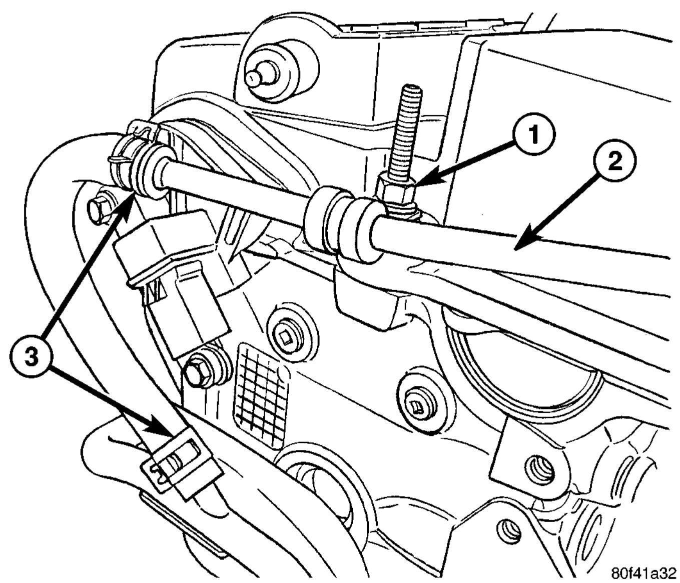


Fig. 38 Coolant Return Line Bracket

1 - NUT
2 - COOLANT RETURN LINE
3 - HOSE CLAMPS

CYLINDER HEAD COVER (Continued)

INSTALLATION

CAUTION: Do not allow oil or solvents to contact the timing belt as they can deteriorate the rubber and cause tooth skipping.

(1) Clean cylinder head cover sealing surface.

(2) Install new cylinder head cover gasket (Fig. 39) and spark plug well seals (Fig. 40).

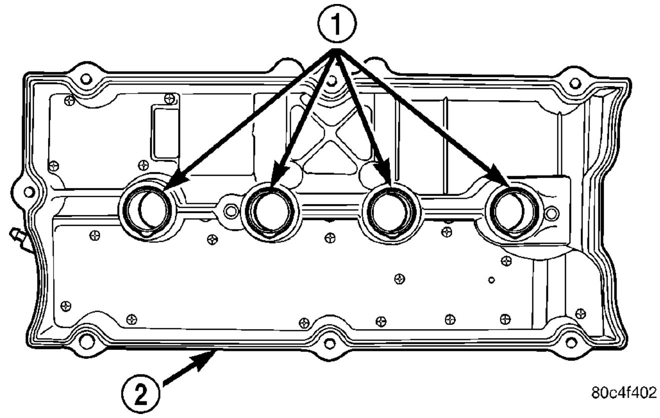


Fig. 39 Cylinder Head Cover Gasket and Spark Plug Well Seals

1 - SPARK PLUG WELL SEALS
2 - GASKET

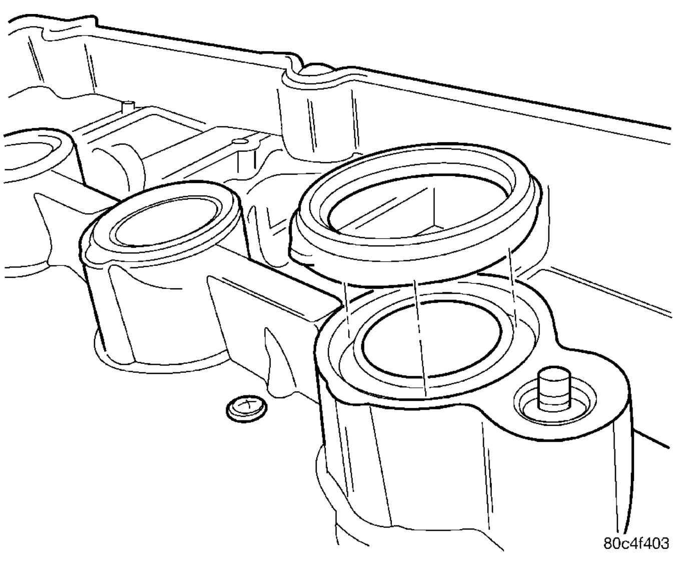


Fig. 40 Spark Plug Well Seals

(3) Apply Mopar® Engine RTV GEN II at the camshaft cap corners and at the top edges of the 1/2 round seal (Fig. 41).

NOTE: Inspect cylinder head cover fastener seal washers. Replace as necessary.

(4) Install cylinder head cover assembly to cylinder head. Install all fasteners, ensuring the double ended studs are in their proper location. Tighten fasteners in sequence shown in (Fig. 42). Using a 3 step torque method as follows:

(a) Tighten all bolts to 4.5 N·m (40 in. lbs.).

(b) Tighten all bolts to 9.0 N·m (80 in. lbs.).

(c) Tighten all bolts to 12 N·m (105 in. lbs.).

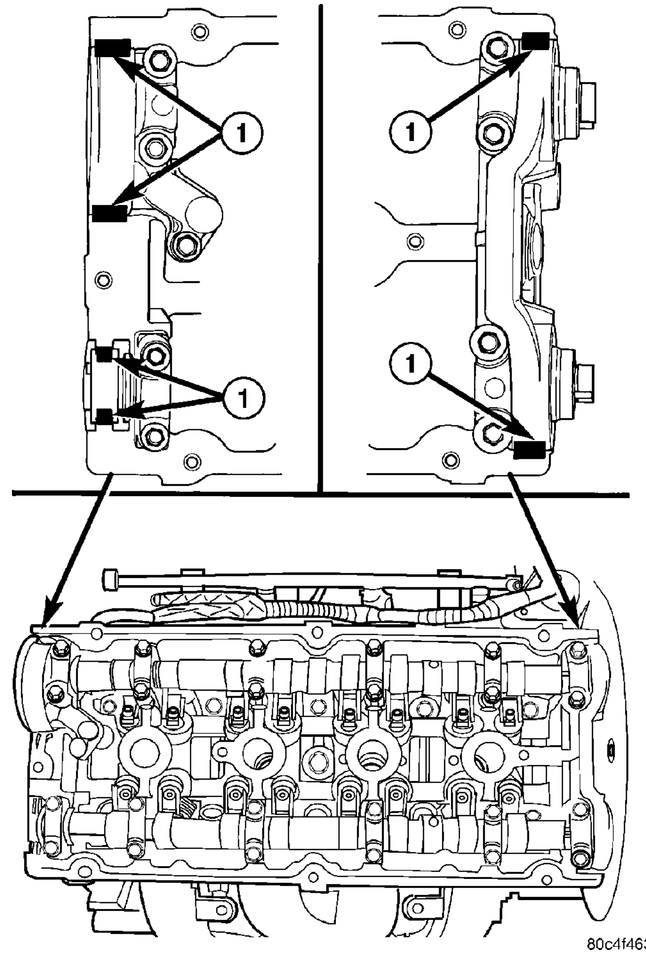


Fig. 41 Sealer Locations

1 – SEALER LOCATION

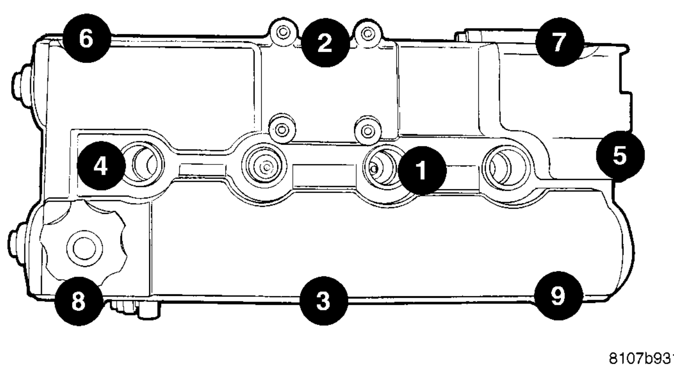


Fig. 42 Cylinder Head Cover Tightening Sequence

(5) Install nut securing coolant return line bracket to cylinder head cover stud (Fig. 38).

CYLINDER HEAD COVER (Continued)

(6) Clip wiring harness to cylinder head cover studs (Fig. 37).

(7) Install ignition coil and connect spark plug wires. Tighten ignition coil fasteners to 12 N·m (105 in. lbs.) (Fig. 37).

(8) Connect ignition coil connector.

(9) If the PCV valve was removed from cylinder head cover, apply Mopar® Thread Sealant with Teflon to threads and install valve to cylinder head cover. Tighten PCV valve to 8 N·m (70 in. lbs.).

(10) Connect PCV and make-up air hoses to cylinder head cover (Fig. 37).

(11) Connect negative battery cable.

HYDRAULIC LASH ADJUSTERS

DIAGNOSIS AND TESTING

HYDRAULIC LASH ADJUSTER 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 (integral to the cylinder head gasket) in 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.

- 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.
- Remove suspected lash adjusters, and replace as necessary.

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Remove rocker arm. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - REMOVAL)

(3) Remove hydraulic lash adjuster (Fig. 43).

(4) Repeat removal procedure for each hydraulic lash adjuster.

(5) If reusing, mark each hydraulic lash adjuster for reassembly in original position. Lash adjusters are serviced as an assembly.

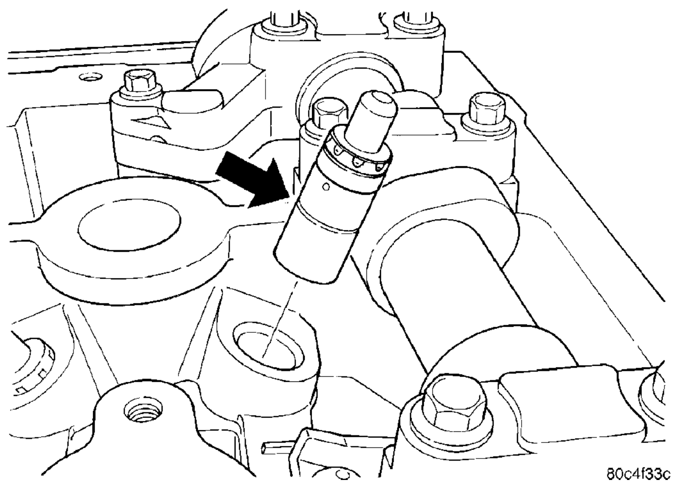


Fig. 43 Hydraulic Lash Adjuster

INSTALLATION

(1) Install hydraulic lash adjuster (Fig. 43). Ensure the lash adjusters are at least partially full of engine oil. This is indicated by little or no plunger travel when the lifter is depressed.

(2) Install rocker arm. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSTALLATION)

(3) Repeat installation procedure for each hydraulic lash adjuster.

(4) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The valves are made of heat resistant steel. They have chrome plated stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves have three-bead lock keepers to retain springs and to promote valve rotation.

OPERATION

The four valves per cylinder (two intake and two exhaust) are opened by using roller rocker arms which pivot on hydraulic lash adjusters.

CLEANING

(1) Clean all valves thoroughly and discard burned, warped and cracked valves.

ROCKER ARMS

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Remove spark plugs.

(3) Rotate engine until the camshaft lobe, on the follower being removed, is positioned on its base circle (heel). Also, the piston should be a minimum of 6.3 mm (0.25 in) below TDC position.

CAUTION: If cam follower assemblies are to be reused, always mark position for reassembly in their original positions.

(4) Using Special Tools 8215A and 8436 slowly depress valve assembly until rocker arm can be removed (Fig. 44).

(5) Repeat removal procedure for each rocker arm.

INSPECTION

Inspect the rocker arm for wear or damage (Fig. 45). Replace as necessary.

INSTALLATION

(1) Lubricate rocker arm with clean engine oil.

(2) Using Special Tools 8215A and 8436 slowly depress valve assembly until rocker arm can be installed on the hydraulic lifter and valve stem (Fig. 44).

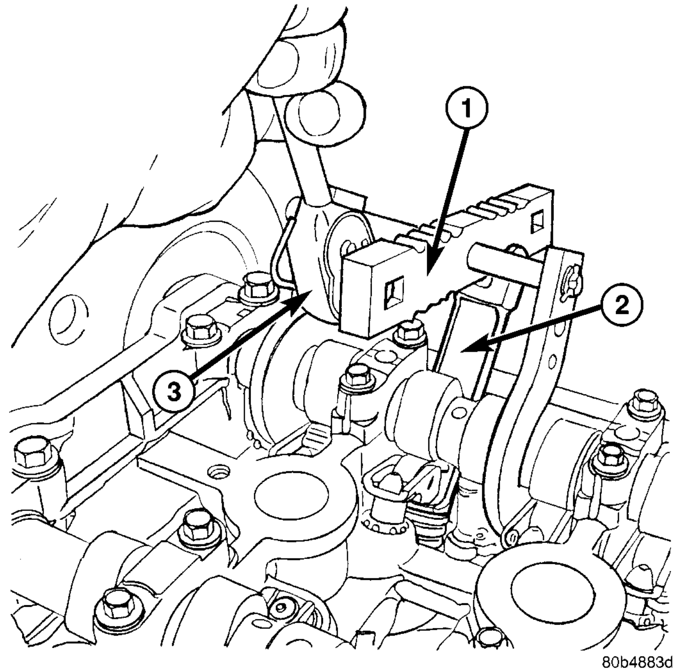


Fig. 44 Rocker Arm - Removal/Installation

1 - SPECIAL TOOL 8215A
2 - SPECIAL TOOL 8436
3 - 3/8″ DRIVE RACHET

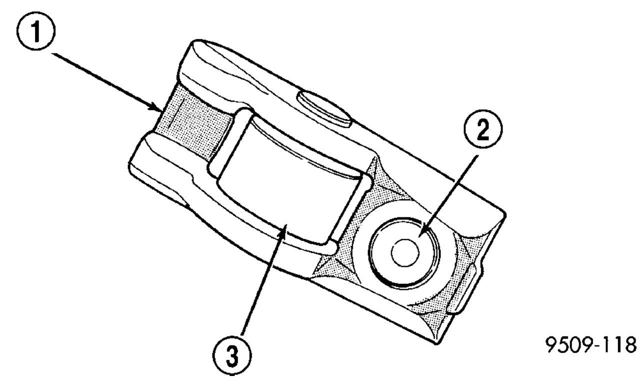


Fig. 45 Rocker Arm

1 - TIP
2 - LASH ADJUSTER POCKET
3 - ROLLER

(3) Repeat installation procedure for each rocker arm.

(4) Install spark plugs.

(5) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

VALVE SPRINGS & SEALS

REMOVAL

REMOVAL - CYLINDER HEAD ON

(1) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

(3) Rotate crankshaft until piston is at TDC on compression.

(4) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.

(5) Using Special Tool MD-998772-A with adapter 6779 (Fig. 46), compress valve springs and remove valve locks.

(6) Remove valve spring(s).

(7) Remove valve stem seal(s) by a using valve stem seal tool (Fig. 48).

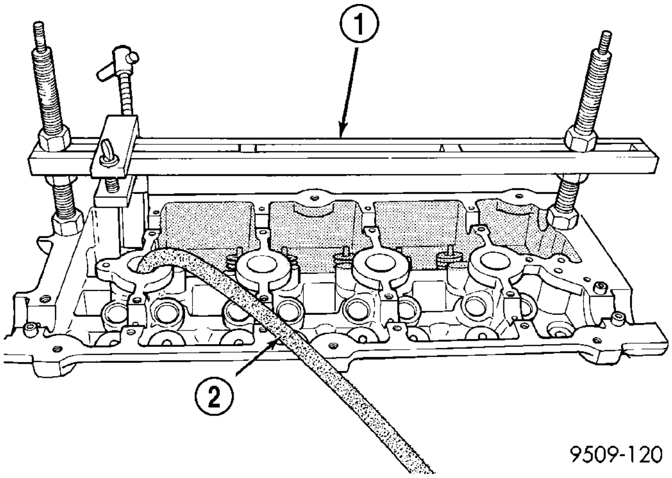


Fig. 46 Valve Spring - Removal/Installation

1 - VALVE SPRING COMPRESSOR MD 998772A
2 - AIR HOSE

REMOVAL - CYLINDER HEAD OFF

(1) With cylinder head removed from cylinder block, 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, locks and retainers to insure installation in original location.

(4) Inspect the valves. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSPECTION)

INSPECTION

(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 lbs. @ 38.0 mm (1.50 in.)
- Valve Open Nominal Tension—136 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.

INSTALLATION

INSTALLATION - CYLINDER HEAD ON

(1) Install valve seal/valve spring seat assembly (Fig. 47). 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. 46). Correct alignment of tool is necessary to avoid nicking valve stems.

(3) Remove air hose and install spark plugs.

(4) Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

(5) Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).

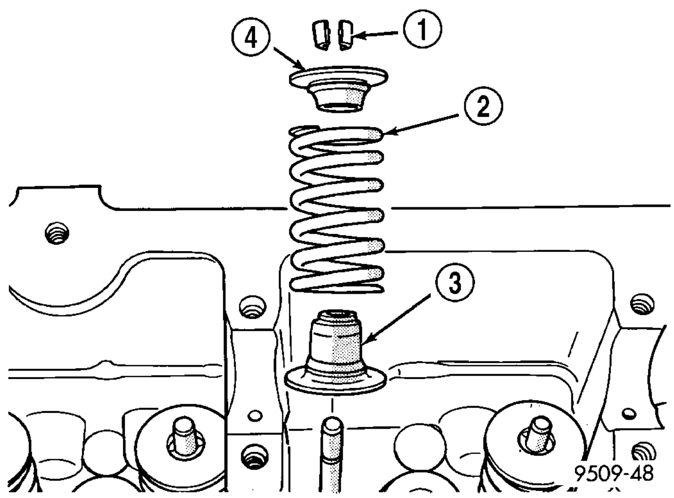


Fig. 47 Valve Stem Seal/Valve Spring Seat

1 - VALVE RETAINING LOCKS
2 - VALVE SPRING
3 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY
4 - VALVE SPRING RETAINER

VALVE SPRINGS & SEALS (Continued)

INSTALLATION - CYLINDER HEAD OFF

(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. 48). 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.

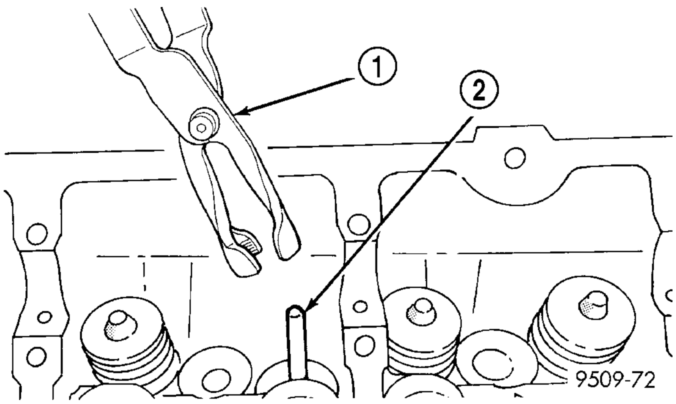


Fig. 48 Valve Stem Oil Seal Tool

1 - VALVE SEAL TOOL
2 - VALVE STEM

(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. 49). 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 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.

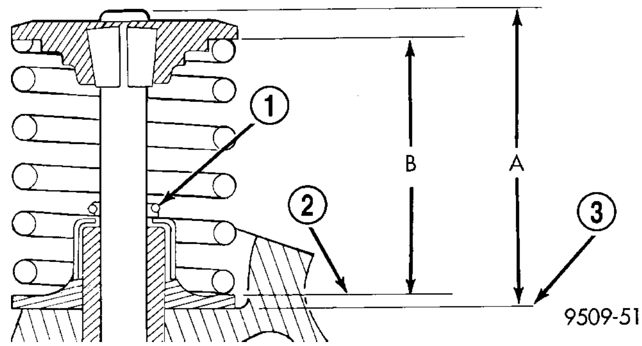


Fig. 49 Checking Spring Installed Height and Valve Tip Height Dimensions

1 - GARTER SPRING
2 - VALVE SPRING SEAT
3 - CYLINDER HEAD SURFACE

ENGINE BLOCK

DESCRIPTION

The cast iron cylinder block is a two-piece assembly, consisting of the cylinder block and bed plate (Fig. 50). The bed plate incorporates the main bearing caps and bolts to the cylinder block. This design offers a much stronger lower end and increased cylinder block rigidity. The rear oil seal retainer is integral with the block. The bed plate and block are serviced as an assembly.

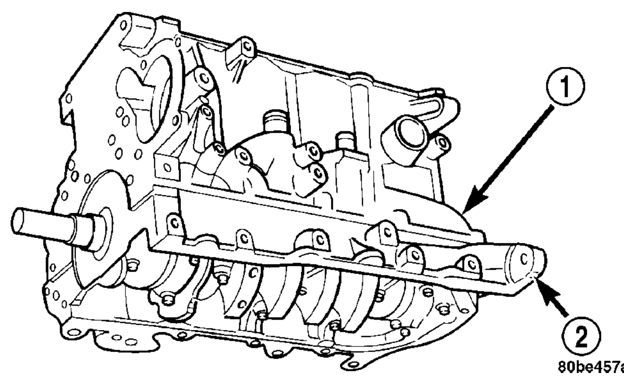


Fig. 50 Cylinder Block and Bed plate

1 - CYLINDER BLOCK
2 - BED PLATE

STANDARD PROCEDURE - CYLINDER BORE HONING

(1) Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, equipped with 220 grit stones, is the best tool for this honing procedure. 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.

ENGINE BLOCK (Continued)

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, recommended tool C-3501 or equivalent, 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. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.

(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 40-60 degrees, the cross hatch angle is most satisfactory for proper seating of rings (Fig. 51).

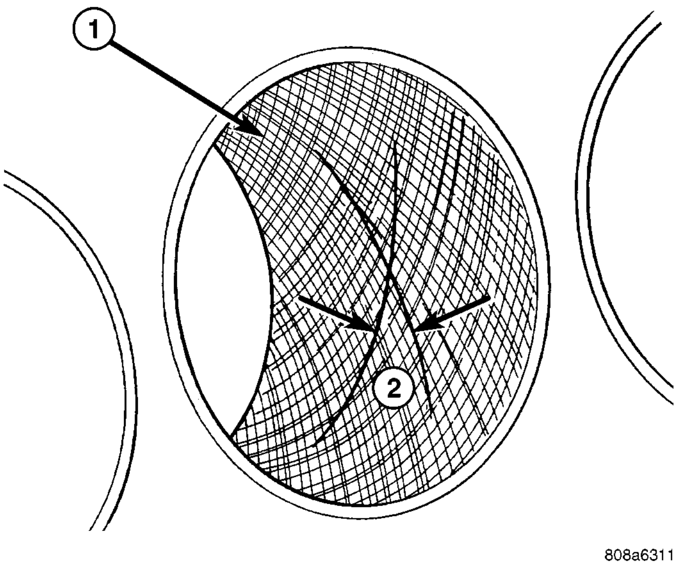


Fig. 51 Cylinder Bore Cross-Hatch Pattern

1 - CROSS-HATCH PATTERN
2 - 40°–60°

(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 40–60 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.

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

ENGINE BLOCK

(1) Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.

(2) If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).

(3) Examine block and cylinder bores for cracks or fractures.

(4) Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Fig. 52) (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

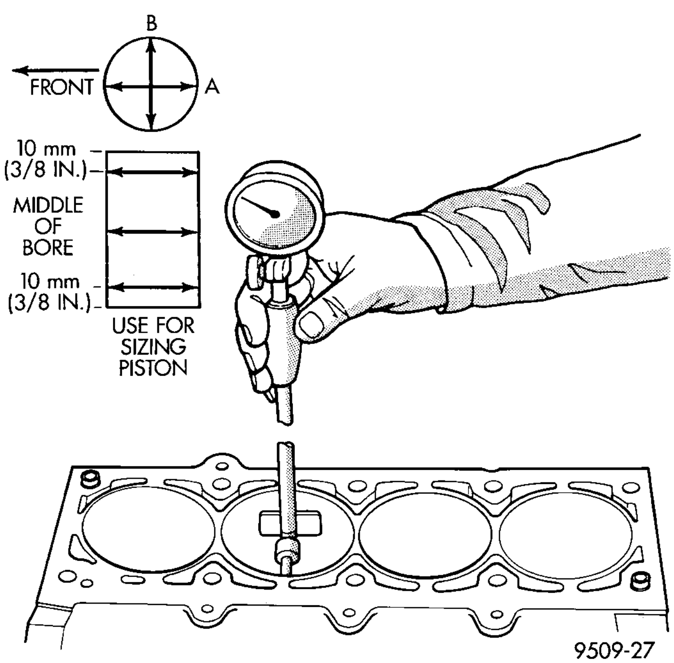


Fig. 52 Checking Cylinder Bore Size

ENGINE BLOCK (Continued)

Measure the cylinder bore at three levels in directions A and B (Fig. 52). 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 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT

STANDARD PROCEDURE - MEASURING CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine with the locating probe on nose of crankshaft (Fig. 53).
(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 9 - ENGINE - SPECIFICATIONS) for end play specification.

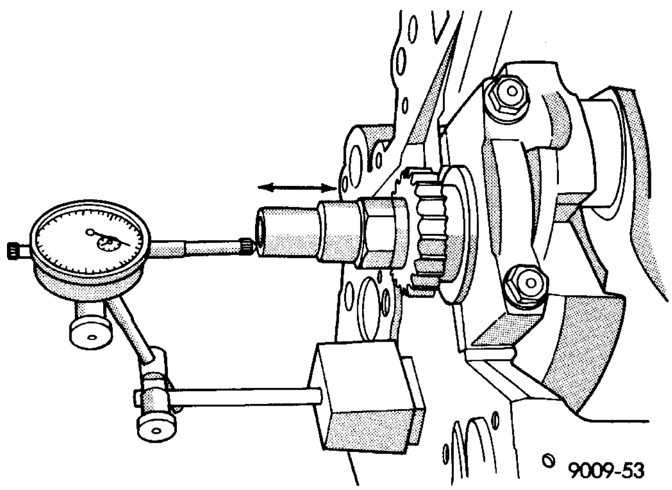


Fig. 53 Checking Crankshaft End Play - Typical

REMOVAL - CRANKSHAFT

NOTE: Crankshaft can not be removed when engine is in vehicle.

(1) Remove engine assembly from vehicle (Refer to 9 - ENGINE - REMOVAL).
(2) Separate transaxle from engine.
(3) Remove drive plate/flex plate.
(4) Remove crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).
(5) Mount engine on a suitable repair stand.
(6) Drain engine oil and remove oil filter.
(7) Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
(8) Remove engine mount support bracket.
(9) Remove front timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).
(10) Remove the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).
(11) Remove the rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).
(12) Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
(13) Remove oil pump pick-up tube.
(14) Remove the crankshaft sprocket and oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
(15) Remove balance shafts and housing assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - REMOVAL).
(16) Remove crankshaft position sensor.

NOTE: If piston/connecting rod replacement is necessary, remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(17) Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap (Fig. 54).

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

(18) Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

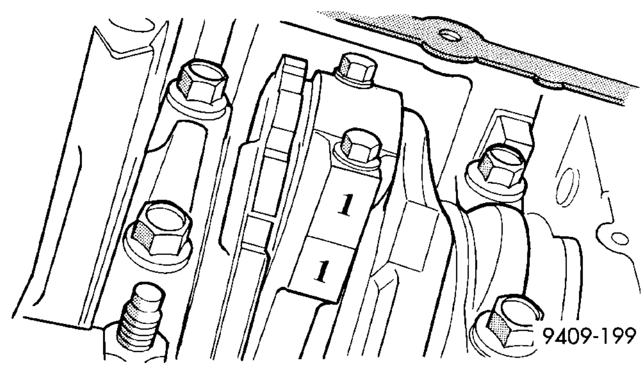


Fig. 54 Identify Connecting Rod to Cylinder-Typical

(19) Remove all bed plate bolts from the engine block (Fig. 55).
(20) Using a mallet gently tap the bed plate loose from the engine block dowel pins.

CRANKSHAFT (Continued)

CAUTION: Do not pry up on one side of the bed plate. Damage may occur to cylinder block to bed plate alignment and thrust bearing.

(21) Bed plate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mis-handled.

(22) Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

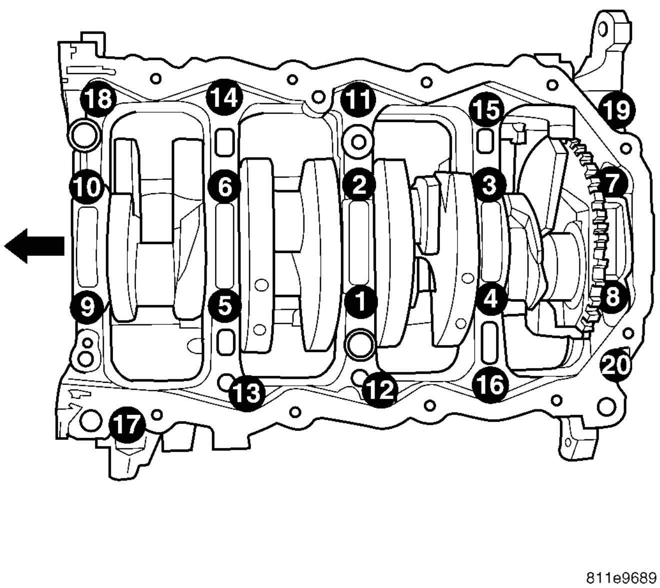


Fig. 55 Bed Plate Bolt Removal Sequence

(23) Remove the target ring mounting screws and discard.
(24) Remove the target ring from the crankshaft.

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring (Fig. 56). Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 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, it is important that the final paper or cloth polish be in the same direction as normal rotation in the engine.

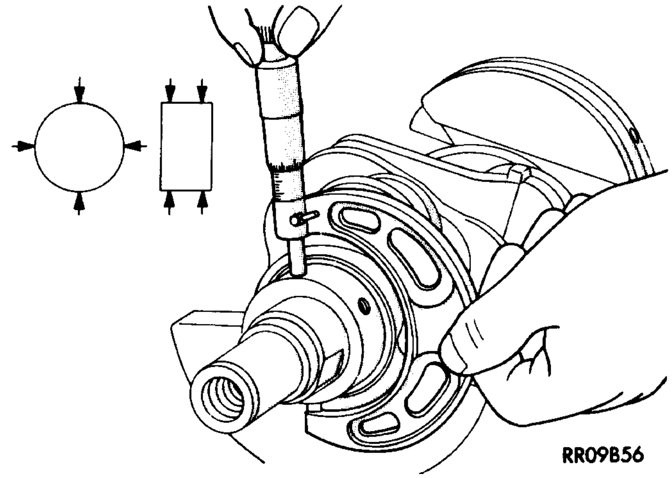


Fig. 56 Crankshaft Journal Measurements - Typical

INSTALLATION - CRANKSHAFT

CRANKSHAFT MAIN BEARING LOCATION

CAUTION: The upper and lower thrust bearing halves are NOT interchangeable. Make certain the bearing half with the oil groove and hole is installed in the engine block.

The crankshaft is supported in five main bearings. All upper bearing shells in the crankcase have oil grooves and holes. All lower bearing shells **except** for the thrust bearing half have oil grooves and holes (Fig. 57). Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal.

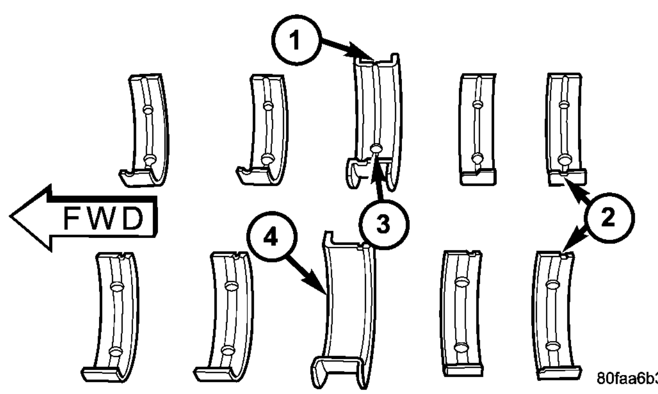


Fig. 57 Main Bearing Identification

1 - OIL GROOVE
2 - MAIN BEARINGS
3 - OIL HOLE
4 - LOWER THRUST BEARING PLAIN (NO OIL HOLE OR GROOVE)

CRANKSHAFT (Continued)

(1) Install the main bearing upper shells with the lubrication groove and oil hole in the engine block (Fig. 58).

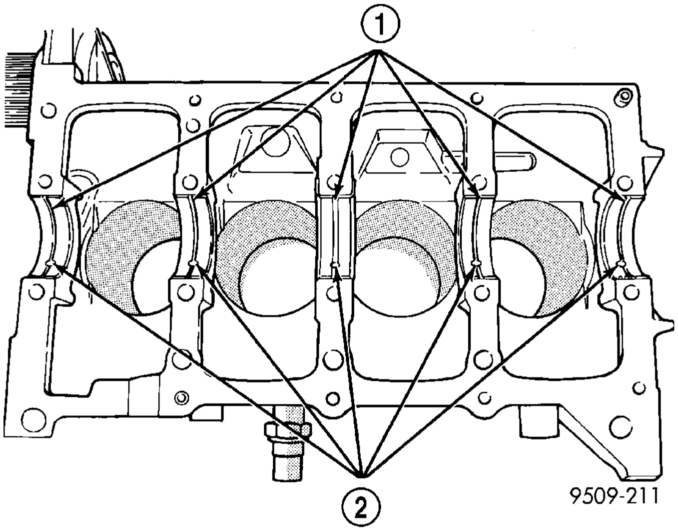


Fig. 58 Installing Main Bearing Upper Shell

1 - LUBRICATION GROOVES
2 - OIL HOLES

(2) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

NOTE: If the crankshaft is sent out for machine work, it must be balenced as an assembly with the target ring installed.

(3) Clean crankshaft and target ring with MOPAR® brake parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

(4) Install **NEW** mounting screws finger tight starting with the #1 location. (Fig. 59) Make sure engagment occurs with the shoulder of the screw and mounting hole before starting all other screws.

(5) Torque all mounting screws with T30 torx bit to 13 N·m (110 in-lbs) following the torque sequence.

CAUTION: Use extreme care when handling crankshaft. Target ring damage can occur if crankshaft is mis-handled.

CAUTION: Do not get oil on the bed plate mating surface. It will affect the sealer ability to seal the bed plate to cylinder block.

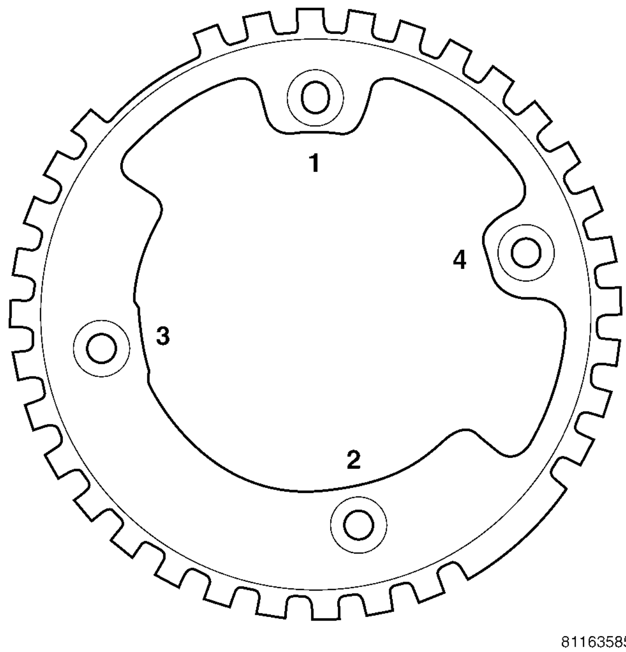


Fig. 59 Target Ring Torque Sequence

(6) Oil the bearings and journals. Install crankshaft in engine block.

CAUTION: Use only Mopar® Bed Plate Sealant on the bed plate or damage may occur to the engine.

(7) Install lower main bearings into main bearing cap/bed plate. Make certain the bearing tabs are seated into the bed plate slots and apply oil.

(8) Apply a 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar® Bed Plate Sealant to bed plate as shown in (Fig. 60).Install the main bearing/bed plate onto the engine block.

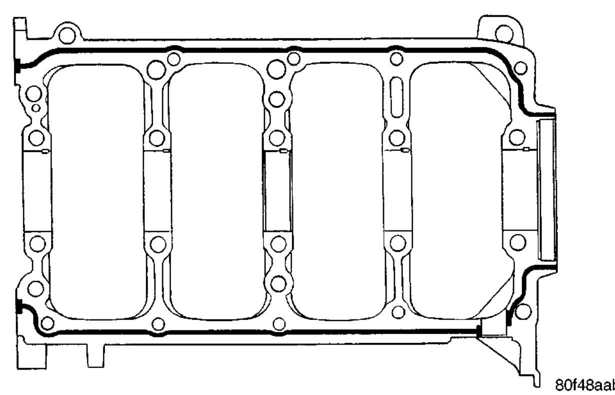


Fig. 60 Bed Plate Sealing

(9) Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.

CRANKSHAFT (Continued)

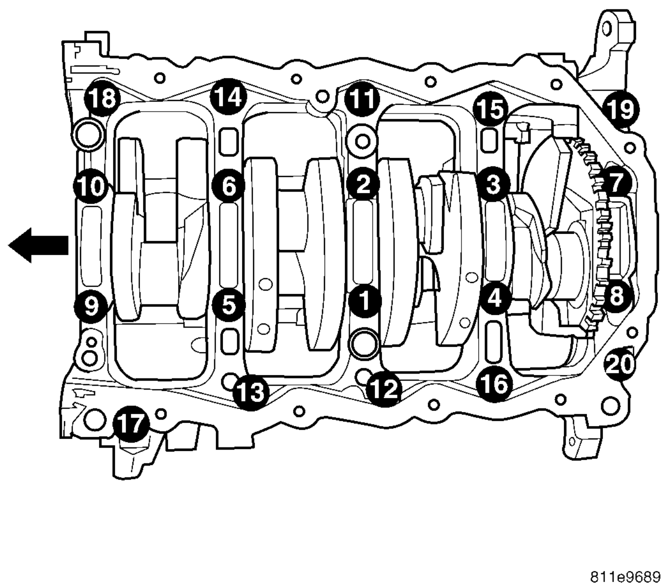


Fig. 61 Main Bearing Caps/Bed Plate Bolt Torque Sequence

(10) Install main bearing bedplate to engine block bolts 11, 17, and 20 finger tight. Tighten these bolts down together until the bed plate contacts the cylinder block (Fig. 61).

(11) To ensure correct thrust bearing alignment, perform the following steps:

- Step 1: Rotate crankshaft until number 4 piston is at TDC.
- Step 2: Move crankshaft rearward to limits of travel.
- Step 3: Then, move crankshaft forward to limits of travel.
- Step 4: Wedge an appropriate tool between the rear of the cylinder block **(NOT BED PLATE)** and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
- Step 5: Install and tighten bolts (1–10) in sequence shown in (Fig. 61) to 41 N·m (30 ft. lbs.).
- Step 6: Remove wedge tool used to hold crankshaft.

(12) Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) in sequence shown in (Fig. 61).

(13) Install main bearing bed plate to engine block bolts (11–20), and torque each bolt to 28 N·m (250 in. lbs.) in sequence shown in (Fig. 61).

(14) Tighten bolts (1–10) to 75 N·m (55 ft. lbs.) in sequence shown in (Fig. 61).

(15) Tighten bolts (11–20) again to 28 N·m (250 in. lbs.) in sequence shown in (Fig. 61).

(16) After the main bearing bed plate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

(17) Check crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).

(18) Install connecting rod bearings and caps. **Do Not Reuse Connecting Rod Bolts.** Torque connecting rod bolts to 27 N·m (20 ft. lbs.) plus 1/4 turn.

(19) Install balance shafts and housing assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - INSTALLATION).

(20) Install the oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).

(21) Install oil pump pick-up tube. Torque fastener to 23 N·m (200 in. lbs.).

(22) Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(23) Install crankshaft position sensor.

(24) Install cylinder head if it was removed (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

(25) Install the rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(26) Install front crankshaft oil seal and crankshaft sprocket (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - INSTALLATION).

(27) Install the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(28) Install the timing belt front covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(29) Install engine mount support bracket.

(30) Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(31) Install **NEW** oil filter.

(32) Remove engine from repair stand and position on Special Tools 6135 and 6710 Engine Dolly and Cradle. Install safety straps around the engine to cradle and tighten and lock them into position.

(33) Install crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).

(34) Install drive plate/flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).

(35) Attach transaxle to engine. Tighten attaching bolts to 101 N·m (75 ft. lbs.).

(36) Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

(1) Remove the crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(2) Remove timing belt. (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(3) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 62).

CAUTION: Do not nick shaft seal surface or seal bore.

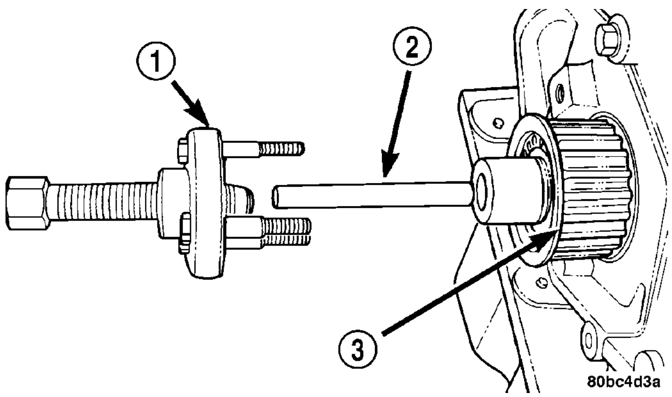


Fig. 62 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

(4) Using Tool 6771 to remove front crankshaft oil seal (Fig. 63). Be careful not to damage the seal surface of cover.

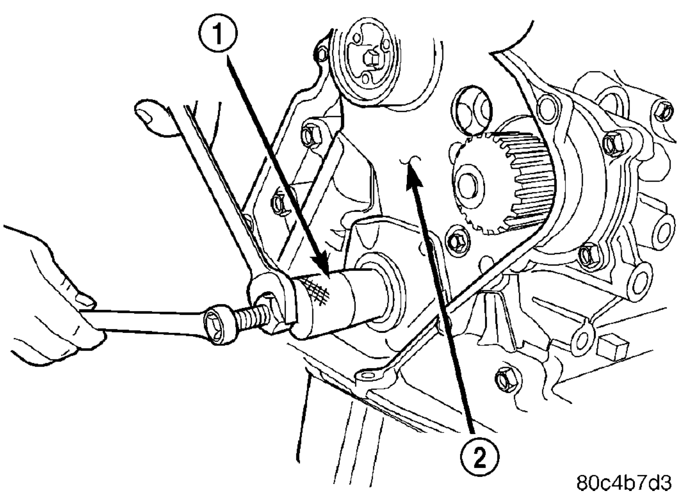


Fig. 63 Front Crankshaft Oil Seal - Removal

1 - SPECIAL TOOL 6771
2 - REAR TIMING BELT COVER

INSTALLATION

(1) Install new seal by using Special Tool 6780 (Fig. 64).

(2) Place seal into opening with seal spring towards the inside of engine. Install seal until flush with cover.

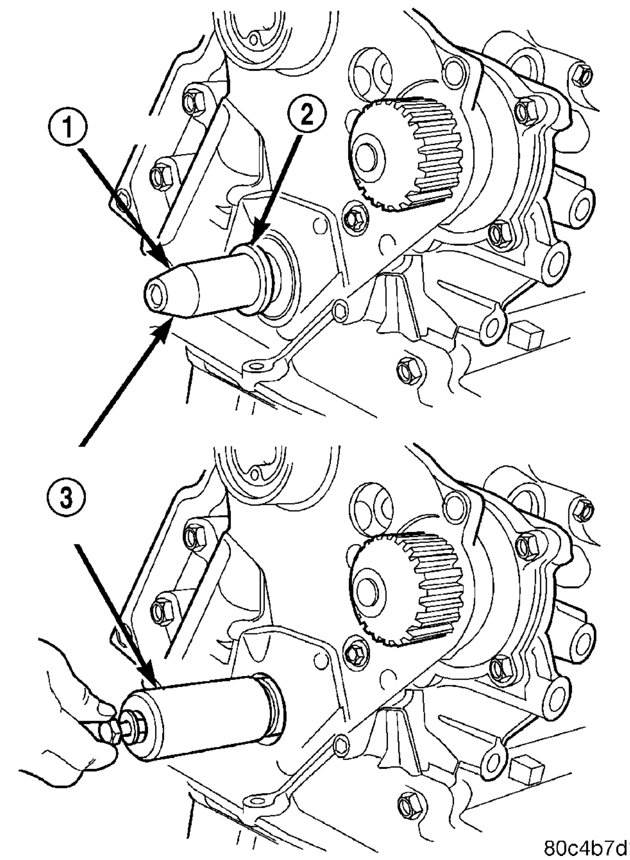


Fig. 64 Crankshaft Front Oil Seal - Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780

(3) Install crankshaft sprocket using Special Tool 6792 (Fig. 65).

(4) Install timing belt. (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(5) Install crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

CRANKSHAFT OIL SEAL - FRONT (Continued)

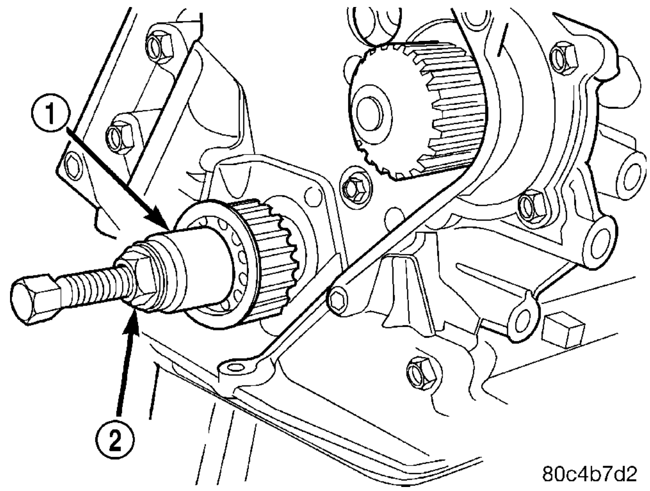


Fig. 65 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

CRANKSHAFT OIL SEAL - REAR

REMOVAL

(1) Remove transaxle. Refer to TRANSMISSION/ TRANSAXLE - REMOVAL for procedure.

(2) Remove flex plate.

(3) Insert a 3/16 flat bladed screwdriver between the dust lip and the metal case of the crankshaft seal. Angle the screwdriver (Fig. 66)through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

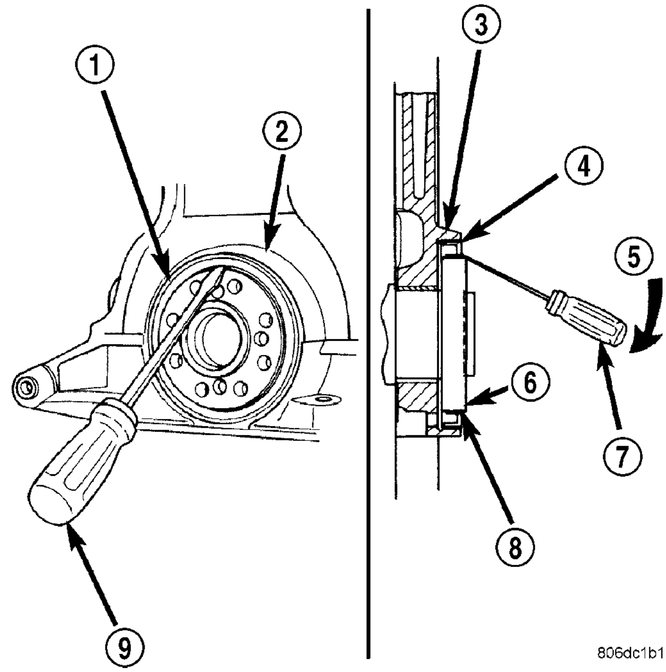


Fig. 66 Rear Crankshaft Oil Seal - Removal

1 - REAR CRANKSHAFT SEAL
2 - ENGINE BLOCK
3 - ENGINE BLOCK
4 - REAR CRANKSHAFT SEAL METAL CASE
5 - PRY IN THIS DIRECTION
6 - CRANKSHAFT
7 - SCREWDRIVER
8 - REAR CRANKSHAFT SEAL DUST LIP
9 - SCREWDRIVER

INSTALLATION

CAUTION: If a 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 Seal Guide on crankshaft (Fig. 67).

(2) Position seal over guide tool (Fig. 67). Guide 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. 68) until the tool bottoms out against the block (Fig. 69).

(4) Install flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten bolts to 95 N·m (70 ft. lbs.).

CRANKSHAFT OIL SEAL - REAR (Continued)

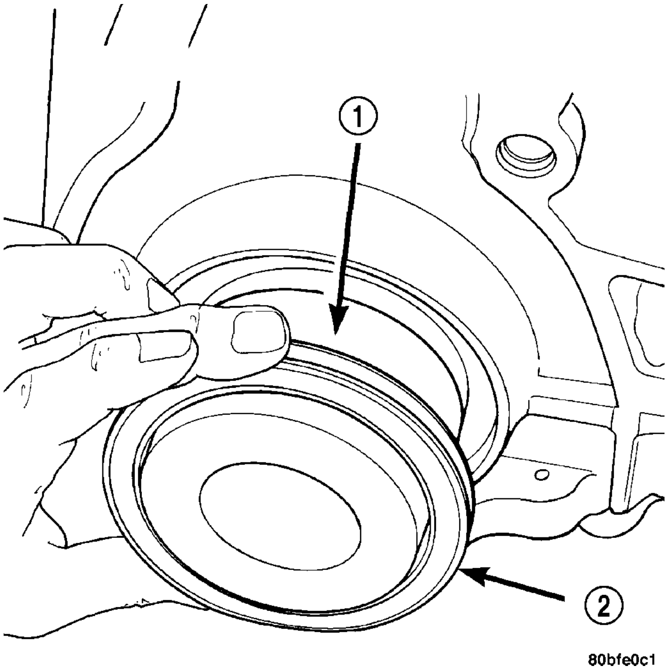


Fig. 67 Rear Crankshaft Seal and Special Tool 6926-1

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL

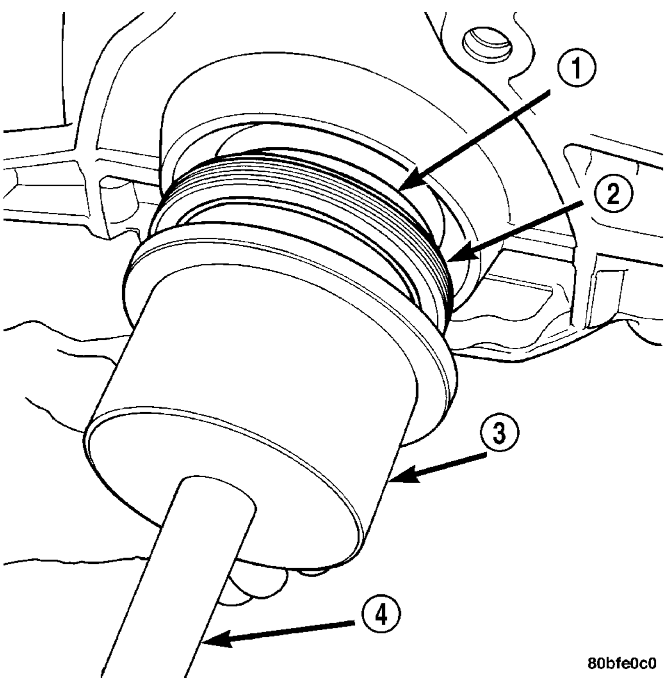


Fig. 68 Crankshaft Seal and Special Tools 6926-2 & C-4171

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL
3 - SPECIAL TOOL 6926–2 INSTALLER
4 - SPECIAL TOOL C-4171

(5) Install transaxle. Refer to TRANSMISSION/ TRANSAXLE - INSTALLATION for procedure.

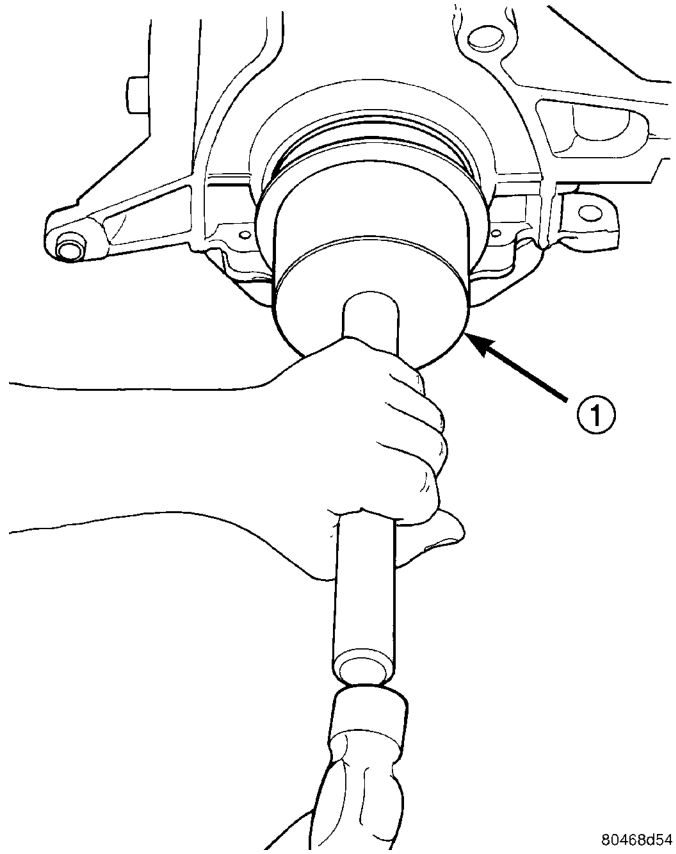


Fig. 69 Rear Crankshaft Seal - Installation

1 - SPECIAL TOOL 6926–2 INSTALLER

PISTON & CONNECTING ROD

DESCRIPTION

The pistons are made of a cast aluminum alloy. The pistons have full floating pins attached to forged steel connecting rods. The pistons pin is offset 1 mm (0.0394 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. Hex head cap screws are used to provide alignment and durability in the assembly. The connecting rod has an oil squirt hole to provide extra cylinder wall lubrication. The pistons and connecting rods are serviced as an assembly.

STANDARD PROCEDURE - PISTON TO CYLINDER BORE FITTING

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin.

PISTON & CONNECTING ROD (Continued)

• Measurement should be taken approximately 22 mm (0.866 in.) from the bottom of the skirt as shown in (Fig. 70).

Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in (Fig. 71). Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS). Correct piston to bore clearance must be established in order to assure quiet and economical operation.

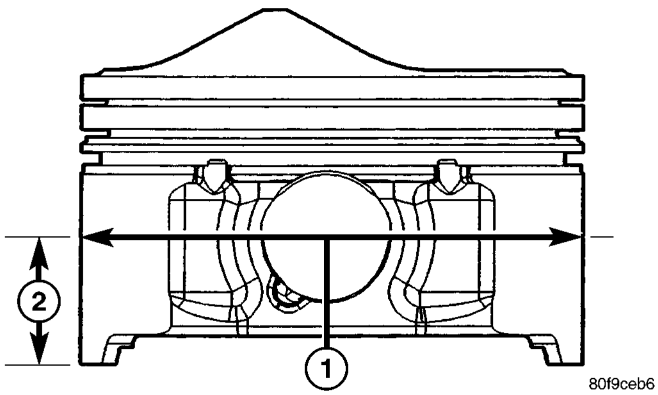


Fig. 70 Piston Measurement - Turbo

1 - PISTON DIAMETER
2 - 22 mm (0.866 in.)

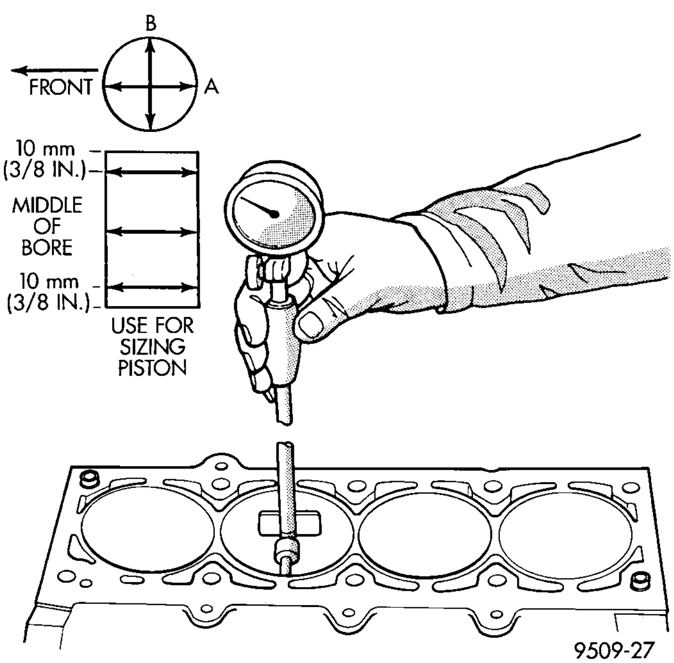


Fig. 71 Cylinder Bore Measurement

REMOVAL

(1) Remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(2) Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(3) Remove Balance Shaft Carrier Assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT CARRIER - REMOVAL).

(4) 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**.

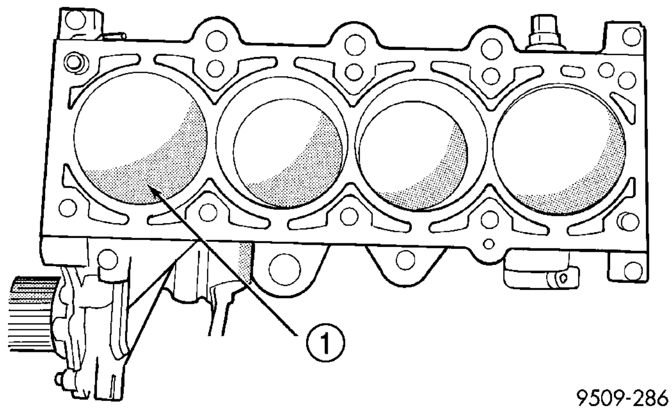


Fig. 72 Piston Markings

1 - DIRECTIONAL ARROW WILL BE IMPRINTED IN THIS AREA

(5) Pistons have a directional stamping in the front half of the piston facing towards the **front** of engine (Fig. 72).

(6) Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centered in cylinder bore.

(7) Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap (Fig. 73).

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

(8) Remove connecting rod bolts and cap. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

CAUTION: Care must be taken not to damage the fractured rod and cap joint surfaces, as engine damage many occur.

CAUTION: Do not damage the oil jet assembly when removing piston/connecting rod (Fig. 75).

(9) To protect crankshaft journal and fractured rod surfaces, install Special Tool 8189, connecting rod guides onto connecting rod (Fig. 74). Carefully push each piston and rod assembly out of cylinder bore.

PISTON & CONNECTING ROD (Continued)

(10) Remove Special Tool 8189, connecting rod guides and re-install bearing cap on the mating rod.

NOTE: Piston and rods are serviced as an assembly.

(11) Repeat procedure for each piston and connecting rod assembly.

(12) Remove piston rings (Refer to 9 - ENGINE/ ENGINE BLOCK/PISTON RINGS - REMOVAL).

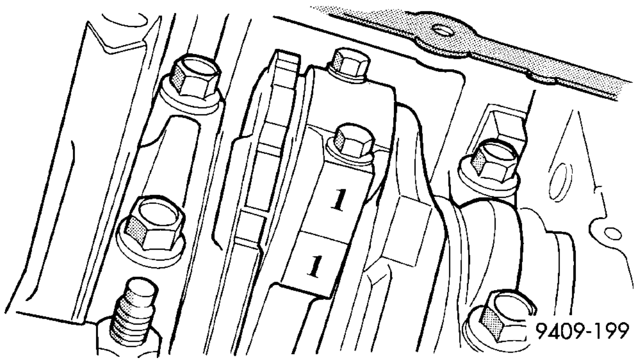


Fig. 73 Identify Connecting Rod to Cylinder - Typical

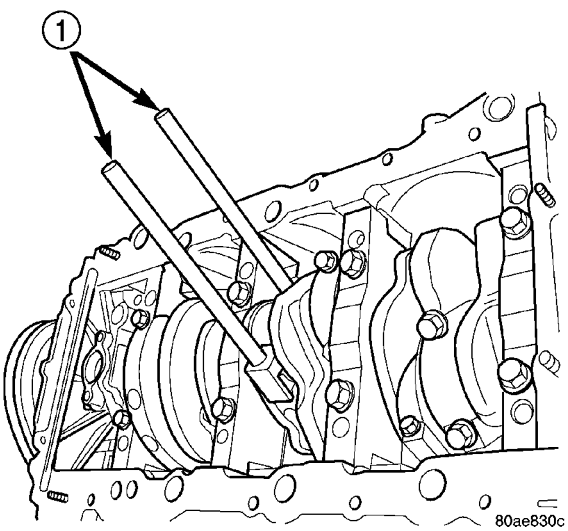


Fig. 74 Connecting Rod Guides - Typical

1 - SPECIAL TOOL 8189 CONNECTING ROD GUIDES

INSTALLATION

(1) Install piston rings on piston (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - INSTALLATION)

(2) 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 (Fig. 76).

(3) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in (Fig. 76). As viewed from top.

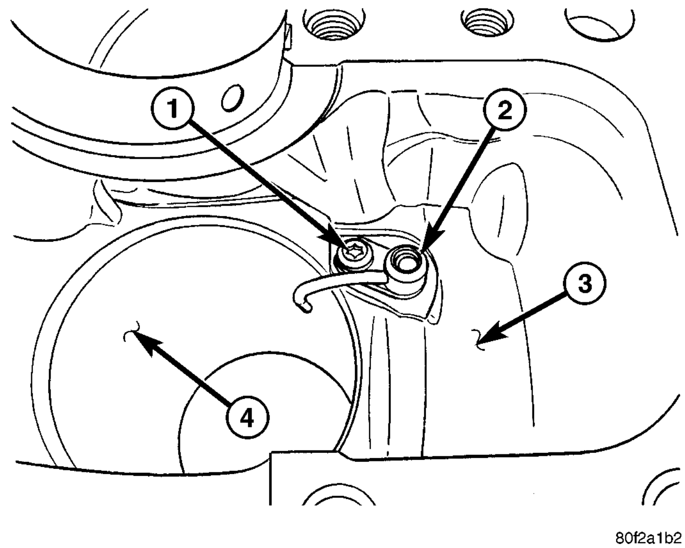


Fig. 75 Oil Jet Fastener - 2.4L Turbo

1 - FASTENER - 12 N·m (105 in. lbs.)
2 - OIL JET
3 - ENGINE BLOCK
4 - CYLINDER WALL

(4) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston (Fig. 77). **Be sure position of rings does not change during this operation** .

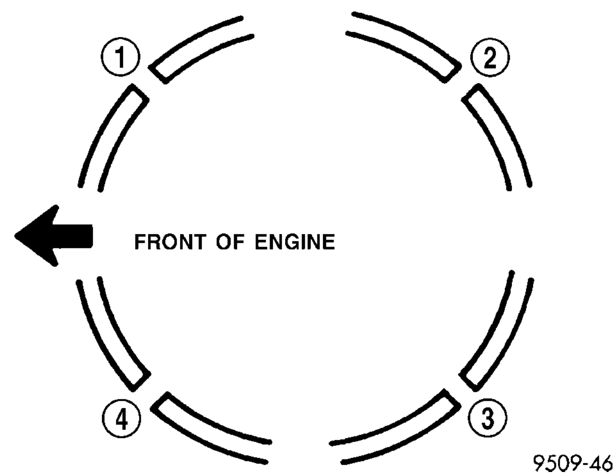


Fig. 76 Piston Ring End Gap Position

1 - GAP OF LOWER SIDE RAIL
2 - NO. 1 RING GAP
3 - GAP OF UPPER SIDE RAIL
4 - NO. 2 RING GAP AND SPACER EXPANDER GAP

(5) The directional stamp on the piston should face toward the front of the engine (Fig. 72).

(6) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

PISTON & CONNECTING ROD (Continued)

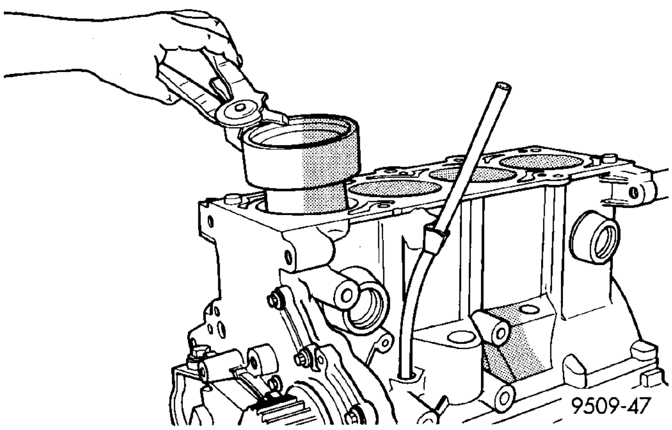


Fig. 77 Piston—Installation

(7) Install connecting rod upper bearing half into connecting rod. Install Special Tool 8189, connecting rod guides onto connecting rod (Fig. 74).

CAUTION: Do not damage the oil jet when installing the piston/connecting rod (Fig. 78).

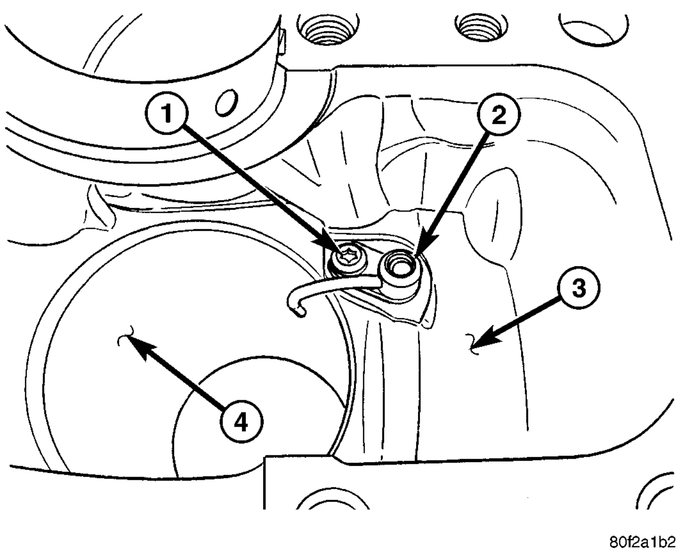


Fig. 78 Oil Jet Fastener - 2.4L Turbo

1 - FASTENER - 12 N·m (105 in. lbs.)
2 - OIL JET
3 - ENGINE BLOCK
4 - CYLINDER WALL

(8) Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

(9) Remove Special Tool 8189, connecting rod guides.

NOTE: The connecting rod cap bolts should not be reused.

(10) Before installing the **NEW** bolts, the threads should be coated with clean engine oil.

(11) Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.

(12) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

(13) Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

(14) Using a feeler gauge, check connecting rod side clearance (Fig. 79). (Refer to 9 - ENGINE - SPECIFICATIONS) for connecting rod side clearance.

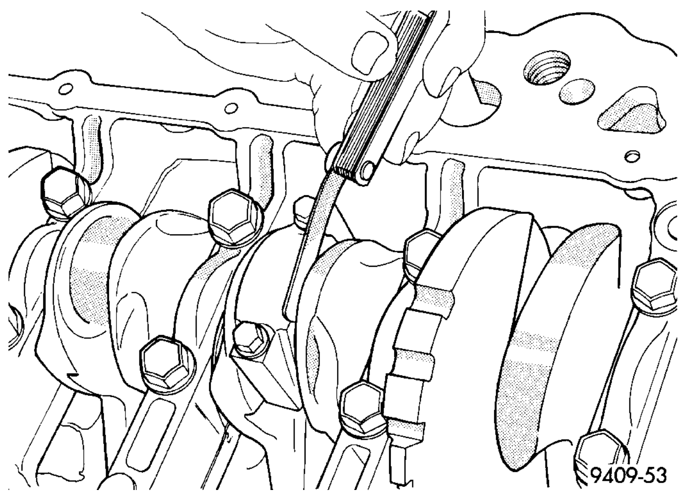


Fig. 79 Checking Connecting Rod Side Clearance - Typical

(15) Install Balance Shaft Carrier Assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT CARRIER - INSTALLATION).

(16) Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(17) Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

CONNECTING ROD BEARINGS

STANDARD PROCEDURE

CONNECTING ROD - FITTING

(1) For measuring connecting rod bearing clearance procedure and use of Plastigage(Refer to 9 - ENGINE - STANDARD PROCEDURE). For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS)

NOTE: The rod bearing bolts should not be reused.

(2) Before installing the **NEW** bolts the threads should be oiled with clean engine oil.

(3) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

(4) Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

(5) Using a feeler gauge, check connecting rod side clearance (Fig. 80). Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

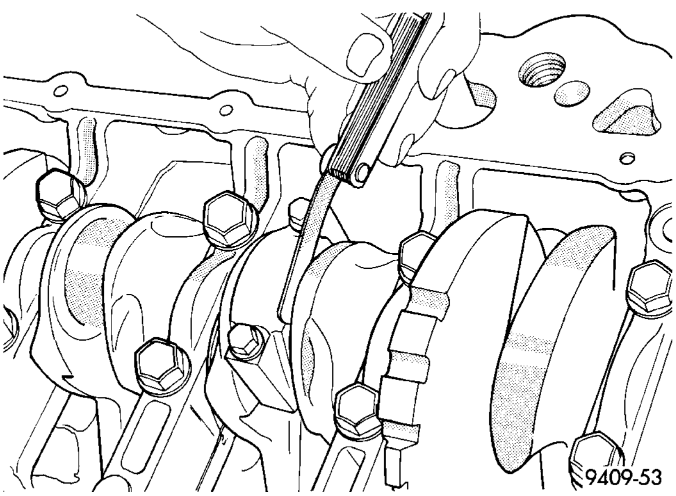


Fig. 80 Connecting Rod Side Clearance - Typical

PISTON RINGS

STANDARD PROCEDURE

PISTON RING - FITTING

(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 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge (Fig. 81). Refer to Engine Specifications.

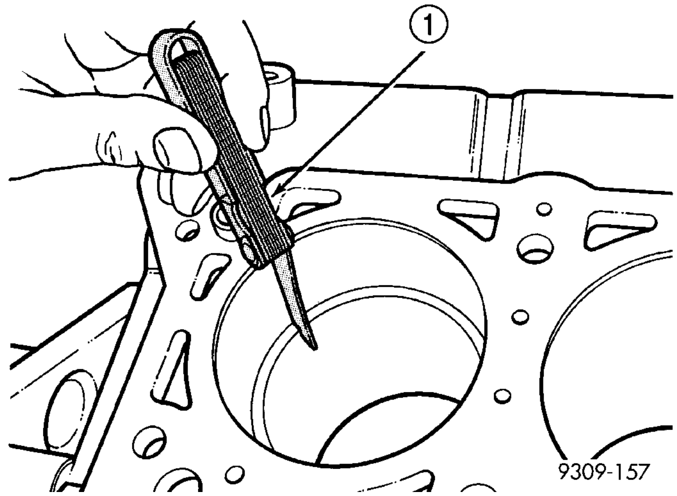


Fig. 81 Piston Ring Gap

1 - FEELER GAUGE

(2) Check piston ring to groove side clearance (Fig. 82). Refer to Engine Specifications.

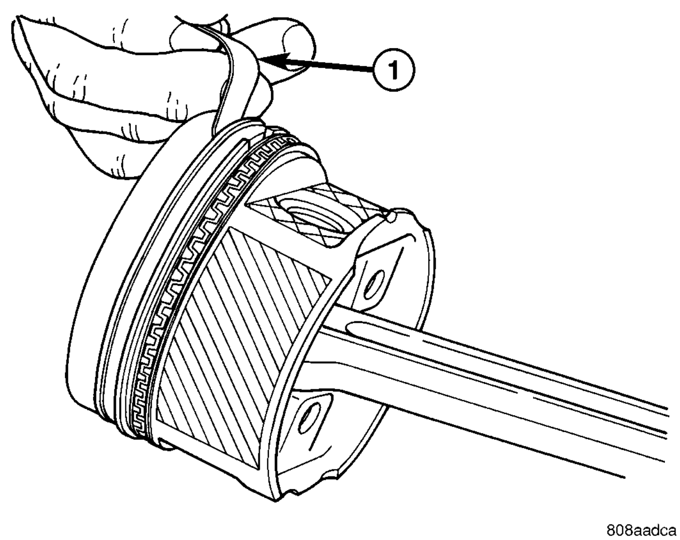


Fig. 82 Piston Ring Side Clearance

1 - FEELER GAUGE

PISTON RINGS (Continued)

REMOVAL

(1) Using a suitable ring expander, remove upper and intermediate piston rings (Fig. 83).

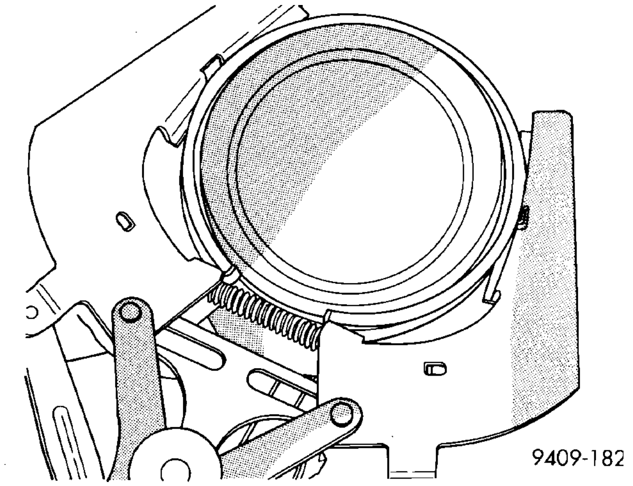


Fig. 83 Piston Rings—Removing and Installing

(2) Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.

(3) Clean ring grooves of any carbon deposits.

INSTALLATION

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.

Install rings with manufacturers identification mark facing up, to the top of the piston (Fig. 84).

CAUTION: Install piston rings in the following order:

1. Oil ring expander.
2. Upper oil ring side rail.
3. Lower oil ring side rail.
4. No. 2 Intermediate piston ring.
5. No. 1 Upper piston ring.

(1) Install oil ring expander (Fig. 84).

(2) Install upper side rail first and then the lower side rail. Install the side rails by placing one end between the piston ring groove and the oil ring 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. 85).**

(3) Install No. 2 piston ring and then No. 1 piston ring (Fig. 84).

(4) Position piston ring end gaps as shown in (Fig. 86).

(5) 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.

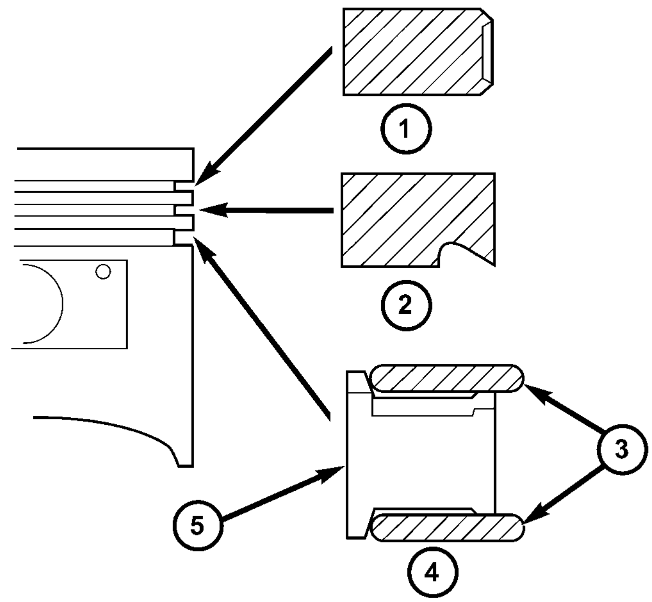


Fig. 84 Piston Ring Installation

1 - NO. 1 PISTON RING
2 - NO. 2 PISTON RING
3 - SIDE RAIL
4 - OIL RING
5 - SPACER EXPANDER

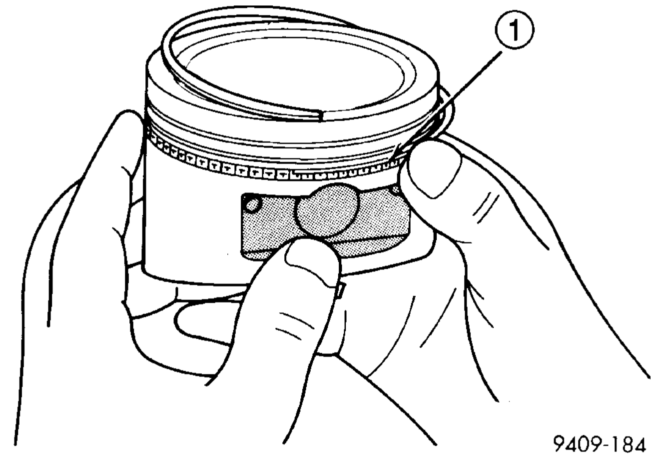


Fig. 85 Installing Side Rail

1 - SIDE RAIL END

STRUCTURAL COLLAR

REMOVAL

STRUCTURAL COLLAR

(1) Raise vehicle on hoist.

(2) Remove bolts attaching bending strut to engine and transaxle (Fig. 87). Remove strut.

(3) Remove bolts attaching collar and clutch slave cylinder to transaxle (Fig. 87).

STRUCTURAL COLLAR (Continued)

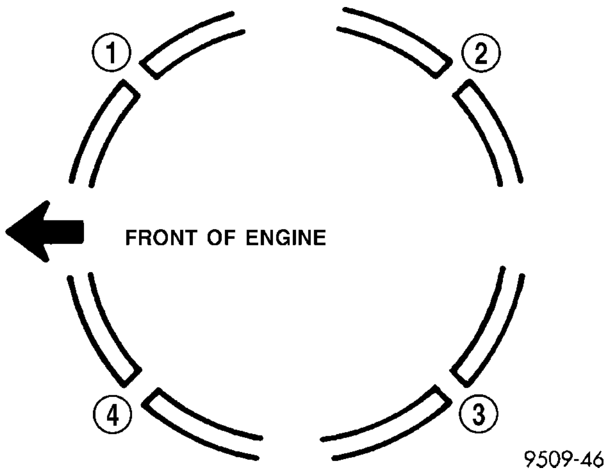


Fig. 86 Piston Ring End Gap Position

1 - GAP OF LOWER SIDE RAIL
2 - NO. 1 RING GAP
3 - GAP OF UPPER SIDE RAIL
4 - NO. 2 RING GAP AND SPACER EXPANDER GAP

(4) Remove remaining bolts attaching collar to oil pan and transaxle (Fig. 87). Remove collar.

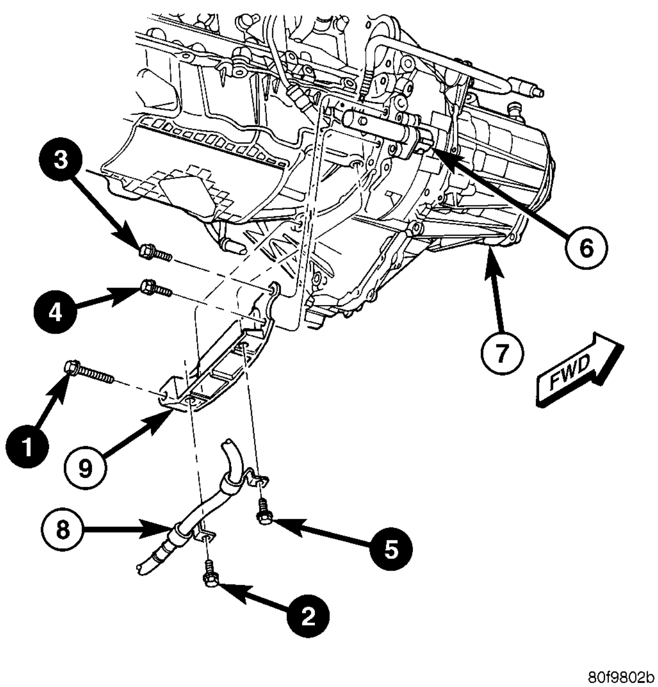


Fig. 87 Structural Collar and Bending Strut - (Manual Transaxle Equipped)

1–5 – BOLT TIGHTENING SEQUENCE
6 – HYDRAULIC CLUTCH SLAVE CYLINDER
7 – TRANSAXLE
8 – POWER STEERING HOSE
9 – COLLAR

INSTALLATION

STRUCTURAL COLLAR

CAUTION: Torque procedure for the structural collar and bending strut must be followed or damage could occur to oil pan, collar, and/or bending strut.

(1) Perform the following steps for installing structural collar and bending strut. Refer to (Fig. 87):

- Step 1: Place collar into position between transaxle and oil pan. Install collar to transaxle bolt (1), **hand start only**.
- Step 2: Position power steering hose support bracket (Fig. 87) and install collar to oil pan bolt (2), **hand tight only**.
- Step 3: Position clutch slave cylinder into mounting position and install bolts (3) and (4) **hand tight only**.
- Step 4: Position power steering hose support bracket and install the remaining collar to oil pan bolt (5) **hand tight only**.
- Step 5: Final torque all bolts in sequence shown in (Fig. 87) to the following torque values:
  - Bolt (1) to 101 N·m (75 ft. lbs.)
  - Bolts (2) and (5) to 61 N·m (45 ft. lbs.)
  - Bolts (3) and (4) to 28 N·m (20 ft. lbs.)

(2) Lower vehicle.

VIBRATION DAMPER

REMOVAL

(1) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove crankshaft damper bolt.

(3) Remove damper by using Special Tool 1026 and Insert 6827A (Fig. 88).

INSTALLATION

(1) Install crankshaft damper using Special Tool 6792 (M12 1.75 x 150 mm bolt, washer, thrust bearing and nut).

NOTE: Lubricate the threads of the M12 1.75 x 150 mm bolt using Mopar® Nickel Anti-seize Compound or equivalent, before beginning to press the damper on.

(2) Apply Mopar® Lock & Seal Adhesive (Medium Strength Threadlocker) to crankshaft damper bolt and tighten to 136 N·m (100 ft. lbs.) (Fig. 89).

VIBRATION DAMPER (Continued)

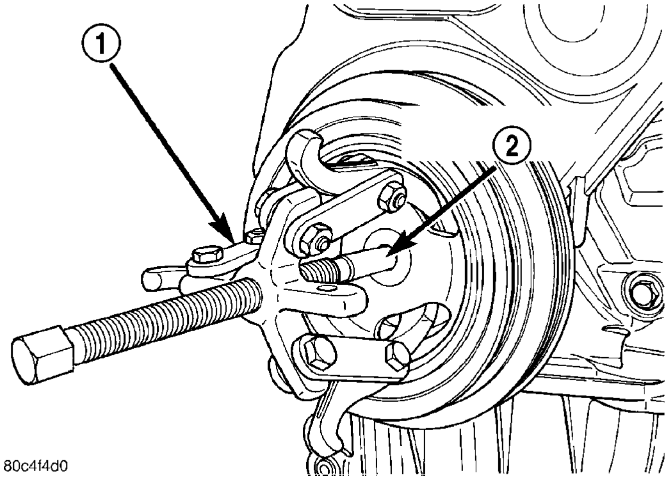


Fig. 88 Crankshaft Damper—Removal

1 - SPECIAL TOOL 1026 3 - JAW PULLER
2 - SPECIAL TOOL 6827A INSERT

(3) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

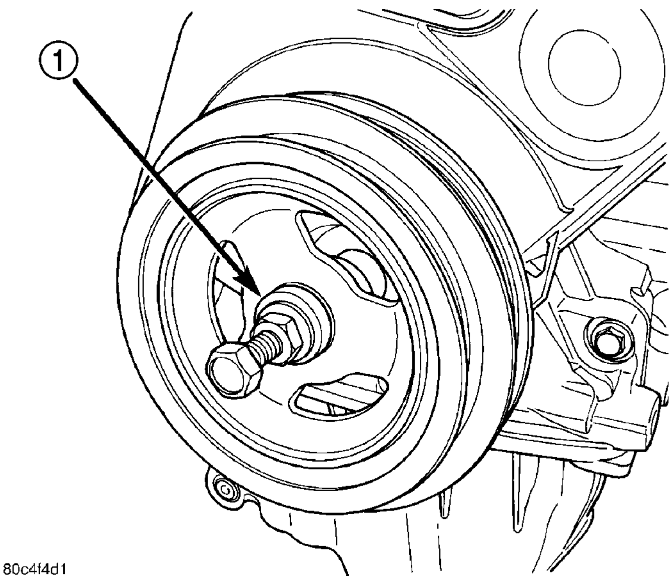


Fig. 89 Crankshaft Damper—Installation

1 - SPECIAL TOOL 6792

ENGINE MOUNTING

DESCRIPTION

The engine mounting system consists of a four-point system utilizing two load-carrying mounts and two torque struts. The load-carrying mounts are located on each frame rail. The two torque controlling struts are attached at the front of the engine, straddling the right side load-carrying mount. The upper strut connects to the suspension strut tower and the lower to the suspension crossmember.

LEFT MOUNT

REMOVAL

(1) Remove air cleaner assembly.
(2) Disconnect negative cable from battery.
(3) Remove bolts attaching the power distribution center (PDC) bracket to left mount and battery tray.
(4) Support transaxle with a suitable jack.
(5) Remove mount to transaxle bolts (Fig. 90).
(6) Remove left mount bracket to body frame rail fasteners (Fig. 90).
(7) Remove mount.

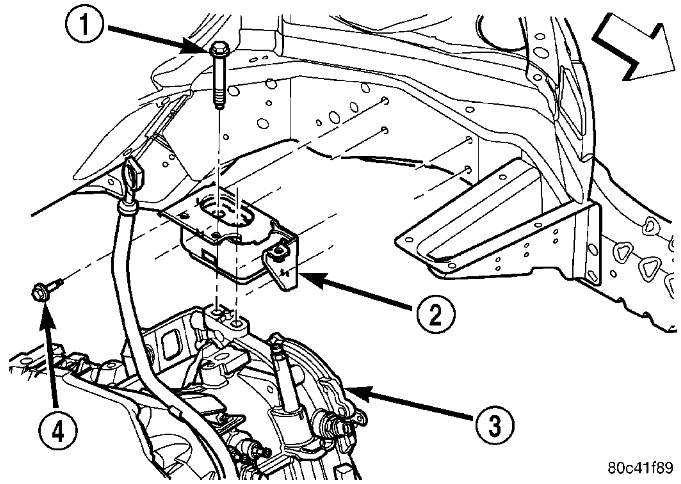


Fig. 90 Left Mount

1 - BOLT
2 - LEFT MOUNT
3 - TRANSAXLE
4 - BOLT

INSTALLATION

(1) Install engine mount bracket to body frame rail and tighten fasteners to 28 N·m (250 in. lbs.) (Fig. 90).
(2) Position engine/transaxle for installation of mount to transaxle bolts. Install and tighten bolts to 68 N·m (50 ft. lbs.) (Fig. 90).
(3) Remove jack from under transaxle.
(4) Install the power distribution center (PDC).
(5) Connect negative cable to battery.
(6) Install air cleaner assembly.

RIGHT MOUNT

REMOVAL

(1) Remove the engine assembly for the required clearance to access the engine mount (Refer to 9 - ENGINE - REMOVAL).

RIGHT MOUNT (Continued)

NOTE: The right engine mount attaching holes are slightly oversize to compensate for manufacturing tolerances. The mount has been set at the manufacturing plant for proper powertrain alignment. Therefore, it is necessary to mark the position of the mount before the attaching bolts are loosened.

(2) Using a permanent ink marker or equivalent, mark the position of engine mount to the body frame rail.

(3) Remove bolts attaching mount to body (Fig. 91).

(4) Remove mount.

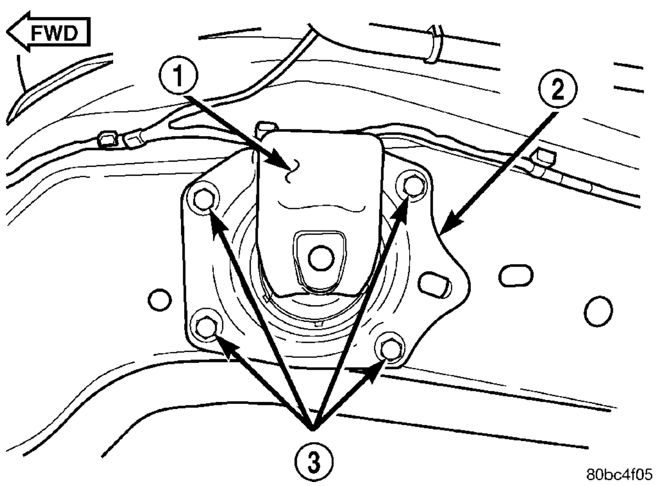


Fig. 91 Engine Mount—Right

1 - SNUBBER PAD
2 - RIGHT ENGINE MOUNT
3 - BOLTS

INSTALLATION

(1) Position mount into the original position on body frame rail (Fig. 91).

NOTE: Engine mount must be installed in the original position on body frame rail. If mount was not marked or frame rail was replaced, perform the following procedure.

(2) Perform the following procedure if the mount position was not previously marked, or the frame rail was replaced:

(a) Insert new mount loosely in frame rail.

(b) Align the four holes in the mount with the mating holes in the rail such that the holes are concentric (frame rail holes centered in the mount holes).

(c) Using a permanent ink marker or equivalent, mark the position of engine mount to the body frame rail while maintaining mounting hole concentricity.

(3) Ensure the mount maintains originally marked position and install mount bolts. Tighten bolts to 28 N·m (250 in. lbs.) (Fig. 91).

(4) Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).

TORQUE STRUT

REMOVAL

REMOVAL - UPPER

(1) Remove bolts attaching upper torque strut to shock tower bracket and engine mount bracket (Fig. 92).

(2) Remove timing belt front upper cover (if A/C equipped).

(3) Remove the upper torque strut.

REMOVAL - LOWER

(1) Raise vehicle on hoist.

(2) Remove accessory drive belt splash shield (Fig. 93).

(3) Remove pencil strut (Fig. 94).

(4) Remove bolts attaching lower torque strut to crossmember and strut bracket (Fig. 94).

(5) Remove lower torque strut.

INSTALLATION

INSTALLATION - UPPER

(1) Position the upper torque strut into mounting location (Fig. 92).

(2) Move torque strut aside (towards right fender) and install timing belt front upper cover (if A/C equipped).

(3) Install the torque strut mounting bolts and perform the torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

INSTALLATION - LOWER

(1) Position lower torque strut into mounting locations.

(2) Install mounting bolts and perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(3) Install pencil strut and tighten nuts to 58 N·m (43 ft. lbs.) (Fig. 94).

(4) Install accessory belt splash shield (Fig. 93) and lower vehicle.

TORQUE STRUT (Continued)

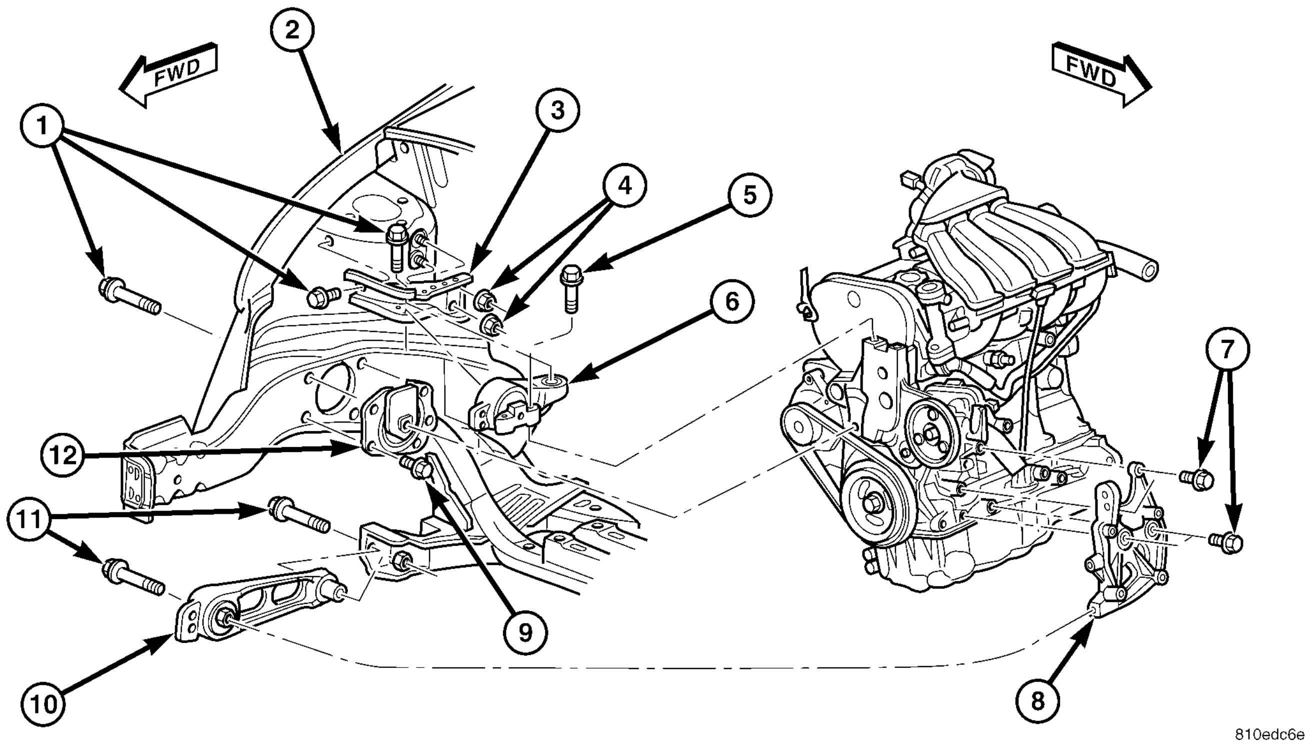


Fig. 92 Engine Mount - Right Side

1 - BOLT
2 - RIGHT FENDER
3 - UPPER TORQUE STRUT BRACKET
4 - NUTS
5 - BOLT
6 - UPPER TORQUE STRUT
7 - BOLT
8 - LOWER TORQUE STRUT BRACKET
9 - BOLT
10 - LOWER TORQUE STRUT
11 - BOLT
12 - RIGHT ENGINE MOUNT

ADJUSTMENTS

ENGINE TORQUE STRUT ADJUSTMENT

The upper and lower torque struts need to be adjusted together to assure proper engine positioning and engine mount loading. Whenever a torque strut bolt(s) is loosened, this procedure must be performed.

(1) Remove accessory drive belt splash shield (Fig. 93).

(2) Remove pencil strut (Fig. 94).

(3) Loosen the upper and lower torque strut attaching bolt at the suspension crossmember and shock tower bracket (Fig. 92).

(4) The engine position may now be adjusted by positioning a suitable floor jack on the forward edge of the transmission bell housing (Fig. 95).

NOTE: The floor jack must be positioned as shown in (Fig. 95) to prevent minimal upward lifting of the engine.

(5) With the engine supported, remove the upper and lower torque strut attachment bolt(s) at shock tower bracket and suspension crossmember (Fig. 92). Verify that the torque struts are free to move within the shock tower bracket and crossmember. Reinstall the torque strut bolt(s), but do not tighten.

(6) Carefully apply upward force, allowing the upper engine to rotate rearward until the distance between the center of the rearmost attaching bolt on the engine mount bracket (point “A”) and the center of the hole on the shock tower bracket (point “B”) is 119 mm (4.70 in.) (Fig. 96).

CAUTION: The engine must be held in position with jack until both the upper and lower torque strut bolts are tightened.

(7) With the engine held at the proper position, tighten both the upper and lower torque strut bolts to 115 N·m (85 ft. lbs.) (Fig. 92).

TORQUE STRUT (Continued)

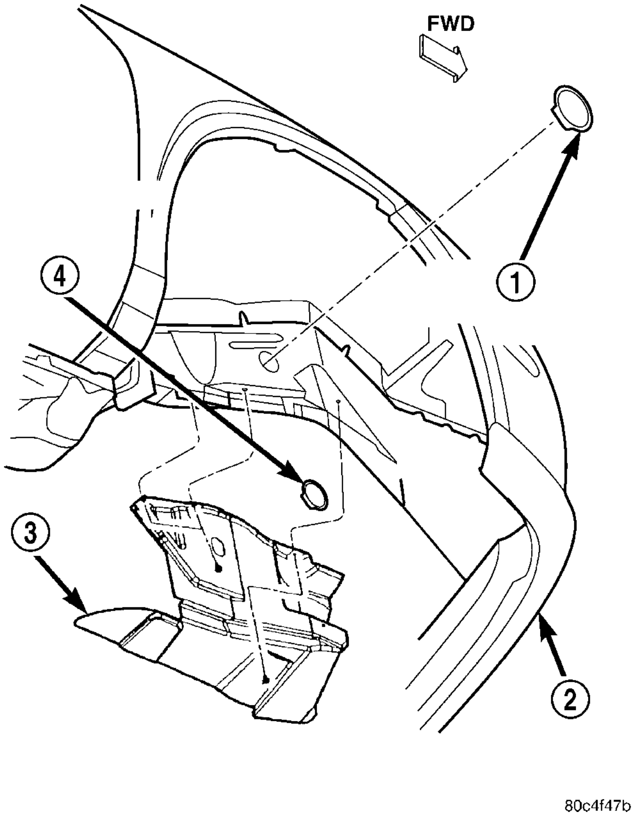


Fig. 93 Splash Shield

1 - RIGHT MOUNT BOLT ACCESS PLUG
2 - FASCIA
3 - SPLASH SHIELD
4 - CRANKSHAFT BOLT ACCESS PLUG

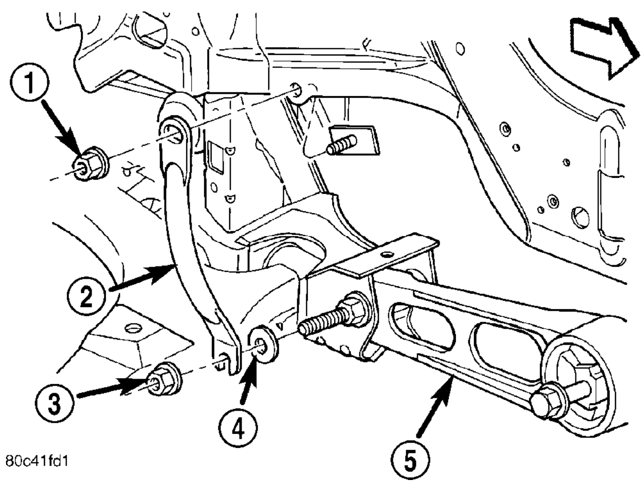


Fig. 94 Pencil Strut

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

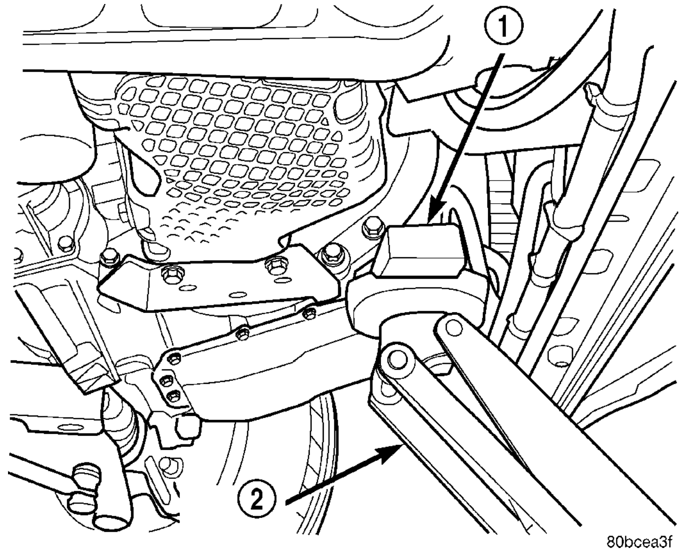


Fig. 95 Floor Jack Positioning

1 - WOOD BLOCK
2 - FLOOR JACK

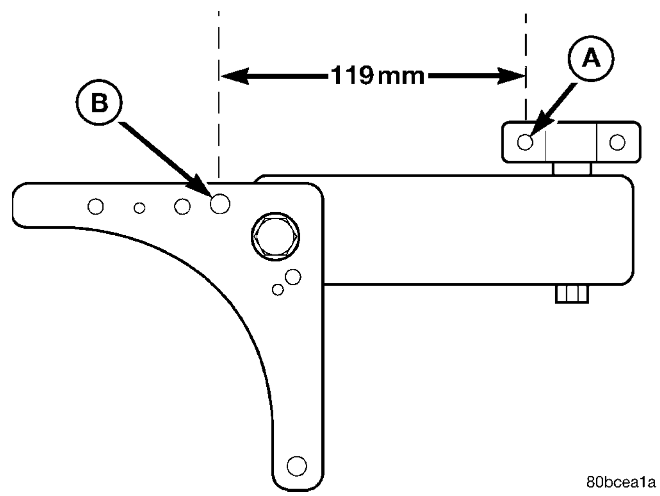


Fig. 96 Engine Position Measurement

(8) Remove the floor jack.

(9) Install pencil strut and tighten nuts to 58 N·m (43 ft. lbs.) (Fig. 94).

(10) Install accessory drive belt splash shield (Fig. 93).

LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is mounted in the front engine cover and driven by the crankshaft.

OPERATION

Engine oil drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. 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. Balance shaft lubrication is provided through an oil passage from the number one 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 the rear shaft bearing journals. A vertical hole at the number five bulkhead routes pressurized oil through a restrictor (integral to the cylinder head gasket) 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. Lubrication of the camshaft lobes are provided by small holes in the camshaft bearing caps that are directed towards each lobe. 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) Disconnect and remove oil pressure switch. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL)

(2) Install Special Tools C-3292 Gauge with 8406 Adaptor fitting.

(3) Start engine and record oil pressure. Refer to Specifications for correct oil pressure requirements. (Refer to 9 - ENGINE - SPECIFICATIONS)

CAUTION: If oil pressure is 0 at idle, do not perform the 3000 RPM test

(4) If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open, a clogged oil pick-up screen or a damaged oil pick-up tube O-ring.

(5) After test is complete, remove test gauge and fitting.

(6) Install oil pressure switch and connector. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - INSTALLATION)

OIL

STANDARD PROCEDURE

ENGINE OIL LEVEL CHECK

The best time to check engine oil level is after the vehicle 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. Remove dipstick (Fig. 97) and observe oil level. Add oil only when the level is at or below the MIN mark (Fig. 98).

CAUTION: Do not operate engine if the oil level is above the MAX mark on the dipstick. Excessive oil volume can cause oil aeration which can lead to engine failure due to loss of oil pressure or increase in oil temperature.

STANDARD PROCEDURE - ENGINE OIL AND FILTER CHANGE

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.

Change engine oil at mileage and time intervals described in the Maintenance Schedule (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

(1) Run engine until achieving normal operating temperature.

(2) Position the vehicle on a level surface and turn engine off.

(3) Remove oil fill cap (Fig. 97).

(4) Raise vehicle on hoist.

(5) Place a suitable oil collecting container under oil pan drain plug.

OIL (Continued)

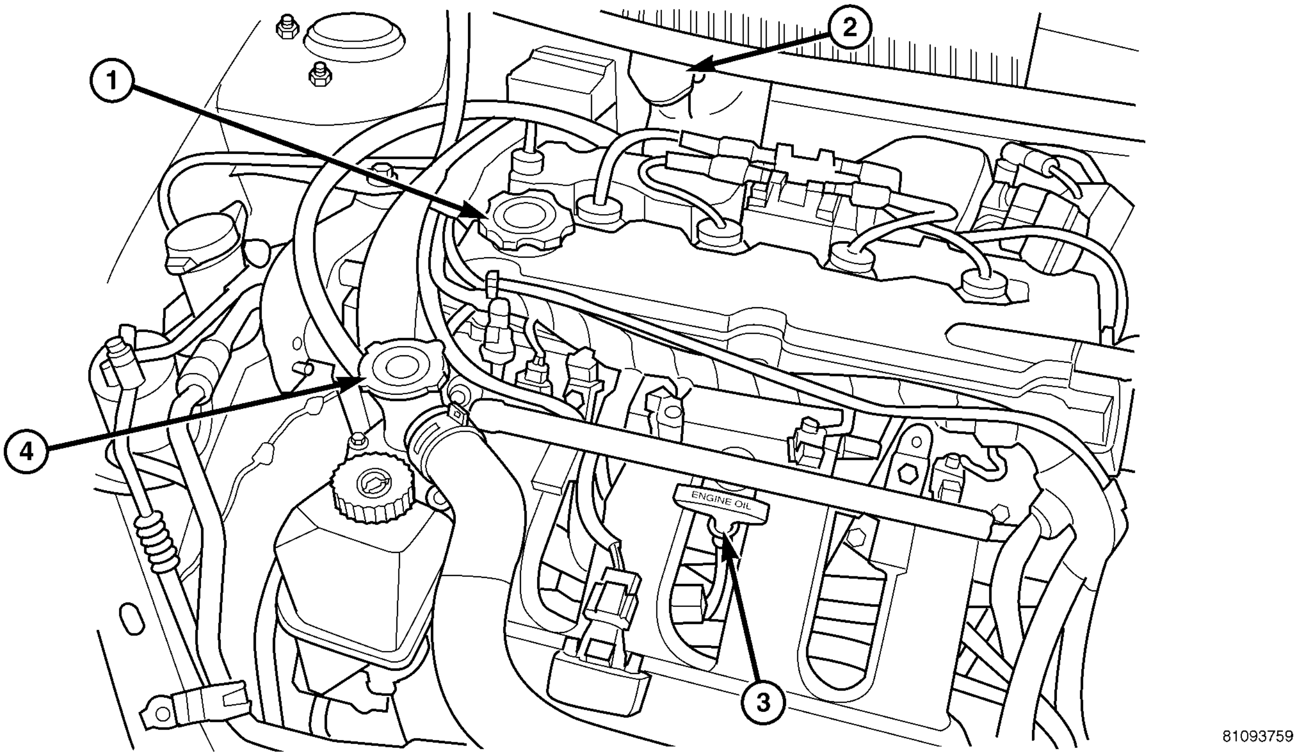


Fig. 97 Fluid Level Service Locations

1 - WASHER FLUID
2 - ENGINE OIL FILL
3 - COOLANT RECOVERY CONTAINER
4 - BRAKE MASTER CYLINDER
5 - CLUTCH MASTER CYLINDER
6 - ENGINE OIL DIPSTICK
7 - POWER STEERING FLUID
8 - COOLANT PRESSURE CAP

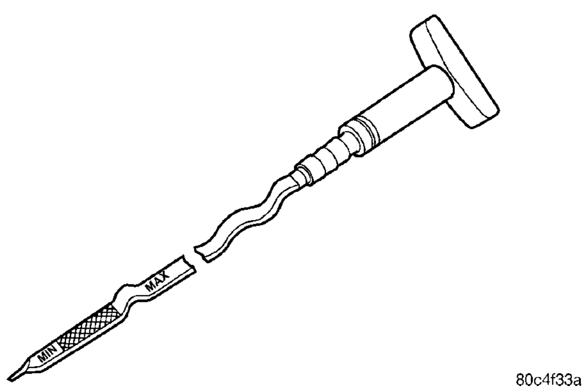


Fig. 98 Engine Oil Dipstick

(6) Remove oil pan drain plug (Fig. 99) and allow oil to drain into collecting container. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.

(7) Remove oil filter (Fig. 99) (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(8) Install oil pan drain plug. Torque drain plug to 28 N·m (20 ft. lbs.).

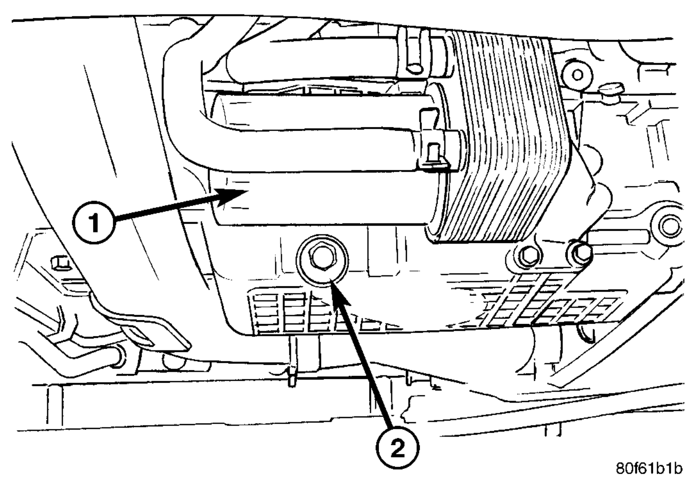


Fig. 99 Oil Filter and Drain Plug - 2.4L Turbo

1 - OIL FILTER
2 - DRAIN PLUG

(9) Install new oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).

OIL (Continued)

(10) Lower vehicle and fill crankcase with specified type and amount of engine oil (Refer to LUBRICATION & MAINTENANCE/SPECIFICATIONS - FLUID CAPACITIES) and (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).

(11) Install oil fill cap (Fig. 97).

(12) Start engine and inspect for leaks.

(13) Stop engine and inspect oil level.

OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. Replace oil filter with a Mopar® or the equivalent.

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.

OIL FILTER

REMOVAL

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) Using a suitable filter wrench, turn oil filter (Fig. 99) counterclockwise to remove.

INSTALLATION

(1) Clean and check filter mounting surface. The surface must be smooth, flat and free of debris or pieces of gasket.

(2) Lubricate new oil filter gasket.

(3) Screw oil filter (Fig. 99) on until the gasket contacts base. Tighten to 21 N·m (15 ft. lbs.).

OIL FILTER ADAPTER

REMOVAL

(1) Raise vehicle on hoist.

(2) Place a suitable oil collecting container under oil filter.

(3) Remove oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(4) Remove oil cooler connector bolt. **DO NOT** disconnect coolant lines from oil cooler. Reposition oil cooler.

(5) Remove filter adapter attaching bolts (Fig. 100).

(6) Remove filter adapter and gasket (Fig. 100).

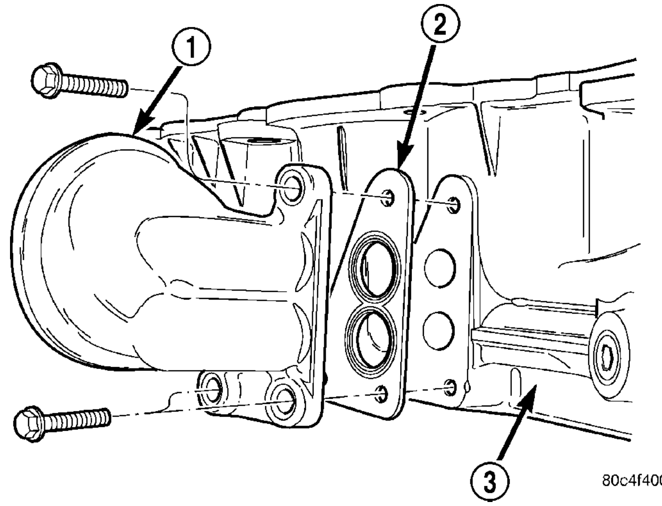


Fig. 100 Oil Filter Adaptor

1 - OIL FILTER ADAPTER
2 - GASKET
3 - OIL PAN

INSTALLATION

(1) Clean all gasket sealing surfaces.

(2) Install gasket and filter adaptor to oil pan (Fig. 100). Tighten bolts to 12 N·m (105 in. lbs.).

(3) Replace oil cooler seal. Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab. Install oil cooler connector bolt. Torque connector bolt to 55 N·m (41 ft. lbs.).

(4) Install oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).

(5) Lower vehicle and check engine oil level. Adjust level as necessary.

OIL PAN

REMOVAL

(1) Raise vehicle on hoist.

(2) Drain engine oil and remove oil filter.

(3) Remove accessory drive belt splash shield.

(4) Remove turbocharger to charge air cooler hose assembly (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/CHARGE AIR COOLER AND HOSES - REMOVAL).

(5) Remove oil cooler connector bolt. **DO NOT** disconnect coolant lines from oil cooler. Reposition oil cooler.

(6) Remove structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COLLAR - REMOVAL).

(7) Remove lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(8) Remove oil filter adapter and gasket (Fig. 101).

(9) Remove oil pan and gasket (Fig. 101).

OIL PAN (Continued)

(10) Clean oil pan and all gasket surfaces.

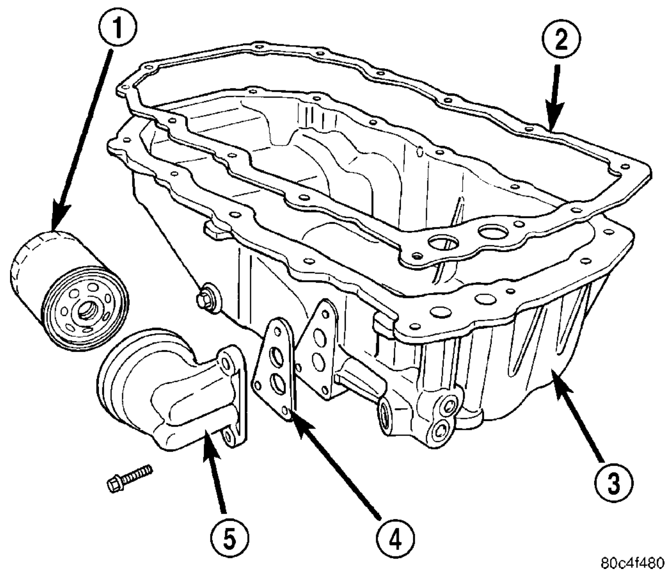


Fig. 101 Oil Pan

1 - OIL FILTER
2 - OIL PAN GASKET
3 - OIL PAN
4 - ADAPTER GASKET
5 - OIL FILTER ADAPTER

INSTALLATION

(1) Apply Mopar® Engine RTV GEN II at the oil pump to engine block parting lines (Fig. 102).

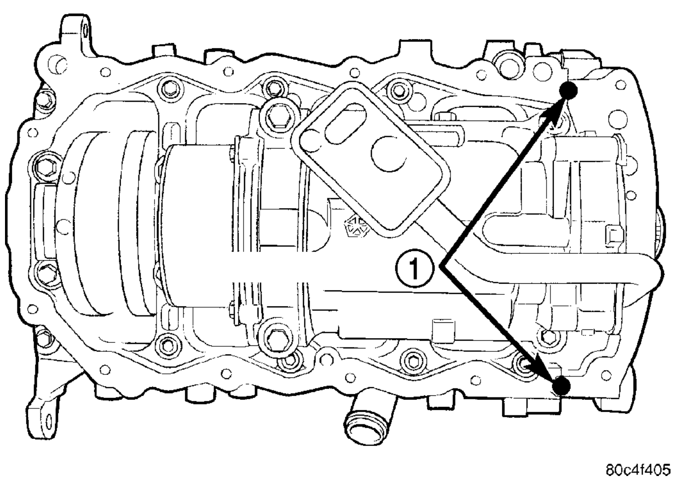


Fig. 102 Oil Pan Sealing

1 - SEALER LOCATIONS

(2) Install oil pan gasket to the block.

(3) Install pan gasket and pan. Tighten screws to 12 N·m (105 in. lbs.).

(4) Install oil filter adapter and gasket (Fig. 101). Tighten screws to 12 N·m (105 in. lbs.).

(5) Replace oil cooler seal. Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab. Install oil cooler connector bolt. Torque connector bolt to 55 N·m (41 ft. lbs.).

(6) Install oil drain plug and oil filter.

(7) Install structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COLLAR - INSTALLATION).

(8) Install lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(9) Install turbocharger to charge air cooler hose assembly (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/CHARGE AIR COOLER AND HOSES - INSTALLATION).

(10) Lower vehicle and fill engine crankcase with proper oil to correct level.

OIL PRESSURE SENSOR/ SWITCH

DESCRIPTION

The oil pressure switch is located on the right rear side of the engine block (Fig. 103). The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

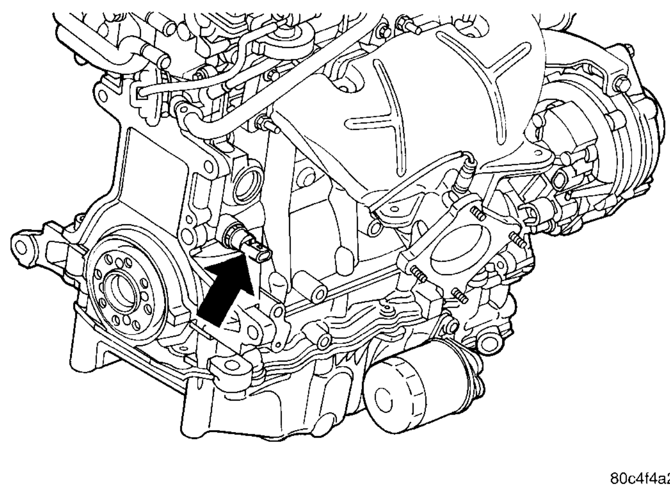


Fig. 103 Oil Pressure Switch

OPERATION

The oil pressure switch is normally "Closed." The switch changes from a ″Closed″ circuit to an ″Open″ circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an ″Open″ circuit to a ″Closed″ circuit, on decreasing pressure, between 2 psig and 4 psig.

OIL PRESSURE SENSOR/SWITCH (Continued)

REMOVAL

(1) Raise vehicle.

(2) Position oil collecting container under pressure switch location.

(3) Disconnect oil pressure switch electrical connector and remove switch (Fig. 104).

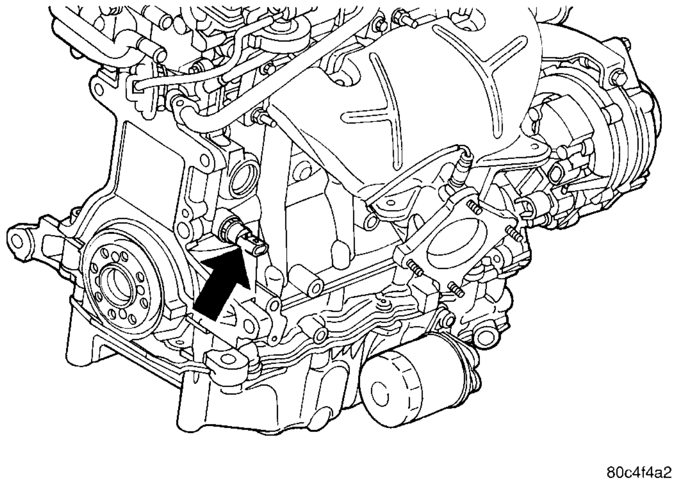


Fig. 104 Engine Oil Pressure Switch

INSTALLATION

(1) Install oil pressure switch and connect electrical connector (Fig. 104).

(2) Lower vehicle.

(3) Start engine and allow to run a minimum of 2 minutes.

(4) Shut engine off and check engine oil level. Adjust level as necessary.

OIL PUMP

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(3) Remove timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(4) Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(5) Remove crankshaft sprocket using Special Tools 6793 and C-4685-C2 (Fig. 105).

(6) Remove crankshaft key (Fig. 106).

(7) Remove oil pick-up tube.

(8) Remove oil pump (Fig. 107) and front crankshaft seal.

DISASSEMBLY

(1) Remove oil pump cover fasteners, and lift off cover (Fig. 108).

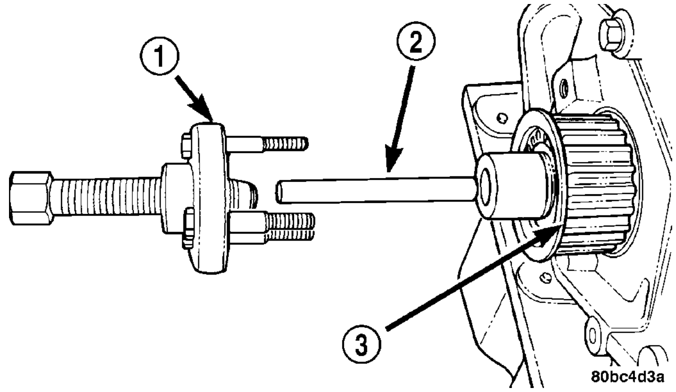


Fig. 105 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

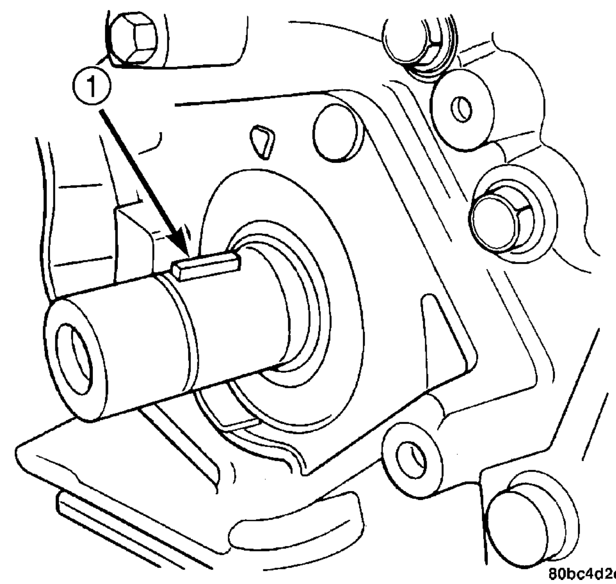


Fig. 106 Crankshaft Key

1 - CRANKSHAFT KEY

(2) Remove pump rotors (Fig. 108).

(3) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

CLEANING

Clean all parts thoroughly.

INSPECTION

(1) Inspect the mating surface of the oil pump. Surface should be smooth. Replace pump cover if scratched or grooved.

(2) Lay a straightedge across the pump cover surface (Fig. 109). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced.

OIL PUMP (Continued)

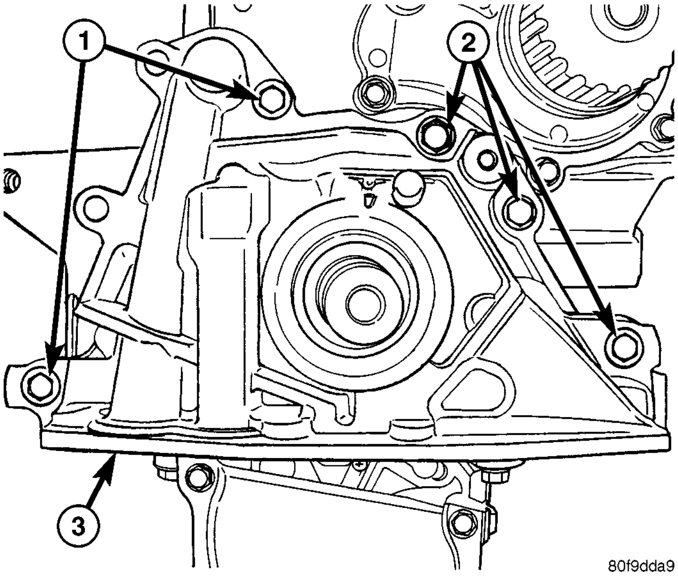


Fig. 107 Oil Pump

1 - BOLTS
2 - BOLTS
3 - OIL PUMP

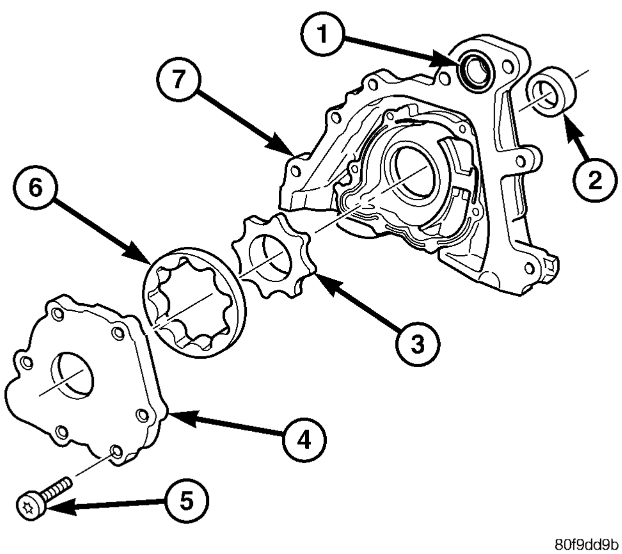


Fig. 108 Oil Pump

1 - O-RING
2 - FRONT CRANKSHAFT SEAL
3 - INNER ROTOR
4 - OIL PUMP COVER
5 - FASTENER
6 - OUTER ROTOR
7 - OIL PUMP BODY

(3) Measure thickness and diameter of outer rotor. If outer rotor thickness measures 10.699 mm (0.421 in.) or less (Fig. 110), or if the diameter is 85.924 mm (3.383 in.) or less, replace outer rotor.

(4) If inner rotor measures 10.699 mm (0.421 in.) or less replace inner rotor (Fig. 111).

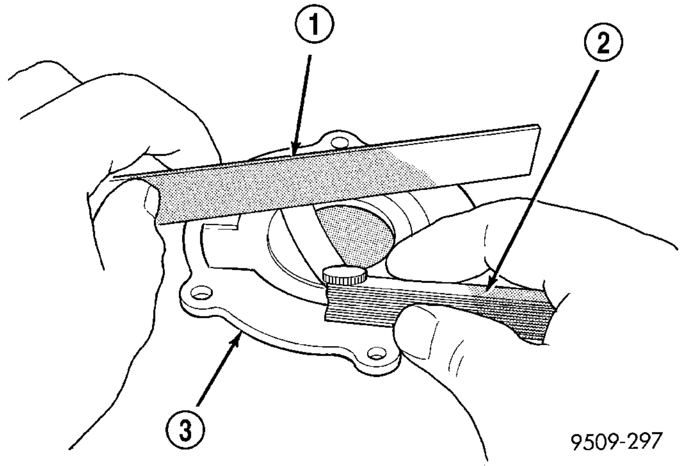


Fig. 109 Checking Oil Pump Cover Flatness

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

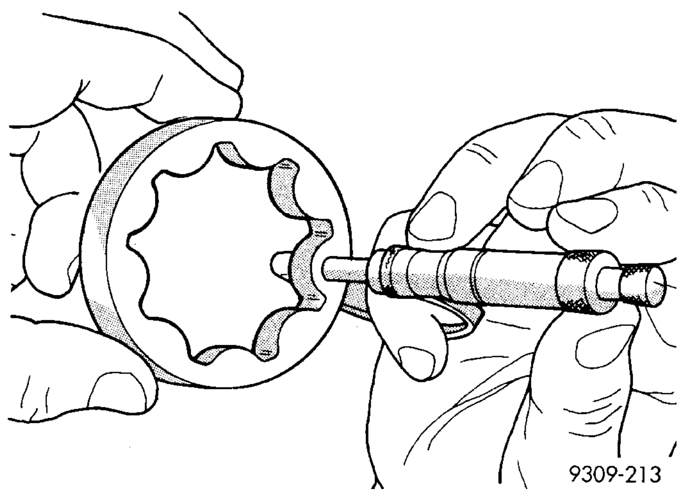


Fig. 110 Measuring Outer Rotor Thickness

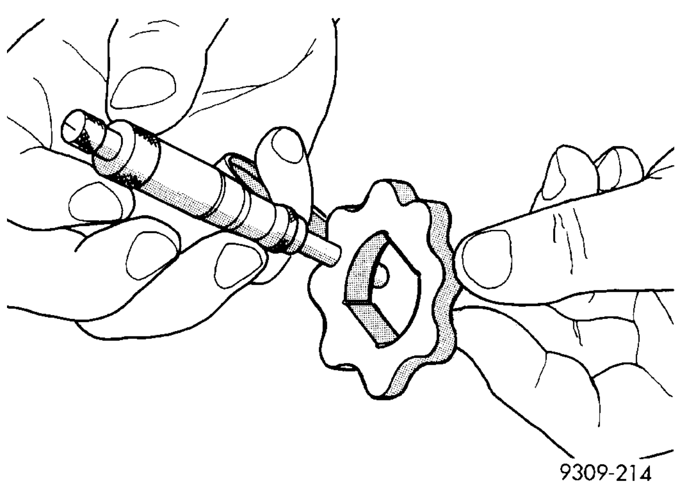


Fig. 111 Measuring Inner Rotor Thickness

OIL PUMP (Continued)

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 fasteners to 13 N·m (118 in. lbs.) (Fig. 108).

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. 112). Install O-ring into oil pump body discharge passage.

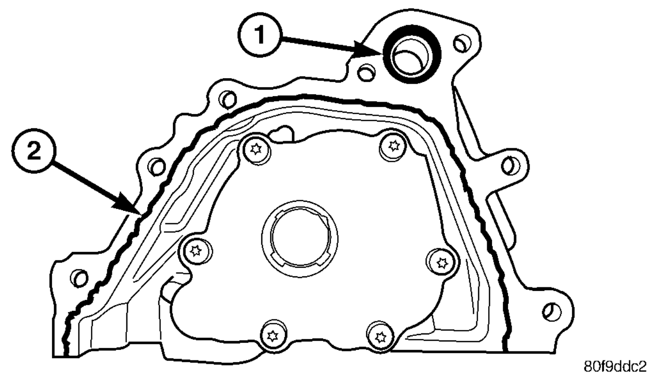


Fig. 112 Oil Pump Sealing

1 - O-RING
2 - SEALER LOCATION

(3) Prime oil pump with engine oil before installation.

(4) Align oil pump rotor flats with flats on crankshaft. Install the oil pump to the block (Fig. 107).

CAUTION: To align, the front crankshaft seal MUST be out of pump, or damage may result.

(5) Install new front crankshaft seal using Special Tool 6780 (Fig. 113).

(6) Install crankshaft key (Fig. 106).

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

(7) Install crankshaft sprocket using Special Tool 6792 (Fig. 114).

(8) Install oil pump pick-up tube.

(9) Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

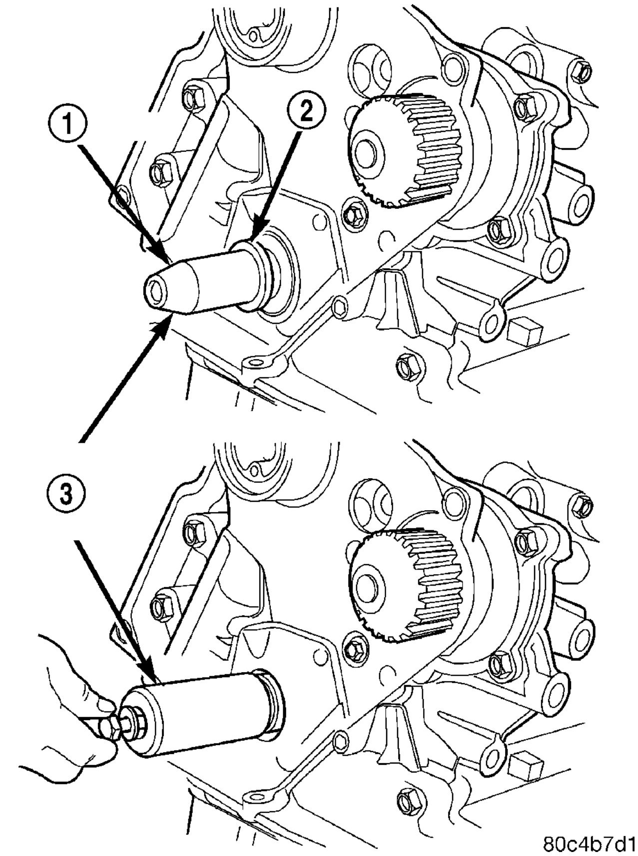


Fig. 113 Front Crankshaft Seal - Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780

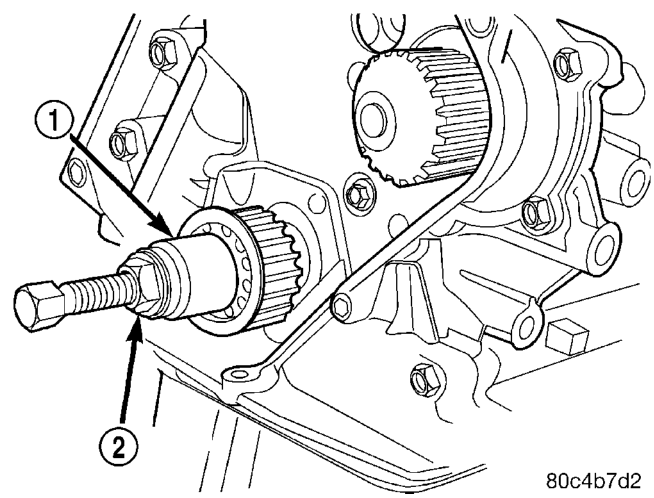


Fig. 114 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

(10) Install timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

OIL PUMP (Continued)

(11) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

OIL JET

DESCRIPTION

The 2.4L Turbocharged engines are equipped with four oil jets installed in the engine block. The oil jets are provided engine oil pressure from the main oil gallery. The oil jets are used to cool the pistons. An integral check ball controls the flow of oil through the oil jet (Fig. 115).

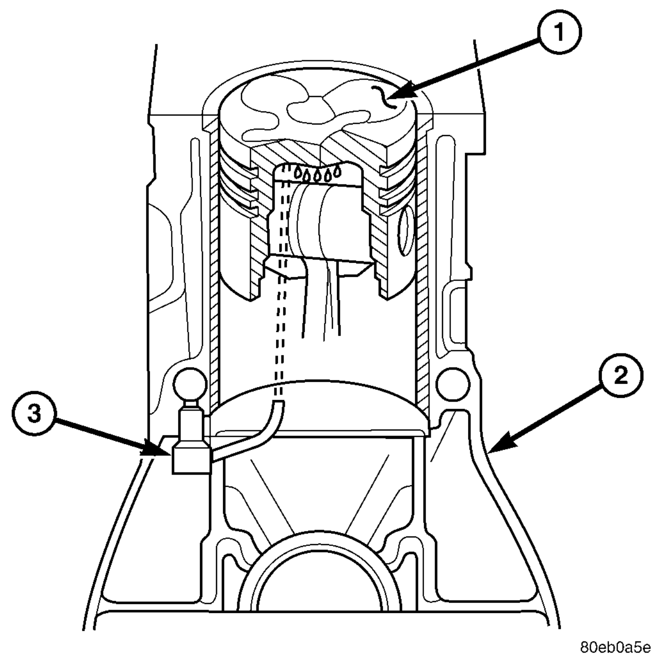


Fig. 115 Oil Jet - 2.4L Turbo

1 - PISTON ASSEMBLY
2 - ENGINE BLOCK
3 - OIL JET

REMOVAL

(1) Remove crankshaft (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - REMOVAL).

(2) Remove oil jet fastener (Fig. 116).

CAUTION: Do Not Pull on Oil Jet Tube

(3) Using pliers or other similar tool, pull oil jet from engine block.

INSTALLATION

(1) Inspect oil jet o-ring (Fig. 117).

(2) Lightly coat o-ring with clean engine oil.

(3) Push oil jet into engine block until it is fully seated.

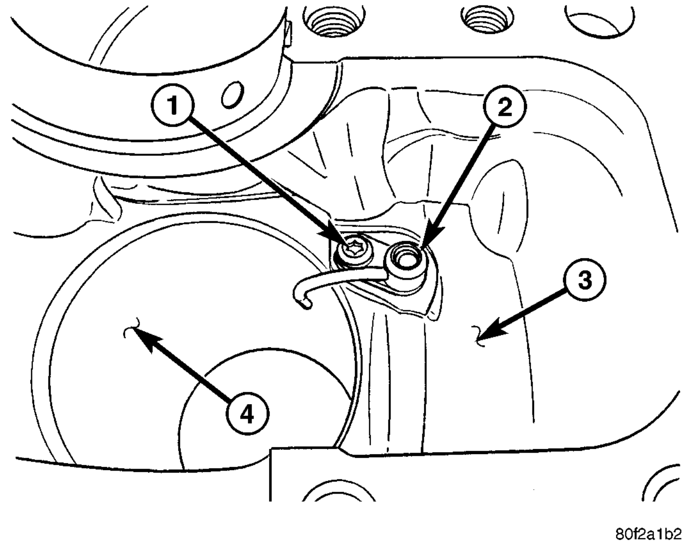


Fig. 116 Oil Jet Fastener - 2.4L Turbo

1 - FASTENER - 12 N·m (105 in. lbs.)
2 - OIL JET
3 - ENGINE BLOCK
4 - CYLINDER WALL

CAUTION: Ensure oil jet is fully seated in engine block before installing fastener. Do Not use the oil jet fastener to draw the oil jet into the engine block. Damage to oil jet may occur.

(4) Install oil jet fastener. Torque fastener to 12 N·m (105 in. lbs.) (Fig. 116).

(5) Install crankshaft (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - INSTALLATION).

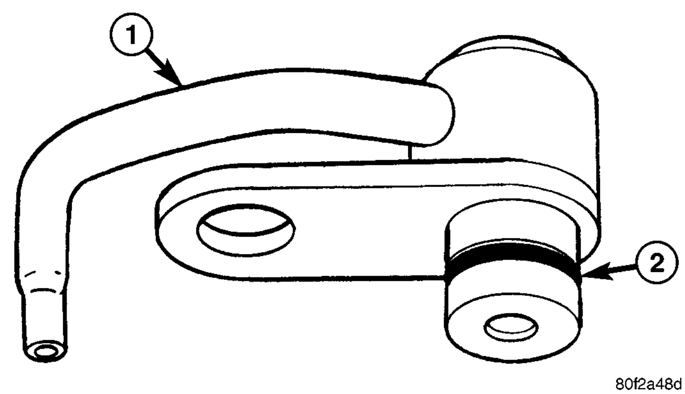


Fig. 117 Oil Jet O-ring

1 - OIL JET
2 - O-RING

OIL COOLER & LINES

DESCRIPTION

An engine oil cooler is used on the 2.4L Turbocharged engine. The cooler is a coolant-to-oil type and mounted between the oil filter and oil filter adapter (Fig. 118).

REMOVAL

(1) Raise vehicle on hoist.
(2) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
(3) Disconnect oil cooler coolant hoses (Fig. 118).
(4) Remove oil filter.
(5) Remove oil cooler connector bolt (Fig. 119).
(6) Remove oil cooler.

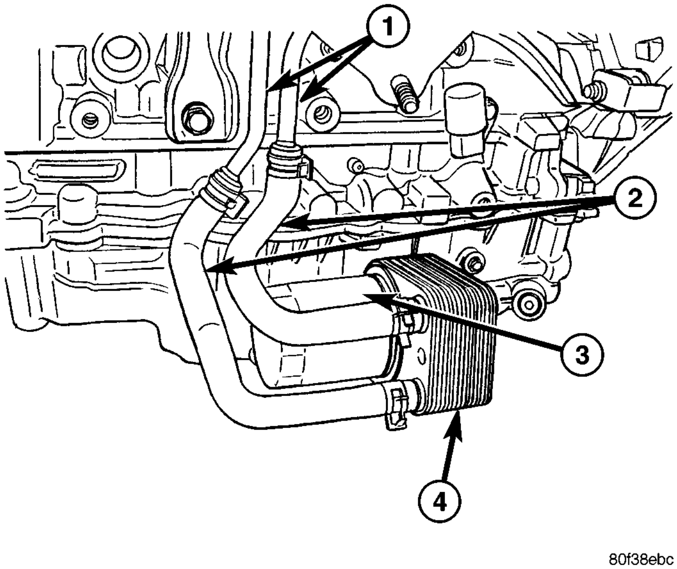


Fig. 118 Oil Cooler and Lines

1 - COOLANT TUBES
2 - COOLANT HOSES
3 - OIL FILTER
4 - OIL COOLER

INSTALLATION

(1) Replace oil cooler seal (Fig. 120).
(2) Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab (Fig. 121).
(3) Install oil cooler connector bolt. Torque connector bolt to 55 N·m (41 ft. lbs.) (Fig. 119).
(4) Install oil filter.
(5) Connect oil cooler coolant hoses (Fig. 118).
(6) Lower vehicle.
(7) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

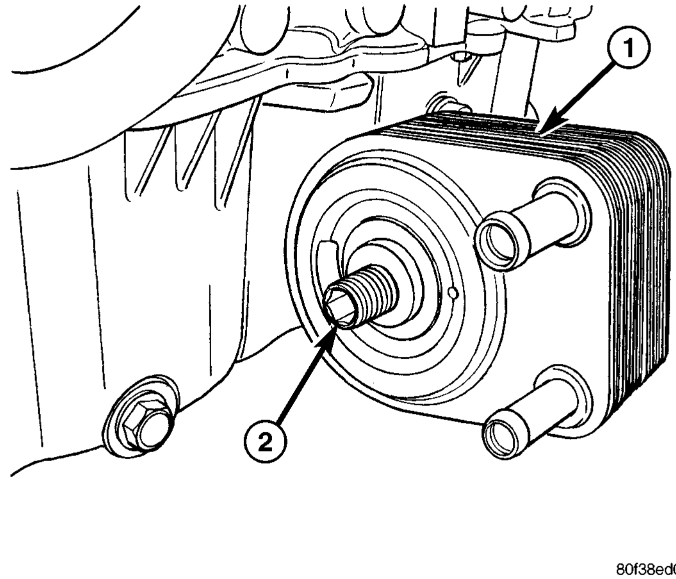


Fig. 119 Oil Cooler Connector Bolt

1 - OIL COOLER
2 - CONNECTOR BOLT

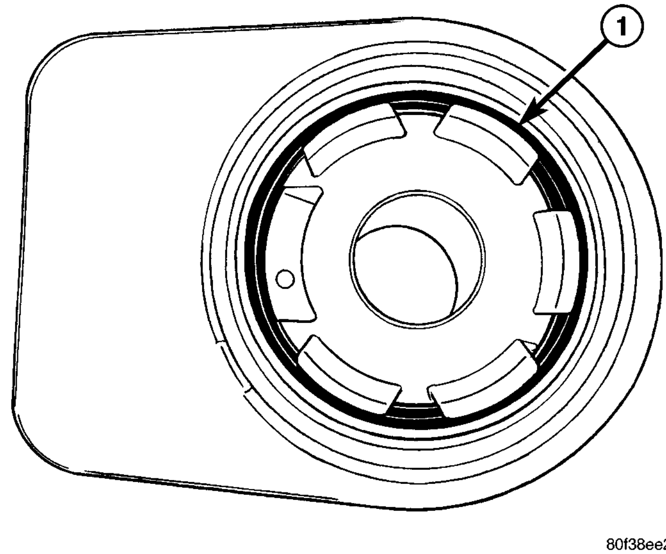


Fig. 120 Oil Cooler Seal

1 - OIL COOLER SEAL

INTAKE MANIFOLD

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

INTAKE MANIFOLD (Continued)

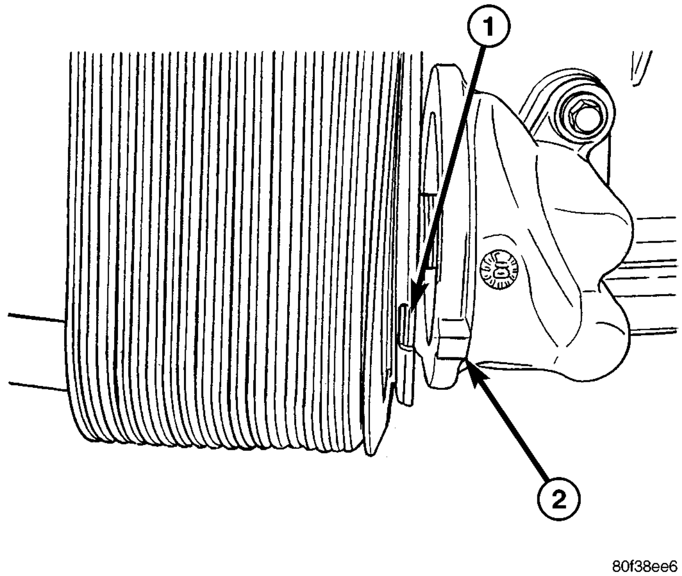


Fig. 121 Oil Cooler Alignment

1 - NOTCH
2 - TAB

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 engine RPM'S change, the area of the suspected leak has been found.

(4) Repair as required.

REMOVAL

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.

(1) Perform fuel system pressure release procedure **before attempting any repairs (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).**

(2) Disconnect negative battery cable.

(3) Remove fuel rail trim cover by pulling straight off fuel rail studs (Fig. 122).

(4) Disconnect charge air cooler to throttle body hose (Fig. 123).

(5) Disconnect vacuum hoses from throttle body and intake manifold.

(6) Disconnect throttle cable from throttle body.

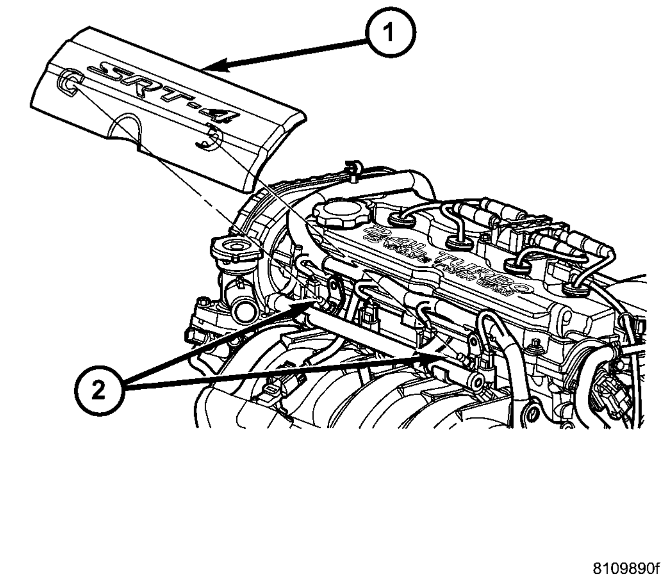


Fig. 122 Fuel Rail Cover

1 - COVER
2 - STUDS

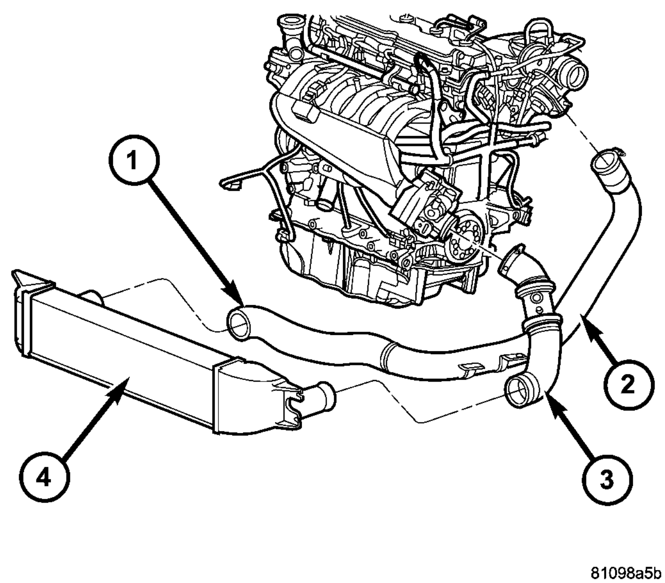


Fig. 123 Charge Air Cooler Hoses

1 - HOSE
2 - HOSE/TUBE - TURBOCHARGER TO CHARGE AIR COOLER
3 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
4 - CHARGE AIR COOLER

(7) Disconnect Throttle Position Sensor (TPS) and Idle Air Control (IAC) motor electrical connectors

INTAKE MANIFOLD (Continued)

(8) Remove intake manifold support bracket (Fig. 124).

(9) Disconnect fuel injector electrical connectors (Fig. 125). Unclip injector wiring harness from fuel rail.

(10) Disconnect MAP sensor electrical connector (Fig. 125).

(11) Disconnect the fuel supply line quick connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE) (Fig. 125).

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

(12) Remove intake manifold fasteners.

(13) Remove intake manifold.

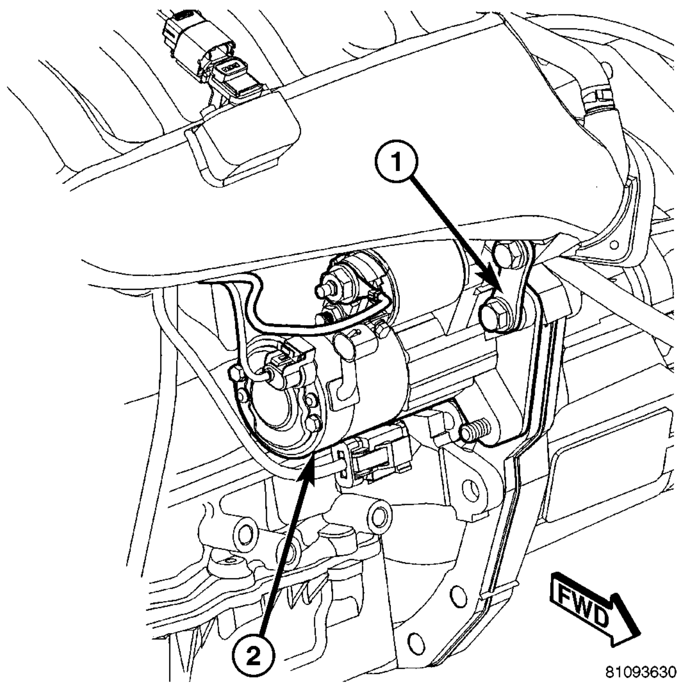


Fig. 124 Intake Manifold Support Bracket

1 - INTAKE MANIFOLD SUPPORT BRACKET
2 - STARTER

CLEANING

(1) Discard gasket(s).

(2) Clean all sealing surfaces.

INSPECTION

(1) Inspect manifold for cracks or distortion. Replace manifold if necessary.

(2) Inspect manifold for gasket surface damage or warpage. Replace manifold if necessary.

INSTALLATION

(1) Clean all gasket surfaces.

(2) Replace intake manifold gasket.

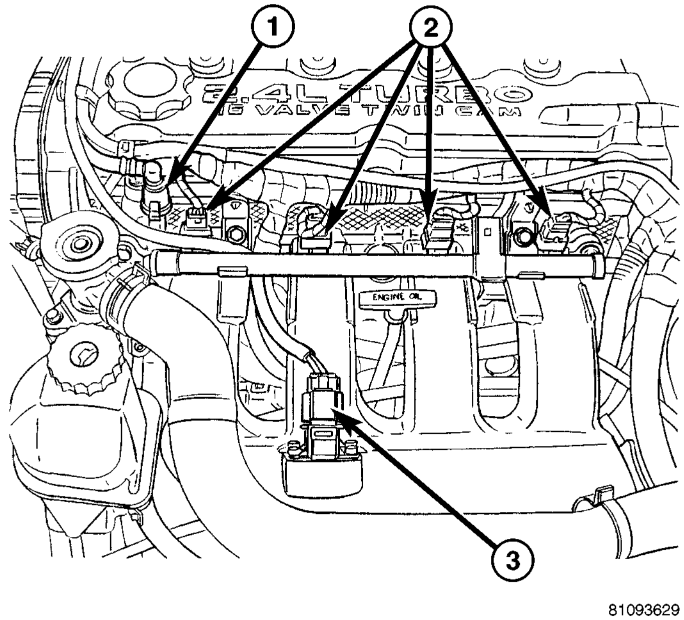


Fig. 125 Electrical and Fuel Line Connections

1 - FUEL SUPPLY LINE CONNECTION
2 - FUEL INJECTOR CONNECTORS
3 - MAP SENSOR

(3) Install intake manifold. Tighten fasteners to 23 N·m (200 in. lbs.).

(4) If removed, install the fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).

(5) Inspect fuel supply line quick connect fitting for damage, replace if necessary (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE). Lubricate tube with clean engine oil. Connect fuel supply line to fuel rail assembly. Check connection by pulling on connector to insure it locked into position (Fig. 125).

(6) Connect MAP sensor electrical connector (Fig. 125).

(7) Connect fuel injector electrical connectors (Fig. 125). Clip injector wiring harness to fuel rail.

(8) Install intake manifold support bracket. Tighten fasteners to 23 N·m (200 in. lbs.) (Fig. 124).

(9) Connect Throttle Position Sensor (TPS) and Idle Air Control (IAC) motor electrical connectors.

(10) Connect throttle cable to throttle body.

(11) Connect vacuum hoses to throttle body and intake manifold.

(12) Connect charge air cooler to throttle body hose (Fig. 123).

(13) Install fuel rail trim cover by pushing it over fuel rail studs (Fig. 122).

(14) Connect negative cable to battery.

INTAKE MANIFOLD (Continued)

(15) With the DRBIII® scan tool use ASD Fuel System Test to pressurize the fuel 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

REMOVAL

NOTE: DO NOT SEPARATE. The exhaust manifold is serviced as an assembly with the Turbocharger. (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/TURBOCHARGER - REMOVAL).

INSTALLATION

NOTE: DO NOT SEPARATE. The exhaust manifold is serviced as an assembly with the Turbocharger. (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/TURBOCHARGER - INSTALLATION).

TIMING BELT COVER(S)

REMOVAL

FRONT COVER—UPPER

(1) Remove upper torque strut attaching bolts and remove strut (Fig. 126).

(2) Remove torque strut bracket from strut tower (Fig. 126).

(3) Remove torque strut bracket from engine (Fig. 126).

(4) Remove upper timing belt cover fasteners (Fig. 127) and remove cover.

FRONT COVER—LOWER

(1) Disconnect negative battery cable.

(2) Raise vehicle on hoist. Remove right front wheel.

(3) Remove the acessory drive belt splash shield.

(4) Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(5) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

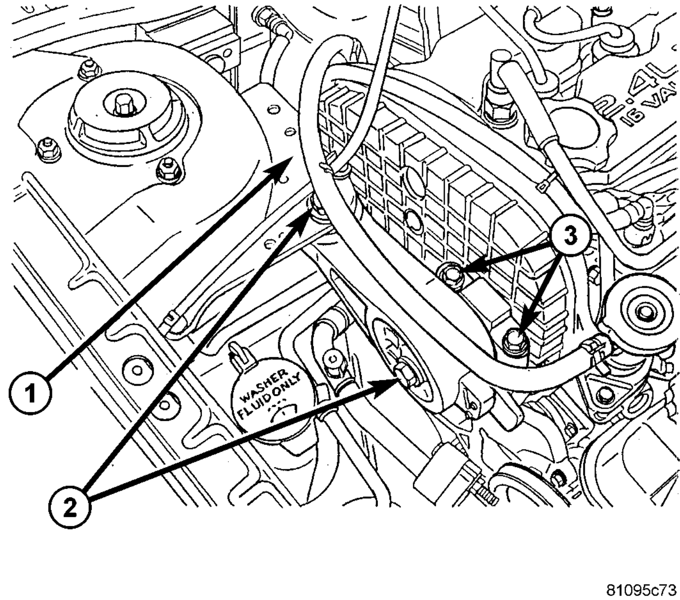


Fig. 126 Upper Torque Strut and Bracket

1 - TORQUE STRUT BRACKET
2 - TORQUE STRUT MOUNTING BOLTS
3 - ENGINE BRACKET MOUNTING BOLTS

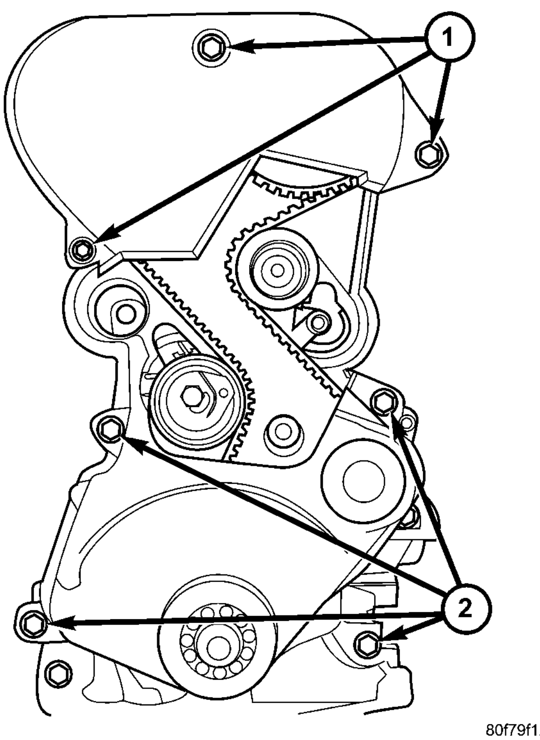


Fig. 127 Front Timing Belt Covers

1 - UPPER COVER FASTENERS
2 - LOWER COVER FASTENERS

TIMING BELT COVER(S) (Continued)

(6) Remove the lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - REMOVAL).

(7) Disconnect exhaust system from manifold.

(8) Disconnect A/C pressure switch at rear of compressor housing.

(9) Lower vehicle and support engine with a jack.

(10) Remove upper torque strut attaching bolts and remove strut (Fig. 126).

(11) Remove power steering pump and bracket. Set pump aside. **Do not disconnect lines from pump.**

(12) With engine properly supported, remove right engine mount through bolt.

(13) Raise engine with jack until engine support bracket bolts are accessible (Fig. 128).

(14) Remove engine support bracket (Fig. 128).

(15) Remove timing belt cover fasteners and remove cover (Fig. 127).

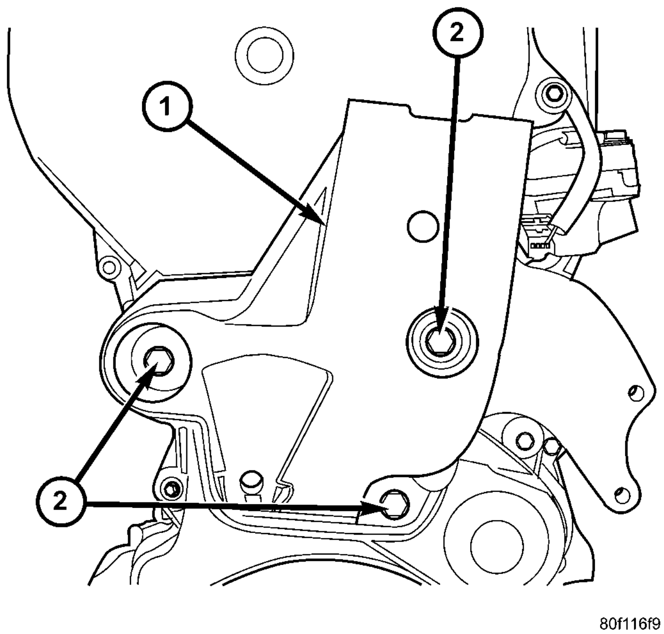


Fig. 128 Engine Support Bracket

1 - ENGINE SUPPORT BRACKET
2 - BOLTS - 61 N·m (45 ft. lbs.)

REAR COVER

(1) Remove front timing belt covers. Refer to above procedures.

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(3) Remove timing belt idler pulley (Fig. 129).

(4) Remove camshaft sprockets. Use Special Tool 6847 to hold camshaft sprockets while removing the sprocket bolts (Fig. 130).

(5) Remove rear timing belt cover fasteners and remove cover from engine (Fig. 131).

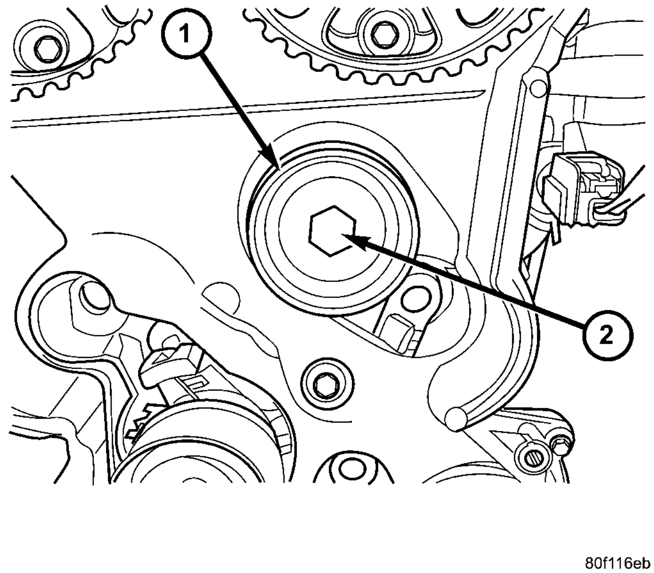


Fig. 129 Timing Belt Idler Pulley

1 - IDLER PULLEY
2 - BOLT

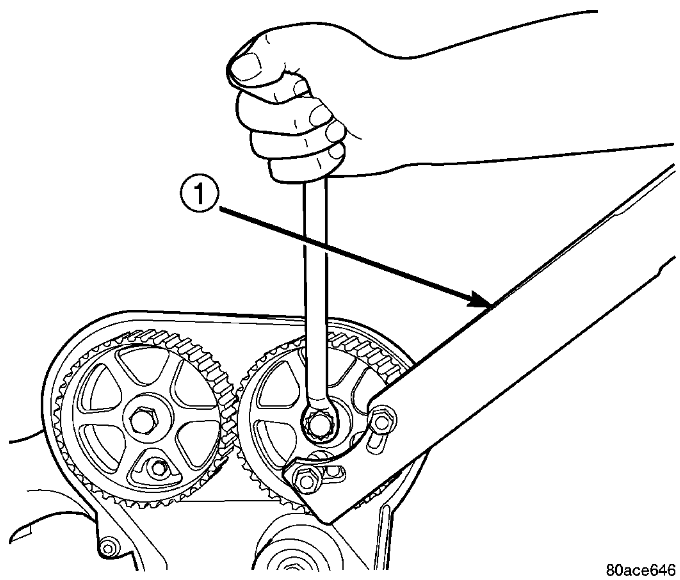


Fig. 130 Camshaft Sprocket—Removal/Installation

1 - SPECIAL TOOL 6847

INSTALLATION

FRONT COVER—UPPER

(1) Install timing belt cover and tighten fasteners to 6 N·m (50 in. lbs.) (Fig. 127).

(2) Install torque strut bracket to engine (Fig. 126).

(3) Install torque strut bracket to strut tower (Fig. 126).

TIMING BELT COVER(S) (Continued)

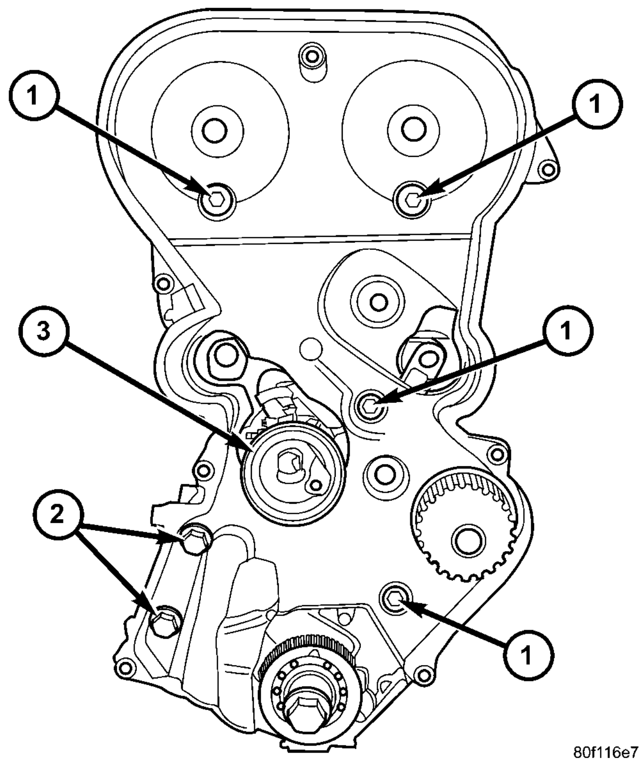


Fig. 131 Rear Timing Belt Cover Fasteners

1 - M6 BOLTS - 12 N·m (105 in. lbs.)
2 - M8 BOLTS - 28 N·m (250 in. lbs.)
3 - TIMING BELT TENSIONER

(4) Install upper torque strut attaching bolts (Fig. 126).

(5) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/ TORQUE STRUT - ADJUSTMENTS).

FRONT COVER—LOWER

(1) Install lower timing belt cover and tighten fasteners to 6 N·m (50 in. lbs.) (Fig. 127).

(2) Install engine support bracket (Fig. 128). Ensure the power steering pump is properly located in mounting location on bracket. Tighten mount bracket bolts to 61 N·m (45 ft. lbs.).

(3) Lower engine into mounting position and install right engine mount through bolt. Tighten bolt to 118 N·m (87 ft. lbs.).

(4) Install power steering pump and bracket.

(5) Install upper torque strut attaching bolts (Fig. 126).

(6) Raise vehicle.

(7) Connect exhaust system to manifold.

(8) Connect A/C pressure switch connector.

(9) Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(10) Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(11) Install lower torque strut (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - INSTALLATION).

(12) Perform torque strut adjustment procedure (Refer to 9 - ENGINE/ENGINE MOUNTING/ TORQUE STRUT - ADJUSTMENTS).

(13) Install acessory drive belt splash shield.

(14) Install right front wheel.

(15) Connect negative cable to battery.

REAR COVER

(1) Install rear timing belt cover and fasteners. Torque fasteners to values specified in (Fig. 131).

(2) Install timing belt idler pulley (Fig. 129). Torque timing belt idler pulley fastener to 61 N·m (45 ft. lbs.).

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin may occur.

(3) Install camshaft sprockets. Hold sprockets with Special Tool 6847 while tightening center bolt to 115 N·m (85 ft. lbs.) (Fig. 130).

(4) Install timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

(5) Install front timing belt covers. Refer to above procedures.

TIMING BELT AND SPROCKETS

REMOVAL

REMOVAL - TIMING BELT

(1) Disconnect negative battery cable.

(2) Remove upper and lower front timing belt covers (Fig. 127). (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

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.

(3) Before the removal of the timing belt, rotate crankshaft until the TDC mark on oil pump housing aligns with the TDC mark on crankshaft sprocket (trailing edge of sprocket tooth) (Fig. 132).

TIMING BELT AND SPROCKETS (Continued)

NOTE: The crankshaft sprocket TDC mark is located on the trailing edge of the sprocket tooth. Failure to align trailing edge of sprocket tooth to TDC mark on oil pump housing will cause the camshaft timing marks to be misaligned.

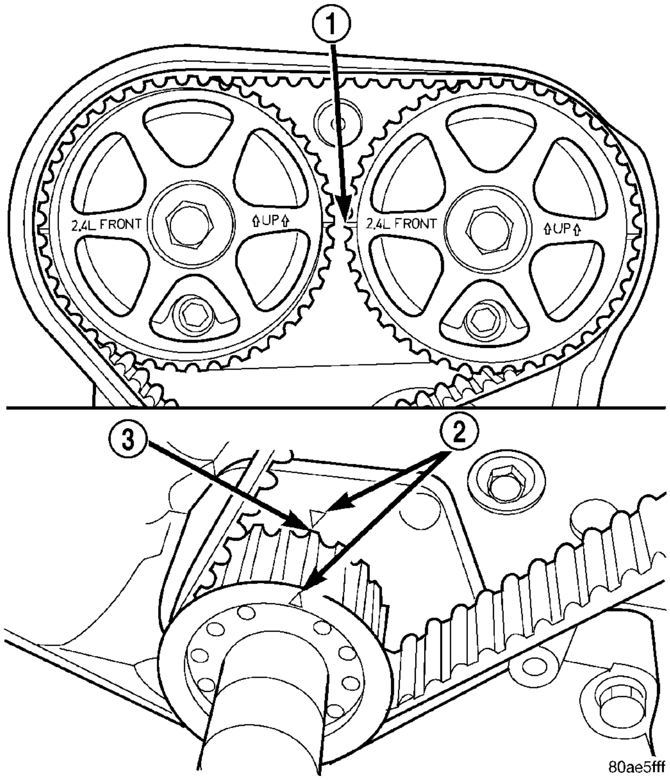


Fig. 132 Crankshaft and Camshaft Timing

1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH

(4) Loosen timing belt tensioner lock bolt (Fig. 133).

(5) Insert a 6 mm Allen wrench into the hexagon opening located on the top plate of the belt tensioner pulley (Fig. 133). Rotate the top plate **CLOCKWISE** until there is enough slack in timing belt to allow for removal.

(6) Remove timing belt.

CAUTION: If timing belt was damaged due to incorrect tracking (alignment), the belt tensioner pulley and bracket must be replaced as an assembly (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT TENSIONER & PULLEY - REMOVAL).

REMOVAL - CAMSHAFT SPROCKET(S)

(1) Remove upper and lower front timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT - REMOVAL).

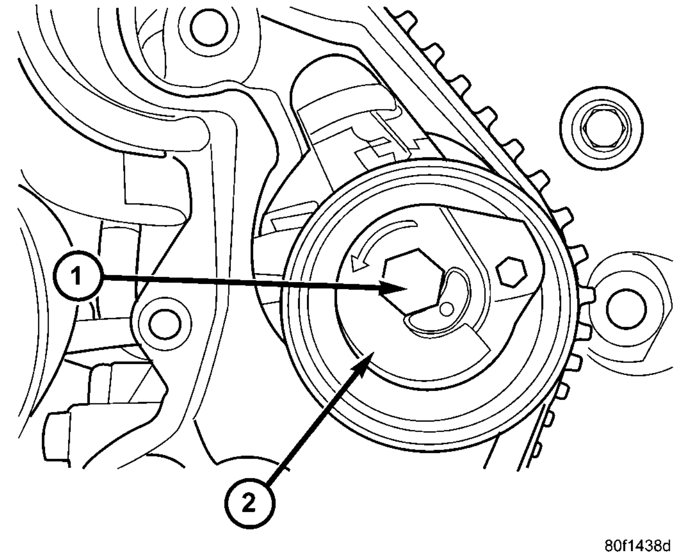


Fig. 133 Timing Belt Tensioner

1 - LOCK BOLT
2 - TOP PLATE

(3) Use Special Tool 6847 to hold camshaft sprockets while removing the sprocket bolt(s) (Fig. 134). Remove camshaft sprocket(s).

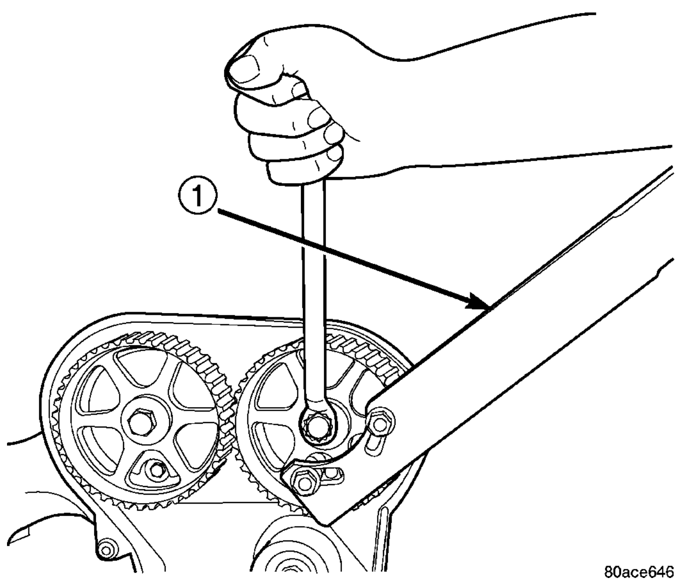


Fig. 134 Camshaft Sprocket—Removal/Installation

1 - SPECIAL TOOL 6847

REMOVAL - CRANKSHAFT SPROCKET

(1) Remove upper and lower front timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT - REMOVAL).

(3) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 135).

TIMING BELT AND SPROCKETS (Continued)

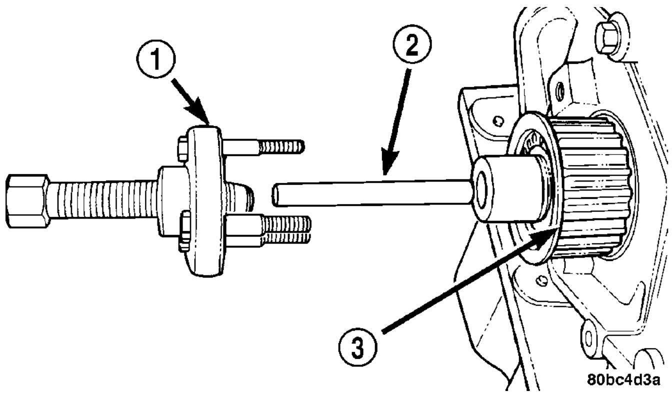


Fig. 135 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

INSTALLATION

INSTALLATION - CRANKSHAFT SPROCKET

CAUTION: The crankshaft sprocket is set to a pre-determined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

(1) Install crankshaft sprocket using Special Tool 6792 (Fig. 136).

(2) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT - INSTALLATION).

(3) Install upper and lower front timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

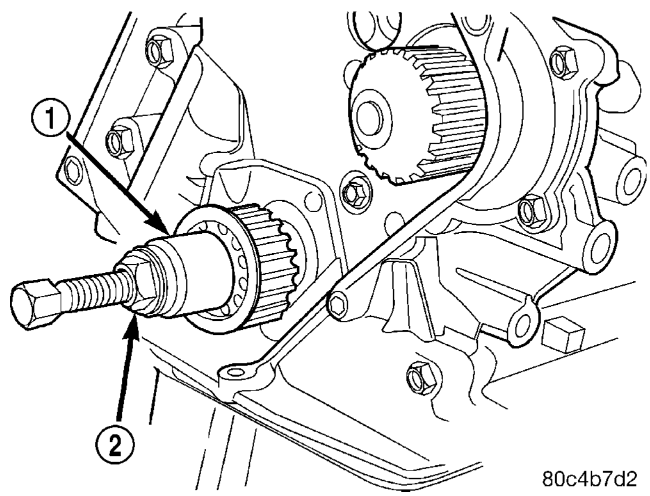


Fig. 136 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

INSTALLATION - CAMSHAFT SPROCKET(S)

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin may occur.

(1) Install camshaft sprockets. Hold sprockets with Special Tool 6847 while tightening center bolt to 115 N·m (85 ft. lbs.) (Fig. 134).

(2) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT - INSTALLATION).

(3) Install upper and lower front timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

INSTALLATION - TIMING BELT

(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. 137).

CAUTION: Ensure that the arrows on both camshaft sprockets are facing up.

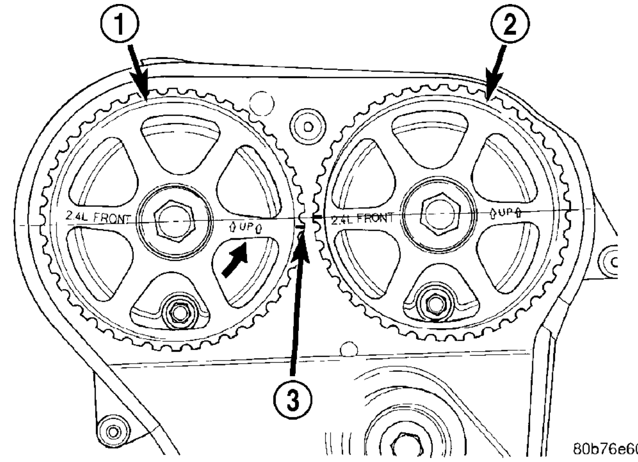


Fig. 137 Camshaft Sprocket Alignment For Timing Belt Installation

1 - CAMSHAFT SPROCKET-EXHAUST
2 - CAMSHAFT SPROCKET-INTAKE
3 - 1/2 NOTCH LOCATION

(3) Install timing belt. Starting at the crankshaft, go around the water pump sprocket, idler pulley, camshaft sprockets and then around the tensioner (Fig. 138).

(4) Move the exhaust camshaft sprocket counter-clockwise (Fig. 138) to align marks and take up belt slack.

TIMING BELT AND SPROCKETS (Continued)

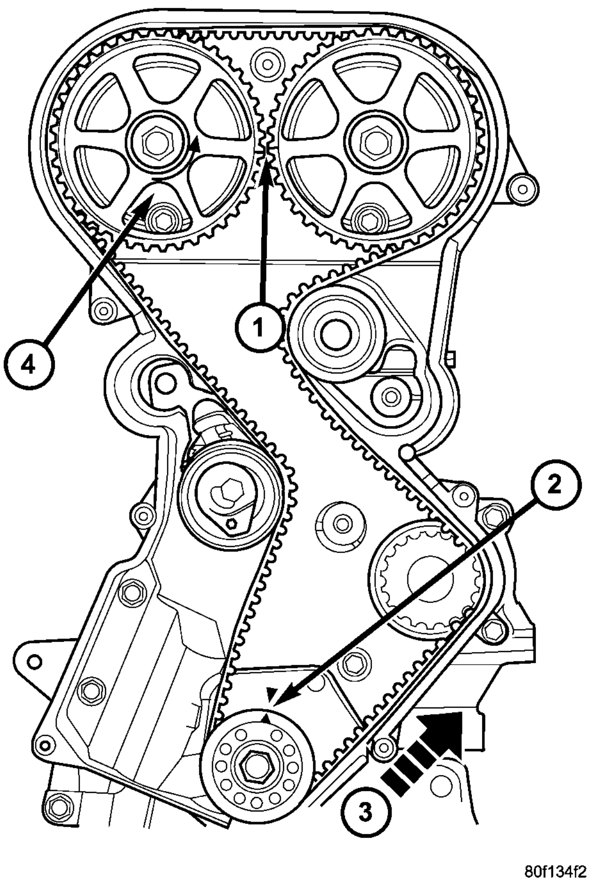


Fig. 138 Timing Belt Installation

1 - CAMSHAFT TIMING MARKS 1/2 NOTCH LOCATION
2 - CRANKSHAFT AT TDC
3 - INSTALL BELT IN THIS DIRECTION
4 - ROTATE CAMSHAFT SPROCKET TO TAKE UP BELT SLACK

(5) Insert a 6 mm Allen wrench into the hexagon opening located on the top plate of the belt tensioner pulley. Rotate the top plate **COUNTERCLOCKWISE**. The tensioner pulley will move against the belt and the tensioner setting notch will eventually start to move clockwise. Watching the movement of the setting notch, continue rotating the top plate counterclockwise until the setting notch is aligned with the spring tang (Fig. 139). Using the allen wrench to prevent the top plate from moving, torque the tensioner lock bolt to 25 N·m (220 in. lbs.). Setting notch and spring tang should remain aligned after lock bolt is torqued.

(6) Remove allen wrench and torque wrench.

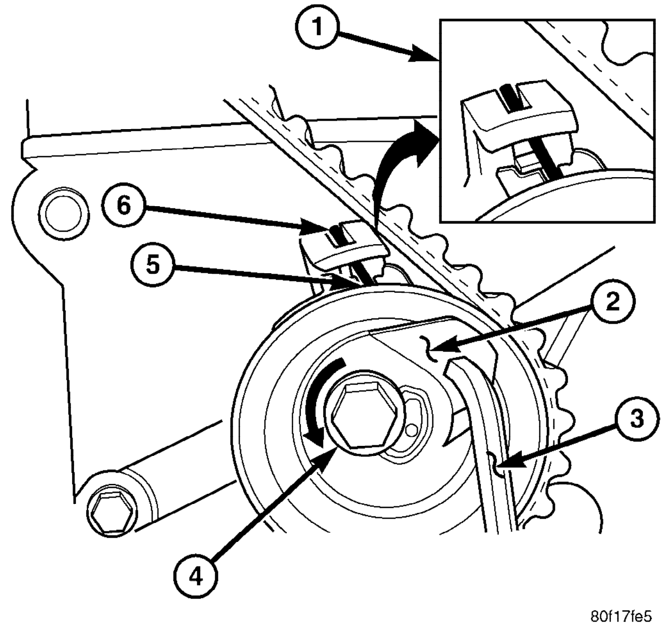


Fig. 139 Timing Belt Tension Adjustment

1 - ALIGN SETTING NOTCH WITH SPRING TANG
2 - TOP PLATE
3 - 6mm ALLEN WRENCH
4 - LOCK BOLT
5 - SETTING NOTCH
6 - SPRING TANG

NOTE: Repositioning the crankshaft to the TDC position must be done only during the CLOCKWISE rotation movement. If TDC is missed, rotate a further two revolutions until TDC is achieved. DO NOT rotate crankshaft counterclockwise as this will make verification of proper tensioner setting impossible.

(7) Rotate the crankshaft CLOCKWISE two complete revolutions manually for seating of the belt, until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position (Fig. 140).

(8) Check if the spring tang is within the tolerance window (Fig. 141). If the spring tang is within the tolerance window, the installation process is complete and nothing further is required. If the spring tang is not within the tolerance window, repeat Steps 5 through 7.

(9) Install upper and lower front timing belt covers (Fig. 127). (Refer to 9 - ENGINE/VALVE TIMING/ TIMING BELT COVER(S) - INSTALLATION).

(10) Connect negative cable to battery.

TIMING BELT AND SPROCKETS (Continued)

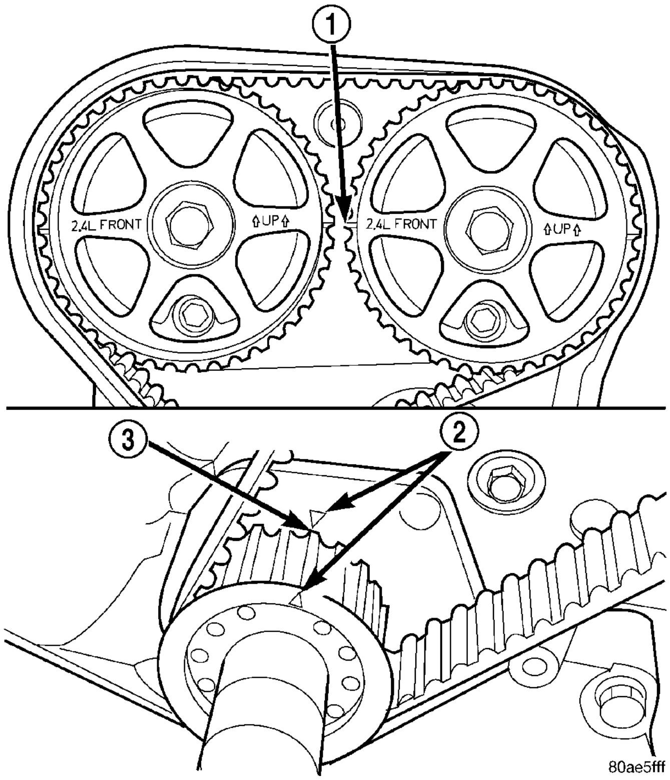


Fig. 140 Crankshaft and Camshaft Timing

1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH

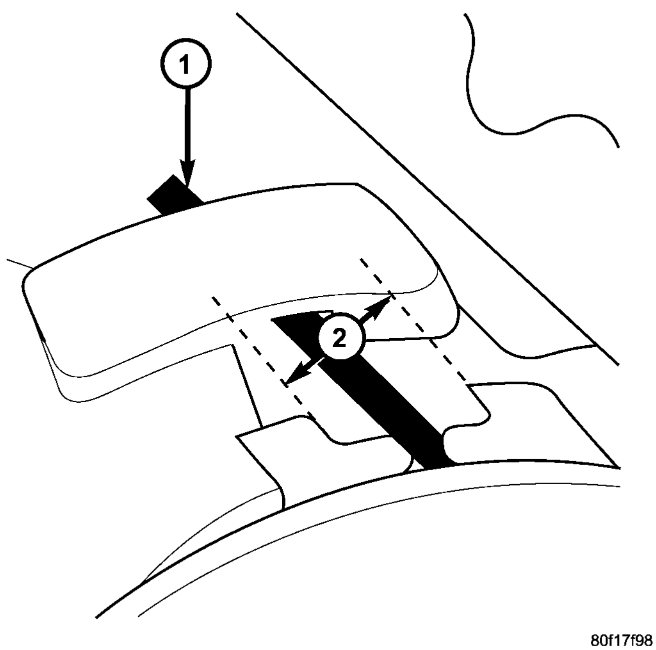


Fig. 141 Timing Belt Tension Verification

1 - SPRING TANG
2 - TOLERANCE WINDOW

TIMING BELT TENSIONER & PULLEY

REMOVAL

(1) Remove timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL).

(2) Remove timing belt idler pulley.

(3) Hold camshaft sprocket with Special Tool 6847 while removing bolt (Fig. 142). Remove both camshaft sprockets.

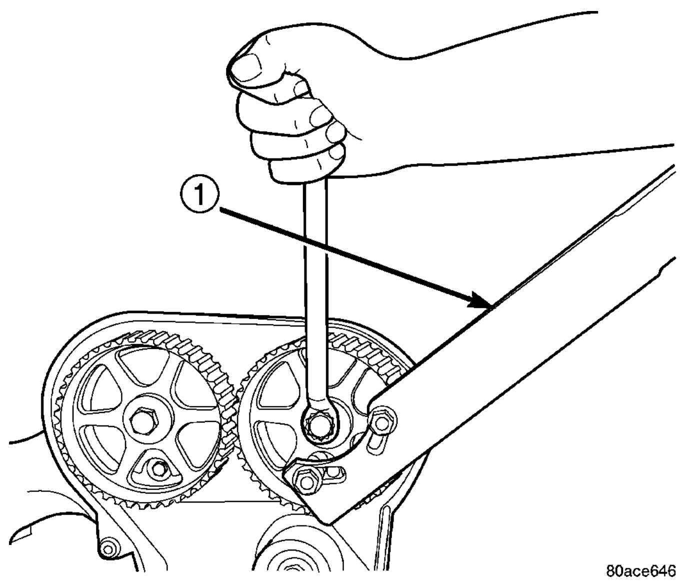


Fig. 142 Camshaft Sprockets

1 - SPECIAL TOOL 6847

(4) Remove rear timing belt cover fasteners and remove cover from engine (Fig. 143).

(5) Remove lower bolt attaching timing belt tensioner assembly to engine and remove tensioner **as an assembly** (Fig. 144).

INSTALLATION

(1) Align timing belt tensioner assembly to engine and install lower mounting bolt **but do not tighten** (Fig. 144). To properly align tensioner assembly to engine; temporarily install one of the engine bracket mounting bolts (M10) 5–7 turns into the tensioner assembly upper mounting location (Fig. 144).

(2) Torque the tensioner's lower mounting bolt to 61 N·m (45 ft. lbs.). Remove the upper bolt used for tensioner alignment.

(3) Install rear timing belt cover and fasteners (Fig. 143).

(4) Install timing belt idler pulley and torque mounting bolt to 61 N·m (45 ft. lbs.).

TIMING BELT TENSIONER & PULLEY (Continued)

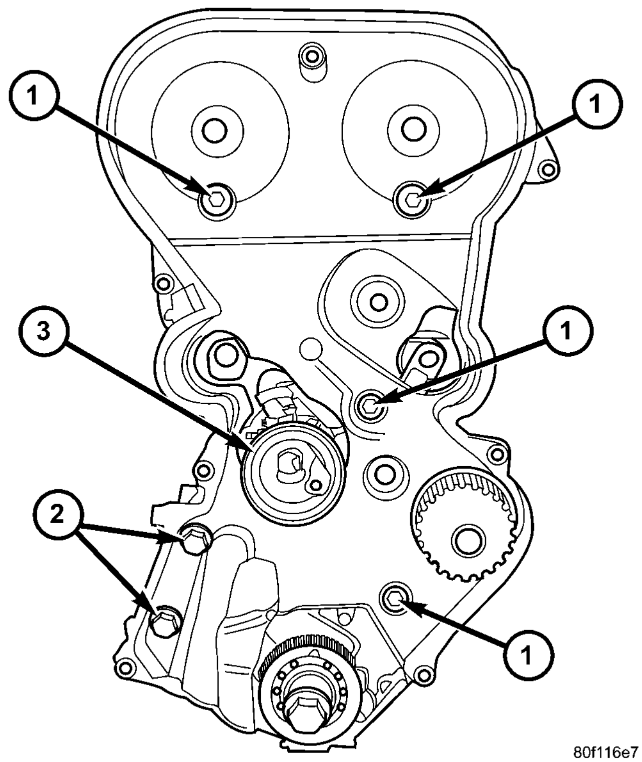


Fig. 143 Rear Timing Belt Cover Fasteners

1 - M6 BOLTS - 12 N·m (105 in. lbs.)
2 - M8 BOLTS - 28 N·m (250 in. lbs.)
3 - TIMING BELT TENSIONER

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin may occur.

(5) Install camshaft sprockets. Use Special Tool 6847 to hold sprockets (Fig. 142) and tighten bolts to 115 N·m (85 ft. lbs.).

(6) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION).

BALANCE SHAFTS AND CARRIER ASSEMBLY

DESCRIPTION

The 2.4L engine is equipped with two nodular cast iron balance shafts installed in a cast aluminum carrier attached to the lower cylinder block (Fig. 145).

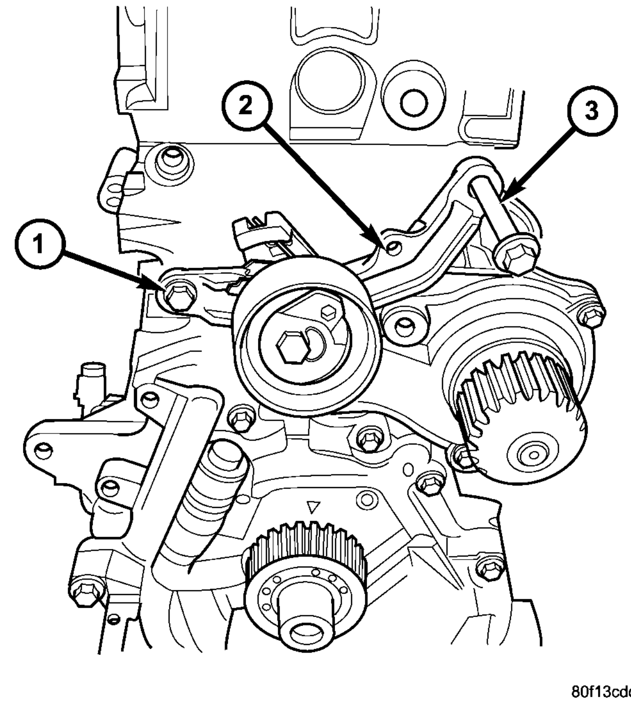


Fig. 144 Timing Belt Tensioner/Bracket Assembly

1 - BOLT
2 - TENSIONER ASSEMBLY
3 - BOLT-INSTALL FOR PROPER ALIGNMENT

OPERATION

The balance shafts are driven by the crankshaft via a roller chain and sprockets. The balance shafts are connected by helical gears. The dual counter rotating shafts decrease second order vertical shaking forces caused by component movement.

REMOVAL

BALANCE SHAFTS/CHAIN/SPROCKETS

NOTE: For service procedures requiring only temporary relocation of carrier assembly refer to BALANCE SHAFT CARRIER procedure below.

(1) Drain engine oil.

(2) Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(3) If replacing crankshaft sprocket, remove oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

BALANCE SHAFTS AND CARRIER ASSEMBLY (Continued)

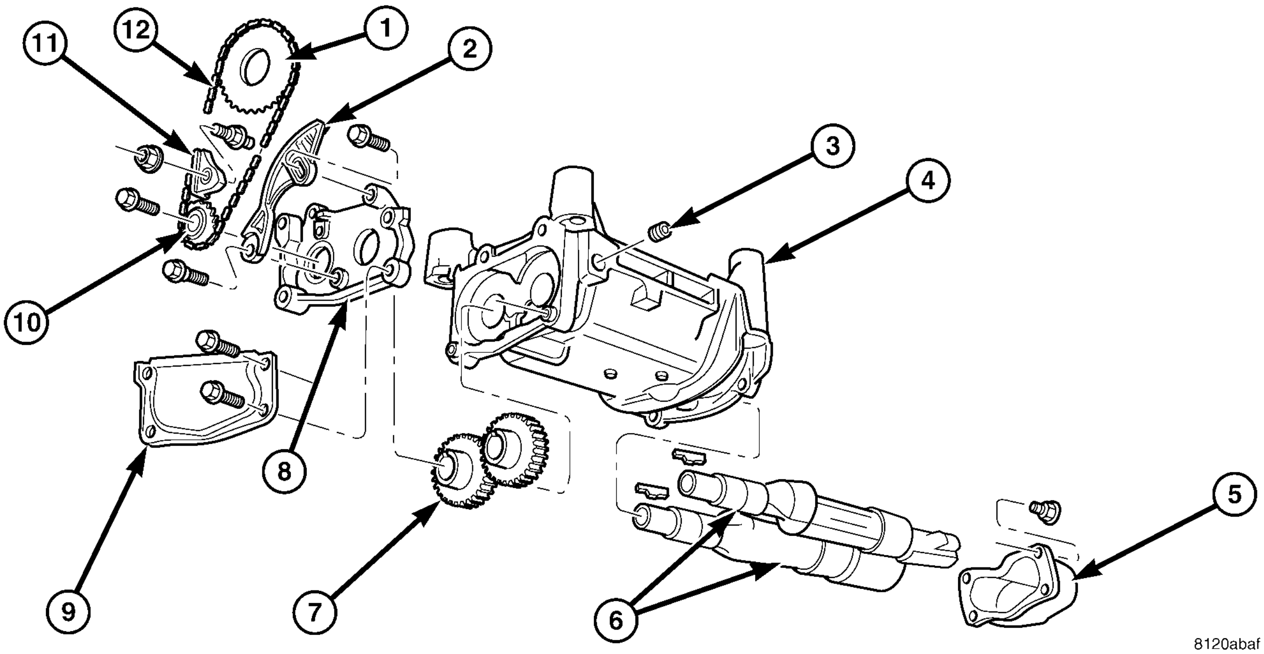


Fig. 145 Balance Shafts and Carrier Assembly

1 - SPROCKET
2 - TENSIONER
3 - PLUG
4 - CARRIER
5 - REAR COVER
6 - BALANCE SHAFTS
7 - GEARS
8 - GEAR COVER
9 - CHAIN COVER
10 - SPROCKET
11 - GUIDE
12 - CHAIN

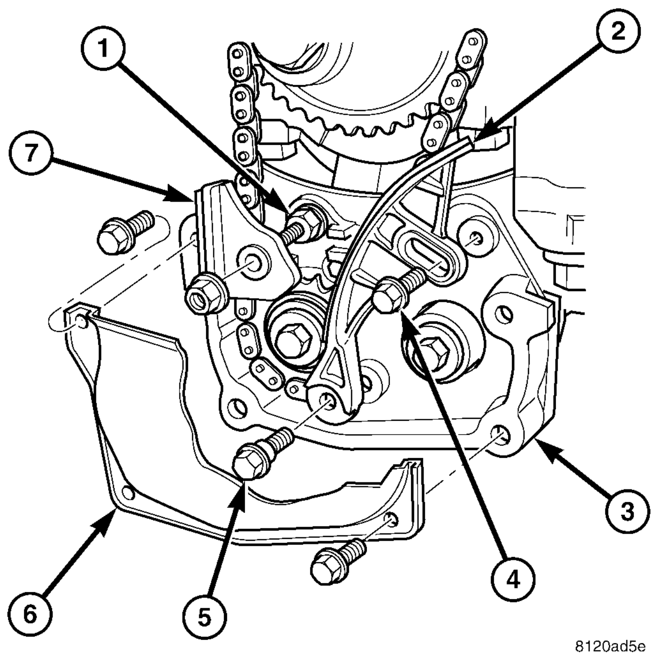


Fig. 146 Chain Cover, Guide and Tensioner

1 - STUD
2 - TENSIONER (ADJUSTER)
3 - GEAR COVER
4 - ADJUSTER SCREW
5 - SHOULDERED PIVOT SCREW
6 - CHAIN COVER (CUTAWAY)
7 - GUIDE

(4) Remove chain cover, guide and tensioner. Discard pivot screw and adjuster screw. (Fig. 146).

(5) Remove screw retaining balance shaft drive sprocket (Fig. 147). Remove chain and sprocket.

(6) Using two wide pry bars, work the crankshaft sprocket back and forth until it is off the crankshaft-shaft.

(7) Remove gear cover retaining stud (double ended to also retain chain guide). Remove cover and balance shaft gears (Fig. 148).

(8) Remove rear cover and balance shafts (Fig. 149).

(9) Remove four carrier to crankcase attaching bolts to separate carrier from engine bedplate.

BALANCE SHAFT CARRIER

The following components will remain intact during carrier removal: Gear cover, gears, balance shafts and the rear cover (Fig. 145).

(1) Drain engine oil.

(2) Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(3) Remove chain cover, guide and tensioner (Fig. 146).

(4) Remove screw retaining balance shaft drive sprocket (Fig. 147).

BALANCE SHAFTS AND CARRIER ASSEMBLY (Continued)

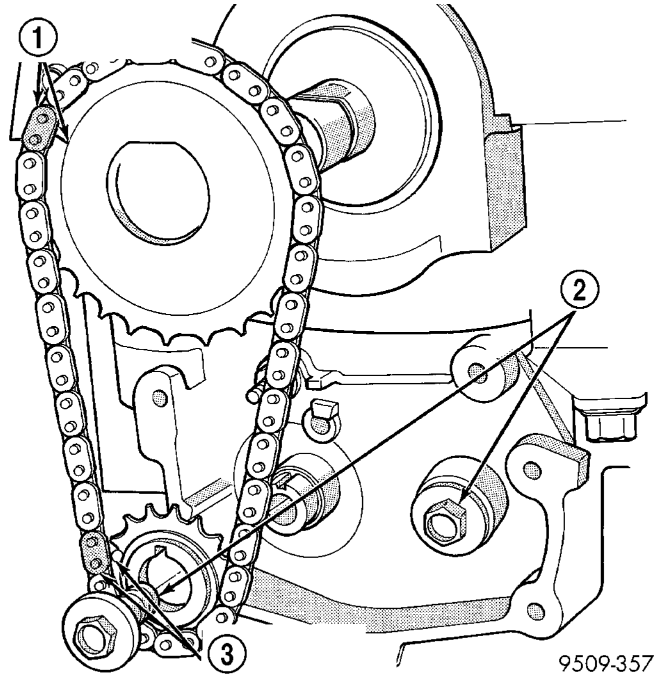


Fig. 147 Drive Chain and Sprockets

1 - NICKEL PLATED LINK AND MARK
2 - GEAR/SPROCKET SCREWS
3 - NICKEL PLATED LINK AND DOT

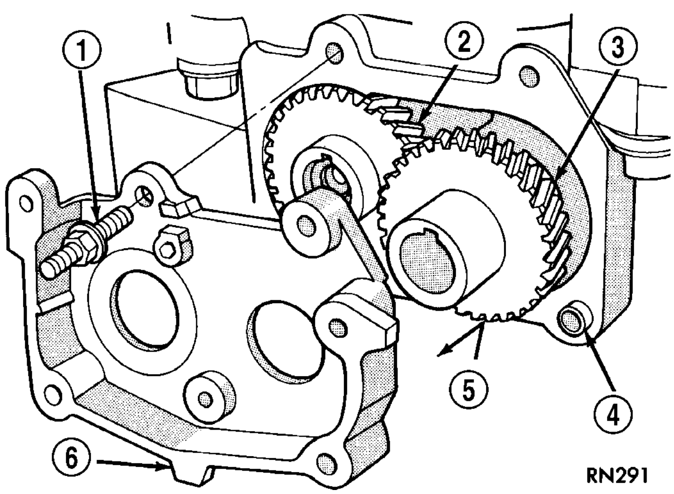


Fig. 148 Gear Cover and Gears

1 - STUD (DOUBLE ENDED)
2 - DRIVE GEAR
3 - DRIVEN GEAR
4 - CARRIER DOWEL
5 - GEAR(S)
6 - GEAR COVER

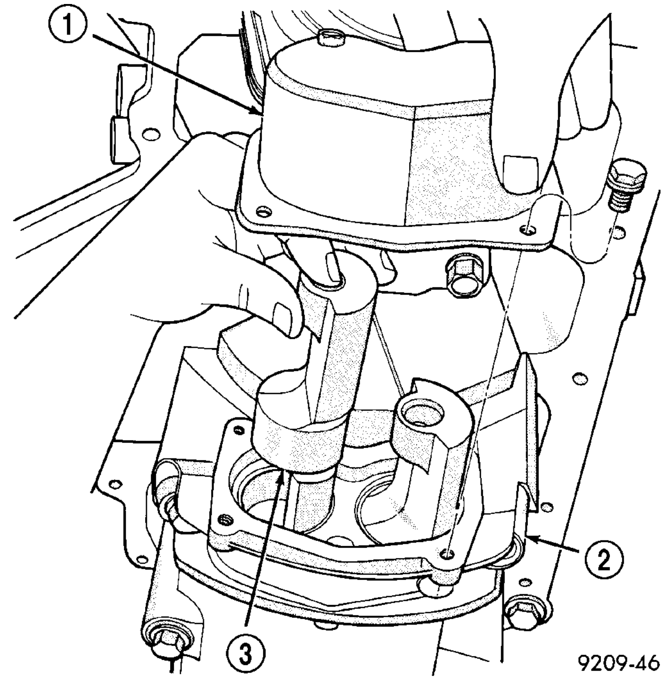


Fig. 149 Balance Shaft - Removal/Installation

1 - REAR COVER
2 - CARRIER
3 - BALANCE SHAFT

(5) Move balance shaft inboard through drive chain sprocket. Sprocket will hang in lower chain loop.

(6) Remove carrier to crankcase attaching bolts to remove carrier.

INSTALLATION

BALANCE SHAFT INSTALLATION/TIMING

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 in this section.**

(1) With balance shafts installed in carrier (Fig. 145) 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. 150).

BALANCE SHAFTS AND CARRIER ASSEMBLY (Continued)

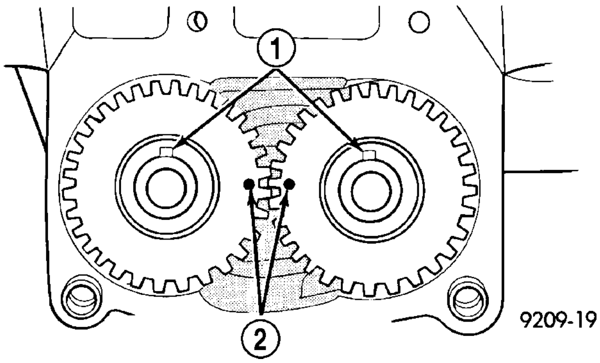


Fig. 150 Gear Timing

1 - KEY WAYS UP
2 - GEAR ALIGNMENT DOTS

(3) Install gear cover and tighten double ended stud/washer fastener to 12 N·m (105 in. lbs.).

(4) Align flat on balance shaft drive sprocket to the flat on crankshaft (Fig. 151).

(5) Install balance shaft drive sprocket on crankshaft using Special Tool 6052 (Fig. 152).

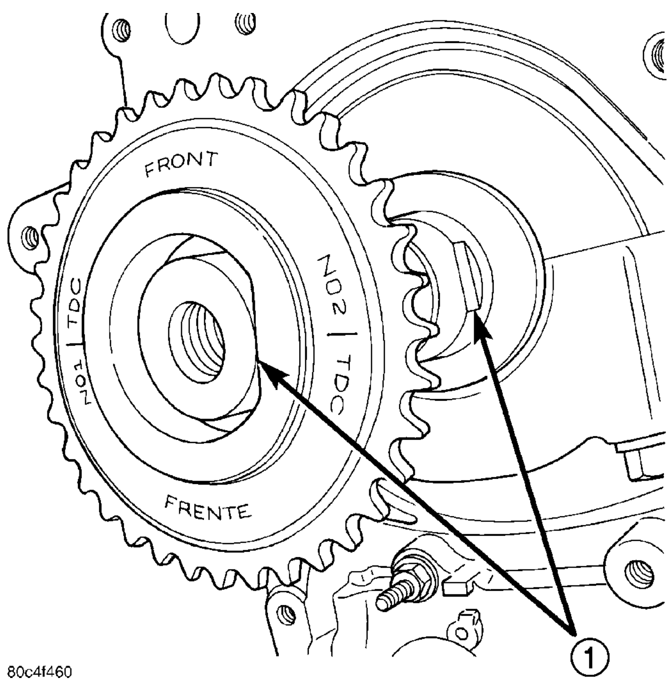


Fig. 151 Balance Shaft Sprocket Alignment to Crankshaft

1 - ALIGN FLATS

(6) Turn crankshaft until number 1 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. 153).

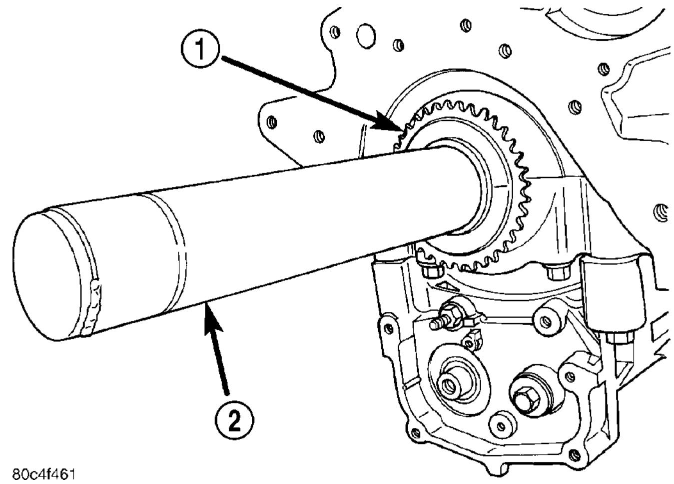


Fig. 152 Balance Shaft Drive

1 - SPROCKET
2 - SPECIAL TOOL 6052

(7) Place chain over crankshaft sprocket so that the plated link of the chain is over the number 1 cylinder timing mark on the balance shaft crankshaft sprocket (Fig. 153).

(8) Place balance shaft sprocket into the timing chain (Fig. 153) and align the timing mark on the sprocket (dot) with the (lower) plated link on the chain.

NOTE: The lower plated link is 8 links from the upper link.

(9) 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.

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.

(10) 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.

(11) **CHAIN TENSIONING:**

(a) Install chain tensioner loosely assembled with **new** shouldered pivot screw and adjuster screw.

(b) 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.).

BALANCE SHAFTS AND CARRIER ASSEMBLY (Continued)

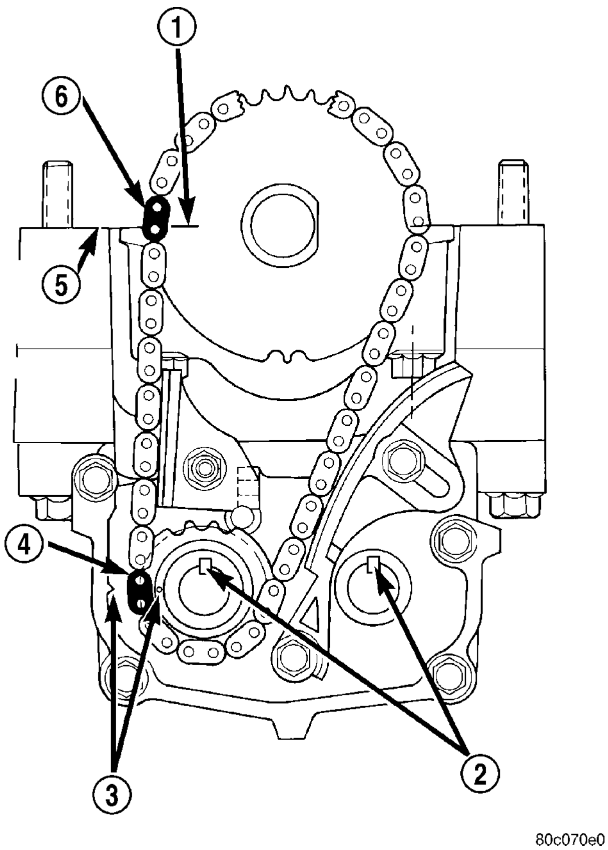


Fig. 153 Balance Shaft Timing

1 - MARK ON SPROCKET
2 - KEYWAYS UP
3 - ALIGN MARKS
4 - PLATED LINK
5 - PARTING LINE (BEDPLATE TO BLOCK)
6 - PLATED LINK

(c) Place a shim 1 mm (0.039 in.) thick x 70 mm (2.75 in.) long between tensioner and chain. Push tensioner and shim up against the chain. **Apply firm pressure 2.5–3 Kg (5.5–6.6 lbs.) directly behind the adjustment slot to take up all slack.** Chain must have shoe radius contact as shown in (Fig. 154).

(d) With the load applied, tighten top tensioner bolt first, then bottom pivot bolt. Tighten bolts to 12 N·m (105 in. lbs.). Remove shim.

(e) Install carrier covers and tighten screws to 12 N·m (105 in. lbs.).

(12) If removed, install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).

(13) Install pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(14) Fill engine crankcase with proper oil to correct level.

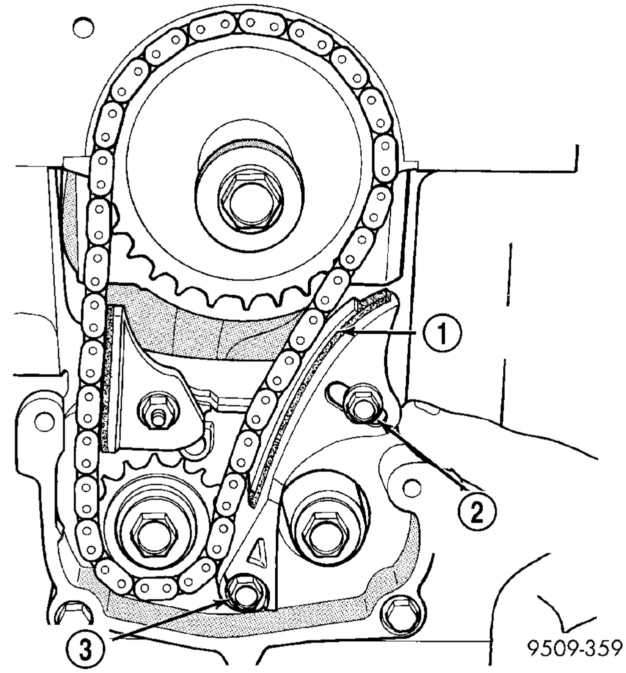


Fig. 154 Chain Tension Adjustment

1 - 1MM (0.039 IN.) SHIM
2 - TENSIONER (ADJUSTER) BOLT
3 - PIVOT BOLT

EXHAUST SYSTEM AND TURBOCHARGER

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EXHAUST SYSTEM AND TURBOCHARGER

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EXHAUST SYSTEM AND TURBOCHARGER

DESCRIPTION

The SRT-4 exhaust system consists of a catalytic converter, exhaust extension pipe, and a tailpipe. The exhaust extension pipe incorporates resonators. This exhaust system configuration does not have a conventional muffler (Fig. 1).

EXHAUST SYSTEM AND TURBOCHARGER (Continued)

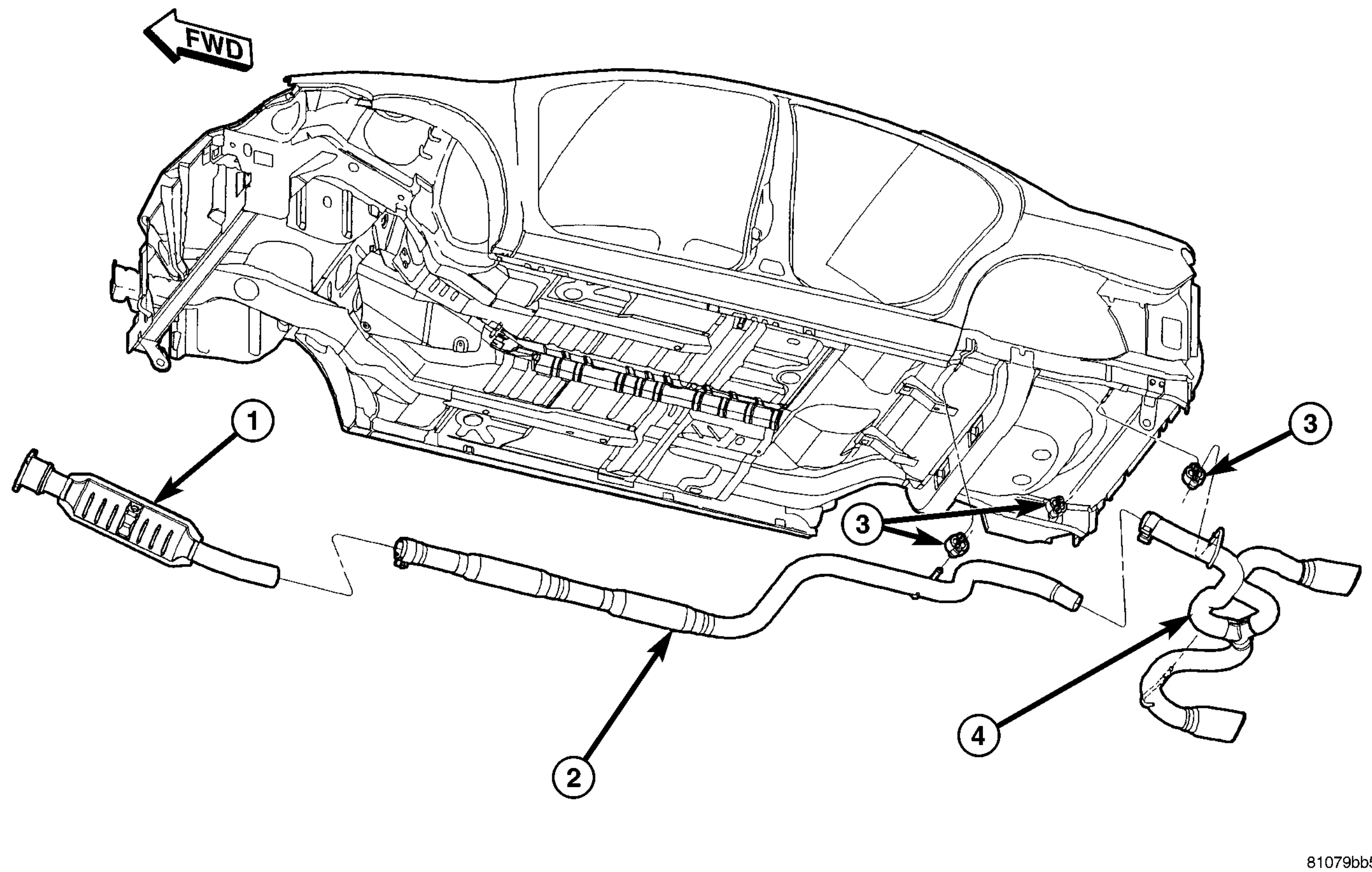


Fig. 1 Exhaust System - SRT-4

1 - CATALYTIC CONVERTER
2 - EXHAUST EXTENSION PIPE
3 - ISOLATOR(S)
4 - TAILPIPE

TURBOCHARGER SYSTEM

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TURBOCHARGER

Check for Diagnostic Trouble Codes (DTC'S) stored in PCM memory. If any DTC'S are present, refer to the appropriate Powertrain Diagnostic Information.

TURBOCHARGER DIAGNOSIS

CONDITION	POSSIBLE CAUSES
Low boost pressure, lack of power	Clogged air filter
	Leaks between engine and turbocharger
	Exhaust restriction
	Restriction in charge air cooler hose(s)
	Wastegate stuck open
	Wastegate actuator malfunction
	Seized turbocharger shaft

TURBOCHARGER SYSTEM (Continued)

CONDITION	POSSIBLE CAUSES
Overboost	Wastegate stuck shut Wastegate actuator malfunction
Noisy operation or vibration	Leak(s) in charge air cooler hose(s) Intake or exhaust leaks Oil starvation Worn turbocharger bearings Damaged turbine/ compressor fins
Blue smoke from exhaust	Oil return line blocked Engine breather clogged Turbocharger shaft seals damaged

DIAGNOSIS AND TESTING - SRT4

During normal operation the SRT - 4 turbocharger will emit a very high frequency whistle at full boost 68.9 - 103.4 kPa (10 - 15 psi) during WOT acceleration.

During throttle tip-out, the surge valve will emit a light air “woosh” noise. If there is excessive NVH or other air leak/turbocharger noises, the intercooler plumbing or turbocharger control system may be compromised.

TO identify the source of the concern, check for Diagnostic Trouble Codes (DTC’S) stored in PCM memory. If any DTC’S are present, refer to the appropriate Powertrain Diagnostic Information.

If there are no DTC’S stored, use the folling chart.

CONDITION	POSSIBLE CAUSES	CORRECTION
UNDERBOOST - 20.6 - 27.5 kPa and turbocharger lag at WOT with some air leak noise OVERBOOST - 103.4 kPa (10 psi) or more even at part throttle (could be as high as 137.8 kPa (20 psi) or more). A ″Fluttering″ noise can be heard during overboost. **CAUTION: Engine damage can result from prolonged Overboost.**	Waste Gate control hose plumbing compromised/disconnected	Refer to (Refer to 11 - EXHAUST SYSTEM/TURBOCHARGER SYSTEM/CHARGE AIR COOLER AND PLUMBING - INSTALLATION)
UNDERBOOST - 27.5 - 62 kPa (4 - 9 psi) @ WOT with ″horse laugh″ on throttle tip-out.	Surge valve control hose plumbing compromised.	Repair plumbing (Refer to 11 - EXHAUST SYSTEM/ TURBOCHARGER SYSTEM/ CHARGE AIR COOLER AND PLUMBING - INSTALLATION)
NORMAL BOOST - but turbocharger lag and ″horse laugh″ noise on throttle tip-out.	Surge valve scroll and vacuum feeds reversed	Reverse vacuum lines (Refer to 11 - EXHAUST SYSTEM/ TURBOCHARGER SYSTEM/ SOLENOID - INSTALLATION)
UNDERBOOST - 0-20.6 kPa (0-3 psi) a WOT with loud air leak noise outside vehicle. Turbocharger may emit a ″howling″ noise.	Intercoooler plumbing hose disconnected	Inspect plumbing and install (Refer to 11 - EXHAUST SYSTEM/ TURBOCHARGER SYSTEM/ CHARGE AIR COOLER AND PLUMBING - INSTALLATION)
Very rough idle	TIP/MAP sensor hoses connected improperly or TIP disconnected	Inspect hosed (Refer to 11 - EXHAUST SYSTEM/ TURBOCHARGER SYSTEM/LINES AND HOSES - INSTALLATION)

TURBOCHARGER

DESCRIPTION

CAUTION: The turbocharger is a performance part and must not be tampered with. Tampering with the wastegate components can reduce durability by increasing cylinder pressure and thermal loading due to incorrect inlet and exhaust manifold pressure. Poor fuel economy and failure to meet regulatory emissions laws may result. Increasing the turbocharger boost WILL NOT increase engine power.

The turbocharger is an exhaust-driven supercharger which increases the pressure and density of the air entering the engine. With the increase of air entering the engine, more fuel can be injected into the cylinders, which creates more power during combustion.

The turbocharger assembly consists of four (4) major component systems (Fig. 2):

- Turbine section
- Compressor section
- Bearing housing
- Wastegate

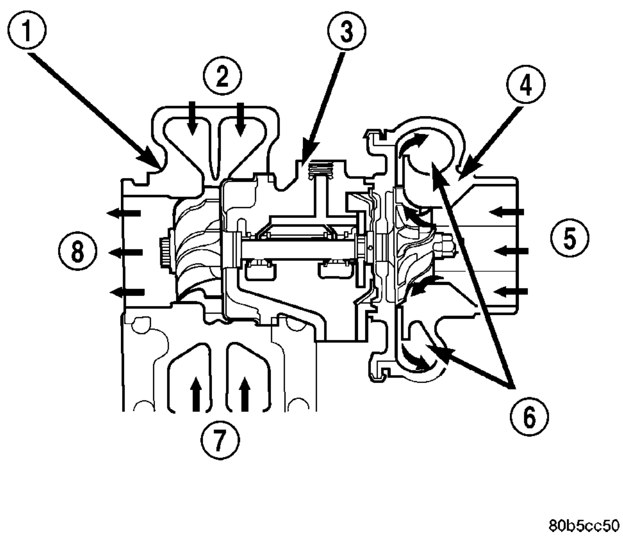


Fig. 2 Turbocharger - Typical

1 - TURBINE SECTION
2 - EXHAUST GAS
3 - BEARING HOUSING
4 - COMPRESSOR SECTION
5 - INLET AIR
6 - COMPRESSED AIR TO ENGINE
7 - EXHAUST GAS
8 - EXHAUST GAS TO EXHAUST PIPE

OPERATION

Exhaust gas pressure and energy drive the turbine, which in turn drives a centrifugal compressor that compresses the inlet air, and forces the air into the engine through the charge air cooler and plumbing. Since heat is a by-product of this compression, the air must pass through a charge air cooler to cool the incoming air and maintain power and efficiency.

Increasing air flow to the engine provides:

- Improved engine performance
- Improved operating economy
- Altitude compensation

The turbocharger also uses a wastegate (Fig. 3), which regulates intake manifold air pressure and prevents over boosting at high engine speeds. When the wastegate valve is closed, all of the exhaust gases flow through the turbine wheel. As the intake manifold pressure increases, the wastegate actuator opens the valve, diverting some of the exhaust gases away from the turbine wheel. This limits turbine shaft speed and air output from the impeller.

The turbocharger is cooled by engine coolant. The coolant is delivered to the turbocharger by a supply line that connects from engine block to the turbocharger. A coolant return line connects the turbocharger to heater tubes.

The turbocharger is lubricated by engine oil that is pressurized, cooled, and filtered. The oil is delivered to the turbocharger by a supply line that is tapped into the cylinder block. The oil travels into the bearing housing, where it lubricates the shaft and bearings (Fig. 4). A return pipe at the bottom of the bearing housing, routes the engine oil back to the crankcase.

The most common turbocharger failure is bearing failure related to repeated hot shutdowns with inadequate “cool-down” periods. A sudden engine shut down after prolonged operation will result in the transfer of heat from the turbine section of the turbocharger to the bearing housing. This causes the oil to overheat and break down, which causes bearing and shaft damage the next time the vehicle is started.

Letting the engine idle after extended operation allows the turbine housing to cool to normal operating temperature. The following chart should be used as a guide in determining the amount of engine idle time required to sufficiently cool down the turbocharger before shut down, depending upon the type of driving and the amount of cargo.

TURBOCHARGER (Continued)

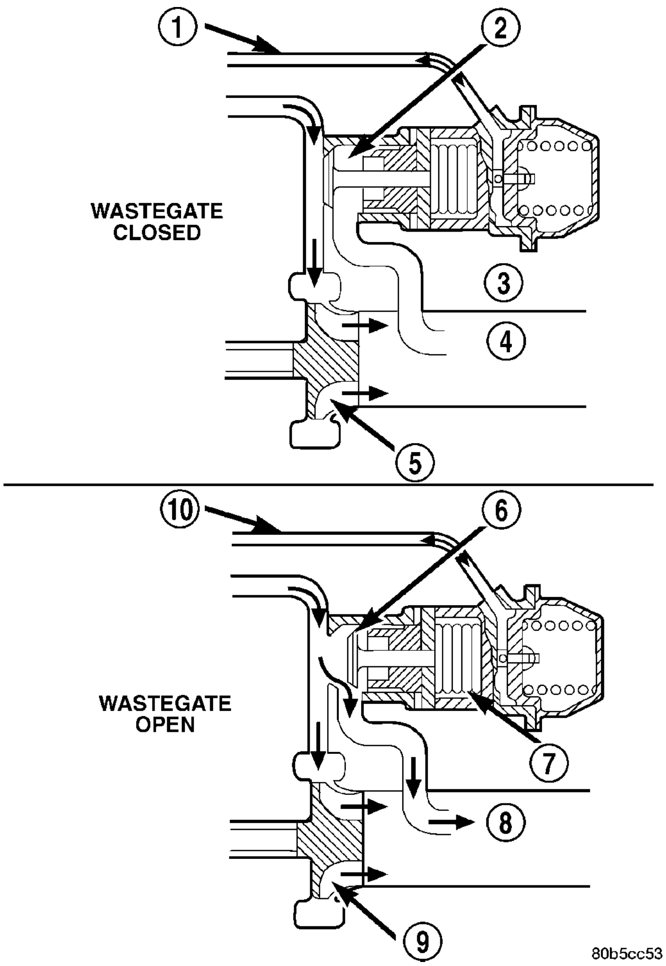


Fig. 3 Wastegate Operation

1 - SIGNAL LINE
2 - EXHAUST BYPASS VALVE
3 - WASTEGATE
4 - EXHAUST
5 - TURBINE
6 - EXHAUST BYPASS VALVE
7 - WASTEGATE
8 - EXHAUST
9 - TURBINE
10 - SIGNAL LINE

TURBOCHARGER ″COOL DOWN″ CHART	
Driving Conditions	Idle Time (in minutes) Before Shut Down
Normal Driving	Not required
Aggressive Driving or Heavily Loaded	3
Trailer Tow	5

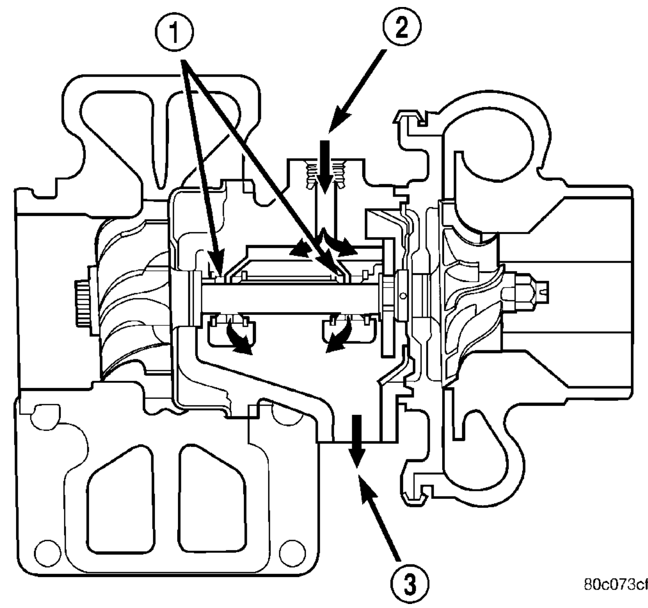


Fig. 4 Turbocharger Oil Supply and Drain

1 - BEARINGS
2 - OIL SUPPLY (FROM ENGINE BLOCK)
3 - OIL RETURN (TO OIL PAN)

REMOVAL - TURBOCHARGER

CAUTION: IF TURBOCHARGER IS REPLACED DUE TO A BEARING FAILURE, REPLACEMENT OF THE OIL PRESSURE FEED LINE IS REQUIRED. OIL RETURN TUBE SHOULD BE CLEANED ALSO.

NOTE: The turbocharger and exhaust manifold are serviced as an assembly. Do Not attempt to remove the turbocharger from the exhaust manifold. Exhaust leaks will result. It is recommended that the turbocharger elbow be replaced along with the turbocharger/exhaust manifold assembly.

(1) Disconnect negative battery cable.

(2) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE - DRAINING COOLING SYSTEM).

(3) Remove air cleaner housing and lid (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(4) Disconnect clean air hose from turbocharger (Fig. 5).

(5) Disconnect throttle and speed control cables at throttle body.

TURBOCHARGER (Continued)

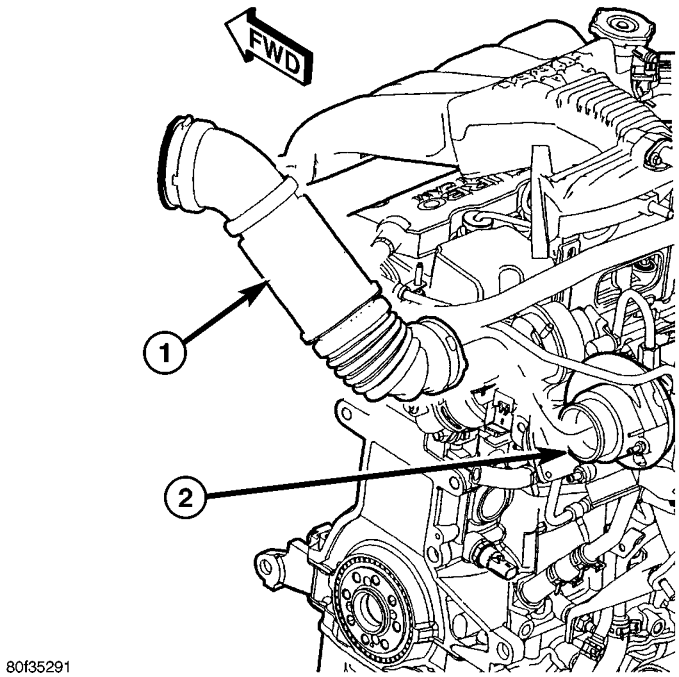


Fig. 5 Clean Air Hose - 2.4L Turbo

1 - CLEAN AIR HOSE
2 - TURBOCHARGER

(6) Disconnect electrical connectors from the following components:

- Inlet Air Temperature (IAT) Sensor
- MAP Sensor
- IAC Motor
- Throttle Position Sensor
- Ignition Coil Capacitor
- Upstream Oxygen Sensor

(7) Disconnect air inlet hose at throttle body (Fig. 6).

(8) Disconnect vacuum hoses at throttle body and upper intake manifold.

(9) Remove upper intake manifold support bracket (Fig. 7).

(10) Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

CAUTION: Cover lower intake manifold opening with suitable cover to prevent any foreign objects from entering.

(11) Remove turbocharger upper heat shield (Fig. 11).

(12) Disconnect oil supply line at turbocharger (Fig. 8).

(13) Remove coolant return line (Fig. 8).

(14) Disconnect vacuum hoses from turbocharger.

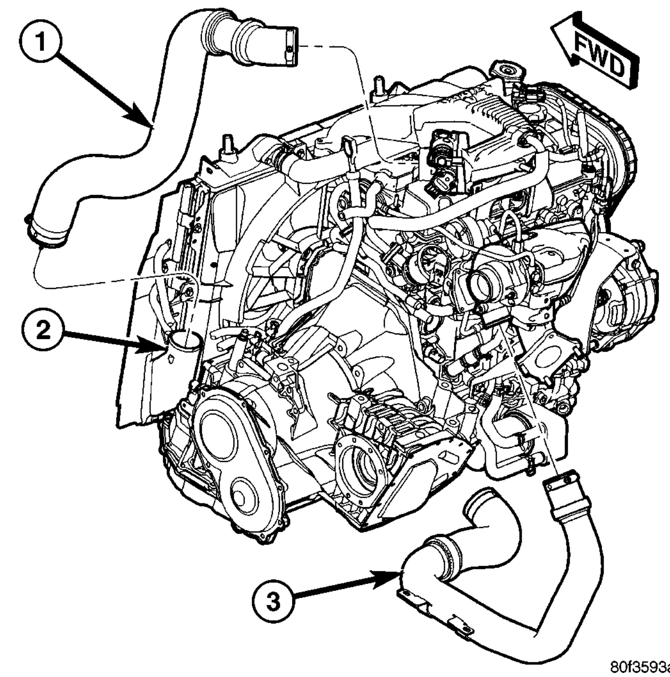


Fig. 6 Charge Air Cooler Hoses

1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
2 - CHARGE AIR COOLER
3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER

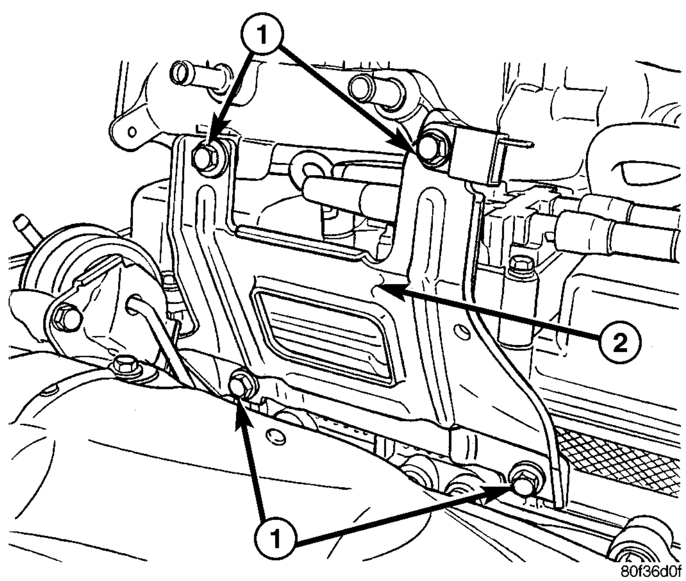


Fig. 7 Support Bracket

1 - FASTENERS
2 - UPPER INTAKE MANIFOLD SUPPORT BRACKET

(15) Raise vehicle on hoist.

(16) Disconnect muffler ground strap. Remove muffler (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).

TURBOCHARGER (Continued)

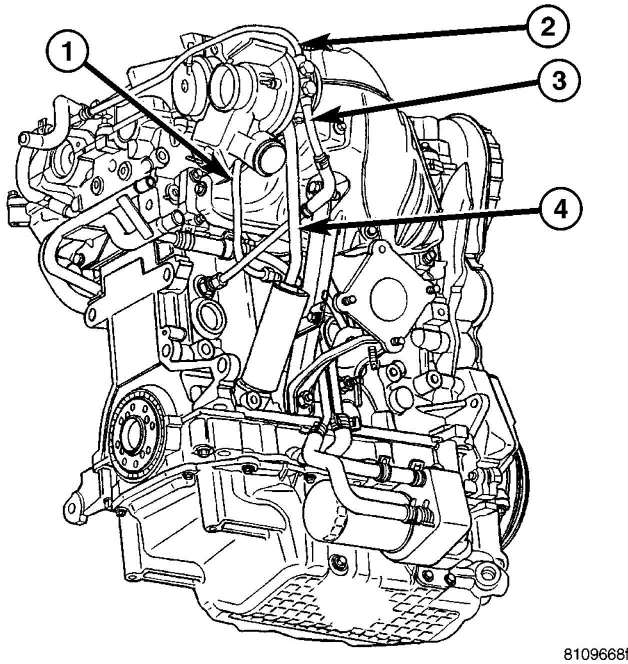


Fig. 8 Turbocharger Lines and Hoses

1 - OIL SUPPLY LINE
2 - COOLANT RETURN LINE
3 - COOLANT SUPPLY LINE
4 - OIL RETURN TUBE

(17) Disconnect downstream oxygen sensor.

(18) Remove fasteners securing catalytic converter to exhaust manifold (Fig. 9).

(19) Remove catalytic converter and intermediate pipe as an assembly.

(20) Remove turbocharger to charge air cooler hose assembly (Fig. 10).

(21) Remove turbocharger elbow support bracket (Fig. 11).

(22) Remove turbocharger support bracket (Fig. 11).

(23) Remove oil return tube (Fig. 8).

(24) Remove turbocharger coolant supply line (Fig. 8).

(25) Remove turbocharger lower heat shield (Fig. 8).

(26) Remove turbocharger elbow (Fig. 11).

(27) Remove lower exhaust manifold fasteners that are accessible while vehicle is on hoist.

(28) Lower vehicle.

(29) Remove upper exhaust manifold fasteners.

(30) Remove turbocharger/exhaust manifold assembly from above/between the engine and cowl panel.

(31) Remove and discard exhaust manifold gasket.

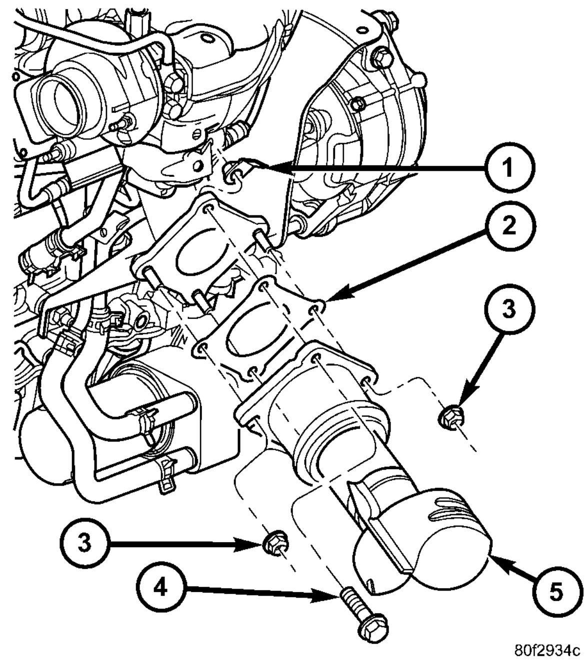


Fig. 9 Converter to Exhaust Manifold Connection - 2.4L Turbo

1 - FLAG NUT
2 - GASKET
3 - NUT
4 - BOLT
5 - CATALYTIC CONVERTER

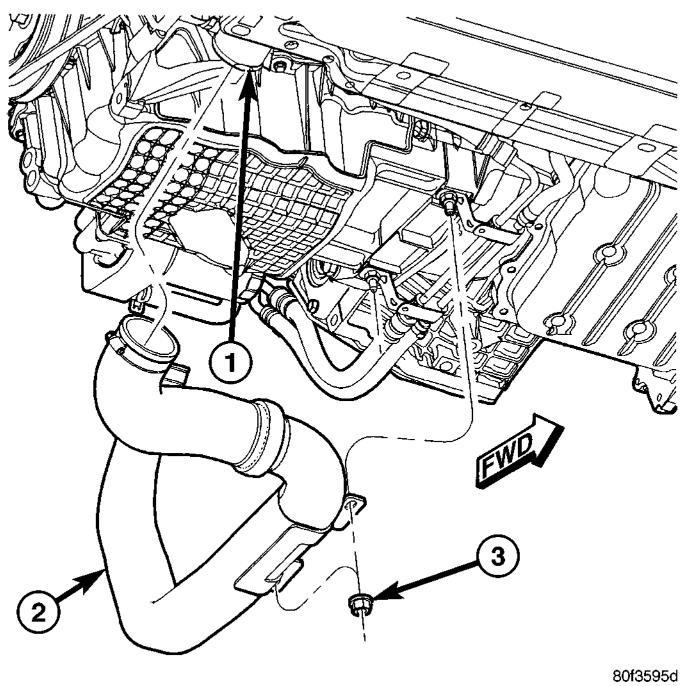


Fig. 10 Charge Air Cooler Hose

1 - CHARGE AIR COOLER
2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
3 - NUT

TURBOCHARGER (Continued)

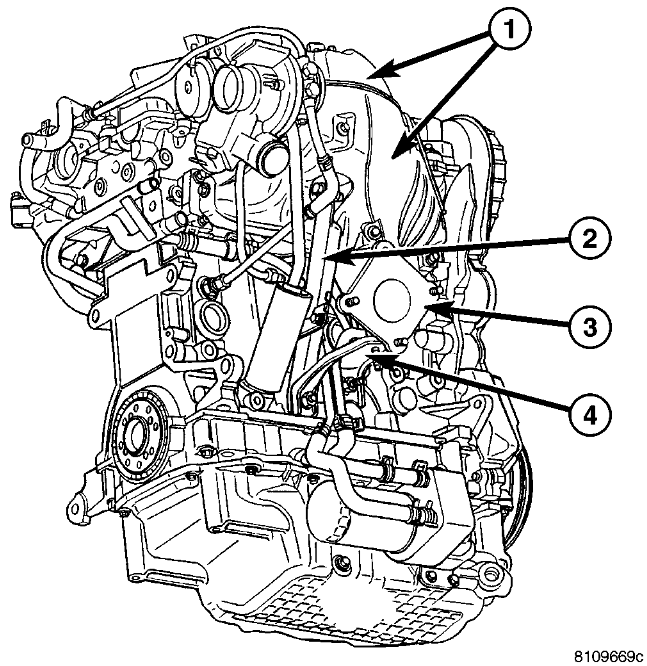


Fig. 11 Turbocharger Brackets and Heat Shields

1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET

INSPECTION - TYPICAL TURBOCHARGER

Visually inspect the turbocharger and exhaust manifold gasket surfaces. Replace stripped or eroded mounting studs.

(1) Visually inspect the turbocharger for cracks. The following cracks are NOT acceptable:

- Cracks in the turbine and compressor housing that go completely through.
- Cracks in the mounting flange that are longer than 15 mm (0.6 in.).
- Cracks in the mounting flange that intersect bolt through-holes.
- Two (2) Cracks in the mounting flange that are closer than 6.4 mm (0.25 in.) together.

(2) Visually inspect the impeller and compressor wheel fins for nicks, cracks, or chips.

(3) Visually inspect the turbocharger compressor housing for an impeller rubbing condition (Fig. 12). Replace the turbocharger if the condition exists.

(4) Measure the turbocharger axial end play:

(a) Install a dial indicator. Zero the indicator at one end of travel.

(b) Move the impeller shaft fore and aft and record the measurement. Allowable end play is 0.038 mm (0.0015 in.) MIN. and 0.089 mm (0.0035 in.) MAX. If the recorded measurement falls outside these parameters, replace the turbocharger assembly.

(5) Measure the turbocharger bearing radial clearance:

(a) Insert a narrow blade or wire style feeler gauge between the compressor wheel and the housing.

(b) Gently push the compressor wheel toward the housing and record the clearance.

(c) With the feeler gauge in the same location, gently push the compressor wheel away from the housing and again record the clearance.

(d) Subtract the smaller clearance from the larger clearance. This is the radial bearing clearance.

(e) Allowable radial bearing clearance is 0.326 mm (0.0128 in.) MIN. and 0.496 mm (0.0195 in.) MAX. If the recorded measurement falls outside these specifications, replace the turbocharger assembly.

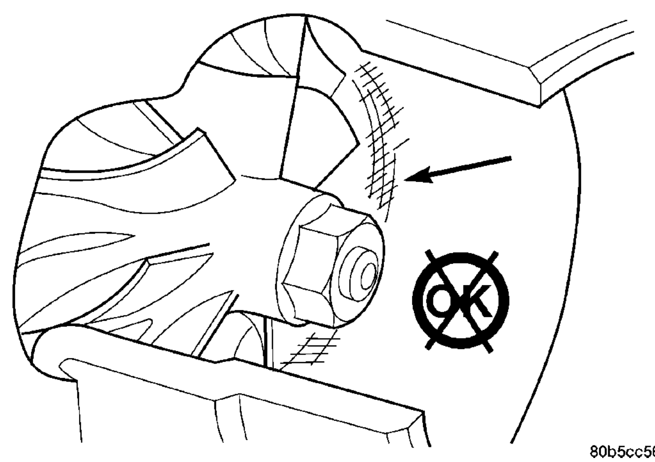


Fig. 12 Inspect Compressor Housing for Impeller Rubbing Condition

INSTALLATION - TURBOCHARGER

CAUTION: IF TURBOCHARGER IS REPLACED DUE TO A BEARING FAILURE, REPLACEMENT OF THE OIL PRESSURE SUPPLY LINE IS REQUIRED. OIL RETURN TUBE SHOULD ALSO BE CLEANED.

NOTE: The turbocharger and exhaust manifold are serviced as an assembly. Do Not attempt to remove the turbocharger from the exhaust manifold. Exhaust leaks will result. It is recommended that the turbocharger elbow be replaced along with the turbocharger/exhaust manifold assembly.

(1) Clean gasket sealing surfaces. Replace exhaust manifold gasket. **DO NOT APPLY SEALER TO GASKET.**

TURBOCHARGER (Continued)

NOTE: Stainless steel layer of exhaust manifold gasket goes against cylinder head, graphite layer of gasket goes against manifold surface.

(2) Turbocharger/exhaust manifold assembly is installed from between the engine and brake master cylinder (Fig. 9).

(3) Position turbocharger/exhaust manifold assembly in place. Gradually tighten fasteners, starting at center and progressing outward in both directions to 28 N·m (250 in. lbs.) (Fig. 13). Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.

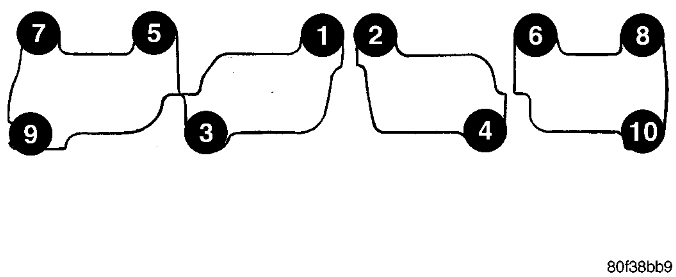


Fig. 13 Exhaust Manifold Tightening Sequence

(4) Install generator heat shield.

(5) Install coolant return line. Install **NEW** washers (Fig. 14). Torque banjo fitting bolt to 37 N·m (27 ft. lbs.) (Fig. 8).

(6) Install turbocharger coolant supply line. Install **NEW** washers (Fig. 14). Torque banjo fitting bolt to 37 N·m (27 ft. lbs.). Torque flared fitting to 31 N·m (23 ft. lbs.) (Fig. 8).

(7) Install turbocharger elbow. Torque fasteners to 28 N·m (250 in. lbs.) (Fig. 11).

(8) Loosely install turbocharger upper heat shield and fasteners (Fig. 11).

(9) Install turbocharger support bracket. Torque M8 fasteners to 28 N·m (250 in. lbs.) and M10 fasteners to 54 N·m (40 ft. lbs.) (Fig. 11).

(10) Replace oil return tube gasket. Install oil return tube. Torque fasteners to 12 N·m (105 in. lbs.). Make sure heat shield for oil return line is properly installed (Fig. 8).

(11) Install turbocharger elbow support bracket (Fig. 11).

(12) Install turbocharger to charge air cooler hose assembly (Fig. 10).

(13) Install catalytic converter with new gasket.

(14) Install fasteners securing catalytic converter to exhaust manifold (Fig. 9). Torque fasteners to 28 N·m (250 in. lbs.).

(15) Connect downstream oxygen sensor.

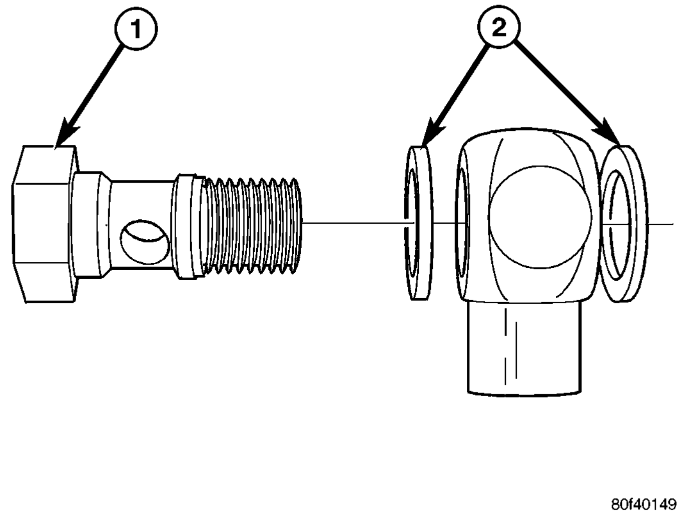


Fig. 14 Banjo Bolt and Washers

1 - BANJO BOLT
2 - WASHERS

(16) Connect exhaust extension pipe to catalytic converter.

(17) Install power steering cooler fasteners.

(18) Lower vehicle.

(19) Connect oil supply line at turbocharger. Install **NEW** washers (Fig. 14). Torque banjo fitting bolt to 37 N·m (27 ft. lbs.).

NOTE: The lower turbocharger heat shield tabs must over lap the upper heat shield tabs to prevent fatiguing and early failure.

(20) Install turbocharger lower heat shield. Torque upper and lower heat shield fasteners to 28 N·m (250 in. lbs.) (Fig. 11).

(21) Connect vacuum hoses to turbocharger.

(22) Connect upstream oxygen sensor.

(23) Install ignition coil. Connect electrical connector.

(24) Install electrical connector into bracket (Fig. 7).

(25) Install clean air hose (Fig. 10).

(26) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(27) Change oil and filter.

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

(29) Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

(30) Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

CHARGE AIR COOLER AND HOSES

REMOVAL

REMOVAL - CHARGE AIR COOLER HOSES

HOSE - CHARGE AIR COOLER TO THROTTLE BODY

(1) Raise vehicle on hoist.
(2) Disconnect Throttle Inlet Pressure (TIP) hose from charge air cooler hose.
(3) Loosen hose clamp at charge air cooler (Fig. 15).
(4) Dislodge hose from charge air cooler.
(5) Loosen hose clamp at throttle body.
(6) Remove charge air cooler hose.

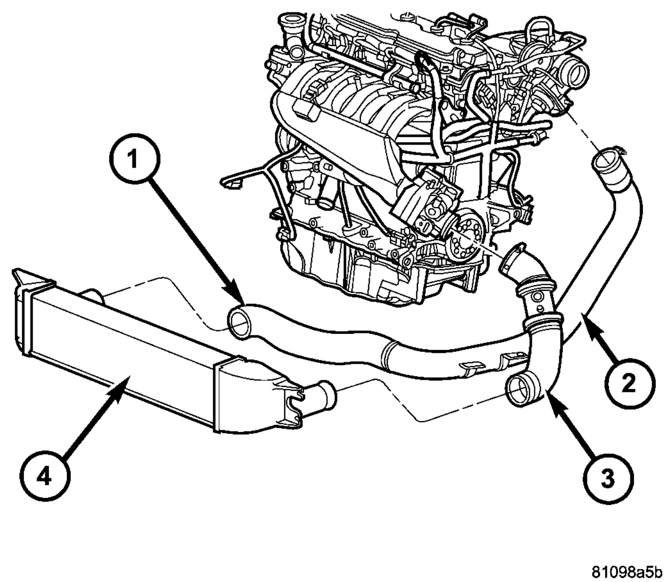


Fig. 15 Charge Air Cooler Hoses

1 - HOSE
2 - HOSE/TUBE - TURBOCHARGER TO CHARGE AIR COOLER
3 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
4 - CHARGE AIR COOLER

HOSE - TURBOCHARGER TO CHARGE AIR COOLER

(1) Raise vehicle on hoist.
(2) Loosen hose clamp at turbocharger (Fig. 15).
(3) Dislodge hose from turbocharger.
(4) Loosen hose clamp at charge air cooler (Fig. 15).
(5) Dislodge hose from charge air cooler.
(6) Remove nuts securing charge air cooler hose to structural collar (Fig. 16).
(7) Remove charge air cooler hose.

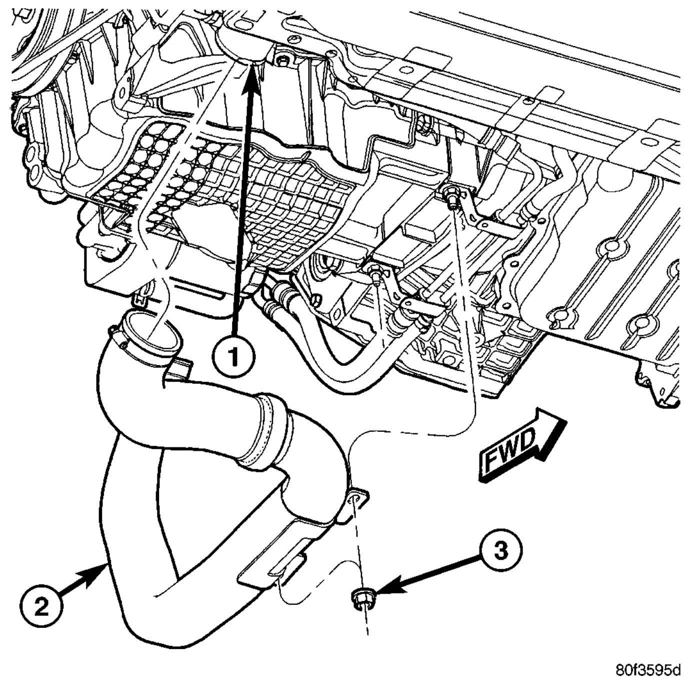


Fig. 16 Charge Air Cooler Hose

1 - CHARGE AIR COOLER
2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
3 - NUT

REMOVAL - CHARGE AIR COOLER

(1) Raise vehicle on hoist.
(2) Remove front bumper fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL) (Fig. 17).
(3) Loosen charge air cooler hose clamps. Disconnect charge air cooler hoses (Fig. 15).
(4) Remove charge air cooler fasteners (Fig. 18).
(5) Remove charge air cooler.

CHARGE AIR COOLER AND HOSES (Continued)

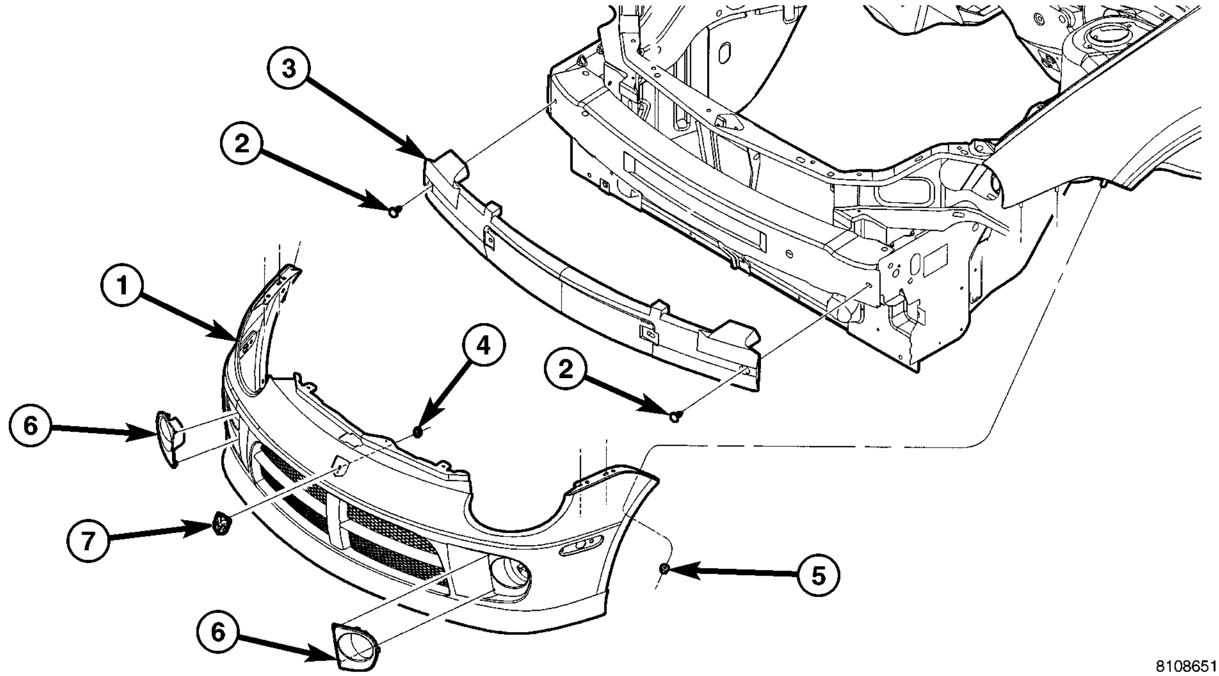


Fig. 17 Front Fascia - SRT-4

1 - SRT FRONT FASCIA
2 - PUSH PIN(S)
3 - FRONT BUMPER FASCIA FOAM
4 - MEDALLION TO FASCIA NUT
5 - WASHER/HEX NUT
6 - FOG LAMP BEZEL
7 - MEDALLION

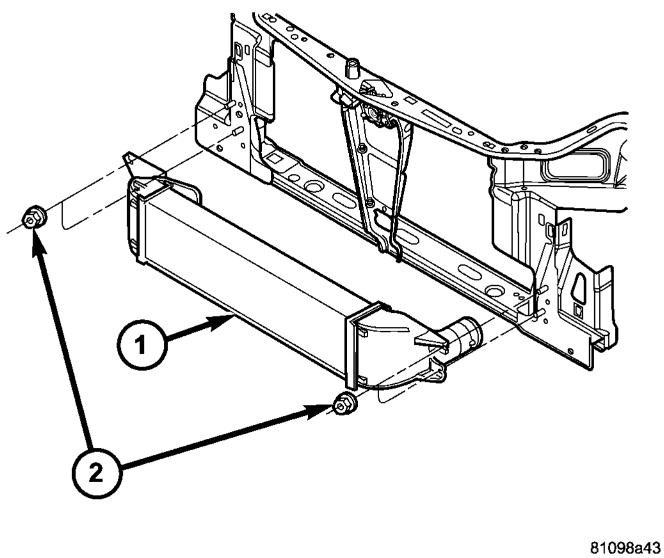


Fig. 18 Charge Air Cooler

1 - CHARGE AIR COOLER
2 - NUT(S)

INSTALLATION

INSTALLATION - CHARGE AIR COOLER HOSES

HOSE - CHARGE AIR COOLER TO THROTTLE BODY

(1) Position hose to mounting location.
(2) Connect hose to throttle body (Fig. 15).
(3) Connect hose to charge air cooler (Fig. 15).
(4) Tighten hose clamps to 1.7 N·m (15 in. lbs.).
(5) Connect Throttle Inlet Pressure (TIP) hose to charge air cooler hose (Fig. 27).
(6) Connect Inlet Air Temperature (IAT) sensor connector (Fig. 27).
(7) Lower vehicle.

HOSE - TURBOCHARGER TO CHARGE AIR COOLER

(1) Position hose to mounting location.
(2) Temporarily install nuts securing charge air cooler hose to structural collar (Fig. 16).
(3) Connect hose to turbocharger (Fig. 15).
(4) Connect hose to charge air cooler (Fig. 15).
(5) Tighten hose clamps to 1.7 N·m (15 in. lbs.).
(6) Tighten nuts securing charge air cooler hose to structural collar (Fig. 16).
(7) Lower vehicle.

CHARGE AIR COOLER AND HOSES (Continued)

INSTALLATION - CHARGE AIR COOLER

(1) Position charge air cooler to mounting location (Fig. 18).

(2) Install fasteners attaching charge air cooler. Torque fasteners to 8 N·m (75 in. lbs.) (Fig. 18).

(3) Connect charge air cooler hoses. Tighten hose clamps to 1.7 N·m (15 in. lbs.) (Fig. 15).

(4) Install front bumper fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION) (Fig. 17).

LINES AND HOSES

REMOVAL - LINES AND HOSES

NOTE: For line and hose location refer to (Fig. 19).

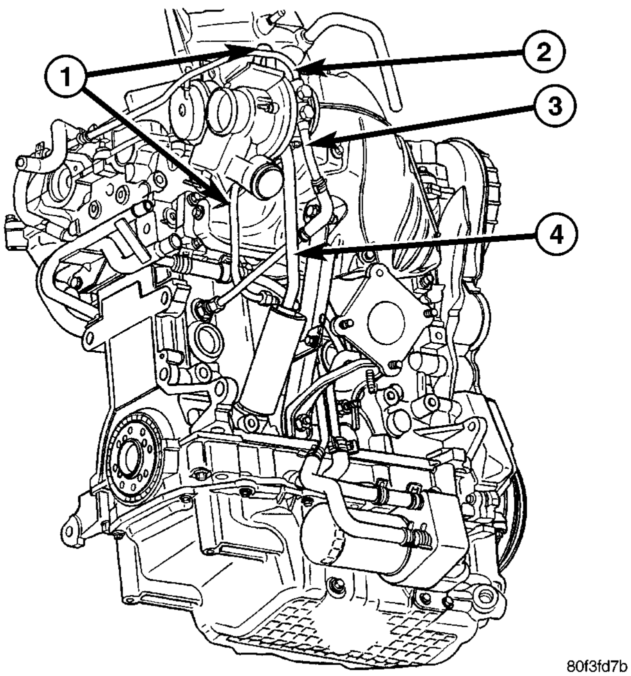


Fig. 19 Turbocharger Lines and Hoses

1 - OIL SUPPLY LINE
2 - COOLANT RETURN LINE
3 - COOLANT SUPPLY LINE
4 - OIL RETURN TUBE

COOLANT SUPPLY LINE

(1) Raise vehicle on hoist.

(2) Drain cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).

(3) Remove banjo bolt from coolant supply line at turbocharger (Fig. 20).

(4) Disconnect coolant supply line flared fitting from brass fitting at engine block (Fig. 21).

(5) Remove coolant supply line.

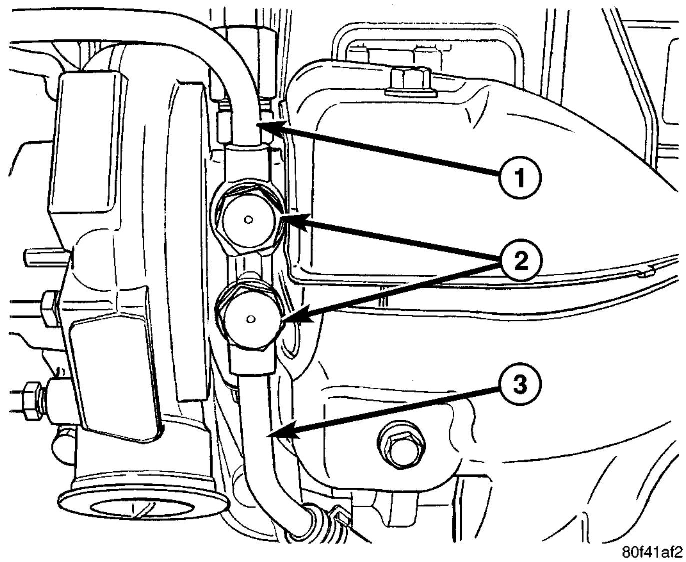


Fig. 20 Coolant Lines - Banjo Fittings

1 - COOLANT RETURN LINE
2 - BANJO BOLTS - 30 N·m (22 ft. lbs.)
3 - COOLANT SUPPLY LINE

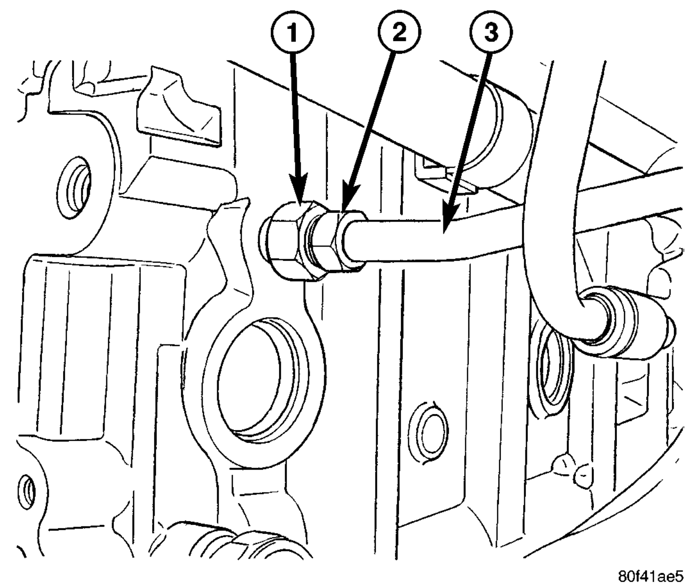


Fig. 21 Coolant Supply Line - Engine Block Fitting

1 - BRASS FITTING - 41 N·m (30 ft. lbs.)
2 - FLARED FITTING - 31 N·m (23 ft. lbs.)
3 - COOLANT SUPPLY LINE

COOLANT RETURN LINE

(1) Drain cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).

(2) Remove air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Disconnect Inlet Air Temperature (IAT) sensor connector (Fig. 28).

LINES AND HOSES (Continued)

(4) Disconnect Throttle Inlet Pressure (TIP) hose from charge air cooler hose (Fig. 28).

(5) Loosen hose clamp at throttle body.

(6) Disconnect charge air cooler hose from throttle body. Reposition charge air cooler hose.

(7) Remove fastener securing coolant return line bracket to cylinder head cover stud (Fig. 22).

(8) Remove hose clamp from coolant return line at heater tube (Fig. 22). Disconnect hose from heater tube.

(9) Remove banjo bolt from coolant return line at turbocharger (Fig. 20).

(10) Remove coolant return line.

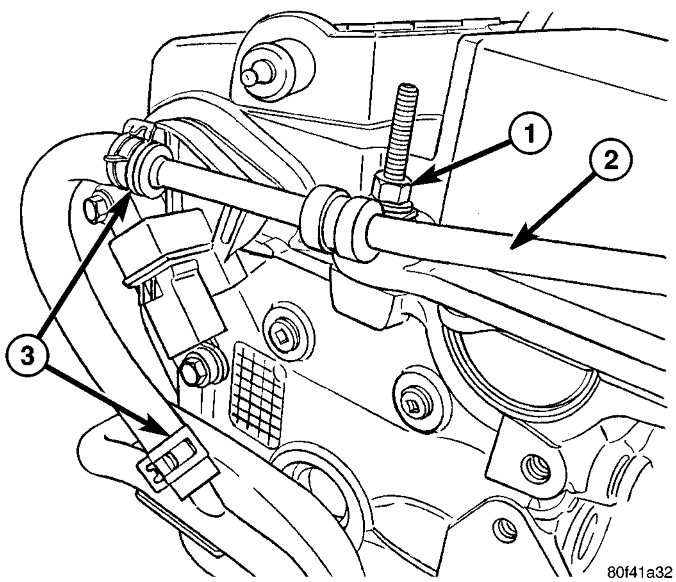


Fig. 22 Coolant Return Line Bracket

1 - NUT
2 - COOLANT RETURN LINE
3 - HOSE CLAMPS

OIL SUPPLY LINE

(1) Raise vehicle on hoist.

(2) Remove elbow support bracket (Fig. 23).

(3) Disconnect oil supply line flared fitting from brass fitting at engine block (Fig. 24).

(4) Lower vehicle.

(5) Disconnect oil supply line flared fitting from brass fitting at turbocharger (Fig. 25).

(6) Remove oil supply line.

OIL RETURN LINE

(1) Raise vehicle on hoist.

(2) Remove the two fasteners securing the oil return line to the turbocharger.

(3) Remove hose clamp from oil return line.

(4) Remove oil return line from crankcase nipple (Fig. 19).

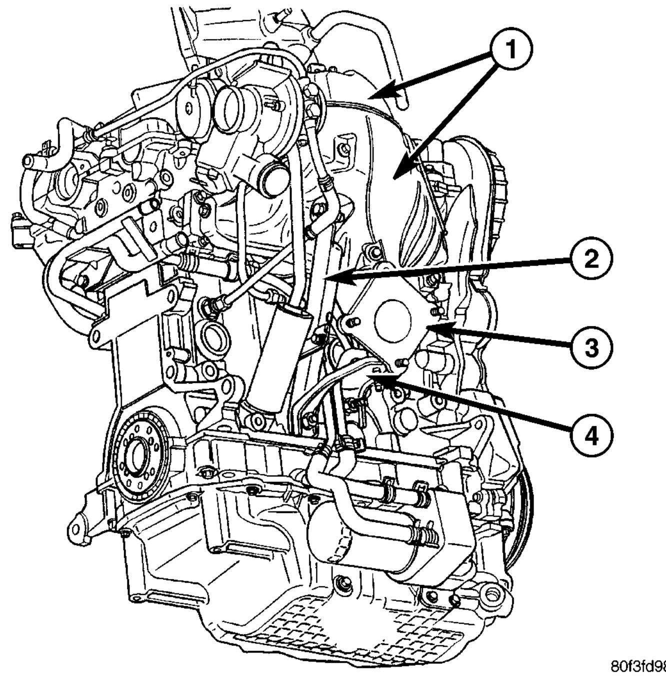


Fig. 23 Turbocharger Brackets and Heat Shields

1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET

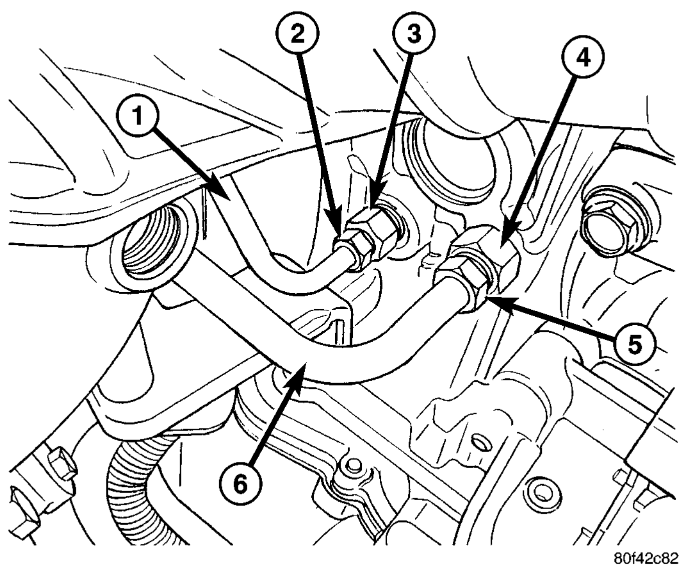


Fig. 24 Oil Supply Line - Engine Block Fitting

1 - OIL SUPPLY LINE
2 - FLARED FITTING - 31 N·m (23 ft. lbs.)
3 - BRASS FITTING - 41 N·m (30 ft. lbs.)
4 - BRASS FITTING - 41 N·m (30 ft. lbs.)
5 - FLARED FITTING - 31 N·m (23 ft. lbs.)
6 - OIL COOLER COOLANT LINE

LINES AND HOSES (Continued)

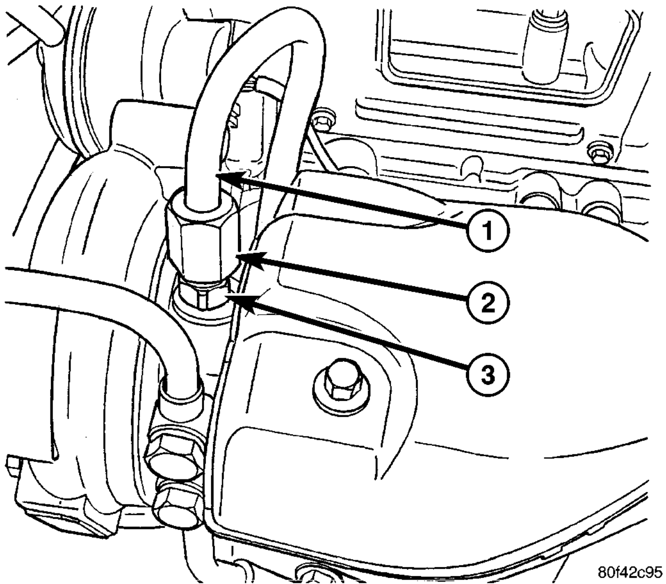


Fig. 25 Oil Supply Line - Turbocharger Fitting

1 - OIL SUPPLY LINE
2 - FLARED FITTING - 31 N·m (23 ft. lbs.)
3 - BRASS FITTING - 41 N·m (30 ft. lbs.)

INSTALLATION - LINES AND HOSES

NOTE: For line and hose location refer to (Fig. 27).

COOLANT SUPPLY LINE

(1) If brass fitting was removed from engine block, apply thread sealer to threads and install in engine block. Torque brass fitting to 41 N·m (30 ft. lbs.).

(2) Position coolant supply line to mounting location.

(3) Install **NEW** washers on banjo fitting of coolant supply line (Fig. 24). Hand start banjo bolt.

(4) Hand start flared fitting of coolant supply line.

(5) Torque banjo fitting bolt to 37 N·m (27 ft. lbs.) (Fig. 26).

(6) Torque flared fitting to 31 N·m (23 ft. lbs.) (Fig. 24).

(7) Lower vehicle.

(8) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

COOLANT RETURN LINE

(1) Position coolant return line to mounting location.

(2) Install **NEW** washers on banjo fitting of coolant return line (Fig. 26). Hand start banjo bolt.

(3) Install hose onto heater tube. Install hose clamp (Fig. 23).

(4) Torque banjo fitting bolt to 37 N·m (27 ft. lbs.) (Fig. 26).

(5) Install fastener securing coolant return line bracket to cylinder head cover stud (Fig. 23).

(6) Install turbocharger clean air hose (Fig. 15).

(7) Tighten hose clamps to 1.7 N·m (15 in. lbs.).

(8) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

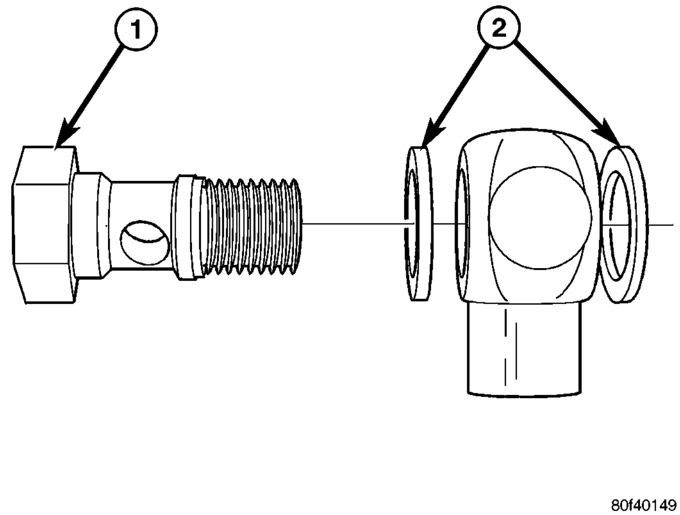


Fig. 26 Banjo Bolt and Washers

1 - BANJO BOLT
2 - WASHERS

OIL SUPPLY LINE

(1) If brass fitting was removed from engine block, apply thread sealer to threads and install. Torque brass fitting to 41 N·m (30 ft. lbs.).

(2) Position oil supply line to mounting location.

(3) Install **NEW** washers on banjo fitting of oil supply line (Fig. 26). Hand start banjo bolt at turbocharger (Fig. 25).

(4) Raise vehicle on hoist.

(5) Hand start flared fitting at engine block (Fig. 25).

(6) Torque flared fitting to 31 N·m (23 ft. lbs.) (Fig. 25).

(7) Install elbow support bracket (Fig. 23).

(8) Lower vehicle.

(9) Torque banjo fitting bolt to 37 N·m (27 ft. lbs.) (Fig. 26).

OIL RETURN LINE

(1) Clean gasket surfaces.

(2) Install new gasket.

(3) Install oil return line hose over crankcase nipple (Fig. 20).

(4) Install the two fasteners securing the oil return line to the turbocharger. Torque fasteners to 12 N·m (105 in. lbs.).

(5) Install and tighten hose clamp for oil return line hose.

(6) Lower vehicle.

SOLENOIDS AND VACUUM HARNESS

DESCRIPTION

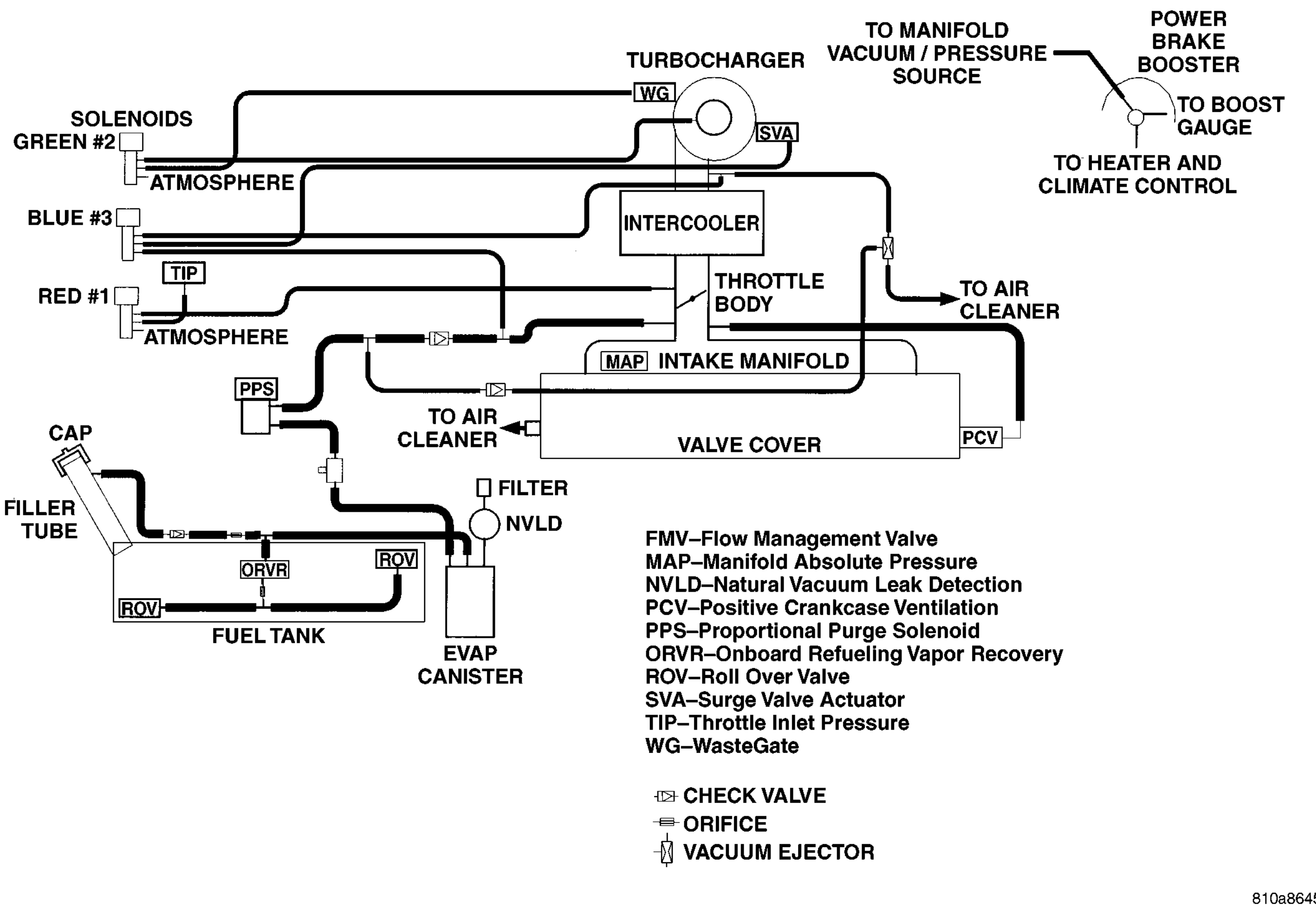


Fig. 27 Vacuum Harness Schematic

NOTE: Refer to (Fig. 27) and (Fig. 28) for vacuum harness routing and component location.

Turbocharged vehicles are equipped with three solenoids that are PCM controlled. They are mounted to the air cleaner housing cover. A vacuum harness connects the solenoids to their respective component.

- Wastegate Actuator Solenoid
- Surge Valve Actuator Solenoid
- Throttle Inlet Pressure (TIP) Solenoid

SOLENOIDS AND VACUUM HARNESS (Continued)

REMOVAL

NOTE: For specific solenoid location, refer to (Fig. 28).

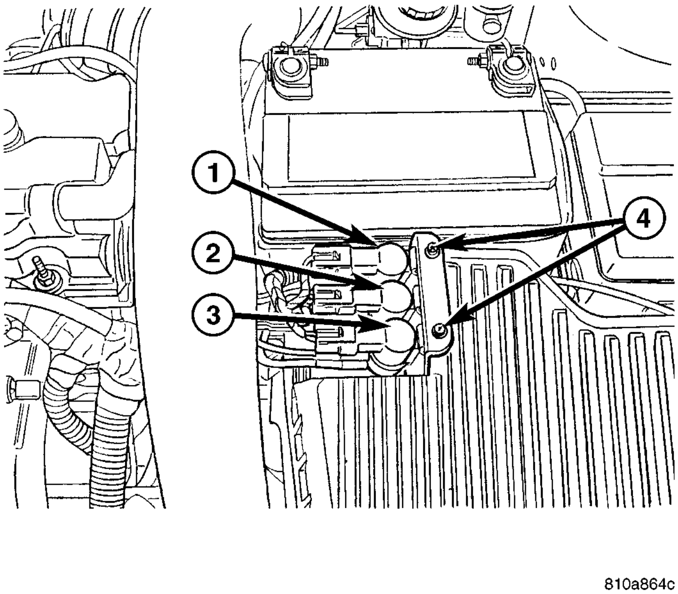


Fig. 28 Turbocharger Solenoids and Mounting Bracket

1 - TIP SOLENOID
2 - SURGE VALVE ACTUATOR SOLENOID
3 - WASTEGATE ACTUATOR SOLENOID
4 - BRACKET MOUNTING SCREWS

(1) Remove solenoid mounting bracket screws (Fig. 28).

(2) Disconnect solenoid electrical connector.

(3) Disconnect vacuum harness connector from solenoid.

(4) Push on solenoid lock tab and slide solenoid off bracket (Fig. 29).

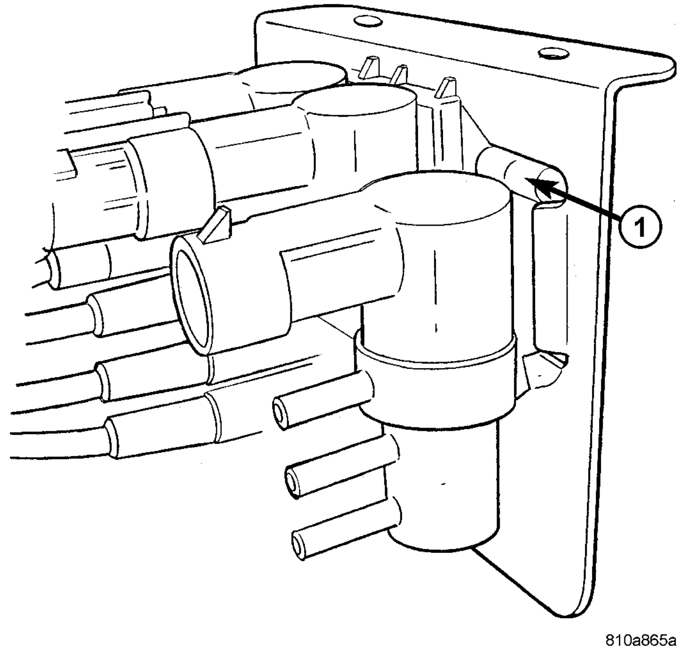


Fig. 29 Solenoid Lock Tab

1 - LOCK TAB

INSTALLATION

(1) Slide solenoid onto mounting bracket until lock tab engages (Fig. 29).

(2) Connect vacuum harness connector to solenoid.

(3) Connect solenoid electrical connector.

(4) Install screws securing solenoid mounting bracket to air cleaner housing (Fig. 28).

EXHAUST SYSTEM

TABLE OF CONTENTS

EXHAUST SYSTEM

DESCRIPTION

The exhaust system consists of an under floor catalytic converter, intermediate pipe, and a muffler with tailpipe (Fig. 1).

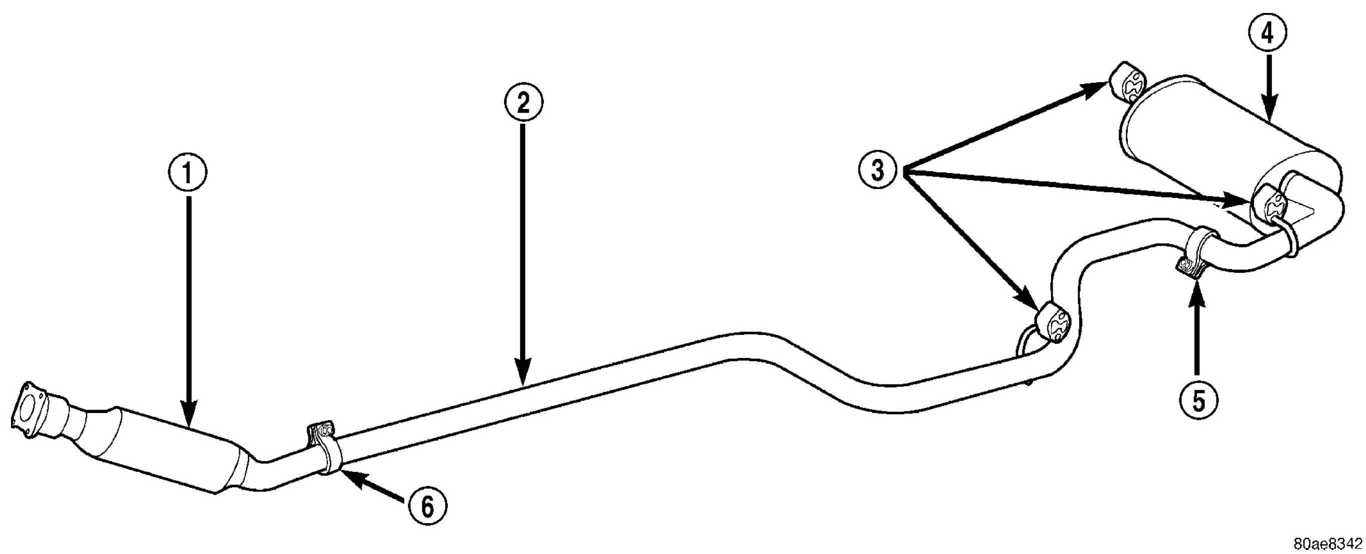


Fig. 1 Exhaust System

1 - CATALYTIC CONVERTER
2 - EXHAUST INTERMEDIATE PIPE
3 - ISOLATORS
4 - MUFFLER
5 - BAND CLAMP
6 - BAND CLAMP

EXHAUST SYSTEM (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - EXHAUST SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST NOISE (UNDER HOOD)	1. Exhaust manifold cracked or broken.	1. Replace manifold.
	2. Manifold to cylinder head leak.	2. Tighten manifold and/or replace gasket.
	3. Exhaust Flex joint to manifold leak.	3.Tighten fasteners or replace gasket.
	4. Exhaust flex joint.	4. Replace catalytic converter assembly.
	5. Pipe and shell noise from front exhaust pipe.	5. Characteristic of single wall pipes.
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints.	1. Tighten or replace clamps at leaking joints.
	2. Burned, blown, or rusted out exhaust pipe or muffler.	2. Replace muffler or exhaust pipes.
	3. Restriction in muffler or tailpipe.	3. Perform exhaust system restriction check. **(Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING - EXHAUST SYSTEM RESTRICTION CHECK).** Replace component(s) as necessary.
	4. Catalytic converter material in muffler.	4. Replace muffler and converter assembly. Check fuel injection and ignition systems for proper operation.

DIAGNOSIS AND TESTING - EXHAUST SYSTEM RESTRICTION CHECK

Exhaust system restriction can be checked by measuring back pressure using the DRB III® and PEP module pressure tester.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

NOTE: For Special Tool identification, (Refer to 11 - EXHAUST SYSTEM - SPECIAL TOOLS).

(1) Disconnect and remove the upstream (before catalytic converter) oxygen sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - REMOVAL)

(2) Install the Exhaust Back Pressure Fitting Adaptor CH8519.

(3) Connect the Low Pressure Sensor (15 psi) CH7063 to the back pressure fitting.

(4) Following the PEP module instruction manual, connect all required cables to the DRB III® and PEP module. Select the available menu options on the DRBIII® display screen for using the digital pressure gauge function.

(5) Apply the park brake and start the engine.

(6) With transmission in Park or Neutral, raise engine speed to 2000 RPM. Monitor the pressure readings on the DRBIII®. Back pressure should not exceed specified limit. Refer to specification in table below EXHAUST BACK PRESSURE LIMITS.

(7) If pressure exceeds maximum limits, inspect exhaust system for restricted component. For further catalytic converter inspection procedures, (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSPECTION). Replace component(s) as necessary.

EXHAUST SYSTEM (Continued)

EXHAUST BACK PRESSURE LIMITS

Exhaust Back Pressure Limit (Max)	
Vehicle in Park/Neutral (no load) @2000 RPM	3.45 Kpa (0.5 psi)

INSPECTION

Inspect the exhaust pipes, catalytic converters, muffler, and resonators for cracked joints, broken welds and corrosion damage that would result in a leaking exhaust system. Inspect the clamps, support brackets, and insulators for cracks and corrosion damage.

NOTE: Slip joint band clamps are spot welded to exhaust system. If a band clamp must be replaced, the spot weld must be ground off.

ADJUSTMENTS

A misaligned exhaust system is usually indicated by a vibration, rattling noise, or binding of exhaust system components. These noises are sometimes hard to distinguish from other chassis noises. Inspect exhaust system for broken or loose clamps, heat shields, insulators, and brackets. Replace or tighten as necessary. It is important that exhaust system clearances and alignment be maintained.

Perform the following procedures to align the exhaust system. For exhaust system clearance specifications, refer to (Fig. 2) or (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS)

(1) Loosen clamps and support brackets.

(2) Align the exhaust system starting at the front, working rearward.

(3) Tighten all clamps and brackets once alignment and clearances are achieved.

SPECIFICATIONS

EXHAUST SYSTEM CLEARANCES

(1) Use the following illustration to adjust the exhaust system (Fig. 2).

EXHAUST SYSTEM (Continued)

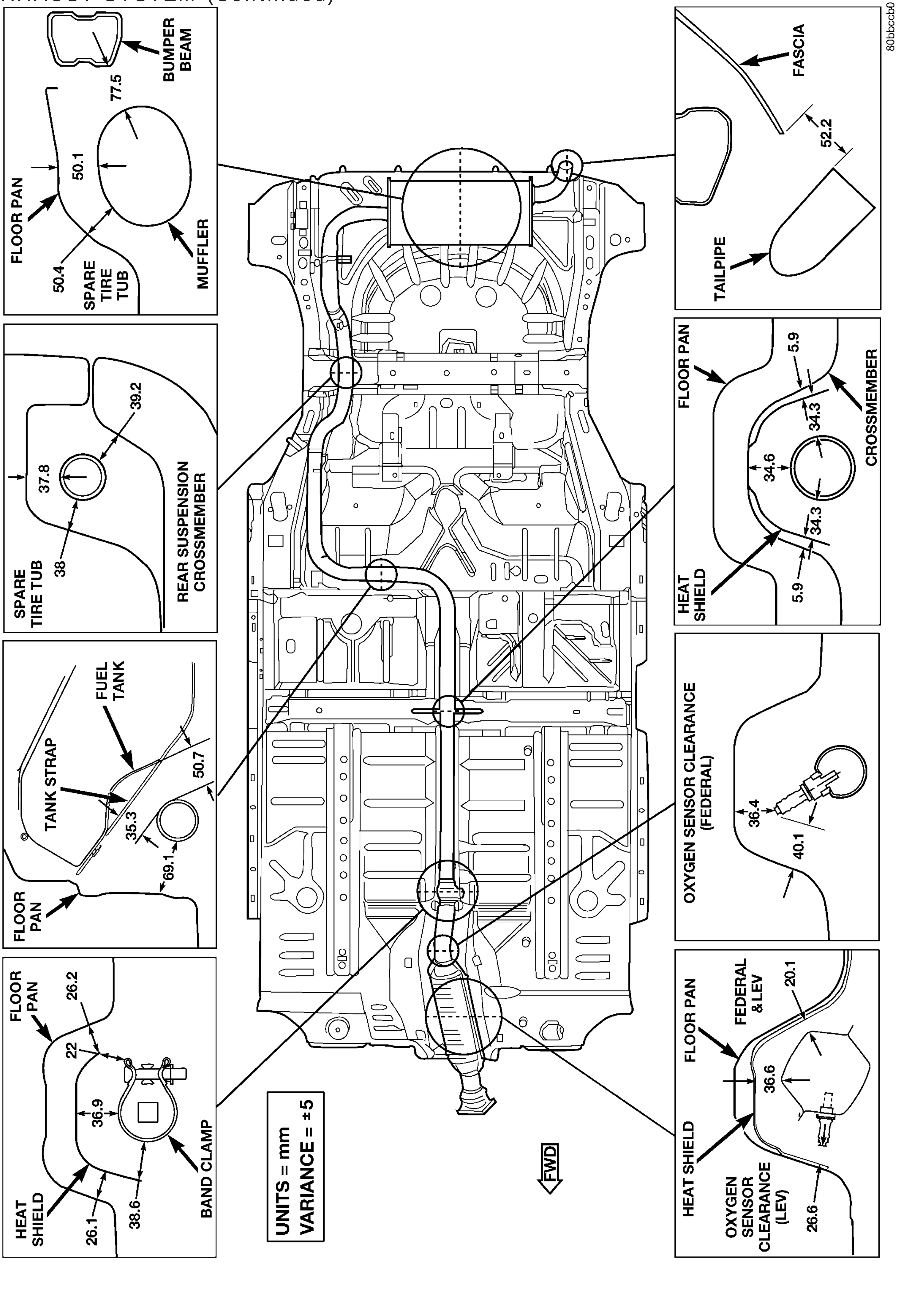


Fig. 2 EXHAUST SYSTEM CLEARANCES

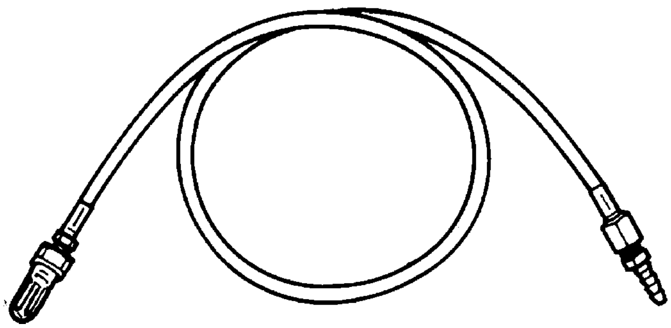
EXHAUST SYSTEM (Continued)

TORQUE

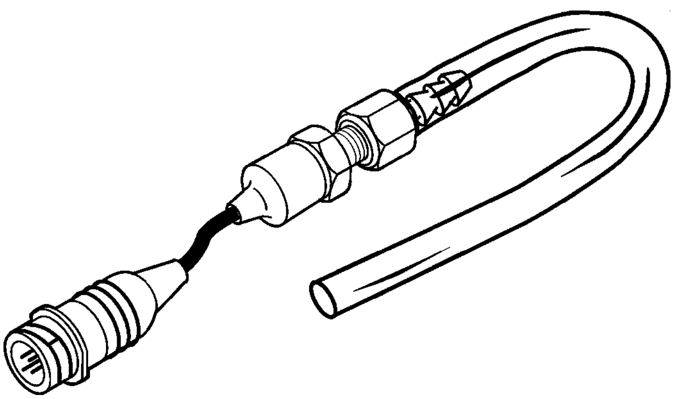
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fastener, Band Clamps	47	35	-
Fasteners, Catalytic Converter to Exhaust Manifold Flange	28	-	250

SPECIAL TOOLS

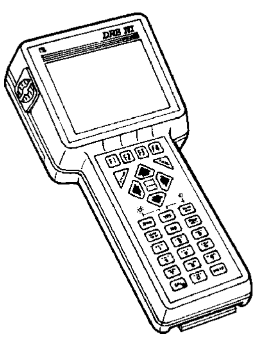
EXHAUST SYSTEM



Back Pressure Test Adapter - CH8519



Pressure Transducer CH7063



DRB III & PEP Module - OT-CH6010A

CATALYTIC CONVERTER

DESCRIPTION

An under-floor catalytic converter is used on all three converter packages; EURO (Fig. 3), Low Emission Vehicle (LEV) (Fig. 4), and the High Output engine (Fig. 5).

CAUTION: Due to exterior physical similarities of some catalytic converters with pipe assemblies, extreme care should be taken with replacement parts.

An exhaust flex-joint coupling secures the catalytic converter to the exhaust manifold by using four fasteners and a gasket for sealing (Fig. 6). The flex-joint is serviced with the catalytic converter.

CAUTION: When servicing the catalytic converter, care must be exercised not to dent or bend the flex-joint. Should this occur, the flex-joint will eventually fail and require the catalytic converter to be replaced. Do not allow the exhaust system to hang unsupported. If the isolators are removed and the catalytic converter is still attached to the exhaust manifold, failure to the flex joint will result.

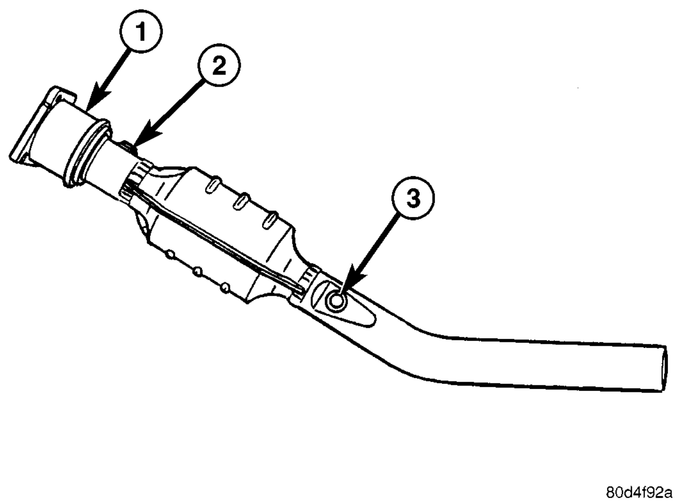


Fig. 3 Catalytic Converter - EURO

1 - FLEX JOINT
2 - OXYGEN SENSOR - UPSTREAM
3 - OXYGEN SENSOR - DOWNSTREAM

OPERATION

The three-way catalytic converter simultaneously converts three exhaust emissions into harmless gases. Specifically, HC and CO emissions are converted into water (H_2O) and carbon dioxide (CO_2). Oxides of Nitrogen (NO_x) are converted into Nitrogen

CATALYTIC CONVERTER (Continued)

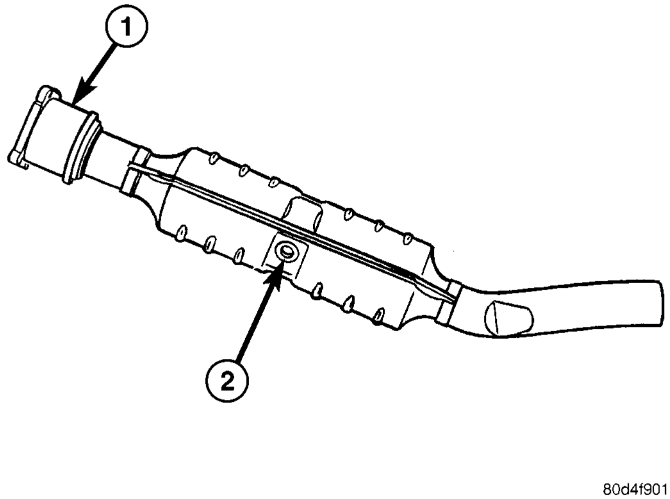


Fig. 4 Catalytic Converter - LEV

1 - FLEX JOINT
2 - OXYGEN SENSOR - DOWNSTREAM

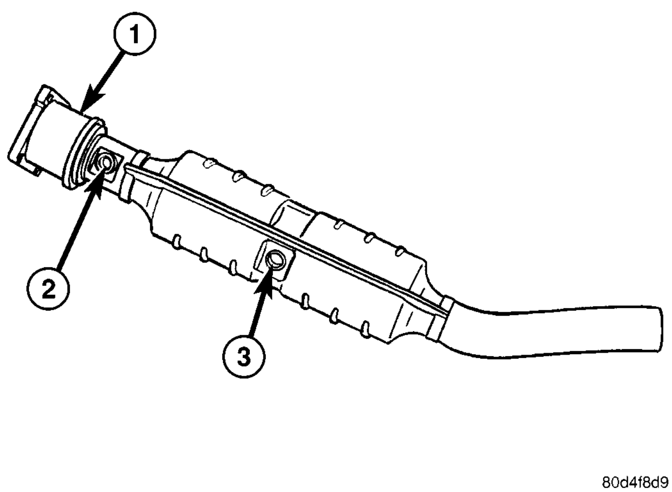


Fig. 5 Catalytic Converter - High Output Engine

1 - FLEX JOINT
2 - OXYGEN SENSOR - UPSTREAM
3 - OXYGEN SENSOR - DOWNSTREAM

(N) and Oxygen. The three-way catalyst is most efficient in converting HC, CO and NOx at the stoichiometric air fuel ratio of 14.7:1.

The oxygen content in a catalyst is important for efficient conversion of exhaust gases. When a high oxygen content (lean) air/fuel ratio is present for an extended period, oxygen content in a catalyst can reach a maximum. When a rich air/fuel ratio is present for an extended period, the oxygen content in the catalyst can become totally depleted. When this

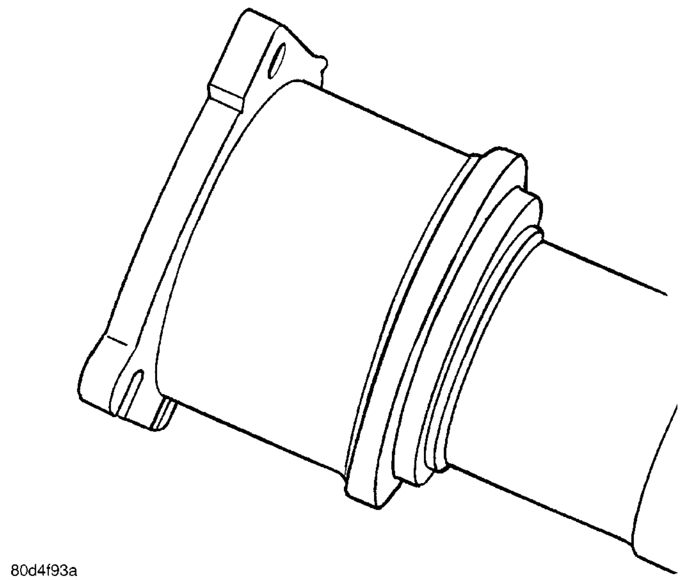


Fig. 6 Flex Joint

occurs, the catalyst fails to convert the gases. This is known as catalyst ″punch through.″

Catalyst operation is dependent on its ability to store and release the oxygen needed to complete the emissions-reducing chemical reactions. As a catalyst deteriorates, its ability to store oxygen is reduced. Since the catalyst's ability to store oxygen is somewhat related to proper operation, oxygen storage can be used as an indicator of catalyst performance. Refer to the appropriate Diagnostic Information for diagnosis of a catalyst related Diagnostic Trouble Code (DTC).

The combustion reaction caused by the catalyst releases additional heat in the exhaust system, causing temperature increases in the area of the reactor 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. Failure of the catalytic converter can occur due to temperature increases caused by unburned fuel passing through the converter. This deterioration of the catalyst core can result in excessively high emission levels, noise complaints, and exhaust restrictions.

Unleaded gasoline must be used to avoid ruining the catalyst core. Do not allow engine to operate above 1200 RPM in neutral for extended periods over 5 minutes. This condition may result in excessive exhaust system/floor pan temperatures because of no air movement under the vehicle.

The flex joint allows flexing as the engine moves, preventing breakage that could occur from the back-and-forth motion of a transverse mounted engine.

CATALYTIC CONVERTER (Continued)

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 vehicles built for States with strict emission requirements) and between model years.

REMOVAL

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Remove muffler and exhaust pipe. (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL)

(2) Disconnect the downstream oxygen sensor electrical connector. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - REMOVAL)

(3) Remove the exhaust manifold support bracket (LEV only) (Fig. 7).

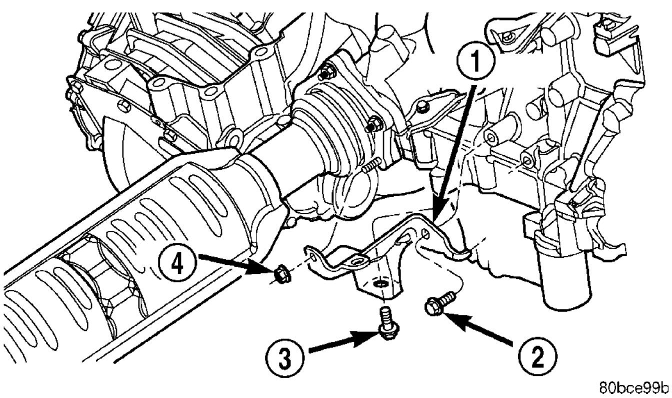


Fig. 7 Exhaust Manifold Support Bracket - LEV

1 - BRACKET
2 - BOLT (M10) - 54 N·m (40 ft. lbs.)
3 - BOLT (M12) - 95 N·m (70 ft. lbs.)
4 - NUT - 28 N·m (250 in. lbs.)

(4) Remove catalytic converter to exhaust manifold attaching fasteners and remove converter from vehicle (Fig. 8).

(5) Remove and discard the flange gasket.

NOTE: When replacement is required on any component of the exhaust system, original equipment parts (or equivalent) must be used.

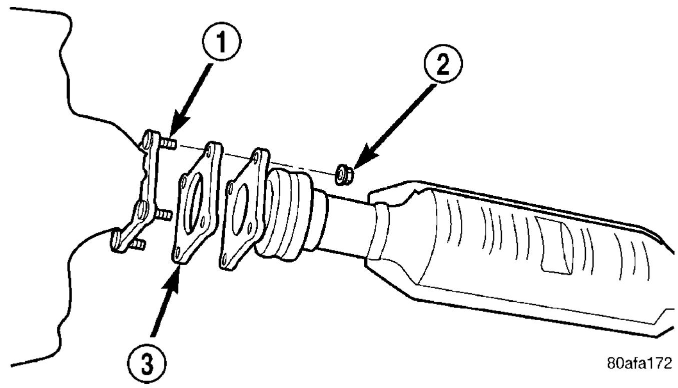


Fig. 8 Catalytic Converter to Exhaust Manifold Connection - Typical

1 - PRESSED-IN STUDS
2 - NUTS
3 - GASKET

INSPECTION

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

Check catalytic converter for a flow restriction. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Exhaust System Restriction Check for procedure.

Visually inspect the catalytic converter element by using a borescope or equivalent. Remove oxygen sensor(s) and insert borescope. If borescope is not available, remove converter and inspect element using a flashlight. Inspect element for cracked or melted substrate.

NOTE: Before replacing a catalytic converter, determine the root cause of failure. Most catalytic converter failures are caused by air, fuel or ignition problems. (Refer to Appropriate Diagnostic Information) for test procedures.

INSTALLATION

NOTE: When assembling exhaust system do not tighten clamps until all components are aligned and clearances are checked.

(1) Assemble catalytic converter to exhaust manifold connection. Use a new flange gasket.

CATALYTIC CONVERTER (Continued)

(2) Install exhaust manifold support bracket (LEV only). Tighten M10 bolt to 54 N·m (40 ft. lbs.), M12 bolt to 95 N·m (70 ft. lbs.), and nut to 28 N·m (250 in. lbs.).

(3) Install bolt attaching manifold support bracket to the heat shield (NLEV only). Tighten bolt to 28 N·m (250 in. lbs.).

(4) Assemble muffler and exhaust pipe to catalytic converter. Install muffler and pipe support isolators to the underbody.

(5) Tighten the catalytic converter to exhaust manifold fasteners to 28 N·m (250 in. lbs.) (Fig. 8).

(6) Working from the front of the system; align each component to maintain position and proper clearance with under body components. Tighten all slip joint band clamps to 47 N·m (35 ft. lbs.).

CAUTION: Exhaust band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp has lost clamping force and must be replaced.

(7) If removed, install downstream oxygen sensor (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - INSTALLATION).

(8) Connect downstream oxygen sensor electrical connector.

(9) Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

(10) Check the exhaust system for contact with the body panels. Make the necessary ajustments, if needed.

HEAT SHIELDS

DESCRIPTION

The heat shields (Fig. 9), (Fig. 10) and (Fig. 11) are needed to protect both the vehicle and the environment from the high temperatures developed in the vicinity of the catalytic converter.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shield on cars if 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.

REMOVAL

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove fasteners attaching heat shield to under body (Fig. 9), or engine component (Fig. 10) (Fig. 11).

(3) Remove heat shield(s).

REMOVAL

(1) Using a flat scraper or sharp tool, locate an edge of heat shield between the body and the heat shield

(2) Attach pliers or locking pliers to the edge and exert a pulling force while applying a heat gun to the heat shield.

(3) Remove and clean heat shiel area with Mopar® Adhesive Cleaner.

INSTALLATION

INSTALLATION

(1) Position heat shield to underbody (Fig. 9) or engine component (Fig. 10) (Fig. 11).

(2) Install and tighten heat shield fasteners (Fig. 9), (Fig. 10), or (Fig. 11)

(3) Inspect heat shield to exhaust system clearances and adjust as necessary. (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS)

(4) Lower the vehicle.

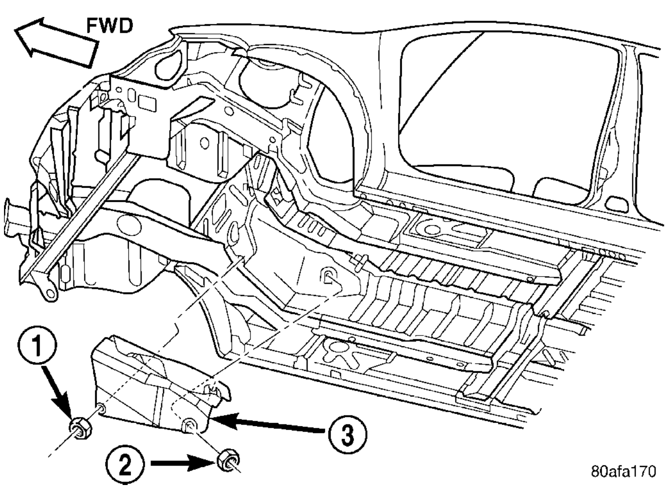


Fig. 9 Heat Shield - Catalytic Converter

1 - NUT
2 - NUT
3 - HEAT SHIELD

(5) Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

(6) Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

HEAT SHIELDS (Continued)

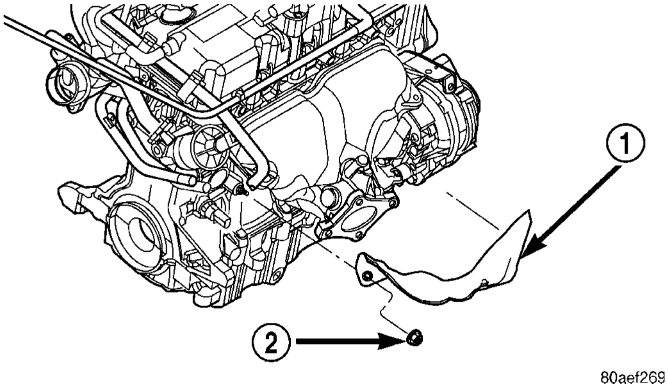


Fig. 10 Heat Shield - Engine Wire Harness

1 - HEAT SHIELD
2 - NUT - 11 N·m (100 in. lbs.)

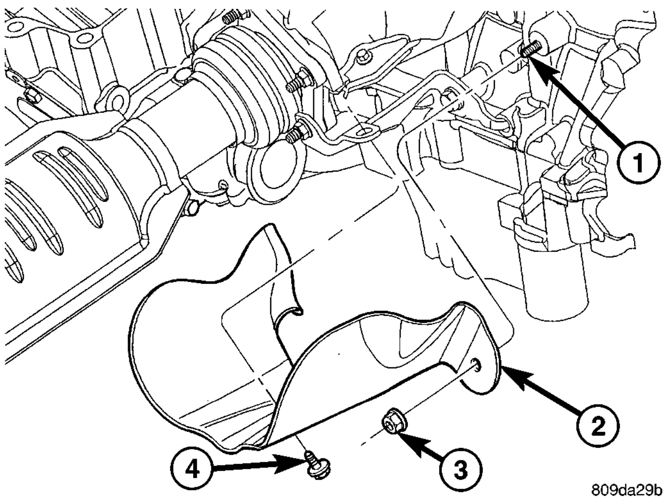


Fig. 11 Heat Shield - Engine Wire Harness

1 - STUD
2 - HEAT SHIELD - WIRING
3 - NUT - 11 N·m (100 in. lbs.)
4 - BOLT - 28 N·m (250 in. lbs.)

INSTALLATION

(1) Remove old adhesive and clean heat shield aera with Mopar® Adhesive Cleaner.

(2) Apply new heat shield to dry surface.

INTERMEDIATE PIPE

REMOVAL

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(1) Raise vehicle on hoist and apply penetrating oil to band clamp fastener of component being removed.

NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

(2) Remove the muffler. (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL)

(3) Loosen band clamp at the catalytic converter to intermediate pipe joint (Fig. 12)

(4) Remove intermediate pipe support isolator. Separate at slip joint and remove intermediate pipe (Fig. 12).

(5) Clean ends of pipes and muffler to assure mating of all parts. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.

NOTE: When replacement is required on any component of the exhaust system, you must use original equipment parts (or their equivalent).

INSTALLATION

When assembling exhaust system **do not** tighten clamps until components are aligned and clearances are checked.

(1) Assemble intermediate pipe to catalytic converter and the isolator support to the underbody (Fig. 12).

(2) Install the muffler to intermediate pipe and the isolator supports to the underbody.

(3) Working from the front of system; align each component to maintain position and proper clearance with underbody parts. (Refer to 11 - EXHAUST SYSTEM - ADJUSTMENTS)

(4) Tighten all band clamps to 47 N·m (35 ft. lbs.) (Fig. 13).

CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp band has been stretched and has lost its clamping force and must be replaced.*

NOTE: *To replace the band clamp; remove the nut and peel back the ends of the clamp until spot weld breaks.

INTERMEDIATE PIPE (Continued)

NOTE: Maintain proper clamp orientation when replacing with new clamp.

(5) Connect the exhaust system ground strap.

(6) Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

(7) Check the exhaust system for contact with the body panels. Make the necessary ajustments, if needed.

MUFFLER

REMOVAL

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(1) Raise vehicle on hoist and apply penetrating oil to band clamp fastener of component being removed.

NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

(2) Remove exhaust system ground strap.

(3) Loosen band clamp and remove support isolators at muffler. Remove muffler from exhaust pipe (Fig. 12).

(4) Clean ends of pipes and muffler to assure mating of all parts. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.

NOTE: When replacement is required on any component of the exhaust system, you must use original equipment parts (or their equivalent).

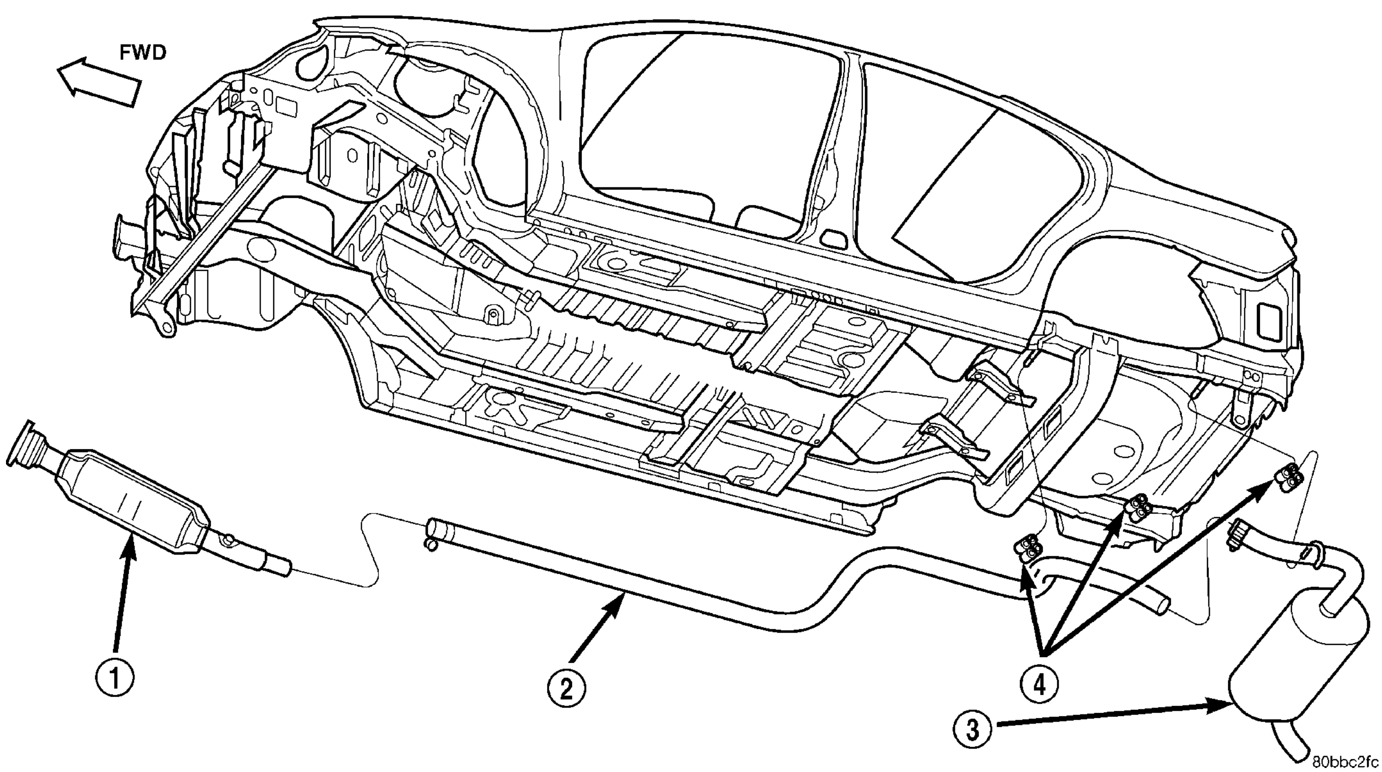

Fig. 12 EXHAUST SYSTEM COMPONENTS

1 - CATALYTIC CONVERTER
2 - INTERMEDIATE PIPE
3 - MUFFLER
4 - ISOLATORS

MUFFLER (Continued)

INSTALLATION

When assembling exhaust system **do not** tighten clamps until components are aligned and clearances are checked.

(1) Install the muffler to intermediate pipe and the isolator supports to the underbody.

(2) Working from the front of system; align each component to maintain position and proper clearance with underbody parts. (Refer to 11 - EXHAUST SYSTEM - ADJUSTMENTS)

(3) Tighten all band clamps to 47 N·m (35 ft. lbs.) (Fig. 13).

CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp band has been stretched and has lost its clamping force and must be replaced.*

NOTE: *To replace the band clamp; remove the nut and peel back the ends of the clamp until spot weld breaks.

NOTE: Maintain proper clamp orientation when replacing with new clamp.

(4) Connect the exhaust system ground strap.

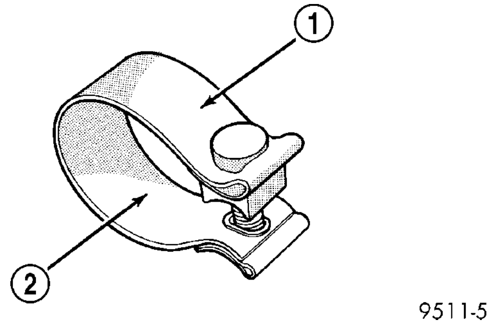

Fig. 13 Band Clamp

1 - CLAMP SIZE
2 - TORQUE SPECIFICATION

(5) Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

(6) Check the exhaust system for contact with the body panels. Make the necessary ajustments, if needed.

FRAME & BUMPERS

TABLE OF CONTENTS

BUMPERS

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Front Bumper Reinforcement Bolt	12 N·m (105 in. lbs.)
Rear Bumper Reinforcement Bolt	10 N·m (90 in. lbs.)
Front Crossmember To Side Rail Bolt	153 N·m (113 ft. lbs.)
Front Crossmember/ Control Arm To Side Rail Bolt	244 N·m (1180 ft. lbs.)

FRONT FASCIA

REMOVAL

(1) Remove splash shield attaching screws.

(2) Remove fasteners attaching air dam to crossmember (Fig. 1).

(3) SRT-4 vehicle remove four attaching screws (Fig. 2).

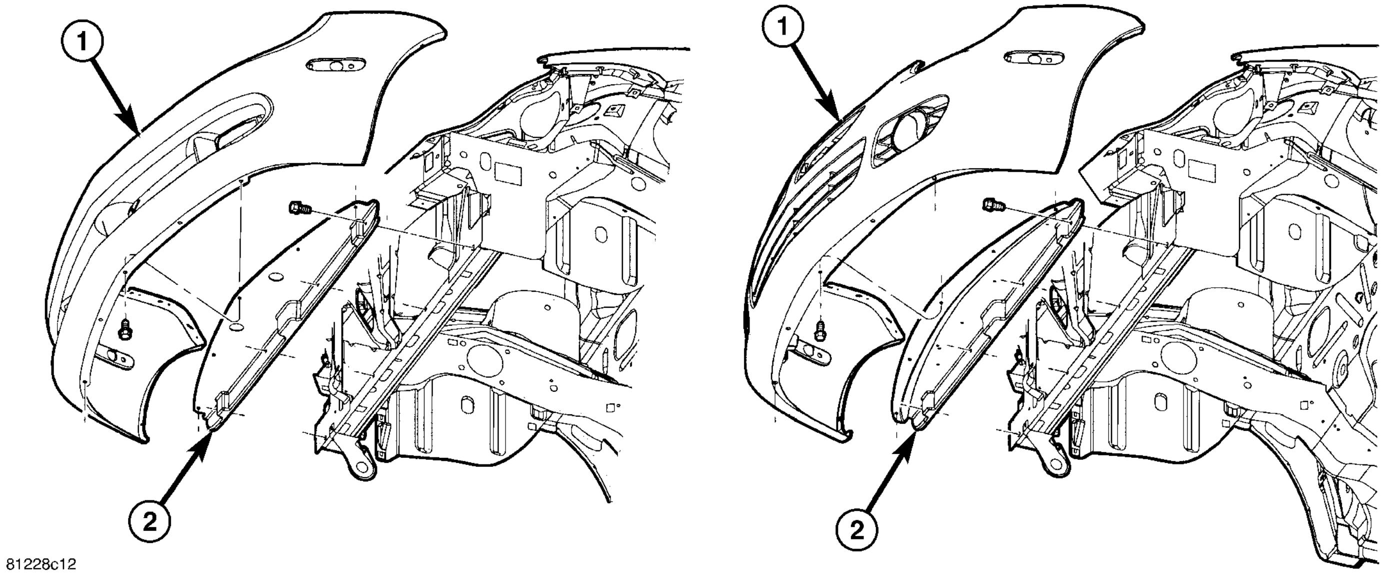

Fig. 1 AIR DAM - DOMESTIC

1 - FASCIA
2 - AIR DAM

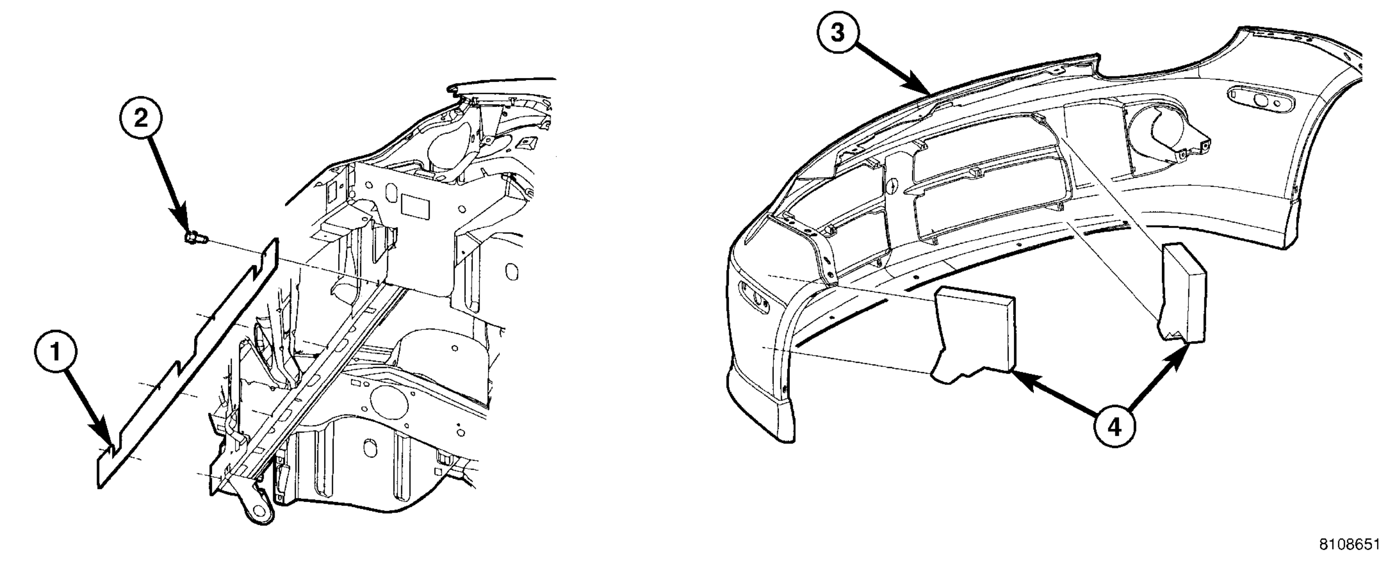

Fig. 2 FRONT AIR DAM - SRT-4

1 - FRONT FASCIA
2 - AIR DAM
3 - FASCIA TO CROSSMEMBER UPPER BLOCKER
4 - AIR DAM (BLADE) BETWEEN AIR DAM AND FASTENER HEAD

FRONT FASCIA (Continued)

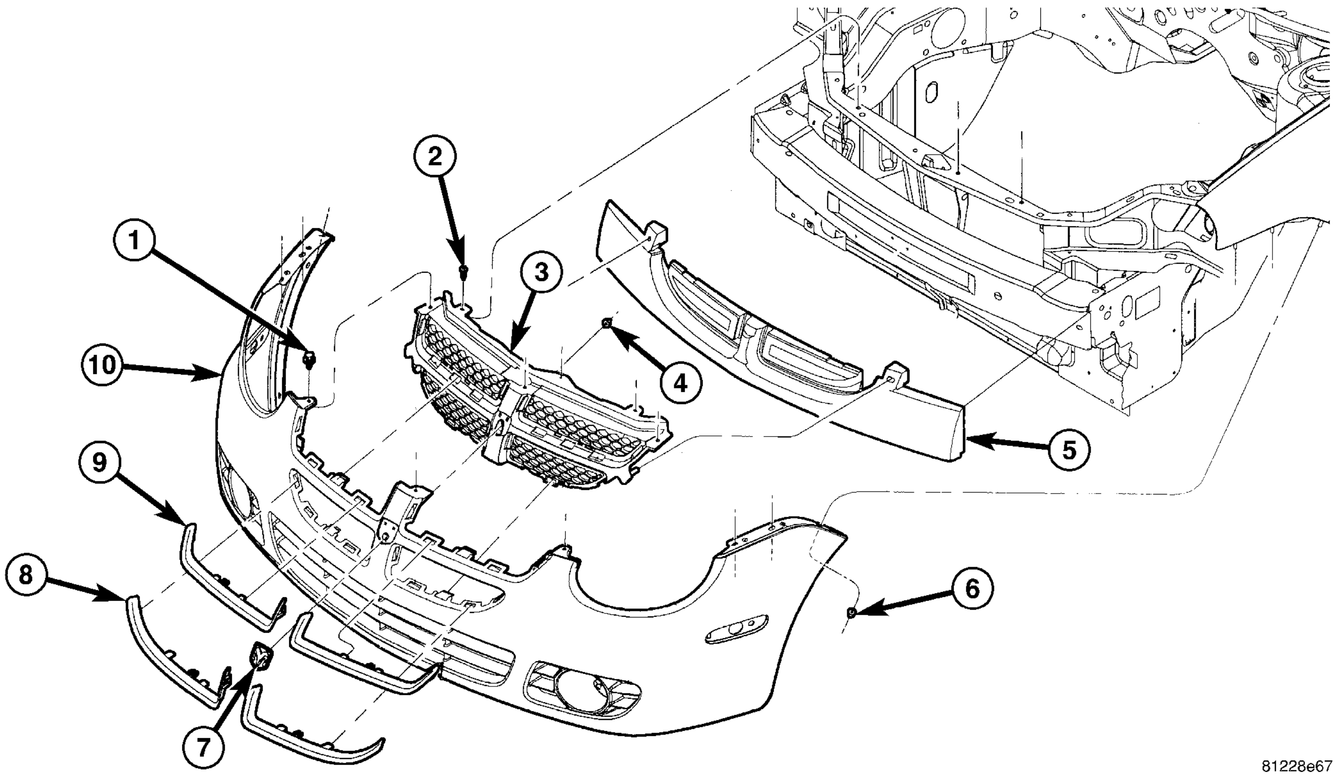

Fig. 3 FRONT FASCIA - DOMESTIC

1 - FASCIA
2 - PUSH PIN FASTENER(S)
3 - ATTACHING SCREW(S)
4 - GRILLE
5 - EMBLEM NUT
6 - SURROUND GRILLE
7 - EMBLEM

(4) Disconnect fog lamp wiring harness, if equipped.

(5) Remove nuts attaching front bumper fascia to bottom of fender flange. (Fig. 3), and (Fig. 4).

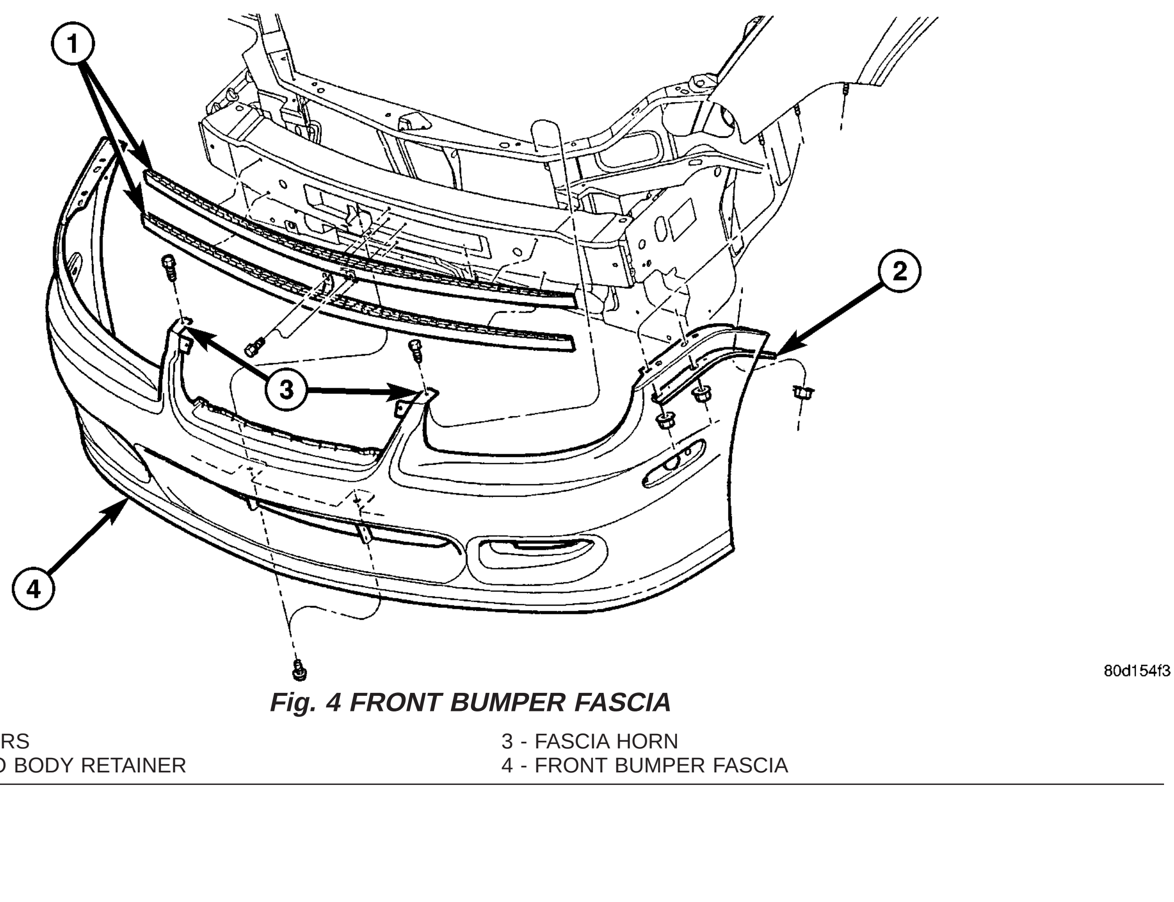

Fig. 4 FRONT BUMPER FASCIA

1 - ENERGY ABORBERS
2 - FRONT FASCIA TO BODY RETAINER
3 - FASCIA HORN
4 - FRONT BUMPER FASCIA

FRONT FASCIA (Continued)

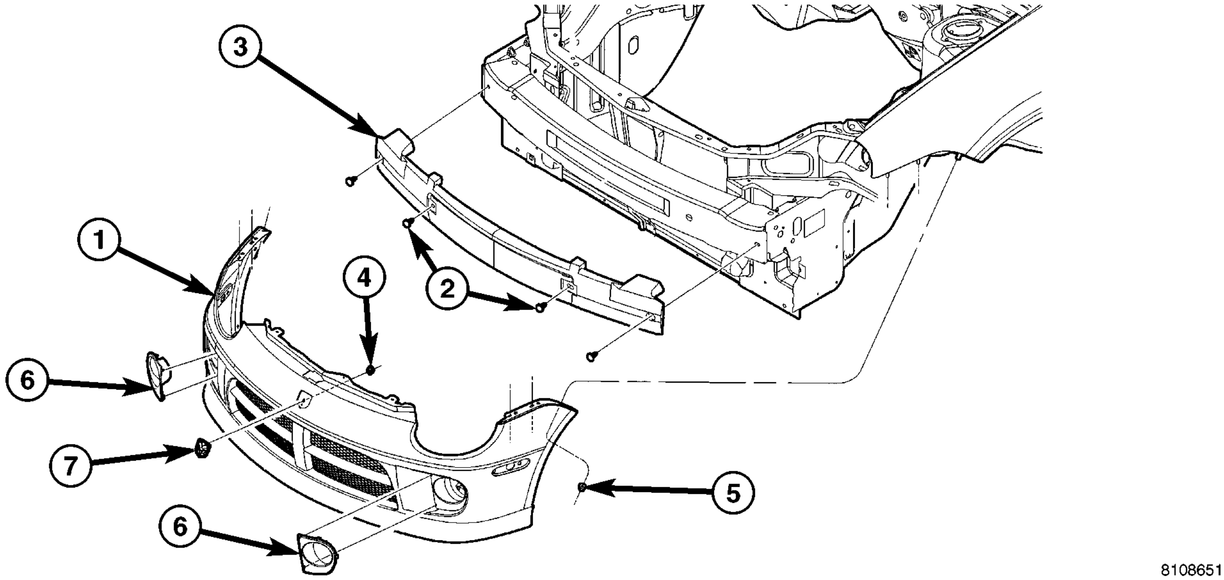

Fig. 5 FRONT FASCIA - SRT-4

1 - SRT-4 FRONT FASCIA
2 - PUSH PIN(S)
3 - FRONT BUMPER FASCIA FOAM
4 - MEDALLION TO FASCIA NUT
5 - WASHER/HEX NUT
6 - FOG LAMP BEZEL
7 - MEDALLION

(6) Remove fascia from vehicle.

(7) SRT-4 vehicle remove the fascia to crossmember upper blockers from the fascia (Fig. 5).

INSTALLATION

(1) SRT-4 vehicle place into position the fascia to crossmember upper blockers to the fascia (Fig. 5).

(2) Position fascia on vehicle , (Fig. 3) and (Fig. 4).

(3) Install nuts attaching front bumper fascia to bottom of fender flange.

(4) Attach fascia horns to radiator crossmember.

(5) SRT-4 vehicle install air dam four attaching screws (Fig. 2).

(6) Install air dam to crossmember fasteners (Fig. 1).

(7) Install splash shield attaching screws.

(8) Connect fog lamp wiring harness.

FRONT BUMPER REINFORCEMENT

REMOVAL

(1) Remove front bumper fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).

(2) Support bumper reinforcement on a suitable lifting device.

(3) Remove nuts attaching reinforcement to the rail assembly (Fig. 6).

(4) Remove bumper reinforcement from vehicle.

(5) Remove bolt attaching energy absorbers to beam, and peal energy absorbers from beam, if equipped.

INSTALLATION

(1) Install energy absorbers to beam and install attaching bolt.

(2) Place bumper reinforcement in position (Fig. 6).

(3) Support bumper reinforcement on a suitable lifting device.

(4) Install nuts attaching reinforcement to rail assembly.

(5) Install front fascia.

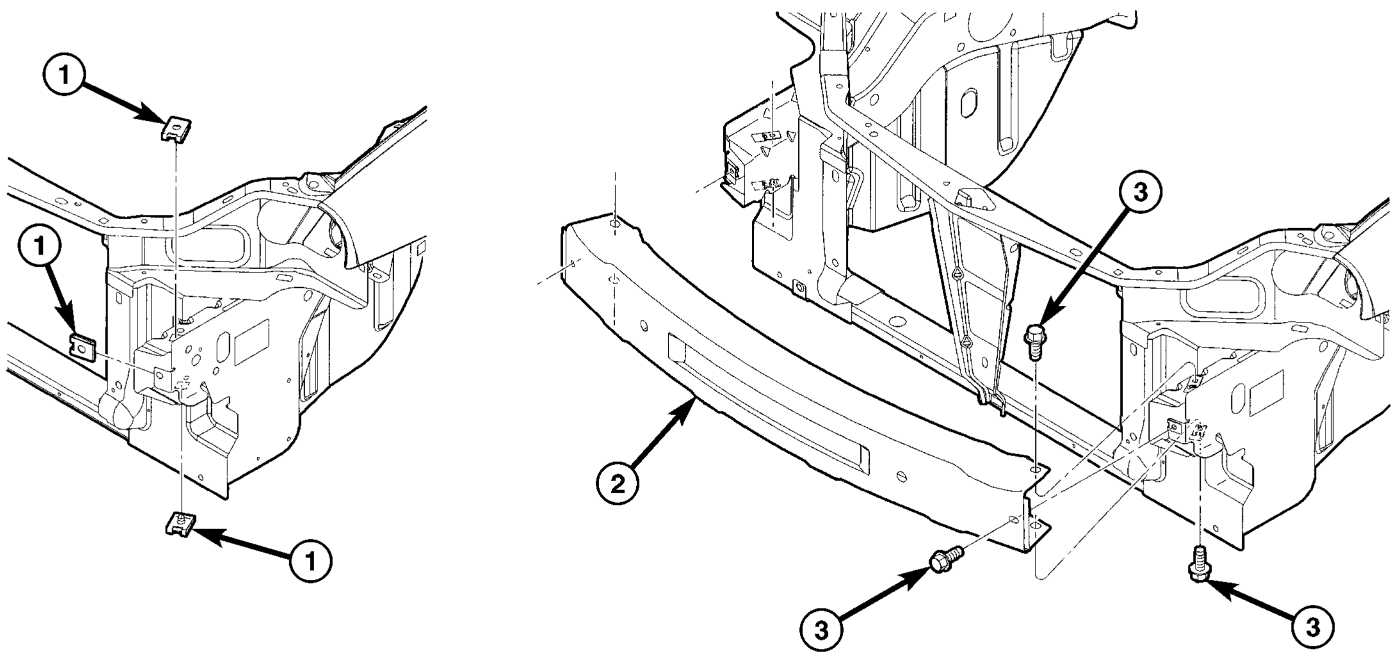

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Fig. 6 FRONT BUMPER REINFORCEMENT

1 - SPRING U-NUTS
2 - FRONT BUMPER REINFORCEMENTS
3 - WASHER/HEX HEAD BOLT(S)

REAR FASCIA

REMOVAL

(1) Release decklid lock and open decklid.

(2) Remove screws and screw pin fasteners attaching fascia in the trunk (Fig. 7).

(3) Raise vehicle on hoist.

(4) Disconnect license lamp.

(5) Remove splash shield from fascia in the wheel opening area.

(6) From under license plate area, remove fasteners attaching lower fascia.

(7) Remove nuts attaching fascia to lower quarter panels.

(8) Remove fascia from vehicle.

INSTALLATION

(1) Position fascia on vehicle.

(2) Install nuts attaching fascia to lower quarter panels (Fig. 7).

(3) From under license plate area, install fasteners attaching lower fascia.

(4) Install splash shield in the wheel opening area.

(5) Connect license lamp.

(6) Lower vehicle.

(7) Install screws and screw pin fasteners attaching fascia in the trunk.

(8) Close decklid.

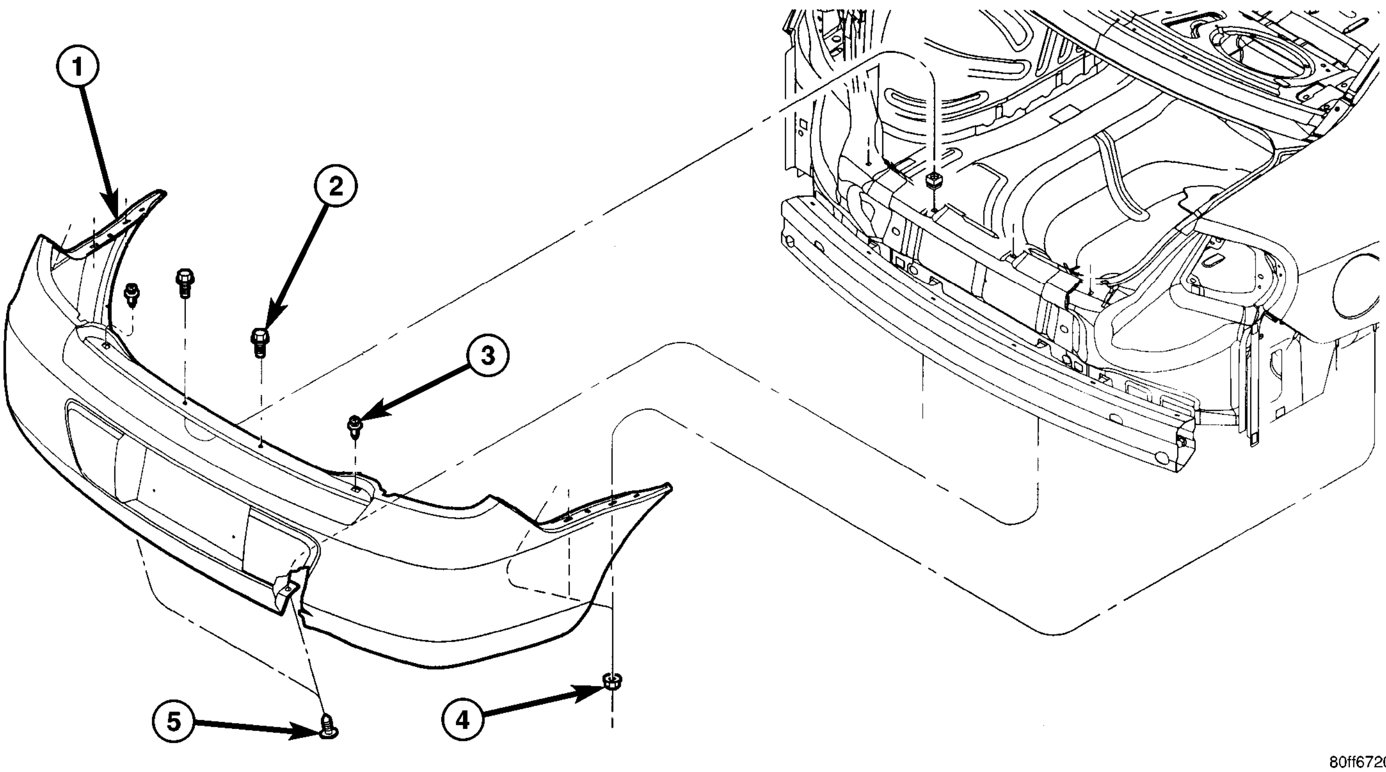

Fig. 7 REAR FASCIA

1 - REAR FASCIA
2 - BOLTS (2)
3 - SCREW PIN FASTENERS (2)
4 - QUARTER PANEL NUTS (3 PER SIDE)
5 - PUSH PIN FASTENERS (2)

REAR BUMPER REINFORCEMENT

REMOVAL

(1) Remove rear fascia (Fig. 8).

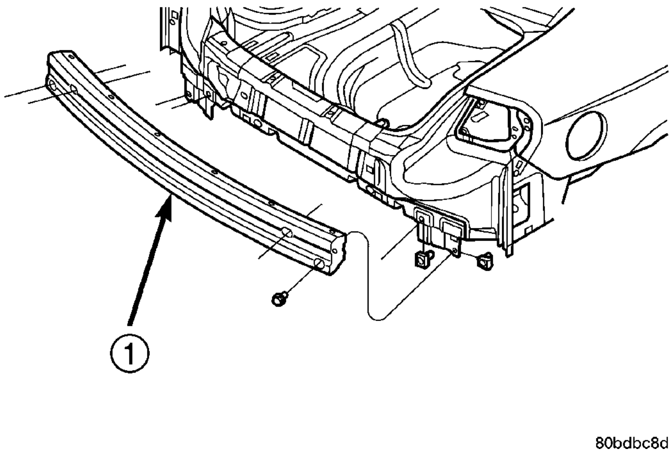

Fig. 8 Rear Bumper Reinforcement

1 - REAR BUMPER REINFORCEMENT

(2) Support bumper reinforcement on a suitable lifting device.

(3) Remove screws attaching reinforcement to rear closure panel.

(4) Remove bumper reinforcement from vehicle.

INSTALLATION

(1) Position bumper reinforcement to vehicle.

(2) Install screws attaching reinforcement to rear closure panel.

(3) Install rear fascia.

FRAME

SPECIFICATIONS

FRAME DIMENSIONS

Structural dimensions are listed in metric measurements. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location.

INDEX

DESCRIPTION	FIGURE
ENGINE COMPARTMENT TOP VIEW	9
ENGINE COMPARTMENT SIDE AND BOTTOM VIEW	10
FORWARD FRAME AND CROSSMEMBER	11
REAR FRAME SECTION SIDE AND BOTTOM VIEW	12

FRAME (Continued)

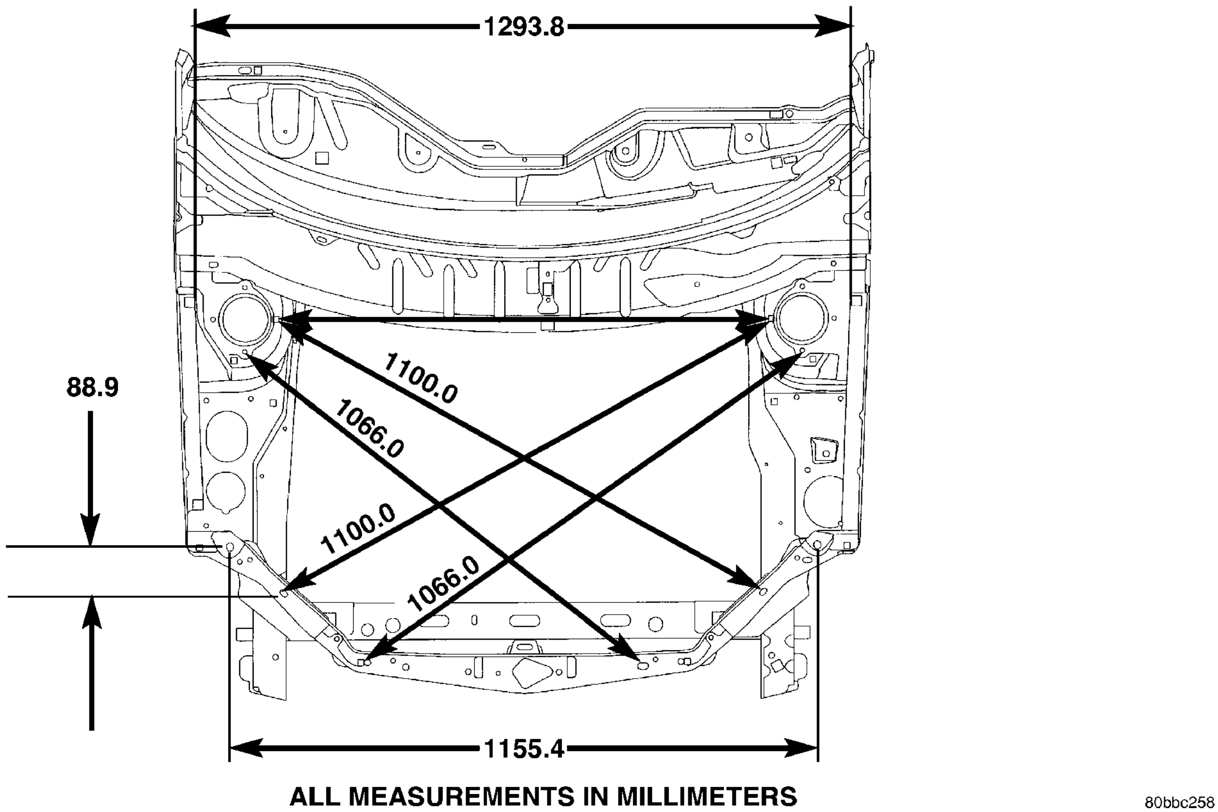

Fig. 9 ENGINE COMPARTMENT TOP VIEW

FRAME (Continued)

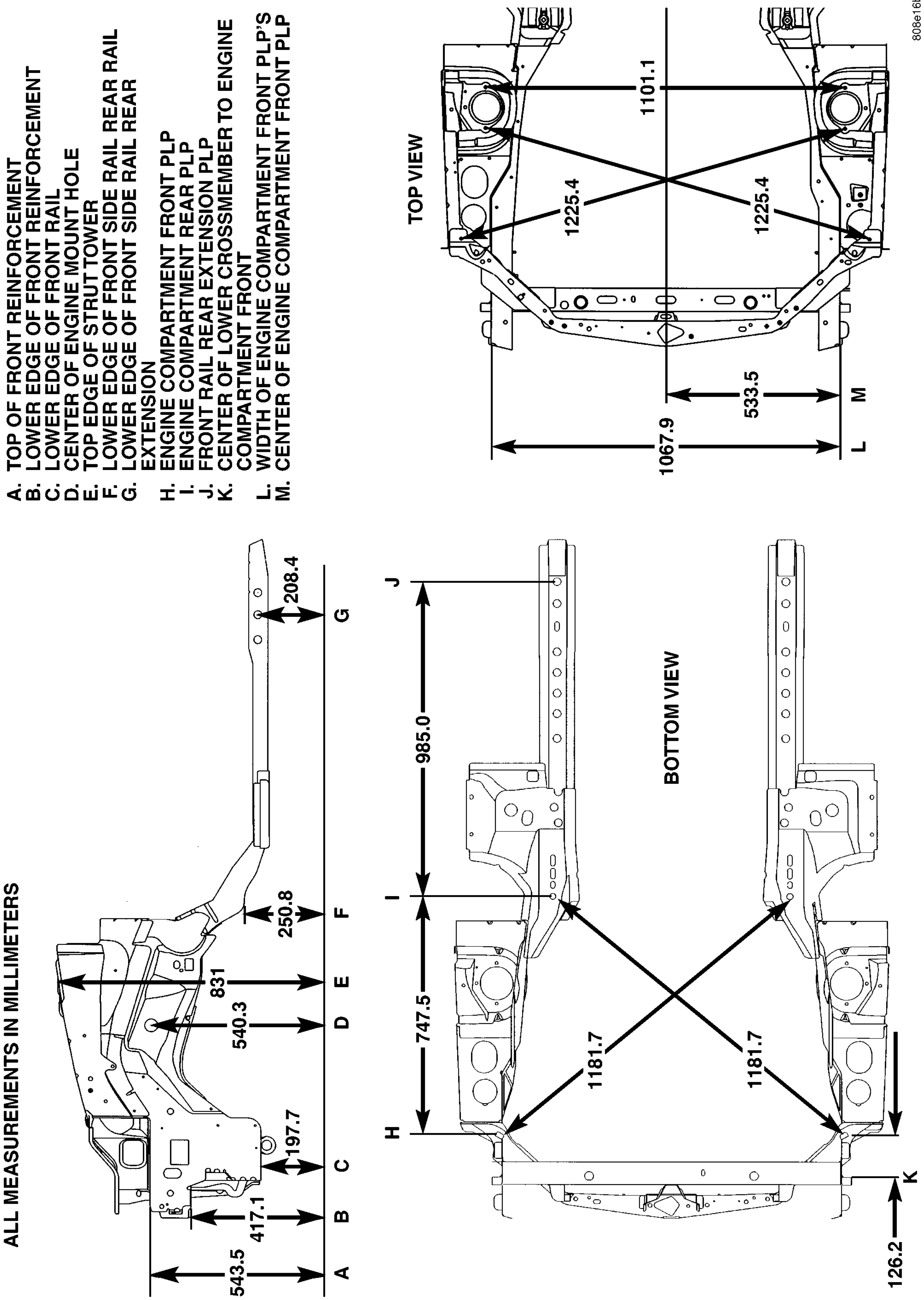

Fig. 10 ENGINE COMPARTMENT SIDE AND BOTTOM VIEW

FRAME (Continued)

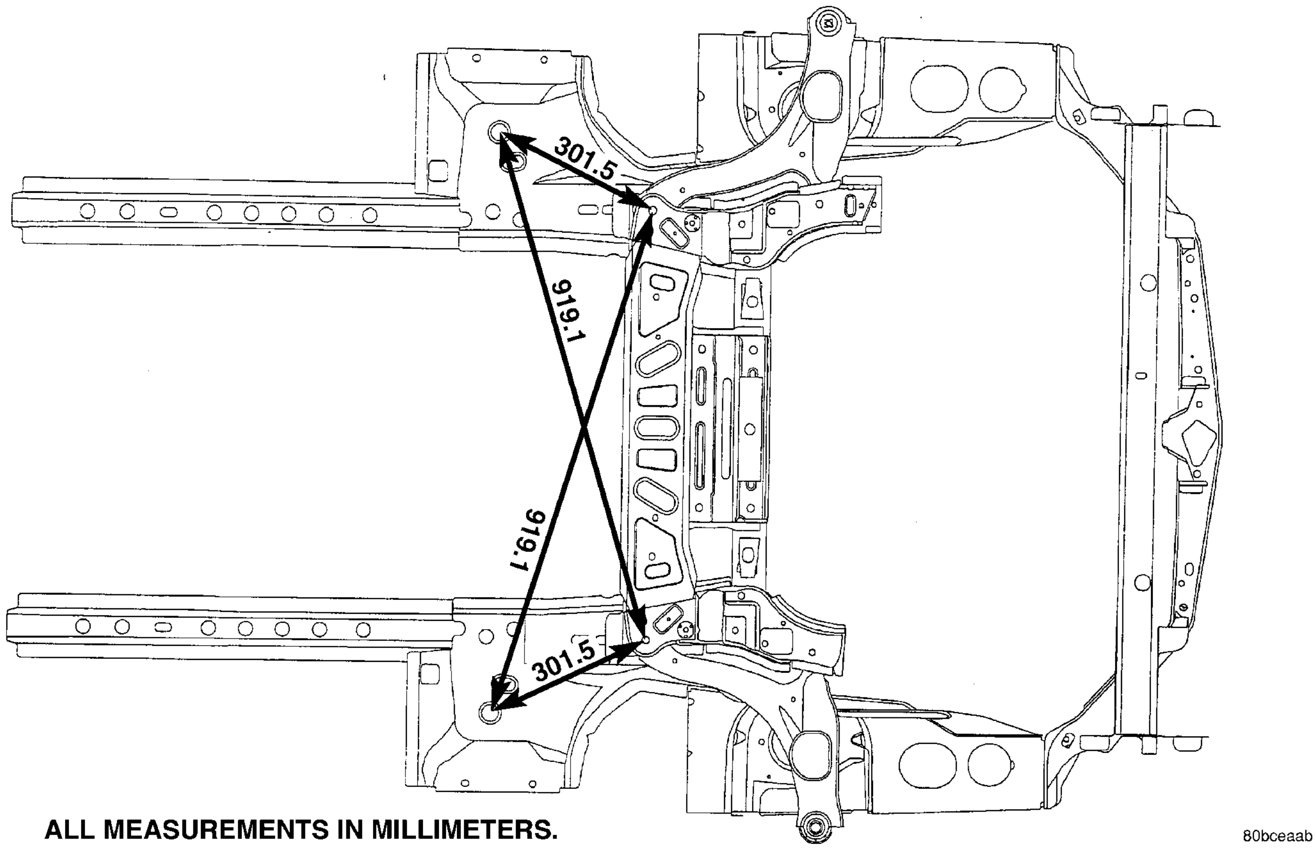

Fig. 11 FORWARD FRAME AND CROSSMEMBER

FRAME (Continued)

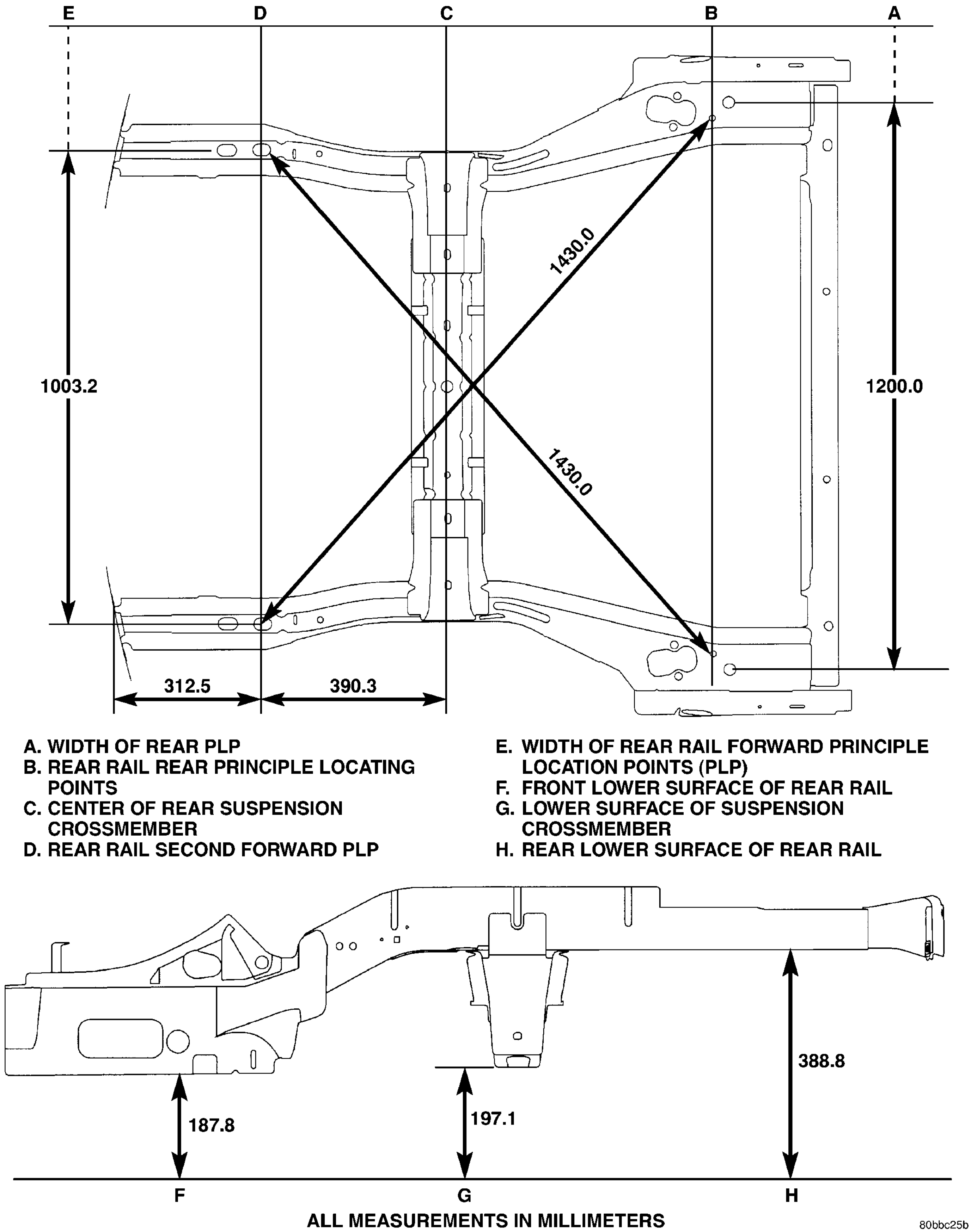

Fig. 12 REAR FRAME SECTION SIDE AND BOTTOM VIEW

FRONT CROSSMEMBER

DESCRIPTION

The front suspension crossmember must be properly installed to achieve design camber, caster settings and wheel stagger. The crossmember can be installed out of position on the frame rails due to its design. Bolts and cage nuts hold the rear of the crossmember to the frame torque boxes. Bolts and J-nuts hold the front of the crossmember to the frame rails. No designed in locating device is used to position the crossmember in the vehicle. Before removing the crossmember mark the frame torque box around the rear mounting location to aid installation. A crossmember that is removed during service must be installed in the same position from which it was removed. To verify that crossmember is in the proper position, refer to the dimensions provided. Front end dimensions are gauged from the principal locating point (PLP) holes located under the frame torque boxes rearward of the front wheels. After removal and installation of the crossmember is performed, verify that front suspension alignment is within specifications. If camber, caster settings and thrust angle are not within specifications, loosen and reposition crossmember to bring suspension within specifications. For additional information, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

REMOVAL

FRONT SUSPENSION CROSSMEMBER

CAUTION: If the front suspension crossmember is being replaced due to collision damage, inspect the steering column lower coupling for damage. Refer to COLUMN in STEERING.

REMOVAL

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

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

(3) Remove both stabilizer bar links from the vehicle (Fig. 13). Remove each link by holding the upper retainer/nut with a wrench and turning the link bolt.

(4) Remove the stabilizer bar cushion retainer bolts and retainers (Fig. 13), and remove the stabilizer bar with cushions attached from the vehicle.

(5) Remove the nut and pinch bolt clamping each ball joint stud to the steering knuckle (Fig. 14).

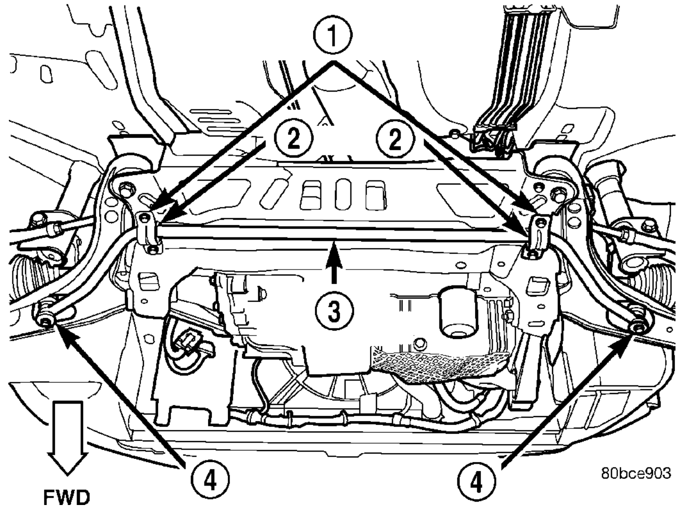

Fig. 13 Stabilizer Bar

1 - STABILIZER BAR CUSHION RETAINERS
2 - CUSHIONS
3 - FRONT STABILIZER BAR
4 - STABILIZER BAR LINKS

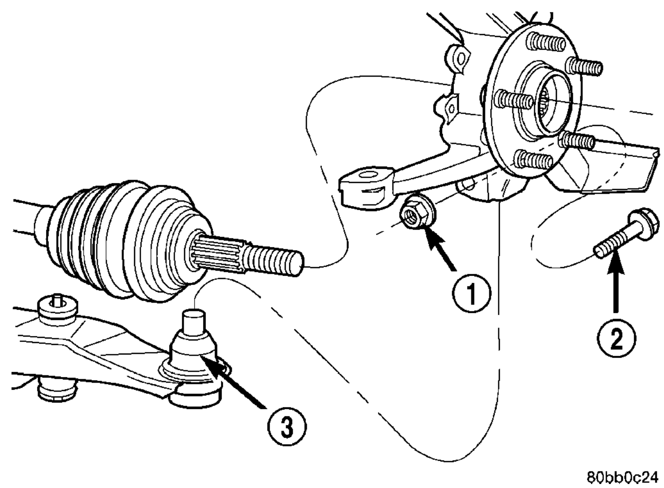

Fig. 14 Ball Joint Bolt And Nut

1 - NUT
2 - BOLT
3 - BALL JOINT

CAUTION: After removing the steering knuckle from the ball joint stud, do not pull outward on the knuckle. Pulling the steering knuckle outward at this point can separate the inner C/V joint on the driveshaft. Refer to FRONT DRIVESHAFTS in the DIFFERENTIAL AND DRIVELINE group for further information.

NOTE: Use caution when separating the ball joint stud from the steering knuckle, so the ball joint seal does not get cut.

(6) Separate each ball joint stud from the steering knuckle by prying down on lower control arm and up

FRONT CROSSMEMBER (Continued)

against the ball joint boss on the steering knuckle (Fig. 15).

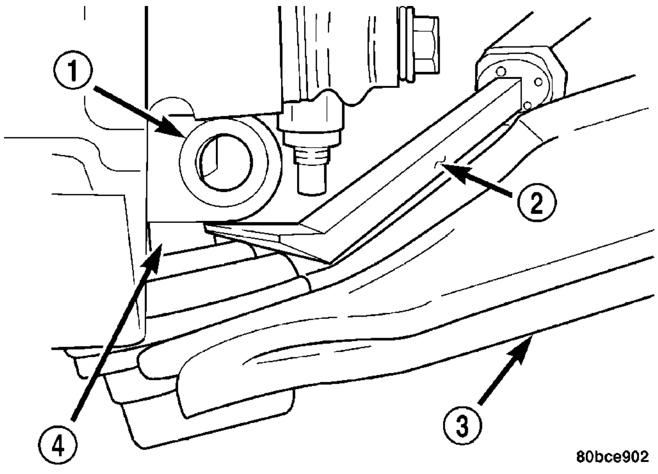

Fig. 15 Pry Bar Usage

1 - STEERING KNUCKLE
2 - PRY BAR
3 - LOWER CONTROL ARM
4 - BALL JOINT STUD

(7) Remove the two screws securing the cooler to the front suspension crossmember. They are located behind the cooler and can be accessed from above. Allow the cooler to hang out of the way.

(8) Using wire or cord, support and tie off the power steering gear to the underbody of the vehicle, so when the crossmember is lowered, the gear does not fall away being held to the vehicle by only the steering column coupler and the fluid hoses.

(9) Loosen and remove the four bolts attaching the power steering gear to the front suspension crossmember (Fig. 16). Remove the power steering gear from the front suspension crossmember.

(10) Remove the drive-belt splash shield fasteners. Remove the shield.

(11) Remove the pencil strut from the right front corner of the crossmember and body of the vehicle (Fig. 17). Remove the washer behind the strut from the torque strut bolt.

(12) Remove the bolts mounting the engine torque strut in place (Fig. 17), then remove the engine torque strut from the vehicle.

NOTE: Before removing the front suspension crossmember from the vehicle, the location of the crossmember must be scribed on the body of the vehicle (Fig. 9). Do this so that the crossmember can be relocated upon reinstallation against the body of vehicle in the same location as before removal. If the front suspension crossmember is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) will be lost.

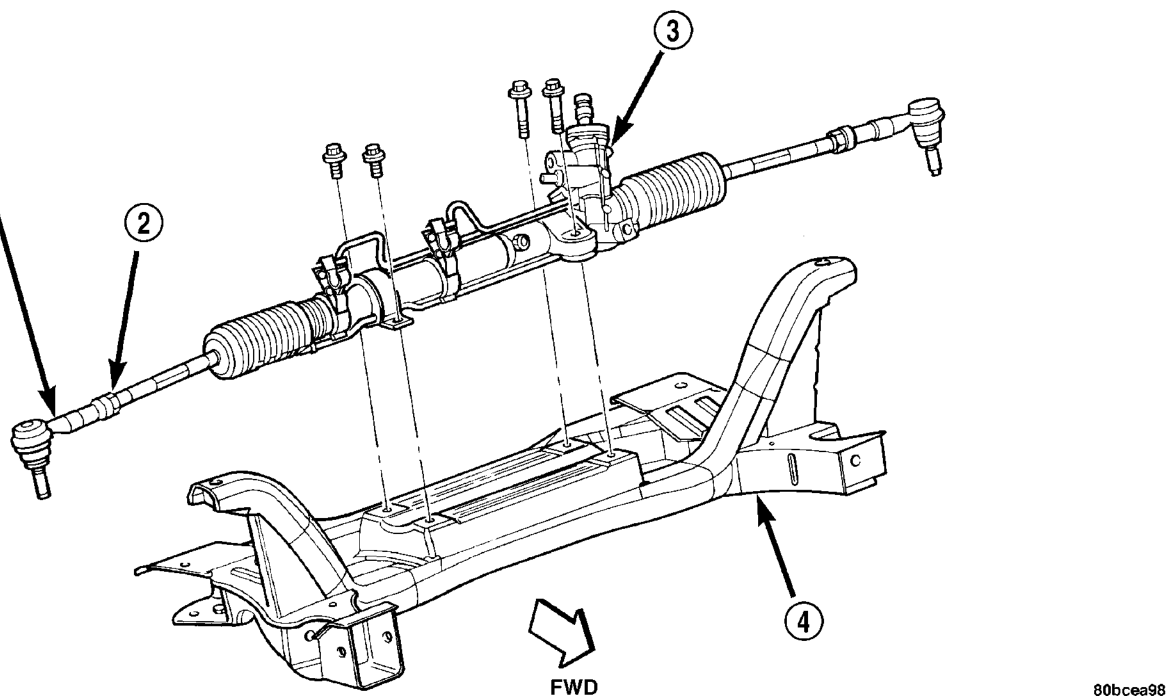

Fig. 16 Steering Gear Mounting

1 - OUTER TIE ROD
2 - JAM NUT
3 - STEERING GEAR
4 - FRONT SUSPENSION CROSSMEMBER

FRONT CROSSMEMBER (Continued)

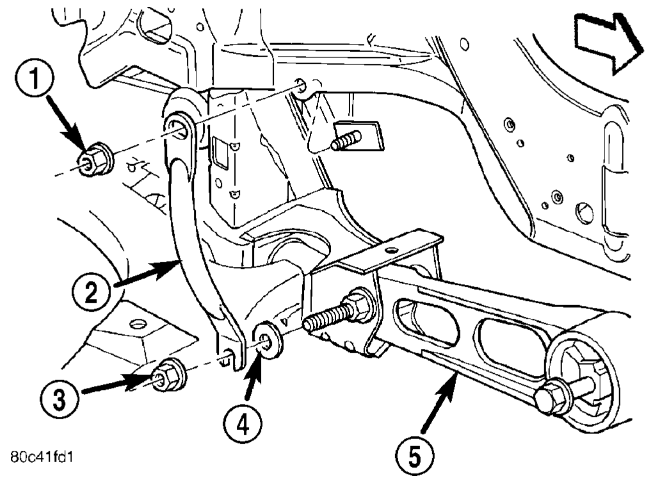

Fig. 17 Strut Mounting

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

(13) Using an awl, scribe a line (Fig. 18) marking the location of where the front suspension crossmember is mounted against the body of the vehicle.

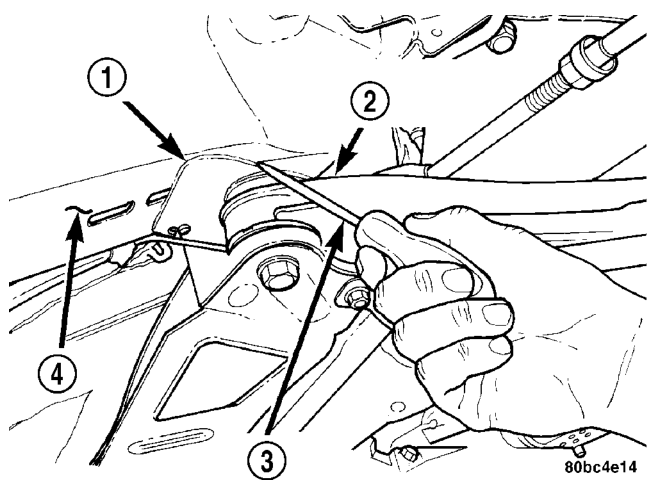

Fig. 18 Marking Crossmember Location

1 - SCRIBED LINE
2 - FRONT SUSPENSION CROSSMEMBER
3 - AWL
4 - BODY

(14) Position a transmission jack under the center of the front suspension crossmember and raise it to support the bottom of the crossmember.

(15) Loosen and completely remove the two front bolts (one right and one left) attaching the front suspension crossmember to the frame rails of vehicle. The right side bolt can be viewed in the mounting bolt figure (Fig. 19). The left side bolt is located in the same location on the other side of the vehicle.

(16) Loosen the two rear bolts (one right and one left) attaching the front suspension crossmember and

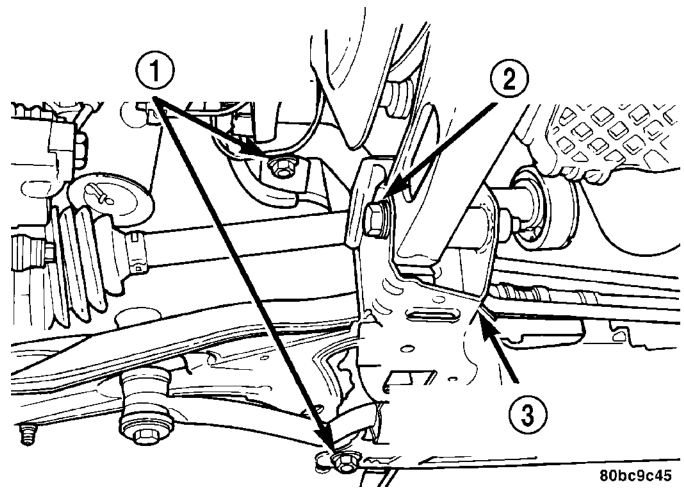

Fig. 19 Mounting Bolts

1 - FRONT SUSPENSION CROSSMEMBER MOUNTING BOLTS
2 - ENGINE TORQUE ISOLATOR STRUT MOUNTING BOLT
3 - FRONT SUSPENSION CROSSMEMBER

lower control arms to the body of the vehicle until they release from the threaded tapping plates in the body of the vehicle. Remove the rear bolts from the body of the vehicle, but do not completely remove the rear bolts because they are designed to disengage from the body threads yet stay within the lower control arm rear isolator bushing. This allows the lower control arm to stay in place on the crossmember. The right side bolt can be viewed in the mounting bolt figure (Fig. 19). The left side bolt is located in the same location on the other side of the vehicle.

(17) Lower the front suspension crossmember.

(18) Remove each lower control arm from the crossmember by removing the front pivot bolt.

INSTALLATION

CAUTION: If the front suspension crossmember is being replaced due to collision damage, inspect the steering column lower coupling for damage. Refer to COLUMN in STEERING.

(1) Install the lower control arms on the front suspension crossmember. Install the pivot bolts, but do not completely tighten them at this time.

(2) Using the transmission jack, raise the front suspension crossmember and lower control arms until the crossmember contacts its mounting spot against the body and frame rails of the vehicle. As the crossmember is raised, carefully guide the power steering gear into mounting position.

(3) Start the two rear crossmember mounting bolts into the tapping plates mounted in the body. The right side bolt can be viewed in the mounting bolt figure (Fig. 19). The left side bolt is located in the same location on the other side of the vehicle. Next,

FRONT CROSSMEMBER (Continued)

install the two front mounting bolts attaching front suspension crossmember to frame rails of vehicle. Lightly tighten all four mounting bolts to a approximately 2 N·m (20 in. lbs.) to hold the front suspension crossmember in position.

NOTE: When reinstalling the front suspension crossmember back in the vehicle, it is very important that the crossmember be attached to the body in exactly the same spot as when it was removed. Otherwise, the vehicle's wheel alignment settings (caster and camber) will be lost.

(4) Using a soft face hammer, tap the front suspension crossmember back-and-forth or side-to-side until it is aligned with the previously scribed positioning marks on the body of the vehicle (Fig. 18). Once the front suspension crossmember is correctly positioned, tighten the rear two crossmember mounting bolts to a torque of 203 N·m (150 ft. lbs.), then tighten the front two crossmember mounting bolts to a torque of 142 N·m (105 ft. lbs.).

(5) Tighten the lower control arm front pivot bolts to a torque of 163 N·m (120 ft. lbs.).

(6) Attach the steering gear to the front suspension crossmember (Fig. 16). Install the four power steering gear mounting bolts. Tighten the mounting bolts to a torque of 61 N·m (45 ft. lbs.).

(7) Remove the wire or cord suspending the power steering gear to the underbody.

(8) Install the two screws securing the cooler to the front suspension crossmember. They are located behind the cooler.

(9) Install each ball joint stud into the steering knuckle aligning the bolt hole in the knuckle boss with the notch formed in the side of the ball joint stud.

(10) Install a new ball joint stud pinch bolt and nut (Fig. 14). Tighten the nut to a torque of 95 N·m (70 ft. lbs.).

(11) Install the engine torque strut and mounting bolts (Fig. 17). To properly align and tighten the torque strut, (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(12) Install the washer on the end of the stud extending from the torque strut bolt (Fig. 17).

(13) Install the pencil strut to the right front corner of the crossmember and body of the vehicle (Fig. 17). Tighten the pencil strut nuts to a torque of 58 N·m (43 ft. lbs.).

(14) Install the drive-belt splash shield and fasteners.

NOTE: Before installing the stabilizer bar, make sure the bar is not upside-down. The stabilizer bar must be installed with the curve on the outboard ends of the bar facing downward to clear the control arms once fully installed (Fig. 20).

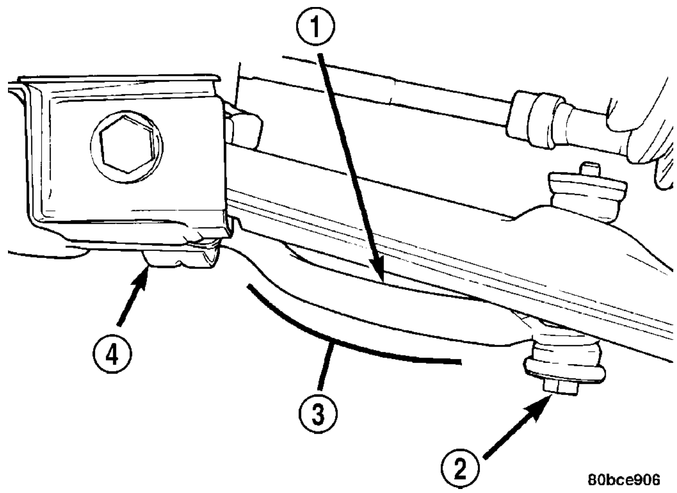

Fig. 20 Downward Curve

1 - STABILIZER BAR
2 - LINK
3 - DOWNWARD CURVE
4 - CUSHION RETAINER

(15) First, place the stabilizer bar in position on the front suspension crossmember. The slits in each cushion must point toward the front of the vehicle and sit directly on top of the raised beads formed into the stamping on the crossmember. Next, install the cushion retainers, matching the raised beads formed into the cushion retainers to the grooves formed into the cushions. Install the cushion retainer bolts, but do not completely tighten them at this time.

(16) Install both stabilizer bar links back on vehicle (Fig. 13). Start each stabilizer bar link bolt with bushing from the bottom, through the stabilizer bar, inner link bushings, lower control arm, and into the upper retainer/nut and bushing. Do not fully tighten the link assemblies at this time.

(17) Install the tire and wheel assemblies back on vehicle. Tighten the wheel mounting nuts to 135 N·m (100 ft. lbs.) torque.

(18) Lower the vehicle.

NOTE: It may be necessary to put the vehicle on a platform hoist or alignment rack to gain access to the stabilizer bar mounting bolts with the vehicle at curb height.

(19) Tighten each stabilizer bar link by holding the upper retainer/nut with a wrench and turning the link bolt. Tighten each link bolt to a torque of 23 N·m (200 in. lbs.).

(20) Tighten the stabilizer bar cushion retainer bolts to a torque of 34 N·m (300 in. lbs.).

(21) Check the front wheel alignment on the vehicle. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

FUEL SYSTEM

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FUEL DELIVERY

TABLE OF CONTENTS

FUEL DELIVERY

DESCRIPTION

The front wheel drive car uses a plastic fuel tank located rear center of the vehicle.

The Fuel Delivery System consists of: the following items:

- Electric fuel pump module
- Fuel filter
- Tubes/lines/hoses
- Fuel injectors

The in-tank fuel pump module contains the fuel pump. The pump is serviced as part of the fuel pump module. Refer to Fuel Pump Module.

The fuel filter is replaceable only as part of the fuel pump module.

OPERATION

The fuel system provides fuel pressure by an in-tank pump module. The Powertrain Control Module (PCM) controls the operation of the fuel system by providing battery voltage to the fuel pump through the fuel pump relay. The PCM requires only three inputs and a good ground to operate the fuel pump relay. The three inputs are:

- Ignition voltage
- Crankshaft Position (CKP) sensor
- Camshaft Position (CMP) sensor

DIAGNOSIS AND TESTING - FUEL DELIVERY SYSTEM

(Refer to Appropriate Diagnostic Information)

STANDARD PROCEDURE

STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE PROCEDURE

(1) Remove Fuel Pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.

(2) Start and run engine until it stalls.

(3) Attempt restarting engine until it will no longer run.

(4) Turn ignition key to OFF position.

(5) Return fuel pump relay to PDC.

(6) One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. The DRB III® scan tool must be used to erase a DTC.

STANDARD PROCEDURE - DRAINING FUEL TANK

Two different procedures may be used to drain fuel tank (lowering tank or using DRBIII® scan tool).

The quickest draining procedure involves lowering the 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. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

As an alternative procedure, the electric fuel pump may be activated allowing tank to be drained at fuel rail connection. Refer to DRBIII® scan tool for fuel pump activation procedures. Before disconnecting fuel line at fuel rail, release fuel pressure. Refer to the Fuel System Pressure Release Procedure in this group for procedures. Disconnect the fuel line at the fuel rail and remove the plastic retainer from the fuel rail. Take plastic retainer and install it back into the fuel line from body. Check the O-ring and make sure that it is in place and not damaged. Attach end of special test hose tool number 6539 at fuel line connection from the body line. Position opposite end of this hose tool to an approved gasoline draining station. Activate fuel pump and drain tank until empty. When done remove the special test hose tool number 6539 from the body line. Remove the plastic retainer from the special test hose tool number 6539 and reinstall it into the fuel line from the body. Check the O-ring and make sure that it is in place and not damaged. Install the fuel line to the fuel rail.

If electric fuel pump is not operating, tank must be lowered for fuel draining. Refer to following procedures.

(1) Remove fuel filler cap.

(2) Perform the Fuel System Pressure Release procedure.

(3) Disconnect negative cable from battery.

(4) Raise vehicle and support.

(5) Certain models are equipped with a separate grounding wire (strap) connecting the fuel fill tube assembly to the body. Disconnect wire by removing screw.

(6) Open fuel fill door and remove screws mounting fuel filler tube assembly to body. Do not disconnect rubber fuel fill or vent hoses from tank at this time.

(7) Place a transmission jack under center of fuel tank. Apply a slight amount of pressure to fuel tank with transmission jack.

(8) Remove fuel tank mounting straps.

(9) **Lower the tank just enough so that the filler tube fitting is the highest point of the fuel tank.**

(10) Remove filler tube from fuel tank. Tank will be drained through this fitting.

FUEL DELIVERY (Continued)

NOTE: WRAP SHOP TOWELS AROUND HOSES TO CATCH ANY GASOLINE SPILLAGE.

(11) Drain fuel tank into holding tank or a properly labeled **Gasoline** safety container.

WARNING: GASOLINE OR GASOLINE VAPORS ARE HIGHLY FLAMMABLE. A FIRE COULD OCCUR IF AN IGNITION SOURCE IS PRESENT. NEVER DRAIN OR STORE GASOLINE OR DIESEL FUEL IN AN OPEN CONTAINER, DUE TO THE POSSIBILITY OF FIRE OR EXPLOSION. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

(12) If fuel pump module removal is necessary, refer to Fuel Pump Module Removal/Installation in this section.

SPECIFICATIONS

TORQUE

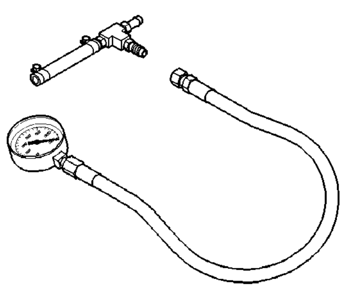
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Accelerator Pedal to Dash Nuts	12	8.8	105
Fuel Pump Module Locknut	55	40	
Fuel Tank Strap Bolts	22.5	16.6	200
Fuel Rail Bolts	22.5	16.6	200
Ignition Coil Mounting Bolts	11	8.1	95

FUEL SYSTEM PRESSURE

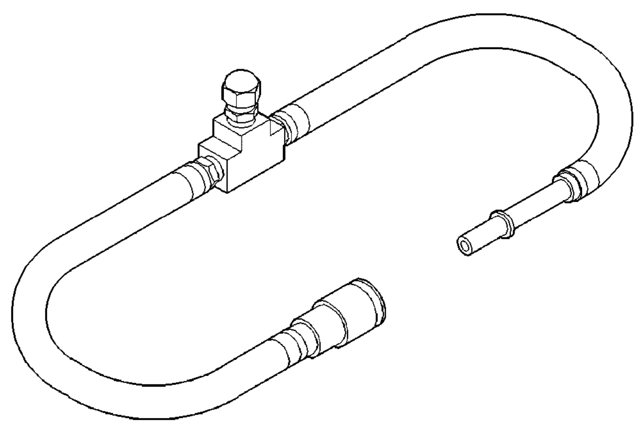
400 kpa ±34 kpa (58 psi ± 5 psi)

SPECIAL TOOLS

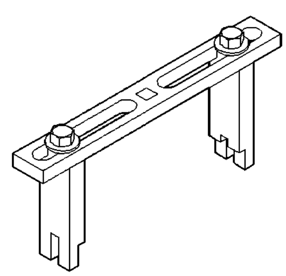
FUEL



Pressure Gauge Assembly C–4799–B

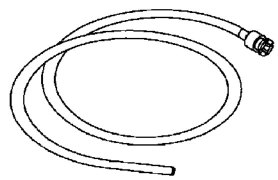


Fuel Pressure Test Adapter 6539

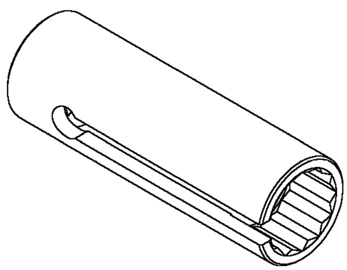


Spanner Wrench 6856

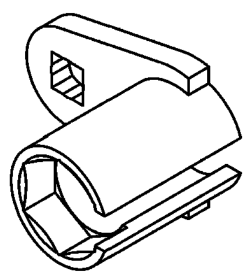
FUEL DELIVERY (Continued)



Fuel Line Adapter 1/4



O2S (Oxygen Sensor) Remover/Installer—C-4907



O2S (Oxygen Sensor) Remover/Installer - 8439

FUEL FILTER

DESCRIPTION - FUEL FILTER/FUEL PRESSURE REGULATOR

A combination fuel filter and fuel pressure regulator is used on all gas powered engines. It is located on the top of the fuel pump module.

It contains a diaphragm, calibrated springs and a fuel return valve. The internal fuel filter is also part of the assembly (Fig. 1).

OPERATION - FUEL FILTER/FUEL PRESSURE REGULATOR

Fuel Pressure Regulator Operation: The pressure regulator is a mechanical device that is calibrated to maintain fuel system operating pressure of approximately 400 kPa ±34 kPa (58 psi ±5 psi.) at the fuel injectors.

Fuel is supplied to the filter/regulator by the electric fuel pump through an opening tube at the bottom of filter/regulator.

The fuel pump module contains a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine.

If fuel pressure at the pressure regulator exceeds approximately 58 psi, an internal diaphragm closes and excess fuel pressure is routed back into the tank through the pressure regulator. A separate fuel return line is not used with any gas powered engine.

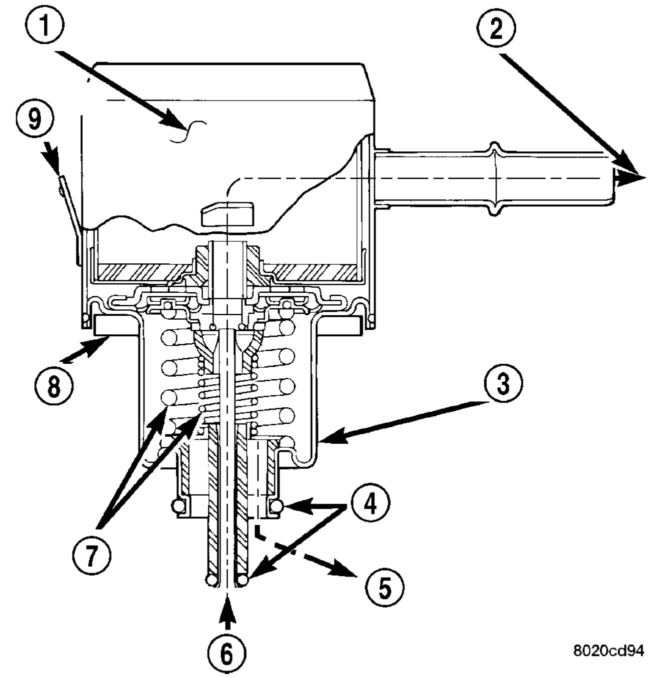


Fig. 1 Side View—Filter/Regulator

1 - INTERNAL FUEL FILTER
2 - FUEL FLOW TO FUEL INJECTORS
3 - FUEL FILTER/FUEL PRESSURE REGULATOR
4 - O-RINGS
5 - EXCESS FUEL BACK TO TANK
6 - FUEL INLET
7 - CALIBRATED SPRINGS
8 - RUBBER GROMMET AT PUMP MODULE
9 - LOCKING TAB

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE, EVEN WITH ENGINE OFF. BEFORE SERVICING THE FUEL FILTER/FUEL PRESSURE REGULATOR, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(1) Refer to Fuel System Pressure Release in the Fuel Delivery System section of this group. The fuel filter/fuel pressure regulator is located on the top of fuel pump module. Fuel pump module removal is not necessary.

(2) Raise vehicle on hoist.

(3) Disconnect fuel supply line at the Filter/Regulator nipple (refer to Quick Connect Fittings in this section).

FUEL FILTER (Continued)

(4) Depress locking spring tab on side of Fuel/Regulator (Fig. 2) and rotate 90° counter-clockwise and pull out.

NOTE: Make sure that the upper and lower O-rings are on the Filter/Regulator assembly.

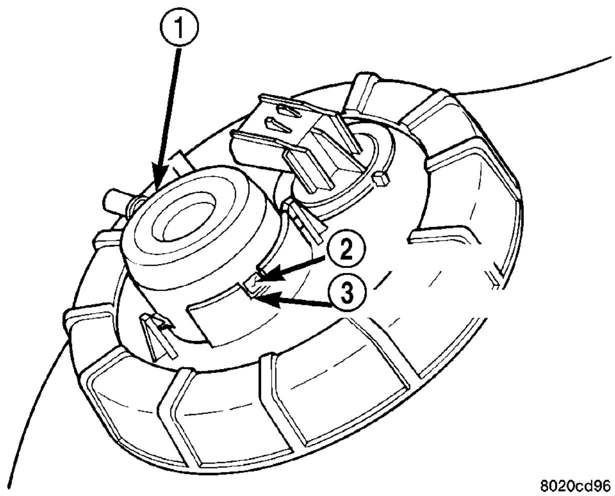


Fig. 2 Locking Spring Tab

1 - FUEL FILTER/PRESSURE REGULATOR
2 - SPRING TAB
3 - LOCATING SLOT

INSTALLATION

Lightly lubricate the O-rings with engine oil.

(1) Insert Filter/Regulator into the opening in the fuel pump module, align the two hold down tabs with the flange.

(2) While applying downward pressure, rotate the Filter/Regulator clockwise until the the spring tab engages the locating slot (Fig. 3).

(3) Connect the fuel line to the Filter/Regulator.

(4) Lower vehicle from hoist.

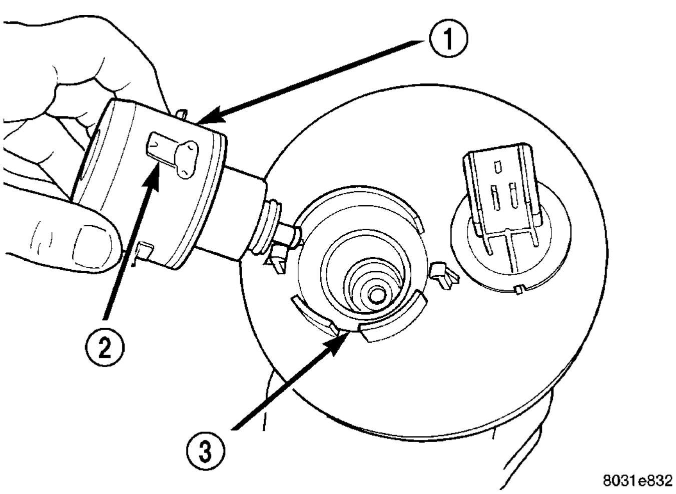


Fig. 3 Spring Tab In Locating Slot

1 - FUEL FILTER/PRESSURE REGULATOR
2 - SPRING TAB
3 - LOCATING SLOT

FUEL LEVEL SENDING UNIT / SENSOR

DESCRIPTION

The fuel gauge sending unit (fuel level sensor) is attached to the side of the fuel pump module. The sending unit consists of a float, an arm, and a variable resistor (track). The resistor track is used to send electrical signals to the instrument cluster for fuel gauge operation and are then transmitted to the engine controller for OBDII emission requirements.

OPERATION

For fuel gauge operation: As fuel level increases, the float and arm move up. This increases the sending unit resistance, causing the fuel gauge to read full. As fuel level decreases, the float and arm move down. This decreases the sending unit resistance causing the fuel gauge to read empty.

After this fuel level signal is sent to the instrument cluster, the instrument cluster will transmit the data across the J1850 bus circuits to the PCM.

For OBD II emission requirements: The voltage signal is sent to the instrument cluster to indicate fuel level. The cluster transmits the fuel level to the PCM where it is used to prevent a false setting of misfire and fuel system monitor trouble codes. This occurs if the fuel level in the tank is less than approximately 15 percent of its rated capacity.

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. 4).

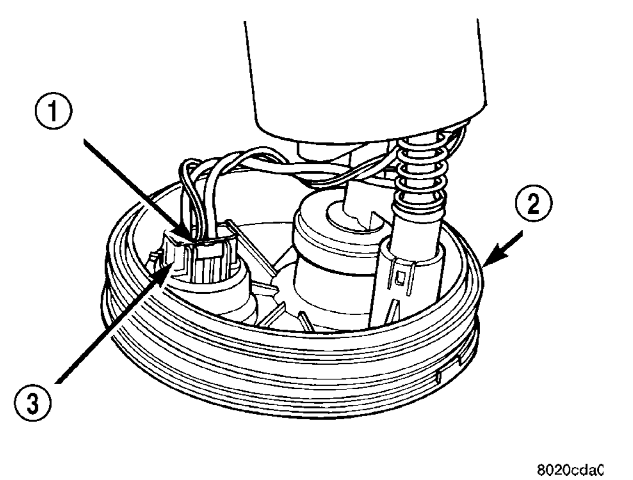


Fig. 4 Fuel Pump/Level Sensor Electrical Connector

1 - RETAINING TAB
2 - TANK SEAL
3 - ELECTRICAL CONNECTOR

FUEL LEVEL SENDING UNIT / SENSOR (Continued)

(2) Pull off blue locking wedge (Fig. 5).

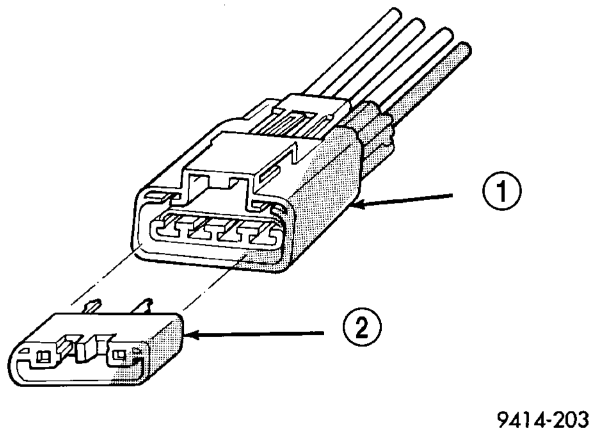


Fig. 5 Wire Terminal Locking Wedge

1 - ELECTRICAL CONNECTOR
2 - BLUE LOCKING WEDGE

(3) Using a small screwdriver lift locking finger away from terminal and push terminal out of connector (Fig. 6).

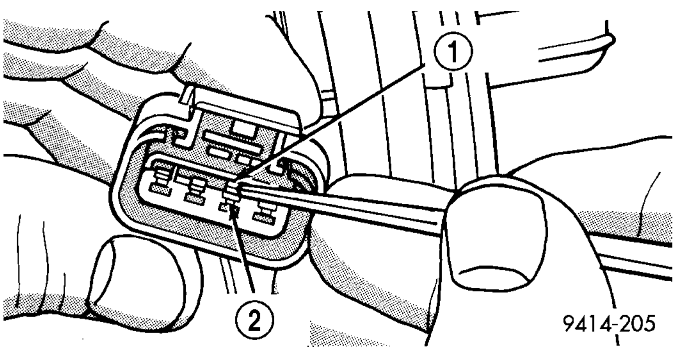


Fig. 6 Removing Wires From Connector

1 - LOCKING FINGER
2 - WIRE TERMINAL

(4) Push level sensor signal and ground terminals out of the connector (Fig. 6).
(5) Slide level sensor wires through opening fuel pump module (Fig. 7).
(6) Slide level sensor out of installation 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.
(3) While feeding wires into guide grooves, slide level sensor up into channel until it snaps into place (Fig. 7). 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

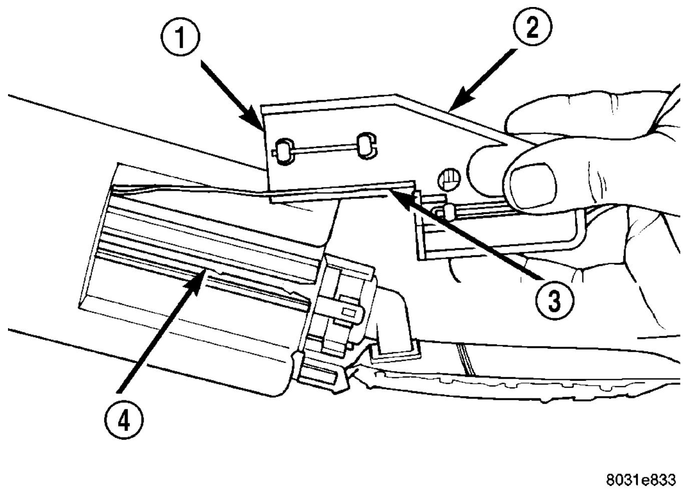


Fig. 7 Level Sensor

1 - REAR VIEW OF LEVEL SENSOR
2 - LEVEL SENSOR
3 - WRAP WIRES IN GROOVE
4 - CHANNEL FOR LEVEL SENSOR

and ground wires are installed in the correct position.
(5) Install locking wedge on connector.
(6) Push connector up into bottom of fuel pump module electrical connector.
(7) Install fuel pump module. Refer to Fuel Pump Module in this section.

FUEL LINES

DESCRIPTION - FUEL LINES/HOSES AND CLAMPS

Also refer to Quick-Connect Fittings.

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. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, use new original equipment lines/tubes/hoses.

If equipped: The hose clamps used to secure rubber hoses on vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this

FUEL LINES (Continued)

system. All other types of clamps may cut into the hoses and cause leaks.

Use new original equipment type hose clamps.

STANDARD PROCEDURE - HOSES AND CLAMP

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 (9 in. lbs.) torque.

Inspect all hose connections such as clamps, couplings and fittings to make sure they are secure and leaks are not present. The component should be replaced immediately if there is any evidence of degradation that could result in failure.

Never attempt to repair a plastic fuel line/tube. Replace as necessary.

Avoid contact of any fuel tubes/hoses with other vehicle components that could cause abrasions or scuffing. Be sure that the plastic fuel lines/tubes are properly routed to prevent pinching and to avoid heat sources.

FUEL PRESSURE REGULATOR

DESCRIPTION

A combination fuel filter and fuel pressure regulator is used on all gas powered engines. It is located on the top of the fuel pump module.

It contains a diaphragm, calibrated springs and a fuel return valve. The internal fuel filter (Fig. 8) is also part of the assembly.

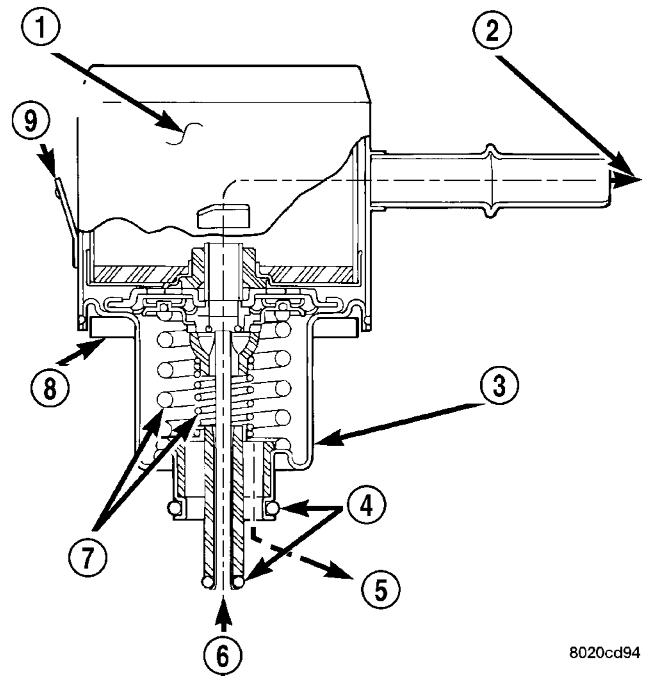


Fig. 8 Side View—Filter/Regulator

1 - INTERNAL FUEL FILTER
2 - FUEL FLOW TO FUEL INJECTORS
3 - FUEL FILTER/FUEL PRESSURE REGULATOR
4 - O-RINGS
5 - EXCESS FUEL BACK TO TANK
6 - FUEL INLET
7 - CALIBRATED SPRINGS
8 - RUBBER GROMMET AT PUMP MODULE
9 - LOCKING TAB

OPERATION

Fuel Pressure Regulator Operation: The pressure regulator is a mechanical device that is calibrated to maintain fuel system operating pressure of approximately 400 kPa ±34 kPa (58 psi ±5 psi.) at the fuel injectors.

Fuel is supplied to the filter/regulator by the electric fuel pump through an opening tube at the bottom of filter/regulator (Fig. 8).

The fuel pump module contains a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine.

If fuel pressure at the pressure regulator exceeds approximately 58 psi, an internal diaphragm closes and excess fuel pressure is routed back into the tank through the pressure regulator. A separate fuel return line is not used with any gas powered engine.

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE, EVEN WITH ENGINE OFF. BEFORE SERVICING THE FUEL FILTER/FUEL PRESSURE REGULATOR, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(1) Refer to Fuel System Pressure Release in the Fuel Delivery System section of this group. The fuel filter/fuel pressure regulator is located on the top of fuel pump module. Fuel pump module removal is not necessary.

(2) Raise vehicle on hoist.

FUEL PRESSURE REGULATOR (Continued)

(3) Disconnect fuel supply line at the Filter/Regulator nipple (refer to Quick Connect Fittings in this section).

(4) Depress locking spring tab on side of Fuel/Regulator (Fig. 9) and rotate 90° counter-clockwise and pull out.

NOTE: Make sure that the upper and lower O-rings are on the Filter/Regulator assembly.

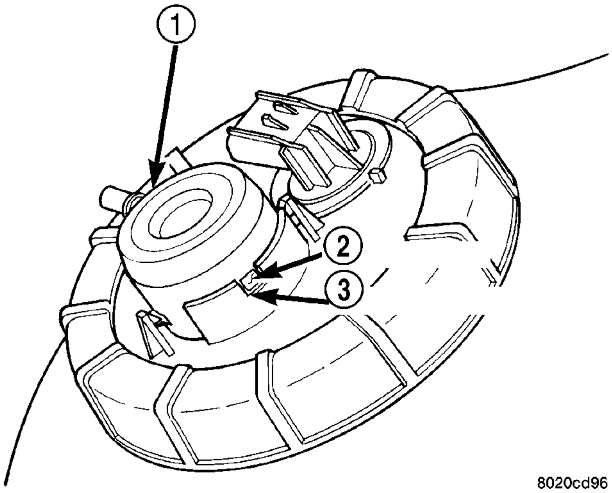


Fig. 9 Locking Spring Tab

1 - FUEL FILTER/PRESSURE REGULATOR
2 - SPRING TAB
3 - LOCATING SLOT

INSTALLATION

Lightly lubricate the O-rings with engine oil.

(1) Insert Filter/Regulator into the opening in the fuel pump module, align the two hold down tabs with the flange.

(2) While applying downward pressure, rotate the Filter/Regulator clockwise until the the spring tab engages the locating slot (Fig. 10).

(3) Connect the fuel line to the Filter/Regulator.

(4) Lower vehicle from hoist.

FUEL PUMP

DESCRIPTION

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 fuel pump module is suspended in fuel in the fuel tank.

OPERATION

The pump draws fuel through a strainer and pushes it through the motor to the outlet. The pump contains a check valve. The valve, in the pump outlet, maintains pump pressure during engine off con-

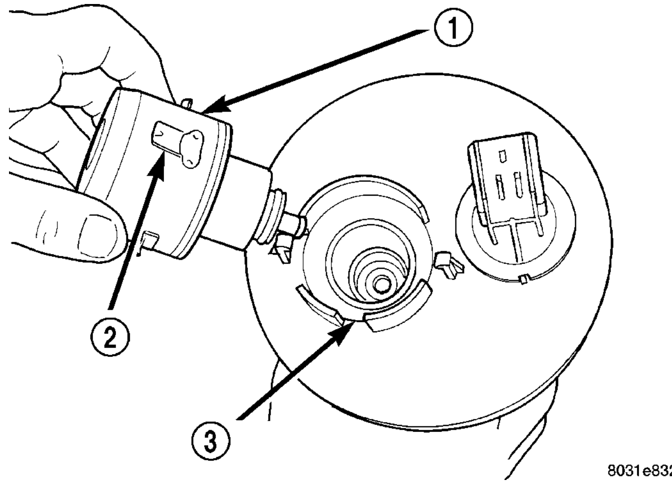


Fig. 10 Spring Tab In Locating Slot

1 - FUEL FILTER/PRESSURE REGULATOR
2 - SPRING TAB
3 - LOCATING SLOT

ditions, for a short while. It is normal for fuel pressure to drop to zero after cooldown. The fuel pump relay provides voltage to the fuel pump. The fuel pump has a maximum deadheaded pressure output of approximately 880 kPa (130 psi). The regulator adjusts fuel system pressure to approximately 400 kpa ±34 kpa (58 psi ± 5 psi).

FUEL PUMP MODULE

DESCRIPTION

The fuel pump module is installed in the fuel tank (Fig. 11).

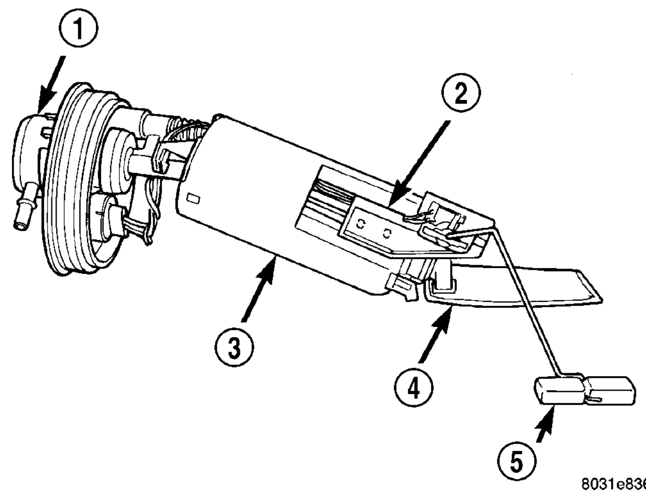


Fig. 11 Fuel Pump Module

1 - FUEL FILTER/PRESSURE REGULATOR
2 - FUEL LEVEL SENSOR
3 - FUEL RESERVOIR
4 - INLET STRAINER
5 - FLOAT

FUEL PUMP MODULE (Continued)

OPERATION

The fuel pump module contains the following:

- Electric fuel pump
- Fuel pump reservoir
- Inlet strainer
- Fuel filter/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 requires service, replace the fuel pump module.

REMOVAL

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) Drain the fuel. Refer to Draining Fuel Tank in the Fuel Tank section of this group.

WARNING: THE FUEL RESERVOIR OF THE FUEL PUMP MODULE DOES NOT EMPTY OUT WHEN THE TANK IS DRAINED. THE FUEL IN THE RESERVOIR WILL SPILL OUT WHEN THE MODULE IS REMOVED.

(2) Remove fuel tank, refer to the Fuel Tank removal/installation section.

(3) Lower tank (Fig. 12).

(4) Use Special Tool 6856 to remove fuel pump module locknut (Fig. 13).

(5) Remove fuel pump and O-ring seal from tank. Discard old seal.

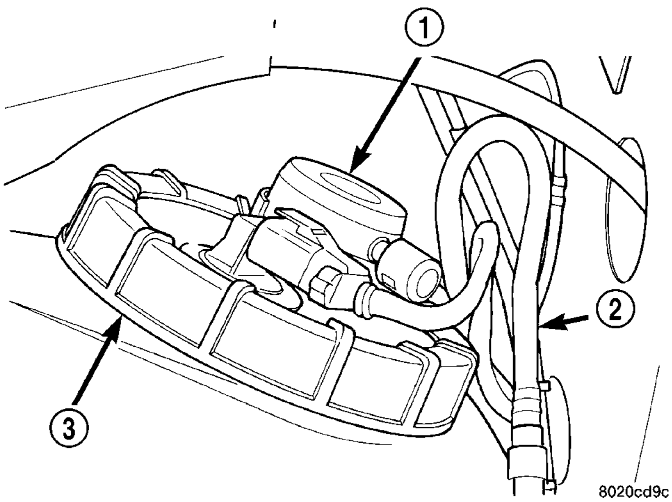


Fig. 12 Fuel Pump Module

1 - FUEL FILTER/PRESSURE REGULATOR
2 - FUEL LINE
3 - LOCKNUT

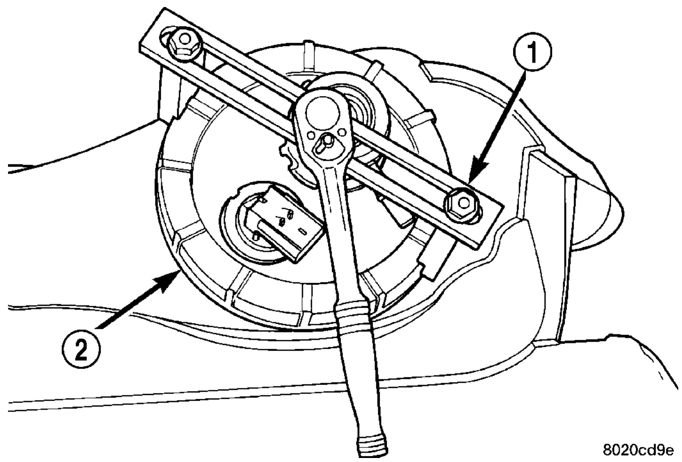


Fig. 13 Fuel Tank

1 - SPECIAL TOOL 6856
2 - LOCKNUT

INSTALLATION

(1) Wipe seal area of tank clean and place a new seal in position in the tank opening.

(2) Position fuel pump in the tank. Make sure the alignment tab on the underside of the fuel pump module flange sits in the notch on the fuel tank (Fig. 14).

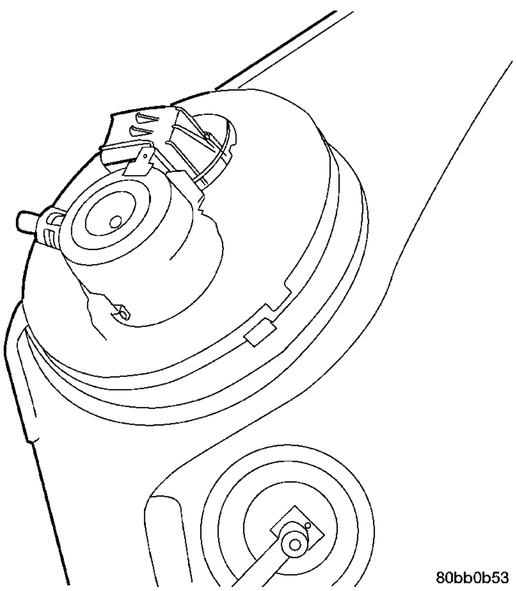


Fig. 14 Alignment Tab

(3) Position the locknut over the fuel pump module.

(4) Tighten the locknut using Special Tool 6856 to 55 N·m (40.5 ft. lbs.) (Fig. 13).

CAUTION: Over tightening the pump lock ring may result in a leak.

(5) Install fuel tank, refer to the Fuel Tank removal/installation section.

FUEL PUMP MODULE (Continued)

(6) Lower vehicle.
(7) Fill fuel tank. Check for leaks.

FUEL RAIL

DESCRIPTION

The fuel rail supplies the necessary fuel to each individual fuel injector and is mounted to the intake manifold (Fig. 15).

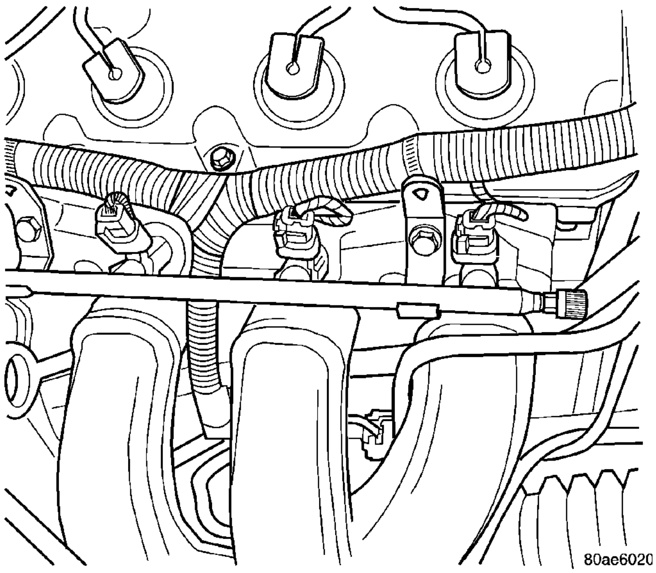


Fig. 15 Fuel Rail

OPERATION

The fuel pressure regulator is no longer mounted to the fuel rail on any engine. It is now located on the fuel tank mounted fuel pump module. Refer to Fuel Filter/Fuel Pressure Regulator in the Fuel Delivery System section of this group for information. The fuel rail is not repairable.

REMOVAL

REMOVAL - 4 CYLINDER

(1) Disconnect negative cable from battery.
(2) Release fuel system pressure. Refer to Fuel System Pressure Release procedure in this section.
(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. 16), refer to the fuel injector connector section for electrical connector removal.
(5) Remove fuel rail mounting screws.
(6) Lift rail off of intake manifold. Cover the fuel injector openings in the intake manifold.
(7) Remove fuel injector retainer (Fig. 17).

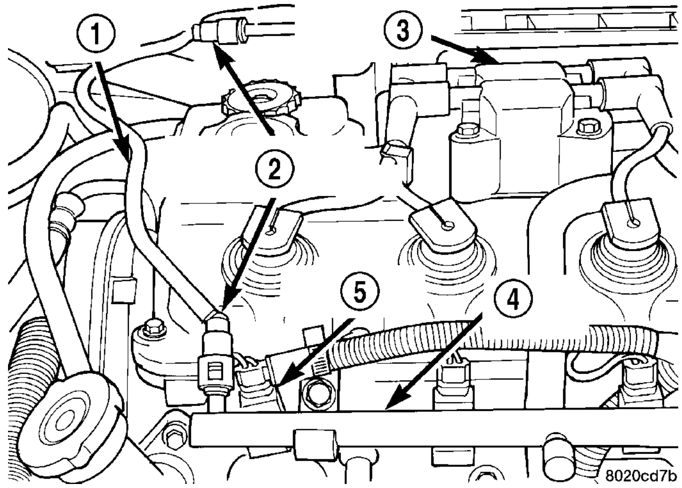


Fig. 16 Fuel Rail and Injectors

1 - FUEL SUPPLY LINE
2 - FUEL LINE QUICK-CONNECTS
3 - IGNITION COIL
4 - FUEL RAIL
5 - FUEL INJECTOR

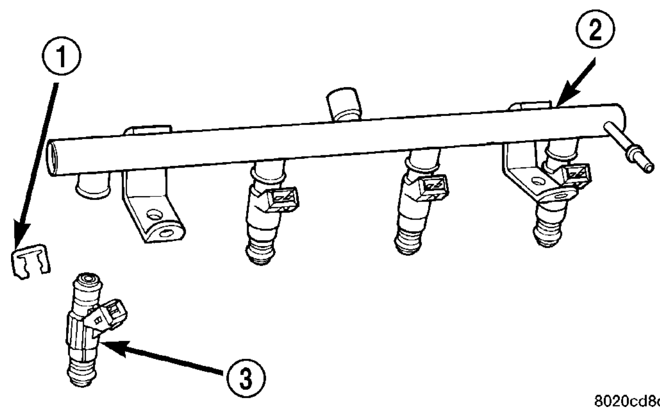


Fig. 17 Fuel Injector Retainer

1 - RETAINER
2 - FUEL RAIL
3 - FUEL INJECTOR

(8) Pull injector out of fuel rail. Replace fuel injector O-rings (Fig. 18).

REMOVAL - 1.6 L

(1) Disconnect the negative battery cable.
(2) Release the fuel pressure, refer to the fuel pressure release procedure in this section.
(3) Disconnect the negative battery cable.
(4) Remove the fuel line from the fuel rail (Fig. 19).
(5) Disconnect the electrical connector from the fuel injectors (Fig. 20).
(6) Remove the electrical harness from the fuel rail.
(7) Remove the 2 bolts for the fuel rail (Fig. 21).
(8) Remove the fuel rail from vehicle.

FUEL RAIL (Continued)

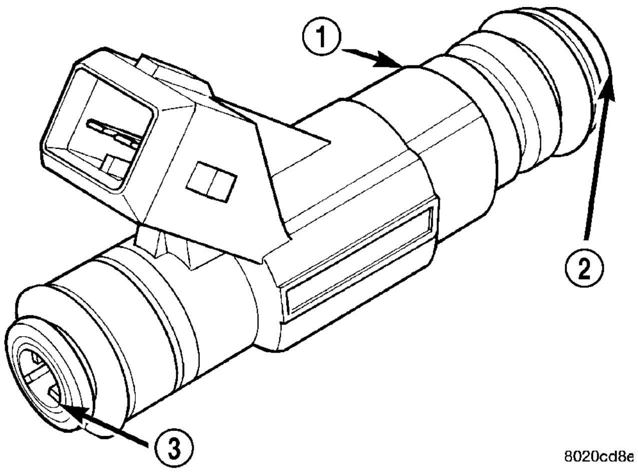


Fig. 18 Fuel Injector O-Rings

1 - FUEL INJECTOR
2 - NOZZLE
3 - TOP (FUEL ENTRY)

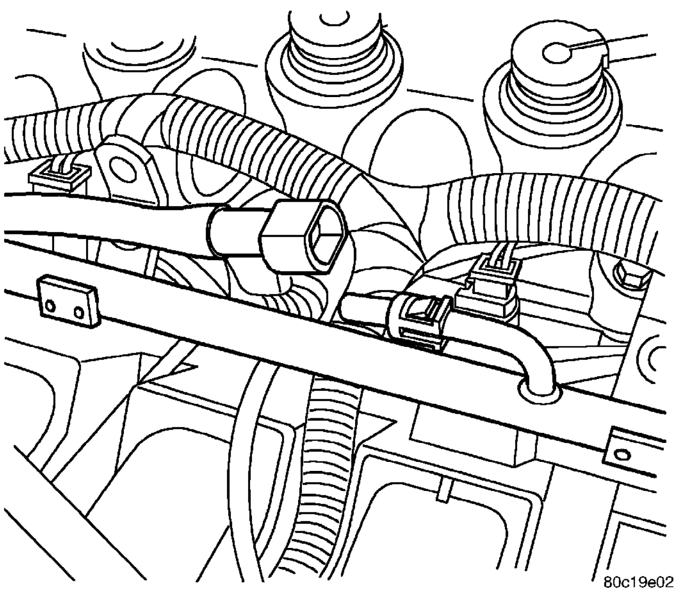


Fig. 19 FUEL LINE CONNECTION

(9) Remove the fuel injectors from the rail.

INSTALLATION

INSTALLATION - 4 CYLINDER

(1) Apply a light coating of clean engine oil to the upper O-ring.

(2) Install injector in cup on fuel rail.

(3) Install retaining clip.

(4) Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.

(5) 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.).

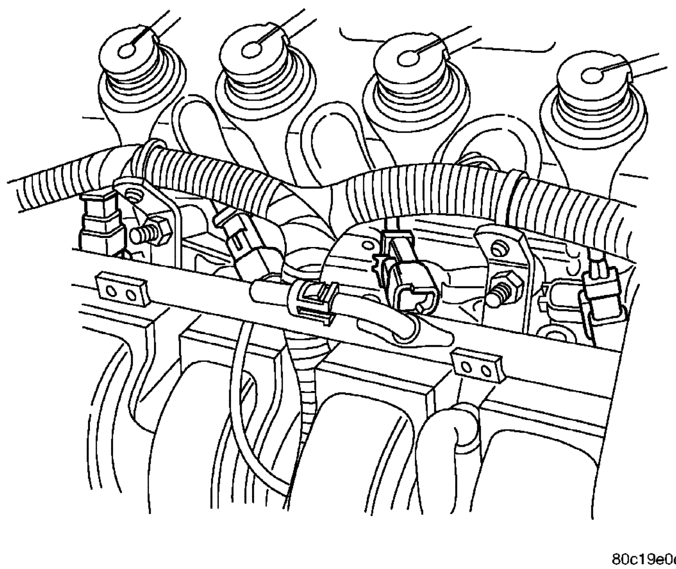


Fig. 20 FUEL INJECTOR CONNECTOR

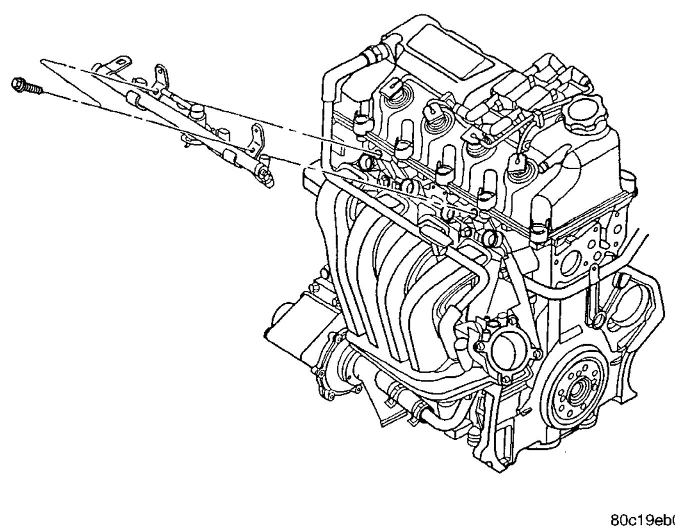


Fig. 21 FUEL RAIL

(6) Attach electrical connectors to fuel injectors, refer to the fuel injector connector section for electrical connector installation.

(7) Connect fuel supply tube to fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.

INSTALLATION - 1.6L

(1) Install fuel injectors to the fuel rail.

(2) Install the fuel rail to vehicle.

(3) Install fuel rail (Fig. 21) and tighten bolts to 22.5 ±3 N·m (200 ±30 in. lbs.).

(4) Connect the fuel injector electrical connectors (Fig. 20).

(5) Install electrical harness to fuel rail.

FUEL RAIL (Continued)

(6) Connect the fuel line (Fig. 19).
(7) Connect the negative battery cable.

FUEL TANK

DESCRIPTION

The fuel tank is constructed of a plastic material. Its main functions are for fuel storage and for placement of the fuel pump module. The tank is made from High density Polyethylene (HDPE) material.If equipped with ORVR (Onboard Refueling Vapor Recovery) it has been added to the fuel tank to control refueling vapor emissions.

OPERATION

All models pass a full 360 degree rollover test without fuel leakage. To accomplish this, fuel and vapor flow controls are required for all fuel tank connections.

All models are equipped with either one or two check valves mounted into the top of the fuel tank (or pump module).

An evaporation control system is connected to the check valve(s)/control valve(Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS/ ORVR - OPERATION) to reduce emissions of fuel vapors into the atmosphere, when the tank is vented due to vapor expansion in the tank. When fuel evaporates from the fuel tank, vapors pass through vent hoses or tubes to a charcoal canister where they are temporarily held. When the engine is running, the vapors are drawn into the intake manifold. In addition, fuel vapors produced during vehicle refueling are allowed to pass through the vent hoses/tubes to the charcoal canister(s) for temporary storage (prior to being drawn into the intake manifold). All models are equipped with a self-diagnosing system using a Leak Detection Pump (LDP) or Natural Vacuum Leak Detection (NVLD). Refer to the Emission Control System for additional information.

INLET CHECK VALVE

All vehicles have an inlet check valve on the inside of the fuel tank at the filler inlet

The valve prevents fuel from splashing back on customer during vehicle refueling. The valve is a non-serviceable item.

REMOVAL

(1) Perform fuel system pressure release, refer to the fuel system pressure release procedure in this section.
(2) Disconnect the negative battery cable (Fig. 22).
(3) Raise and support vehicle on hoist.
(4) Disconnect vapor line from EVAP canister tube.

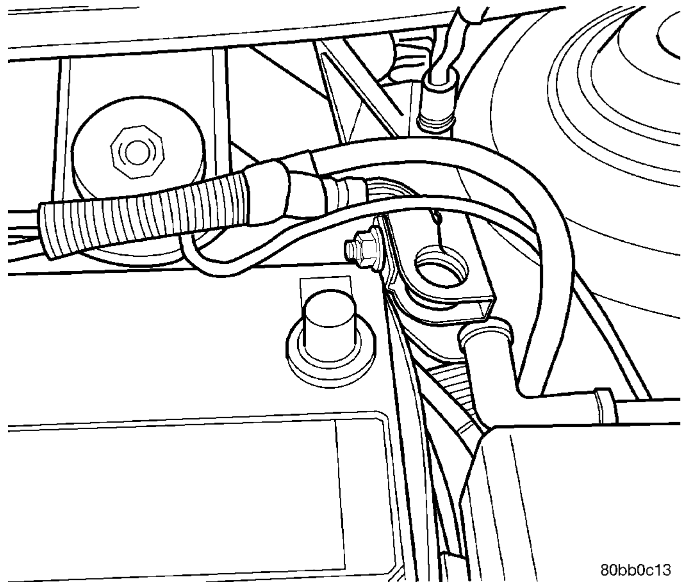


Fig. 22 Battery Cable

(5) Remove EVAP canister (Fig. 23).

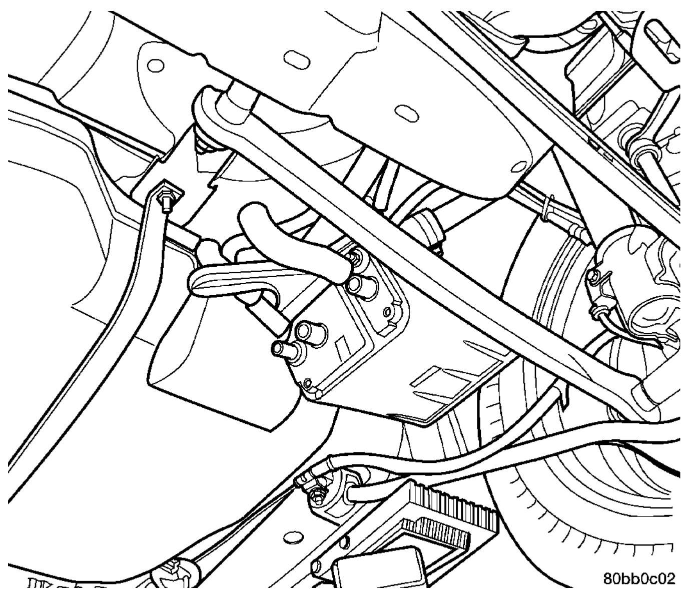


Fig. 23 EVAP Canister

(6) Drain fuel tank. Remove the drain port cap and remove fuel. Drain fuel tank into holding tank or a properly labeled **Gasoline** safety container. Reinstall drain port cap when done draining fuel (Fig. 24).
(7) Disconnect fuel pump module electrical connector and ground wire (Fig. 25).
(8) Disconnect the fuel tube from Fuel Filter/Regulator. Refer to Quick Connect Fittings in the Fuel Delivery section of this group.
(9) Disconnect fuel filler tube and filler vent tube from filler hose at fuel tank.
(10) Support tank with transmission jack. Loosen tank mounting straps and lower tank slightly.
(11) Remove tank mounting straps and lower tank.

FUEL TANK (Continued)

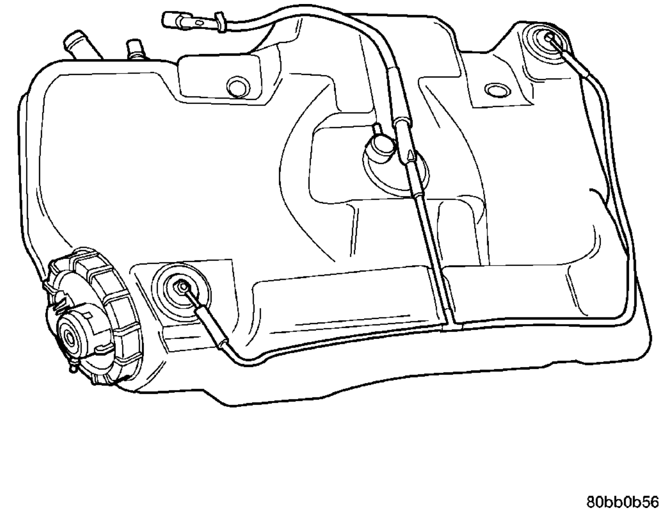


Fig. 24 Fuel Tank

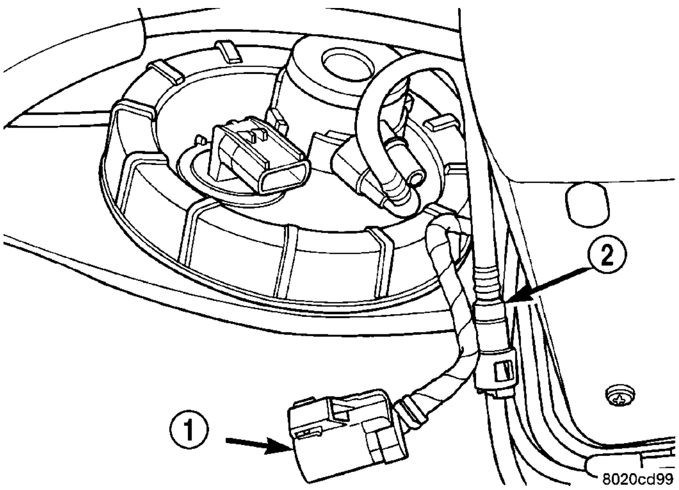


Fig. 25 Pump Module Electrical Connector

1 - ELECTRICAL CONNECTOR
2 - FUEL LINE

INSTALLATION

(1) Position fuel tank on transmission jack.

(2) Raise tank into position.

(3) Tighten fuel tank strap nuts to 22.5 N·m (200 in. lbs.) torque. Remove transmission jack. Ensure straps are not twisted or bent.

(4) Connect fuel filler tube tank inlet nipple. Tighten clamp.

(5) Connect EVAP vent hose.

(6) Attach fuel tubes to pump module and chassis fuel tube. Refer to Quick Connect Fittings in the Fuel Delivery section of this Group.

(7) Attach electrical connector and ground wire to fuel pump module.

(8) Install vapor lines to EVAP canister.

(9) Install EVAP canister.

(10) Lower vehicle.

(11) Fill fuel tank, install filler cap, and connect battery cable.

(12) Use the DRB scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

FUEL TANK FILLER TUBE

REMOVAL

(1) Loosen fuel filler tube cap.

(2) Remove fuel filler neck screws (Fig. 26).

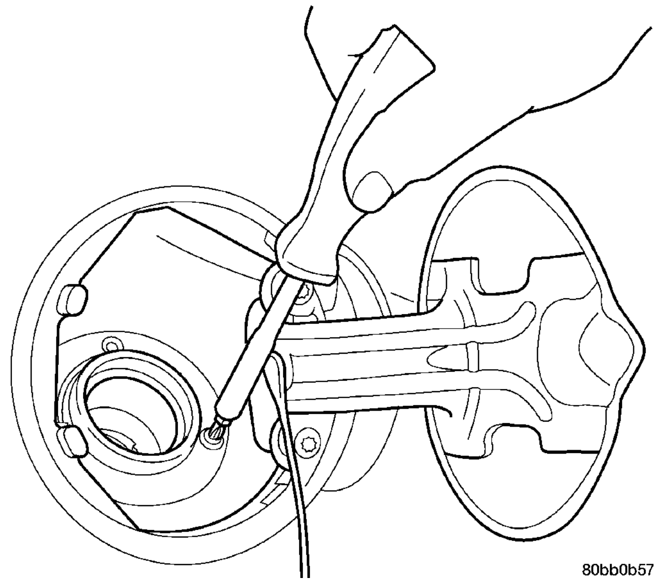


Fig. 26 Fuel Filler Neck

(3) Raise and support vehicle.

(4) Remove splash shield from wheel well.

(5) Disconnect fuel fill vapor tube.

(6) Disconnect fuel filler tube from fuel tank.

(7) Remove groundstrap from body.

(8) Remove filler neck (Fig. 27).

INSTALLATION

(1) Install filler tube.

(2) Install fuel filler neck screws and plastic filler cup.

(3) Connect fuel fill vapor tube.

(4) Connect fuel filler tube to fuel tank. Tighten clamp.

(5) Connect ground strap to body.

(6) Lower vehicle.

(7) Install fuel filler tube cap.

FUEL TANK FILLER TUBE (Continued)

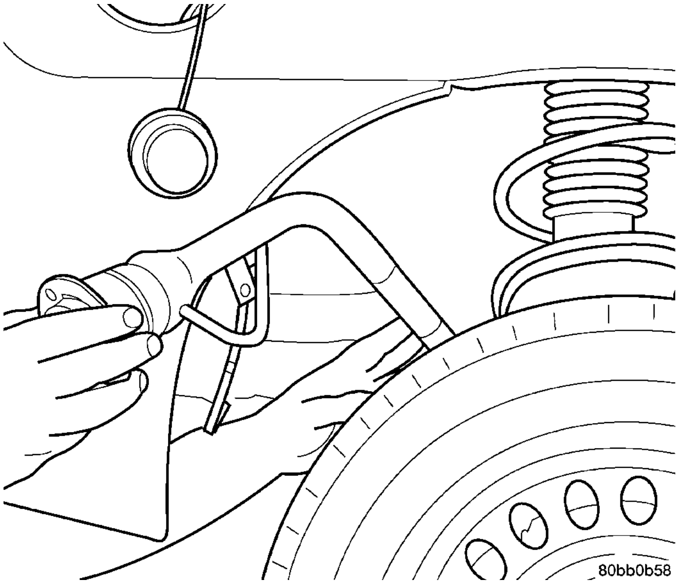


Fig. 27 Remove Filler Neck

INLET FILTER

REMOVAL

(1) Remove fuel pump module. Refer to Fuel Pump Module Removal in this section.

(2) Using a thin straight blade screwdriver, pry back the locking tabs on fuel pump reservoir and remove the strainer (Fig. 28).

(3) Remove strainer O-ring from the fuel pump reservoir body.

(4) Remove any contaminants in the fuel tank by washing the inside of the fuel tank.

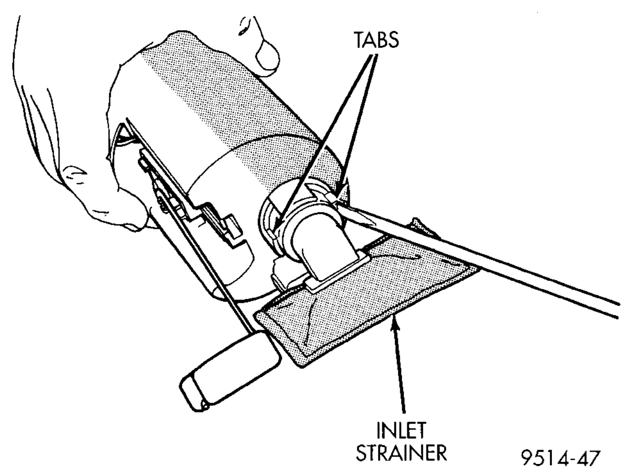


Fig. 28

INSTALLATION

(1) Lubricate the strainer O-ring with clean engine 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.

QUICK CONNECT FITTING

STANDARD PROCEDURE - 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. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

(1) Perform Fuel Pressure Release Procedure. Refer to the Fuel Pressure Release Procedure in this section.

(2) Disconnect negative cable from battery or auxiliary jumper terminal.

(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: Make sure that the o-ring in installed in fitting. 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 push-pulling-push 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 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. 29). **Do not rely upon the audible click to confirm a secure connection.**

(5) Connect negative cable to battery or auxiliary jumper terminal.

QUICK CONNECT FITTING (Continued)

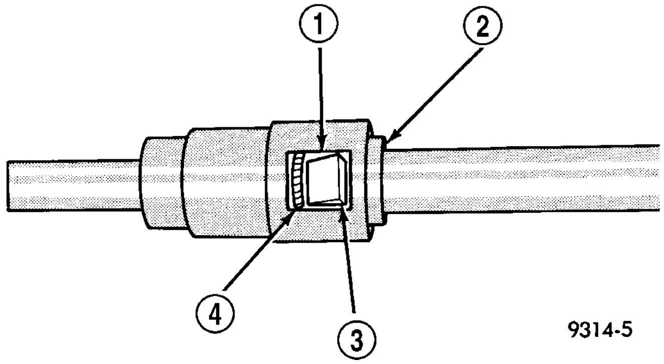


Fig. 29 Plastic Quick-Connect Fitting/Fuel Tube Connection

1 - WINDOW
2 - TAB (2)
3 - EAR
4 - SHOULDER (ON TUBE)

CAUTION: When using the ASD Fuel System Test, the Auto Shutdown (ASD) Relay remains energized for several minutes, until the test is stopped, or until the ignition switch is turned to the Off position.

(6) Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

TWO-TAB TYPE FITTING

This type of fitting is equipped with tabs located on both sides of the fitting (Fig. 30). These tabs are supplied for disconnecting the quick-connect fitting from component being serviced.

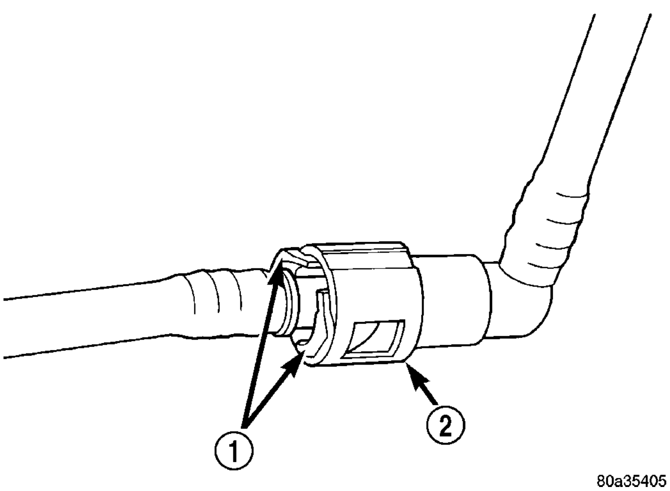


Fig. 30 Typical Two-Tab Type Quick-Connect Fitting

1 - TAB(S)
2 - QUICK-CONNECT FITTING

CAUTION: The interior components (O-rings, spacers) of this type of quick-connect fitting are not serviced separately, but new plastic retainers are available. 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 PRESSURE RELEASE PROCEDURE IN THIS GROUP. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

DISCONNECTION/CONNECTION

(1) Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure in this group.

(2) Disconnect negative battery cable from battery or auxiliary jumper terminal.

(3) Clean fitting of any foreign material before disassembly.

(4) To disconnect quick-connect fitting, squeeze plastic retainer tabs (Fig. 30) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer. Pull fitting from fuel system component being serviced. The plastic retainer will remain on component being serviced after fitting is disconnected. The O-rings and spacer will remain in quick-connect fitting connector body.

(5) Inspect quick-connect fitting body and component for damage. Replace as necessary.

CAUTION: When the quick-connect fitting was disconnected, the plastic retainer will remain on the component being serviced. If this retainer must be removed, very carefully release the retainer from the component with two small screwdrivers. After removal, inspect the retainer for cracks or any damage.

(6) Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.

(7) Insert quick-connect fitting to component being serviced and into plastic retainer. When a connection is made, a click will be heard.

(8) Verify a locked condition by firmly push-pull-ing-push on fuel tube and fitting (15-30 lbs.).

(9) Connect negative cable to battery or auxiliary jumper terminal.

(10) Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

QUICK CONNECT FITTING (Continued)

PLASTIC RETAINER RING TYPE FITTING

This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 31) usually black in color.

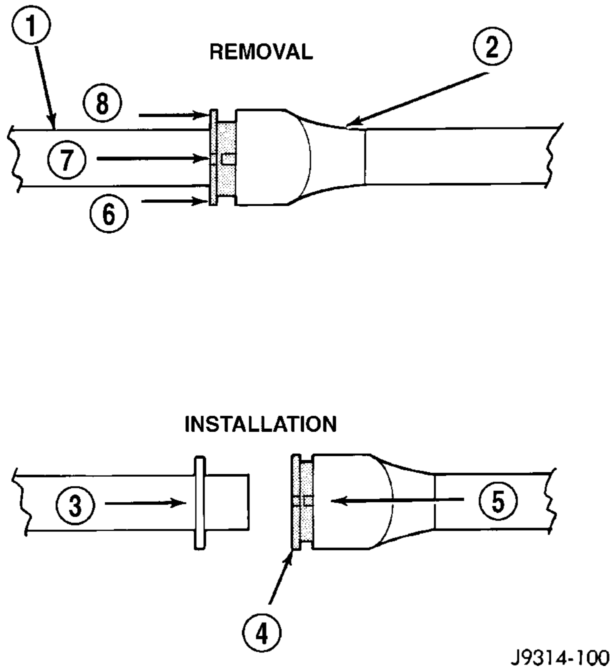


Fig. 31 Plastic Retainer Ring Type Fitting

1 - FUEL TUBE
2 - QUICK CONNECT FITTING
3 - PUSH
4 - PLASTIC RETAINER
5 - PUSH
6 - PUSH
7 - PUSH
8 - PUSH

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. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

DISCONNECTION/CONNECTION

(1) Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure in this section.

(2) Disconnect negative battery cable from battery or auxiliary jumper terminal.

(3) Clean fitting of any foreign material before disassembly.

(4) To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic retainer ring into fitting (Fig. 31). With plastic ring depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**

(5) After disconnection, plastic retainer ring will remain with 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 quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.

(8) Insert quick-connect fitting into component being serviced until a click is felt.

(9) Verify a locked condition by firmly push-pulling-push on fuel tube and fitting (15-30 lbs.).

(10) Connect negative battery cable to battery or auxiliary jumper terminal.

(11) Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

FUEL CAP LOCK CYLINDER

DESCRIPTION

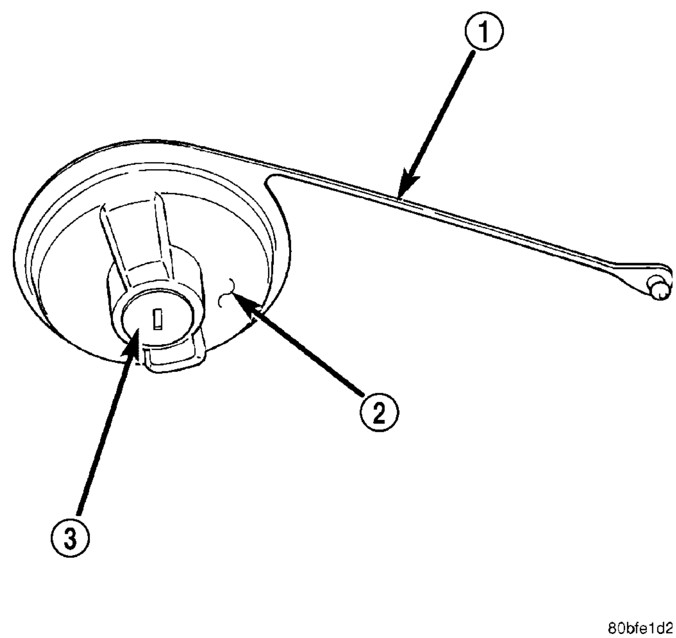


Fig. 32 LOCKING FUEL CAP

FUEL CAP LOCK CYLINDER (Continued)

Some vehicles are equipped with a locking fuel filler neck cap tethered to the fuel tank filler neck (Fig. 32). This limited factory installed locking fuel cap utilizes the standard vehicle key to lock and unlock the fuel cap from the fuel tank filler tube.

OPERATION

A locking fuel filler neck cap is utilized to prevent refueling the vehicle with the ignition on, theft or contamination of the vehicle fuel supply. The standard vehicle ignition key is used to lock or unlock the fuel filler cap. By inserting and rotating the ignition key to the right, unlocks the cap. Rotating to the left, locks the cap.

REMOVAL

(1) Using a flat-bladed pry tool, pry fuel cap retaining ring free from cap assembly (Fig. 33).

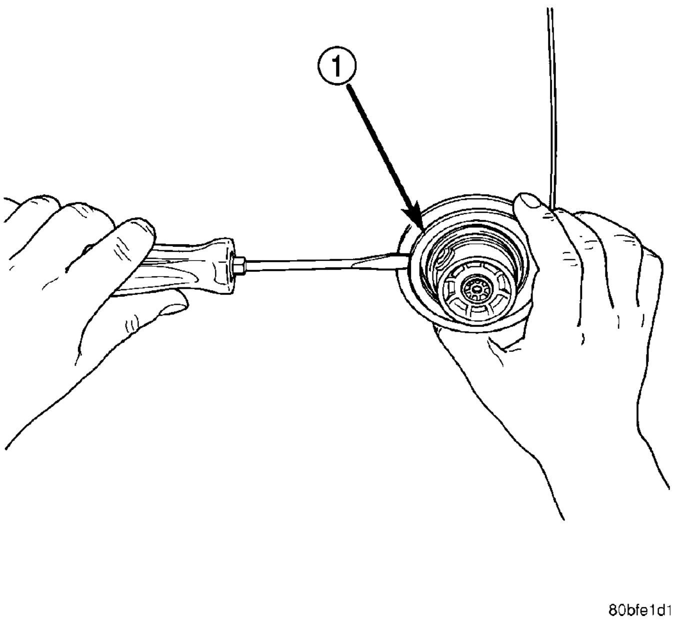


Fig. 33 REMOVING RETAINING RING

1 - RETAINING RING

(2) Remove threaded portion of cap assembly (Fig. 34).

(3) Remove lock cylinder engagement collar and tether (Fig. 35).

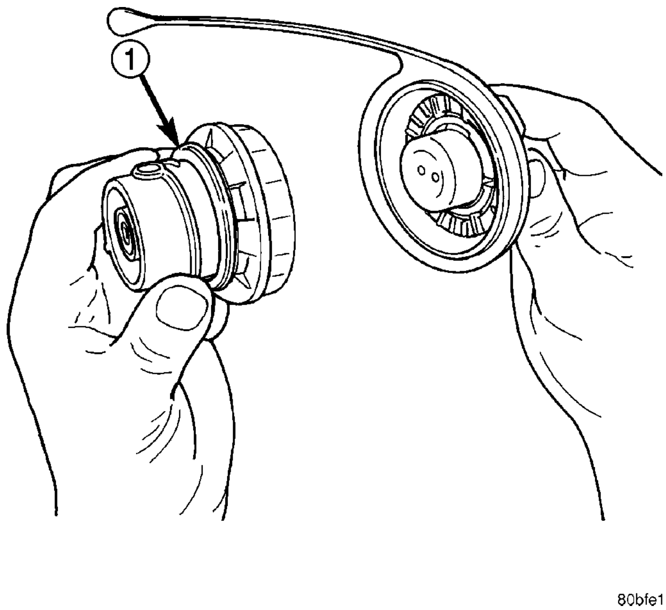


Fig. 34 STEP 2

1 - CAP ASSEMBLY

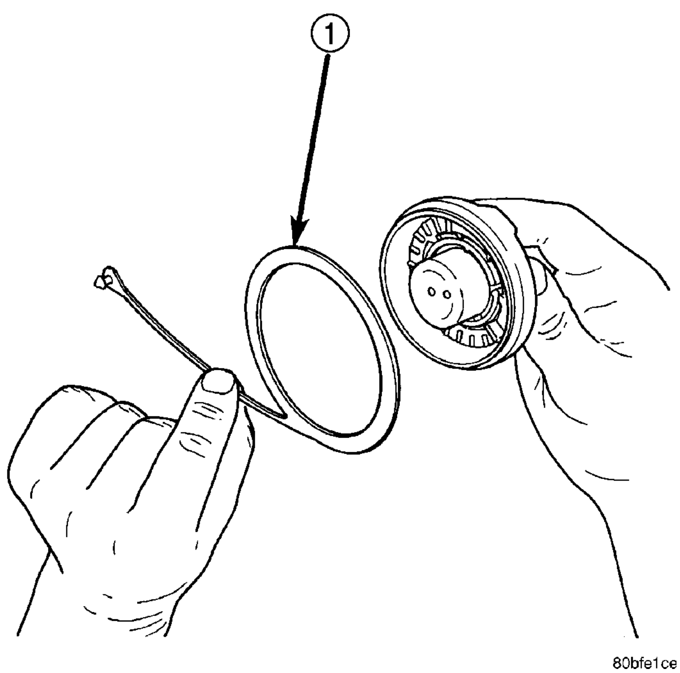


Fig. 35 REMOVING FUEL CAP TETHER

1 - TETHER

FUEL CAP LOCK CYLINDER (Continued)

(4) Depress the spring loaded lock cylinder retaining clip (Fig. 36) and remove the lock cylinder from the cap (Fig. 37).

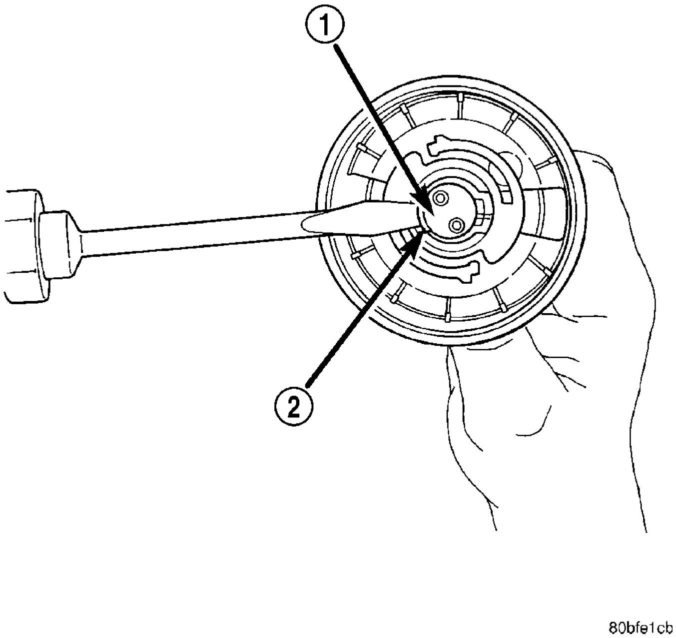


Fig. 36 DEPRESSING LOCK CYLINDER RETAINING CLIP

1 - LOCK CYLINDER
2 - RETAINING CLIP

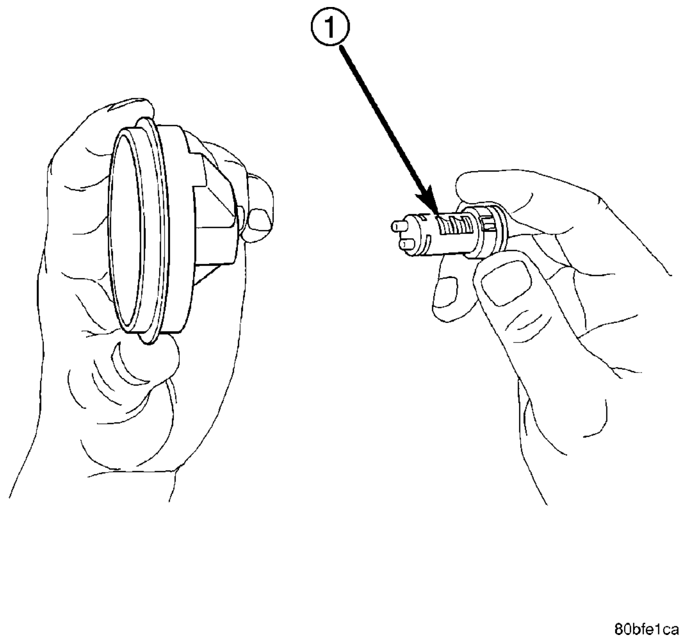


Fig. 37 LOCK CYLINDER REMOVED

1 - LOCK CYLINDER

INSTALLATION

(1) Install the keyed lock cylinder in cap.

(2) Position lock cylinder engagement collar and tether (Fig. 35).

(3) Position threaded portion of cap (Fig. 34).

(4) Snap retaining ring in position.

FUEL INJECTION

TABLE OF CONTENTS

FUEL INJECTION

OPERATION

OPERATION - INJECTION SYSTEM

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.

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.

OPERATION - 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°F the PCM will wait 38 seconds.
- If the coolant is over 50°F the PCM will wait 15 seconds.
- If the coolant is over 167°F the PCM will wait 3 seconds.

(2) For other temperatures the PCM will interpolate the correct waiting time.

(3) O2 sensor must read either greater than 0.745 volts or less than 0.29 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.

FUEL INJECTION (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 when the engine is not running. 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) relay and fuel pump relay. 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, (EGR solenoid and PCV heater if equipped) and heated oxygen sensors.
- The PCM energizes the 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.

Once the ASD and fuel pump relays have been energized, the PCM determines injector pulse width based on the following:

- MAP
- Engine RPM
- Battery voltage
- Engine coolant temperature
- Inlet/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:

- Manifold Absolute Pressure (MAP)
- Crankshaft position (engine speed)
- Engine coolant temperature
- Inlet/Intake air temperature (IAT)
- Camshaft position
- Knock sensor
- Throttle position
- A/C switch status
- Battery voltage
- Vehicle speed
- Speed control
- O2 sensors

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:

- Manifold absolute pressure
- Crankshaft position (engine speed)
- Inlet/Intake air temperature
- Engine coolant temperature
- Camshaft position
- Knock sensor
- Throttle position
- Exhaust gas oxygen content (O2 sensors)
- A/C switch status
- 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

FUEL INJECTION (Continued)

instrument panel). Also, the PCM stores an engine misfire DTC in memory, if 2nd trip with fault.

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 (if equipped)
- Purge system monitor
- Catalyst efficiency monitor
- All inputs monitored for proper voltage range, rationality.
- All monitored components (refer to the Emission section 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, after 2 trips.

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 status
- Battery voltage
- Battery temperature or Calculated Battery Temperature
- Engine coolant temperature
- Engine run time
- Inlet/Intake air temperature
- 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.

- Wide Open Throttle-open loop

DECELERATION MODE

This is a CLOSED LOOP mode. During deceleration the following inputs are received by the PCM:

- A/C status
- Battery voltage
- Inlet/Intake air temperature
- Engine coolant temperature
- Crankshaft position (engine speed)
- Exhaust gas oxygen content (upstream heated oxygen sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position sensor
- IAC motor (solenoid) control changes in response 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 (Open Loop). In response, the PCM may momentarily turn off the injectors. This helps improve fuel economy, emissions and engine braking.

WIDE-OPEN-THROTTLE MODE

This is an OPEN LOOP mode. During wide-open-throttle operation, the following inputs are used by the PCM:

- Inlet/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 and disables EGR (if equipped).

The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel, based on MAP and RPM.

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 the Emission section for 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.

FUEL CORRECTION or ADAPTIVE MEMORIES

DESCRIPTION

In Open Loop, the PCM changes pulse width without feedback from the O2 Sensors. Once the engine warms up to approximately 30 to 35° F, the PCM goes into closed loop **Short Term Correction** and utilizes feedback from the O2 Sensors. Closed loop **Long Term Adaptive Memory** is maintained above 170° to 190° F unless the PCM senses wide open throttle. At that time the PCM returns to Open Loop operation.

FUEL INJECTION (Continued)

OPERATION

Short Term

The first fuel correction program that begins functioning is the short term fuel correction. This system corrects fuel delivery in direct proportion to the readings from the Upstream O2 Sensor.

The PCM monitors the air/fuel ratio by using the input voltage from the O2 Sensor. When the voltage reaches its preset high or low limit, the PCM begins to add or remove fuel until the sensor reaches its switch point. The short term corrections then begin.

The PCM makes a series of quick changes in the injector pulse-width until the O2 Sensor reaches its opposite preset limit or switch point. The process then repeats itself in the opposite direction.

Short term fuel correction will keep increasing or decreasing injector pulse-width based upon the upstream O2 Sensor input. The maximum range of authority for short term memory is 25% (+/-) of base pulse-width. Short term is violated and is lost when ignition is turned OFF.

Long Term

The second fuel correction program is the long term adaptive memory. In order to maintain correct emission throughout all operating ranges of the engine, a cell structure based on engine rpm and load (MAP) is used.

Ther number of cells varies upon the driving conditions. Two cells are used only during idle, based upon TPS and Park/Neutral switch inputs. There may be two other cells used for deceleration, based on TPS, engine rpm, and vehicle speed. The other twelve cells represent a manifold pressure and an rpm range. Six of the cells are high rpm and the other six are low rpm. Each of these cells has a specific MAP voltage range Typical Adaptive Memory Fuel Cells.

As the engine enters one of these cells the PCM looks at the amount of short term correction being used. Because the goal is to keep short term at 0 (O2 Sensor switching at 0.5 volt), long term will update in the same direction as short term correction was moving to bring the short term back to 0. Once short term is back at 0, this long term correction factor is stored in memory.

The values stored in long term adaptive memory are used for all operating conditions, including open loop and cold starting. However, the updating of the long term memory occurs after the engine has exceeded approximately 170°-190° F, with fuel control in closed loop and two minutes of engine run time. This is done to prevent any transitional temperature or start-up compensations from corrupting long term fuel correction.

Long term adaptive memory can change the pulse-width by as much as 25%, which means it can correct for all of short term. It is possible to have a problem that would drive long term to 25% and short term to another 25% for a total change of 50% away from base pulse-width calculation.

TYPICAL ADAPTIVE MEMORY FUEL CELLS

	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Idle	Decel
Vacuum	20	17	13	9	5	0		
Above 1,984 rpm	1	3	5	7	9	11	13 Drive	15
Below 1,984 rpm	0	2	4	6	8	10	12 Neutral	14
MAP volt =	0	1.4	2.0	2.6	3.3	3.9		

Fuel Correction Diagnostics

There are two fuel correction diagnostic routines:

- Fuel System Rich
- Fuel System Lean

A DTC is set and the MIL is illuminated if the PCM detects either of these conditions. This is determined based on total fuel correction, short term times long term.

PROGRAMMABLE COMMUNICATIONS INTERFACE (PCI) BUS

DESCRIPTION

The Programmable Communication Interface Multiplex system (PCI Bus) consist of a single wire. The Body Control Module (BCM) acts as a splice to connect each module and the Data Link Connector (DLC) together. Each module is wired in parallel to the data bus through its PCI chip set and uses its

FUEL INJECTION (Continued)

ground as the bus reference. The wiring is a minimum 20 gage wire.

OPERATION

Various modules exchange information through a communications port called the PCI Bus. The Powertrain Control Module (PCM) transmits the Malfunction Indicator Lamp (Check Engine) On/Off signal and engine RPM on the PCI Bus. The PCM receives the Air Conditioning select input, transaxle gear position inputs over the PCI Bus. The PCM also receives the air conditioning evaporator temperature signal from the PCI Bus.

The following components access or send information on the PCI Bus.

- Instrument Panel
- Body Control Module
- Air Bag System Diagnostic Module
- Full ATC Display Head (if equipped)
- ABS Module
- Transmission Control Module
- Powertrain Control Module
- Travel Module
- SKIM

SYSTEM DIAGNOSIS

OPERATION

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.

For DTC information see On-Board Diagnostics (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION) .

SPECIFICATIONS

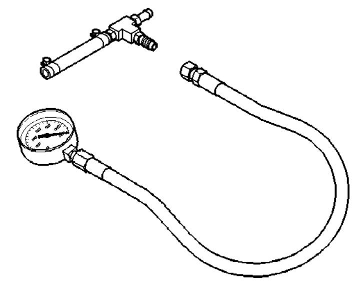
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Air Cleaner Lid Screws	3.9		35
Crankshaft Position Sensor Mounting Bolts	8		70
Engine Coolant Temperature Sensor	18	13.2	165
IAC Motor-To-Throttle Body Bolts	4.5		40
MAP Sensor	4.5		40
Oxygen Sensor	28	20	
Powertrain Control Module (PCM) Mounting Screws	4		35
Throttle Body Mounting Bolts	23	16.9	200
Throttle Position Sensor Mounting Screws	2		17
Vehicle Speed Sensor Mounting Bolt	2.2		19.4

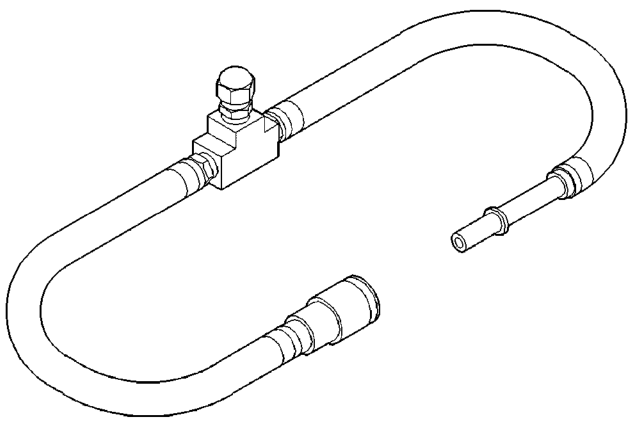
FUEL INJECTION (Continued)

SPECIAL TOOLS

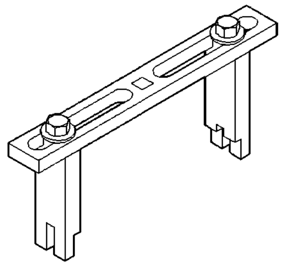
FUEL



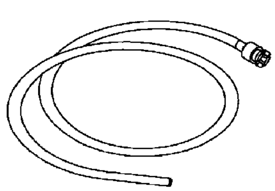
Pressure Gauge Assembly C–4799–B



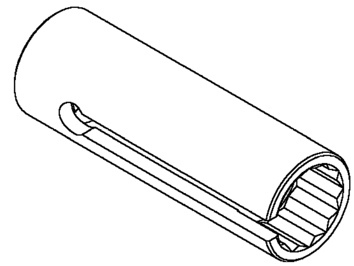
Fuel Pressure Test Adapter 6539



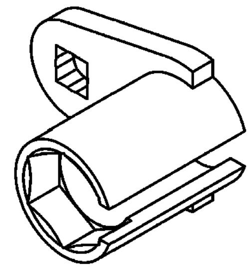
Spanner Wrench 6856



Fuel Line Adapter 1/4



O2S (Oxygen Sensor) Remover/Installer—C-4907



O2S (Oxygen Sensor) Remover/Installer - 8439

ACCELERATOR PEDAL

REMOVAL

CAUTION: When servicing the accelerator pedal, throttle cable or speed control cable, do not damage or kink the core wire inside the cable sheathing.

(1) Remove throttle cable cover.

(2) Hold the throttle body throttle lever in the wide open position. Remove the throttle cable from the throttle body cam (Fig. 1).

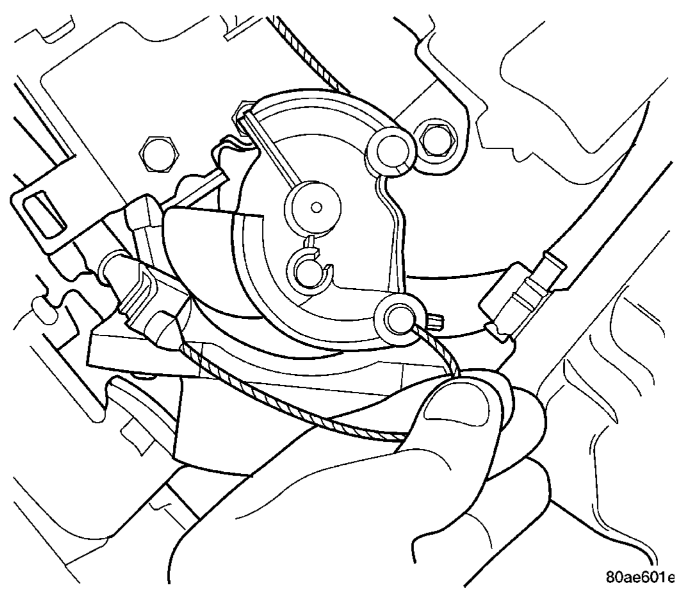


Fig. 1 Throttle Cable

ACCELERATOR PEDAL (Continued)

(3) From inside the vehicle, hold up the pedal and remove the cable retainer and throttle cable from the upper end of the pedal shaft (Fig. 2).

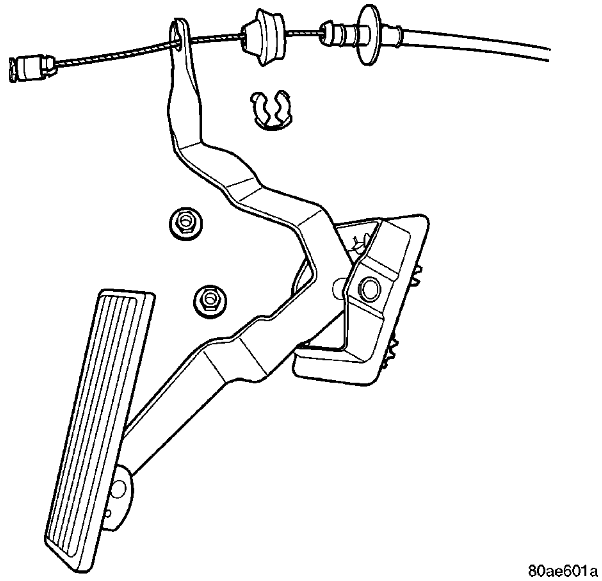


Fig. 2 Accelerator Pedal and Throttle Cable

(4) Pull back the carpet.

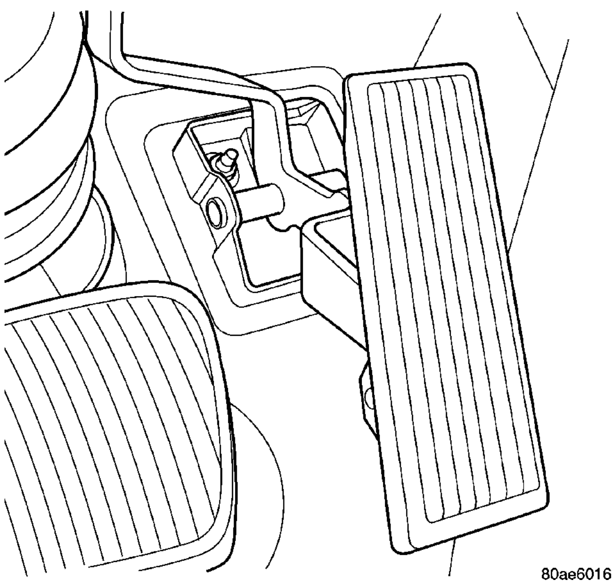


Fig. 3 Accelerator Pedal

(5) Working from inside the vehicle, remove nuts from accelerator pedal attaching studs (Fig. 3). Remove assembly from vehicle.

INSTALLATION

CAUTION: When servicing the accelerator pedal, throttle cable or speed control cable, do not damage or kink the core wire inside the cable sheathing.

(1) Position accelerator pedal assembly on dash panel. Install retaining nuts. Tighten retaining nuts to 12 N·m (105 in. lbs.) torque.

(2) From inside the vehicle, hold up the pedal and install the throttle cable and cable retainer in the upper end of the pedal shaft.

(3) From the engine compartment, hold the throttle body lever in the wide open position and install the throttle cable.

(4) Install the throttle cable cover.

ACCELERATOR PEDAL POSITION SENSOR

DESCRIPTION

The Accelerator Pedal Position Sensor (APPS) is a variable resistor that provides the PCM with an input signal (voltage) (Fig. 4). The signal represents throttle blade position. As the position of the accelerator pedal changes, the resistance of the APPS changes (Fig. 5).

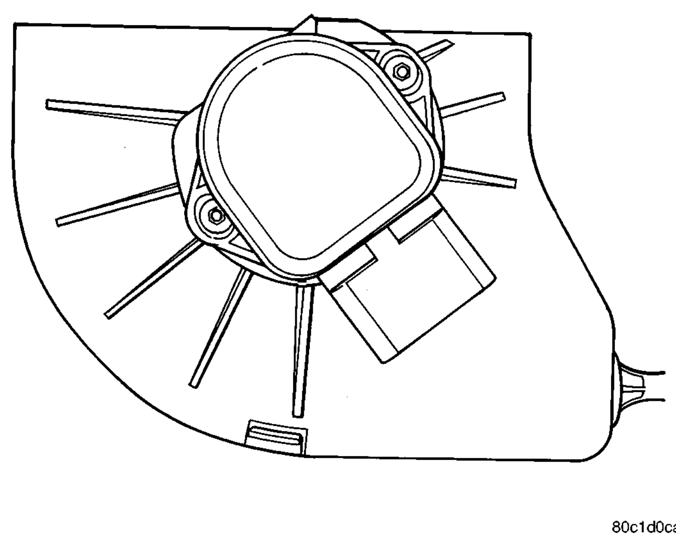


Fig. 4 APPS MODULE

ACCELERATOR PEDAL POSITION SENSOR (Continued)

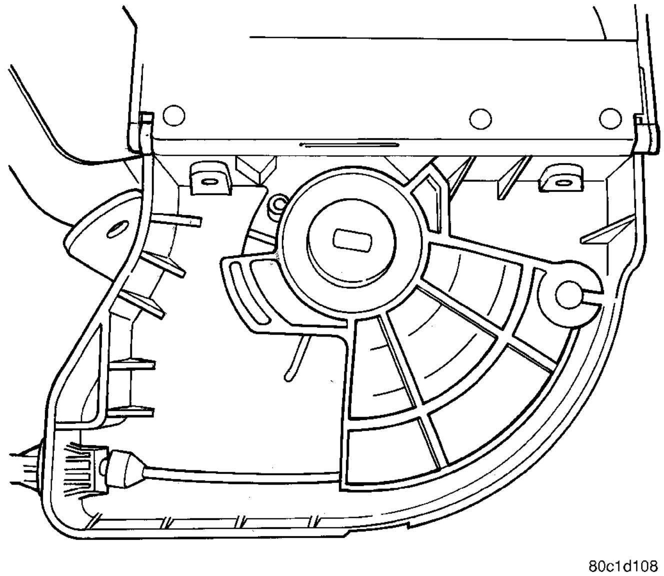


Fig. 5 ASSP MODULE OPEN

REMOVAL

REMOVAL - RHD

(1) Disconnect the negative battery cable.
(2) Remove the 2 bracket mounting bolts (Fig. 6).

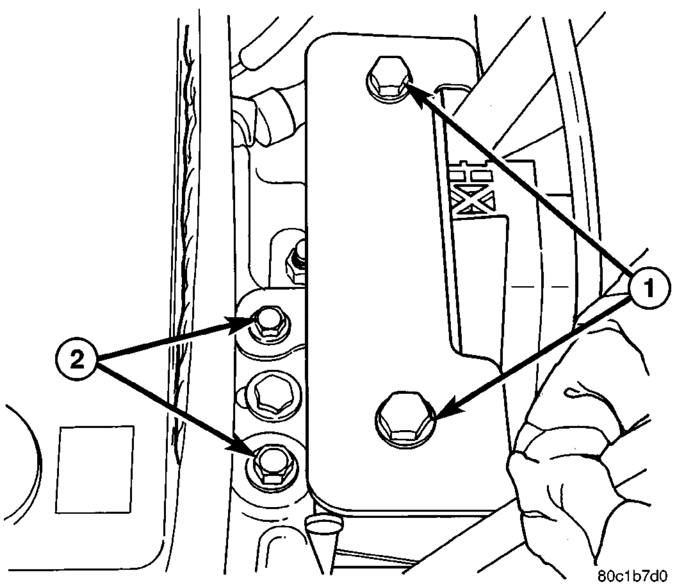


Fig. 6 APPS MOUNTING

1 - MODULE MOUNTING BOLTS
2 - BRACKET MOUNTING BOLTS

(3) Remove the 2 bolts holding module to the mounting bracket
(4) Unlock the electrical connector and then disconnect the electrical connector from the module (Fig. 7).
(5) Open the APPS module cover and disconnect the cable from the cam and module.

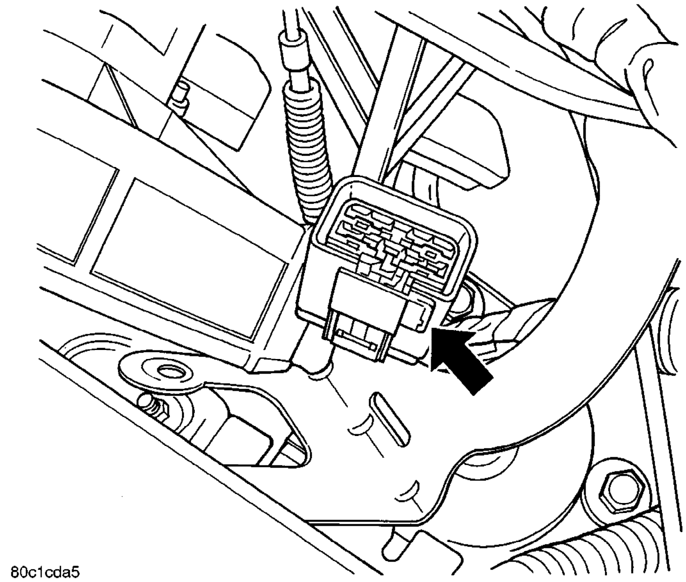


Fig. 7 ELECTRICAL CONNECTOR LOCK

(6) Remove assembly.

REMOVAL - LHD

(1) Disconnect the negative battery cable.
(2) Remove the 2 mounting bolts (Fig. 8).

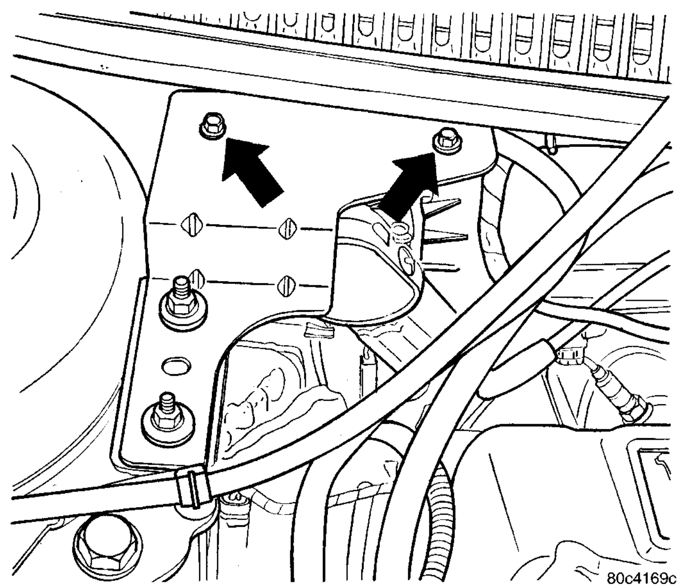


Fig. 8 APPS LOCATION

(3) Open APPS module and disconnect the cable (Fig. 9).
(4) Remove APPS module.

INSTALLATION

INSTALLATION - RHD

(1) Open APPS module and connect cable.

ACCELERATOR PEDAL POSITION SENSOR (Continued)

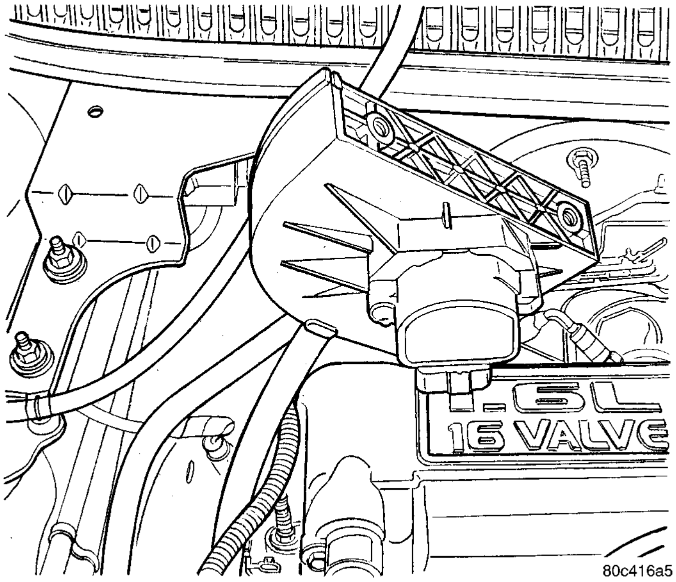


Fig. 9 APPS MOUNTING

(2) Route electrical connector though mounting bracket (Fig. 10).

(3) Install electrical connector and lock (Fig. 11).

(4) Install the 2 top bolts (Fig. 6).

(5) Install the 2 mounting bolts (Fig. 6).

(6) Connect the negative battery cable.

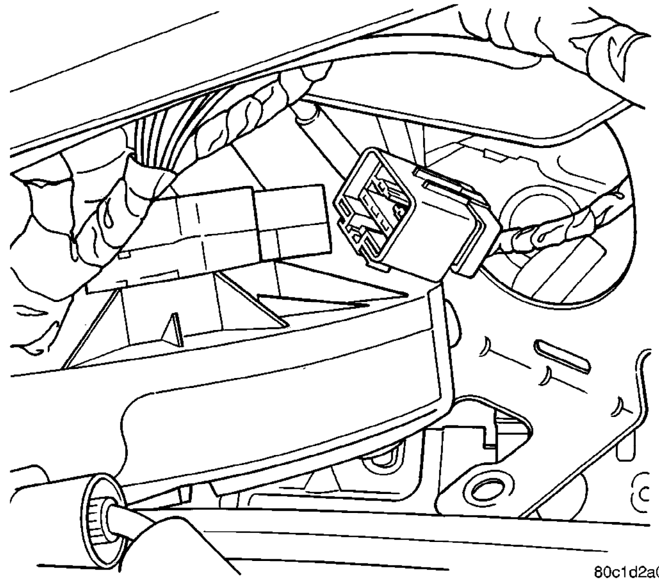


Fig. 11 ELECTRICAL CONNECTOR

INSTALLATION - LHD

(1) Open APPS module and connect the cable (Fig. 12).

(2) Install APPS module.

(3) Tighten the 2 mounting bolts (Fig. 12).

(4) Connect the negative battery cable.

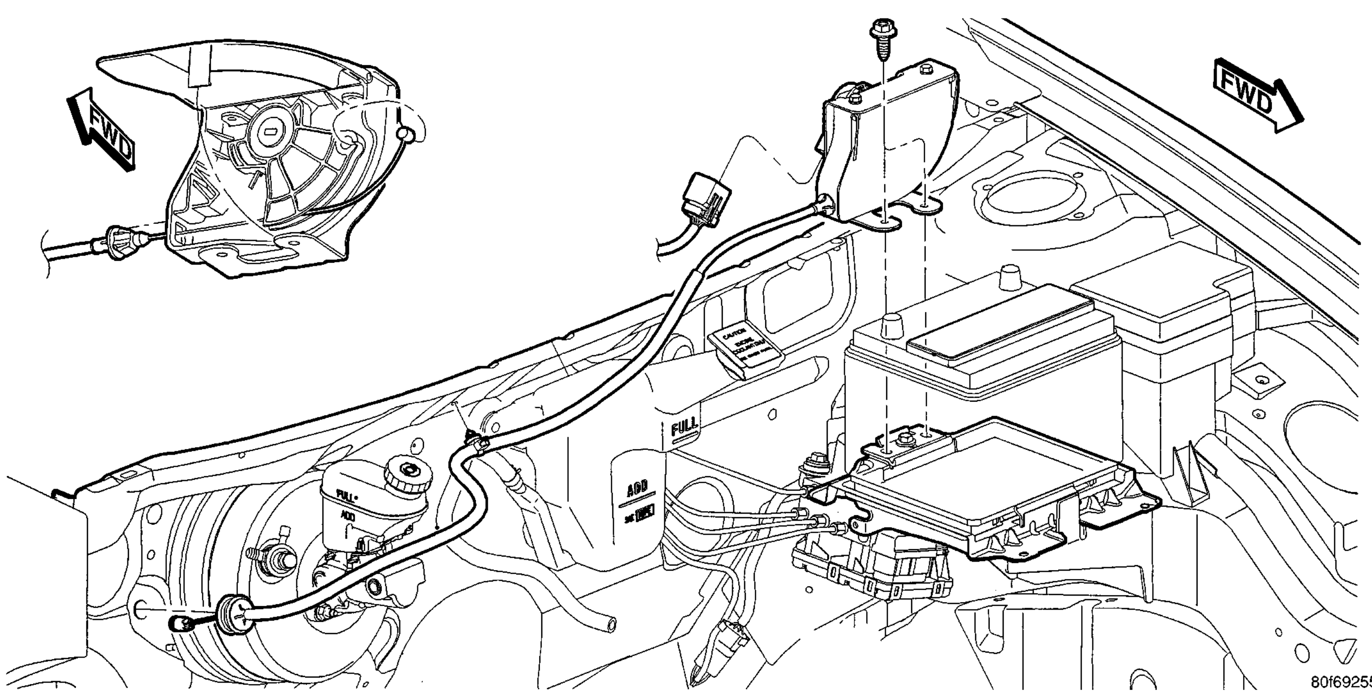


Fig. 10 APPS AND CABLE RHD

ACCELERATOR PEDAL POSITION SENSOR (Continued)

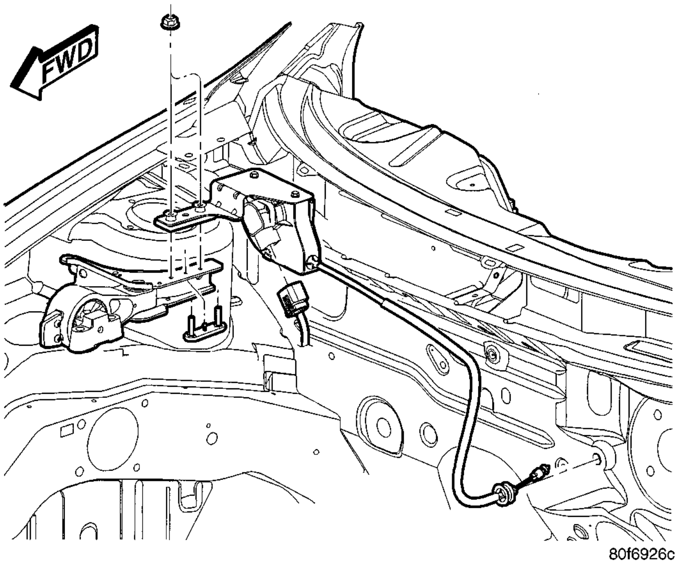


Fig. 12 APPS AND CABLE LHD

CRANKSHAFT POSITION SENSOR

DESCRIPTION

The crankshaft position sensor mounts to the engine block near the starter (Fig. 13).

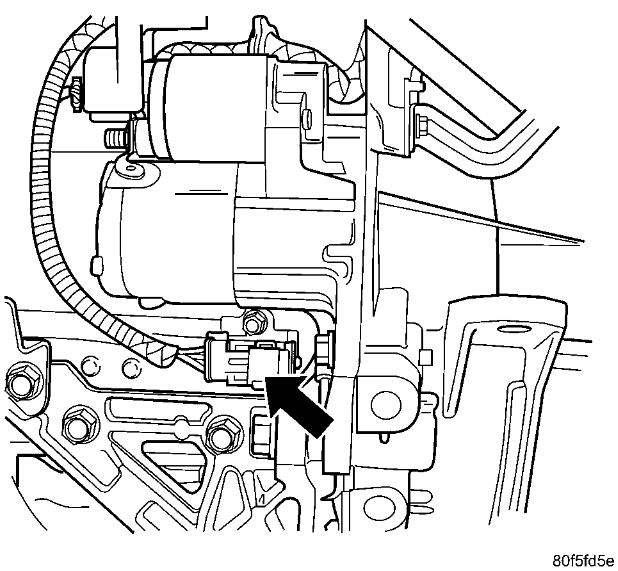


Fig. 13 Crankshaft Position Sensor

The PCM uses the Crankshaft Position sensor to calculate the following:

- Engine RPM
- TDC number 1 and 4
- Ignition coil synchronization
- Injector synchronization
- Camshaft-to-crankshaft misalignment (Timing belt skipped 1 tooth or more diagnostic trouble code).

OPERATION

The PCM sends approximately 5 volts to the Hall-effect sensor. This voltage is required to operate the Hall-effect chip and the electronics inside the sensor. A ground for the sensor is provided through the sensor return circuit. The input to the PCM occurs on a 5 volt output reference circuit that operates as follows: The Hall-effect sensor contains a powerful magnet. As the magnetic field passes over the dense portion of the counterweight, the 5-volt signal is pulled to ground (.3 volts) through a transistor in the sensor. When the magnetic field passes over the notches in the crankshaft counterwieght, the magnetic field turns off the transistor in the sensor, causing the PCM to register the 5-volt signal. The PCM identifies crankshaft position by registering the change from 5 to 0 volts, as signaled from the Crankshaft Position sensor.

The PCM determines what cylinder to fire from the crankshaft position sensor (Fig. 14) input and the camshaft position sensor input. The #8 crankshaft counterweight has a target ring with 32 teeth and notches, including one long referance tooth and notch. From the crankshaft position sensor input the PCM determines engine speed and crankshaft angle (position).

CRANKSHAFT POSITION SENSOR (Continued)

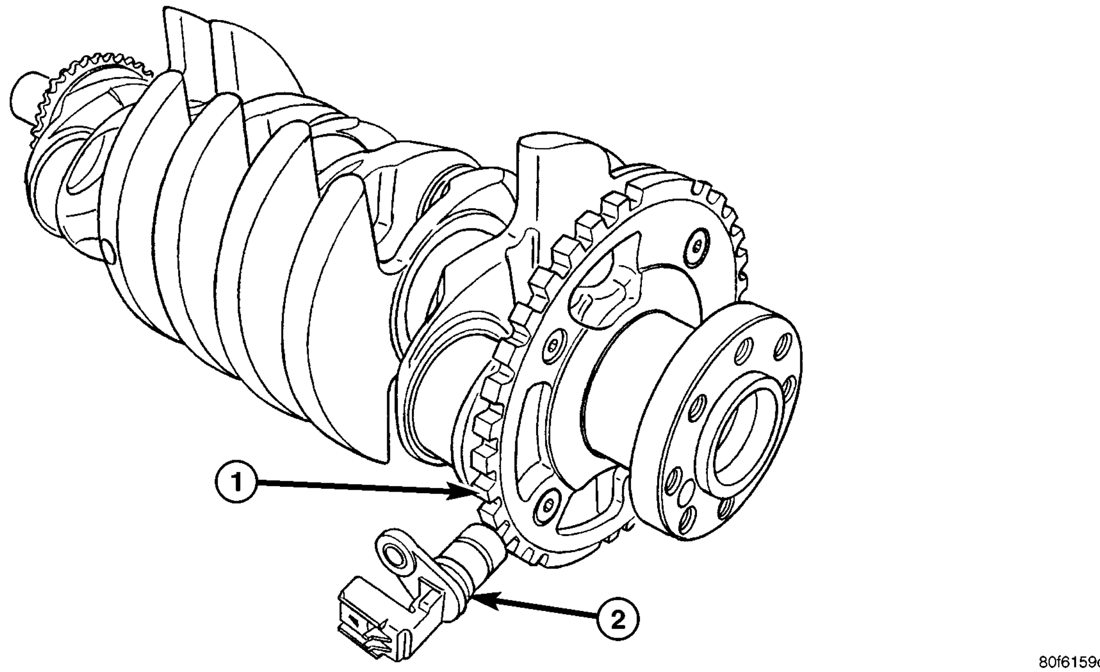


Fig. 14 TIMING REFERENCE NOTCHES (NGC)

1 - Crankshaft
2 - Crankshaft Position Sensor

REMOVAL

REMOVAL - 1.6L

(1) Disconnect the negative battery cable
(2) Raise vehicle and support.
(3) Disconnect the electrical connector (Fig. 15).

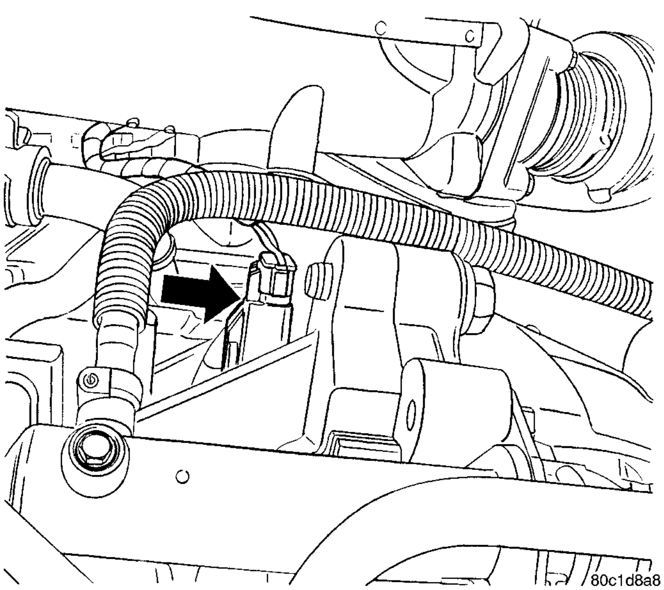


Fig. 15 CRANKSHAFT SENSOR LOCATION

(4) Remove bolt from Crankshaft sensor.
(5) Remove sensor (Fig. 16).

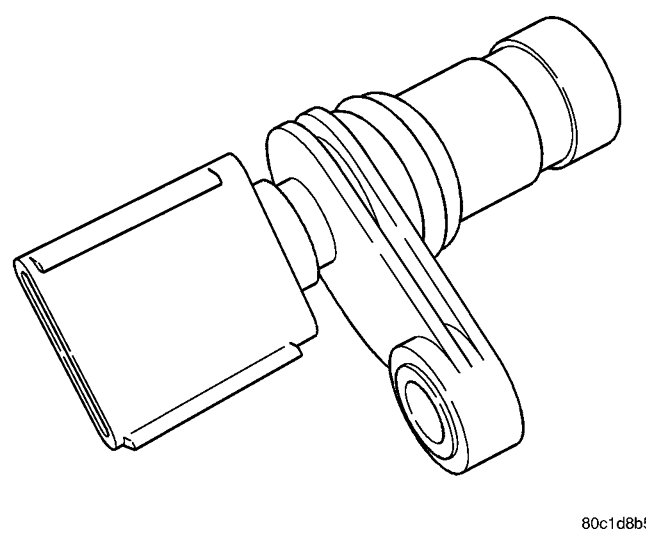


Fig. 16 CRANKSHAFT POSITION SENSOR

REMOVAL - 2.0, 2.4, 2.4L TURBO

The Crankshaft Position Sensor is in the front of the engine block just under the starter motor (Fig. 17).

(1) Disconnect the negative battery cable.
(2) Raise vehicle and support.
(3) On **2.4L SRT-4** remove the lower inner cooler hose from the metal tube.

CRANKSHAFT POSITION SENSOR (Continued)

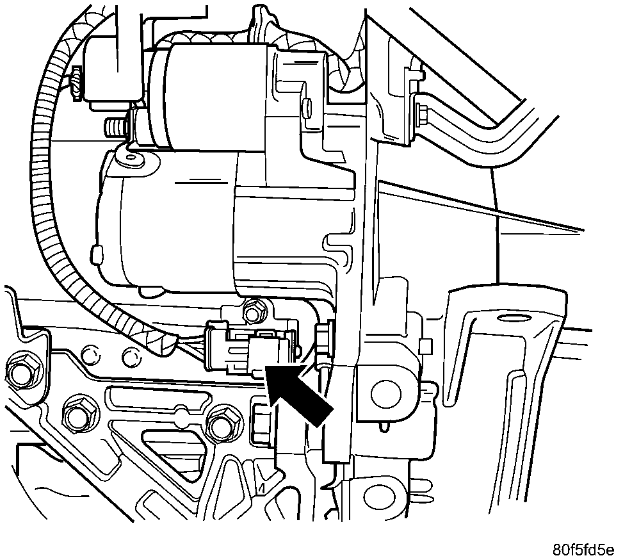


Fig. 17 CRANKSHAFT POSITION SENSOR LOCATION

(4) Remove the Structural Collar (Fig. 18), refer to the Engine, Structural Collar Removal and Installation section.

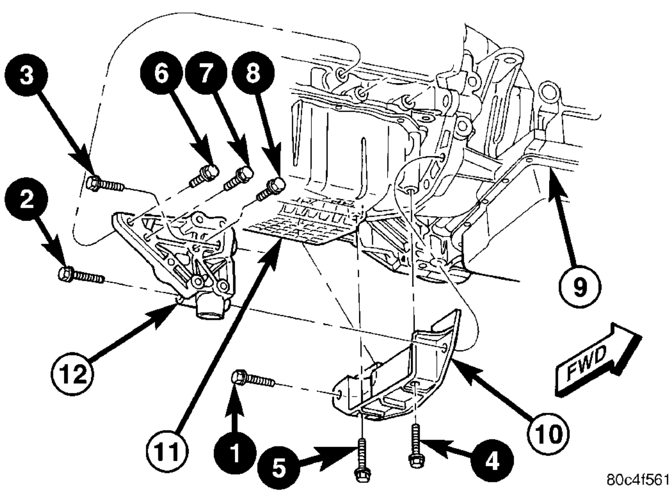


Fig. 18 Structural Collar and Bending Strut—(Automatic Transaxle Equipped)

1–8 – BOLT TIGHTENING SEQUENCE
9 – TRANSAXLE
10 – COLLAR
11 – OIL PAN
12 – STRUT

(5) Unlock and disconnect the electrical connector to the crankshaft position sensor.
(6) Remove the crankshaft position sensor bolt.
(7) Remove the sensor (Fig. 19).

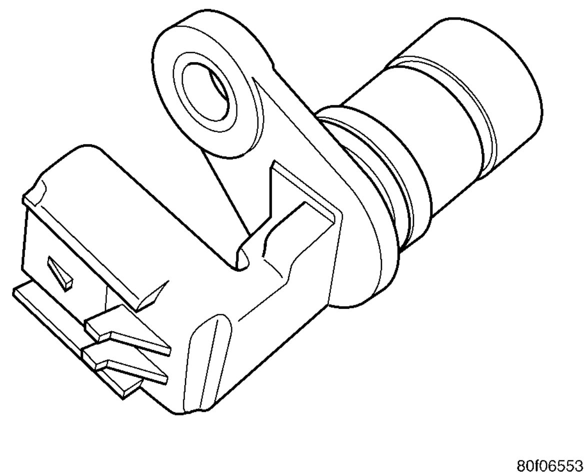


Fig. 19 CRANKSHAFT POSITION SENSOR - 2.4 L TURBO

INSTALLATION

INSTALLATION - 1.6L

(1) Install the Crankshaft sensor (Fig. 15).
(2) Install bolt and tighten to 10 N·m (90 in. lbs.).
(3) Connect the electrical connector (Fig. 16).
(4) Lower vehicle.
(5) Connect the negative battery cable.

INSTALLATION - 2.0, 2.4, 2.4L Turbo

(1) Check o-ring for damage and lubricate the o-ring with engine oil before installing sensor (Fig. 19).
(2) Use a twisting motion when installing the sensor.
(3) Install and tighten the crankshaft position sensor bolt and tighten to 9 N·m (80 ±15 in. lbs.).
(4) Connect and lock the electrical connector to the crankshaft position sensor.
(5) Install the Structural Collar, refer to the Engine, Structural Collar Removal and Installation section (Fig. 18).
(6) On **2.4L SRT-4** install the lower inner cooler hose to metal tube and tighten clamp.
(7) Lower vehicle.
(8) Connect the negative battery cable.

FUEL INJECTOR

DESCRIPTION

The injectors are positioned in the intake manifold with the nozzle ends directly above the intake valve port (Fig. 20).

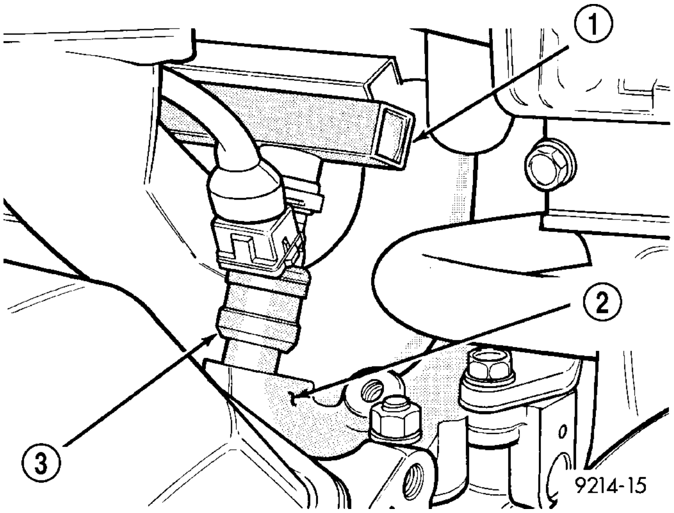


Fig. 20 Fuel Injector Location—Typical

1 - FUEL RAIL
2 - INTAKE MANIFOLD
3 - FUEL INJECTORS

OPERATION

The fuel injectors are 12 volt electrical solenoids (Fig. 21). 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 or two streams. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber. Fuel injectors are not interchangeable between engines.

The PCM provides battery voltage to each injector through the ASD relay. Injector operation is controlled by a ground path provided for each injector by the PCM. Injector on-time (pulse-width) is variable, and is determined by the PCM processing all the data previously discussed to obtain the optimum injector pulse width for each operating condition. The pulse width is controlled by the duration of the ground path provided.

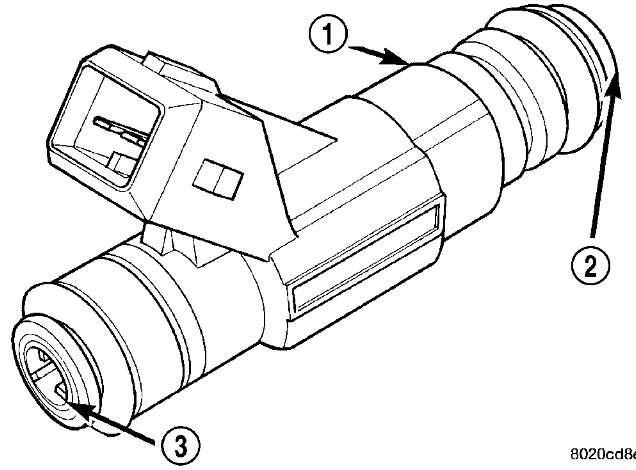


Fig. 21 FUEL INJECTOR - TYPICAL

1 - FUEL INJECTOR
2 - NOZZLE
3 - TOP (FUEL ENTRY)

STANDARD PROCEDURE

REMOVAL - INJECTOR CONNECTOR

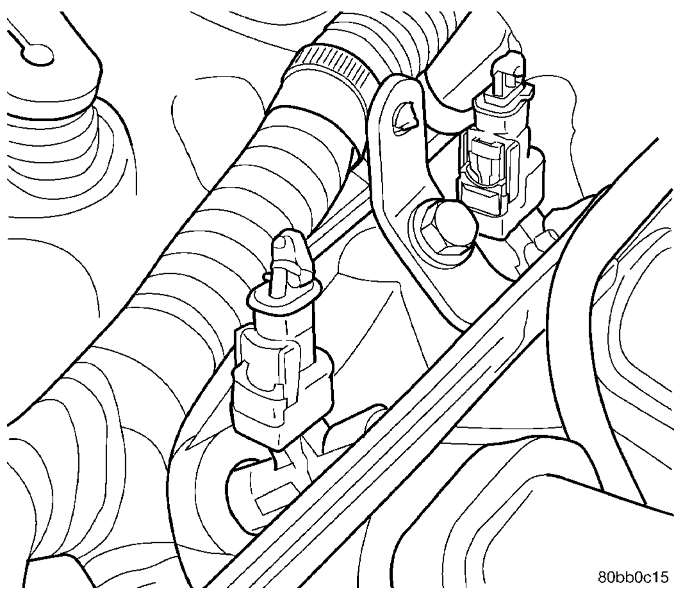


Fig. 22 Fuel Injectors

(1) Disconnect electrical connectors at the fuel injectors (Fig. 22). To remove connector refer to (Fig. 23). Pull the red colored slider away from injector (1). While pulling the slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, make note of wiring location before removal.

FUEL INJECTOR (Continued)

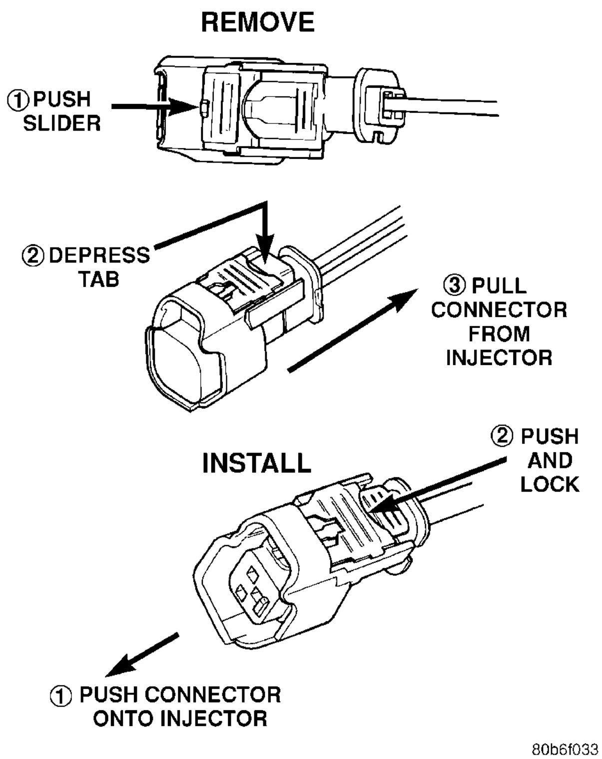


Fig. 23 Remove/Install Injector Connector

REMOVAL

(1) Disconnect negative cable from battery.

(2) Release fuel system pressure. Refer to Fuel System Pressure Release procedure in this section.

(3) Disconnect fuel supply tube from rail. Refer to Quick-Connect Fittings in the Fuel Delivery section of this group.

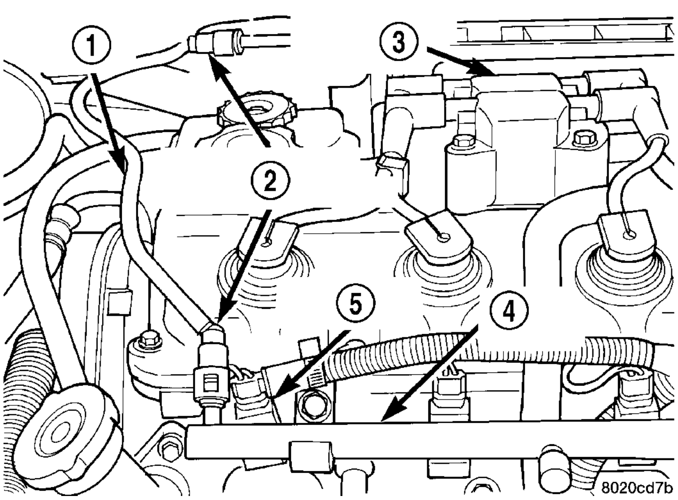


Fig. 24 Fuel Rail and Injectors

1 - FUEL SUPPLY LINE
2 - FUEL LINE QUICK-CONNECTS
3 - IGNITION COIL
4 - FUEL RAIL
5 - FUEL INJECTOR

(4) Disconnect electrical connectors from fuel injectors (Fig. 24), refer to the fuel injector connector section for electrical connector removal.

(5) Remove fuel rail mounting screws.

(6) Lift rail off of intake manifold. Cover the fuel injector openings in the intake manifold.

(7) Remove fuel injector retainer (Fig. 25).

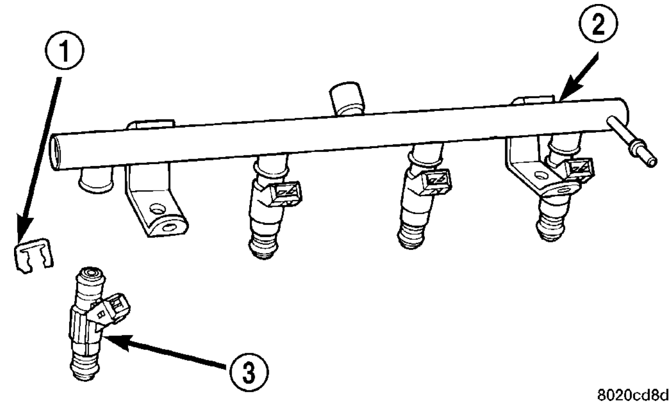


Fig. 25 Fuel Injector Retainer

1 - RETAINER
2 - FUEL RAIL
3 - FUEL INJECTOR

(8) Pull injector out of fuel rail. Replace fuel injector O-rings (Fig. 26).

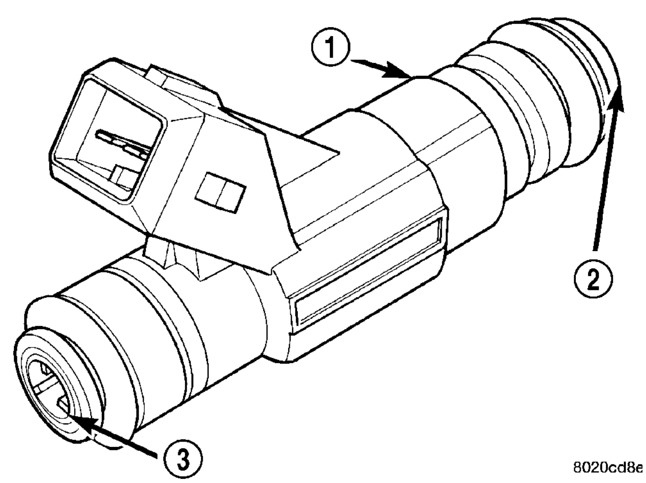


Fig. 26 Fuel Injector O-Rings

1 - FUEL INJECTOR
2 - NOZZLE
3 - TOP (FUEL ENTRY)

INSTALLATION

(1) Apply a light coating of clean engine oil to the upper O-ring.

(2) Install injector in cup on fuel rail.

(3) Install retaining clip.

(4) Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.

FUEL INJECTOR (Continued)

(5) 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.).

(6) Attach electrical connectors to fuel injectors, refer to the fuel injector connector section for electrical connector installation.

(7) Connect fuel supply tube to fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.

FUEL PUMP RELAY

DESCRIPTION

The fuel pump relay is located in the PDC. The inside top of the PDC cover has a label showing relay and fuse location.

OPERATION

The fuel pump relay supplies 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 fuel pump relay power circuit contains a fuse between the buss bar in the PDC and the relay. The fuse is located in the PDC. Refer to the Wiring Diagrams for circuit information.

The PCM controls the fuel pump 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. When the ignition switch is in the On position, the PCM energizes the fuel pump. If the crankshaft position sensor does not detect engine rotation, the PCM de-energizes the relay after approximately one second.

IDLE AIR CONTROL MOTOR

DESCRIPTION

The Idle Air Control (IAC) solenoid is mounted on the throttle body. The PCM operates the idle air control solenoid (Fig. 27). It is an electric stepper solenoid.

OPERATION

The PCM adjusts engine idle speed through the idle air control solenoid 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 solenoid pintle protrudes into the air bypass passage and regulates air flow through it.

The PCM adjusts engine idle speed by moving the IAC solenoid pintle in and out of the bypass passage.

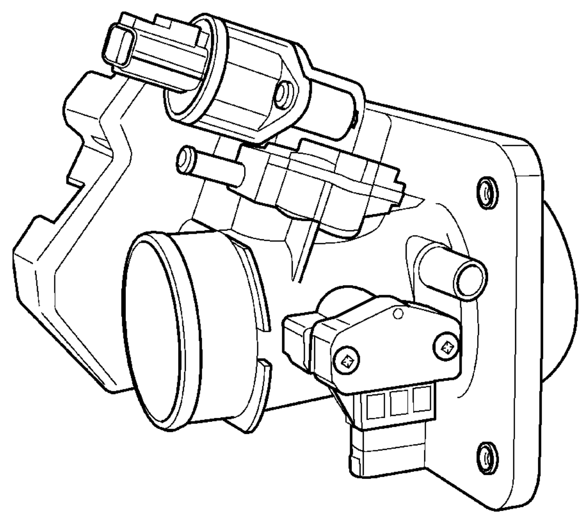


Fig. 27 Idle Air Control Solenoid—Typical

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 and power steering).

When engine rpm is above idle speed, the IAC is used for the following functions:

- Off-idle dashpot
- Deceleration air flow control
- A/C compressor load control and power steering (also opens the passage slightly before the compressor is engaged so that the engine rpm does not dip down when the compressor engages)

Target Idle

Target idle is determined by the following inputs:

- Gear position
- ECT Sensor
- Battery voltage
- Ambient/Battery Temperature Sensor
- VSS
- TPS
- MAP Sensor

REMOVAL

REMOVAL

When servicing throttle body components, always reassemble components with new O-rings and seals where applicable. Never use lubricants on O-rings or seals, damage may result. If assembly of component is difficult, use water to aid assembly. Use care when removing hoses to prevent damage to hose or hose nipple.

(1) Disconnect negative cable from battery.

IDLE AIR CONTROL MOTOR (Continued)

(2) Remove electrical connector from idle air control motor.

(3) Remove idle air control motor mounting screws (Fig. 28).

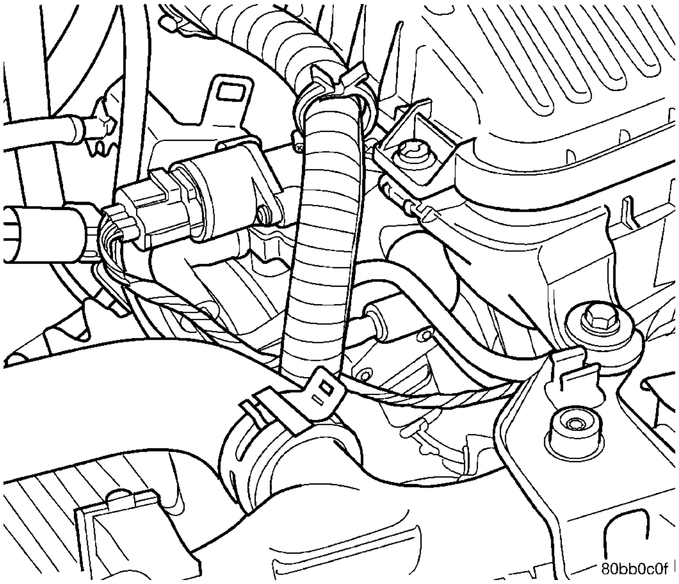


Fig. 28 Servicing Idle Air Control Motor

(4) Remove motor from throttle body. Ensure the O-ring is removed with the motor.

REMOVAL - 2.4L SRT-4

When servicing throttle body components, always reassemble components with new O-rings and seals where applicable. Never use lubricants on O-rings or seals (Fig. 29), damage may result. If assembly of component is difficult, use water to aid assembly. Use care when removing hoses to prevent damage to hose or hose nipple.

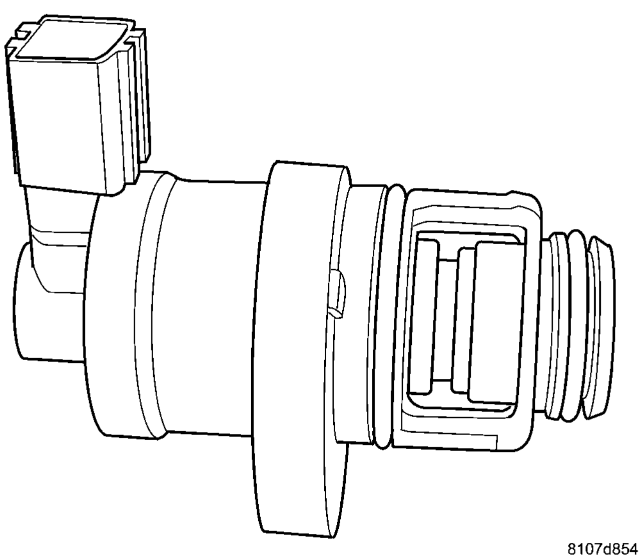


Fig. 29 IDLE AIR CONTROL MOTOR

(1) Disconnect negative cable from battery.

(2) Relocate the air cleaner box.

(3) Remove electrical connector from idle air control motor.

(4) Remove idle air control motor mounting screws (Fig. 30).

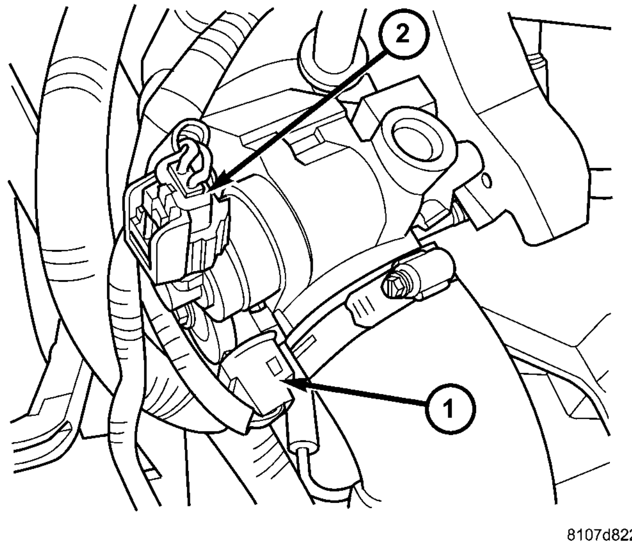


Fig. 30 TPS AND IAC LOCATION

1 - Throttle Position Sensor
2 - Idle Air Control Motor

(5) Remove motor from throttle body. Ensure the O-ring is removed with the motor.

INSTALLATION

INSTALLATION

When servicing throttle body components, always reassemble components with new O-rings and seals where applicable. Never use lubricants on O-rings or seals, damage may result. If assembly of component is difficult, use water to aid assembly. Use care when removing hoses to prevent damage to hose or hose nipple.

(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 III® Idle Air Control 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 4.5 N·m (40 in. lbs.) torque.

(4) Connect electrical connector to idle air control motor

(5) Connect negative cable to battery.

IDLE AIR CONTROL MOTOR (Continued)

INSTALLATION - 2.4L SRT-4

(1) Install the IAC to the throttle body (Fig. 31).

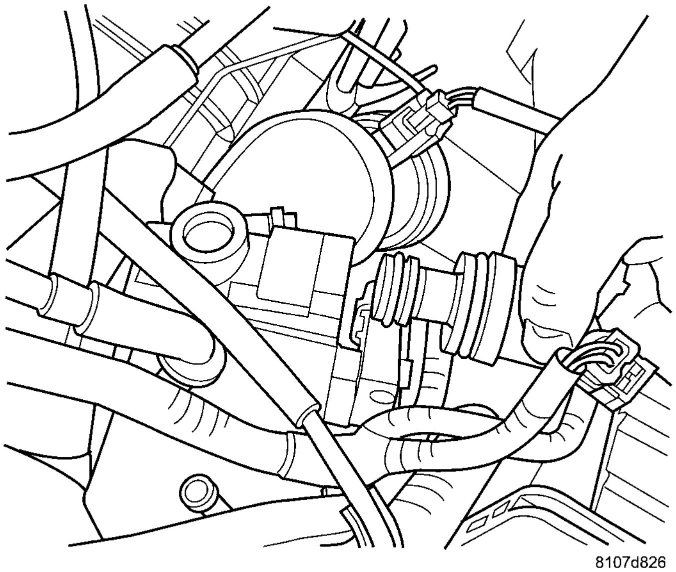


Fig. 31 IAC REMOVE/INSTALL

(2) Tighten mounting screw to 5.1 N·m (45 in. lbs.) torque.

(3) Attach electrical connector to the IAC and lock connector.

(4) Relocate the air cleaner box and install fasteners.

(5) Connect the negative battery cable.

INLET AIR TEMPERATURE SENSOR

DESCRIPTION

The IAT sensor attaches to the clean air duct (Fig. 32).

The IAT Sensor is a Negative Temperature Coefficient (NTC) Sensor that provides information to the PCM regarding the temperature of the air entering the intake manifold.

REMOVAL

(1) Disconnect the negative battery cable.

(2) Disconnect the inlet air temperature sensor

(3) Remove the air cleaner lid.

(4) Disconnect the inlet air tube from the throttle body.

(5) Remove inlet air tube from air cleaner lid.

INSTALLATION

(1) Install inlet air tube to air cleaner lid and tighten clamp.

(2) Install inlet air tube to throttle body and tighten clamp.

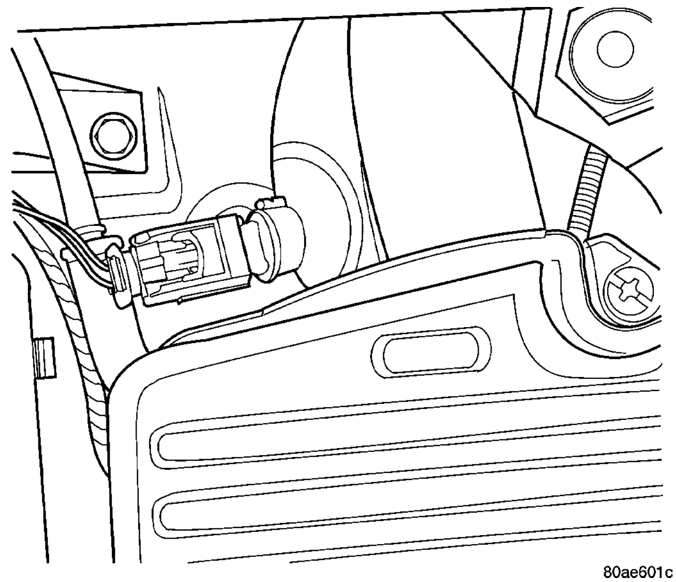


Fig. 32 Inlet Air Temperature Sensor

(3) Install air cleaner lid to air cleaner box.

(4) Connect the inlet air temperature sensor electrical connector.

(5) Connect the negative battery cable.

MANIFOLD TUNE VALVE

DESCRIPTION

The valve connects both passages of the intake manifold plenum (Fig. 33). It is an elecrtic motor.

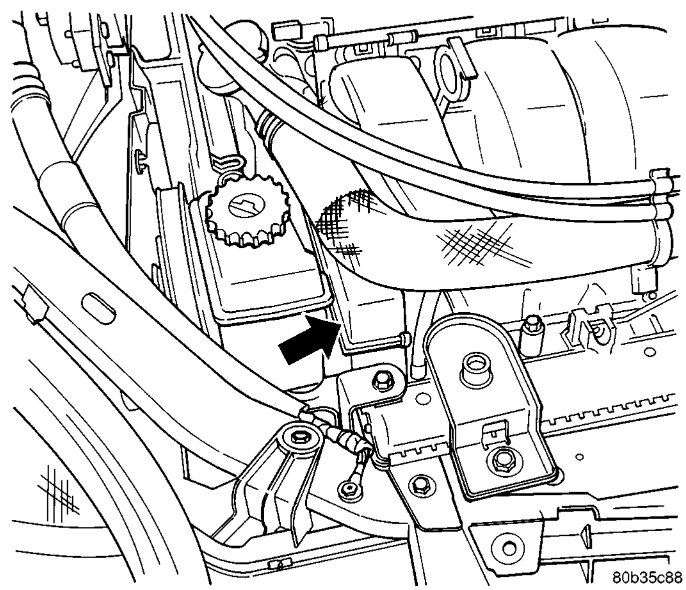


Fig. 33 Manifold Tuning Valve

OPERATION

The PCM controls the MTV solenoid. The manifold tuning valve optimizes acoustical tuning of the

MANIFOLD TUNE VALVE (Continued)

intake system during wide open throttle operation throughout the RPM range.

REMOVAL

(1) Disconnect the negative battery cable.

(2) Tie the upper radiator hose back to gain access to the Manifold Tuning Valve (MTV).

(3) Remove the 3 bolts from the rear power steering bracket.

(4) Remove the bracket (Fig. 34).

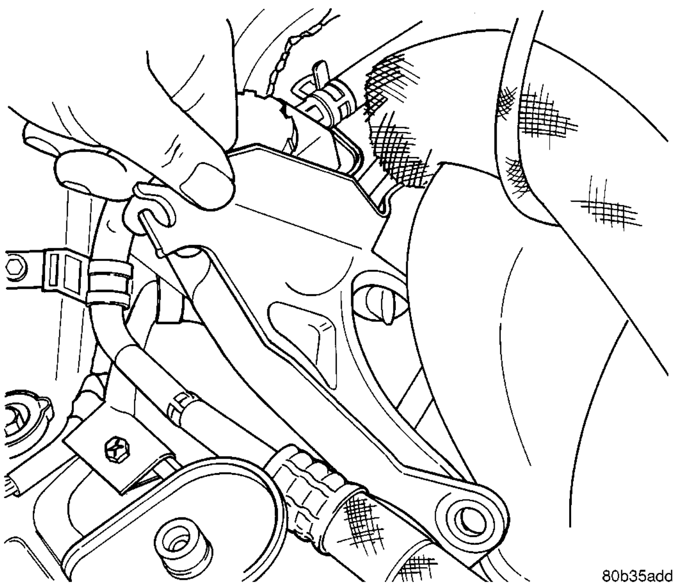


Fig. 34 POWER STEERING BRACKET

(5) Remove the 2 bolts from the MTV (Fig. 35).

NOTE: When removing the MTV do not loose the spring that is between the valve and intake manifold.

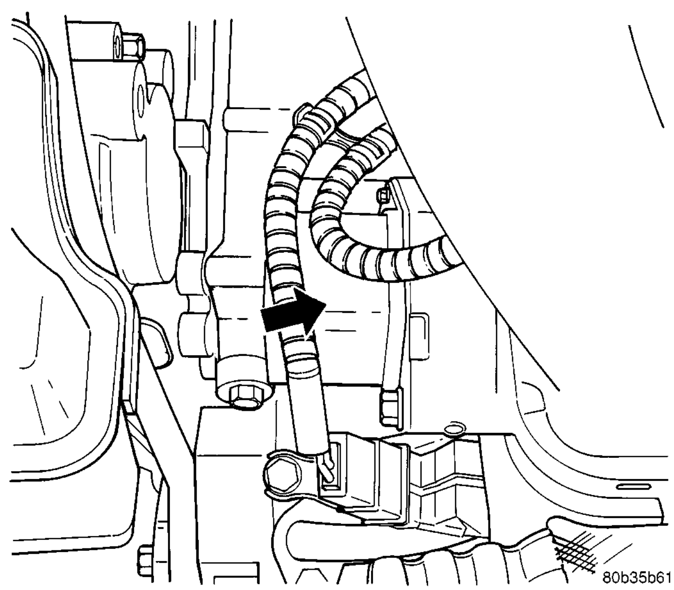


Fig. 35 MANIFOLD TUNING VALVE (MTV)

(6) Remove the MTV.

(7) Disconnect the electrical from the MTV and bracket (Fig. 36).

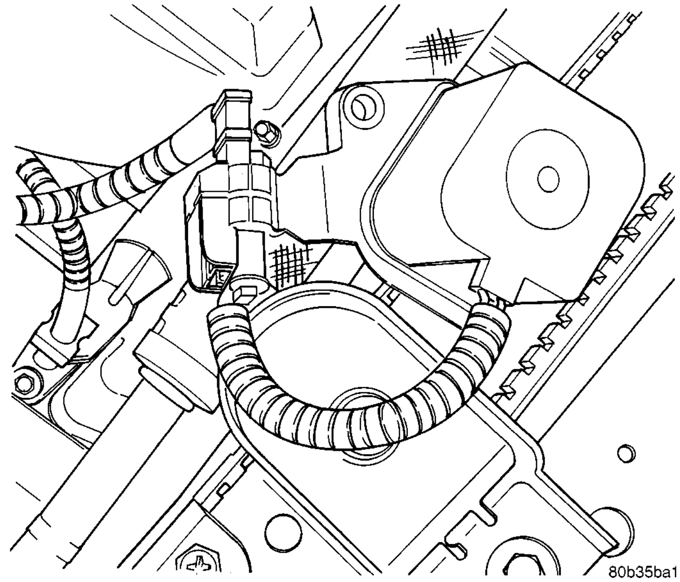


Fig. 36 ELECTRICAL CONNECTOR

INSTALLATION

(1) Connect the electrical connector to the MTV and bracket (Fig. 36).

NOTE: When removing the MTV do not loose the spring that is between the valve and intake manifold.

(2) Install the MTV. Align the slot in the valve with the tab on the intake manifold. Do not forget to install the spring.

(3) Install the 2 bolts to the MTV (Fig. 35).

(4) Install the bracket (Fig. 34).

(5) Install the 3 bolts for the rear power steering bracket.

(6) Untie the upper radiator hose.

(7) Connect the negative battery cable.

MAP SENSOR

DESCRIPTION

The MAP sensor mounts to the intake manifold (Fig. 37).

The MAP sensor signal is provided from a single piezoresistive element located in the center of a diaphragm. The element and diaphragm are both made of silicone. As the pressures changes the diaphragm moves causing the element to deflect which stresses the silicone. When silicone is exposed to stress its resistance changes. As manifold vacuum increases, the MAP sensor input voltage decreases proportionally. The sensor also contains electronics that condi-

MAP SENSOR (Continued)

tion the signal and provide temperature compensation.

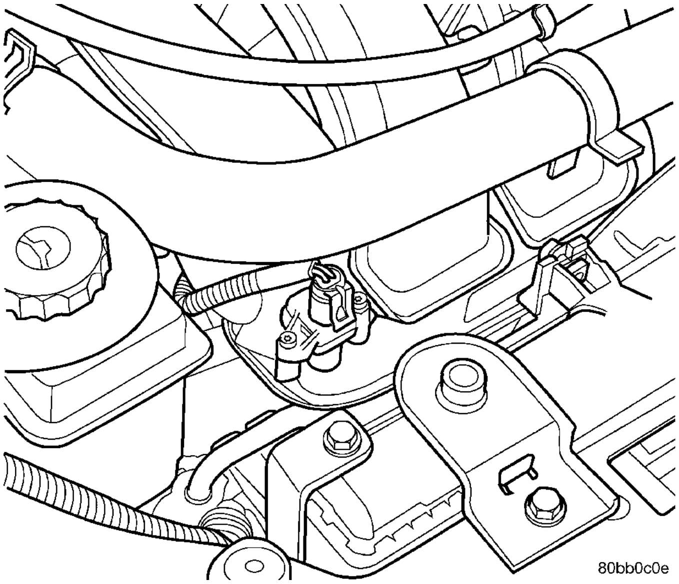


Fig. 37 Manifold Absolute Pressure Sensor

OPERATION

The MAP serves as a PCM input, using a silicon based sensing unit, to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When MAP equals Barometric pressure, the pulse width will be at maximum.

Also like the cam and crank sensors, a 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0 — 15 psi the voltage changes 4.0V. The sensor is supplied a regulated 4.8 to 5.1 volts to operate the sensor. Like the cam and crank sensors ground is provided through the sensor return circuit.

The MAP sensor input is the number one contributor to pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or is it in Denver at 5000 feet above sea level, because the air density changes with altitude. It will also help to correct for varying weather conditions. If a hurricane was coming through the pressure would be very, very low or there could be a real fair weather, high pressure area. This is important because as air pressure changes the barometric pressure changes. Barometric pressure and altitude have a direct inverse correlation, as altitude goes up barometric goes down. The first thing that happens as the key is rolled on, before reaching the crank position, the PCM powers up, comes around and looks at the MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure relative to altitude. Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key on. The difference between current and what it was at key on is manifold vacuum.

During key On (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring known good sensor in you work area.

As the altitude increases the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key On the barometric pressure needs to be updated. Any time the PCM sees Wide Open throttle, based upon TPS angle and RPM it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor to aid in calculating the following:

- Barometric pressure
- Engine load
- Manifold pressure
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (F4AC1 transmissions only, via the PCI bus)
- Idle speed
- Decel fuel shutoff

The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is 29.92 in Hg. For every 100 feet of altitude barometric pressure drops .10 in. Hg. If a storm goes through it can either add, high pressure, or decrease, low pressure, from what should be present for that altitude. You should make a habit of knowing what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

REMOVAL - 2.0L

The MAP sensor attaches to the intake manifold plenum (Fig. 38).

(1) Disconnect the electrical connector from the MAP sensor.

(2) Remove sensor mounting screws.

MAP SENSOR (Continued)

(3) Remove sensor.

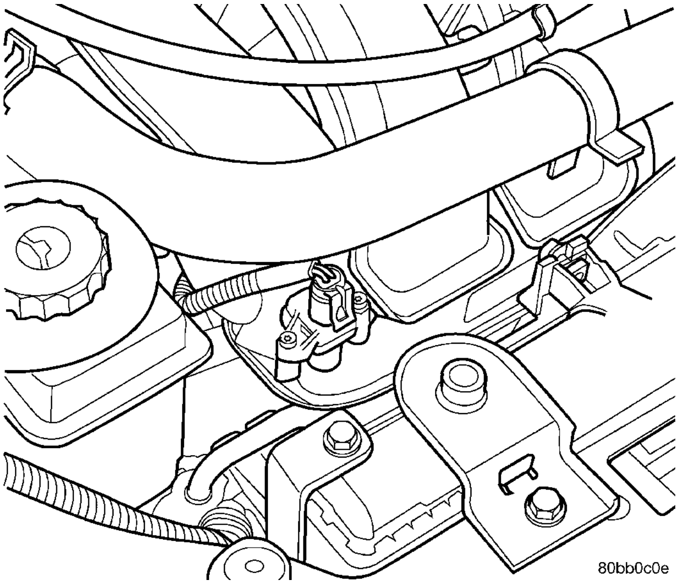


Fig. 38 MAP Sensor

REMOVAL - 1.6L

(1) Disconnect the negative battery cable.

(2) Remove the electrical connector at the Manifold Absolute pressure (MAP) sensor (Fig. 39).

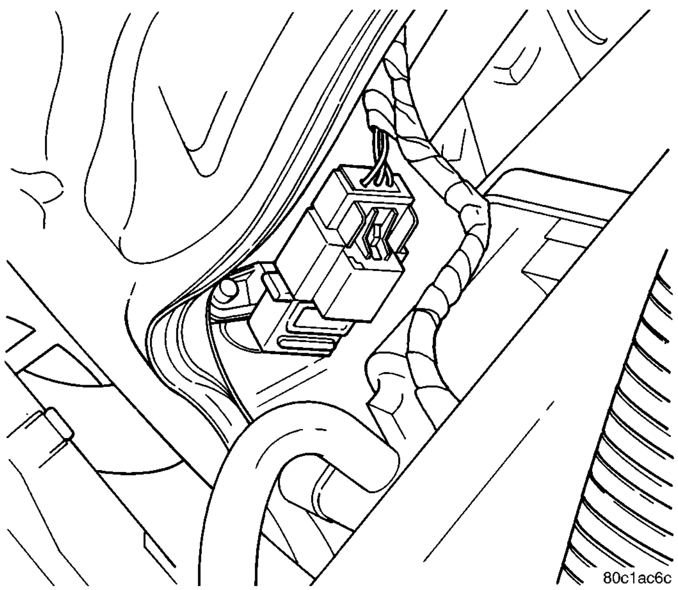


Fig. 39 MAP SENSOR

(3) Remove 2 screws from sensor.

(4) Remove sensor.

INSTALLATION

INSTALLATION - 2.0L

The MAP sensor attaches to the intake manifold plenum (Fig. 38).

(1) Insert sensor into intake manifold while making sure not to damage O-ring seal.

(2) Tighten mounting screws to 4.5 N·m (40 in. lbs.) torque for plastic manifold.

(3) Attach electrical connector to sensor.

INSTALLATION - 1.6L

(1) Make sure that the manifold is clean (Fig. 40).

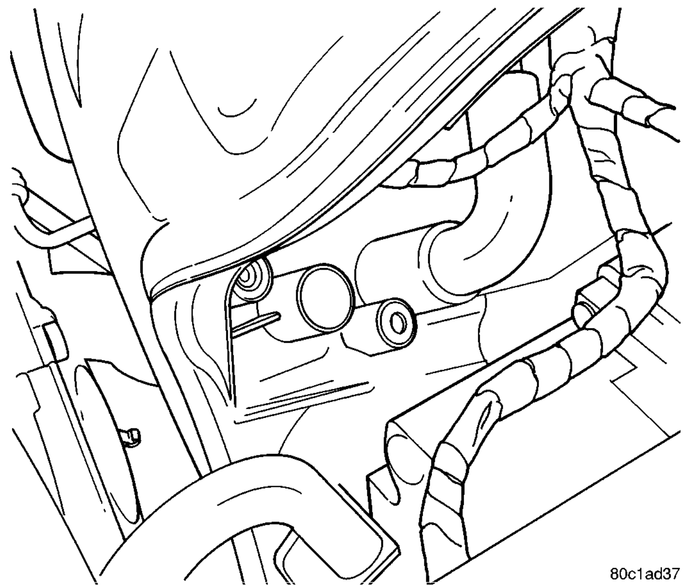


Fig. 40 INTAKE MANIFOLD/MAP SENSOR LOCATION

(2) Install sensor to manifold.

(3) Tighten screws.

(4) Connect the electrical connetor to the sensor.

(5) Connect the negative battery cable

O2 SENSOR

DESCRIPTION

The upstream oxygen sensor (Fig. 44) threads into the outlet flange of the exhaust manifold (Fig. 41).

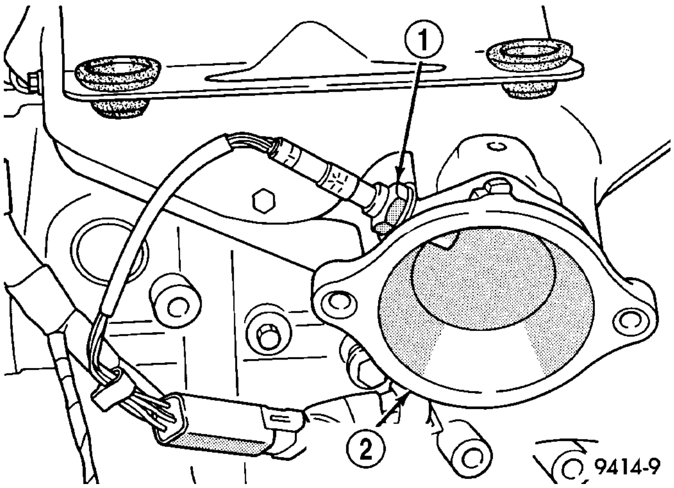


Fig. 41 Upstream Heated Oxygen Sensor 1/1

1 - OXYGEN SENSORS
2 - EXHAUST MANIFOLD

The downstream heated oxygen sensor threads into the system depending on emission package (Fig. 42). Federal package the O2s is mounted after the catalytic convertor, LEV package the O2s is mounted mid catalytic convertor, ULEV package is mounted between the catalytic convertor (Fig. 43).

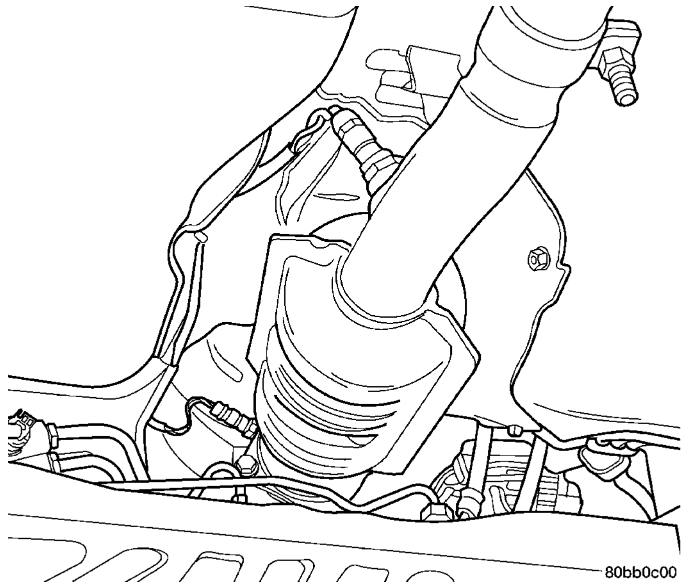


Fig. 42 Downstream Heated Oxygen Sensor 1/2

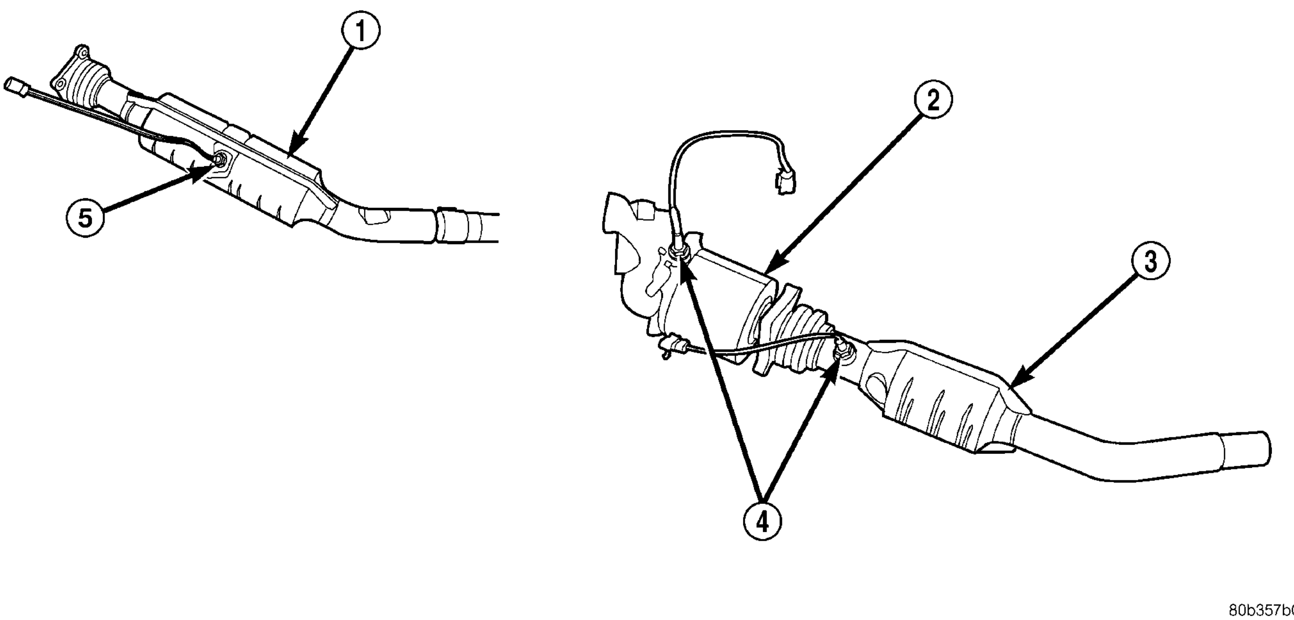


Fig. 43 Heated Oxygen Sensor Systems

1 - CATALYTIC CONVERTER (LEV EMISSION)
2 - CLOSE-COUPLED CATALYTIC CONVERTER (ULEV EMISSION)
3 - UNDER-FLOOR CATALYTIC CONVERTER (ULEV EMISSION)
4 - OXYGEN SENSORS
5 - OXYGEN SENSOR

O2 SENSOR (Continued)

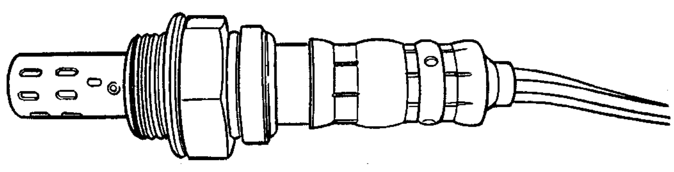


Fig. 44 NGK O2 Sensors

OPERATION

A seperate upstream and downstream grounds are used on the NGC vehicles (4 Cyl.).

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 O2 sensors produce a constant 2.5 volts on NGC vehicles, depending upon the oxygen content of the exhaust gas. When a large amount of oxygen is present (caused by a lean air/fuel mixture, can be caused by misfire and exhaust leaks), the sensors produces a low voltage. When there is a lesser amount of oxygen present (caused by a rich air/fuel mixture, can be caused by internal engine problems) it produces a higher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch.

The oxygen sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all operating modes. Maintaining correct sensor temperature at all times 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 operation the PCM monitors the O2 sensors input (along with other inputs) and adjusts the injector pulse width accordingly. During Open Loop operation the PCM ignores the O2 sensor input. The PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

NGC Controller - Has a common ground for the heater in the O2S. 12 volts is supplied to the heater in the O2S by the NGC controller. Both the upstream and downstream O2 sensors for NGC are pulse width modulation (PWM). **NOTE**: When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C-1 connector or momentarily disconnecting the Battery negative terminal. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

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 2.5 to 3.5 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 2.5 volt. When there is a lesser amount of oxygen present (rich air-fuel mixture) the sensor produces a voltage as high as 3.5 volt. By monitoring the oxygen content and converting it to electrical voltage, the sensor acts as a rich-lean switch.

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.

DOWNSTREAM OXYGEN SENSOR

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

O2 SENSOR (Continued)

catalytic convertor efficiency. Also used to establish the upstream O2 goal voltage (switching point).

REMOVAL

REMOVAL - UPSTREAM 1/1

(1) Raise and support vehicle.

(2) Unplug sensor connector.

(3) Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 45).

(4) 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.

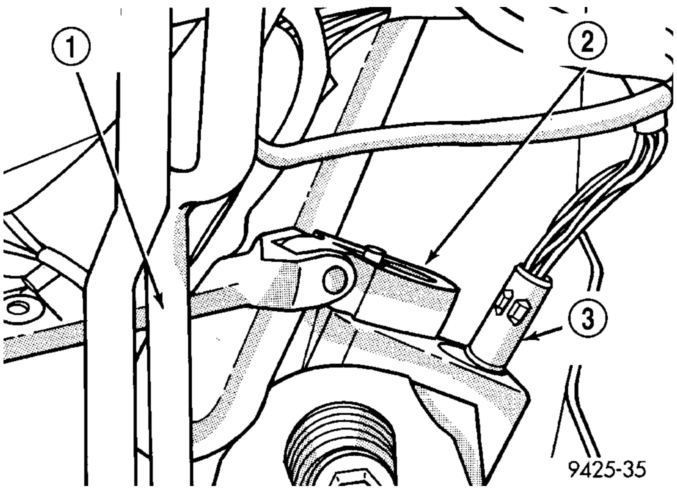


Fig. 45 Upstream Heated Oxygen Sensor Removal/Installation

1 - EXHAUST PIPE FLANGE
2 - CROW FOOT WRENCH
3 - UPSTREAM OXYGEN SENSOR

REMOVAL - DOWNSTREAM 1/2

The downstream heated oxygen sensor threads into the exhaust outlet pipe behind the catalytic convertor (Fig. 46).

(1) Raise vehicle.

(2) Disconnect electrical connector from harness.

(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. 47).

(5) 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.

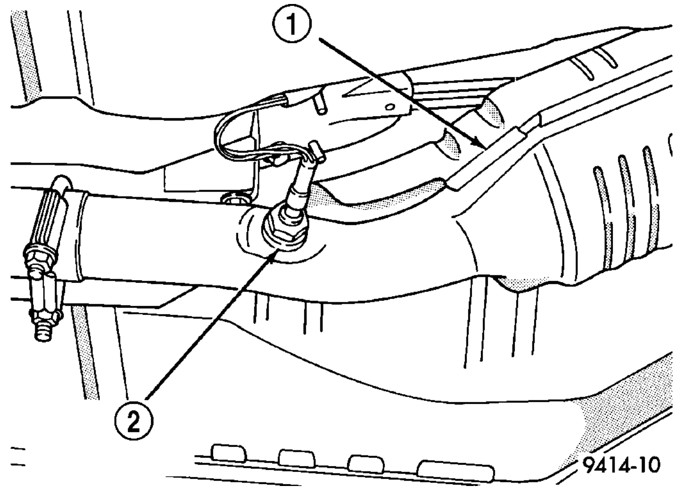


Fig. 46 Downstream Heated Oxygen Sensor

1 - CATALYTIC CONVERTOR
2 - DOWNSTREAM OXYGEN SENSOR

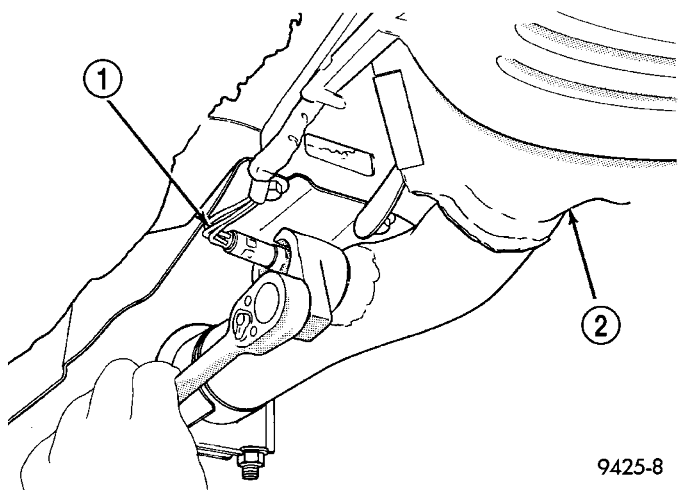


Fig. 47 Downstream Heated Oxygen Sensor Removal/Installation

1 - DOWNSTREAM HEATED OXYGEN SENSOR
2 - CATALYTIC CONVERTOR

REMOVAL - 2.4L TURBO/2.4L SRT-4

(1) Disconnect the negative battery cable.

(2) Unlock and disconnect the electrical connector. It is on the passenger side near the EVAP purge solenoid.

(3) Raise vehicle and support.

(4) Remove sensor (Fig. 48) using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent

INSTALLATION

INSTALLATION - UPSTREAM 1/1

New sensors have compound on the threads and do not require an additional coating.

O2 SENSOR (Continued)

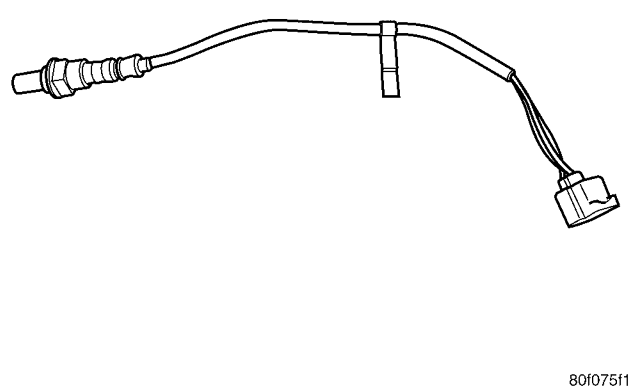


Fig. 48 UPSTREAM O2 SENSOR- 2.4L TURBO

(1) Install sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 45). Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Plug sensor connector.

(3) Lower vehicle.

INSTALLATION - DOWNSTREAM 1/2

The downstream heated oxygen sensor threads into the exhaust outlet pipe behind the catalytic convertor (Fig. 46).

New sensors have compound on the threads and do not require an additional coating.

(1) Install sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent (Fig. 47). Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect sensor electrical harness from clips along body.

(3) Connect electrical connector to harness.

(4) Lower vehicle.

INSTALLATION - 2.4L TURBO/2.4L SRT-4

(1) Install O2 sensor (Fig. 48) using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent and tighten to N·m 28 (20 ft. lbs.).

(2) Route O2 sensor wire (Fig. 49) above the heat shield for the generator and away from the exhaust manifold.

(3) Lower vehicle.

(4) Connect and lock the O2S connector. It is on the passenger side near the EVAP purge solenoid.

(5) Connect the negative battery cable.

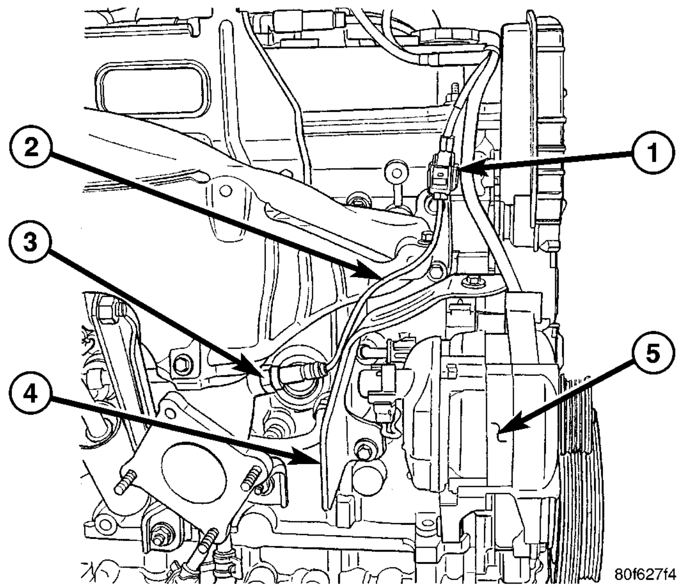


Fig. 49 O2 WIRE ROUTING

1 - O2 Sensor Electrical Connector
2 - Wire routing
3 - O2 Sensor
4 - Heat Shield
5 - Generator

THROTTLE BODY

REMOVAL

REMOVAL - 2.0L

(1) Disconnect the negative battery cable (Fig. 50).

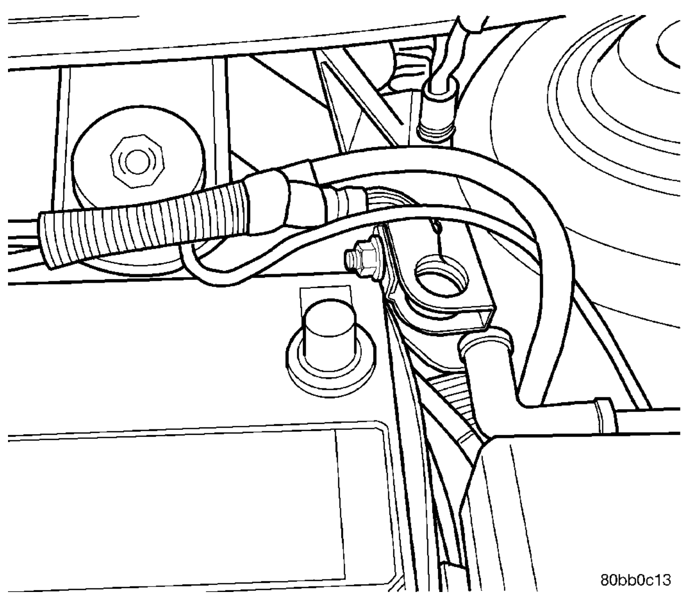


Fig. 50 Battery Negative Cable

(2) Remove the air cleaner box cover.

THROTTLE BODY (Continued)

(3) Remove the air cleaner element (Fig. 51). Pull up on element, past the lip in the box, to remove it from the air cleaner box.

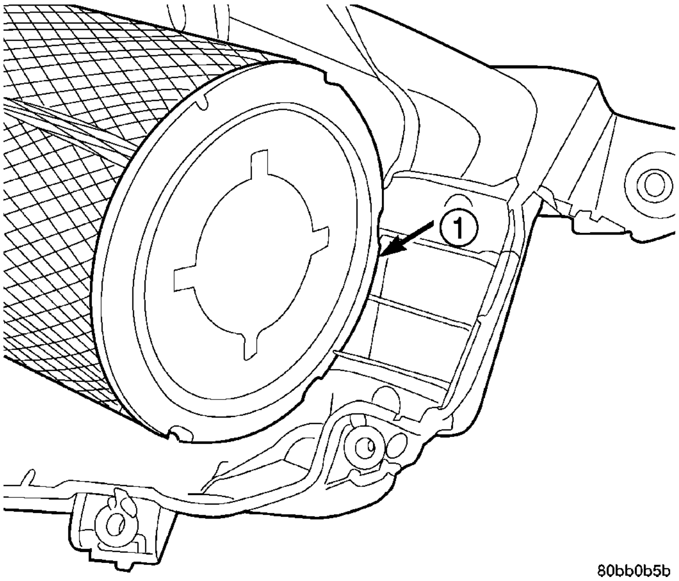


Fig. 51 Air Cleaner Element

1 - LIP

(4) Disconnect the electrical connection at the throttle body.

(5) Loosen the clamp on throttle body outlet hose.

(6) Remove the bolts holding the throttle body to the air cleaner box (Fig. 52).

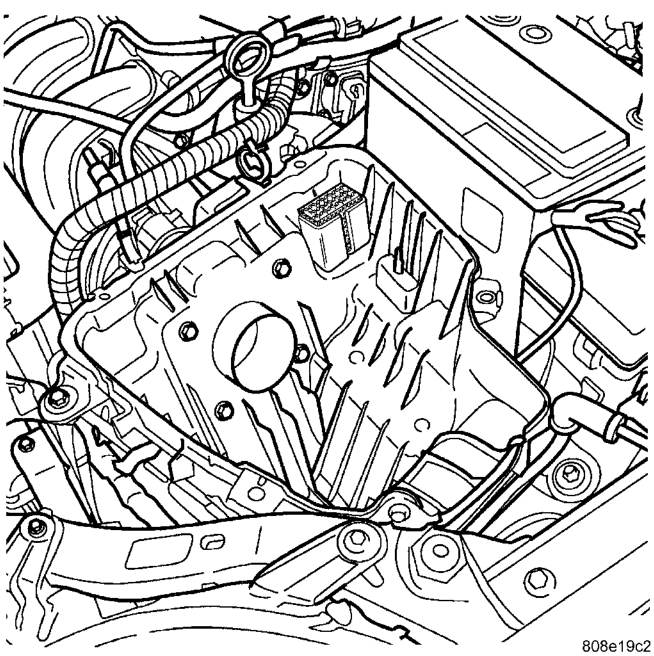


Fig. 52 Throttle body bolts

(7) Remove cable's from throttle body cam (Fig. 53) and (Fig. 54).

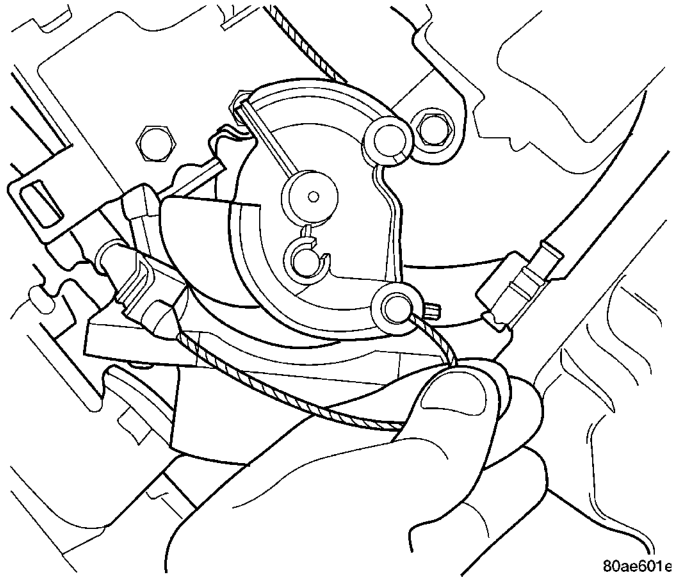


Fig. 53 Disconnecting Throttle Cable

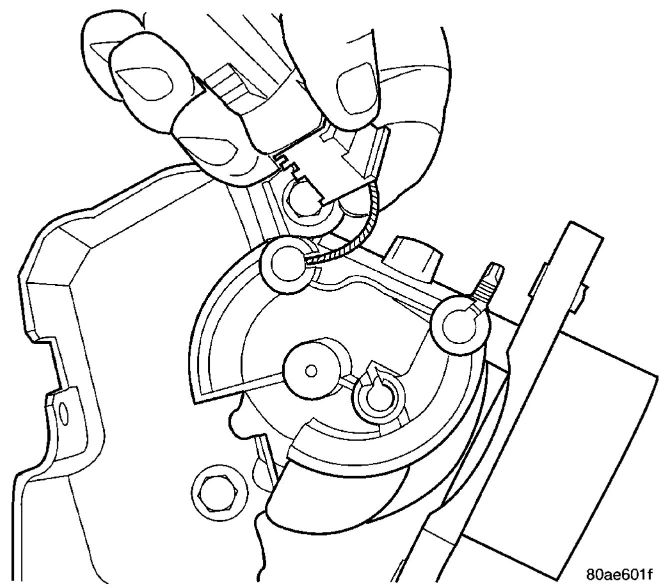


Fig. 54 Transmission Kickdown Cable Connector

REMOVAL - 1.6L

If any components on the throttle body are bad, the throttle body has to be replaced, except the seal to the intake manifold (Fig. 55) or (Fig. 56). There is no serviceable component on the throttle body.

NOTE: The electrical connector must be pointed toward the front of vehicle and purge nipple must be in the up position for proper orientation of the throttle body (Fig. 57).

(1) Disconnect the negative battery cable.

(2) Remove the throttle clean air duct at the throttle body.

(3) Disconnect the electrical connector at the throttle body.

THROTTLE BODY (Continued)

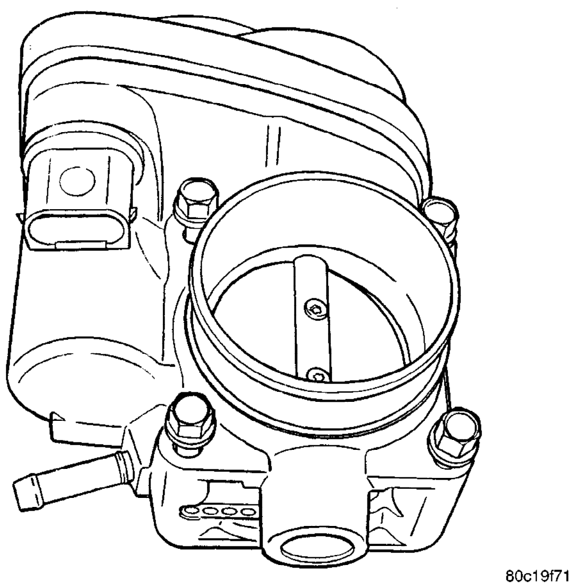


Fig. 55 THROTTLE BODY FRONT

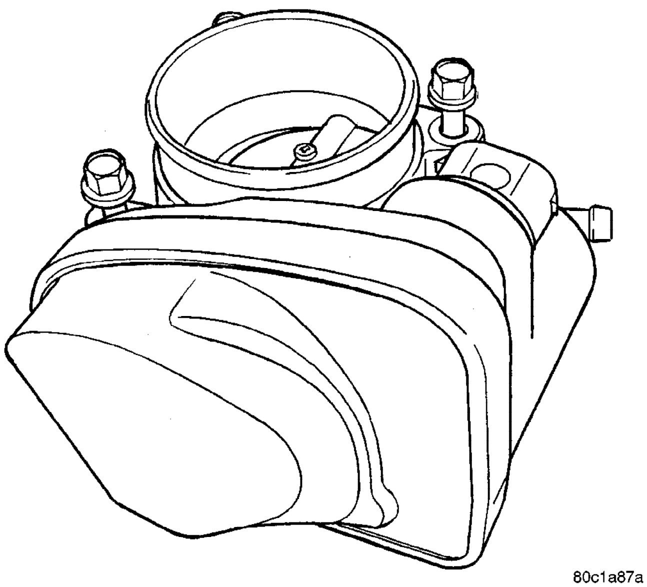


Fig. 56 THROTTLE BODY BACK

(4) Disconnect the vacuum line from the throttle body.

(5) Remove the 4 bolts from the throttle body (Fig. 57).

(6) Remove the throttle body.

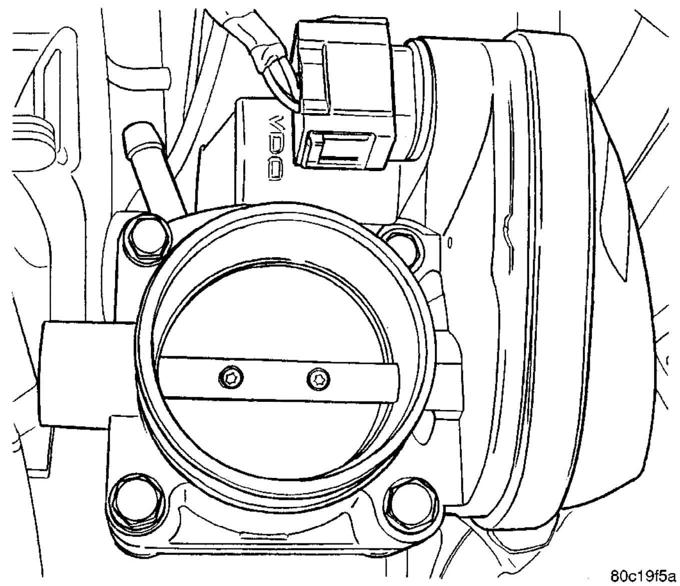


Fig. 57 THROTTLE BODY

REMOVAL - 2.4L SRT-4

(1) Disconnect the negative battery cable.

(2) Unlock and disconnect the electrical connector for the ambient air temperature sensor (Fig. 58).

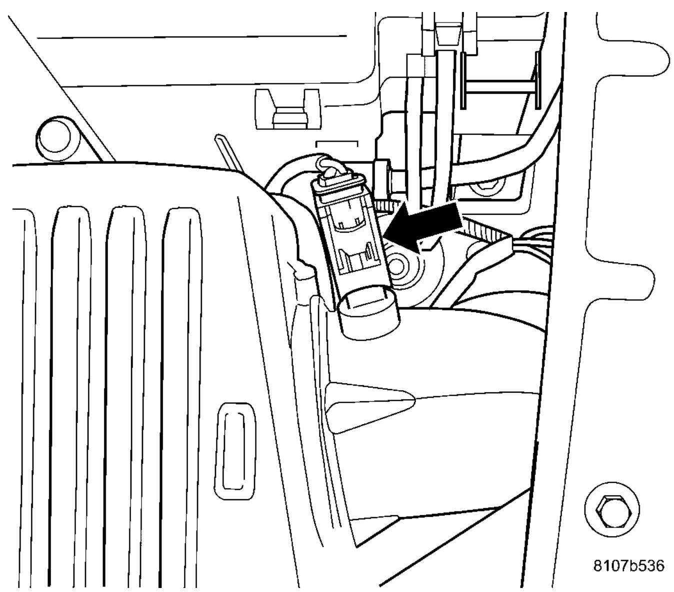


Fig. 58 AMBIENT AIR TEMP. SENSOR - 2.4L SRT-4

THROTTLE BODY (Continued)

(3) Remove the turbo inlet hose from the air cleaner housing (Fig. 59).

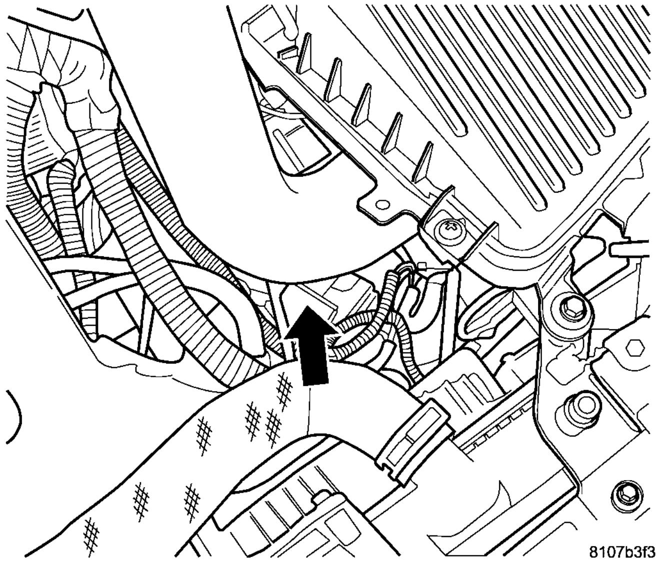


Fig. 59 THROTTLE BODY LOCATION 2.4L SRT-4

(4) Remove the makeup air hose for the PCV system.

(5) Remove the air cleaner box, refer to the Engine/Air Cleaner Housing, for more information.

(6) Unlock and disconnect the electrical connectors from the idle air control motor and throttle position sensor (Fig. 60).

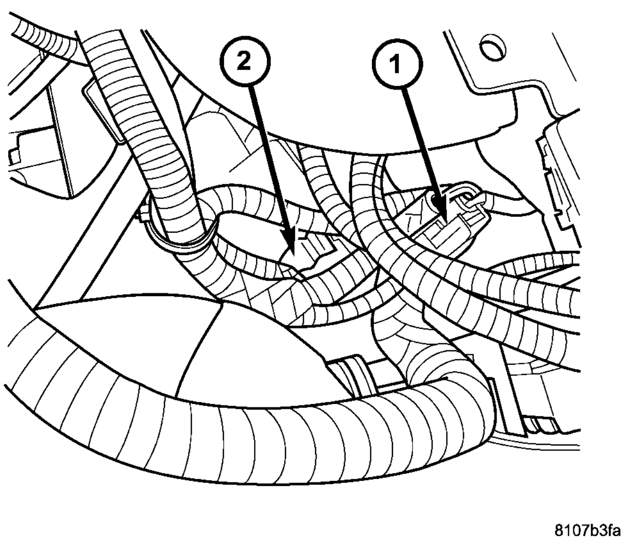


Fig. 60 IAC & TPS LOCATION - 2.4L SRT-4

1 - Idle Air Control Motor
2 - Throttle Position Sensor

(7) Disconnect the throttle body inlet hose and remove from throttle body.

(8) Disconnect the purge hose from the throttle body.

(9) Remove the throttle cable from the throttle body lever.

(10) Remove the 2 bolts from the throttle body.

(11) Remove the throttle body (Fig. 61).

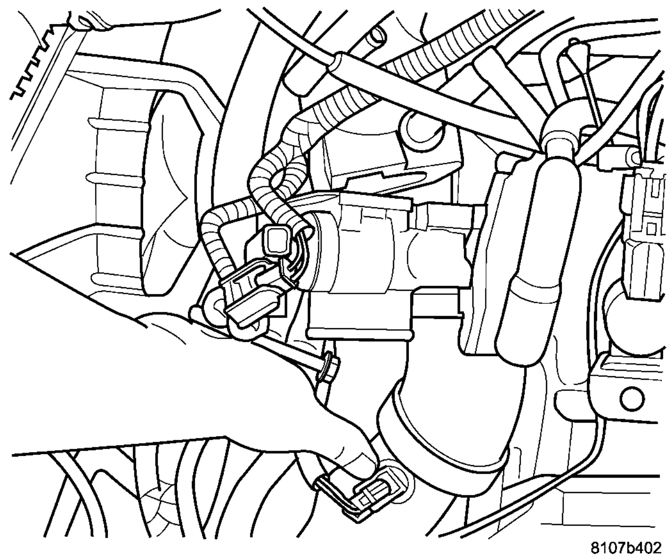


Fig. 61 THROTTLE BODY - 2.4L SRT-4

(12) Remove the 2 screws for the throttle cable bracket.

(13) Clean and replace gasket (Fig. 62).

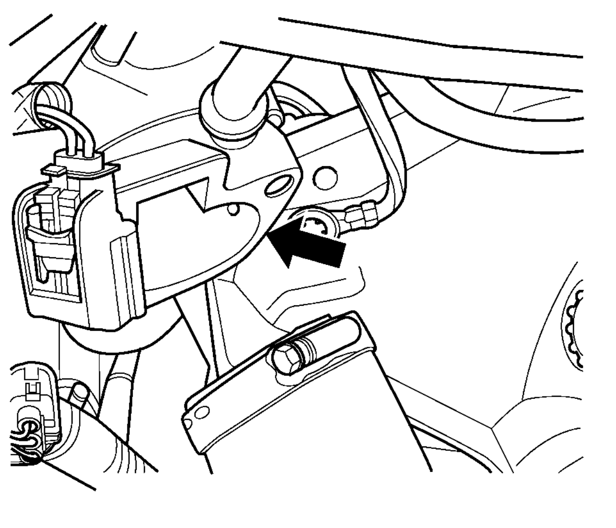


Fig. 62 MOUNTING SURFACE - 2.4L SRT-4

INSTALLATION

INSTALLATION - 2.0L

(1) Install cable's into throttle cam and clip cable's into throttle cable bracket.

THROTTLE BODY (Continued)

(2) Install throttle body onto air cleaner box. Tighten mounting bolts.

(3) Install and tighten the clamp on throttle body outlet hose.

(4) Connect the electrical connectors to the throttle body.

(5) Install the air cleaner element, make sure that the element is past the lip on the air cleaner box.

(6) Install the air cleaner box cover and tighten the screws.

(7) Connect the negative battery cable.

INSTALLATION - 1.6L

NOTE: The electrical connector must be pointed toward the front of vehicle and purge nipple must be in the up position for proper orientation of the throttle body (Fig. 57).

(1) Make sure that the mating surfaces for the throttle body and intake manifold are clean (Fig. 63).

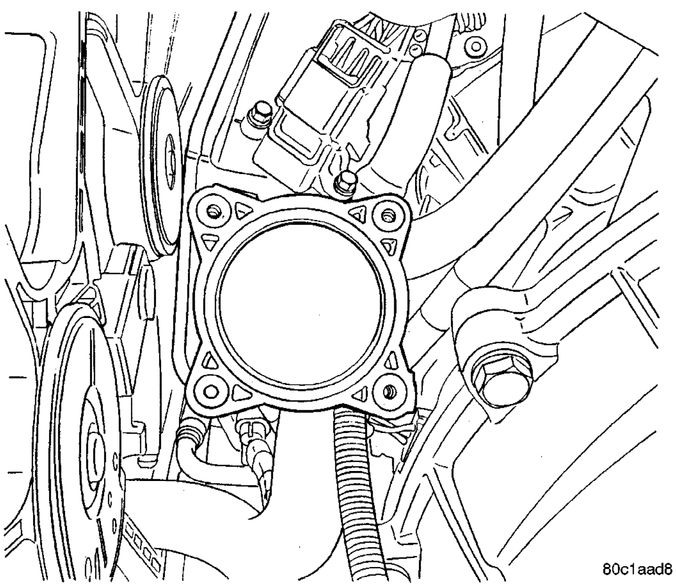


Fig. 63 INTAKE MANIFOLD

(2) Install the throttle body making sure that the gasket is installed in the throttle body (Fig. 64) and (Fig. 65). Align the pin on the manifold gasket to the pin alignment hole in throttle body, make sure that the purge nipple is pointed up and electrical connector is pointed toward the front of vehicle.

(3) Install the 4 bolts to the throttle body (Fig. 57). Tighten the bolts in a cross pattern to 11.8 N·m (105 in. lbs.).

(4) Connect the vacuum line from the throttle body.

(5) Connect the electrical connectors at the throttle body.

(6) Install the clean air duct at the throttle body.

(7) Connect the negative battery cable.

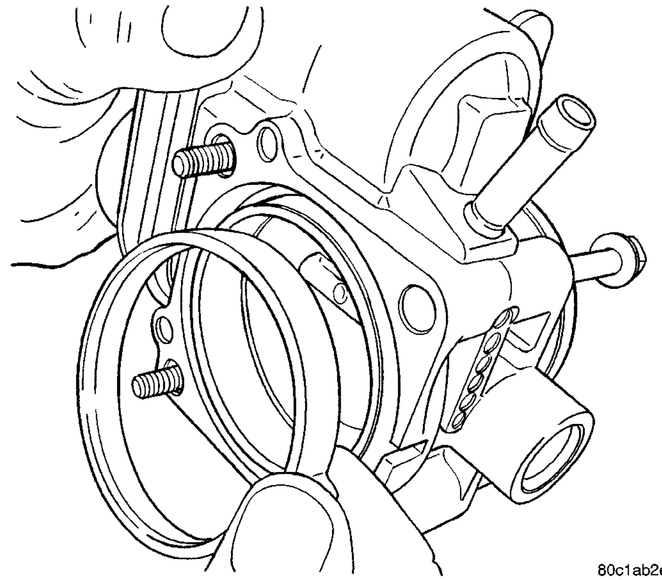


Fig. 64 THROTTLE BODY SEAL

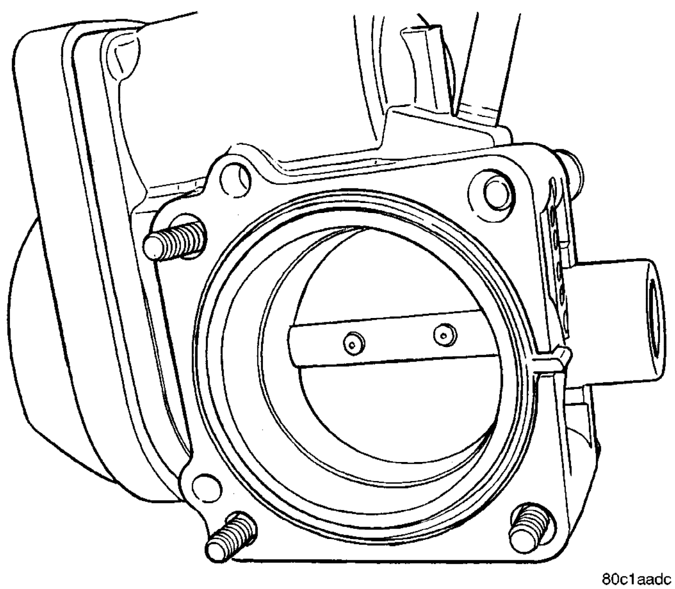


Fig. 65 THROTTLE BODY SEAL INSTALLED

INSTALLATION - 2.4L SRT-4

(1) Clean and replace gasket (Fig. 62).

(2) Install the 2 screws for the throttle cable bracket and tighten.

(3) Install the throttle body (Fig. 61).

(4) Install the 2 bolts for the throttle body and tighten.

(5) Install the throttle cable to the throttle body lever.

(6) Connect the purge hose to the throttle body.

(7) Connect the throttle body inlet hose and tighten clamp.

(8) Connect and lock the electrical connectors to the idle air control motor and throttle position sensor (Fig. 60).

THROTTLE BODY (Continued)

(9) Install the air cleaner box, refer to the Engine/ Air Cleaner Housing, for more information.

(10) Install the makeup air hose for the PCV system.

(11) Install the turbo inlet hose to the air cleaner housing (Fig. 59).

(12) Connect and lock the electrical connector for the ambient air temperature sensor (Fig. 58).

(13) Connect the negative battery cable.

THROTTLE CONTROL CABLE

REMOVAL

REMOVAL

(1) Remove throttle cable cover or engine cover, if equipped.

(2) Working from the engine compartment, remove throttle cable from throttle body cam (Fig. 66) and (Fig. 67).

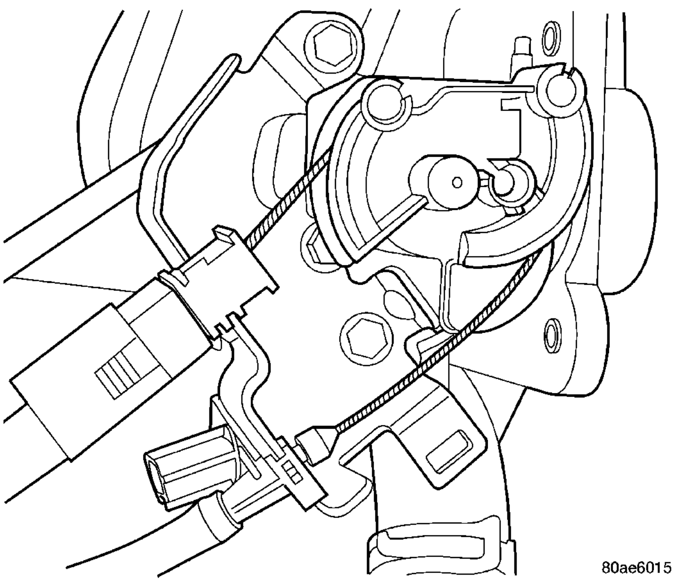


Fig. 66 Throttle Body Cables Attachment to Throttle Body

(3) Lift the retaining tabs on the cable and slide cable out of bracket.

(4) From inside the vehicle, hold the throttle pedal up and remove the cable retainer and cable from upper end of pedal shaft (Fig. 2).

(5) Remove retainer clip from throttle cable and grommet at the dashpanel (Fig. 68).

(6) From the engine compartment, pull the throttle cable and grommet out of the dash panel.

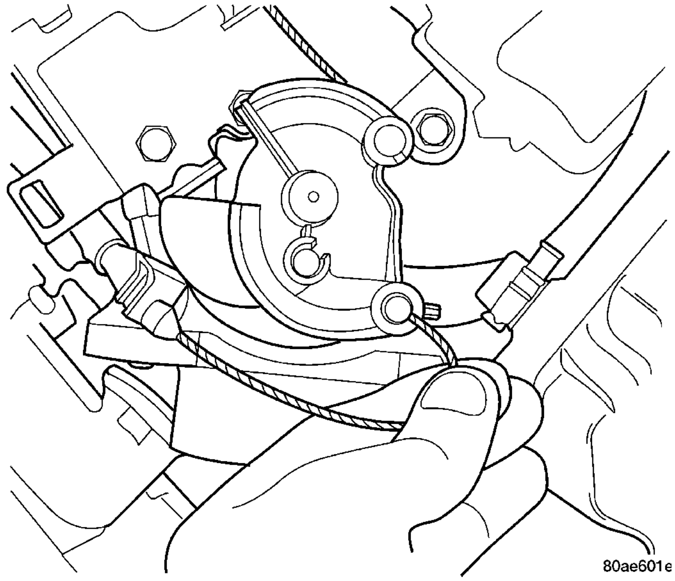


Fig. 67 Disconnecting Throttle Cable

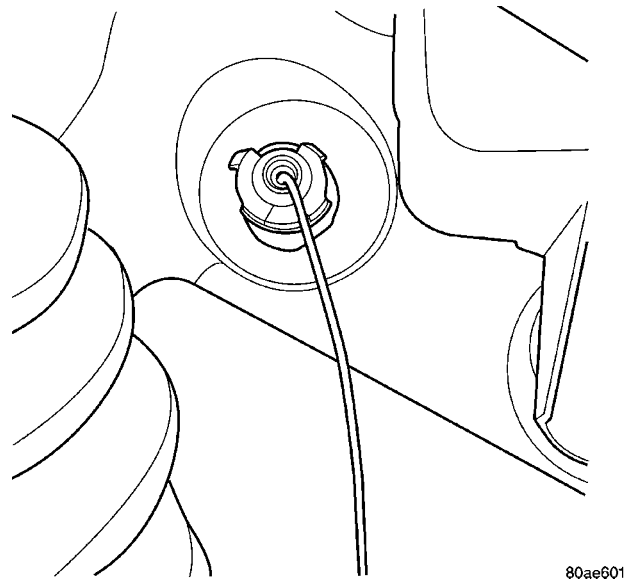


Fig. 68 Retainer Clip

REMOVAL - 2.4L SRT-4

(1) Disconnect the negative battery cable.

(2) Remove the air cleaner box, refer to the Engine/Air Cleaner Assembly for more information.

(3) Remove the hose from the turbo to air cleaner box.

(4) Working from the engine compartment, remove throttle cable from throttle body cam (Fig. 69).

(5) Lift the retaining tabs on the cable and slide cable out of bracket.

THROTTLE CONTROL CABLE (Continued)

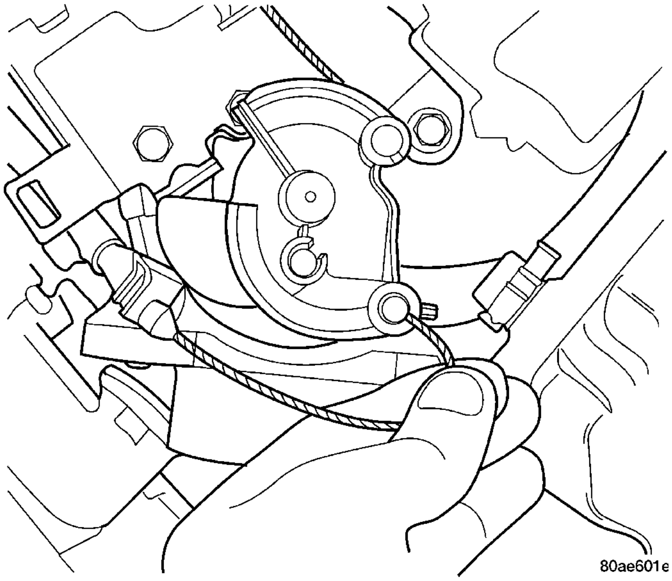


Fig. 69 Throttle Cable

(6) From inside the vehicle, hold the throttle pedal up and remove the cable retainer and cable from upper end of pedal shaft.

(7) Remove retainer clip from throttle cable and grommet at the dashpanel (Fig. 70).

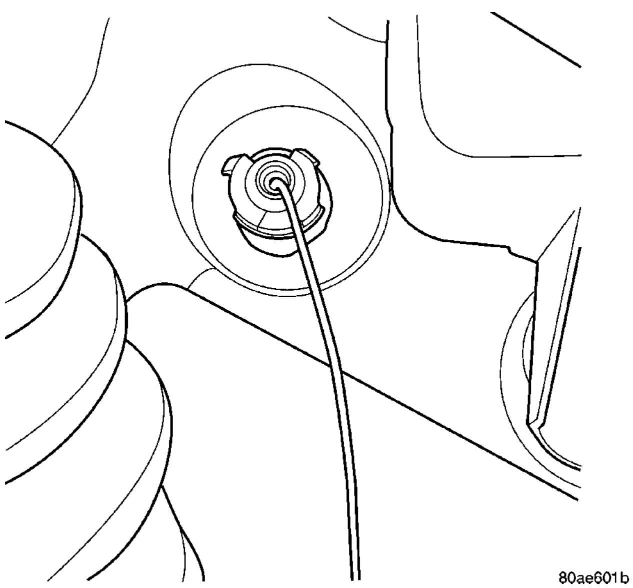


Fig. 70 Retainer Clip

(8) From the engine compartment, pull the throttle cable and grommet out of the dash panel.

INSTALLATION

INSTALLATION

(1) Install grommet into dashpanel.

(2) From the engine compartment, push the housing end fitting into the dashpanel grommet.

(3) From the engine compartment, rotate the throttle lever forward to the wide open position and install cable clasp (Fig. 67).

(4) Install cable housing (throttle body end) into the cable mounting bracket on the engine.

(5) Install throttle cable cover.

(6) From inside the vehicle, hold up pedal and feed throttle cable core wire through hole in upper end of the pedal shaft. Install cable retainer (Fig. 68).

(7) Install cable retainer clip (Fig. 68).

INSTALLATION

(1) Install grommet into dashpanel.

(2) From the engine compartment, push the housing end fitting into the dashpanel grommet.

(3) From the engine compartment, rotate the throttle lever forward to the wide open position and install cable clasp (Fig. 67).

(4) Install cable housing (throttle body end) into the cable mounting bracket on the engine.

(5)

(6) From inside the vehicle, hold up pedal and feed throttle cable core wire through hole in upper end of the pedal shaft. Install cable retainer (Fig. 68).

(7) Install cable retainer clip (Fig. 68).

(8) Install the hose from the turbo to air cleaner box at the turbo and tighten clamp.

(9) Install the air cleaner box and install the hose from the turbo to air cleaner box and tighten clamp.

(10) Connect the negative battery cable.

THROTTLE POSITION SENSOR

DESCRIPTION

The throttle position sensor mounts to the side of the throttle body (Fig. 71).

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.

THROTTLE POSITION SENSOR (Continued)

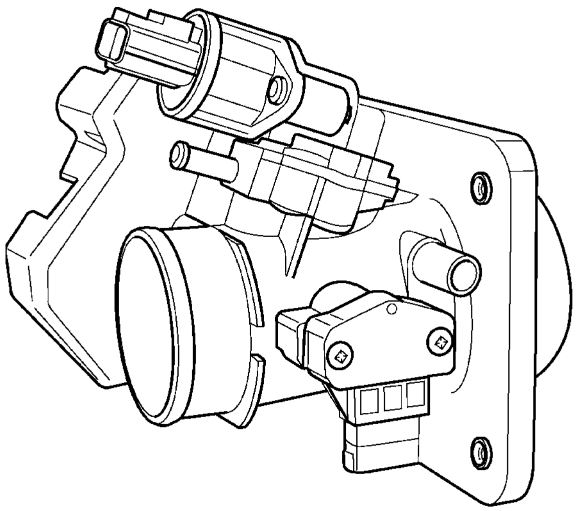


Fig. 71 Throttle Position Sensor and Idle

OPERATION

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 0.6 volt at minimum throttle opening (idle) to a maximum of 4.5 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.

REMOVAL

REMOVAL

(1) Disconnect the negative battery cable.

(2) Loosen the clamp for the air duct at the throttle body.

(3) Remove the mounting bolt and nut for the air cleaner box.

(4) Pull the air cleaner box and throttle body up to access the throttle position sensor.

(5) Remove the throttle position sensor.

REMOVAL - 2.4L SRT-4

(1) Disconnect the negative battery cable

(2) Remove the air cleaner box and relocate.

(3) Unlock and disconnect the electrical connect to the throttle position sensor.

(4) Remove the 2 mounting screws.

(5) Remove sensor.

INSTALLATION

INSTALLATION

(1) Install the throttle position sensor.

(2) Locate the air cleaner box and throttle body and tighten the mounting bolt and nut.

(3) Install the air duct hose and tighten the clamp.

(4) Connect the negative battery cable.

INSTALLATION - 2.4L SRT-4

(1) The throttle shaft end of the throttle body slides into a socket in the TPS. 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 5.1 N·m (45 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) Connect the electrical connector and lock connector.

(4) Relocate the air cleaner box and install the 2 fasteners.

(5) Connect the negative battery cable.

STEERING

TABLE OF CONTENTS

STEERING

DESCRIPTION - POWER STEERING SYSTEM

This vehicle comes with power steering as standard equipment. There are two different steering systems available, a standard and a special R/T / SRT-4 system. The power steering system consists of these major components:

- POWER STEERING GEAR
- POWER STEERING PUMP
- POWER STEERING FLUID RESERVOIR
- POWER STEERING FLUID PRESSURE HOSE
- POWER STEERING FLUID RETURN HOSE
- POWER STEERING FLUID COOLER

For information on the first two components, refer to their respective sections within this service manual group (Refer to 19 - STEERING/GEAR - DESCRIPTION)(Refer to 19 - STEERING/PUMP - DESCRIPTION). Information on the remaining components can be found in POWER STEERING PUMP.

OPERATION - POWER STEERING SYSTEM

Turning of the steering wheel is converted into linear (side-to-side) travel through the meshing of the helical pinion teeth with the rack teeth within the steering gear. The lateral travel pushes and pulls the tie rods to change the direction of the vehicle's front wheels.

Power assist steering is provided by a belt driven rotary type pump. It directs fluid through power steering fluid hoses to the power steering gear where it is used to assist the driver's turning effort.

Manual steering control of the vehicle can be maintained if power steering assist is lost. However, under this condition, steering effort is significantly increased.

WARNING

WARNINGS AND CAUTIONS

WARNING: POWER STEERING FLUID, 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.

WARNING: FLUID LEVEL SHOULD BE CHECKED WITH THE ENGINE OFF TO PREVENT PERSONAL INJURY FROM MOVING PARTS.

CAUTION: When the system is open, cap all open ends of the hoses, power steering pump fittings or power steering gear ports to prevent entry of foreign material into the components.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER STEERING FLOW 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 flow and pressure test is performed using the Power Steering Analyzer Kit, Special Tool 6815 (Fig. 1), hoses, Special

STEERING (Continued)

Tools 6905 and 6959, and fittings from adapter kit, Special Tool 6893.

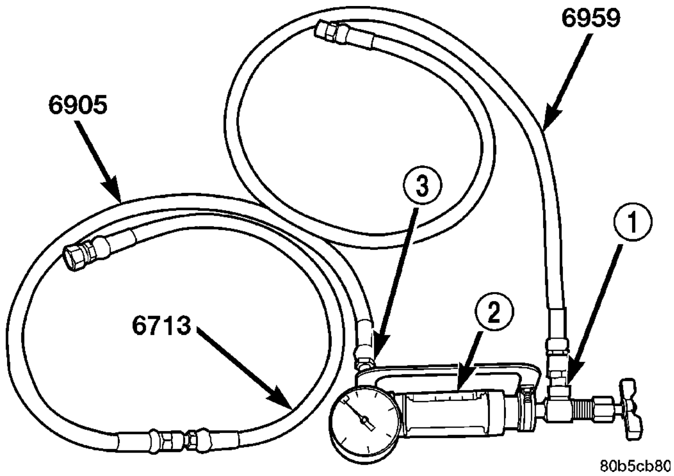


Fig. 1 Power Steering Analyzer With Hoses Installed

1 - OUTLET
2 - SPECIAL TOOL 6815
3 - INLET

(1) Assemble hoses on Power Steering Analyzer, Special Tool 6815, as shown. Install Pressure Hose, Special Tool 6905 (in 6893 kit), in the inlet fitting on Power Steering Analyzer. Install Pressure Hose, Special Tool 6713 (in 6815 kit) on Pressure Hose, Special Tool 6905. Install Pressure Hose, Special Tool 6959, in the outlet fitting on Power Steering Analyzer.

CAUTION: To prevent personal injury, safety goggles should be worn at all times when performing any test procedures on the power steering system.

(2) Install Adapter Fitting, Special Tool 6844, on Pressure Hose, Special Tool 6713. Install Adapter Fitting, Special Tool 6826, on Pressure Hose, Special Tool 6959. Both Special Tool 6844 and 6826 can be found in Adapter Set, Special Tool 6893 (Fig. 2).

NOTE: 2.4L turbo engine only – To ease pressure hose removal from pump it will help to remove the bolt fastening the pressure hose routing clamp to the front of the engine block (Fig. 7).

(3) Unscrew the tube nut and disconnect the power steering fluid pressure hose from the power steering pump (Fig. 3) (Fig. 4).

(4) Connect Adapter Fitting, Special Tool 6844, attached to pressure hose from inlet (gauge end) of Power Steering Analyzer to the pressure fitting on the power steering pump. Tighten the tube nut to 34 N·m (25 ft. lbs.).

(5) Connect the vehicle's power steering fluid pressure hose to Adapter Fitting, Special Tool 6826, which should be already installed in the outlet hose (valve end) of Power Steering Analyzer. Tighten the tube nut to 34 N·m (25 ft. lbs.).

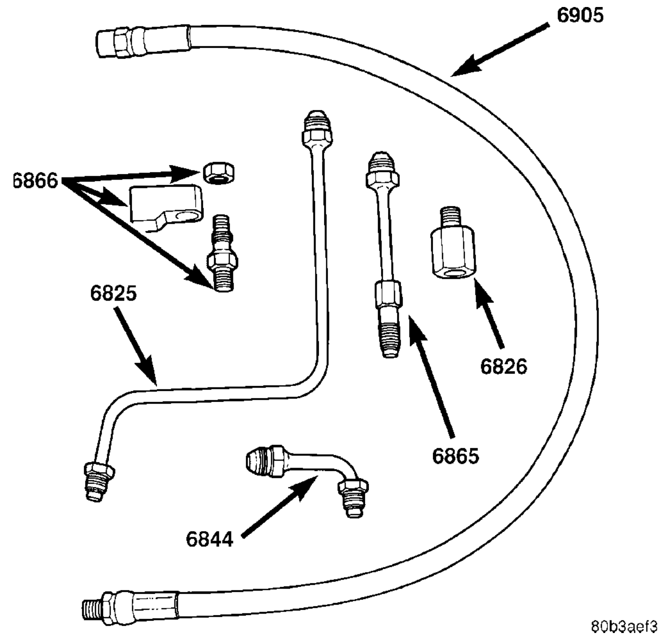


Fig. 2 Power Steering Analyzer Adapters 6893

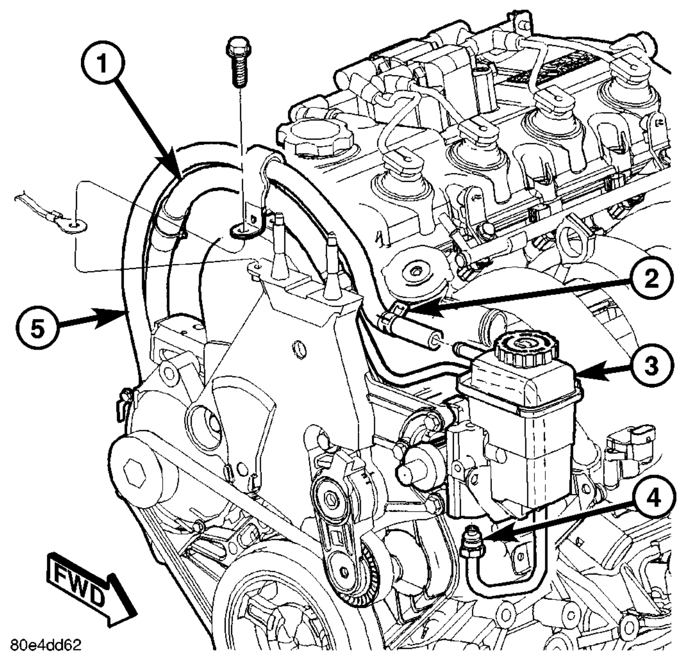


Fig. 3 Power Steering Hoses At Pump - 2.0L Engine

1 - PRESSURE HOSE
2 - HOSE CLAMP
3 - POWER STEERING PUMP AND RESERVOIR
4 - TUBE NUT
5 - RETURN HOSE

TEST PROCEDURE

(1) Completely open the valve on the Power Steering Analyzer flow meter.

STEERING (Continued)

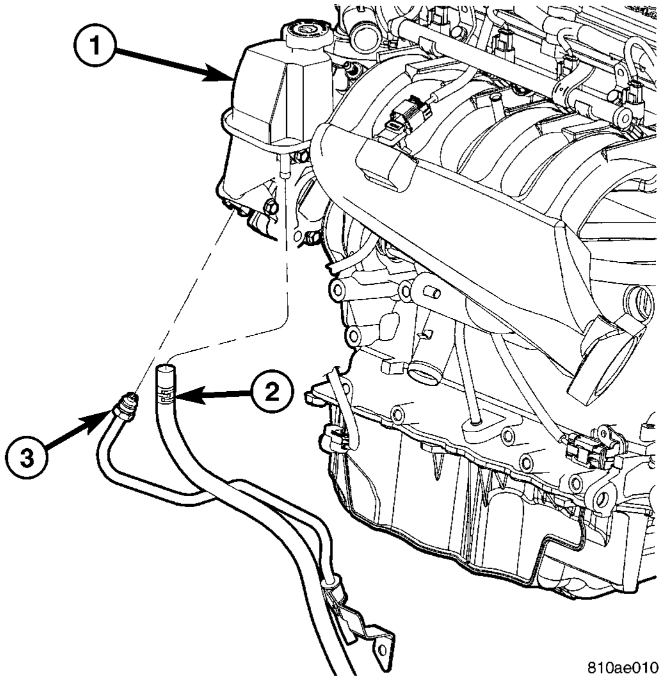


Fig. 4 Power Steering Hoses At Pump - 2.4L Turbo

1 - POWER STEERING PUMP
2 - RETURN HOSE CLAMP
3 - PRESSURE HOSE TUBE NUT

(2) Start the engine and let idle long enough to circulate power steering fluid through the analyzer and hoses, until the air is out of the fluid. Shut the off engine.

(3) Check the power steering fluid level and add fluid as necessary. Start the engine again and let idle.

(4) The analyzer gauge should read below 862 kPa (125 psi). If above, inspect the hoses for restrictions and repair as necessary. The initial pressure should be in the range of 345-552 kPa (50-80 psi). The flow meter should read between 1.5 and 1.7 GPM.

CAUTION: The following test procedure step involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than five seconds as the pump could be damaged.

NOTE: Power steering pump maximum relief pressure is 9308 to 9998 kPa (1350 to 1450 psi.).

(5) Close the flow meter 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.**

- If the power steering pump pressure's are above specifications, but not within 345 kPa (50 psi) of each other, replace the power steering pump.
- If the pressure's are within 345 kPa (50 psi) of each other, but below specifications, replace the power steering pump.

If the power steering pump requires replacement, (Refer to 19 - STEERING/PUMP - REMOVAL).

CAUTION: Do not force the pump to operate against the stops for more than 5 seconds at a time as pump damage may result.

(6) Completely open the valve on the Power Steering Analyzer flow meter. Turn the steering wheel to the extreme left until the stop in the steering gear is met, then turn the steering wheel to the right until the right stop is met. Record the highest indicated pressure at each position. Compare the recorded readings to the specifications. If the highest output pressure reading against one stop is not within 345 kPa (50 psi) of the highest reading at the other stop, the steering gear is leaking internally and must be replaced.

If the power steering gear requires replacement, (Refer to 19 - STEERING/GEAR - REMOVAL).

DIAGNOSIS AND TESTING - STEERING DIAGNOSIS CHARTS

NOTE: There are three diagnosis charts following that cover the topics Power Steering Noise, Steering Wheel Feel, and Power Steering Fluid.

STEERING (Continued)

POWER STEERING NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONABLE HISS OR WHISTLE*	1. Damaged or mispositioned steering column shaft/coupling dash panel seal.	1. Reposition or replace steering column shaft/coupling dash panel seal.
	2. Noisy valve in power steering gear.	2. Replace power steering gear.
RATTLE OR CLUNK	1. Power steering gear loose on front suspension crossmember.	1. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.
	2. Front suspension crossmember mounting fasteners loose at frame.	2. Tighten the front suspension crossmember mounting fasteners to the specified torque.
	3. Loose tie rod (outer or inner).	3. Check tie rod pivot points for wear. Replace worn/loose parts as required.
	4. Loose lower control arm mounting bolts at front suspension crossmember.	4. Tighten control arm mounting bolts to the specified torques.
	5. Loose strut assembly mounting fasteners at strut tower.	5. Tighten strut assembly fasteners to the specified torques.
	6. Power steering fluid pressure hose touching the body of the vehicle.	6. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing.
	7. Internal power steering gear noise.	7. Replace power steering gear.
	8. Damaged front suspension crossmember.	8. Replace front suspension crossmember.
CHIRP OR SQUEAL (POWER STEERING PUMP)	1. Loose power steering pump drive belt.	1. Check and replace automatic belt tensioner as necessary. Replace belt if worn or glazed.
WHINE OR GROWL (POWER STEERING PUMP) **	1. Low fluid level.	1. Fill power steering fluid reservoir to proper level and check for leaks.
	2. Power steering hose touching vehicle body or frame.	2. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing. Replace hose if damaged.
	3. Extreme wear of power steering pump internal components.	3. Replace power steering pump and flush system as necessary.
SUCKING AIR SOUND	1. Loose clamp on power steering fluid return hose.	1. Tighten or replace hose clamp.
	2. Missing O-Ring on power steering 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 check for leaks.

STEERING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Air leak between power steering fluid reservoir and power steering pump.	4. Replace power steering pump (with reservoir).
SQUEAK OR RUBBING SOUND	1. Steering column shroud rubbing.	1. Realign shrouds as necessary.
	2. Steering column shaft rubbing.	2. Move or realign item rubbing shaft.
	3. Steering column shaft dry-rubbing seal at dash panel.	3. Lubricate contact surface.
	4. Steering gear internally noisy.	4. Replace steering gear.
SCRUBBING OR KNOCKING NOISE.	1. Incorrect tire or wheel size.	1. Replace incorrect size tire or wheel with size used as original equipment.
	2. Interference between steering gear and other vehicle components.	2. Check for bent or misaligned components and correct as necessary.
	3. Steering gear internal stops worn excessively.	3. Replace steering gear.

NOTE: * There is some noise in all power steering systems. One of the most common is a hissing sound evident when turning the steering wheel when at a standstill or when parking and the steering wheel is at the end of its travel. 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 when high velocity fluid passes valve orifice edges. There is no relationship between this noise and the performance of the steering system.

NOTE: ** Power steering pump growl results from the development of high pressure fluid flow. Normally this noise level should not be high enough to be objectionable.

STEERING WHEEL FEEL

CONDITION	POSSIBLE CAUSES	CORRECTION
STEERING WHEEL/ COLUMN CLICKING, CLUNKING OR RATTLING.	1. Steering column preload is not set properly.	1. Place steering wheel in full tilt-up position and secure lever. Loosen steering column coupling pinch bolt to reset steering column preload. Replace pinch bolt and torque to specifications.
	2. Loose steering coupling pinch bolt.	2. Replace pinch bolt and torque to specifications.
	3. Steering column bearings.	3. Replace steering column.
STEERING WHEEL HAS FORE AND AFT LOOSENESS.	1. Steering wheel retaining screw not properly tightened and torqued.	1. Tighten the steering wheel retaining nut to its specified torque.
	2. Steering column preload is not set properly.	2. Place steering wheel in full tilt-up position and secure lever. Loosen steering column coupling pinch bolt to reset steering column preload. Replace pinch bolt and torque to specifications.
	3. Steering column lower bearing spring retainer slipped on steering column shaft.	3. Replace steering column.

STEERING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
STEERING WHEEL OR DASH VIBRATES DURING LOW SPEED OR STANDSTILL STEERING MANEUVERS.	1. Air in the fluid of the power steering system.	1. Bleed air from system following the power steering pump initial operation service procedure.*
	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. Engine torque struts out of alignment.	4. Align engine torque struts.
	5. Loose tie rod end jam nut.	5. Tighten the inner to outer tie rod jam nut to the specified torque.
	6. Overcharged air conditioning system.	6. Check air conditioning pump head pressure and correct as necessary.
STEERING 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 check for leaks.
	2. Tires not inflated to specified pressure.	2. Inflate tires to the specified pressure.
	3. Lack of lubrication in front suspension 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. Lack of lubrication in steering gear outer tie rod ends.	4. 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.
	5. Loose power steering pump drive belt.	5. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	6. Faulty power steering pump flow control (Follow Power Steering System Flow and Pressure Test procedure).	6. Replace power steering pump.
	7. Excessive friction in steering column or intermediate shaft.	7. Isolate and correct condition.
	8. Binding upper strut bearing.	8. Disassemble strut assembly. Correct binding condition in strut bearing or replace bearing.
	9. Excessive friction in power steering gear.	9. Replace power steering gear.
STIFF, HARD TO TURN, SURGE, 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. Check for leaks.

STEERING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Loose power steering pump drive belt.	3. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	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. Low power steering pump pressure (Follow Power Steering System Flow and Pressure Test procedure).	5. Replace the power steering pump as necessary.
	6. High internal leak in power steering gear (Follow Power Steering System Flow and Pressure Test procedure).	6. Replace power steering gear.
STEERING WHEEL DOES NOT RETURN TO CENTER POSITION.	1. Tires not inflated properly.	1. Inflate tires to specified pressure.
	2. Improper front wheel alignment.	2. Check and adjust wheel alignment as necessary.
	3. Lack of lubrication in front suspension control arm ball joints.	3. Lubricate ball joints if ball joints are not a lubricated for life type of ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	4. Steering column coupling joints misaligned.	4. Realign steering column coupling joints.
	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. Replace, reposition, or lubricate dash seal.
	7. Binding upper strut bearing.	7. Disassemble strut assembly. Correct binding condition in strut bearing or replace bearing.
	8. Tight shaft bearing in steering column.	8. Replace the steering column.
	9. Excessive friction in steering column coupling.	9. Replace steering column coupling.
	10. Excessive friction in power steering gear.	10. Replace power steering gear.
EXCESSIVE STEERING WHEEL KICKBACK OR TOO MUCH STEERING WHEEL FREE PLAY.	1. Air in the fluid of the power steering system.	1. Bleed air from system following the the power steering pump initial operation service procedure.*
	2. Power steering gear loose on front suspension crossmember.	2. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.

STEERING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Steering column coupling worn, broken or loose.	3. Replace steering column coupling.
	4. Free play in steering column.	4. Check all components of the steering system and repair or replace as required.
	5. Worn control arm ball joints.	5. Replace ball joint or control arm as required.
	6. Loose steering knuckle to ball joint stud pinch bolt.	6. Inspect pinch bolts, replace as necessary, and tighten to specified torque.
	7. Front wheel bearings loose or worn.	7. Replace wheel bearing or knuckle as necessary.
	8. Loose outer tie rod ends.	8. Replace outer tie rod ends that have excessive free play.
	9. Loose inner tie rod ends.	9. Replace power steering gear.
	10 Defective steering gear rotary valve.	10. Replace power steering gear.

NOTE: * Steering shudder can be expected in new vehicles and vehicles with recent steering system repairs. Shudder should dissipate after the vehicle has been driven several weeks.

NOTE: ** To evaluate this condition, it may be necessary to disconnect the coupling at the base of the steering column. Turn the steering wheel and feel or listen for internal rubbing in steering column. To avoid damaging the column clockspring, note the following. Before disconnecting coupling, place tires in the straight-ahead position and center steering wheel. Once disconnected, DO NOT rotate steering wheel more than one revolution in either direction and place steering wheel in original location before reconnecting coupling. If this position is lost, the steering column clockspring must be re-centered following the procedure found within the procedure for steering column installation in the steering column section.

POWER STEERING FLUID

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW FLUID LEVEL WITH VISIBLE LEAK.	1. Loose power steering hose fittings.	1. Tighten the fitting to its specified torque.
	2. Damaged or missing fitting seal, gasket, or O-ring.	2. Replace as necessary.
	3. Power steering pump or power steering gear leaking.	3. Repair or replace the leaking component as required.
AERATED FLUID.*	1. Low fluid level.**	1. Fill power steering fluid reservoir to proper level.
	2. Air leak between power steering fluid reservoir and pump.	2. Inspect for proper sealing. Replace the power steering pump (with reservoir).
	3. Cracked power steering pump housing.	3. Replace the power steering pump.
RESERVOIR FLUID OVERFLOW AND FLUID IS MILKY IN COLOR	1. Water contamination.	1. Drain the power steering fluid from the system. Flush the system with fresh clean power steering fluid, drain, then refill to the proper level.

STEERING (Continued)

NOTE: * Aerated fluid will appear with bubbles or foam, somewhat like champagne, when viewed through the reservoir fill opening.

NOTE: ** Extremely cold temperatures may cause power steering fluid aeration, if the power steering fluid is low.

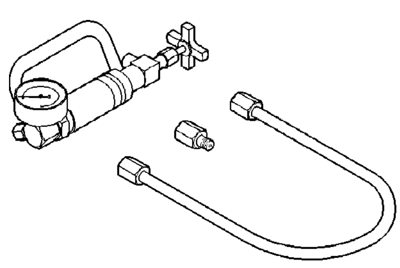
SPECIFICATIONS

POWER STEERING FASTENER TORQUE

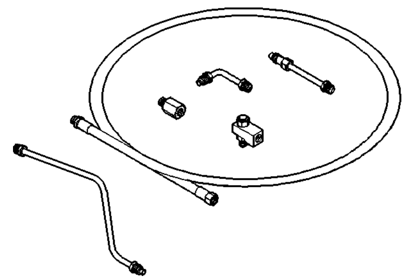
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Cooler Mounting Screws	10	—	90
Gear Mounting Bolts	61	45	—
Hose Tube Nuts	34	25	—
Pump Pressure Fitting	88	65	—
Pump Mounting Bolts	28	21	250
Pump Rear Bracket-To-Engine Bolts	54	40	—
Return Hose Bracket Bolt	28	21	250
Pressure Hose Bracket Bolt	61	45	—
Pressure Switch	8	—	70
Suspension Crossmember Front Mounting Bolts	142	105	—
Suspension Crossmember Rear Mounting Bolts	203	150	—
Tie Rod Steering Arm Nut	55	40	—
Tie Rod Jam Nut	75	55	—

SPECIAL TOOLS

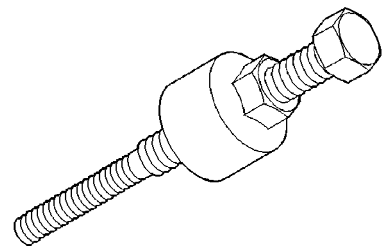
POWER STEERING



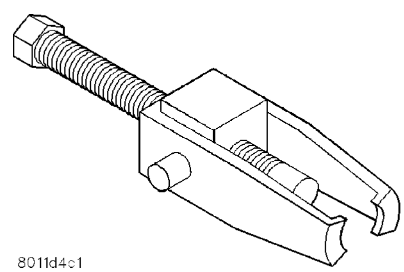
Power Steering Analyzer 6815



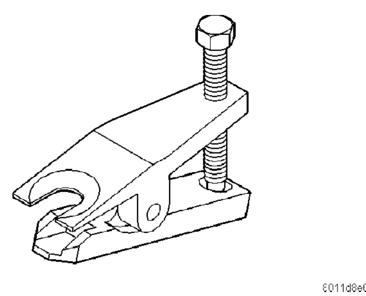
Adapters, Power Steering Analyzer 6893



Installer C-4063B



Puller C-4333



Remover MB991113

COLUMN

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COLUMN

DESCRIPTION

This vehicle is equipped with a tilt steering column. The steering column is designed to be serviced only as a complete assembly if an internal component is found to be defective (Fig. 1). The shaft, bearings and upper coupling are all serviced with the column.

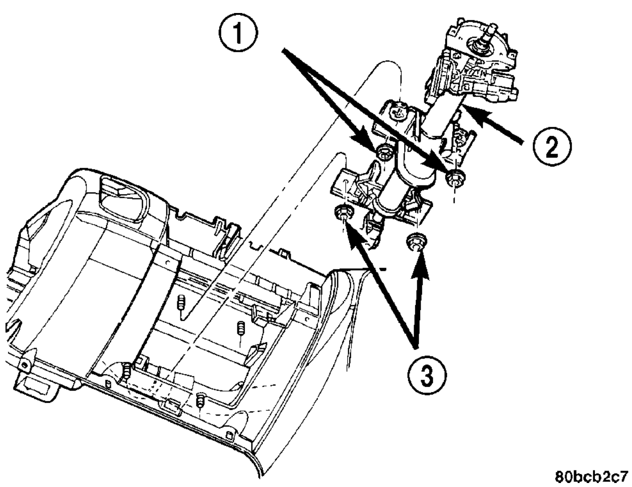

Fig. 1 Steering Column

1 - UPPER MOUNTING NUTS
2 - STEERING COLUMN
3 - LOWER MOUNTING NUTS

The replaceable components on the steering column assembly are:
- key cylinder
- ignition switch
- multi-function switch
- clockspring
- trim shrouds
- steering wheel
- driver airbag module
- trim ring
- SKIM module

These components can be serviced without removal of the steering column from the vehicle. Refer to the appropriate section of this service manual for servicing these components separately.

COLUMN (Continued)

WARNING

WARNINGS AND CAUTIONS

WARNING: SAFETY GOGGLES SHOULD BE WORN AT ALL TIMES WHEN WORKING ON STEERING COLUMNS.

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.

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 8 - ELECTRICAL/RESTRAINTS - WARNING).

WARNING: WHEN HANDLING AN UNDEPLOYED AIR BAG 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 AIR BAG MODULE.**
- **WHEN CARRYING A LIVE MODULE, THE TRIM COVER SHOULD BE POINTED AWAY FROM THE BODY TO MINIMIZE INJURY IF THE MODULE SHOULD ACCIDENTLY DEPLOY.**
- **IF THE AIR BAG MODULE IS PLACED ON A BENCH OR OTHER SURFACE, THE PLASTIC COVER SHOULD BE FACE-UP TO MINIMIZE MOVEMENT, IN CASE OF ACCIDENTAL DEPLOYMENT.**

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.

DIAGNOSIS AND TESTING - STEERING COLUMN

For diagnosis of conditions relating to the steering column, (Refer to 19 - STEERING - DIAGNOSIS AND TESTING).

REMOVAL

REMOVAL - STEERING COLUMN

NOTE: Before proceeding with this procedure, (Refer to 19 - STEERING/COLUMN - WARNING).

(1) Disconnect the negative (-) cable from the battery and isolate the cable.

(2) Before beginning removal of the steering column, be sure the front wheels of vehicle are in the STRAIGHT-AHEAD position.

(3) Remove the screw securing the left end of the top cover to the instrument panel. It is located just above the left instrument panel end cap.

(4) Starting on the driver's end, push upward on the instrument panel top cover, disengaging its retainer clips along the face of the instrument panel. Disengage just enough clips to allow access to the upper ends of the instrument cluster bezel.

(5) Disengage the clips along the outer edge of the instrument cluster bezel and remove the bezel from the vehicle.

(6) Remove the two screws along the bottom of the steering column cover that mounts below the steering column on the instrument panel. Disengage the clips on the upper end of the steering column cover and remove the cover by pulling it straight away from the instrument panel.

WARNING: WHEN AN UNDEPLOYED AIRBAG MODULE IS TO BE REMOVED FROM THE STEERING WHEEL, FIRST DISCONNECT THE BATTERY GROUND CABLE AND ISOLATE IT. ALLOW THE SYSTEM CAPACITOR TO DISCHARGE FOR A MINIMUM OF TWO MINUTES, THEN BEGIN THE AIRBAG REMOVAL.

COLUMN (Continued)

(7) Remove the two mounting screws, one on each side of steering wheel, attaching the driver airbag to the steering wheel (Fig. 2).

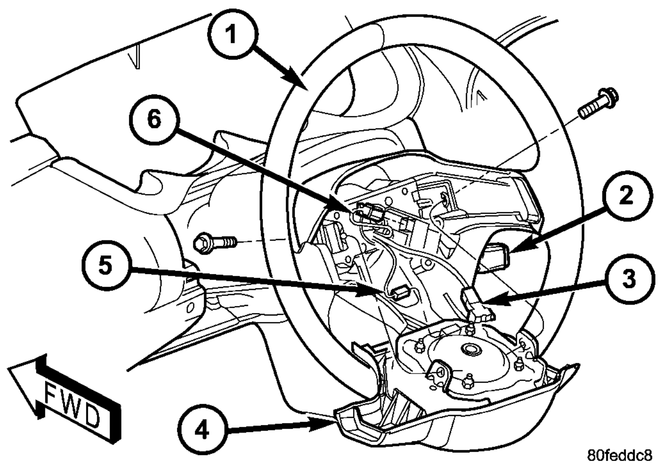

Fig. 2 Airbag Mounting And Wiring Connections

1 - STEERING WHEEL
2 - SPEED CONTROL SWITCH (IF EQUIPPED)
3 - AIRBAG SQUIB CONNECTOR
4 - DRIVER AIRBAG
5 - HORN SWITCH CONNECTOR
6 - SPEED CONTROL SWITCH CONNECTOR (IF EQUIPPED)

(8) Lay the driver airbag back away from the center of the steering wheel (Fig. 2). Disconnect the airbag squib and horn switch wiring connectors from the rear of the airbag. Remove the driver airbag from the steering wheel.

(9) If equipped with speed control, disconnect the wiring connector from the speed control switch (Fig. 2).

(10) Holding the steering wheel firmly in place, remove the steering wheel retaining screw from the steering column shaft (Fig. 3).

CAUTION: When installing a wheel puller on the steering wheel, be sure the puller bolts are fully seated in the threaded holes on the steering wheel. If the bolts are not fully seated in the threaded holes, the threads may be stripped out of the steering wheel when attempting to remove the steering wheel. Also, thread the retaining nut back on the end of the shaft until it is flush with the shaft end to avoid damage to the shaft threads by the wheel puller.

(11) Install a steering wheel puller on the steering wheel.

CAUTION: Do not bump or hammer on steering wheel or steering column shaft when removing steering wheel from steering column.

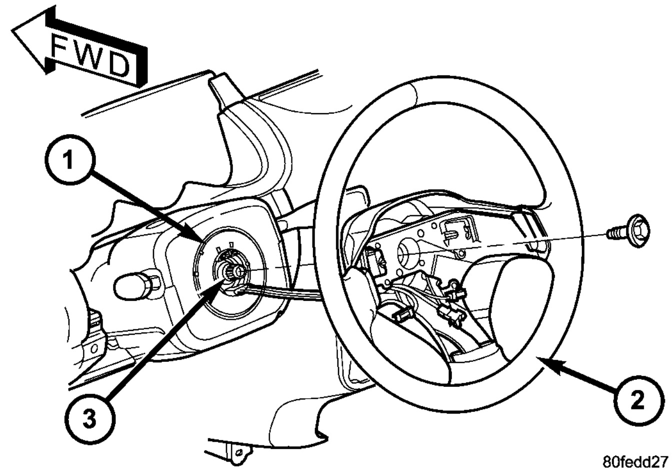

Fig. 3 Steering Wheel Mounting

1 - CLOCKSPRING
2 - STEERING WHEEL
3 - STEERING SHAFT

(12) While holding the steering wheel firmly in the straight-ahead position, remove steering wheel from the steering column shaft using the puller. While removing the steering wheel, carefully feed the wiring through the opening in the wheel.

(13) Remove the ignition key from the ignition key cylinder.

(14) Remove the two screws attaching the lower shroud to the steering column and upper shroud (Fig. 4). After removing the screws, unclip the shrouds from each other by applying hand pressure along the seams where the shrouds connect on the sides, then remove the lower shroud from the upper shroud and column. Remove the upper shroud from the steering column.

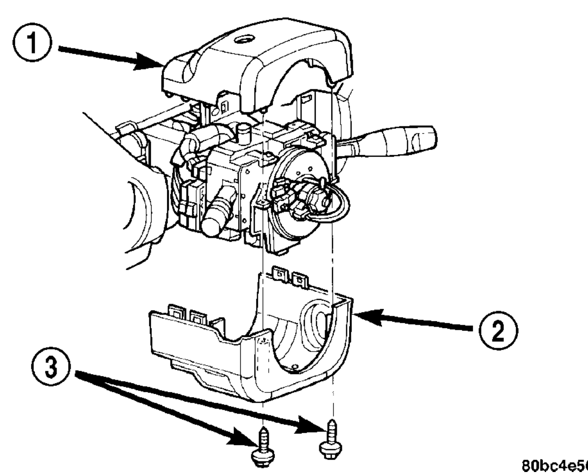

Fig. 4 Steering Column Shrouds

1 - UPPER SHROUD
2 - LOWER SHROUD
3 - MOUNTING SCREWS

COLUMN (Continued)

(15) At the base of the column, remove the steering column coupling retainer pin, back off the pinch bolt nut, and remove the steering column coupling pinch bolt (Fig. 5) (the pinch bolt nut is caged to the coupling and is not removable). Separate the upper and lower steering column couplings.

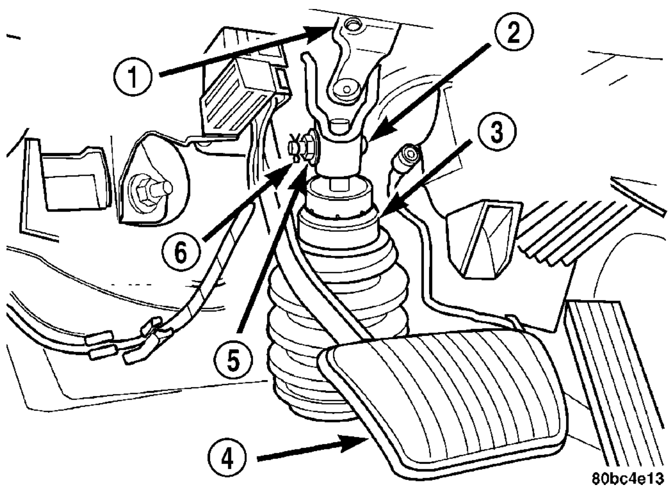

Fig. 5 Steering Column Couplings

1 - STEERING COLUMN UPPER COUPLING
2 - PINCH BOLT
3 - STEERING COLUMN LOWER COUPLING
4 - BRAKE PEDAL
5 - NUT
6 - RETAINER PIN

(16) If the vehicle is equipped with a automatic transaxle, disconnect the automatic transaxle ignition interlock cable from the steering column. Depress the tab on top of the cable connector and remove the cable from the back side of the steering column ignition cylinder housing (Fig. 6).

(17) Remove the two lower mounting nuts attaching the steering column to the instrument panel (Fig. 7).

(18) Remove the two upper mounting nuts attaching the steering column to the instrument panel (Fig. 7).

(19) Lower the steering column away from the instrument panel.

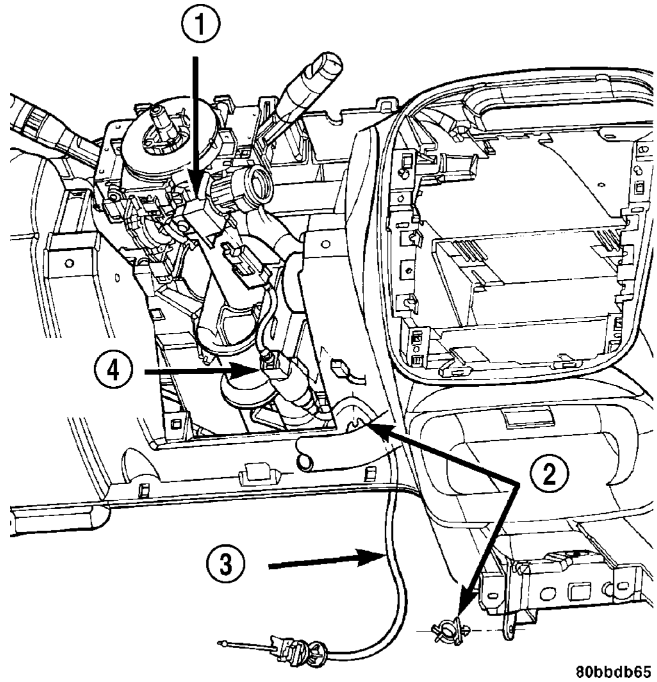

Fig. 6 Interlock Cable

1 - IGNITION SWITCH
2 - CLIP
3 - INTERLOCK CABLE
4 - BTSI SOLENOID

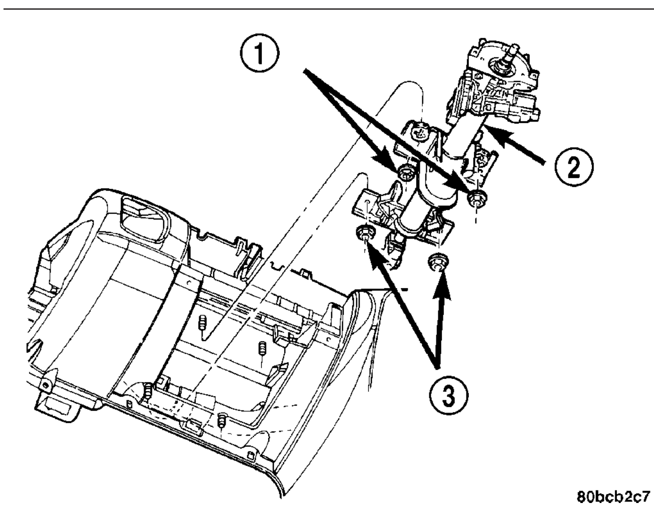

Fig. 7 Steering Column Mounting Nuts

1 - UPPER MOUNTING NUTS
2 - STEERING COLUMN
3 - LOWER MOUNTING NUTS

COLUMN (Continued)

(20) Disconnect the wiring harness electrical connector from the clockspring (Fig. 8).

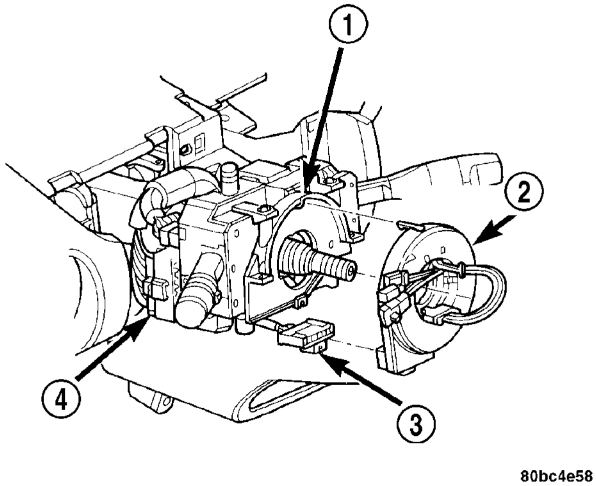

Fig. 8 Clockspring Electrical Connector

1 - STEERING COLUMN
2 - CLOCKSPRING
3 - CLOCKSPRING ELECTRICAL CONNECTOR
4 - IGNITION SWITCH ELECTRICAL CONNECTOR

(21) Disconnect the wiring harness electrical connectors from the multi-function switch, windshield wiper switch, and ignition switch (Fig. 9).

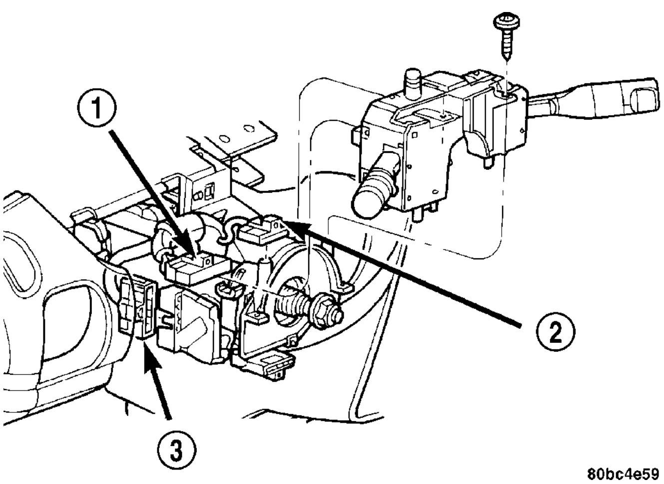

Fig. 9 Electrical Connectors

1 - MULTI-FUNCTION SWITCH ELECTRICAL CONNECTOR
2 - WINDSHIELD WIPER SWITCH ELECTRICAL CONNECTOR
3 - IGNITION SWITCH ELECTRICAL CONNECTOR

(22) If the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), disconnect its electrical connector (Fig. 10).

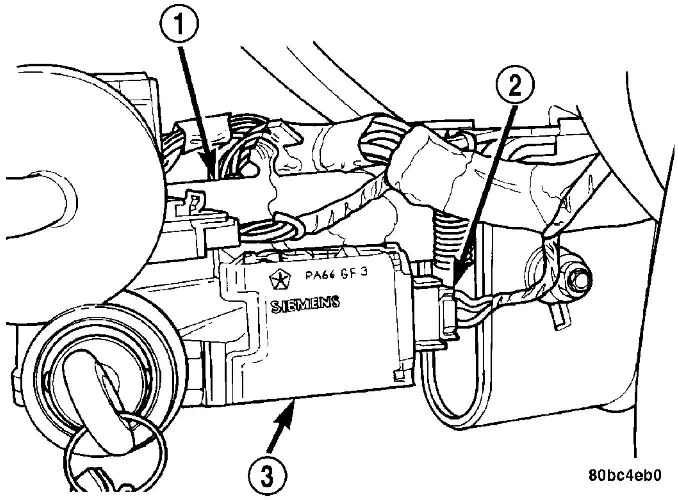

Fig. 10 SKIM Electrical Connector

1 - STEERING COLUMN
2 - SKIM ELECTRICAL CONNECTOR
3 - SKIM

(23) Remove the steering column from the vehicle.

(24) If the steering column is being replaced, perform the following:

(a) Remove the ignition key cylinder from the steering column. To do this, insert the key and turn the ignition key cylinder to the ON position. Next, depress the retaining tab and remove the Ignition key cylinder by pulling the key and cylinder straight out of the column together (Fig. 11).

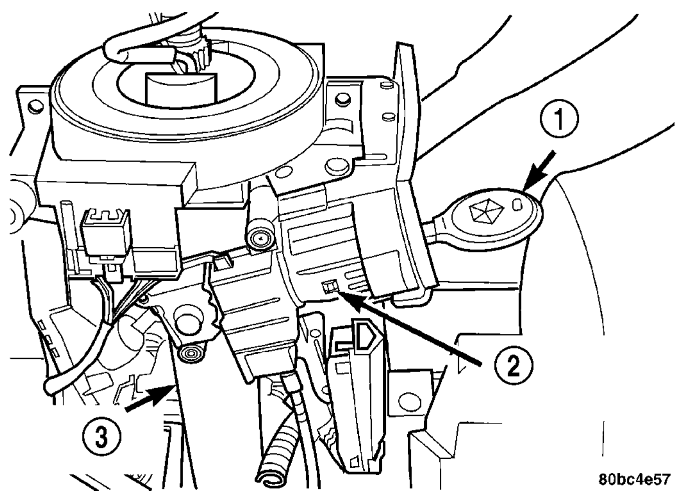

Fig. 11 Ignition Key Cylinder Retaining Tab

1 - IGNITION KEY
2 - RETAINING TAB
3 - STEERING COLUMN

COLUMN (Continued)

(b) Disengage the latch hooks on the back of the clockspring by lifting the clockspring slightly to clear the column housing with the top latch hook. Next, lower the clockspring slightly to do the same for the lower latch hook (Fig. 12). Remove the clockspring from the column.

(c) Remove the two screws securing the multi-function/windshield wiper switch to the steering column (Fig. 13). Pull the switch straight away from the column to remove it.

(d) If the column is equipped with a SKIM, remove the module from the column by removing the two mounting screws and sliding the SKIM off the non-halo trim ring (Fig. 14).

(e) Remove the non-halo trim ring from the column by unclipping it from the ignition cylinder housing (Fig. 14).

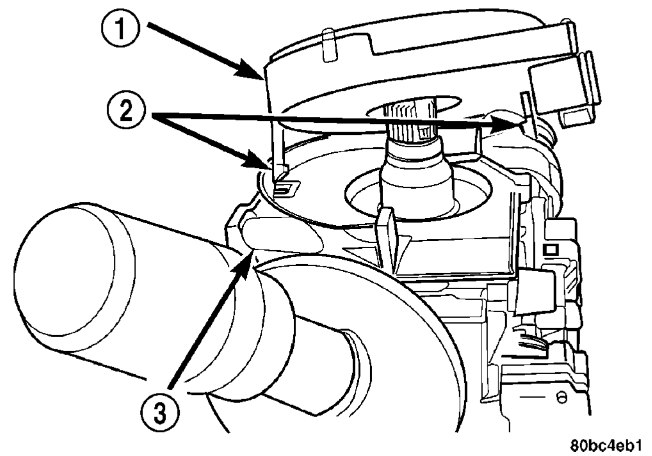

Fig. 12 Clockspring Latch Hooks

1 - CLOCKSPRING
2 - LATCH HOOKS
3 - STEERING COLUMN

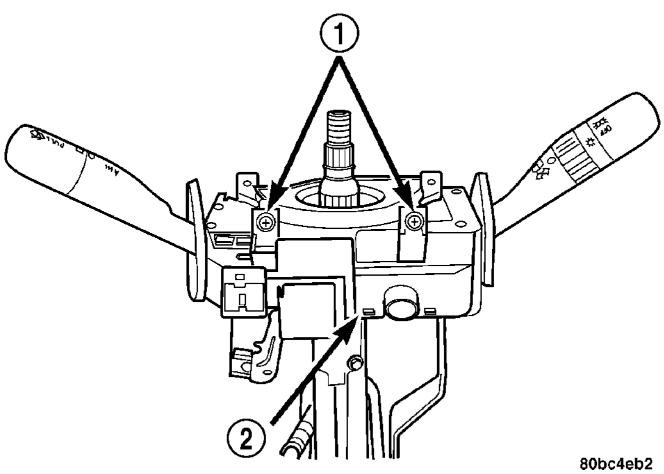

Fig. 13 Multi-function/Wiper Switch Mounting (Typical)

1 - MOUNTING SCREWS
2 - MULTI-FUNCTION/WINDSHIELD WIPER SWITCH ASSEMBLY

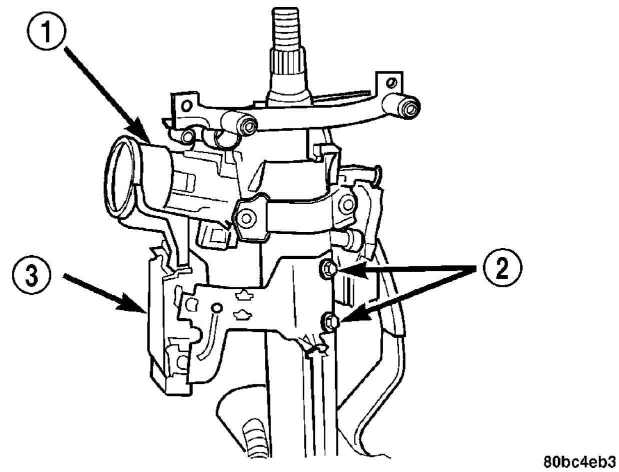

Fig. 14 SKIM Mounting (Typical)

1 - HALO TRIM RING
2 - MOUNTING SCREWS
3 - SKIM

REMOVAL - RHD

Right-Hand-Drive steering column is typical of Left-Hand-Drive. (Refer to 19 - STEERING/COLUMN - REMOVAL - LHD)

INSTALLATION

INSTALLATION - STEERING COLUMN

(1) If the steering column is being replaced, perform the following on the column before installing it on the vehicle:

(a) Install the non-halo trim ring on the column until its tabs snap into place on the ignition cylinder housing (Fig. 14).

(b) If the column is equipped with a Sentry Key Immobilizer Module (SKIM), install the module on the column by sliding the module onto the non halo trim ring and installing the two mounting screws (Fig. 14). Tighten the mounting screws to a torque of 3 N·m (25 in. lbs.).

(c) Position the multi-function/windshield wiper switch in onto the top of the column and install the two screws securing the switch in place (Fig. 13).

(d) Place the clockspring onto the end of the column engaging the clockspring latch hooks into the column (Fig. 12).

(e) Install the ignition key cylinder in the steering column. To do this, first position the key cylinder in the ON position (with the key in it) so the retaining tab can be depressed. Push key cylinder into the column ignition cylinder housing until the retaining tab locks into place (Fig. 11).

NOTE: When installing a tilt column, do not release the tilt lever from the locked position until after the column is installed on the instrument panel.

COLUMN (Continued)

(2) Install the steering column into steering column access opening in the lower instrument panel.

(3) If the vehicle is equipped with a SKIM, Connect its wiring harness electrical connector (Fig. 10).

(4) Connect the wiring harness electrical connectors to the multi-function switch, windshield wiper switch, and ignition switch (Fig. 9).

(5) Connect the wiring harness electrical connector to the clockspring (Fig. 8).

(6) Align the slots in the mounting brackets on the steering column with the studs in the instrument panel (Fig. 7) Attach the column to the instrument panel by first installing the two upper mounting nuts (Do not completely tighten the two upper mounting nuts at this time). Next, install the two lower mounting nuts. Tighten all four mounting nuts to a torque of 17 N·m (150 in. lbs.).

(7) If the vehicle is equipped with an automatic transaxle, connect the automatic transaxle ignition interlock cable to the steering column by pushing the end of the cable into the back side of the ignition cylinder housing until it snaps into place (Fig. 6).

(8) Position the steering column shaft in the correct position for mounting to the lower coupling. To do this, turn the steering wheel end of the shaft until the missing spline area on that end of the shaft faces straight up.

(9) Verify the front wheels of vehicle are in the STRAIGHT-AHEAD position.

NOTE: Do not tighten the coupling pinch bolt anytime the vehicle is not at curb riding height. It may cause unwanted conditions within the steering column if the vehicle is suspended in any manner when the pinch bolt is tightened.

(10) **Place the steering column in the full tilt-up position**, then reconnect the steering column lower coupling to the steering column upper coupling (Fig. 5). Install the coupling pinch bolt an tighten the pinch bolt nut to a torque of 28 N·m (250 in. lbs.). Install the pinch bolt retainer pin.

(11) Install the upper and lower steering column shrouds onto the steering column (Fig. 4). Snap the two shrouds together and then install and tighten the two screws securing the shrouds to the column.

(12) Install the steering column cover that mounts below the steering column on the instrument panel by first aligning the retainer clips and snapping the cover into place. Install the two screws along the bottom of the steering column cover.

(13) Align the clips along the outer edge of the instrument cluster bezel with the mounting holes in the instrument panel and install the bezel.

(14) Align the clips on the bottom of the instrument panel top cover with the mounting holes in the instrument panel and install the top cover by pushing it down into place.

(15) Install the screw securing the left end of the top cover to the instrument panel.

CAUTION: If there is any question as to whether the clockspring is in the centered position, the clock spring needs to be recentered before installing the steering wheel. If the clockspring is not centered, it may be overextended, causing the clockspring to become inoperative.

(16) Center the clockspring using the following procedure:

- Using your fingers, rotate the clockspring rotor in the CLOCKWISE DIRECTION to the end of the travel. Do not apply excessive torque.
- From the end of travel, rotate the rotor two full turns and an additional half turn in the counterclockwise direction. (The wires should end up at the bottom of the clockspring).

CAUTION: Do not install the steering wheel onto the shaft of the steering column by driving it onto the shaft.

(17) Feed the clockspring wiring leads through the hole in the steering wheel (Fig. 3). Align the steering wheel's wide mounting spline with the steering column shaft missing spline area and push the wheel onto the shaft. Make sure the clockspring squares up with the back of the wheel and does not bind.

(18) Install the steering wheel retaining screw and tighten it until the steering wheel is fully installed on shaft. Tighten the retaining screw to a torque of 54.2 N·m (40 ft. lbs.).

(19) If equipped with speed control, connect the wiring lead from the clockspring to the speed control switch on the steering wheel (Fig. 2).

(20) Position the driver airbag near the steering wheel (Fig. 2). Connect the horn switch wiring lead to the connector on the back of the airbag.

(21) Install the airbag squib wiring lead from the clockspring into the connector on the back of the driver airbag (Fig. 2). Be sure the wiring connector is securely latched into the airbag connector.

CAUTION: The fasteners 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 it with only the correct fastener listed in the parts book.

(22) Install the driver airbag into the center of the steering wheel. Align the airbag mounting holes with the bolt holes in the steering wheel (Fig. 2). Install

COLUMN (Continued)

only the two original or identical replacement airbag module mounting screws. Tighten the two driver airbag attaching bolts to a torque of 10 N·m (90 in. lbs.).

NOTE: When reconnecting the battery on a vehicle that has had the airbag module removed, the following procedure should be used.

(23) Reconnect the ground cable to the negative post of the battery in the following manor:

• Connect a scan tool (DRBIII®) to the data link diagnostic connector located below the steering column.

• Turn the ignition key to the ON position. Exit the vehicle with the scan tool leaving the scan tool harness plugged in.

• Ensuring that there are no occupants in the vehicle, connect the ground (-) cable to the negative post of the battery.

• Using the scan tool, read and record any fault codes. Refer to the Appropriate Diagnostic Information if any faults are found.

• Erase any stored faults if there are no active fault codes. If a problem exists, the fault code will not erase.

• Reach around the back of the steering wheel (in front of the instrument cluster) and turn the ignition key to OFF, then back ON while observing the 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. 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 Appropriate Diagnostic Information to diagnose the system malfunction.

(24) Turn the key to OFF and remove the scan tool from the vehicle.

(25) Test the operation of the horn, wipers and any other functions that are steering column operated. If applicable, reset the radio and the clock.

(26) Verify the tilt mechanism operates properly.

(27) Road test the vehicle to ensure proper operation of the steering system and the speed control system.

INSTALLATION - RHD

Right-Hand-Drive steering column is typical of Left-Hand-Drive. (Refer to 19 - STEERING/COLUMN - INSTALLATION - LHD)

SPECIFICATIONS - STEERING COLUMN FASTENER TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Airbag Mounting Screws	10	—	90
Coupling Pinch Bolt	28	21	250
SKIM Mounting Screws	3	—	25
Speed Control Switch Screws	2	—	20
Steering Column Mounting Nuts	17	—	150
Steering Wheel Retaining Screw	54	40	—

IGNITION SWITCH

REMOVAL

The ignition switch attaches to the lock cylinder housing on the end opposite the lock cylinder (Fig. 15). For ignition switch terminal and circuit identification, refer to the Wiring Diagrams sections.

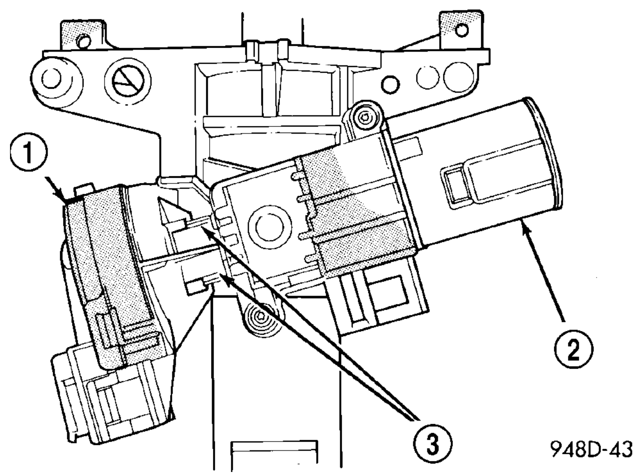

Fig. 15 Ignition Switch—Viewed From Below Column

1 - IGNITION SWITCH
2 - LOCK CYLINDER HOUSING
3 - RETAINING TABS

(1) Disconnect negative cable from battery.

(2) Place key cylinder in RUN position. Through the hole in the lower shroud, depress lock cylinder retaining tab and remove key cylinder (Fig. 16).

(3) Remove upper and lower shrouds from steering column.

(4) Disconnect electrical connectors from ignition switch.

IGNITION SWITCH (Continued)

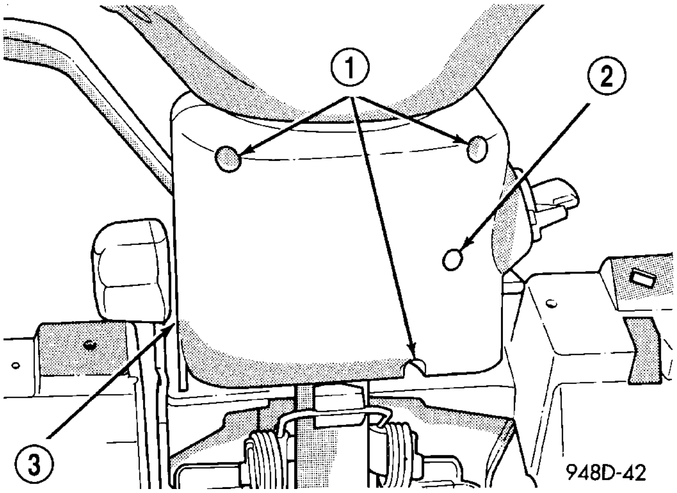

Fig. 16 Steering Column Shrouds

1 - SCREW ACCESS HOLE
2 - TAB ACCESS HOLE
3 - LOWER SHROUD

(5) Remove ignition switch mounting screw (Fig. 17) with a #10 Torx® bit.

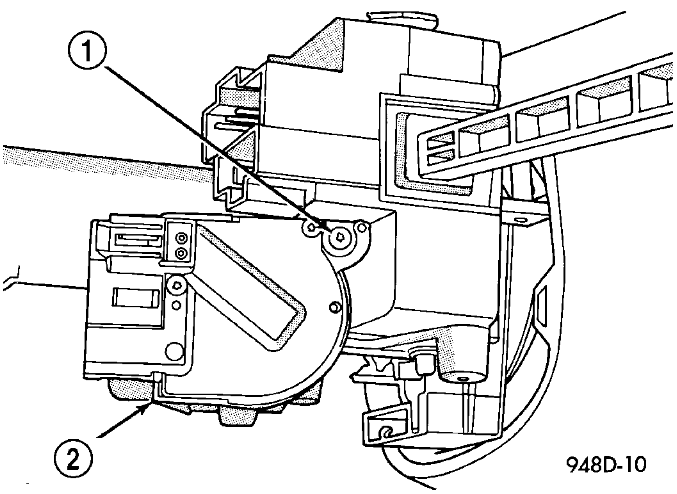

Fig. 17 Ignition Switch Mounting Screw

1 - MOUNTING SCREW
2 - IGNITION SWITCH

(6) Depress retaining tabs (Fig. 18) and pull ignition switch from steering column.

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. 19). Install mounting screw (Fig. 17).

(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).

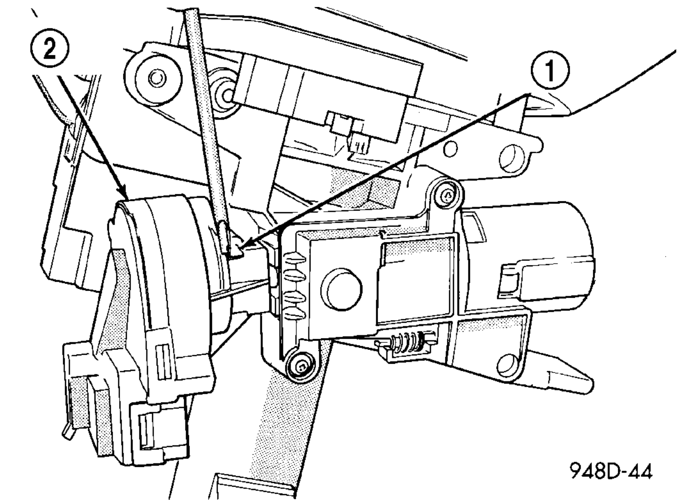

Fig. 18 Removing Ignition Switch

1 - DEPRESS RETAINING TABS
2 - IGNITION SWITCH

(6) Connect negative cable to battery.

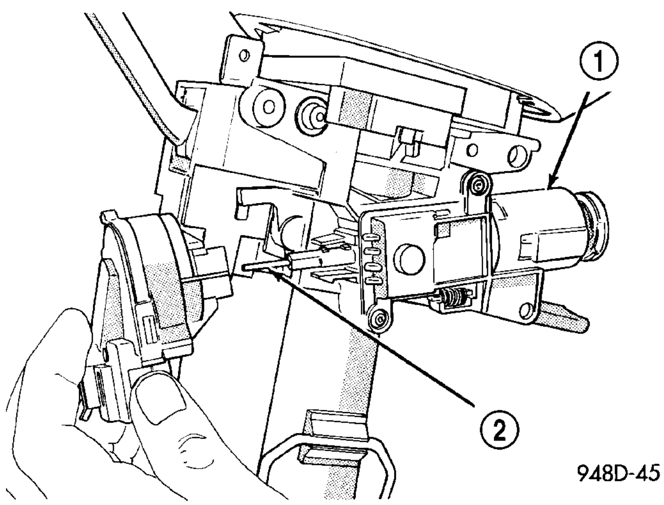

Fig. 19 Ignition Switch Installation

1 - LOCK CYLINDER HOUSING
2 - SHAFT

(7) Check for proper operation of ignition switch and key-in warning switch.

KEY/LOCK CYLINDER

REMOVAL

The lock cylinder is inserted in the end of the housing opposite the ignition switch. The ignition key rotates the cylinder to 5 different detentes (Fig. 20) :

- Accessory
- Off (lock)
- Unlock
- On/Run
- Start

KEY/LOCK CYLINDER (Continued)

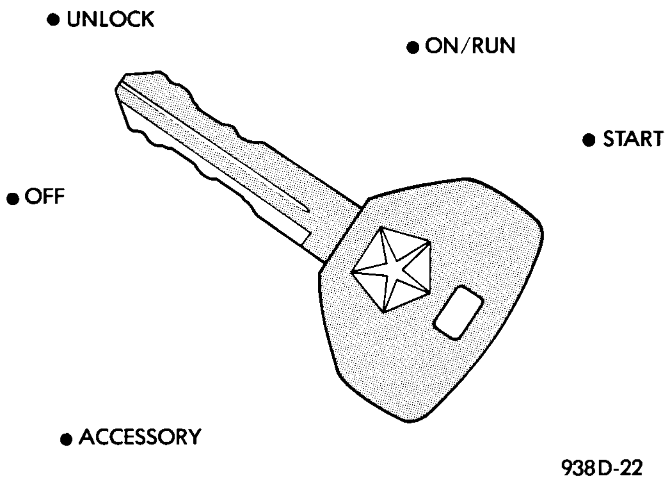

Fig. 20 Ignition Lock Cylinder Detentes

(1) Disconnect negative cable from battery.

(2) Place key cylinder in RUN position. Through the hole in the lower shroud, depress lock cylinder retaining tab and remove key cylinder.

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. 21).

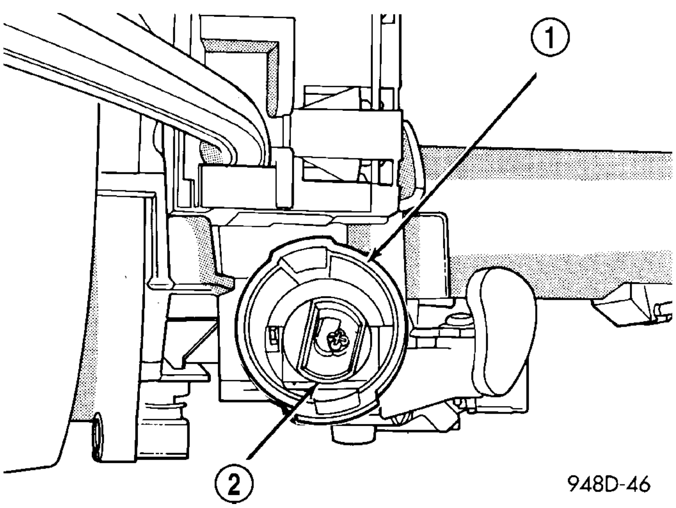

Fig. 21 Socket in Lock Cylinder Housing

1 - LOCK CYLINDER HOUSING
2 - SOCKET

(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.

(4) Turn the key to the OFF position. Remove the key.

(5) Connect negative cable to battery.

STEERING COUPLING - LOWER

DESCRIPTION

This vehicle uses a corrugated design lower coupling to connect the steering column to the steering gear (Fig. 22).

This coupling has a hollow corrugated tube that allows the coupling to bend rather than collapse when a vehicle is involved in a collision.

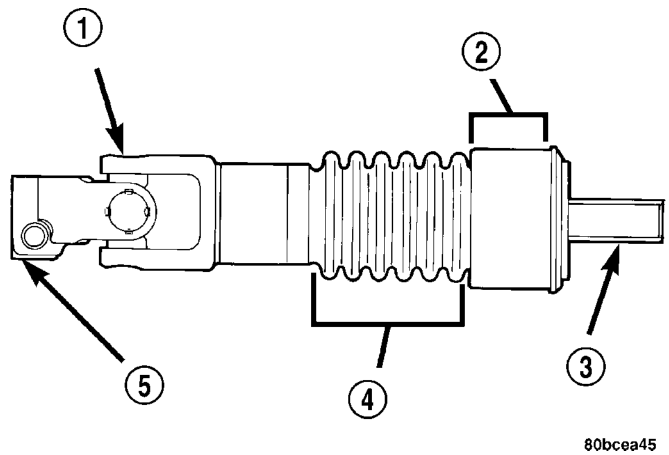

Fig. 22 Steering Column Lower Coupling

1 - FLEX JOINT
2 - SEAL COLLAR SEALING SURFACE
3 - TO STEERING COLUMN
4 - CORRUGAGATED TUBE SECTION
5 - TO STEERING GEAR

DIAGNOSIS AND TESTING - STEERING COLUMN LOWER COUPLING

The steering column coupling must be inspected whenever a vehicle is involved in an impact or whenever any of the following conditions exist:

- whenever a vehicle is involved in a collision which deploys the air bag, regardless of the extent of damage done to the vehicle.
- 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.
- 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 or rearward in a vehicle.

STEERING COUPLING - LOWER (Continued)

INSPECTION PROCEDURE

(1) Place the steering wheel in the STRAIGHT-AHEAD position. Using a steering wheel holding clamp, lock the steering wheel in place to keep it from rotating. This keeps the clockspring in the proper orientation.

(2) Inside the passenger compartment, remove the steering column coupling retainer pin, back off the pinch bolt nut, and remove the steering column coupling pinch bolt (Fig. 23) (the pinch bolt nut is caged to the coupling and is not removable). Separate the upper and lower steering column couplings.

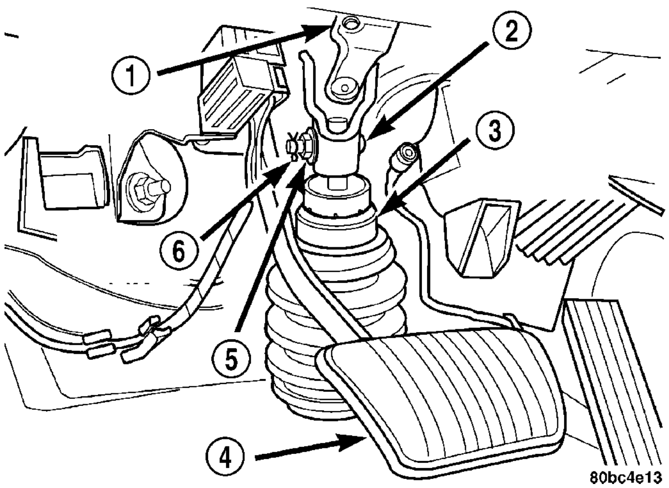

Fig. 23 Steering Column Couplings

1 - STEERING COLUMN UPPER COUPLING
2 - PINCH BOLT
3 - STEERING COLUMN LOWER COUPLING
4 - BRAKE PEDAL
5 - NUT
6 - RETAINER PIN

(3) Remove the silencer seal enclosing the steering column coupling (Fig. 24).

(4) Inspect steering column lower coupling in the following areas for signs of damage:

- Inspect the lower coupling flex joint for binding.
- Inspect the sealing collar on the lower coupling (Fig. 25) to ensure the it is not cracked, broken, or otherwise damaged requiring coupling replacement.
- Inspect the corrugated section (Fig. 25) of the lower coupling for the following conditions or any other visible signs of damage.
  - Uneven spacing between the corrugations on the coupling.
  - Dings or dents in the corrugations of the coupling or anywhere else on the coupling wall.
  - A bend in the corrugated section of the coupling.

If any of the preceding conditions exist, the steering column lower coupling must be replaced.

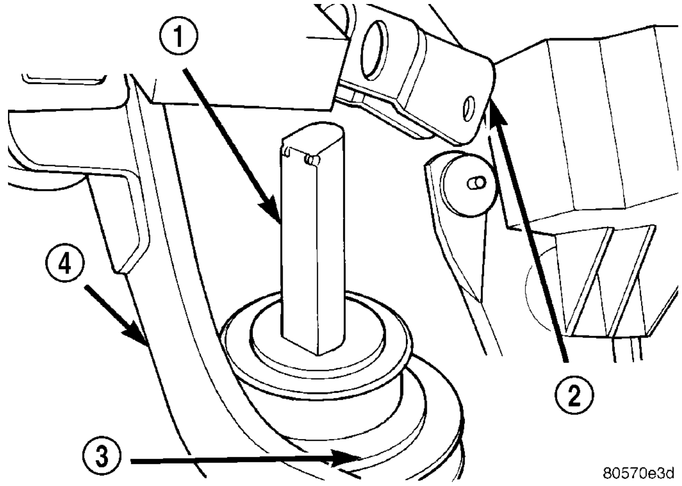

Fig. 24 Steering Column Coupling Seal

1 - LOWER STEERING COLUMN COUPLER
2 - UPPER STEERING COLUMN SHAFT COUPLER
3 - SILENCER SEAL
4 - BRAKE PEDAL

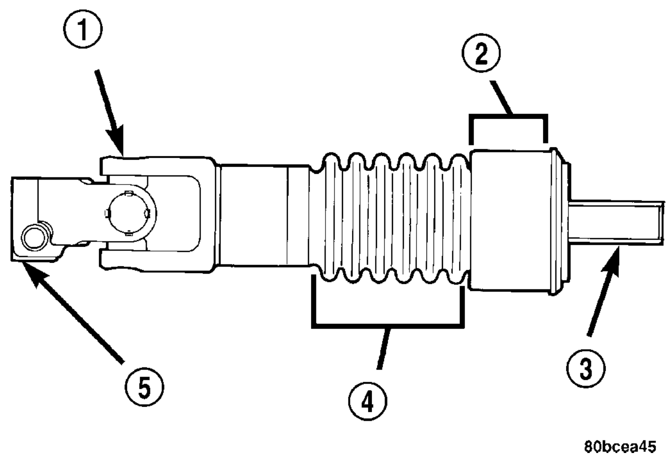

Fig. 25 Lower Coupling Inspection

1 - FLEX JOINT
2 - SEAL COLLAR SEALING SURFACE
3 - TO STEERING COLUMN
4 - CORRUGAGATED TUBE SECTION
5 - TO STEERING GEAR

Inspect the steering column upper coupling for damage or binding. If the upper coupling needs to be replaced, the steering column must be replaced.

NOTE: Verify that grease is present on the lip of the dash-to-coupling seal where it contacts the lower coupling's plastic collar.

(5) If the lower coupling does not require replacement, install the dash panel-to-steering column coupling silencer seal (Fig. 24) back on the vehicle.

STEERING COUPLING - LOWER (Continued)

NOTE: Do not tighten the coupling pinch bolt anytime the vehicle is not at curb riding height. It may cause unwanted conditions within the steering column if the vehicle is suspended in any manner when the pinch bolt is tightened.

(6) **Ensure front wheels of vehicle are positioned STRAIGHT-AHEAD and the steering column is in the full tilt-up position with the tilt lever secured.**Align and attach the steering column upper coupling to the lower coupling. Install the coupling pinch bolt (Fig. 23). Tighten the pinch bolt nut to a torque of 28 N·m (250 in. lbs.).

(7) Install the coupling pinch bolt retainer pin.

(8) Remove the steering wheel holding clamp.

REMOVAL - STEERING COLUMN LOWER COUPLING

NOTE: Before proceeding with this procedure, (Refer to 19 - STEERING/COLUMN - WARNING).

(1) Place the steering wheel in the STRAIGHT-AHEAD position. Using a steering wheel holder, lock the steering wheel in place to keep it from rotating (Fig. 26). This keeps the clockspring in the proper orientation.

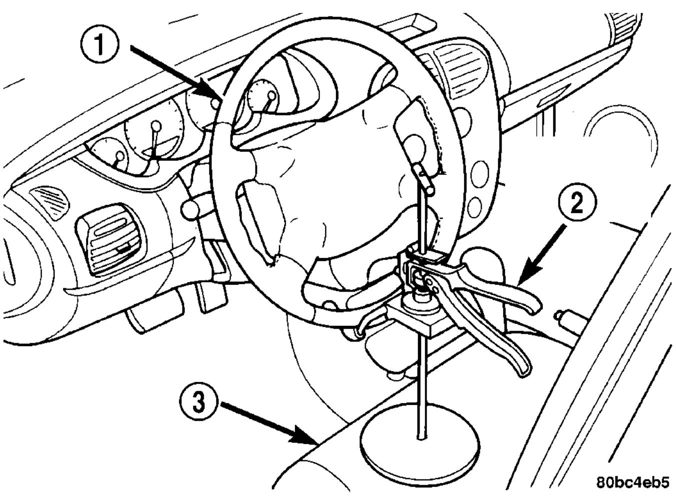

Fig. 26 Steering Wheel Holder (Typical)

1 - STEERING WHEEL
2 - STEERING WHEEL HOLDER
3 - DRIVERS SEAT

(2) Inside the passenger compartment, remove the steering column coupling retainer pin, back off the pinch bolt nut, and remove the steering column coupling pinch bolt (Fig. 27) (the pinch bolt nut is caged to the coupling and is not removable). Separate the upper and lower steering column couplings.

(3) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

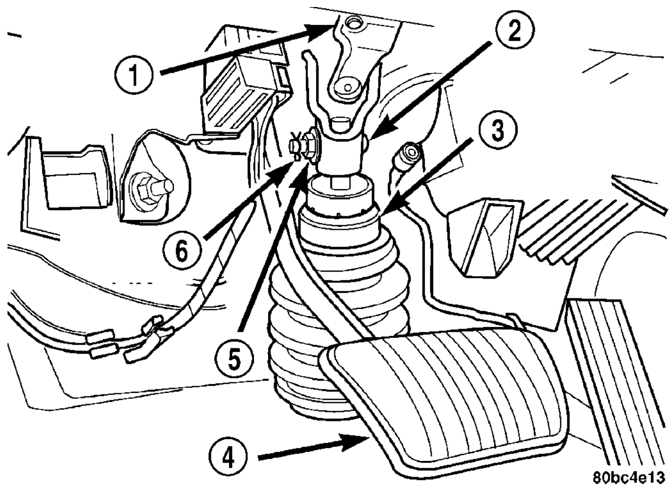

Fig. 27 Steering Column Couplings

1 - STEERING COLUMN UPPER COUPLING
2 - PINCH BOLT
3 - STEERING COLUMN LOWER COUPLING
4 - BRAKE PEDAL
5 - NUT
6 - RETAINER PIN

(4) Release the locking tab on the wiring harness connector for the power steering fluid pressure switch before connector removal. Remove the wiring harness connector from the power steering fluid pressure switch (Fig. 28).

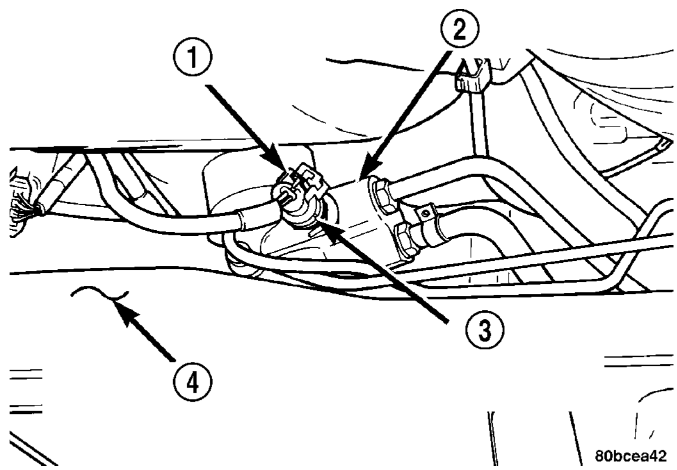

Fig. 28 Power Steering Fluid Pressure Switch

1 - WIRING HARNESS CONNECTOR
2 - POWER STEERING GEAR
3 - POWER STEERING FLUID PRESSURE SWITCH
4 - REAR OF FRONT SUSPENSION CROSSMEMBER

(5) Remove the drive-belt splash shield fasteners. Remove the shield.

(6) Remove the pencil strut from the right front corner of the crossmember and body of the vehicle (Fig. 29). Remove the washer behind the strut from the torque strut bolt.

STEERING COUPLING - LOWER (Continued)

(7) Remove the bolts mounting the engine torque strut in place (Fig. 29), then remove the engine torque strut from the vehicle.

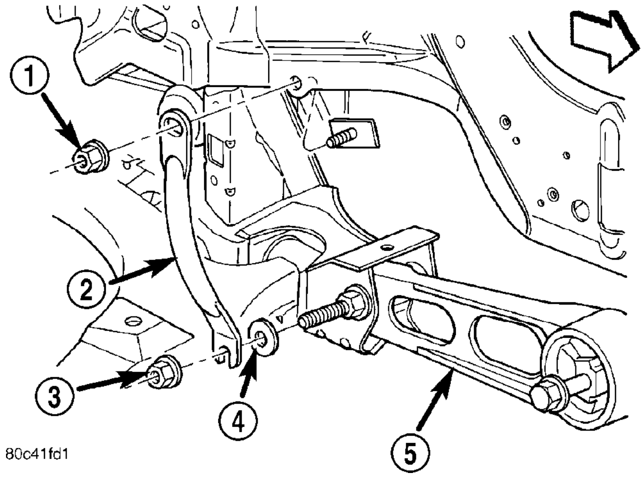

Fig. 29 Strut Mounting

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

NOTE: Before removing the front suspension crossmember from the vehicle, the location of the crossmember must be scribed on the body of the vehicle (Fig. 9). Do this so that the crossmember can be relocated upon reinstallation against the body of vehicle in the same location as before removal. If the front suspension crossmember is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) will be lost.

(8) Using an awl, scribe a line (Fig. 30) marking the location of where the front suspension crossmember is mounted against the body of the vehicle.

(9) Position a transmission jack under the center of the front suspension crossmember and raise it to support the bottom of the crossmember.

(10) Loosen and completely remove the two front bolts (one right and one left) attaching the front suspension crossmember to the frame rails of vehicle. The right side bolt can be viewed in the mounting bolt figure (Fig. 31). The left side bolt is located in the same location on the other side of the vehicle.

(11) Loosen the two rear bolts (one right and one left) attaching the front suspension crossmember and lower control arms to the body of the vehicle until they release from the threaded tapping plates in the body of the vehicle. Do not completely remove the rear bolts because they are designed to disengage from the body threads yet stay within the lower control arm rear isolator bushing. This allows the lower control arm to stay in place on the crossmember. The right side bolt can be viewed in the mounting bolt figure (Fig. 31). The left side bolt is located in the same location on the other side of the vehicle.

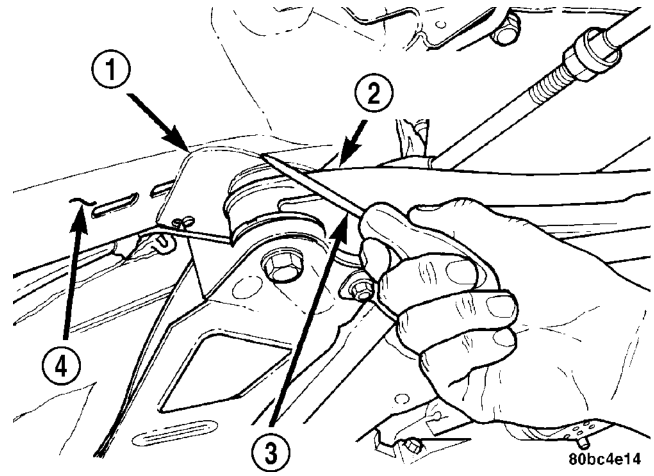

Fig. 30 Marking Crossmember Location

1 - SCRIBED LINE
2 - FRONT SUSPENSION CROSSMEMBER
3 - AWL
4 - BODY

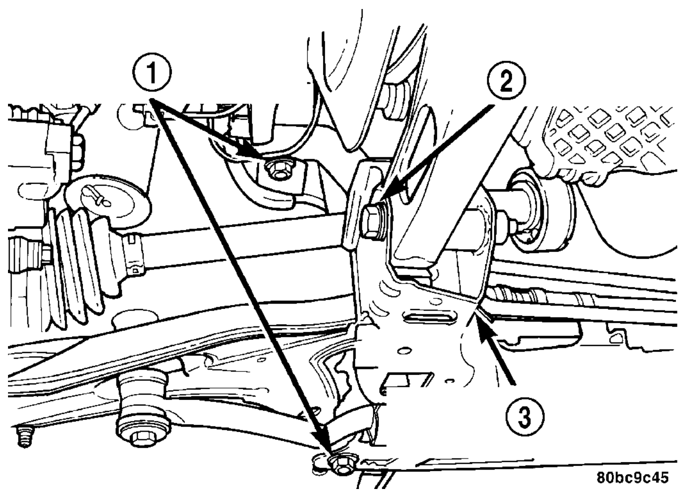

Fig. 31 Mounting Bolts

1 - FRONT SUSPENSION CROSSMEMBER MOUNTING BOLTS
2 - ENGINE TORQUE ISOLATOR STRUT MOUNTING BOLT
3 - FRONT SUSPENSION CROSSMEMBER

CAUTION: Lower the steering gear slowly, paying special attention to the power steering fluid hoses coming down from the power steering pump. Do not strain or over extend the hoses coming to the gear. Damage to the hoses or connecting hardware could occur.

(12) Lower the front suspension crossmember using the transmission jack enough to allow sufficient access to the steering column lower coupling (Fig. 32). When lowering front suspension crossmem-

STEERING COUPLING - LOWER (Continued)

ber, do not let crossmember hang from lower control arms or power steering hoses. The weight should be supported by the transmission jack.

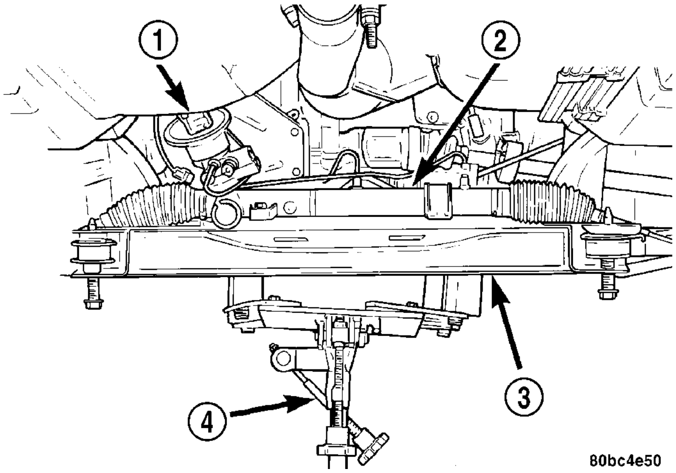

Fig. 32 Crossmember Lowered

1 - STEERING COLUMN LOWER COUPLING
2 - POWER STEERING GEAR
3 - FRONT SUSPENSION CROSSMEMBER
4 - TRANSMISSION JACK

(13) Remove the roll pin securing the steering column lower coupling to the power steering gear pinion shaft using a roll pin punch (Fig. 33). Push the steering column lower coupling up and off of the power steering gear pinion shaft.

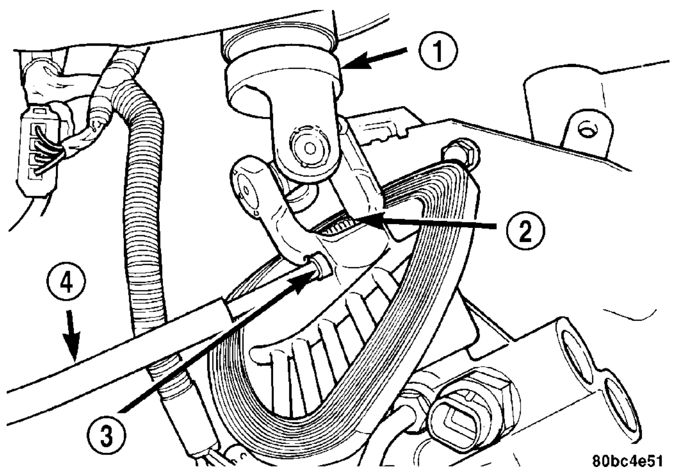

Fig. 33 Coupling Roll Pin

1 - STEERING COLUMN LOWER COUPLING
2 - POWER STEERING GEAR PINION SHAFT
3 - ROLL PIN
4 - ROLL PIN PUNCH

INSTALLATION - STEERING COLUMN LOWER COUPLING

NOTE: Before proceeding with this procedure, (Refer to 19 - STEERING/COLUMN - WARNING).

(1) Push the column end of the steering column lower coupling partway up through its hole in the dash panel, then match the flat on the inside of the steering column lower coupling to the flat on the power steering gear pinion shaft and slide the coupling onto the top of the pinion shaft. Align the roll pin hole in the coupling with the groove in the pinion shaft and install the roll pin through the coupling until it is centered (Fig. 33).

(2) Center the power steering gear rack in its travel.

(3) Using the transmission jack, raise the front suspension crossmember and power steering gear until the crossmember contacts its mounting spot against the body and frame rails of the vehicle. As the crossmember is raised, carefully guide the steering column lower coupling up through its hole in the dash panel.

(4) Start the two rear crossmember mounting bolts into the tapping plates mounted in the body. The right side bolt can be viewed in the mounting bolt figure (Fig. 31). The left side bolt is located in the same location on the other side of the vehicle. Next, install the two front mounting bolts attaching front suspension crossmember to frame rails of vehicle. Lightly tighten all four mounting bolts to a approximately 2 N·m (20 in. lbs.) to hold the front suspension crossmember in position.

NOTE: When reinstalling the front suspension crossmember back in the vehicle, it is very important that the crossmember be attached to the body in exactly the same spot as when it was removed. Otherwise, the vehicle's wheel alignment settings (caster and camber) will be lost.

(5) Using a soft face hammer, tap the front suspension crossmember back-and-forth or side-to-side until it is aligned with the previously scribed positioning marks on the body of the vehicle (Fig. 30). Once the front suspension crossmember is correctly positioned, tighten the rear two crossmember mounting bolts to a torque of 203 N·m (150 ft. lbs.), then tighten the front two crossmember mounting bolts to a torque of 142 N·m (105 ft. lbs.).

(6) Install the engine torque strut and mounting bolts (Fig. 29). To properly align and tighten the torque strut, (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(7) Install the washer on the end of the stud extending from the torque strut bolt (Fig. 29).

(8) Install the pencil strut to the right front corner of the crossmember and body of the vehicle (Fig. 29). Tighten the pencil strut nuts to a torque of 58 N·m (43 ft. lbs.).

(9) Install the drive-belt splash shield and fasteners.

STEERING COUPLING - LOWER (Continued)

(10) Reconnect the wiring harness connector to the power steering fluid pressure switch (Fig. 28). Be sure the locking tab on the wiring harness connector is securely latched.

(11) Lower the vehicle to ground level.

(12) Install the dash-to-lower coupling seal in place over the lower coupling's plastic collar.

NOTE: Verify that grease is present on the lip of the dash-to-coupling seal where it contacts the coupling's plastic collar.

(13) Inside the passenger compartment, **position the steering column in the full tilt-up position and secure the tilt lever**, then reconnect the steering column lower coupling to the steering column upper coupling (Fig. 27). Install the coupling pinch bolt an tighten the pinch bolt nut to a torque of 28 N·m (250 in. lbs.). Install the pinch bolt retainer pin.

(14) Remove the steering wheel holder.

(15) While looking under the instrument panel at the lower coupling, rotate the steering wheel back-and-forth to verify that the lower coupling does not squeak against the dash-to-coupling seal.

STEERING WHEEL

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.

WARNING: ALLOW SYSTEM CAPACITOR TO DISCHARGE FOR 2 MINUTES BEFORE REMOVING ANY AIRBAG COMPONENTS.

(1) Adjust the steering wheel so that the tires are in the STRAIGHT-AHEAD position.

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(2) Disconnect and isolate the battery negative cable.

(3) Remove the two mounting screws, one on each side of steering wheel, attaching the driver airbag to the steering wheel (Fig. 34).

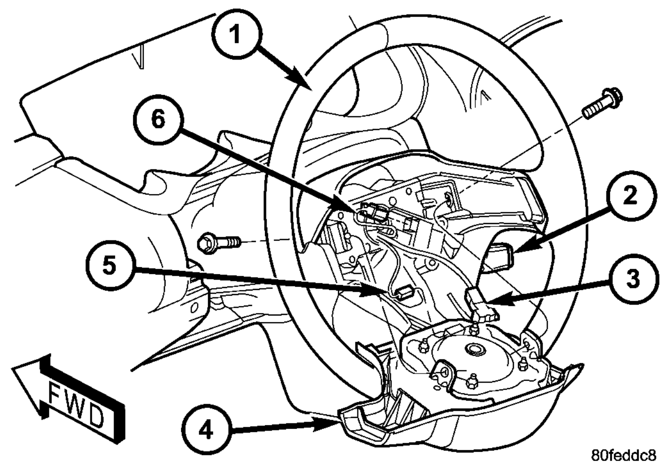

Fig. 34 Airbag Mounting And Wiring Connections

1 - STEERING WHEEL
2 - SPEED CONTROL SWITCH (IF EQUIPPED)
3 - AIRBAG SQUIB CONNECTOR
4 - DRIVER AIRBAG
5 - HORN SWITCH CONNECTOR
6 - SPEED CONTROL SWITCH CONNECTOR (IF EQUIPPED)

(4) Lay the driver airbag back away from the center of the steering wheel (Fig. 34). Disconnect the airbag squib and horn switch wiring connectors from the rear of the airbag. Remove the driver airbag from the steering wheel.

(5) If equipped with speed control, disconnect the wiring connector from the speed control switch (Fig. 34).

(6) Holding the steering wheel firmly in place, remove the steering wheel retaining screw from the steering column shaft (Fig. 35).

CAUTION: When installing a wheel puller on the steering wheel, be sure the puller bolts are fully seated in the threaded holes on the steering wheel. If the bolts are not fully seated in the threaded holes, the threads may be stripped out of the steering wheel when attempting to remove the steering wheel. Also, thread the retaining nut back on the end of the shaft until it is flush with the shaft end to avoid damage to the shaft threads by the wheel puller.

(7) Install a steering wheel puller on the steering wheel.

CAUTION: Do not bump or hammer on steering wheel or steering column shaft when removing steering wheel from steering column.

STEERING WHEEL (Continued)

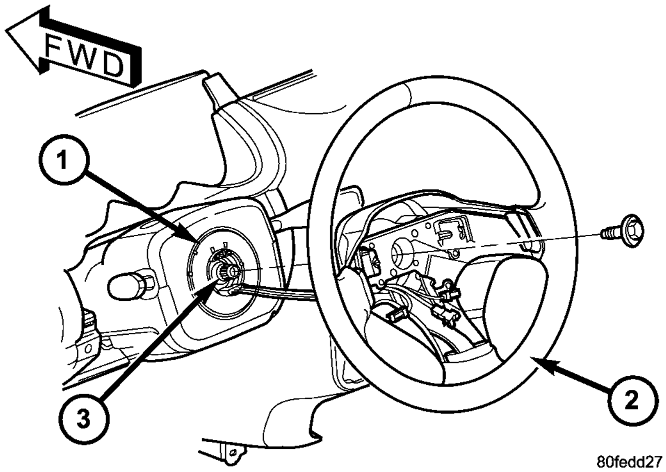

Fig. 35 Steering Wheel Mounting

1 - CLOCKSPRING
2 - STEERING WHEEL
3 - STEERING SHAFT

(8) While holding the steering wheel firmly in the STRAIGHT-AHEAD position, remove steering wheel from the steering column shaft using the puller. While removing the steering wheel, take care to feed the wires gently through the holes in the steering wheel.

(9) If equipped with speed control, remove the speed control switch.

INSTALLATION

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.

(1) Confirm that:

(a) The front wheels are positioned straight-ahead.

(b) The turn signal stalk is in the neutral position.

(2) If equipped with speed control, install the speed control switch on the steering wheel.

CAUTION: Do not install the steering wheel onto the shaft of the steering column by driving it onto the shaft.

(3) Feed the clockspring wiring leads through the hole in the steering wheel (Fig. 35). Align the steering wheel's wide mounting spline with the steering column shaft missing spline area and push the wheel onto the shaft. Make sure the clockspring squares up with the back of the wheel and does not bind.

(4) Install the steering wheel retaining screw and tighten it until the steering wheel is fully installed on shaft (Fig. 35). Tighten the retaining screw to a torque of 54.2 N·m (40 ft. lbs.).

(5) If equipped with speed control, connect the wiring lead from the clockspring to the speed control switch on the steering wheel (Fig. 34).

(6) Position the driver airbag near the steering wheel (Fig. 34). Connect the horn switch wiring lead to the connector on the back of the airbag.

(7) Install the airbag squib wiring lead from the clockspring into the connector on the back of the driver airbag (Fig. 34). Be sure the wiring connector is securely latched into the airbag connector.

CAUTION: The fasteners 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 it with only the correct fastener listed in the parts book.

(8) Install the driver airbag into the center of the steering wheel. Align the airbag mounting holes with the bolt holes in the steering wheel (Fig. 34). Install only the two original or identical replacement airbag module mounting screws. Tighten the two driver airbag attaching bolts to a torque of 10 N·m (90 in. lbs.).

WARNING: DO NOT CONNECT THE BATTERY NEGATIVE CABLE AT THIS TIME. REFER TO ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM FIRST. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

UPPER SHROUD

REMOVAL

(1) Remove lower instrument panel cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(2) Remove instrument cluster bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).

(3) Remove two column shroud retaining screws.

(4) Separate upper and lower steering column shrouds (Fig. 36) and remove from vehicle.

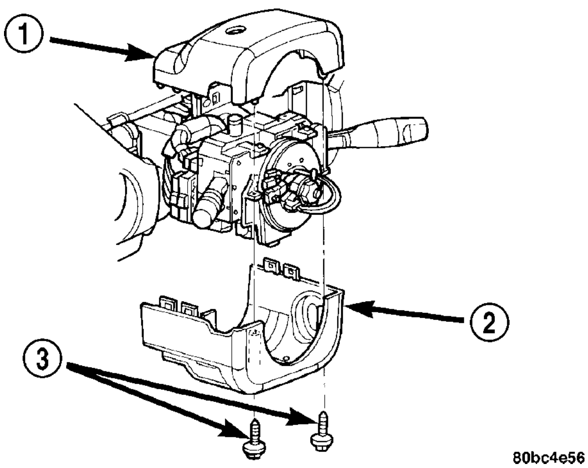

Fig. 36 Steering Column Shrouds

1 - UPPER SHROUD
2 - LOWER SHROUD
3 - MOUNTING SCREWS

INSTALLATION

(1) Connect the upper and lower steering column shrouds (Fig. 36).

(2) Install the two column shroud retaining screws.

(3) Install the instrument cluster bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(4) Remove lower instrument panel cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

GEAR

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GEAR

DESCRIPTION - POWER STEERING GEAR

The power steering gear is mounted on the front suspension crossmember (Fig. 1). The outer ends of the outer tie rods attach to the steering knuckles.

There are two different type power steering gears used on this vehicle, a standard, and an optional which is used on the R/T and SRT-4 vehicles. Externally the gears appear the same. Internally, the standard has a 16:1 turning ratio while the R/T / SRT-4 gear has an 18:1 turning ratio. The gear used on R/T and SRT-4 vehicles also has a restricted lateral (lock-to-lock) travel range to accommodate the wheel and tire combinations. Sport feel valve coding provides R/T and SRT-4 vehicles with more firm feel steering to match the performance tire compounding and construction.

NOTE: The power steering gear should not be serviced or adjusted. If a malfunction or oil leak occurs with the steering gear, the complete steering gear needs to be replaced.

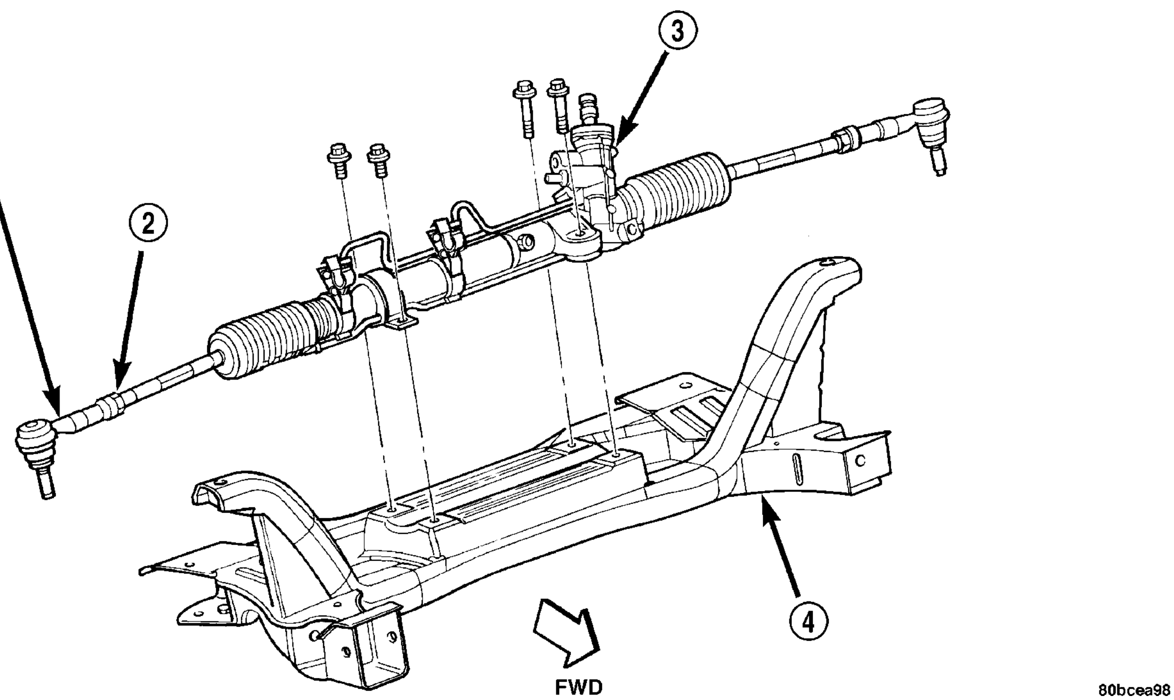

Fig. 1 Power Steering Gear

1 - OUTER TIE ROD
2 - JAM NUT
3 - STEERING GEAR
4 - FRONT SUSPENSION CROSSMEMBER

GEAR (Continued)

OPERATION - POWER STEERING GEAR

Turning of the steering wheel is converted into lateral (side-to side) travel through the meshing of the helical pinion teeth with the rack teeth located in the steering gear. This lateral travel pushes and pulls the tie rods to change the direction of the vehicle's front wheels.

Power assist is provided by a pump and is controlled by an open-center, rotary type control valve. It directs fluid to either side of the gear's integral steering rack piston. Depending on the rotation of the steering wheel, more fluid pressure is directed to one side of the rack piston compared to the other.

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 restricts fluid flow to one side of the integral rack piston and redirects fluid behind the other side of the integral rack piston, building up hydraulic pressure, thus assisting in the turning effort.

REMOVAL

REMOVAL - POWER STEERING GEAR

NOTE: Before proceeding with this procedure, (Refer to 19 - STEERING - WARNING).

(1) Place the steering wheel in the STRAIGHT-AHEAD position. Using a steering wheel holder, lock the steering wheel in place to keep it from rotating (Fig. 2). This keeps the clockspring in the proper orientation.

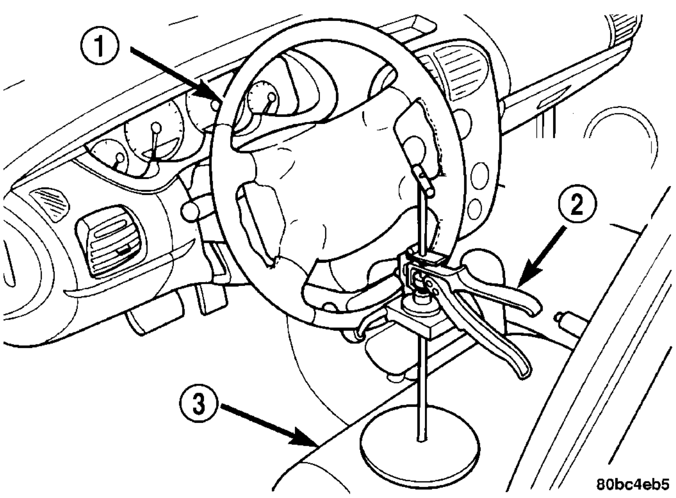

Fig. 2 Steering Wheel Holder (Typical)

1 - STEERING WHEEL
2 - STEERING WHEEL HOLDER
3 - DRIVERS SEAT

(2) Inside the passenger compartment, remove the steering column coupling retainer pin, back off the pinch bolt nut, and remove the steering column coupling pinch bolt (Fig. 3) (the pinch bolt nut is caged to the coupling and is not removable). Separate the upper and lower steering column couplings.

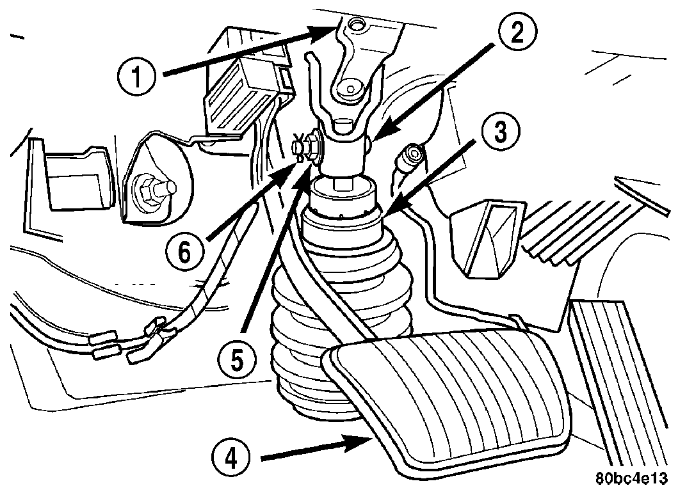

Fig. 3 Steering Column Couplings

1 - STEERING COLUMN UPPER COUPLING
2 - PINCH BOLT
3 - STEERING COLUMN LOWER COUPLING
4 - BRAKE PEDAL
5 - NUT
6 - RETAINER PIN

(3) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(4) Remove both front tire and wheel assemblies from the vehicle (Refer to 22 - TIRES/WHEELS - REMOVAL).

(5) Remove nuts attaching both outer tie rods to the steering knuckles (Fig. 4). Remove each nut by holding the tie rod stud stationary while loosening and removing the nut with a wrench.

(6) Remove the outer tie rod from the steering knuckles using Remover, Special Tool MB991113 (Fig. 5).

(7) Remove the tie rod heat shield.

(8) Release the locking tab on the wiring harness connector for the power steering fluid pressure switch before connector removal. Remove the wiring harness connector from the power steering fluid pressure switch (Fig. 6).

(9) Back out the tube nut securing the power steering fluid pressure hose to the gear.

(10) Loosen the clamp, then disconnect the fluid cooler hose from the gear.

(11) Open the routing clips on the front of the power steering gear and remove the power steering fluid pressure hose from the routing clips. At the

GEAR (Continued)

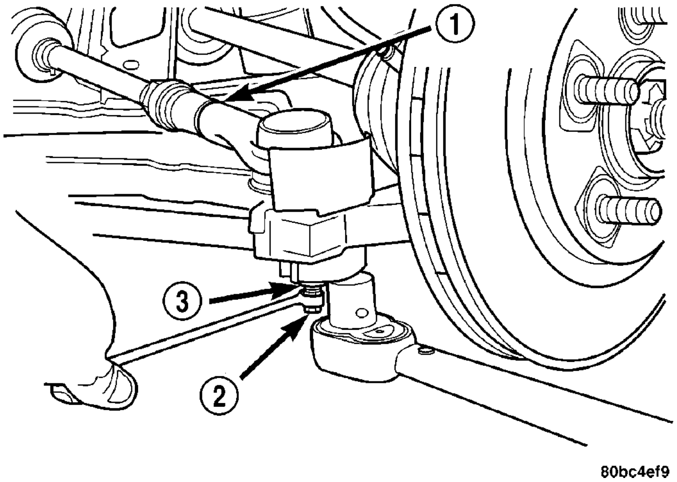

Fig. 4 Tools On Outer Tie Rod Nut

1 - OUTER TIE ROD
2 - STUD
3 - NUT

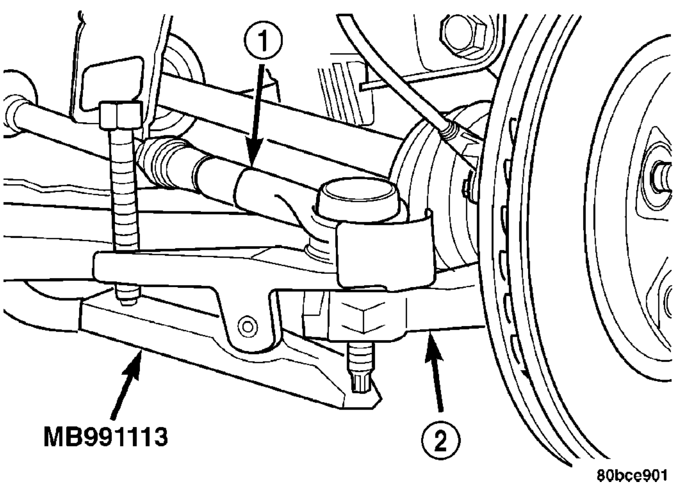

Fig. 5 Tie Rod Removal From Knuckle

1 - OUTER TIE ROD
2 - STEERING KNUCKLE

same time, remove the cooler tube from the right routing clip.

(12) Remove the two screws securing the cooler to the front suspension crossmember. They are located behind the cooler and can be accessed from above. Allow the cooler to hang out of the way.

(13) Remove the drive-belt splash shield fasteners. Remove the shield.

(14) Remove the pencil strut from the right front corner of the crossmember and body of the vehicle (Fig. 7). Remove the washer behind the strut from the torque strut bolt.

(15) Remove the bolts mounting the engine torque strut in place (Fig. 7), then remove the engine torque strut from the vehicle.

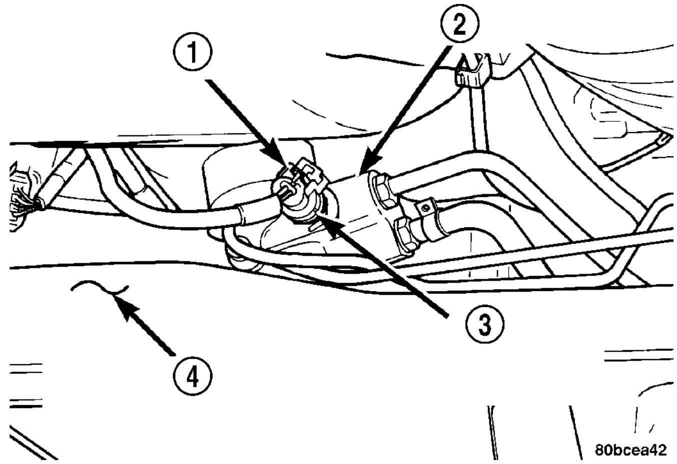

Fig. 6 Power Steering Fluid Pressure Switch

1 - WIRING HARNESS CONNECTOR
2 - POWER STEERING GEAR
3 - POWER STEERING FLUID PRESSURE SWITCH
4 - REAR OF FRONT SUSPENSION CROSSMEMBER

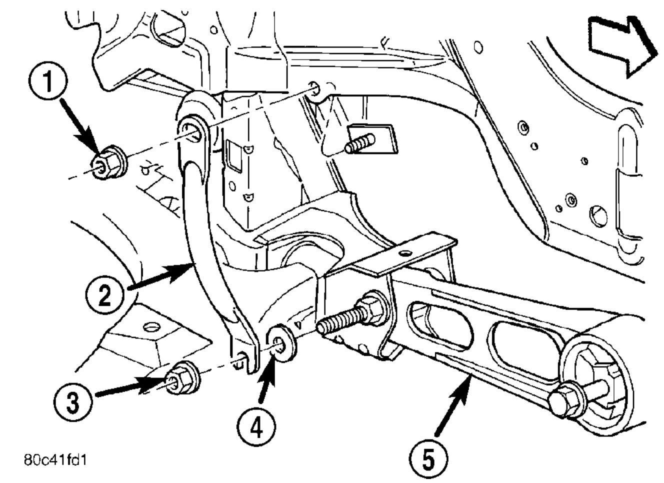

Fig. 7 Strut Mounting

1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT

NOTE: Before removing the front suspension crossmember from the vehicle, the location of the crossmember must be scribed on the body of the vehicle (Fig. 8). Do this so that the crossmember can be relocated upon reinstallation against the body of vehicle in the same location as before removal. If the front suspension crossmember is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) will be lost.

(16) Using an awl, scribe a line (Fig. 8) marking the location of where the front suspension crossmember is mounted against the body of the vehicle.

GEAR (Continued)

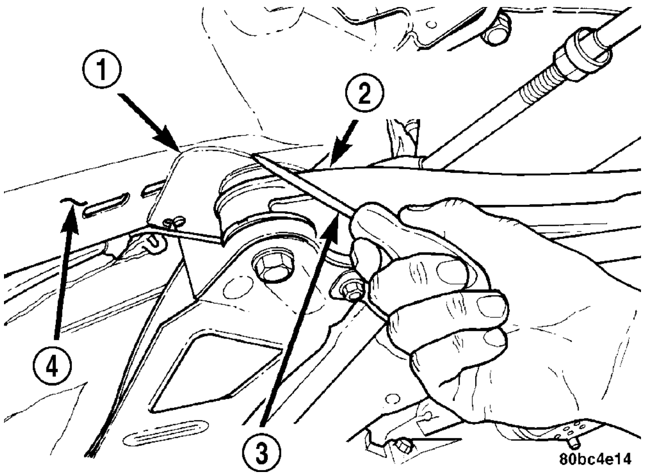

Fig. 8 Marking Crossmember Location

1 - SCRIBED LINE
2 - FRONT SUSPENSION CROSSMEMBER
3 - AWL
4 - BODY

(17) Position a transmission jack under the center of the front suspension crossmember and raise it to support the bottom of the crossmember.

(18) Loosen and completely remove the two front bolts (one right and one left) attaching the front suspension crossmember to the frame rails of vehicle. The right side bolt can be viewed in the mounting bolt figure (Fig. 9). The left side bolt is located in the same location on the other side of the vehicle.

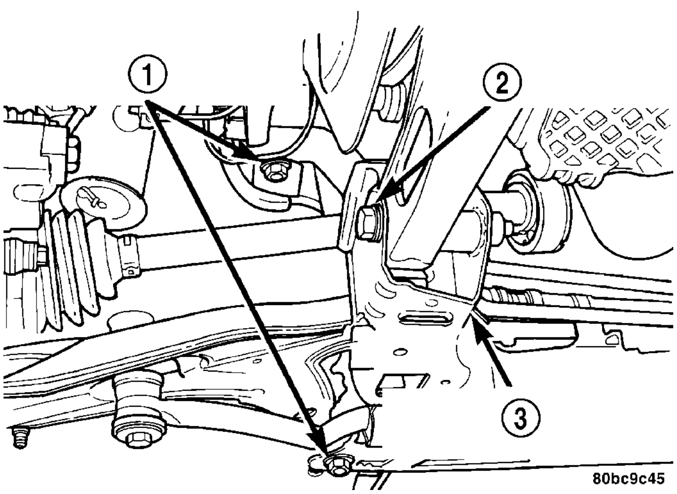

Fig. 9 Mounting Bolts

1 - FRONT SUSPENSION CROSSMEMBER MOUNTING BOLTS
2 - ENGINE TORQUE ISOLATOR STRUT MOUNTING BOLT
3 - FRONT SUSPENSION CROSSMEMBER

(19) Loosen the two rear bolts (one right and one left) attaching the front suspension crossmember and lower control arms to the body of the vehicle until they release from the threaded tapping plates in the body of the vehicle. Do not completely remove the rear bolts because they are designed to disengage from the body threads yet stay within the lower control arm rear isolator bushing. This allows the lower control arm to stay in place on the crossmember. The right side bolt can be viewed in the mounting bolt figure (Fig. 9). The left side bolt is located in the same location on the other side of the vehicle.

(20) Lower the front suspension crossmember using the transmission jack enough to allow the power steering gear to be removed from the rear of the crossmember (Fig. 10). When lowering front suspension crossmember, do not let crossmember hang from lower control arms. The weight should be supported by the transmission jack.

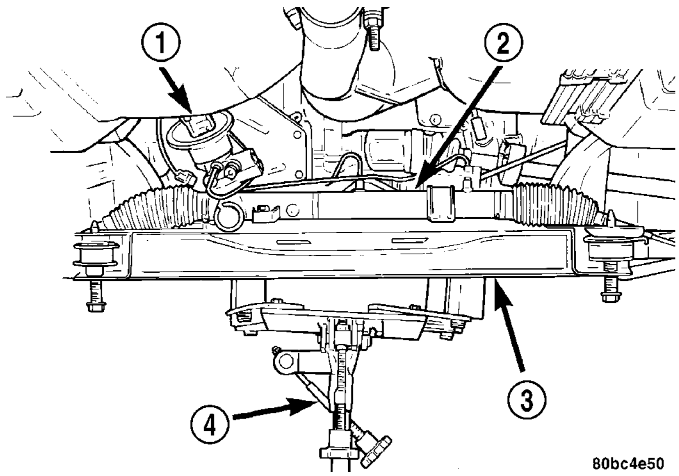

Fig. 10 Crossmember Lowered

1 - STEERING COLUMN LOWER COUPLING
2 - POWER STEERING GEAR
3 - FRONT SUSPENSION CROSSMEMBER
4 - TRANSMISSION JACK

(21) Remove the roll pin securing the steering column lower coupling to the power steering gear pinion shaft using a roll pin punch (Fig. 11). Push the steering column lower coupling up and off of the power steering gear pinion shaft.

(22) Release the pinion shaft dash cover seal from the tabs cast into the power steering gear housing and remove the seal from the power steering gear (Fig. 12).

(23) Loosen and remove the four bolts attaching the power steering gear to the front suspension crossmember (Fig. 1). Remove the power steering gear from the front suspension crossmember.

REMOVAL - RHD

Right-Hand-Drive power steering gear is typical of Left-Hand-Drive. (Refer to 19 - STEERING/GEAR - REMOVAL - LHD)

GEAR (Continued)

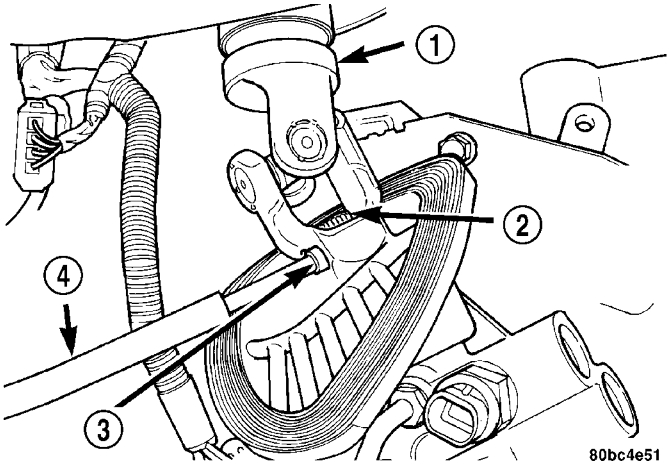

Fig. 11 Coupling Roll Pin

1 - STEERING COLUMN LOWER COUPLING
2 - POWER STEERING GEAR PINION SHAFT
3 - ROLL PIN
4 - ROLL PIN PUNCH

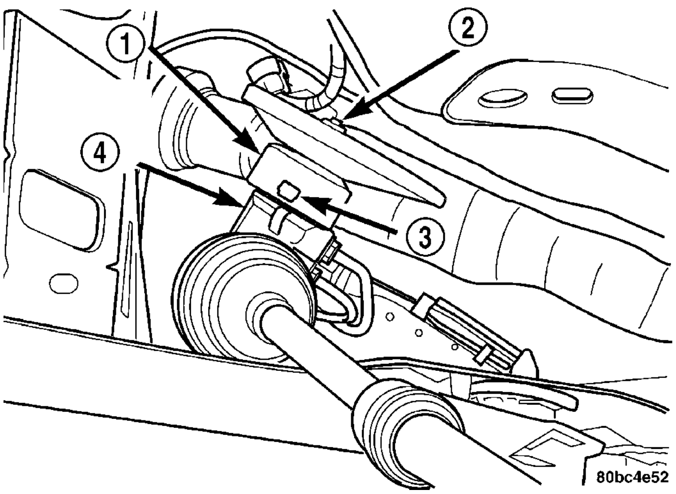

Fig. 12 Pinion Shaft Dash Cover Seal

1 - SEAL
2 - PINION SHAFT
3 - TAB
4 - POWER STEERING GEAR

INSTALLATION

INSTALLATION - POWER STEERING GEAR

(1) Install the steering gear on the front suspension crossmember (Fig. 1). Install the four power steering gear mounting bolts. Tighten the mounting bolts to a torque of 61 N·m (45 ft. lbs.).

(2) Install the pinion shaft dash cover seal over the power steering pinion shaft and onto the power steering gear housing. Align the holes on each side of the seal with the tabs cast into the power steering gear housing (Fig. 12).

(3) With the steering column lower coupling pushed partway up through its hole in the dash panel, match the flat on the inside of the steering column lower coupling to the flat on the power steering gear pinion shaft and slide the coupling onto the top of the pinion shaft. Align the roll pin hole in the coupling with the groove in the pinion shaft and install the roll pin through the coupling until it is centered (Fig. 11).

(4) Center the power steering gear rack in its travel.

(5) Using the transmission jack, raise the front suspension crossmember and power steering gear until the crossmember contacts its mounting spot against the body and frame rails of the vehicle. As the crossmember is raised, carefully guide the steering column lower coupling up through its hole in the dash panel.

(6) Start the two rear crossmember mounting bolts into the tapping plates mounted in the body. The right side bolt can be viewed in the mounting bolt figure (Fig. 9). The left side bolt is located in the same location on the other side of the vehicle. Next, install the two front mounting bolts attaching front suspension crossmember to frame rails of vehicle. Lightly tighten all four mounting bolts to a approximately 2 N·m (20 in. lbs.) to hold the front suspension crossmember in position.

NOTE: When reinstalling the front suspension crossmember back in the vehicle, it is very important that the crossmember be attached to the body in exactly the same spot as when it was removed. Otherwise, the vehicle's wheel alignment settings (caster and camber) will be lost.

(7) Using a soft face hammer, tap the front suspension crossmember back-and-forth or side-to-side until it is aligned with the previously scribed positioning marks on the body of the vehicle (Fig. 8). Once the front suspension crossmember is correctly positioned, tighten the rear two crossmember (and rear lower control arm) mounting bolts to a torque of 203 N·m (150 ft. lbs.), then tighten the front two crossmember mounting bolts to a torque of 142 N·m (105 ft. lbs.).

(8) Install the engine torque strut and mounting bolts (Fig. 7). To properly align and tighten the torque strut, (Refer to 9 - ENGINE/ENGINE MOUNTING/TORQUE STRUT - ADJUSTMENTS).

(9) Install the washer on the end of the stud extending from the torque strut bolt (Fig. 7).

(10) Install the pencil strut to the right front corner of the crossmember and body of the vehicle (Fig. 7). Tighten the pencil strut nuts to a torque of 58 N·m (43 ft. lbs.).

(11) Install the drive-belt splash shield and fasteners.

(12) Using a lint free towel, wipe clean the open power steering hose ends and the power steering

GEAR (Continued)

gear ports. Replace the pressure hose used O-ring with new. Lubricate the O-ring with power steering fluid.

(13) Attach the power steering fluid pressure hose to the pressure port on the power steering gear. Start the tube nut threads into the gear, but do not tighten them at this time. On vehicles equipped with a power steering fluid cooler, reconnect the cooler line to the gear in place of the power steering fluid return hose.

(14) Open the routing clips on the front of the steering gear housing and install the power steering fluid pressure hose into the routing clips.

(15) Place the cooler in mounting position and snap the cooler tube going to the gear into the right routing clip.

(16) Close both routing clips.

(17) Tighten the power steering fluid pressure hose tube nut at the gear to a torque of 34 N·m (25 ft. lbs.).

(18) Install the two screws securing the cooler to the front suspension crossmember. They are located behind the cooler.

(19) Place the hose clamp on the hose far enough from the end to clear the steel fitting on the gear. Do the same for the fluid return hose on a vehicle that is not equipped with a cooler.

(20) Push either hose listed in the above step onto the steel fitting, then move and secure the clamp on the hose past the bead on the steel fitting in the steering gears outlet port.

(21) Route the fluid return hose along the front of the steering gear, clipping it into place in the C-clamps on the outside of the routing clips on the front of the power steering gear housing.

(22) Reconnect the wiring harness connector from the power steering fluid pressure switch (Fig. 6). Be sure the locking tab on the wiring harness connector is securely latched.

(23) Perform the following to each outer tie rod:

- Place the tie rod heat shield on the knuckle's steering arm, aligning the hole in the shield with the hole in the knuckle and the tangs on the outside of the shield with the outside configuration of the steering arm. The shield should now be facing outboard, away from the power steering gear and tie rod (Fig. 4).
- Attach the outer tie rod end to its steering knuckle.
- Start the attaching nut onto the stud of the outer tie rod.
- While holding the stud of the tie rod stationary with a wrench, tighten the attaching nut (Fig. 4).
- Using a crowfoot wrench attached to a torque wrench, tighten the attaching nut to 55 N·m (40 ft. lbs.).

(24) Install the tire and wheel assemblies back on vehicle. Tighten the wheel mounting nuts to 135 N·m (100 ft. lbs.) torque.

(25) Lower the vehicle to ground level.

(26) Install the dash-to-lower coupling seal in place over the lower coupling's plastic collar.

NOTE: Verify that grease is present on the lip of the dash-to-coupling seal where it contacts the coupling's plastic collar.

(27) Inside the passenger compartment, **place the steering column in the full tilt-up position and secure the tilt lever**, then reconnect the steering column lower coupling to the steering column upper coupling (Fig. 3). Install the coupling pinch bolt and tighten the pinch bolt nut to a torque of 28 N·m (250 in. lbs.). Install the pinch bolt retainer pin.

(28) Remove the steering wheel holder.

(29) While looking under the instrument panel at the lower coupling, rotate the steering wheel back-and-forth to verify that the lower coupling does not squeak against the dash-to-coupling seal.

(30) Perform the POWER STEERING PUMP INITIAL OPERATION service procedure to properly fill and bleed the power steering system. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(31) Check for fluid leaks.

(32) Adjust the front toe setting on the vehicle. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

INSTALLATION - RHD

Right-Hand-Drive power steering gear is typical of Left-Hand-Drive. (Refer to 19 - STEERING/GEAR - INSTALLATION - LHD)

TIE ROD - OUTER

REMOVAL

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the tire and wheel assembly from the vehicle. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Loosen tie rod jam nut (Fig. 13). Thread the jam nut far enough up the inner tie rod to pull the collar away from the outer tie rod end. Pull the collar off the end of the outer tie rod.

(4) Remove the nut attaching the outer tie rod end to steering knuckle (Fig. 14). Remove the nut by holding the tie rod stud stationary while loosening and removing the nut with a wrench.

(5) Remove the outer tie rod from the steering knuckle using Remover, Special Tool MB991113 (Fig. 15).

TIE ROD - OUTER (Continued)

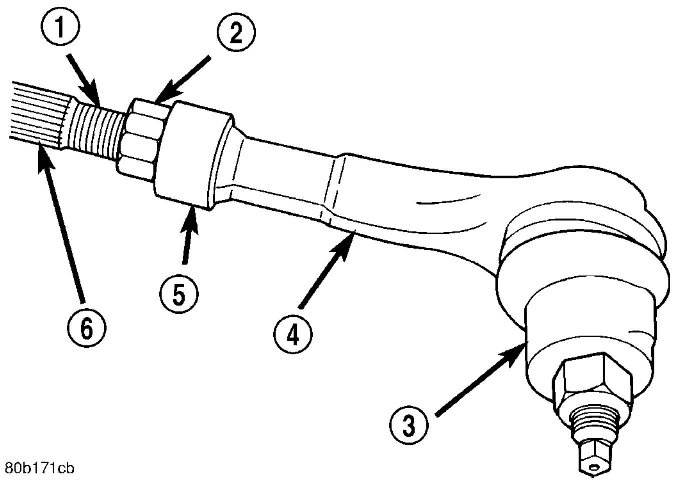

Fig. 13 Outer Tie Rod

1 - INNER TIE ROD
2 - OUTER TIE ROD JAM NUT
3 - STEERING KNUCKLE
4 - OUTER TIE ROD END
5 - COLLAR
6 - INNER TIE ROD SERRATION

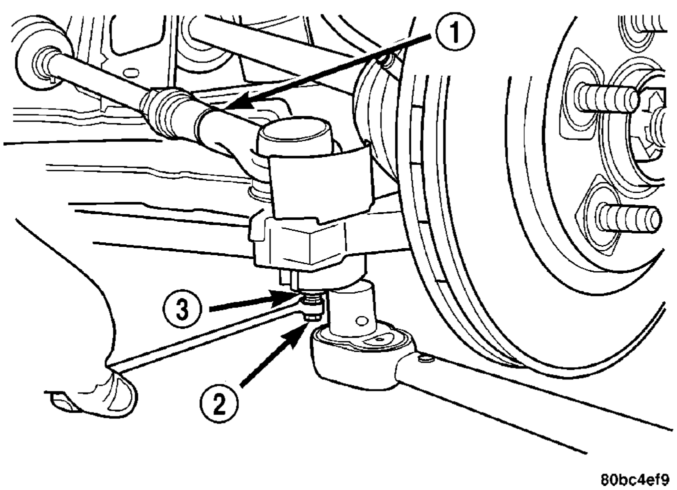

Fig. 14 Tools On Outer Tie Rod Nut

1 - OUTER TIE ROD
2 - STUD
3 - NUT

(6) Remove the tie rod heat shield.

(7) Remove the outer tie rod from the inner tie rod by unthreading it.

INSTALLATION

(1) Install the jam nut on the inner tie rod threads if it is not already installed (Fig. 13).

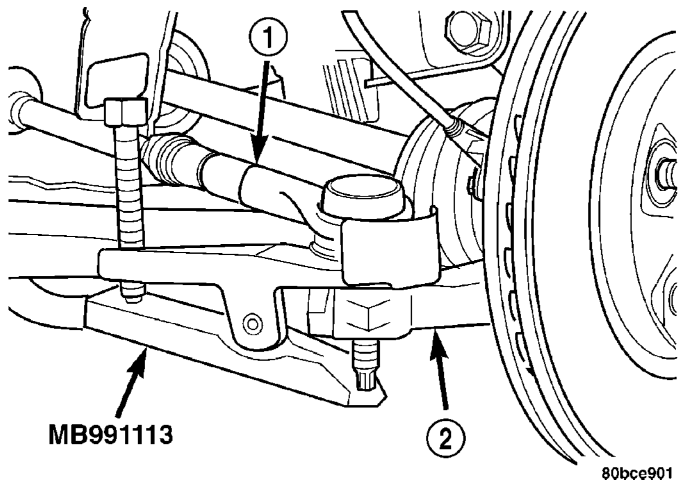

Fig. 15 Tie Rod Removal From Knuckle

1 - OUTER TIE ROD
2 - STEERING KNUCKLE

NOTE: Be sure the collar is installed on the inner tie rod with the flat end of the collar against jam nut and the open end of the collar facing the outer tie rod end.

(2) Install the collar on the inner tie rod (Fig. 13).

(3) Thread the outer tie rod onto the inner tie rod.

(4) Position the collar around the end of the outer tie rod (Fig. 13).

(5) Thread the jam nut down the inner tie rod far enough to hold the collar in place on the outer tie rod. Do not tighten the jam nut.

(6) Place the tie rod heat shield on the knuckle's steering arm, aligning the hole in the shield with the hole in the knuckle and the tangs on the outside of the shield with the outside configuration of the steering arm. The shield should now be facing outboard, away from the power steering gear and tie rod (Fig. 14).

(7) Attach the outer tie rod end to the steering knuckle.

(8) Start the attaching nut onto the stud of the outer tie rod.

(9) While holding the stud of the tie rod stationary with a wrench, tighten the attaching nut (Fig. 14).

(10) Using a crowfoot wrench attached to a torque wrench, tighten the attaching nut to 75 N·m (55 ft. lbs.).

(11) Install the tire and wheel assembly(Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel nut to a torque of 135 N·m (100 ft. lbs.).

(12) Lower the vehicle.

(13) Adjust the front toe setting on the vehicle. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

POWER STEERING PRESSURE SWITCH

DESCRIPTION

A power steering pressure switch is used to improve the vehicle's idle quality. The pressure switch improves vehicle idle quality by causing a readjustment of the engine idle speed as necessary when increased fluid pressure is sensed in the power steering system.

The pressure switch functions by signaling the powertrain control module that an increase in pressure of the power steering system is putting additional load on the engine. This type of condition exists when the front tires of the vehicle are turned while the vehicle is stationary and the engine is at idle speed. When the powertrain control module receives the signal from the power steering pressure switch, it directs the engine to increase its idle speed. This increase in 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 (Fig. 16).

OPERATION

The switch 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 2758 kPa (400 psi), the switch is open. The PCM increases idle air flow through the IAC motor to prevent engine stalling. The PCM sends 12 volts through a resister to the sensor circuit to ground. When pump pressure is low, the switch is closed.

REMOVAL

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Disconnect negative battery cable from the negative post of the battery. Be sure cable is isolated from negative post on battery.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Locate the power steering fluid pressure switch on the back side of the power steering gear (Fig. 16).

(4) Remove the vehicle wiring harness connector from the power steering fluid pressure switch.

NOTE: When removing and installing the power steering pressure switch, use a 7/8 inch deep well socket. The deep well socket will prevent damage to the plastic electrical connector area of the power steering fluid pressure switch.

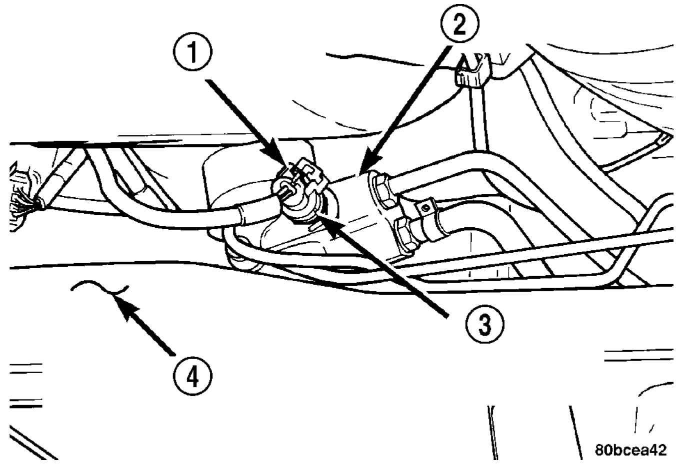

Fig. 16 Switch Location

1 - WIRING HARNESS CONNECTOR
2 - POWER STEERING GEAR
3 - POWER STEERING FLUID PRESSURE SWITCH
4 - REAR OF FRONT SUSPENSION CROSSMEMBER

(5) Unscrew and remove the power steering fluid pressure switch from the power steering gear.

INSTALLATION

(1) By hand, screw the power steering pressure switch into the power steering gear until it is fully seated (Fig. 16). Tighten the power steering pressure switch to a maximum torque of 8 N·m (70 in. lbs.). Over-torquing will result in stripping the threads out of the power steering pressure switch port in the steering gear.

(2) Install the vehicle wiring harness connector. Be sure the latch on the wiring harness connector is fully engaged with the locking tab on the power steering pressure switch.

(3) Lower the vehicle.

(4) Fill the power steering fluid reservoir to the correct fluid level. (Refer to 19 - STEERING/PUMP/FLUID - STANDARD PROCEDURE)

(5) Connect the negative cable to the negative post of the battery.

(6) Start the engine and turn the steering wheel several times stop-to-stop to bleed any air from the fluid in the power steering system. Stop the engine, check the fluid level, and inspect the system for leaks.

PUMP

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PUMP

DESCRIPTION - POWER STEERING PUMP

The hydraulic pressure for operation of the power steering gear is provided by a belt driven power steering pump (Fig. 1) (Fig. 2). All applications use a constant flow rate and displacement vane-type power steering pump that is located on the front corner of the engine.

No repair procedures are to be done on the internal components of the power steering pump. The only serviceable components of the power steering pump are the power steering pump pulley and the pump itself. The power steering fluid reservoir is serviced with the pump.

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 pumps that are the correct replacement for that specific application.

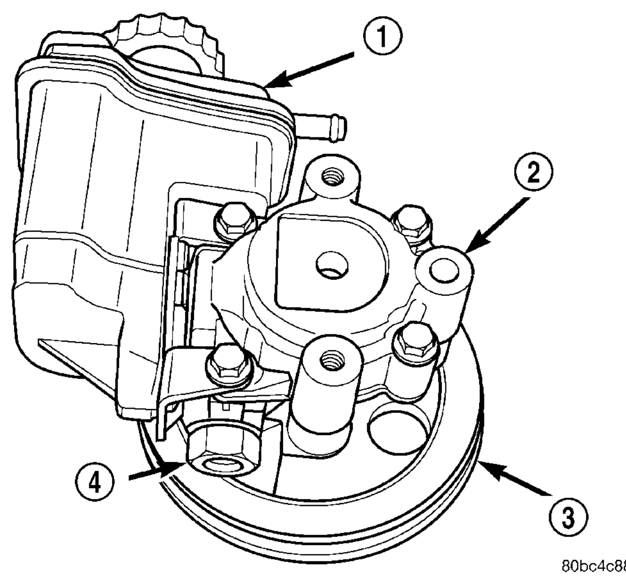

Fig. 1 Power Steering Pump - 2.0L Engine

1 - POWER STEERING FLUID RESERVOIR
2 - POWER STEERING PUMP
3 - PULLEY
4 - PUMP PRESSURE FITTING

PUMP (Continued)

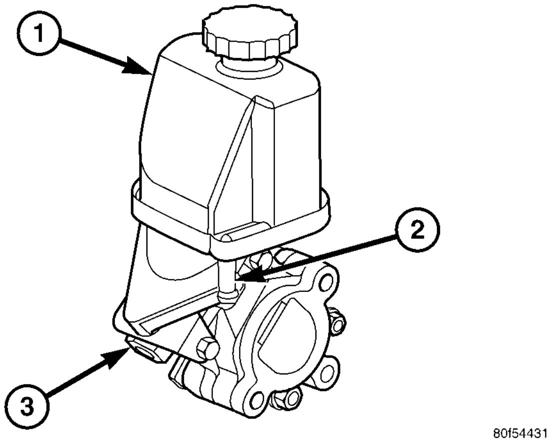

Fig. 2 Power Steering Pump - 2.4L Turbo

1 - RESERVOIR
2 - RETURN FITTING
3 - PRESSURE FITTING

STANDARD PROCEDURE - POWER STEERING PUMP INITIAL OPERATION

WARNING: THE FLUID LEVEL SHOULD BE CHECKED AND ADJUSTED WITH THE ENGINE OFF TO PREVENT INJURY FROM MOVING ENGINE COMPONENTS.

CAUTION: Use only Mopar® ATF+4 Automatic Transmission Fluid (MS-9602) in the power steering system. Do not overfill.

(1) Fill the power steering fluid reservoir to the proper level, then let the fluid settle for at least two minutes. (Refer to 19 - STEERING/PUMP/FLUID - STANDARD PROCEDURE - POWER STEERING FLUID LEVEL CHECKING)

(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.

REMOVAL

REMOVAL - POWER STEERING PUMP (2.0L ENGINE)

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Remove battery cable from the negative post on the battery.

(2) Siphon as much fluid as possible from the power steering fluid reservoir.

(3) Remove the power steering pump drive belt from the power steering pump pulley. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)

(4) Remove the hose clamp securing the return hose to the power steering fluid reservoir. Slide the hose off the end of the reservoir fitting (Fig. 3).

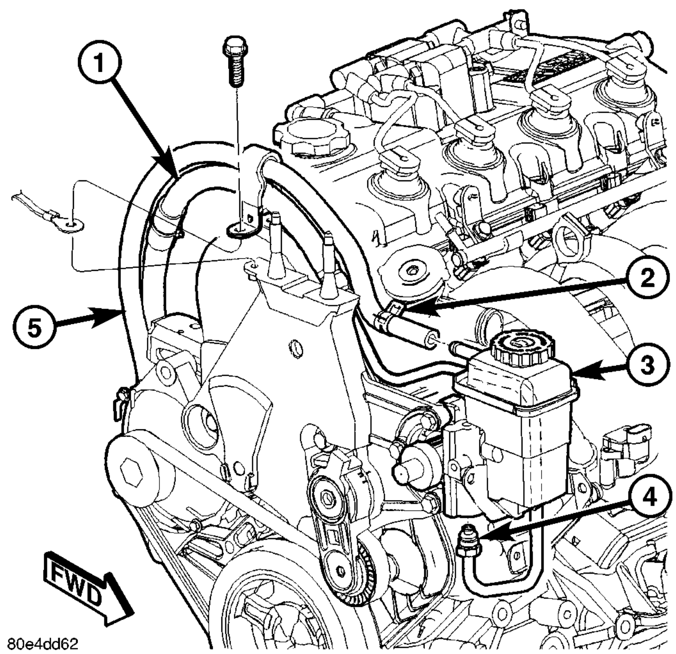

Fig. 3 Power Steering Hoses At Pump - 2.0L Engine

1 - PRESSURE HOSE
2 - HOSE CLAMP
3 - POWER STEERING PUMP AND RESERVOIR
4 - TUBE NUT
5 - RETURN HOSE

(5) Back out the tube nut securing the power steering fluid pressure hose to the power steering pump (Fig. 3), then remove the hose from the pump.

(6) Remove the mounting bolt securing the support bracket to the rear of the power steering pump (Fig. 4).

(7) Loosen the two mounting bolts securing the support bracket to the engine block (Fig. 4).

PUMP (Continued)

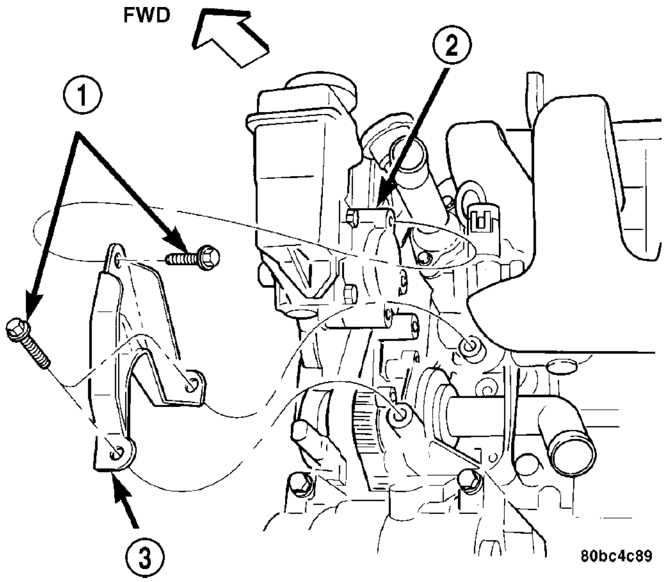

Fig. 4 Power Steering Pump Support Bracket

1 - MOUNTING BOLTS
2 - POWER STEERING PUMP
3 - SUPPORT BRACKET

(8) Remove the three mounting bolts holding the power steering pump to the cast bracket (Fig. 5). Access to the mounting bolts can be achieved through the holes in the pump pulley.

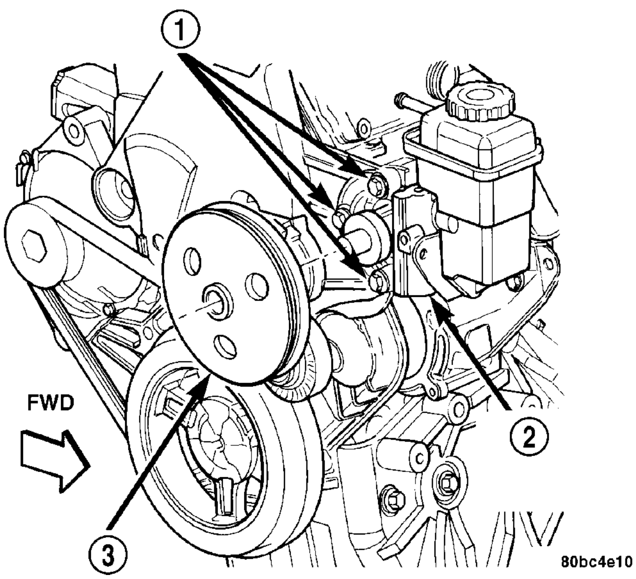

Fig. 5 Power Steering Pump Mounting Bolts

1 - MOUNTING BOLTS
2 - POWER STEERING PUMP
3 - PULLEY

NOTE: It may be necessary to remove the screw holding the A/C line routing clamp to the radiator upper closure panel (Fig. 6).

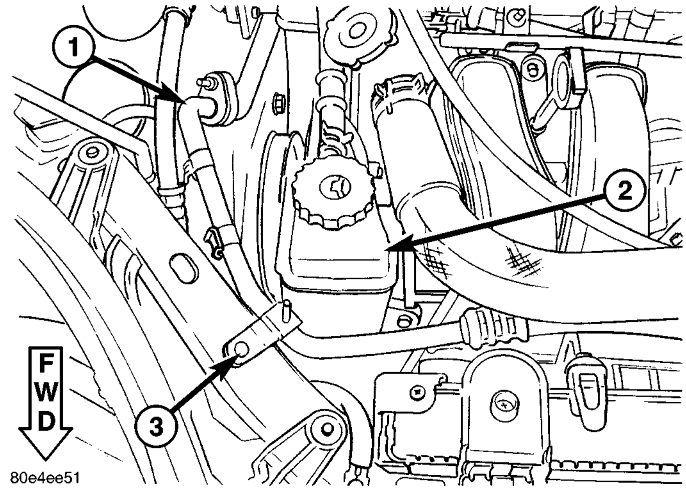

Fig. 6 A/C Line Routing Near Power Steering Pump

1 - A/C LINE
2 - POWER STEERING PUMP RESERVOIR
3 - ROUTING CLAMP SCREW

(9) Remove the power steering pump with reservoir from the engine.

(10) For transferal of the power steering pump pulley, (Refer to 19 - STEERING/PUMP - DISASSEMBLY).

REMOVAL - 2.4L TURBO ENGINE

(1) Siphon as much fluid as possible from power steering fluid reservoir.

(2) Raise vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove right front tire and wheel assembly.

(4) Remove accessory drive belt splash shield.

(5) Remove accessory drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELT - REMOVAL)

(6) Remove upper (of three) mounting bolt securing power steering pump in place (Fig. 9).

(7) Lower vehicle.

(8) Remove bolt securing fluid pressure hose routing clamp to engine (Fig. 7).

(9) Remove clamp securing fluid return hose to pump reservoir (Fig. 8), then remove hose from reservoir fitting. Cap off hose end and reservoir fitting.

PUMP (Continued)

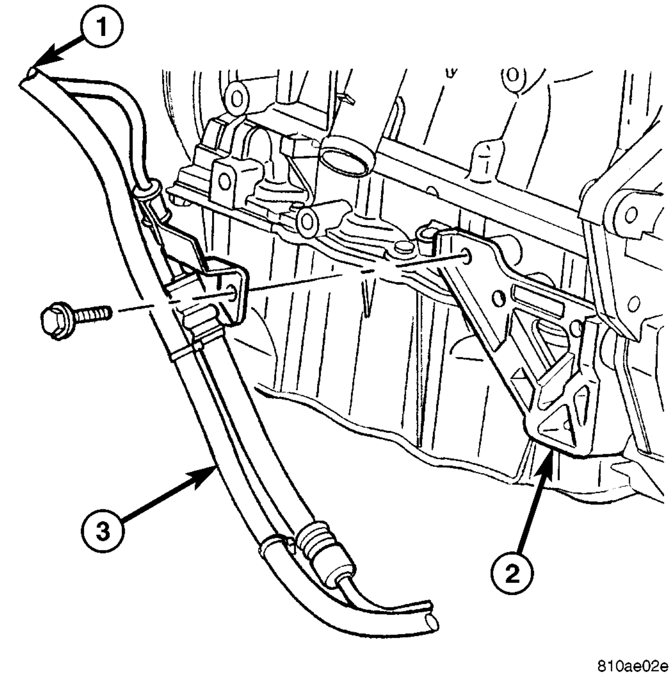

Fig. 7 Power Steering Hoses At Engine - 2.4L Turbo

1 - TO POWER STEERING PUMP
2 - ENGINE
3 - PRESSURE/RETURN HOSE ASSEMBLY

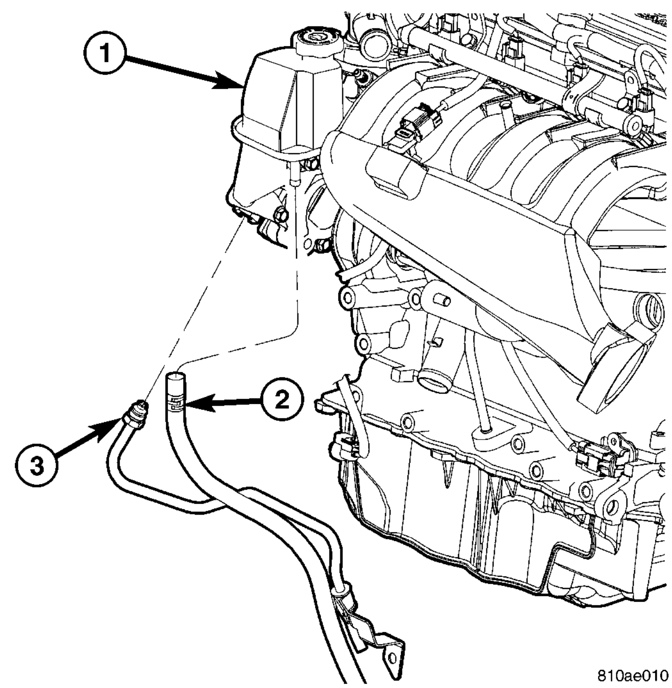

Fig. 8 Power Steering Hoses At Pump - 2.4L Turbo

1 - POWER STEERING PUMP
2 - RETURN HOSE CLAMP
3 - PRESSURE HOSE TUBE NUT

(10) Back out tube nut securing fluid pressure hose to power steering pump and remove hose from pump (Fig. 8). Cap off hose end and pump pressure port.

(11) Remove two remaining (lower) mounting bolts securing power steering pump in place (Fig. 9).

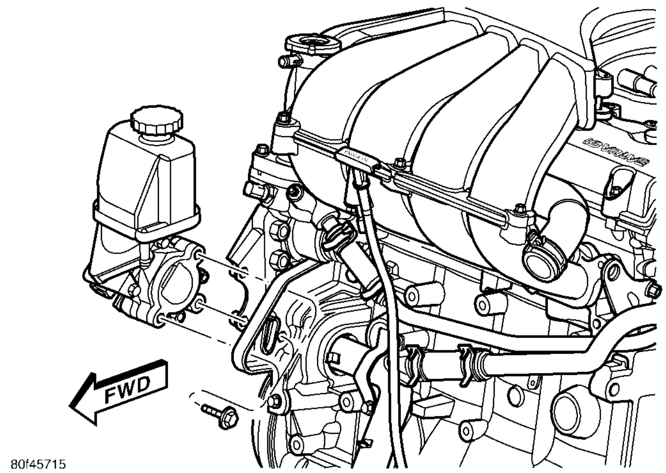

Fig. 9 Pump Mounting - 2.4L Turbo

(12) Remove lower bolt and loosen (do not remove) upper bolt securing stamped steel support bracket to engine block (Fig. 10).

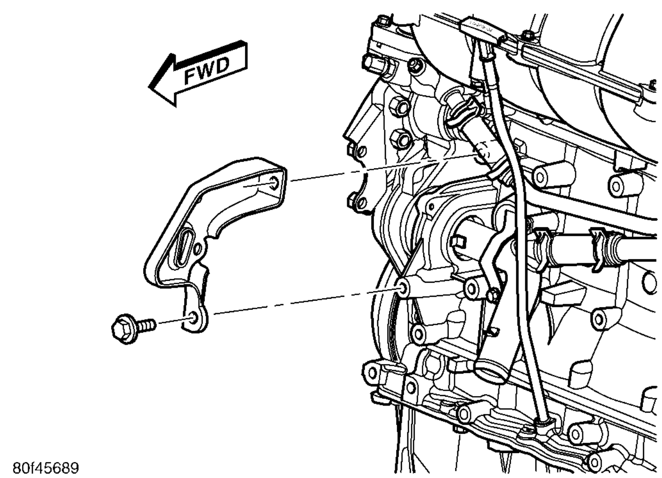

Fig. 10 Bracket Mounting To Engine - 2.4L Turbo

(13) Remove power steering pump with pulley and reservoir attached.

PUMP (Continued)

DISASSEMBLY - POWER STEERING PUMP (PULLEY)

NOTE: The only serviceable part of the power steering pump is the pulley. Use the following procedure for removal of the pulley from the pump.

NOTE: The power steering pump must be removed from the vehicle for power steering pump pulley service. (Refer to 19 - STEERING/PUMP - REMOVAL)

CAUTION: Use care when removing and installing the power steering pump pulley. It is made of plastic composite, except for the center shank. The special tools are to be used in the shank area only as described in the following procedure.

CAUTION: Do not hammer on the power steering pump pulley or shaft to remove the power steering pump pulley. Damage to the pulley and the power steering pump can occur.

(1) Install Puller, Special Tool C-4333, or an equivalent, on the steering pump pulley as shown (Fig. 11). Tighten the puller screw drive and remove the pulley from the power steering pump shaft.

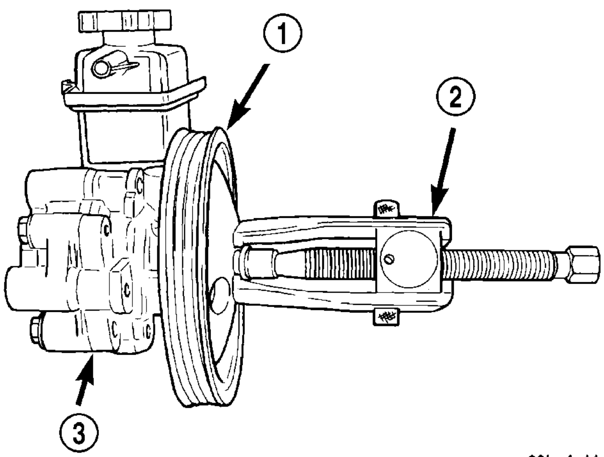

Fig. 11 Pulley Removal

1 - PULLEY
2 - C-4333
3 - POWER STEERING PUMP

NOTE: Replace the power steering pump pulley if it is cracked or loose.

(2) Remove the puller from the power steering pump pulley.

NOTE: For installation of the pulley, (Refer to 19 - STEERING/PUMP - ASSEMBLY).

ASSEMBLY - POWER STEERING PUMP (PULLEY)

CAUTION: Use care when removing and installing the power steering pump pulley. It is made of plastic composite, except for the center shank. The special tools are to be used in the shank area only as described in the following procedure.

(1) Place the power steering pump pulley squarely on end of the power steering pump shaft. Mount Installer, Special Tool C-4063, or an equivalent, in the internal threads of the power steering pump shaft and against power steering pump pulley (Fig. 12).

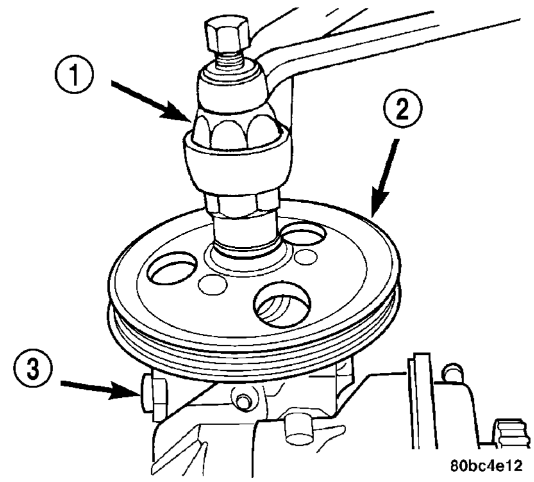

Fig. 12 Pulley Installation

1 - C-4063
2 - PULLEY
3 - POWER STEERING PUMP

(2) Ensuring that the installer and the pulley remain aligned with pump shaft, turn the installer outer nut and force the pulley onto the power steering pump shaft until it is flush with the end of the pump shaft. Once the pulley is flush with the end of the shaft, the installer outer nut will no longer be able to turn.

(3) Remove the installer from the power steering pump.

(4) Install the power steering pump back on the engine. (Refer to 19 - STEERING/PUMP - INSTALLATION)

INSTALLATION

INSTALLATION - POWER STEERING PUMP (2.0L ENGINE)

(1) Install the power steering pump with reservoir and pulley on the engine and install the three mounting bolts securing the pump to the cast bracket

PUMP (Continued)

(Fig. 5). Tighten the three bolts to a torque of 28 N·m (250 in. lbs.).

(2) Install the mounting bolt securing the support bracket to the rear of the power steering pump (Fig. 4). Do not completely tighten the bolt at this time.

(3) Install the two mounting bolts securing the support bracket to the engine block (Fig. 4). Tighten the bolts to a torque of 54 N·m (40 ft. lbs.).

(4) Tighten the mounting bolt securing the support bracket to the rear of the power steering pump to a torque of 28 N·m (250 in. lbs.).

(5) Install the power steering pump drive belt on the power steering pump pulley. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(6) Using a lint free towel, wipe clean all open power steering hose ends and power steering pump fittings.

(7) Install a new O-ring on the end of the power steering pressure hose. Lubricate the O-ring using clean power steering fluid.

(8) Attach the power steering fluid pressure hose to the pressure fitting on the lower end of the power steering pump (Fig. 3). Thread the tube nut securing the power steering fluid pressure hose into the power steering pump pressure fitting. Tighten the tube nut to at torque of 34 N·m (25 ft. lbs.).

(9) Slide the power steering fluid return hose onto the fluid reservoir fitting (Fig. 3). Position the hose clamp so it is installed on the hose past the bead formed into the fluid reservoir fitting.

(10) If previously disconnected, attach the A/C line routing clamp to the radiator upper closure panel (Fig. 6).

(11) Perform the POWER STEERING PUMP INITIAL OPERATION procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(12) Check for leaks.

INSTALLATION - 2.4L TURBO ENGINE

(1) Using a lint free towel, wipe clean open power steering pressure hose end and power steering pump pressure port. Replace any used O-rings with new. Lubricate O-ring with clean power steering fluid.

(2) Install power steering pump with pulley and reservoir into its mounting area in same fashion it was removed.

(3) Place pump in mounting position with stamped steel support bracket behind it. Hand start all three pump mounting bolts through bracket and pump, and thread into engine cover (Fig. 9). DO NOT TIGHTEN BOLTS AT THIS TIME.

(4) Install removed bolt fastening support bracket to engine block (Fig. 10). Tighten both bolts to 54 N·m (40 ft. lbs.) torque.

(5) Tighten two lower pump mounting bolts (Fig. 9) to 28 N·m (250 in. lbs.) torque.

(6) Thread pressure hose tube nut into pump pressure fitting (Fig. 8). Tighten tube nut to 34 N·m (25 ft. lbs.) torque.

(7) Install fluid return hose onto power steering fluid reservoir return fitting (Fig. 8). Expand hose clamp and slide it over hose and pump return fitting. Secure clamp once it is past bead formed into fluid reservoir fitting.

(8) Install bolt securing fluid pressure hose routing clamp to engine (Fig. 7).

(9) Raise vehicle.

(10) Tighten upper pump mounting bolt (Fig. 9) to 28 N·m (250 in. lbs.) torque.

(11) Install accessory drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

(12) Install accessory drive belt splash shield.

(13) Install right front tire and wheel assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts to 135 N·m (100 ft. lbs.) torque.

(14) Lower vehicle.

(15) Perform POWER STEERING PUMP INITIAL OPERATION procedure to properly fill and bleed power steering system. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(16) Check for leaks.

SPECIFICATIONS

POWER STEERING PUMP FLOW

DESCRIPTION	SPECIFICATION
Flow At 1500 RPM And Minimum Pressure	5.67 – 6.43 Liters/Min. 1.5 – 1.7 GPM
Control Valve Relief Pressure	9308 – 9998 kPa 1350 – 1450 psi

FLUID

STANDARD PROCEDURE - POWER STEERING FLUID LEVEL CHECKING

WARNING: FLUID LEVEL SHOULD BE CHECKED WITH THE ENGINE OFF TO PREVENT PERSONAL INJURY FROM MOVING PARTS.

CAUTION: Use only Mopar® ATF+4 Automatic Transmission Fluid (MS-9602) in the power steering system. Do not overfill the system.

FLUID (Continued)

The power steering fluid level can be viewed on the dipstick attached to the filler cap. Before opening the power steering system, wipe the reservoir filler cap free of dirt and debris. Remove the cap and check the fluid level on the dipstick. When the fluid is at normal ambient temperature, approximately 21°C to 27°C (70°F to 80°F), the fluid level should register between the ADD and FULL markings on the dipstick. The optimum level is at the FULL line.

FLUID COOLER

DESCRIPTION

All models of this vehicle are equipped with a cooler for the power steering system fluid (Fig. 13). The purpose of the cooler is to keep the temperature of the power steering system fluid from rising to a level that would affect the performance of the power steering system.

The power steering fluid cooler is located at the front of the front suspension crossmember. It is mounted to the crossmember top surface using 2 fasteners.

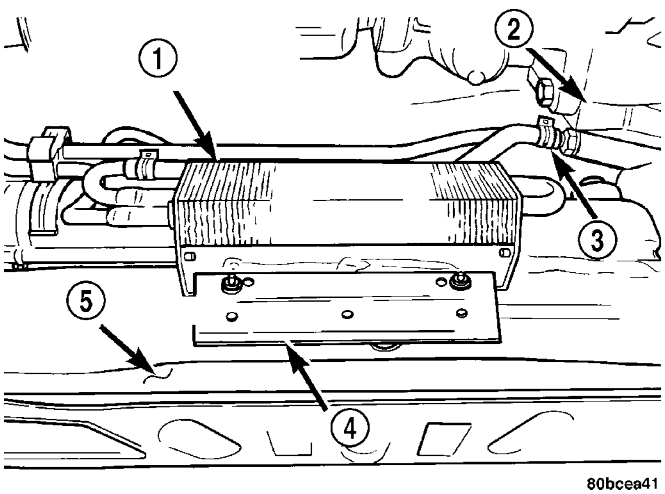

Fig. 13 Power Steering Fluid Cooler

1 - POWER STEERING FLUID COOLER
2 - TRANSAXLE
3 - CLAMP
4 - AIR DAM
5 - CROSSMEMBER

The cooler is placed in series with the power steering fluid return hose, between the steering gear fluid outlet port and the fluid return hose leading to the power steering fluid reservoir. The power steering gear has a steel fitting attached to its outlet port that a short hose leading to the cooler is pushed onto. This hose is secured to both the steering gear outlet fitting and the cooler using standard adjustable clamps. The cooler is secured to the power steering fluid return hose using a standard adjustable clamp.

OPERATION

The cooler used on this vehicle is referred to as a fluid-to-air type cooler. This means that the air flow across the tubes of the cooler is used to extract the heat from the cooler which it has absorbed from the power steering fluid flowing through it. Utilizing a small air dam mounted to its base to redirect air across its coils, the cooler lowers the temperature of the power steering fluid prior to it entering the power steering fluid reservoir where it is resupplied to the power steering pump.

REMOVAL

REMOVAL - 2.0L ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Siphon as much fluid as possible from the power steering fluid reservoir.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Remove the hose clamp attaching the power steering fluid return hose to the power steering fluid cooler. Remove the return hose from the cooler.

(4) Remove the hose clamp attaching the power steering cooler fluid hose to the steel fitting in the power steering gear outlet port (Fig. 14) (Fig. 15).

(5) Remove the two screws securing the cooler to the front suspension crossmember (Fig. 14) (Fig. 15).

(6) On LHD vehicles, open the tube routing clamp on the right front of the power steering gear housing and remove the cooler tube from it.

(7) Remove the cooler from the vehicle.

REMOVAL - 2.4L TURBO ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Siphon as much fluid as possible from power steering fluid reservoir.

(2) Raise vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove hose clamp securing return hose to power steering cooler tube (Fig. 21). Slide hose off end of tube. Cap off hose end and cooler tube.

(4) Remove hose clamp securing cooler hose to power steering gear return outlet tube/fitting (Fig. 21). Slide hose off end of tube. Cap off hose end and outlet tube.

(5) Remove fasteners securing cooler to crossmember.

(6) Remove cooler from vehicle.

FLUID COOLER (Continued)

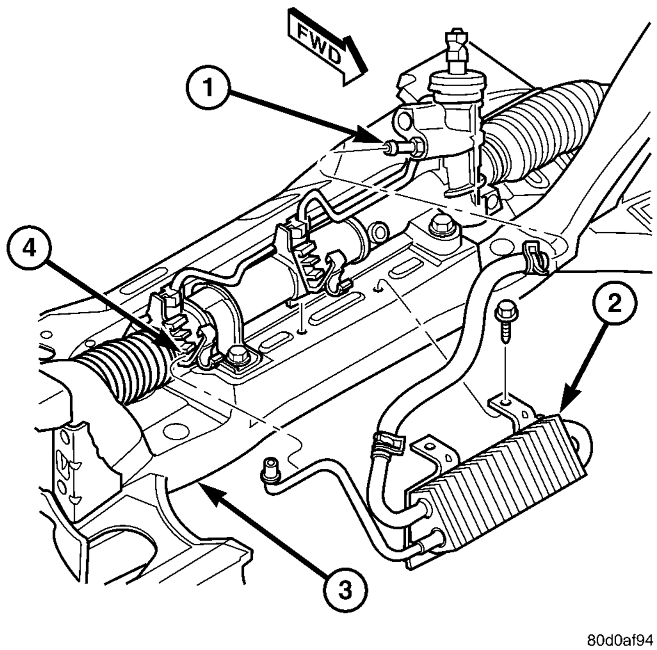

Fig. 14 Power Steering Cooler - LHD

1 - STEERING GEAR OUTLET FITTING
2 - POWER STEERING COOLER
3 - FRONT SUSPENSION CROSSMEMBER
4 - TUBE CLAMP

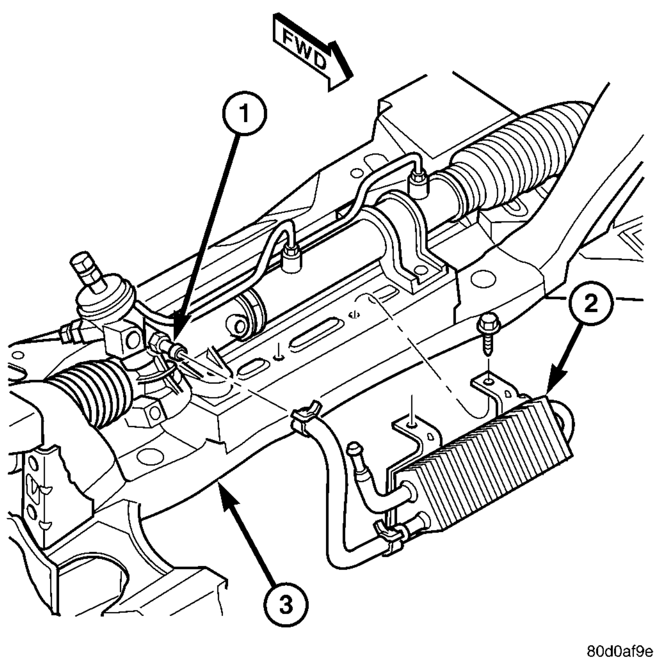

Fig. 15 Power Steering Cooler - RHD

1 - STEERING GEAR OUTLET FITTING
2 - POWER STEERING COOLER
3 - FRONT SUSPENSION CROSSMEMBER

INSTALLATION

INSTALLATION - 2.0L ENGINE

(1) Slide a hose clamp onto the end of the power steering cooler inlet hose (gear end) far enough to clear the steel fitting on the power steering gear once the hose is installed.

(2) On LHD vehicles, align the cooler outlet tube with the open tube routing clamp on the right front of the power steering gear housing (Fig. 14), and snap it into place. Close the clamp.

(3) Slide the hose (with cooler attached) onto the steering gear outlet fitting (Fig. 14) (Fig. 15).

(4) Install the hose clamp on the power steering cooler fluid hose past the bead formed into the steel fitting and secure in place.

(5) Install the two screws attaching the cooler to the front suspension crossmember (Fig. 14) (Fig. 15). Tighten the cooler attaching screws to a torque of 10 N·m (90 in. lbs.).

(6) Install the power steering fluid return hose on the power steering fluid cooler outlet tube. Install the hose clamp on the power steering return hose securing it to the power steering cooler. Be sure the hose clamp is installed on the return hose past the bead on the end of the cooler tube.

(7) Lower the vehicle.

(8) Perform the POWER STEERING PUMP INITIAL OPERATION procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(9) Check for leaks at all connections.

INSTALLATION - 2.4L TURBO ENGINE

(1) Position power steering fluid cooler on crossmember and install fasteners. Tighten fasteners to 10 N·m (90 in. lbs.) torque.

(2) Using a lint free towel, wipe clean open power steering hose end, cooler hose and tube ends, and gear tube/fitting.

(3) Position hose clamp onto end of cooler hose (at gear outlet tube/fitting) far enough to clear outlet tube once installed.

(4) Slide cooler hose onto power steering gear return outlet tube/fitting (Fig. 21). Slide hose clamp on hose past bead formed into end of tube and secure in place.

(5) Position hose clamp onto end of return hose (at cooler) far enough to clear outlet tube once installed.

(6) Slide return hose onto power steering cooler outlet tube (Fig. 21). Slide hose clamp on hose past bead formed into end of tube and secure in place.

(7) Lower vehicle.

(8) Perform POWER STEERING PUMP INITIAL OPERATION procedure to properly fill and bleed power steering system. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(9) Check for leaks.

HOSE - POWER STEERING PRESSURE

REMOVAL - 2.0L ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Siphon as much fluid as possible from the power steering fluid reservoir.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(3) Back out the tube nut securing the power steering fluid pressure hose to the gear (Fig. 16) (Fig. 17).

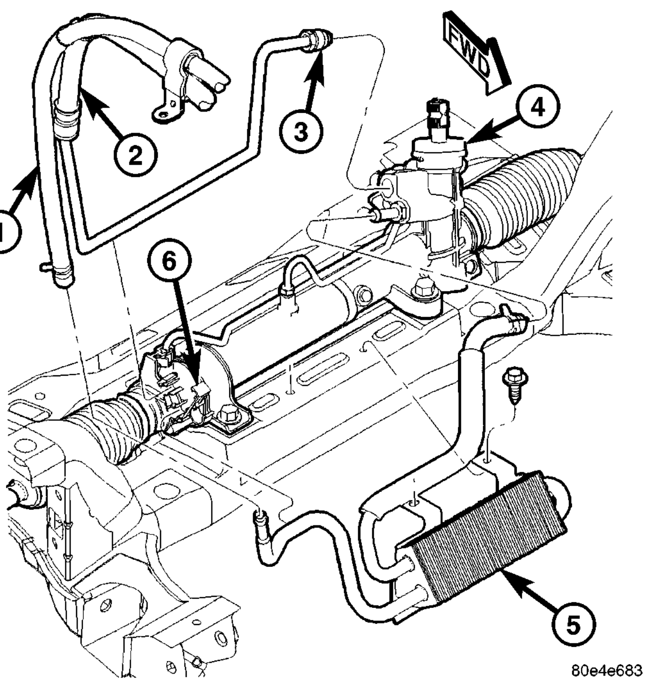

Fig. 16 Hoses And Cooler At LHD Gear - 2.0L Engine

1 - RETURN HOSE
2 - PRESSURE HOSE
3 - TUBE NUT
4 - POWER STEERING GEAR
5 - POWER STEERING COOLER
6 - TUBE CLAMP

(4) LHD only - Open the tube clamp on the right side of the gear (Fig. 16) and release the tube from the clamp.

(5) Remove the pressure hose tube from the gear.

(6) RHD only - Remove the bolt securing the pressure hose bracket to the engine (Fig. 18).

(7) Lower the vehicle.

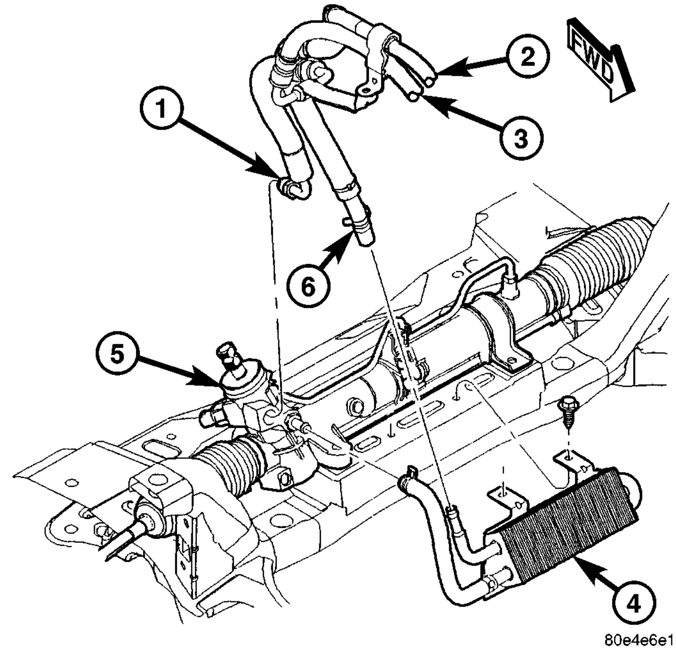

Fig. 17 Hoses And Cooler At RHD Gear - 2.0L Engine

1 - TUBE NUT
2 - RETURN HOSE
3 - PRESSURE HOSE
4 - POWER STEERING COOLER
5 - POWER STEERING GEAR
6 - HOSE CLAMP

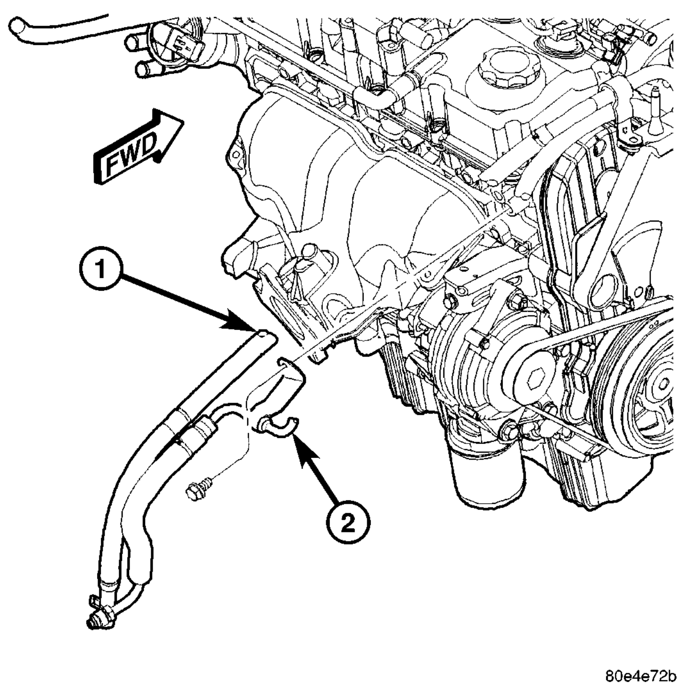

Fig. 18 RHD Pressure Hose At Engine - 2.0L Engine

1 - RETURN HOSE
2 - PRESSURE HOSE

HOSE - POWER STEERING PRESSURE (Continued)

(8) Remove the bolt securing the hose routing bracket to the engine mount dragon head (Fig. 19). Remove the hose from the bracket.

(9) Un-thread the tube nut securing the power steering pressure hose to the power steering pump (Fig. 19).

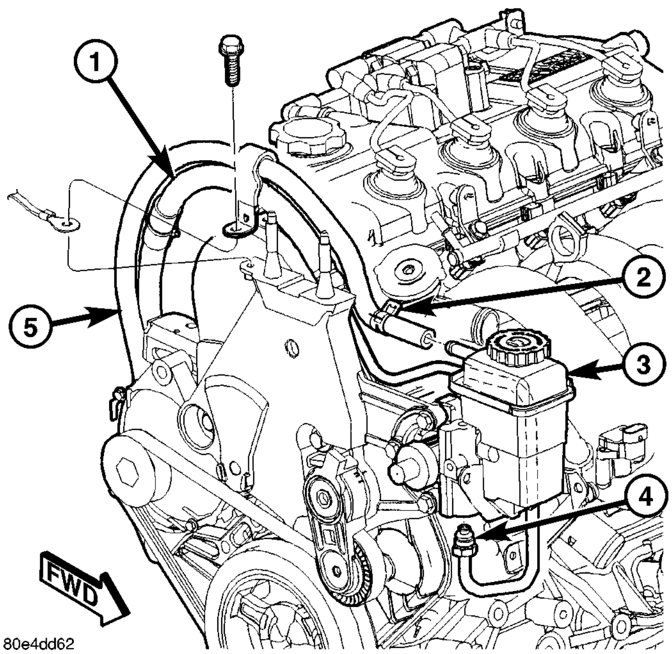

Fig. 19 Power Steering Hoses At Pump - 2.0L Engine

1 - PRESSURE HOSE
2 - HOSE CLAMP
3 - POWER STEERING PUMP AND RESERVOIR
4 - TUBE NUT
5 - RETURN HOSE

(10) Remove the power steering pressure hose.

INSTALLATION - 2.0L ENGINE

(1) Install the power steering pressure hose into the engine compartment from the top. First, guide the pump end of the hose under the pump, then route the rest of the hose along the right side of the engine. Guide the gear end of the hose down behind the engine towards the power steering gear.

(2) Using a lint free towel, wipe clean the open power steering hose end and the power steering pump port. Replace the used O-ring with new. Lubricate the O-ring with clean power steering fluid.

(3) Install the power steering pressure hose into the outlet fitting on the bottom of the power steering pump (Fig. 19).

(4) Thread the tube nut into the pump outlet fitting (Fig. 19) and tighten it to a torque of 34 N·m (25 ft. lbs.).

(5) Install the hose into the hose routing bracket aligning it as shown and attach the bracket to the engine mount dragon head along with the ground strap (Fig. 19). Tighten the screw to a torque of 12 N·m (105 in. lbs.).

(6) Raise the vehicle.

CAUTION: The power steering fluid hoses must remain away from the exhaust system, vehicle components, and unfriendly surfaces that can cause possible damage to the power steering hoses.

(7) RHD only - Install the bolt attaching the power steering fluid pressure hose routing clamp to the engine (Fig. 18). Tighten the bolt to a torque of 61 N·m (45 ft. lbs.).

(8) Using a lint free towel, wipe clean the open power steering hose end and the power steering gear port. Replace the used O-ring with new. Lubricate the O-ring with clean power steering fluid.

(9) Attach the power steering fluid pressure hose to the port on the power steering gear (Fig. 16) (Fig. 17). Start the tube nut threads into the gear. Do not completely tighten at this time.

(10) LHD only - Open the tube clamp on the right side of the gear and insert the pressure hose tube (Fig. 16). Close the clamp.

(11) Tighten the pressure hose tube nut at the gear to a torque of 34 N·m (25 ft. lbs.).

(12) Lower the vehicle.

(13) Perform the POWER STEERING PUMP INITIAL OPERATION procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(14) Check for leaks at all hose connections.

HOSE - POWER STEERING RETURN

REMOVAL - 2.0L ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Siphon as much fluid as possible from the power steering fluid reservoir.

(2) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove the hose clamp securing the return hose to the power steering cooler tube (Fig. 16) (Fig. 17). Slide the hose off the end of the cooler tube.

(4) Lower the vehicle.

(5) Remove the hose clamp securing the return hose to the power steering fluid reservoir (Fig. 19). Slide the hose off the end of the reservoir fitting.

(6) Remove the bolt securing the hose routing bracket to the engine mount dragon head (Fig. 19). Remove the hose from the bracket.

HOSE - POWER STEERING RETURN (Continued)

INSTALLATION - 2.0L ENGINE

(1) Slide a hose clamp onto the power steering pump end of the hose far enough to clear the fitting on the power steering fluid reservoir once the hose is installed.

(2) Install the power steering return hose into the engine compartment from the top. First, guide the pump end of the hose onto the fitting of the power steering pump fluid reservoir (Fig. 19), then route the rest of the hose along the right side of the engine. Guide the remaining end of the hose down behind the engine towards the power steering gear.

(3) Expand the hose clamp and slide it onto the fluid reservoir fitting. Secure the clamp once it is past the bead formed into the fluid reservoir fitting.

(4) Install the hose into the hose routing bracket aligning it as shown and attach the bracket to the engine mount dragon head along with the ground strap (Fig. 19). Tighten the screw to a torque of 12 N·m (105 in. lbs.).

(5) Raise the vehicle.

CAUTION: The power steering fluid hoses must remain away from the exhaust system, vehicle components, and unfriendly surfaces that can cause possible damage to the power steering hoses.

(6) Using a lint free towel, wipe clean the open power steering hose end and the power steering fluid cooler tube.

(7) Install a hose clamp onto the end of the hose far enough to clear the fitting on the cooler once the hose is installed.

(8) Slide the hose onto the end of the cooler tube (Fig. 16) (Fig. 17). Install the hose clamp past the bead formed into the cooler tube and secure in place.

(9) Lower the vehicle.

(10) Perform the POWER STEERING PUMP INITIAL OPERATION procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

(11) Check for leaks at all hose connections.

HOSE - POWER STEERING PRESSURE/RETURN

REMOVAL - 2.4L TURBO ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

(1) Siphon as much fluid as possible from power steering fluid reservoir.

(2) Remove clamp securing fluid return hose to pump reservoir (Fig. 20), then remove hose from reservoir fitting. Cap off hose end and reservoir fitting.

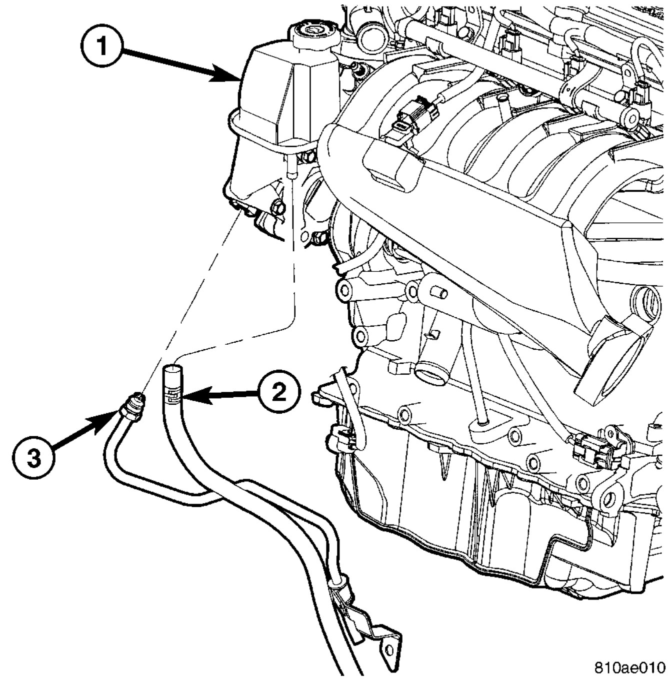

Fig. 20 Power Steering Hoses At Pump - 2.4L Turbo

1 - POWER STEERING PUMP
2 - RETURN HOSE CLAMP
3 - PRESSURE HOSE TUBE NUT

(3) Back out tube nut securing fluid pressure hose to power steering pump and remove hose from pump (Fig. 20). Cap off hose end and pump pressure port.

(4) Raise vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(5) Back out tube nut securing fluid pressure hose to power steering gear (Fig. 21). Cap off hose end and gear port.

(6) Remove hose clamp securing return hose to power steering cooler tube (Fig. 21). Slide hose off end of tube. Cap off hose end and cooler tube.

(7) Remove bolt securing fluid pressure hose routing clamp to engine (Fig. 22).

(8) Remove clamp securing charge air cooler forward hose to metal tube. Slide hose off tube.

(9) Remove nuts securing charge air cooler hose to bolts in engine's structural collar (Fig. 23).

(10) Remove bolts securing pressure/return hose routing clamps to engine's structural collar (Fig. 24).

(11) Remove pressure/return hose assembly from vehicle.

HOSE - POWER STEERING PRESSURE/RETURN (Continued)

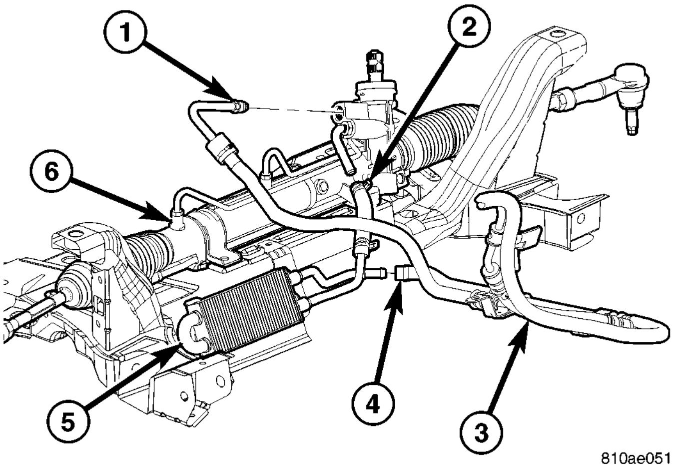

Fig. 21 Hoses And Cooler At Gear - 2.4L Turbo

1 - PRESSURE HOSE TUBE NUT
2 - COOLER HOSE CLAMP
3 - PRESSURE/RETURN HOSE ASSEMBLY
4 - RETURN HOSE CLAMP
5 - POWER STEERING COOLER
6 - POWER STEERING GEAR

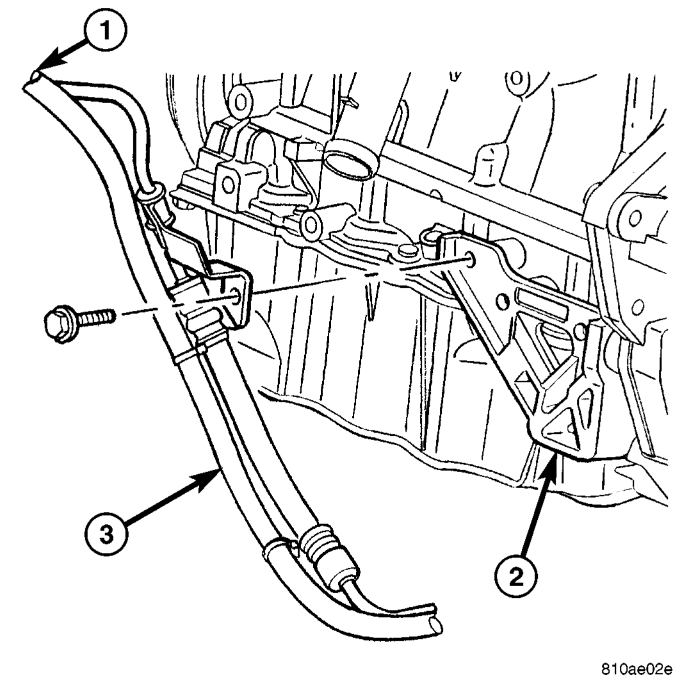

Fig. 22 Power Steering Hoses At Engine - 2.4L Turbo

1 - TO POWER STEERING PUMP
2 - ENGINE
3 - PRESSURE/RETURN HOSE ASSEMBLY

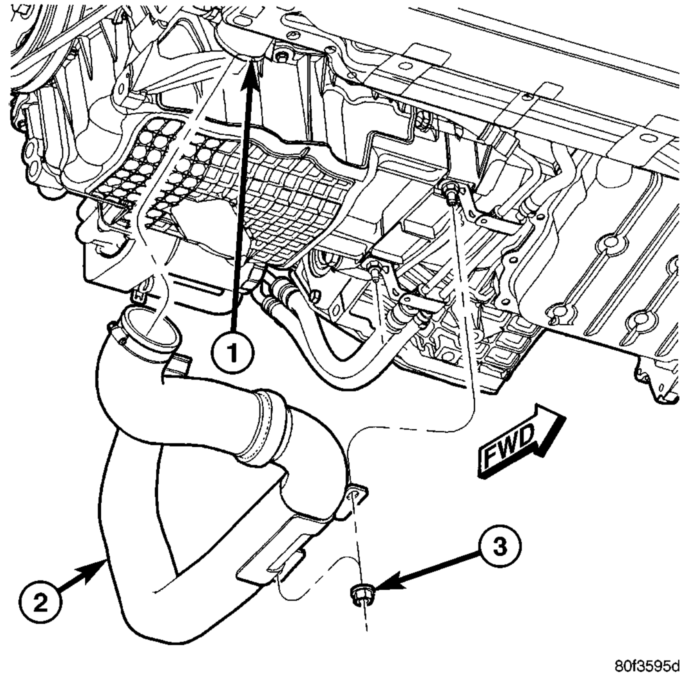

Fig. 23 Charge Air Cooler Hoses

1 - CHARGE AIR COOLER
2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
3 - NUT

INSTALLATION - 2.4L TURBO ENGINE

(1) Using a lint free towel, wipe clean open power steering hose ends and power steering pump, cooler and gear ports. Replace any used O-rings with new. Lubricate O-rings with power steering fluid.

(2) Install power steering pressure/return hose assembly into engine compartment from below, guiding hoses up to pump.

(3) Attach pressure/return hose routing clamps to engine's structural collar (Fig. 24). Tighten mounting bolts to 61 N·m (45 ft. lbs.) torque.

(4) Slide charge air cooler metal tube into forward hose, but do not fasten hose clamp at this time.

(5) Attach charge air cooler hose to bolts in engine's structural collar (Fig. 23). Tighten nuts to 31 N·m (23 ft. lbs.) torque.

(6) Install hose clamp securing charge air cooler forward hose to metal tube.

(7) Position hose clamp onto end of return hose (at cooler) far enough to clear outlet tube once installed.

(8) Slide return hose onto power steering cooler outlet tube (Fig. 21). Slide hose clamp on hose past bead formed into end of tube and secure in place.

(9) Thread fluid pressure hose into inlet port on power steering gear (Fig. 21). Tighten pressure hose tube nut at gear to 34 N·m (25 ft. lbs.) torque.

(10) Lower vehicle.

HOSE - POWER STEERING PRESSURE/RETURN (Continued)

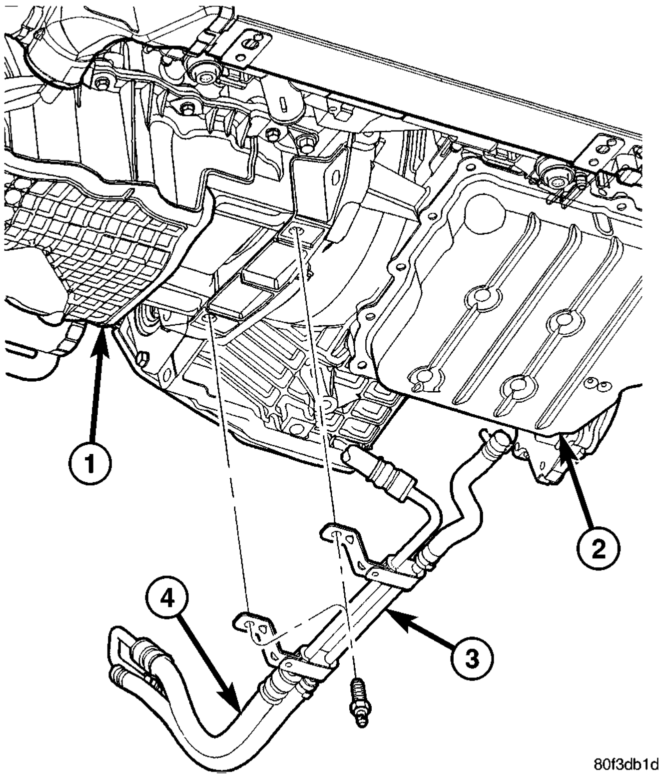

Fig. 24 Routing Clamp Bolts At Structural Collar (Typical)

1 - ENGINE
2 - TRANSAXLE
3 - RETURN HOSE (SERVICED WITH PRESSURE HOSE)
4 - PRESSURE HOSE (SERVICED WITH RETURN HOSE)

(11) Thread pump end of fluid pressure hose tube nut into power steering pump pressure port (Fig. 20). DO NOT TIGHTEN AT THIS TIME.

(12) Install mounting bolt through routing bracket, attaching pressure hose to front of engine (Fig. 22). Tighten mounting bolt to 61 N·m (45 ft. lbs.) torque.

(13) Tighten pressure hose tube nut at pump to 34 N·m (25 ft. lbs.) torque.

(14) Position hose clamp onto end of return hose (at reservoir) far enough to clear return fitting molded into reservoir once installed.

(15) Slide return hose onto reservoir return fitting (Fig. 20). Slide hose clamp on hose past bead formed into end of fitting and secure in place.

(16) Perform POWER STEERING PUMP INITIAL OPERATION procedure to properly fill and bleed power steering system. (Refer to 19 - STEERING/ PUMP - STANDARD PROCEDURE)

(17) Check for leaks.

TRANSAXLE

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T350 MANUAL TRANSAXLE

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T350 MANUAL TRANSAXLE

DESCRIPTION

This five speed is a constant-mesh manual transaxle. All gear ranges, except reverse, are synchronized. The reverse gear utilizes a brake and blocking ring for shifting ease. The reverse idler gear is supported on a sliding spindle idler shaft. The transaxle case is aluminum with a steel end–plate bearing cover. It is housed in a die-cast aluminum case featuring a two–piece, middle split design (Fig. 1).

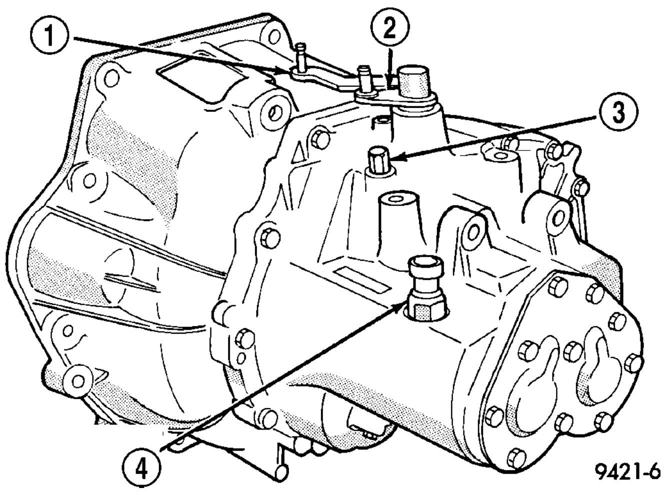


Fig. 1 T350 Manual Transaxle

1 - SHIFT LEVER
2 - CROSSOVER LEVER
3 - VENT
4 - REVERSE LAMP SWITCH

The T350 transaxle internal components can be serviced only by separating the gear case from the bellhousing case.

CAUTION: The transaxle output shaft is serviced as a unit. No disassembly and reassembly is possible. Damage to the transaxle may result.

TRANSAXLE IDENTIFICATION

The transaxle model, assembly number, and build date are on a metal I.D. tag that is attached to the end cover of the transaxle (Fig. 2). This information is also shown on a bar code label that is attached to the front of the transaxle (Fig. 3).

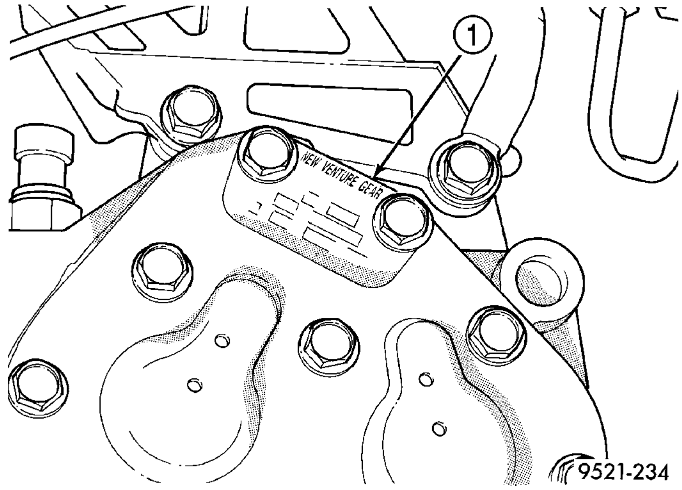


Fig. 2 Metal I.D. Tag

1 - METAL I.D. TAG

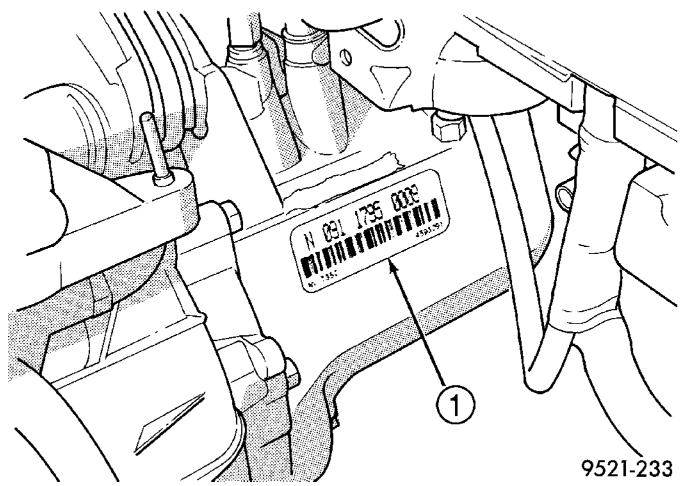


Fig. 3 Bar Code Label

1 - BAR CODE LABEL

NOTE: Transaxles use various final drive gear ratios in different vehicle applications. Therefore, it is necessary that the correct transaxle assembly number is used when ordering service parts.

GEAR RATIOS

CAUTION: All gears and shafts must not be interchanged with other transaxles; they will not function correctly.

The differential is a conventional arrangement of gears that is supported by tapered roller bearings. The final output gear turns the ring gear and differential assembly, thereby turning the drive axle shafts.

T350 MANUAL TRANSAXLE (Continued)

The gear ratios of each transaxle are shown in the following chart. The chart also shows which transaxles are available with the reverse–input shaft brake. This brake allows easier shifting into reverse and helps eliminate reverse gear clash.

GEAR	1.6L	2.0L	2.0L R/T
1st	3.50	3.50	3.50
2nd	1.95	1.95	1.95
3rd	1.36	1.36	1.36
4th	0.97	0.97	0.97
5th	0.81	0.72/0.81*	0.81
FINAL DRIVE RATIO	3.94	3.55	3.94
REVERSE BRAKE	YES	YES	YES
CLUTCH RELEASE SYSTEM	HYDRAULIC	HYDRAULIC	HYDRAULIC
* Export Models			

GEARSHIFT PATTERN

The NV T350 (A-578) transaxle shift pattern is a modified H–pattern (Fig. 4). Overdrive fifth and reverse gears are in–line and outboard of the first through fourth gear positions.

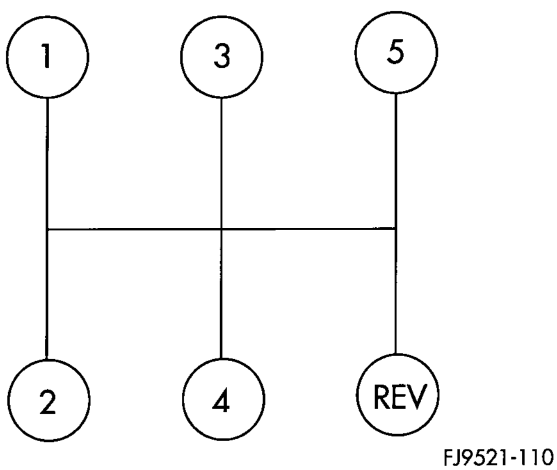


Fig. 4 T350 Transaxle Shift Pattern

LUBRICANT/ADDITIVES

T350 transaxles use Mopar® ATF+4 (Automatic Transmission Fluid—Type 9602).**Hypoid gear lube or engine oil should not be used in this transaxle.** Hard shifting effort, bearing, gear, and/or synchronizer failure may occur if incorrect fluid is used.

The addition of any fluids to the transaxle, other than the fluid listed above, is not recommended. 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.

SEALANTS

The sealant used to seal the transaxle case halves and input bearing is Mopar® Gasket Maker, Loctite® 518, or equivalent. The sealant used for the bearing end plate cover is Mopar® RTV.

DIAGNOSIS AND TESTING - COMMON PROBLEM CAUSES

The majority of transaxle malfunctions are a result of:

- Insufficient lubrication
- Incorrect lubricant
- Misassembled or damaged internal components
- Improper operation

HARD SHIFTING

Hard shifting may be caused by a misadjusted crossover cable. If hard shifting is accompanied by gear clash, synchronizer clutch and stop rings or gear teeth may be worn or damaged.

Misassembled synchronizer components also cause shifting problems. Incorrectly installed synchronizer sleeves, struts, or springs can cause shift problems.

Worn, damaged, missassembled or leaking hydraulic system/components can also cause difficult shifting or gear clash.

NOISY OPERATION

Transaxle noise is most often a result of worn or damaged components. Chipped, broken gear or synchronizer teeth, and brinnelled, spalled bearings all cause noise.

Abnormal wear and damage to the internal components is frequently the end result of insufficient lubricant.

SLIPS OUT OF GEAR

Transaxle disengagement may be caused by misaligned or damaged shift components, or worn teeth on the drive gears or synchronizer components. Incorrect assembly also causes gear disengagement.

LOW LUBRICANT LEVEL

Insufficient transaxle lubricant is usually the result of leaks, or inaccurate fluid level check or refill method. **Vehicle must be level to accurately check fluid level.** Leakage is evident by the presence of oil around the leak point. If leakage is not evident, the condition is probably the result of an underfill.

If air–powered lubrication equipment is used to fill a transaxle, be sure the equipment is properly calibrated. Equipment out of calibration can lead to an underfill condition.

T350 MANUAL TRANSAXLE (Continued)

CLUTCH PROBLEMS

Worn, damaged, or misaligned clutch components can cause difficult shifting, gear clash, and noise.

A worn or damaged clutch disc, pressure plate, or release bearing can cause hard shifting and gear clash.

REMOVAL

(1) Raise hood.

(2) Disconnect both battery cables, remove battery hold down clamp and bolt, and remove battery.

(3) Remove air cleaner/throttle body assy. (Fig. 5)as follows:

(a) Disconnect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(b) Disconnect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(c) Disconnect throttle body air duct at intake manifold.

(d) Remove mounting bolt and nut (Fig. 5) and partially remove air cleaner assembly.

(e) Disconnect accelerator and speed control (if equipped) cables after the assy. is removed from position. Remove air cleaner assembly from vehicle.

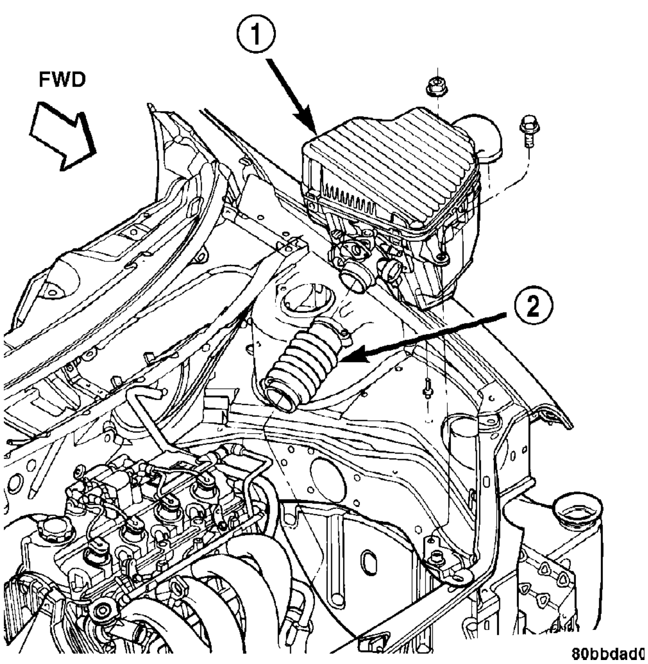


Fig. 5 Air Cleaner Assembly Removal/Installation

1 - AIR CLEANER ASSY.
2 - THROTTLE BODY DUCT

(4) Remove battery tray from bracket.

(5) Disconnect ground cable at battery tray bracket.

(6) Disconnect back-up lamp switch connector.

(7) Remove shift cable-to-bracket clips (Fig. 6).

(8) Disconnect shift selector and crossover cable from levers (Fig. 6). Remove cables and secure out of the way.

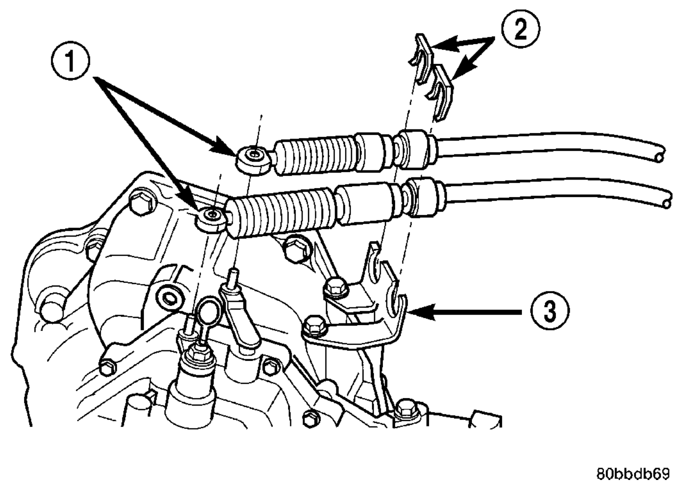


Fig. 6 Shift Cables at Transaxle

1 - SHIFT CABLES
2 - CLIPS
3 - BRACKET

(9) Disconnect the vehicle speed sensor connector (Fig. 7).

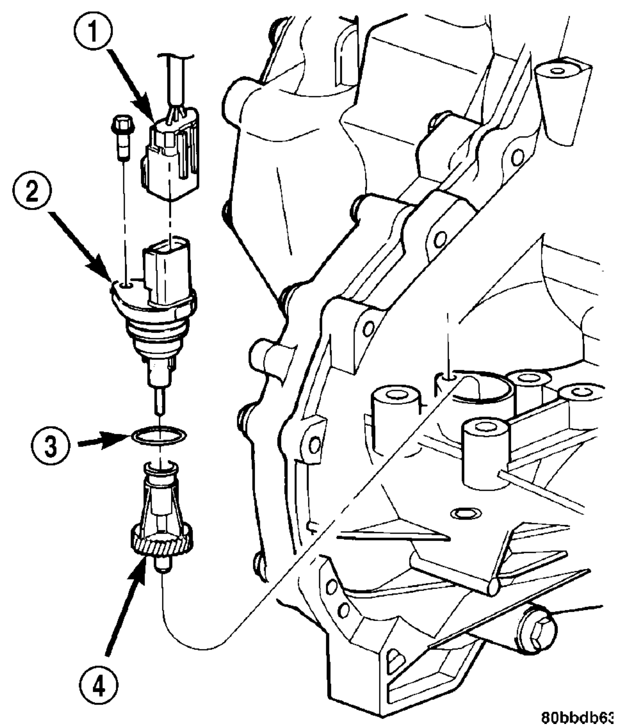


Fig. 7 Vehicle Speed Sensor Connector

1 - CONNECTOR
2 - SENSOR
3 - O-RING
4 - SPEEDO PINION

T350 MANUAL TRANSAXLE (Continued)

(10) Raise vehicle on hoist.

(11) Disconnect and suspend clutch slave cylinder from transaxle (Fig. 8) (Fig. 9).

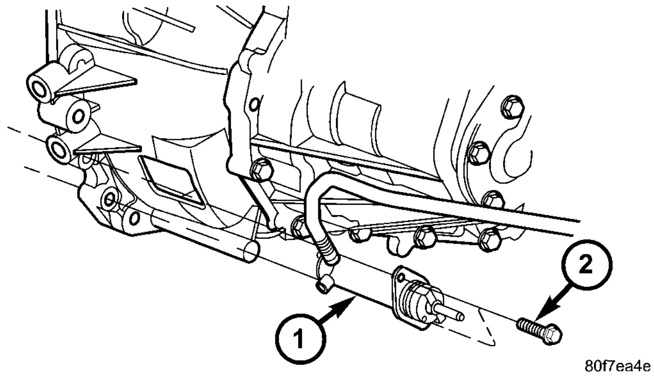


Fig. 8 Clutch Slave Cylinder at Transaxle—1.6L Models

1 - SLAVE CYLINDER
2 - BOLT

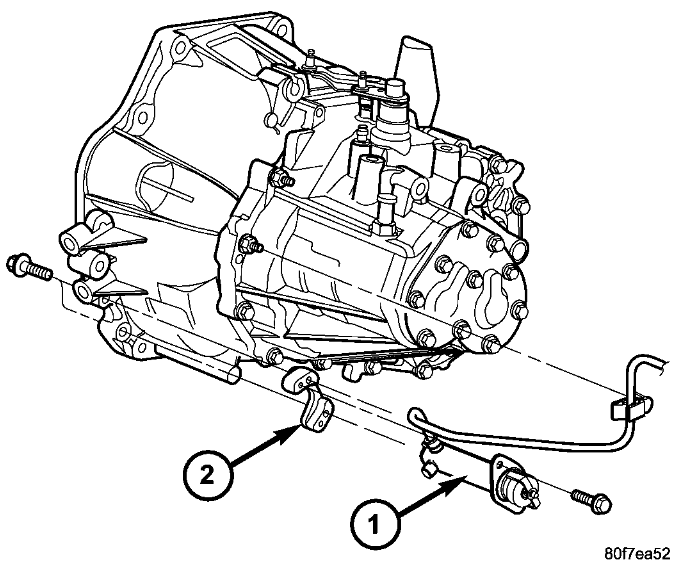


Fig. 9 Clutch Slave Cylinder at Transaxle—2.0L Models

1 - SLAVE CYLINDER
2 - BRACKET

(12) Remove transaxle oil drain plug and drain oil into a suitable container.

(13) Remove both axle shafts. Refer to Group 3, Differential and Driveline for the correct procedures.

(14) Remove structural collar (Fig. 10).

(15) Remove the left engine-to-transaxle lateral bending brace (Fig. 10).

(16) Remove bellhousing dust cover (Fig. 10).

(17) Remove the right engine-to-transaxle lateral bending brace (Fig. 11).

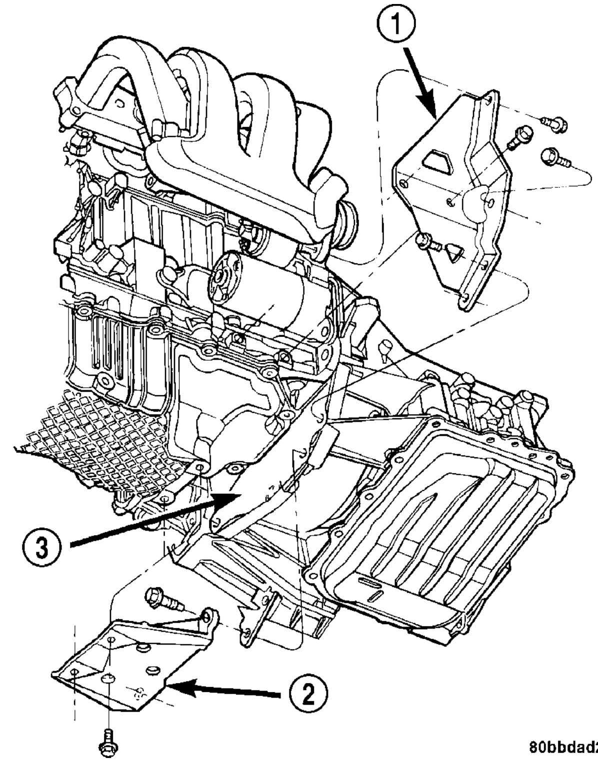


Fig. 10 Left Lateral Bending Brace and Structural Collar—Typical

1 - SUPPORT BRACKET
2 - STRUCTURAL COLLAR
3 - DUST COVER

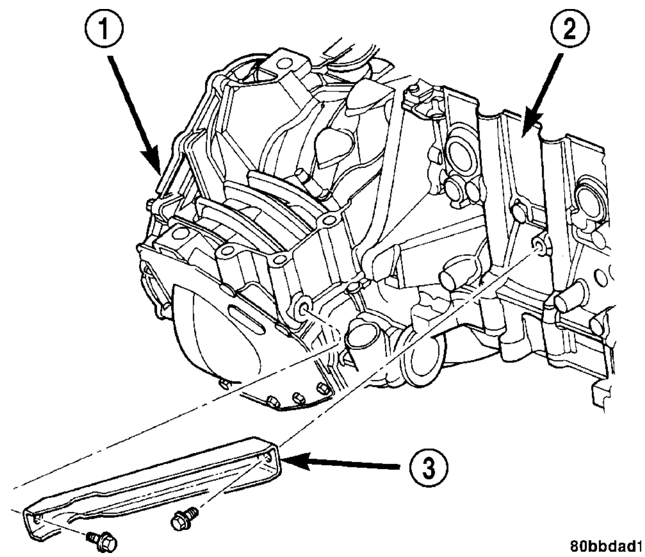


Fig. 11 Right Lateral Bending Brace Removal/ Installation—Typical

1 - TRANSAXLE
2 - ENGINE
3 - LATERAL BENDING BRACE

T350 MANUAL TRANSAXLE (Continued)

(18) Remove starter motor (Fig. 12).

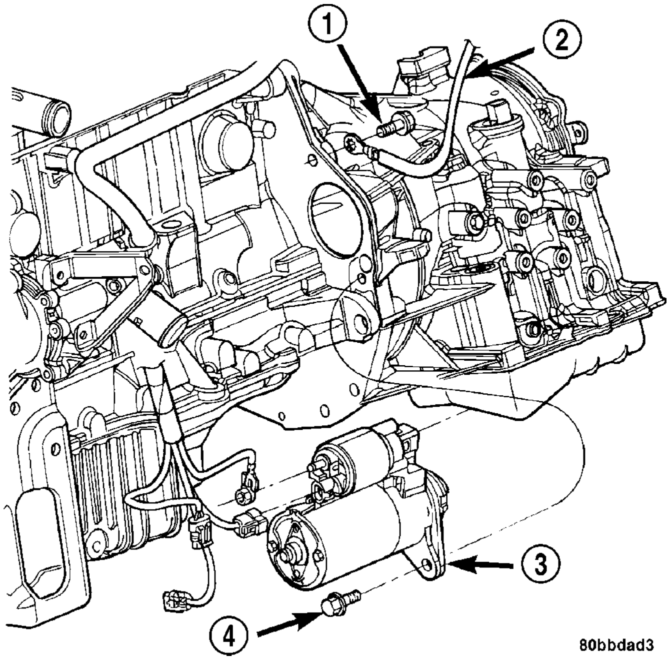


Fig. 12 Starter Motor Removal/Installation—Typical

1 - BOLT
2 - GROUND
3 - STARTER
4 - BOLT

(19) Remove four (4) modular clutch-to-drive plate bolts. While removing bolts, one tight-tolerance (slotted) drive plate hole will be encountered. When this bolt is removed, mark driveplate and modular clutch assembly at this location, and be sure to align marks upon reassembly.

(20) Support engine at oil pan with screw jack and wood block.

(21) Remove transaxle upper mount thru-bolt. Gain access to this bolt through the driver's side wheel house (Fig. 13).

(22) Carefully lower engine and transaxle on screw jack until proper removal clearance is obtained.

(23) Obtain a helper to assist in holding transaxle while removing transaxle-to-engine mounting bolts (Fig. 14).

(24) Remove transaxle from vehicle (Fig. 14).

(25) If installing a new or replacement transaxle, remove the upper mount as shown in (Fig. 15), transfer to the replacement unit and torque all bolts to 68 N·m (50 ft. lbs.) torque.

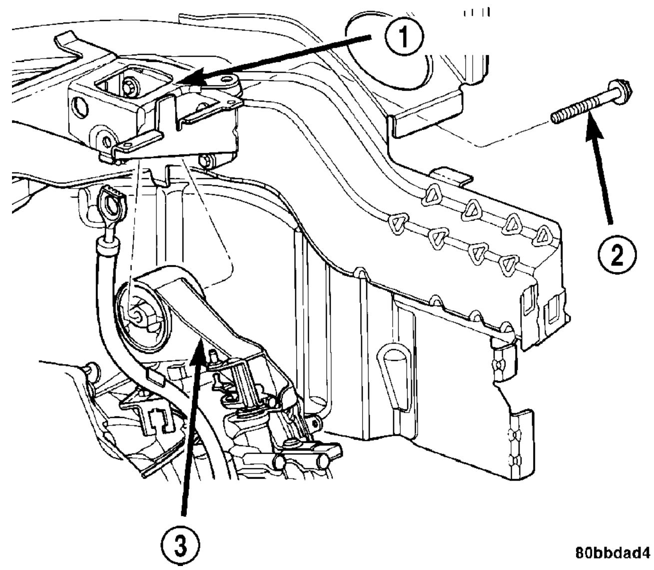


Fig. 13 Transaxle Upper Mount Thru-Bolt—Typical

1 - MOUNT BRACKET
2 - BOLT
3 - MOUNT

DISASSEMBLY

The T350 transaxle internal components can be serviced only by separating the gear case from the bellhousing case.

CAUTION: The transaxle output shaft is serviced as a unit. No disassembly and reassembly is possible. Damage to the transaxle may result.

(1) Place transaxle on bench.

(2) Remove the clutch release bearing and lever. Move the release fork and bearing to an in-line position. Grasp the release lever with two hands in the pivot stud socket area. Pull with even pressure to release the lever from the pivot stud.

CAUTION: Do not use a screwdriver or pry bar to release the lever as this may cause damage to the lever and/or clip.

(3) Remove shift levers by driving out the roll pins.

(4) Remove transaxle case half bolts (Fig. 16).

T350 MANUAL TRANSAXLE (Continued)

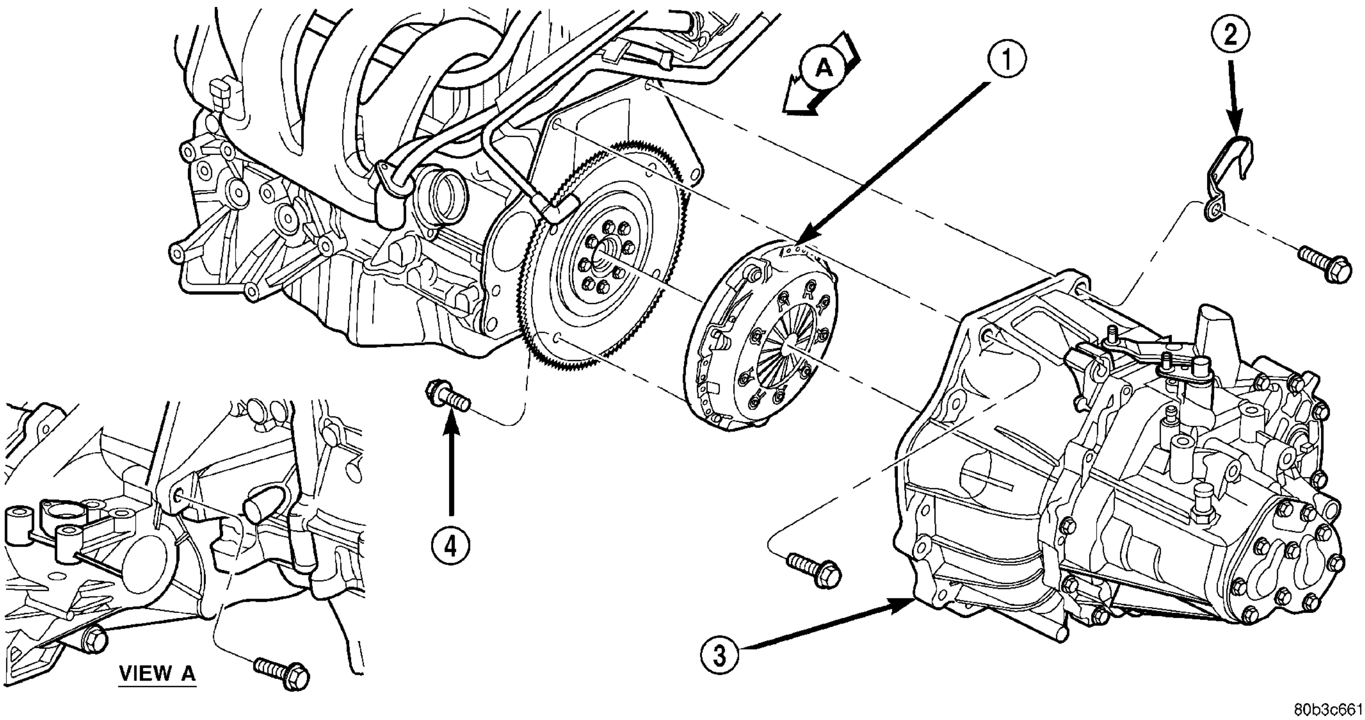


Fig. 14 Transaxle Removal/Installation—2.0L Shown

1 - MODULAR CLUTCH ASSEMBLY
2 - CLIP
3 - TRANSAXLE
4 - CLUTCH MODULE BOLT (4)

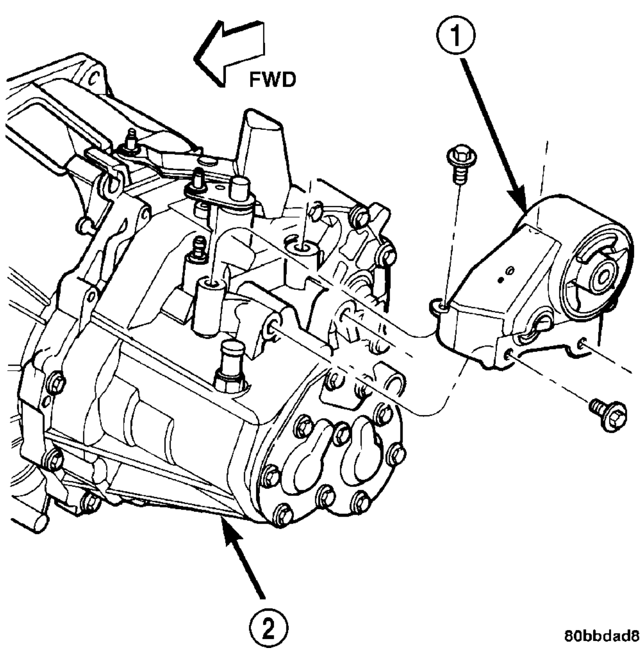


Fig. 15 Transaxle Upper Mount and Bracket

1 - MOUNT
2 - TRANSAXLE

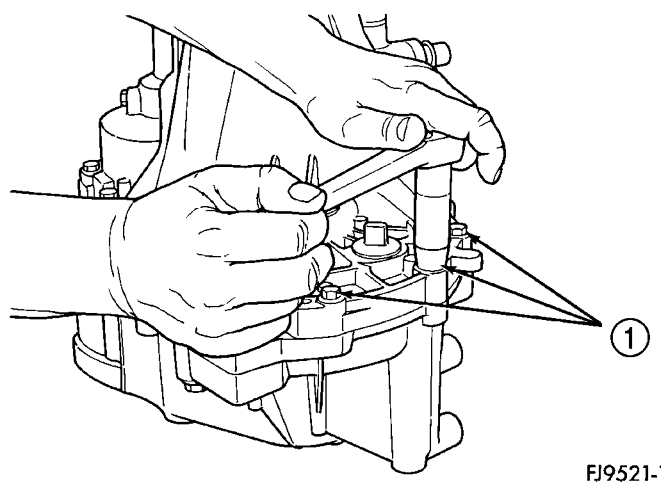


Fig. 16 Case Bolts

1 - CASE BOLTS

T350 MANUAL TRANSAXLE (Continued)

(5) Place two screwdrivers into the slots provided in the case halves near the dowels (Fig. 17). Separate the case halves (Fig. 18).

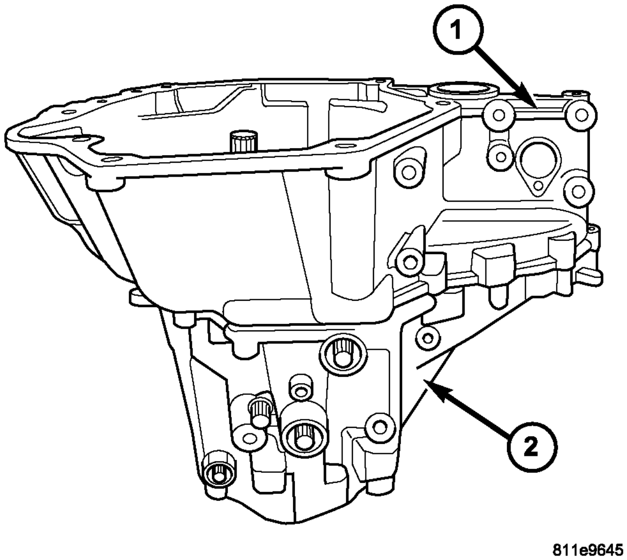


Fig. 17 Transaxle Case Halves

1 - BELLHOUSING HALF
2 - GEARTRAIN HALF

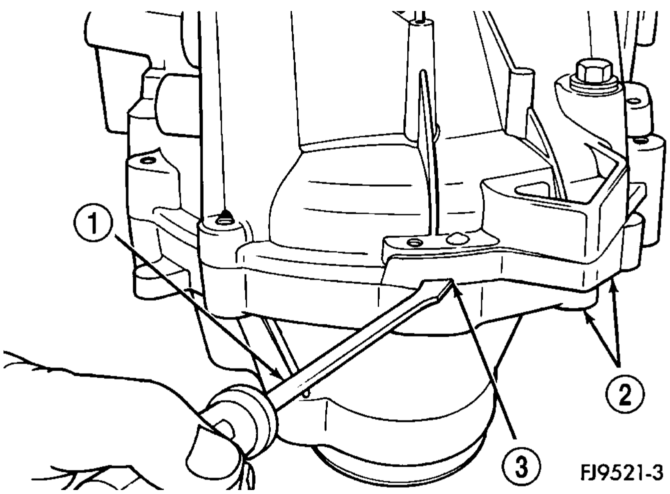


Fig. 18 Separate Case Halves

1 - PRY TOOL
2 - CASE HALVES
3 - PRY SLOT

(6) Remove bellhousing half from gear case half (Fig. 19).

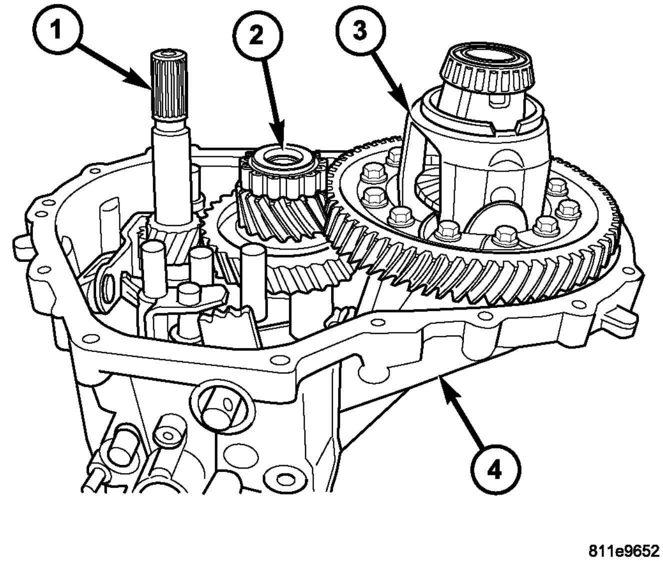


Fig. 19 Bellhousing Case Half Removed

1 - INPUT SHAFT
2 - OUTPUT SHAFT
3 - DIFFERENTIAL ASSEMBLY
4 - GEARTRAIN HOUSING

(7) Remove output shaft roller bearing from output shaft.

(8) Remove differential assembly from housing (Fig. 20).

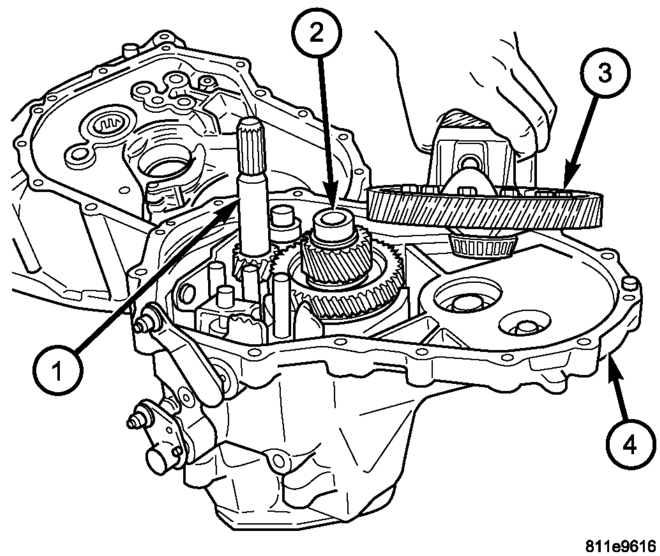


Fig. 20 Differential Removal/Installation

1 - INPUT SHAFT
2 - OUTPUT SHAFT
3 - DIFFERENTIAL ASSEMBLY
4 - GEARTRAIN HOUSING

T350 MANUAL TRANSAXLE (Continued)

(9) Remove reverse idler shaft bolt (Fig. 21).

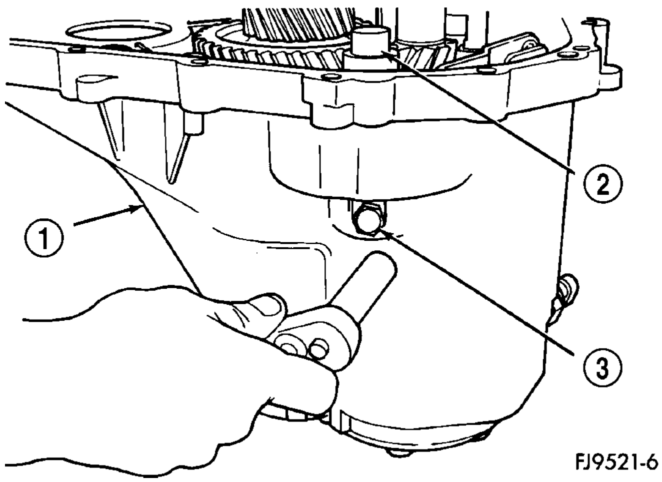


Fig. 21 Reverse Idler Shaft

1 - CASE
2 - REVERSE IDLER SHAFT
3 - REVERSE IDLER SHAFT BOLT

(10) Remove reverse idler shaft (Fig. 22).

(11) Remove reverse idler gear and spacer (Fig. 23).

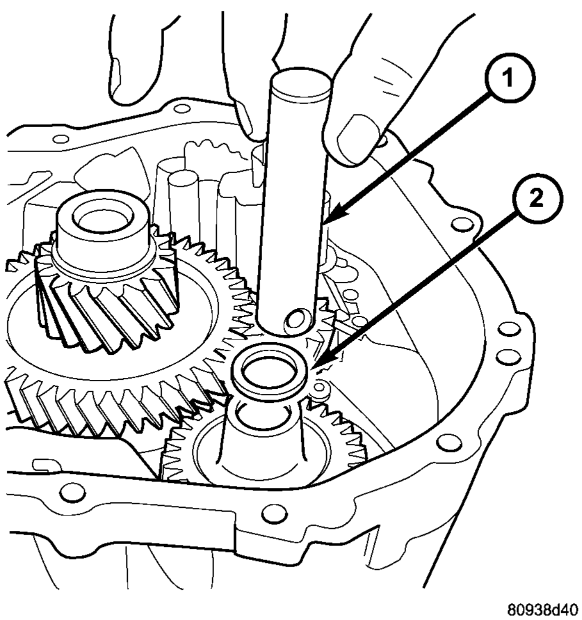


Fig. 22 Reverse Idler Shaft Removal

1 - REVERSE IDLER SHAFT
2 - SPACER

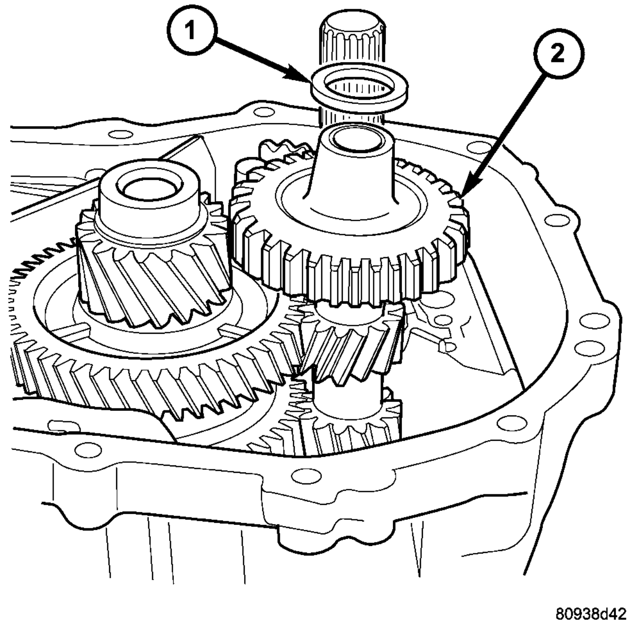


Fig. 23 Reverse Idler Gear and Spacer

1 - SPACER
2 - REVERSE IDLER GEAR

(12) Remove two screws retaining reverse fork bracket (Fig. 24). Remove reverse fork bracket and reverse cam blockout assembly (Fig. 25).

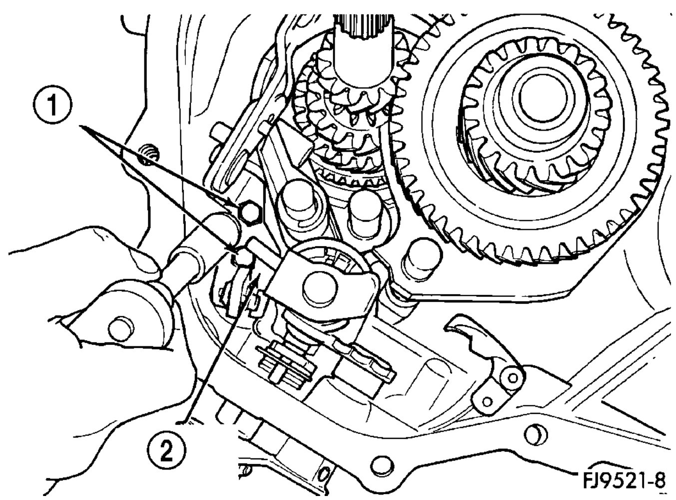


Fig. 24 Screws Retaining Reverse Fork Bracket

1 - SCREWS (2)
2 - REVERSE FORK BRACKET

T350 MANUAL TRANSAXLE (Continued)

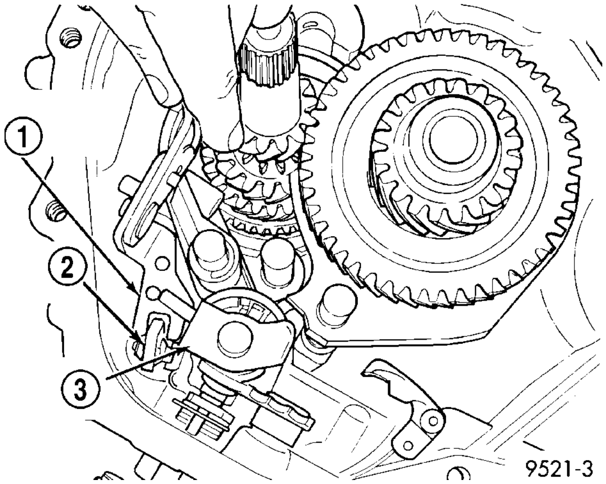


Fig. 25 Remove Reverse Fork Bracket

1 - REVERSE FORK BRACKET
2 - REVERSE CAM BLOCKOUT
3 - SHIFT BLOCKER ASSEMBLY

(13) Using snap–ring pliers, remove selector shaft spacer (Fig. 26).

(14) Pull the selector shaft shift pin out of the slot in the blocker assembly. Turn selector shaft up and out of the way (Fig. 27).

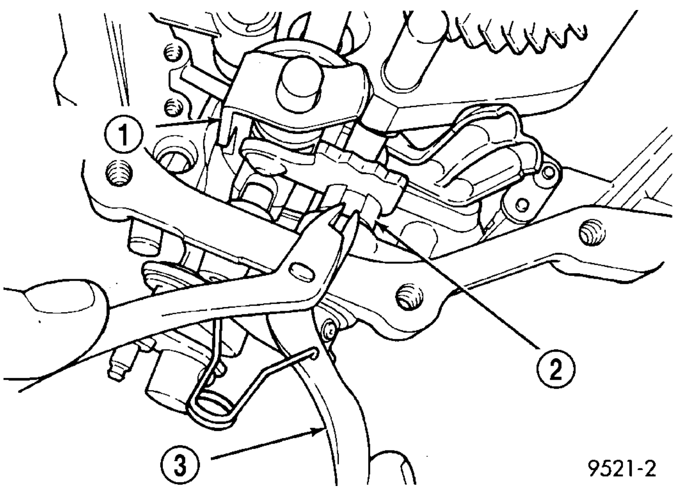


Fig. 26 Remove Selector Shaft Spacer

1 - SHIFT BLOCKER ASSEMBLY
2 - SELECTOR SHAFT SPACER (PLASTIC)
3 - SNAP RING PLIERS

(15) Remove transaxle end cover (Fig. 28) (Fig. 29).

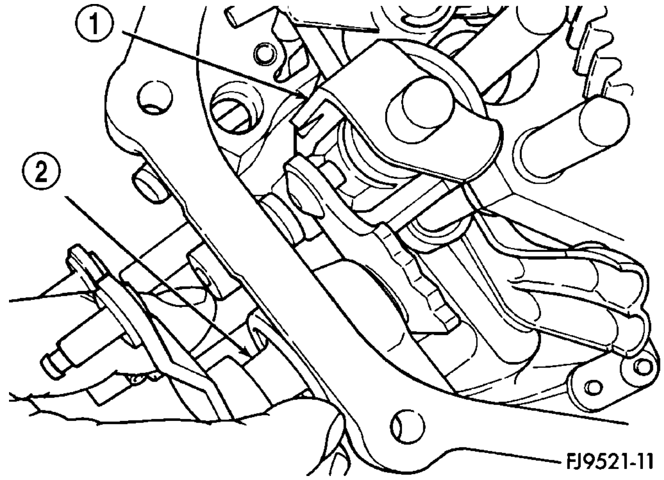


Fig. 27 Selector Shaft

1 - SHIFT ASSEMBLY
2 - SELECTOR SHAFT

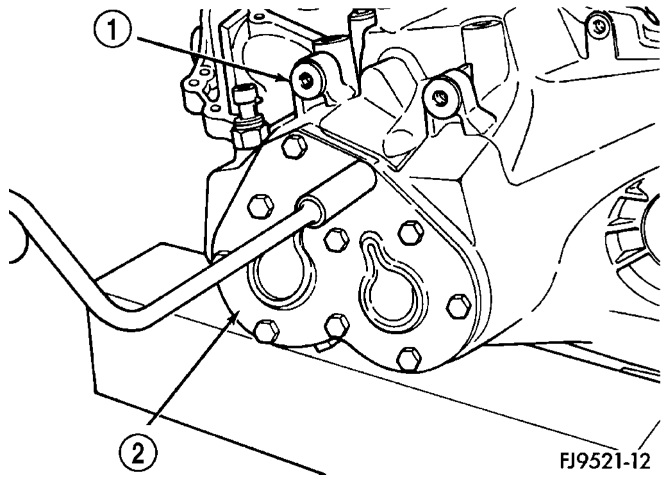


Fig. 28 Transaxle Cover Removal

1 - TRANSAXLE CASE
2 - END COVER

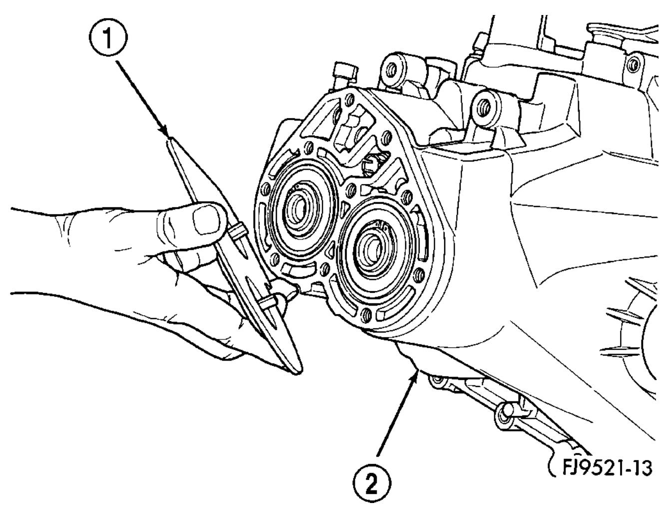


Fig. 29 End Cover

1 - END COVER
2 - CASE

T350 MANUAL TRANSAXLE (Continued)

(16) Remove two snap rings retaining the output shaft and the input shaft to the bearings (Fig. 30).

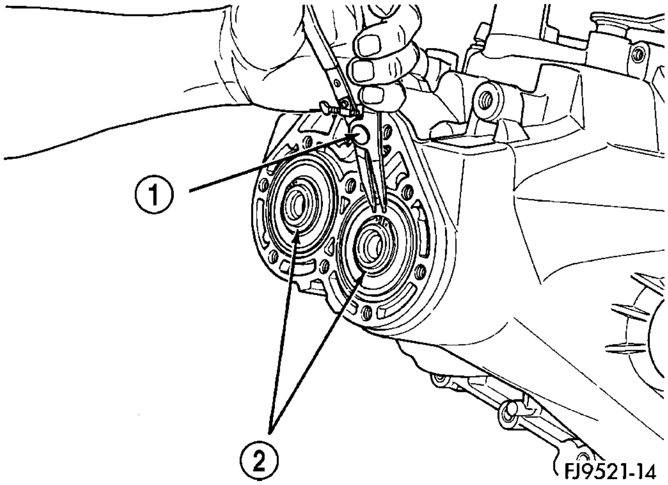


Fig. 30 Snap Rings Retaining Bearings

1 - SNAP RING PLIERS
2 - SNAP RINGS

(17) Using bench fixture and shims provided (Miller tools # 6785, 6785-1, and 6785-2), turn transaxle over. Install transaxle onto bench fixture (Fig. 31). Verify shim spacers are in position on bench fixture. Install transaxle into shop press.

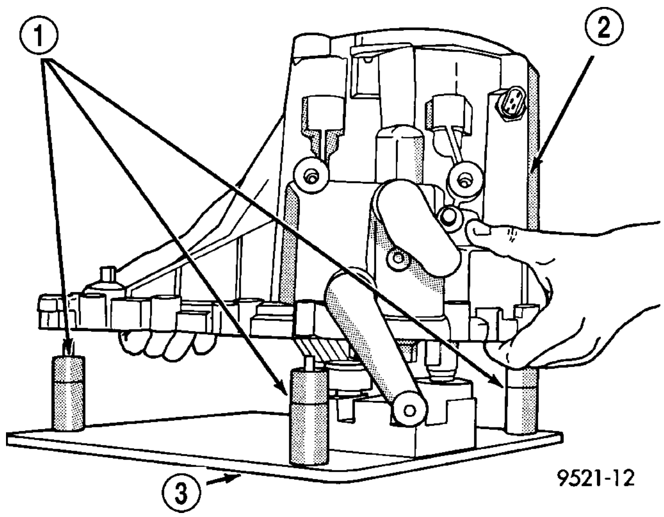


Fig. 31 Bench Fixture

1 - SHIMS
2 - TRANSAXLE
3 - 6785 BENCH FIXTURE

(18) Install bearing fixture Miller tool #6768 onto transaxle end bearings (Fig. 32). Verify tool is properly aligned to input and output shafts.

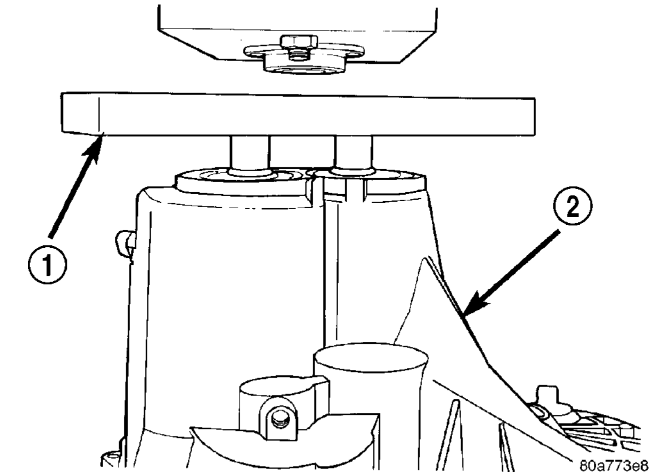


Fig. 32 Bearing Fixture

1 - BEARING FIXTURE
2 - TRANSAXLE CASE

CAUTION: The oil dams in the input and output shafts can be damaged while pressing on the shafts if the bearing fixture is not used properly.

(19) Install transaxle gear case into shop press. Press output and input shaft assemblies out of case (Fig. 33).

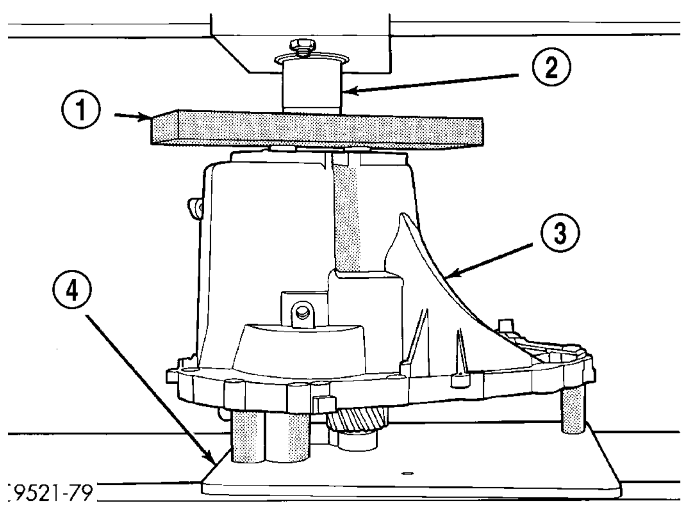


Fig. 33 Pressing Gears Out of Case

1 - BEARING FIXTURE
2 - PRESS RAM
3 - TRANSAXLE CASE
4 - BENCH FIXTURE

T350 MANUAL TRANSAXLE (Continued)

(20) 22Remove transaxle from press.

(21) Carefully remove transaxle case from the shaft assemblies and bench fixture (Fig. 34). Be sure the oil–feed trough to the end bearings is not damaged (Fig. 35).

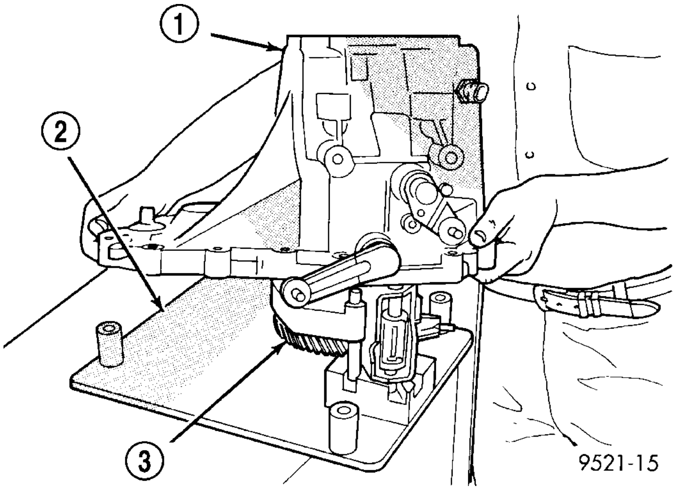


Fig. 34 Transaxle Case Removal

1 - TRANSAXLE CASE
2 - BENCH FIXTURE
3 - GEARTRAIN

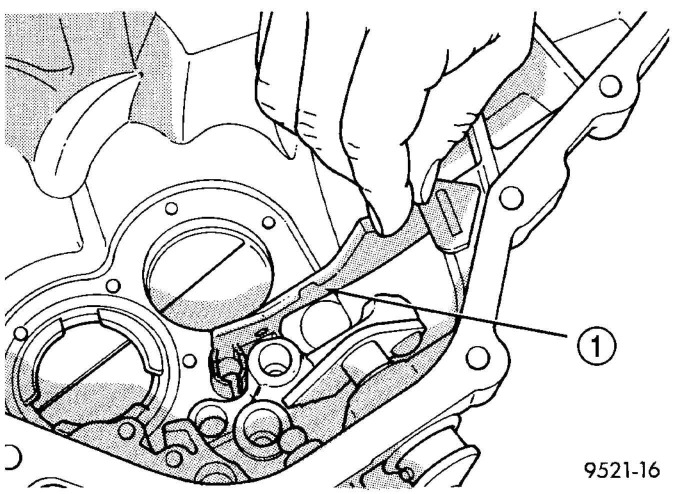


Fig. 35 Oil Feed Trough

1 - OIL FEED TROUGH

(22) Remove the reverse brake friction cone and blocking ring from the input shaft assembly (Fig. 36) (Fig. 37).

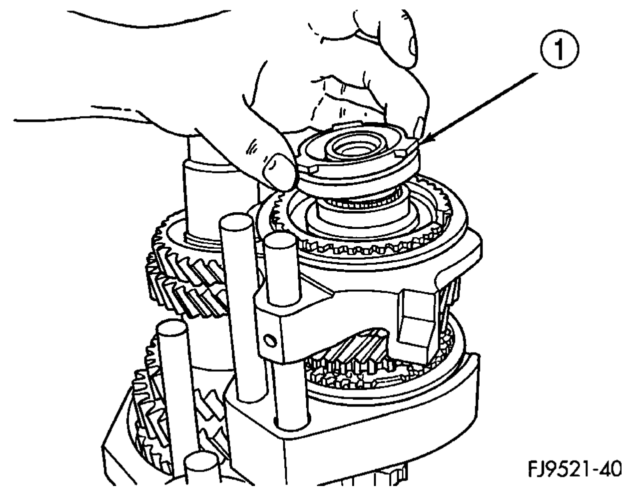


Fig. 36 Reverse Brake Friction Cone

1 - REVERSE BRAKE FRICTION CONE

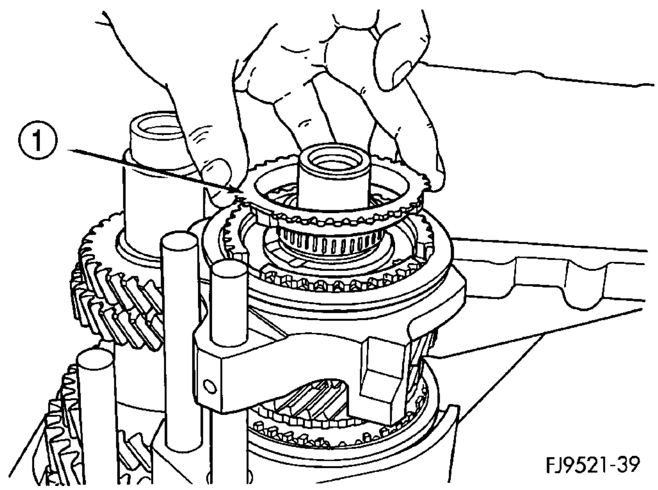


Fig. 37 Reverse Brake Blocking Ring

1 - REVERSE BRAKE BLOCKING RING

T350 MANUAL TRANSAXLE (Continued)

(23) Remove the shift blocker assembly from the bench fixture (Fig. 38).

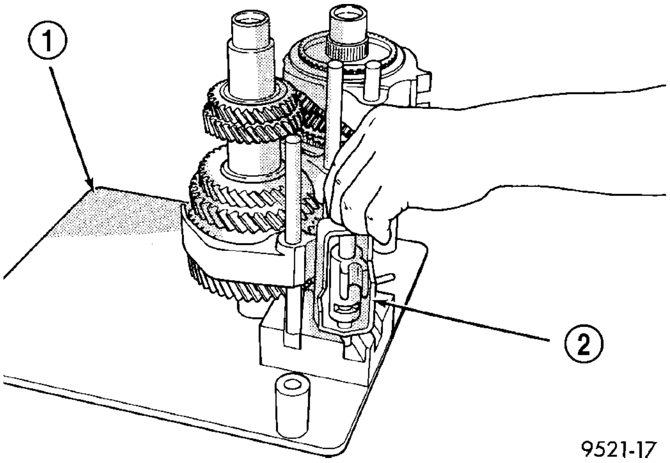


Fig. 38 Shift Blocker Removal

1 - 6785 BENCH FIXTURE
2 - SHIFT BLOCKER ASSEMBLY

(24) Remove the 1-2 shift fork from the output shaft (Fig. 39).

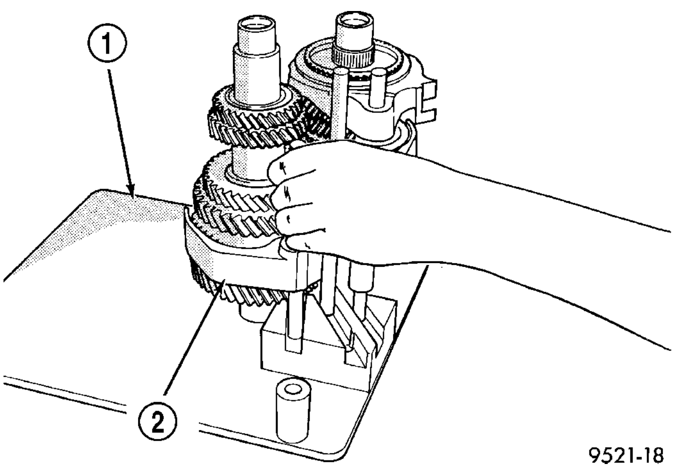


Fig. 39 1–2 Shift Fork Removal

1 - 6785 BENCH FIXTURE
2 - 1–2 SHIFT FORK

(25) Remove input and output shaft assemblies from bench fixture (Fig. 40).

CAUTION: The output shaft assembly is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1-2 synchronizer or gear fails, it is necessary to replace the complete output shaft assembly.

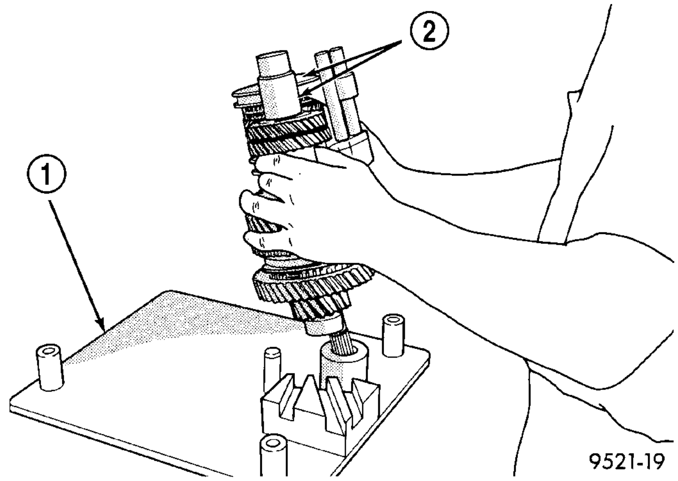


Fig. 40 Gear Train Removal

1 - 6785 BENCH FIXTURE
2 - INPUT AND OUTPUT SHAFTS

CLEANING

Clean the gears, bearings, shafts, synchronizers, thrust washers, oil feeder, shift mechanism, gear case, and bellhousing with solvent. Dry all parts except the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

INSPECTION

Inspect the gears, bearings, shafts and thrust washers. Replace the bearings and cups if the rollers are worn, chipped, cracked, flat spotted, or brinnelled, or if the bearing cage is damaged or distorted. Replace the thrust washers if cracked, chipped, or worn. Replace the gears if the teeth are chipped, cracked, or worn thin. Inspect the synchronizers. Replace the sleeve if worn or damaged in any way. Replace the stop rings if the friction material is burned, flaking off, or worn. Check the condition of the synchro keys and springs. Replace these parts if worn, cracked, or distorted.

T350 MANUAL TRANSAXLE (Continued)

ASSEMBLY

The T350 transaxle internal components can be serviced only by separating the gear case from the bellhousing case.

CAUTION: The transaxle output shaft is serviced as a unit. No disassembly and reassembly is possible. Damage to the transaxle may result.

The sealant used to seal the transaxle case halves is Mopar® Gasket Maker, Loctite® 518, or equivalent. The sealant used for the bearing end plate cover is Mopar® RTV.

(1) Verify bench fixture shims are removed from bench fixture. Install output and input shafts into bench fixture (Miller tool #6785) (Fig. 41).

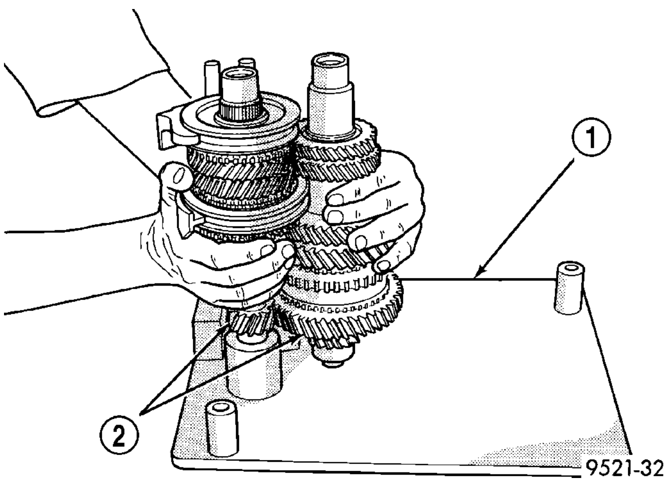


Fig. 41 Bench Fixture

1 - BENCH FIXTURE
2 - GEARTRAIN

(2) Install shift rails and forks into bench fixture (Fig. 42).

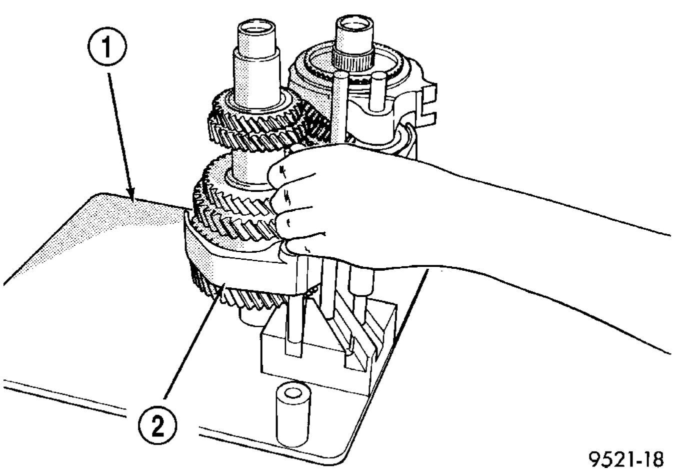


Fig. 42 Shift Rail Installation

1 - 6785 BENCH FIXTURE
2 - 1–2 SHIFT FORK

(3) Install shift blocker assembly into bench fixture (Fig. 43).

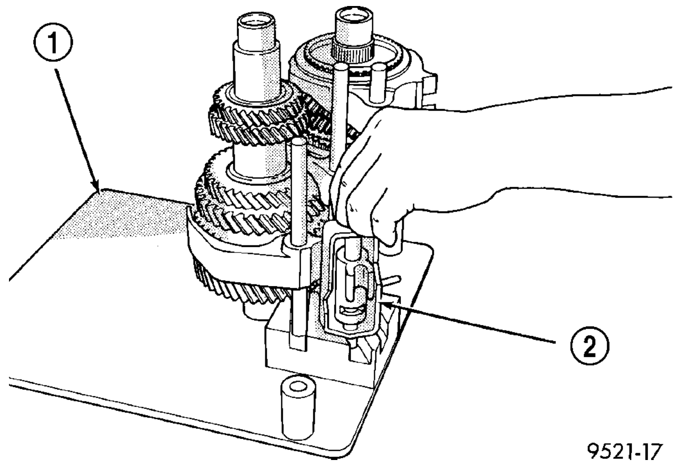


Fig. 43 Shift Blocker Installation

1 - 6785 BENCH FIXTURE
2 - SHIFT BLOCKER ASSEMBLY

(4) Install reverse brake blocking ring (Fig. 44).

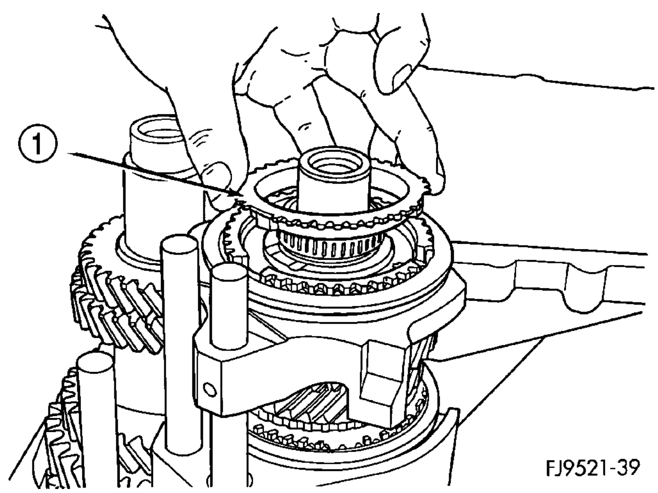


Fig. 44 Reverse Brake Blocking Ring Installation

1 - REVERSE BRAKE BLOCKING RING

T350 MANUAL TRANSAXLE (Continued)

(5) Install reverse brake friction cone (Fig. 45).

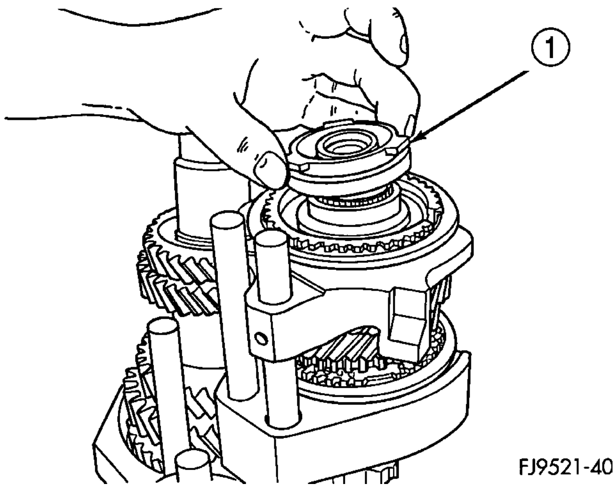


Fig. 45 Reverse Brake Friction Cone Installation

1 - REVERSE BRAKE FRICTION CONE

(6) Install gear–case half over bench fixture (Fig. 46). Line up shift finger over 3-4 lug.

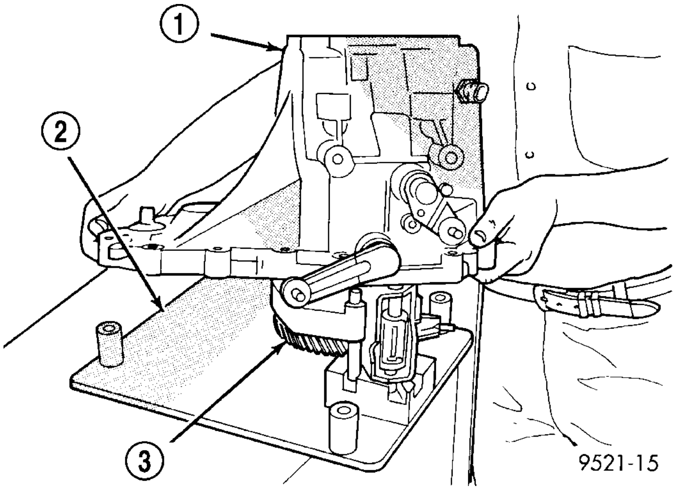


Fig. 46 Gear Case Half

1 - TRANSAXLE CASE
2 - BENCH FIXTURE
3 - GEARTRAIN

(7) Line up reverse brake friction cone lugs to the slots in the gear case (Fig. 47). Verify reverse brake shim is in position.

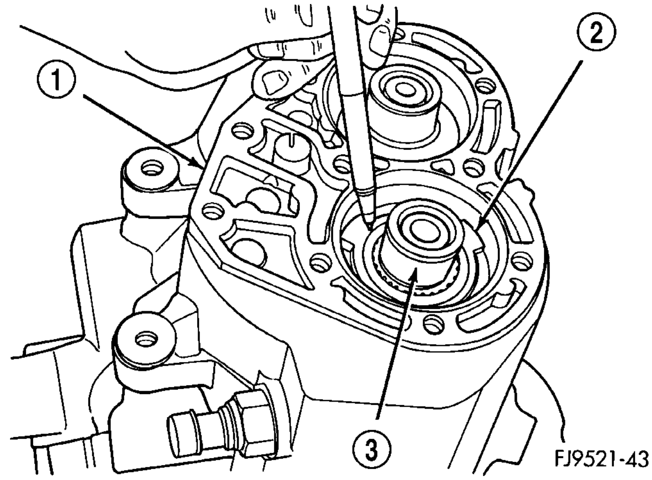


Fig. 47 Friction Cone Lugs

1 - CASE
2 - FRICTION CONE LUGS
3 - INPUT SHAFT

(8) Position input and output bearings on the shafts. Using Miller tool C-4992-1, press on input and output shaft bearings until they bottom into the case and against the shafts (Fig. 48).

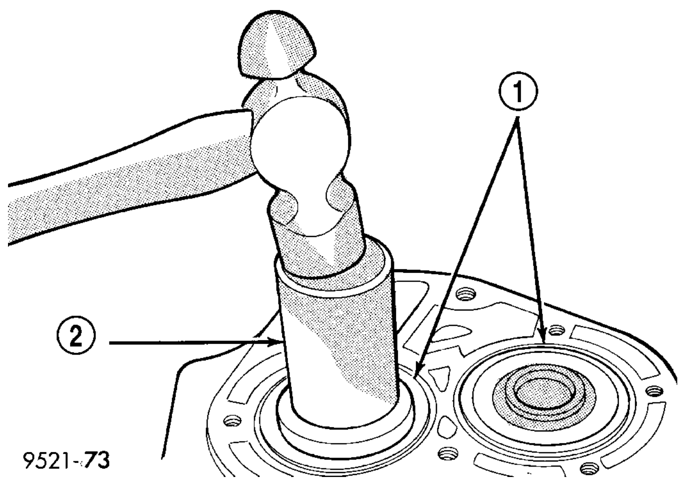


Fig. 48 Installing Input and Output Bearings

1 - INPUT AND OUTPUT BEARINGS
2 - SPECIAL TOOL C-4992-1

T350 MANUAL TRANSAXLE (Continued)

(9) Install shaft snap rings at input and output bearings (Fig. 49).

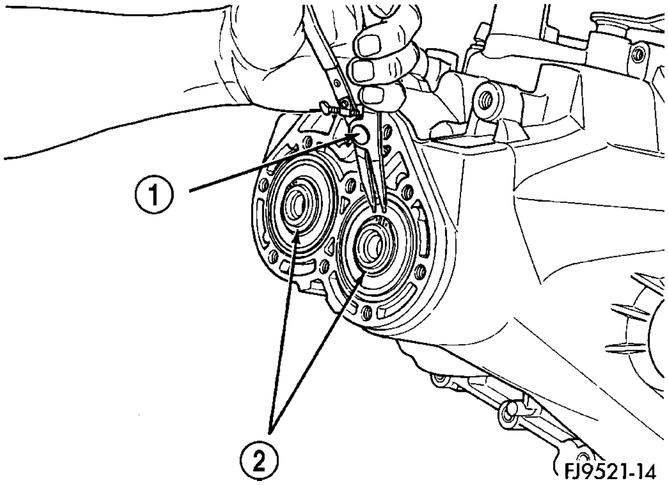


Fig. 49 Snap Rings Retaining Bearings

1 - SNAP RING PLIERS
2 - SNAP RINGS

(10) Apply Mopar® RTV sealant to end–cover outer edge and around bolt holes. Install end–cover onto gear case. Tighten end cover bolts to 29 N·m (21 ft. lbs.) torque (Fig. 50).

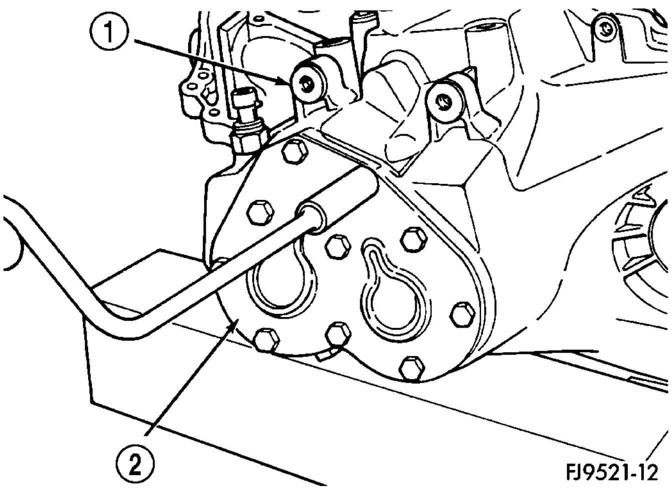


Fig. 50 Transaxle End Cover

1 - TRANSAXLE CASE
2 - END COVER

(11) Remove gear case from bench fixture.

(12) Install gear case in a holding fixture with end cover facing down.

(13) Turn selector shaft into slot on blocker assembly (Fig. 51).

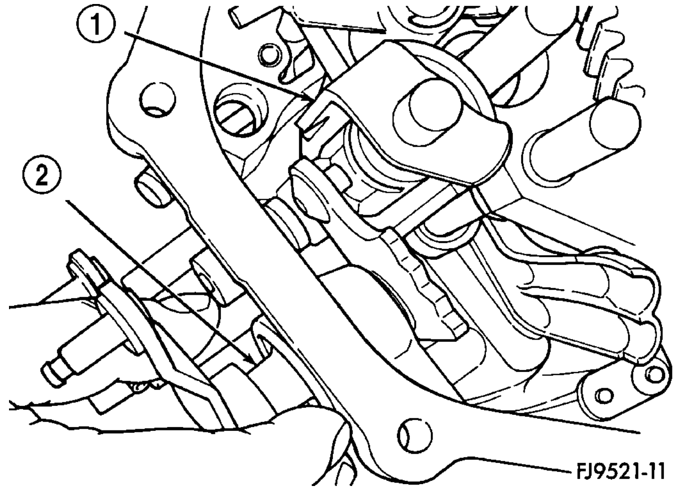


Fig. 51 Selector Shaft

1 - SHIFT ASSEMBLY
2 - SELECTOR SHAFT

(14) Push selector shaft spacer clip onto selector shaft. Install shift levers.

(15) Install reverse idler gear and spacer as shown in (Fig. 52).

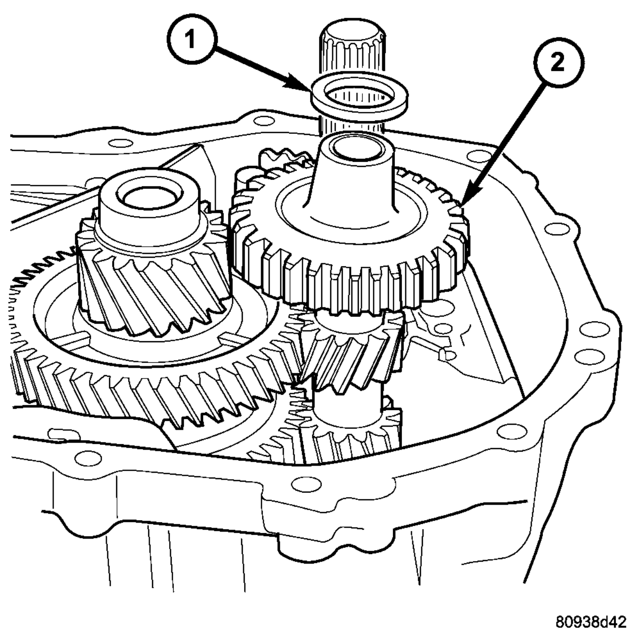


Fig. 52 Reverse Idler Gear and Spacer

1 - SPACER
2 - REVERSE IDLER GEAR

T350 MANUAL TRANSAXLE (Continued)

(16) Install reverse idler shaft (Fig. 53).

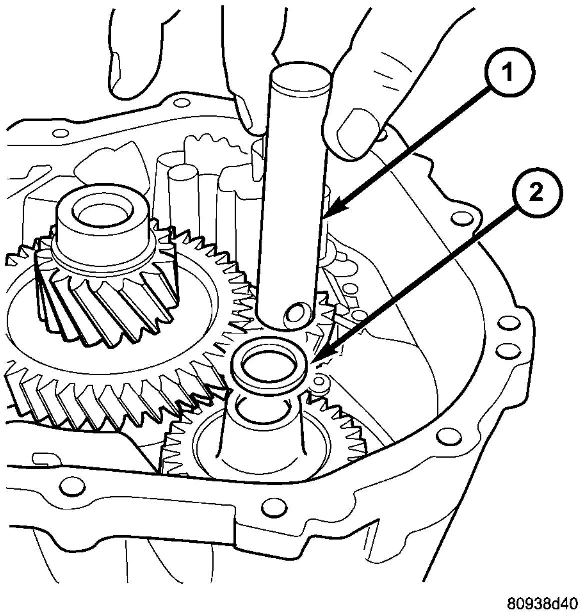


Fig. 53 Reverse Idler Shaft Installation

1 - REVERSE IDLER SHAFT
2 - SPACER

(17) Install bolt into shaft and tighten to 26 N·m (19 ft. lbs.) torque (Fig. 54).

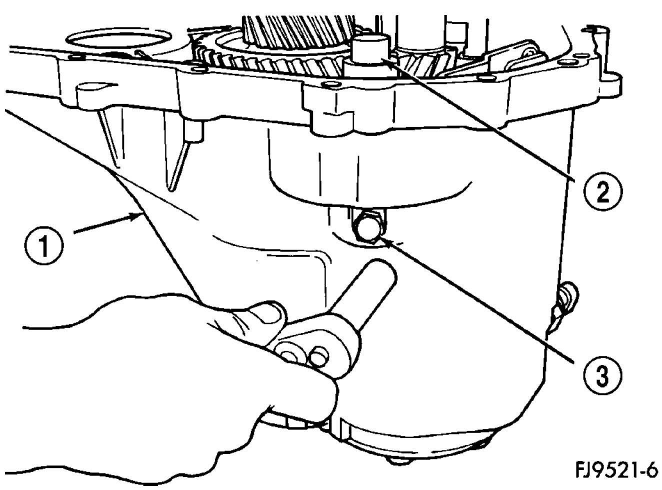


Fig. 54 Reverse Idler Shaft Bolt

1 - CASE
2 - REVERSE IDLER SHAFT
3 - REVERSE IDLER SHAFT BOLT

(18) Install reverse fork bracket and reverse lock-out. Tighten screws to 11 N·m (96 in. lbs.) torque (Fig. 55) (Fig. 56).

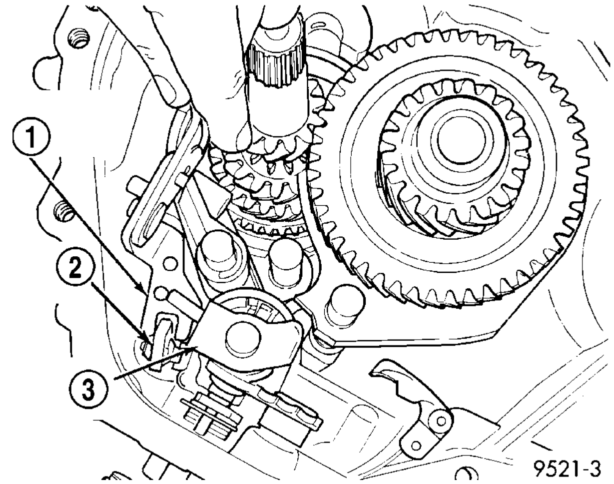


Fig. 55 Reverse Fork Bracket

1 - REVERSE FORK BRACKET
2 - REVERSE CAM BLOCKOUT
3 - SHIFT BLOCKER ASSEMBLY

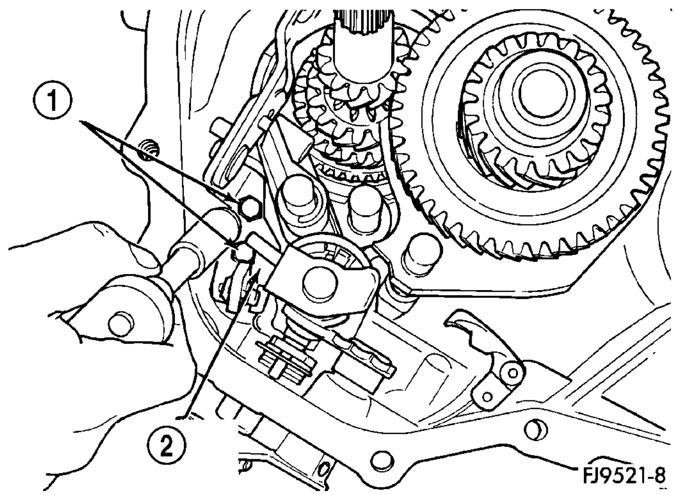


Fig. 56 Reverse Fork Screws

1 - SCREWS (2)
2 - REVERSE FORK BRACKET

T350 MANUAL TRANSAXLE (Continued)

(19) Install differential into gear case (Fig. 57).

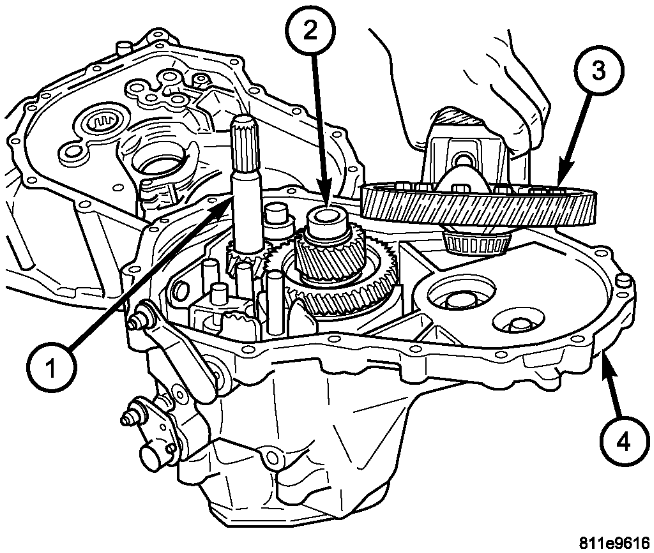


Fig. 57 Differential Removal/Installation

1 - INPUT SHAFT
2 - OUTPUT SHAFT
3 - DIFFERENTIAL ASSEMBLY
4 - GEARTRAIN HOUSING

BEARING ADJUSTMENT PROCEDURE

(1) Use 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 gives a false end–play reading while gauging for proper shims. Improperly seated bearing cups 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. If distress is seen on either the cup or bearing rollers, both cup and cone must be replaced.

(3) Bearing preload and drag torque specifications must be maintained to avoid premature bearing failures. Used (original) bearings may lose up to 50% of the original drag torque after break–in. All bearing adjustments must be made with no other component interference or gear intermesh.

(4) Replace bearings as a pair: If one differential bearing is defective, replace both differential bearings, if one input shaft bearing is defective, replace both input shaft bearings.

(5) Bearing cones must not be reused if removed.

(6) Turning–torque readings should be obtained while smoothly rotating in either direction.

DIFFERENTIAL BEARING PRELOAD ADJUSTMENT

NOTE: True bearing turning–torque readings can be obtained only with the geartrain removed from the case.

(1) Remove bearing cup and existing shim from clutch bellhousing case.

(2) Press in new bearing cup into bellhousing case (or use a cup that has been ground down on the outer edge for ease of measurement).

(3) Press in new bearing cup into gear case side.

(4) Oil differential bearings with transmission fluid. Install differential assembly in transaxle gear case. Install clutch bellhousing over gear case. Install and torque case bolts to 29 N·m (21 ft. lbs.).

(5) Position transaxle with bellhousing facing down on workbench with C-clamps. Position dial indicator.

NOTE: Position of dial indicator in (Fig. 58) is for illustrative purposes only. The dial indicator should be parallel to T-Handle to obtain the most accurate reading.

(6) Apply a medium load to differential with Tool C-4995 and a T-handle, in the downward direction. Roll differential assembly back and forth a number of times. This will settle the bearings. Zero the dial indicator. To obtain end play readings, apply a medium load in an upward direction while rolling differential assembly back and forth (Fig. 58). Record end play.

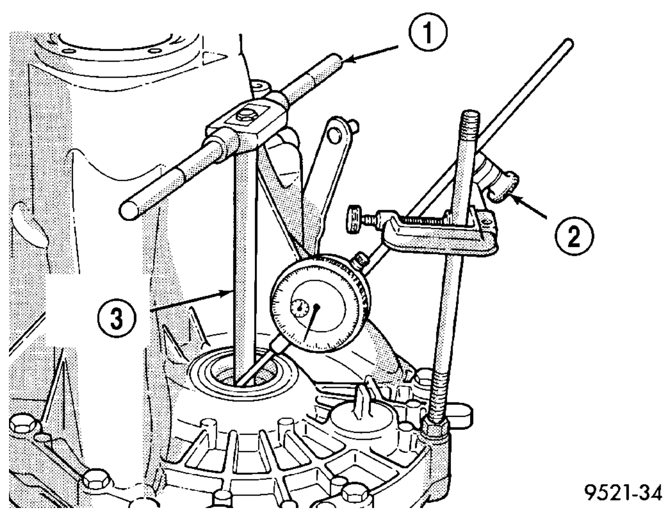


Fig. 58 Checking Differential Bearing End Play To Determine Shim Thickness

1 - T-HANDLE
2 - DIAL INDICATOR SET
3 - SPECIAL TOOL C-4995

(7) The shim required for proper bearing preload is the **total of end play, plus (constant) preload of 0.18mm (0.007 in.).** Never combine shims to obtain the required preload.

(8) Remove case bolts. Remove clutch bellhousing differential bearing cup. Install shim(s) selected in

T350 MANUAL TRANSAXLE (Continued)

Step 7. Then press the bearing cup into clutch bellhousing.

(9) Install clutch bellhousing. Install and torque case bolts to 26 N·m (19 ft. lbs.).

(10) Using Special Tool C-4995 and an inch-pound torque wrench, check turning torque of the differential assembly (Fig. 59). **The turning torque should be 6 to 12 in. lbs. If the turning torque is too high, install a 0.05mm (0.002 inch) thinner shim. If the turning torque is too low, install a 0.05mm (0.002 inch) thicker shim.**

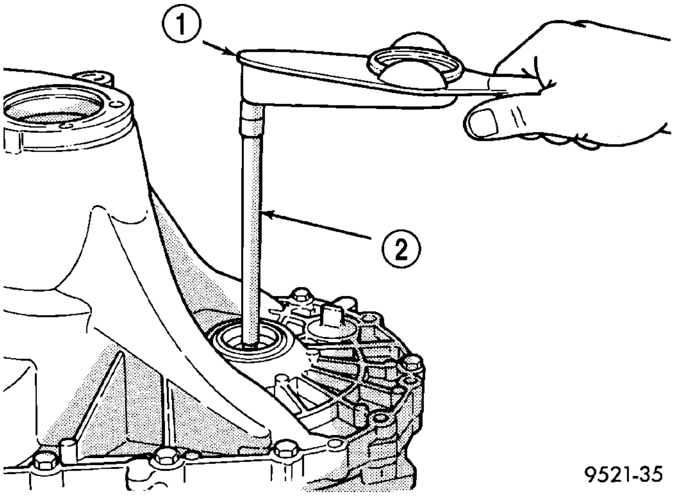


Fig. 59 Checking Differential Bearing Turning Torque

1 - INCH-POUND TORQUE WRENCH
2 - SPECIAL TOOL C-4995

(11) Recheck turning torque. Repeat Step 10 until the proper turning torque is obtained.

Once proper turning torque has been established, place gear case on the end plate. Draw a bead of Mopar® Gasket Maker, Loctite® 518, or equivalent, on the flat surface of the case mating flange. Install clutch bellhousing onto gear case. Install and tighten case bolts to 29 N·m (21 ft. lbs.).

INSTALLATION

(1) Install clutch module onto input shaft. Install transaxle into position.

(2) Install transaxle-to-engine mounting bolts (Fig. 14)and tighten to 95 N·m (70 ft. lbs.) torque.

(3) Raise engine and transaxle with screw jack until through hole in upper mount aligns with hole in mount bracket. Install mount bolt and tighten to 108 N·m (80 ft. lbs.) torque (Fig. 13).

(4) Remove screwjack.

(5) Install four (4) modular clutch-to-driveplate bolts. Align drive plate and modular clutch alignment marks placed upon disassembly. Start with tight-tolerance (slotted) hole, install and torque bolts to 88 N·m (65 ft. lbs.) torque.

(6) Install starter motor and tighten bolts to 54 N·m (40 ft. lbs.) torque. Make sure to fasten ground cable to upper starter bolt as shown in (Fig. 12).

(7) Connect starter electrical harness and tighten positive cable nut to 10 N·m (90 in. lbs.) torque.

(8) Install bellhousing dust cover (Fig. 10).

(9) Install left engine-to-transaxle bending brace (Fig. 10).

(10) Install structural collar (Fig. 10) as follows:

(a) Position collar and install all bolts finger tight.

(b) Tighten the collar-to-oil pan bolts to 3 N·m (30 in. lbs.) torque.

(c) Tighten the collar-to-transaxle bolts to 108 N·m (80 ft. lbs.) torque.

(d) Final torque the collar-to-oil pan bolts to 54 N·m (40 ft. lbs.) torque.

(11) Install the right lateral bending brace and tighten bolts to 81 N·m (60 ft. lbs.) torque (Fig. 11).

(12) Install slave cylinder to transaxle (Fig. 8) (Fig. 9).

(13) Install both front axle driveshafts. Refer to Group 3, Differential and Driveline for the correct procedures.

(14) Fill transaxle with suitable amount of Mopar® ATF+4.

(15) Lower vehicle.

(16) Connect vehicle speed sensor connector (Fig. 7).

(17) Connect shift crossover and selector cables to shift lever. Install cables to bracket and install retaining clips (Fig. 6).

(18) Connect back-up lamp switch connector.

(19) Connect ground strap to transaxle upper mount bracket.

(20) Install battery lower tray and battery, and tighten battery hold down clamp to secure battery.

(21) Install the air cleaner/throttle body assy. as follows:

(a) Connect the accelerator and speed control (if equipped) cables to the air cleaner/throttle body assy.

(b) Install assy into position, making sure the air cleaner locating slot is engaged to the battery bracket tab, and tighten fasteners to 14 N·m (120 in. lbs.) torque.

(c) Verify throttle body duct is fully seated to intake manifold and tighten clamp to 5 N·m (40 in. lbs.) torque.

(d) Connect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(e) Connect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(22) Connect the battery cables.

(23) Road test vehicle and inspect for leaks.

T350 MANUAL TRANSAXLE (Continued)

SPECIFICATIONS

Bolts that have thread sealer or torque lock patches should not be reused. Always install new bolts in these applications.

TORQUE SPECIFICATIONS

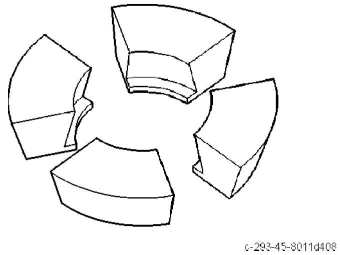
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Back-up Lamp Switch	24	18	—
Crossover Cable Adj. Screw	8	—	70
Drain Plug	14	—	120
Differential Ring Gear Bolts	81	60	—
Dust Shield to Transaxle	12	—	105
End Plate Cover Bolts	29	21	—
Front Engine Mount to Trans	108	80	—
Front Mount Through Bolt	61	45	—
Front Mount to Engine Bolt	54	40	—
Lateral Bending Strut to Engine	54	40	—
Lateral Bending Strut to Trans.	54	40	—
Left Mount Through Bolt	108	80	—
Left Mount to Transaxle	54	40	—
Output Bearing Race Ret. Strap	11	—	96
Reverse Fork Bracket	11	—	96
Reverse Idler Shaft Bolt	29	19	—
Shift Cable Bracket to Transaxle	28	—	250
Transaxle Case Bolts	29	21	—
Transaxle to Engine Bolt	95	70	—
Vehicle Speed Sensor	7	—	60
Vertical Bending Strut to Engine	108	80	—
Vertical Bending Strut to Trans.	108	80	—

NV T350 (A-578) MANUAL TRANSAXLE FLUID FILL

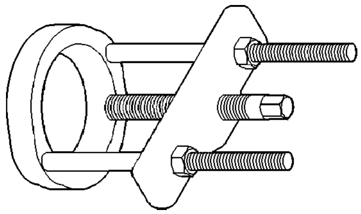
TRANSAXLE	METRIC MEASURE	U.S. MEASURE
NV T350	2.4-2.7 Liters	2.5-2.8 Quarts

T350 MANUAL TRANSAXLE (Continued)

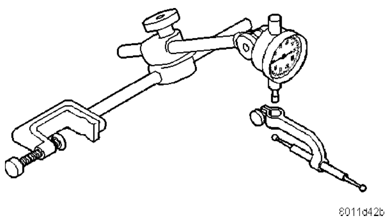
SPECIAL TOOLS



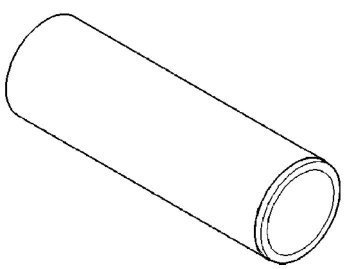
Adapter Blocks C-293–45



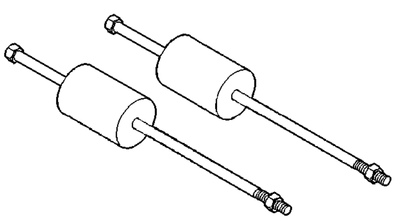
Puller Press C-293–PA



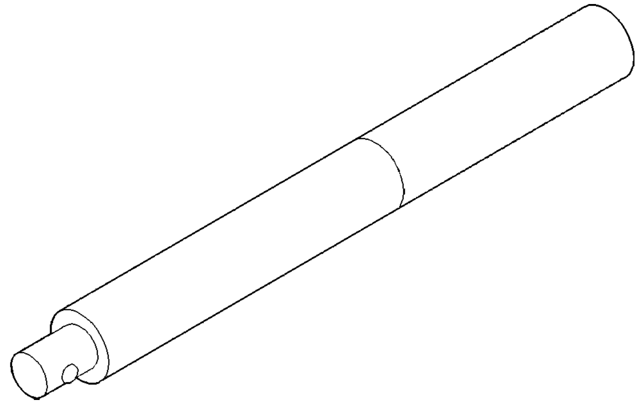
Dial Indicator C-3339



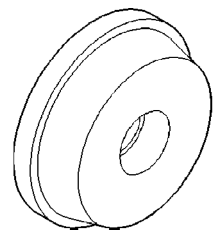
Sleeve C-3717



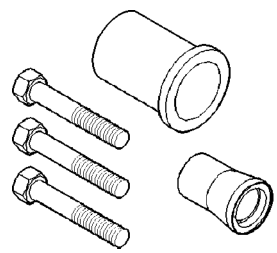
Slide Hammer C-3752



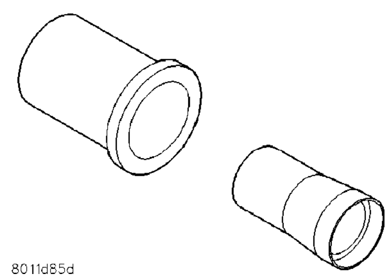
Universal Handle C-4171



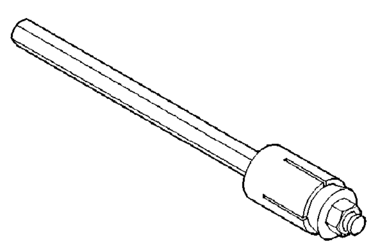
Bearing Installer C-4628



Seal Remover C-4680

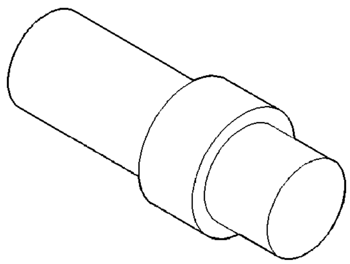


Seal Installer C-4992

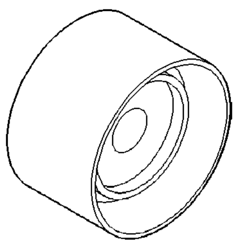


Torque Tool C-4995

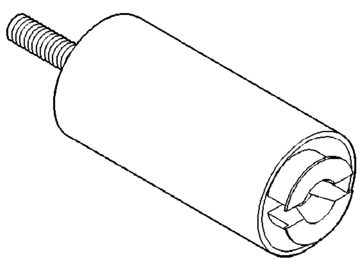
T350 MANUAL TRANSAXLE (Continued)



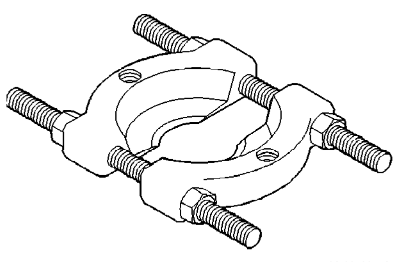
Adapter C-4996



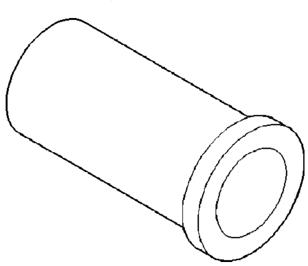
Installer L-4410



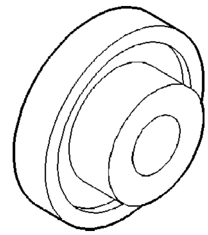
Special Jaw Set L-4518



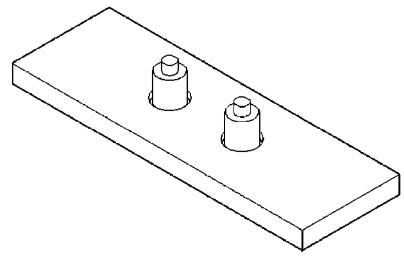
Bearing Splitter 1130



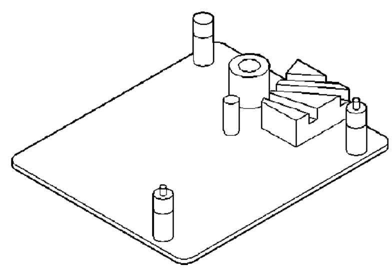
Driver 6342



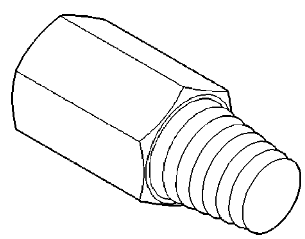
Seal Installer 6709



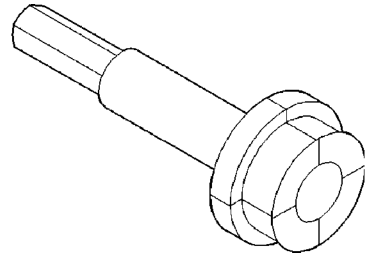
Bearing Remover 6768



Bench Fixture 6785



Remover 6786



Remover 6787

AXLE SEAL

REMOVAL

(1) Remove axle shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(2) Insert a flat–blade pry tool at outer edge of axle shaft seal (Fig. 60).

(3) Tap on the pry tool with a small hammer and remove axle shaft seal.

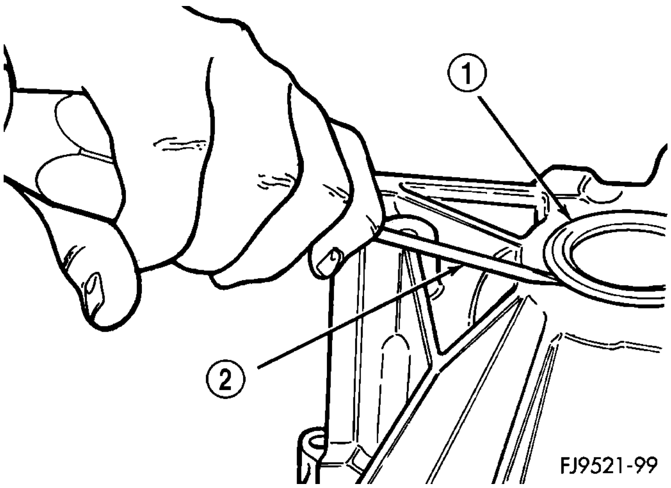


Fig. 60 Axle Shaft Seal Removal

1 - AXLE SEAL
2 - PRY TOOL

INSTALLATION

(1) Clean axle shaft seal bore of any excess sealant.

(2) Align axle shaft seal with axle shaft seal bore.

(3) Install axle seal on Tool #6709 and C-4171 and insert into axle shaft seal bore.

(4) Tap seal into position until seated against transaxle case.

(5) Install axle shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)

(6) Check transaxle fluid level and adjust as necessary.

BACK-UP LAMP SWITCH

REMOVAL

(1) Lift vehicle on hoist.

(2) From bottom side of vehicle, disconnect back-up lamp switch connector (Fig. 61).

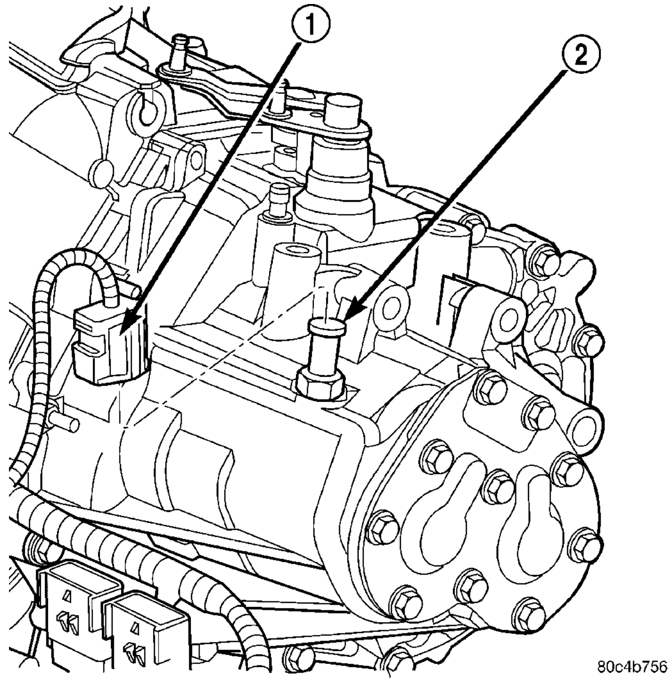


Fig. 61 BACK-UP LAMP SWITCH

1 - CONNECTOR
2 - BACK UP LAMP SWITCH

(3) Unscrew switch from transaxle.

INSTALLATION

(1) Install back-up lamp switch. Teflon tape or equivalent must be used on switch threads. Tighten switch to 24 N·m (18 ft. lbs.) torque.

CAUTION: Do not overtighten switch.

(2) Connect back-up lamp switch connector (Fig. 61).

(3) Lower vehicle.

(4) Verify back-up lamp operation.

DIFFERENTIAL

DISASSEMBLY

(1) Remove differential bearing cones (ring gear and diff. case side) using Tool C-293-PA, Adapters C-293-45, and Tool 4996 (Fig. 62) (Fig. 63).

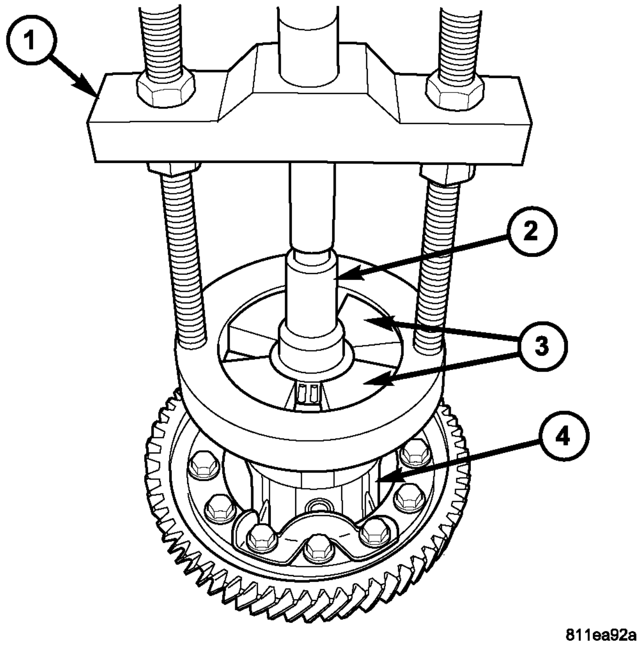


Fig. 62 Remove Differential Bearing Cone from Diff. Case Side

1 - TOOL C-293
2 - TOOL C-4996
3 - TOOL C-293-45
4 - DIFFERENTIAL CASE

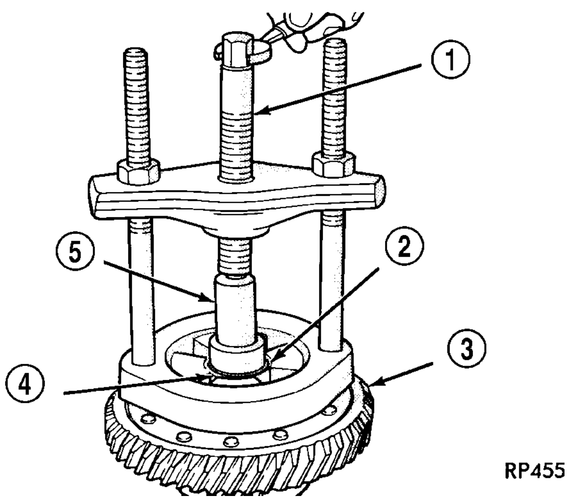


Fig. 63 Remove Differential Bearing Cone from Ring Gear Side

1 - SPECIAL TOOL C-293
2 - SPECIAL TOOL ADAPTER C-293-45 (USE 4 PIECES)
3 - DIFFERENTIAL ASSEMBLY
4 - DIFFERENTIAL BEARING CONE
5 - SPECIAL TOOL C-4996 (NOTE POSITION)

(2) Using a suitable screwdriver, pry off and remove speedometer drive gear (Fig. 64) (Fig. 65).

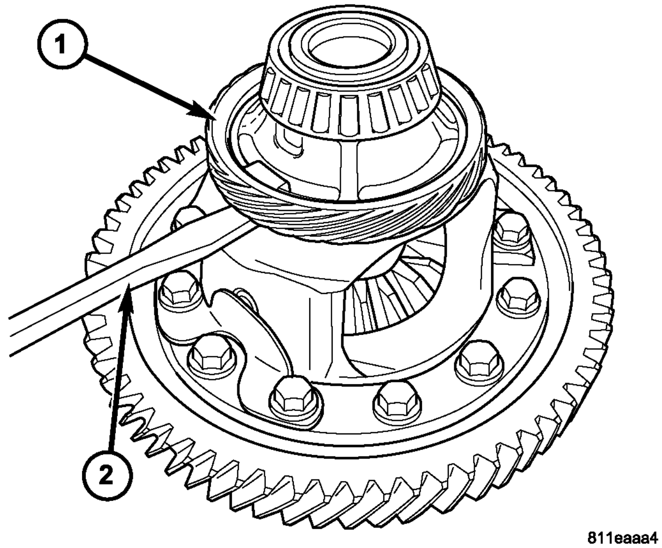


Fig. 64 Pry off Speedometer Drive Gear

1 - SPEEDOMETER GEAR
2 - SCREWDRIVER

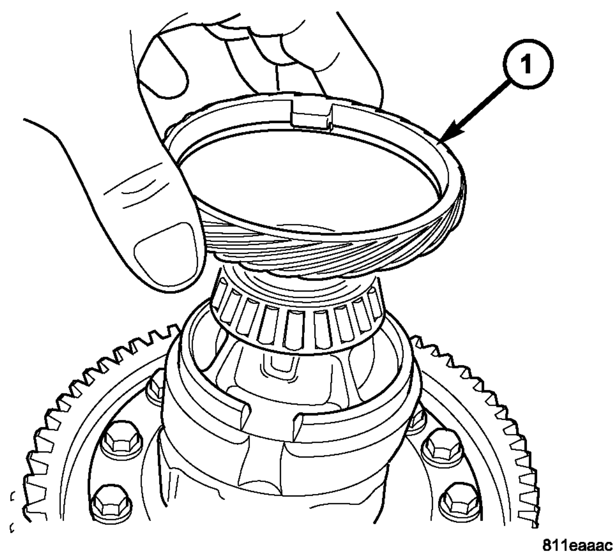


Fig. 65 Speedometer Drive Gear

1 - SPEEDOMETER GEAR

DIFFERENTIAL (Continued)

(3) If servicing only pinion and side gears, remove ring gear-to-case bolts at pinion shaft retainer only (Fig. 66). Remove pinion shaft retainer (Fig. 67). **Discard and use NEW bolts upon assembly.**

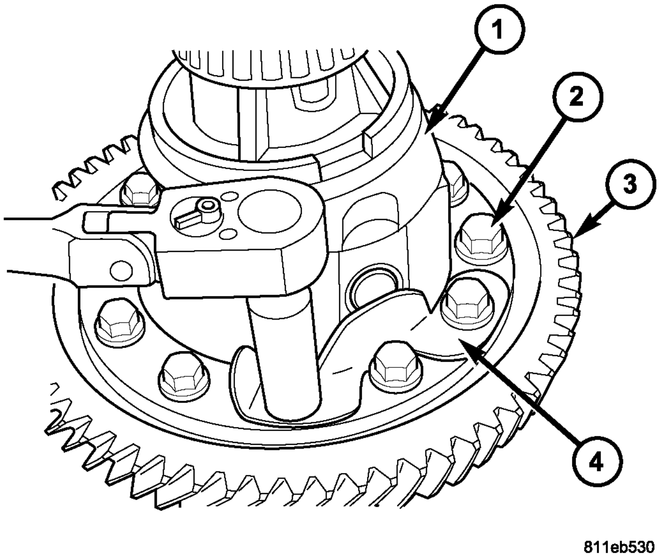


Fig. 66 Differential Ring Gear-to-Case Bolts

1 - DIFFERENTIAL CASE
2 - BOLT (12)
3 - RING GEAR
4 - PINION SHAFT RETAINER (2)

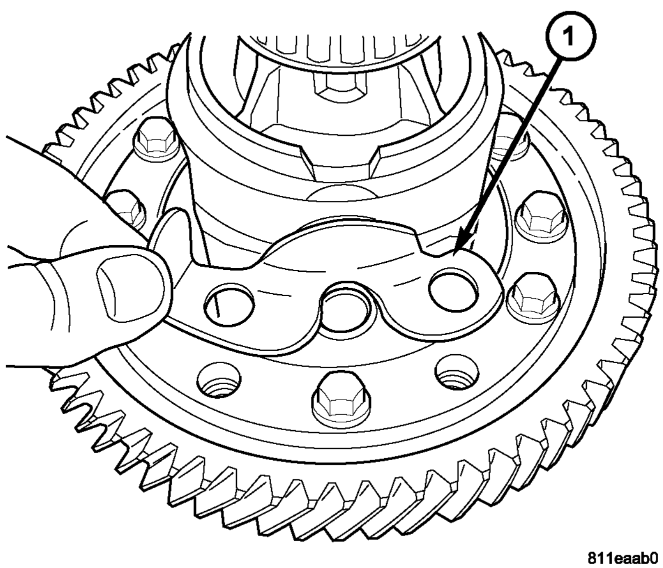


Fig. 67 Pinion Shaft Retainer

1 - PINION SHAFT RETAINER

(4) If servicing ring gear as well, remove remaining ring gear-to-case bolts and remove ring gear from case (Fig. 68).

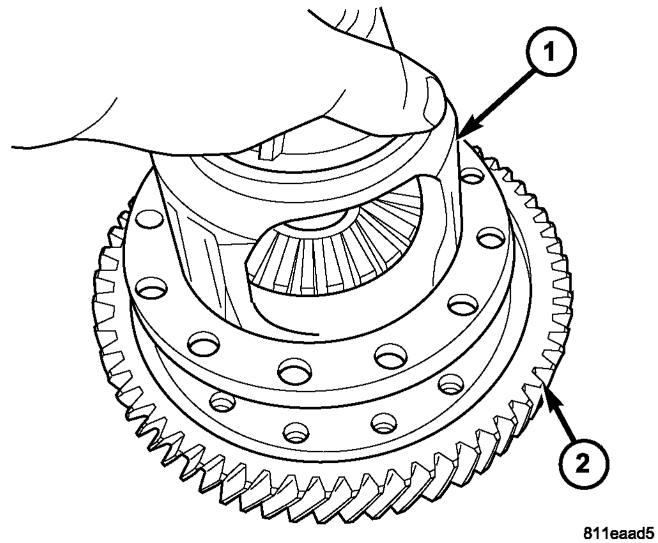


Fig. 68 Differential Ring Gear and Case

1 - DIFFERENTIAL CASE
2 - RING GEAR

(5) Remove pinion shaft (Fig. 69).

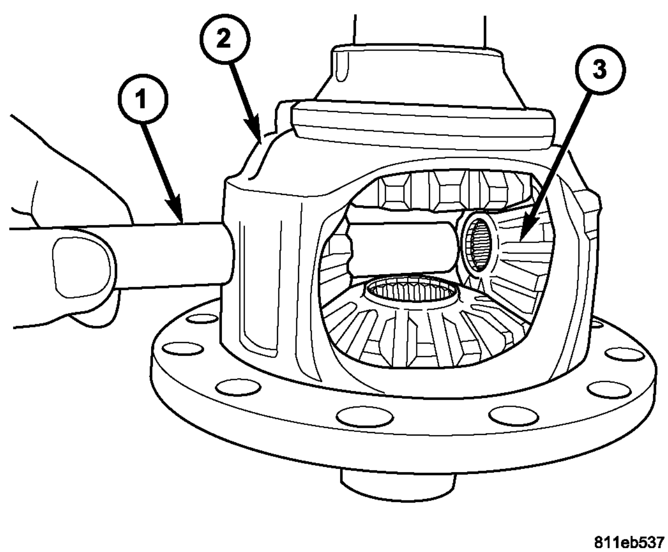


Fig. 69 Pinion Shaft Removal/Installation

1 - PINION SHAFT
2 - DIFFERENTIAL CASE
3 - PINION GEAR (2)

(6) Remove pinion gears, side gears, and thrust washers (Fig. 70) (Fig. 71) (Fig. 72).

DIFFERENTIAL (Continued)

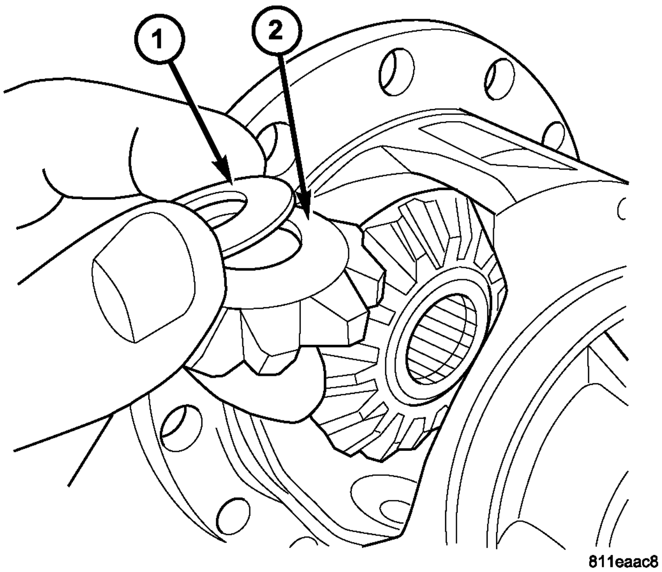


Fig. 70 Pinion Gear and Washer

1 - WASHER
2 - PINION GEAR

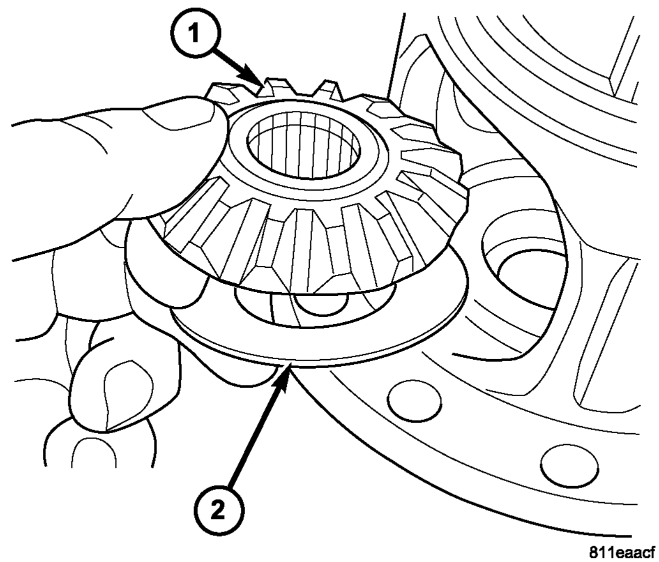


Fig. 71 Side Gear and Washer

1 - SIDE GEAR
2 - WASHER

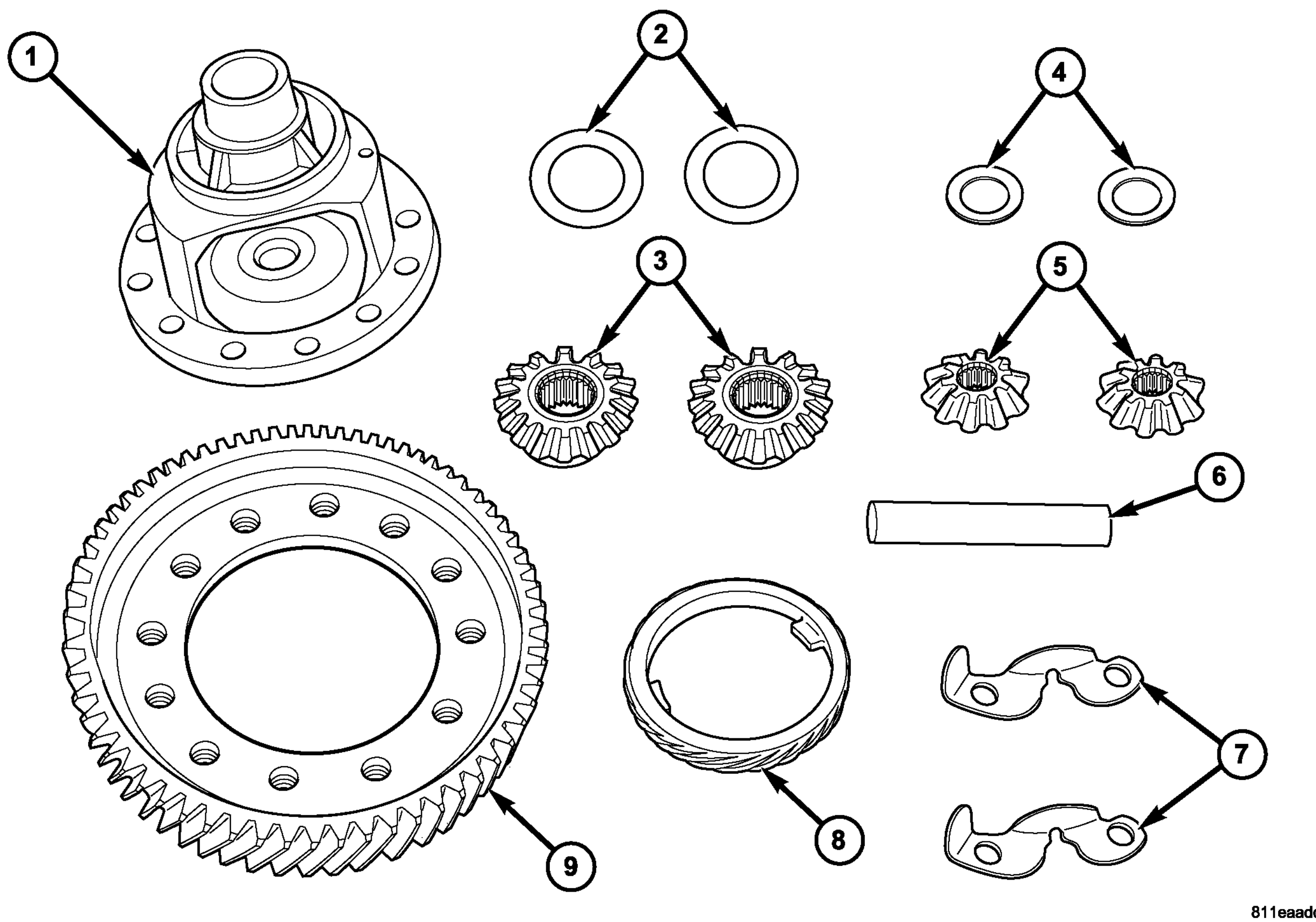


Fig. 72 Differential Components

1 - DIFFERENTIAL CASE
2 - SIDE GEAR WASHER (2)
3 - SIDE GEAR (2)
4 - PINION GEAR WASHER (2)
5 - PINION GEAR (2)
6 - PINION SHAFT
7 - PINION SHAFT RETAINER (2)
8 - SPEEDOMETER DRIVE GEAR
9 - RING GEAR

DIFFERENTIAL (Continued)

ASSEMBLY

(1) Install side gears, pinion gears, and thrust washers into case through opening and rotating into position (Fig. 73) (Fig. 74).

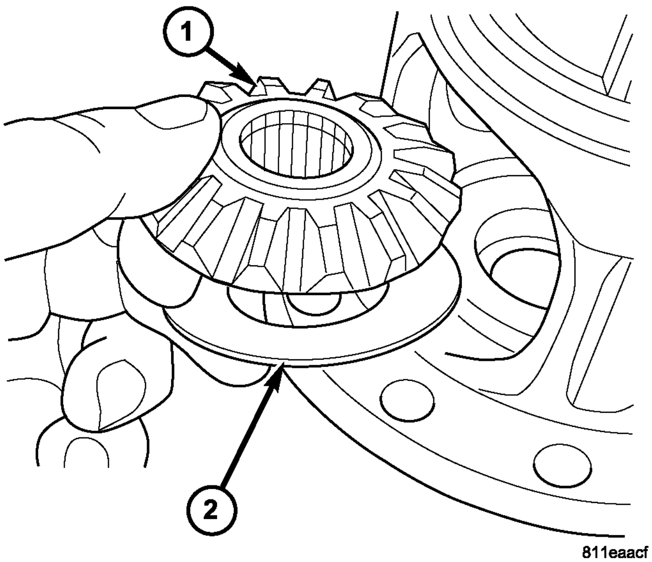


Fig. 73 Side Gear and Washer

1 - SIDE GEAR
2 - WASHER

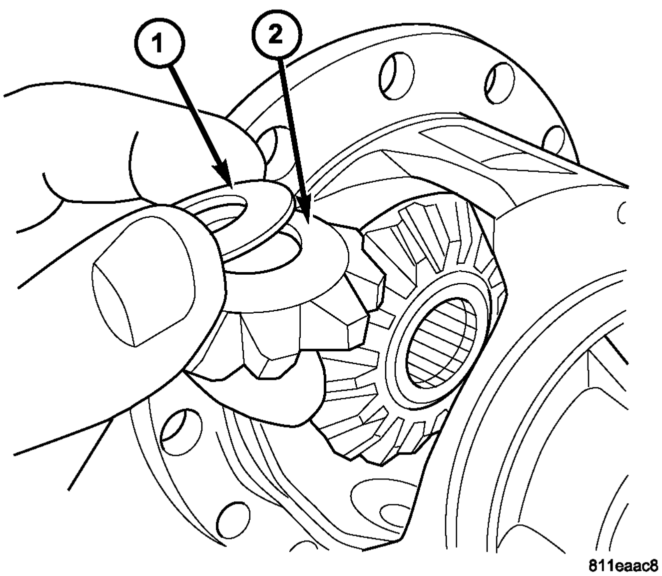


Fig. 74 Pinion Gear and Washer

1 - WASHER
2 - PINION GEAR

(2) Install pinion shaft (Fig. 75).

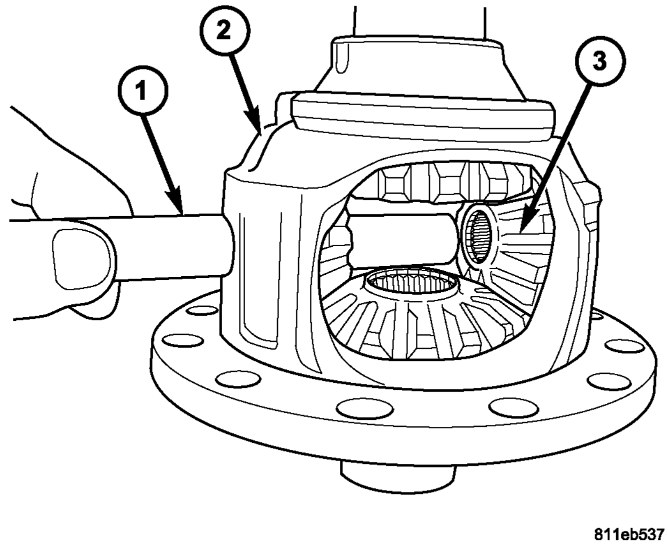


Fig. 75 Pinion Shaft Removal/Installation

1 - PINION SHAFT
2 - DIFFERENTIAL CASE
3 - PINION GEAR (2)

(3) If previously removed, install ring gear to differential case (Fig. 76).

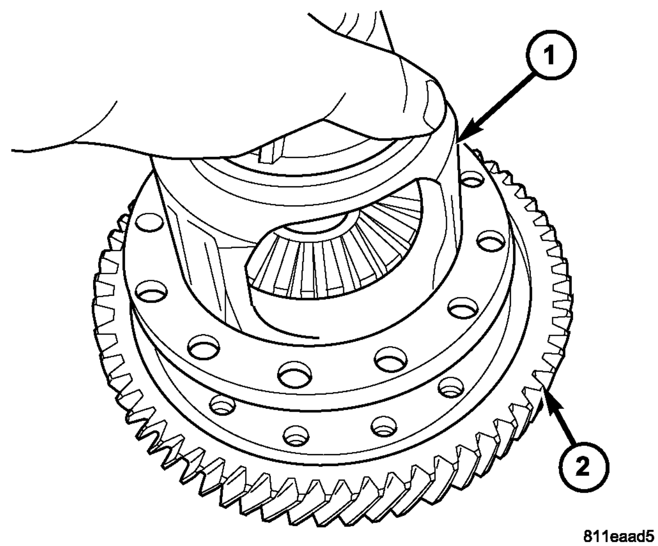


Fig. 76 Differential Ring Gear and Case

1 - DIFFERENTIAL CASE
2 - RING GEAR

DIFFERENTIAL (Continued)

(4) Install pinion shaft retainer (Fig. 77). Install **NEW** ring gear-to-case bolts and torque to 81 N·m (60 ft. lbs.) torque (Fig. 78).

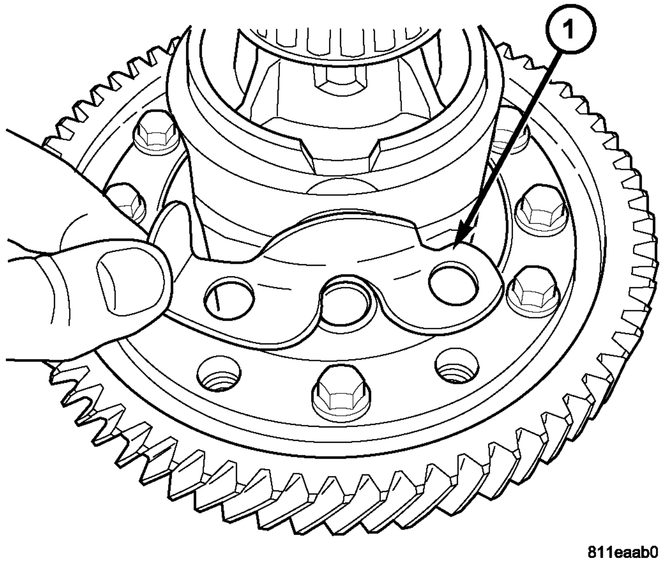


Fig. 77 Pinion Shaft Retainer

1 - PINION SHAFT RETAINER

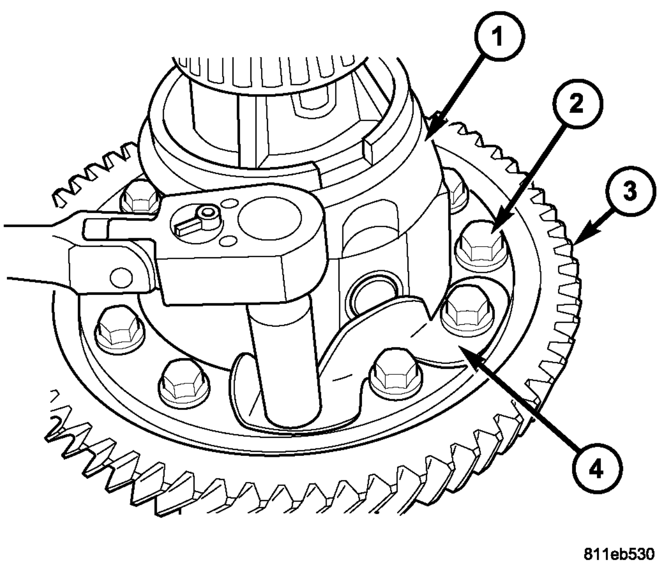


Fig. 78 Differential Ring Gear-to-Case Bolts

1 - DIFFERENTIAL CASE
2 - BOLT (12)
3 - RING GEAR
4 - PINION SHAFT RETAINER (2)

(5) Install speedometer drive gear to case (Fig. 79). Note orientation of index tab.

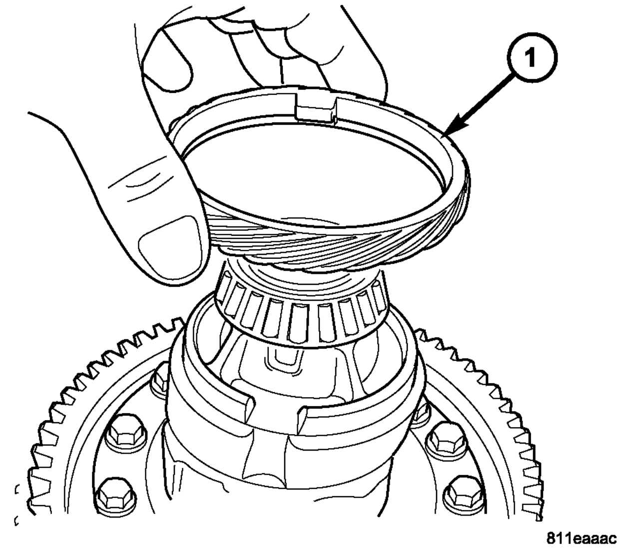


Fig. 79 Speedometer Drive Gear

1 - SPEEDOMETER GEAR

(6) Using Steel Block and Tool L-4440, press speedometer drive gear into position (Fig. 80).

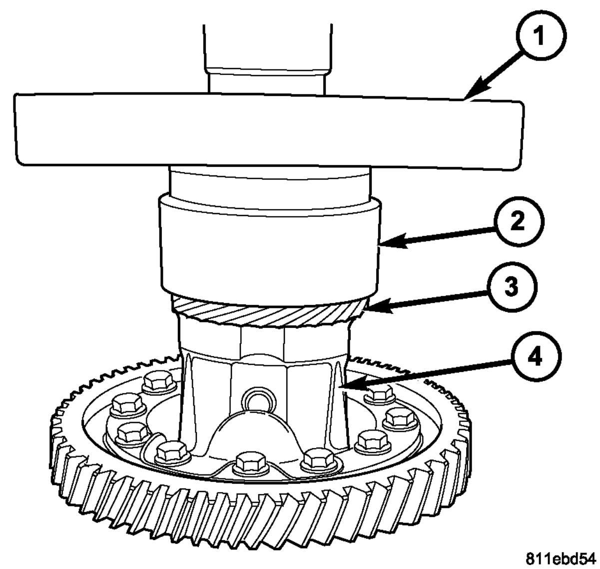


Fig. 80 Press Gear onto Differential

1 - STEEL STOCK
2 - TOOL L-4440
3 - SPEEDOMETER GEAR
4 - DIFFERENTIAL CASE

DIFFERENTIAL (Continued)

(7) Using an arbor press, Handle C-4171, and Tool L-4410, install differential side bearings to ring gear and case side (Fig. 81) (Fig. 82).

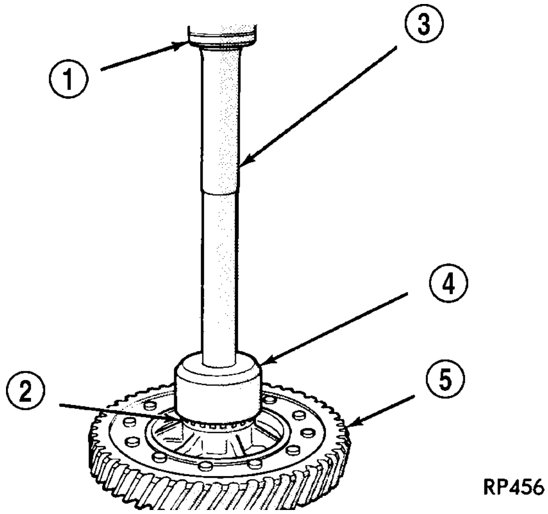


Fig. 81 Install Differential Bearing Cone to Ring Gear Side

1 - ARBOR PRESS RAM
2 - BEARING CONE
3 - SPECIAL TOOL HANDLE C-4171
4 - SPECIAL TOOL L-4410
5 - DIFFERENTIAL ASSEMBLY

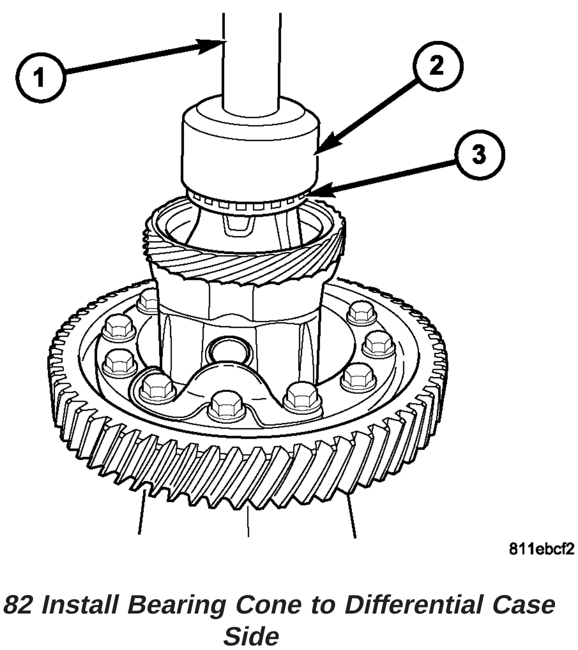


Fig. 82 Install Bearing Cone to Differential Case Side

1 - TOOL C-4171
2 - TOOL L-4410
3 - BEARING CONE

Measure and Adjust Side Gear End-Play

(1) Rotate the assembly two full revolutions both clockwise and counterclockwise.Set up dial indicator as shown and record end play (Fig. 83) (Fig. 84). Rotate side gear 90 degrees and take another measurement. Again, rotate side gear 90 degrees and record a final measurement.

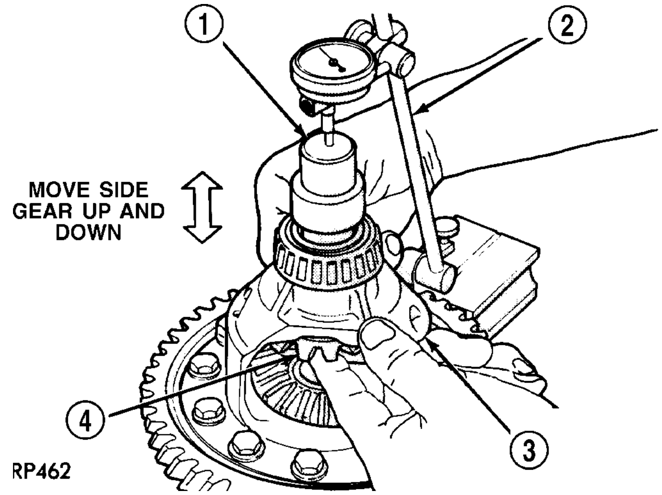


Fig. 83 Checking Side Gear End Play (Typical)

1 - SPECIAL TOOL C-4996 (NOTE POSITION)
2 - DIAL INDICATOR SET
3 - DIFFERENTIAL ASSEMBLY
4 - SIDE GEAR

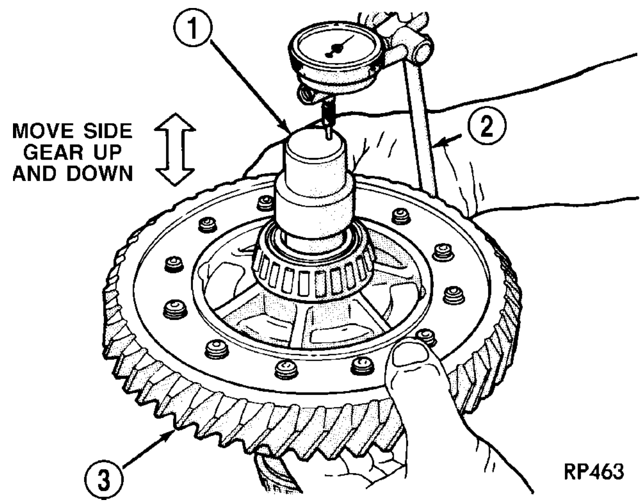


Fig. 84 Checking Side Gear End Play—Typical

1 - SPECIAL TOOL C-4996 (NOTE POSITION)
2 - DIAL INDICATOR SET
3 - DIFFERENTIAL ASSEMBLY

DIFFERENTIAL (Continued)

(2) Using the smallest end play recorded, shim that side gear to within 0.001 to 0.013 inch. The other side gear should be checked using the same procedure.

CAUTION: Side gear end play must be within 0.001 to 0.013 inch. Five select thrust washers are available: 0.027, 0.032, 0.037, 0.042, and 0.047 inch.

ADJUSTMENTS

DIFFERENTIAL BEARING PRELOAD ADJUSTMENT / SHIM SELECTION

Measure and adjust differential side bearing preload during any transaxle service, especially when the following components are replaced:

- Transaxle gear case
- Clutch bellhousing case
- Differential case
- Differential bearings

NOTE: True bearing turning torque readings can be obtained only with the geartrain removed from the case.

(1) Remove bearing cup and existing shim from clutch bellhousing case.

(2) Press in new bearing cup into bellhousing case (or use a cup that has been ground down on the outer edge for ease of measurement).

(3) Press in new bearing cup into gear case side.

(4) Oil differential bearings with transmission fluid. Install differential assembly in transaxle gear case. Install clutch bellhousing over gear case. Install and torque case bolts to 29 N·m (21 ft. lbs.).

(5) Position transaxle with bellhousing facing down on workbench with C-clamps. Position dial indicator.

NOTE: Indicator is set up as shown for illustrative purposes only (Fig. 85). Indicator must be parallel to T-Handle to obtain the most accurate reading.

(6) Apply a medium load to differential with Tool C-4995 and a T-handle, in the downward direction. Roll differential assembly back and forth a number of times. This will settle the bearings. Zero the dial indicator. To obtain end play readings, apply a medium load in an upward direction while rolling differential assembly back and forth (Fig. 85). Record end play.

(7) The shim required for proper bearing preload is the **total of end play, plus (constant) preload of 0.18 mm (0.007 in.).** Never combine shims to obtain the required preload.

(8) Remove case bolts. Remove clutch bellhousing differential bearing cup. Install shim(s) selected in Step 7. Then press the bearing cup into clutch bellhousing.

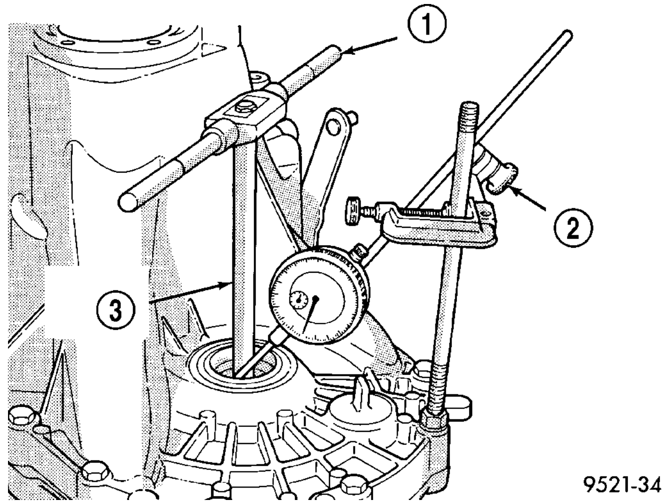


Fig. 85 Checking Differential Bearing End Play to Determine Shim Thickness

1 - T-HANDLE
2 - DIAL INDICATOR SET
3 - SPECIAL TOOL C-4995

(9) Install clutch bellhousing. Install and torque case bolts to 26 N·m (19 ft. lbs.).

(10) Using Special Tool C-4995 and an inch-pound torque wrench, check turning torque of the differential assembly (Fig. 86). **The turning torque should be 6 to 12 in. lbs. If the turning torque is too high, install a 0.05 mm (0.002 inch) thinner shim. If the turning torque is too low, install a 0.05mm (0.002 inch) thicker shim.**

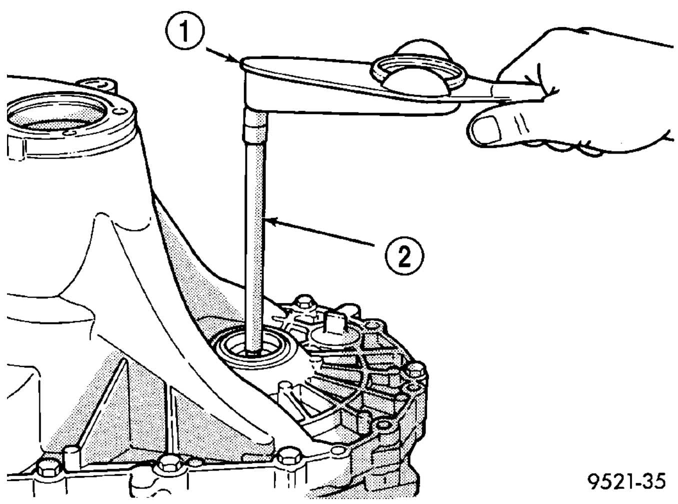


Fig. 86 Checking Differential Bearing Turning Torque

1 - INCH-POUND TORQUE WRENCH
2 - SPECIAL TOOL C-4995

(11) Recheck turning torque. Repeat Step 10 until the proper turning torque is obtained.

DIFFERENTIAL BEARING CUPS

REMOVAL

(1) Remove differential assembly from gear case using the procedure outlined in this group.

(2) Install Miller tool #L-4518 into the differential bearing cup (Fig. 87).

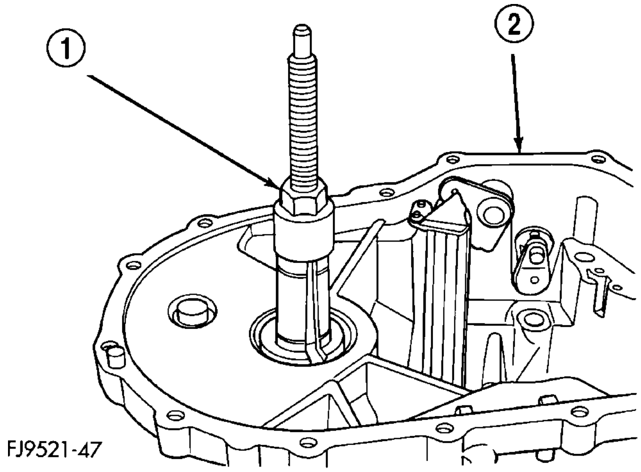


Fig. 87 Tool Installed in Bearing

1 - SPECIAL TOOL L-4518
2 - GEAR CASE

(3) Install the tool cup over the tool (Fig. 88).

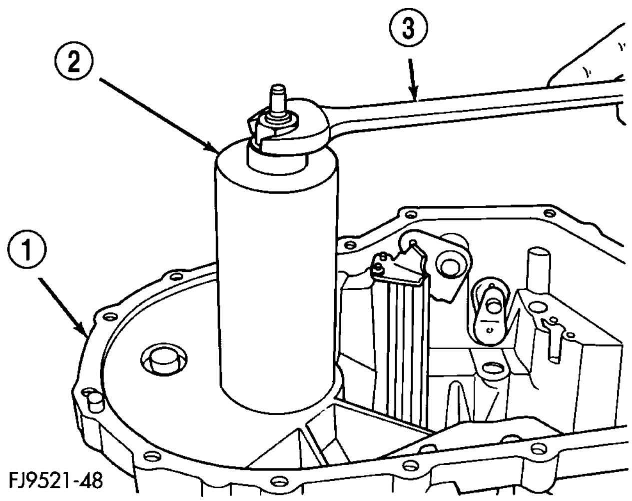


Fig. 88 Tool Cup Installed

1 - GEAR CASE
2 - SPECIAL TOOL L-4518
3 - WRENCH

(4) Tighten the tool until the race is removed from the case.

INSTALLATION

(1) Position the bearing cup into the case.

(2) Install the bearing cup onto Miller tool #L-4520.

(3) Using Miller tool #L-4520 and C-4171 driver, install differential bearing cup into the transaxle case.

FLUID

STANDARD PROCEDURE - FLUID DRAIN AND FILL

NOTE: The fluid required in this transaxle is Mopar® ATF+4 (Automatic Transmission Fluid—Type 9602).

All T350 transaxles are equipped with a fill plug. The fill plug is located on the left side of the trans-axle differential area (Fig. 89). The fluid level should be within 3/16 inch from the bottom of the transaxle fill hole (vehicle must be level when checking).

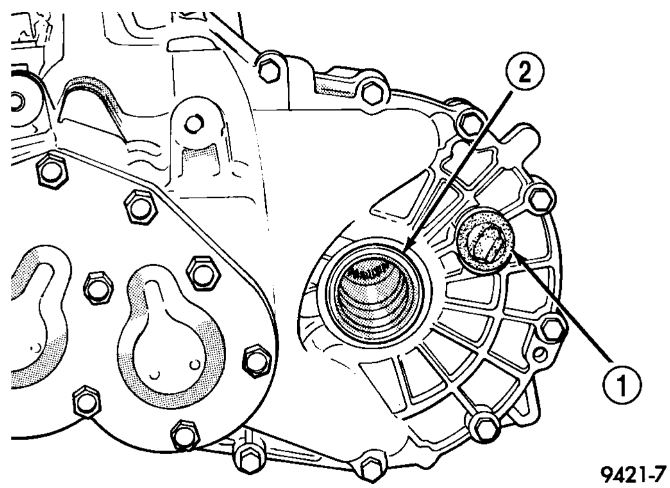


Fig. 89 Fill Plug Location

1 - RUBBER FILL PLUG
2 - LEFT DRIVESHAFT SEAL

FLUID (Continued)

All T350 transaxles are equipped with a drain plug. The drain plug is located on the lower right side of the transaxle differential housing (Fig. 90). Tighten drain plug to 28 N·m (250 in. lbs.)

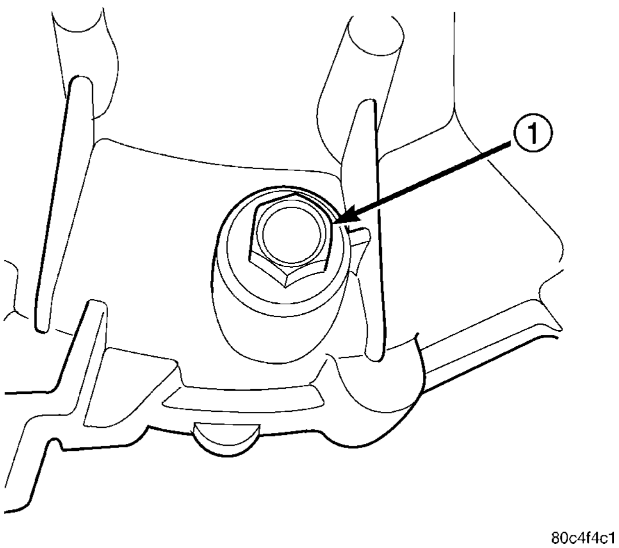


Fig. 90 Drain Plug Location

1 - DRAIN PLUG

Fill transaxle to capacity. Refer to following chart. Wipe the outside of the transaxle if any lubricant spills.

NV T350 MANUAL TRANSAXLE FLUID FILL

TRANSAXLE	METRIC MEASURE	U.S. MEASURE
NV T350	2.4-2.7 Liters	2.5-2.8 Quarts

GEAR SHIFT CABLE

REMOVAL

NOTE: The crossover and selector cables are manufactured as a cable "assembly" and cannot be serviced individually.

(1) Raise hood and disconnect battery negative cable.

(2) Disengage gearshift boot from center console.

(3) Push down on knob and rotate clockwise to remove gearshift boot/knob assy (Fig. 91).

(4) Remove the center console assembly as shown in (Fig. 92).

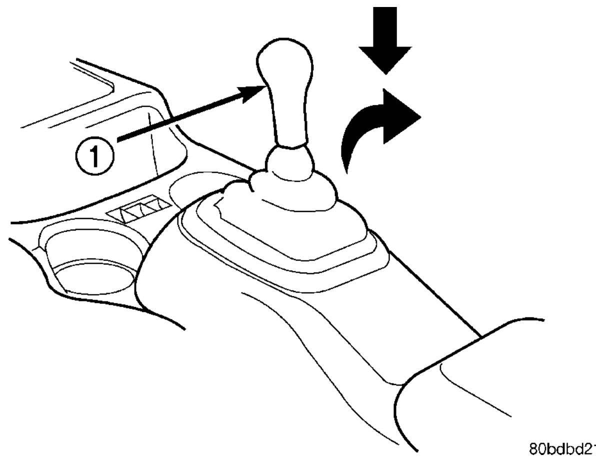


Fig. 91 Gearshift Knob/Boot Removal

1 - GEARSHIFT KNOB

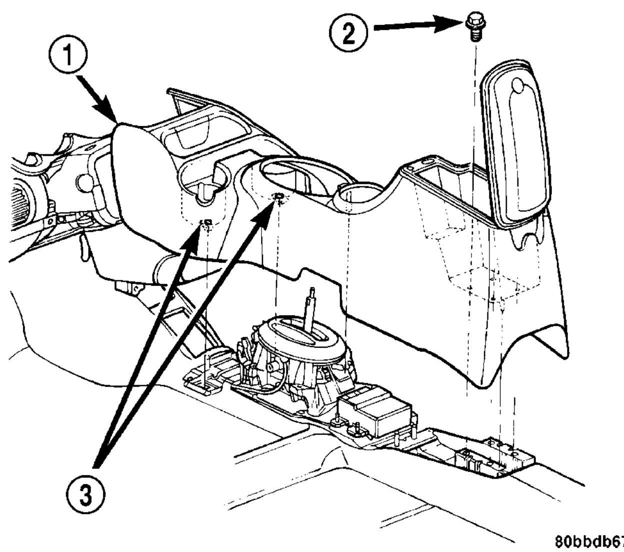


Fig. 92 Center Console

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

GEAR SHIFT CABLE (Continued)

(5) Remove crossover cable retaining clip and disconnect from shift lever (Fig. 93).

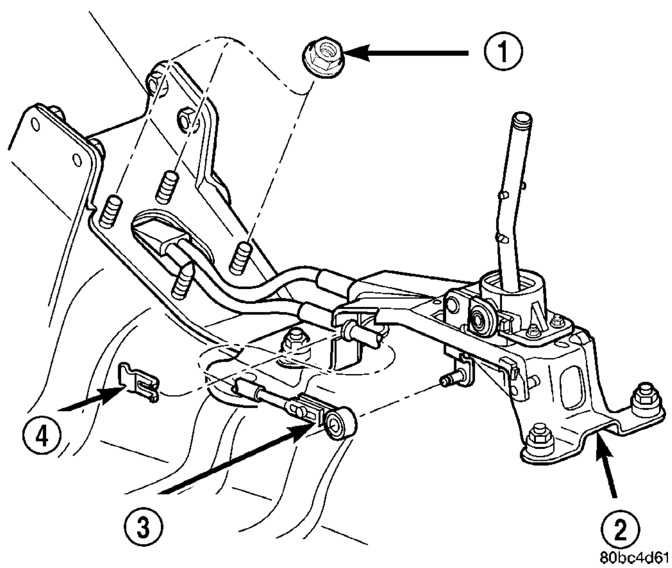


Fig. 93 Crossover Cable at Shifter Assembly

1 - GROMMET PLATE NUT
2 - SHIFTER
3 - CROSSOVER CABLE
4 - CLIP

(6) Remove selector cable retaining clip and disconnect from shift lever (Fig. 94).

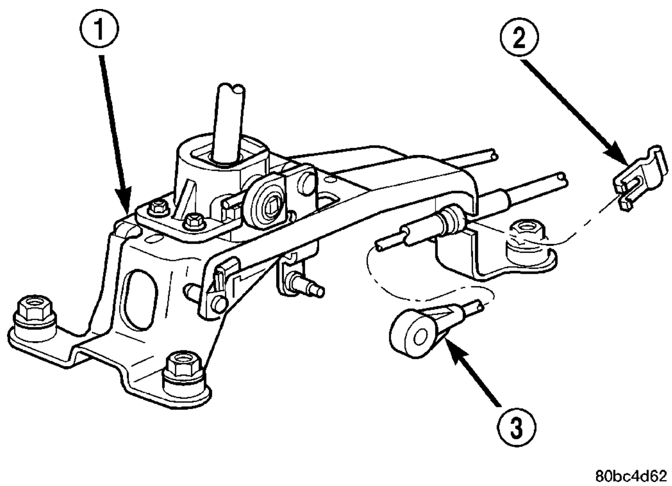


Fig. 94 Selector Cable at Shifter Assembly

1 - SHIFTER
2 - CLIP
3 - SELECTOR CABLE

(7) Remove three grommet plate-to-floor pan attaching nuts (Fig. 93).

(8) Remove air cleaner/throttle body assy. (Fig. 95)as follows:

(a) Disconnect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(b) Disconnect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(c) Disconnect throttle body air duct from intake manifold.

(d) Remove mounting bolt and nut (Fig. 95) and partially remove air cleaner assembly.

(e) Disconnect accelerator and speed control (if equipped) cables after the assy. is removed from position. Remove air cleaner assembly from vehicle.

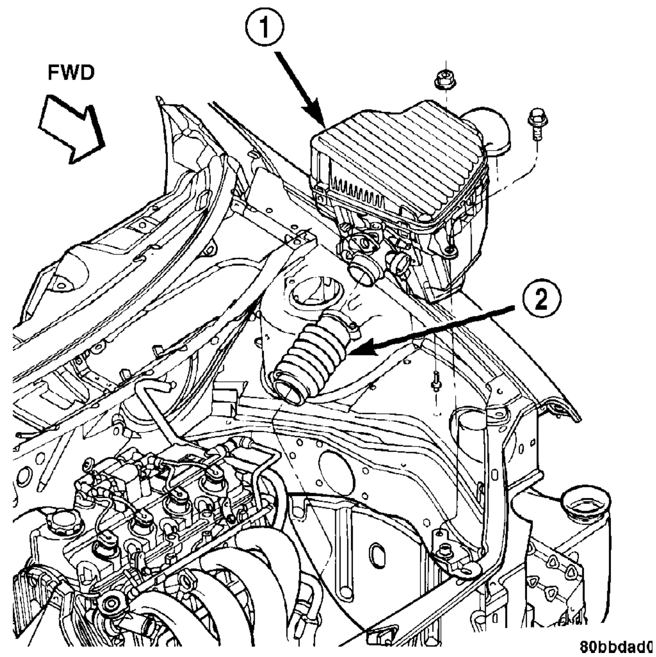


Fig. 95 Air Cleaner Assembly Removal/Installation

1 - AIR CLEANER ASSY.
2 - THROTTLE BODY DUCT

GEAR SHIFT CABLE (Continued)

(9) Disconnect cables from the shift levers at the transaxle (Fig. 96).

CAUTION: Pry up with equal force on both sides of shifter cable isolator bushings to avoid damaging cable isolator bushings.

Remove cable retaining clips and remove cables from bracket (Fig. 96).

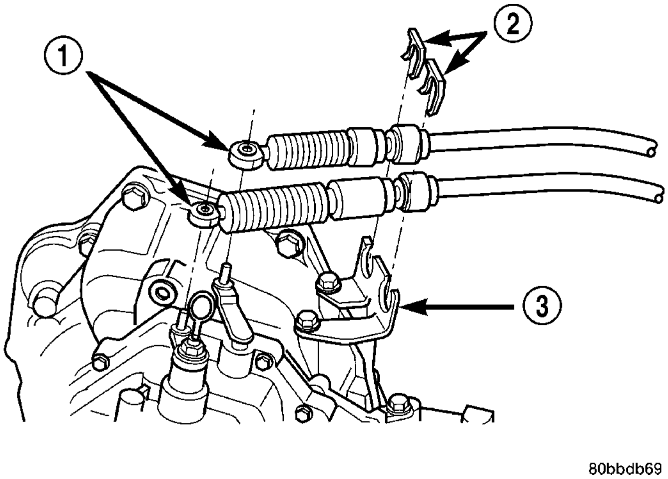


Fig. 96 Shift Cables at Transaxle

1 - SHIFT CABLES
2 - CLIPS
3 - BRACKET

(10) Raise vehicle on hoist.
(11) Remove converter heat shield (Fig. 97).

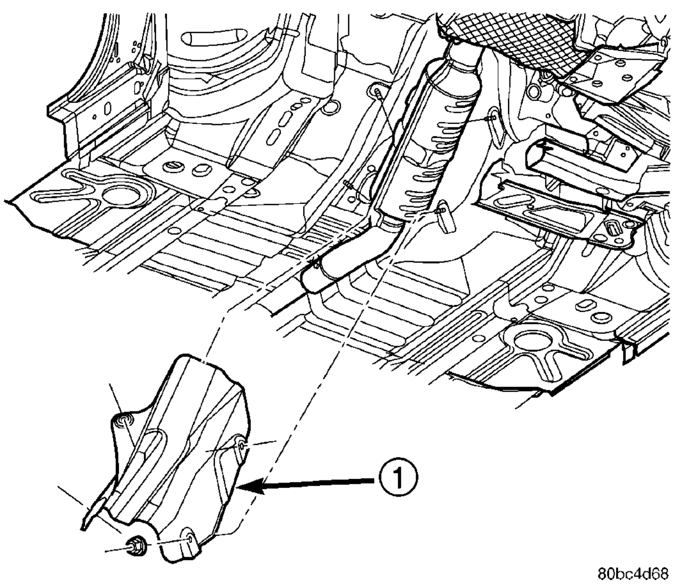


Fig. 97 Converter Heat Shield Removal/Installation

1 - CONVERTER HEAT SHIELD

(12) Remove remaining grommet plate-to-floor pan screw (Fig. 98).
(13) Remove cable assembly from vehicle.

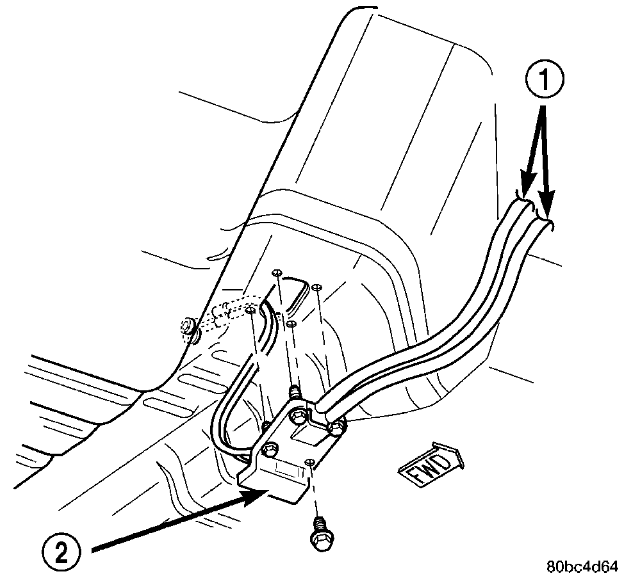


Fig. 98 Shift Cable Assembly at Floor Pan

1 - CABLE ASSEMBLY
2 - GROMMET PLATE

INSTALLATION

NOTE: The crossover and selector cables are manufactured as a cable “assembly” and cannot be serviced individually.

CAUTION: Gearshift cable bushings must not be lubricated or the bushings will swell and split.

(1) Raise vehicle on hoist.
(2) Install cable assembly through floor pan opening and secure to floor pan with grommet plate and one screw (Fig. 98). Make sure the three grommet plate studs protrude through cable assembly and floor pan and tighten screw to 7 N·m (60 in. lbs.).
(3) Route transaxle end of cable assembly into engine compartment and over transaxle assembly.
(4) Install converter heat shield (Fig. 97).
(5) Lower vehicle.
(6) Install gearshift cables to mounting bracket and fasten with NEW clips (Fig. 96). Make sure clips are installed flush to bracket.
(7) Connect gearshift selector and crossover cable to shift levers at transaxle (Fig. 96).
(8) Install and tighten the three grommet plate-to-floor pan nuts to 6 N·m (50 in. lbs.) torque.
(9) Install selector cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 94).
(10) Install crossover cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 93).

GEAR SHIFT CABLE (Continued)

NOTE: Only the crossover cable is adjustable. The selector cable does not have any adjustment capabilities.

(11) **Adjust crossover cable as follows:**

(a) Loosen adjusting screw on crossover cable at shifter (Fig. 99).

(b) The gearshift mechanism and transaxle crossover lever are spring-loaded and self-centering. Alignment pins used in the past are not required anymore. Allow gearshift mechanism and transaxle crossover lever to relax in their neutral positions. To ensure the gearshift lever is in the proper position, place the shifter in 3rd or 4th gear if necessary. Torque adjustment screw to 8 N·m (70 in. lbs.). Care must be taken to avoid moving the shift mechanism off-center during screw tightening.

(c) Perform functional check by shifting transaxle into all gears.

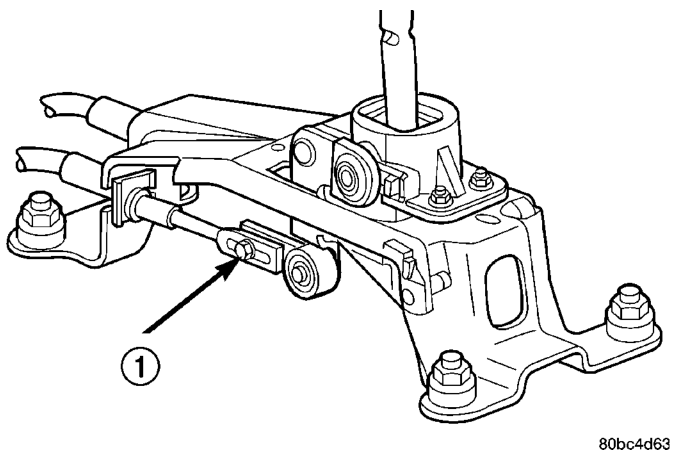


Fig. 99 Crossover Cable Adjustment Screw

1 - CROSSOVER ADJUSTMENT SCREW

(12) Install center console assembly (Fig. 92). Verify that boot is not pinched at console opening before tightening.

(13) Install knob/boot assembly to shifter lever, align knob to three o'clock position, push knob down to engage spring and rotate counter clockwise to secure (Fig. 91).

(14) Locate boot to console at forward tab and secure with retaining tabs.

(15) Return shifter boot to its original position (seated around knob lip).

(16) Install the air cleaner/throttle body assy. (Fig. 95) as follows:

(a) Connect the accelerator and speed control (if equipped) cables to the air cleaner/throttle body assy.

(b) Install assy into position, making sure the air cleaner locating slot is engaged to the battery bracket tab, and tighten fasteners to 14 N·m (120 in. lbs.) torque.

(c) Verify throttle body duct is fully seated to intake manifold and tighten clamp to 5 N·m (40 in. lbs.) torque.

(d) Connect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(e) Connect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(17) Connect battery negative cable.

ADJUSTMENTS

NOTE: Only the crossover cable is adjustable. The selector cable does not have adjustment capabilities.

(1) Disengage gearshift boot retaining tabs to free it from console.

(2) Push down on knob and rotate clockwise to remove shifter boot/knob assembly (Fig. 100).

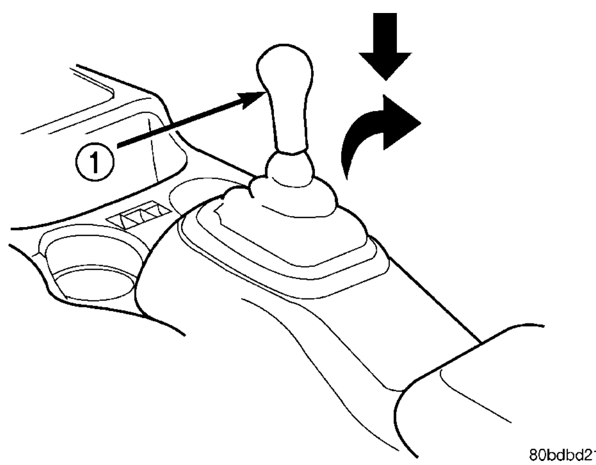


Fig. 100 Gearshift Knob/Boot Removal

1 - GEARSHIFT KNOB

GEAR SHIFT CABLE (Continued)

(3) Remove the center console assembly as shown in (Fig. 101).

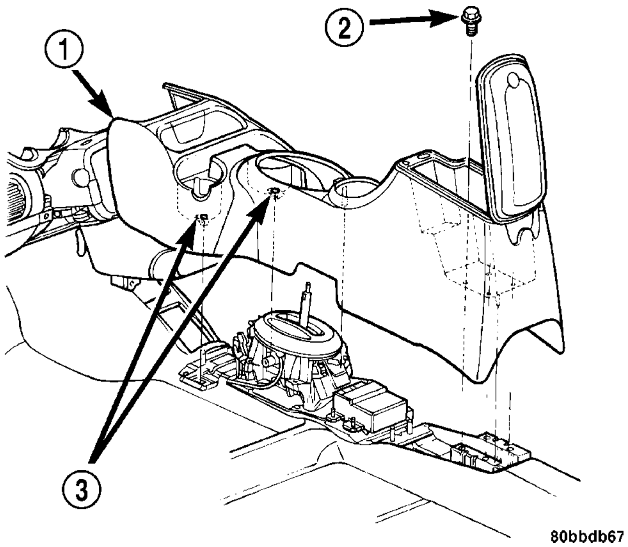


Fig. 101 Center Console Removal/Installation—Typical

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

(4) Loosen crossover adjustment screw at shifter assembly (Fig. 102).

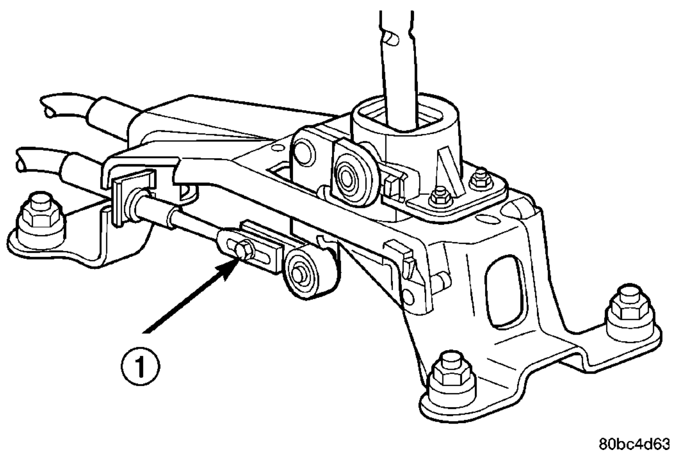


Fig. 102 Crossover Adjustment Screw

1 - CROSSOVER ADJUSTMENT SCREW

(5) The gearshift mechanism and transaxle crossover lever are spring-loaded and self-centering. Alignment pins used in the past are not required anymore. Allow gearshift mechanism and transaxle crossover lever to relax in their neutral positions. To ensure the gearshift lever is in the proper position, place the shifter in 3rd or 4th gear if necessary. Torque adjustment screw to 8 N·m (70 in. lbs.). Care must be taken to avoid moving the shift mechanism off-center during screw tightening.

(6) Install center console assembly (Fig. 101).

(7) Install knob/boot assembly to shifter lever, align knob to three o'clock position, push knob down to engage spring and rotate counter clockwise.

(8) Secure boot retaining tabs to console.

GEAR SHIFT KNOB/BOOT ASSEMBLY

REMOVAL

(1) Disengage boot from console by lifting up to free retaining tabs.

(2) Push down on knob and rotate clockwise to remove (Fig. 103).

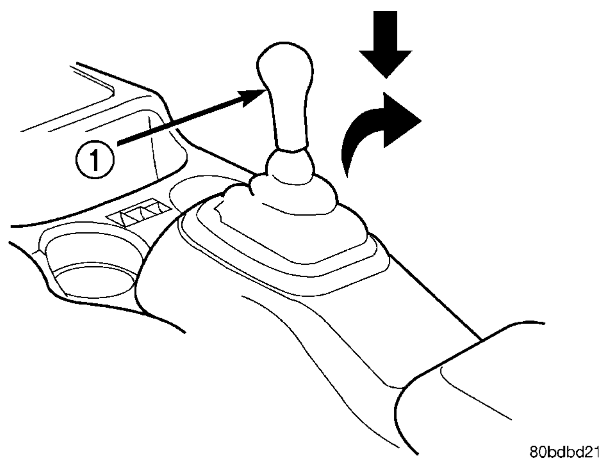


Fig. 103 Gearshift Knob Removal

1 - GEARSHIFT KNOB

INSTALLATION

(1) Install knob/boot assembly to shifter lever, align knob to three o'clock position, push knob down to engage spring and rotate counter clockwise.

(2) Locate boot to console at forward tab and secure to console with retaining tabs.

INPUT BEARING AND SLEEVE

REMOVAL

The input bearing is a one–piece bearing and sleeve unit (Fig. 104). The sleeve is the slide point for the clutch–release bearing and lever.

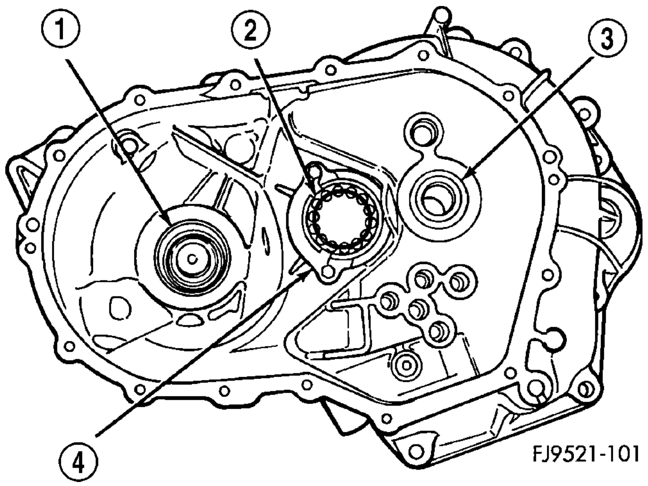


Fig. 104 Input Bearing And Sleeve

1 - DIFFERENTIAL BEARING
2 - OUTPUT BEARING
3 - INPUT BEARING
4 - BEARING RETAINER

(1) Install tool #6342 over input bearing on the gear case side of the transaxle clutch housing.

(2) Press the input bearing out of the housing (Fig. 105).

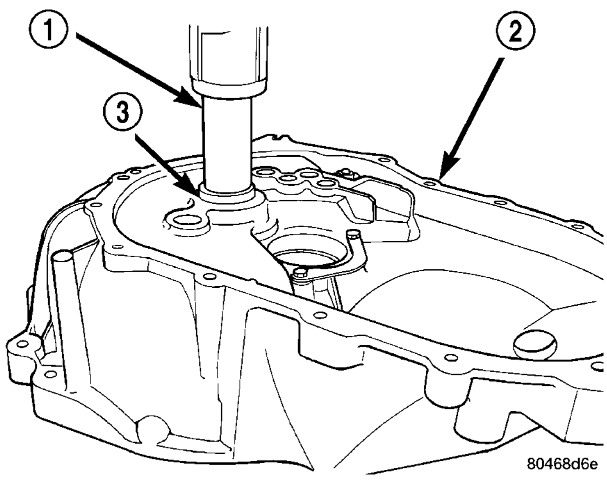


Fig. 105 Input Bearing Removal

1 - SPECIAL TOOL 6342
2 - BELLHOUSING HALF
3 - INPUT BEARING AND SLEEVE

INSTALLATION

(1) Apply coating of Loctite® sealant on bearing outer diameter. Position sleeve and bearing assembly at input bearing bore.

(2) Install tool #C-4680-1 over input bearing (Fig. 106).

(3) Using a suitable spacer tool and shop press, install input bearing into bore until it is fully seated (Fig. 107).

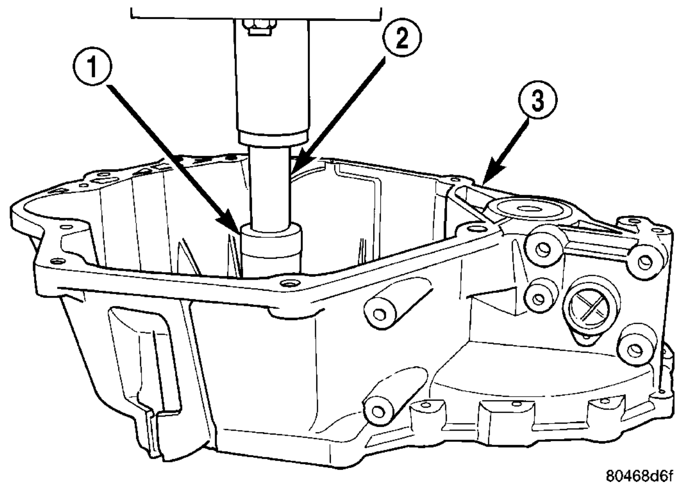


Fig. 106 Input Bearing Tool

1 - SPECIAL TOOL C-4680-1
2 - SPACER
3 - BELLHOUSING HALF

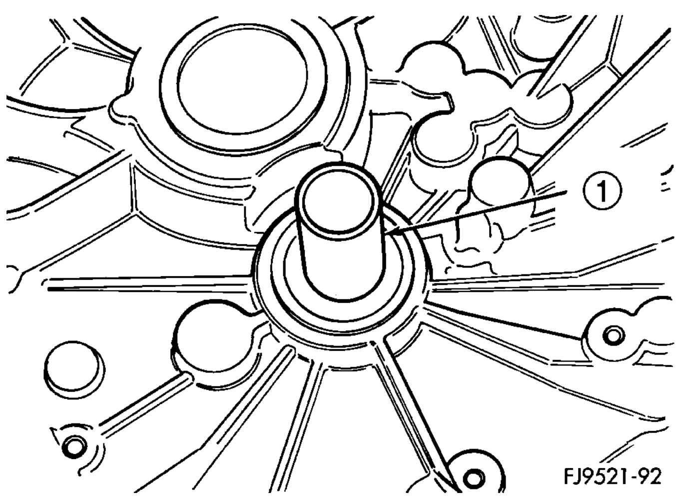


Fig. 107 Input Bearing Installed

1 - SLEEVE AND BEARING ASSEMBLY

INPUT SHAFT

DISASSEMBLY

Before disassembly of the input shaft, it is necessary to check the synchronizer stop ring gap. Use a feeler gauge to measure the gaps between the stop rings and the speed gears. The correct gaps are listed below:

- 1st - 0.522-2.208 mm (0.021-0.087 in)
- 2nd - 0.522-2.208 mm (0.021-0.087 in)
- 3rd - 0.73-1.53 mm (0.029-0.060 in)
- 4th - 0.77-1.57 mm (0.030-0.062 in).
- 5th - 0.73-1.53 mm (0.029-0.060 in)
- Reverse Brake—0.505-1.74 mm (0.020-0.068 in.)

The reverse brake measurement is taken between the stop ring and case.

If a stop ring gap does not fall within the specifications, it must be inspected for wear and replaced. If the 1st or 2nd synchronizer stop ring is worn beyond specifications, the complete output shaft assembly must be replaced.

The input shaft incorporates the 3rd, 4th, and 5th speed gears and synchronizers on the assembly (Fig. 108).

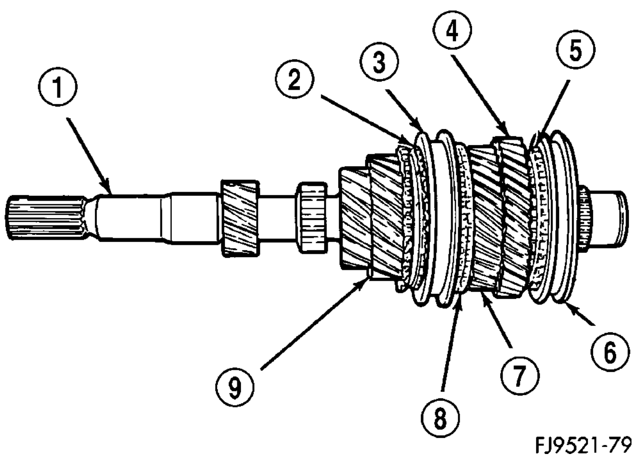


Fig. 108 Input Shaft

1 - INPUT SHAFT
2 - STOP RING
3 - SLEEVE
4 - 5TH SPEED GEAR
5 - STOP RING
6 - SLEEVE
7 - 4TH SPEED GEAR
8 - STOP RING
9 - 3RD SPEED GEAR

(1) Install bearing splitter behind 5th speed gear. Remove snap ring at 5th synchronizer hub on input shaft (Fig. 109).

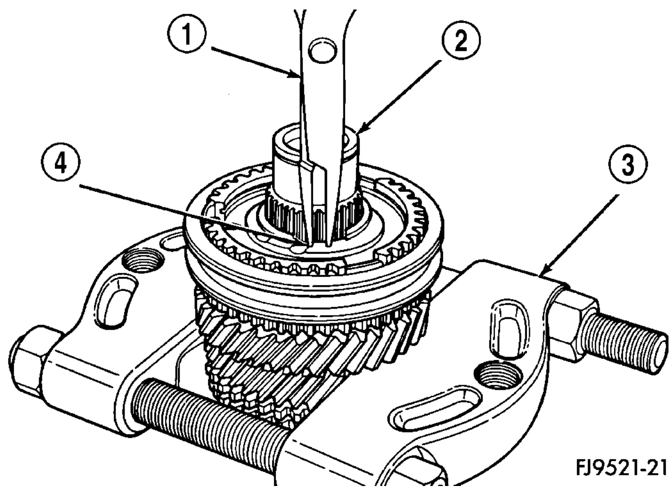


Fig. 109 5th Synchro and Hub Snap Ring Removal

1 - SNAP RING PLIERS
2 - INPUT SHAFT
3 - BEARING SPLITTER
4 - SNAP RING

(2) Remove synchronizer and gear using shop press (Fig. 110).

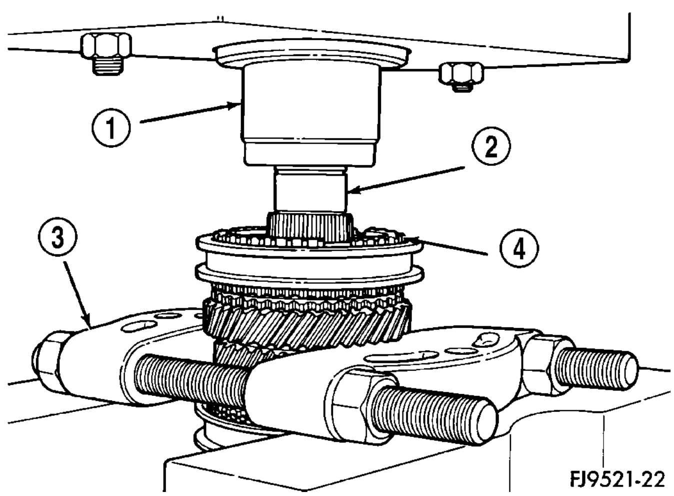


Fig. 110 Remove Synchronizer Using Shop Press

1 - PRESS RAM
2 - INPUT SHAFT
3 - BEARING SPLITTER
4 - SYNCHRONIZER ASSEMBLY

INPUT SHAFT (Continued)

(3) Remove caged needle bearing (Fig. 111).

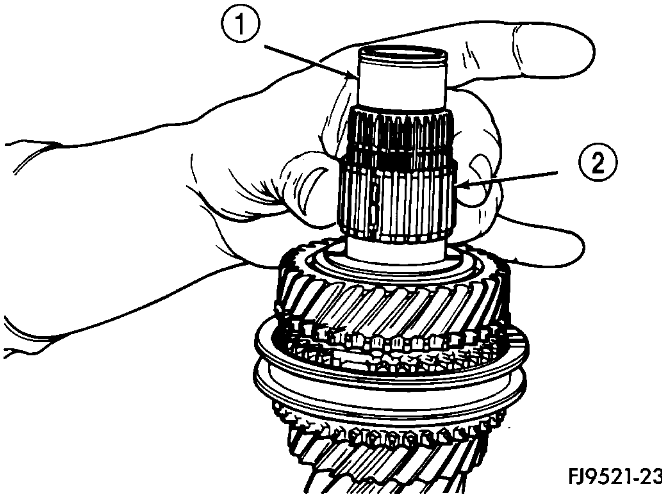


Fig. 111 Caged Needle Bearing Removal

1 - INPUT SHAFT
2 - CAGED NEEDLE BEARING

(4) Remove 4-5 gears split thrust washer ring (Fig. 112).

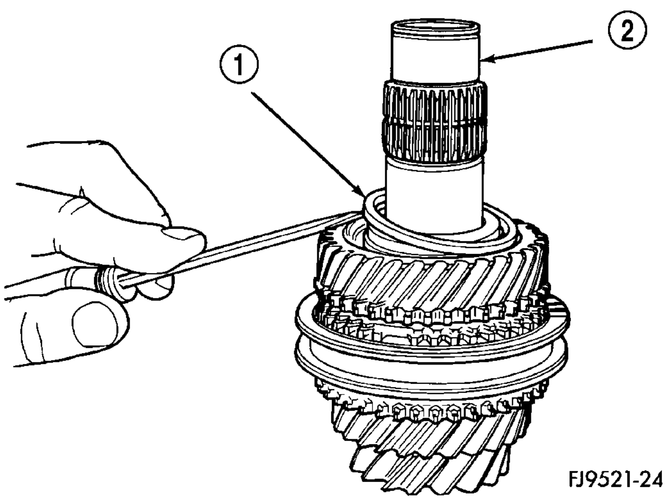


Fig. 112 Split Thrust Washer Ring

1 - SPLIT THRUST WASHER RING
2 - INPUT SHAFT

(5) Remove split thrust washer (Fig. 113).

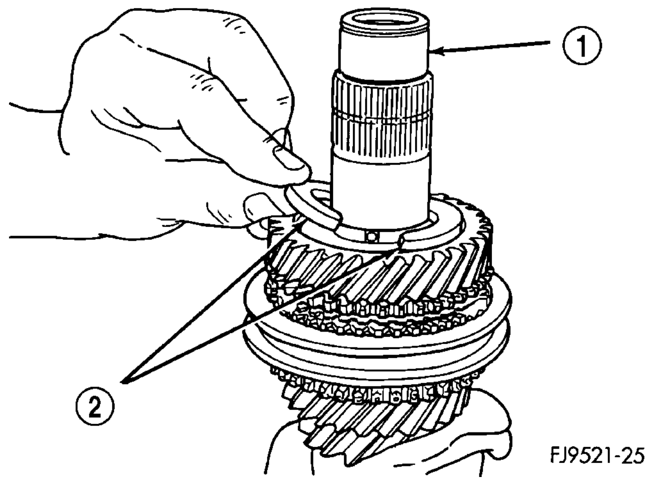


Fig. 113 Split Thrust Washer Removal

1 - INPUT SHAFT
2 - SPLIT THRUST WASHER

(6) Remove split thrust washer separation pin (Fig. 114).

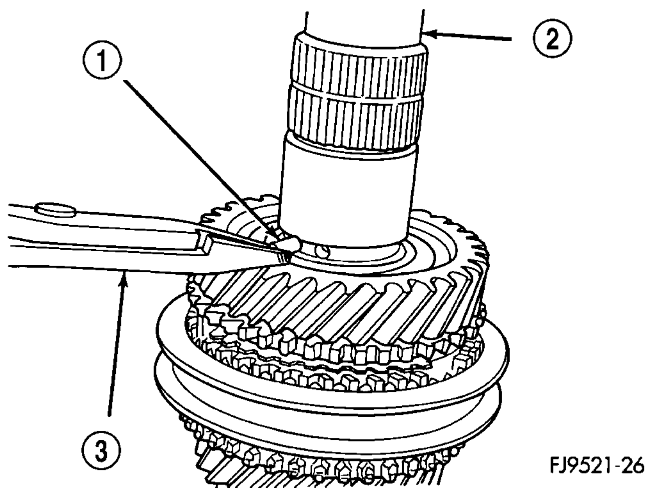


Fig. 114 Split Thrust Washer Separation Pin

1 - SEPARATION PIN
2 - INPUT SHAFT
3 - PLIERS

INPUT SHAFT (Continued)

(7) Remove 4th gear (Fig. 115).

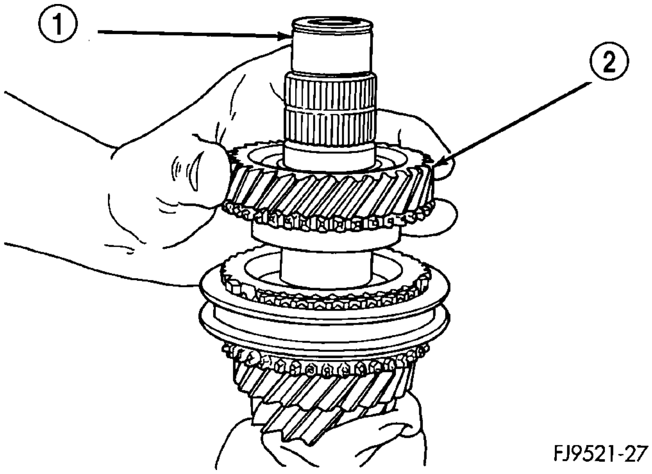


Fig. 115 4th Gear Removal

1 - INPUT SHAFT
2 - 4TH GEAR

(8) Remove 4th gear caged needle bearing (Fig. 116). Check the caged needle bearing for a broken retention spring.

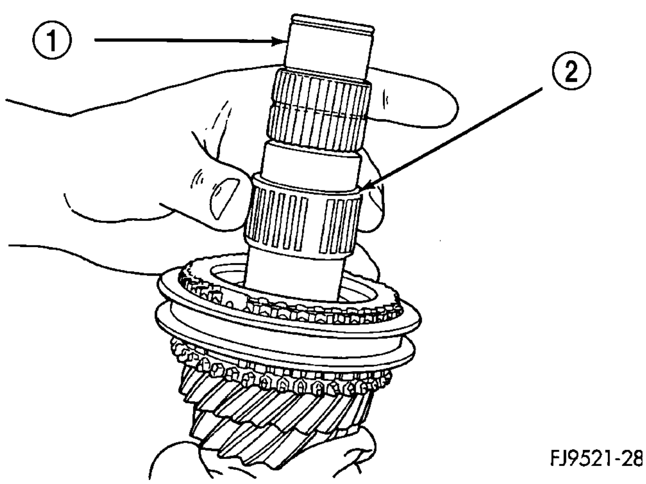


Fig. 116 Caged Needle Bearing Removal

1 - INPUT SHAFT
2 - CAGED NEEDLE BEARING

(9) Remove blocking ring. Remove 3-4 synchronizer hub retaining snap ring (Fig. 117).

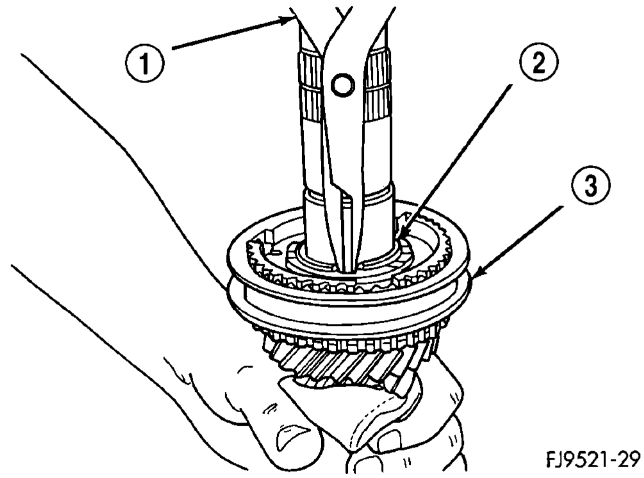


Fig. 117 3-4 Synchronizer Hub Snap Ring

1 - SNAP RING PLIERS
2 - SYNCHRO SNAP RING
3 - SYNCHRONIZER ASSEMBLY

(10) Install input shaft in shop press. Using bearing splitter, remove 3-4 synchronizer and 3rd gear (Fig. 118).

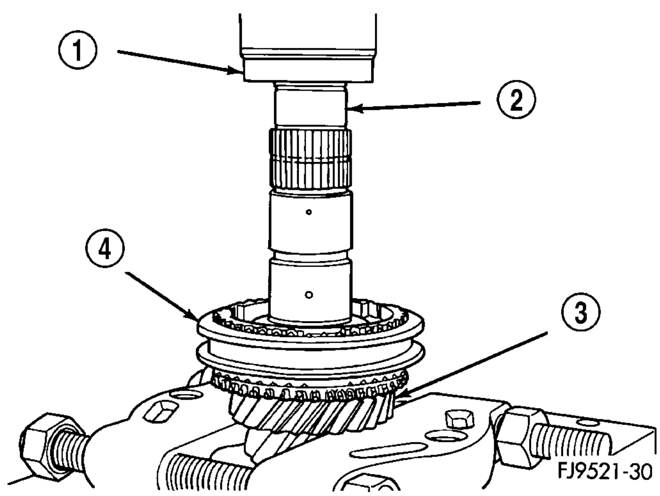


Fig. 118 3rd Gear Removal

1 - PRESS RAM
2 - INPUT SHAFT
3 - 3RD GEAR
4 - SYNCHRONIZER ASSEMBLY

INPUT SHAFT (Continued)

(11) Remove 3rd gear caged needle bearing (Fig. 119). Inspect needle bearing for a broken retention spring

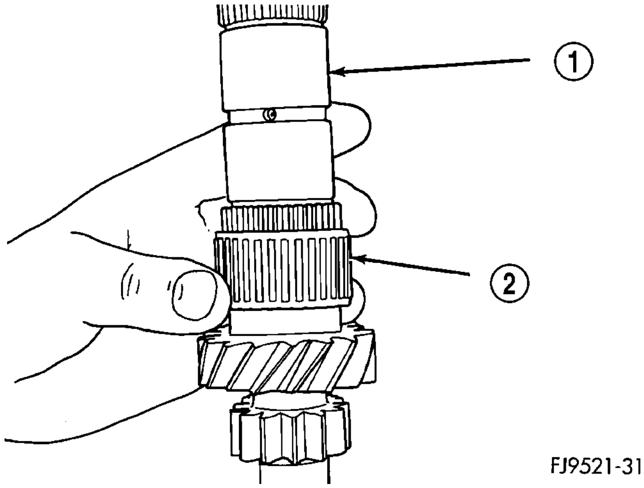


Fig. 119 3rd Gear Caged Needle Bearing

1 - INPUT SHAFT
2 - 3RD GEAR CAGED NEEDLE BEARING

(12) Inspect the input shaft for worn or damaged bearing races or chipped gear teeth. Replace as necessary.

ASSEMBLY

(1) Place input shaft into shop press.
(2) Install 3rd gear caged needle bearing (Fig. 120).

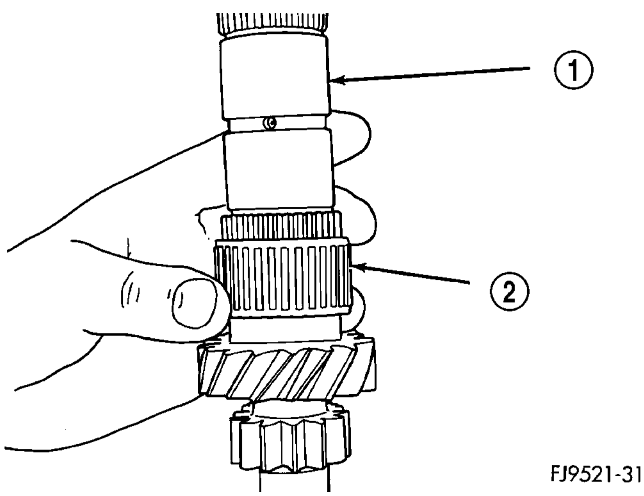


Fig. 120 3rd Gear Caged Needle Bearing

1 - INPUT SHAFT
2 - 3RD GEAR CAGED NEEDLE BEARING

(3) Install 3rd gear and 3-4 synchronizer onto input shaft. Install Tool #C-3717 over input shaft and press on synchronizer hub and 3rd gear (Fig. 121). The synchronizer hub has the letter **U** stamped on the top face of the hub. This designates that the hub must be installed with the **U** facing upward.

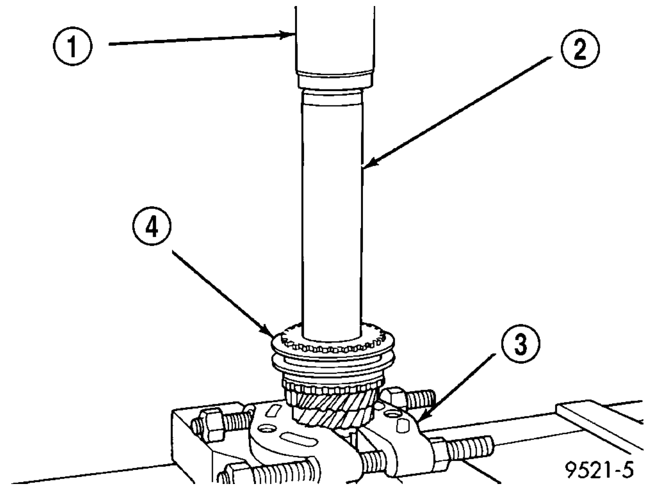


Fig. 121 Press On 3rd Gear Synchronizer Hub

1 - PRESS RAM
2 - SPECIAL TOOL C-3717
3 - BEARING SPLITTER
4 - 3RD GEAR SYNCHRONIZER ASSEMBLY

(4) Install 3-4 synchronizer snap ring into slot on input shaft.
(5) Install blocking ring into 3-4 synchronizer. Install 4th gear caged needle bearing.
(6) Install 4th gear onto input shaft.
(7) Install 4-5 split thrust washer separation pin (Fig. 122).

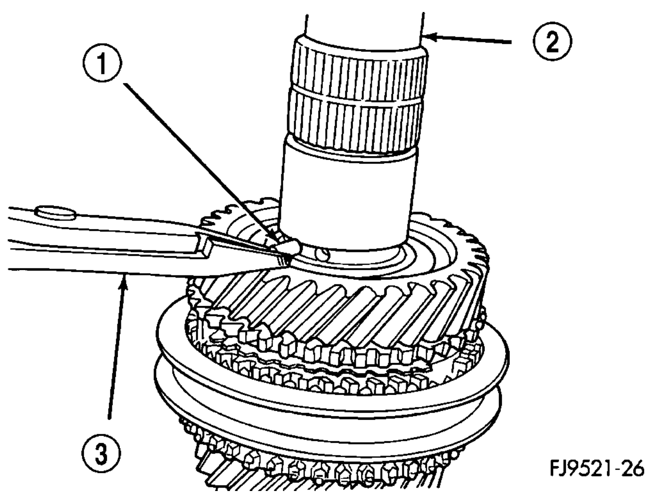


Fig. 122 Split Thrust Washer Separation Pin

1 - SEPARATION PIN
2 - INPUT SHAFT
3 - PLIERS

INPUT SHAFT (Continued)

(8) Install split thrust washer onto input shaft (Fig. 123).

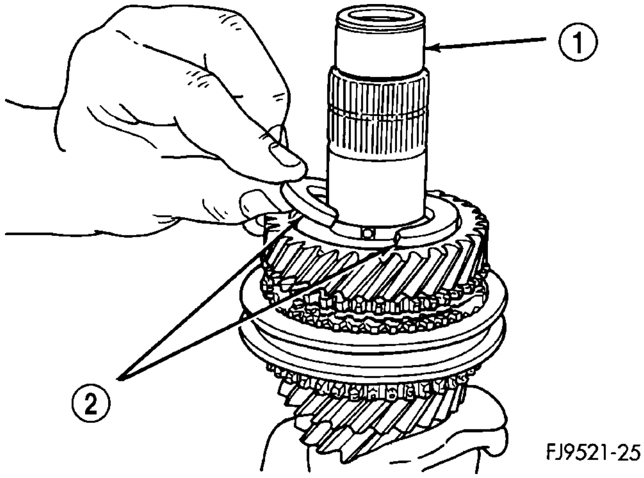


Fig. 123 Split Thrust Washer Installation

1 - INPUT SHAFT
2 - SPLIT THRUST WASHER

(9) Install split thrust washer retaining ring (Fig. 124).

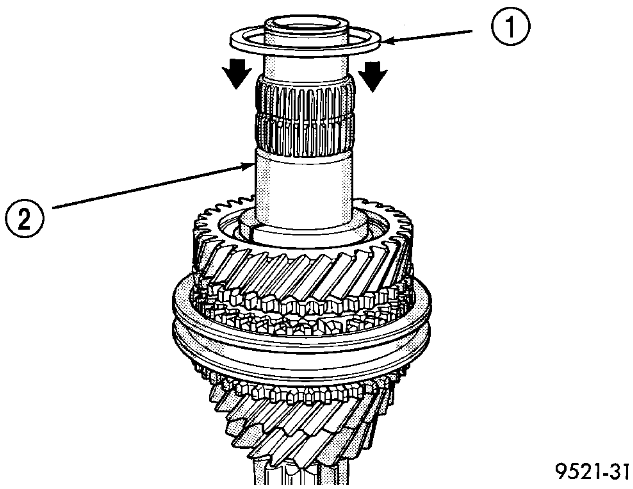


Fig. 124 Retaining Ring Installation

1 - SPLIT THRUST WASHER RING
2 - INPUT SHAFT

(10) Install 5th gear caged needle bearing (Fig. 125).

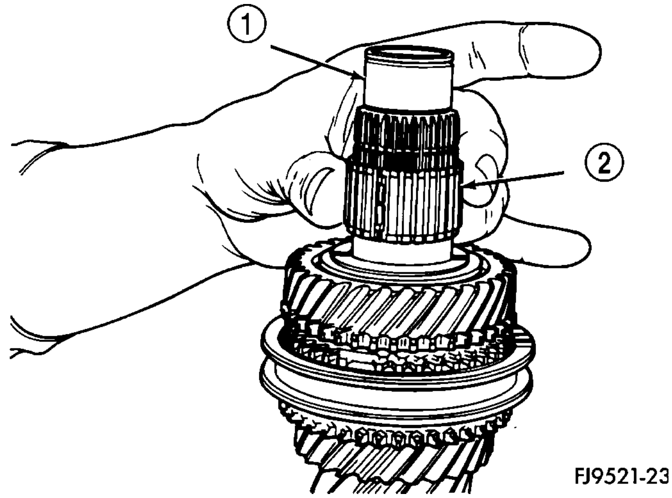


Fig. 125 Caged Needle Bearing Installation

1 - INPUT SHAFT
2 - CAGED NEEDLE BEARING

(11) Using special tool #C-3717, install 5th speed gear and synchronizer (Fig. 126). The 5th gear synchronizer hub has the letter **S** stamped on the top face of the hub. This designates that the hub must be installed with the **S** facing upward.

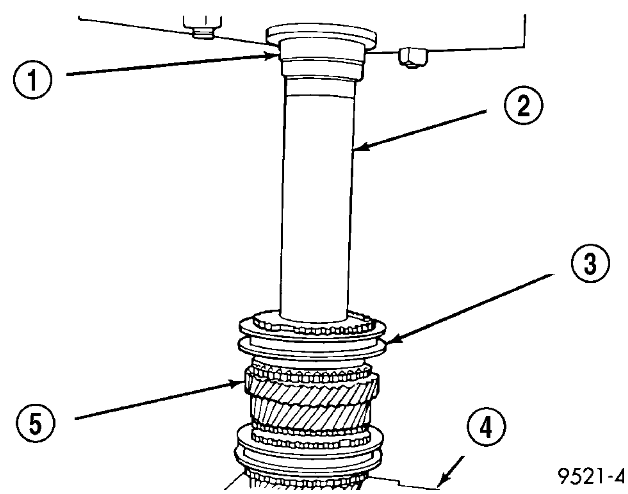


Fig. 126 5th Speed Gear Installation

1 - PRESS RAM
2 - SPECIAL TOOL C-3717
3 - SYNCHRONIZER ASSEMBLY
4 - BEARING SPLITTER
5 - 5TH SPEED GEAR

INPUT SHAFT (Continued)

(12) Install 5th gear synchronizer snap ring (Fig. 127).

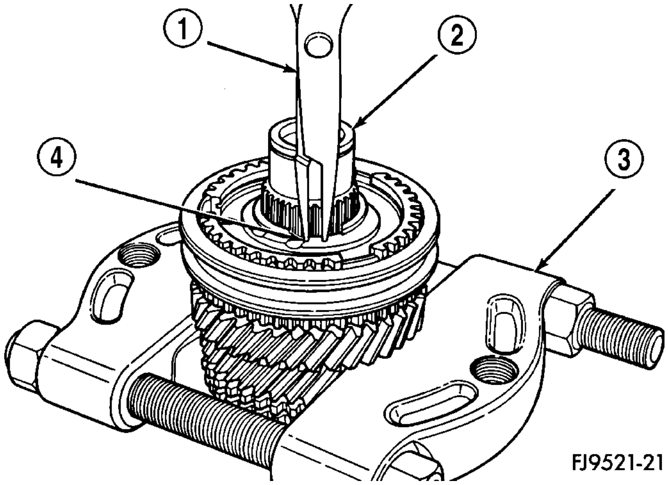


Fig. 127 5th Gear Synchronizer Snap Ring Installation

1 - SNAP RING PLIERS
2 - INPUT SHAFT
3 - BEARING SPLITTER
4 - SNAP RING

OUTPUT BEARING AND RACE

REMOVAL

CAUTION: The position of the output shaft bearing is critical. The bearing is not identical end-to-end. Install bearing with larger diameter cage ring facing out.

(1) Remove caged roller bearing from output bearing race (Fig. 128).

(2) Remove screws at output bearing retainer strap (Fig. 129).

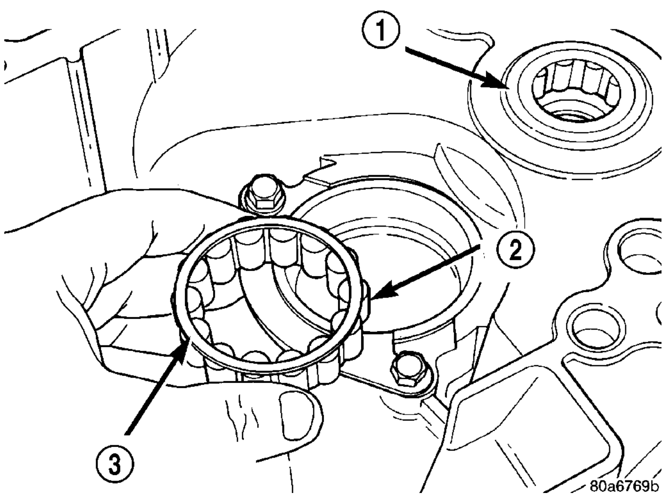


Fig. 128 Output Roller Bearing

1 - INPUT BEARING
2 - OUTPUT BEARING
3 - LARGER DIAMETER CAGE RING

(3) Install tool #6787 and slide hammer (Fig. 130). Tighten tool to output bearing race.

(4) Using slide hammer, remove output bearing race.

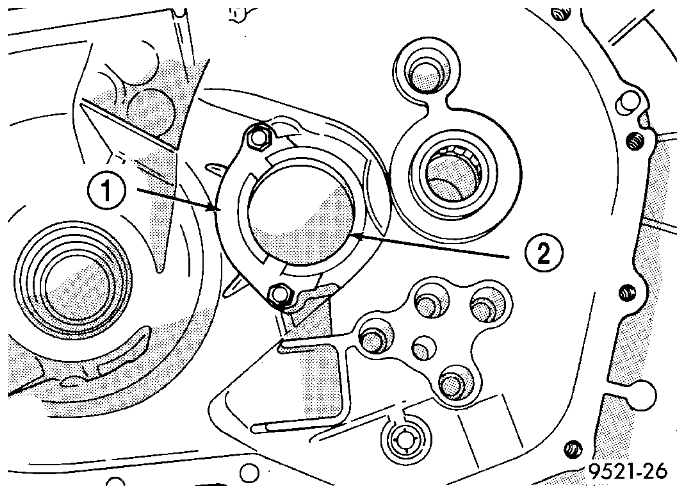


Fig. 129 Output Bearing Strap

1 - BEARING RETAINER
2 - OUTPUT BEARING RACE

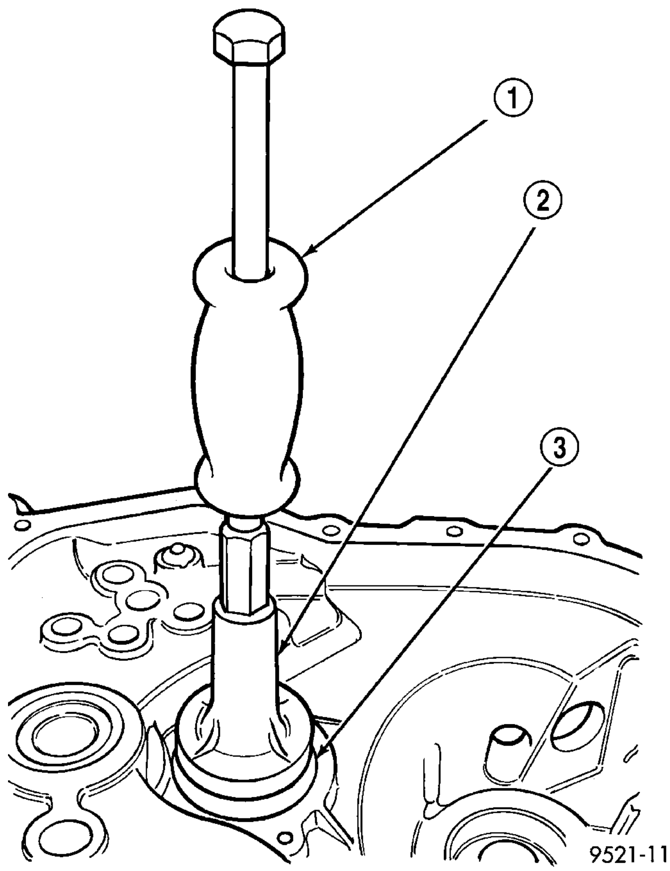


Fig. 130 Output Bearing Race Removal

1 - C-3752
2 - SPECIAL TOOL 6787
3 - OUTPUT SHAFT BEARING RACE

OUTPUT BEARING AND RACE (Continued)

INSTALLATION

(1) Line up output bearing race to race bore.

(2) Insert tool #4628 with C-4171 into output bearing race (Fig. 131). Tap race into bore. Install output bearing into race. Verify that the larger diameter cage is facing outward. Position bearing retaining strap. Tighten bolts to 11 N·m (96 in. lbs.).

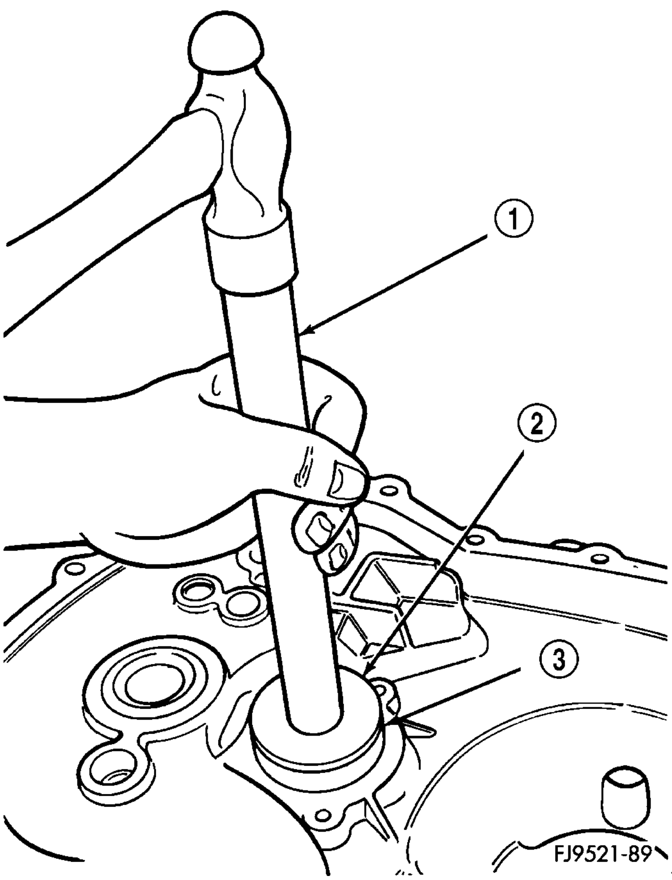


Fig. 131 Output Bearing Race Installation

1 - TOOL C-4171
2 - TOOL C-4628
3 - OUTPUT BEARING RACE

OUTPUT SHAFT

DISASSEMBLY

CAUTION: The output shaft is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1-2 synchronizer or gear fails, it is necessary to replace the output shaft assembly.

It is necessary to check the synchronizer stop ring gap. Use a feeler gauge to measure the gaps between the stop rings and the speed gears. The correct gaps are listed below:

- 1st—0.522-2.208 mm (0.021-0.087 in)
- 2nd—0.522-2.208 mm (0.021-0.087 in)
- 3rd—0.73-1.53 mm (0.029-0.060 in)
- 4th—0.77-1.57 mm (0.030-0.062 in)
- 5th—0.73-1.53 mm (0.029-0.060 in)
- Reverse Brake—0.51-1.74 mm (0.020-0.068 in.)

If a stop ring gap does not fall within the specifications it must be inspected for wear and replaced. If the 1st or 2nd synchronizer stop ring is worn beyond specifications, the complete output shaft assembly must be replaced.

The output shaft incorporates the 1st and 2nd gears and synchronizers on the assembly (Fig. 132).

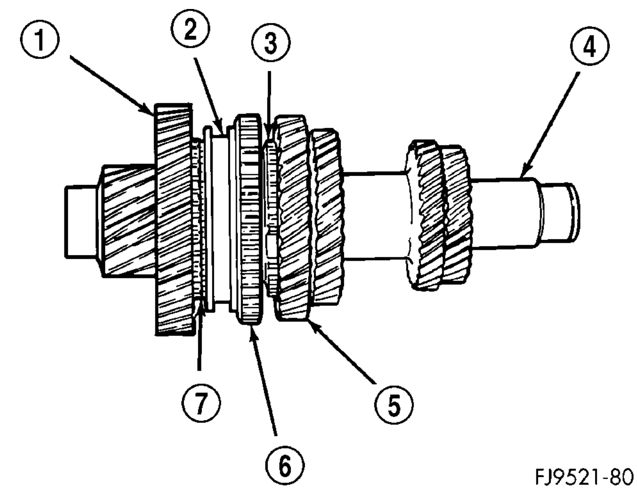


Fig. 132 Output Shaft

1 - 1ST GEAR
2 - SLEEVE
3 - STOP RING
4 - OUTPUT SHAFT
5 - 2ND SPEED GEAR
6 - REVERSE GEAR
7 - STOP RING

REAR BEARING OIL FEED TROUGH

REMOVAL

The bearing oil feed trough is retained in the case by a pin that is molded into the case and clips that are part of the trough (Fig. 133).

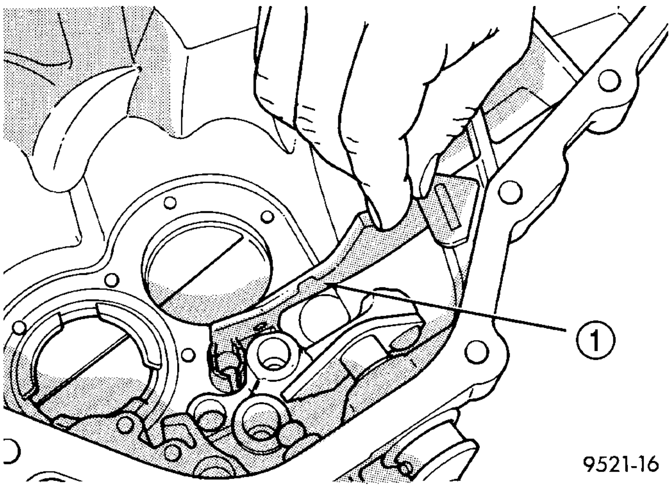


Fig. 133 Oil Feed Trough

1 - OIL FEED TROUGH

(1) Using light plier pressure, squeeze the clips together at the rear of the trough.

(2) Slide the trough over the retaining pin that locates the trough in the case.

INSTALLATION

(1) To install oil feed trough, reverse removal procedure.

SHIFT CROSSOVER LEVER

REMOVAL

(1) Disconnect crossover cable from crossover lever and cable bracket. Refer to Gearshift Cable Removal and Installation in this Group.

(2) Using a pin punch, remove the crossover roll pin from lever.

(3) Pull up and remove the crossover lever from the transaxle crossover shaft (Fig. 134).

INSTALLATION

(1) Install crossover lever to shaft and fasten with NEW roll pin.

(2) Install crossover cable to bracket. Fasten with clip.

(3) Install crossover cable to crossover lever.

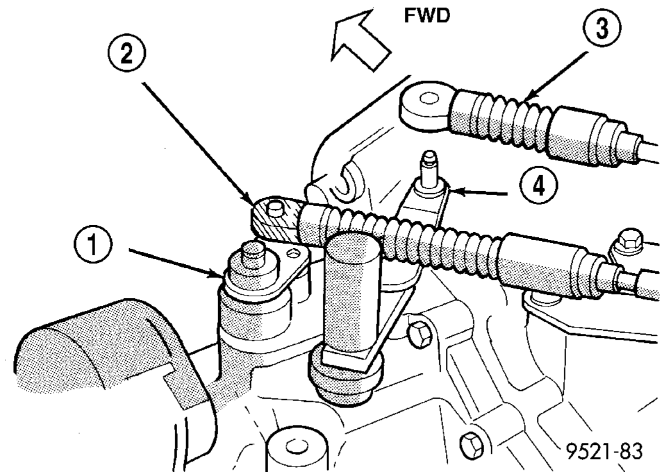


Fig. 134 Crossover Lever

1 - CROSSOVER LEVER
2 - CROSSOVER CABLE
3 - SELECTOR CABLE
4 - SELECTOR LEVER

SHIFT CROSSOVER SHAFT

REMOVAL

(1) Disassemble transaxle.

(2) With the transaxle disassembled, remove the crossover shaft seal.

(3) Using snap–ring pliers, remove the snap ring at the crossover shaft bore (Fig. 135).

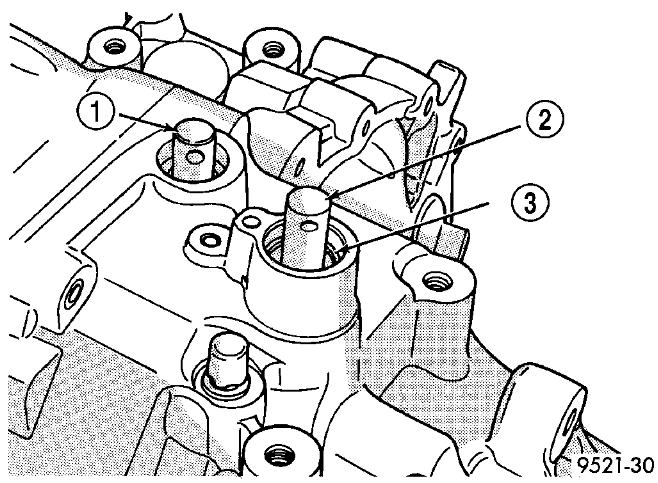


Fig. 135 Crossover Shaft Snap Ring

1 - SELECTOR SHAFT
2 - CROSSOVER SHAFT
3 - SNAP RING

(4) Push the crossover shaft in the case and remove the crossover assembly.

INSTALLATION

(1) Install crossover shaft to case and install snap ring (Fig. 135).

(2) Install the crossover shaft seal.

(3) Assemble transaxle.

SHIFT CROSSOVER SHAFT BUSHING

REMOVAL

(1) Install slide hammer #3752 through the crossover bushing.

(2) Thread nut and washer onto slide hammer.

(3) Using the slide hammer, remove the crossover shaft bushing (Fig. 136).

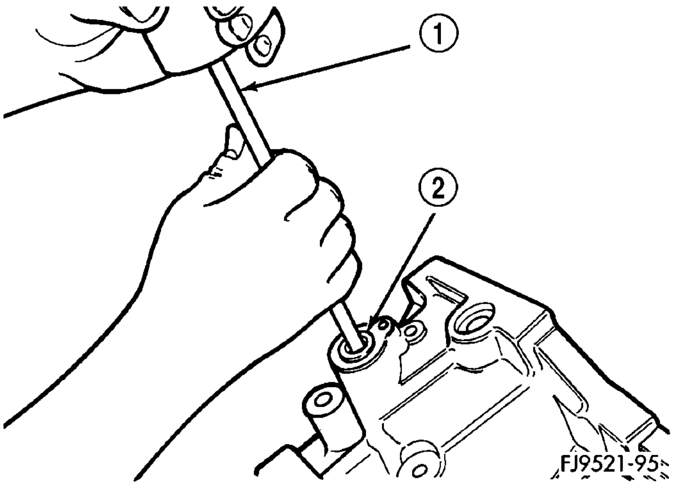


Fig. 136 Crossover Shaft Bushing Removal

1 - SLIDE HAMMER
2 - SHIFTER SHAFT BUSHING

INSTALLATION

(1) Position the replacement crossover shaft bushing over the crossover shaft bushing bore.

(2) Using an appropriate size deep–well socket, install the crossover shaft bushing into the bushing bore.

SHIFT MECHANISM

REMOVAL

(1) Lift up on gearshift boot to disengage retainer tabs from console.

(2) Push down on knob and rotate clockwise to remove knob/boot assembly (Fig. 137).

(3) Remove the center console assembly as shown in (Fig. 138).

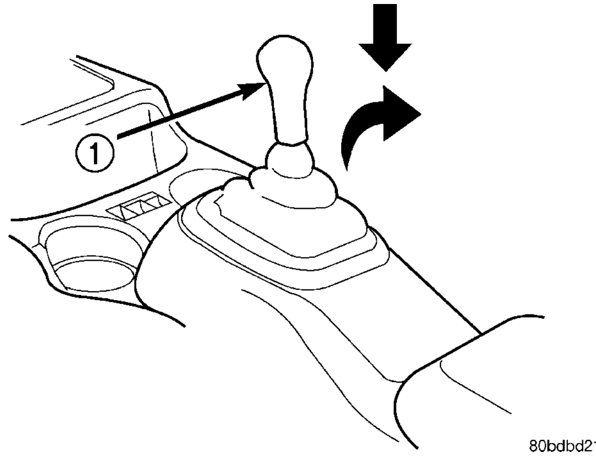


Fig. 137 Gearshift Knob/Boot Removal

1 - GEARSHIFT KNOB

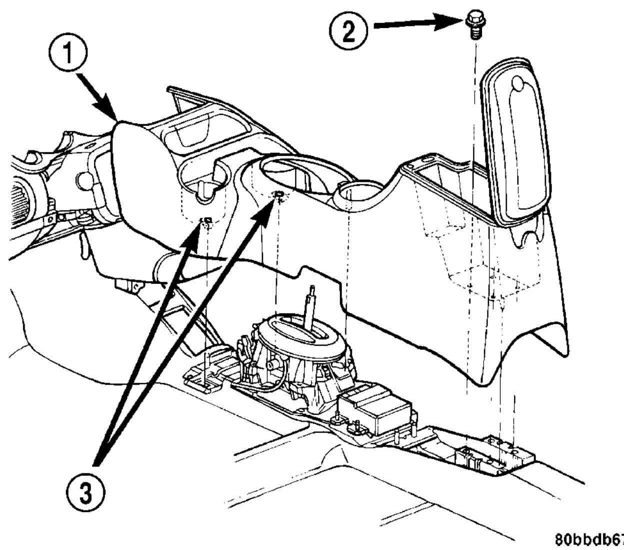


Fig. 138 Center Console

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

SHIFT MECHANISM (Continued)

(4) Remove crossover cable retaining clip and disconnect from shift lever (Fig. 139).

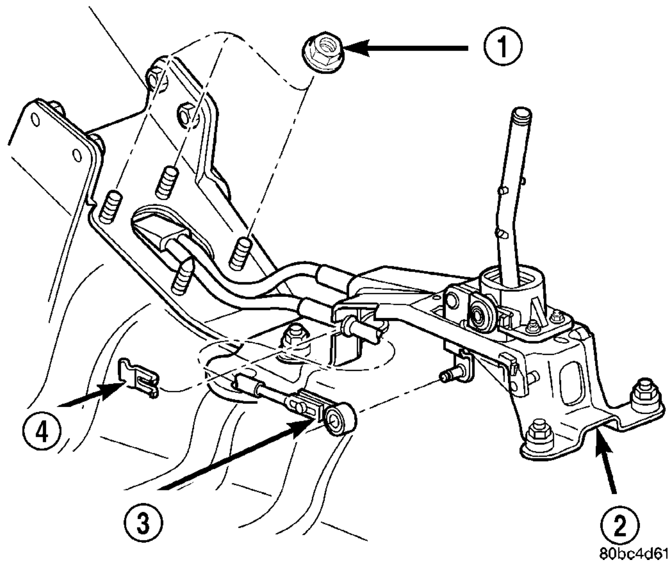


Fig. 139 Crossover Cable at Shifter Assembly

1 - GROMMET PLATE NUT
2 - SHIFTER
3 - CROSSOVER CABLE
4 - CLIP

(5) Remove selector cable retaining clip and disconnect from shift lever (Fig. 140).

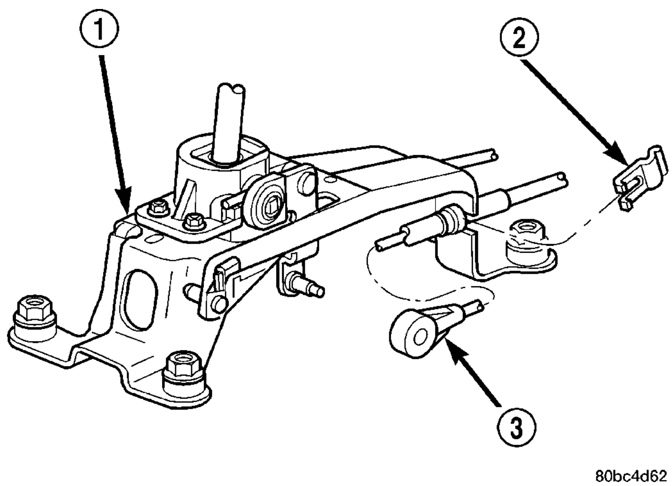


Fig. 140 Selector Cable at Shifter Assembly

1 - SHIFTER
2 - CLIP
3 - SELECTOR CABLE

(6) Remove four shifter assy.-to-floor pan nuts and remove shifter from vehicle (Fig. 141).

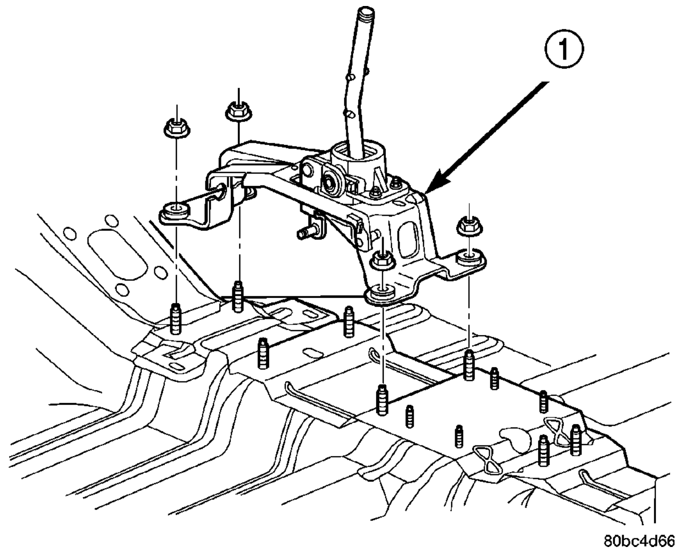


Fig. 141 Shifter Assy. Removal/Installation

1 - SHIFTER ASSEMBLY

INSTALLATION

(1) Install shifter assy. to floor pan (Fig. 141). Install and tighten four nuts to 12 N·m (105 in. lbs.) torque.

(2) Install selector cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 140).

(3) Install crossover cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 139).

(4) Install center console assembly (Fig. 138).

(5) Install knob/boot assembly to shifter lever, align knob to three o'clock position, push knob down to engage spring and rotate counter clockwise.

(6) Locate boot to console at forward tab and secure to console with retaining tabs.

SHIFT RAIL BUSHINGS

REMOVAL

(1) Thread tool #6786 into shift rail bushing.

(2) Install slide hammer #3752 onto tool.

(3) Remove bushing using slide hammer and tool assembly (Fig. 142).

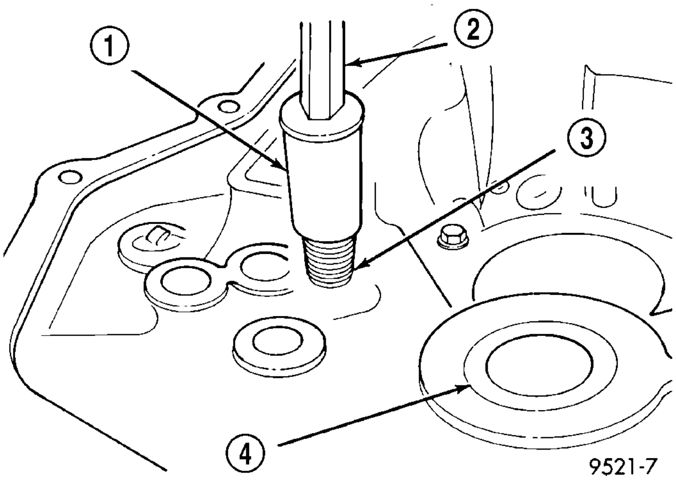


Fig. 142 Shift Rail Bushing Removal

1 - SPECIAL TOOL 6786
2 - SLIDE HAMMER C-3752
3 - SHIFTER RAIL BUSHING
4 - INPUT BEARING

INSTALLATION

(1) Line up replacement bushing in bore.

(2) Using tool #MD998343, tap bushing into bore until flush with the chamfer in the case.

SHIFT SELECTOR SHAFT

REMOVAL

(1) Disassemble transaxle.

(2) With the transaxle disassembled, remove the selector shaft by pushing on the shaft from the outside. Pull shaft out from the inside.

INSTALLATION

(1) Pull selector shaft into position from the outside.

(2) Assemble transaxle.

SHIFT SELECTOR SHAFT BUSHING

REMOVAL

(1) Remove selector shaft using procedure in this group.

(2) Thread tool #6786 into bushing.

(3) Install slide hammer #3752 onto tool and remove bushing using slide hammer (Fig. 143).

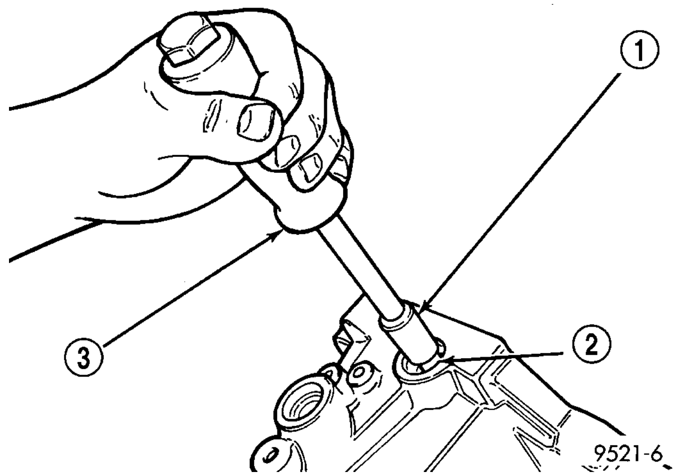


Fig. 143 Selector Shaft Bushing Removal

1 - SPECIAL TOOL 6786
2 - SHIFT SHAFT BUSHING
3 - SLIDE HAMMER C-3752

INSTALLATION

(1) Position replacement bushing over selector shaft bore.

(2) Using an appropriate size deep–well socket, install bushing in selector shaft bore (Fig. 144).

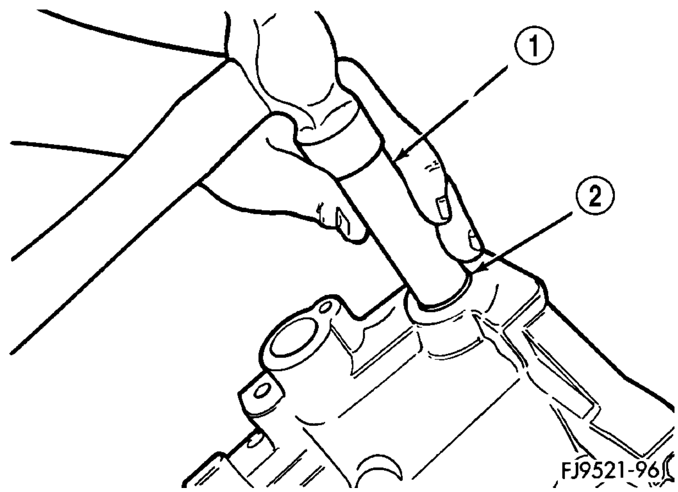


Fig. 144 Selector Shaft Bushing Installation

1 - DEEP WELL SOCKET
2 - SHIFTER SHAFT BUSHING

SHIFT SHAFT SEALS

REMOVAL

It is not necessary to remove the shift shafts from the transaxle to service the shift shaft seals.

(1) Using a pick tool, pry up on the shift shaft seal, and remove seal from bore.

SHIFT SHAFT SEALS (Continued)

INSTALLATION

(1) Position new shift shaft seal into bore.

(2) Install shift shaft seal into bore using an appropriate size deep-well socket.

SYNCHRONIZER

DISASSEMBLY

Place synchronizer in a clean shop towel and wrap. Press on inner hub. Carefully open up shop towel and remove springs, balls, keys, hub, and sleeve.

CLEANING

CLEAN

Do not attempt to clean the blocking rings in solvent. The friction material will become contaminated. Place synchronizer components in a suitable holder and clean with solvent. Air dry.

INSPECTION

INSPECT

Proper inspection of components involve:

- Teeth, for wear, scuffed, nicked, burred, or broken teeth
- Keys, for wear or distortion
- Balls and springs, for distortion, cracks, or wear

If any of these conditions exist in these components, replace as necessary.

ASSEMBLY

(1) Position synchronizer hub onto a suitable holding fixture (input shaft). The synchronizer hubs are directional. The hubs must be installed with the **U** facing upward.

(2) Install springs into hub slot (Fig. 145).

(3) Insert key into hub and spring.

(4) Apply petroleum jelly to the hole in the key. Insert balls into each key (Fig. 146).

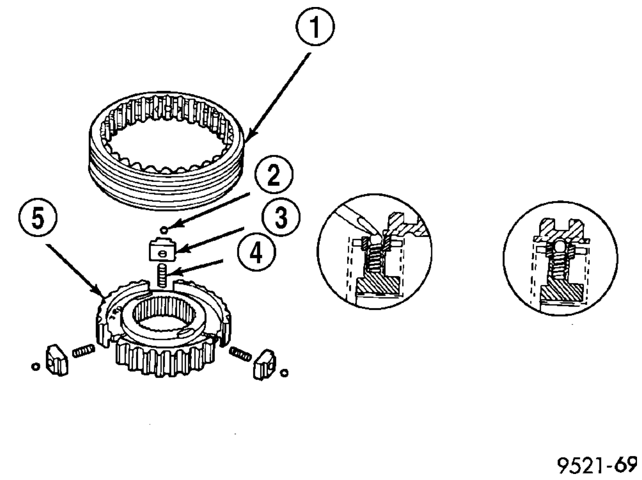


Fig. 145 Synchronizer Assembly

1 - SLEEVE
2 - BALL
3 - KEY
4 - SPRING
5 - HUB

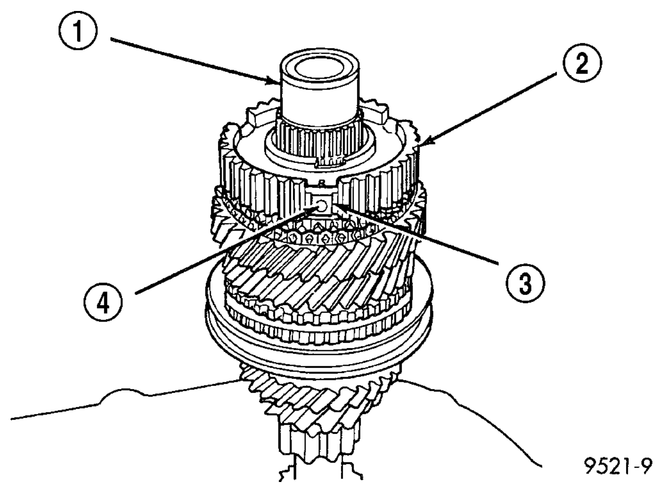


Fig. 146 Synchronizer Balls

1 - INPUT SHAFT
2 - HUB
3 - KEY
4 - BALL

SYNCHRONIZER (Continued)

(5) Slide sleeve over the hub and depress balls as you carefully slip the sleeve into position (Fig. 147).

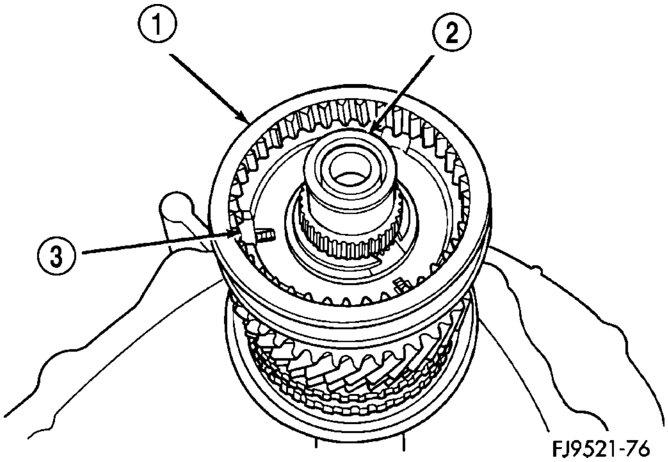


Fig. 147 Synchronizer Sleeve

1 - SLEEVE
2 - INPUT SHAFT
3 - KEY

(6) Line up stop ring tang over the keys in the hub (Fig. 148). Install stop rings. Center the keys and balls by pushing on both stop rings.

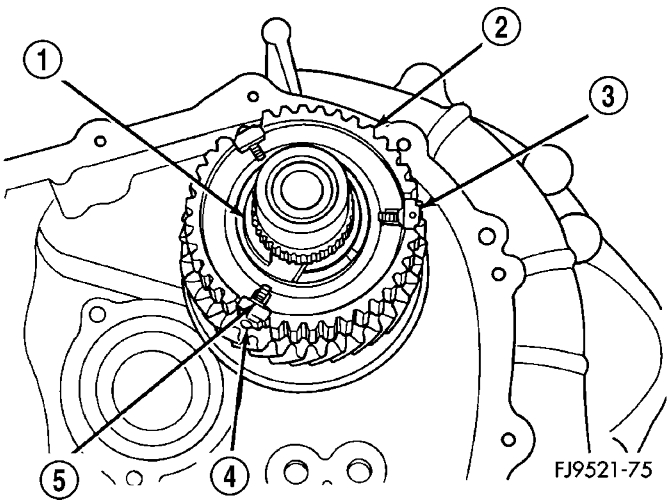


Fig. 148 Keys in Hub

1 - SNAP RING
2 - CLUTCH
3 - KEY
4 - BALL
5 - SPRING

VEHICLE SPEED SENSOR

DESCRIPTION

VEHICLE SPEED SENSOR

The Vehicle Speed Sensor (VSS) is a pulse generator mounted to an adapter near the transmission output shaft. The sensor is driven through the adapter by a speedometer pinion gear. The VSS pulse signal to the speedometer/odometer is monitored by the PCM speed control circuitry to determine vehicle speed and to maintain speed control set speed.

REMOVAL

(1) Raise vehicle on hoist.

(2) Disconnect the speed sensor connector (Fig. 149).

CAUTION: Clean area around speed sensor before removing to prevent dirt from entering the transaxle during speed sensor removal.

(3) Remove speed sensor retaining bolt (Fig. 149).

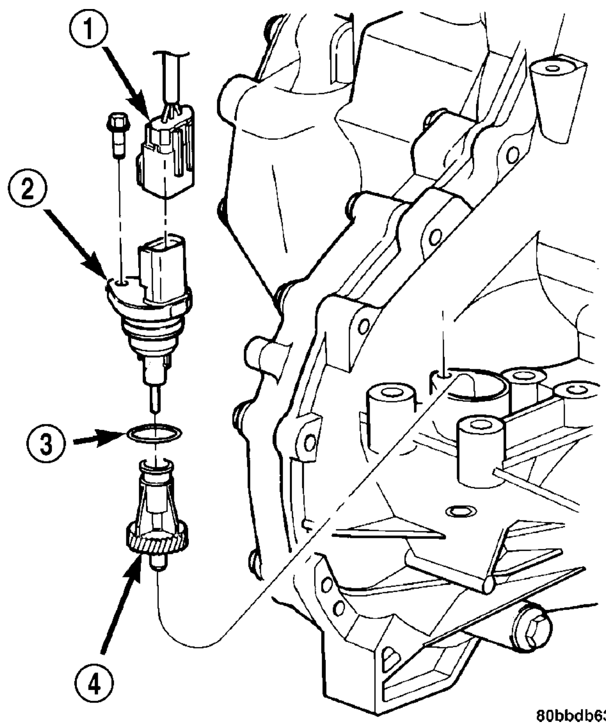


Fig. 149 Speed Sensor and Pinion—Removal/ Installation

1 - CONNECTOR
2 - SENSOR
3 - O-RING
4 - SPEEDO PINION

VEHICLE SPEED SENSOR (Continued)

(4) Remove speed sensor from transaxle.

CAUTION: Carefully remove vehicle speed sensor so that sensor drive gear does not fall into transaxle. Should sensor drive gear fall into the transaxle during sensor removal, drive gear must be reattached to sensor.

(5) Remove speed sensor drive gear from speed sensor.

INSTALLATION

(1) Install pinion gear to speed sensor (Fig. 149).

(2) Using a NEW o-ring, install the speed sensor to the transaxle (Fig. 149).

(3) Install the bolt and torque to 7 N·m (60 in. lbs.).

(4) Connect speed sensor connector (Fig. 149).

(5) Lower vehicle and road test to verify proper speedometer operation.

T850 MANUAL TRANSAXLE

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T850 MANUAL TRANSAXLE

DESCRIPTION

The NV T850 5-speed transaxle (Fig. 1) is a constant-mesh manual transaxle that is synchronized in all gear ranges, including reverse.

The transaxle consists of three major sub-assemblies: the input shaft, intermediate shaft, and differential assembly. The transaxle shift system consists of a mechanical shift cover, rails, forks, and cables. The unique design of this shift system provides a higher mechanical advantage, resulting in less friction and lower shift cable loads for smoother, more positive operation.

The NV T850 transaxle is available with the 2.4L Turbocharged Engine option. Its gear ratios are as follows:

GEAR	RATIO
1st	3.65
2nd	2.05
3rd	1.37
4th	0.97
5th	0.76
Reverse	3.47
Final Drive Ratio	3.53

T850 MANUAL TRANSAXLE (Continued)

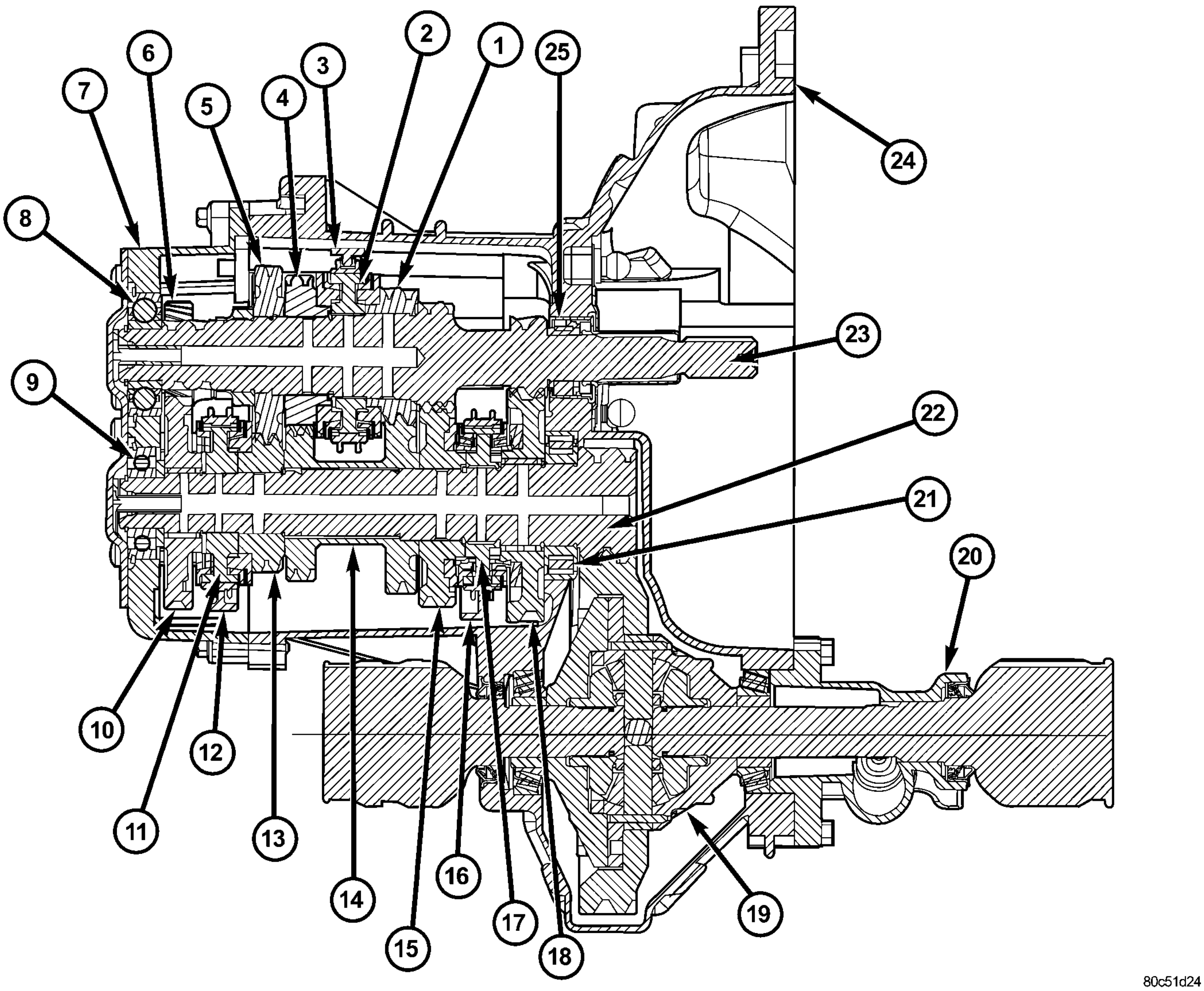


Fig. 1 NV T850 Transaxle

1 - 3RD GEAR (SPEED)
2 - 3/4 SYNCHRONIZER
3 - 3/4 SHIFT FORK
4 - 4TH GEAR (SPEED)
5 - 5TH GEAR (INPUT)
6 - REVERSE IDLER GEAR
7 - END COVER, REAR
8 - INPUT SHAFT BEARING (SEALED BALL)
9 - INTERMEDIATE SHAFT BEARING (SEALED BALL)
10 - REVERSE GEAR
11 - 5/R SYNCHRONIZER
12 - 5/R SHIFT FORK
13 - 5TH GEAR (SPEED)
14 - 3/4 CLUSTER GEAR
15 - 2ND GEAR (SPEED)
16 - 1/2 SHIFT FORK
17 - 1/2 SYNCHRONIZER
18 - 1ST GEAR (SPEED)
19 - DIFFERENTIAL ASSEMBLY
20 - EXTENSION HOUSING
21 - INTERMEDIATE SHAFT BEARING (CAGED ROLLER)
22 - INTERMEDIATE SHAFT
23 - INPUT SHAFT
24 - CASE
25 - INPUT SHAFT BEARING (ROLLER)

T850 MANUAL TRANSAXLE (Continued)

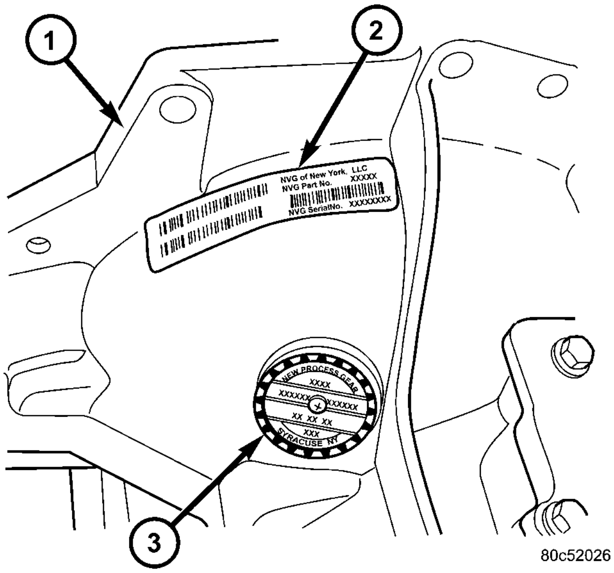


Fig. 2 T850 Transaxle Identification

1 - TRANSAXLE BELLHOUSING
2 - BARCODE LABEL
3 - I.D. TAG

TRANSAXLE IDENTIFICATION

The transaxle model, assembly part number, build date, and final drive ratio (FDR) can be found on a metal tag fastened to the transaxle case on the bell-housing (Fig. 2). A barcode label is also glued to the transaxle bellhousing, and it too includes the trans-axle part number.

OPERATION

NEUTRAL

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. Since no synchronizers are engaged on either the input or intermediate shafts, power is not transmitted to the intermediate shaft and the differential does not turn (Fig. 3).

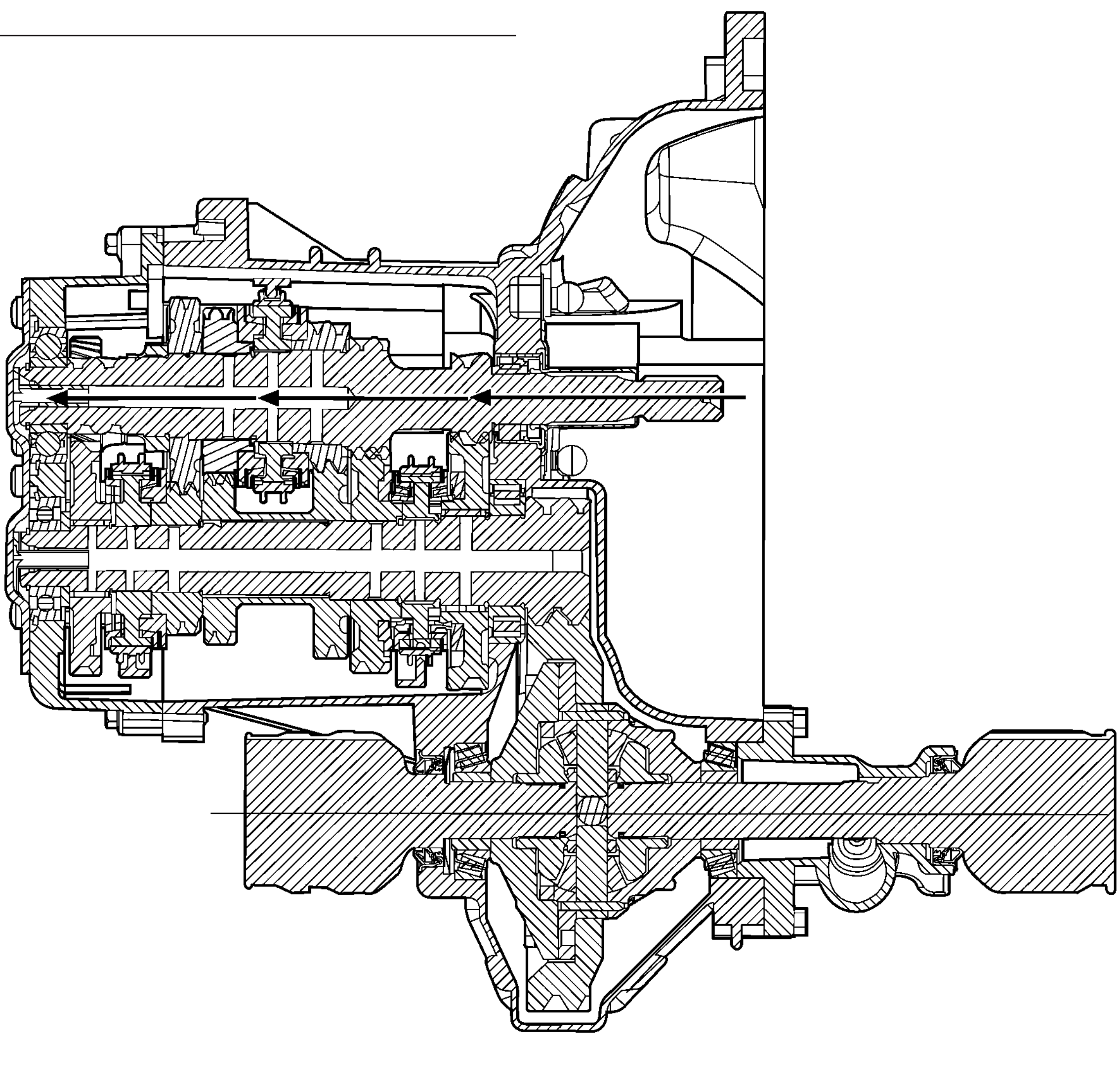


Fig. 3 Neutral Gear Operation

T850 MANUAL TRANSAXLE (Continued)

1ST GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft first gear is integral to the input shaft, and is in constant mesh with the intermediate shaft first speed gear. Because of this constant mesh, the intermediate shaft first speed gear freewheels until first gear is selected. As the gearshift lever is moved to the first gear position, the 1-2 fork moves the 1-2 synchronizer sleeve towards first gear on the intermediate shaft. The synchronizer sleeve engages the first gear clutch teeth, fixing the gear to the intermediate shaft, and allowing power to transmit through the intermediate shaft to the differential (Fig. 4).

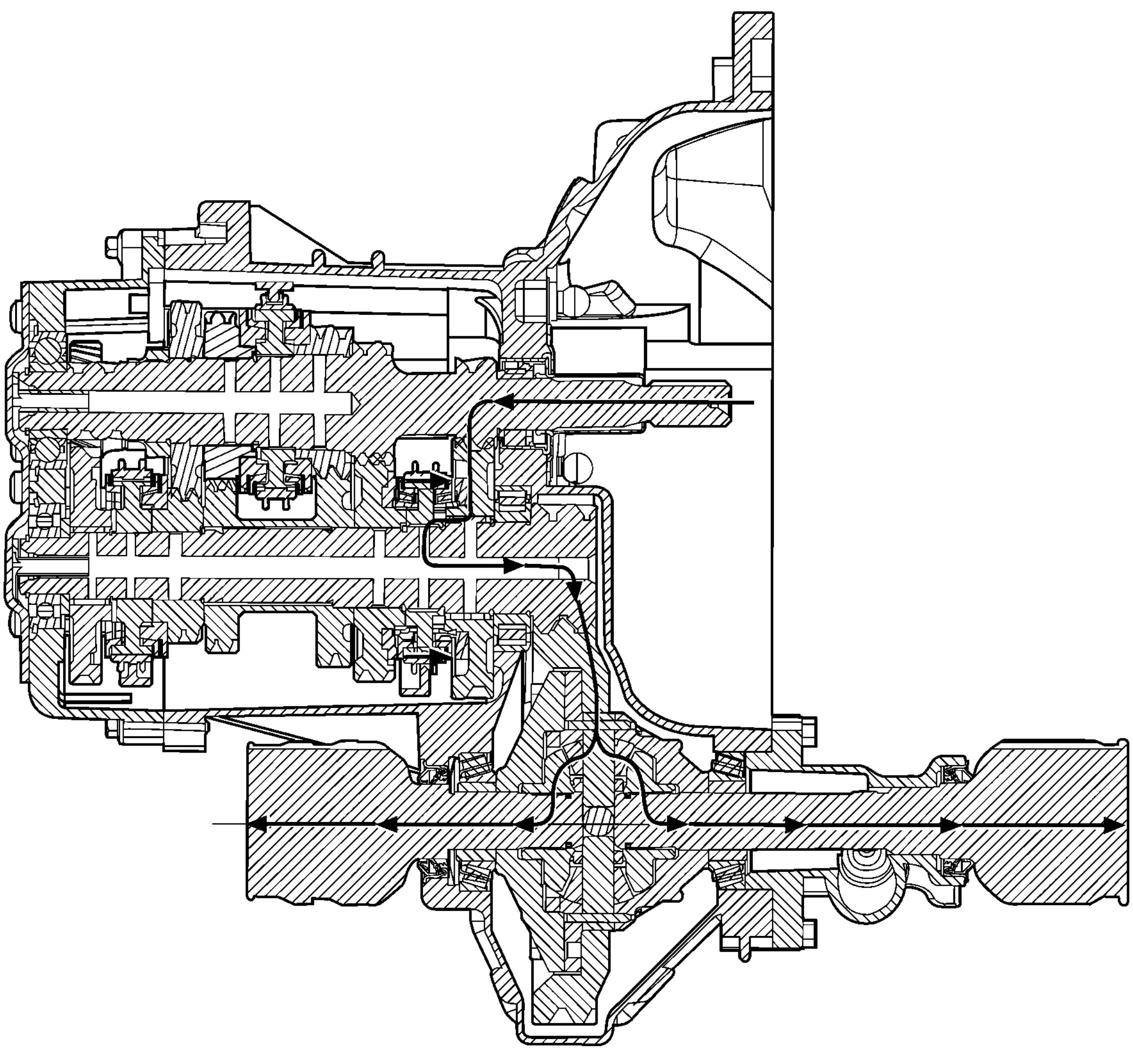


Fig. 4 1st Gear Operation

T850 MANUAL TRANSAXLE (Continued)

2ND GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft second gear is integral to the input shaft, and is in constant mesh with the intermediate shaft second speed gear. Because of this constant mesh, the intermediate shaft second speed gear freewheels until second gear is selected. As the gearshift lever is moved to the second gear position, the 1-2 fork moves the 1-2 synchronizer sleeve towards second gear on the intermediate shaft. The synchronizer sleeve engages the second gear clutch teeth, fixing the gear to the intermediate shaft, and allowing power to transmit through the intermediate shaft to the differential (Fig. 5).

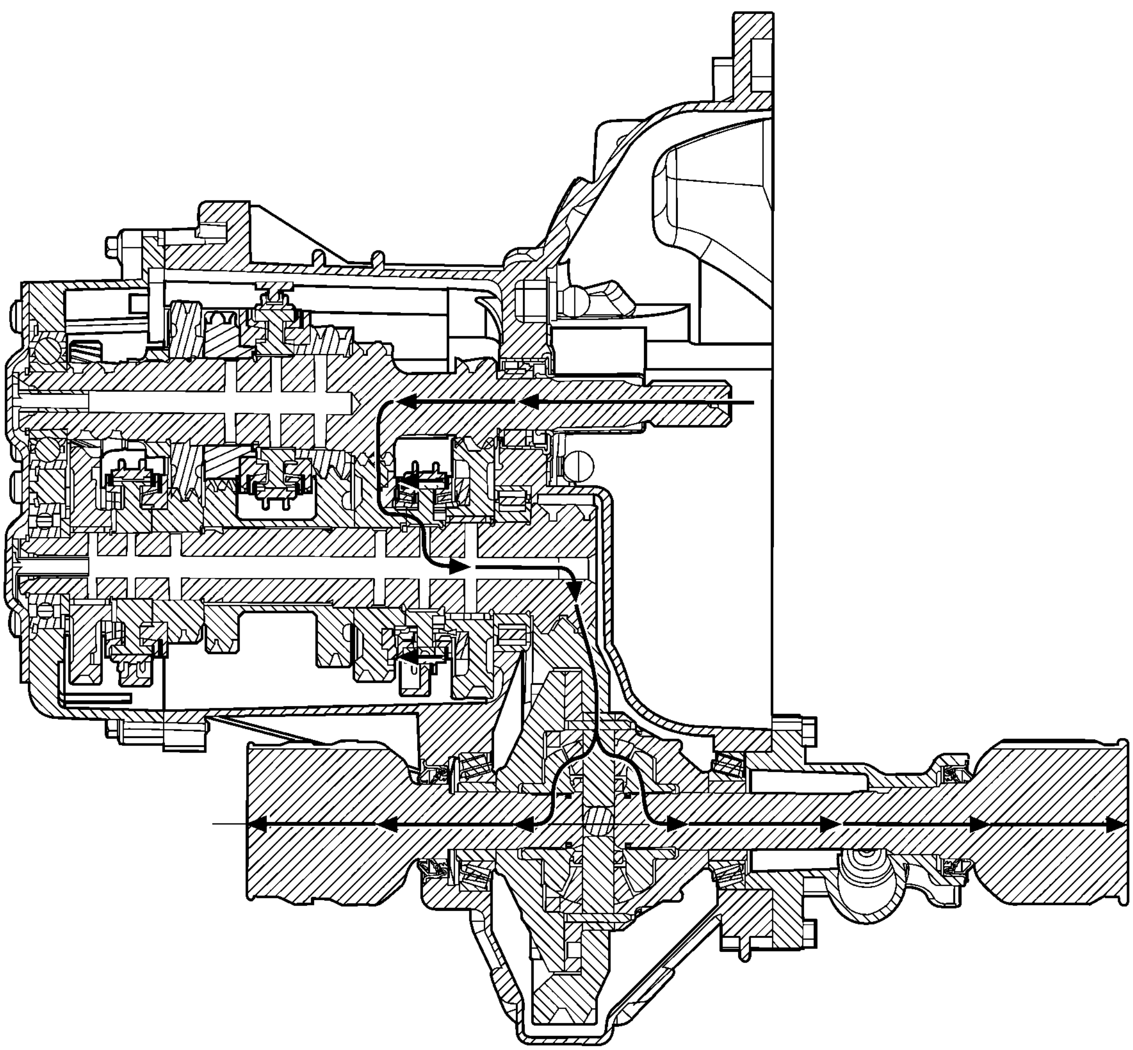


Fig. 5 2nd Gear Operation

T850 MANUAL TRANSAXLE (Continued)

3RD GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft third speed gear is in constant mesh with the intermediate shaft 3-4 cluster gear, which is fixed to the intermediate shaft. Because of this constant mesh, the input shaft third speed gear freewheels until third gear is selected. As the gearshift lever is moved to the third gear position, the 3-4 fork moves the 3-4 synchronizer sleeve towards third gear on the input shaft. The synchronizer sleeve engages the third gear clutch teeth, fixing the gear to the input shaft, and allowing power to transmit through the intermediate shaft to the differential (Fig. 6).

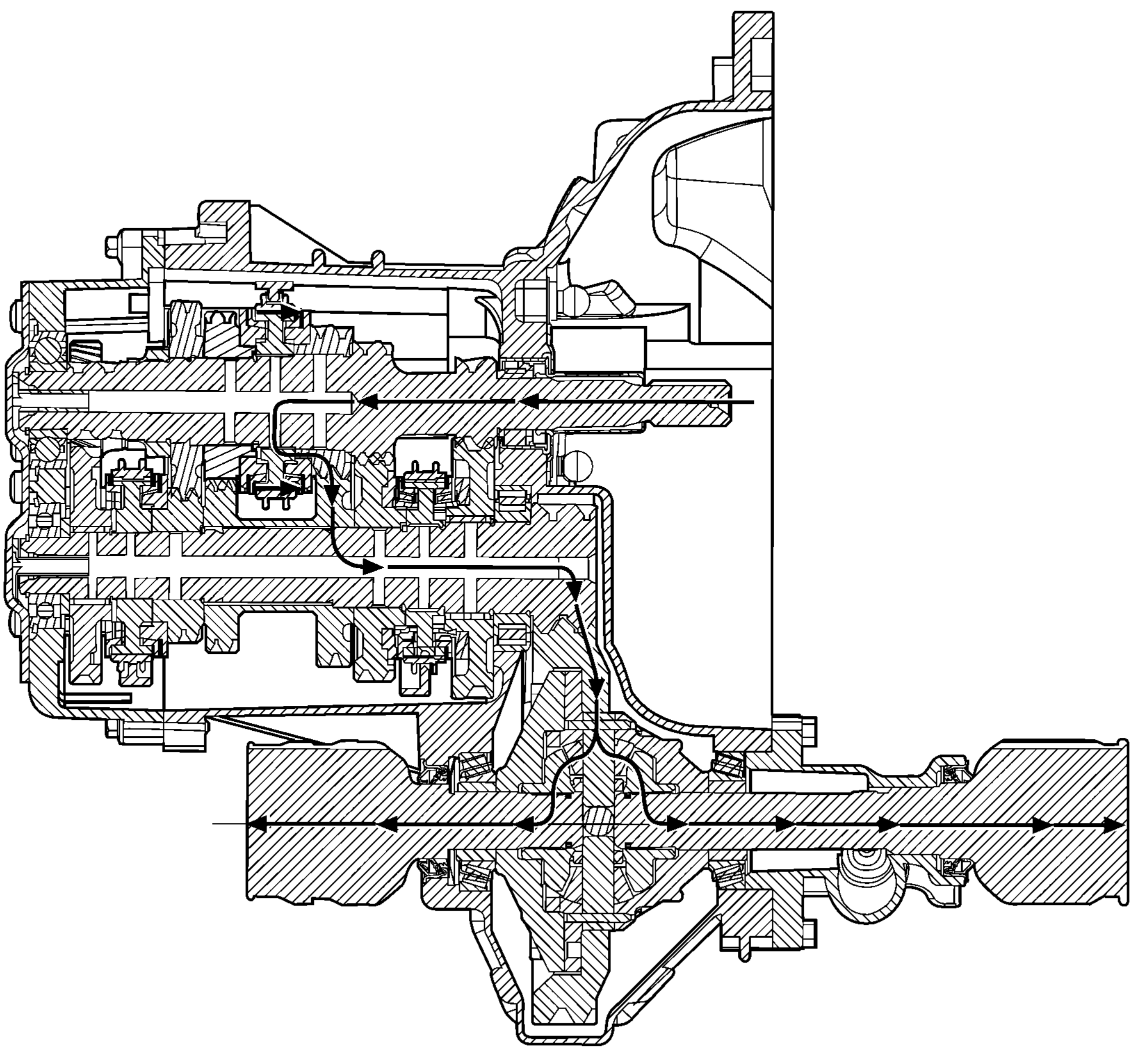


Fig. 6 3rd Gear Operation

T850 MANUAL TRANSAXLE (Continued)

4TH GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft fourth speed gear is in constant mesh with the intermediate shaft 3-4 cluster gear, which is fixed to the intermediate shaft. Because of this constant mesh, the input shaft fourth speed gear freewheels until fourth gear is selected. As the gearshift lever is moved to the fourth gear position, the 3-4 fork moves the 3-4 synchronizer sleeve towards fourth gear on the input shaft. The synchronizer sleeve engages the fourth gear clutch teeth, fixing the gear to the input shaft, and allowing power to transmit through the intermediate shaft to the differential (Fig. 7).

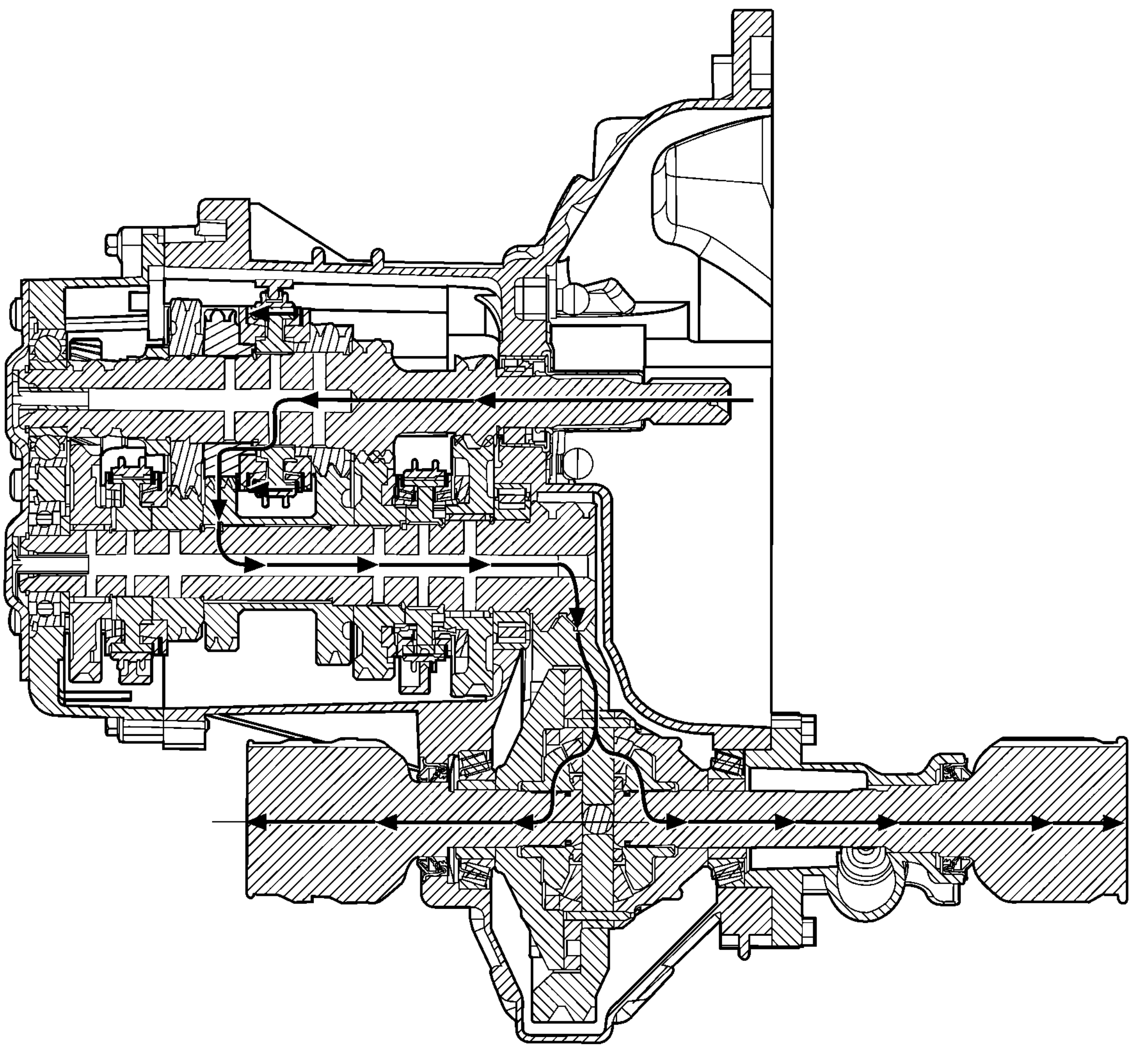


Fig. 7 4th Gear Operation

T850 MANUAL TRANSAXLE (Continued)

5TH GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft fifth gear is pressed on to the input shaft, and is in constant mesh with the intermediate shaft fifth speed gear. Because of this constant mesh, the intermediate shaft fifth speed gear freewheels until fifth gear is selected. As the gearshift lever is moved to the fifth gear position, the 5-R fork moves the 5-R synchronizer sleeve towards the intermediate shaft fifth speed gear. The synchronizer sleeve engages the fifth gear clutch teeth, fixing the gear to the input shaft, and allowing power to transmit through the intermediate shaft to the differential (Fig. 8).

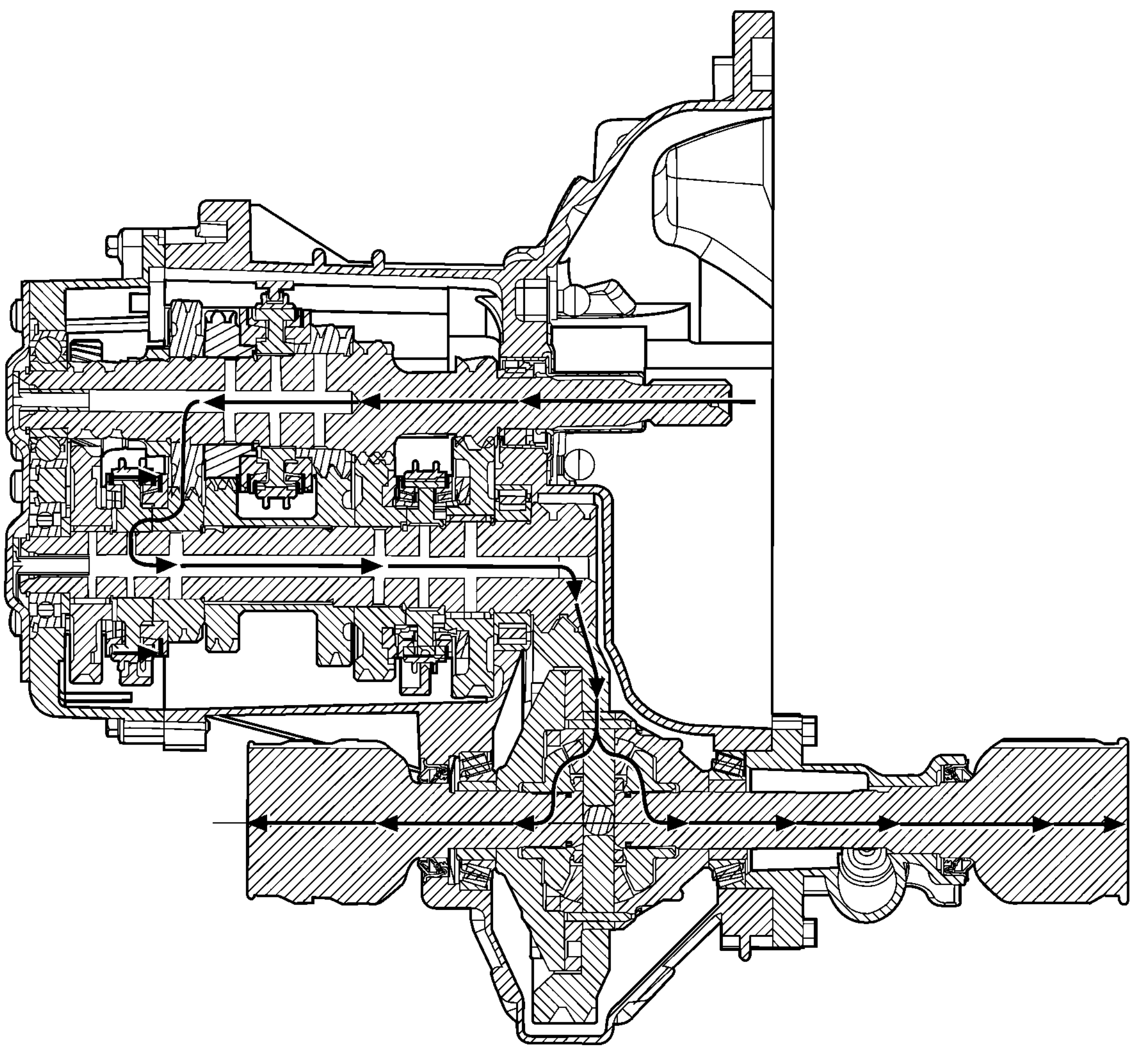


Fig. 8 5th Gear Operation

T850 MANUAL TRANSAXLE (Continued)

REVERSE GEAR

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft reverse gear is integral to the input shaft, and is in constant mesh with the reverse idler gear. The reverse idler gear, which reverses the rotation of the intermediate shaft, is in constant mesh with the intermediate shaft reverse gear. Because of this constant mesh, the intermediate shaft reverse gear freewheels until reverse gear is selected. As the gearshift lever is moved to the reverse gear position, the 5-R fork moves the 5-R synchronizer sleeve towards the intermediate shaft reverse gear. The synchronizer sleeve engages the reverse gear clutch teeth, fixing the gear to the intermediate shaft, and allowing power to transmit through the intermediate shaft to the differential (in reverse) (Fig. 9).

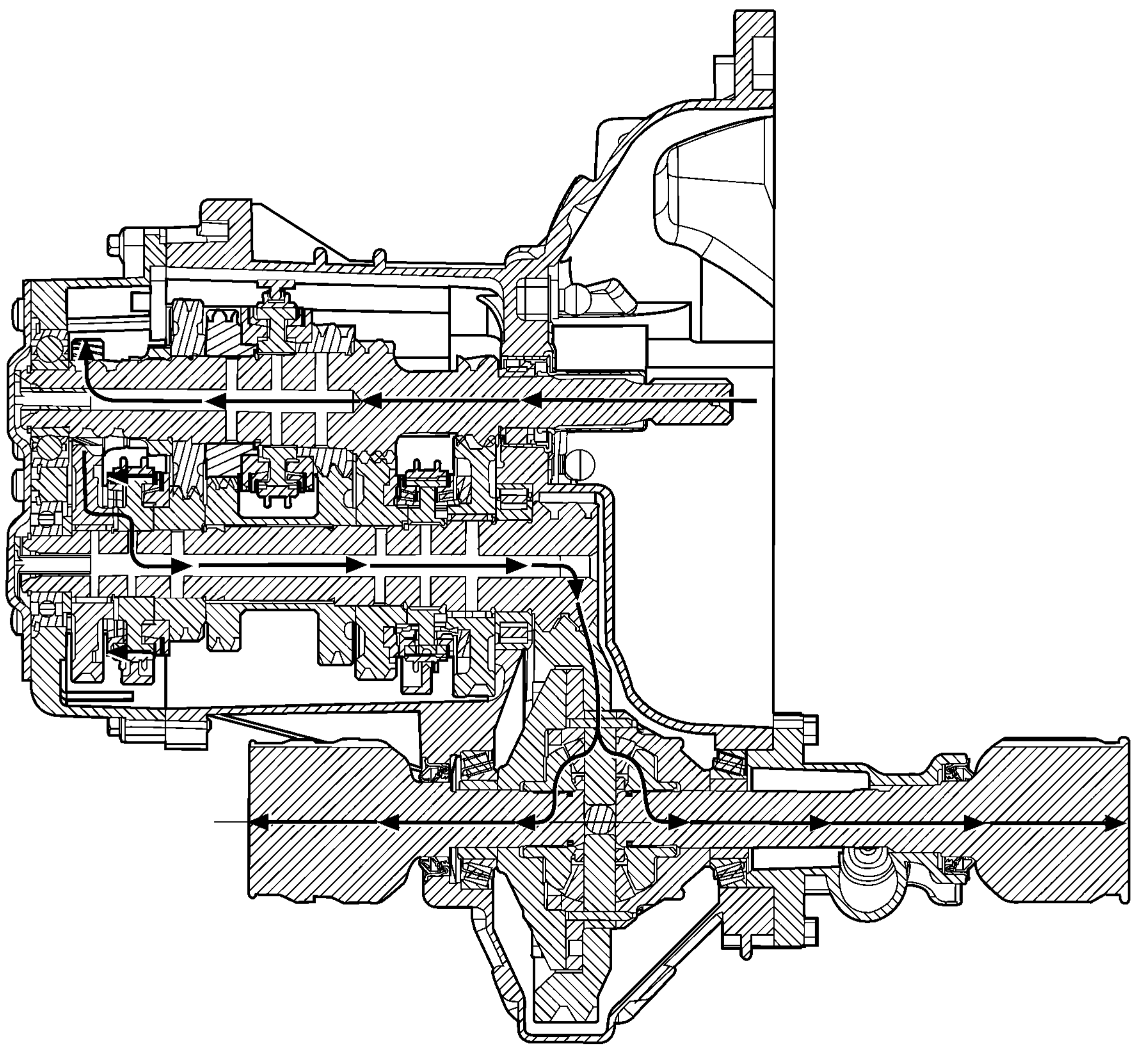


Fig. 9 Reverse Gear Operation

T850 MANUAL TRANSAXLE (Continued)

DIAGNOSIS AND TESTING - COMMON PROBLEM CAUSES

The majority of transaxle malfunctions are a result of:

- Insufficient lubrication
- Incorrect lubricant
- Misassembled or damaged internal components
- Improper operation

HARD SHIFTING

Hard shifting may be caused by a misadjusted crossover cable. If hard shifting is accompanied by gear clash, synchronizer clutch and stop rings or gear teeth may be worn or damaged.

Hard shifting may also be caused by a binding or broken shift cover mechanism. Remove shift cover and verify smooth operation. Replace as necessary.

Misassembled synchronizer components also cause shifting problems. Incorrectly installed synchronizer sleeves, keys, balls, or springs can cause shift problems.

NOISY OPERATION

Transaxle noise is most often a result of worn or damaged components. Chipped, broken gear or synchronizer teeth, and brinnelled, spalled bearings all cause noise.

Abnormal wear and damage to the internal components is frequently the end result of insufficient lubricant.

SLIPS OUT OF GEAR

Transaxle disengagement may be caused by misaligned or damaged shift components, or worn teeth on the drive gears or synchronizer components. Incorrect assembly also causes gear disengagement. Check for missing snap rings.

LOW LUBRICANT LEVEL

Insufficient transaxle lubricant is usually the result of leaks, or inaccurate fluid level check or refill method. Leakage is evident by the presence of oil around the leak point. If leakage is not evident, the condition is probably the result of an underfill.

If air–powered lubrication equipment is used to fill a transaxle, be sure the equipment is properly calibrated. Equipment out of calibration can lead to an underfill condition.

CLUTCH PROBLEMS

Worn, damaged, or misaligned clutch components can cause difficult shifting, gear clash, and noise.

A worn or damaged clutch disc, pressure plate, or release bearing can cause hard shifting and gear clash.

REMOVAL

(1) Raise hood.

(2) Disconnect battery negative cable.

(3) Remove turbocharger solenoid pack from air cleaner assembly (Fig. 10). Position out of way.

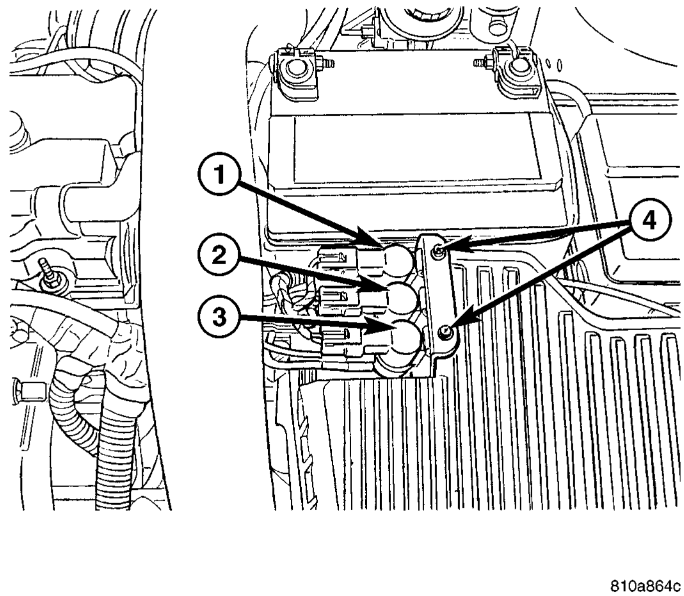


Fig. 10 Turbocharger Solenoids and Mounting Bracket

1 - TIP SOLENOID
2 - SURGE VALVE ACTUATOR SOLENOID
3 - WASTEGATE ACTUATOR SOLENOID
4 - BRACKET MOUNTING SCREWS

(4) Disconnect AAT sensor and remove air cleaner assembly.

(5) Remove throttle body inlet hose (from intercooler).

(6) Disconnect IAC and TPS connectors. Disconnect accelerator cable from throttle body linkage.

(7) Remove throttle body adapter.

(8) Remove battery.

(9) Remove battery tray (Fig. 11).

(10) Disconnect shift cables from transaxle shift levers and bracket.

(11) Raise vehicle on hoist.

(12) If necessary, drain transmission fluid at transaxle drain plug.

(13) Remove both front wheel/tire assemblies.

(14) Disconnect and remove both ABS front wheel speed sensors.

(15) Remove halfshaft assemblies and intermediate shaft assembly (Fig. 12). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(16) Using Tool 6638A, disconnect clutch hydraulic circuit “quick-connect” fitting (Fig. 13).

T850 MANUAL TRANSAXLE (Continued)

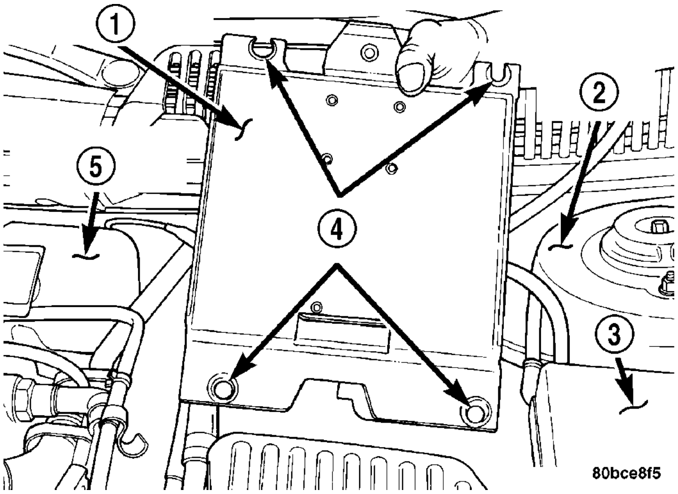


Fig. 11 Battery Tray Removal

1 - BATTERY TRAY
2 - LEFT STRUT TOWER
3 - PDC
4 - MOUNTING HOLES/SLOTS
5 - COOLANT RESERVOIR

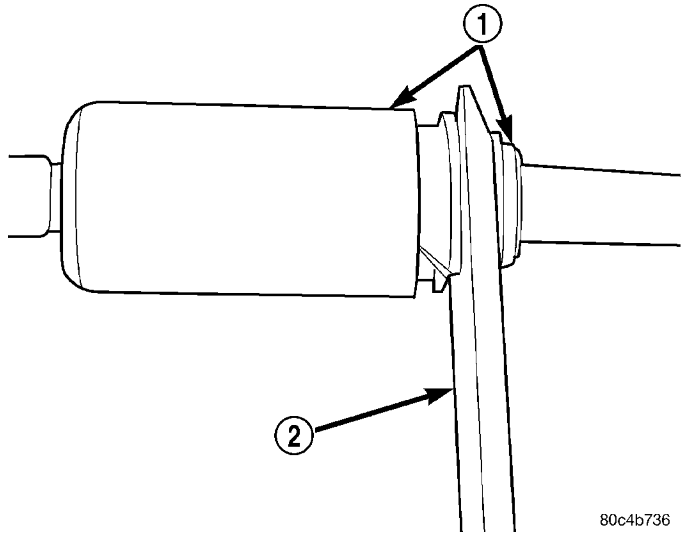


Fig. 13 Disconnect Clutch Hydraulic Quick Connect using Tool 6638A

1 - QUICK CONNECT FITTING
2 - TOOL 6638A

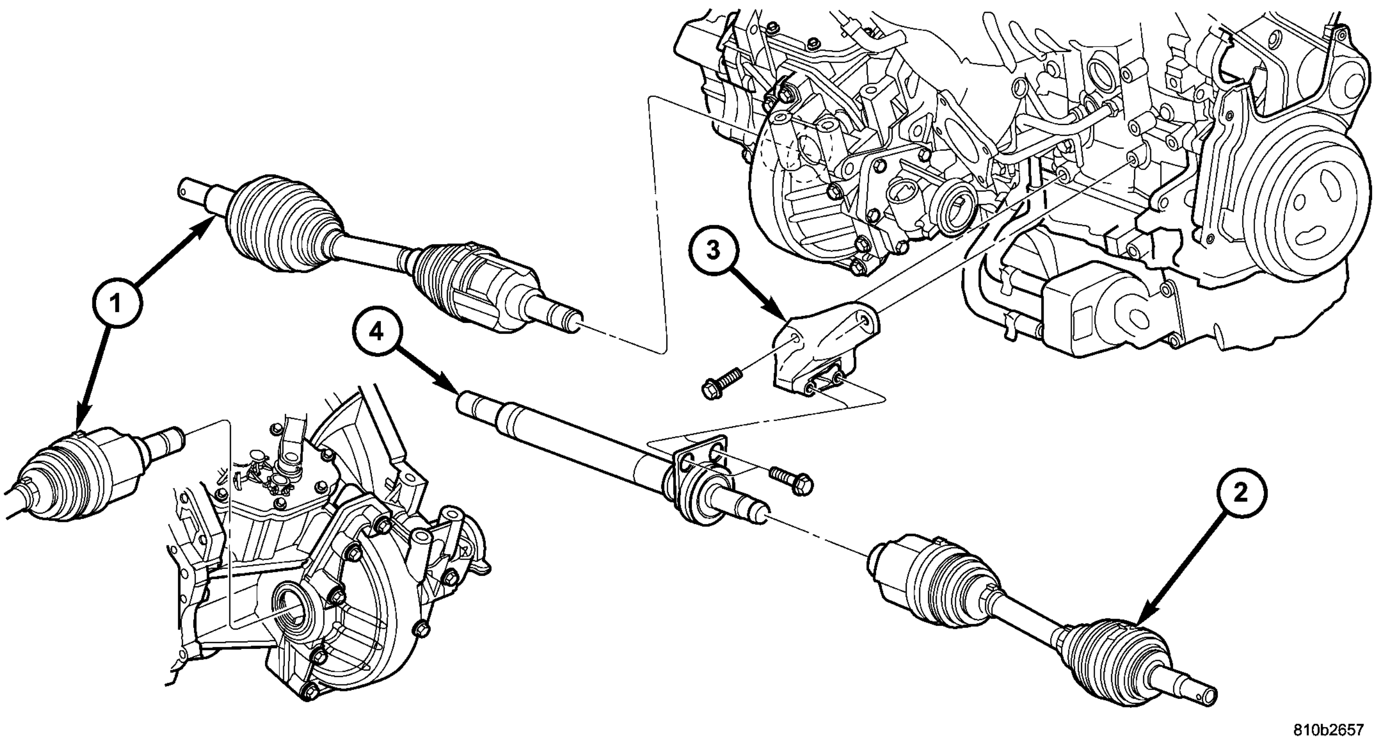


Fig. 12 Halfshaft and Intermediate Shaft—2.4L Turbo Models

1 - HALFSHAFT - LEFT
2 - HALFSHAFT - RIGHT
3 - SUPPORT BRACKET - INTERMEDIATE SHAFT
4 - INTERMEDIATE SHAFT/BEARING ASSEMBLY

T850 MANUAL TRANSAXLE (Continued)

(17) Disconnect back-up lamp switch connector (Fig. 14).

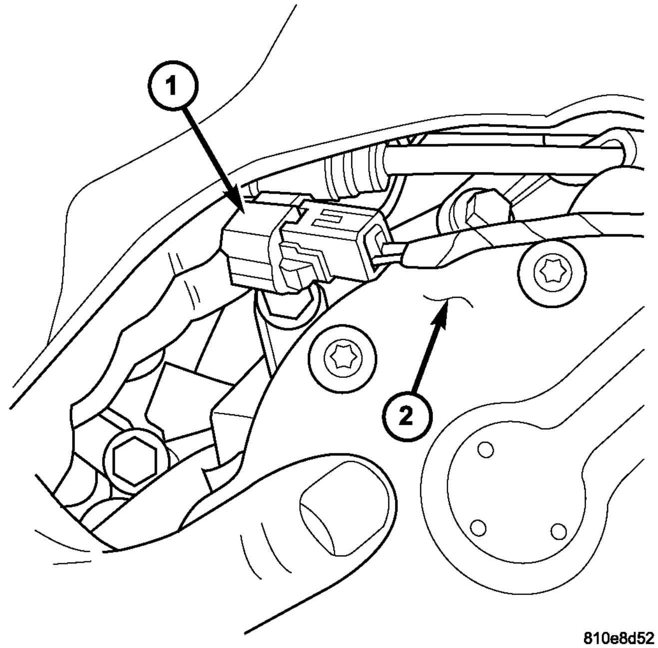


Fig. 14 Back-up Lamp Switch Connector

1 - CONNECTOR
2 - END COVER

(18) Remove starter motor-to-transaxle case bolts (Fig. 15).

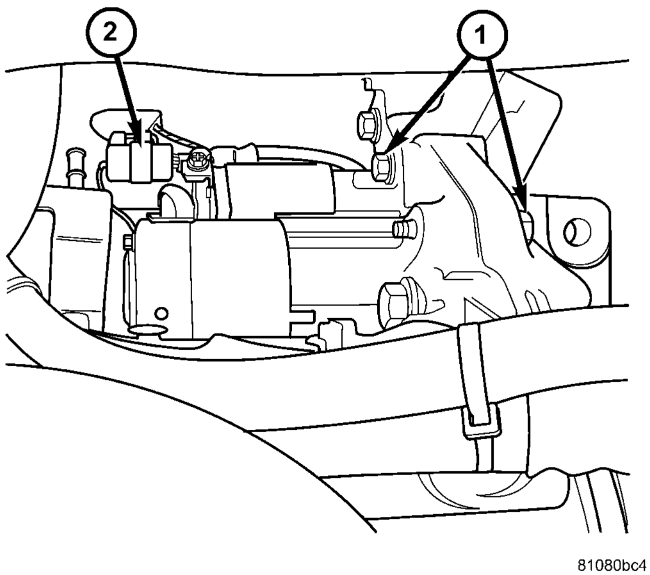


Fig. 15 Starter Motor-to-Transaxle Case Bolts

1 - MOUNTING BOLTS
2 - CONNECTOR

(19) Remove front lateral bending brace (Fig. 16).

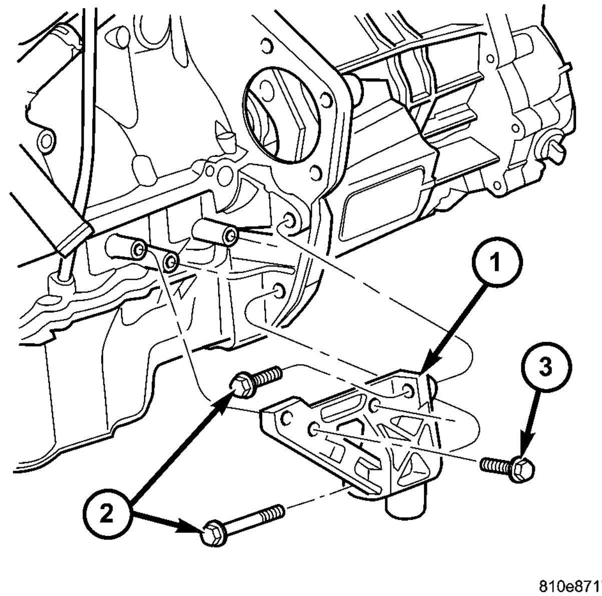


Fig. 16 Lateral Bending Brace

1 - LATERAL BENDING BRACE
2 - BOLT (1 LONG/1 SHORT)
3 - BOLT (2)

(20) Disconnect turbocharger pipe and power steering lines from structural collar (Fig. 17) (Fig. 18).

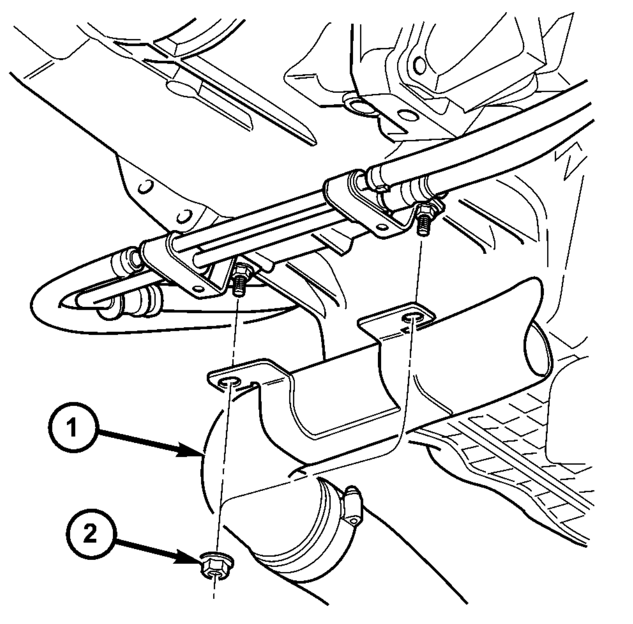


Fig. 17 Charge Air Cooler Hose/Fasteners

1 - CAC HOSE ASSY
2 - NUT (2)

T850 MANUAL TRANSAXLE (Continued)

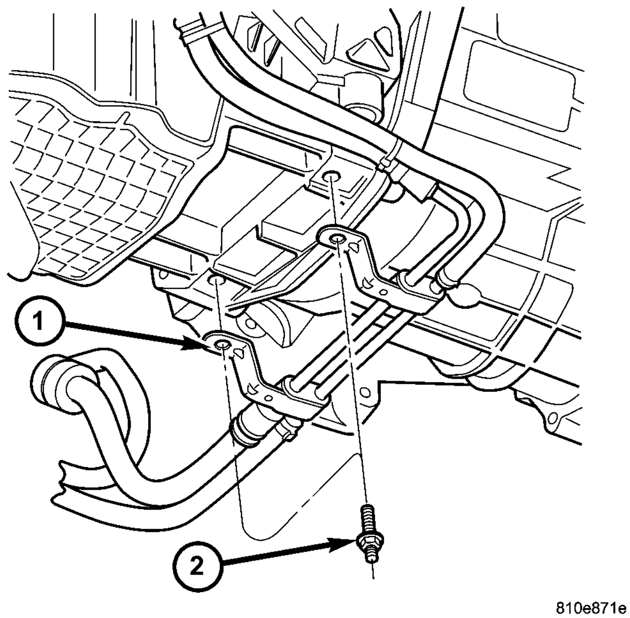


Fig. 18 Structural Collar/Power Steering Hose Fasteners

1 - POWER STEERING HOSE ASSY
2 - BOLT/STUD (2)

(21) Remove structural collar (Fig. 19).

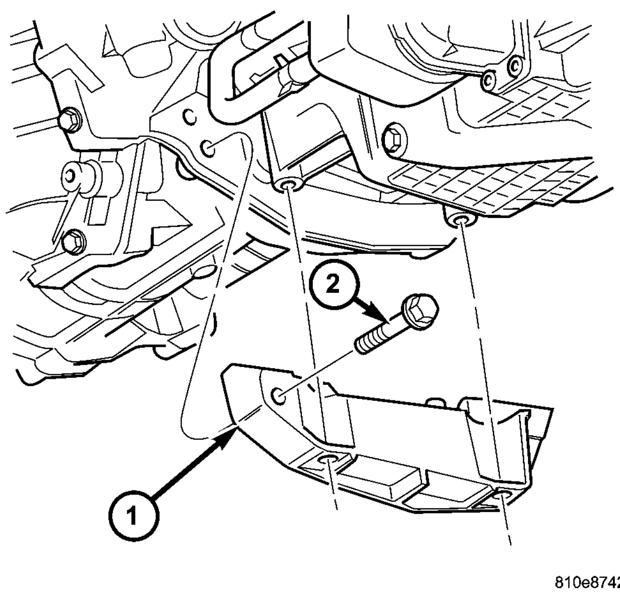


Fig. 19 Structural Collar Removal/Installation

1 - STRUCTURAL COLLAR
2 - BOLT

(22) Remove four (4) modular clutch-to-engine drive plate bolts (Fig. 20). While removing bolts, one tight-tolerance (slotted) hole will be encountered. When this bolt is removed, mark driveplate and modular clutch assembly at this location, and be sure to align marks upon reassembly.

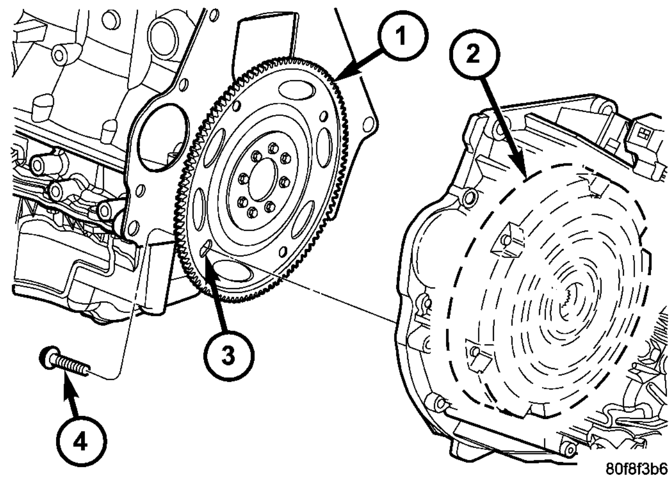


Fig. 20 Modular Clutch-to-Driveplate Bolts

1 - DRIVEPLATE
2 - MODULAR CLUTCH ASSEMBLY
3 - TIGHT TOLERANCE HOLE
4 - BOLT (4)

(23) Install and secure transmission jack.

(24) Remove left mount through-bolt.

(25) Lower engine/transaxle assembly enough to gain access to left mount and bellhousing bolts.

(26) Remove left mount-to-transaxle bolts. Remove mount (Fig. 21).

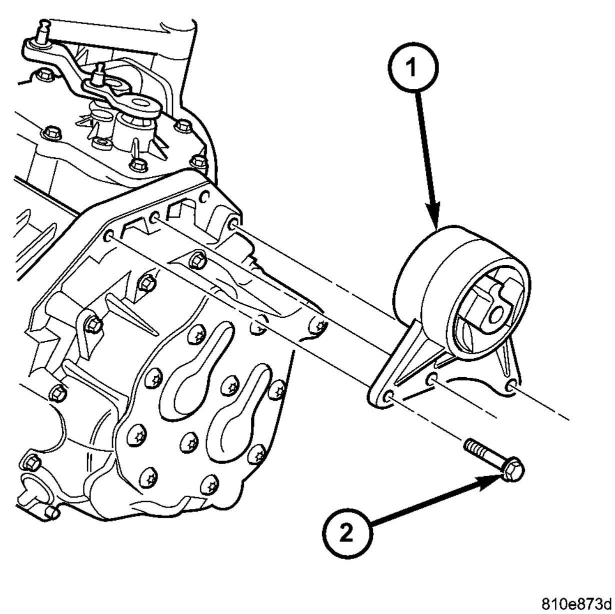


Fig. 21 Transaxle Upper Mount and Fasteners

1 - MOUNT/BRACKET
2 - BOLT (3)

T850 MANUAL TRANSAXLE (Continued)

(27) Install screw jack and wood block to support engine after transmission removal.

(28) Remove transmission bellhousing-to-block bolts and remove transmission and modular clutch assembly.

(29) If replacing transmission, transfer impact blocker, back-up lamp switch, vehicle speed sensor and gearshift cable bracket.

DISASSEMBLY

(1) Remove clutch release lever and bearing (Fig. 22). Inspect release lever pivot balls and replace if necessary (Fig. 23). Use slide hammer C-3752 and remover/installer 6891 (Fig. 24) if pivot ball replacement is necessary.

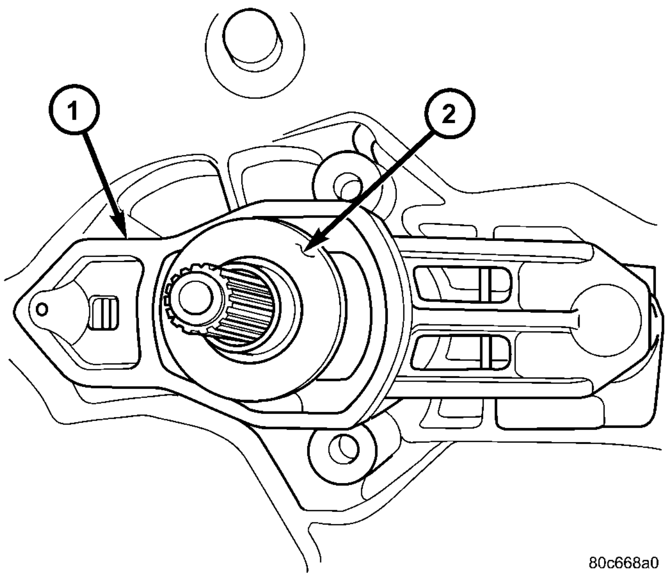


Fig. 22 Release Bearing and Lever

1 - RELEASE LEVER
2 - RELEASE BEARING

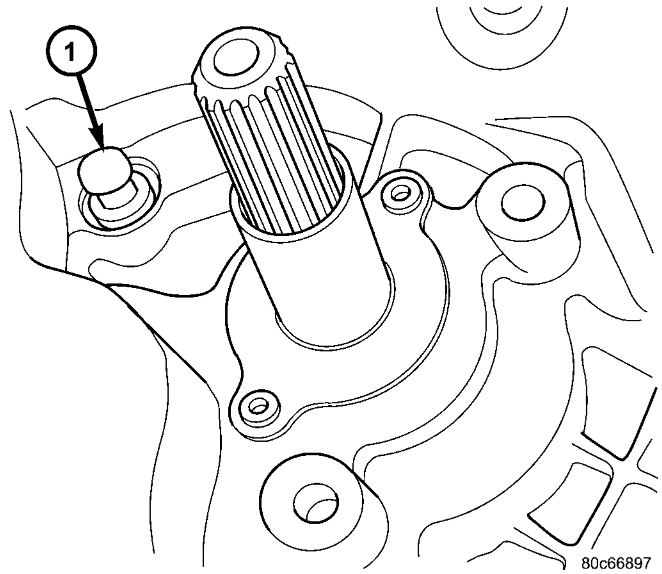


Fig. 23 Pivot Ball Orientation

1 - PIVOT BALL (1)

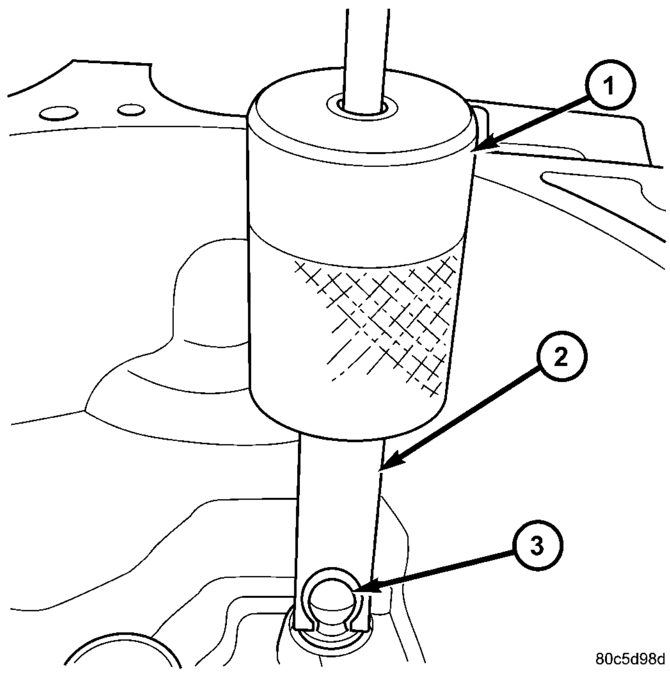


Fig. 24 Pivot Ball Removal/Installation

1 - C-3752 SLIDE HAMMER
2 - REMOVER/INSTALLER 6891
3 - PIVOT BALL

T850 MANUAL TRANSAXLE (Continued)

(2) Remove input shaft bearing retainer (Fig. 25).

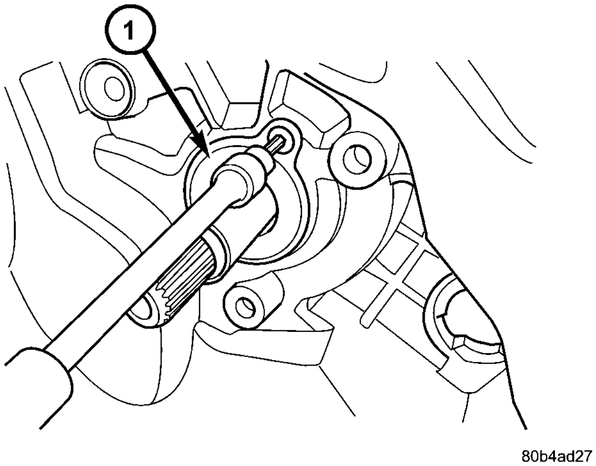


Fig. 25 Input Bearing Retainer

1 - INPUT BEARING RETAINER

NOTE: Place transaxle in neutral before shift cover removal.

(3) Remove shift cover-to-case bolts and remove shift cover assembly (Fig. 26).

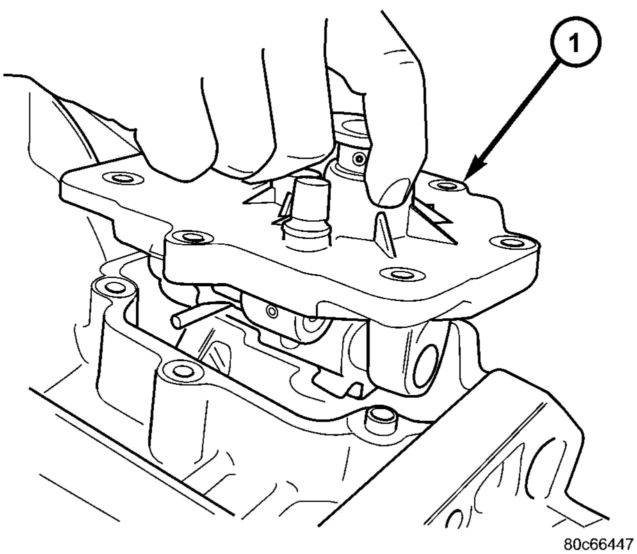


Fig. 26 Shift Cover Removal/Installation

1 - SHIFT COVER ASSEMBLY

(4) Using a suitable screwdriver, remove extension housing axle oil seal (Fig. 27).

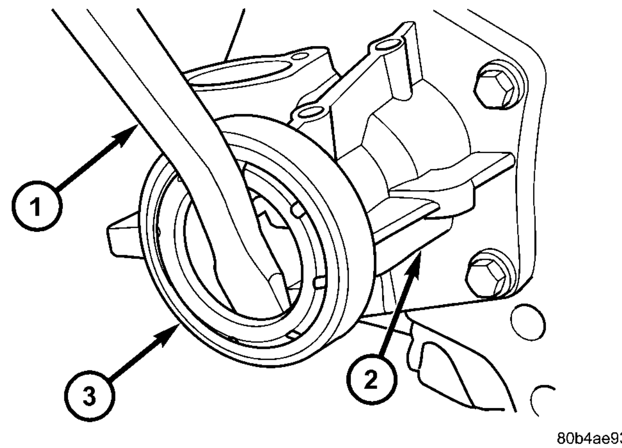


Fig. 27 Extension Housing Seal

1 - SCREWDRIVER
2 - EXTENSION HOUSING
3 - SEAL

(5) Remove extension housing-to-case and differential cover bolts (Fig. 28).

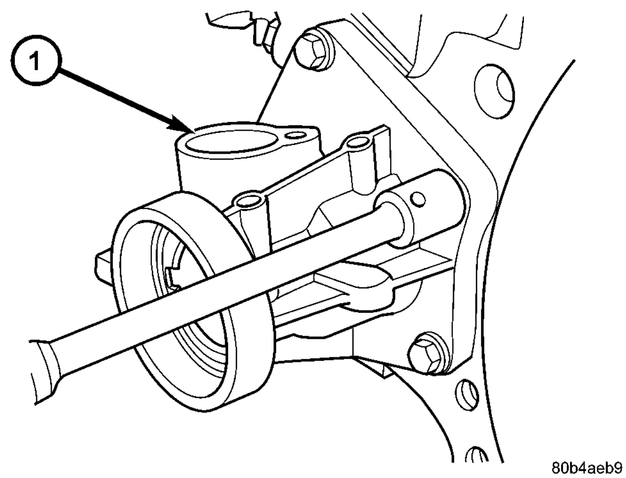


Fig. 28 Extension Housing-to-Case Bolts

1 - EXTENSION HOUSING

T850 MANUAL TRANSAXLE (Continued)

(6) Place transaxle with bellhousing surface down.
(7) Remove backup lamp switch (Fig. 29).

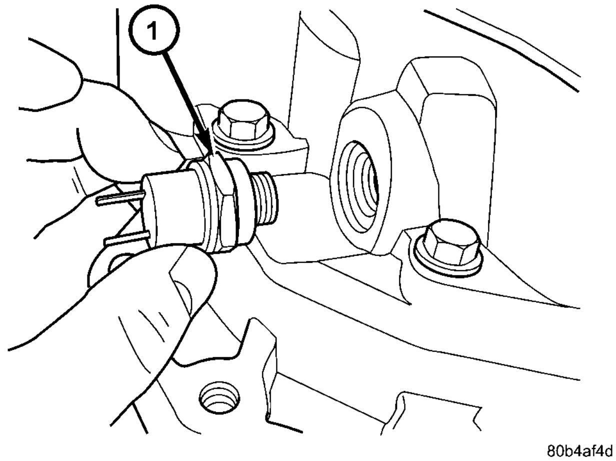


Fig. 29 Back-Up Lamp Switch

1 - BACK-UP LAMP SWITCH

(8) Remove end plate (Fig. 30).

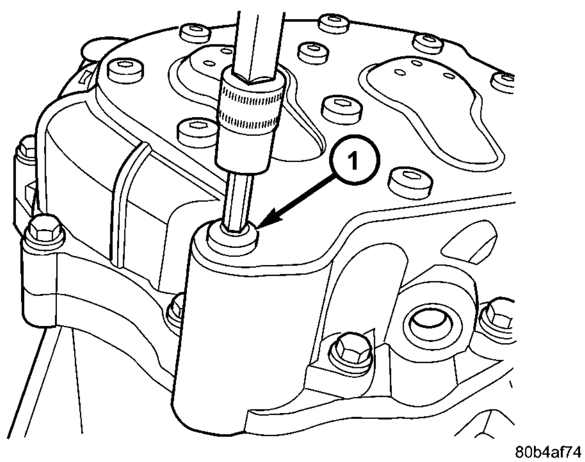


Fig. 30 End Plate Bolts

1 - BOLT (11)

(9) Set up lifting bar (tool 8489) as shown in (Fig. 31).
(10) Lift up on bar (input shaft bearing side) and remove input shaft bearing snap ring.
(11) Lift up on bar (intermediate shaft side) and remove intermediate shaft bearing snap ring.

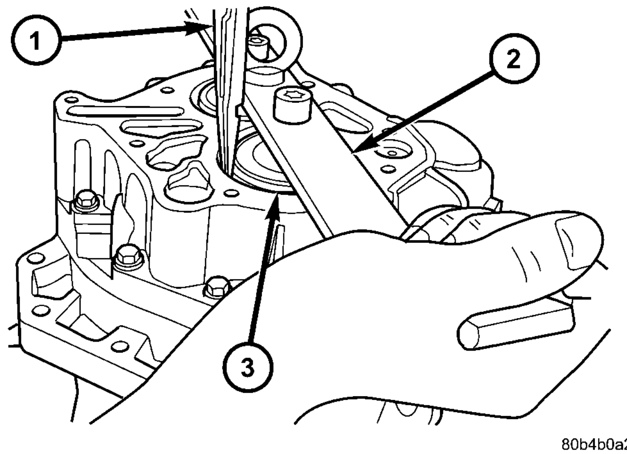


Fig. 31 Input Bearing Snap Ring

1 - SNAP RING PLIERS
2 - LIFTING BAR 8489
3 - SNAP RING

(12) Remove lifting bar 8489.
(13) Remove end cover-to-case bolts (12) (Fig. 32).

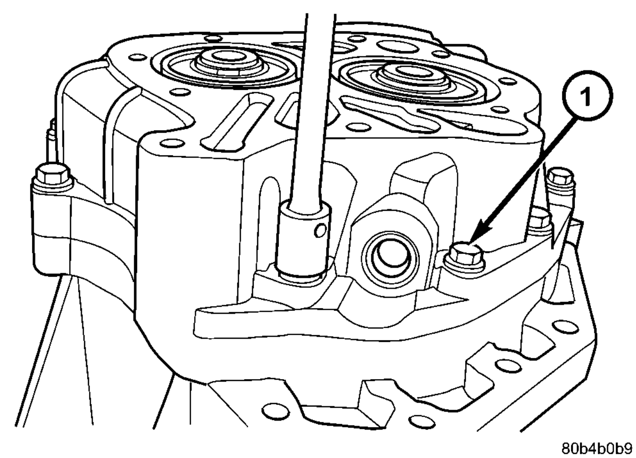


Fig. 32 End Cover Bolts

1 - BOLT (12)

T850 MANUAL TRANSAXLE (Continued)

(14) Remove end cover from transaxle (Fig. 33).

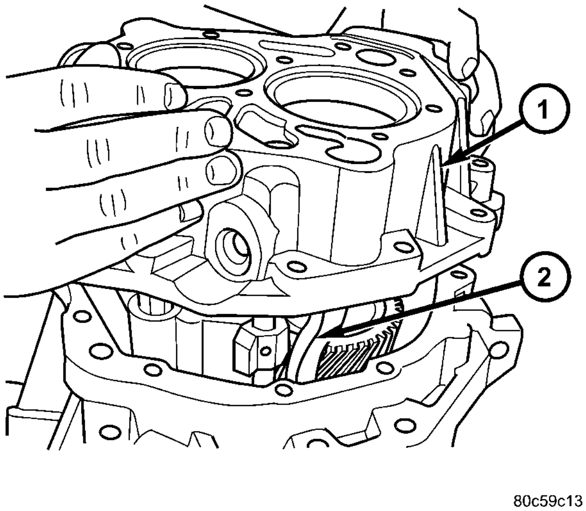


Fig. 33 End Cover Removal/Installation

1 - END COVER
2 - OIL TROUGH

(15) Remove 3/4 shift rail bushing from end cover using slide hammer C-3752 and remover 6786 (Fig. 34).

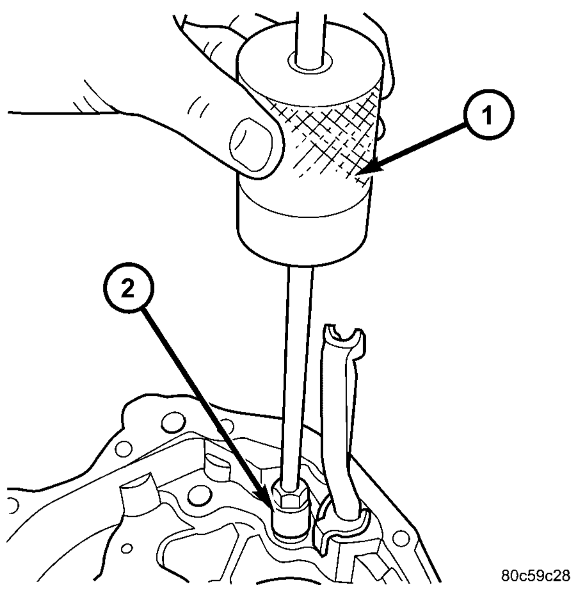


Fig. 34 3/4 Shift Rail Bushing Removal

1 - SLIDE HAMMER C-3752
2 - REMOVER 6786

(16) Remove reverse idler bolt (Fig. 35). Remove reverse idler gear, washers, and shaft upon geartrain removal.

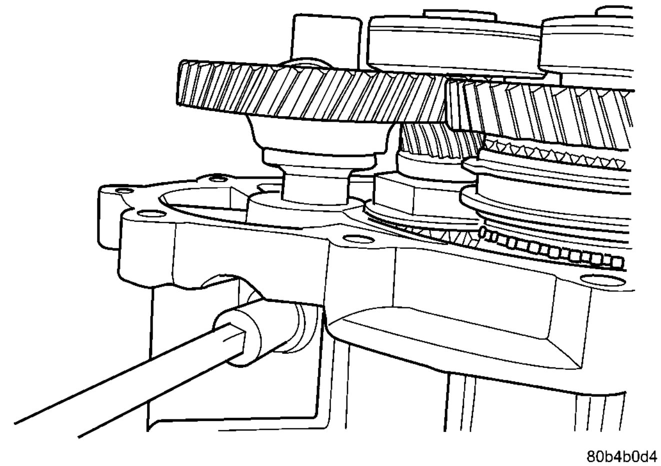


Fig. 35 Reverse Idler Shaft Bolt

(17) Remove 1-2/5-R shift rail (Fig. 36).

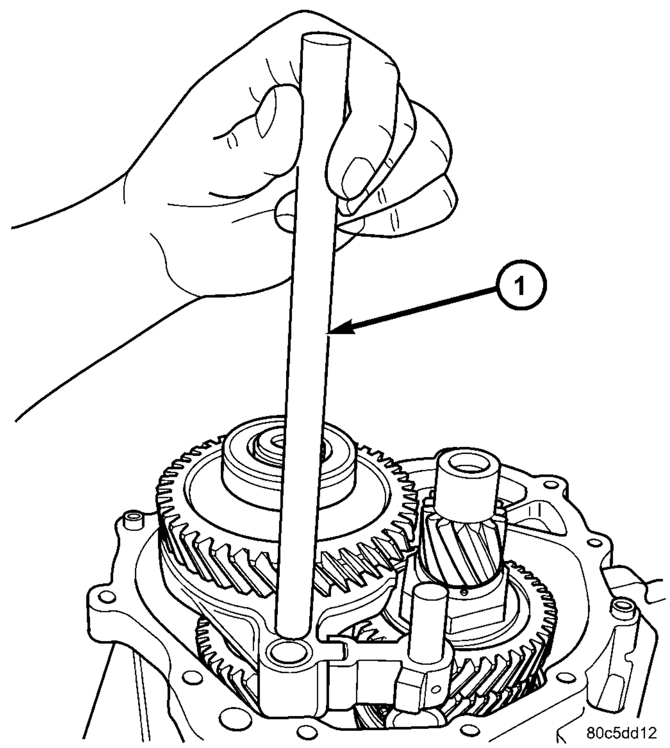


Fig. 36 1/2-5/R Shift Rail Removal/Installation

1 - 1/2-5/R SHIFT RAIL

T850 MANUAL TRANSAXLE (Continued)

(18) Install lifting bar 8489.

(19) Lift geartrain (w/reverse idler gear assy.) out of transaxle and install on fixture 8487 (Fig. 37).

(20) Remove remaining shift rail and forks from geartrain (Fig. 37).

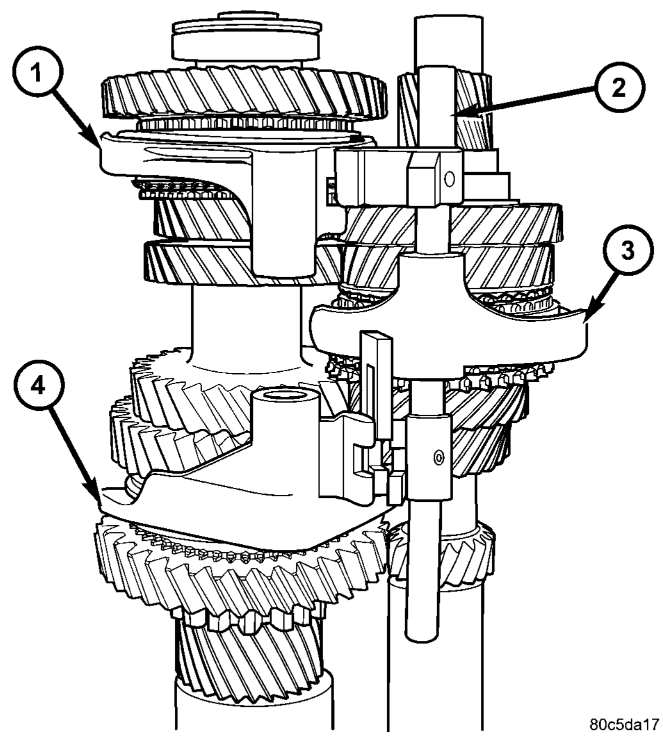


Fig. 37 Shift Fork/Rail Orientation

1 - 5/R FORK
2 - 3/4 RAIL ASSEMBLY
3 - 3/4 FORK
4 - 1/2 FORK

(21) Remove lifting bar from geartrain.

NOTE: At this point, differential bearing turning torque should be measured to ensure proper shim selection upon reassembly.

(22) Reinstall and torque extension housing and measure differential turning torque. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/DIFFERENTIAL - ADJUSTMENTS)

(23) Remove impact blocker (if equipped) (Fig. 38).

(24) Remove differential cover bolts.

(25) Remove differential cover. If necessary, use a soft tipped hammer to aid in removal.

(26) Remove extension housing.

(27) Remove differential assembly. Note orientation of shim, oil slinger, and differential side bearing races (Fig. 39).

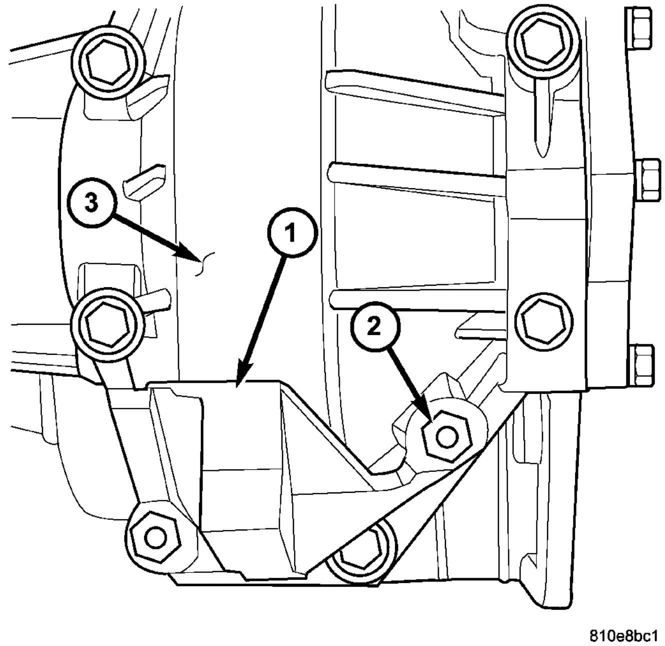


Fig. 38 Impact Blocker

1 - IMPACT BLOCKER
2 - NUT (2)
3 - DIFFERENTIAL COVER

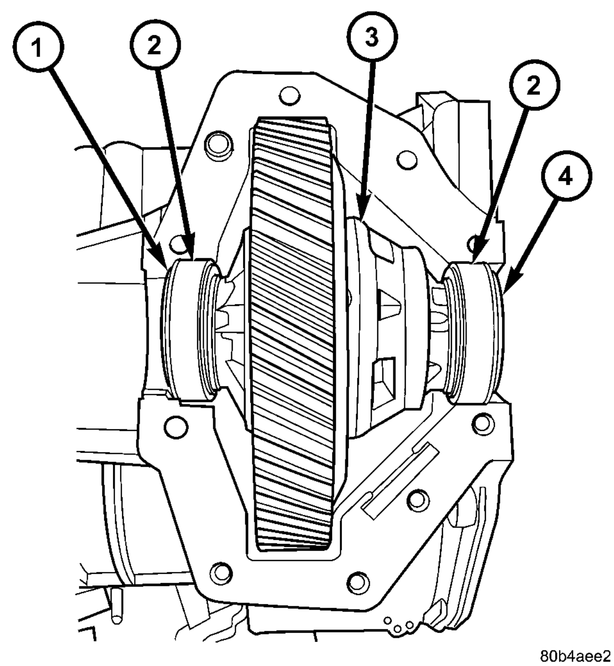


Fig. 39 Differential Shim/Slinger Orientation

1 - SLINGER
2 - BEARING RACE
3 - DIFFERENTIAL ASSEMBLY
4 - SHIM (SELECT)

T850 MANUAL TRANSAXLE (Continued)

(28) Remove differential chip collector magnet and clean (Fig. 40). **Magnet is adhered with RTV, and may require force to remove.**

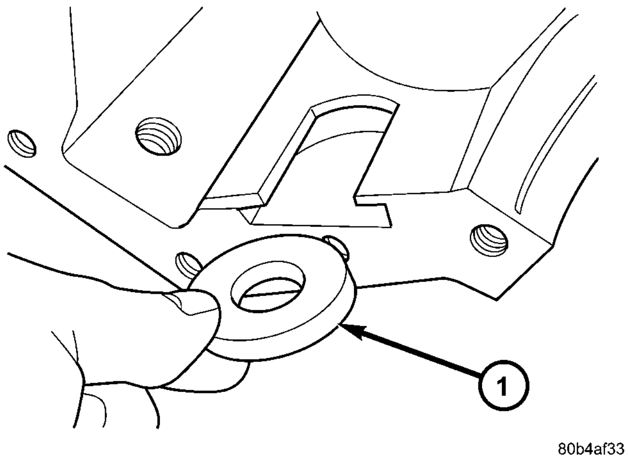


Fig. 40 Differential Magnet

1 - MAGNET

(29) Remove intermediate shaft bearing race with puller 8472 (Fig. 41).

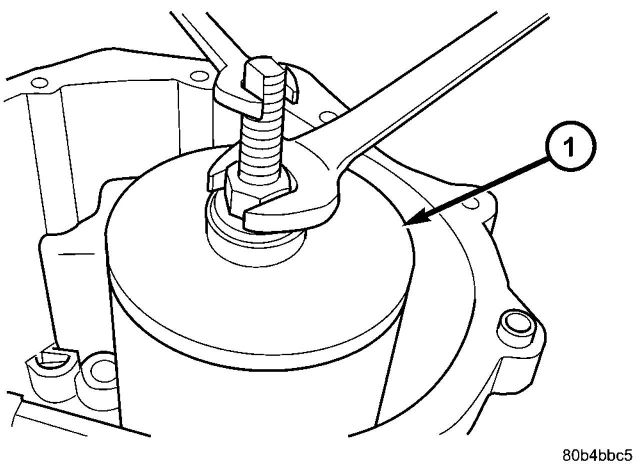


Fig. 41 Intermediate Shaft Bearing Race Removal

1 - REMOVER 8472

(30) Remove shift rail bushing from case with remover 6786 and slide hammer C-3752 (Fig. 42).

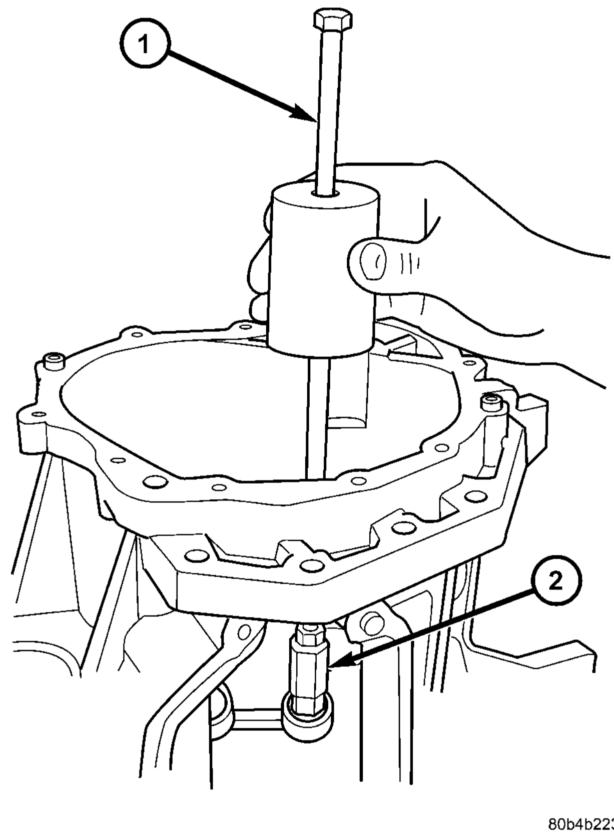


Fig. 42 Shift Rail Bushing Removal

1 - SLIDE HAMMER C-3752
2 - REMOVER 6786

T850 MANUAL TRANSAXLE (Continued)

(31) Remove input shaft bearing using an arbor press and tool 8474 (Fig. 43).

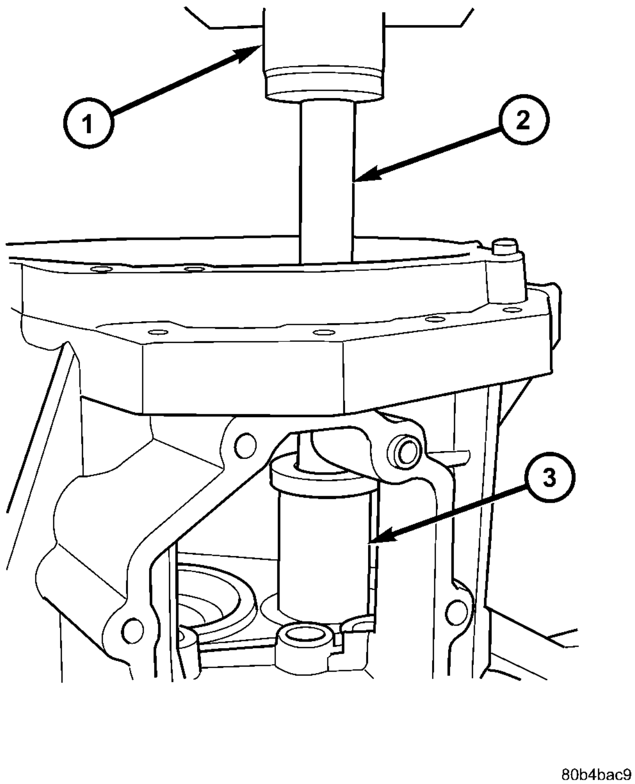


Fig. 43 Input Shaft Bearing Removal

1 - ARBOR PRESS
2 - DRIVER HANDLE C-4171
3 - REMOVER/INSTALLER 8474

ASSEMBLY

NOTE: When assembling this transaxle, always use NEW snap rings.

NOTE: Before assembling transaxle, differential turning torque must be measured and adjusted. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/DIFFERENTIAL - ADJUSTMENTS). Differential turning torque must be measured with geartrain out of case.

(1) Install input shaft bearing using an arbor press and remover/installer 8474 (Fig. 44).

(2) Install shift shaft bushing to case using installer 8475 (Fig. 45).

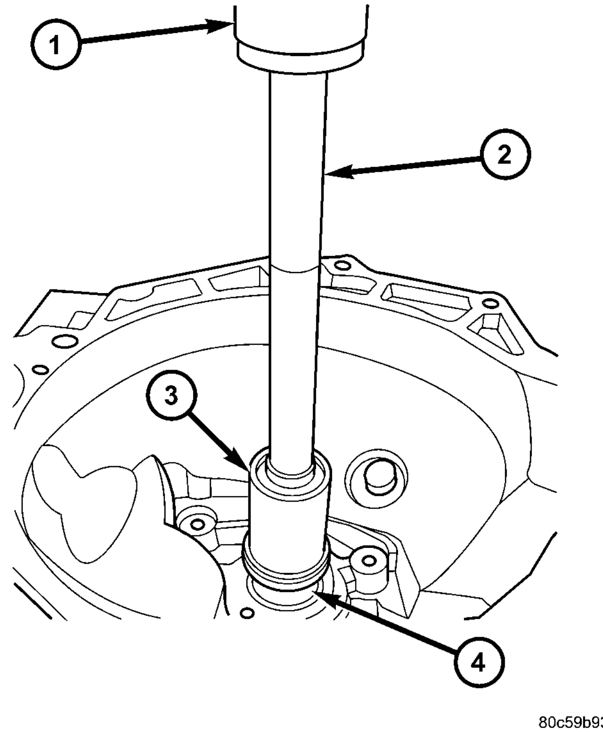


Fig. 44 Input Shaft Bearing Installation

1 - ARBOR PRESS
2 - C-4171 DRIVER HANDLE
3 - REMOVER/INSTALLER 8474
4 - INPUT SHAFT BEARING

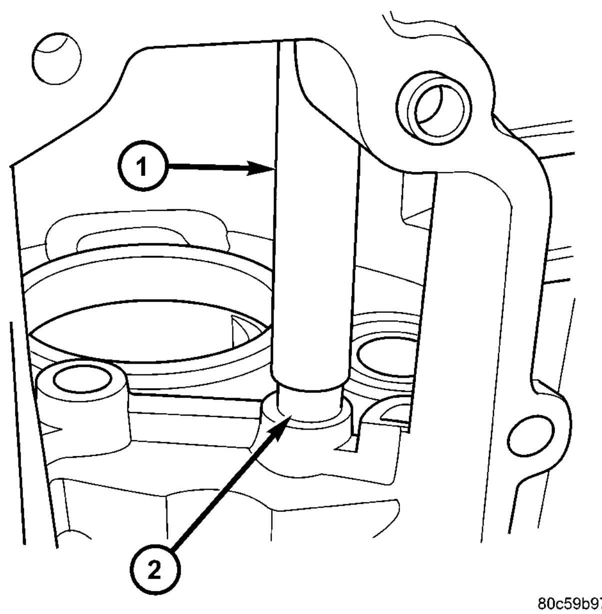


Fig. 45 Shift Shaft Bushing Installation

1 - INSTALLER 8475
2 - SHIFT SHAFT BUSHING

T850 MANUAL TRANSAXLE (Continued)

(3) Install intermediate shaft bearing race to case with an arbor press, driver handle C-4171, and installer 8471 (Fig. 46). Press until installer 8471 bottoms on transaxle case.

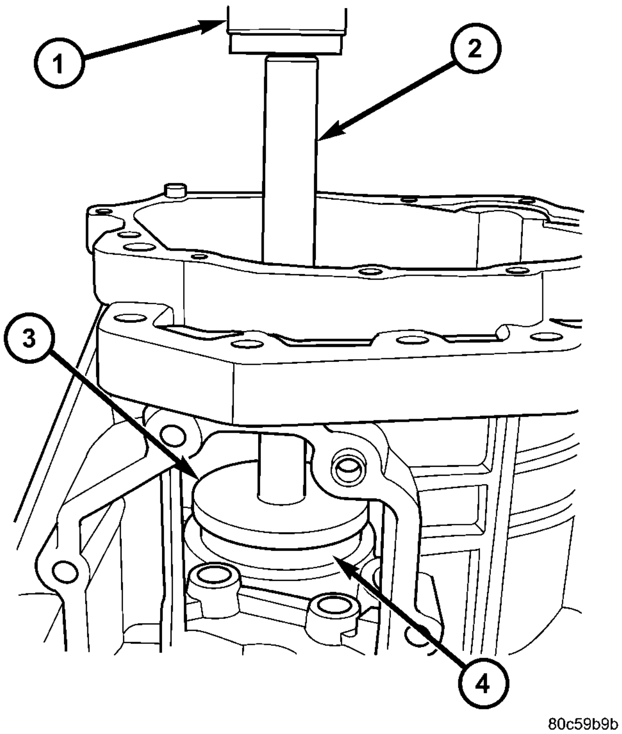


Fig. 46 Install Intermediate Shaft Bearing Race

1 - ARBOR PRESS
2 - DRIVER HANDLE C-4171
3 - INSTALLER 8471
4 - INTERMEDIATE SHAFT BEARING RACE

NOTE: If input shaft assembly was not disassembled, it is necessary to remove input shaft sealed ball bearing before assembling transaxle. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/INPUT SHAFT - DISASSEMBLY)

(4) Install assembled input and intermediate shafts to fixture 8487 (Fig. 47).

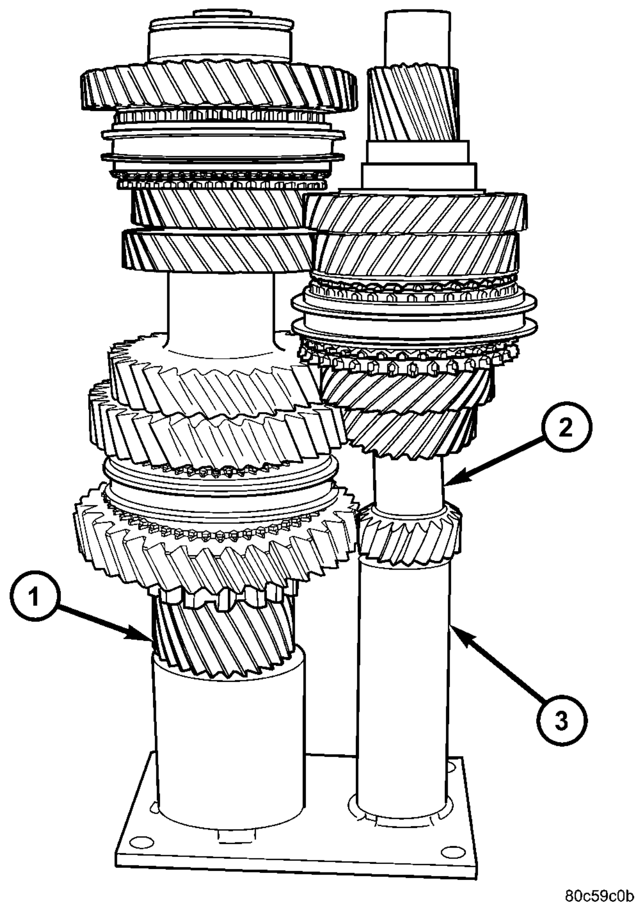


Fig. 47 Install Geartrain to Fixture 8487

1 - INTERMEDIATE SHAFT
2 - INPUT SHAFT
2 - FIXTURE 8487

T850 MANUAL TRANSAXLE (Continued)

(5) Install shift forks and 3/4 rail assembly to geartrain as shown in (Fig. 48).

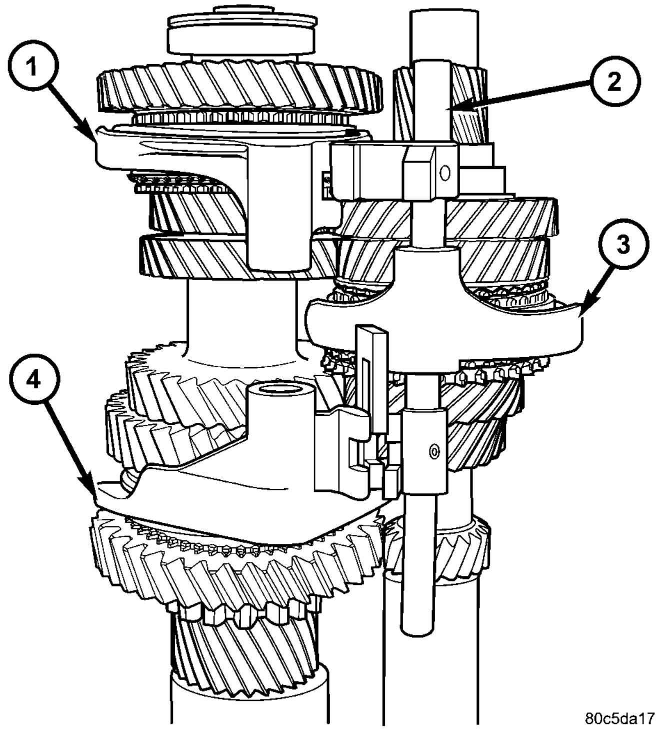


Fig. 48 Shift Fork/Rail Orientation

1 - 5/R FORK
2 - 3/4 RAIL ASSEMBLY
3 - 3/4 FORK
4 - 1/2 FORK

NOTE: Before installing geartrain, make sure that input shaft sealed roller bearing is not installed, otherwise reverse idler assembly installation will be difficult. (Refer to 21 - TRANSMISSION/TRANSAXLE/ MANUAL/INPUT SHAFT - DISASSEMBLY)

(6) Install lifting bar 8489 to geartrain. Install geartrain to case. **When installing geartrain to case, use care not to damage bearing surfaces.**

(7) Remove lifting bar 8489 from geartrain.

(8) Install shift 1/2-5/R rail as shown in (Fig. 49).

(9) Install reverse idler shaft into position (Fig. 50). Install and torque shaft-to-case bolt to 54 N·m (40 ft. lbs.).

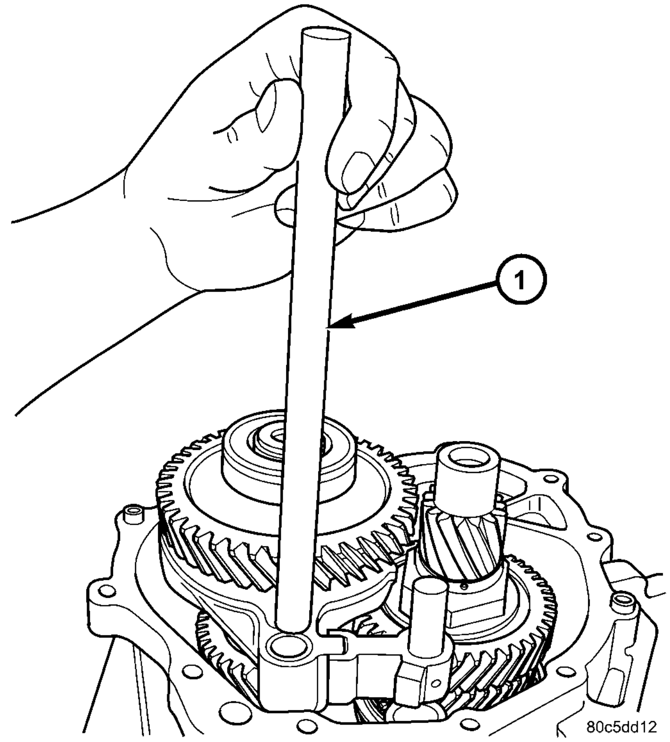


Fig. 49 Shift Rail Installation

1 - 1/2-5/R SHIFT RAIL

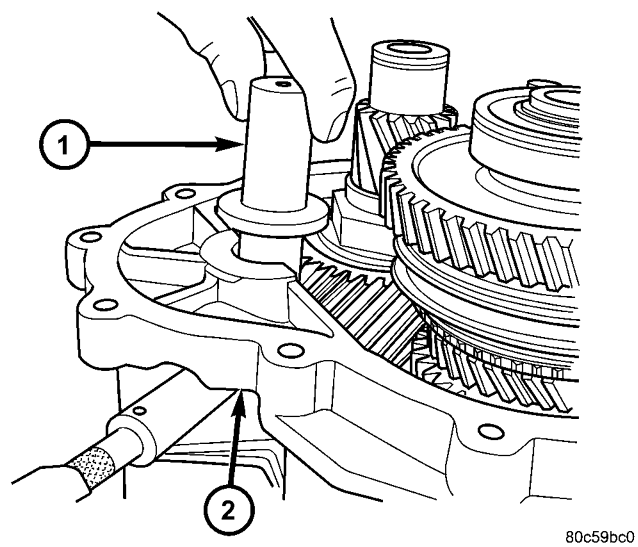


Fig. 50 Install Reverse Idler Shaft

1 - REVERSE IDLER SHAFT
2 - BOLT

T850 MANUAL TRANSAXLE (Continued)

(10) Install reverse idler gear bearing (Fig. 51).

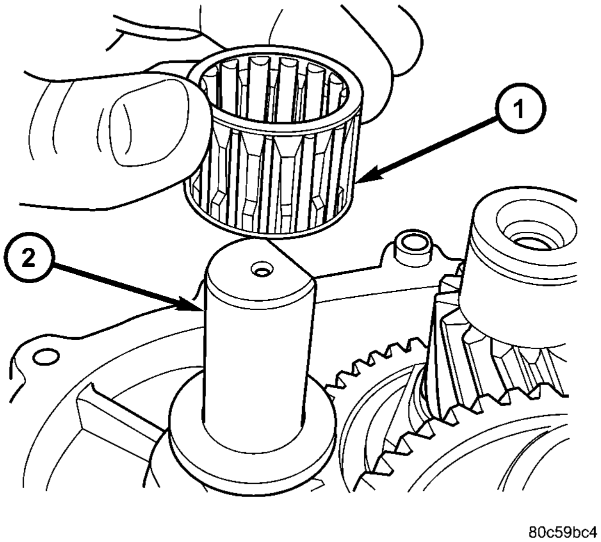


Fig. 51 Install Reverse Idler Gear Bearing

1 - NEEDLE BEARING
2 - REVERSE IDLER SHAFT

(11) Install reverse idler gear with hub down as shown in (Fig. 52).

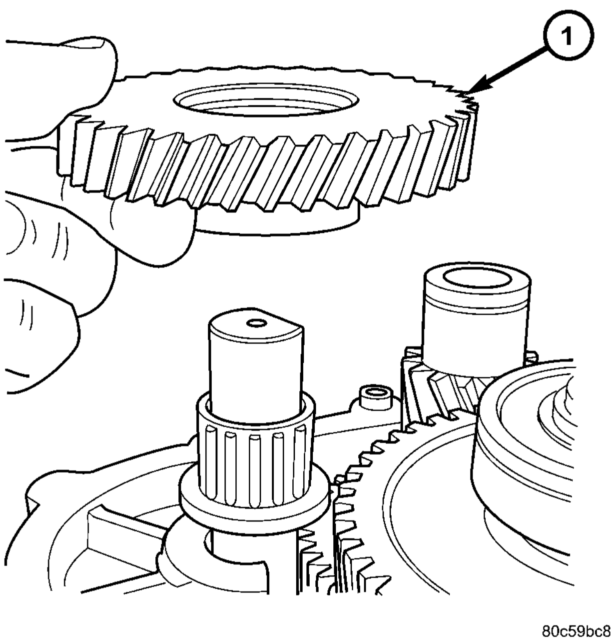


Fig. 52 Install Reverse Idler Gear

1 - REVERSE IDLER GEAR

(12) Install flat washer (Fig. 53).

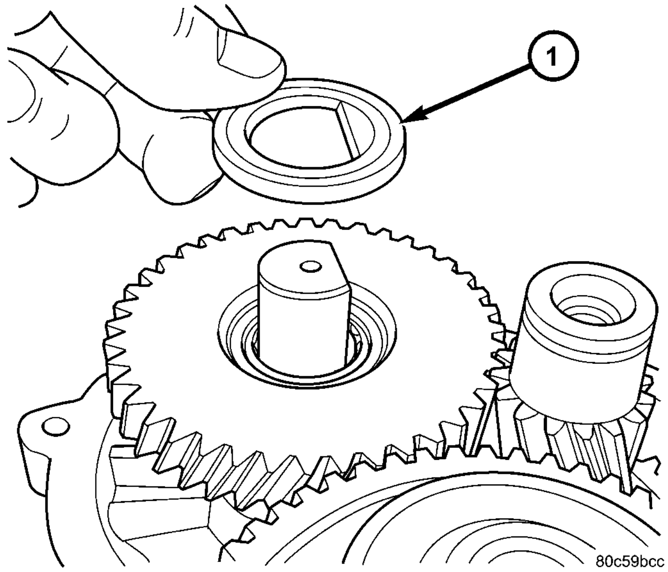


Fig. 53 Install Flat Washer

1 - FLAT WASHER

(13) Install wave washer (Fig. 54).

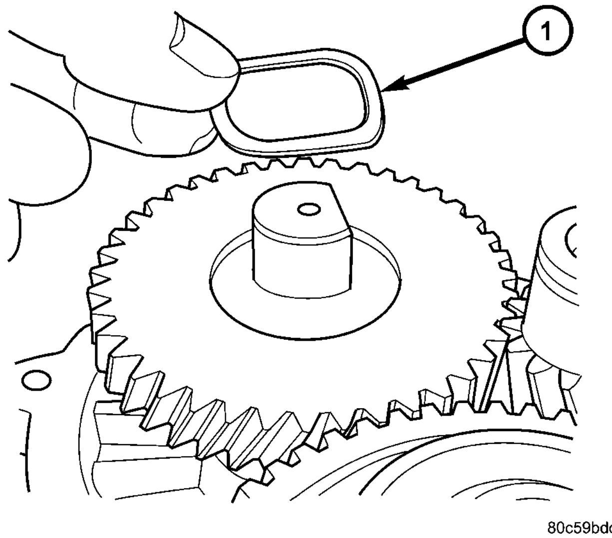


Fig. 54 Install Wave Washer

1 - WAVE WASHER

T850 MANUAL TRANSAXLE (Continued)

(14) Install input shaft sealed roller bearing using installer 8482 (Fig. 55).

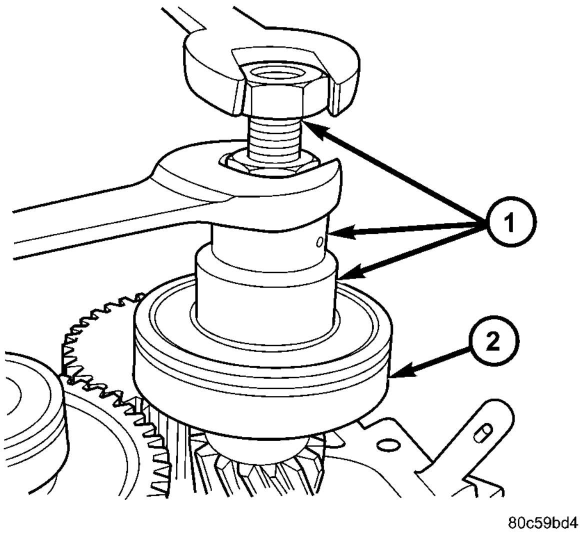


Fig. 55 Install Input Shaft Sealed Roller Bearing

1 - INSTALLER 8482
2 - SEALED ROLLER BEARING

(15) Install **new** input shaft bearing snap ring (Fig. 56).

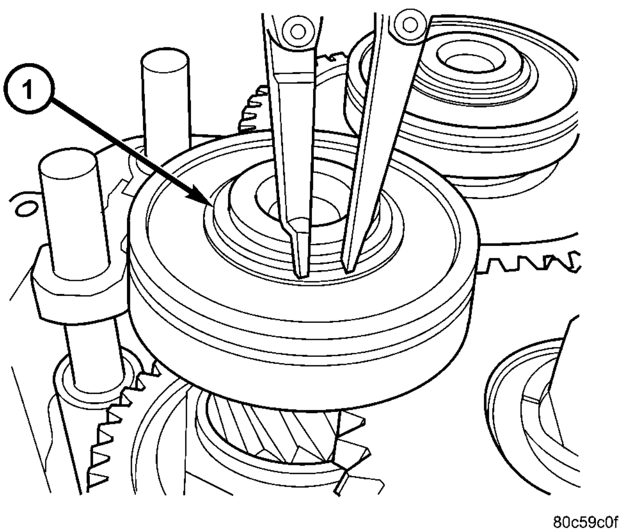


Fig. 56 Input Shaft Bearing Snap Ring

1 - SNAP RING

(16) Install shift rail bushing to end cover using installer 8475 (Fig. 57).

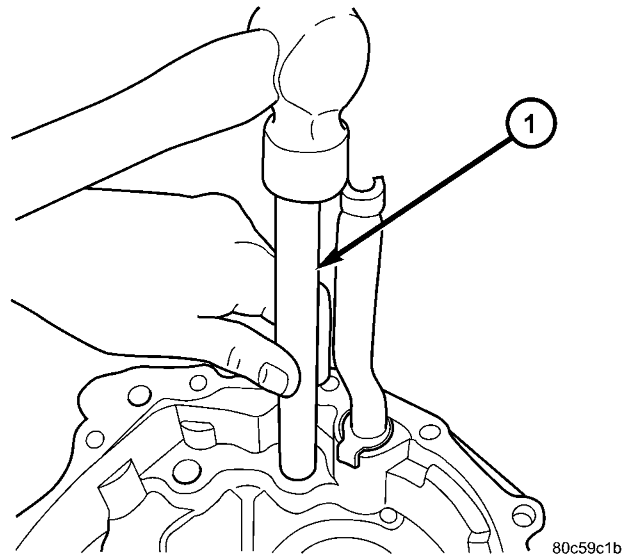


Fig. 57 Shift Rail Bushing Installation

1 - INSTALLER 8475

(17) Apply a 1 mm (0.04 in.) bead of Mopar® Gasket Maker to transaxle end cover and install to transaxle case (Fig. 58). **While installing end cover, be sure to guide oil trough into pocket (Fig. 59).** Torque end cover-to-case bolts to 28 N·m (250 in. lbs.) (Fig. 60).

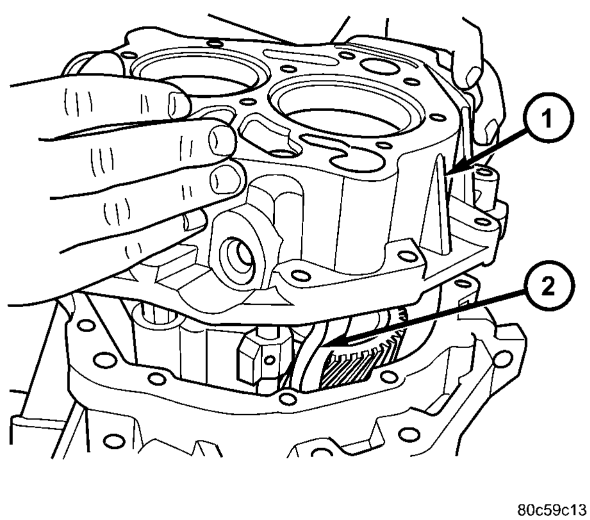


Fig. 58 End Cover Removal/Installation

1 - END COVER
2 - OIL TROUGH

T850 MANUAL TRANSAXLE (Continued)

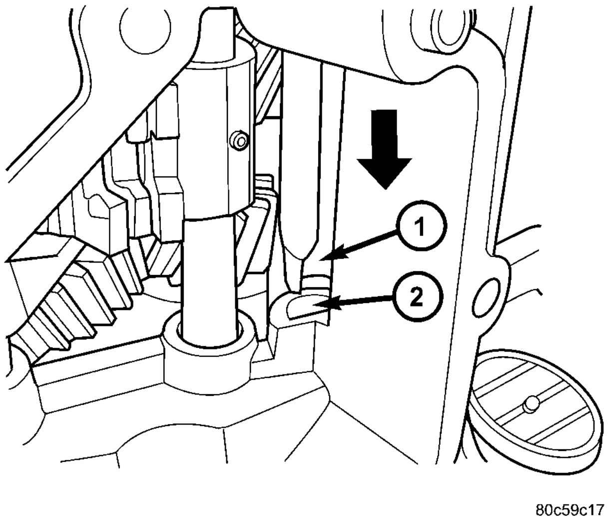


Fig. 59 Oil Trough Pocket

1 - OIL TROUGH
2 - POCKET

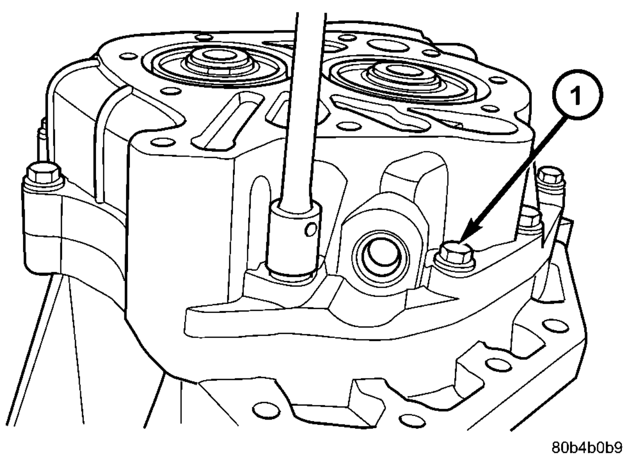


Fig. 60 End Cover Bolts

1 - BOLT (12)

(18) Install lifting bar 8489 to geartrain.

(19) Lift up on bar (input shaft side) and install input shaft bearing snap ring (Fig. 61).

(20) Lift up on bar (intermediate shaft side) and install intermediate shaft bearing snap ring.

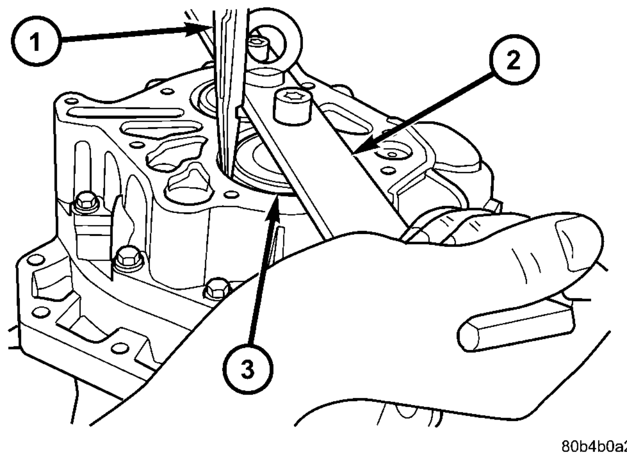


Fig. 61 Input Bearing Snap Ring

1 - SNAP RING PLIERS
2 - LIFTING BAR 8489
3 - SNAP RING

(21) Remove lifting bar 8489.

(22) Install a bead of Mopar® Gear Lube RTV to end plate and immediately install to case. Install and torque bolts to 28 N·m (250 in. lbs.) (Fig. 62).

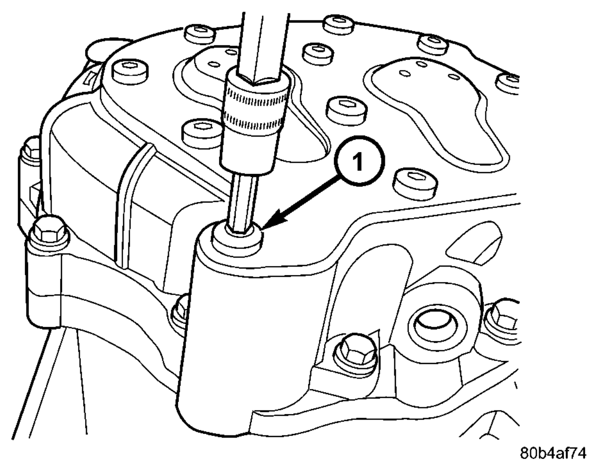


Fig. 62 End Cover Bolts

1 - BOLT (11)

T850 MANUAL TRANSAXLE (Continued)

(23) Install back up lamp switch and torque to 23 N·m (17 ft. lbs.) (Fig. 63).

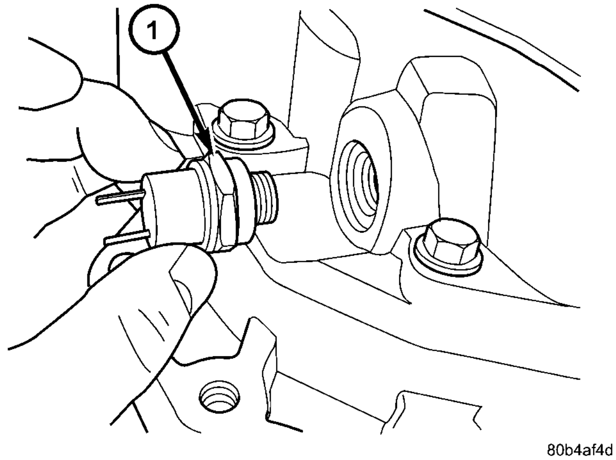


Fig. 63 Back-Up Lamp Switch

1 - BACK-UP LAMP SWITCH

(24) Roll transaxle assembly on side.

(25) Install differential chip collector magnet (Fig. 64). Retain to case with a dab of Mopar® Gear Lube RTV.

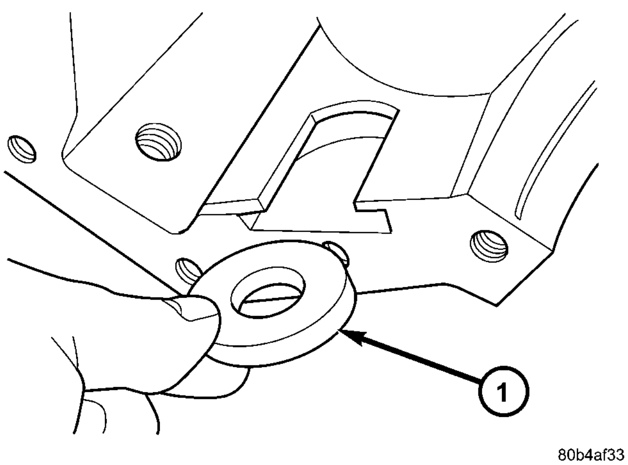


Fig. 64 Differential Magnet

1 - MAGNET

(26) Install differential assembly with bearing races and select shim (Fig. 65). Shim selection was determined before transaxle assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/DIFFERENTIAL - ADJUSTMENTS).

(27) Install a 1 mm (0.04 in.) bead of Mopar® Gasket Maker to differential cover and install to case. Torque differential cover-to-case bolts to 54 N·m (40 ft. lbs.).

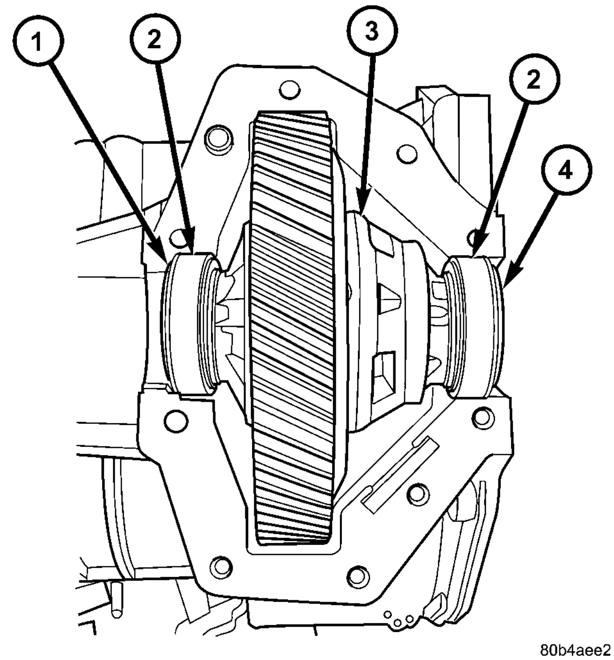


Fig. 65 Differential Shim/Slinger Orientation

1 - SLINGER
2 - BEARING RACE
3 - DIFFERENTIAL ASSEMBLY
4 - SHIM (SELECT)

(28) Install a 1 mm (0.04 in.) bead of Mopar® Gasket Maker to extension housing. Install extension housing to differential cover and case and torque bolts to 28 N·m (250 in. lbs.) (Fig. 66).

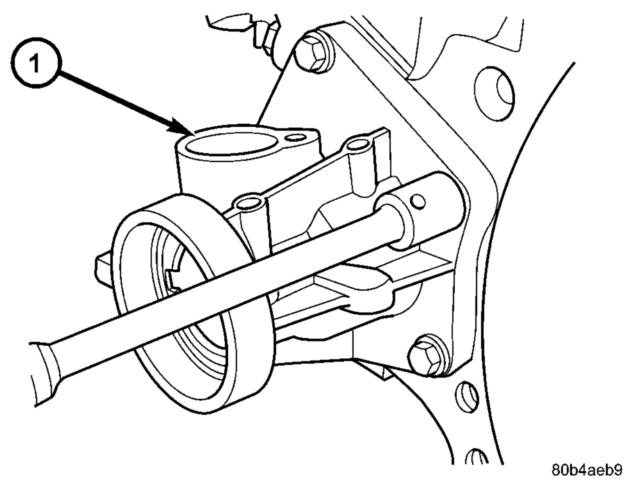


Fig. 66 Extension Housing-to-Case Bolts

1 - EXTENSION HOUSING

T850 MANUAL TRANSAXLE (Continued)

(29) Install both axle output shaft seals using driver handle C-4171 and installer 8476 (Fig. 67) (Fig. 68).

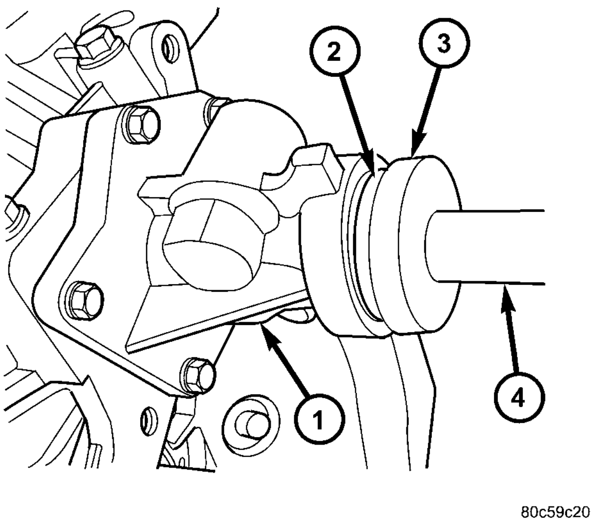


Fig. 67 Axle Seal Installation (Extension Housing Side)

1 - EXTENSION HOUSING
2 - SEAL
3 - INSTALLER 8476
4 - DRIVER HANDLE C-4171

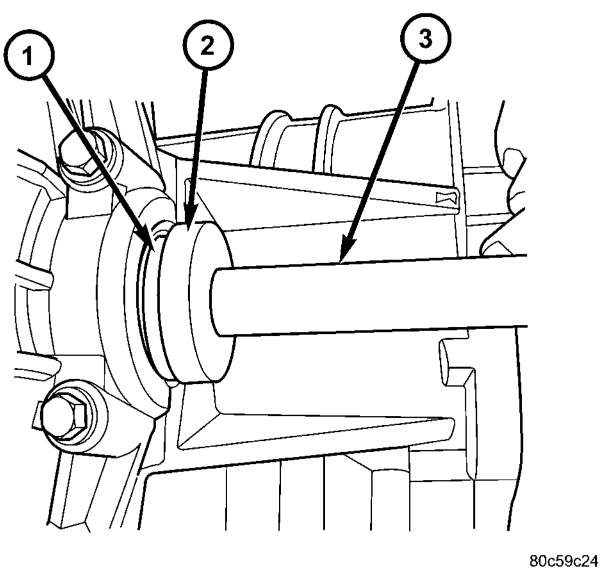


Fig. 68 Axle Seal Installation—Typical

1 - SEAL
2 - INSTALLER 8476
3 - DRIVER HANDLE C-4171

(30) Install impact blocker (If Equipped) (Fig. 69).

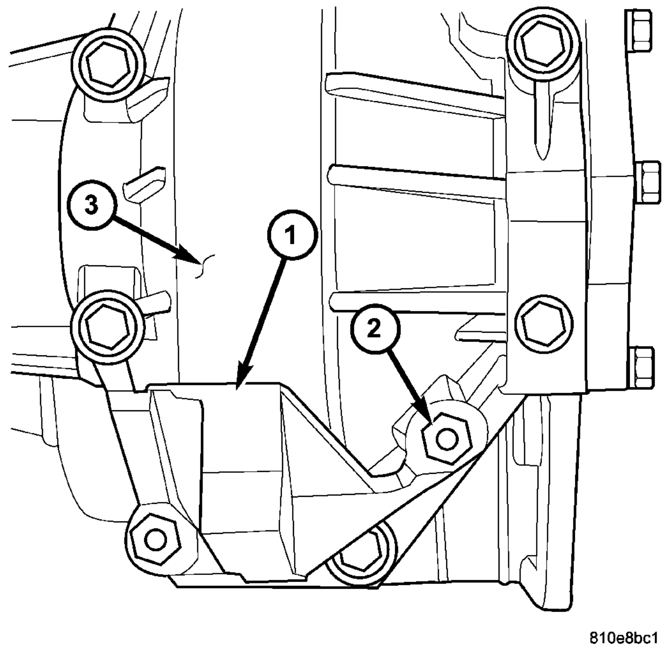


Fig. 69 Impact Blocker

1 - IMPACT BLOCKER
2 - NUT (2)
3 - DIFFERENTIAL COVER

(31) Apply a 1 mm (0.04 in.) bead of Mopar® Gasket Maker to shift cover assembly. Place shift cover and transaxle geartrain into neutral and install shift cover (Fig. 70) and torque bolts to 28 N·m (250 in. lbs.).

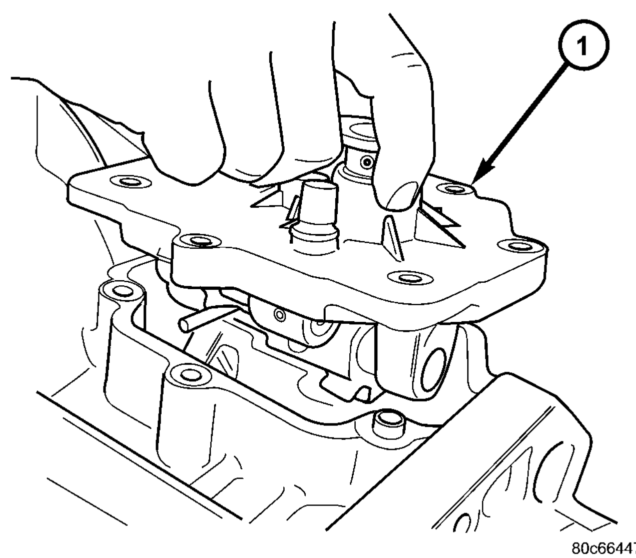


Fig. 70 Shift Cover Removal/Installation

1 - SHIFT COVER ASSEMBLY

T850 MANUAL TRANSAXLE (Continued)

(32) Install input shaft bearing retainer (Fig. 71). Torque bolts to 12 N·m (105 in. lbs.).

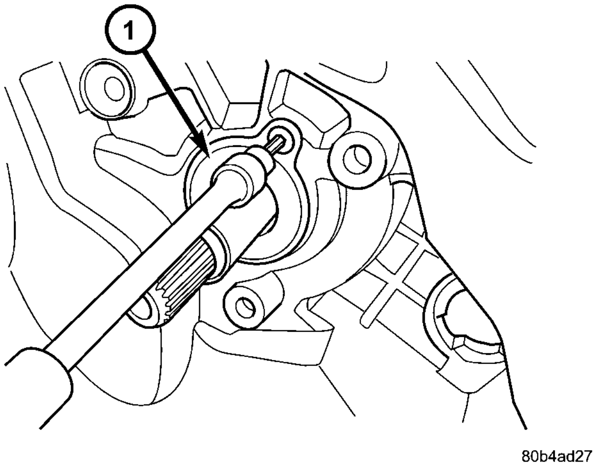


Fig. 71 Input Bearing Retainer

1 - INPUT BEARING RETAINER

(33) If previously removed, install clutch release lever pivot ball(s) using slide hammer C-3752 and remover/installer 6891 (Fig. 72) (Fig. 73).

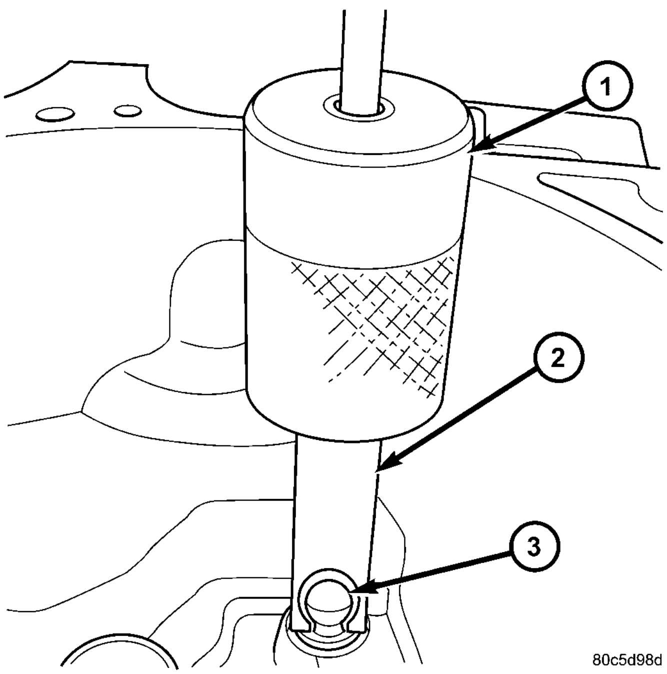


Fig. 72 Pivot Ball Removal/Installation

1 - C-3752 SLIDE HAMMER
2 - REMOVER/INSTALLER 6891
3 - PIVOT BALL

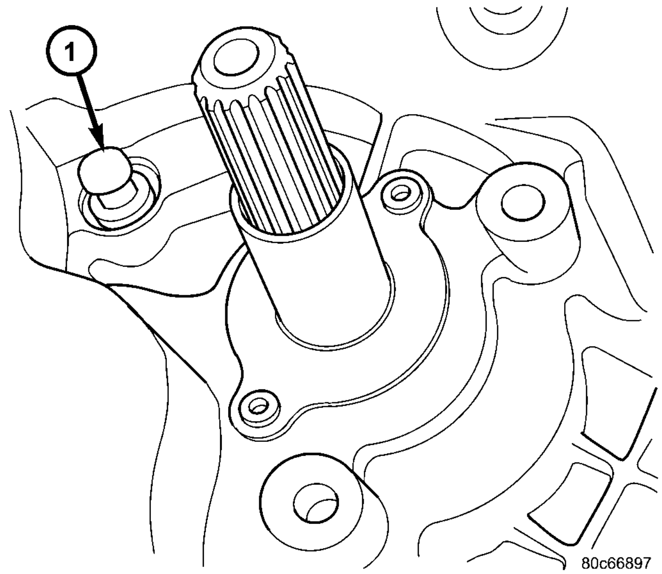


Fig. 73 Pivot Ball Position

1 - PIVOT BALL (1)

(34) Install clutch release bearing to lever. Apply grease to interface (contact) points. Make sure release bearing retainers engage lever pocket as shown in (Fig. 74).

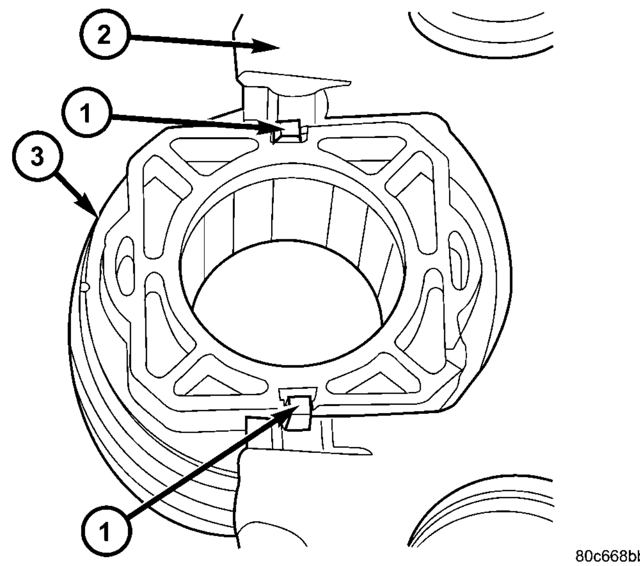


Fig. 74 Release Bearing-to-Lever

1 - RETAINER (2)
2 - RELEASE LEVER
3 - RELEASE BEARING

T850 MANUAL TRANSAXLE (Continued)

(35) Apply grease to pivot ball(s), and on release lever at slave cylinder contact point.

(36) Install clutch release bearing/lever assembly into position by sliding bearing onto input bearing retainer, and using moderate hand pressure to seat release lever to pivot ball (Fig. 75). A “pop” sound should be heard. Verify proper engagement by lightly pulling outward on lever at pivot ball location, and then actuating lever and bearing to ensure proper operation.

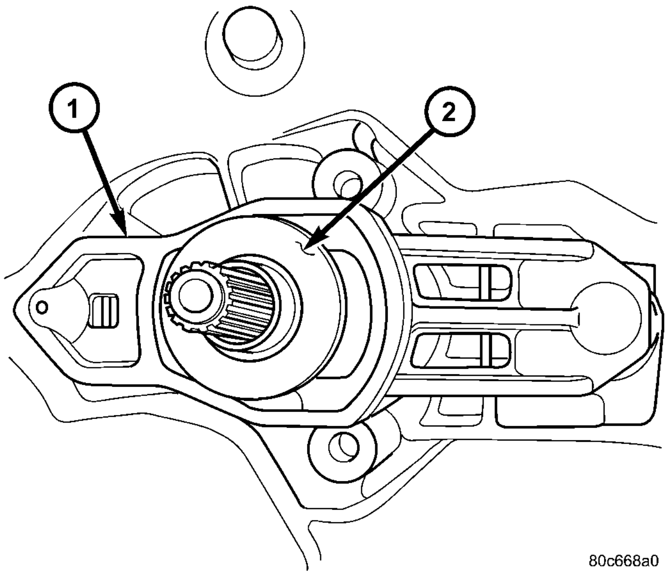


Fig. 75 Release Bearing and Lever

1 - RELEASE LEVER
2 - RELEASE BEARING

INSTALLATION

(1) Install modular clutch to input shaft assembly.

(2) Install transaxle assembly to transmission jack and secure.

(3) Install transaxle into position. Install and torque transaxle-to-block bolts to 108 N·m (80 ft. lbs.).

(4) Install upper mount/bracket to transaxle and torque bolts to 68 N·m (50 ft. lbs.) (Fig. 76).

(5) Raise engine/transaxle assembly into position. Install and torque through-bolt to 122 N·m (90 ft. lbs.).

(6) Install four (4) modular clutch-to-driveplate bolts (Fig. 77). Align driveplate and modular clutch alignment marks placed on disassembly. Start with the tight-tolerance (slotted) hole, install and torque bolts to 88 N·m (65 ft. lbs.).

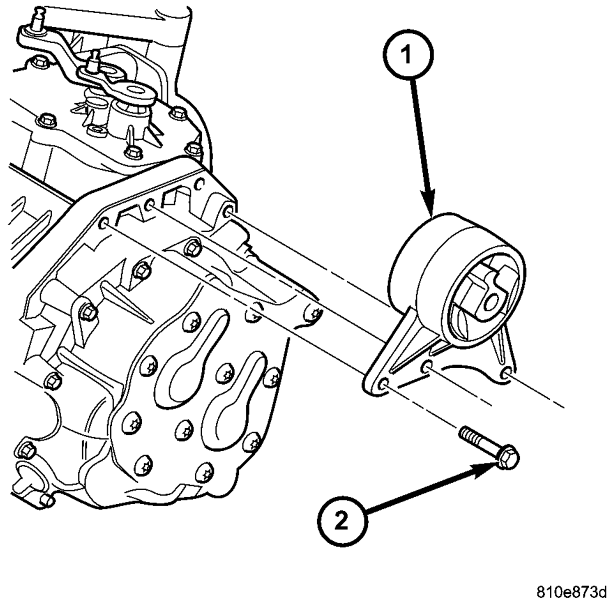


Fig. 76 Transaxle Upper Mount and Fasteners

1 - MOUNT/BRACKET
2 - BOLT (3)

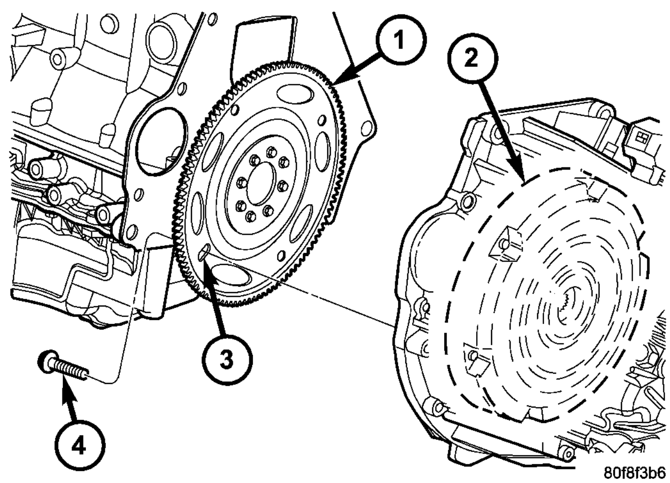


Fig. 77 Modular Clutch-to-Driveplate Bolts

1 - DRIVEPLATE
2 - MODULAR CLUTCH ASSEMBLY
3 - TIGHT TOLERANCE HOLE
4 - BOLT (4)

T850 MANUAL TRANSAXLE (Continued)

(7) Install structural collar and lateral bending brace (Fig. 78) (Fig. 79). Install and finger tighten all bolts. Torque structural collar horizontal bolts to 108 N·m (80 ft. lbs.). Torque structural collar vertical bolts to 54 N·m (40 ft. lbs.). Torque lateral bending brace bolts to 61 N·m (45 ft. lbs.).

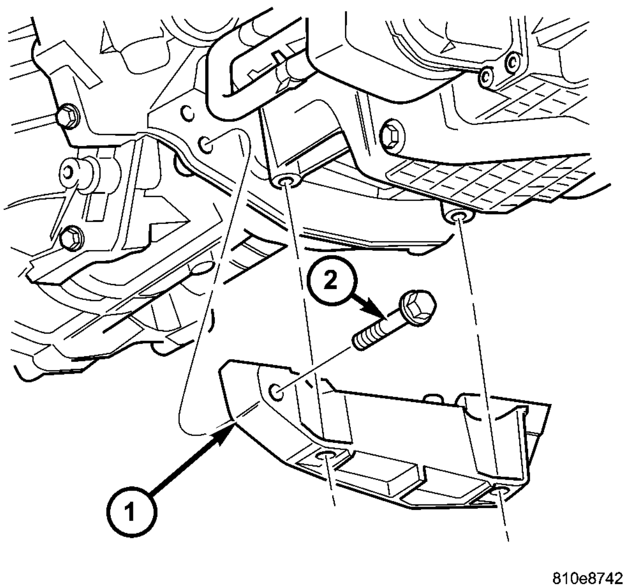


Fig. 78 Structural Collar Removal/Installation

1 - STRUCTURAL COLLAR
2 - BOLT

(8) Install intercooler pipe and power steering hoses into position and secure with nuts (Fig. 80).

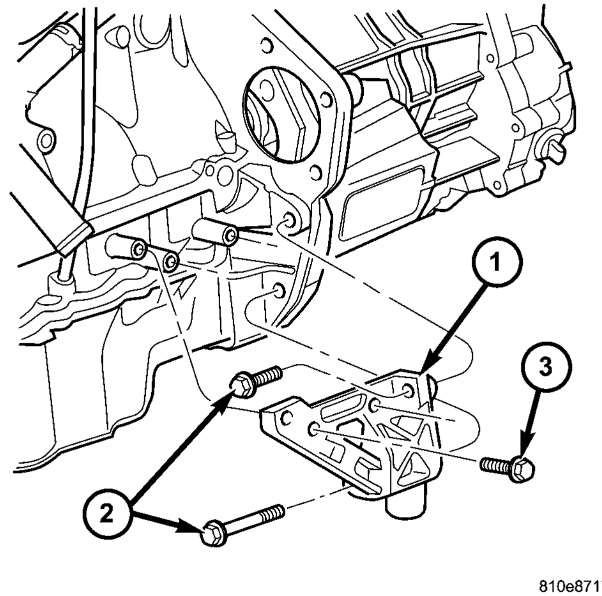


Fig. 79 Lateral Bending Brace

1 - LATERAL BENDING BRACE
2 - BOLT (1 LONG/1 SHORT)
3 - BOLT (2)

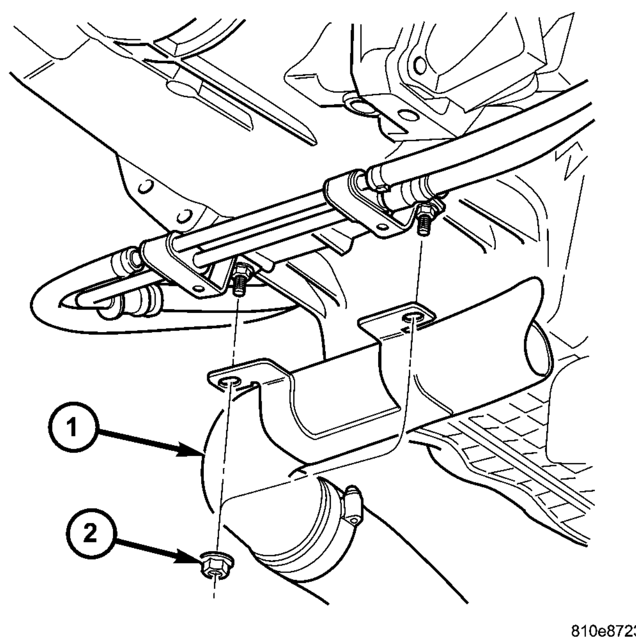


Fig. 80 Charge Air Cooler Hose/Fasteners

1 - CAC HOSE ASSY
2 - NUT (2)

T850 MANUAL TRANSAXLE (Continued)

(9) Connect clutch hydraulic plumbing to slave cylinder quick-connect. An audible “click” should be heard. Verify connection by pulling outward.

(10) Install halfshafts and intermediate shaft assembly (Fig. 81). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(11) Install and torque ABS wheel speed sensors to 12 N·m (105 in. lbs.).

(12) Check and adjust transaxle fluid level if necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/FLUID - STANDARD PROCEDURE)

(13) Lower vehicle.

(14) Install gearshift cables to transaxle bracket and secure with NEW retaining clips.

(15) Install battery tray (Fig. 82).

(16) Install battery (with thermal wrap) and hold down clamp/bolt. Connect battery temperature sensor.

(17) Install throttle body adapter housing.

(18) Connect accelerator cable while installing throttle body into position. Install two (2) throttle body-to-manifold bolts to 28 N·m (250 in. lbs.).

(19) Connect IAC & TPS sensor connectors.

(20) Install intercooler-to-throttle body hose. Connect IAT sensor and TIP hose.

(21) Install air cleaner assembly and connect AAT sensor.

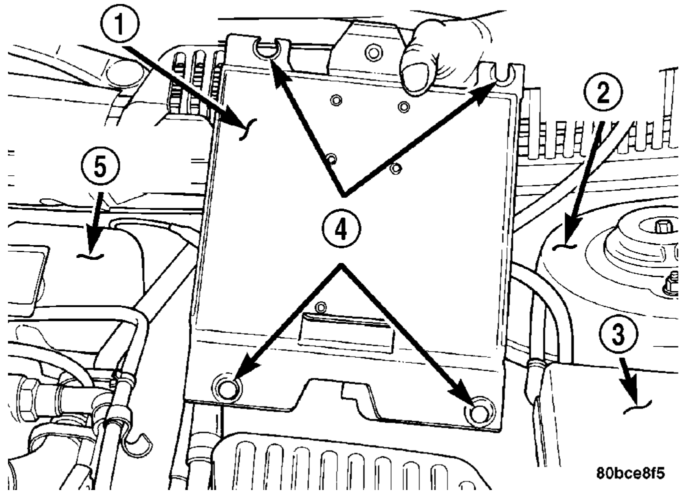


Fig. 82 Battery Tray Removal/Installation

1 - BATTERY TRAY
2 - LEFT STRUT TOWER
3 - PDC
4 - MOUNTING HOLES/SLOTS
5 - COOLANT RESERVOIR

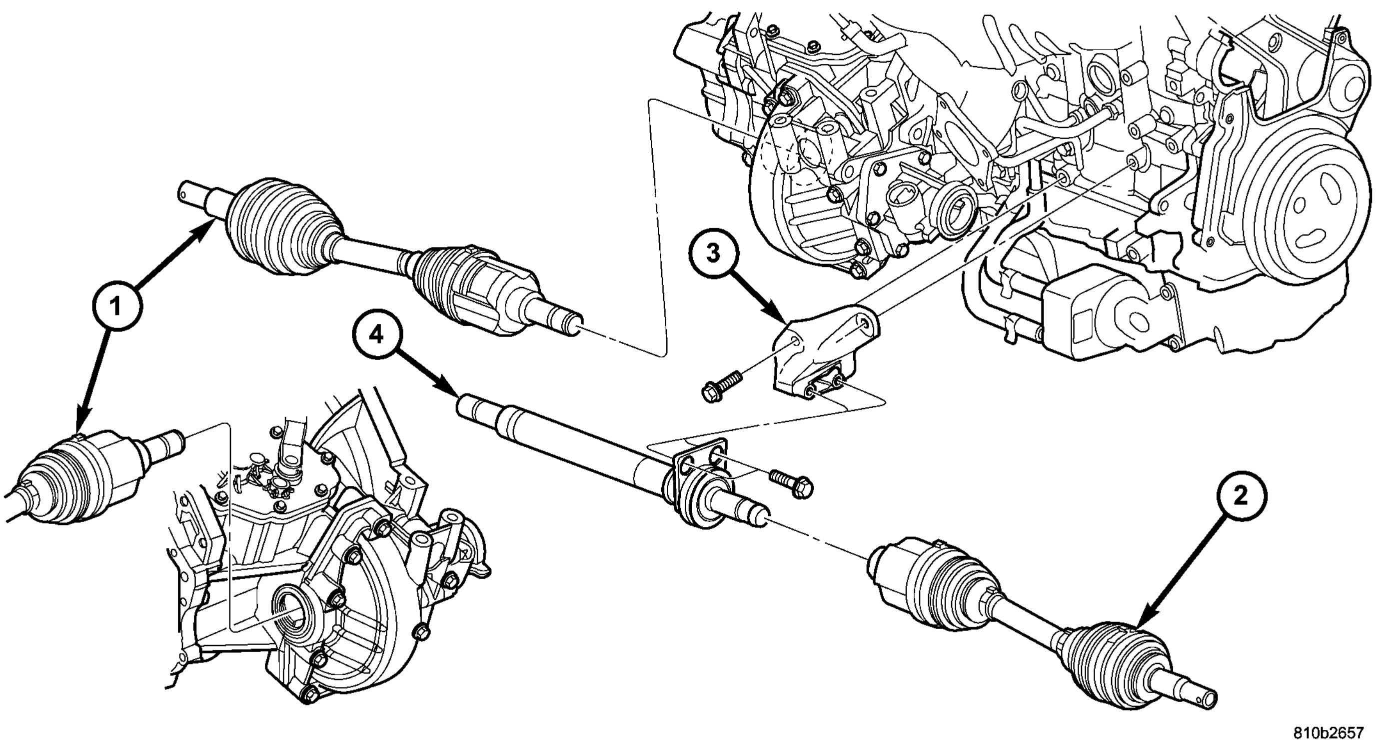


Fig. 81 Halfshaft and Intermediate Shaft—2.4L Turbo Models

1 - HALFSHAFT - LEFT
2 - HALFSHAFT - RIGHT
3 - SUPPORT BRACKET - INTERMEDIATE SHAFT
4 - INTERMEDIATE SHAFT/BEARING ASSEMBLY

T850 MANUAL TRANSAXLE (Continued)

(22) Install turbo solenoid pack (Fig. 83).

(23) Connect air cleaner inlet tube from turbocharger.

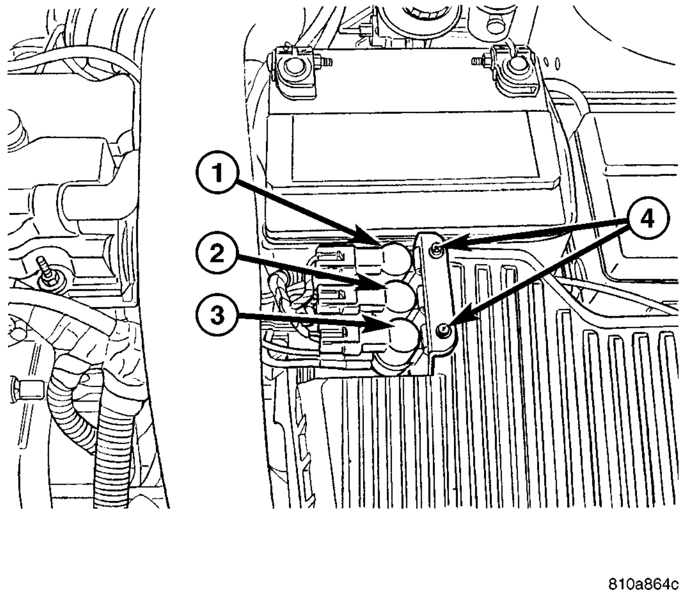


Fig. 83 Turbocharger Solenoids and Mounting Bracket

1 - TIP SOLENOID
2 - SURGE VALVE ACTUATOR SOLENOID
3 - WASTEGATE ACTUATOR SOLENOID
4 - BRACKET MOUNTING SCREWS

SPECIFICATIONS - T850 MANUAL TRANSAXLE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Transaxle Type	Constant-mesh, fully synchronized 5-speed with integral differential
Lubrication Method	Splash oil collected in case passage and oil trough and distributed to mainshafts via gravity
Fluid Type	ATF+4 (Automatic Transmission Fluid—Type 9602)

GEAR RATIOS

GEAR	RATIO
1st	3.65
2nd	2.05
3rd	1.37
4th	0.97
5th	0.76
Reverse	3.47
Final Drive Ratio	3.53

T850 MANUAL TRANSAXLE (Continued)

INPUT SHAFT

BLOCKER RING WEAR GAP	
3rd Gear	0.856-1.539 mm (0.0338-0.0606 in.)
4th Gear	0.762-1.631 mm (0.030-0.064 in.)
GEAR END PLAY	
3rd Gear	0.099-0.505 mm (0.004-0.020 in.)
4th Gear	0.048-0.457 mm (0.002-0.018 in.)

INTERMEDIATE SHAFT

BLOCKER RING WEAR GAP	
1st Gear	0.66-1.84 mm (0.026-0.072 in.)
2nd Gear	0.66-1.84 mm (0.026-0.072 in.)
5th Gear	0.86-1.54 mm (0.034-0.061 in.)
Reverse	0.77-1.63 mm (0.030-0.064 in.)
GEAR END PLAY	
1st Gear	0.091-0.828 mm (0.004-0.033 in.)
2nd Gear	0.051-0.787 mm (0.002-0.031 in.)
5th Gear	0.102-0.762 mm (0.004-0.030 in.)
Reverse	0.066-0.805 mm (0.003-0.0317 in.)

DIFFERENTIAL

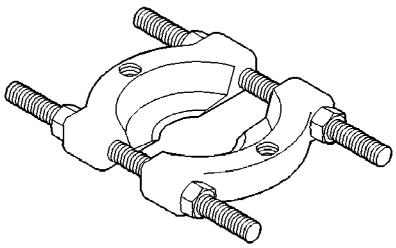
DESCRIPTION	METRIC	STANDARD
Differential Turning Torque	2.3-3.4 N·m	20-30 in. lbs.
Side Gear End Play (each side)	0.025-0.152 mm	0.001-0.006 in.

TORQUE SPECIFICATIONS

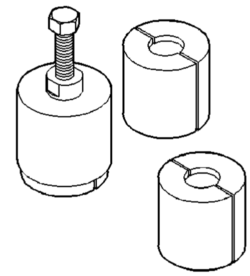
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolt, Bearing Plate-to-Case	28	—	250
Bolt, Differential Cover-to-Case	54	40	—
Bolt, End Cover-to-Case	28	—	250
Bolt, End Cover Plate-to-Cover	28	—	250
Bolt, Reverse Idler Shaft-to-Case	54	40	—
Bolt, Ring Gear-to-Differential Case	95	70	—
Bolt, Shift Cover-to-Case	28	—	250
Nut, 5th Gear-to-Input Shaft	262	193	—
Nut, Impact Blocker	28	21	—
Plug, Drain	23	17	—
Screw, Input Bearing Retainer	12	—	105
Switch, Back-Up Lamp	23	17	—
Vent	7	—	60

T850 MANUAL TRANSAXLE (Continued)

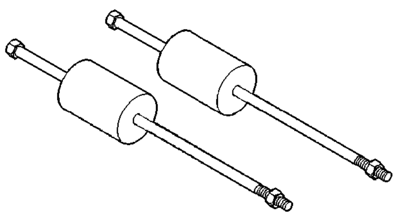
SPECIAL TOOLS - T850 TRANSAXLE



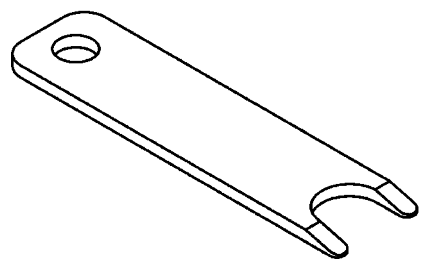
Bearing Splitter, P-334



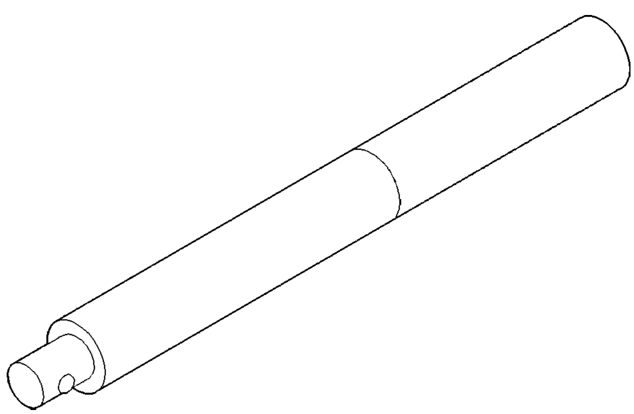
Puller Set, 5048



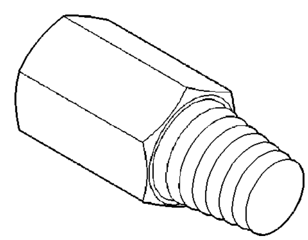
Slide Hammer, C-3752



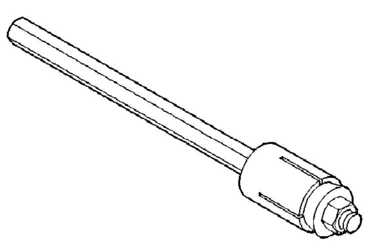
Disconnect Tool, 6638A



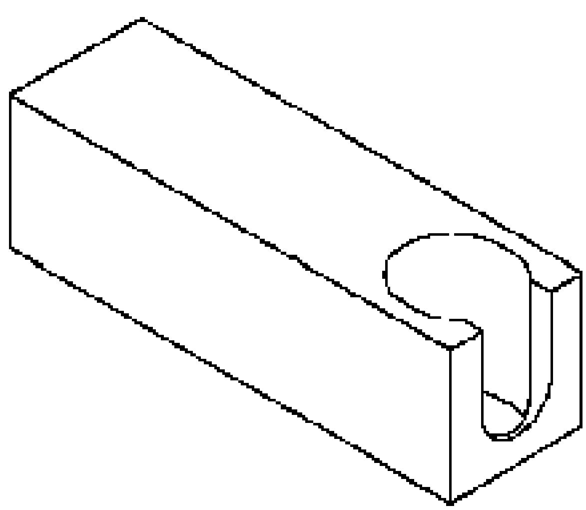
Universal Handle, C-4171



Remover, 6786

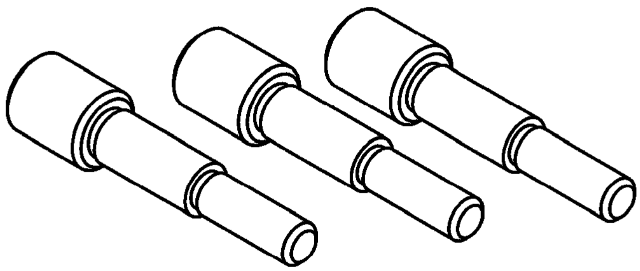


Torque Tool, C-4995

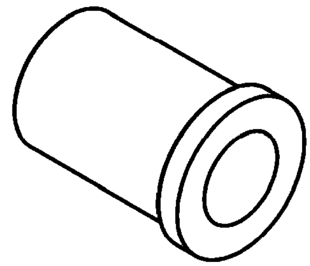


Remover/Installer, 6891

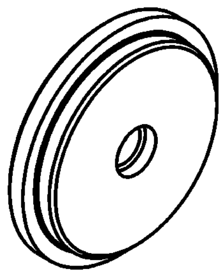
T850 MANUAL TRANSAXLE (Continued)



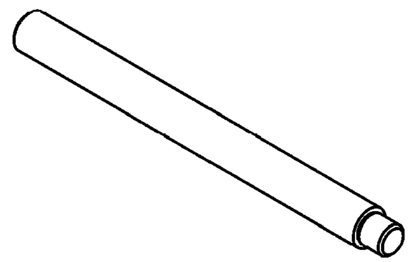
Alignment Pins, 8470



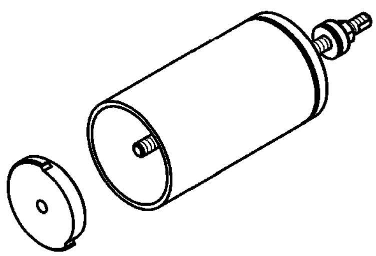
Remover/Installer, 8474



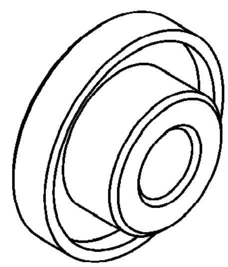
Installer, 8471



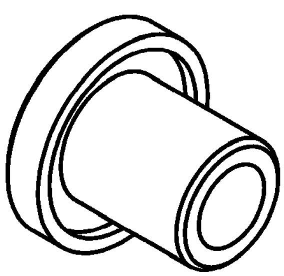
Installer, 8475



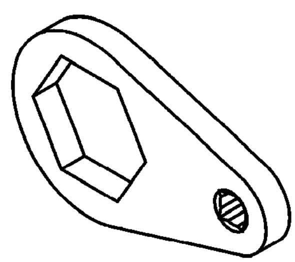
Race Remover, 8472



Installer, 8476

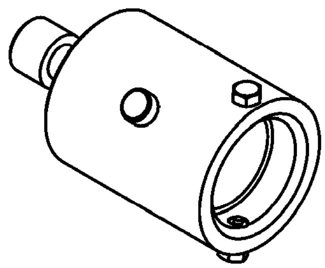


Bearing Installer, 8473

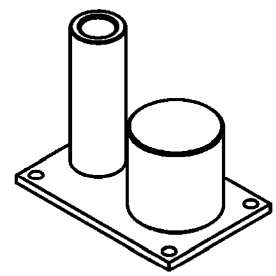


Wrench, 8478

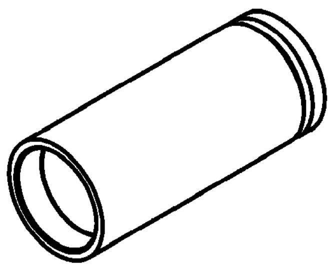
T850 MANUAL TRANSAXLE (Continued)



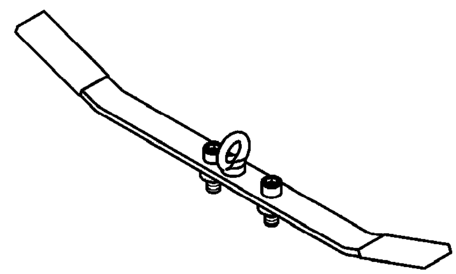
Stake Tool, 8479



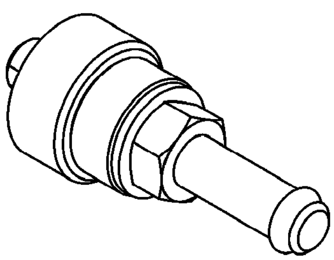
Fixture, 8487



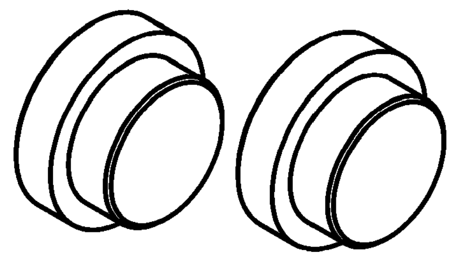
Installer, 8481



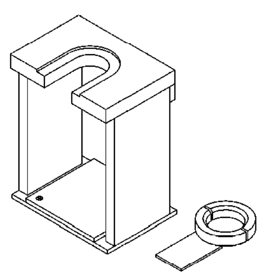
Lifting Bar, 8489



Bearing Installer, 8482



Thrust Buttons, 8491



Fixture, 8483

AXLE SEALS

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove one or both front halfshaft assemblies. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(3) Using a suitable screwdriver, remove one or both axle seals (Fig. 84).

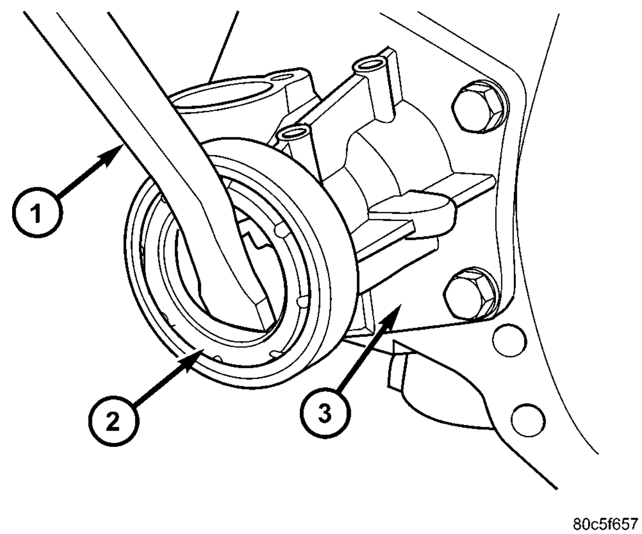


Fig. 84 Axle Seal Removal (Extension Housing Side Shown)

1 - SCREWDRIVER
2 - AXLE SEAL
3 - EXTENSION HOUSING

INSTALLATION

(1) Using driver handle C-4171 and installer 8476, install axle seals into position (Fig. 86) (Fig. 85).

(2) Install one or both front halfshaft assemblies. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)

(3) Check transaxle fluid level and adjust if necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/FLUID - STANDARD PROCEDURE)

(4) Lower vehicle.

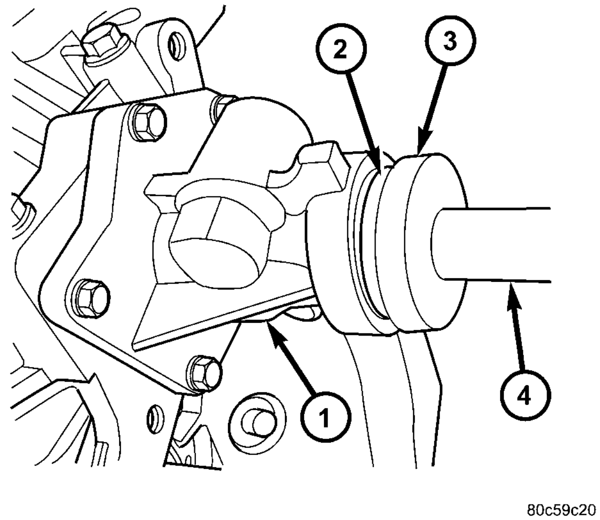


Fig. 85 Axle Seal Installation (Extension Housing Side)

1 - EXTENSION HOUSING
2 - SEAL
3 - INSTALLER 8476
4 - DRIVER HANDLE C-4171

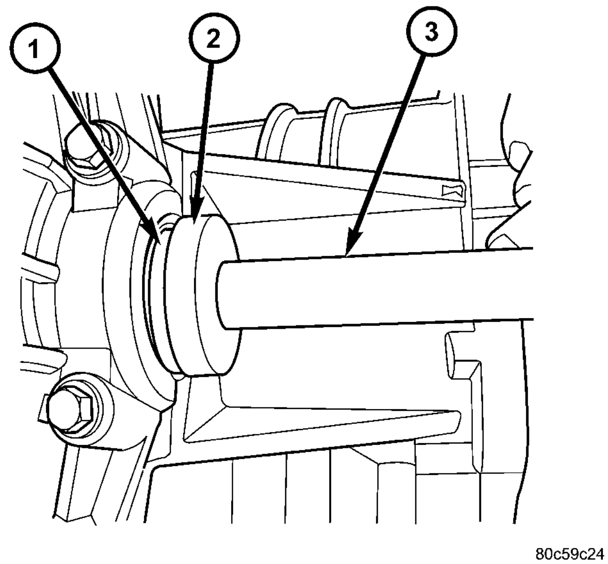


Fig. 86 Axle Seal Installation

1 - SEAL
2 - INSTALLER 8476
3 - DRIVER HANDLE C-4171

BACK-UP LAMP SWITCH

REMOVAL

(1) Raise vehicle on hoist.
(2) Disconnect back-up lamp switch connector.
(3) Remove back-up lamp switch (Fig. 87).

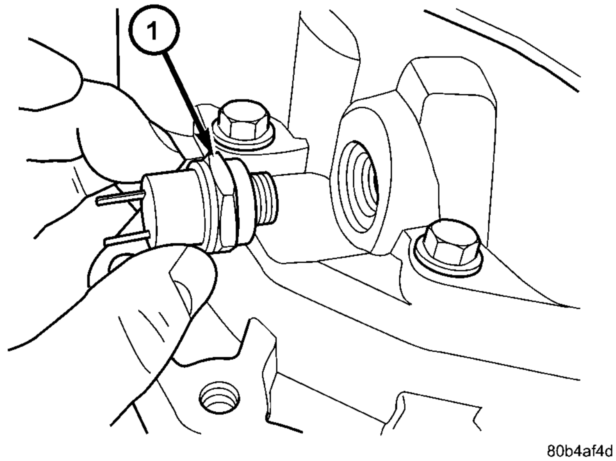


Fig. 87 Back-Up Lamp Switch

1 - BACK-UP LAMP SWITCH

INSTALLATION

(1) Install back-up lamp switch (Fig. 87) and torque to 23 N·m (17 ft. lbs.).
(2) Connect back-up lamp switch connector.
(3) Lower vehicle.

DIFFERENTIAL

DESCRIPTION

NOTE: The Quaife ATB Differential is serviced only as a complete assembly. The only serviceable components are the ring gear and tapered roller bearings. No other component replacement will be possible.

The Quaife Automatic Torque Biasing (ATB) Limited Slip Differential (Fig. 88) (Fig. 89) is a performance-oriented unit which is designed to provide traction to both drive wheels during all driving conditions.

A billet differential gear body houses two helical sun gears which are splined to the front axles. Each sun gear is in mesh with its own set of (6) helical planetary pinion gears which provide differential action during turning and cornering maneuvers. A center pack consisting of belleville spring washers sandwiched between a pair of spring housings apply pressure to the the sun gears. The unit is supported by tapered roller bearings.

This design prevents the complete loss of drive that occurs with a conventional “open” differential when one wheel slips.

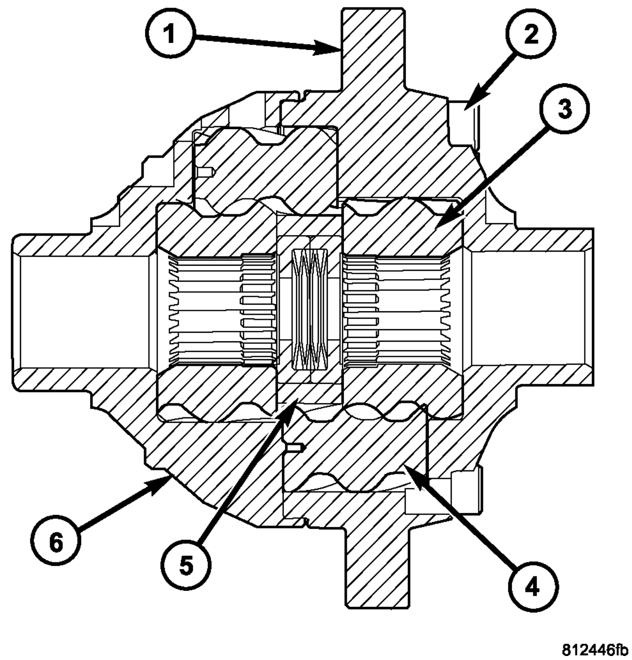


Fig. 88 Quaife ATB Differential

1 - GEAR BODY (FLANGED SIDE)
2 - BOLT (11)
3 - SUN GEAR (2)
4 - PLANET PINION (12)
5 - CENTER PACK
6 - GEAR BODY (SMALL SIDE)

OPERATION

The Quaife Automatic Torque Biasing Differential is a Limited-Slip design that behaves like an open differential during normal driving situations. During aggressive driving maneuvers (straight-line hard acceleration, hard cornering) it senses which wheel has better grip, and biases power to that wheel smoothly and consistently, without removing power from the other wheel.

In the event of wheel slip, torque bias is generated by the axial and radial thrusts of the pinions in the pockets. The resultant friction force enables the driving road wheel and sun gear to transmit a greater proportion of the torque. This is a progressive action, yet at no stage will the differential ever lock.

This differential also controls loss off traction when the drive wheels are on slippery surfaces such as ice, snow, or mud, providing the appropriate biased traction needed to overcome these adverse conditions.

DIFFERENTIAL (Continued)

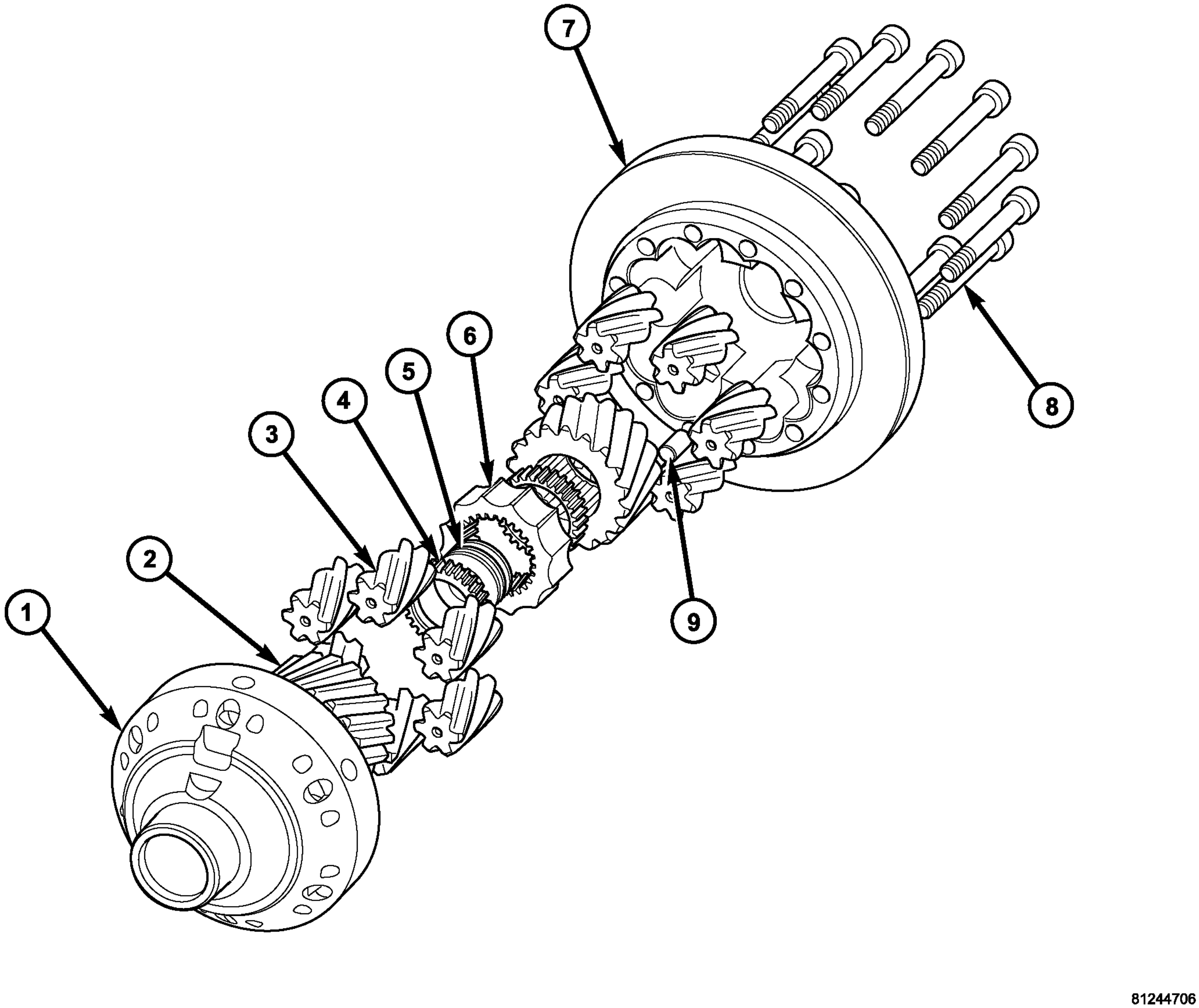


Fig. 89 Differential Components

1 - GEAR BODY (SMALL SIDE)
2 - SUN GEAR (2)
3 - PLANET PINION (12)
4 - SPRING HOUSING (2)
5 - BELLEVILLE WASHER (6)
6 - CENTER BLOCK
7 - GEAR BODY (FLANGE SIDE)
8 - BOLT (11)
9 - DOWEL

DIFFERENTIAL (Continued)

DISASSEMBLY

NOTE: The Quaife ATB Differential is serviced only as a complete assembly. The only serviceable components are the ring gear and tapered roller bearings. No other component replacement will be possible.

(1) Remove differential side bearings:

(a) Install Tool 8491-1 to differential case (Fig. 90).

(b) Set up Tool 5048 (5048-1, -4, -6) as shown in (Fig. 91)

(c) Remove differential side bearing (Fig. 92)

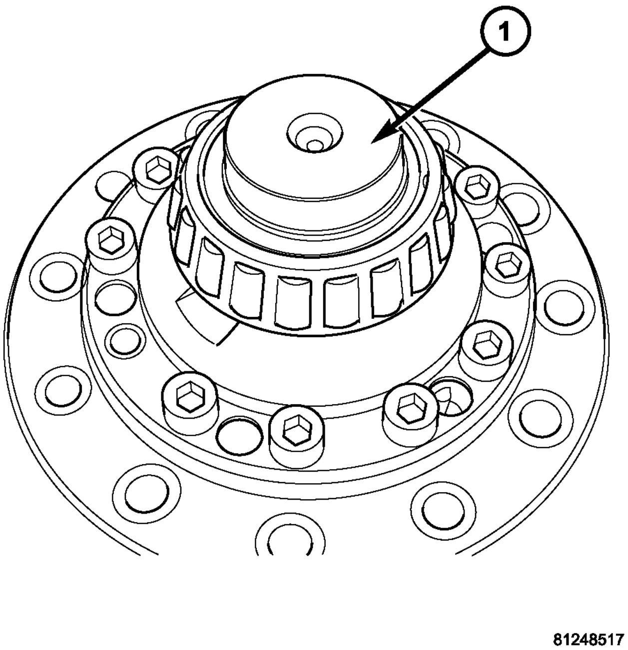


Fig. 90 Tool 8491

TOOL 8491

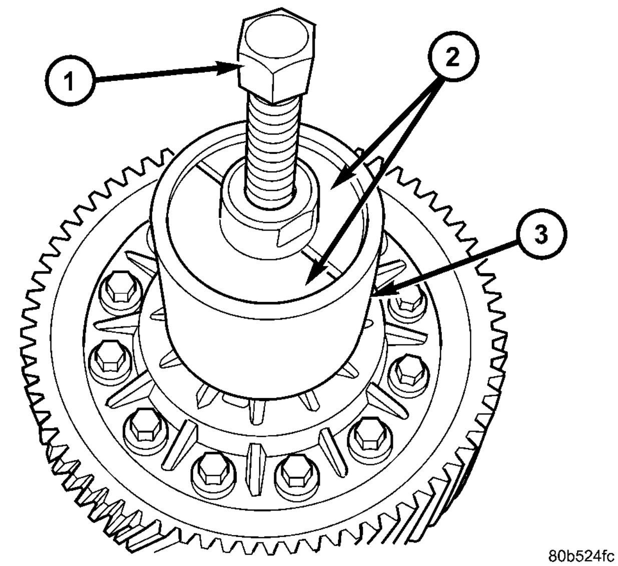


Fig. 91 Puller 5048

1 - 5048-1 FORCING SCREW
2 - 5048-4 COLLETS
3 - 5048-6 SLEEVE

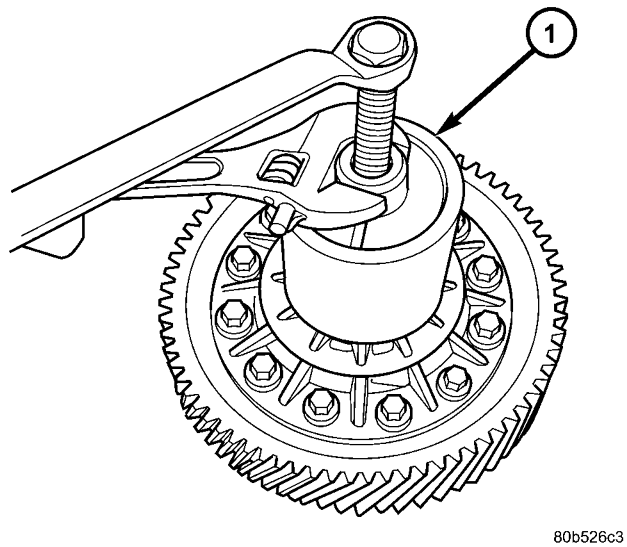


Fig. 92 Differential Side Bearing Removal

1 - TOOL 5048

DIFFERENTIAL (Continued)

(2) Remove ring gear-to-case bolts (Fig. 93).

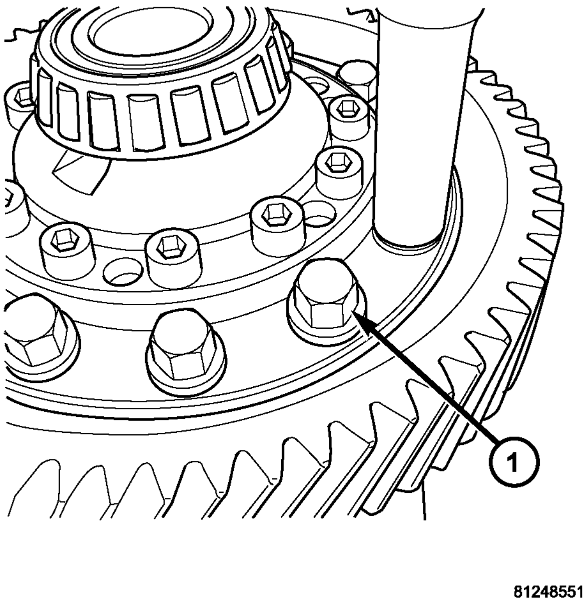


Fig. 93 Ring Gear-to-Case Bolts

1 - BOLT (12)

(3) Press ring gear off of differential case (Fig. 94).

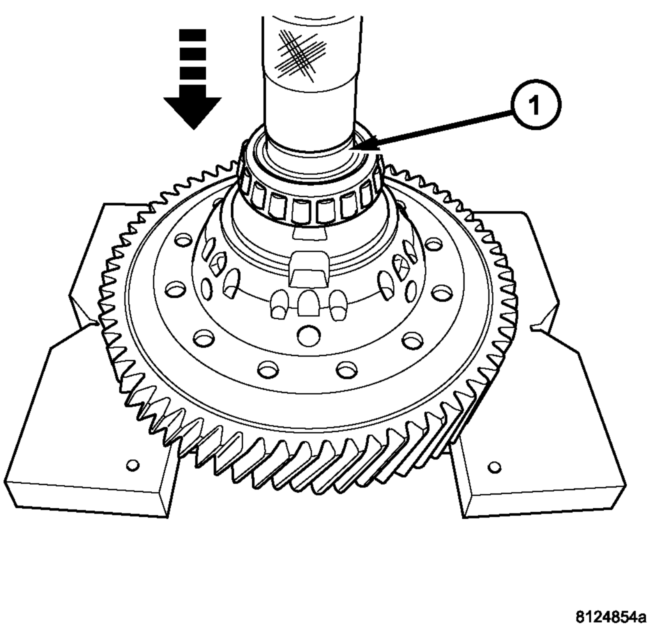


Fig. 94 Pressing Ring Gear off of Case

1 - TOOL 8491

(4) Remove eleven (11) differential gear body halve bolts (Fig. 95). Separate halves, noting position and orientation of locating dowel.

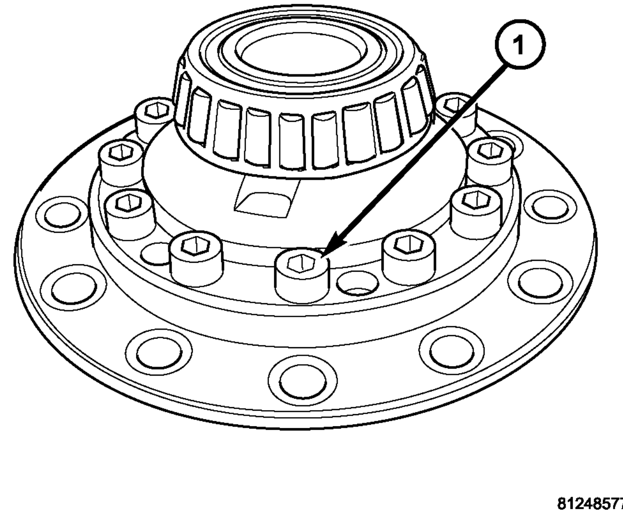


Fig. 95 Differential Case Halve Bolts

1 - BOLT (11)

(5) Remove differential components and inspect (Fig. 96). **Note assembly orientation of belleville spring washers.**

INSPECTION

Wash all components in a suitable solvent and blow-dry with compressed air (except bearings). Inspect all components for excessive wear. Minor irregular wear and small gear chips are acceptable and do not inhibit differential operation. However, large gear chips or components discolored due to lack of lubrication should result in differential replacement.

ASSEMBLY

NOTE: The Quaife ATB Differential is serviced only as a complete assembly. The only serviceable components are the ring gear and tapered roller bearings. No other component replacement will be possible.

(1) Assemble and install differential components as shown in (Fig. 96). **Make sure center pack (spring housing and belleville spring washers) is assembled as shown in** (Fig. 97).

DIFFERENTIAL (Continued)

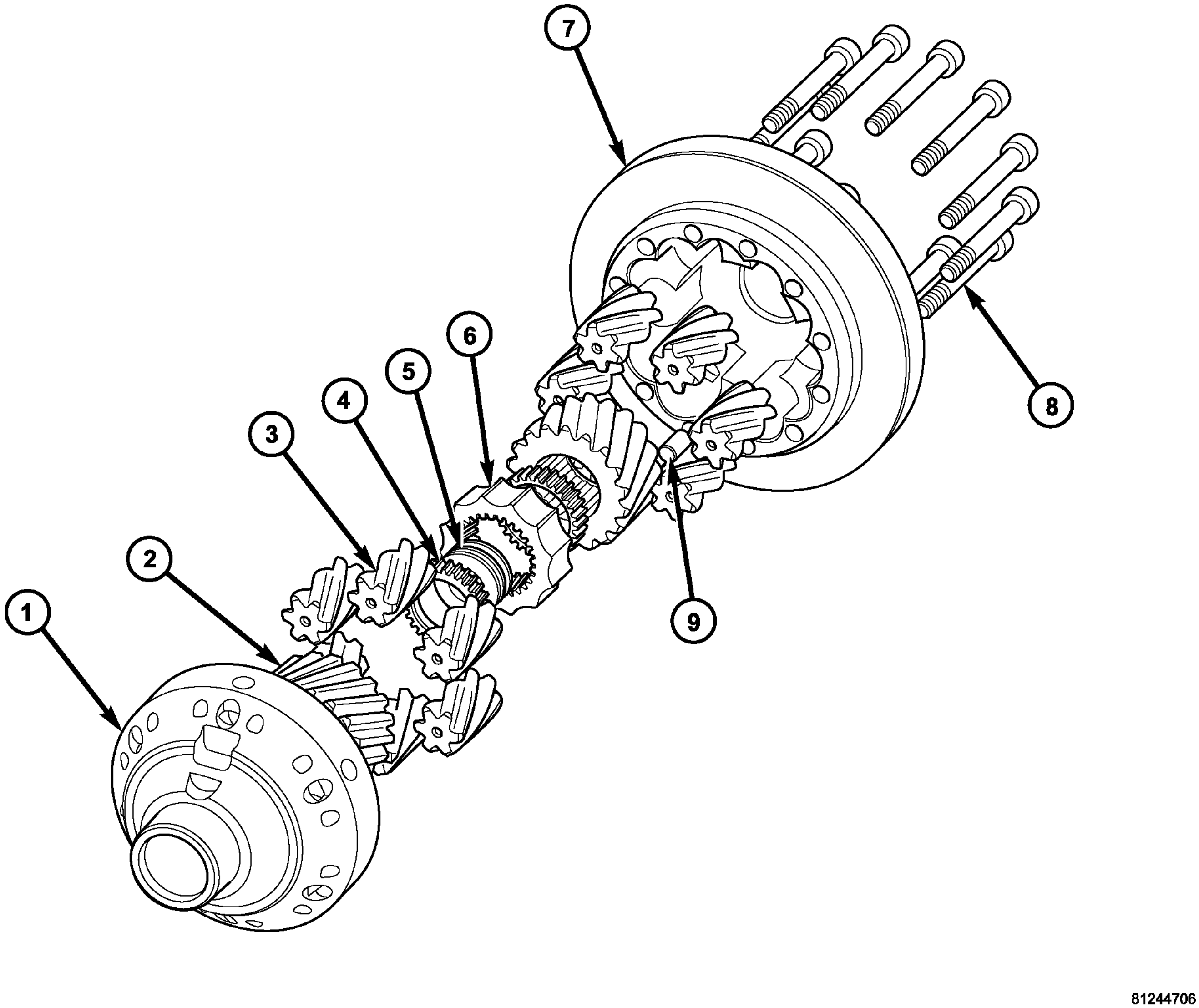


Fig. 96 Differential Components

1 - GEAR BODY (SMALL SIDE)
2 - SUN GEAR (2)
3 - PLANET PINION (12)
4 - SPRING HOUSING (2)
5 - BELLEVILLE WASHER (6)
6 - CENTER BLOCK
7 - GEAR BODY (FLANGE SIDE)
8 - BOLT (11)
9 - DOWEL

DIFFERENTIAL (Continued)

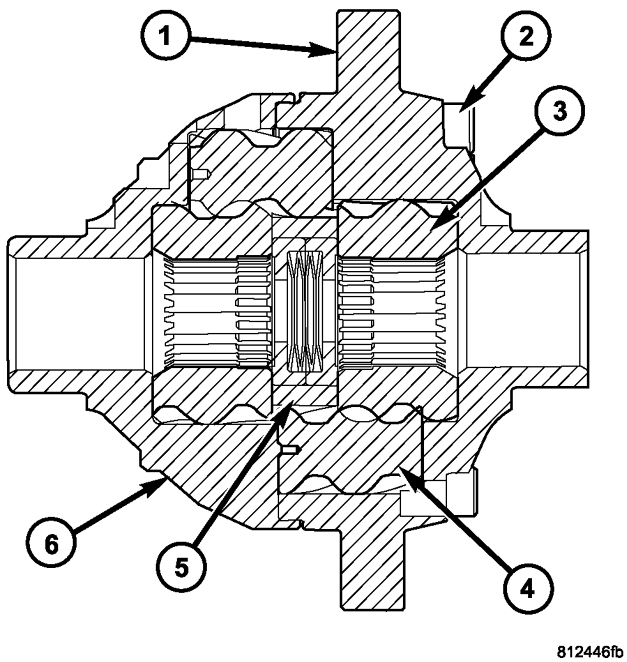


Fig. 97 Quaife ATB Differential

1 - GEAR BODY (FLANGED SIDE)
2 - BOLT (11)
3 - SUN GEAR (2)
4 - PLANET PINION (12)
5 - CENTER PACK
6 - GEAR BODY (SMALL SIDE)

(2) Noting position of locating dowel, install flanged gear body halve.

(3) Apply Mopar® Lock & Seal Adhesive to the eleven (11) gear body halve bolts. Install and torque to 39 N·m (28 ft. lbs.).

(4) Install ring gear. Install and torque twelve (12) bolts to 95 N·m (70 ft. lbs.) (Fig. 98).

(5) Using Tool 8473 and Tool 8491, install differential side bearings with arbor press (Fig. 99).

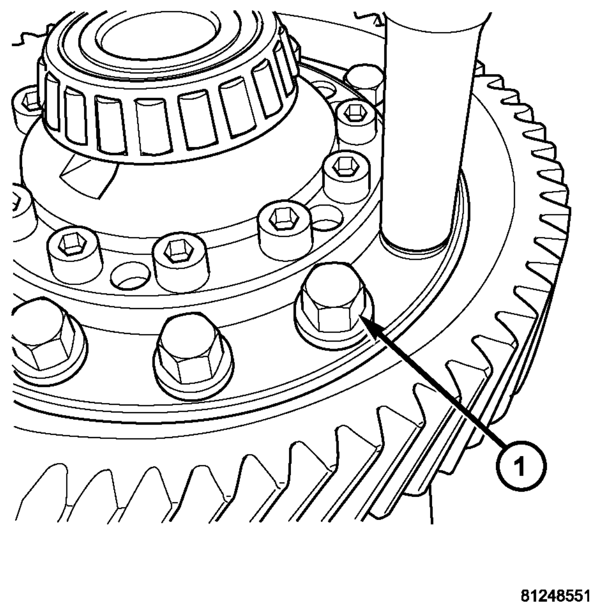


Fig. 98 Ring Gear-to-Case Bolts

1 - BOLT (12)

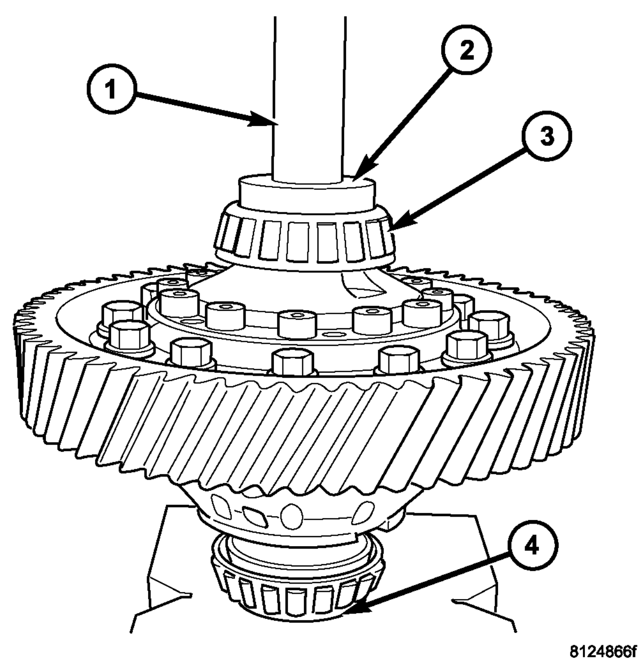


Fig. 99 Differential Bearing Installation

1 - TOOL C-4171
2 - TOOL 8473
3 - BEARING
4 - TOOL 8491

DIFFERENTIAL (Continued)

ADJUSTMENTS

ADJUSTMENT - DIFFERENTIAL TURNING TORQUE

NOTE: Differential turning torque should only be measured with the geartrain out of the transaxle. If measurement is taken with transaxle assembled, an inaccurate measurement will result.

NOTE: All differential cover-to-case bolts and bearing plate-to-case bolts must be installed and torqued to obtain accurate measurement.

(1) If transaxle is assembled, remove geartrain and leave differential in place. (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - DISASSEMBLY)

(2) Install differential cover and torque differential cover-to-case bolts to 54 N·m (40 ft. lbs.).

(3) Install extension housing and torque extension housing-to-case bolts to 28 N·m (250 in. lbs.).

(4) Place transaxle on work bench so axle centerline is parallel to the ground.

(5) Install turning torque tool C-4995 to differential at side opposite extension housing.

(6) Using in. lb./N·m dial indicator, rotate differential case multiple times and record measurement (Fig. 100). Differential turning torque should be within 2.3-3.4 N·m (20-30 in. lbs.). Refer to shim chart for proper shim selection. If turning torque measured is less than 2.3 N·m (20 in. lbs.), install a thicker shim. If turning torque measured is greater than 3.4 N·m (30 in. lbs.), install a thinner shim.

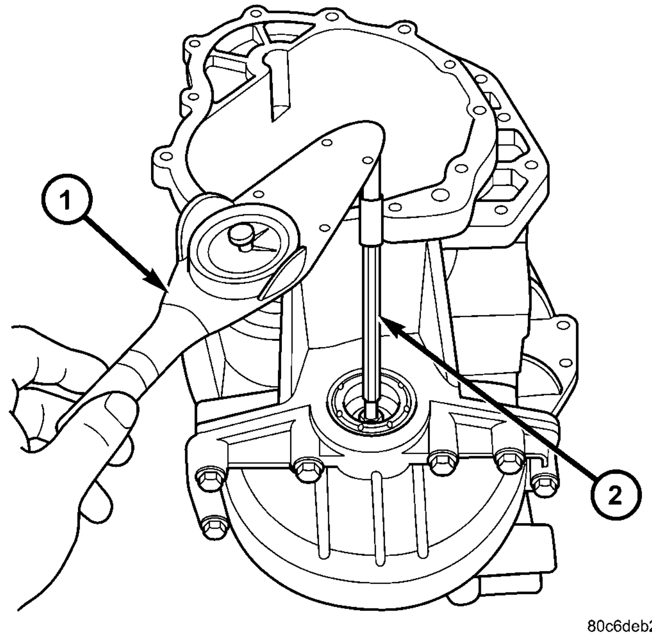


Fig. 100 Differential Turning Torque Measurement

1 - DIAL TORQUE WRENCH
2 - TOOL C-4995

DIFFERENTIAL (Continued)

DIFFERENTIAL BEARING SHIM CHART

PART NUMBER	SHIM THICKNESS	
	METRIC (MM)	STANDARD (STD)
4659242	0.50	0.0197
4659243	0.54	0.0213
4659247	0.58	0.0228
4659248	0.62	0.0244
4659249	0.66	0.0260
4659250	0.70	0.0276
4659251	0.74	0.0291
4659252	0.78	0.0307
4659253	0.82	0.0322
4659254	0.86	0.0339
4659255	0.90	0.0354
4659256	0.94	0.0370
4659257	0.98	0.0386
4659258	1.02	0.0402
4659259	1.06	0.0418
4659260	1.10	0.0434
4659261	1.14	0.0449
4659262	1.18	0.0465
4659263	1.22	0.0481
4659264	1.26	0.0497
4659265	1.30	0.0512
4659266	1.34	0.0528
4659267	1.38	0.0544
4659268	1.42	0.0560
4659269	1.46	0.0575
4659270	1.50	0.0591
4659271	1.54	0.0607
4659272	1.58	0.0623
4659273	1.62	0.0638
4659274	1.66	0.0654
4659275	1.70	0.0670
4659283	2.02	0.0796
4659284	2.06	0.0812

FLUID

STANDARD PROCEDURE

STANDARD PROCEDURE - FLUID LEVEL CHECK

NOTE: For proper fluid level check intervals, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)

The fluid required in this transaxle is Mopar® ATF+4 along with 0.12L (4 oz.) Mopar Limited Slip Additive/Friction Modifier (P/N 04318060AB).. Use of substitute fluids may result in improper transaxle operation and/or failure.

(1) Raise vehicle on hoist.

(2) Remove transaxle fill plug (Fig. 101).

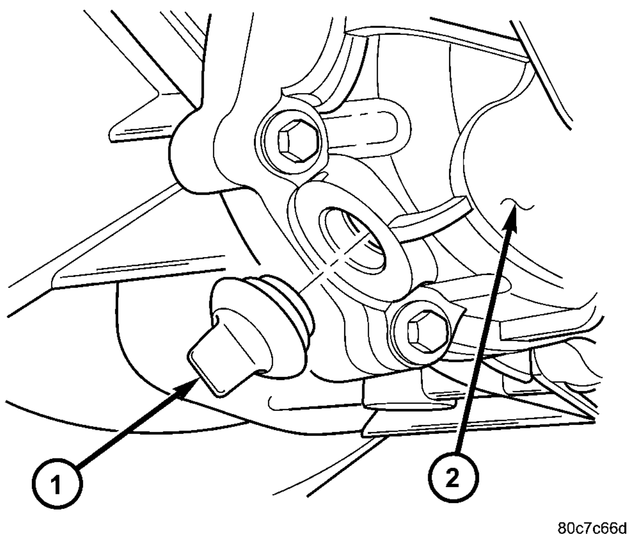


Fig. 101 Transaxle Fill Plug

1 - FILL PLUG
2 - END COVER

(3) Inspect fluid level. Fluid should be within 3/16” below fill hole. Add Mopar® ATF+4 as neccessary.

(4) Install fill plug, ensuring it is properly seated.

(5) Lower vehicle.

STANDARD PROCEDURE - FLUID DRAIN AND FILL

NOTE: For proper fluid change intervals, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)

The fluid required in this transaxle is Mopar® ATF+4 along with 0.12L (4 oz.) Mopar Limited Slip Additive/Friction Modifier (P/N 04318060AB). Use of substitute fluids may result in improper transaxle operation, noise and/or failure.

FLUID DRAIN

(1) Raise vehicle on hoist.

(2) Remove transaxle drain plug (Fig. 102) and drain fluid into suitable container.

(3) Install drain plug and torque to 23 N·m (17 ft. lbs.).

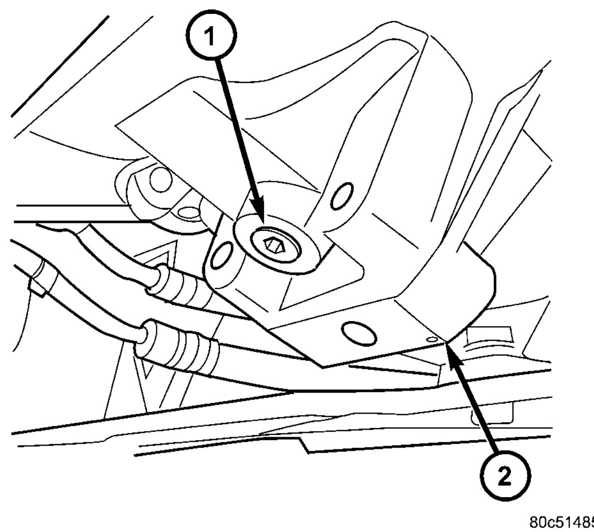


Fig. 102 Transaxle Drain Plug

1 - TRANSAXLE DRAIN PLUG
2 - DIFFERENTIAL COVER

FLUID (Continued)

FLUID FILL

(1) Remove transaxle fill plug (Fig. 103).

(2) Add 0.12L (4 oz.) Mopar® Limited Slip Additive/Fricion Modifier (P/N 04318060AB) and up to 2.3-2.5L (2.4-2.6 qts.) of Mopar® ATF+4 until fluid is within 3/16” below fill hole.

(3) Install fill plug, ensuring it is properly seated.

(4) Lower vehicle.

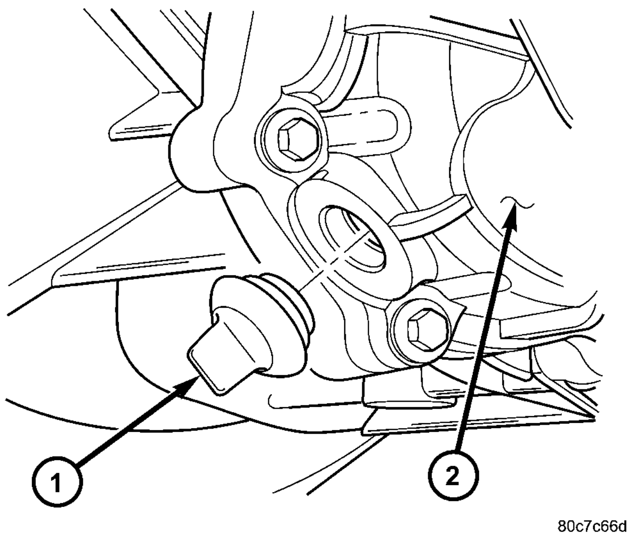


Fig. 103 Transaxle Fill Plug

1 - FILL PLUG
2 - END COVER

GEAR SHIFT CABLE

REMOVAL

NOTE: The crossover and selector cables are manufactured as a cable “assembly” and cannot be serviced individually.

(1) Raise hood and disconnect battery negative cable.

(2) Disengage gearshift boot from center console.

(3) Pull up on gearshift knob with moderate force to remove from gearshift mechanism (Fig. 104).

(4) Remove gearshift boot from console.

(5) Remove the center console assembly as shown in (Fig. 105).

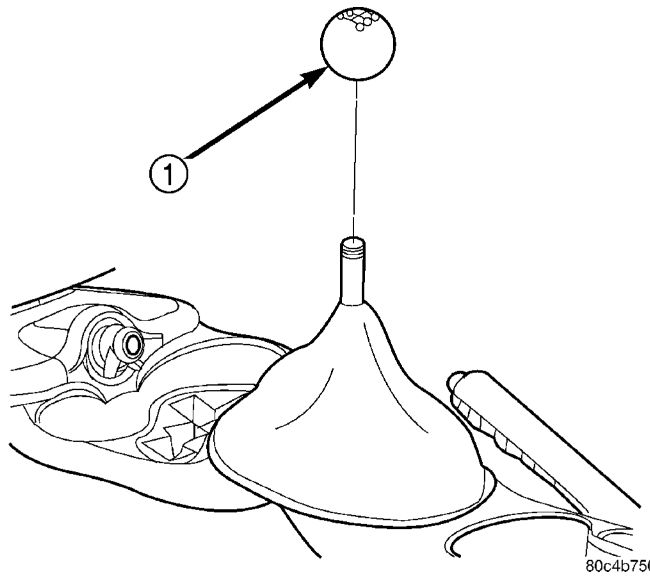


Fig. 104 Gearshift Knob Removal/Installation

1 - GEARSHIFT KNOB

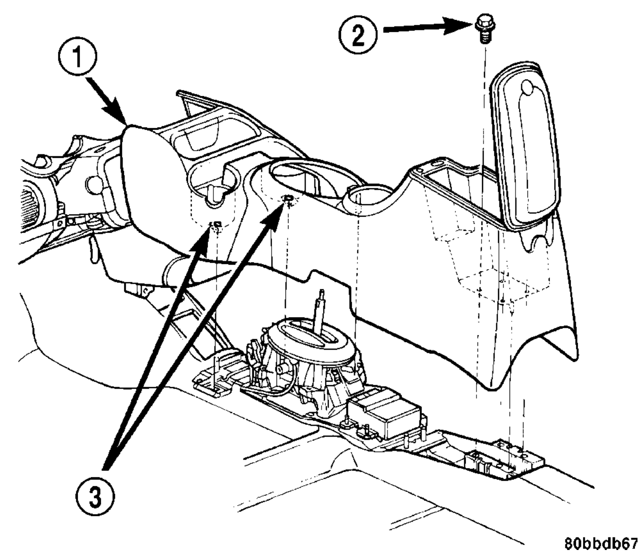


Fig. 105 Center Console Removal/Installation—Typical

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

GEAR SHIFT CABLE (Continued)

(6) Remove crossover cable retaining clip and disconnect from shift lever (Fig. 106).

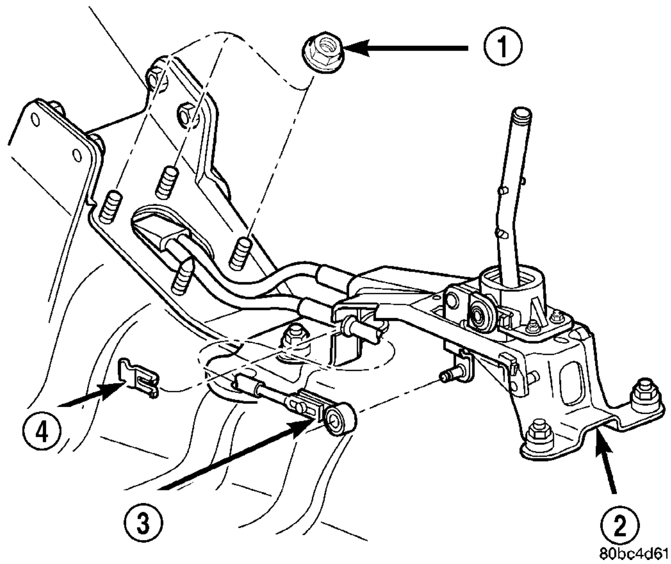


Fig. 106 Crossover Cable at Shifter Assembly

1 - GROMMET PLATE NUT
2 - SHIFTER
3 - CROSSOVER CABLE
4 - CLIP

(7) Remove selector cable retaining clip and disconnect from shift lever (Fig. 107).

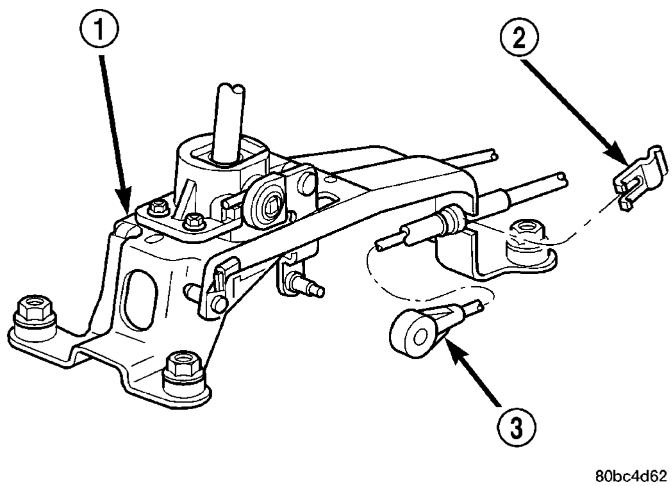


Fig. 107 Selector Cable at Shifter Assembly

1 - SHIFTER
2 - CLIP
3 - SELECTOR CABLE

(8) Remove three grommet plate-to-floor pan attaching nuts (Fig. 106).

(9) Remove air cleaner assembly.

(10) Disconnect cables from the shift levers at the transaxle (Fig. 108).

CAUTION: Pry up with equal force on both sides of shifter cable isolator bushings to avoid damaging cable isolator bushings.

Remove cable retaining clips and remove cables from bracket (Fig. 108).

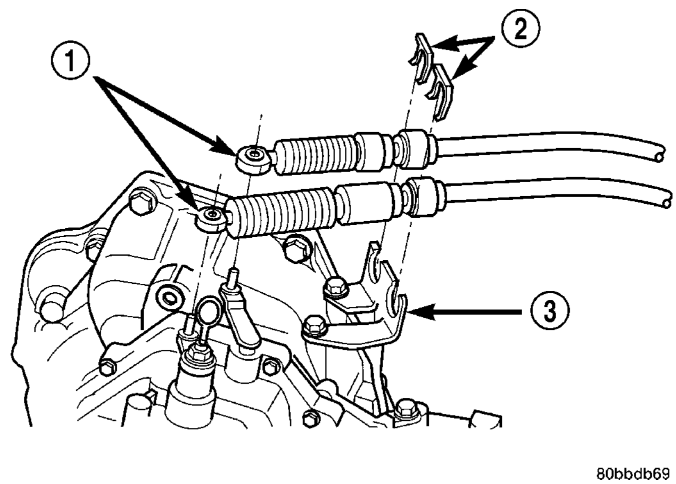


Fig. 108 Shift Cables at Transaxle

1 - SHIFT CABLES
2 - CLIPS
3 - BRACKET

(11) Raise vehicle on hoist.

(12) Remove converter heat shield (Fig. 109).

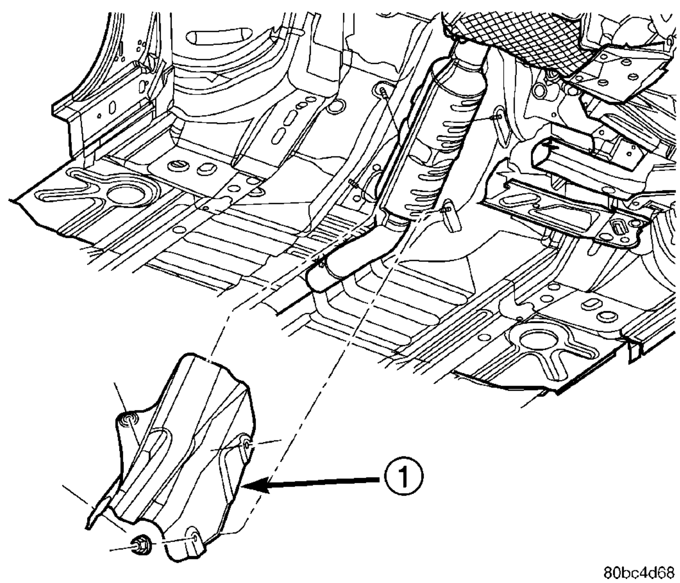


Fig. 109 Converter Heat Shield Removal/Installation

1 - CONVERTER HEAT SHIELD

GEAR SHIFT CABLE (Continued)

(13) Remove remaining grommet plate-to-floor pan screw (Fig. 110).

(14) Remove cable assembly from vehicle.

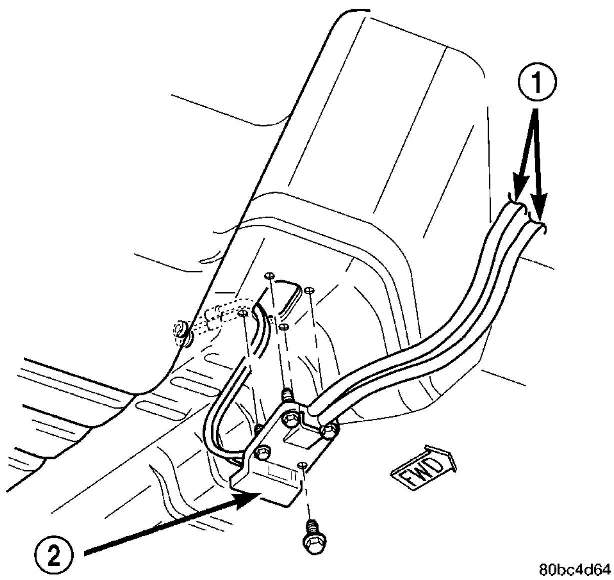


Fig. 110 Shift Cable Assembly at Floor Pan

1 - CABLE ASSEMBLY
2 - GROMMET PLATE

INSTALLATION

NOTE: The crossover and selector cables are manufactured as a cable "assembly" and cannot be serviced individually.

CAUTION: Gearshift cable bushings must not be lubricated or the bushings will swell and split.

(1) Raise vehicle on hoist.

(2) Install cable assembly through floor pan opening and secure to floor pan with grommet plate and one screw (Fig. 110). Make sure the three grommet plate studs protrude through cable assembly and floor pan and tighten screw to 7 N·m (60 in. lbs.).

(3) Route transaxle end of cable assembly into engine compartment and over transaxle assembly.

(4) Install converter heat shield (Fig. 109).

(5) Lower vehicle.

(6) Install gearshift cables to mounting bracket and fasten with NEW clips (Fig. 108). Make sure clips are installed flush to bracket.

(7) Connect gearshift selector and crossover cable to shift levers at transaxle (Fig. 108).

(8) Install and tighten the three grommet plate-to-floor pan nuts to 6 N·m (50 in. lbs.) torque.

(9) Install selector cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 107).

(10) Install crossover cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 106).

NOTE: Only the crossover cable is adjustable. The selector cable does not have any adjustment capabilities.

(11) **Adjust crossover cable as follows:**

(a) Loosen adjusting screw on crossover cable at shifter (Fig. 111).

(b) The gearshift mechanism and transaxle crossover lever are spring-loaded and self-centering. Alignment pins used in the past are not required anymore. Allow gearshift mechanism and transaxle crossover lever to relax in their neutral positions. To ensure the gearshift lever is in the proper position, place the shifter in 3rd or 4th gear if necessary. Torque adjustment screw to 8 N·m (70 in. lbs.). Care must be taken to avoid moving the shift mechanism off-center during screw tightening.

(c) Perform functional check by shifting transaxle into all gears.

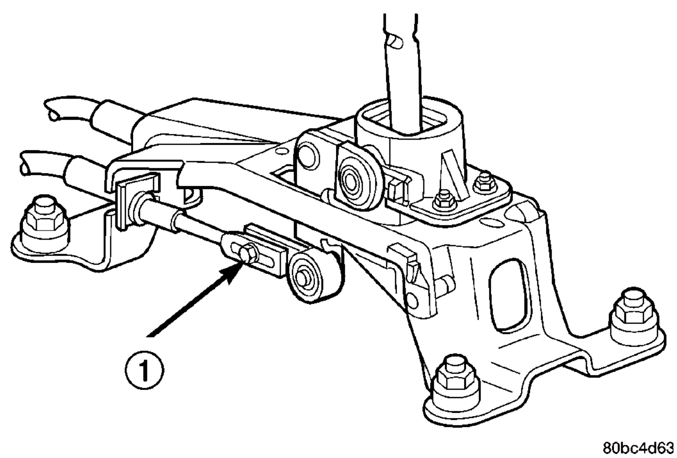


Fig. 111 Crossover Cable Adjustment Screw

1 - CROSSOVER ADJUSTMENT SCREW

(12) Install center console assembly (Fig. 105).

(13) Install gearshift boot to console. Locate boot to console at forward tab and secure with retaining tabs.

(14) Position knob hole over the gearshift mechanism and align the shift pattern (Fig. 104). Strike knob with rubber mallet to engage knob to mechanism.

(15) Install the air cleaner assembly.

(16) Connect battery negative cable.

GEAR SHIFT CABLE (Continued)

ADJUSTMENTS

NOTE: Only the crossover cable is adjustable. The selector cable does not have adjustment capabilities.

Pull up on gearshift knob with moderate force to remove from gearshift mechanism (Fig. 112).

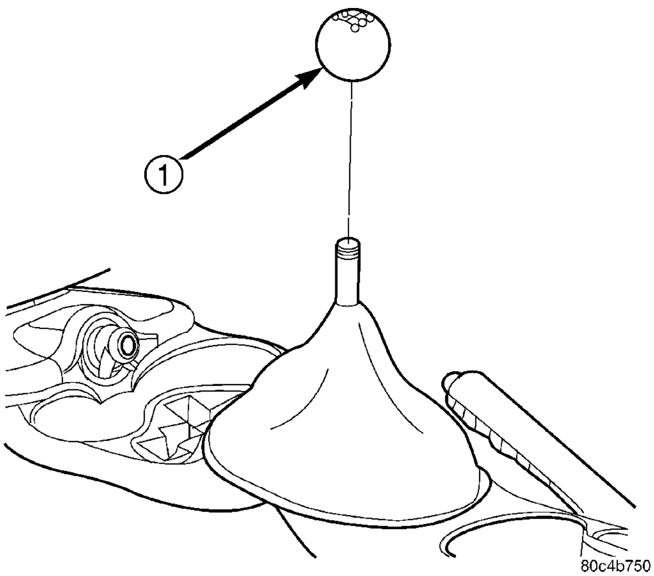


Fig. 112 Gearshift Knob Removal/Installation

1 - GEARSHIFT KNOB

(1) Remove the center console assembly as shown in (Fig. 113).

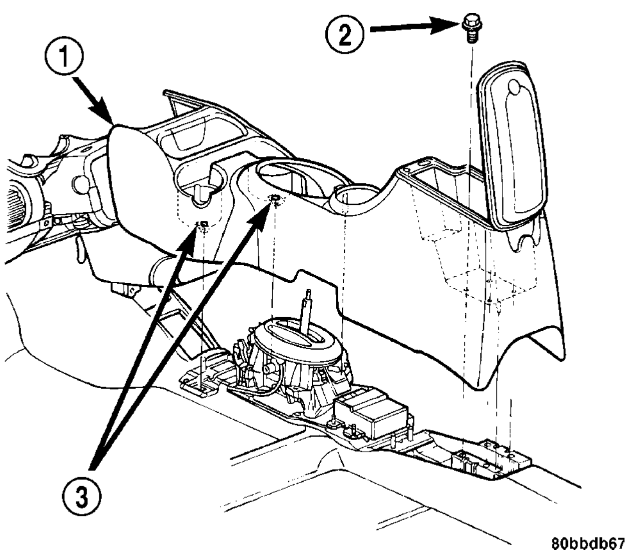


Fig. 113 Center Console Removal/Installation—Typical

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

(2) Loosen crossover adjustment screw at shifter assembly (Fig. 114).

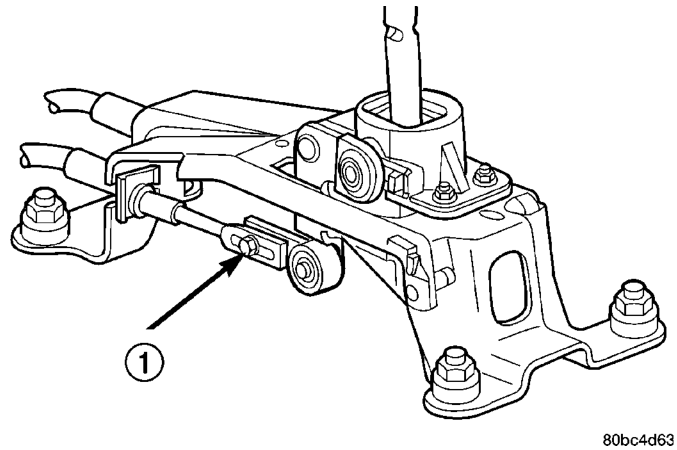


Fig. 114 Crossover Cable Adjustment Screw

1 - CROSSOVER ADJUSTMENT SCREW

(3) The gearshift mechanism and transaxle crossover lever are spring-loaded and self-centering. Alignment pins used in the past are not required anymore. Allow gearshift mechanism and transaxle crossover lever to relax in their neutral positions. To ensure the gearshift lever is in the proper position, place the shifter in 3rd or 4th gear if necessary. Torque adjustment screw to 8 N·m (70 in. lbs.). Care must be taken to avoid moving the shift mechanism off-center during screw tightening.

(4) Install center console assembly (Fig. 113).

(5) Install gearshift boot to console. Locate boot to console at forward tab and secure with retaining tabs.

(6) Position knob hole over the gearshift mechanism and align the shift pattern (Fig. 112). Strike knob with rubber mallet to engage knob to mechanism.

GEAR SHIFT MECHANISM

REMOVAL

(1) Disengage gearshift boot from center console.

(2) Pull up on gearshift knob with moderate force to remove from gearshift mechanism (Fig. 115).

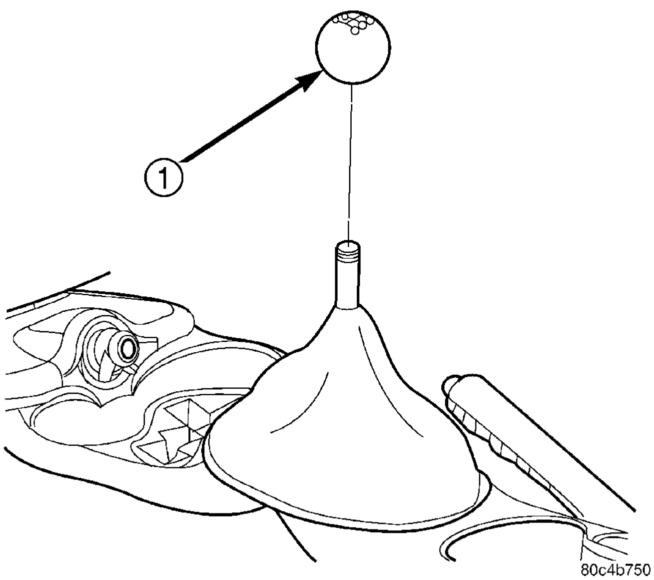


Fig. 115 Gearshift Knob Removal/Installation

1 - GEARSHIFT KNOB

(3) Remove the center console assembly as shown in (Fig. 116).

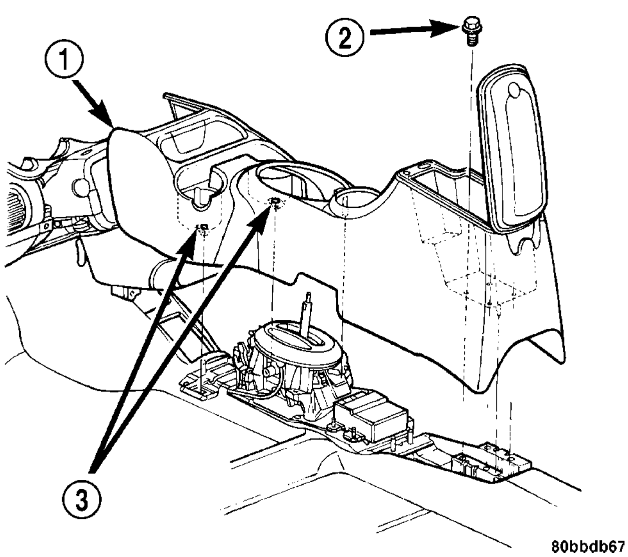


Fig. 116 Center Console Removal/Installation—Typical

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

(4) Remove crossover cable retaining clip and disconnect from shift lever (Fig. 117).

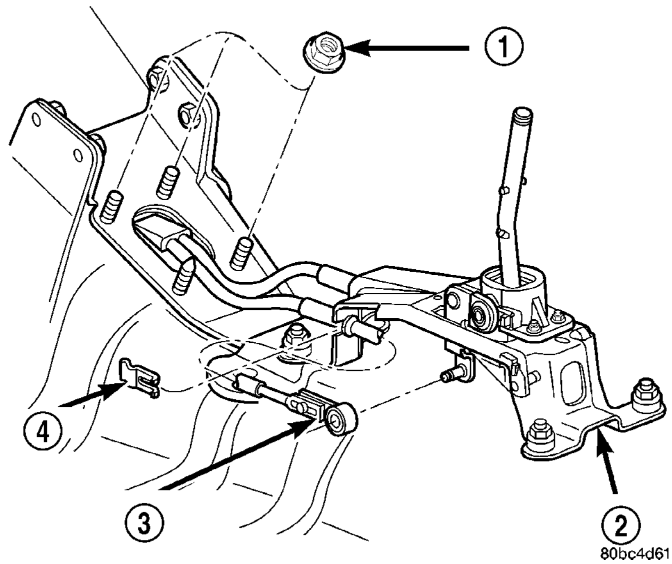


Fig. 117 Crossover Cable at Shifter Assembly

1 - GROMMET PLATE NUT
2 - SHIFTER
3 - CROSSOVER CABLE
4 - CLIP

(5) Remove selector cable retaining clip and disconnect from shift lever (Fig. 118).

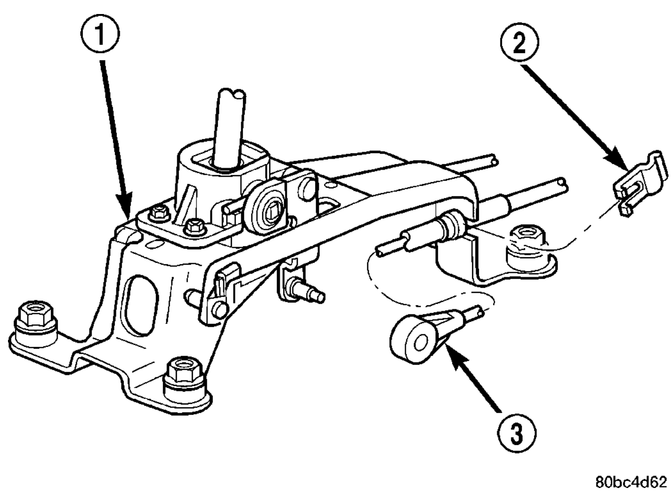


Fig. 118 Selector Cable at Shifter Assembly

1 - SHIFTER
2 - CLIP
3 - SELECTOR CABLE

GEAR SHIFT MECHANISM (Continued)

(6) Remove four shifter assy.-to-floor pan nuts and remove shifter from vehicle (Fig. 119).

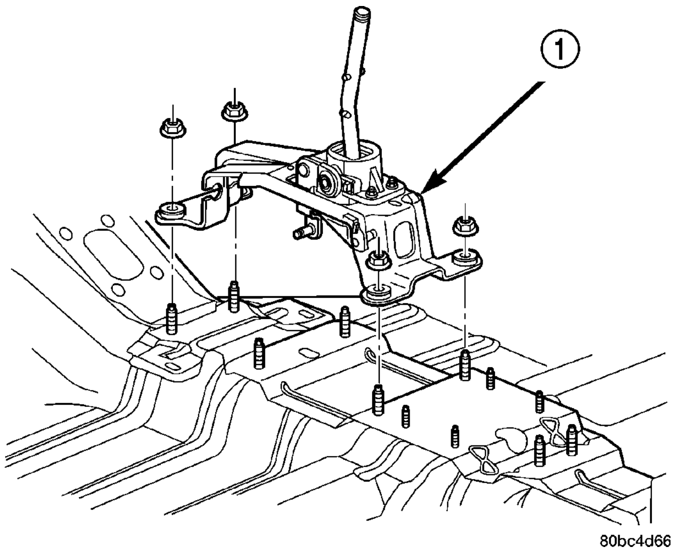


Fig. 119 Shifter Assy. Removal/Installation

1 - SHIFTER ASSEMBLY

INSTALLATION

(1) Install shifter assy. to floor pan (Fig. 119). Install and tighten four nuts to 12 N·m (105 in. lbs.) torque.

(2) Install selector cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 118).

(3) Install crossover cable to shifter lever and secure cable to shifter bracket. Install clip (Fig. 117).

(4) Install center console assembly (Fig. 116).

(5) Install gearshift boot to console. Locate boot to console at forward tab and secure with retaining tabs.

(6) Position knob hole over the gearshift mechanism and align the shift pattern (Fig. 104). Strike knob with rubber mallet to engage knob to mechanism.

(7) Connect battery negative cable.

GEAR SHIFT KNOB

REMOVAL

(1) Pull up on gearshift knob with moderate force to remove from gearshift mechanism (Fig. 120).

INSTALLATION

(1) Position knob hole over the gearshift mechanism and align the shift pattern (Fig. 120).

(2) Strike knob with rubber mallet to engage knob to mechanism.

(3) Verify that shift pattern is aligned properly.

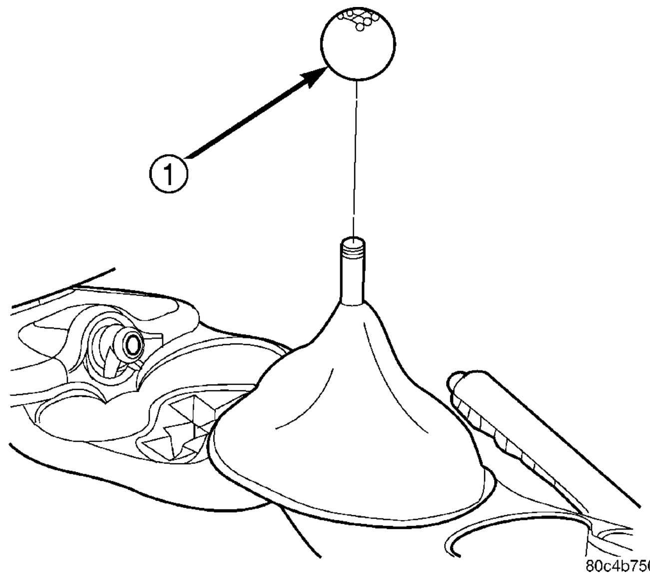


Fig. 120 Gearshift Knob Removal/Installation

1 - GEARSHIFT KNOB

INPUT SHAFT

DESCRIPTION

The input shaft assembly (Fig. 121) is part of the transaxle geartrain, is driven by the clutch assembly, and consists of the following components:

- Input Mainshaft
- 3rd Speed Gear
- 4th Speed Gear
- 3/4 Synchronizer
- 5th Input Gear

The input shaft meshes with the intermediate shaft, and is supported by a needle bearing at the front of the transaxle, and a sealed roller bearing at the rear of the transaxle.

DISASSEMBLY

NOTE: When servicing the input shaft assembly, all snap rings which are removed MUST be replaced with new snap rings upon reassembly. The 5th gear nut must be replaced also.

(1) Invert input shaft assembly and place in fixture 8487.

(2) Remove input bearing snap ring (Fig. 122).

(3) Remove input bearing. Place input shaft assembly onto arbor press table, with the input bearing supported by bearing splitter (Fig. 123). Using adapter 8486-4, press bearing off of shaft, while helper supports shaft to prevent dropping.

(4) Place input shaft assembly back into fixture 8487. Secure fixture to bench with fasteners, or secure to bench vise.

INPUT SHAFT (Continued)

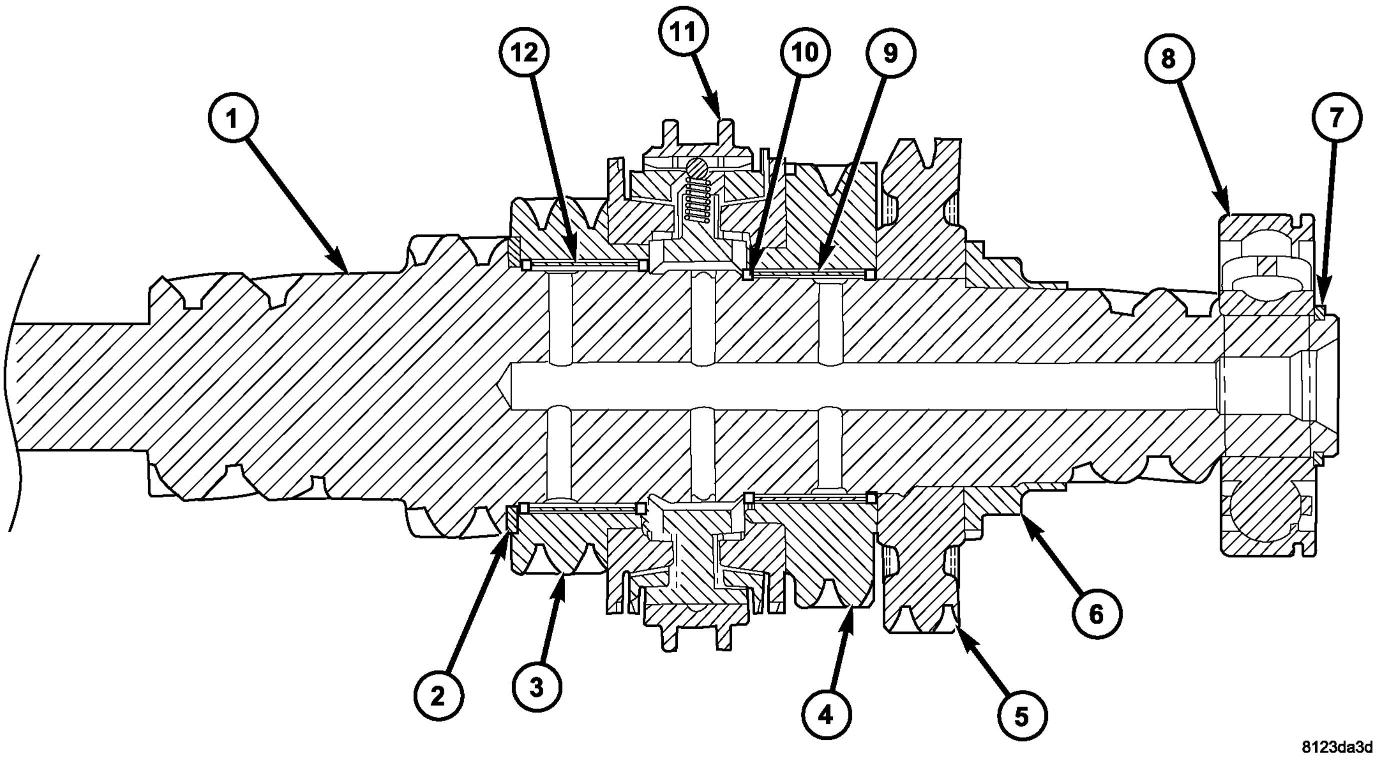


Fig. 121 Input Shaft Assembly

1 - INPUT SHAFT
2 - THRUST WASHER
3 - 3RD GEAR
4 - 4TH GEAR
5 - 5TH GEAR
6 - 5TH GEAR NUT
7 - SNAP RING
8 - INPUT BEARING (SEALED)
9 - NEEDLE BEARING
10 - SNAP RING
11 - 3/4 SYNCHRONIZER
12 - NEEDLE BEARING

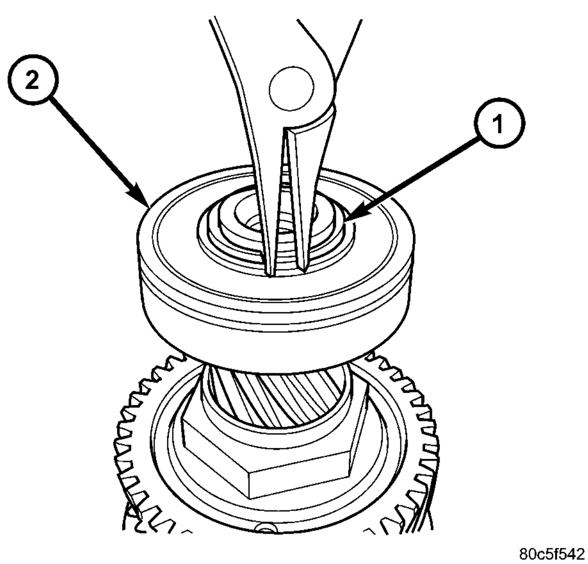


Fig. 122 Input Bearing Snap Ring Removal

1 - SNAP RING
2 - INPUT BEARING

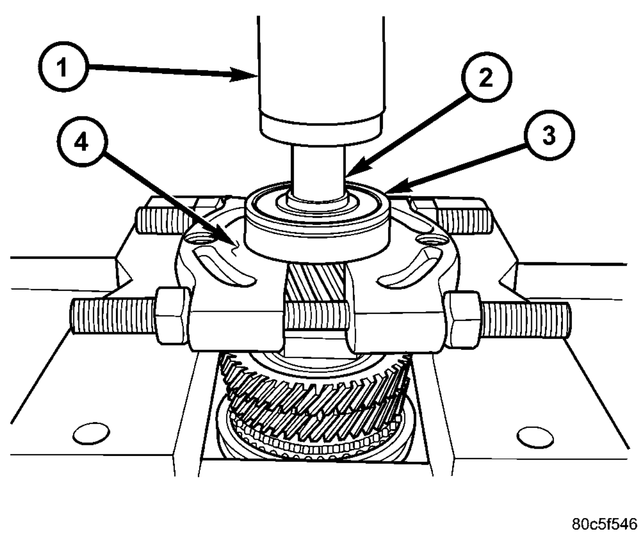


Fig. 123 Input Bearing Removal

1 - ARBOR PRESS RAM
2 - ADAPTER 8486-4
3 - INPUT BEARING
4 - BEARING SPLITTER

INPUT SHAFT (Continued)

NOTE: 5th gear nut is staked to the shaft. If necessary, grind stake area to ease removal, but use care not to contact gear.

(5) Remove 5th gear nut with wrench 8478 (Fig. 124). Discard nut and use a new one upon assembly.

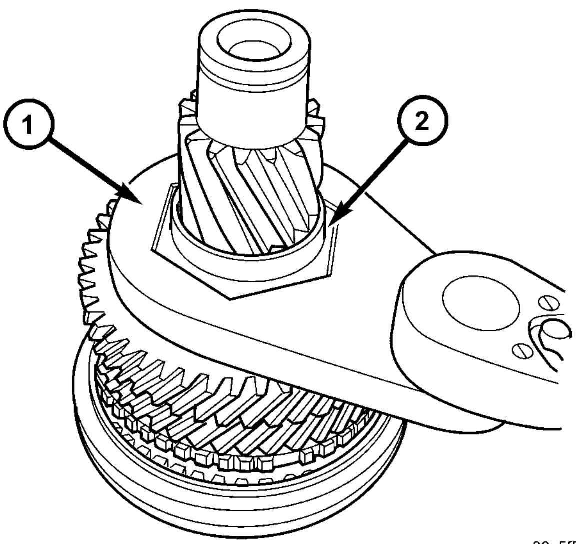


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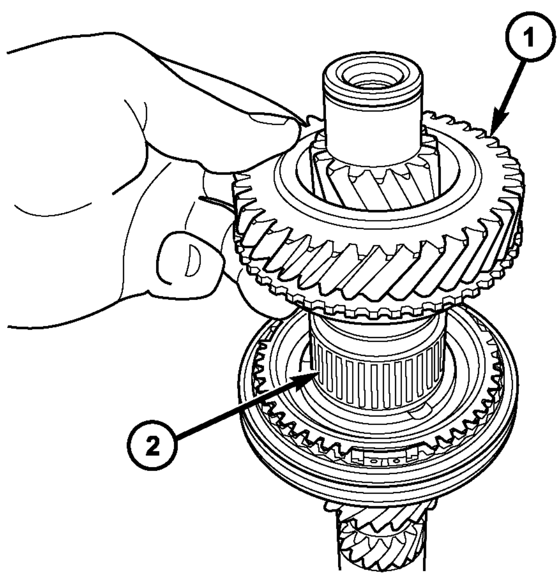
Fig. 124 5th Gear Nut Removal/Installation

1 - WRENCH 8478
2 - 5TH GEAR NUT

(6) Remove 5th gear with arbor press and bearing splitter.

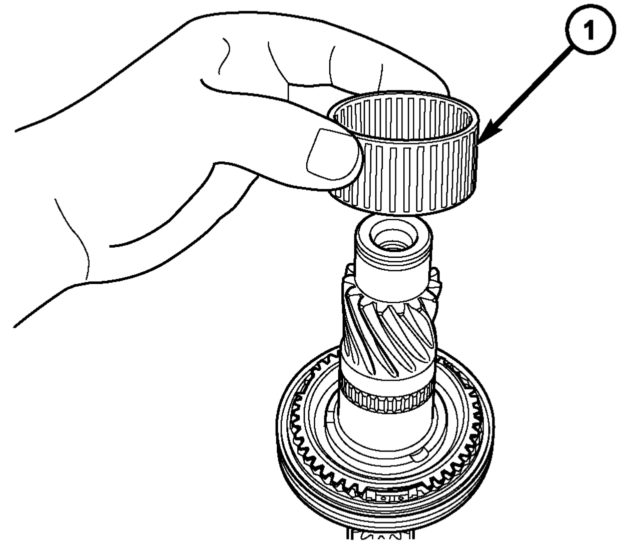
(7) Remove 4th gear and needle bearing (Fig. 125) (Fig. 126).



8123b0e7

Fig. 125 4th Gear Removal/Installation

1 - 4TH GEAR
2 - NEEDLE BEARING

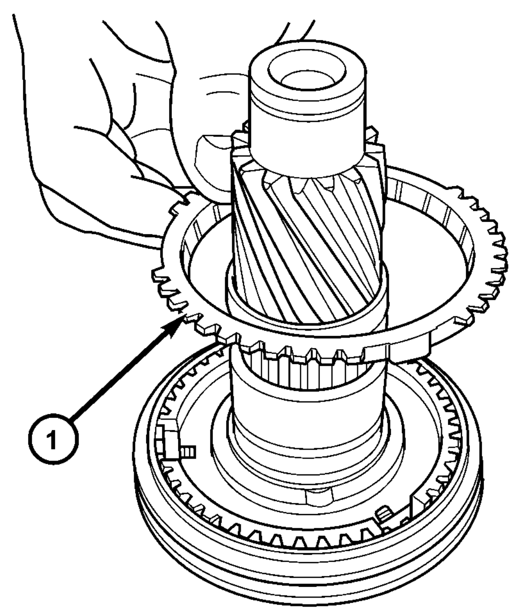


8123b0d3

Fig. 126 4th Gear Needle Bearing Removal/ Installation

1 - 4TH GEAR NEEDLE BEARING

(8) Remove 4th gear blocker ring (Fig. 127).



80c5f556

Fig. 127 4th Gear Blocker Ring

1 - 4th GEAR BLOCKER RING

INPUT SHAFT (Continued)

(9) Remove 3/4 synchronizer snap ring (Fig. 128). Discard and replace with new snap ring upon assembly.

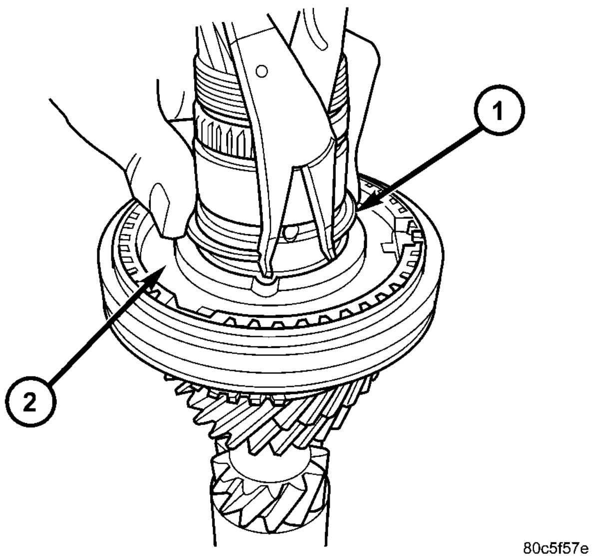


Fig. 128 3/4 Synchro Snap Ring

1 - SNAP RING
2 - 3/4 SYNCHRONIZER

(10) Remove 3/4 synchronizer (Fig. 129).

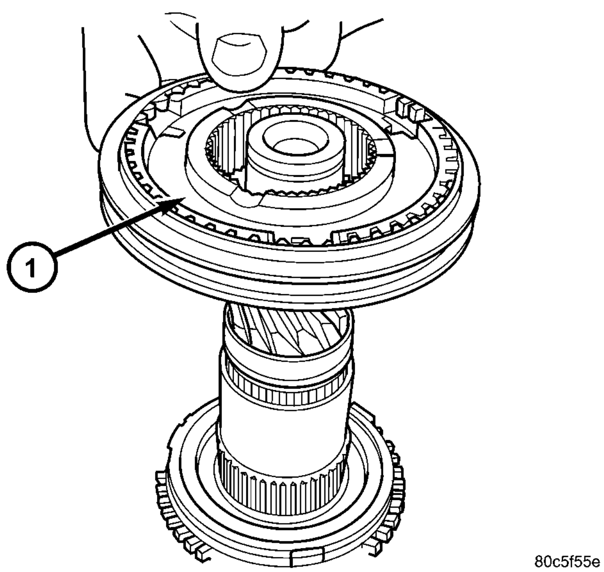


Fig. 129 3/4 Synchro Assembly

1 - 3/4 SYNCHRONIZER

(11) Remove 3rd gear blocker ring (Fig. 130).

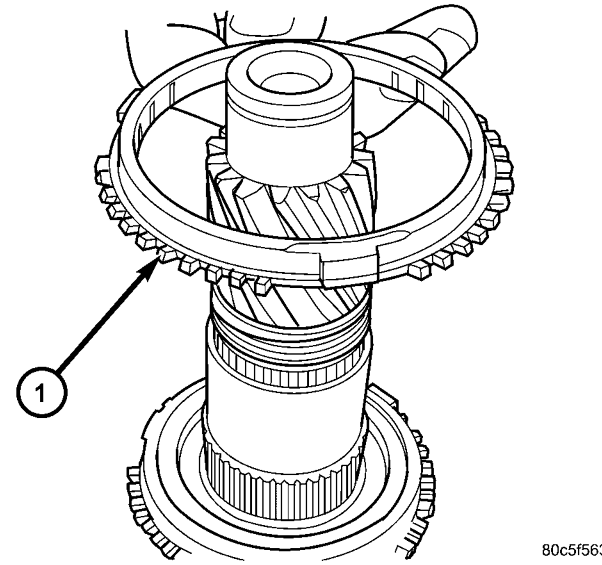


Fig. 130 3rd Gear Blocker Ring

1 - 3RD GEAR BLOCKER RING

(12) Remove 3rd gear and needle bearing (Fig. 131) (Fig. 132).

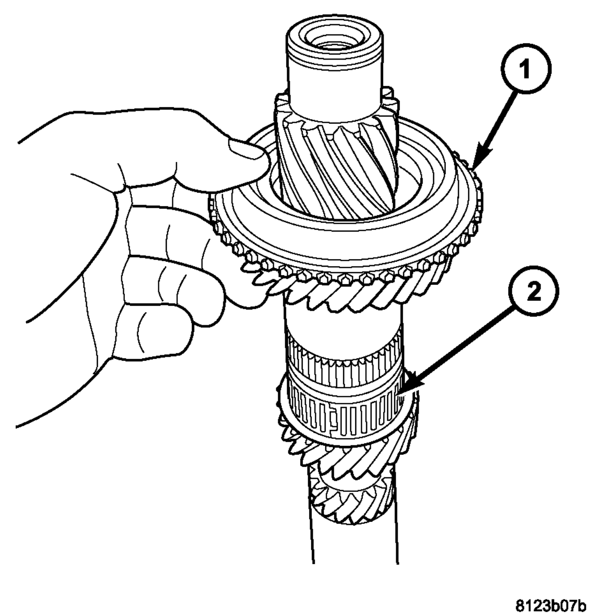


Fig. 131 3rd Gear Removal/Installation

1 - 3RD GEAR
2 - NEEDLE BEARING

INPUT SHAFT (Continued)

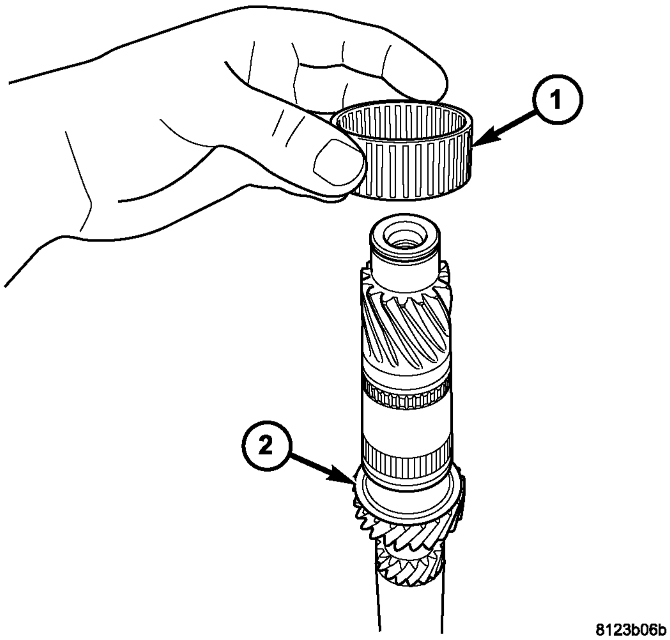


Fig. 132 3rd Gear Needle Bearing Removal/ Installation

1 - 3RD GEAR NEEDLE BEARING
2 - THRUST WASHER

(13) Inspect third gear thrust washer for signs of excessive wear. To replace, drive off of input shaft with suitable drift and hammer.

ASSEMBLY

NOTE: When servicing the input shaft assembly, all snap rings MUST be replaced with new ones upon assembly. 5th gear nut must also be replaced.

NOTE: When installing 3/4 synchronizer hub to shaft, make sure to align oil slots on synchronizer hub face with oil hole in the shaft splined hub journal.

NOTE: Refer to (Fig. 133) for input shaft assembly reference.

(1) Install input shaft into fixture 8487.
(2) Install thrust washer if removed upon disassembly.

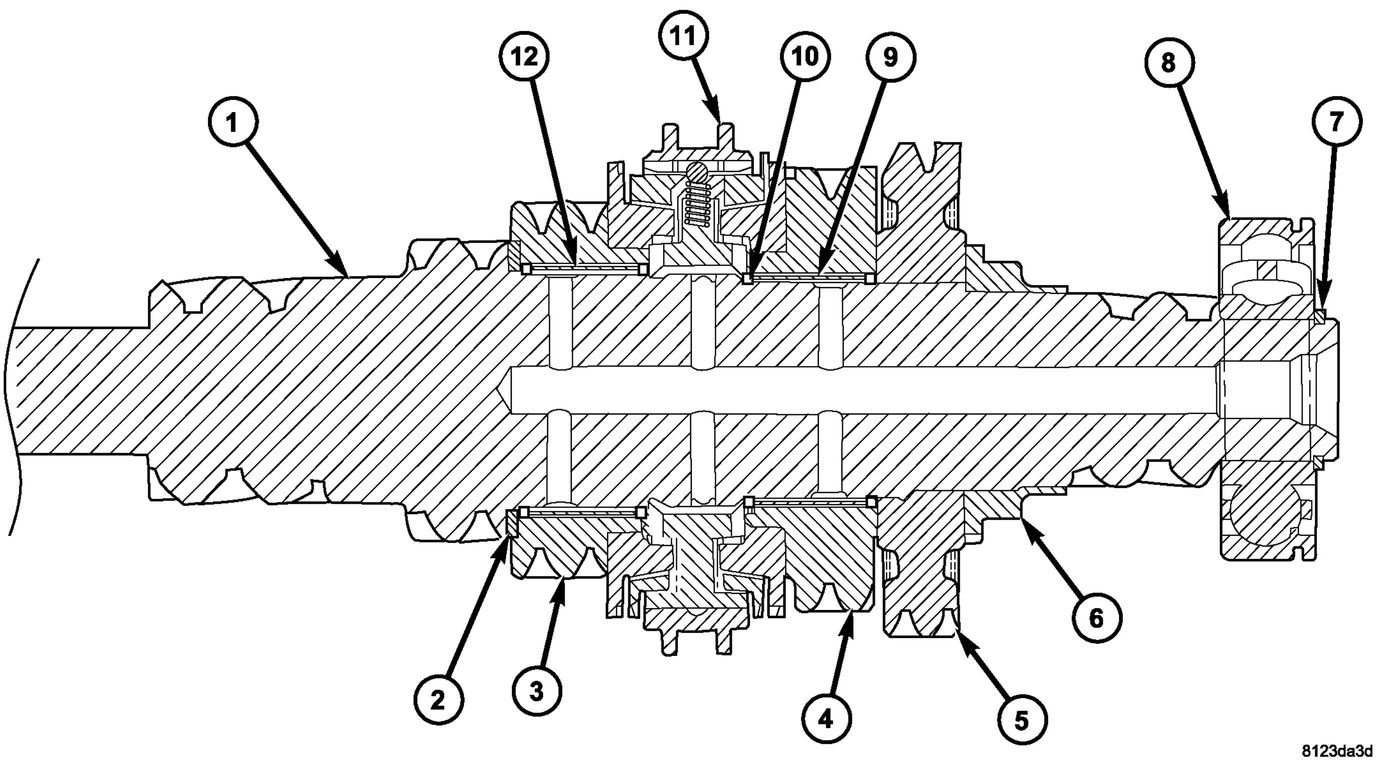


Fig. 133 Input Shaft Assembly

1 - INPUT SHAFT
2 - THRUST WASHER
3 - 3RD GEAR
4 - 4TH GEAR
5 - 5TH GEAR
6 - 5TH GEAR NUT
7 - SNAP RING
8 - INPUT BEARING (SEALED)
9 - NEEDLE BEARING
10 - SNAP RING
11 - 3/4 SYNCHRONIZER
12 - NEEDLE BEARING

INPUT SHAFT (Continued)

(3) Install 3rd gear and needle bearing (Fig. 134) (Fig. 135).

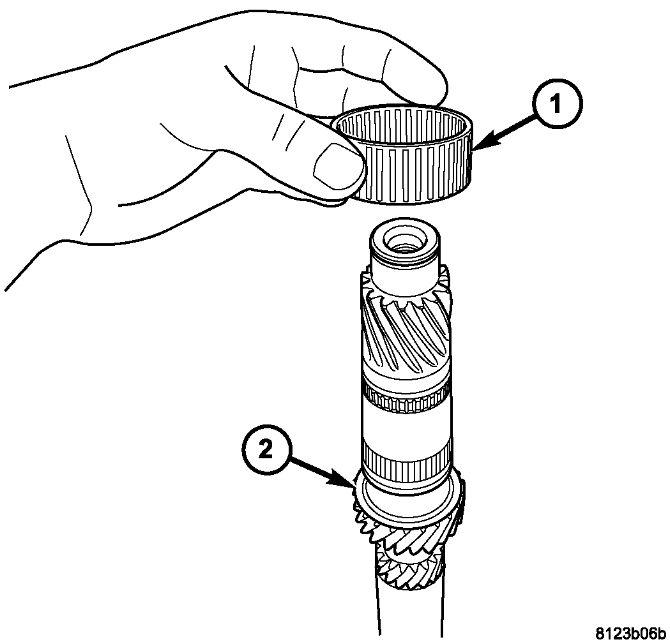


Fig. 134 3rd Gear Needle Bearing Removal/ Installation

1 - 3RD GEAR NEEDLE BEARING
2 - THRUST WASHER

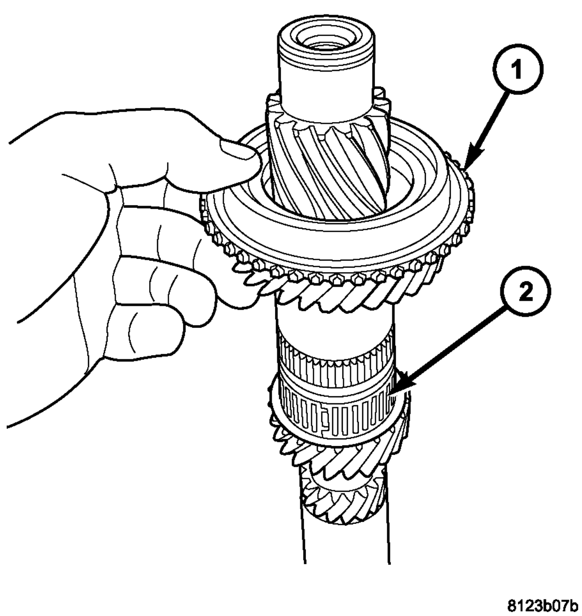


Fig. 135 3rd Gear Removal/Installation

1 - 3RD GEAR
2 - NEEDLE BEARING

(4) Install 3rd gear blocker ring (Fig. 136).

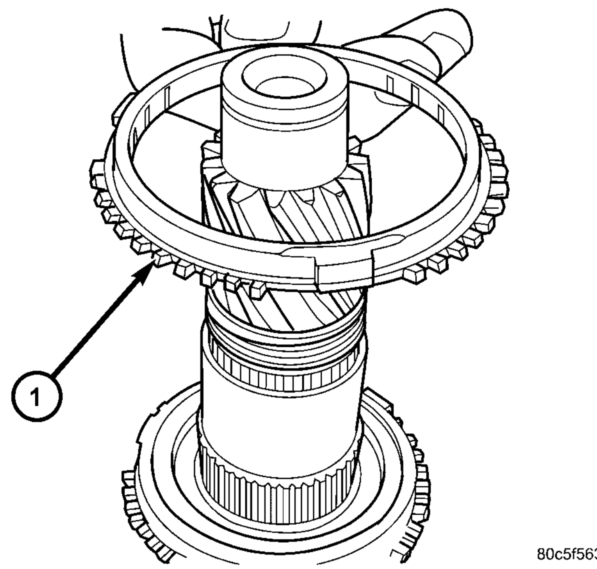


Fig. 136 3rd Gear Blocker Ring

1 - 3RD GEAR BLOCKER RING

(5) Install 3/4 synchronizer (Fig. 137). **When installing 3/4 synchronizer hub to shaft, make sure to align oil slots on synchronizer hub face with oil hole in the shaft splined hub journal.**

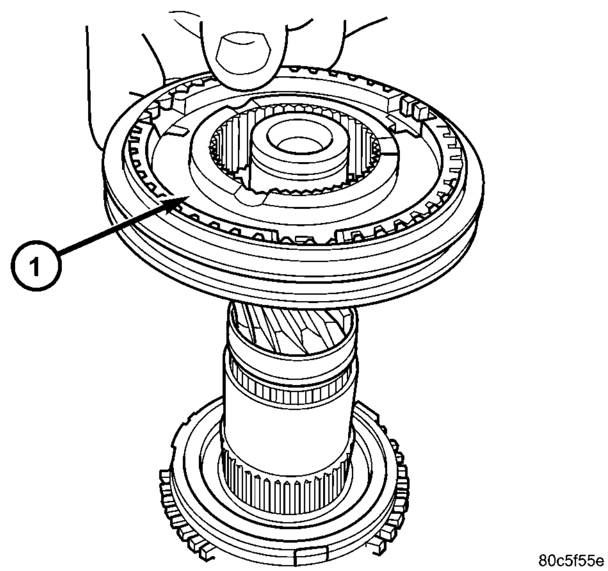


Fig. 137 3/4 Synchro Assembly

1 - 3/4 SYNCHRONIZER

INPUT SHAFT (Continued)

(6) Install **NEW** 3/4 synchronizer snap ring (Fig. 138).

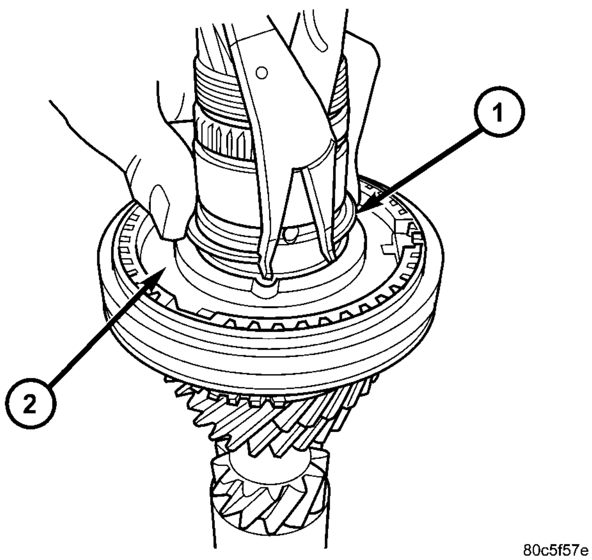


Fig. 138 3/4 Synchro Snap Ring

1 - SNAP RING
2 - 3/4 SYNCHRONIZER

(7) Install 4th gear blocker ring (Fig. 139).

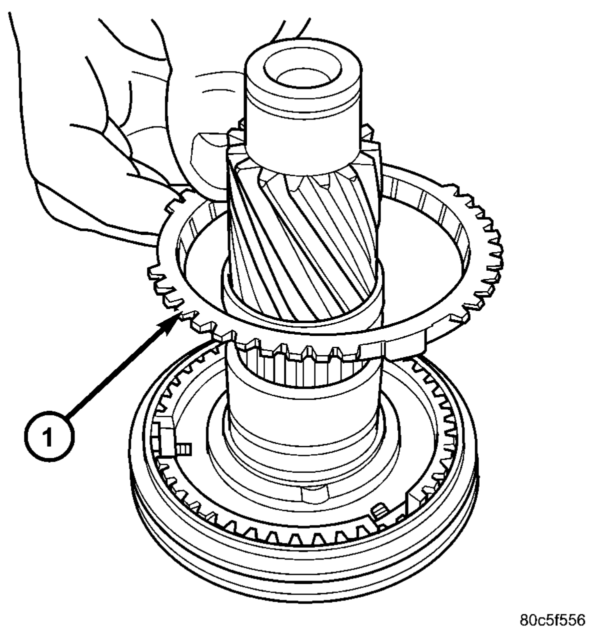


Fig. 139 4th Gear Blocker Ring

1 - 4th GEAR BLOCKER RING

(8) Install 4th gear and needle bearing (Fig. 140) (Fig. 141).

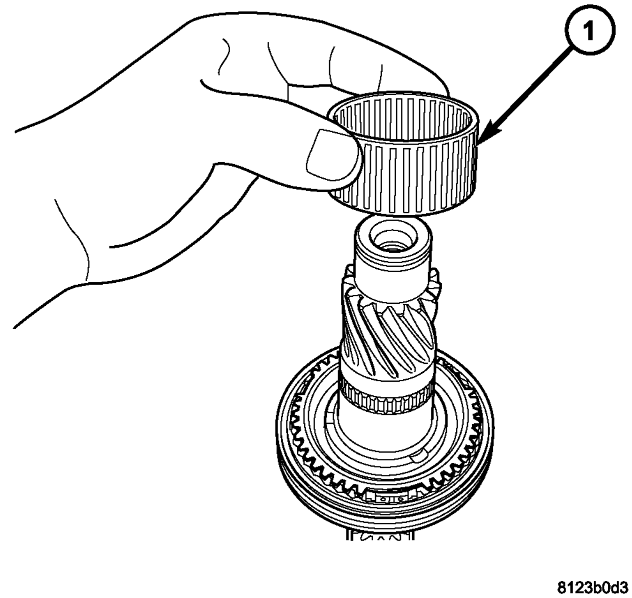


Fig. 140 4th Gear Needle Bearing Removal/ Installation

1 - 4TH GEAR NEEDLE BEARING

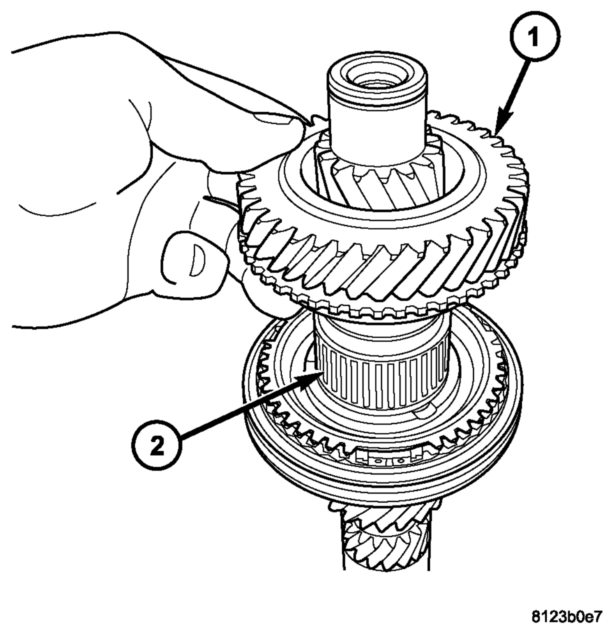


Fig. 141 4th Gear Removal/Installation

1 - 4TH GEAR
2 - NEEDLE BEARING

INPUT SHAFT (Continued)

(9) Install 5th gear and press into position using installer 8481 (Fig. 142).

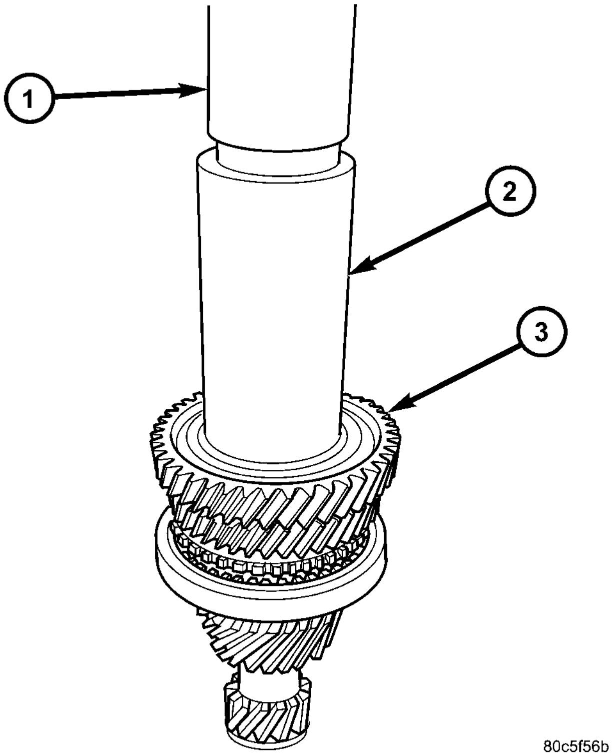


Fig. 142 5th Gear Installation

1 - ARBOR PRESS RAM
2 - INSTALLER 8481
3 - 5TH GEAR

(10) Install **NEW** 5th gear nut and torque to 262 N·m (193 ft. lbs.) using wrench 8478 (Fig. 143).

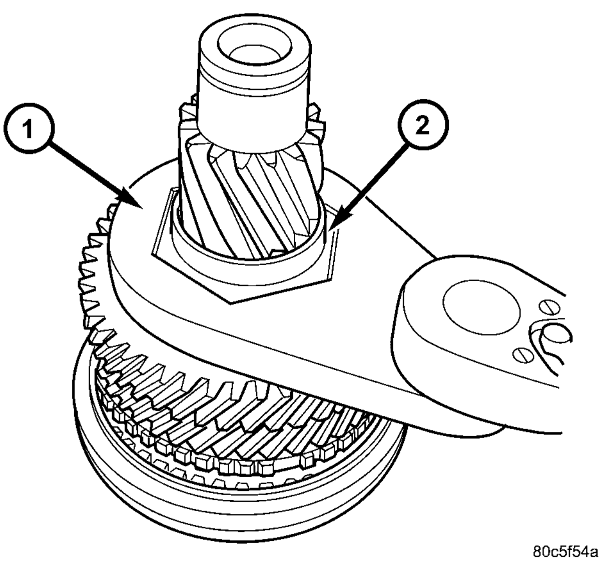


Fig. 143 5th Gear Nut Removal/Installation

1 - WRENCH 8478
2 - 5TH GEAR NUT

(11) Stake 5th Gear nut in four (4) places as follows:

(a) Install staking tool 8479 to 5th gear nut.

(b) Tighten upper thumb screw by hand (Fig. 144).

(c) Tighten two (2) side thumb screws by hand.

(d) Tighten both staking screws until they bottom on tool body (Fig. 145).

(e) Loosen staking screws and thumb screws. Remove tool and visually inspect stake (Fig. 146).

(f) Remove tool, rotate 90°, and repeat process to stake in four (4) places.

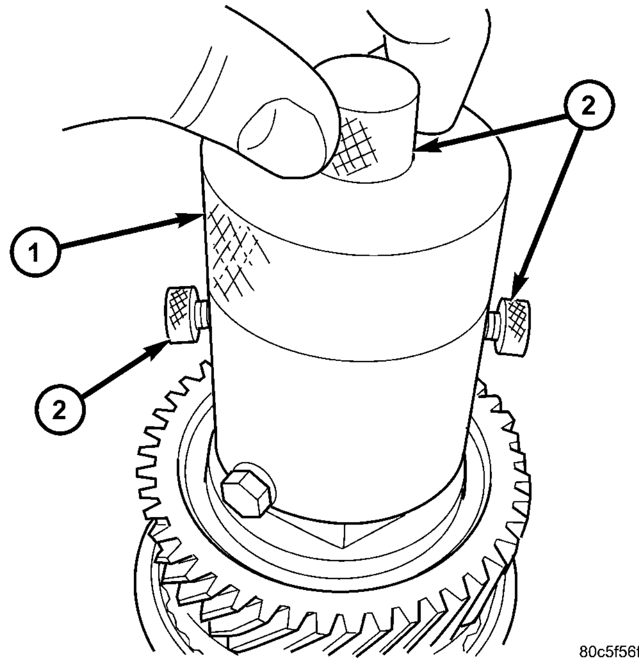


Fig. 144 Staking Tool Set-Up

1 - STAKING TOOL 8479
2 - THUMB SCREWS (3)

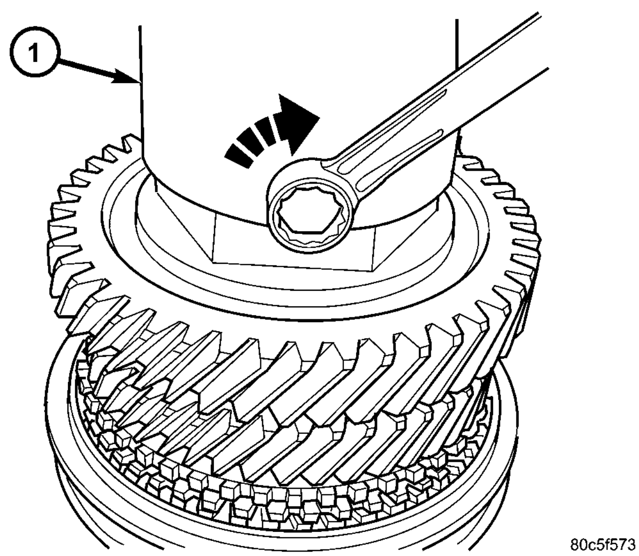


Fig. 145 Tighten Stake Screws

1 - STAKING TOOL 8479

INPUT SHAFT (Continued)

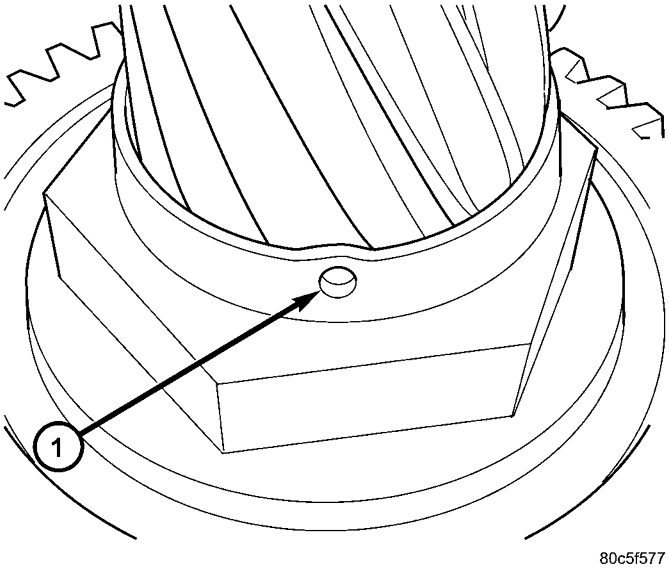


Fig. 146 5th Gear Nut Stake (Four Places)

1 - STAKE

NOTE: The input shaft sealed roller bearing and snap ring do not get installed until transaxle assembly to facilitate installation of the reverse idler gear mechanism.

INTERMEDIATE SHAFT

DESCRIPTION

The intermediate shaft assembly (Fig. 147) is part of the transaxle geartrain, meshes with and is driven by the input shaft, drives the differential via an integrated pinion gear, and consists of the following components:

- Intermediate Mainshaft
- 1st Speed Gear
- 2nd Speed Gear
- 3/4 Cluster Gear
- 5th Speed Gear
- Reverse Gear
- 1/2 Synchronizer
- 5/R Synchronizer

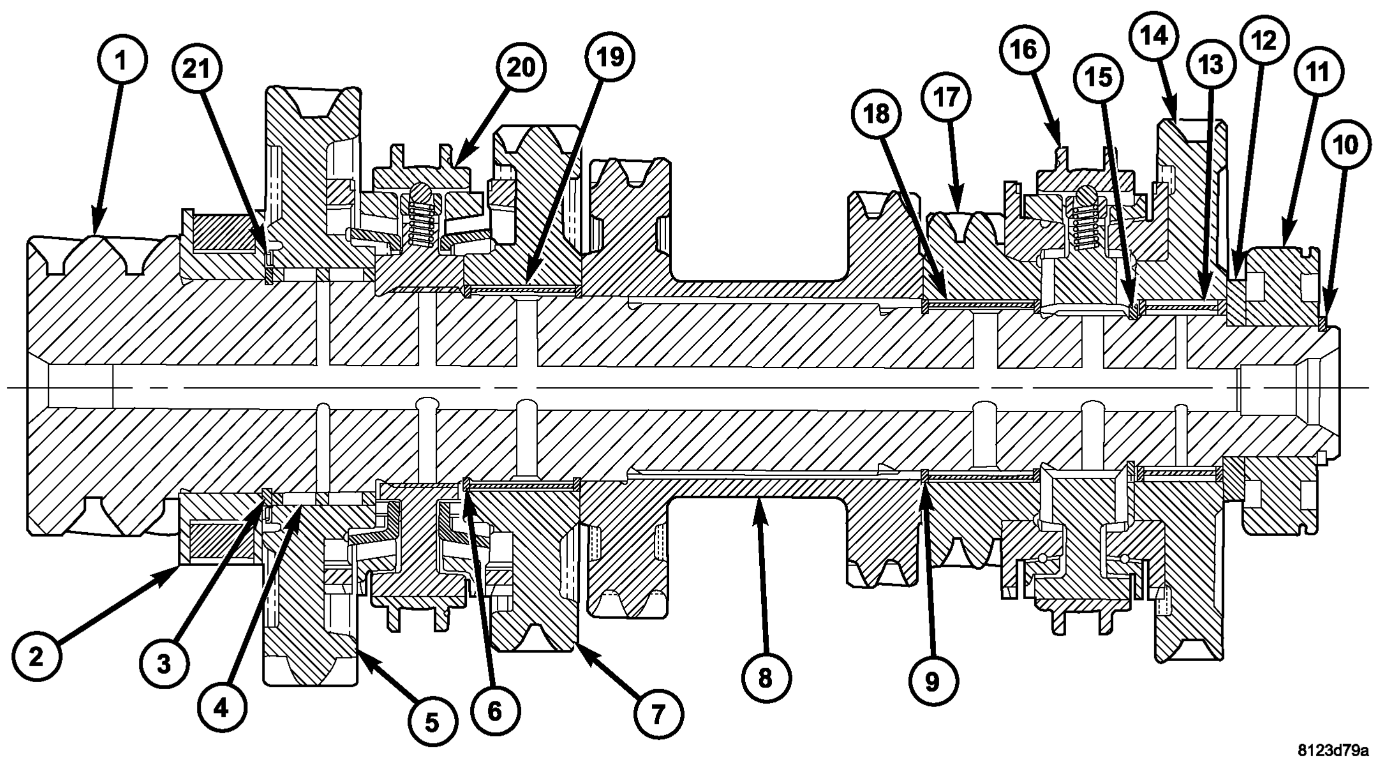


Fig. 147 Intermediate Shaft Assembly

1 - INTERMEDIATE SHAFT
2 - ROLLER BEARING
3 - SNAP RING
4 - NEEDLE BEARING
5 - 1ST SPEED GEAR
6 - SNAP RING
7 - 2ND SPEED GEAR
8 - 3/4 CLUSTER GEAR
9 - SNAP RING
10 - SNAP RING
11 - SEALED ROLLER BEARING
12 - THRUST WASHER
13 - NEEDLE BEARING
14 - REVERSE GEAR
15 - SNAP RING
16 - 5/R SYNCHRO
17 - 5TH SPEED GEAR
18 - NEEDLE BEARING
19 - NEEDLE BEARING
20 - 1/2 SYNCHRO
21 - THRUST BEARING

INTERMEDIATE SHAFT (Continued)

The intermediate shaft is supported by a caged roller bearing at the front of the transaxle, and a sealed roller bearing at the rear of the transaxle.

DISASSEMBLY

CAUTION: Do not re-use snap rings when servicing the intermediate shaft assembly. Discard upon disassembly and install new ones provided with available snap ring service kit.

(1) Install intermediate shaft assembly to arbor press table with bearing splitter P-334 under the reverse gear.

(2) Install 8486-4 button to intermediate shaft. Using arbor press ram, press reverse gear and intermediate roller bearing off of shaft, while holding remaining assembly with hand (Fig. 148).

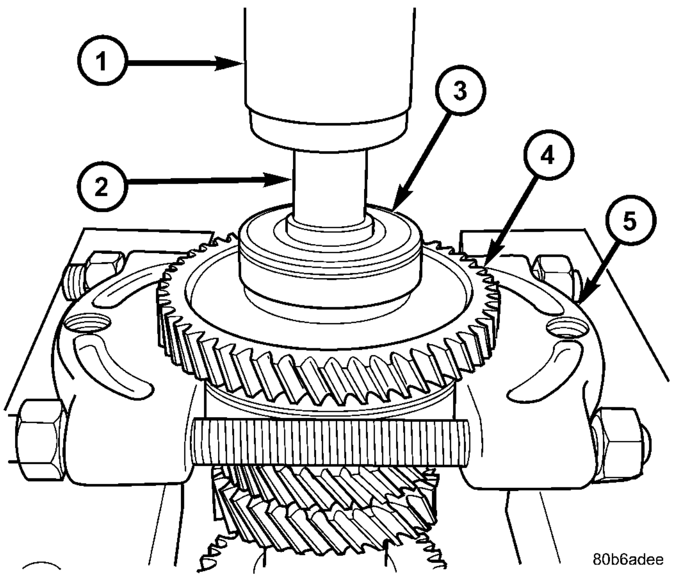


Fig. 148 Bearing and Reverse Gear Removal

1 - ARBOR PRESS RAM
2 - ADAPTER
3 - SEALED ROLLER BEARING
4 - REVERSE GEAR
5 - BEARING SPLITTER P-334

(3) Remove reverse gear blocker ring.

(4) Remove reverse gear needle bearing (Fig. 149).

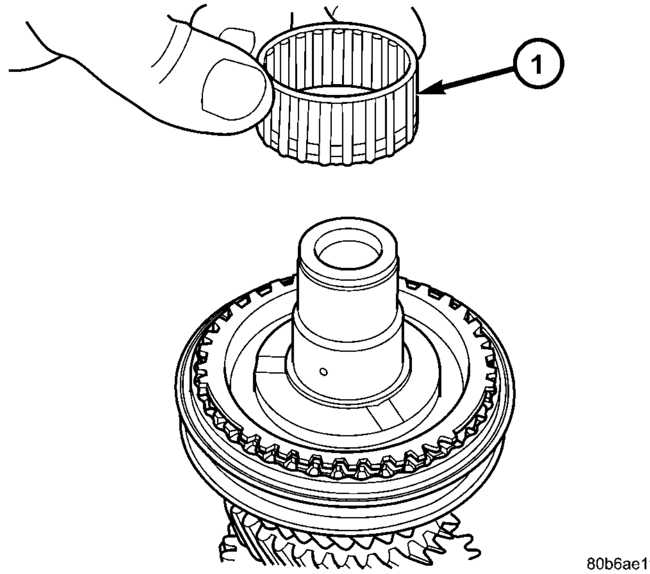


Fig. 149 Reverse Gear Needle Bearing

1 - NEEDLE BEARING

(5) Remove 5/R synchro snap ring (Fig. 150).

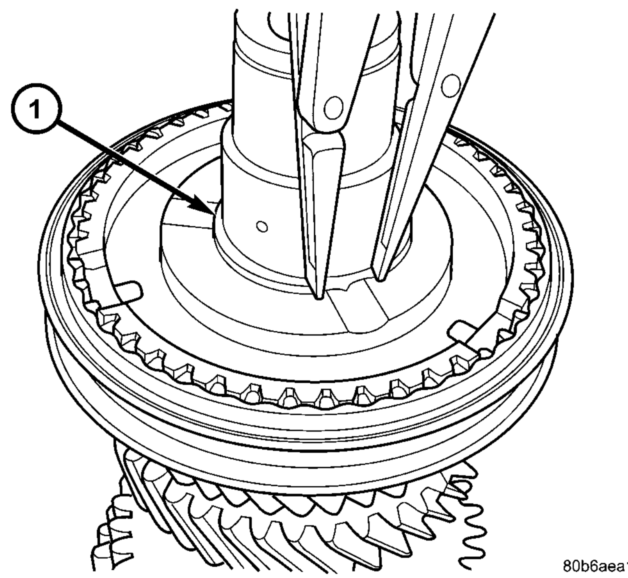


Fig. 150 5/R Synchro Snap Ring

1 - SNAP RING

INTERMEDIATE SHAFT (Continued)

(6) Remove 5/R synchro (Fig. 151).

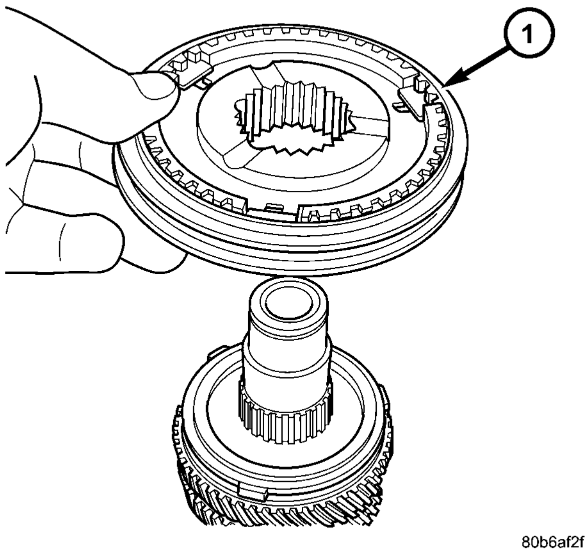


Fig. 151 5/R Synchronizer

1 - 5/R SYNCHRO ASSEMBLY

(7) Remove 5th gear blocker ring (Fig. 152).

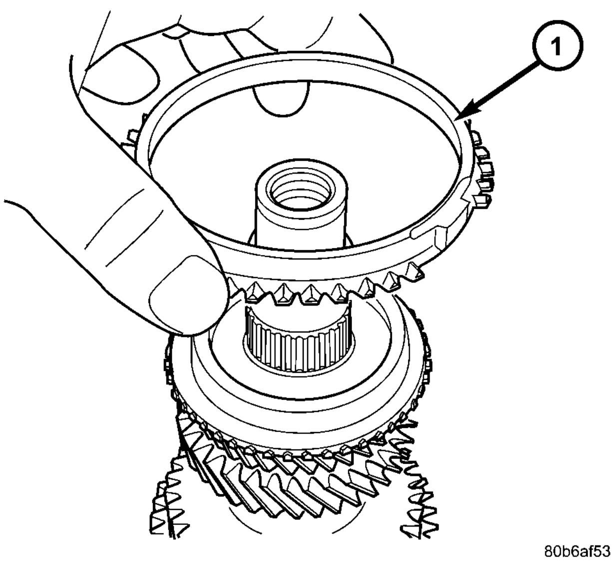


Fig. 152 5th Gear Blocker Ring

1 - 5th GEAR BLOCKER RING

(8) Remove 5th gear and needle bearing (Fig. 153) (Fig. 154).

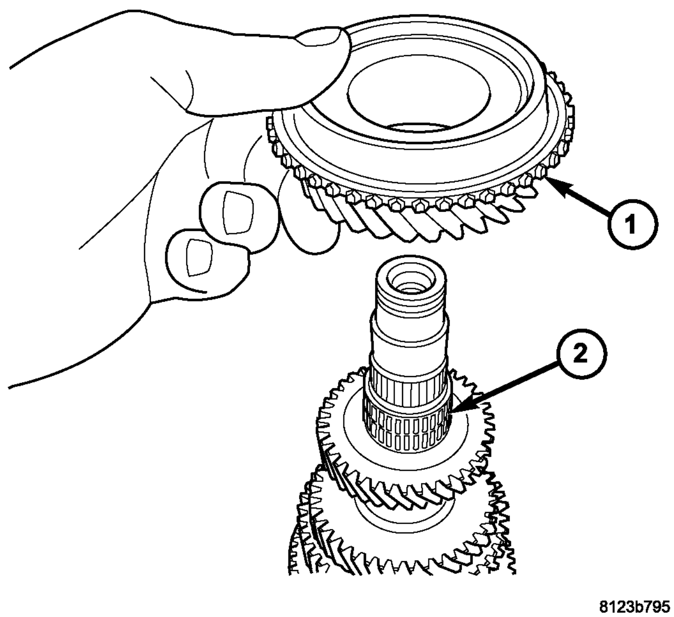


Fig. 153 5th Gear Removal/Installation

1 - 5TH GEAR
2 - NEEDLE BEARING

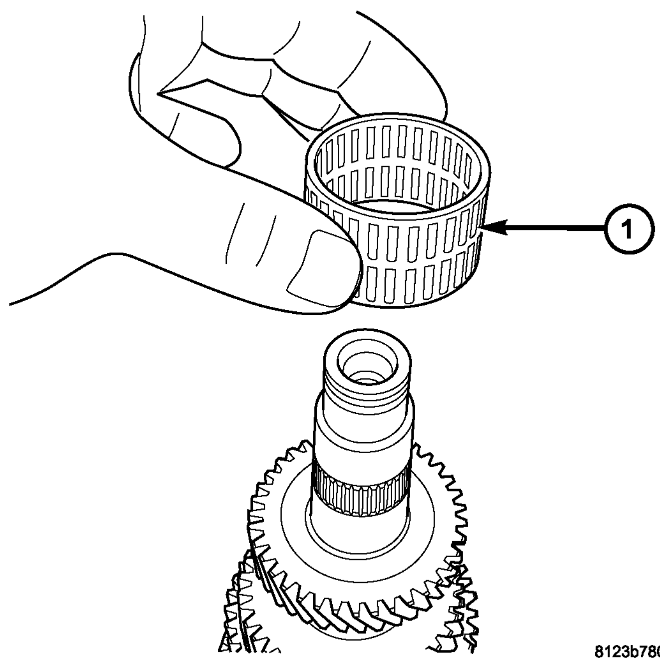


Fig. 154 5th Gear Needle Bearing Removal/ Installation

1 - 5TH GEAR NEEDLE BEARING

INTERMEDIATE SHAFT (Continued)

(9) Remove 3/4 cluster gear snap ring (Fig. 155).

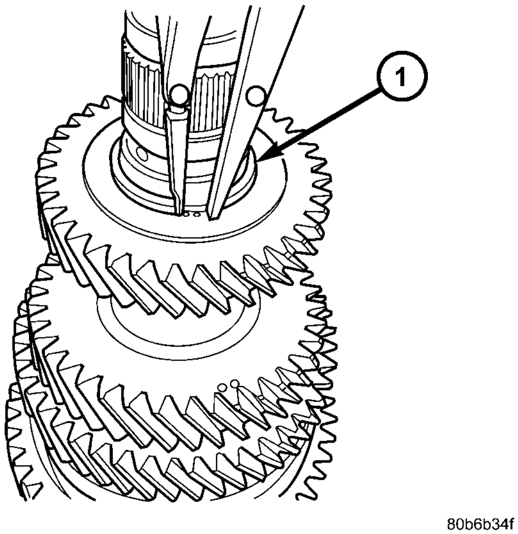


Fig. 155 3/4 Cluster Gear Snap Ring

1 - SNAP RING

(10) Install shaft assembly into fixture 8483, with split collar 8483-3 oriented chamfer side up (Fig. 156). Place 8483-2 into position with chamfer side up (Fig. 157).

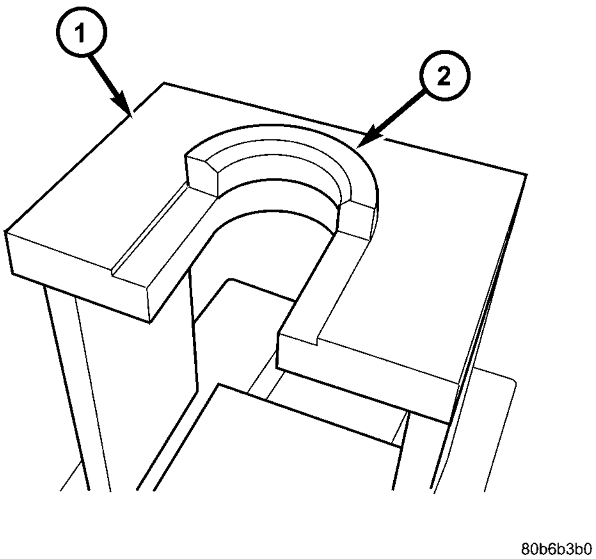


Fig. 156 Fixture 8483

1 - FIXTURE 8483
2 - COLLAR 8483-3

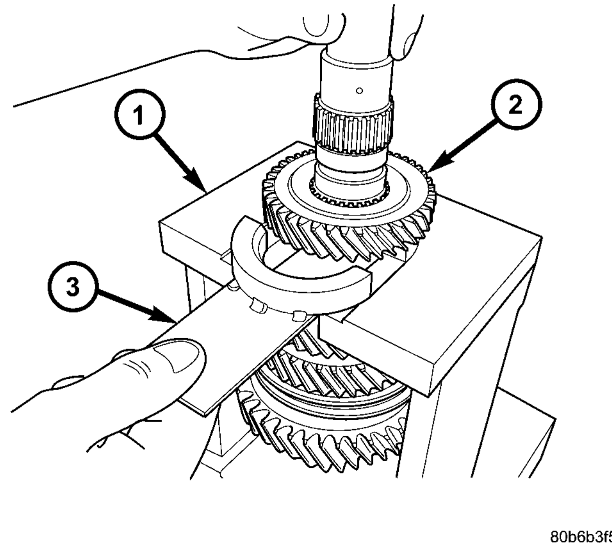


Fig. 157 Loading Intermediate Shaft

1 - FIXTURE 8483
2 - 3/4 CLUSTER GEAR
3 - COLLAR 8483-2

(11) Using an arbor press, press intermediate shaft out of 3/4 cluster gear (Fig. 158).

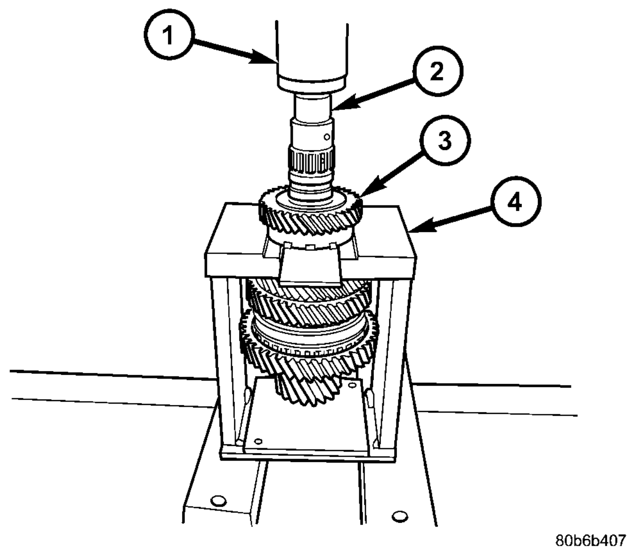


Fig. 158 Press Intermediate Shaft Out of 3/4 Cluster Gear

1 - ARBOR PRESS RAM
2 - INTERMEDIATE SHAFT
3 - 3/4 CLUSTER GEAR
4 - FIXTURE 8483

INTERMEDIATE SHAFT (Continued)

(12) Remove intermediate shaft from fixture and remove 3/4 cluster gear from shaft (Fig. 159).

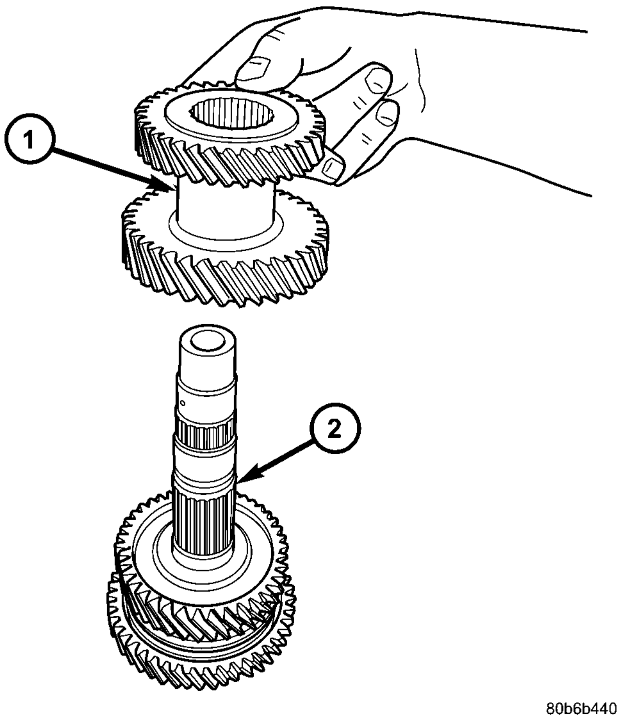


Fig. 159 3/4 Cluster Gear

1 - 3/4 CLUSTER GEAR
2 - INTERMEDIATE SHAFT

(13) Remove 2nd gear and needle bearing (Fig. 160) (Fig. 161).

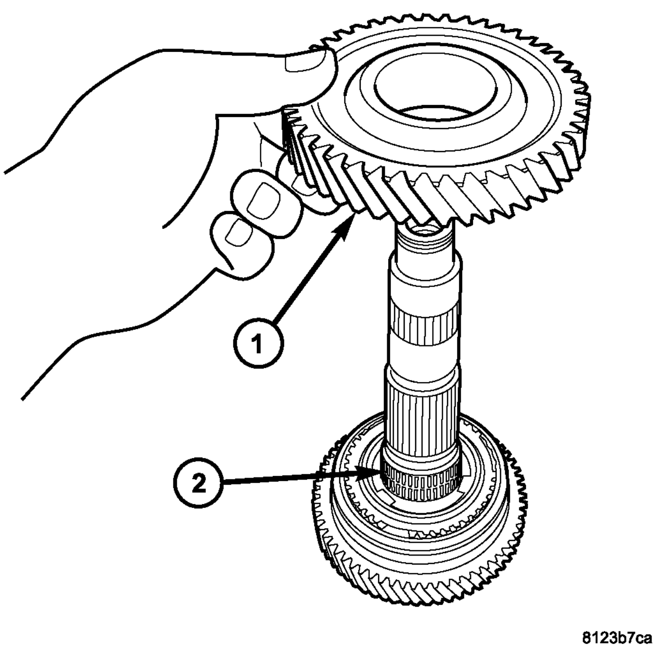


Fig. 160 2nd Gear Removal/Installation

1 - 2ND GEAR
2 - NEEDLE BEARING

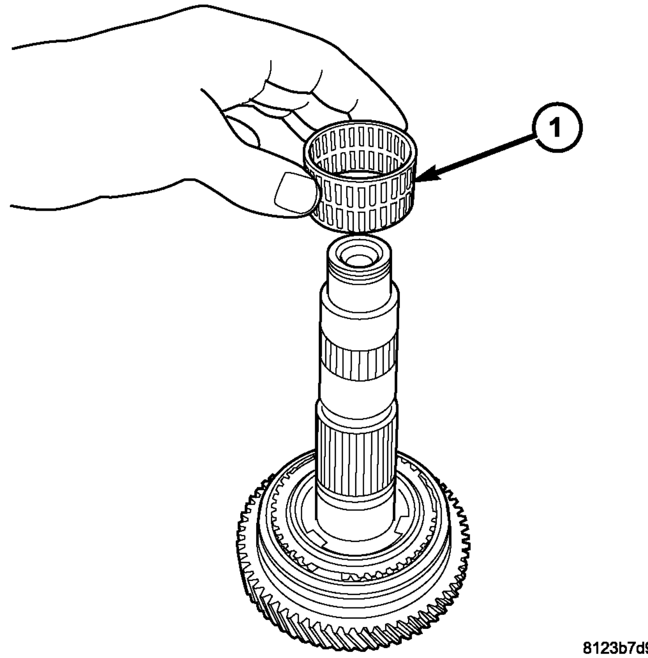


Fig. 161 2nd Gear Needle Bearing Removal/ Installation

1 - NEEDLE BEARING

(14) Remove 2nd gear reactor ring (Fig. 162).

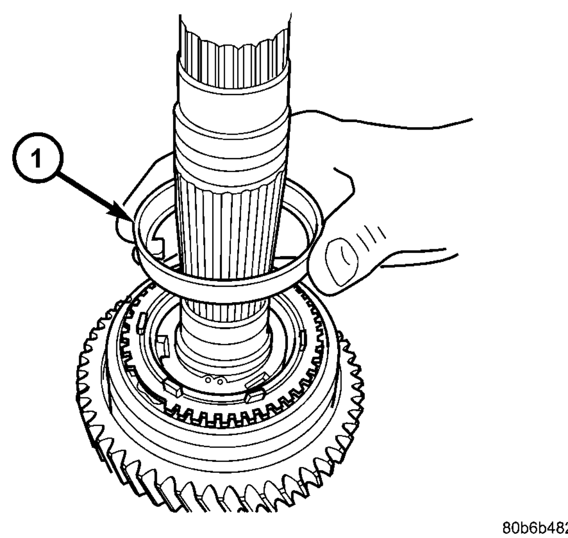


Fig. 162 2nd Gear Reactor Ring

1 - 2ND GEAR REACTOR RING

INTERMEDIATE SHAFT (Continued)

(15) Remove 2nd gear friction cone (Fig. 163).

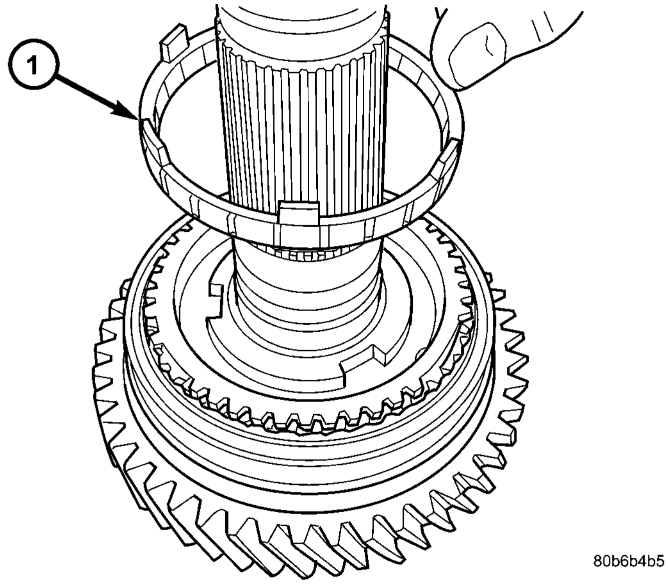


Fig. 163 2nd Gear Friction Cone

1 - 2ND GEAR FRICTION CONE

(16) Remove 2nd Gear outer blocker ring (Fig. 164).

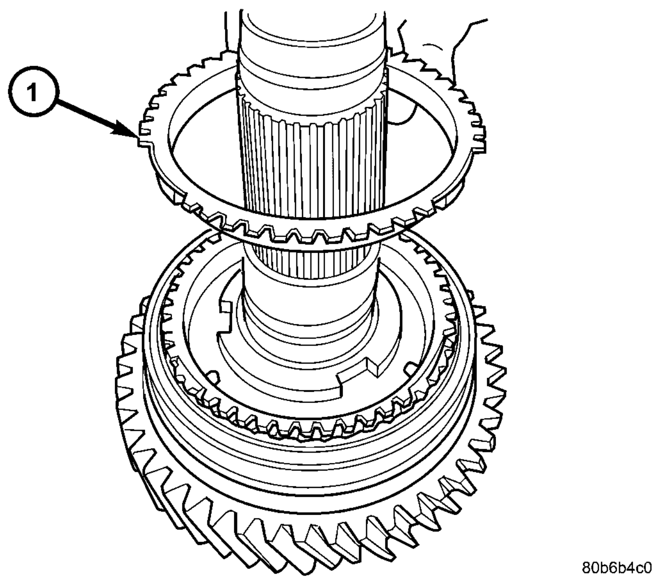


Fig. 164 2nd Gear Outer Blocker Ring

1 - 2ND GEAR BLOCKER RING

(17) Remove 1/2 synchro snap ring (Fig. 165).

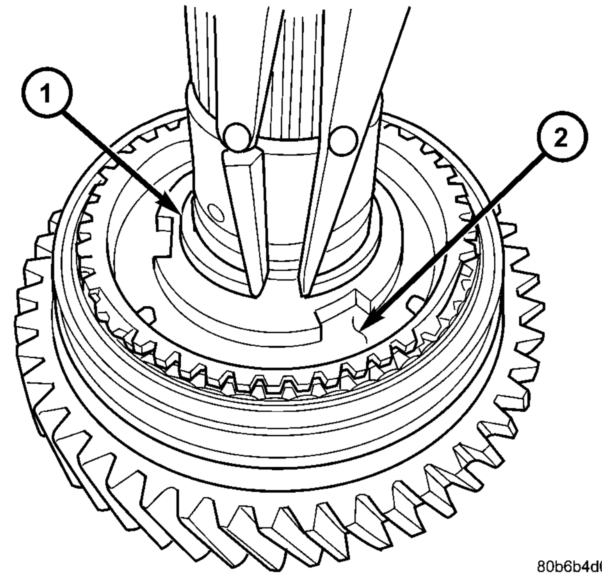


Fig. 165 1/2 Synchro Snap Ring

1 - SNAP RING
2 - 1/2 SYNCHRO HUB

(18) Remove 1/2 synchro from shaft (Fig. 166).

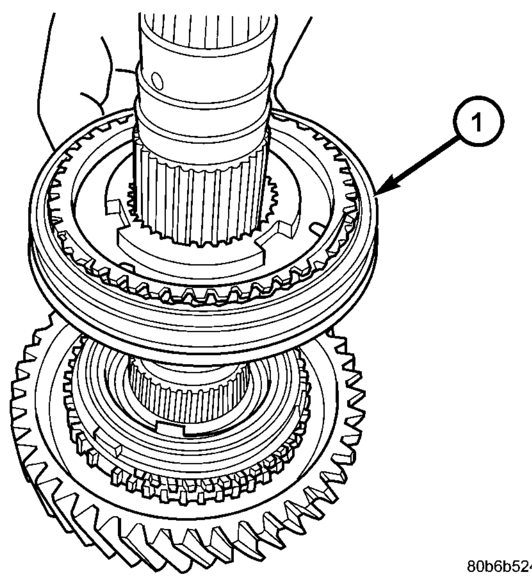


Fig. 166 1/2 Synchronizer

1 - 1/2 SYNCHRONIZER

INTERMEDIATE SHAFT (Continued)

(19) Remove 1st gear blocker ring (Fig. 167).

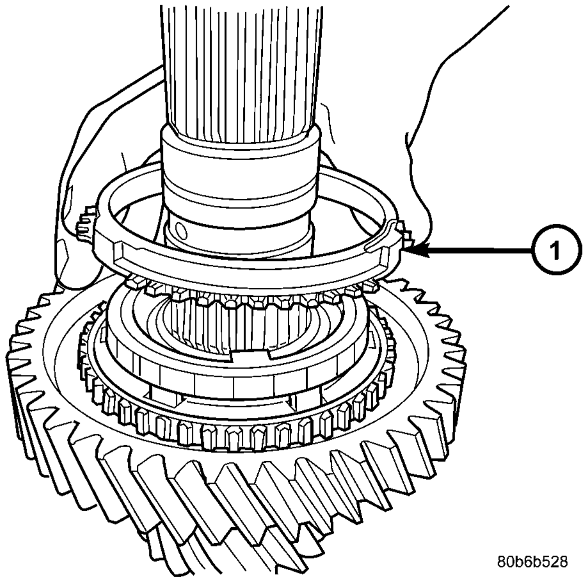


Fig. 167 1st Gear Blocker Ring

1 - 1ST GEAR BLOCKER RING

(20) Remove 1st gear friction cone (Fig. 168).

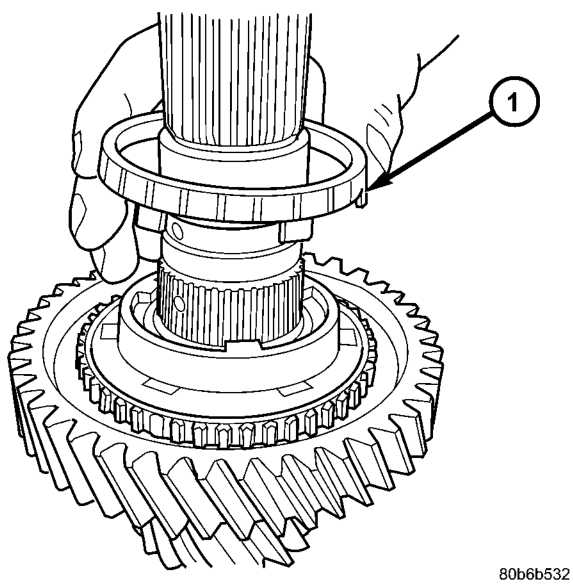


Fig. 168 1st Gear Friction Cone

1 - 1ST GEAR FRICTION CONE

(21) Remove 1st gear reactor ring (Fig. 169).

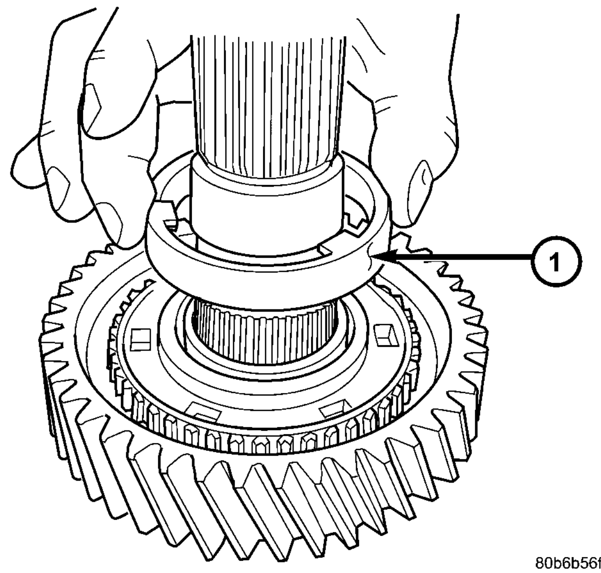


Fig. 169 1st Gear Reactor Ring

1 - 1ST GEAR REACTOR RING

(22) Remove 1st gear from shaft (Fig. 170).

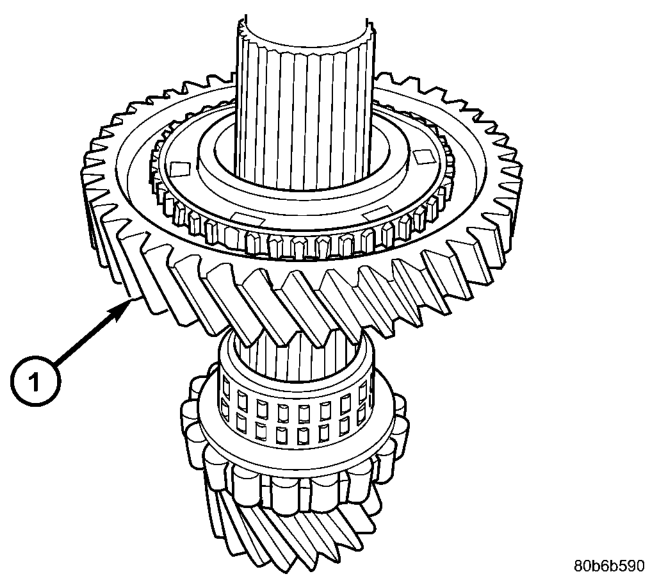


Fig. 170 1st Gear Removal

1 - 1ST GEAR

INTERMEDIATE SHAFT (Continued)

(23) Remove 1st gear needle bearing (Fig. 171).

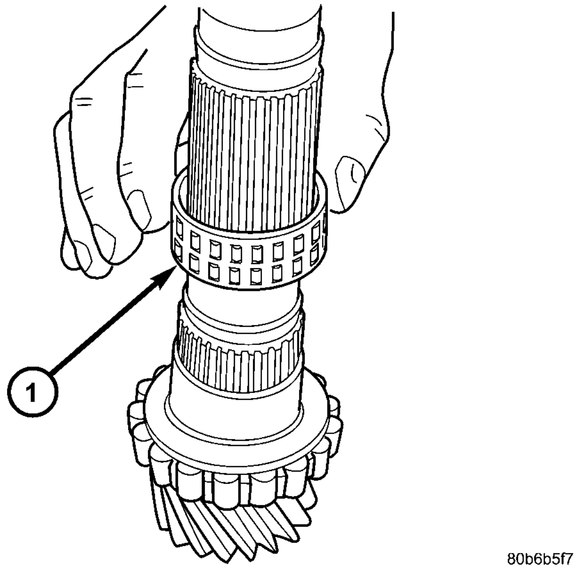


Fig. 171 1st Gear Needle Bearing

1 - 1ST GEAR NEEDLE BEARING

(24) Remove first gear thrust bearing (Fig. 172).

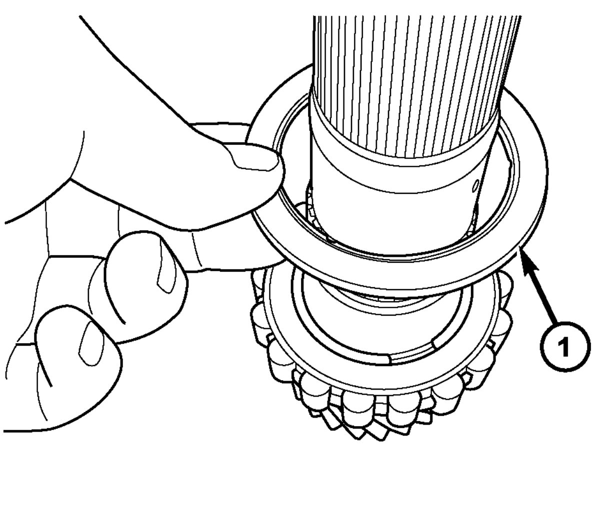


Fig. 172 1st Gear Thrust Bearing Removal/ Installation

1 - THRUST BEARING

(25) Remove intermediate shaft roller bearing snap ring (Fig. 173).

(26) Press intermediate shaft out of roller bearing supported by bearing splitter P-334 (Fig. 174). **Roller bearing is not re-usable once removed. It is necessary to install a new roller bearing upon re-assembly.**

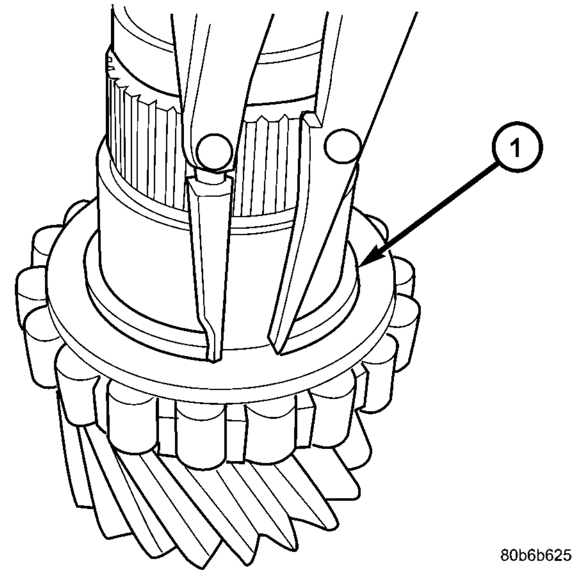


Fig. 173 Intermediate Shaft Roller Bearing Snap Ring

1 - SNAP RING

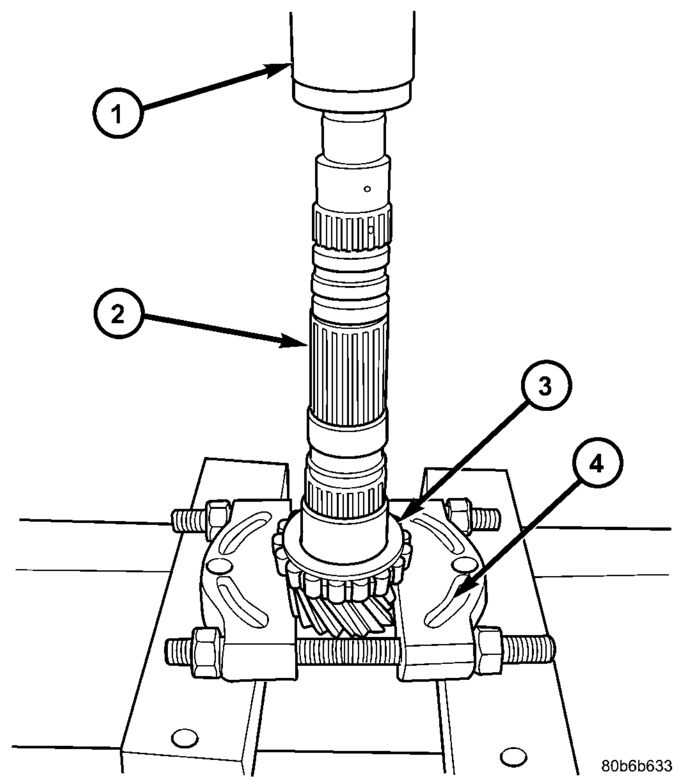


Fig. 174 Intermediate Shaft Roller Bearing Removal

1 - ARBOR PRESS RAM
2 - INTERMEDIATE SHAFT
3 - ROLLER BEARING
4 - BEARING SPLITTER P-334

INTERMEDIATE SHAFT (Continued)

ASSEMBLY

NOTE: Do not re-use snap rings when servicing the intermediate shaft assembly. Discard snap rings and install new ones provided with available snap ring service kit.

NOTE: When installing 1/2 & 5/R synchronizers, make sure to align oil slots on synchronizer hub face with oil hold in the shaft splined hub journal.

NOTE: Refer to (Fig. 175) for intermediate shaft assembly reference.

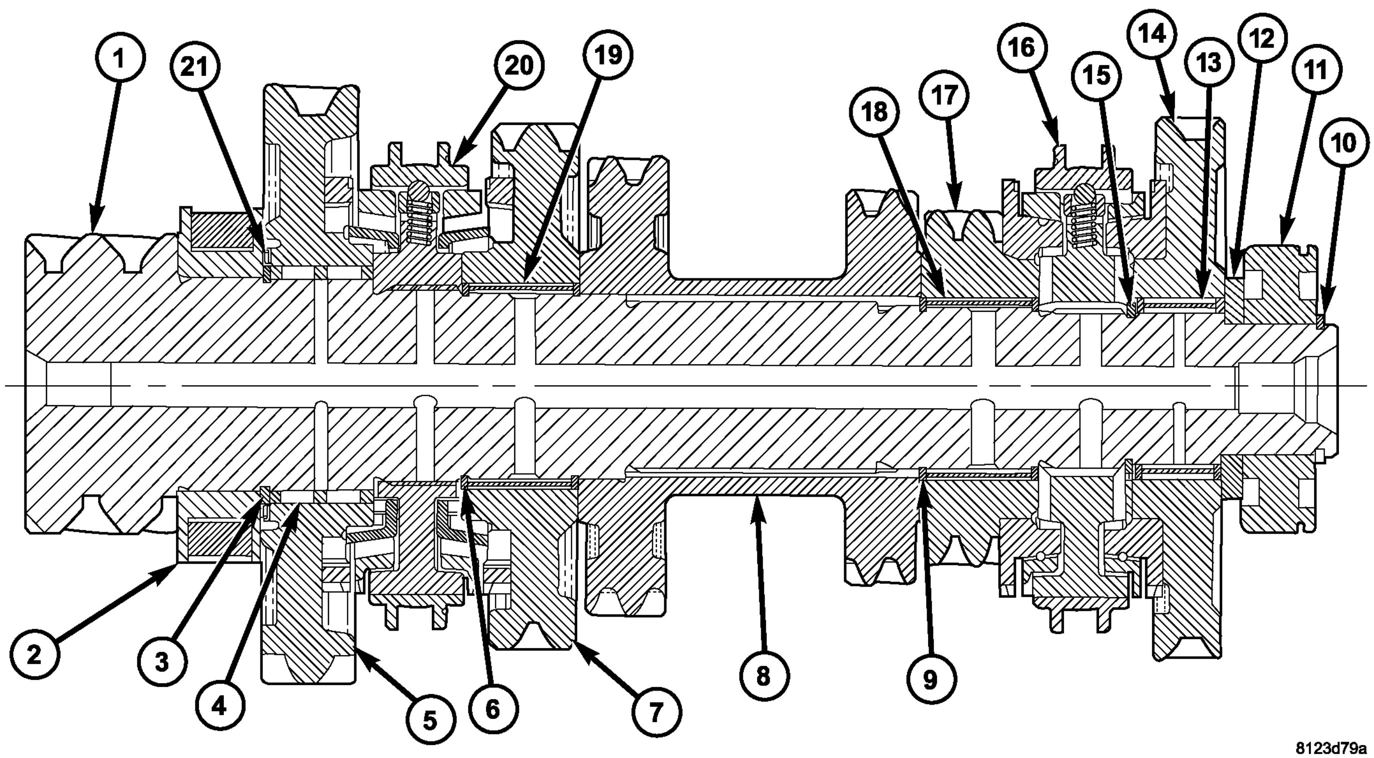


Fig. 175 Intermediate Shaft Assembly

1 - INTERMEDIATE SHAFT
2 - ROLLER BEARING
3 - SNAP RING
4 - NEEDLE BEARING
5 - 1ST SPEED GEAR
6 - SNAP RING
7 - 2ND SPEED GEAR
8 - 3/4 CLUSTER GEAR
9 - SNAP RING
10 - SNAP RING
11 - SEALED ROLLER BEARING
12 - THRUST WASHER
13 - NEEDLE BEARING
14 - REVERSE GEAR
15 - SNAP RING
16 - 5/R SYNCHRO
17 - 5TH SPEED GEAR
18 - NEEDLE BEARING
19 - NEEDLE BEARING
20 - 1/2 SYNCHRO
21 - THRUST BEARING

INTERMEDIATE SHAFT (Continued)

(1) Press intermediate shaft into NEW roller bearing with arbor press (Fig. 176).

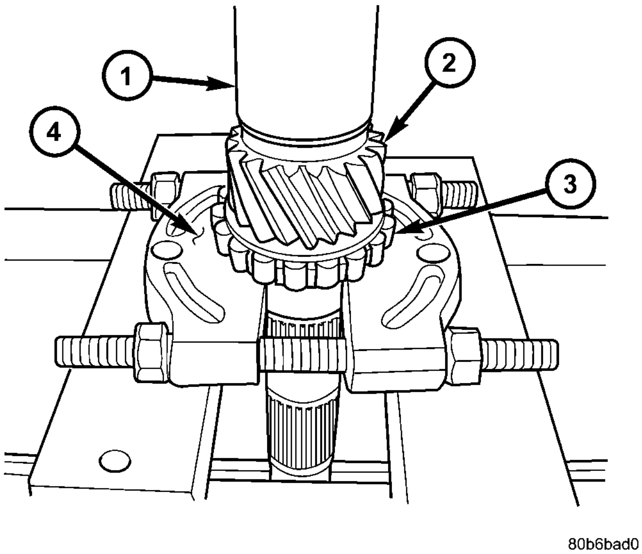


Fig. 176 Intermediate Shaft Bearing Installation

1 - ARBOR PRESS
2 - INTERMEDIATE SHAFT
3 - CAGED ROLLER BEARING
4 - BEARING SPLITTER

(2) Install intermediate shaft roller bearing snap ring (Fig. 177).

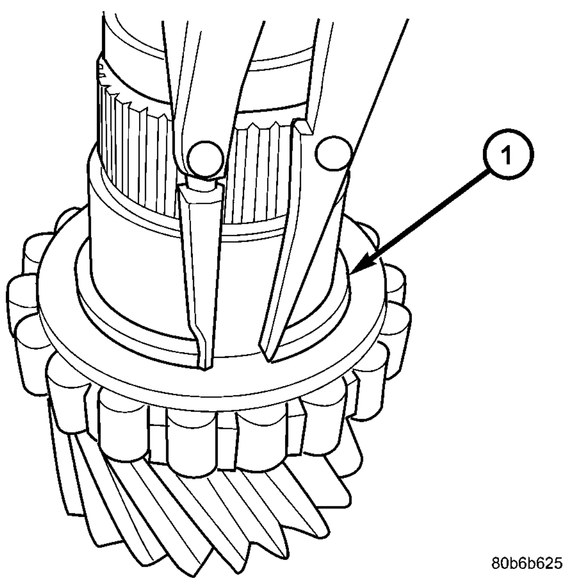


Fig. 177 Intermediate Shaft Roller Bearing Snap Ring

1 - SNAP RING

(3) Install 1st gear thrust bearing (Fig. 178).

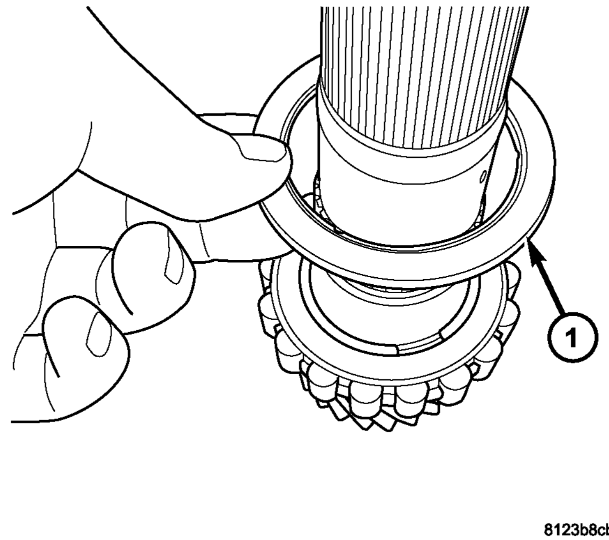


Fig. 178 1st Gear Thrust Bearing Removal/ Installation

1 - THRUST BEARING

(4) Install 1st gear needle bearing to intermediate shaft (Fig. 179).

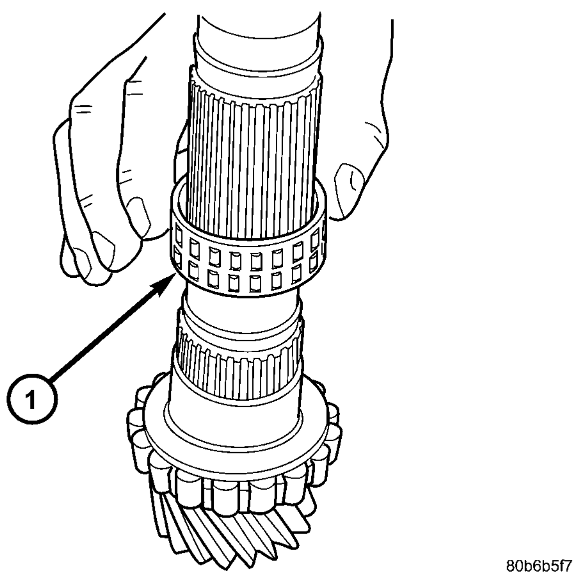


Fig. 179 1st Gear Needle Bearing

1 - 1ST GEAR NEEDLE BEARING

INTERMEDIATE SHAFT (Continued)

(5) Install 1st gear to intermediate shaft (Fig. 180).

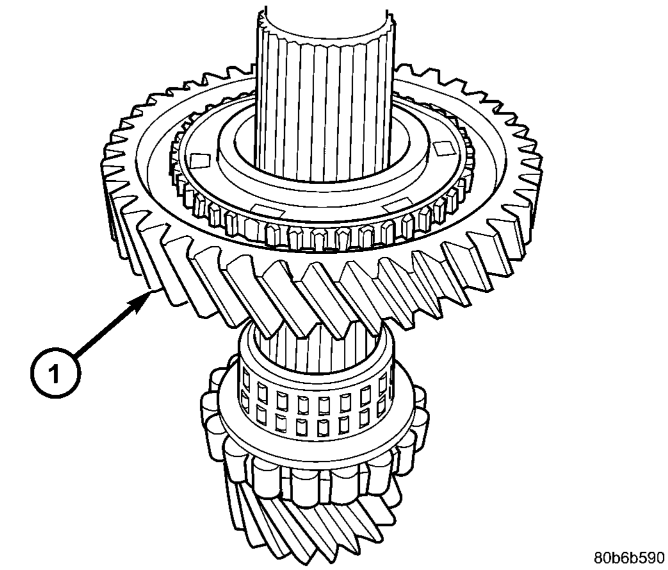


Fig. 180 1st Gear Installation

1 - 1ST GEAR

(6) Install 1/2 synchro to fixture 8483. Insert 1st gear blocker ring, friction cone, and reactor ring as shown in (Fig. 181).

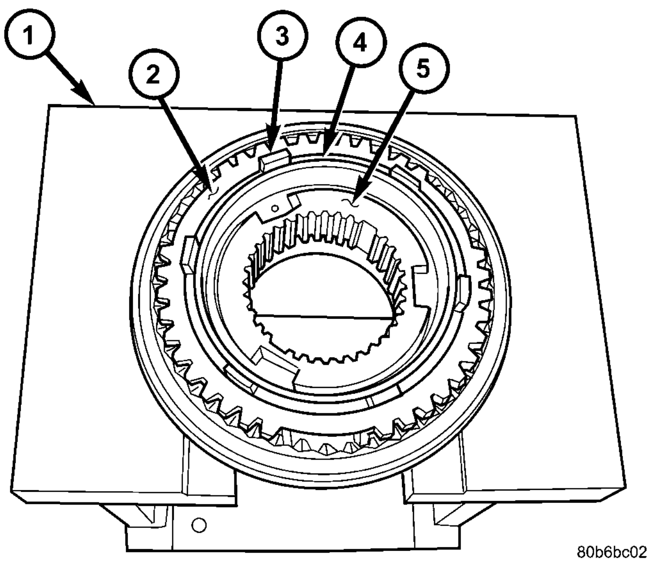


Fig. 181 1/2 Synchro on Fixture 8483

1 - FIXTURE 8483
2 - 1ST GEAR BLOCKER RING
3 - 1ST GEAR FRICTION CONE
4 - 1ST GEAR REACTOR RING
5 - 1/2 SYNCHRONIZER

(7) Install intermediate shaft to synchro assembly on fixture (Fig. 182). **When installing 1/2 synchronizer, make sure to align oil slots on synchronizer hub face with oil hole in the shaft splined hub journal.** Line up friction cone and reactor ring tabs to gear slots. Remove shaft assembly from fixture.

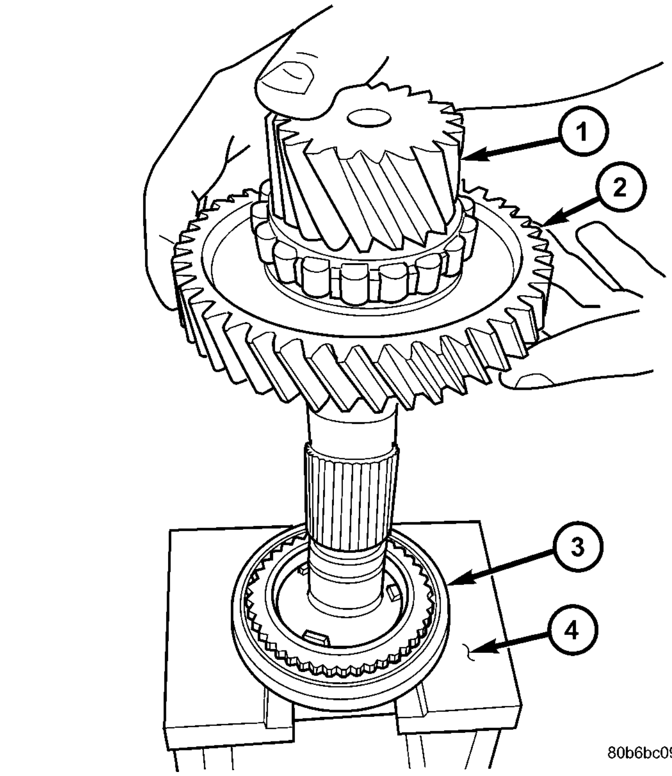


Fig. 182 Install 1/2 Synchro to Intermediate Shaft

1 - INTERMEDIATE SHAFT
2 - 1ST GEAR
3 - 1/2 SYNCHRO ASSEMBLY
4 - FIXTURE 8483

(8) Install **NEW** 1/2 synchro snap ring (Fig. 183).

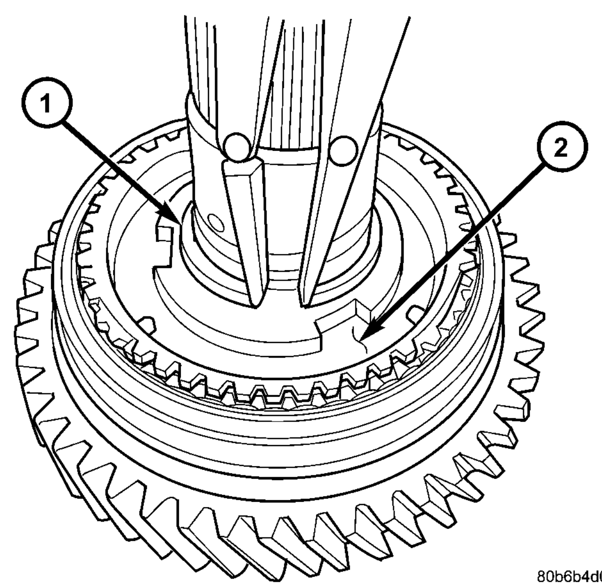


Fig. 183 1/2 Synchro Snap Ring

1 - SNAP RING
2 - 1/2 SYNCHRO HUB

INTERMEDIATE SHAFT (Continued)

(9) Install 2nd gear blocker ring (Fig. 184).

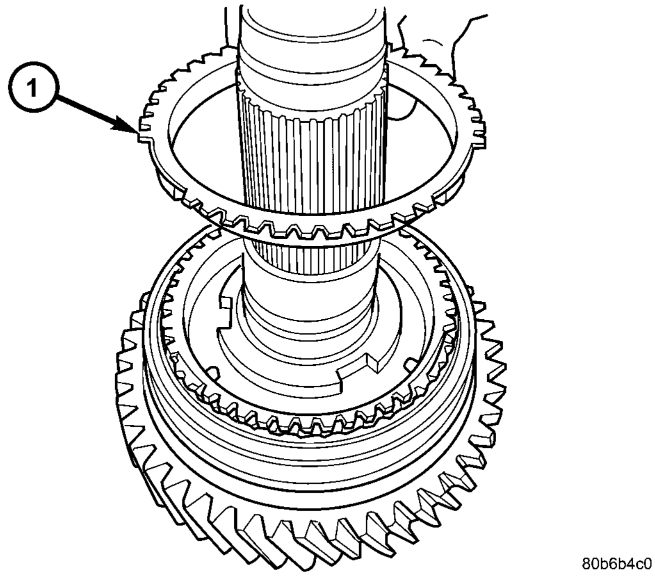


Fig. 184 2nd Gear Blocker Ring

1 - 2ND GEAR BLOCKER RING

(10) Install 2nd gear friction cone (Fig. 185).

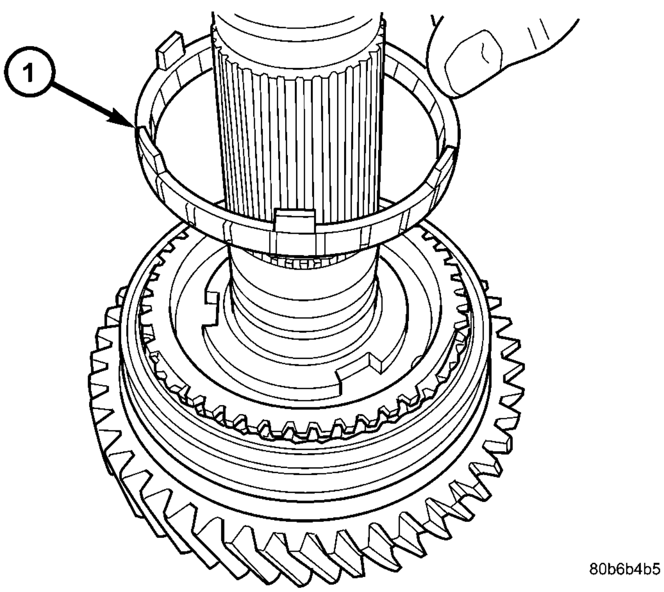


Fig. 185 2nd Gear Friction Cone

1 - 2ND GEAR FRICTION CONE

(11) Install 2nd gear reactor ring (Fig. 186).

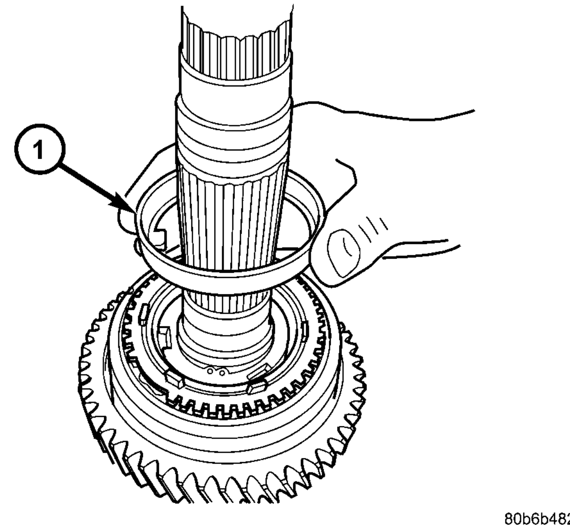


Fig. 186 2nd Gear Reactor Ring

1 - 2ND GEAR REACTOR RING

(12) Install 2nd gear and needle bearing to intermediate shaft (Fig. 187) (Fig. 188).

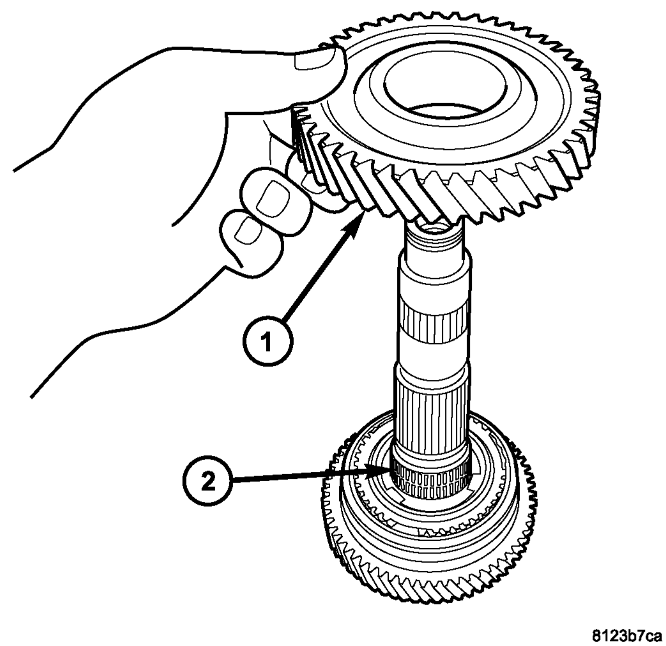


Fig. 187 2nd Gear Removal/Installation

1 - 2ND GEAR
2 - NEEDLE BEARING

INTERMEDIATE SHAFT (Continued)

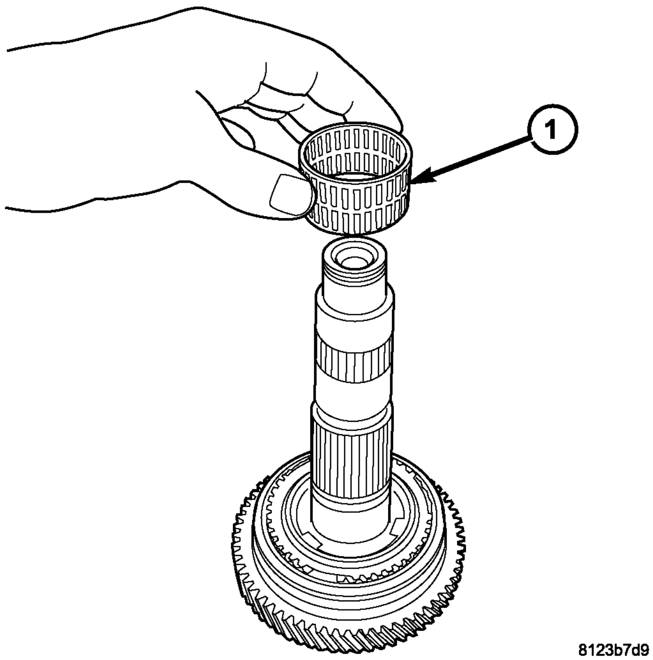


Fig. 188 2nd Gear Needle Bearing Removal/Installation

1 - NEEDLE BEARING

(13) Press 3/4 cluster gear onto intermediate shaft using cup 8481 (Fig. 189).

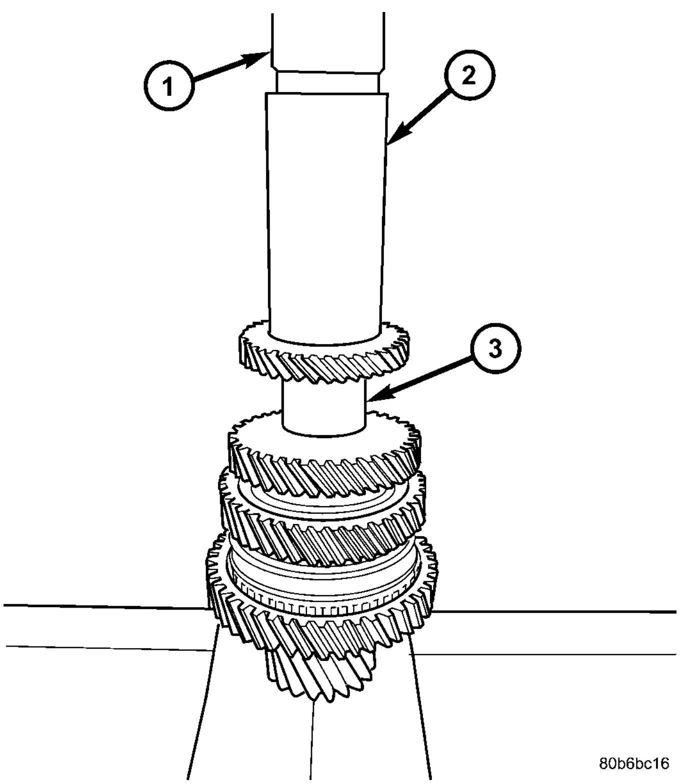


Fig. 189 Install 3/4 Cluster Gear using Tool 8481

1 - ARBOR PRESS
2 - INSTALLER 8481
3 - 3/4 CLUSTER GEAR

(14) Install **NEW** 3/4 cluster gear snap ring (Fig. 190).

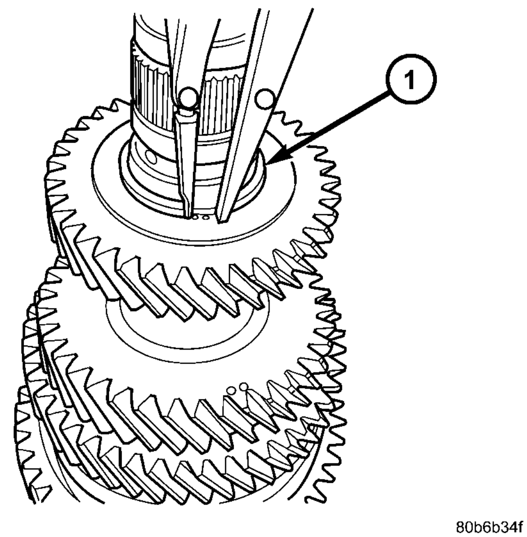


Fig. 190 3/4 Cluster Gear Snap Ring

1 - SNAP RING

(15) Install 5th gear and needle bearing to intermediate shaft (Fig. 191) (Fig. 192).

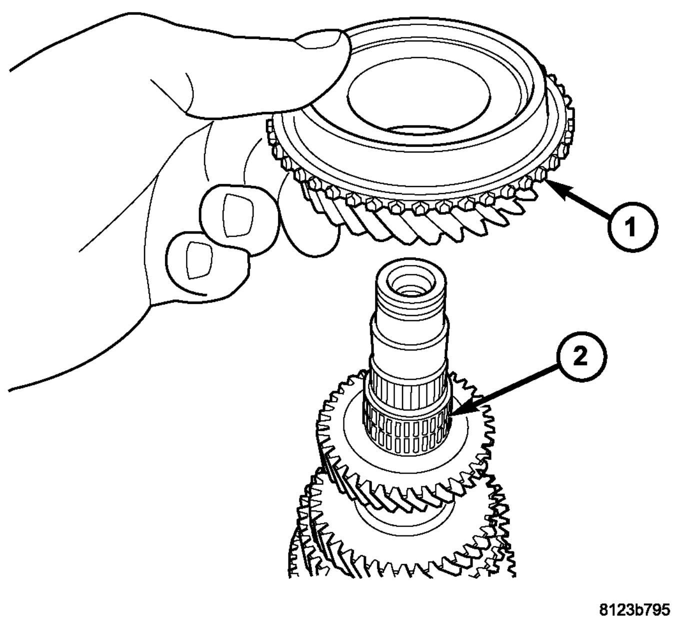


Fig. 191 5th Gear Removal/Installation

1 - 5TH GEAR
2 - NEEDLE BEARING

INTERMEDIATE SHAFT (Continued)

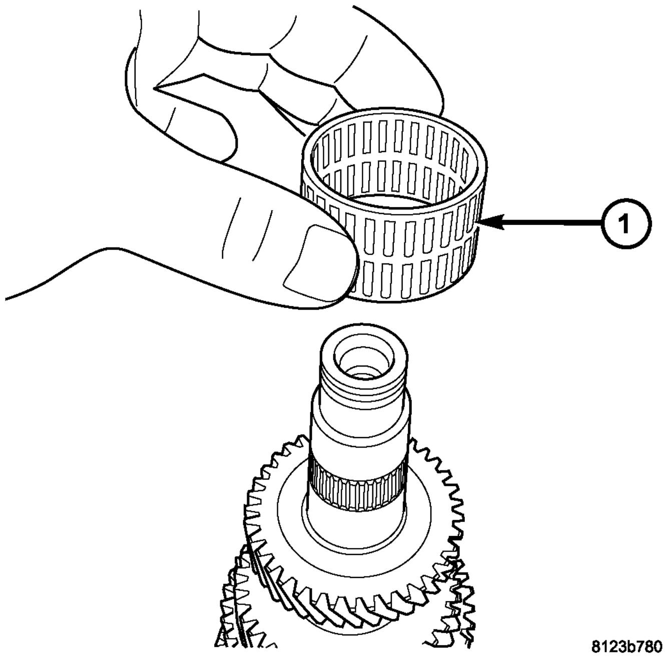


Fig. 192 5th Gear Needle Bearing Removal/ Installation

1 - 5TH GEAR NEEDLE BEARING

(16) Install 5th gear blocker ring to synchronizer (Fig. 193).

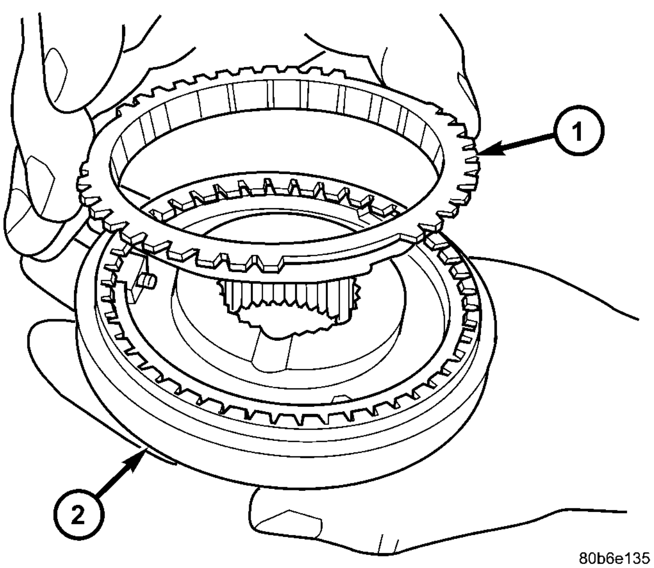


Fig. 193 5th Gear Blocker Ring to Synchro

1 - 5th GEAR BLOCKER RING
2 - 5/R SYNCHRONIZER

(17) Install 5th gear synchronizer assembly to intermediate shaft (Fig. 194). **When installing 5/R synchronizer, make sure to align oil slots on synchronizer hub face with oil hole in the shaft splined hub journal.**

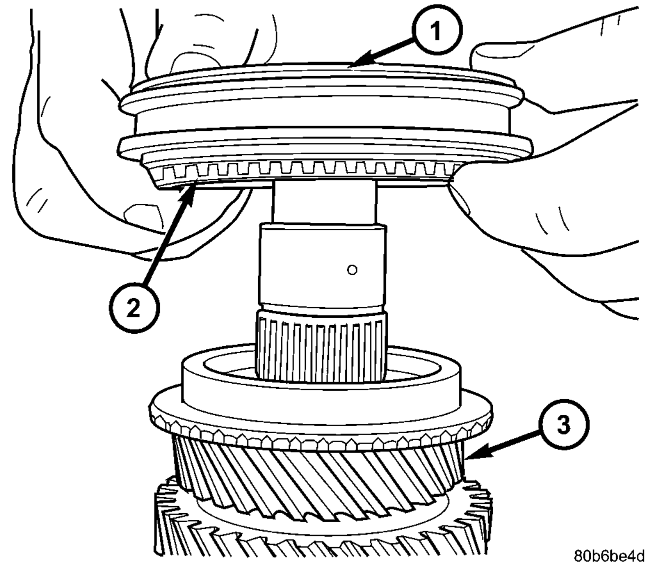


Fig. 194 Install 5/R Synchro and 5th Blocker Ring to 5th Gear

1 - 5/R SYNCHRONIZER
2 - 5TH GEAR BLOCKER RING
3 - 5TH GEAR

(18) Install **NEW** 5/R synchro snap ring (Fig. 195).

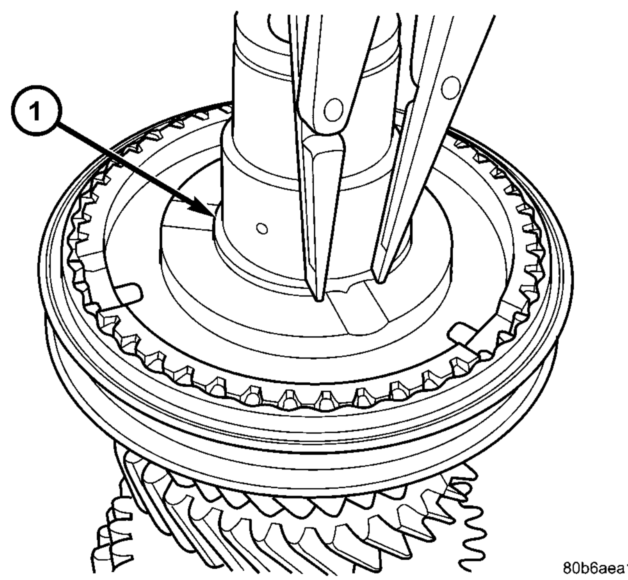


Fig. 195 5/R Synchro Snap Ring

1 - SNAP RING

INTERMEDIATE SHAFT (Continued)

(19) Install reverse gear blocker ring (Fig. 196).

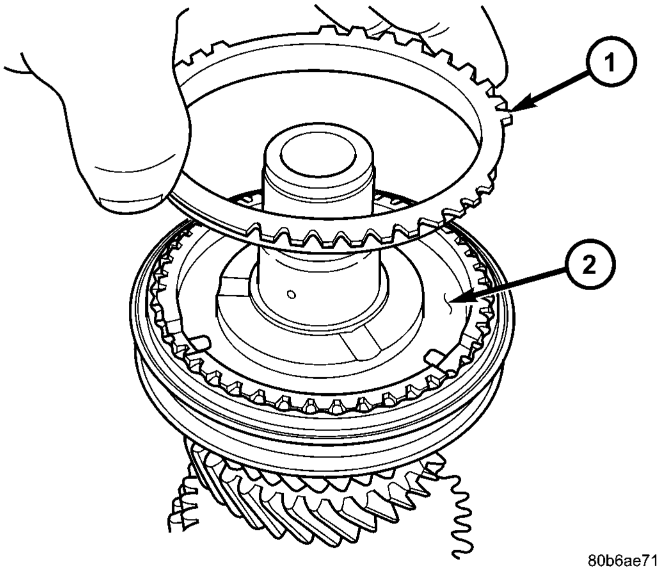


Fig. 196 Reverse Gear Blocker Ring

1 - REVERSE BLOCKER RING
2 - 5/R SYNCHRONIZER

(20) Install reverse gear needle bearing (Fig. 197).

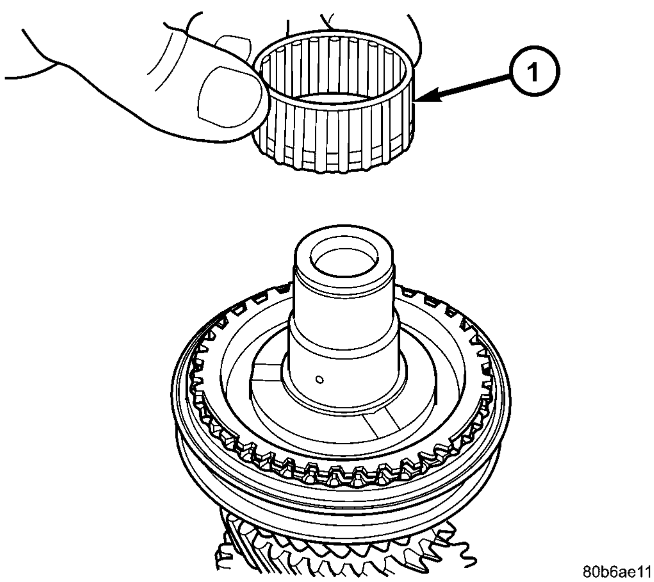


Fig. 197 Reverse Gear Needle Bearing

1 - NEEDLE BEARING

(21) Install reverse gear to intermediate shaft.

(22) Install intermediate shaft sealed roller bearing and thrust washer using installer 8482 (Fig. 198).

(23) Install **NEW** intermediate shaft sealed bearing snap ring (Fig. 199).

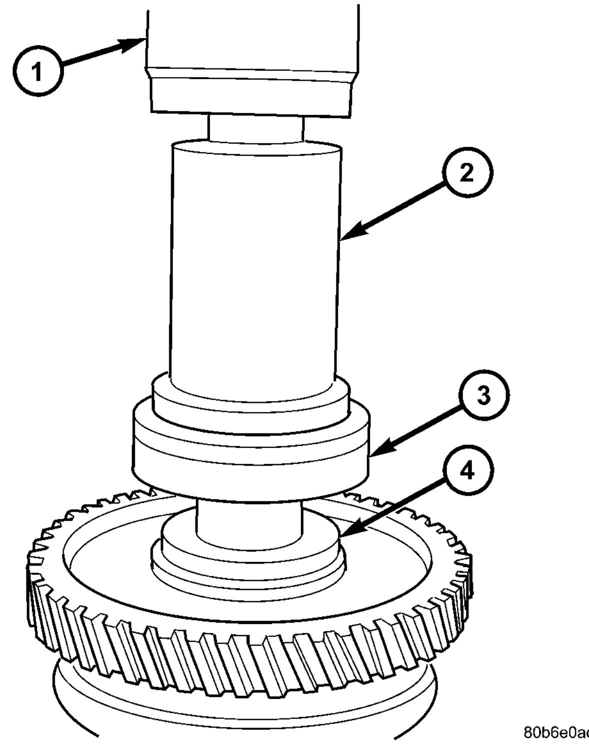


Fig. 198 Sealed Roller Bearing Installatiion

1 - ARBOR PRESS
2 - REMOVER/INSTALLER 8482
3 - SEALED ROLLER BEARING
4 - THRUST WASHER

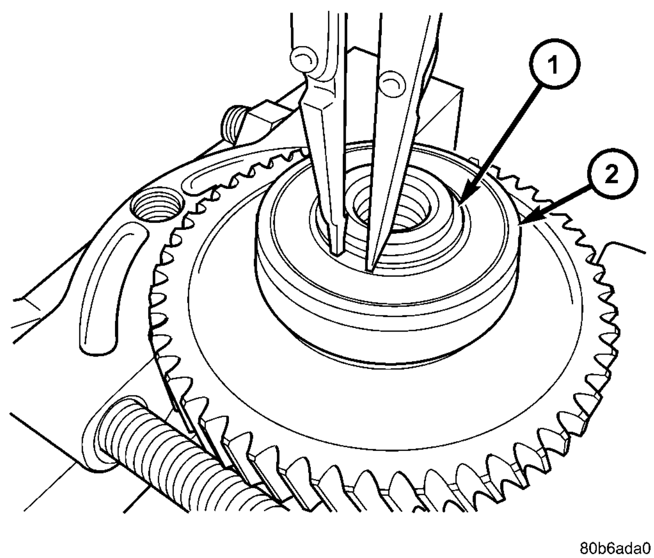


Fig. 199 Intermediate Shaft Bearing Snap Ring

1 - SNAP RING
2 - BEARING

SHIFT COVER

DESCRIPTION

The shift cover assembly (Fig. 200) (Fig. 201) is operated by the gearshift crossover and selector cables, and operates the shift fork/shaft system. It consists of crossover and selector lever mechanisms, transaxle vent, a main shift selector shaft, and the 5-R blockout mechanism. The shift cover is only serviced as an assembly.

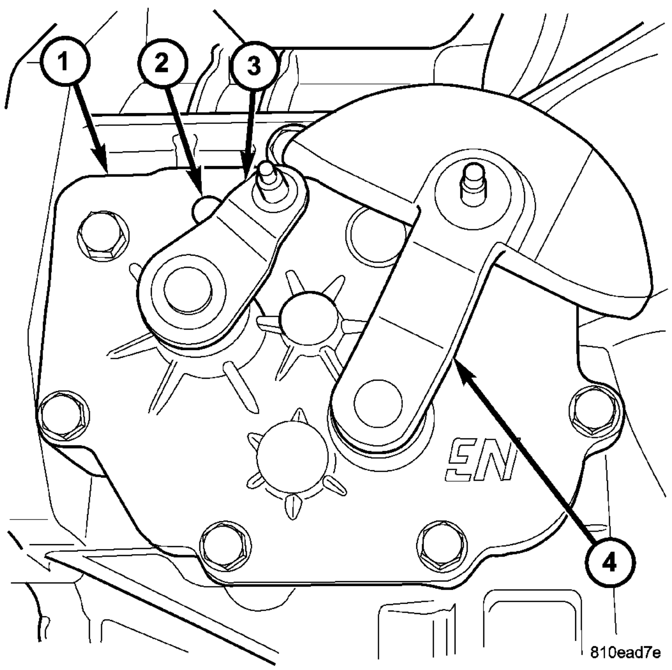


Fig. 200 Shift Lever Identification

1 - SHIFT COVER ASSEMBLY
2 - VENT
3 - CROSSOVER LEVER
4 - SELECTOR LEVER

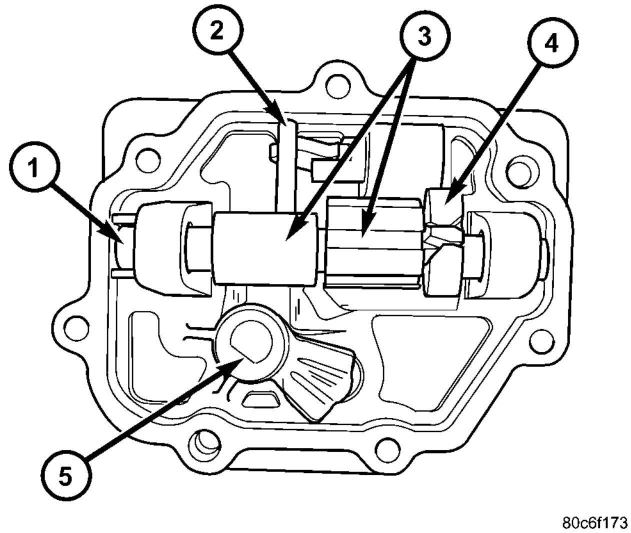


Fig. 201 Shift Cover Assembly Components

1 - SHAFT
2 - 5-R BLOCKOUT PIN/CAM
3 - SHIFT SELECTOR
4 - SHIFT BLOCKER
5 - SELECTOR LEVER/DETENT

SHIFT FORK AND SHAFT

DESCRIPTION

The T850 utilizes a unique shift fork and shaft arrangement consisting of three shift forks and two shafts as shown in (Fig. 202). This system is operated by the shift cover assembly, which combined with a unique gearshift cable design, offers a higher mechanical advantage over traditional shift systems. This arrangement results in less friction and lower shift cable loads for smoother, more positive operation. The shift fork assemblies are constructed of brass, float about the shafts with the aid of needle bearings, and are serviced only as fork/bearing assemblies.

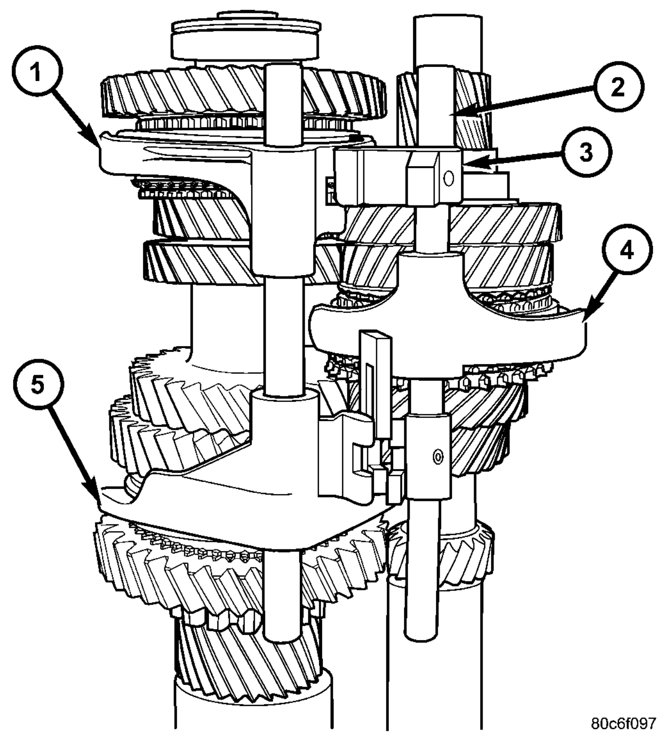


Fig. 202 Shift Fork/Shaft Components

1 - 5/R FORK
2 - SHAFT/LINK ASSEMBLY
3 - LINK
4 - 3/4 FORK
5 - 1/2 FORK

SYNCHRONIZER

DESCRIPTION

The T850 transaxle uses two styles of synchronizer assemblies; a conventional single-cone style is used for the 5th/Reverse and 3rd/4th applications (Fig. 203), and a dual-cone style for the 1st/2nd gear application (Fig. 204).

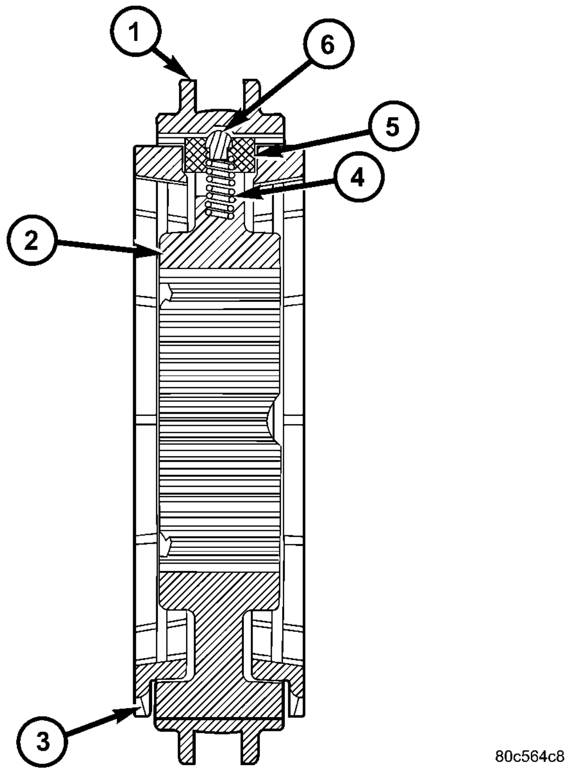


Fig. 203 3/4-5/R Synchronizer Assembly

1 - SLEEVE
2 - HUB
3 - BLOCKER RING (2)
4 - SPRING (3)
5 - KEY (3)
6 - BALL (3)

DISASSEMBLY

Place synchronizer in a clean shop towel and wrap. Press on inner hub. Carefully open up shop towel and remove springs, balls, keys, hub, and sleeve.

CLEANING

CLEAN

Do not attempt to clean the blocking rings in solvent. The friction material will become contaminated. Place synchronizer components in a suitable holder and clean with solvent. Air dry.

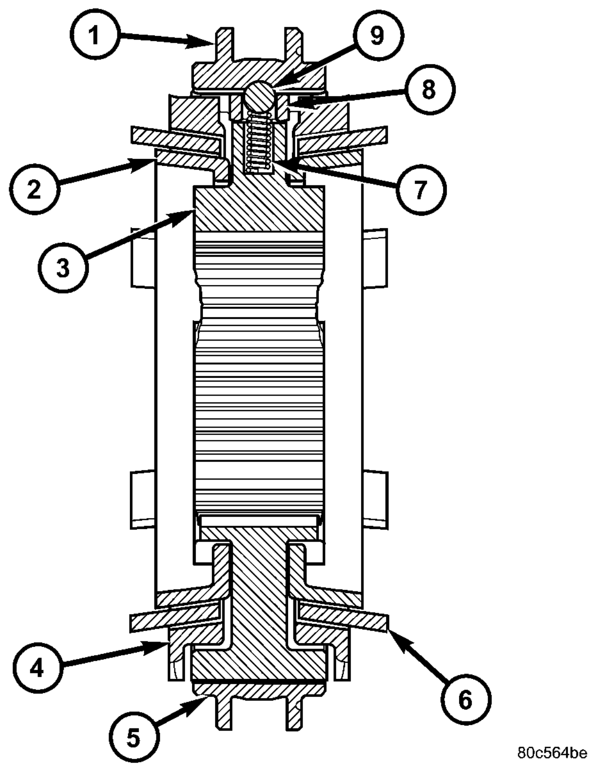


Fig. 204 1/2 Synchronizer Assembly

1 - SLEEVE
2 - REACTOR RING (2)
3 - HUB
4 - BLOCKER RING (2)
5 - SLEEVE
6 - FRICTION CONE (2)
7 - SPRING (3)
8 - KEY (3)
9 - BALL (3)

INSPECTION

INSPECT

Proper inspection of components involve:

- Teeth, for wear, scuffed, nicked, burred, or broken teeth
- Keys, for wear or distortion
- Balls and springs, for distortion, cracks, or wear

If any of these conditions exist in these components, replace as necessary.

ASSEMBLY

(1) Position synchronizer hub onto work bench. Hub is non-directional.

(2) Install springs into hub slot.

(3) Insert key into hub and spring.

(4) Apply petroleum jelly to the hole in the key. Insert balls into each key.

(5) Slide sleeve over the hub and depress balls as you carefully slip the sleeve into position.

VEHICLE SPEED SENSOR

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove passenger side halfshaft and intermediate shaft assembly. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(3) Disconnect the speed sensor connector (Fig. 205).

CAUTION: Clean area around speed sensor before removing to prevent dirt from entering the transaxle during speed sensor removal.

(4) Remove speed sensor retaining bolt (Fig. 205).

(5) Remove speed sensor from transaxle.

CAUTION: Carefully remove vehicle speed sensor so that sensor drive gear does not fall into transaxle. Should sensor drive gear fall into the transaxle during sensor removal, drive gear must be reattached to sensor.

(6) Remove speed sensor drive gear from speed sensor.

INSTALLATION

(1) Install pinion gear to speed sensor (Fig. 205).

(2) Using a NEW o-ring, install the speed sensor to the transaxle (Fig. 205).

(3) Install the bolt and torque to 7 N·m (60 in. lbs.).

(4) Connect speed sensor connector (Fig. 205).

(5) Install intermediate shaft and passenger side halfshaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)

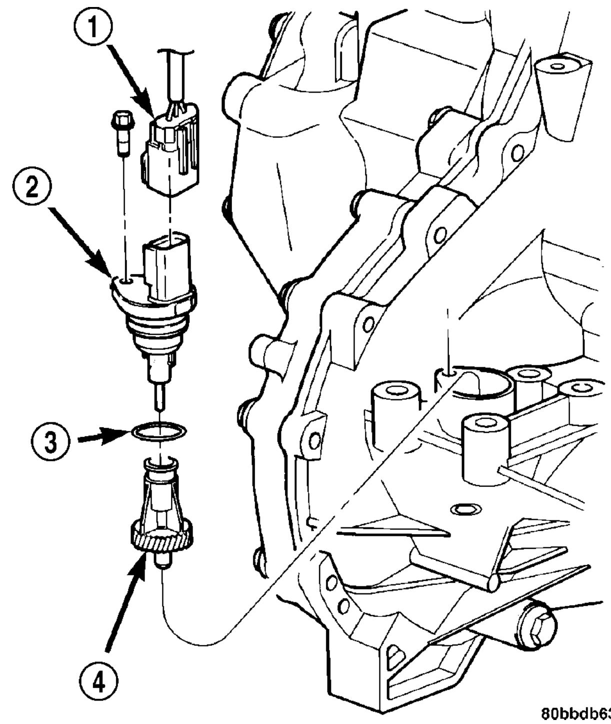


Fig. 205 Speed Sensor and Pinion Removal/ Installation—Typical

1 - CONNECTOR
2 - SENSOR
3 - O-RING
4 - GEAR

(6) Lower vehicle and road test to verify proper speedometer operation.

40TE AUTOMATIC TRANSAXLE

TABLE OF CONTENTS

40TE AUTOMATIC TRANSAXLE

DESCRIPTION

The 40TE (Fig. 1) is a four-speed transaxle that is a conventional hydraulic/mechanical assembly with an integral differential, and is controlled with adaptive electronic controls and monitors. The hydraulic system of the transaxle consists of the transaxle fluid, fluid passages, hydraulic valves, and various line pressure control components. An input clutch assembly which houses the underdrive, overdrive, and reverse clutches is used. It also utilizes separate holding clutches: 2nd/4th gear and Low/Reverse. The primary mechanical components of the transaxle consist of the following:

- Three multiple disc input clutches
- Two multiple disc holding clutches
- Four hydraulic accumulators
- Two planetary gear sets
- Hydraulic oil pump
- Valve body
- Solenoid/Pressure switch assembly
- Integral differential assembly

Control of the transaxle is accomplished by fully adaptive electronics. Optimum shift scheduling is accomplished through continuous real-time sensor feedback information provided to the Powertrain Control Module (PCM) or Transmission Control Module (TCM).

The PCM/TCM is the heart of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the PCM/TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

The PCM/TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB scan tool.

40TE AUTOMATIC TRANSAXLE (Continued)

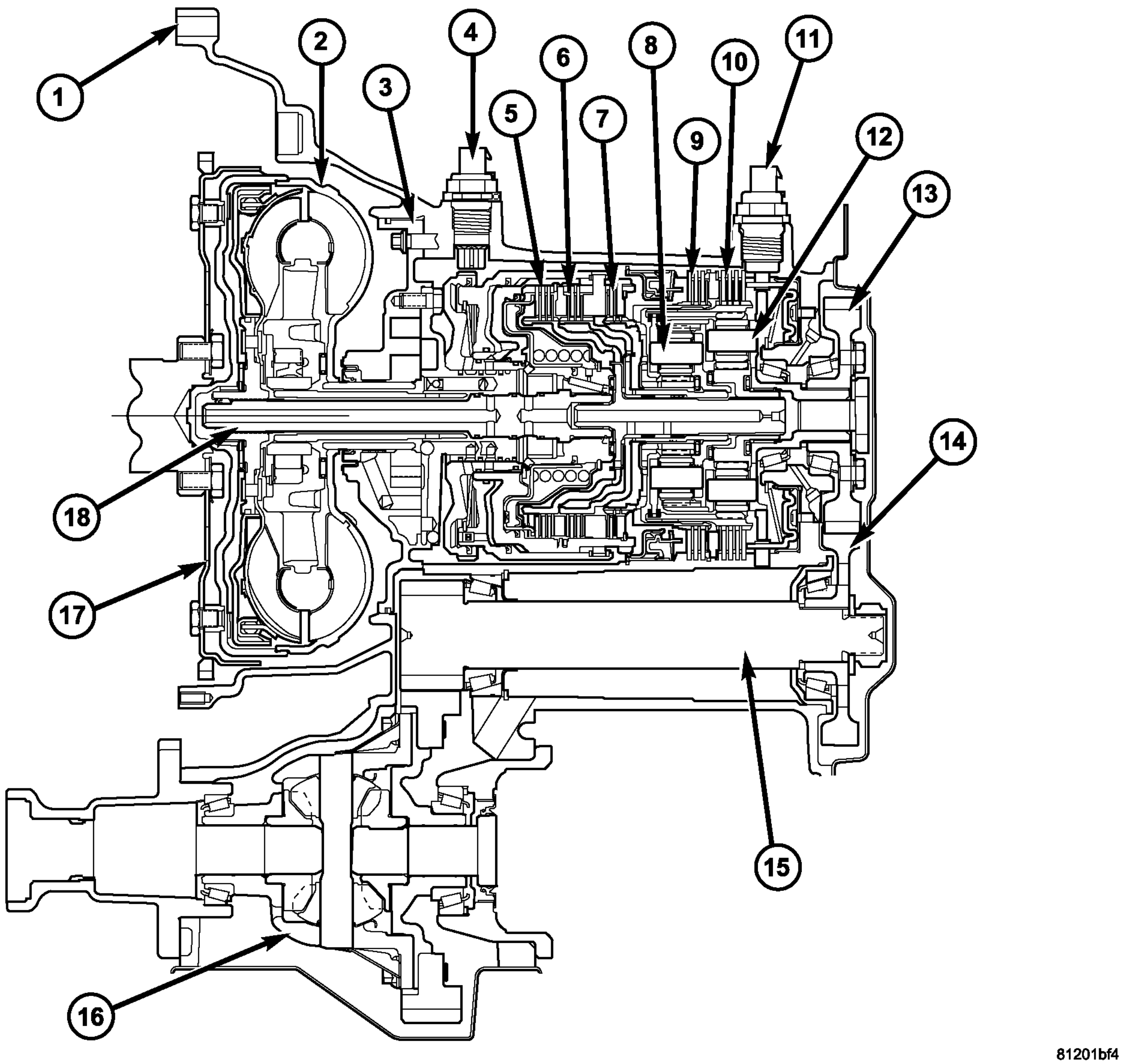


Fig. 1 40TE Automatic Transaxle

1 - TRANSAXLE CASE
2 - TORQUE CONVERTER
3 - OIL PUMP
4 - INPUT SPEED SENSOR
5 - UNDERDRIVE CLUTCH
6 - OVERDRIVE CLUTCH
7 - REVERSE CLUTCH
8 - FRONT PLANET CARRIER
9 - 2/4 CLUTCH
10 - L/R CLUTCH
11 - OUTPUT SPEED SENSOR
12 - REAR PLANET CARRIER/OUTPUT SHAFT
13 - OUTPUT SHAFT GEAR
14 - TRANSFER SHAFT GEAR
15 - TRANSFER SHAFT
16 - DIFFERENTIAL
17 - CONVERTER DRIVE PLATE
18 - INPUT SHAFT

40TE AUTOMATIC TRANSAXLE (Continued)

TRANSAXLE IDENTIFICATION

The 40TE transaxle is identified by a barcode label that is fixed to the transaxle case as shown in (Fig. 2).

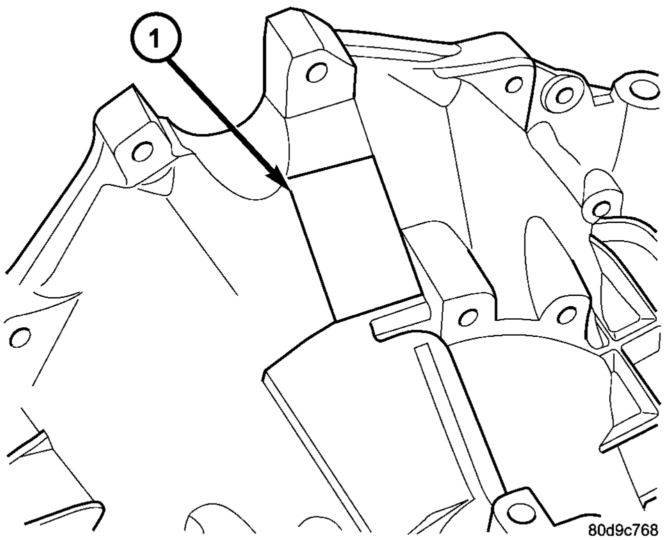


Fig. 2 Transaxle Identification Label

1 - IDENTIFICATION LABEL

The label contains a series of digits that can be translated into useful information such as transaxle part number, date of manufacture, manufacturing origin, plant shift number, build sequence number, etc. Refer to (Fig. 3) for identification label breakdown.

If the tag is not legible or missing, the "PK" number, which is stamped into the transaxle case behind the transfer gear cover, can be referred to for identification. This number differs slightly in that it contains the entire transaxle part number, rather than the last three digits.

OPERATION

Transmission output is directed to an integral differential by a transfer gear system in the following input-to-output ratios:

First	2.84 : 1
Second	1.57 : 1
Third	1.00 : 1
Overdrive	0.69 : 1
Reverse	2.21 : 1

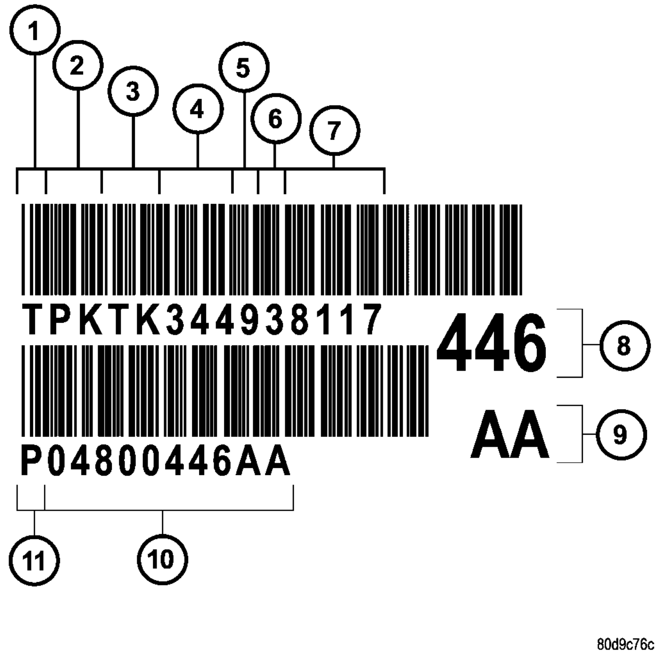


Fig. 3 Identification Label Breakdown

1 - T=TRACEABILITY
2 - SUPPLIER CODE (PK=KOKOMO)
3 - COMPONENT CODE (TK=KOKOMO TRANSMISSION)
4 - BUILD DAY (344=DEC. 9)
5 - BUILD YEAR (9=1999)
6 - LINE/SHIFT CODE (3=3RD SHIFT)
7 - BUILD SEQUENCE NUMBER
8 - LAST THREE OF P/N
9 - ALPHA
10 - TRANSAXLE PART NUMBER
11 - P=PART NUMBER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - 4XTE TRANSAXLE GENERAL DIAGNOSIS

NOTE: Before attempting any repair on a 4XTE four-speed automatic transaxle, check for diagnostic trouble codes (DTC's) using the DRB scan tool. Refer to the Transmission Diagnostic Procedures Manual.

Transaxle malfunctions may be caused by these general conditions:

- Poor engine performance
- 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 cor-

40TE AUTOMATIC TRANSAXLE (Continued)

rections are completed, hydraulic pressure checks should be performed.

DIAGNOSIS AND TESTING - ROAD TEST

Prior to performing a road test, verify that the fluid level, fluid condition, and linkage adjustment have been approved.

During the road test, the transaxle should be operated in each position to check for slipping and any variation in shifting.

If the vehicle operates properly at highway speeds, but has poor acceleration, the converter stator overrunning clutch may be slipping. If acceleration is normal, but high throttle opening is needed to maintain highway speeds, the converter stator clutch may have seized. Both of these stator defects require replacement of the torque converter and thorough transaxle cleaning.

Slipping clutches can be isolated by comparing the "Elements in Use" chart with clutch operation encountered on a road test. This chart identifies which clutches are applied at each position of the selector lever.

A slipping clutch may also set a DTC and can be determined by operating the transaxle in all selector positions.

ELEMENTS IN USE AT EACH POSITION OF SELECTOR LEVER

Shift Lever Position	INPUT CLUTCHES			HOLDING CLUTCHES	
	Underdrive	Overdrive	Reverse	2/4	Low/Reverse
P - PARK					X
R - REVERSE			X		X
N - NEUTRAL					X
OD - OVERDRIVE First	X				X
Second	X			X	
Direct	X	X			
Overdrive		X		X	
D - DRIVE* 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.					

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 diagnose slipping units, but the cause of the malfunction cannot be determined. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

40TE AUTOMATIC TRANSAXLE (Continued)

DIAGNOSIS AND TESTING - HYDRAULIC PRESSURE TESTS

Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most hydraulic 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 300 psi gauge (C-3293SP) to port(s) required for test(s) being conducted. Use adapter set L-4559 to adapt gauge(s) to transaxle.

Test port locations are shown in (Fig. 4).

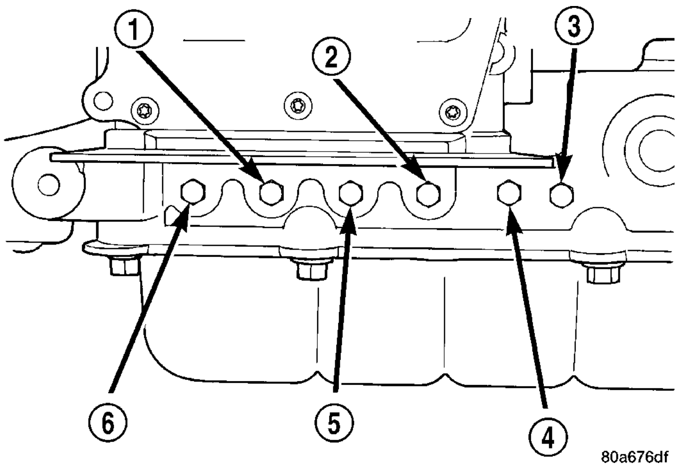


Fig. 4 Pressure Taps

1 - OVERDRIVE CLUTCH
2 - TORQUE CONVERTER OFF
3 - LOW/REVERSE CLUTCH
4 - 2/4 CLUTCH
5 - REVERSE CLUTCH
6 - UNDERDRIVE CLUTCH

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 TWO A–SELECTOR IN OD (4th 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 (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, then either the solenoid assembly or PCM/TCM is at fault.

TEST THREE-OVERDRIVE CLUTCH CHECK (3rd and 2nd Gear)

(1) Attach gauge to the overdrive clutch tap.

(2) Move selector lever to the (OD) position.

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 20 mph. Vehicle should be in 3rd gear.

(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.

(7) This test checks the overdrive clutch hydraulic circuit as well as the shift schedule.

TEST FOUR-SELECTOR IN OVERDRIVE (4th Gear)

(1) Attach gauge to the 2/4 clutch tap.

(2) Move selector lever to the (OD) position.

(3) Allow vehicle front wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph. Vehicle should be in 4th gear.

(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 OVERDRIVE (4th Gear-CC on)

(1) Attach gauge to the torque converter clutch off pressure tap.

(2) Move selector lever to the (OD) position.

40TE AUTOMATIC TRANSAXLE (Continued)

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph. Vehicle should be in 4th gear, CC on.

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 gauges to the reverse and LR clutch tap.

(2) Move selector lever to the (R) position.

(3) Read reverse clutch pressure with output stationary (foot on brake) and throttle opened to achieve 1500 rpm.

(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 Two A, a defective solenoid assembly or PCM/TCM is the cause.

PRESSURE CHECK SPECIFICATIONS

Gear Selector Position	Actual Gear	Pressure Taps					
		Underdrive Clutch	Overdrive 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 the same speed.

DIAGNOSIS AND TESTING - 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.

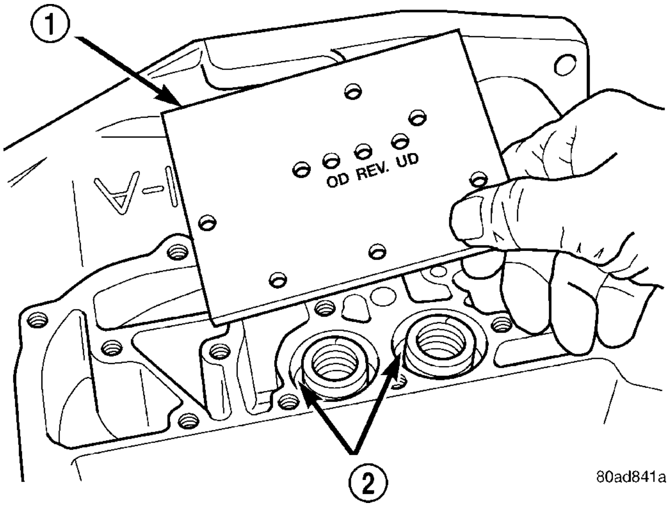


Fig. 5 Air Pressure Test Plate

1 - TOOL 6056
2 - ACCUMULATORS

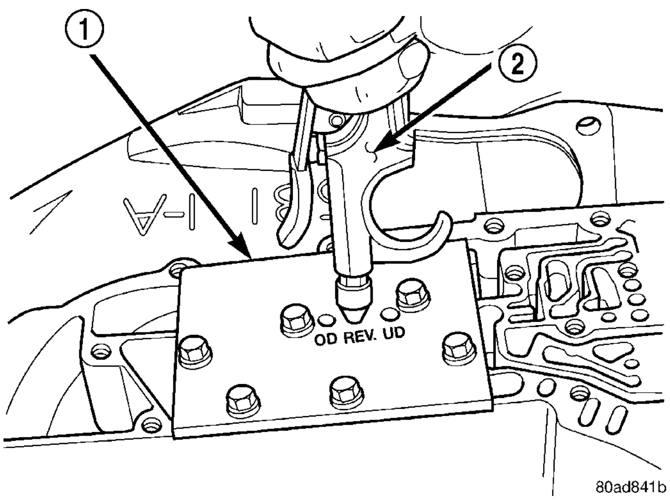


Fig. 6 Testing Reverse Clutch

1 - TOOL 6056
2 - AIR NOZZLE

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.

DIAGNOSIS AND TESTING - TORQUE CONVERTER HOUSING FLUID LEAKAGE

When diagnosing converter housing fluid leaks, three actions must be taken before repair:

(1) Verify proper transmission fluid level.

(2) Verify that the leak originates from the converter housing area and is transmission fluid.

(3) Determine the true source of the leak.

Fluid leakage at or around the torque converter area may originate from an engine oil leak (Fig. 7). The area should be examined closely. Factory fill fluid is red and, therefore, can be distinguished from engine oil.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill, or fill after repair.

40TE AUTOMATIC TRANSAXLE (Continued)

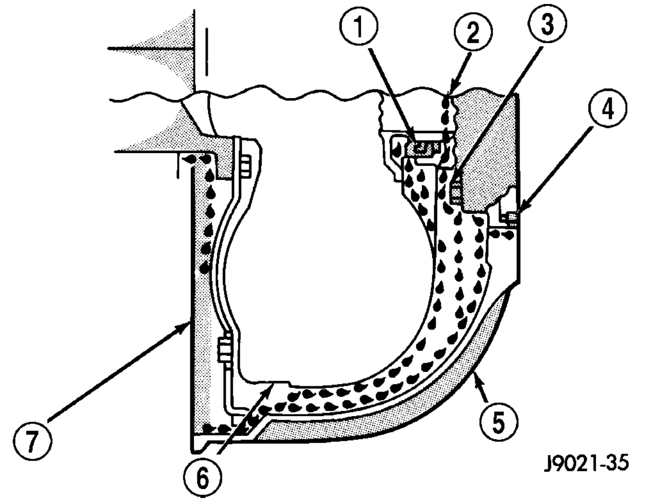


Fig. 7 Converter Housing Leak Paths

1 - PUMP SEAL
2 - PUMP VENT
3 - PUMP BOLT
4 - PUMP GASKET
5 - CONVERTER HOUSING
6 - CONVERTER
7 - REAR MAIN SEAL LEAK

Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair.

Pump seal leaks tend to move along the drive hub and onto the rear of the converter (Fig. 7). Pump o-ring or pump body leaks follow the same path as a seal leak. Pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself. Pump seal or gasket leaks usually travel down the inside of the converter housing (Fig. 7).

TORQUE CONVERTER LEAKAGE

Possible sources of torque converter leakage are:

- Torque converter weld leaks at the outside diameter weld (Fig. 8).
- Torque converter hub weld (Fig. 8).

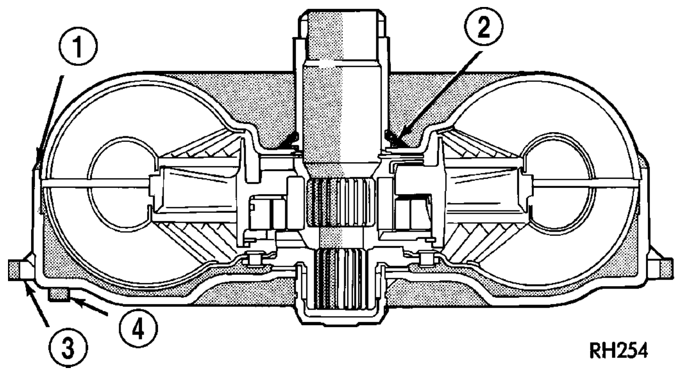


Fig. 8 Converter Leak Points - Typical

1 - OUTSIDE DIAMETER WELD
2 - TORQUE CONVERTER HUB WELD
3 - STARTER RING GEAR
4 - LUG

REMOVAL

(1) Disconnect battery cables.
(2) Remove hold down and battery.
(3) Remove battery tray.
(4) Remove air cleaner/throttle body assembly.
(5) Using a suitable blade or cutter, cut transaxle oil cooler hoses off flush with end of fittings. A service splice kit will be installed upon reinstallation.
(6) Disconnect input speed sensor connector.
(7) Disconnect output speed sensor connector.
(8) Disconnect solenoid/pressure switch assembly connector.
(9) Disconnect gearshift cable from manual valve.
(10) Disconnect gearshift cable from upper mount bracket. Secure cable out of the way.
(11) Remove starter motor upper mounting bolt.
(12) Raise vehicle on hoist.
(13) Remove halfshafts.
(14) Remove structural collar.
(15) Remove left lateral bending brace.
(16) Remove starter motor and position out of way.
(17) Remove power steering cooler-to-crossmember fasteners. Secure cooler out of way.
(18) Remove right lateral bending brace-to-transaxle bolt.
(19) Remove converter dust shield.
(20) Remove torque converter-to-drive plate bolts.
(21) Remove both lower transaxle bellhousing-to-engine bolts.
(22) Support engine with a screw jack and wood block.
(23) Remove transaxle upper mount through-bolt. Lower engine/transaxle assembly with screw jack.
(24) Obtain helper and transmission jack.
(25) Position transmission jack to transaxle. Secure transaxle to jack.
(26) Remove two (2) transaxle bellhousing-to-block bolts (upper).
(27) Remove transaxle from vehicle.

DISASSEMBLY

NOTE: If transaxle is being overhauled (clutch and/or seal replacement) or replaced, it is necessary to perform the PCM/TCM Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

40TE AUTOMATIC TRANSAXLE (Continued)

NOTE: This procedure does not include final drive (differential) disassembly.

(1) Remove input and output speed sensors.

(2) Remove three (3) solenoid/pressure switch assembly-to-case bolts.

(3) Remove solenoid/pressure switch assembly and gasket (Fig. 9).

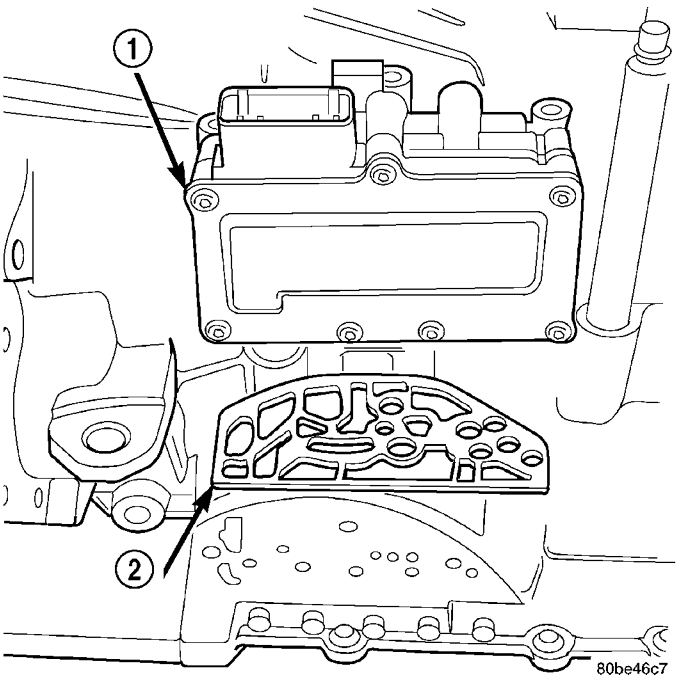


Fig. 9 Solenoid/Pressure Switch Assembly and Gasket

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - GASKET

(4) Remove oil pan-to-case bolts (Fig. 10).

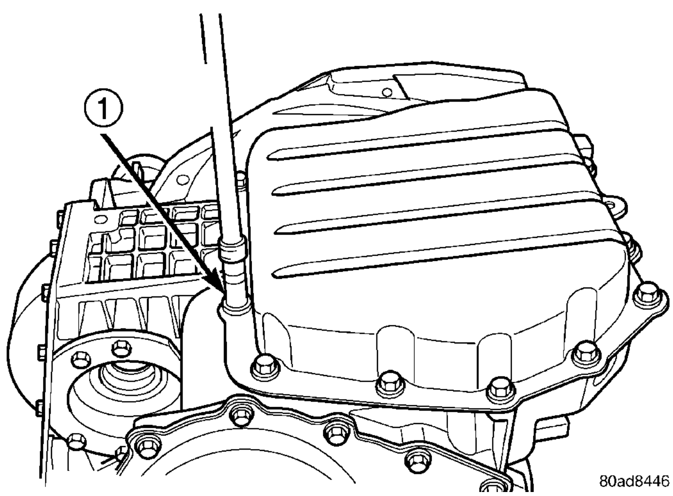


Fig. 10 Remove Oil Pan Bolts

1 - OIL PAN BOLTS (USE RTV UNDER BOLT HEADS)

(5) Remove oil pan (Fig. 11).

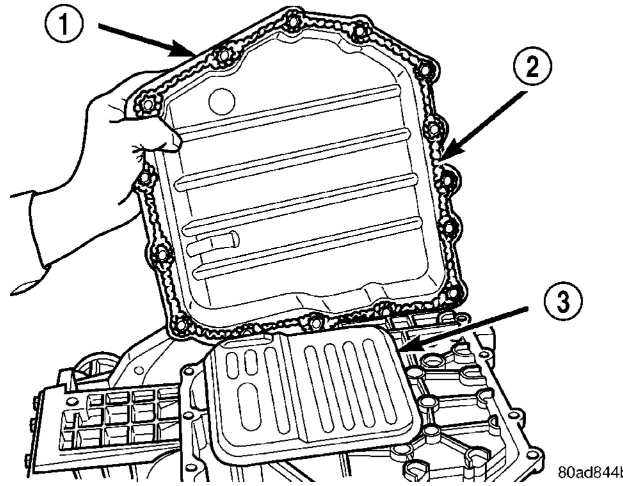


Fig. 11 Remove Oil Pan

1 - OIL PAN
2 - 1/8 INCH BEAD OF MOPAR® ATF RTV (MS-GF41)
3 - OIL FILTER

(6) Remove oil filter (Fig. 12).

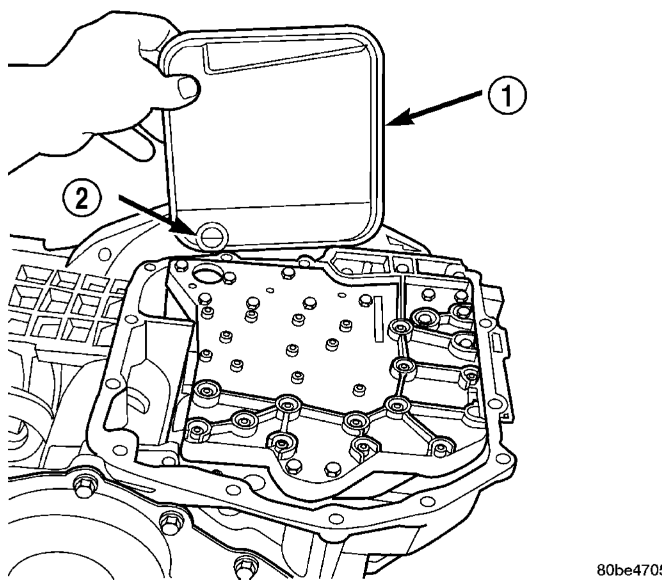


Fig. 12 Remove Filter and O-Ring

1 - OIL FILTER
2 - O-RING

40TE AUTOMATIC TRANSAXLE (Continued)

(7) Turn manual valve fully clock-wise to get park rod into position for removal.

(8) Remove valve body-to-case bolts (Fig. 13).

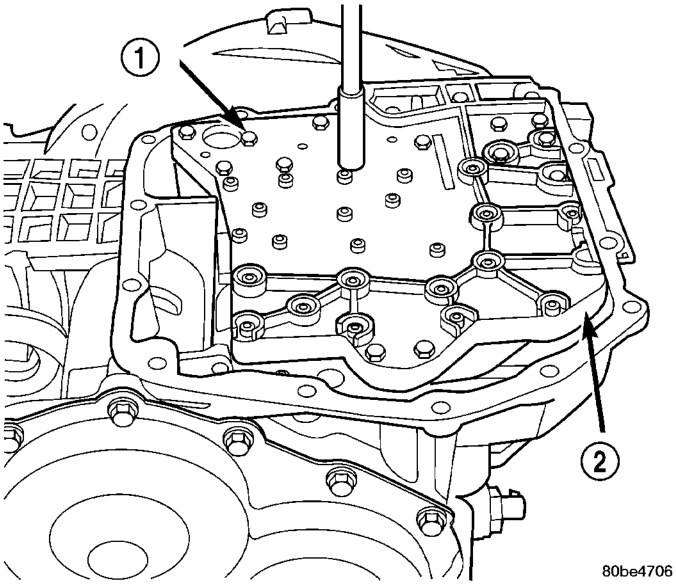


Fig. 13 Remove Valve Body-to-Case Bolts

1 - VALVE BODY ATTACHING BOLTS (18)
2 - VALVE BODY

CAUTION: Do not handle the valve body assembly from the manual valve. Damage can result.

(9) Using a screwdriver, push park rod rollers away from guide bracket (Fig. 14) and remove valve body assembly (Fig. 15).

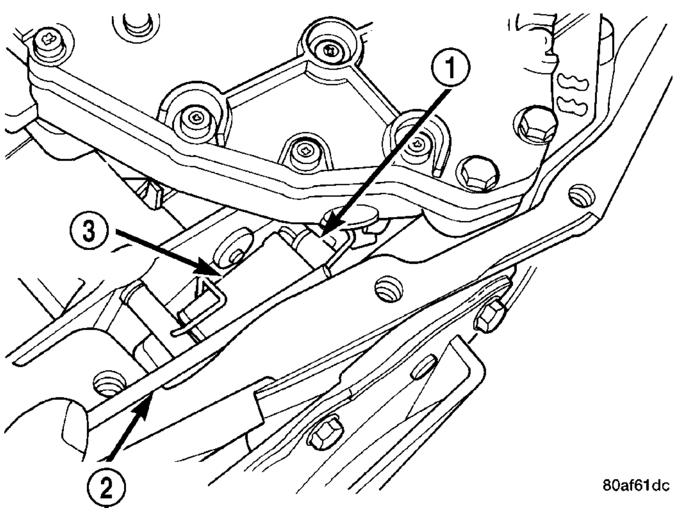


Fig. 14 Push Park Rod Rollers from Guide Bracket

1 - PARK SPRAG ROLLERS
2 - SCREWDRIVER
3 - PARK SPRAG GUIDE BRACKET

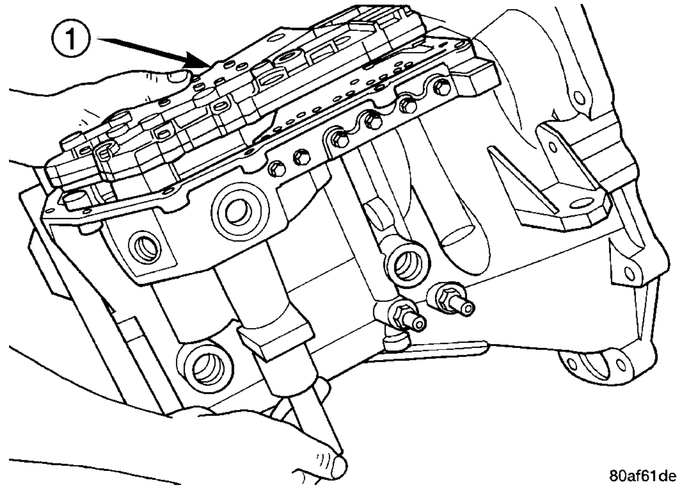


Fig. 15 Valve Body Removal/Installation

1 - VALVE BODY

NOTE: Depending on engine application, some accumulators will have two springs and others will have one spring. The springs are color-coded according to application and year. When disassembling, mark accumulator spring location to ease assembly.

(10) Remove underdrive and overdrive accumulators (Fig. 16).

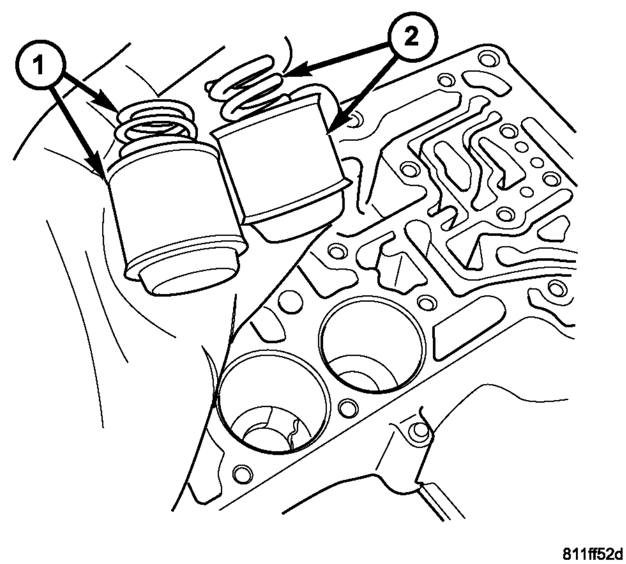


Fig. 16 Underdrive and Overdrive Accumulators

1 - OVERDRIVE PISTON AND SPRING
2 - UNDERDRIVE PISTON AND SPRING

40TE AUTOMATIC TRANSAXLE (Continued)

(11) Remove low/reverse accumulator snap ring (Fig. 17).

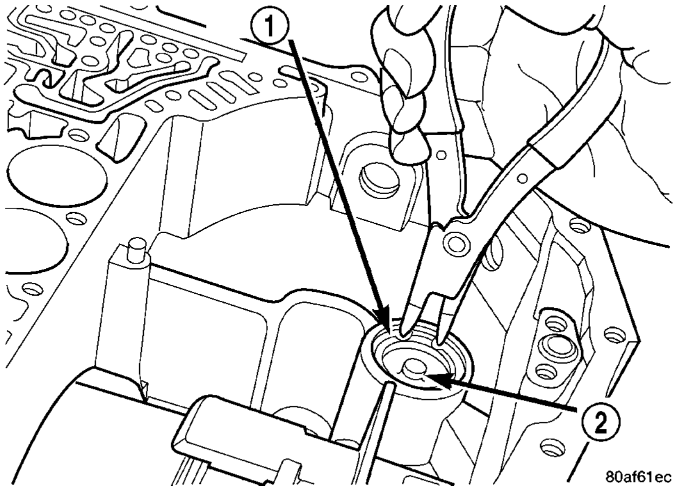


Fig. 17 Remove Low/Reverse Accumulator Snap Ring

1 - SNAP RING
2 - PLUG

(12) Remove low/reverse accumulator plug (Fig. 18).

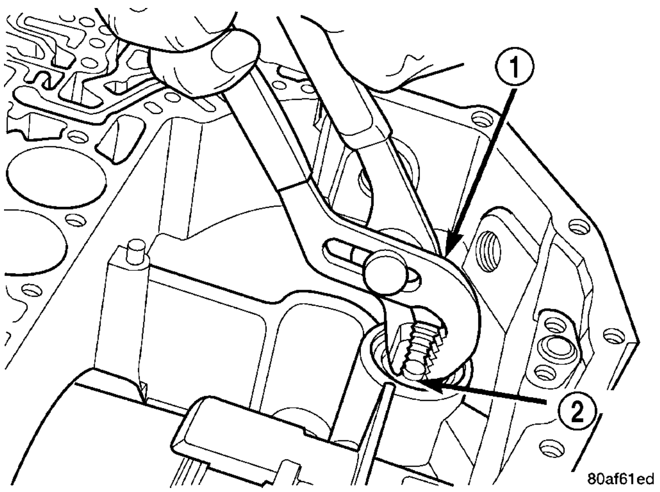


Fig. 18 Remove Low/Reverse Accumulator Plug

1 - ADJUSTABLE PLIERS
2 - PLUG

(13) Remove low/reverse accumulator piston using suitable pliers (Fig. 19). Remove piston and springs (Fig. 20).

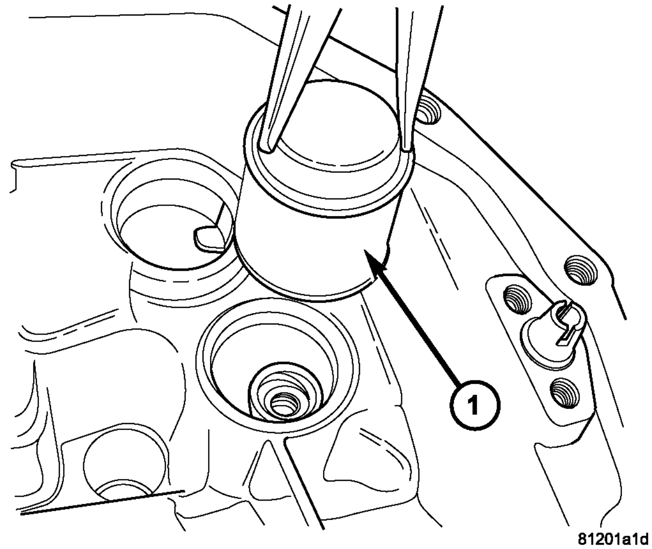


Fig. 19 Low/Reverse Accumulator Piston

1 - ACCUMULATOR PISTON

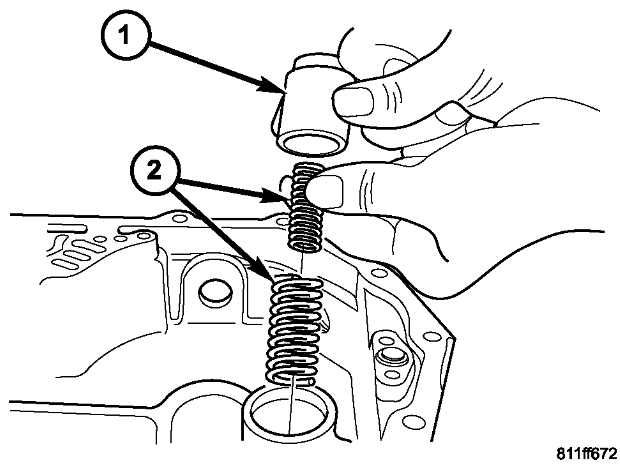


Fig. 20 Low/Reverse Accumulator

1 - PISTON
2 - RETURN SPRINGS

40TE AUTOMATIC TRANSAXLE (Continued)

(14) Measure input shaft end play. Place transaxle so input shaft is vertical. Set up end play set and dial indicator as shown in (Fig. 21). **Input shaft end play should be within 0.13-0.64 mm (0.005-0.025 in.)** If outside of this range, a #4 thrust plate change is required. Record indicator reading for reference upon reassembly.

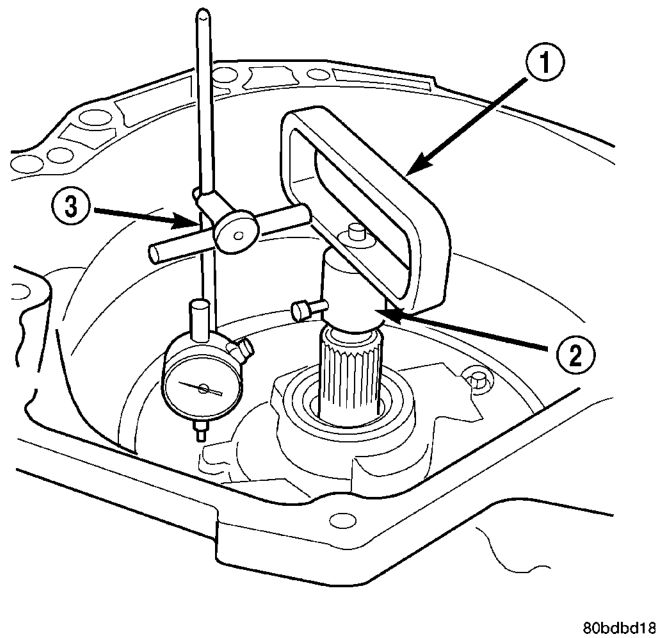


Fig. 21 Measure Input Shaft End Play Using Tool 8266—Typical

1 - TOOL 8266–8
2 - TOOL 8266–2
3 - TOOL C-3339

(15) Remove oil pump-to-case bolts (Fig. 22).

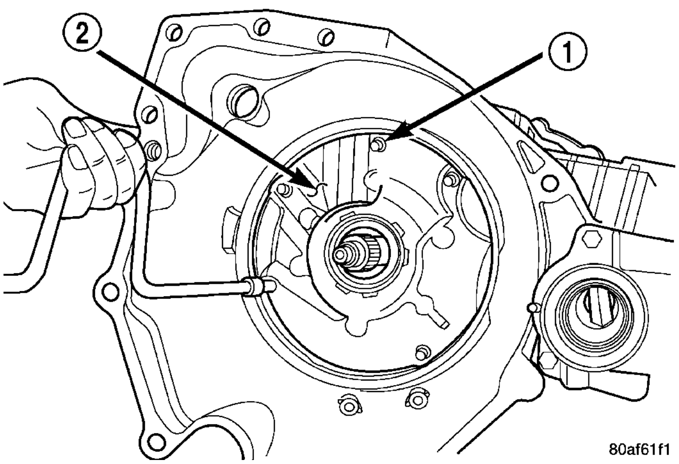


Fig. 22 Remove Oil Pump-to-Case Bolts

1 - PUMP ATTACHING BOLTS
2 - PUMP HOUSING

CAUTION: Be sure input speed sensor is removed before removing oil pump.

(16) Install pullers Tool C-3752 as shown in (Fig. 23).

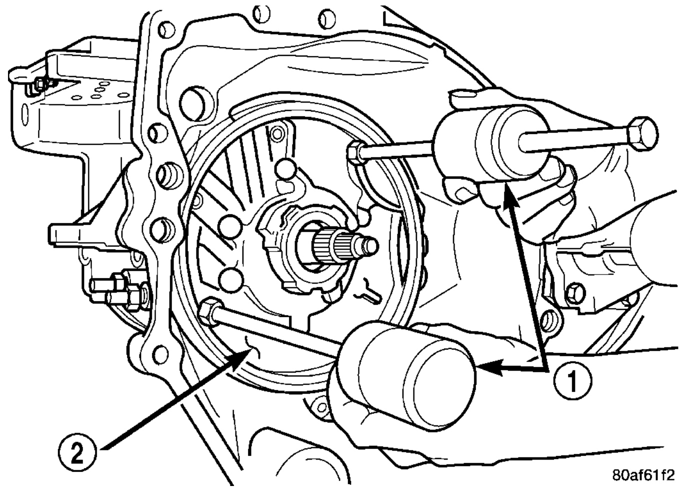


Fig. 23 Install Tool C-3752

1 - PULLERS TOOL C-3752
2 - PUMP

(17) Remove oil pump assembly (Fig. 24) (Fig. 25).

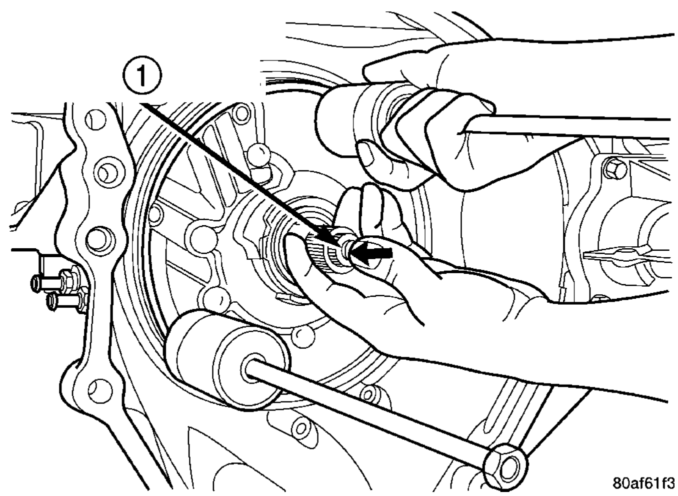


Fig. 24 Remove Oil Pump

1 - “PUSH IN” ON INPUT SHAFT WHILE REMOVING PUMP

40TE AUTOMATIC TRANSAXLE (Continued)

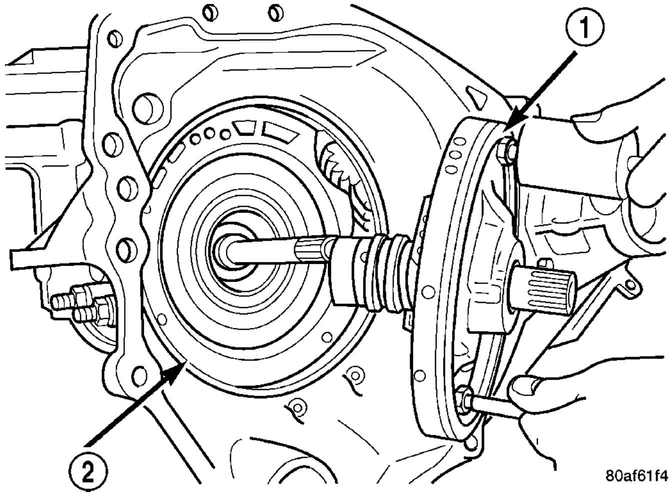


Fig. 25 Oil Pump Removed

1 - OIL PUMP
2 - GASKET

(18) Remove oil pump gasket (Fig. 26).

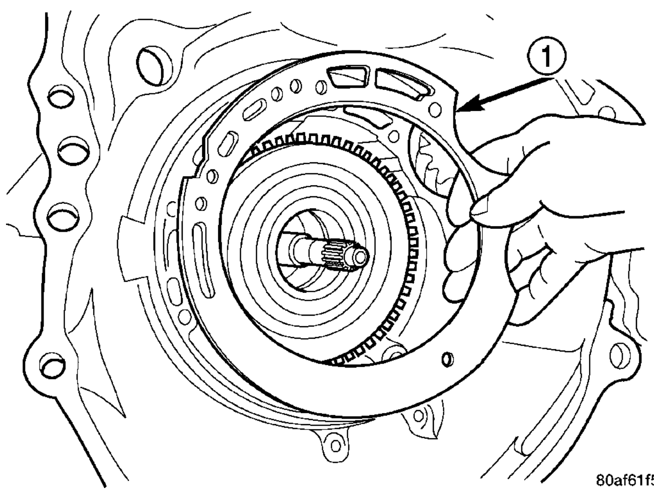


Fig. 26 Remove Oil Pump Gasket

1 - PUMP GASKET

CAUTION: If transaxle failure has occurred, the cooler bypass valve must be replaced. Do not re-use or attempt to clean valve.

(19) Remove cooler bypass valve (Fig. 27).
(20) Remove #1 needle bearing (Fig. 28).
(21) Remove input clutch assembly (Fig. 29).

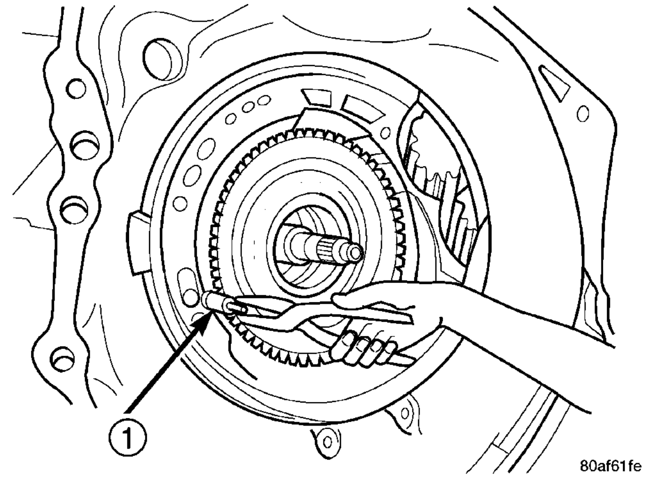


Fig. 27 Remove Bypass Valve

1 - COOLER BYPASS VALVE

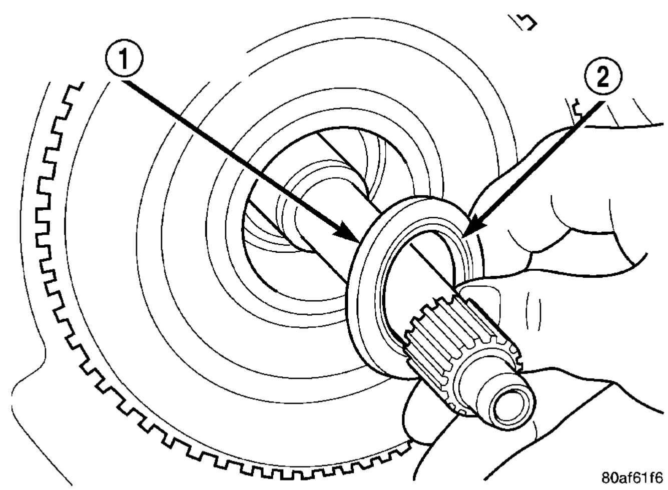


Fig. 28 Remove No. 1 Caged Needle Bearing

1 - #1 CAGED NEEDLE BEARING
2 - NOTE: TANGED SIDE OUT

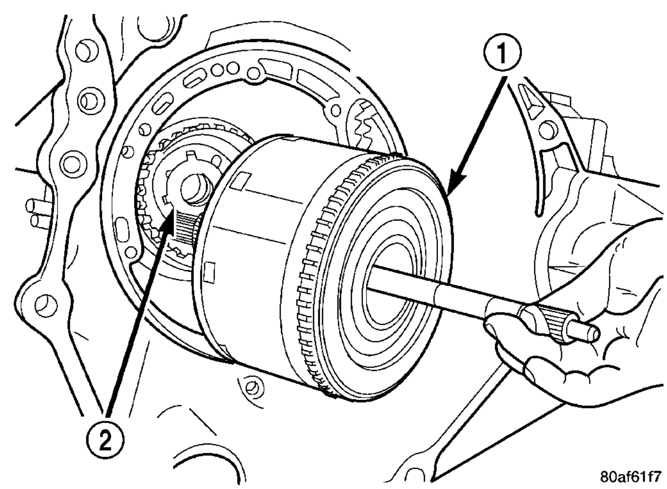


Fig. 29 Remove Input Clutch Assembly

1 - INPUT CLUTCH ASSEMBLY
2 - #4 THRUST WASHER

40TE AUTOMATIC TRANSAXLE (Continued)

(22) Remove #4 thrust plate (Fig. 30).

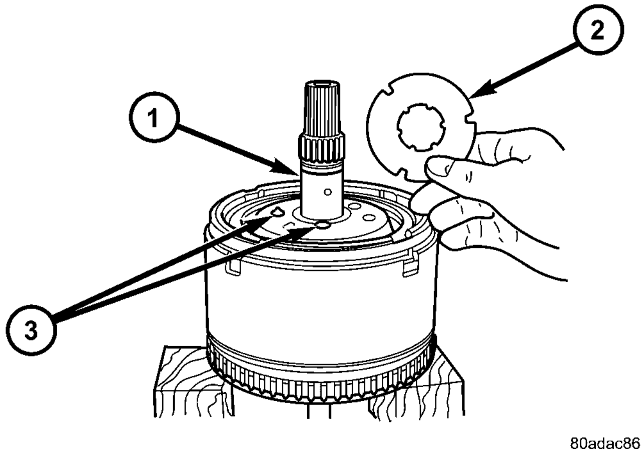


Fig. 30 No. 4 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #4 THRUST PLATE (SELECT)
3 - 3 DABS OF PETROLATUM FOR RETENTION

(23) Remove front sun gear assembly and #4 thrust washer (Fig. 31).

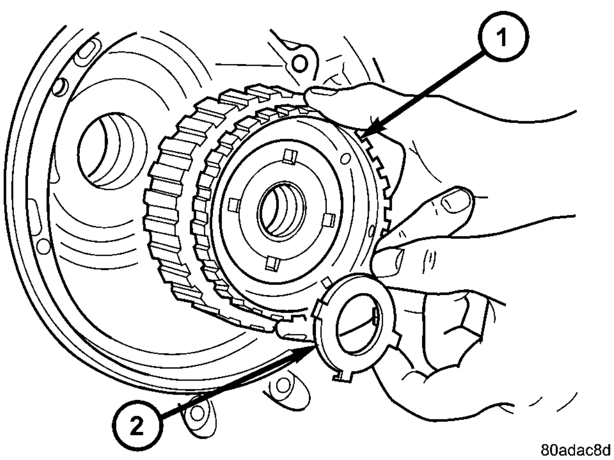


Fig. 31 Remove Front Sun Gear Assembly

1 - FRONT SUN GEAR ASSEMBLY
2 - #4 THRUST WASHER (FOUR TABS)

(24) Remove front carrier/rear annulus assembly and #6 needle bearing (Fig. 32).

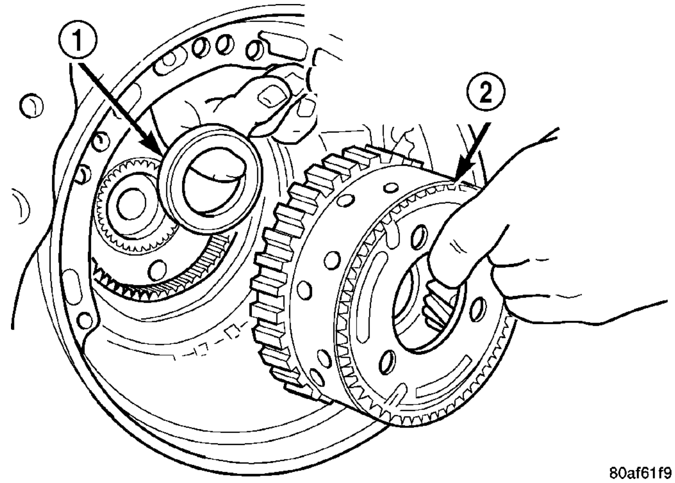


Fig. 32 Remove Front Carrier/Rear Annulus Assembly

1 - #6 NEEDLE BEARING
2 - FRONT CARRIER AND REAR ANNULUS ASSEMBLY (TWIST AND PULL OR PUSH TO REMOVE OR INSTALL).

(25) Remove rear sun gear and #7 needle bearing (Fig. 33).

NOTE: The number 7 needle bearing has three anti-reversal tabs and is common with the number five and number two position. The orientation should allow the bearing to seat flat against the rear sun gear (Fig. 34). A small amount of petrolatum can be used to hold the bearing to the rear sun gear.

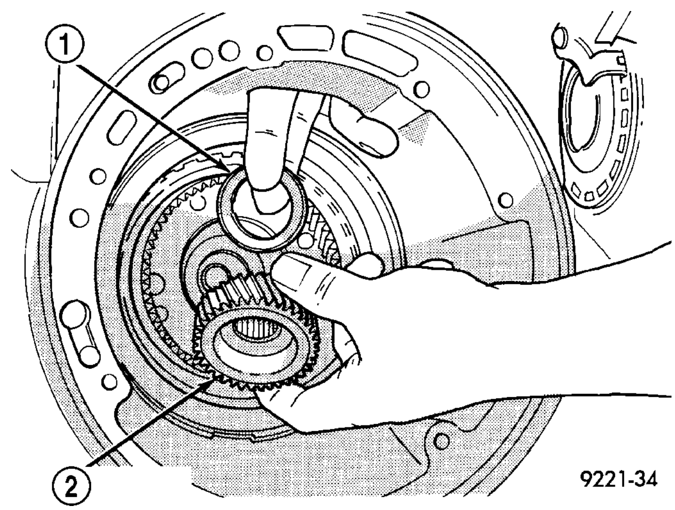


Fig. 33 Remove Rear Sun Gear

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

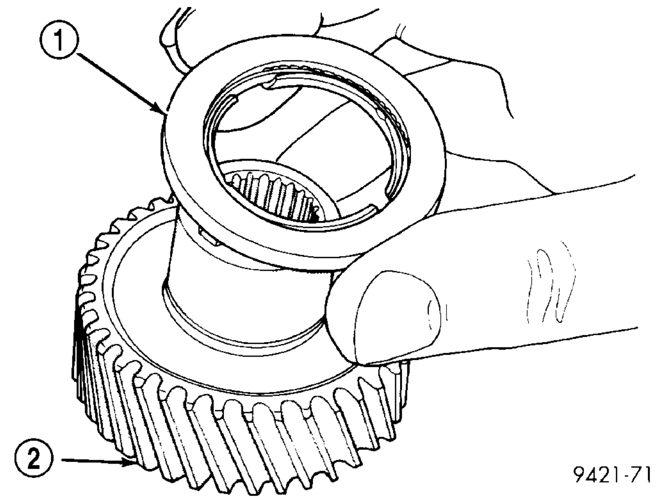


Fig. 34 Number 7 Bearing

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

(26) Setup tool 5058 as shown in (Fig. 35). Compress 2/4 clutch return spring (just enough to remove snap ring) and remove snap ring.

NOTE: Verify that Tool 5058 is centered properly over the 2/4 clutch retainer before compressing. If necessary, fasten the 5058 bar to the bellhousing flange with any combination of locking pliers and bolts to center the tool properly.

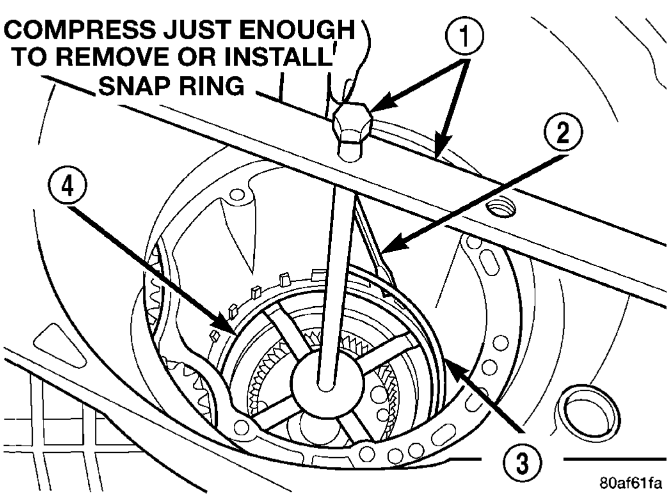


Fig. 35 Remove 2/4 Clutch Retainer Snap Ring

1 - TOOL 5058
2 - SCREWDRIVER
3 - SNAP RING
4 - 2/4 CLUTCH RETAINER

NOTE: The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

(27) Remove 2/4 clutch retainer (Fig. 36).

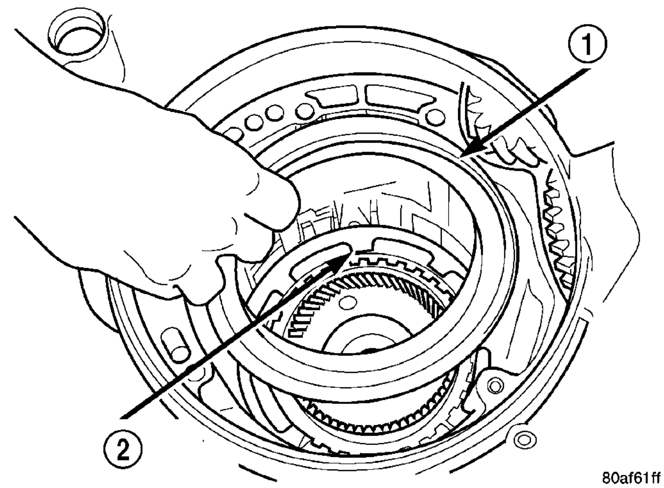


Fig. 36 2/4 Clutch Retainer

1 - 2/4 CLUTCH RETAINER
2 - 2/4 CLUTCH RETURN SPRING

(28) Remove 2/4 clutch return spring (Fig. 37).

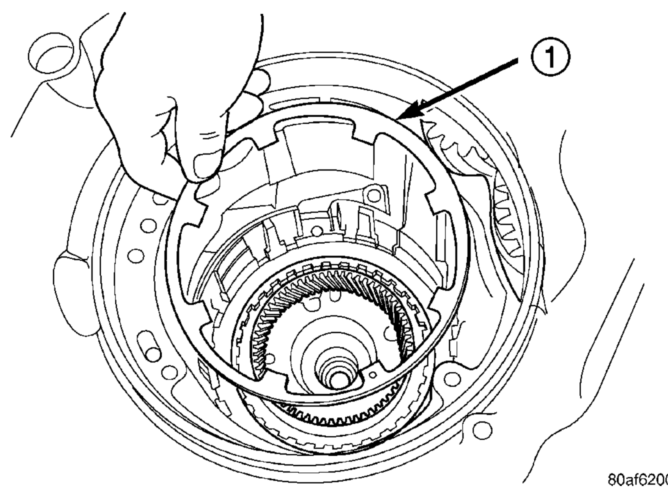


Fig. 37 Remove 2/4 Clutch Return Spring

1 - 2/4 CLUTCH RETURN SPRING

40TE AUTOMATIC TRANSAXLE (Continued)

(29) Remove 2/4 clutch pack (Fig. 38). **Tag 2/4 clutch pack for reassembly identification.**

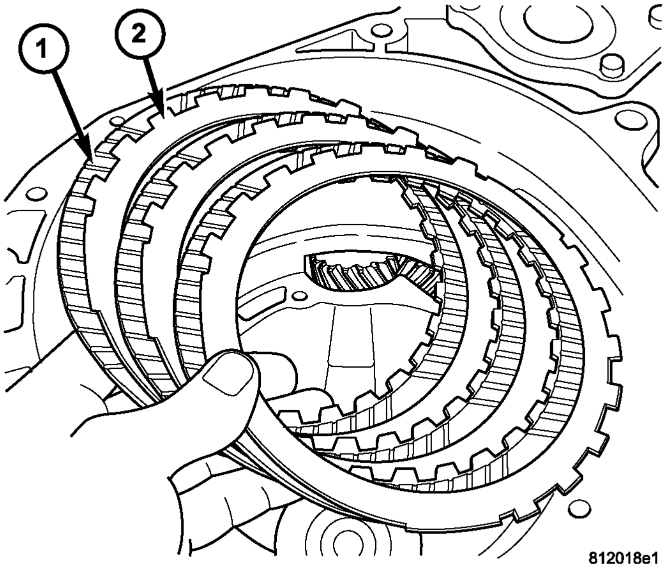


Fig. 38 Remove 2/4 Clutch Pack

1 - CLUTCH DISC
2 - CLUTCH PLATE

(30) Remove tapered snap ring (Fig. 39).

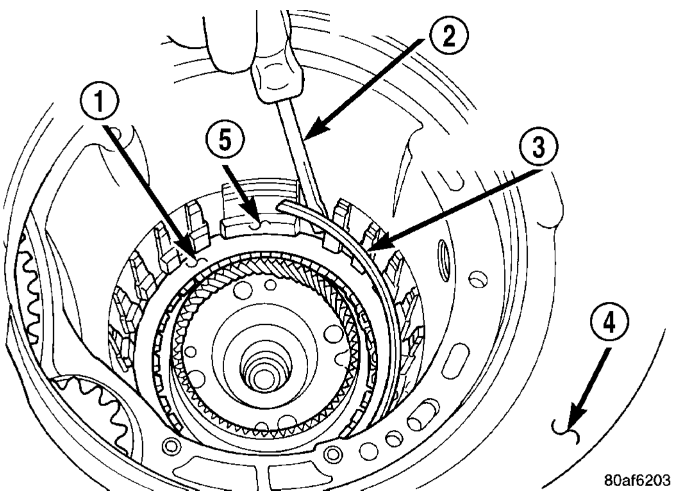


Fig. 39 Remove Tapered Snap Ring

1 - LOW/REVERSE CLUTCH REACTION PLATE
2 - SCREWDRIVER
3 - LOW/REVERSE TAPERED SNAP RING (TAPERED SIDE UP)
4 - OIL PAN FACE
5 - LONG TAB

(31) Remove low/reverse reaction plate (Fig. 40).

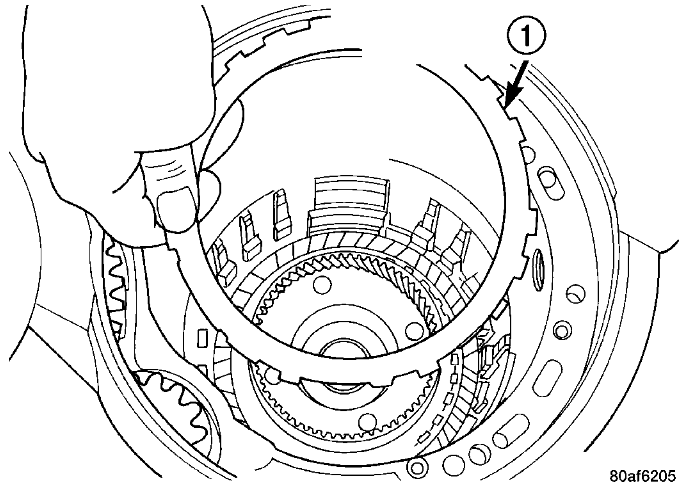


Fig. 40 Remove Low/Reverse Reaction Plate

1 - LOW/REVERSE REACTION PLATE (FLAT SIDE UP)

(32) Remove one low/reverse clutch disc (Fig. 41).

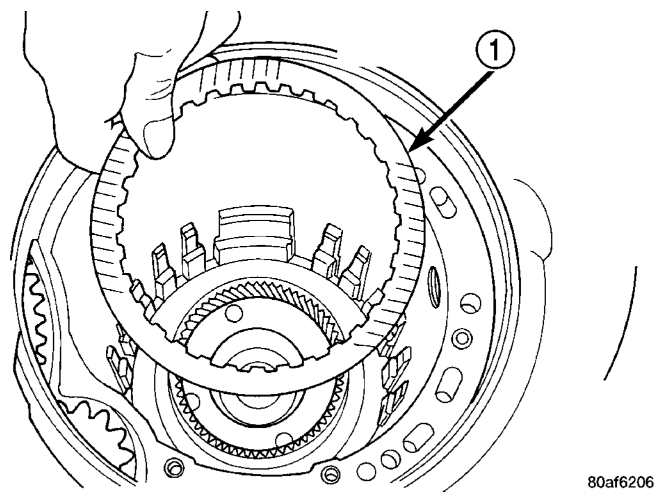


Fig. 41 Remove One Disc

1 - ONE DISC FROM LOW/REVERSE CLUTCH

40TE AUTOMATIC TRANSAXLE (Continued)

(33) Remove low/reverse reaction plate snap ring (Fig. 42).

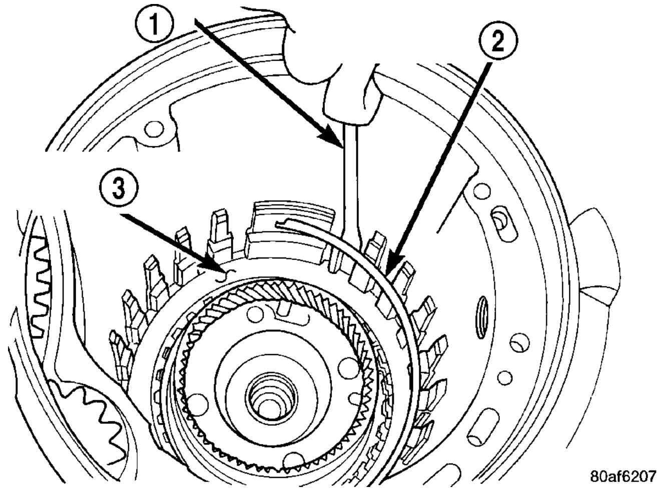


Fig. 42 Remove Low/Reverse Reaction Plate Snap Ring

1 - SCREWDRIVER
2 - LOW/REVERSE REACTION PLATE FLAT SNAP RING
3 - DO NOT SCRATCH CLUTCH PLATE

(34) Remove low/reverse clutch pack (Fig. 43).

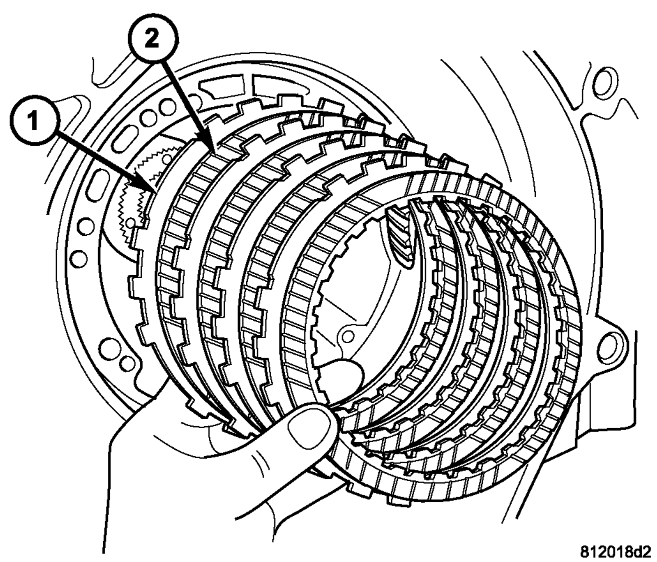


Fig. 43 Remove Low/Reverse Clutch

1 - CLUTCH PLATE
2 - CLUTCH DISC

(35) Remove transfer gear cover-to-case bolts (Fig. 44).

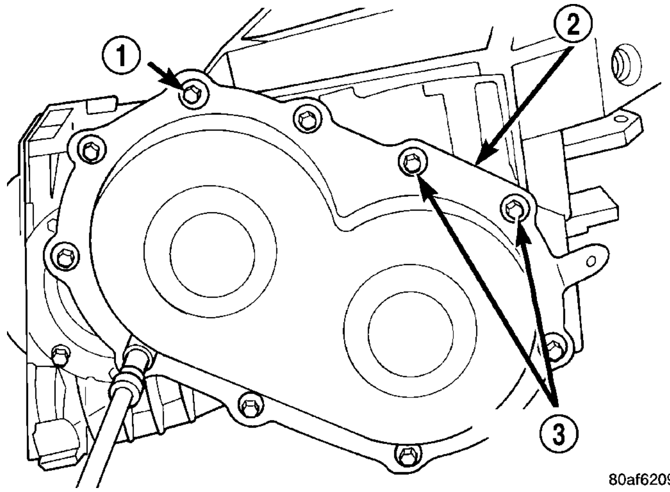


Fig. 44 Remove Rear Cover Bolts

1 - REAR COVER BOLTS
2 - REAR COVER
3 - USE SEALANT ON BOLTS

(36) Remove transfer gear cover (Fig. 45).

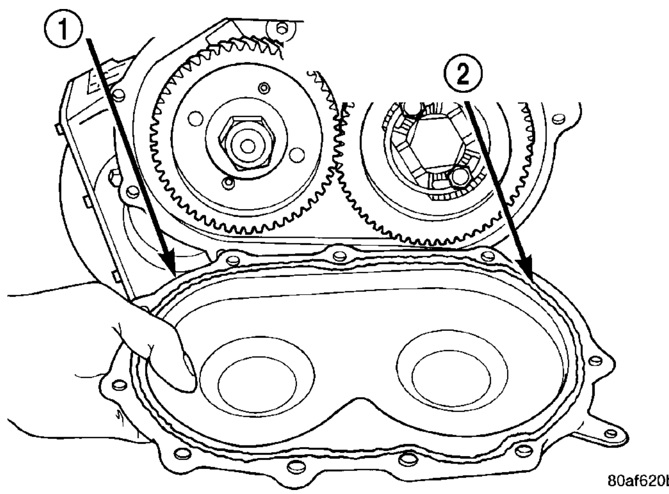


Fig. 45 Remove Rear Cover

1 - REAR COVER
2 - 1/8 INCH BEAD OF MOPAR® ATF RTV (MS-GF41) AS SHOWN

40TE AUTOMATIC TRANSAXLE (Continued)

(37) Using Tool 6259, remove transfer shaft gear-to-shaft nut and coned washer (Fig. 46) (Fig. 47).

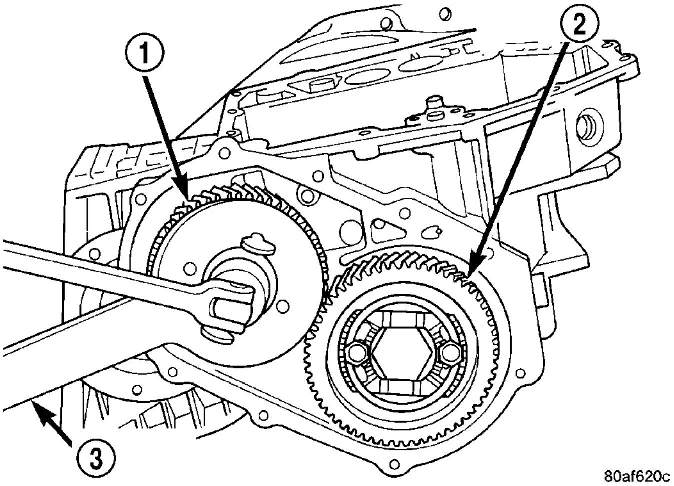


Fig. 46 Remove Transfer Shaft Gear Nut

1 - TRANSFER SHAFT GEAR
2 - OUTPUT GEAR
3 - SPECIAL TOOL 6259

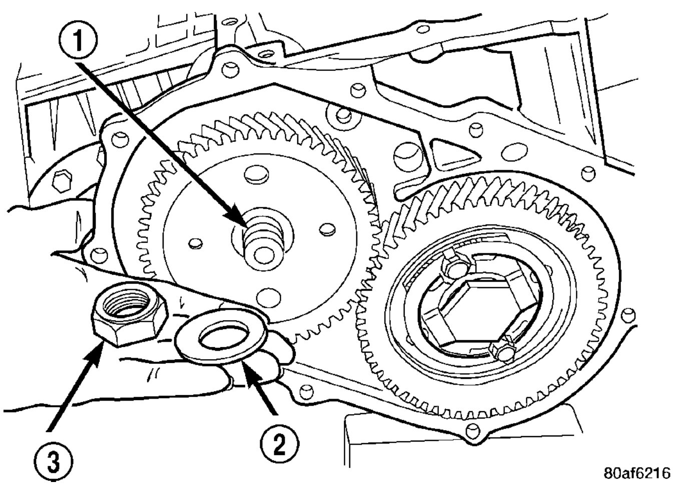


Fig. 47 Transfer Shaft Gear Nut and Coned Washer

1 - TRANSFER SHAFT
2 - LOCK WASHER
3 - NUT

(38) Using tool L-4407A, remove transfer shaft gear (Fig. 48).

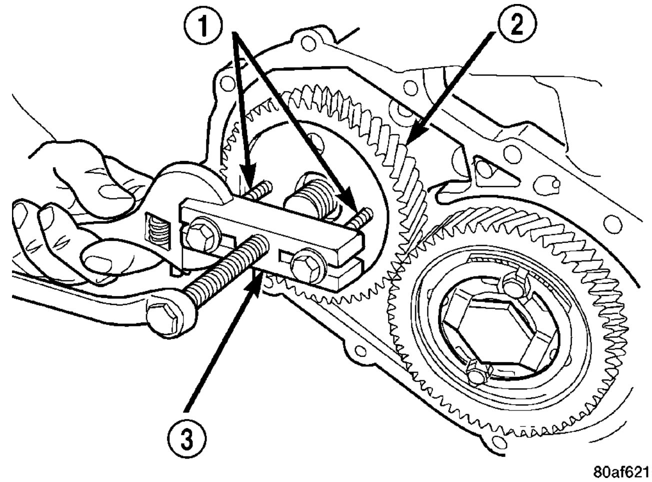


Fig. 48 Remove Transfer Shaft Gear

1 - SPECIAL TOOL L4407-6
2 - TRANSFER SHAFT GEAR
3 - SPECIAL TOOL L4407A

(39) Remove transfer gear shim (select) (Fig. 49).

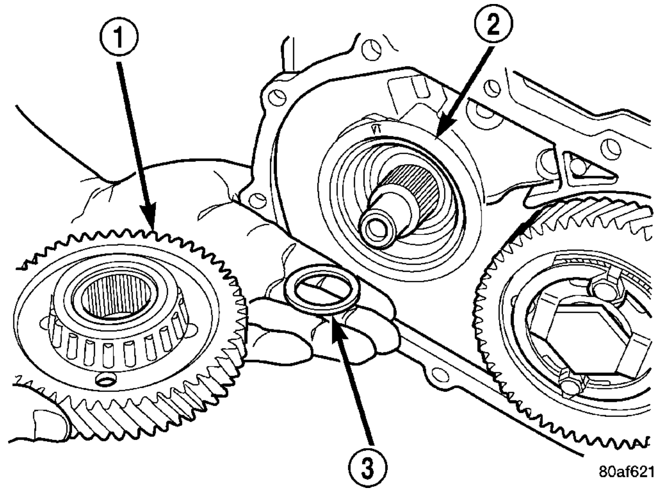


Fig. 49 Remove Transfer Shaft Gear and (Select) Shim

1 - TRANSFER SHAFT GEAR
2 - BEARING CUP RETAINER
3 - SHIM (SELECT)

40TE AUTOMATIC TRANSAXLE (Continued)

(40) Remove bearing cup retainer (Fig. 50).

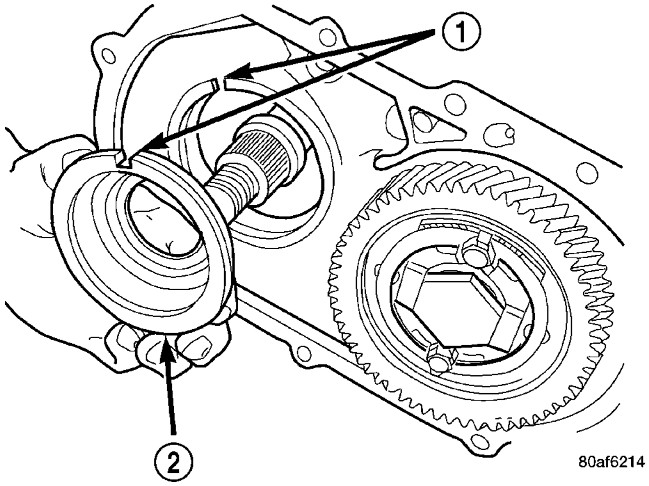


Fig. 50 Remove Bearing Cup Retainer

1 - ALIGN INDEXING TAB TO SLOT
2 - BEARING CUP RETAINER

(41) Remove transfer gear bearing cone using setup shown in (Fig. 51).

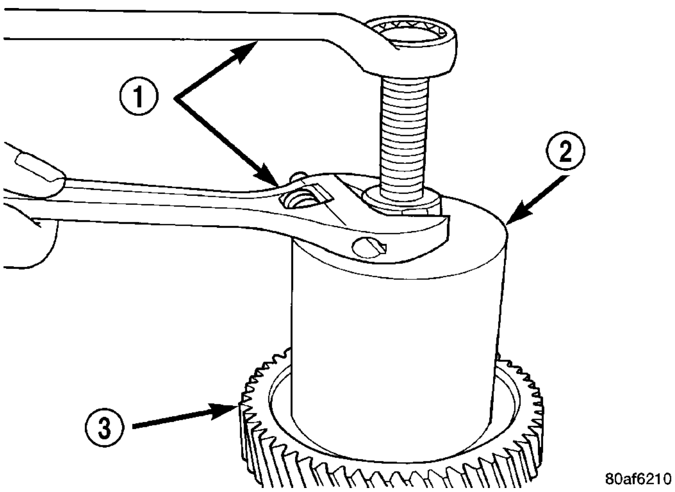


Fig. 51 Remove Transfer Gear Bearing Cone

1 - WRENCHES
2 - TOOL 5048 WITH JAWS TOOL 5048–4 AND BUTTON TOOL L-4539–2
3 - TRANSFER SHAFT GEAR

(42) Remove transfer shaft bearing cup from retainer using Tool 6062 (Fig. 52).

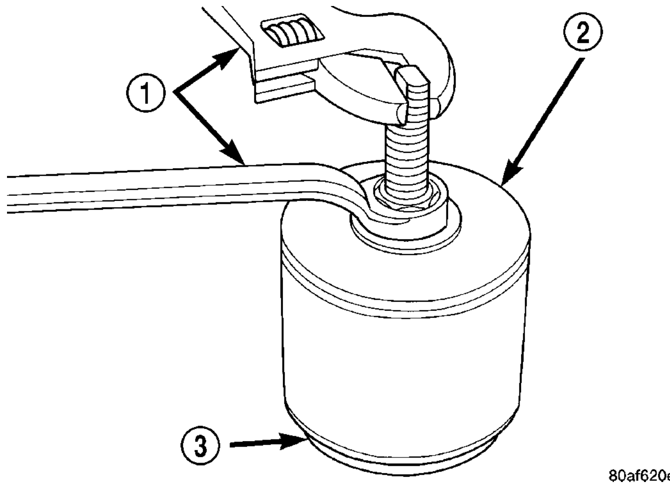


Fig. 52 Remove Transfer Shaft Bearing Cup

1 - WRENCHES
2 - TOOL 6062
3 - TRANSFER SHAFT BEARING CUP RETAINER

(43) Using Tool 6051, remove transfer shaft bearing snap ring (Fig. 53).

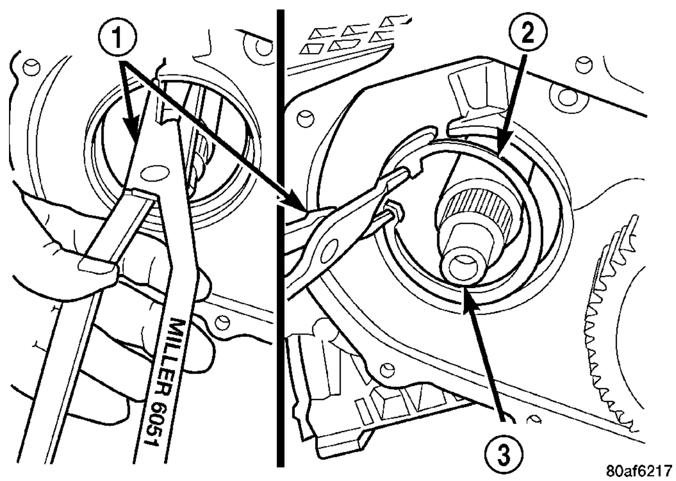


Fig. 53 Remove Transfer Shaft Bearing Snap Ring

1 - SNAP RING PLIERS TOOL 6051
2 - TRANSFER SHAFT BEARING SNAP RING
3 - TRANSFER SHAFT

40TE AUTOMATIC TRANSAXLE (Continued)

(44) Using tool 5049A, remove transfer shaft from transaxle (Fig. 54).

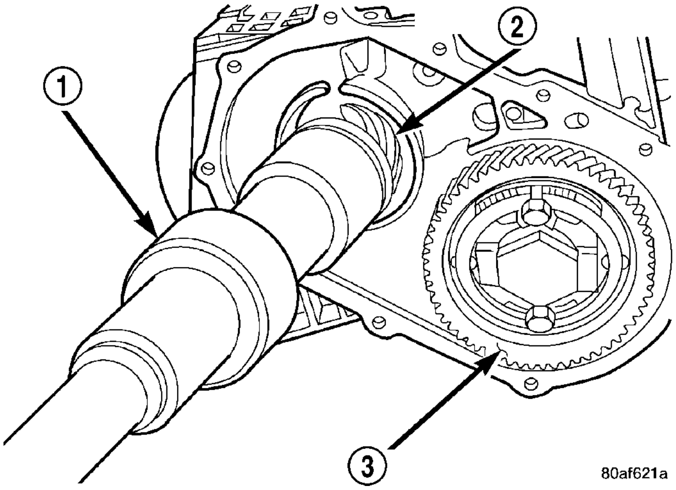


Fig. 54 Remove Transfer Shaft

1 - SPECIAL TOOL 5049–A
2 - TRANSFER SHAFT
3 - OUTPUT GEAR

(45) Slip bearing cup retainer and oil baffle off of shaft (Fig. 55).

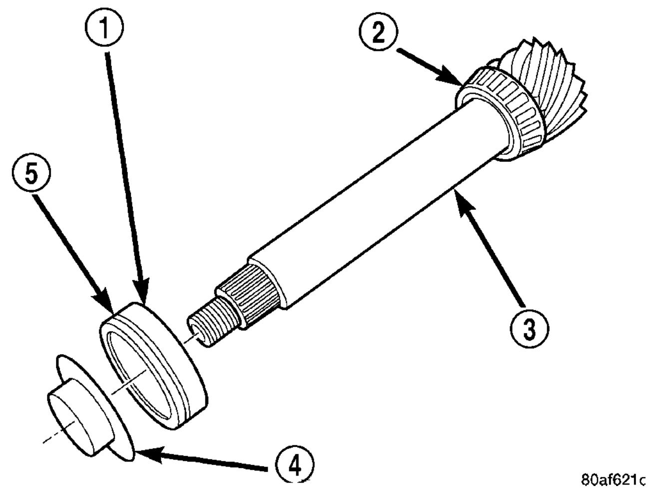


Fig. 55 Bearing Cup Removed

1 - BEARING CUP
2 - BEARING CONE
3 - TRANSFER SHAFT
4 - OIL BAFFLE
5 - O-RING

(46) Using tool P-334, press transfer shaft bearing cone off of shaft (Fig. 56).

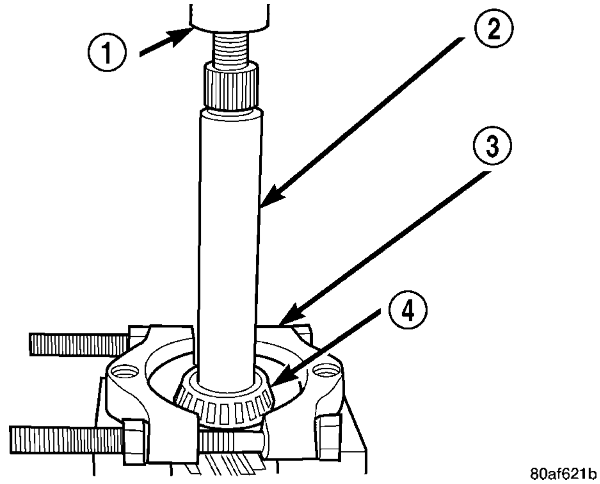


Fig. 56 Remove Transfer Shaft Bearing Cone

1 - ARBOR PRESS RAM
2 - TRANSFER SHAFT
3 - TOOL P-334
4 - BEARING CONE

(47) Bend output gear retaining strap ears flat to allow bolt removal.

(48) Remove output shaft stirrup strap bolts (Fig. 57).

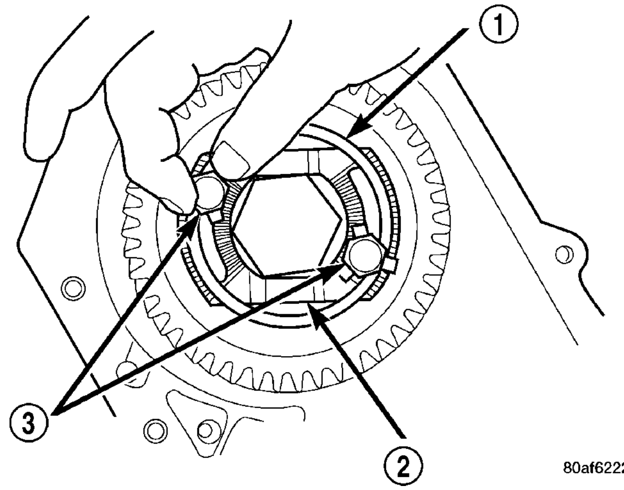


Fig. 57 Remove Strap Bolts

1 - RETAINING STRAP
2 - STIRRUP
3 - RETAINING STRAP BOLTS

40TE AUTOMATIC TRANSAXLE (Continued)

(49) Remove stirrup and strap (Fig. 58).

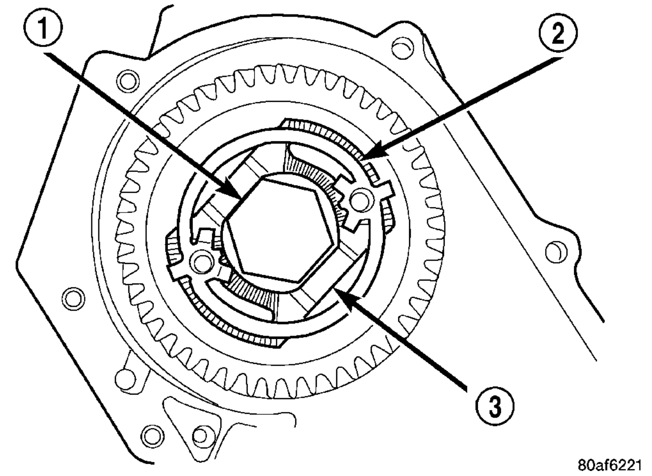


Fig. 58 Remove Stirrup Strap

1 - OUTPUT GEARBOLT
2 - RETAINING STRAP
3 - STIRRUP

(50) Using Tool 6259 (Fig. 59), remove output shaft gear-to-shaft bolt and washer (Fig. 60).

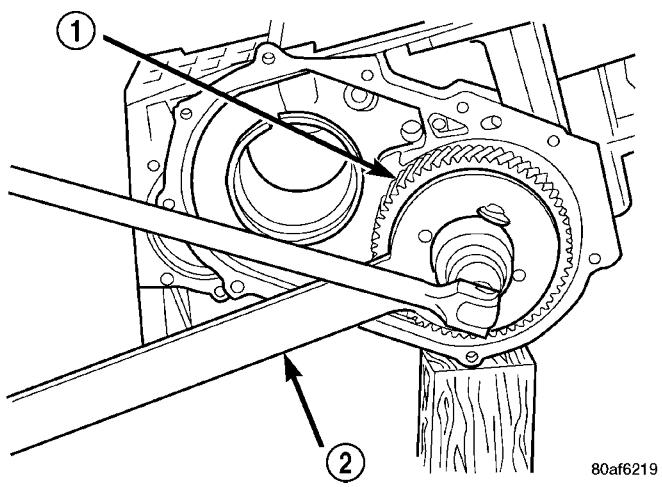


Fig. 59 Remove Output Gear Bolt

1 - OUTPUT GEAR
2 - TOOL 6259

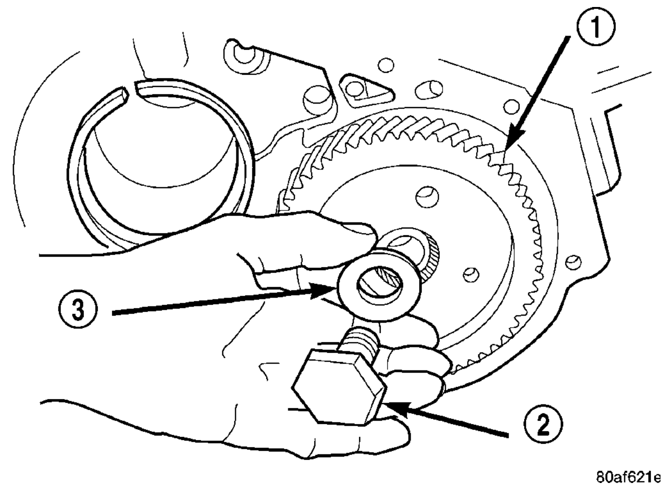


Fig. 60 Output Gear Bolt and Washer

1 - OUTPUT GEAR
2 - BOLT
3 - CONED LOCK WASHER

(51) Using Tool L4407A, and button 6055, remove output gear from shaft (Fig. 61).

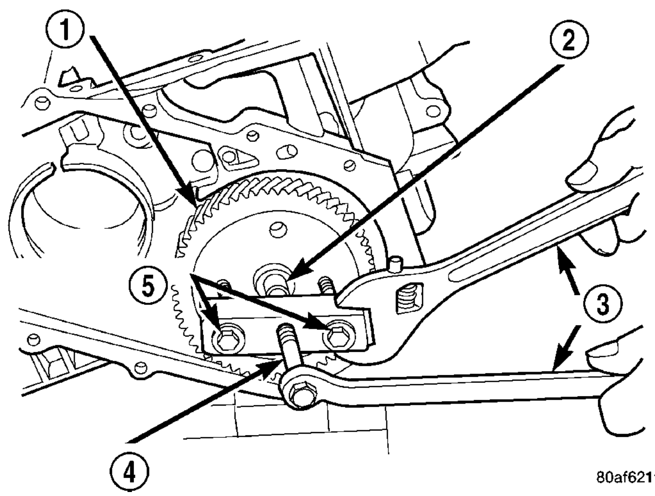


Fig. 61 Remove Output Gear

1 - OUTPUT GEAR
2 - BUTTON TOOL 6055
3 - WRENCHES
4 - TOOL L4407A
5 - BOLTS TOOL L4407–6

40TE AUTOMATIC TRANSAXLE (Continued)

(52) Remove output gear bearing shim (select) (Fig. 62).

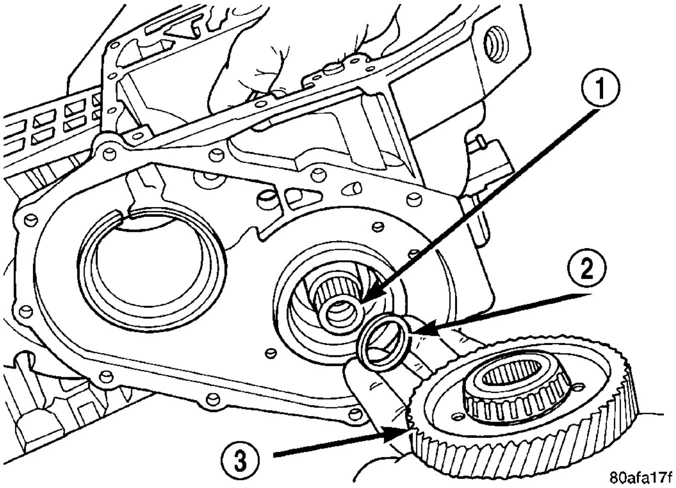


Fig. 62 Output Gear and (Select) Shim

1 - REAR CARRIER ASSEMBLY
2 - SHIM (SELECT)
3 - OUTPUT GEAR

(53) Using setup as shown in (Fig. 63), remove output gear bearing cone.

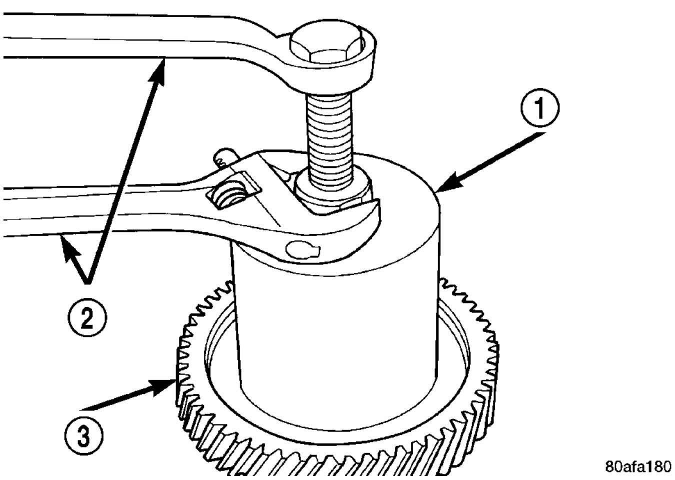


Fig. 63 Remove Bearing Cone

1 - TOOL 5048 WITH JAWS 5048–5 AND BUTTON L-4539–2
2 - WRENCHES
3 - OUTPUT GEAR

(54) Remove rear carrier assembly from transaxle (Fig. 64).

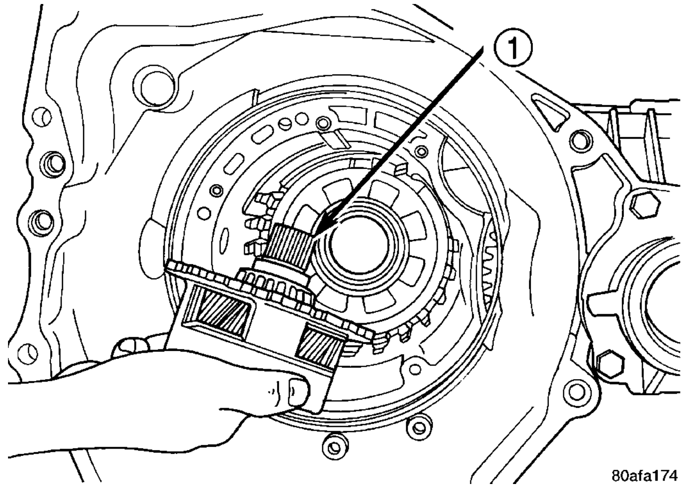


Fig. 64 Remove Rear Carrier Assembly

1 - REAR CARRIER ASSEMBLY

(55) Remove rear carrier assembly bearing cone using setup shown in (Fig. 65).

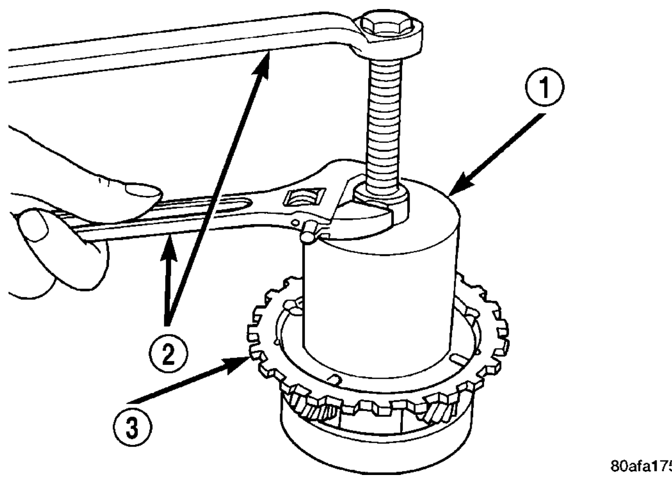


Fig. 65 Remove Rear Carrier Bearing Cone

1 - TOOL 5048 WITH JAWS 5048–3 AND BUTTON 6055
2 - WRENCHES
3 - REAR CARRIER ASSEMBLY

40TE AUTOMATIC TRANSAXLE (Continued)

(56) Install low/reverse spring compressor tool as shown in (Fig. 66) (Fig. 67).

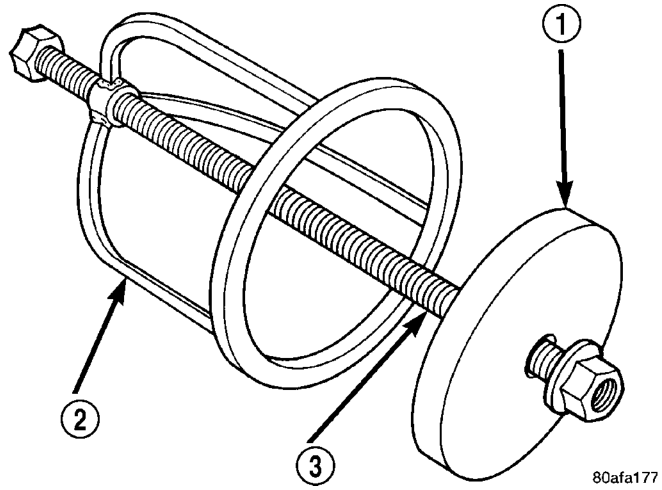


Fig. 66 Low/Reverse Spring Compressor Tool

1 - TOOL 6057
2 - TOOL 5059
3 - TOOL 5058–3

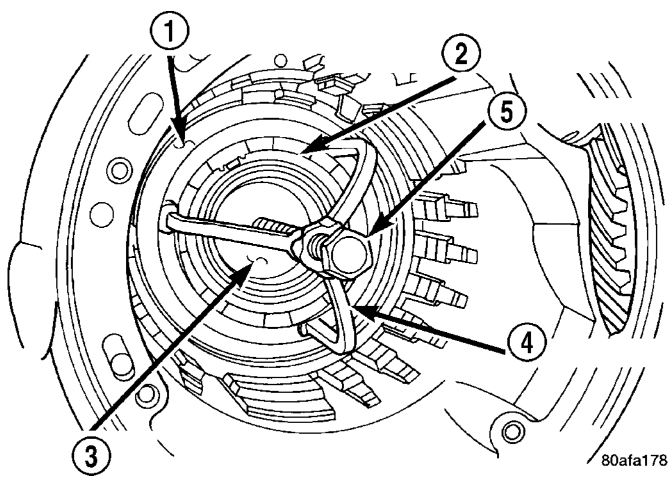


Fig. 67 Compressor Tool in Use

1 - LOW/REVERSE CLUTCH RETURN SPRING
2 - SNAP RING (INSTALL AS SHOWN)
3 - TOOL 6057
4 - TOOL 5059
5 - TOOL 5058–3

(57) Compress low/reverse piston return spring and remove snap ring (Fig. 68).

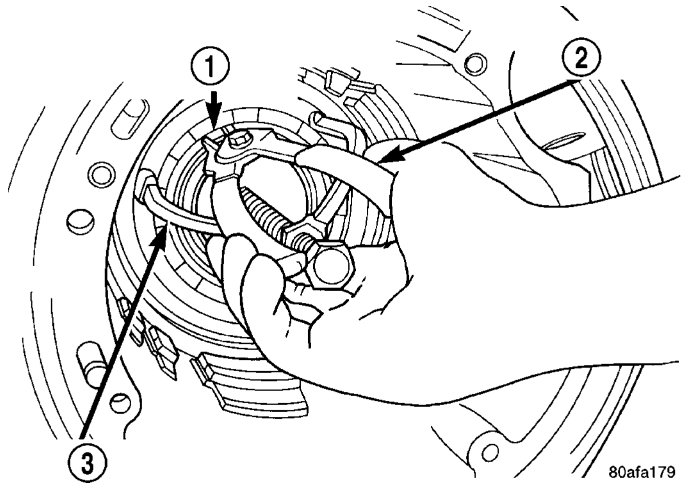


Fig. 68 Install Snap Ring

1 - SNAP RING OPENING MUST BE BETWEEN SPRING LEVERS (AS SHOWN)
2 - SNAP RING PLIERS
3 - TOOL 6057

(58) Remove low/reverse spring compressor tool and low reverse piston return spring (Fig. 69).

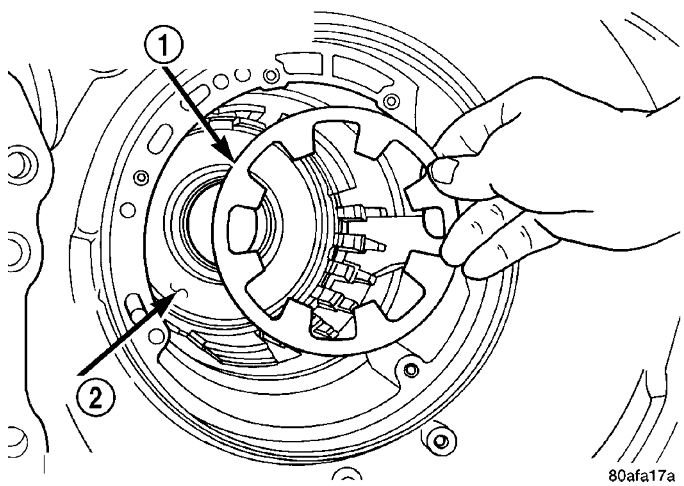


Fig. 69 Low/Reverse Piston

1 - LOW/REVERSE PISTON RETURN SPRING
2 - PISTON

40TE AUTOMATIC TRANSAXLE (Continued)

(59) Using a suitable punch , drive out park guide bracket pivot shaft plug (Fig. 70).

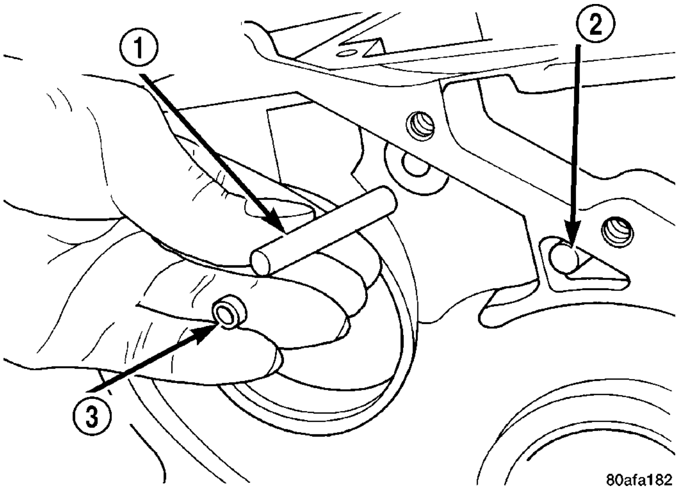


Fig. 70 Remove Anchor Shaft and Plug

1 - GUIDE BRACKET ANCHOR SHAFT
2 - PIVOT SHAFT
3 - ANCHOR SHAFT PLUG

(60) Using ordinary pliers, remove pivot shaft and guide bracket assembly (Fig. 71).

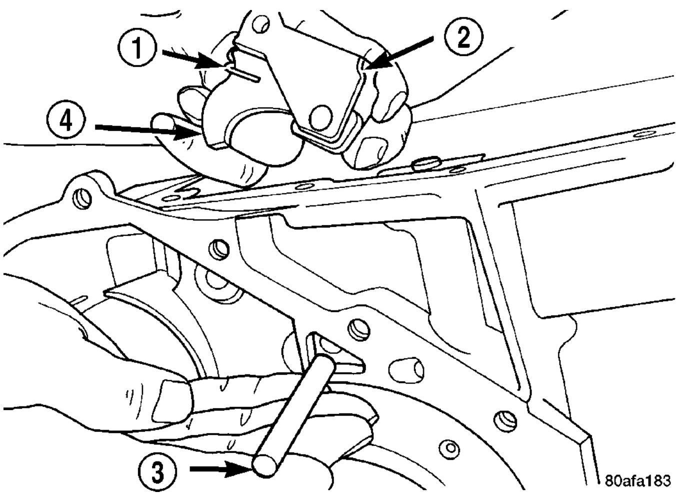


Fig. 71 Pivot Shaft and Guide Bracket

1 - ANTIRACHET SPRING
2 - GUIDE BRACKET
3 - PIVOT SHAFT
4 - PAWL

(61) Inspect guide bracket components for excessive wear and replace if necessary (Fig. 72).

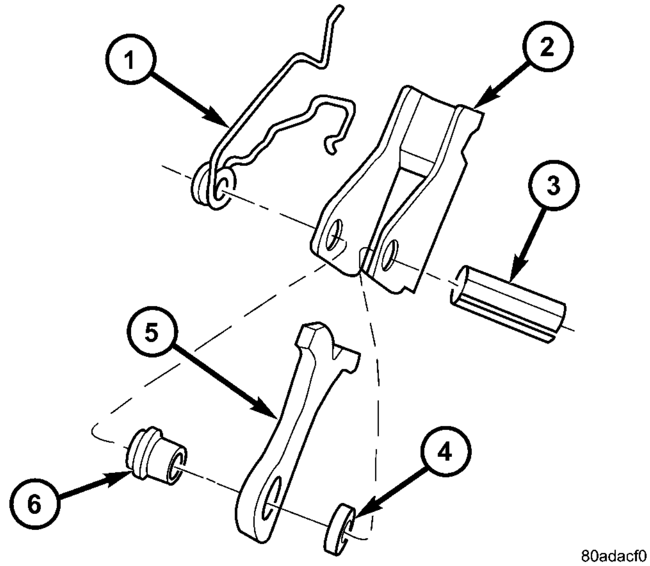


Fig. 72 Guide Bracket Disassembled

1 - ANTIRATCHET SPRING
2 - GUIDE BRACKET
3 - SPLIT SLEEVE
4 - SPACER
5 - PAWL
6 - STEPPED SPACER

NOTE: The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

(62) Remove low/reverse clutch piston (Fig. 73).

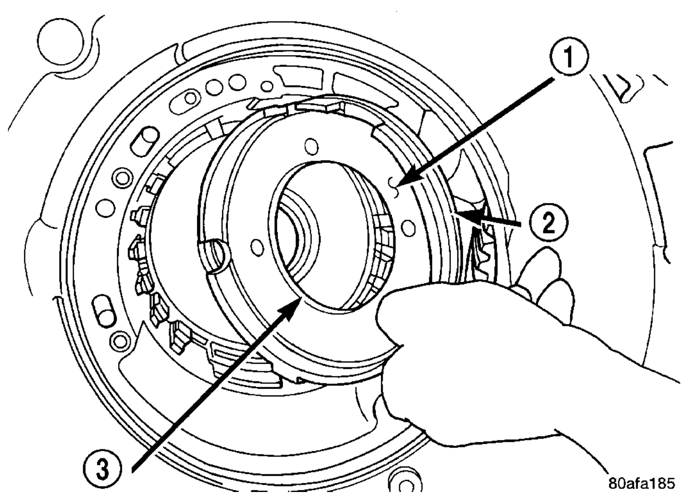


Fig. 73 Remove Low/Reverse Clutch Piston

1 - LOW/REVERSE CLUTCH PISTON
2 - BONDED SEAL
3 - BONDED SEAL

40TE AUTOMATIC TRANSAXLE (Continued)

(63) Remove low/reverse piston retainer-to-case screws (Fig. 74).

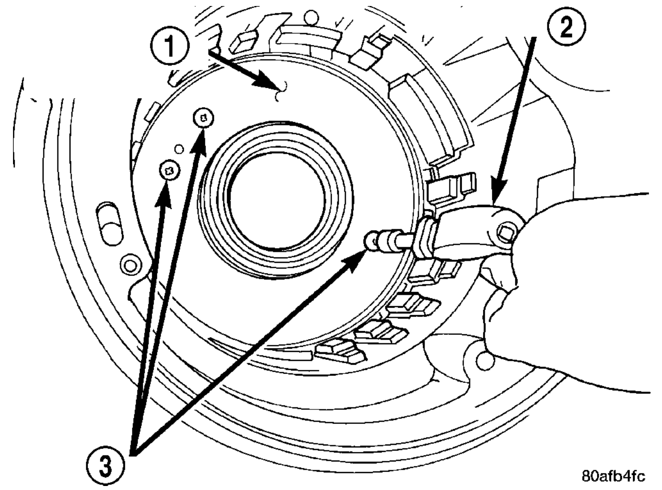


Fig. 74 Remove Piston Retainer-to-Case Screws

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - SCREWDRIVER
3 - TORX-LOC SCREWS

(64) Remove low/reverse piston retainer (Fig. 75).

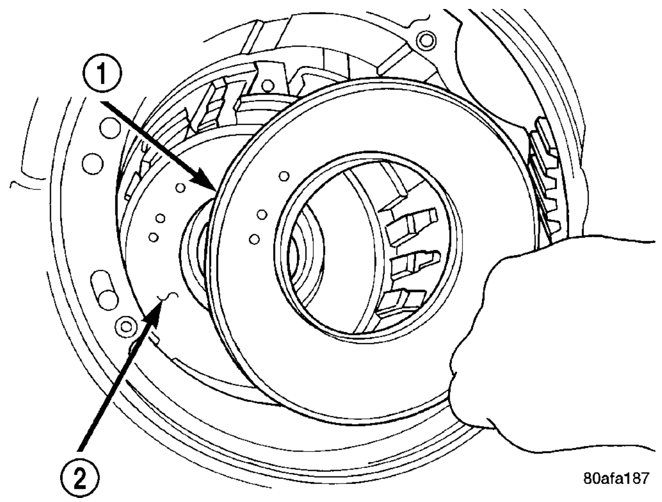


Fig. 75 Remove Piston Retainer

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - GASKET

(65) Remove low/reverse piston retainer-to-case gasket (Fig. 76).

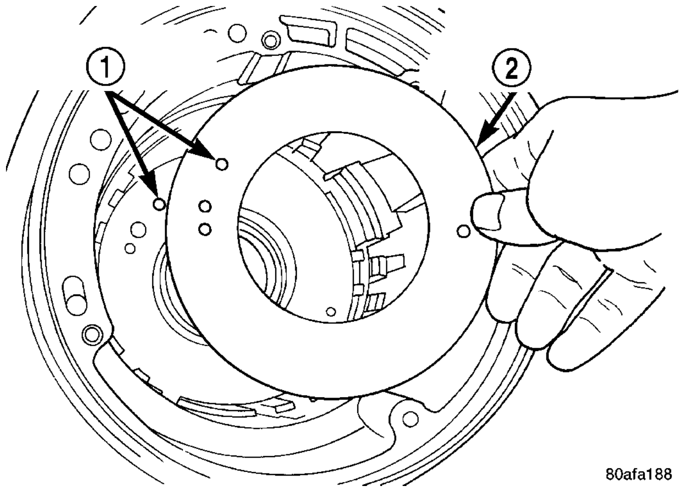


Fig. 76 Remove Piston Retainer Gasket

1 - GASKET HOLES MUST LINE UP
2 - LOW/REVERSE CLUTCH PISTON RETAINER GASKET

(66) Using a hammer and suitable drift, drive out inner output bearing cup (Fig. 77).

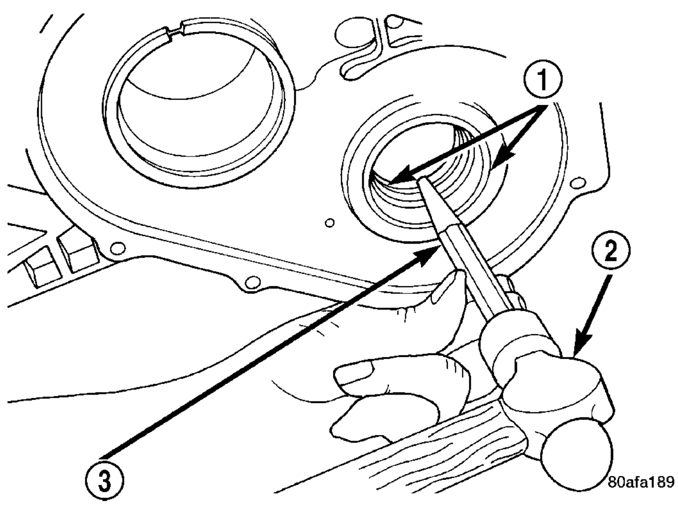


Fig. 77 Remove Output Bearing Inner Cup

1 - OUTPUT BEARING CUPS (REPLACE IN PAIRS)
2 - HAMMER
3 - BRASS DRIFT

40TE AUTOMATIC TRANSAXLE (Continued)

(67) Using tool 6062, remove outer output bearing cup (Fig. 78).

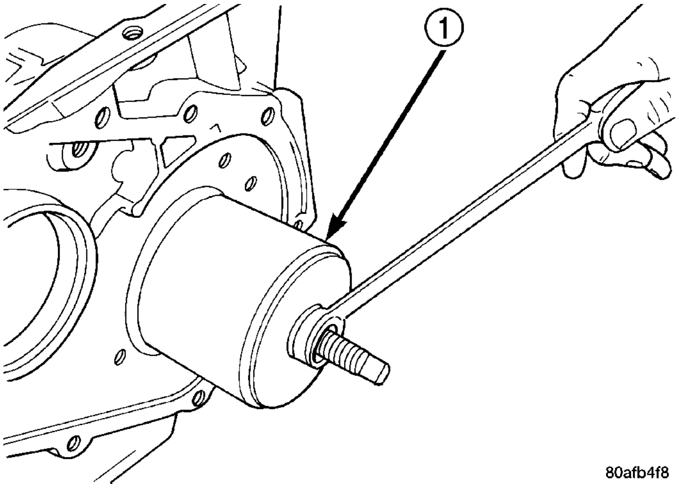


Fig. 78 Remove Output Bearing Outer

1 - TOOL 6062

ASSEMBLY

CAUTION: The cooler bypass valve must be replaced if transaxle failure has occurred. Do not attempt to reuse or clean old valve.

NOTE: If transaxle is being overhauled (clutch and/or seal replacement), the TCM/PCM Quick Learn procedure must be performed. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install both output bearing cups using Tool 5050 (Fig. 79).

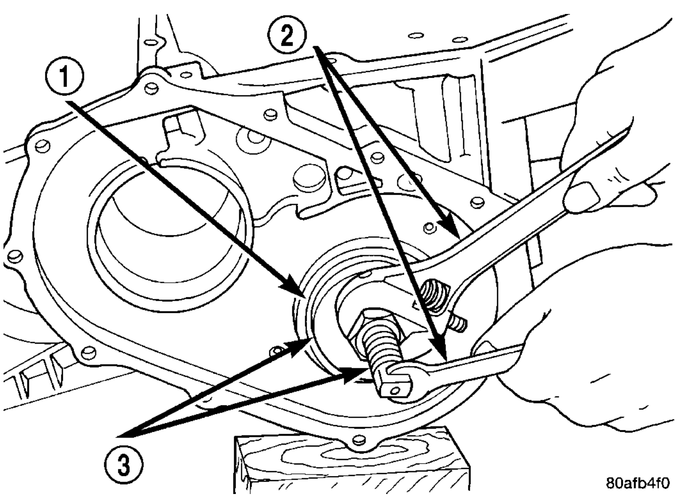


Fig. 79 Install Both Output Bearing Cups

1 - OUTPUT BEARING CUPS
2 - WRENCHES
3 - TOOL 5050

(2) Install low/reverse piston retainer gasket (Fig. 80). Make sure gasket holes line up with case.

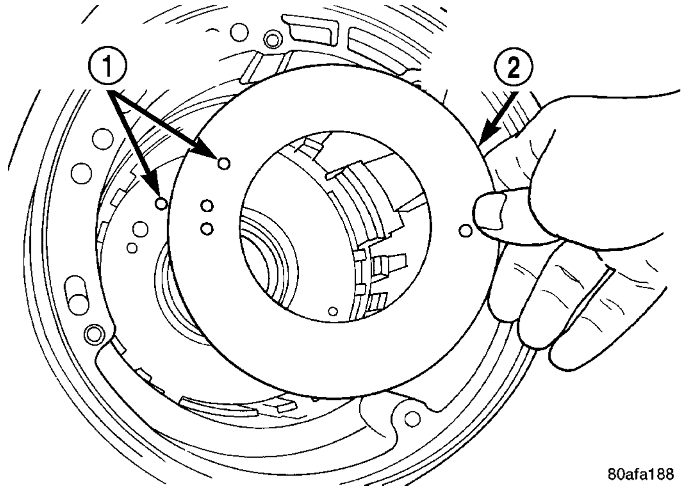


Fig. 80 Install Piston Retainer Gasket

1 - GASKET HOLES MUST LINE UP
2 - LOW/REVERSE CLUTCH PISTON RETAINER GASKET

(3) Install low/reverse piston retainer (Fig. 81).

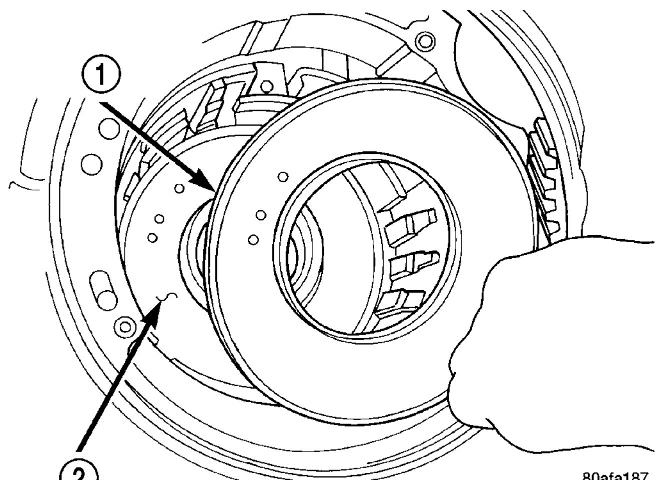


Fig. 81 Install Piston Retainer

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - GASKET

40TE AUTOMATIC TRANSAXLE (Continued)

(4) Install low/reverse piston retainer-to-case bolts (Fig. 82) and torque to 5 N·m (45 in. lbs.).

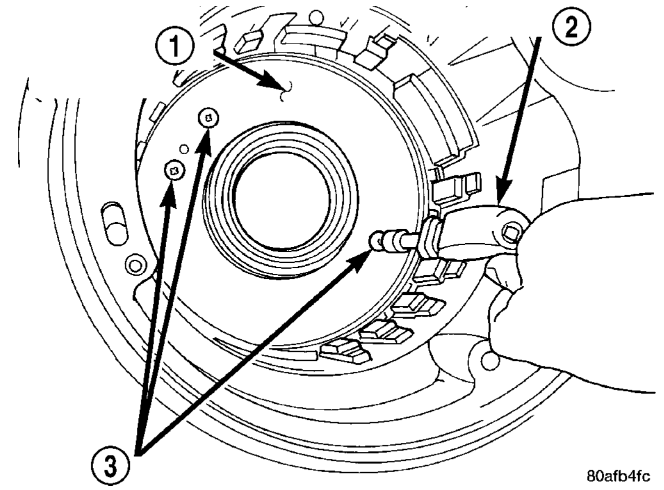


Fig. 82 Install Piston Retainer-to-Case Screws

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - SCREWDRIVER
3 - TORX-LOC SCREWS

NOTE: The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

(5) Install low/reverse clutch piston (Fig. 83).

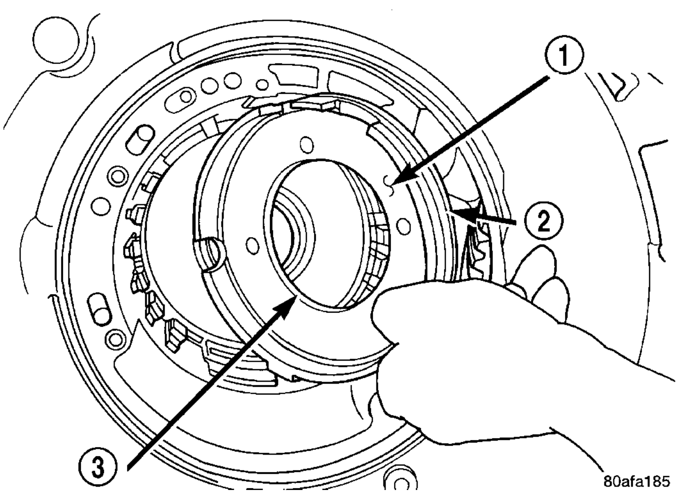


Fig. 83 Install Low/Reverse Clutch Piston

1 - LOW/REVERSE CLUTCH PISTON
2 - BONDED SEAL
3 - BONDED SEAL

(6) Assemble park guide bracket assembly (Fig. 85) (Fig. 84).

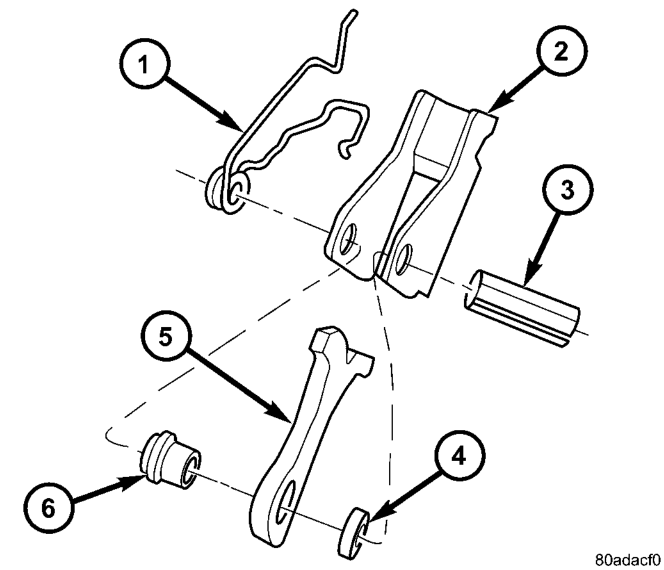


Fig. 84 Guide Bracket Disassembled

1 - ANTIRATCHET SPRING
2 - GUIDE BRACKET
3 - SPLIT SLEEVE
4 - SPACER
5 - PAWL
6 - STEPPED SPACER

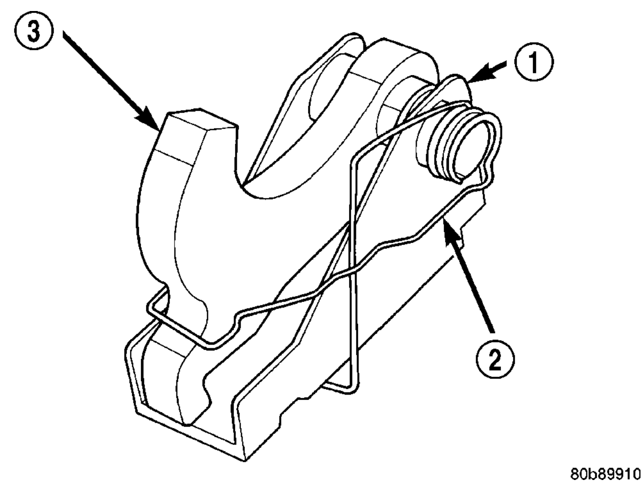


Fig. 85 Guide Bracket

1 - GUIDE BRACKET
2 - ANTIRATCHET SPRING (MUST BE ASSEMBLED AS SHOWN)
3 - PAWL

40TE AUTOMATIC TRANSAXLE (Continued)

(7) Install guide bracket into position and insert pivot shaft (Fig. 86).

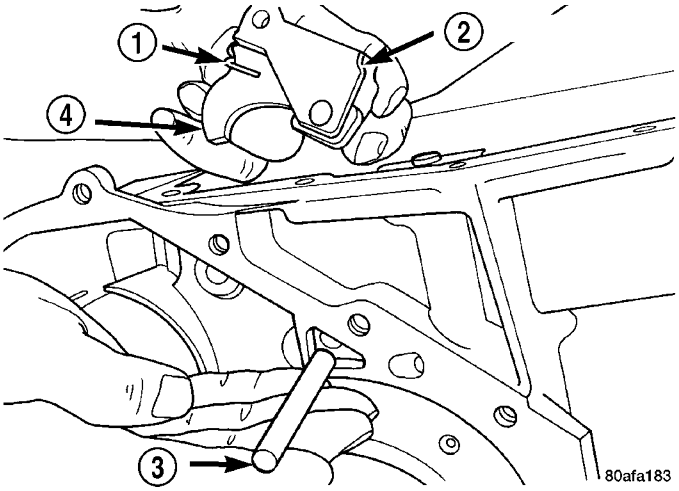


Fig. 86 Pivot Shaft and Guide Bracket

1 - ANTIRACHET SPRING
2 - GUIDE BRACKET
3 - PIVOT SHAFT
4 - PAWL

(8) Install anchor shaft and plug (Fig. 87). Make sure guide bracket and split sleeve are in contact with the rear of the transaxle case.

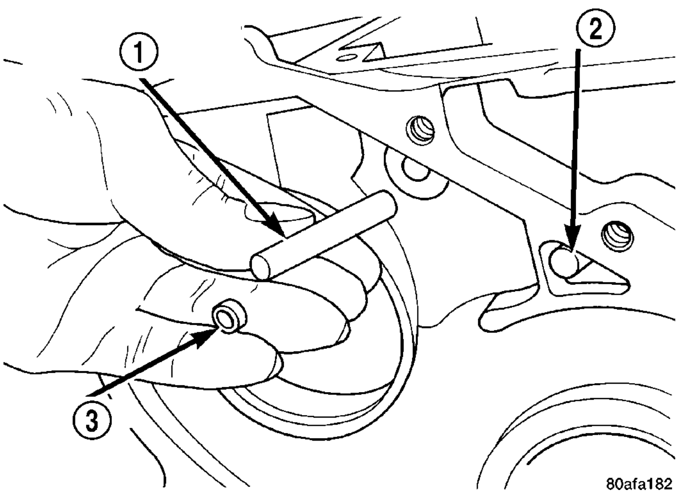


Fig. 87 Install Anchor Shaft and Plug

1 - GUIDE BRACKET ANCHOR SHAFT
2 - PIVOT SHAFT
3 - ANCHOR SHAFT PLUG

(9) Install low/reverse piston return spring (Fig. 88).

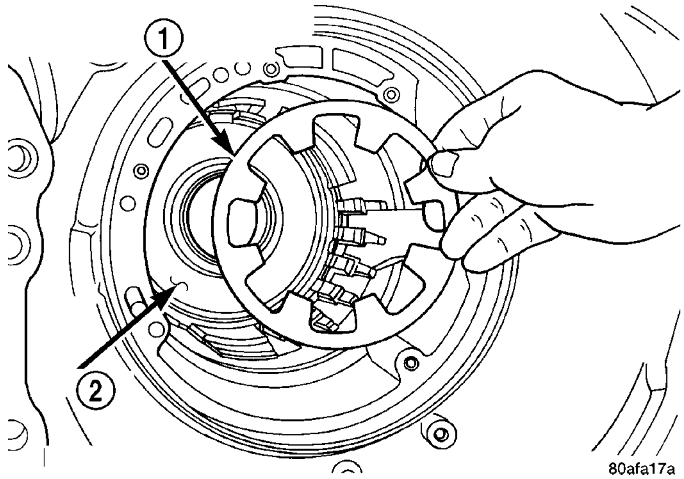


Fig. 88 Low/Reverse Piston Return Spring

1 - LOW/REVERSE PISTON RETURN SPRING
2 - PISTON

(10) Install low/reverse spring compressor into position (Fig. 89). Compress low/reverse piston and install snap ring as shown in (Fig. 90).

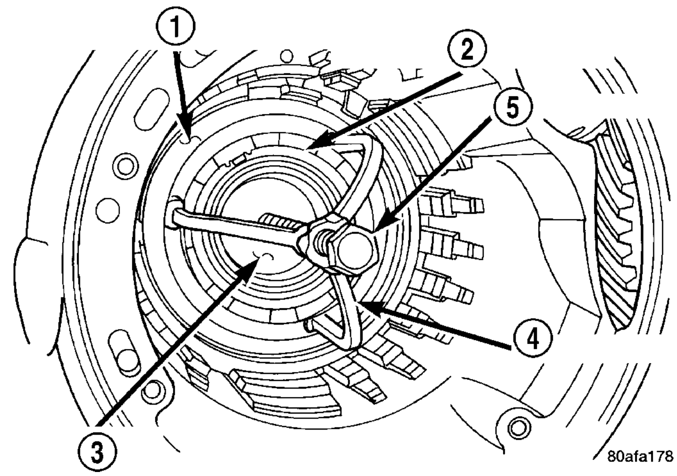


Fig. 89 Compressor Tool in Use

1 - LOW/REVERSE CLUTCH RETURN SPRING
2 - SNAP RING (INSTALL AS SHOWN)
3 - TOOL 6057
4 - TOOL 5059
5 - TOOL 5058–3

40TE AUTOMATIC TRANSAXLE (Continued)

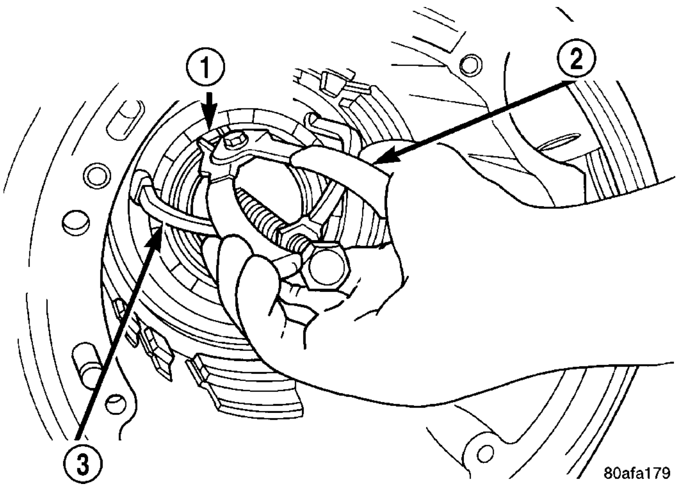


Fig. 90 Install Snap Ring

1 - SNAP RING OPENING MUST BE BETWEEN SPRING LEVERS (AS SHOWN)
2 - SNAP RING PLIERS
3 - TOOL 6057

(11) Install rear carrier bearing cone using Tool 6053 (Fig. 91).

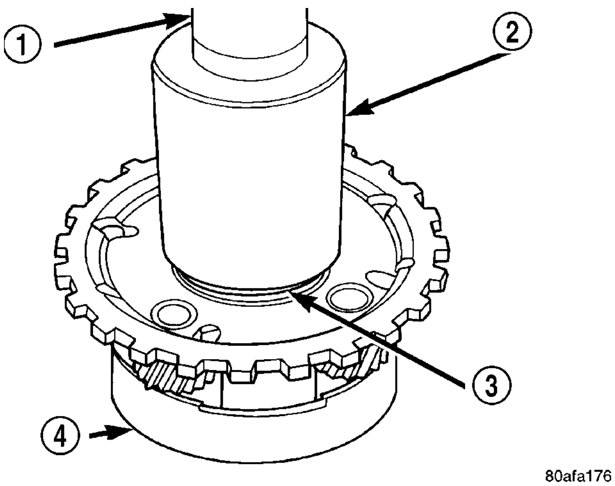


Fig. 91 Install Rear Carrier Bearing Cone

1 - ARBOR PRESS RAM
2 - TOOL 6053
3 - NEW BEARING CONE
4 - REAR CARRIER ASSEMBLY

(12) Install rear carrier assembly to transaxle case (Fig. 92).

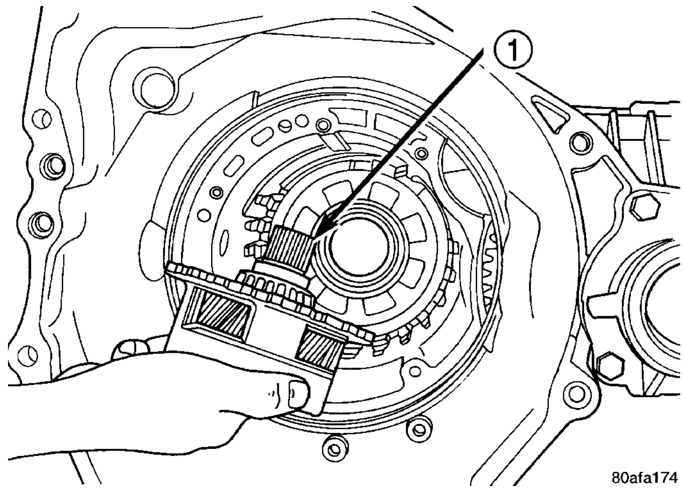


Fig. 92 Install Rear Carrier Assembly

1 - REAR CARRIER ASSEMBLY

(13) Install output gear bearing cone using Tool 5052 (Fig. 93).

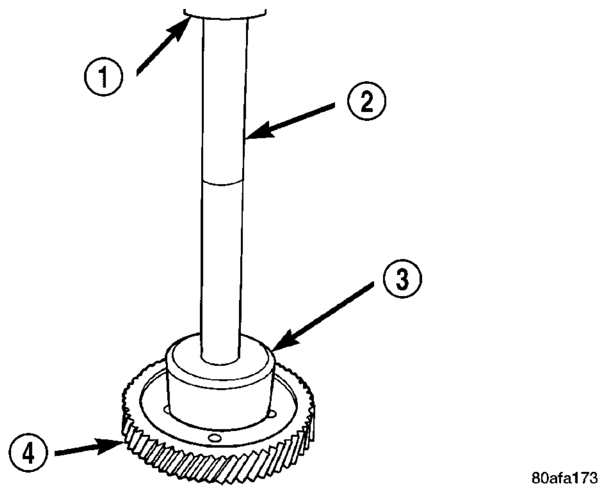


Fig. 93 Install Output Gear Bearing Cone

1 - ARBOR PRESS RAM
2 - HANDLE C-4171
3 - TOOL 5052
4 - OUTPUT GEAR

40TE AUTOMATIC TRANSAXLE (Continued)

(14) **OUTPUT GEAR BEARING ADJUSTMENT:**

(a) With output gear Installd, install a 4.50 mm (0.177 in.) gauging shim (Fig. 95) on the rear carrier assembly hub, using grease to hold the shim in place.

(b) Using Tool 6259, install output gear and bearing assembly. Torque to 271 N·m (200 ft. lbs.).

(c) Measure bearing end play. Attach Tool L-4432 to the gear (Fig. 94).

(d) Push and pull the gear while rotating back and forth to ensure seating of bearing rollers.

(e) Using a dial indicator mounted to the transaxle case, measure output gear end play as shown in (Fig. 94).

(f) Refer to the output gear bearing shim chart for the required shim to obtain proper bearing setting.

(g) Use Tool 6259 to remove the output gear retaining bolt and washer. To remove the output gear, use Tool L4407A.

(h) Remove the gauging shim and install the proper shim determined by the chart. Use grease to hold the shim in place.

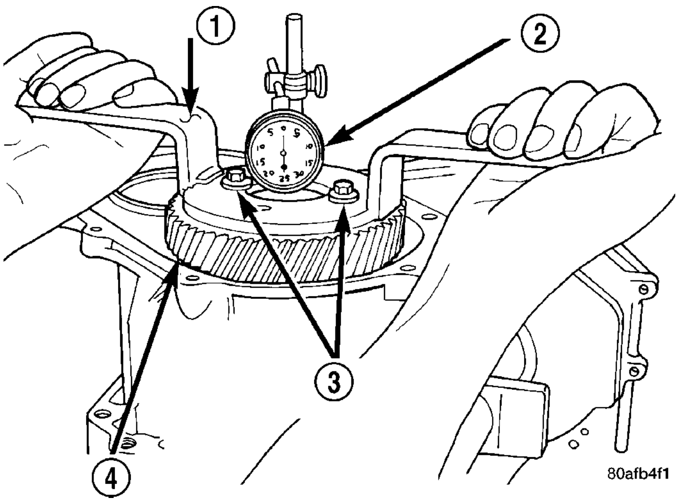


Fig. 94 Checking Output Gear Bearings End Play

1 - TOOL L-4432
2 - DIAL INDICATOR
3 - SPECIAL SCREWS TOOL 6260
4 - OUTPUT GEAR

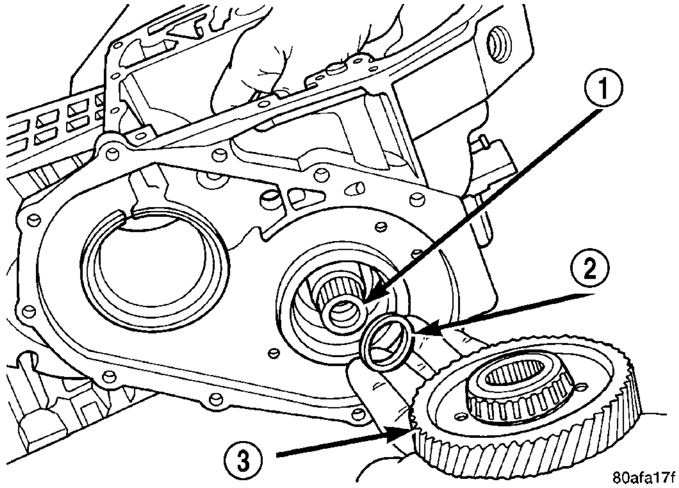


Fig. 95 Output Gear and (Select) Shim

1 - REAR CARRIER ASSEMBLY
2 - SHIM (SELECT)
3 - OUTPUT GEAR

40TE AUTOMATIC TRANSAXLE (Continued)

OUTPUT GEAR BEARING SHIM CHART

End Play	Shim Needed	Part Number	End Play	Shim Needed	Part Number
0.05mm (0.002 in.)	4.42mm (0.174 in.)	4412830AB	0.53mm (0.021 in.)	3.94mm (0.155 in.)	4412818AB
0.08mm (0.003 in.)	4.38mm (0.172 in.)	4412829AB	0.56mm (0.022 in.)	3.90mm (0.154 in.)	4412817AB
0.10mm (0.004 in.)	4.38mm (0.172 in.)	4412829AB	0.58mm (0.023 in.)	3.90mm (0.154 in.)	4412817AB
0.13mm (0.005 in.)	4.34mm (0.171 in.)	4412828AB	0.61mm (0.024 in.)	3.86mm (0.152 in.)	4412816AB
0.15mm (0.006 in.)	4.30mm (0.169 in.)	4412827AB	0.64mm (0.025 in.)	3.82mm (0.150 in.)	4412815AB
0.18mm (0.007 in.)	4.30mm (0.169 in.)	4412827AB	0.66mm (0.026 in.)	3.82mm (0.150 in.)	4412815AB
0.20mm (0.008 in.)	4.26mm (0.168 in.)	4412826AB	0.69mm (0.027 in.)	3.78mm (0.149 in.)	4412814AB
0.23mm (0.009 in.)	4.22mm (0.166 in.)	4412825AB	0.71mm (0.028 in.)	3.74mm (0.147 in.)	4412813AB
0.25mm (0.010 in.)	4.22mm (0.166 in.)	4412825AB	0.74mm (0.029 in.)	3.74mm (0.147 in.)	4412813AB
0.28mm (0.011 in.)	4.18mm (0.165 in.)	4412824AB	0.76mm (0.030 in.)	3.70mm (0.146 in.)	4412812AB
0.30mm (0.012 in.)	4.14mm (0.163 in.)	4412823AB	0.79mm (0.031 in.)	3.66mm (0.144 in.)	4412811AB
0.33mm (0.013 in.)	4.14mm (0.163 in.)	4412823AB	0.81mm (0.032 in.)	3.66mm (0.144 in.)	4412811AB
0.36mm (0.014 in.)	4.10mm (0.161 in.)	4412822AB	0.84mm (0.033 in.)	3.62mm (0.143 in.)	4412810AB
0.38mm (0.015 in.)	4.10mm (0.161 in.)	4412822AB	0.86mm (0.034 in.)	3.62mm (0.143 in.)	4412810AB
0.41mm (0.016 in.)	4.06mm (0.160 in.)	4412821AB	0.89mm (0.035 in.)	3.58mm (0.141)	4412809AB
0.43mm (0.017 in.)	4.02mm (0.158 in.)	4412820AB	0.91mm (0.036in.)	3.54mm (0.139 in.)	4412808AB
0.46mm (0.018 in.)	4.02mm (0.158 in.)	4412820AB	0.94mm (0.037 in.)	3.54mm (0.139 in.)	4412808AB
0.48mm (0.019 in.)	3.98mm (0.157 in.)	4412819AB	0.97mm (0.038 in.)	3.50mm (0.138 in.)	4412807AB
0.51mm (0.020 in.)	3.94mm (0.155 in.)	4412818AB			

40TE AUTOMATIC TRANSAXLE (Continued)

(15) Install the output gear and bearing assembly using Tool 6261 (Fig. 96).

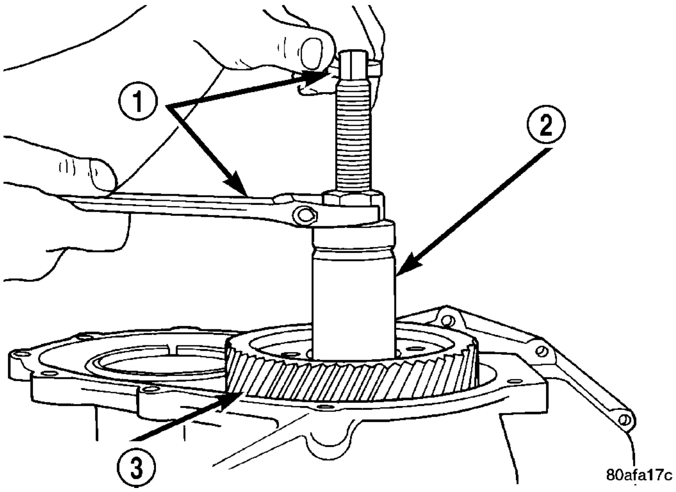


Fig. 96 Install Output Gear

1 - WRENCHES
2 - TOOL 6261 WITH STUD
3 - OUTPUT GEAR

(16) Install NEW output gear retaining bolt and washer (Fig. 97). Using Tool 6259, torque output gear retaining bolt to 271 N·m (200 ft. lbs.) (Fig. 98).

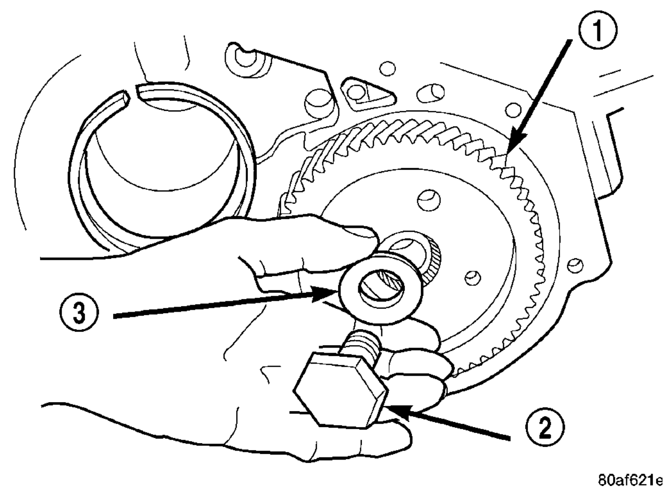


Fig. 97 Output Gear Bolt and Washer

1 - OUTPUT GEAR
2 - BOLT
3 - CONED LOCK WASHER

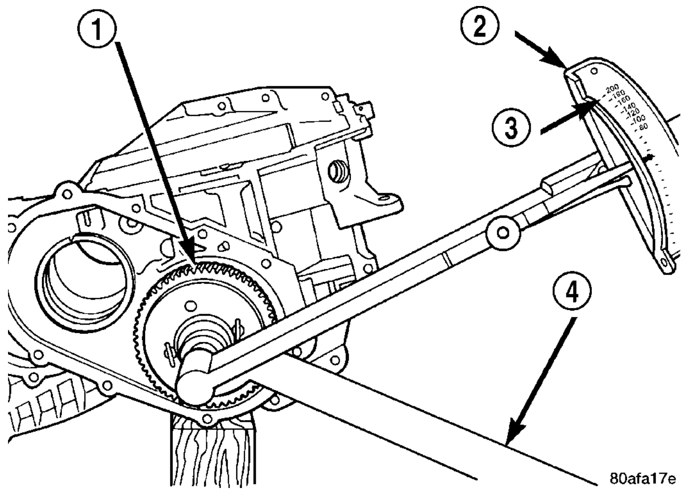


Fig. 98 Tighten Output Gear to 271 N•m (200 ft. lbs.)

1 - OUTPUT GEAR
2 - TORQUE WRENCH
3 - 200 FT. LBS.
4 - TOOL 6259

(17) Using an inch pound torque wrench (Fig. 99), check output shaft turning torque. **Output shaft turning torque should be within 3-8 in. lbs.** If the turning torque is too high, install a 0.04 mm (0.0016 in.) thicker shim. If the turning torque is too low, install a 0.04 mm (0.0016 in.) thinner shim. Repeat until the proper turning torque of 3-8 in. lbs. is obtained.

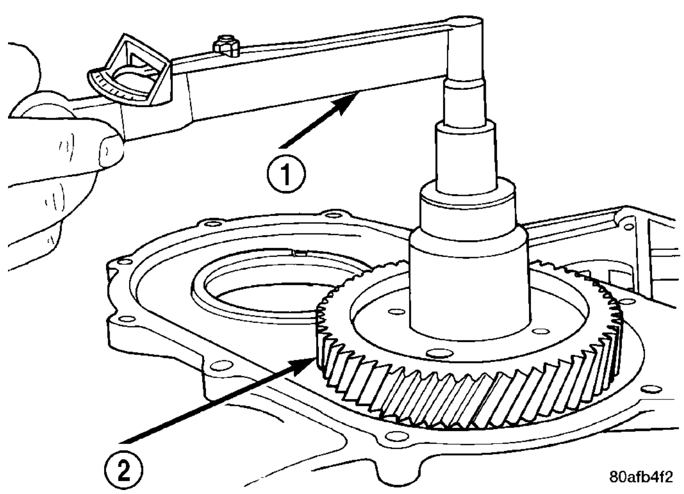


Fig. 99 Check Output Gear Bearings Turning Torque

1 - INCH-POUND TORQUE WRENCH
2 - OUTPUT GEAR

40TE AUTOMATIC TRANSAXLE (Continued)

(18) Install output gear stirrup with serrated side out (Fig. 100).

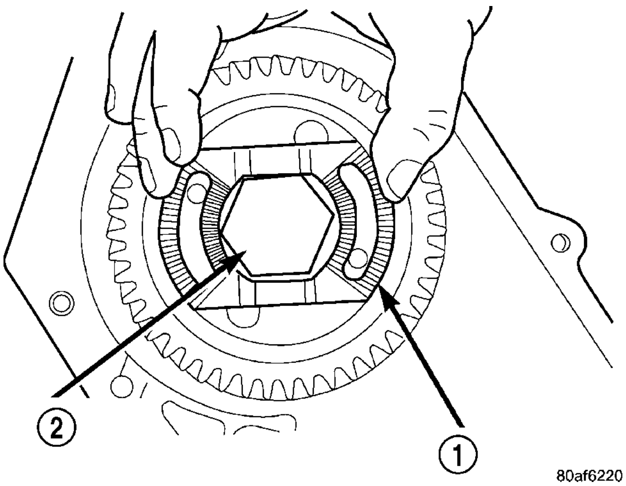


Fig. 100 Install Stirrup

1 - STIRRUP
2 - OUTPUT GEAR RETAINING BOLT

(19) Install retaining strap (Fig. 101).

(20) Install strap bolts but do not tighten at this time (Fig. 101).

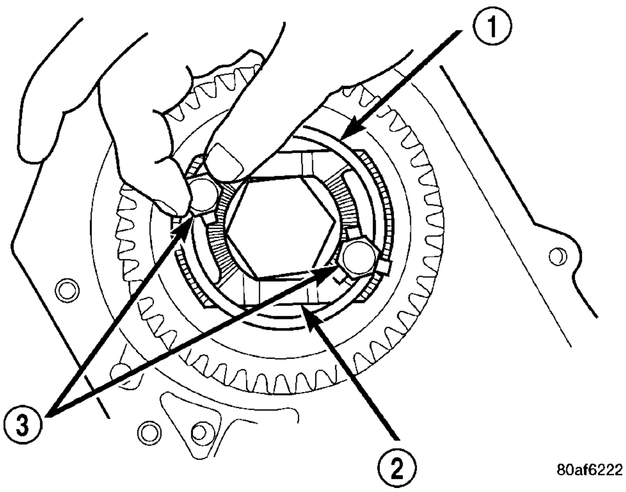


Fig. 101 Install Strap Bolts

1 - RETAINING STRAP
2 - STIRRUP
3 - RETAINING STRAP BOLTS

(21) Rotate stirrup clockwise against flats of retaining bolt (Fig. 102).

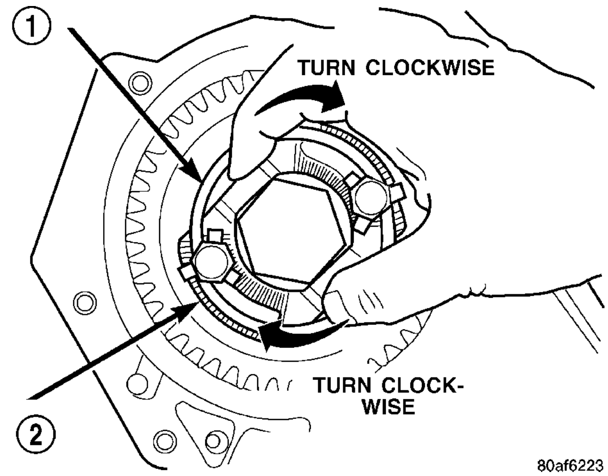


Fig. 102 Turn Stirrup Clockwise Against Flats Of Output Gear Retaining Bolt

1 - RETAINING STRAP
2 - STIRRUP

(22) Torque stirrup strap bolts to 23 N·m (200 in. lbs.) (Fig. 103).

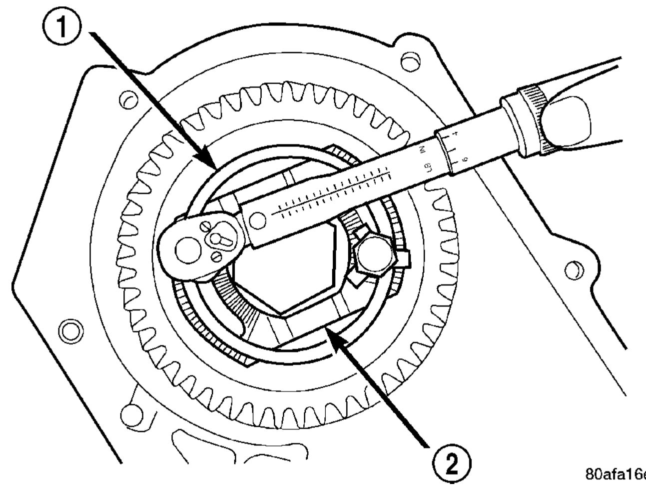


Fig. 103 Tighten Stirrup Strap Bolts to 23 N·m (200 in. lbs.)

1 - RETAINING STRAP
2 - STIRRUP

40TE AUTOMATIC TRANSAXLE (Continued)

(23) Bend tabs on strap up against flats of bolts (Fig. 104).

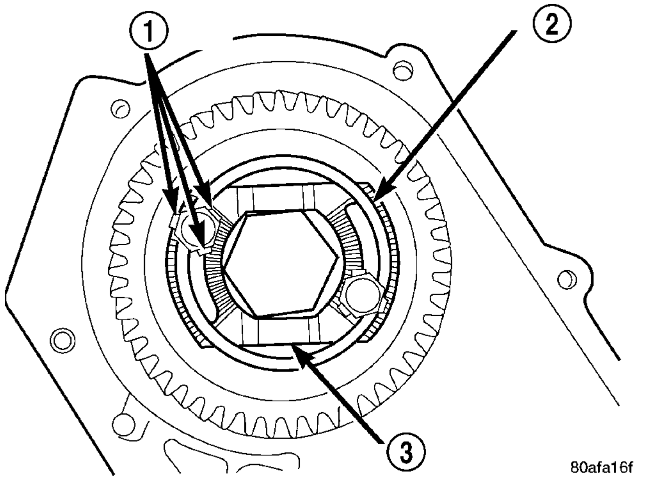


Fig. 104 Bend Tabs On Strap Up Against Flats Of Bolts

1 - RETAINING STRAP TABS
2 - RETAINING STRAP
3 - STIRRUP

(24) Install transfer shaft bearing cone using Tool 6052 (Fig. 105).

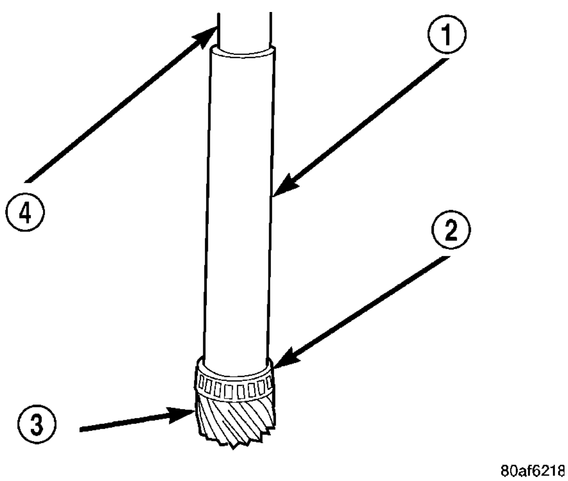


Fig. 105 Install Transfer Shaft Bearing Cone

1 - TOOL 6052
2 - NEW BEARING CONE
3 - TRANSFER SHAFT
4 - ARBOR PRESS RAM

(25) Install bearing cup and oil baffle to transfer shaft (Fig. 106).

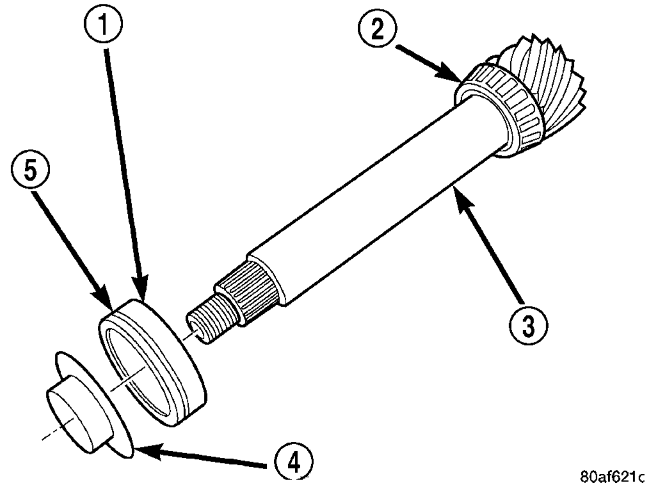


Fig. 106 Install Bearing Cup to Shaft

1 - BEARING CUP
2 - BEARING CONE
3 - TRANSFER SHAFT
4 - OIL BAFFLE
5 - O-RING

(26) Using Tool 5049A, install transfer shaft (Fig. 107).

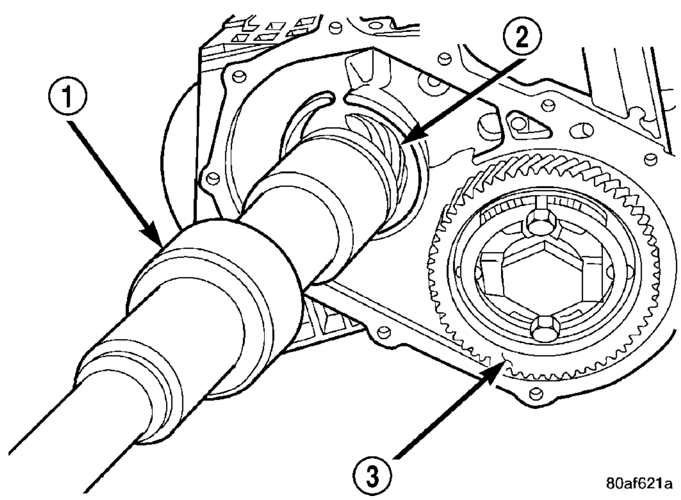


Fig. 107 Install Transfer Shaft

1 - SPECIAL TOOL 5049–A
2 - TRANSFER SHAFT
3 - OUTPUT GEAR

40TE AUTOMATIC TRANSAXLE (Continued)

(27) Using Tool 6051, install transfer shaft bearing snap ring (Fig. 108).

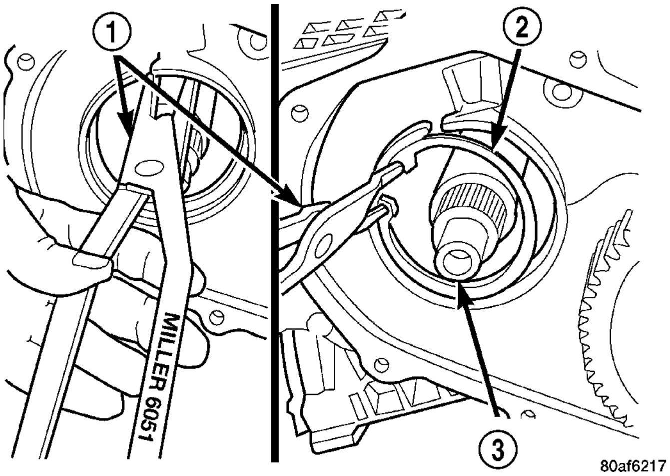


Fig. 108 Install Transfer Shaft Bearing Snap Ring

1 - SNAP RING PLIERS TOOL 6051
2 - TRANSFER SHAFT BEARING SNAP RING
3 - TRANSFER SHAFT

(28) Install transfer shaft bearing cup into retainer using Tool 6061 (Fig. 109).

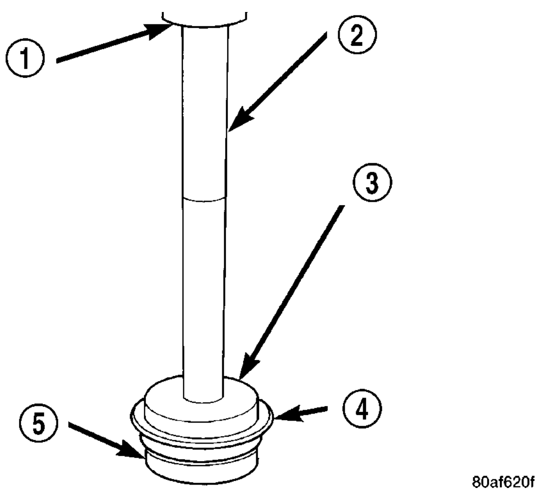


Fig. 109 Install Transfer Shaft Bearing Cup Into Retainer

1 - ARBOR PRESS RAM
2 - HANDLE C-4171
3 - TOOL 6061
4 - TRANSFER SHAFT BEARING CUP RETAINER
5 - USE REMOVED BEARING CUP TO SUPPORT RETAINER

(29) Install bearing cup retainer to transaxle (Fig. 110).

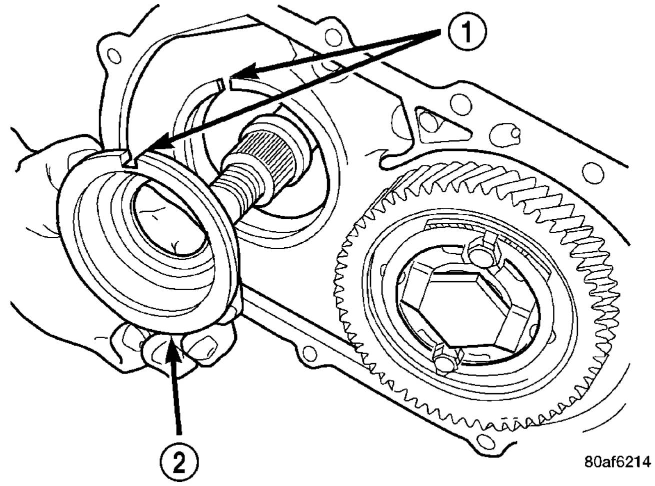


Fig. 110 Install Bearing Cup Retainer

1 - ALIGN INDEXING TAB TO SLOT
2 - BEARING CUP RETAINER

(30) Install transfer gear bearing cone to transfer gear using Tool 5052 (Fig. 111).

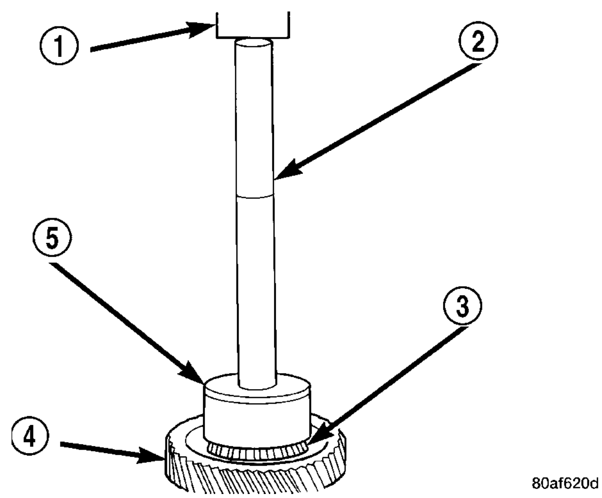


Fig. 111 Install Transfer Gear Bearing Cone

1 - ARBOR PRESS RAM
2 - HANDLE C-4171
3 - NEW BEARING CONE
4 - TRANSFER SHAFT GEAR
5 - TOOL 5052

40TE AUTOMATIC TRANSAXLE (Continued)

(31) **TRANSFER GEAR BEARING ADJUSTMENT:**

(a) Install a 4.66 mm (0.184 in.) gauging shim on the transfer shaft (Fig. 112).

(b) Install transfer shaft gear using Tool 6261. Using Tool 6259, install transfer shaft gear retaining nut to 271 N·m (200 ft. lbs.).

(c) Measure end play. Attach Tool L4432 to the transfer gear.

(d) Mount a steel ball with grease into the end of the transfer shaft.

(e) Push and pull the gear while rotating back and forth to ensure seating of the bearing rollers.

(f) Using a dial indicator, measure transfer shaft end play.

(g) Refer to the transfer shaft bearing shim chart for the required shim combination to obtain the proper bearing setting.

(h) Use Tool 6259 to remove the retaining nut and washer. Remove the transfer shaft gear using Tool L4407A.

(i) Remove the gauging shim (Fig. 112) and install the proper shim indicated by the chart.

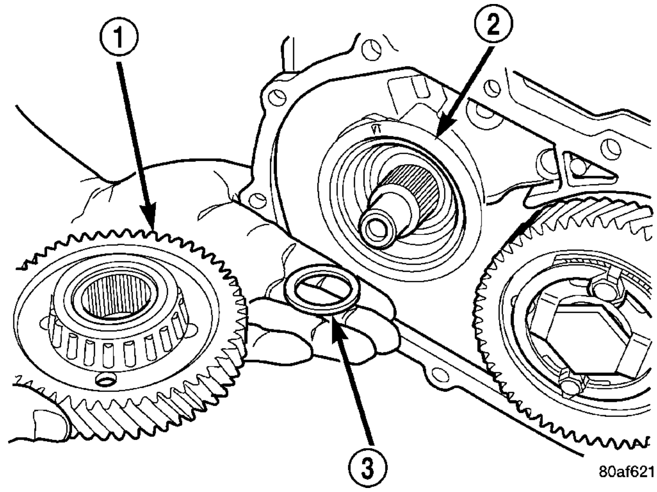


Fig. 112 Install Transfer Shaft Gear and (Select) Shim

1 - TRANSFER SHAFT GEAR
2 - BEARING CUP RETAINER
3 - SHIM (SELECT)

TRANSFER SHAFT BEARING SHIM CHART

End Play	Shim Needed	Part Number	End Play	Shim Needed	Part Number
0.05mm (0.002 in.)	4.66mm (0.183 in.)	4505588AB	0.76mm (0.030 in.)	3.94mm (0.155 in.)	4412818AB
0.08mm (0.003 in.)	4.62mm (0.182 in.)	4412835AB	0.79mm (0.031 in.)	3.90mm (0.154 in.)	4412817AB
0.10mm (0.004 in.)	4.58mm (0.180 in.)	4412834AB	0.81mm (0.032 in.)	3.90mm (0.154 in.)	4412817AB
0.13mm (0.005 in.)	4.58mm (0.180 in.)	4412834AB	0.84mm (0.033 in.)	3.86mm (0.152 in.)	4412816AB
0.15mm (0.006 in.)	4.54mm (0.178 in.)	4412833AB	0.86mm (0.034 in.)	3.82mm (0.150 in.)	4412815AB
0.18mm (0.007 in.)	4.50mm (0.177 in.)	4412832AB	0.89mm (0.035 in.)	3.82mm (0.150 in.)	4412815AB
0.20mm (0.008 in.)	4.50mm (0.177 in.)	4412832AB	0.91mm (0.036 in.)	3.78mm (0.149 in.)	4412814AB
0.23mm (0.009 in.)	4.46mm (0.175 in.)	4412831AB	0.94mm (0.037 in.)	3.74mm (0.147 in.)	4412813AB
0.25mm (0.010 in.)	4.46mm (0.175 in.)	4412831AB	0.97mm (0.038 in.)	3.74mm (0.147 in.)	4412813AB
0.28mm (0.011 in.)	4.42mm (0.174 in.)	4412830AB	0.99mm (0.039 in.)	3.70mm (0.146 in.)	4412812AB
0.30mm (0.012 in.)	4.38mm (0.172 in.)	4412829AB	1.02mm (0.040 in.)	3.66mm (0.144 in.)	4412811AB
0.33mm (0.013 in.)	4.38mm (0.172 in.)	4412829AB	1.04mm (0.041 in.)	3.66mm (0.144 in.)	4412811AB

40TE AUTOMATIC TRANSAXLE (Continued)

End Play	Shim Needed	Part Number	End Play	Shim Needed	Part Number
0.36mm (0.014 in.)	4.34mm (0.171 in.)	4412828AB	1.07mm (0.042 in.)	3.62mm (0.143 in.)	4412810AB
0.38mm (0.015 in.)	4.30mm (0.169 in.)	4412827AB	1.08mm (0.043 in.)	3.62mm (0.143 in.)	4412810AB
0.41mm (0.016 in.)	4.30mm (0.169 in.)	4412827AB	1.12mm (0.044 in.)	3.58mm (0.141)	4412809AB
0.43mm (0.017 in.)	4.26mm (0.168 in.)	4412826AB	1.14mm (0.045 in.)	3.54mm (0.139 in.)	4412808AB
0.46mm (0.018 in.)	4.22mm (0.166 in.)	4412825AB	1.17mm (0.046 in.)	3.54mm (0.139 in.)	4412808AB
0.48mm (0.019 in.)	4.22mm (0.166 in.)	4412825AB	1.19mm (0.047 in.)	3.50mm (0.138 in.)	4412807AB
0.50mm (0.020 in.)	4.18mm (0.165 in.)	4412824AB	1.22mm (0.048 in.)	3.46mm (0.136 in.)	4412806AB
0.53mm (0.021 in.)	4.18mm (0.165 in.)	4412824AB	1.24mm (0.049 in.)	3.46mm (0.136 in.)	4412806AB
0.56mm (0.022 in.)	4.14mm (0.163 in.)	4412823AB	1.27mm (0.050 in.)	3.42mm (0.135 in.)	4412805AB
0.58mm (0.023 in.)	4.10mm (0.161 in.)	4412822AB	1.30mm (0.051 in.)	3.38mm (0.133 in.)	4412804AB
0.61mm (0.024 in.)	4.10mm (0.161 in.)	4412822AB	1.32mm (0.052 in.)	3.38mm (0.133 in.)	4412804AB
0.64mm (0.025 in.)	4.06mm (0.160 in.)	4412821AB	1.35mm (0.053 in.)	3.34mm (0.132 in.)	4412803AB
0.66mm (0.026 in.)	4.02mm (0.158 in.)	4412820AB	1.37mm (0.054 in.)	3.34mm (0.132 in.)	4412803AB
0.69mm (0.027 in.)	4.02mm (0.158 in.)	4412820AB	1.40mm (0.055 in.)	3.30mm (0.130 in.)	4412802AB
0.71mm (0.028 in.)	3.98mm (0.157 in.)	4412819AB	1.45mm (0.057 in	3.26mm (0.128 in.)	4412801AB
0.74mm (0.029 in.)	3.94mm (0.155 in.)	4412818AB	1.47mm (0.058 in.)	2.22mm (0.127 in.)	4505570AB

40TE AUTOMATIC TRANSAXLE (Continued)

(32) Install the transfer shaft gear using Tool 6261 (Fig. 113).

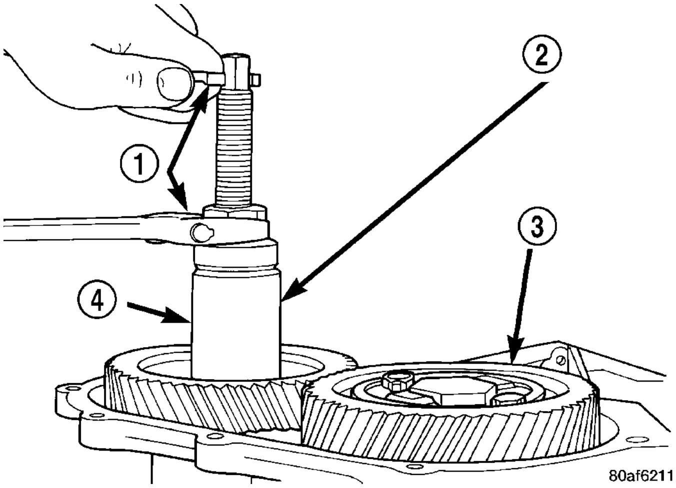


Fig. 113 Install Transfer Shaft Gear

1 - WRENCHES
2 - SPECIAL TOOL 6261
3 - OUTPUT GEAR
4 - TRANSFER SHAFT GEAR

CAUTION: Install a NEW retaining nut, as the original nut MUST NOT be reused.

(33) Install the new retaining nut and washer.

(34) Using Tool 6259, torque transfer gear retaining nut to 271 N·m (200 ft. lbs.) (Fig. 114).

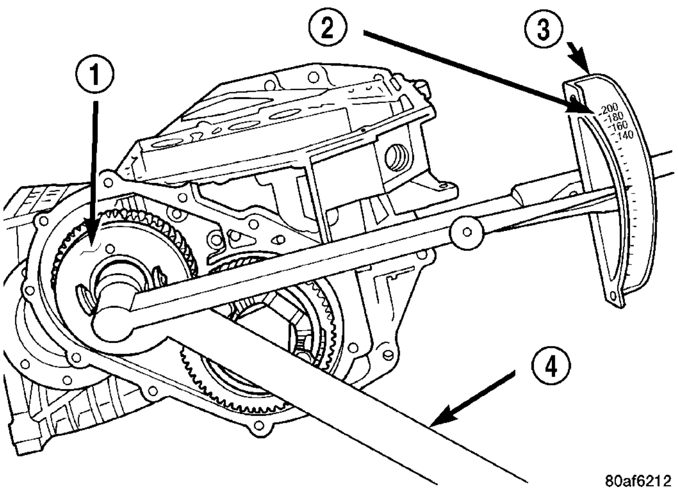


Fig. 114 Tighten Nut to 271 N•m (200 ft. lbs.)

1 - TRANSFER SHAFT GEAR
2 - 200 FT. LBS.
3 - TORQUE WRENCH
4 - SPECIAL TOOL 6259

(35) Measure transfer shaft end play. **Transfer shaft end play should be within 0.05-0.10 mm (0.002-0.004 in.).** If the end play is too high, install a 0.04 mm (0.0016 in.) thicker shim. If the end play is too low, install a 0.04 mm (0.0016 in.) thinner shim. Repeat until 0.05-0.10 mm (0.002-0.004 in.) end play is obtained.

(36) Install a bead of Mopar® ATF RTV (MS-GF41) to transfer gear cover (Fig. 115).

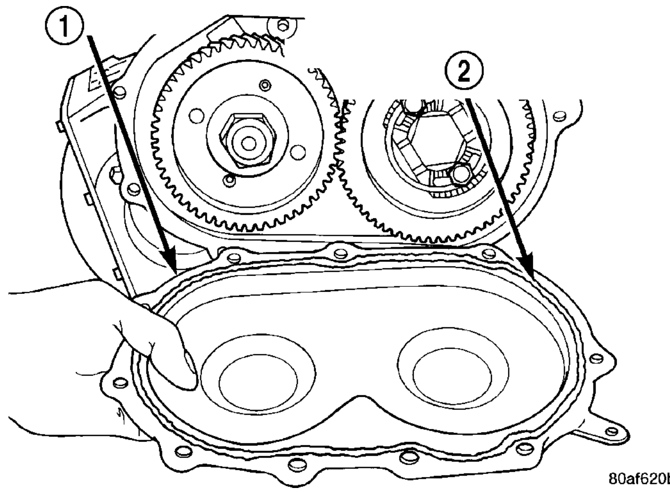


Fig. 115 Install Rear Cover

1 - REAR COVER
2 - 1/8 INCH BEAD OF MOPAR® ATF RTV (MS-GF41) AS SHOWN

(37) Install transfer gear cover-to-case bolts and torque to 20 N·m (175 in. lbs.) torque (Fig. 116).

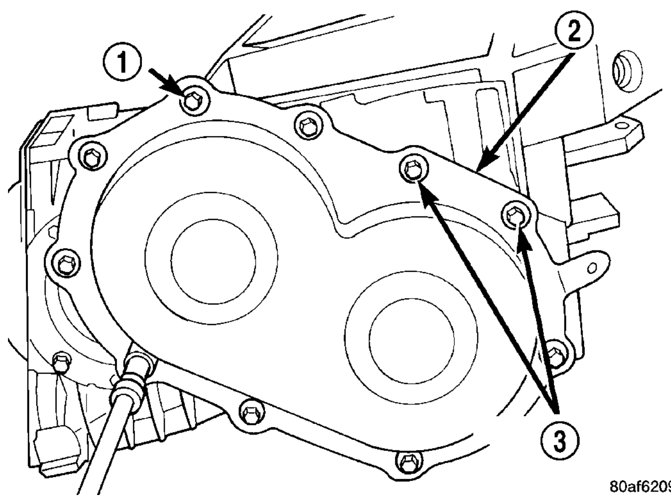


Fig. 116 Install Rear Cover Bolts

1 - REAR COVER BOLTS
2 - REAR COVER
3 - USE SEALANT ON BOLTS

40TE AUTOMATIC TRANSAXLE (Continued)

(38) Install low/reverse clutch pack (Fig. 117). Leave uppermost disc out until snap ring is installed.

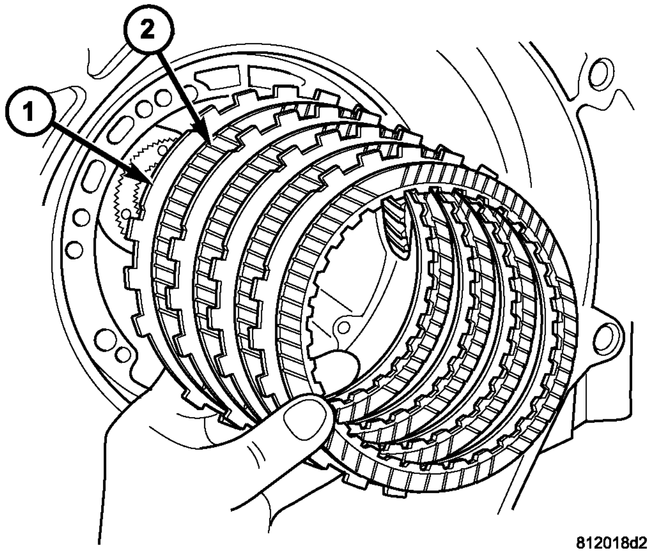


Fig. 117 Install Low/Reverse Clutch

1 - CLUTCH PLATE
2 - CLUTCH DISC

(39) Install low/reverse reaction plate flat snap ring (Fig. 118).

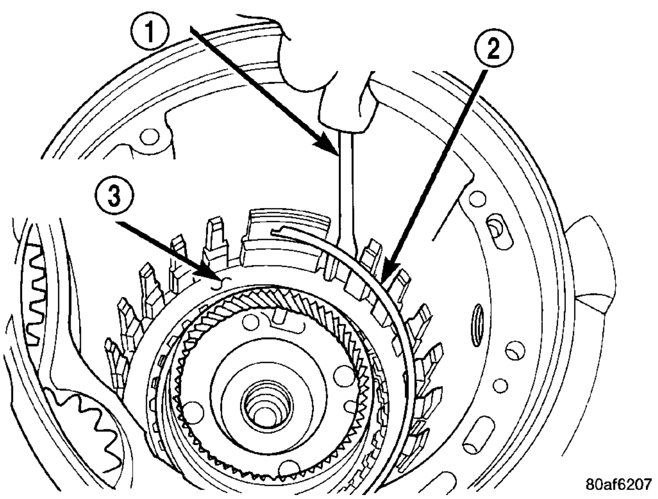


Fig. 118 Install Low/Reverse Reaction Plate Snap Ring

1 - SCREWDRIVER
2 - LOW/REVERSE REACTION PLATE FLAT SNAP RING
3 - DO NOT SCRATCH CLUTCH PLATE

(40) Install remaining low/reverse clutch disc (Fig. 119).

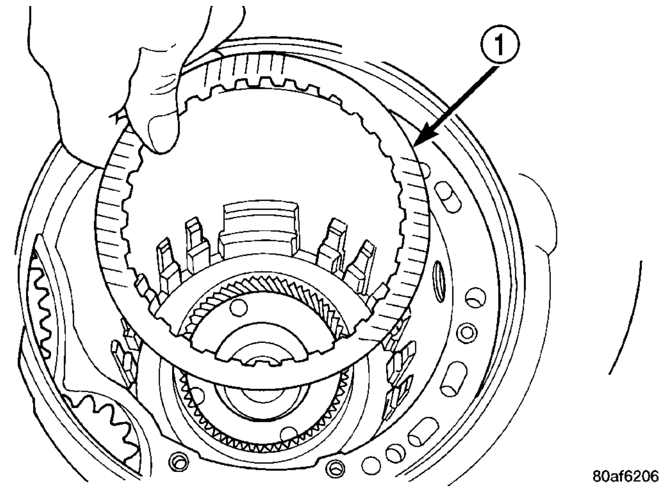


Fig. 119 Install One Disc

1 - ONE DISC FROM LOW/REVERSE CLUTCH

(41) Install low/reverse reaction plate with flat side up (Fig. 120).

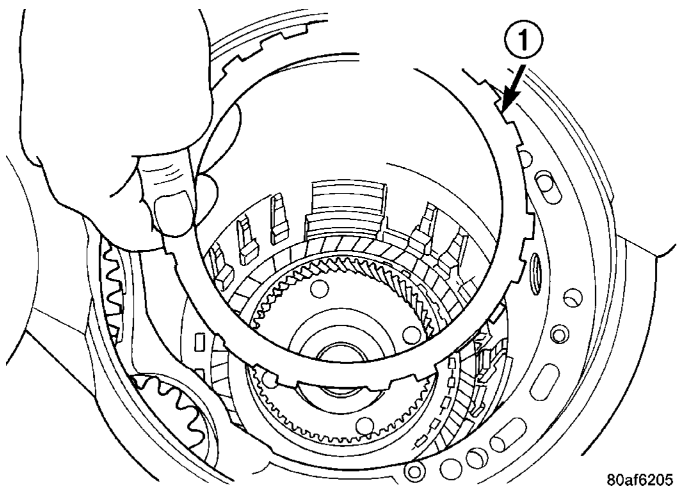


Fig. 120 Install Low/Reverse Reaction Plate

1 - LOW/REVERSE REACTION PLATE (FLAT SIDE UP)

40TE AUTOMATIC TRANSAXLE (Continued)

(42) Install tapered snap ring (with tapered side up) as shown in (Fig. 121) (Fig. 122).

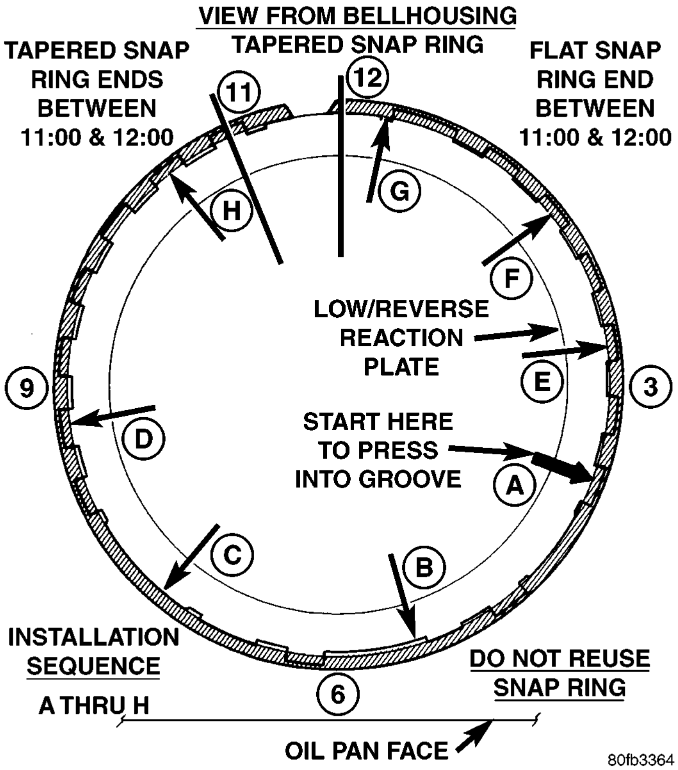


Fig. 121 Tapered Snap Ring Instructions

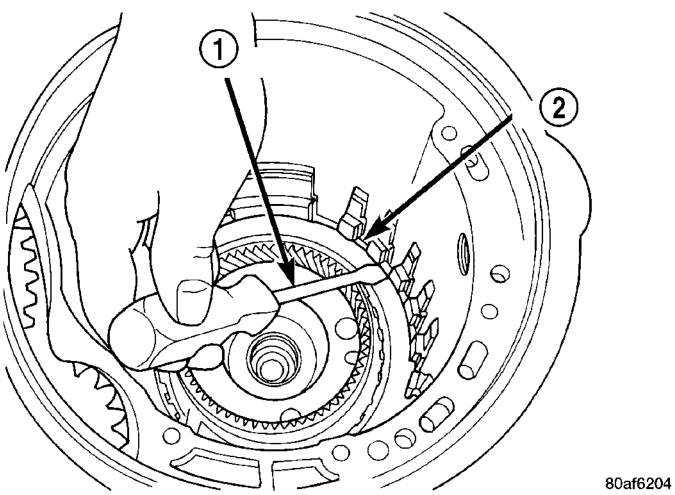


Fig. 122 Snap Ring Installed

1 - SCREWDRIVER
2 - TAPERED SNAP RING (INSTALL AS SHOWN)

(43) Set up dial indicator as shown in (Fig. 123) to measure low/reverse clutch clearance. Press down on clutch pack with finger and zero dial indicator. **Low/Reverse clutch pack clearance is 0.89-1.47 mm (0.035-0.058 in.)**. Set up indicator and record measurement in four (4) places. Take average of readings and select the proper low/reverse reaction plate to achieve specifications.

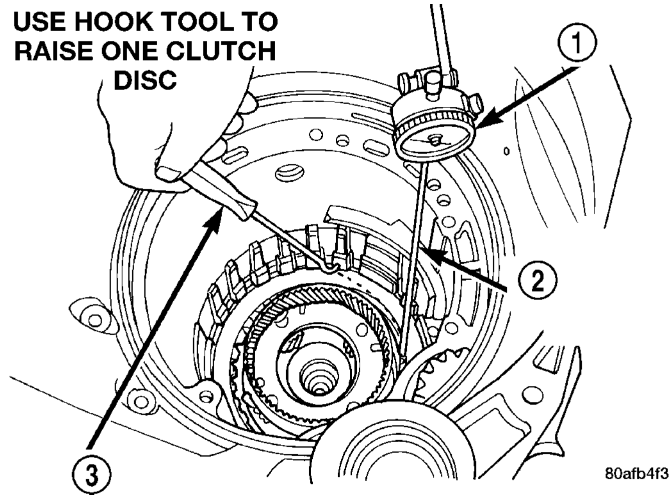


Fig. 123 Check Low/Reverse Clutch Clearance

1 - DIAL INDICATOR
2 - DIAL INDICATOR TIP TOOL 6268
3 - HOOK TOOL

LOW/REVERSE REACTION PLATE CHART

PART NUMBER	THICKNESS
4799846AA	5.88 mm (0.232 in.)
4799847AA	6.14 mm (0.242 in.)
4799848AA	6.40 mm (0.252 in.)
4799849AA	6.66 mm (0.262 in.)
4799855AA	6.92 mm (0.273 in.)

(44) Install 2/4 clutch pack (Fig. 124).

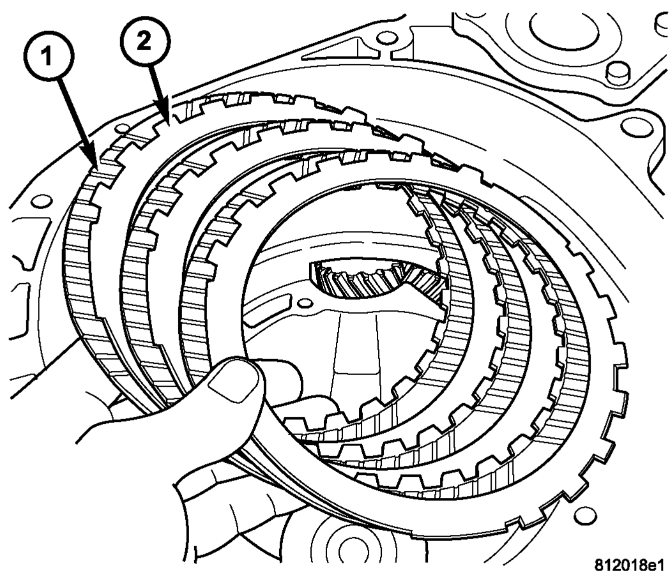


Fig. 124 Install 2/4 Clutch

1 - CLUTCH DISC
2 - CLUTCH PLATE

40TE AUTOMATIC TRANSAXLE (Continued)

NOTE: The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

(45) Orient 2/4 clutch return spring to retainer as shown in (Fig. 125), and install to transaxle (Fig. 126).

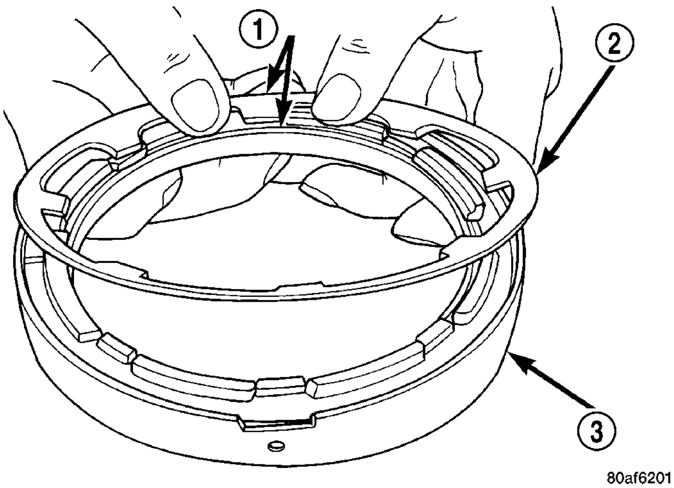


Fig. 125 Proper Orientation of 2/4 Clutch Retainer and Spring

1 - NOTE POSITION
2 - RETURN SPRING
3 - 2/4 CLUTCH RETAINER

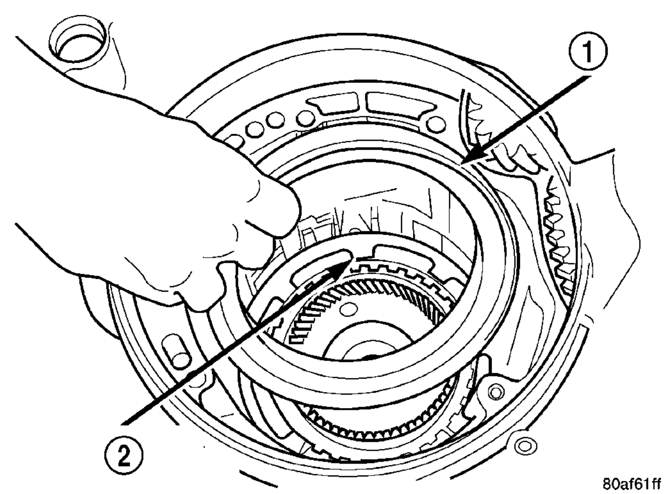


Fig. 126 2/4 Clutch Retainer

1 - 2/4 CLUTCH RETAINER
2 - 2/4 CLUTCH RETURN SPRING

(46) Using tool 5058, compress 2/4 clutch return spring just enough to install snap ring (Fig. 127).

(47) Install snap ring.

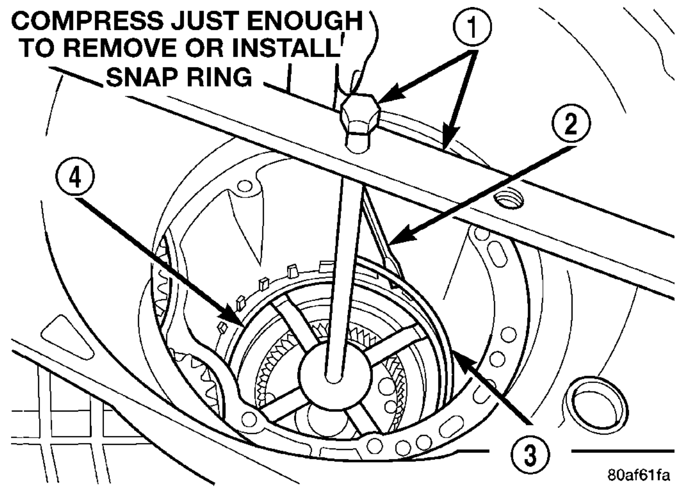


Fig. 127 Install 2/4 Clutch Retainer Snap Ring

1 - TOOL 5058
2 - SCREWDRIVER
3 - SNAP RING
4 - 2/4 CLUTCH RETAINER

(48) Set up dial indicator as shown in (Fig. 128) and measure 2/4 clutch clearance. Press down on clutch pack with finger and zero dial indicator. **2/4 clutch pack clearance is 0.76-2.64 mm (0.030-0.104 in.).** Set up indicator and record measurement in four (4) places. Take average of readings. If clearance is outside this range, the clutch is assembled improperly. **There is no adjustment for 2/4 clutch clearance.**

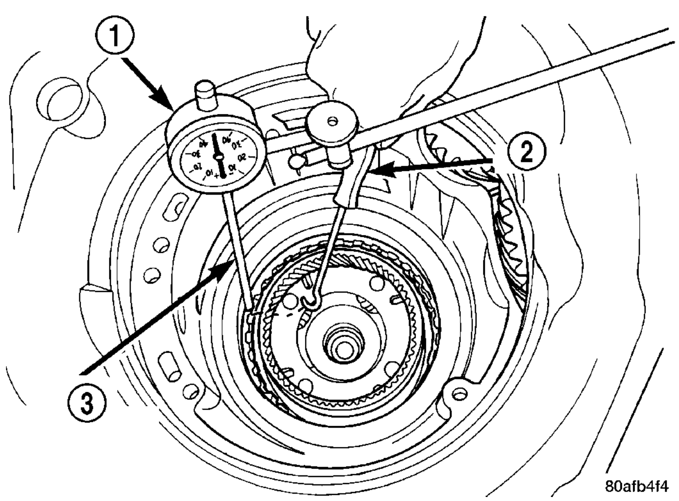


Fig. 128 Check 2/4 Clutch Clearance

1 - DIAL INDICATOR
2 - HOOK TOOL
3 - DIAL INDICATOR TIP TOOL 6268

40TE AUTOMATIC TRANSAXLE (Continued)

(49) Install rear sun gear and #7 needle bearing (Fig. 130).

NOTE: The number seven needle bearing has three anti-reversal tabs and is common with the number five and number two position. The orientation should allow the bearing to seat flat against the rear sun gear (Fig. 129). A small amount of petrolatum can be used to hold the bearing to the rear sun gear.

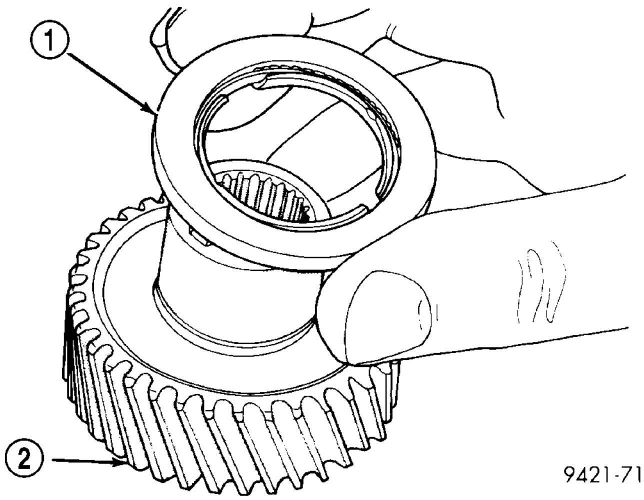


Fig. 129 Number 7 Bearing

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

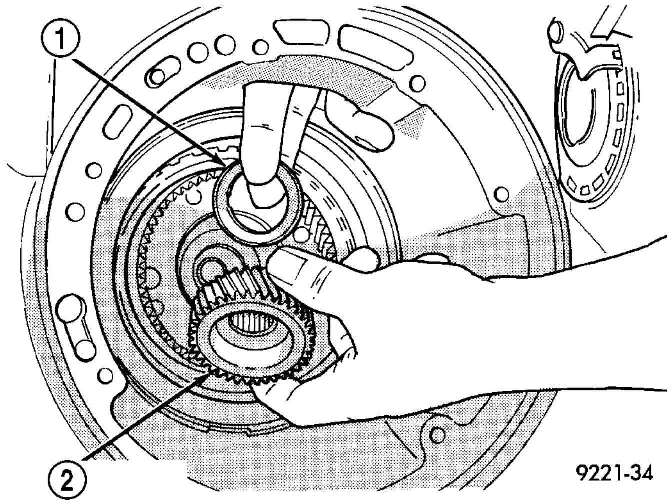


Fig. 130 Install Rear Sun Gear and #7 Needle Bearing

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

(50) Install front carrier/rear annulus assembly and #6 needle bearing (Fig. 131).

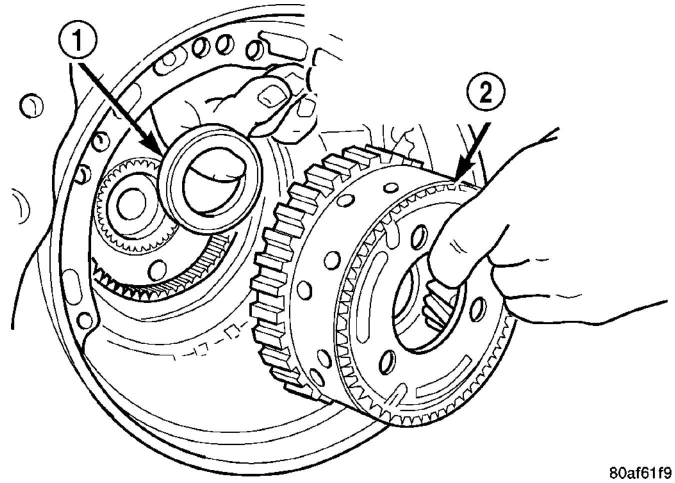


Fig. 131 Install Front Carrier/Rear Annulus Assembly

1 - #6 NEEDLE BEARING
2 - FRONT CARRIER AND REAR ANNULUS ASSEMBLY (TWIST AND PULL OR PUSH TO REMOVE OR INSTALL).

(51) Install front sun gear assembly and #4 thrust washer (Fig. 132).

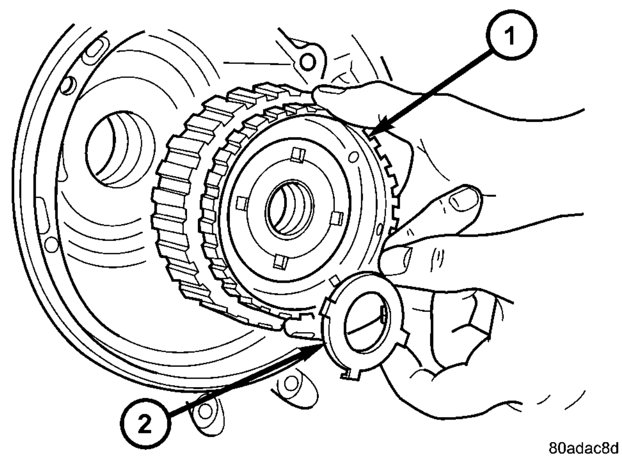


Fig. 132 Install Front Sun Gear Assembly

1 - FRONT SUN GEAR ASSEMBLY
2 - #4 THRUST WASHER (FOUR TABS)

40TE AUTOMATIC TRANSAXLE (Continued)

(52) **DETERMINING #4 THRUST PLATE THICKNESS / INPUT SHAFT END PLAY:**

(a) Select the thinnest #4 thrust plate thickness and install to input clutch assembly (Fig. 133). Use petrolatum to retain.

(b) Install input clutch assembly into position and verify that it is completely seated by viewing through input speed sensor hole. If view through input speed sensor hole is not as shown in (Fig. 134), the input clutch assembly is not seated properly.

(c) Remove oil pump o-ring (Fig. 135). **Be sure to reinstall oil pump o-ring after selecting the proper #4 thrust plate.**

(d) Install pump and gasket to transmission. Install and torque bolts.

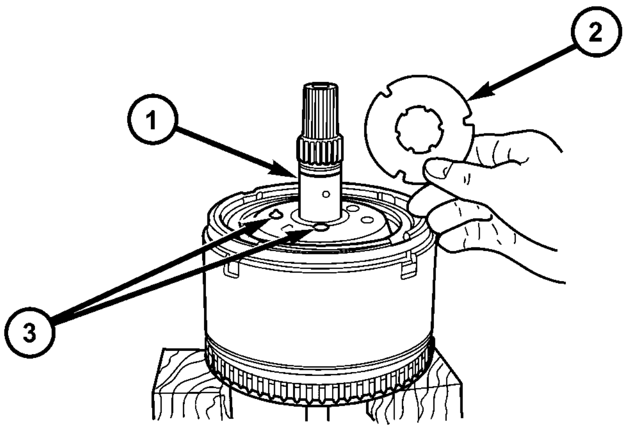


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Fig. 133 Select Thinnest No. 4 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #4 THRUST PLATE (SELECT)
3 - 3 DABS OF PETROLATUM FOR RETENTION

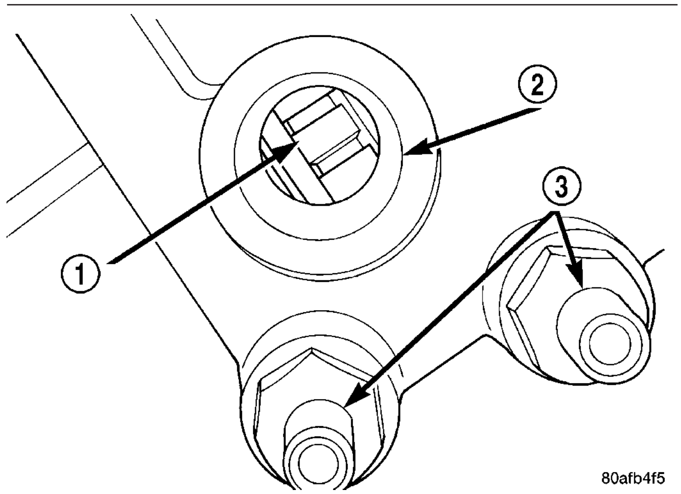

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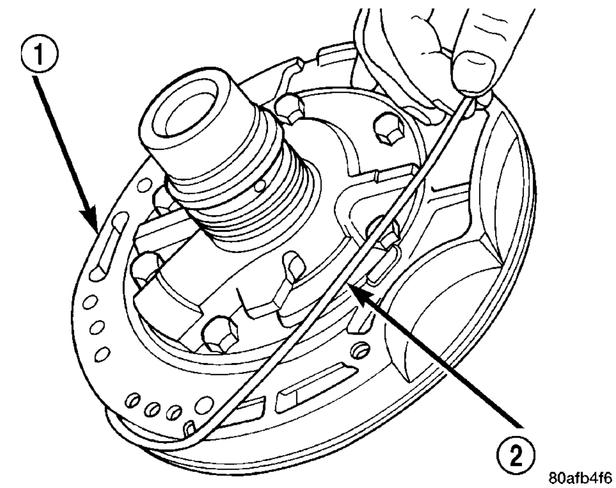
Fig. 134 View Through Input Speed Sensor Hole

1 - INPUT CLUTCH RETAINER
2 - INPUT SPEED SENSOR HOLE
3 - OIL COOLER FITTINGS

(e) Set up input shaft for measurement with Indicator Set C3339 and End Play Set 8266 as shown in (Fig. 136).

(f) Measure the input shaft end play with the transaxle in the vertical position. **Input shaft end play must be within 0.005 to 0.025 inch.** For example, if end play reading is 0.055 inch, select No. 4 Thrust Plate which is 0.071 to 0.074 thick. This should provide an input shaft end play reading of 0.020 inch which is within specifications.

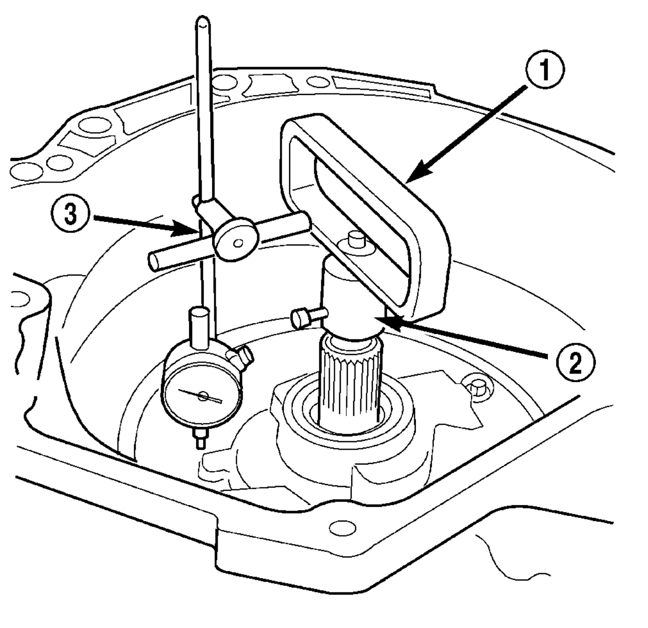
(g) Refer to the No. 4 thrust plate chart to select the proper No. 4 thrust plate:



80afb4f6

Fig. 135 Remove Oil Pump O-Ring

1 - OIL PUMP ASSEMBLY
2 - O-RING



80bdbd18

Fig. 136 Measure Input Shaft End Play Using Tool 8266—Typical

1 - TOOL 8266–8
2 - TOOL 8266–2
3 - TOOL C-3339

40TE AUTOMATIC TRANSAXLE (Continued)

NO. 4 THRUST PLATE CHART

PART NUMBER	THICKNESS
4431665AB	1.60mm (0.063 in.)
3836237AB	1.73mm (0.068 in.)
4431666AB	1.80mm (0.071 in.)
3836238AB	1.96mm (0.077 in.)
4431667AB	2.03mm (0.080 in.)
3836239AB	2.16mm (0.085 in.)
4431668AB	2.24mm (0.088 in.)
3836240AB	2.39mm (0.094 in.)
4431669AB	2.46mm (0.097 in.)
3836241AB	2.62mm (0.103 in.)
4446670AB	2.67mm (0.105 in.)
4446671AB	2.90mm (0.114 in.)

(53) Install input clutch assembly (Fig. 137).

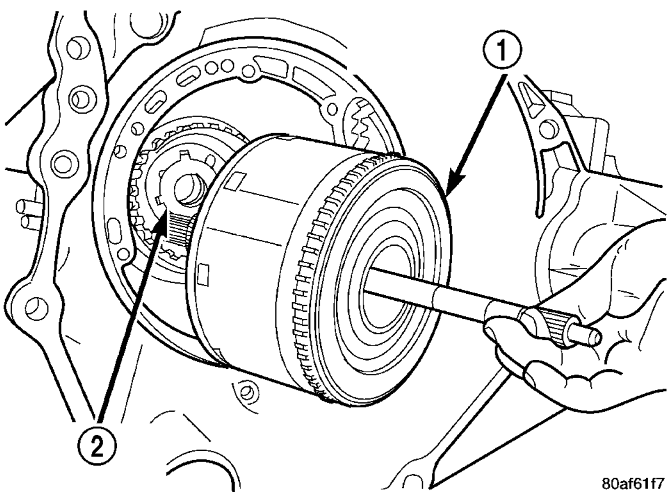


Fig. 137 Install Input Clutch Assembly

1 - INPUT CLUTCH ASSEMBLY
2 - #4 THRUST WASHER

(54) Install #1 caged needle bearing (Fig. 138).

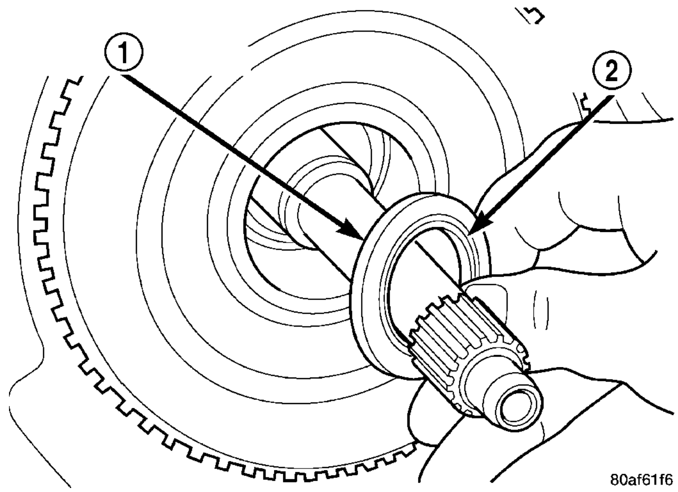


Fig. 138 Install No. 1 Caged Needle Bearing

1 - #1 CAGED NEEDLE BEARING
2 - NOTE: TANGED SIDE OUT

CAUTION: The cooler bypass valve must be replaced if transaxle failure has occurred. Do not attempt to reuse or clean old valve.

(55) Install cooler bypass valve with o-ring end towards rear of case (Fig. 139).

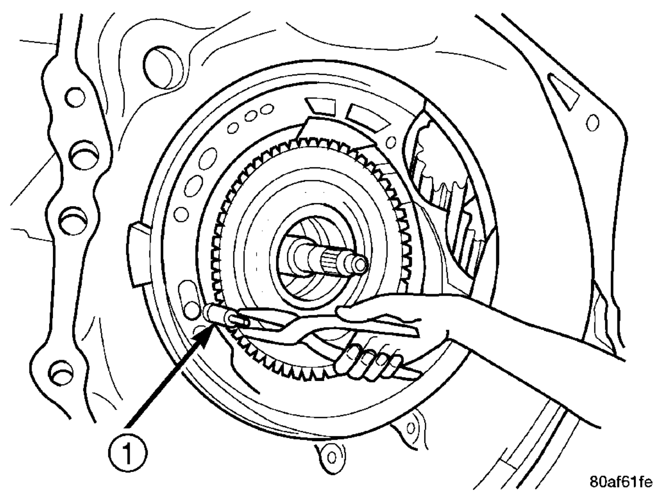


Fig. 139 Install Cooler Bypass Valve

1 - COOLER BYPASS VALVE

40TE AUTOMATIC TRANSAXLE (Continued)

(56) Install oil pump gasket (Fig. 140).

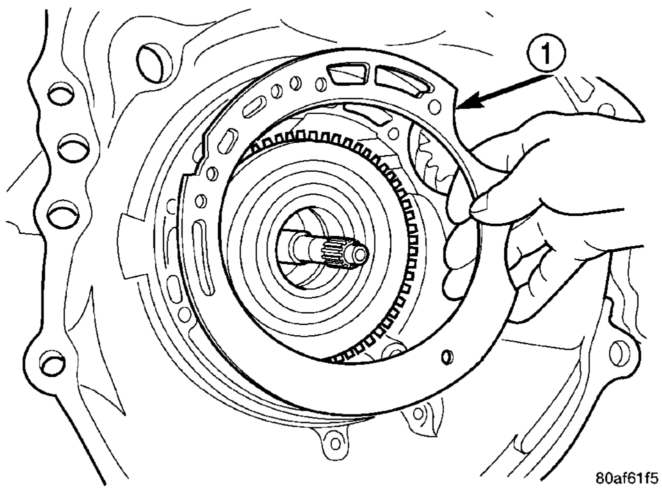


Fig. 140 Install Oil Pump Gasket

1 - PUMP GASKET

(57) Install oil pump assembly (Fig. 141).

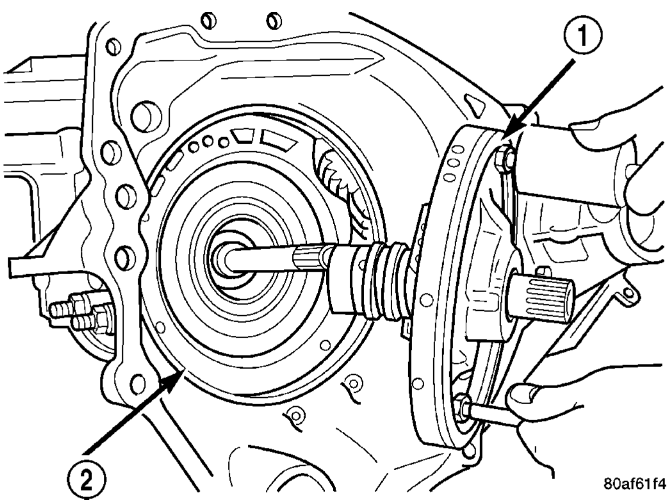


Fig. 141 Install Oil Pump

1 - OIL PUMP
2 - GASKET

(58) Install oil pump-to-case bolts and torque to 27 N·m (20 ft. lbs.) (Fig. 142).

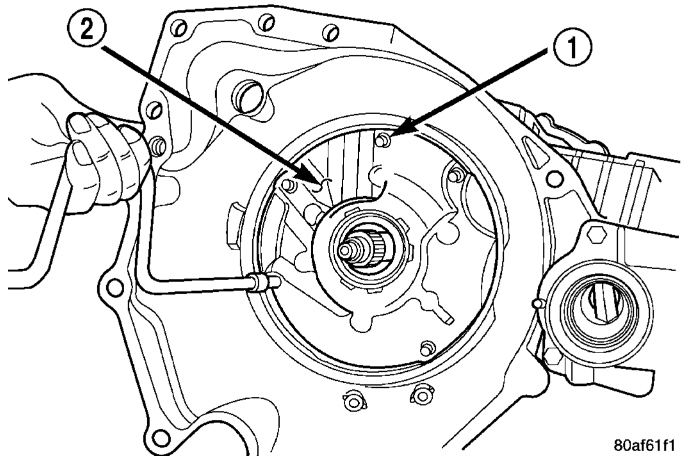


Fig. 142 Install Pump-to-Case Bolts

1 - PUMP ATTACHING BOLTS
2 - PUMP HOUSING

(59) Install low/reverse accumulator (Fig. 143).

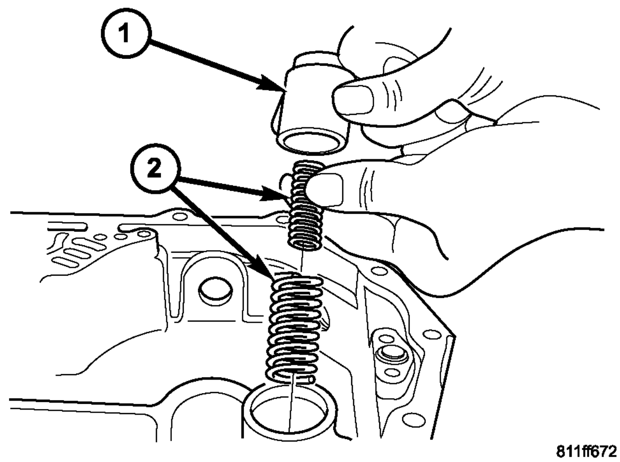


Fig. 143 Low/Reverse Accumulator

1 - PISTON
2 - RETURN SPRINGS

40TE AUTOMATIC TRANSAXLE (Continued)

(60) Install low/reverse accumulator plug (Fig. 144).

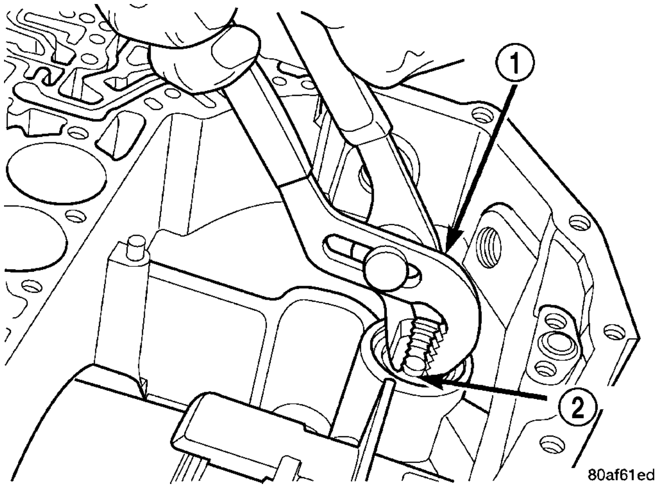


Fig. 144 Install Low/Reverse Accumulator Plug

1 - ADJUSTABLE PLIERS
2 - PLUG

(61) Install low/reverse accumulator snap ring (Fig. 145).

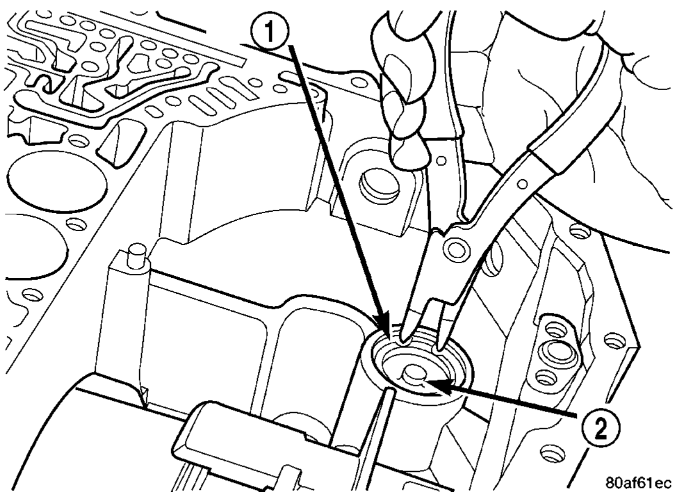


Fig. 145 Install Low/Reverse Accumulator Snap Ring

1 - SNAP RING
2 - PLUG

NOTE: Depending on engine application, some accumulators will have two springs, and others will have one spring. The springs are color-coded for application and year.

(62) Install underdrive and overdrive accumulators and springs (Fig. 146).

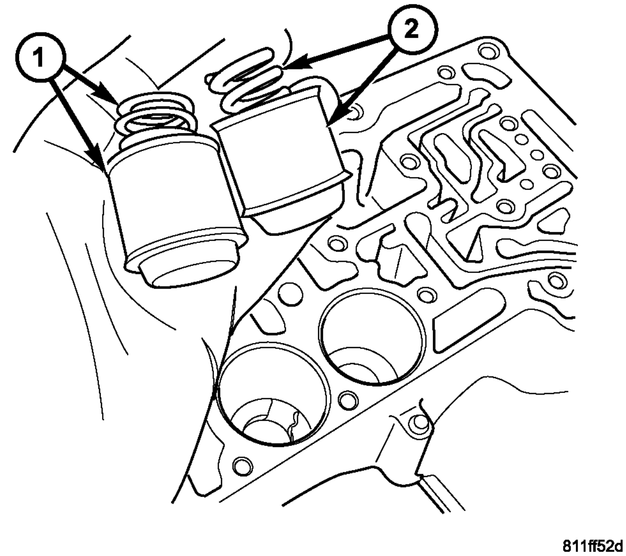


Fig. 146 Underdrive and Overdrive Accumulators

1 - OVERDRIVE PISTON AND SPRING
2 - UNDERDRIVE PISTON AND SPRING

(63) Install valve body to transaxle (Fig. 147). Rotate manual valve shaft fully clockwise to ease installation. Make sure park rod rollers are positioned within park guide bracket.

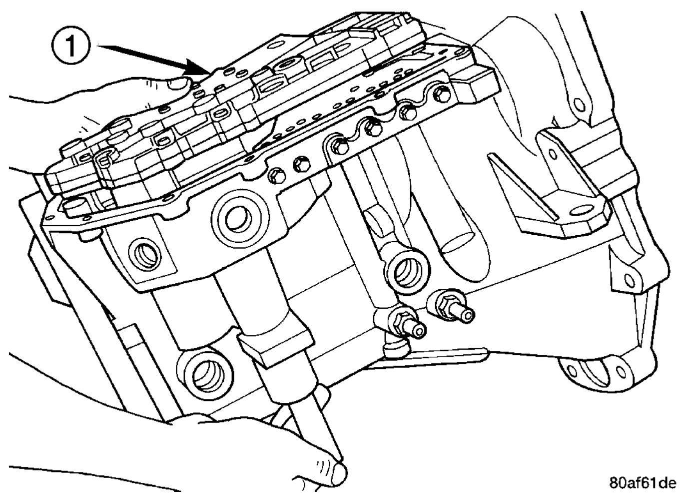


Fig. 147 Valve Body Removal/Installation

1 - VALVE BODY

40TE AUTOMATIC TRANSAXLE (Continued)

(64) Install and torque valve body-to-case bolts to 12 N·m (105 in. lbs.) (Fig. 148).

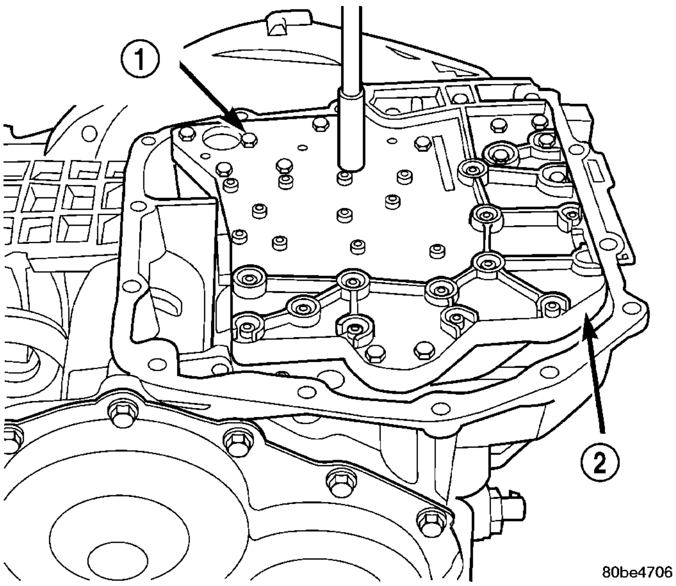


Fig. 148 Install Valve Body-to-Case Bolts

1 - VALVE BODY ATTACHING BOLTS (18)
2 - VALVE BODY

(65) Install oil filter and new o-ring (Fig. 149).

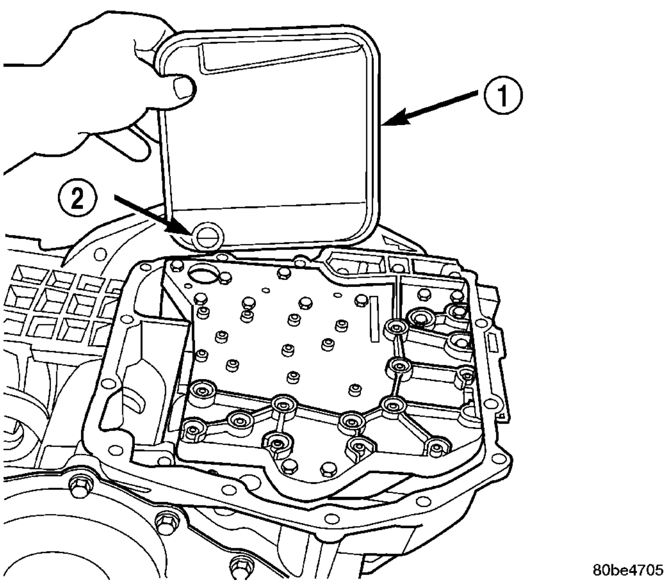


Fig. 149 Install Oil Filter and O-Ring

1 - OIL FILTER
2 - O-RING

(66) Apply an 1/8” bead of Mopar® ATF RTV (MS-GF41) to oil pan and immediately install to case (Fig. 150).

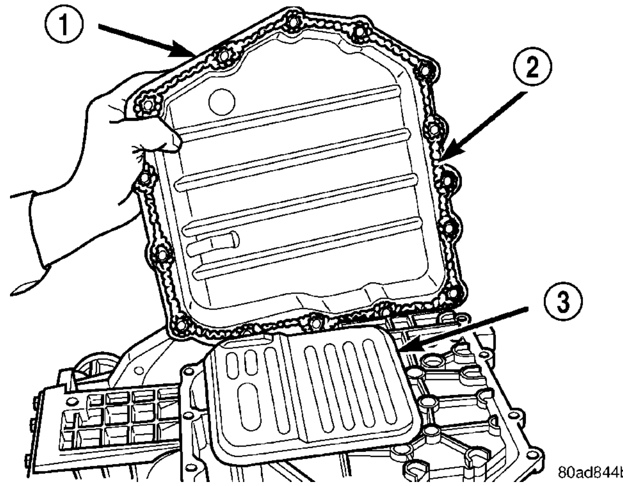


Fig. 150 Install Oil Pan

1 - OIL PAN
2 - 1/8 INCH BEAD OF MOPAR® ATF RTV (MS-GF41)
3 - OIL FILTER

(67) Install oil pan-to-case bolts and torque to 19 N·m (165 in. lbs.).

(68) Install solenoid/pressure switch assembly and gasket to case (Fig. 151).

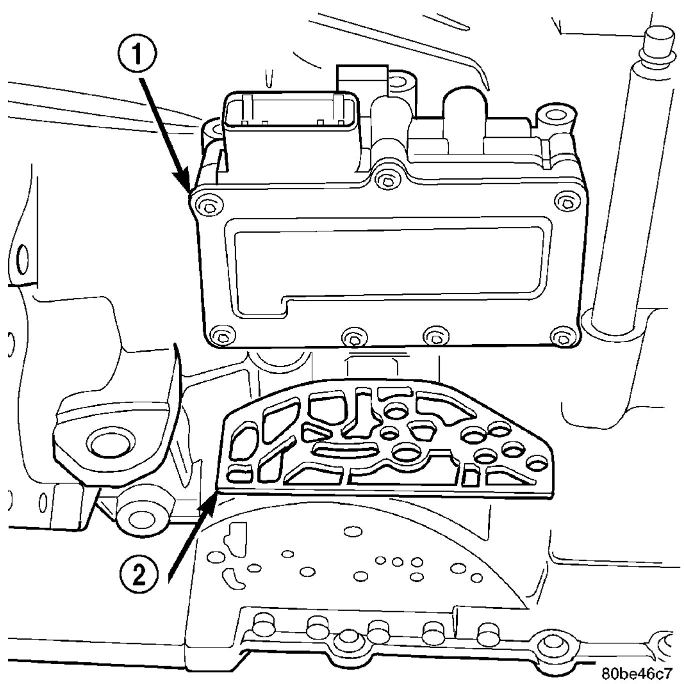


Fig. 151 Solenoid/Pressure Switch Assembly and Gasket

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - GASKET

40TE AUTOMATIC TRANSAXLE (Continued)

(69) Install and tighten solenoid/pressure switch assembly-to-transaxle case bolts to 12 N·m (110 in. lbs.) (Fig. 152).

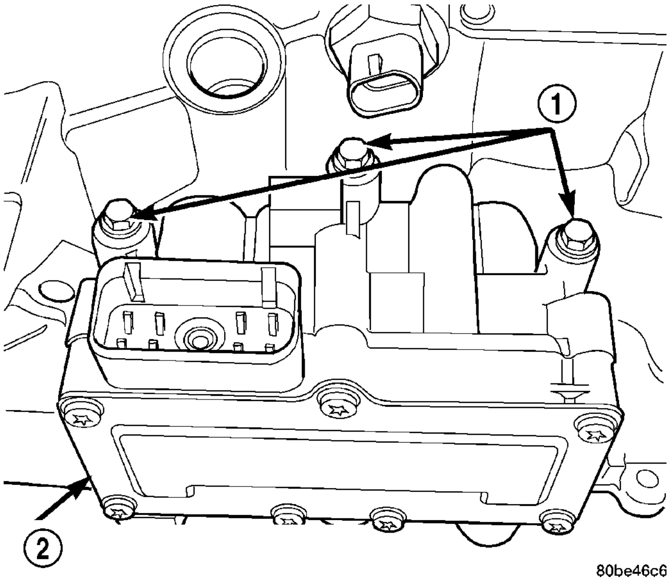


Fig. 152 Attaching Bolts

1 - BOLTS
2 - SOLENOID AND PRESSURE SWITCH ASSEMBLY

(70) Install and torque input and output speed sensors to case to 27 N·m (20 ft. lbs.).

INSTALLATION

(1) Install transaxle assembly to engine. Install and torque transaxle-to-engine bolts to 108 N·m (80 ft. lbs.).

(2) Raise engine/transaxle assembly into position with screw jack and wood block.

(3) Install and torque transaxle upper mount-to-rail through-bolt to 118 N·m (87 ft. lbs.).

(4) Remove transmission jack and screw jack supports.

(5) Install torque converter-to-drive plate bolts and torque to 88 N·m (65 ft. lbs.).

(6) Install converter dust shield.

(7) Install and torque right lateral bending brace-to-transaxle bolt to 81 N·m (60 ft. lbs.).

(8) Install starter motor assembly.

(9) Install left lateral bending brace. Torque brace-to-transaxle case bolts to 108 N·m (80 ft. lbs.). Torque brace-to-engine bedplate bolt to 54 N·m (40 ft. lbs.). Torque brace-to-intake manifold bolt to 28 N·m (200 in. lbs.).

(10) Install structural collar.

(11) Install power steering oil cooler.

(12) Install halfshafts.

(13) Lower vehicle.

(14) Install gearshift cable to mount. Secure cable end to manual valve lever.

(15) Install solenoid/pressure switch assembly connector.

(16) Connect input speed sensor connector.

(17) Connect output speed sensor connector.

(18) Install cooler lines with service splice kit. Refer to instructions provided with kit.

(19) Install air cleaner/throttle body assembly.

(20) Install battery tray.

(21) Install battery and hold down.

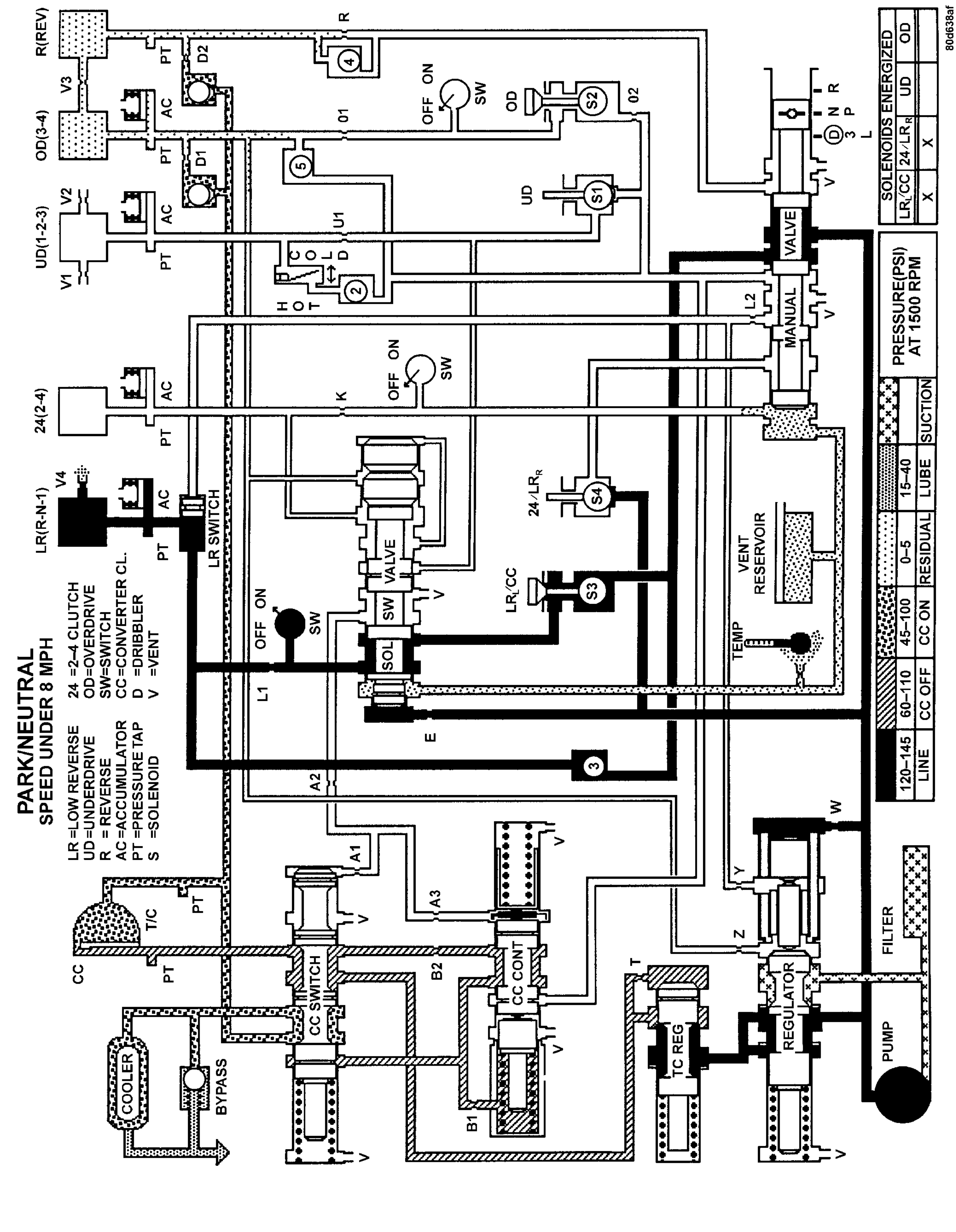
(22) Connect battery cables.

(23) Fill transaxle with suitable amount of fluid.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/FLUID - STANDARD PROCEDURE).

40TE AUTOMATIC TRANSAXLE (Continued)

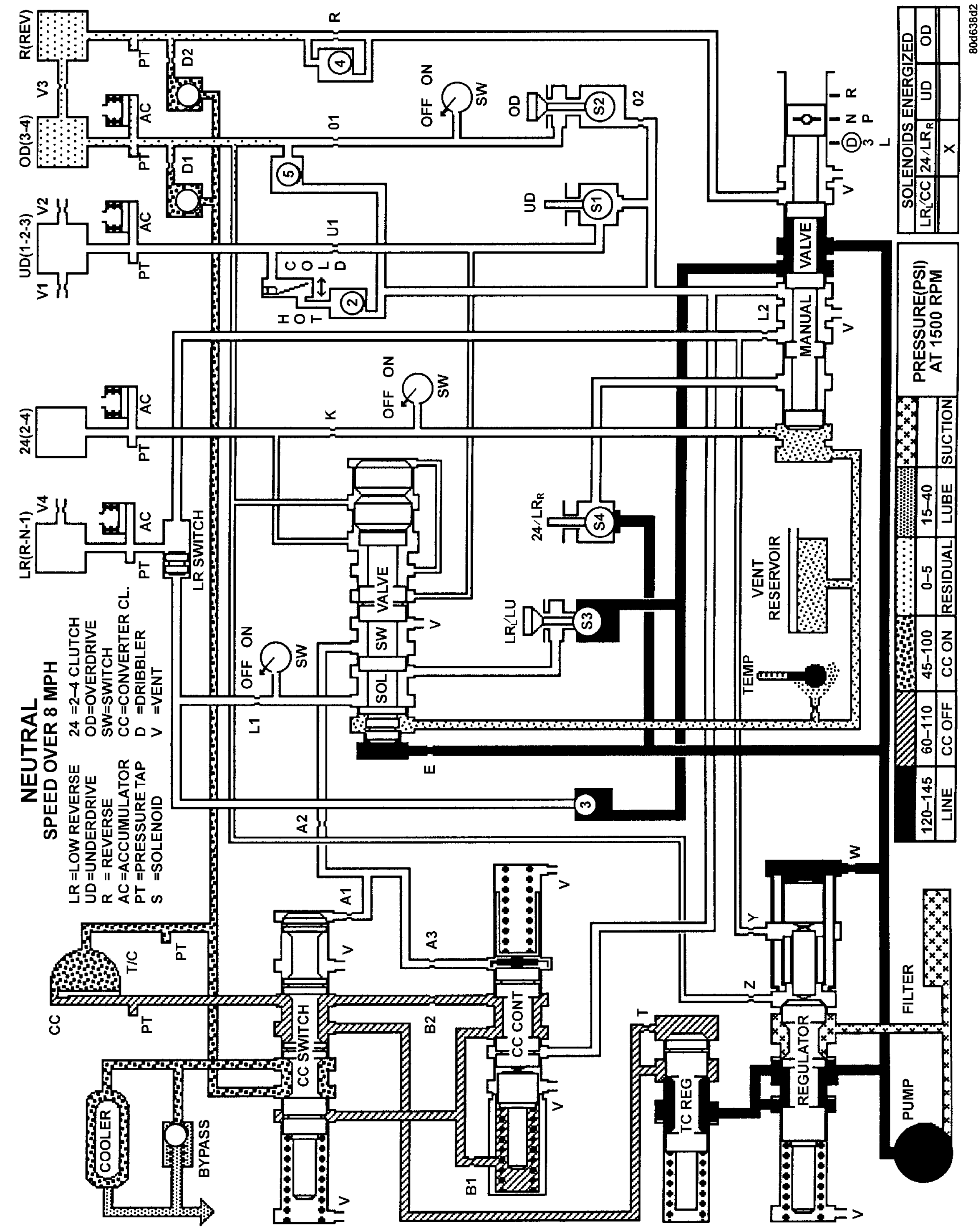
SCHEMATICS AND DIAGRAMS

4XTE TRANSAXLE HYDRAULIC SCHEMATICS



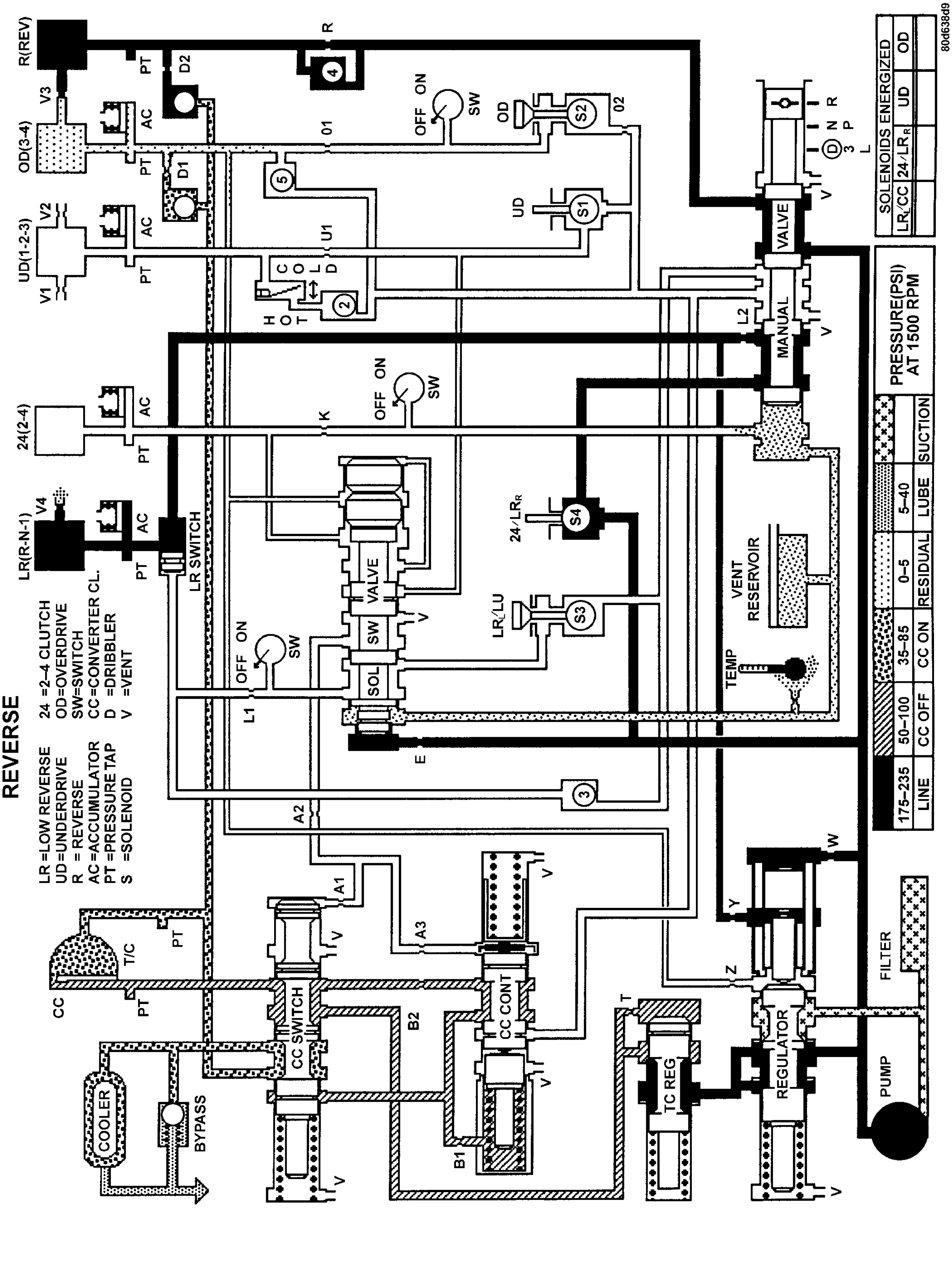
Park/Neutral (Speed Under 8 MPH)

40TE AUTOMATIC TRANSAXLE (Continued)



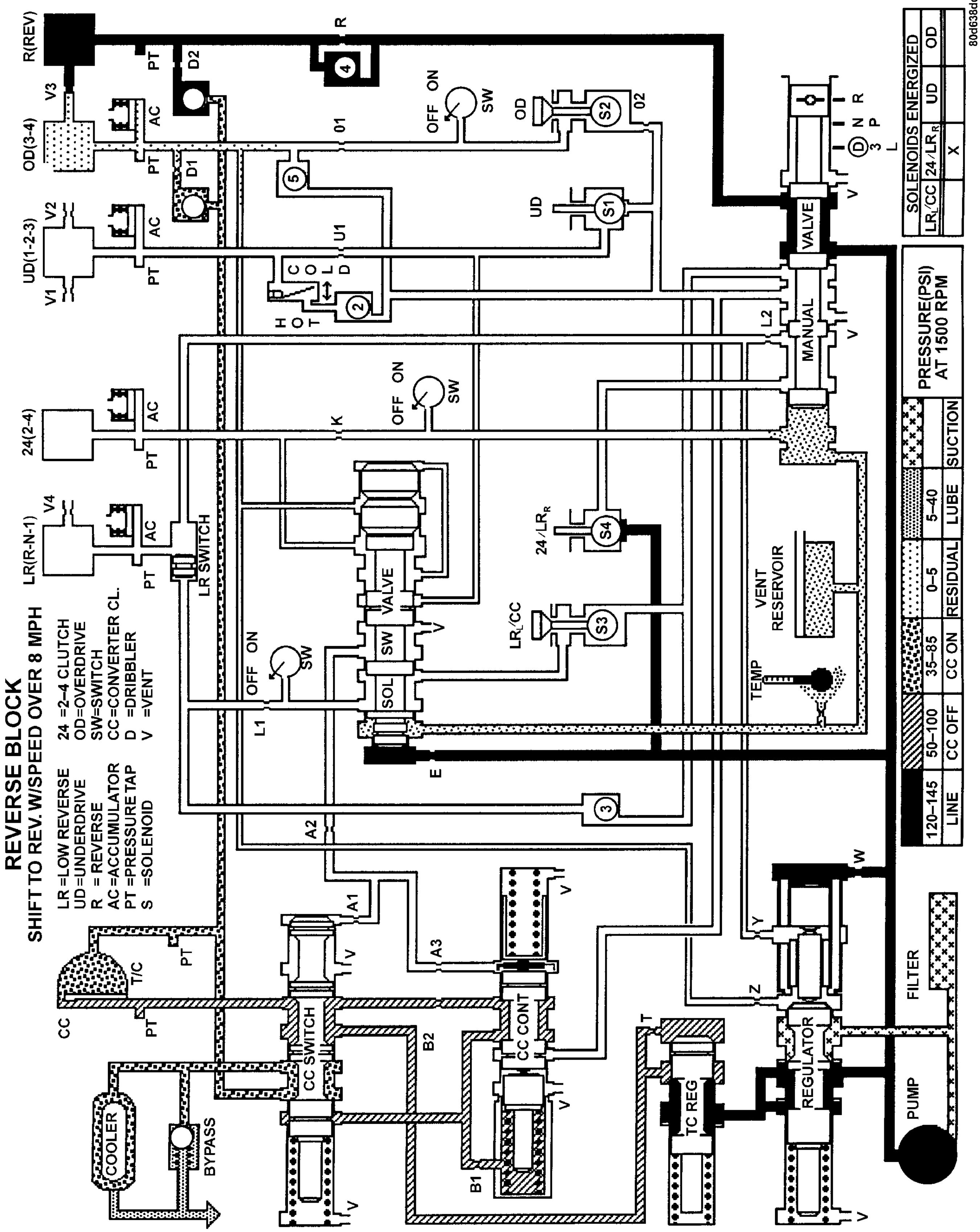
Neutral (Speed Over 8 MPH)

40TE AUTOMATIC TRANSAXLE (Continued)



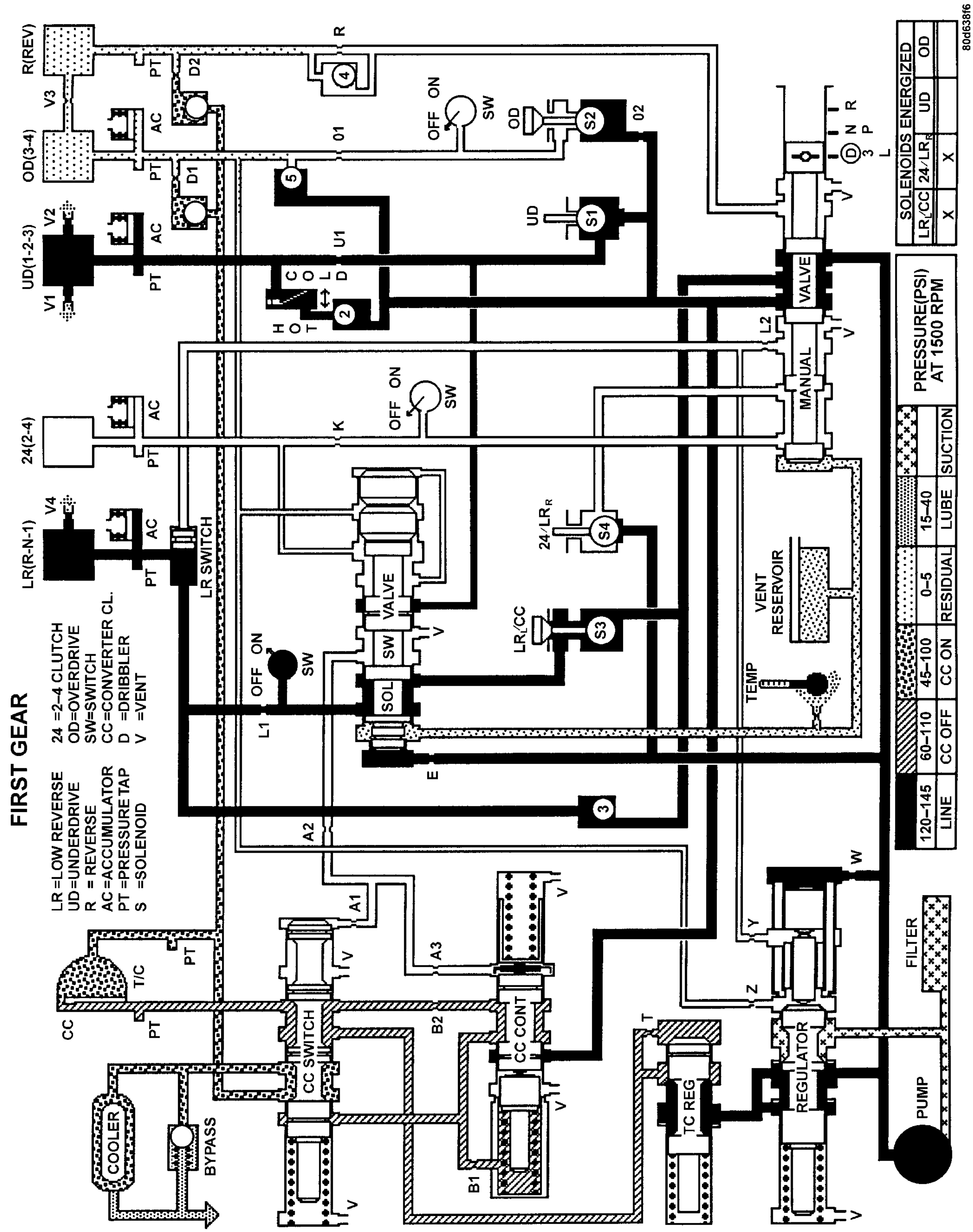
Reverse

40TE AUTOMATIC TRANSAXLE (Continued)



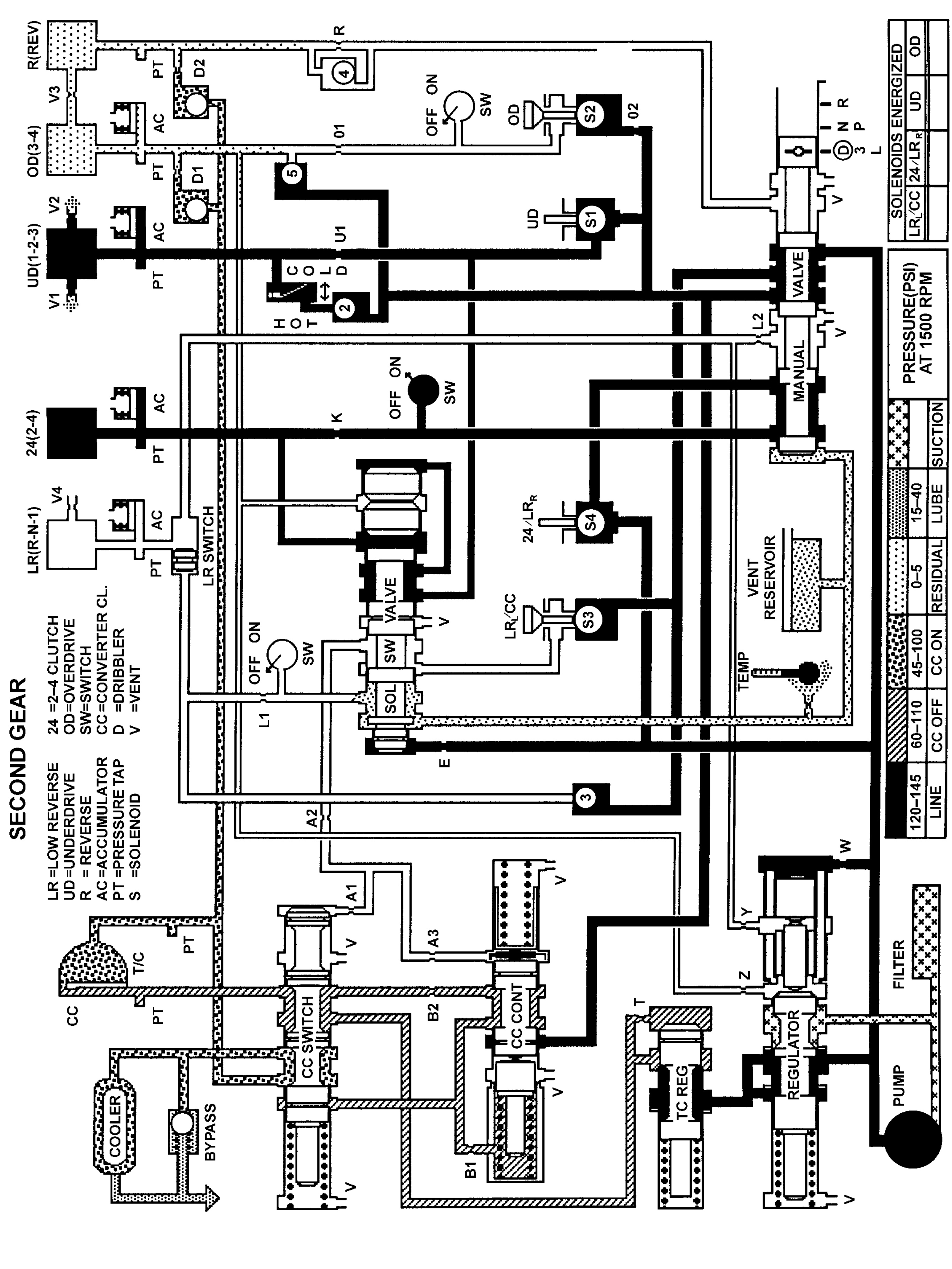
Reverse Block (Shift to Reverse W/Speed Over 8 mph)

40TE AUTOMATIC TRANSAXLE (Continued)



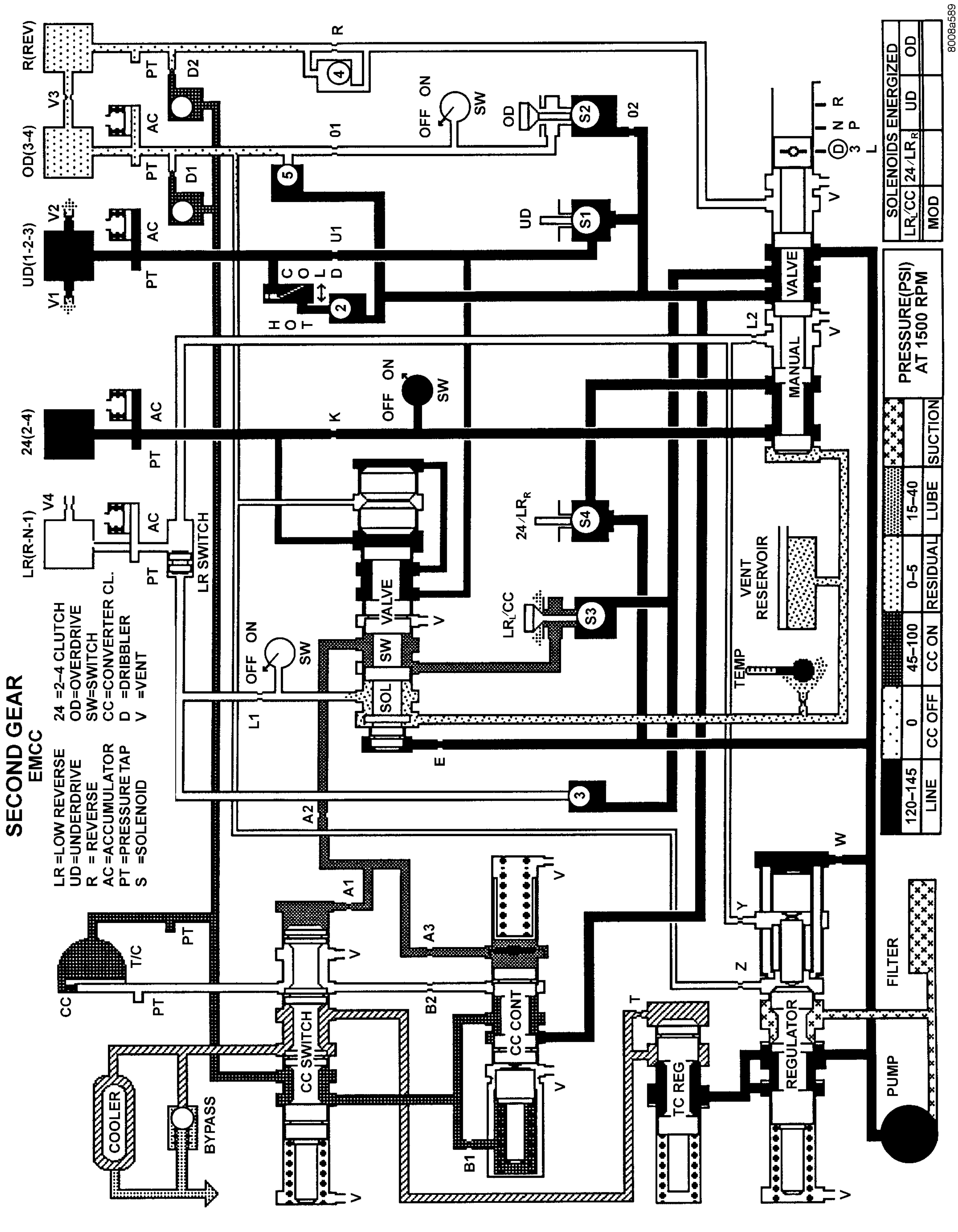
First Gear

40TE AUTOMATIC TRANSAXLE (Continued)



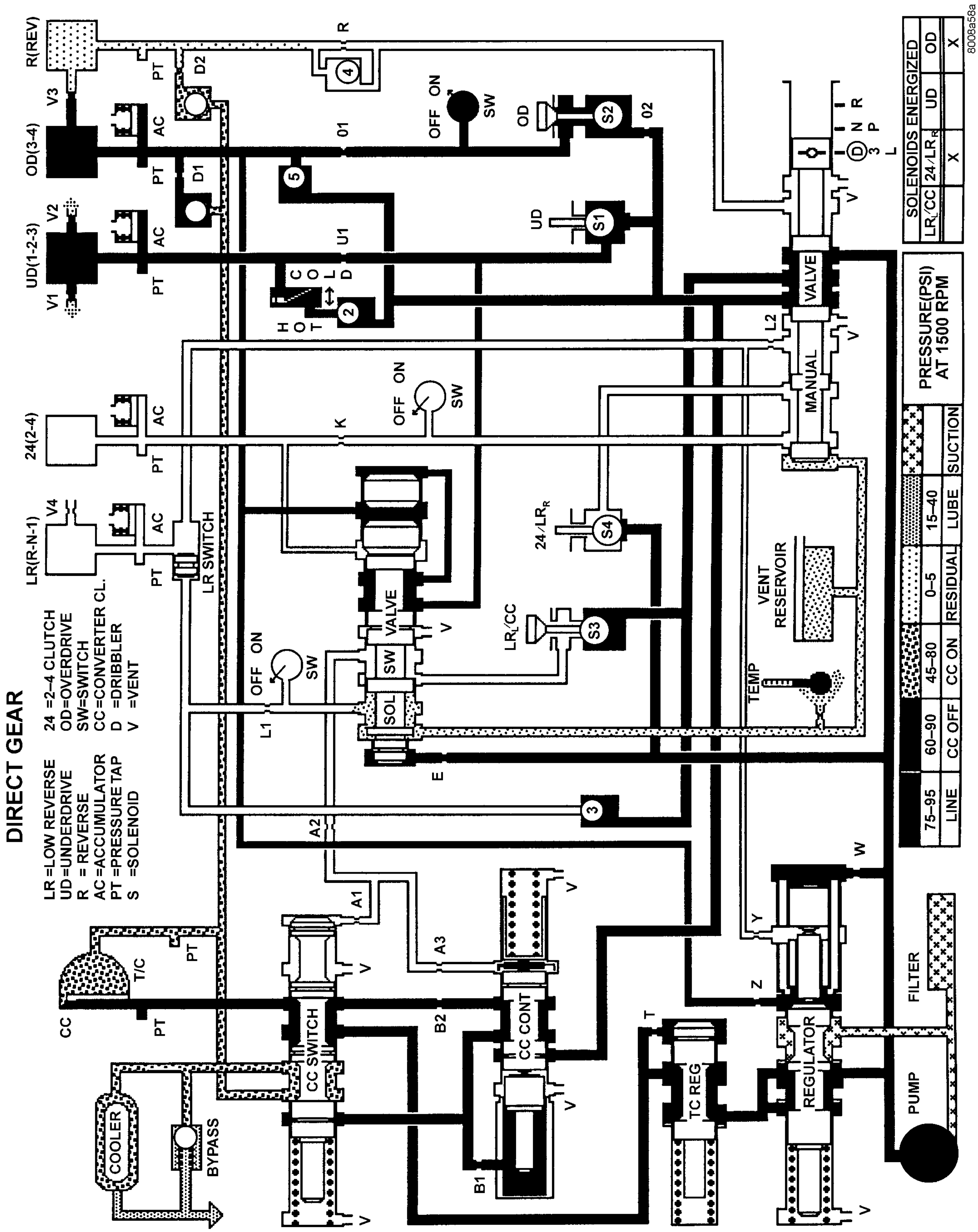
Second Gear

40TE AUTOMATIC TRANSAXLE (Continued)



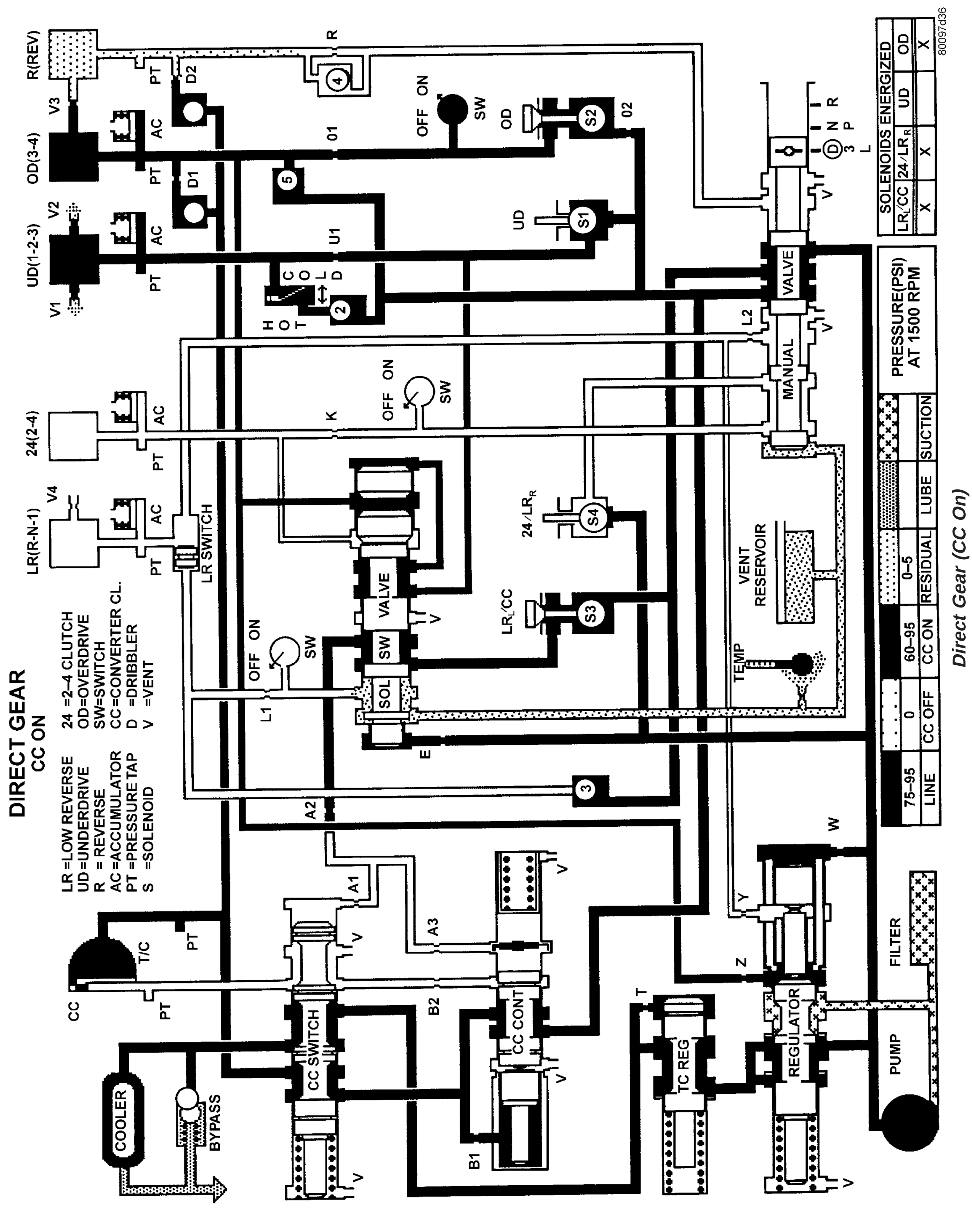
Second Gear (EMCC)

40TE AUTOMATIC TRANSAXLE (Continued)



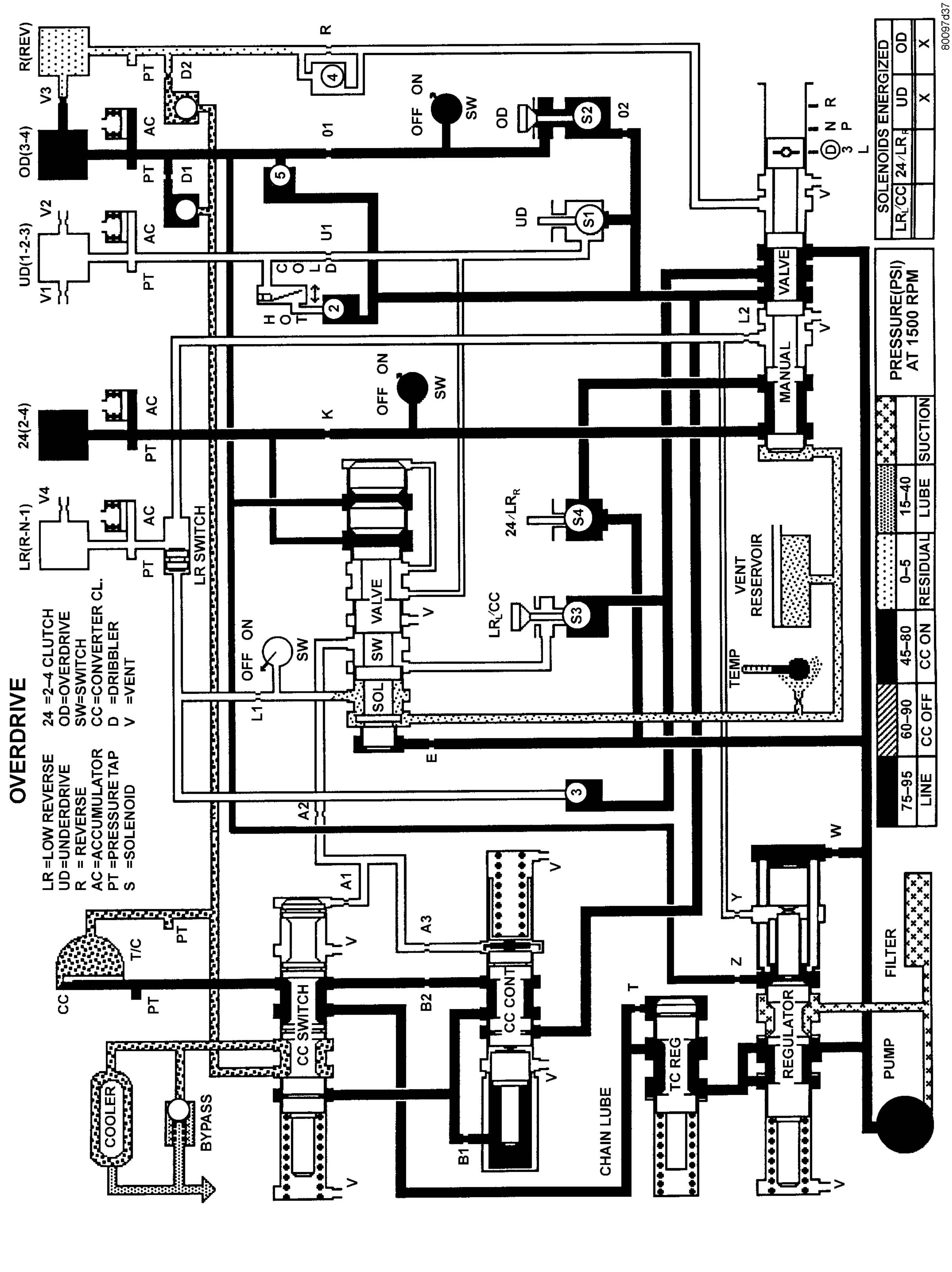
Direct Gear

40TE AUTOMATIC TRANSAXLE (Continued)



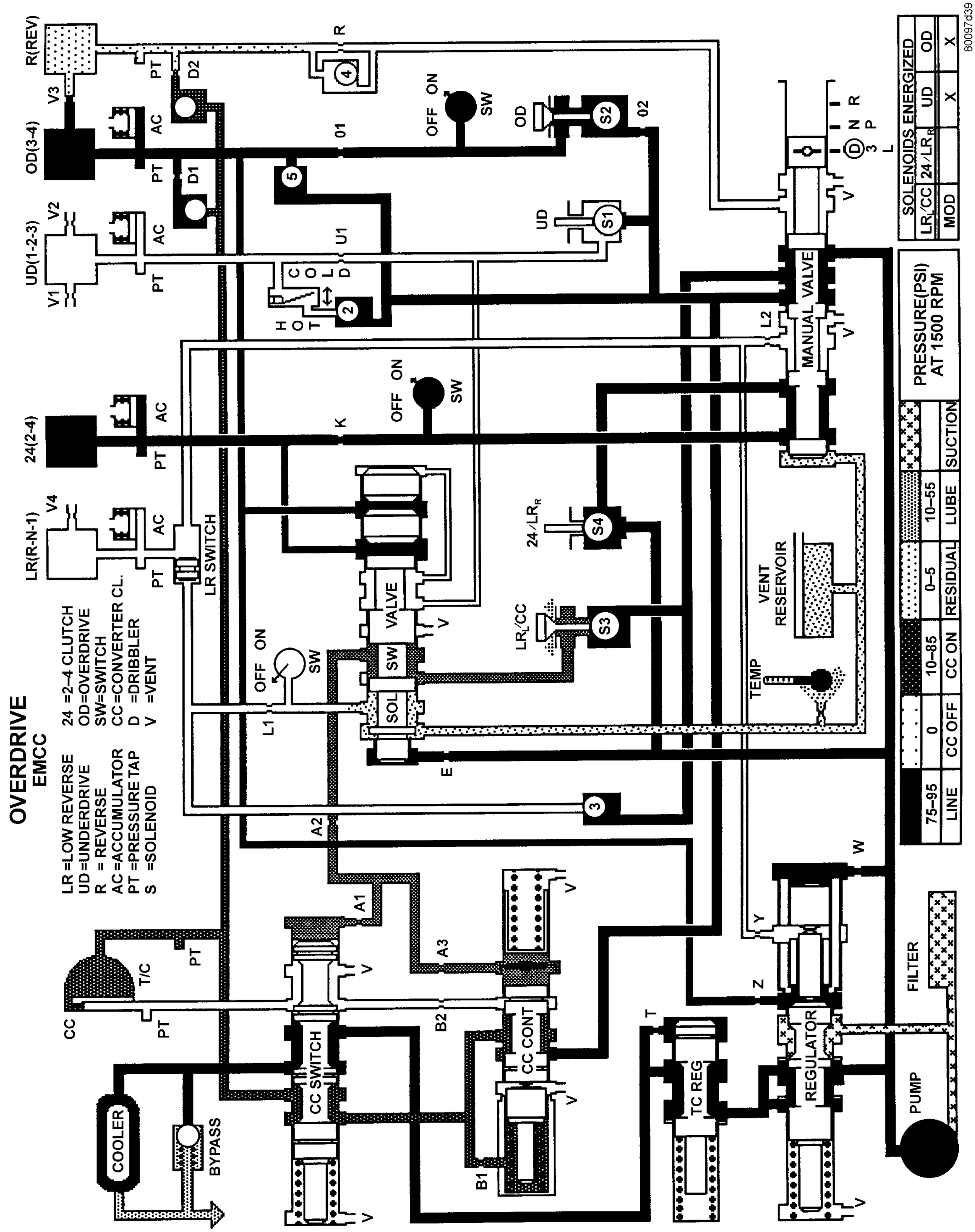
Direct Gear (CC On)

40TE AUTOMATIC TRANSAXLE (Continued)



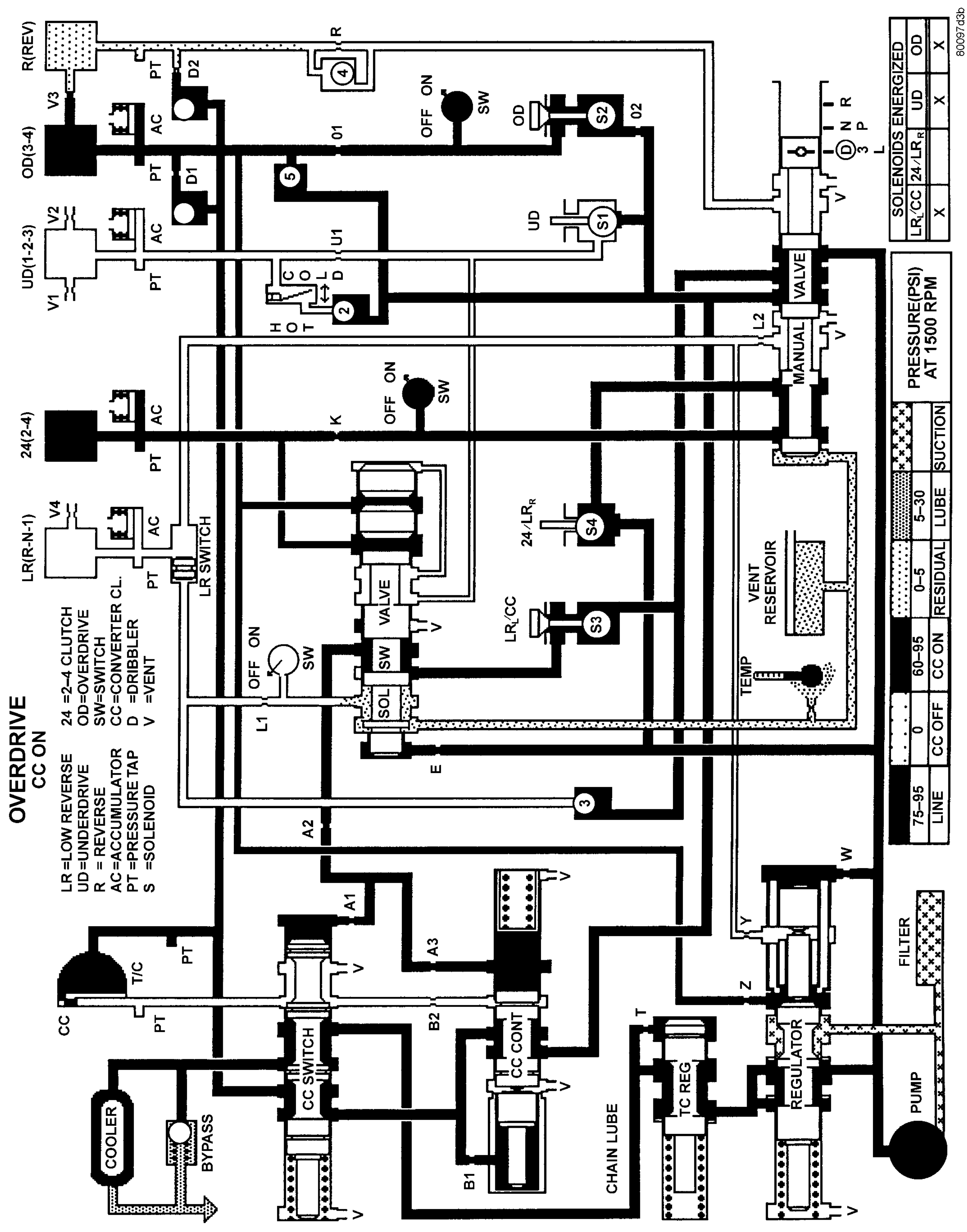
Overdrive

40TE AUTOMATIC TRANSAXLE (Continued)



Overdrive (EMCC)

40TE AUTOMATIC TRANSAXLE (Continued)



Overdrive (CC On)

40TE AUTOMATIC TRANSAXLE (Continued)

SPECIFICATIONS

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Transaxle Type	Fully adaptive, electronically controlled, four speed automatic with torque converter and integral differential
Cooling Method	Oil-to-Water Heat Exhanger
Lubrication	Pump (internal-external gear-type

GEAR RATIOS

DESCRIPTION	SPECIFICATION
First Gear	2.84
Second Gear	1.57
Direct Gear	1.00
Overdrive Gear	0.69
Reverse Gear	2.21

BEARING SETTINGS (END PLAY & TURNING TORQUE)

DESCRIPTION	METRIC	STANDARD
Differential Assembly	0.6-2 N·m	5-18 in. lbs.
Output Hub	0.3-2 N·m	3-8 in. lbs.
Transfer Shaft (End Play)	0.051-0.102 mm	0.002-0.004 in.
Overall Drag At Output Hub	0.3-1.9 N·m	3-16 in. lbs.

CLUTCH CLEARANCES

DESCRIPTION	METRIC	STANDARD
Low/Rev Clutch (Select Reaction Plate)	0.89-1.47 mm	0.035-0.058 in.
Two/Four Clutch (No Selection)	0.76-2.64 mm	0.030-0.104 in.
Reverse Clutch (Select Snap Ring)	0.89-1.37 mm	0.035-0.054 in.
Overdrive Clutch (No Selection)	1.07-3.25 mm	0.042-0.128 in.
Underdrive Clutch (Select Reaction Plate)	0.94-1.50 mm	0.037-0.059 in.

OIL PUMP CLEARANCES

DESCRIPTION	METRIC	STANDARD
Outer Gear-to-Crescent	0.060-0.298 mm	0.0023-0.0117 in.
Inner Gear-to-Crescent	0.093-0.385 mm	0.0036-0.0151 in.
Outer Gear-to-Pocket	0.089-0.202 mm	0.0035-0.0079 in.
Outer Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.
Inner Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.

40TE AUTOMATIC TRANSAXLE (Continued)

INPUT SHAFT

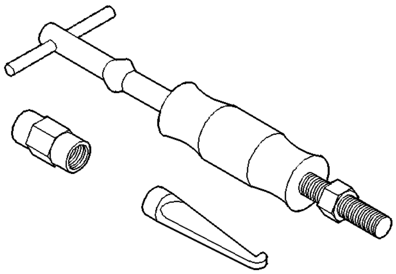
DESCRIPTION	METRIC	SPECIFICATION
End Play	0.127-0.635mm	0.005-0.025 in.

TORQUE SPECIFICATIONS

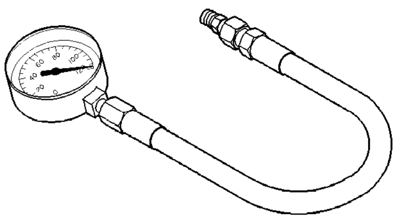
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolt, Differential Cover-to-Case	19	—	165
Bolt, Differential Ring Gear-to-Case	95	70	—
Bolt, Differential Bearing Retainer-to-Case	28	21	—
Bolt, Driveplate-to-Crankshaft	95	70	—
Bolt, Extension Housing/ Plate-to-Case	28	21	—
Bolt, Oil Pan-to-Case	19	—	165
Bolt, Output Gear	271	200	—
Bolt, Output Gear Stirrup/Strap	23	17	—
Bolt, Oil Pump-to-Case	27	20	—
Bolt, Reaction Support-to-Case	27	20	—
Bolt, Solenoid/Pressure Switch Assy.-to-Case	12	—	110
Bolt, Torque Converter-to-Driveplate	75	55	—
Bolt, Transfer Gear Cover	20	—	175
Bolt, Valve Body-to-Case	12	—	105
Fitting, Oil Cooler Line	12	—	105
Nut, Tranfer Gear	271	200	—
Tap, Transaxle Pressure	5	—	45
Screw, L/R Clutch Retainer	5	—	45
Screw, Solenoid/Pressure Switch Assy. Connector	4	—	35
Screw, Valve Body-to-Transfer Plate	5	—	45
Sensor, Input Speed	27	20	—
Sensor, Output Speed	27	20	—
Sensor, Transmission Range Sensor	5	—	45

40TE AUTOMATIC TRANSAXLE (Continued)

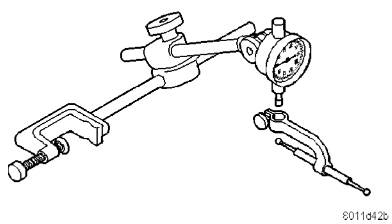
SPECIAL TOOLS



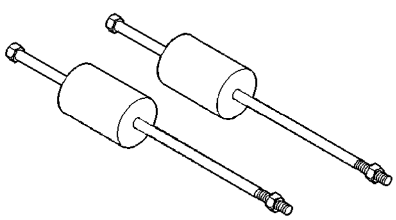
Puller C-637



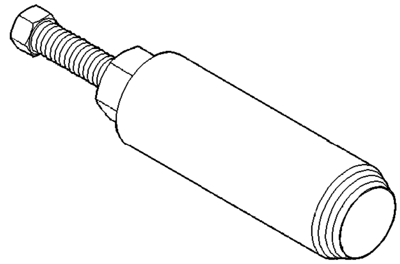
Pressure Gauge (High) C-3293SP



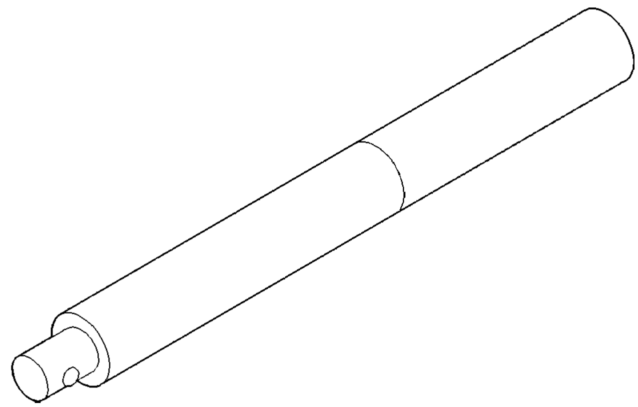
Dial Indicator C-3339



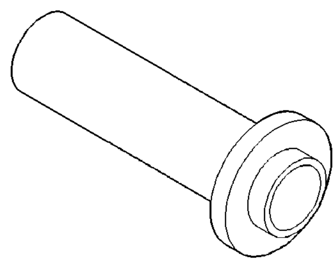
Oil Pump Puller C-3752



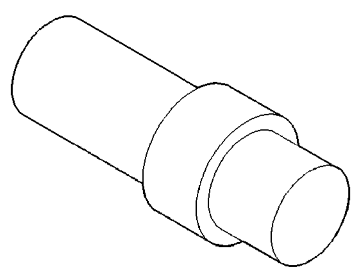
Seal Puller C-3981B



Universal Handle C-4171

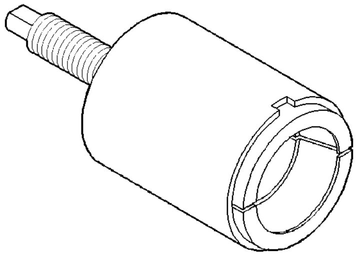


Seal Installer C-4193A

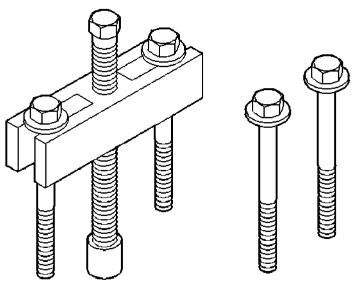


Adapter C-4996

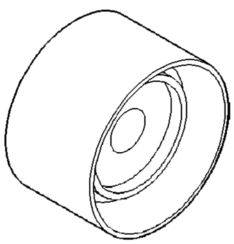
40TE AUTOMATIC TRANSAXLE (Continued)



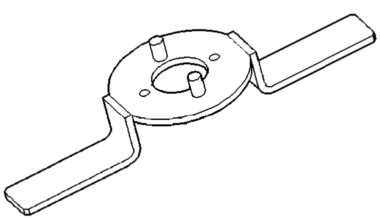
Remover Kit L-4406



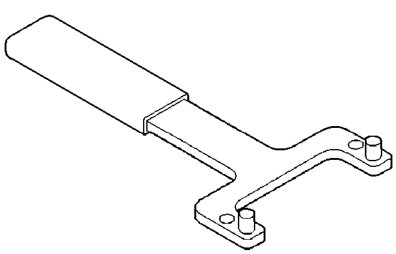
Gear Puller L-4407A



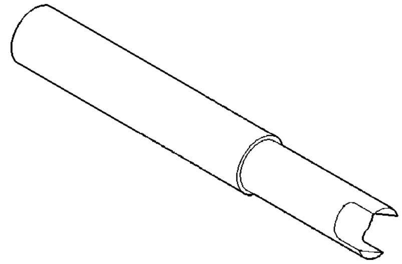
Bearing Installer L-4410



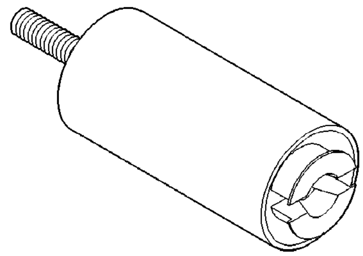
Gear Checking Plate L-4432



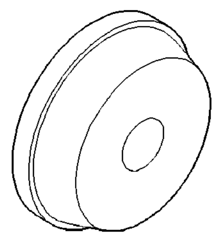
Bearing Puller L-4435



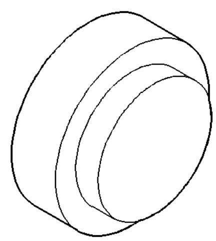
Differential Tool L-4436A



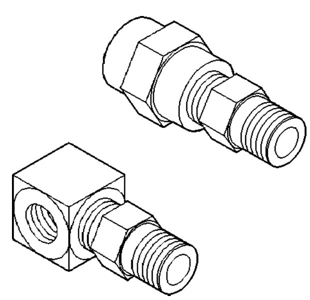
Special Jaw Set L-4518



Installer L-4520

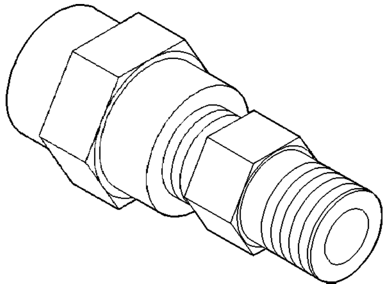


Thrust Button L-4539-2

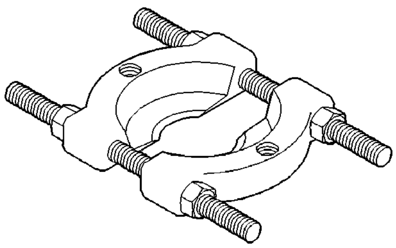


Adapter L-4559

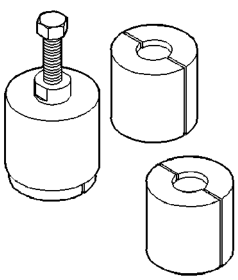
40TE AUTOMATIC TRANSAXLE (Continued)



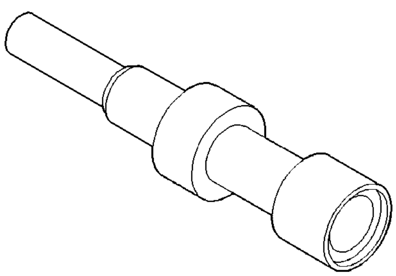
Adapter L-4559-2



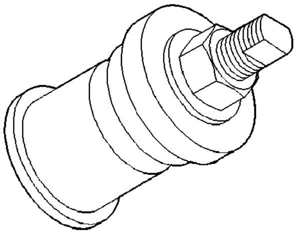
Bearing Splitter P-334



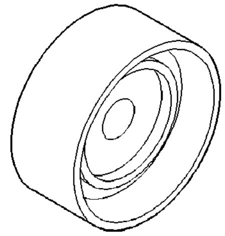
Puller Set 5048



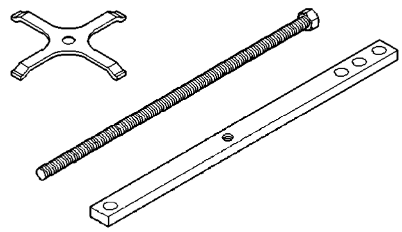
Remover/Installer 5049-A



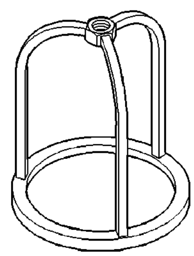
Installer 5050A



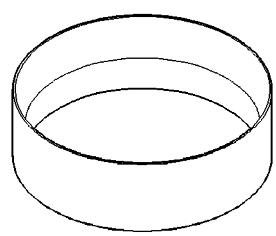
Installer 5052



Compressor 5058A

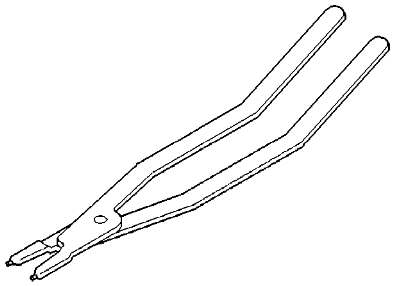


Compressor 5059-A

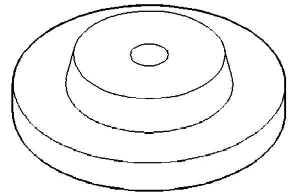


Installer 5067

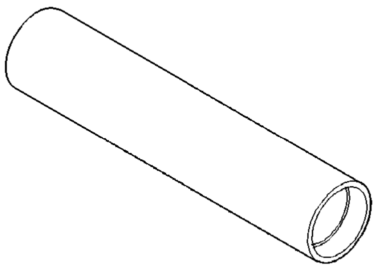
40TE AUTOMATIC TRANSAXLE (Continued)



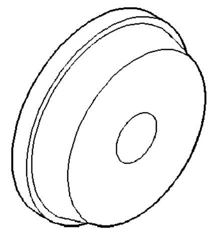
Pliers 6051



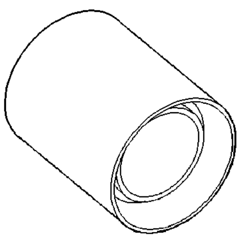
Disk 6057



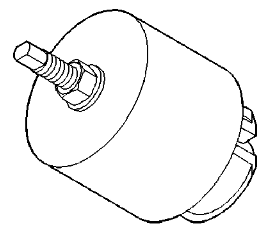
Installer 6052



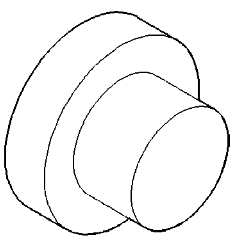
Installer 6061



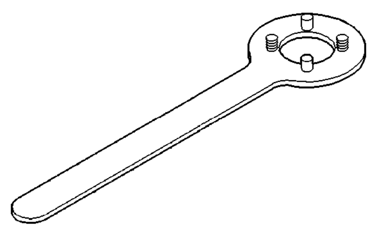
Installer 6053



Remover 6062-A



Butto 6055



Holder 6259

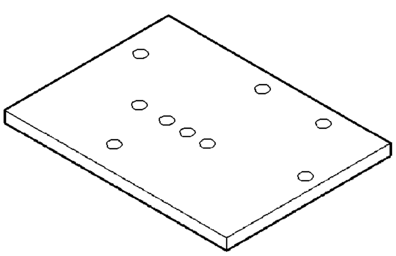
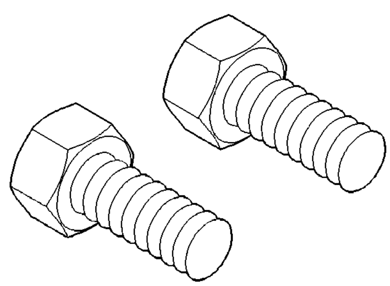
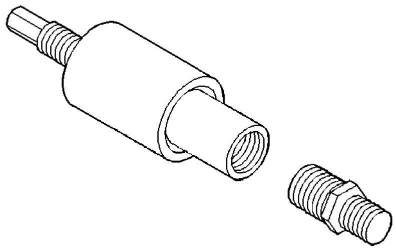


Plate 6056

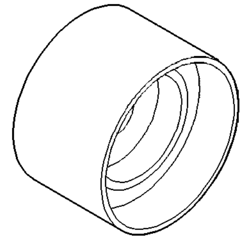


Bolt 6260

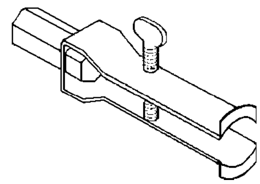
40TE AUTOMATIC TRANSAXLE (Continued)



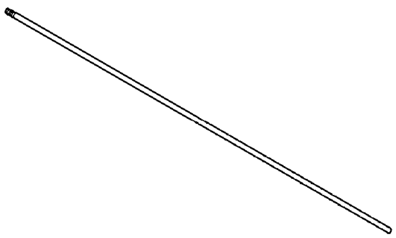
Installer 6261



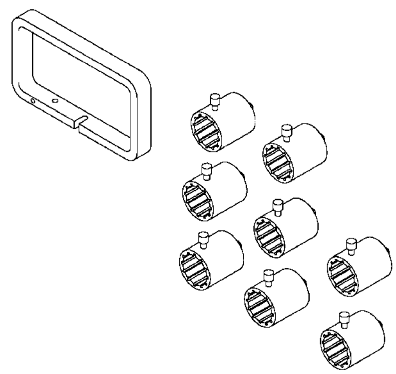
Installer 6536-A



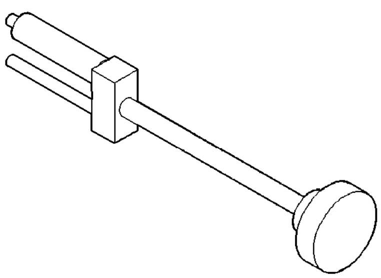
Puller 7794-A



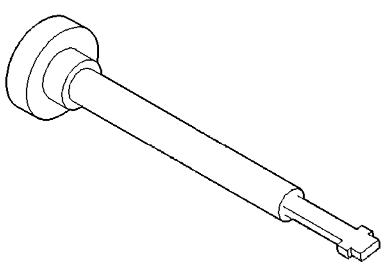
Tip 6268



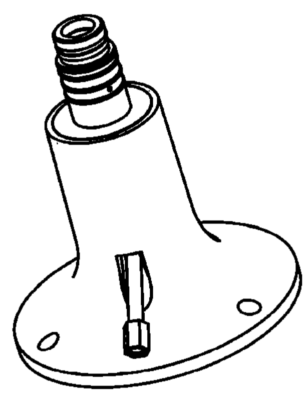
End Play Socket Set 8266



Remover/Installer 6301



Remover/Installer 6302



Input Clutch Pressure Fixture 8391

ACCUMULATOR

DESCRIPTION

The 4XTE underdrive, overdrive, low/reverse, and 2/4 clutch hydraulic circuits each contain an accumulator. An accumulator typically consists of a piston, return spring(s), and a cover or plug. The overdrive and underdrive accumulators are located within the transaxle case, and are retained by the valve body (Fig. 153).

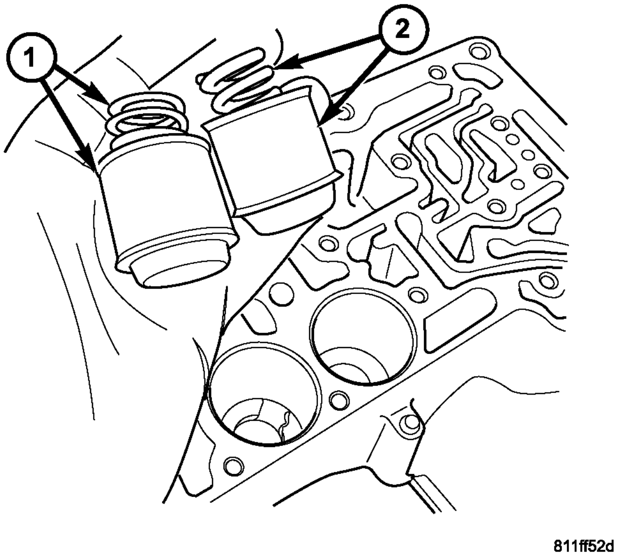


Fig. 153 Underdrive and Overdrive Accumulators

1 - OVERDRIVE PISTON AND SPRING
2 - UNDERDRIVE PISTON AND SPRING

The low reverse accumulator (Fig. 154) is also located within the transaxle case, but the assembly is retained by a cover and a snap-ring.

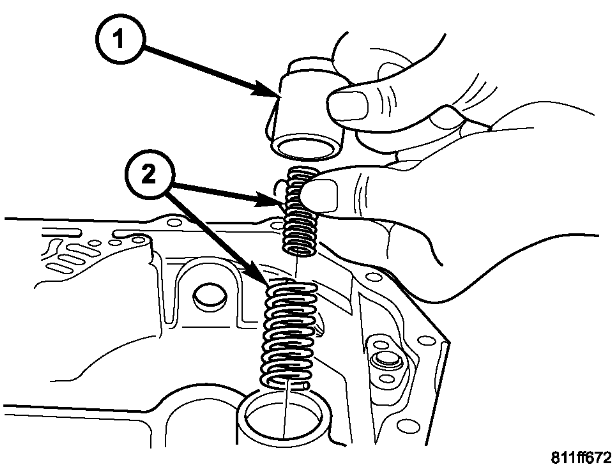


Fig. 154 Low/Reverse Accumulator

1 - PISTON
2 - RETURN SPRINGS

The 2/4 accumulator is located in the valve body. It is retained by a cover and retaining screws (Fig. 155).

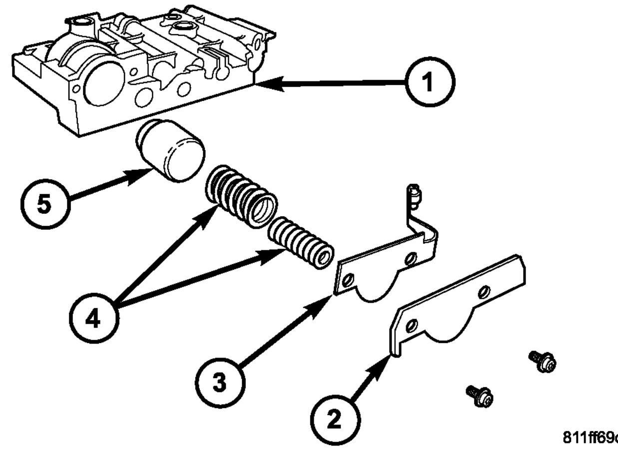


Fig. 155 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - RETURN SPRINGS
5 - PISTON

OPERATION

The function of an accumulator is to cushion the application of a frictional clutch element. When pressurized fluid is applied to a clutch circuit, the application force is dampened by fluid collecting in the respective accumulator chamber against the piston and spring(s). The intended result is a smooth, firm clutch application.

DRIVING CLUTCHES

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly (Fig. 156). The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

DRIVING CLUTCHES (Continued)

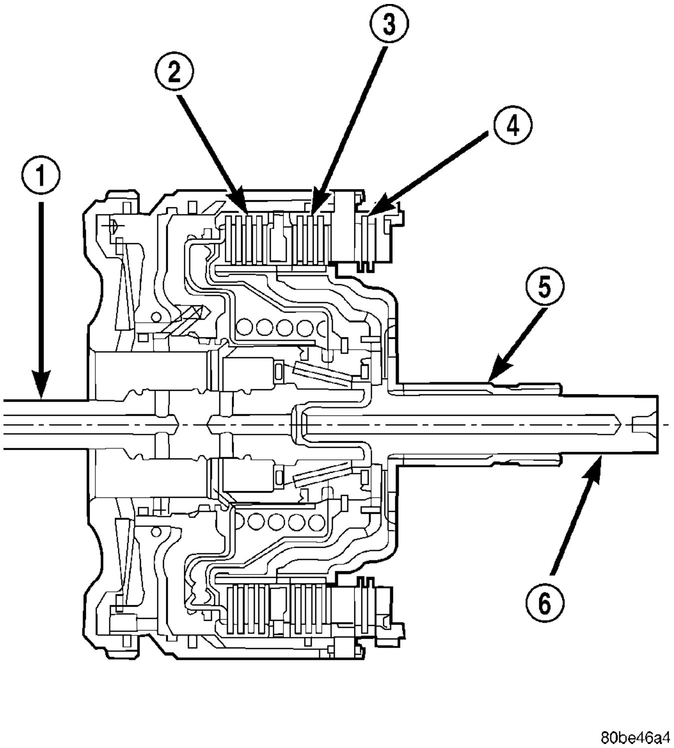


Fig. 156 Input Clutch Assembly

1 - INPUT SHAFT
2 - UNDERDRIVE CLUTCH
3 - OVERDRIVE CLUTCH
4 - REVERSE CLUTCH
5 - OVERDRIVE SHAFT
6 - UNDERDRIVE SHAFT

NOTE: Refer to the "Elements In Use" chart in Diagnosis and Testing for a collective view of which clutch elements are applied at each position of the selector lever.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the rear sun gear.

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and overdrive gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the front planet carrier.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear only by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the front sun gear assembly is driven.

FINAL DRIVE

DESCRIPTION

The 4XTE differential is a conventional open design. It consists of a ring gear and a differential case. The differential case consists of pinion and side gears, and a pinion shaft. The differential case is supported in the transaxle by tapered roller bearings (Fig. 157).

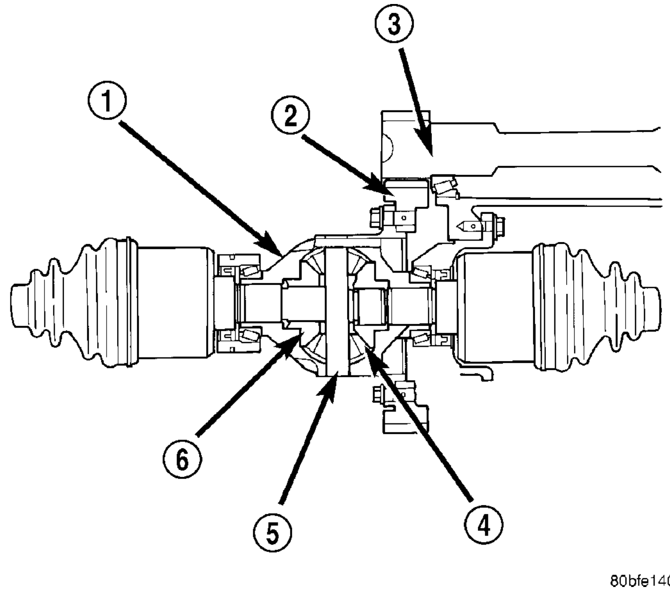


Fig. 157 Differential Assembly

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - TRANSFER SHAFT
4 - PINION GEAR
5 - PINION SHAFT
6 - SIDE GEAR

OPERATION

The differential assembly is driven by the transfer shaft by way of the differential ring gear. The ring gear drives the differential case, and the case drives the driveshafts through the differential gears. The differential pinion and side gears are supported in the case by thrust washers and a pinion shaft. Differential pinion and side gears make it possible for front tires to rotate at different speeds while cornering.

DISASSEMBLY

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.

FINAL DRIVE (Continued)

The transfer shaft should be removed for differential repair and bearing turning torque checking.

(1) Remove the differential cover and bolts (Fig. 158) (Fig. 159).

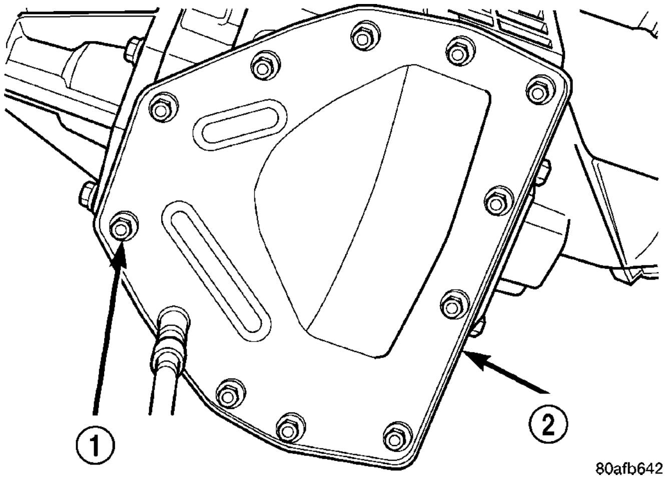


Fig. 158 Differential Cover Bolts

1 - DIFFERENTIAL COVER BOLTS
2 - DIFFERENTIAL COVER

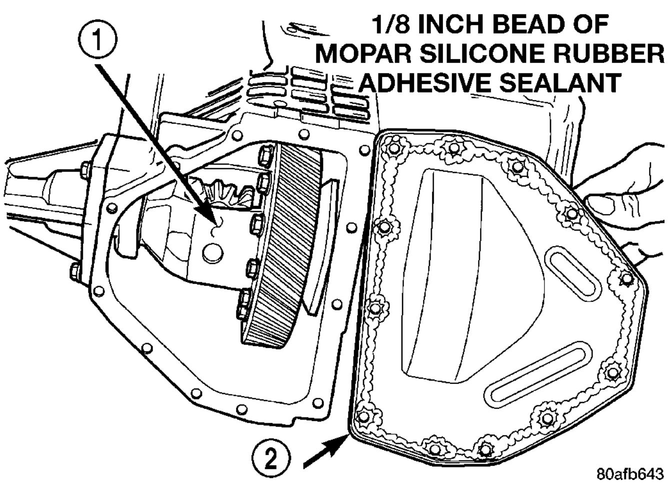


Fig. 159 Remove Differential Cover

1 - DIFFERENTIAL ASSEMBLY
2 - DIFFERENTIAL COVER

(2) Remove the differential bearing retainer and bolts (Fig. 160) (Fig. 161).

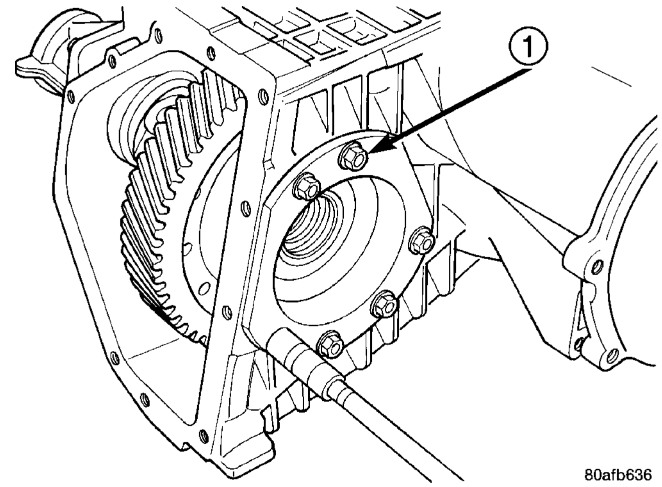


Fig. 160 Differential Retainer Bolts

1 - DIFFERENTIAL RETAINER BOLTS

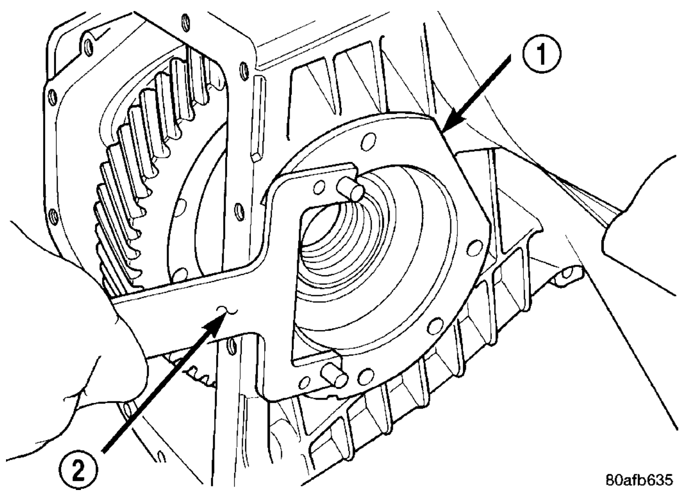


Fig. 161 Remove Bearing Retainer

1 - DIFFERENTIAL BEARING RETAINER
2 - TOOL L-4435

FINAL DRIVE (Continued)

(3) Using a plastic hammer, remove extension housing/adapter plate on the right side of the transaxle.

WARNING: HOLD ONTO DIFFERENTIAL ASSEMBLY TO PREVENT IT FROM ROLLING OUT OF HOUSING.

(4) Remove differential assembly.

(5) Set up dial indicator set C-3339 and tool C-4996 as shown in (Fig. 162) (Fig. 163) to measure side gear end play. **Side gear end play must be within 0.001-0.013 in.**

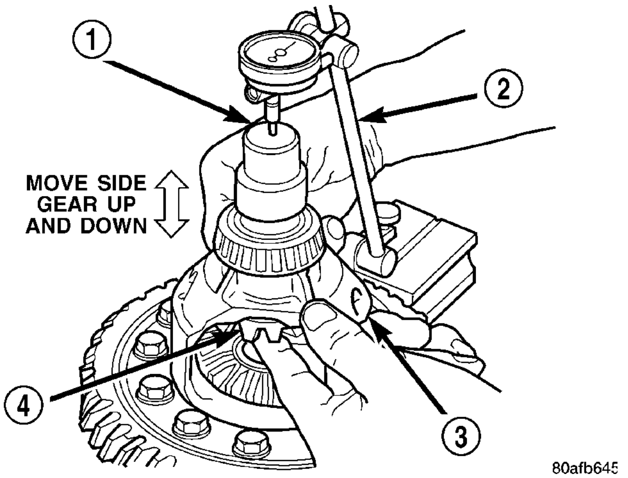


Fig. 162 Checking Side Gear End Play (Extension Housing Side)

1 - SPECIAL TOOL C-4996 (NOTE POSITION)
2 - DIAL INDICATOR SET
3 - DIFFERENTIAL ASSEMBLY
4 - SIDE GEAR

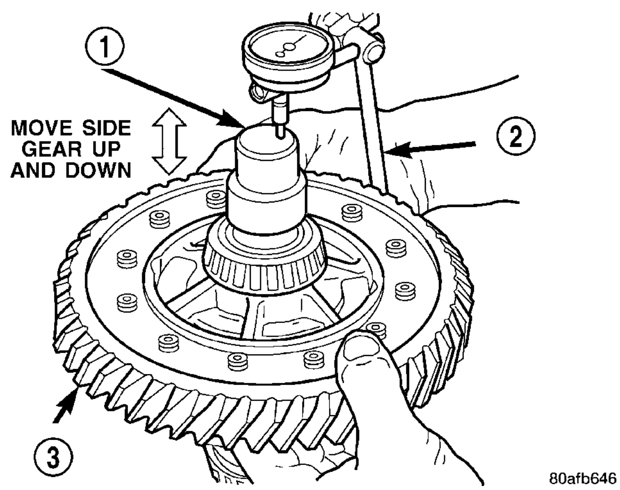


Fig. 163 Checking Side Gear End Play (Ring Gear Side)

1 - SPECIAL TOOL C-4996 (NOTE POSITION)
2 - DIAL INDICATOR SET
3 - DIFFERENTIAL ASSEMBLY

(6) Use Miller Special Tool 5048, 5048-3 Collets, and L-4539-2 Button to remove the differential bearing cone on the extension housing side.

(7) Use Miller Special Tool 5048, 5048-4 Collets, and L-4539-2 Button to remove the differential bearing cone on the bearing retainer side (Fig. 164) (Fig. 165) (Fig. 166).

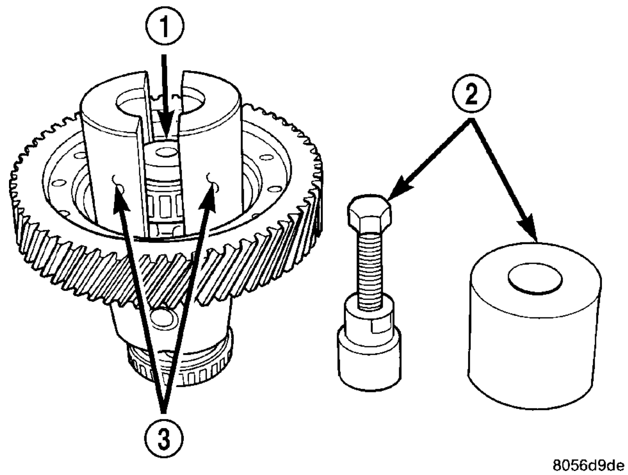


Fig. 164 Position Button and Collets Onto Differential and Bearing (Ring Gear Side)

1 - SPECIAL TOOL L-4539-2
2 - SPECIAL TOOL 5048
3 - SPECIAL TOOL 5048-4

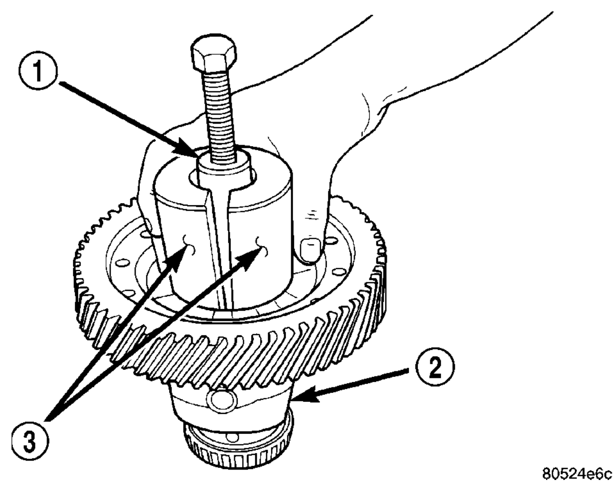


Fig. 165 Position Tool 5048 Over Button and Collets at Differential Bearing (Ring Gear Side)

1 - SPECIAL TO0L 5048
2 - DIFFERENTIAL
3 - SPECIAL TOOL 5048-4

FINAL DRIVE (Continued)

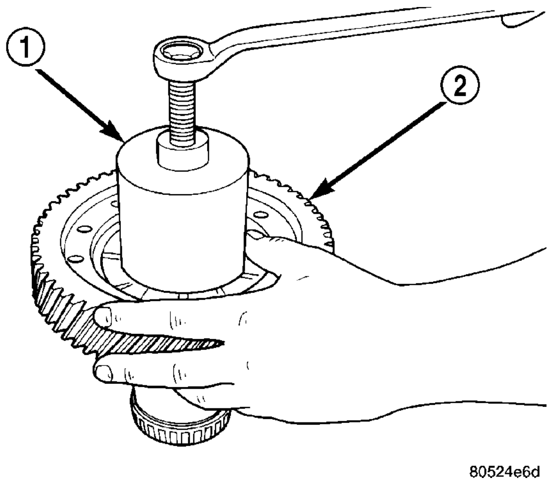


Fig. 166 Remove Differential Bearing Cone (Ring Gear Side)

1 - SPECIAL TOOL 5048
2 - RING GEAR

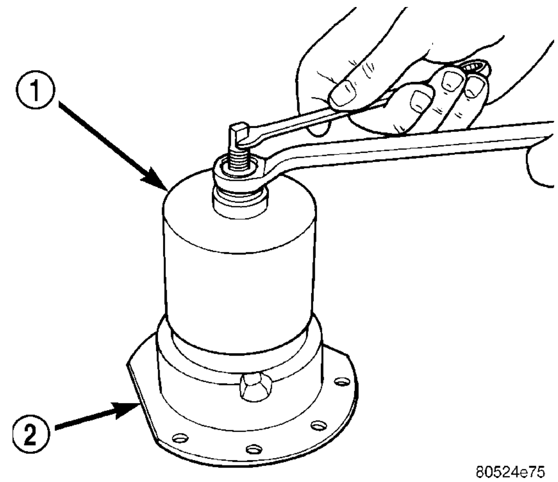


Fig. 168 Remove Bearing Cup

1 - SPECIAL TOOL 6062A
2 - DIFFERENTIAL BEARING RETAINER

(8) Using Miller Special Tool L-4518, remove the differential bearing race from the extension housing/adapter plate.

(9) Using Miller Special Tool 6062A, remove the differential bearing race from the bearing retainer (Fig. 167) (Fig. 168).

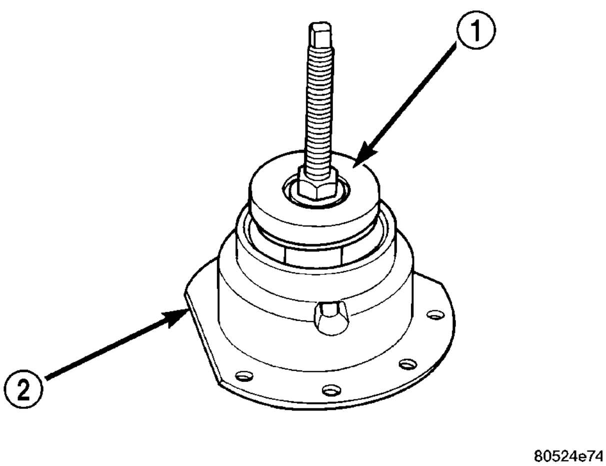


Fig. 167 Position Bearing Cup Remover Tool in Retainer

1 - SPECIAL TOOL 6062A
2 - DIFFERENTIAL BEARING RETAINER

DIFFERENTIAL SERVICE TOOLS

COMPONENT	REMOVER	INSTALLER
Diff. Bear. On Retainer Side	5048, 5048-4 Collets, L-4539-2 Button	5052, C-4171
Diff. Bear. On Ext. Hous. Side	5048, 5048-3 Collets, L-4539-2 Button	L-4410, C-4171
Diff. Race. On Retainer Side	6062-A	6061, C-4171
Diff. Race. On Ext. Hous. Side	L-4518	L-4520, C-4171
Extension Housing Seal	7794-A, C-637 Slide Hammer	L-4520, C-4171
Bearing Retainer Seal	794-A, C-637 Slide Hammer	L-4520, C-4171

FINAL DRIVE (Continued)

ASSEMBLY

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.

NOTE: Use Mopar® ATF RTV (MS-GF41), or equivalent, on retainer and extension housing/adapter plate to seal to case.

(1) Using Miller Special Tool L-4410, and C-4171, install differential bearing to differential (extension housing side) (Fig. 169).

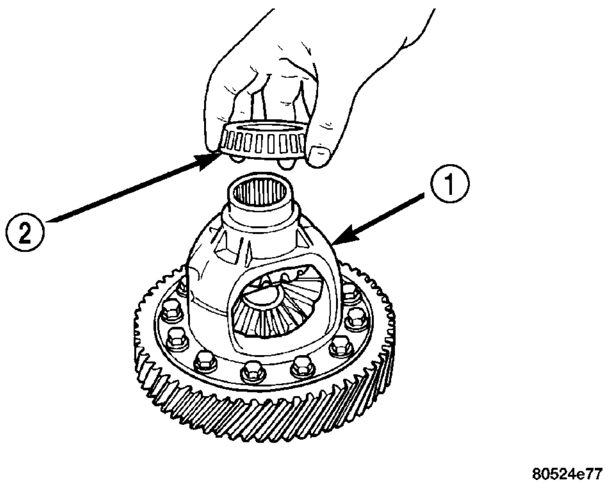


Fig. 169 Position Bearing Cone Onto Differential

1 - DIFFERENTIAL ASSEMBLY
2 - DIFFERENTIAL BEARING

(2) Using Miller Special Tool 5052 and C-4171, install differential bearing to differential (bearing retainer side).

(3) Using Miller Special Tool 6061 and C-4171, install differential bearing race to bearing retainer (Fig. 170).

(4) Using Miller Special Tool L–4520 and C-4171, install differential bearing cup to extension housing.

(5) Measure and adjust differential bearing preload (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/FINAL DRIVE - ADJUSTMENTS) .

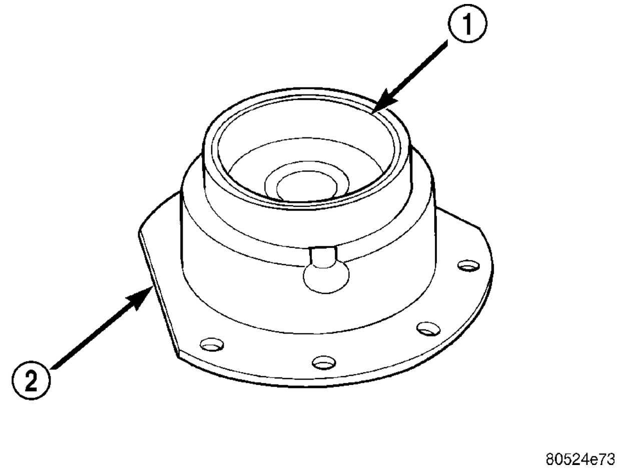


Fig. 170 Differential Bearing Retainer

1 - DIFFERENTIAL BEARING CUP
2 - DIFFERENTIAL BEARING RETAINER

(6) Install differential assembly to case. Install extension housing/adapter plate and bearing retainer.

(7) Install bearing retainer with a bead of Mopar® ATF RTV (MS-GF41) and torque bolts (Fig. 171) to 28 N·m (250 in. lbs.).

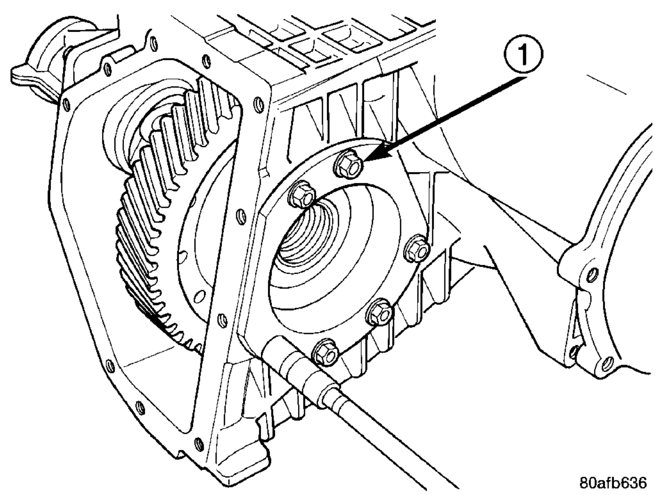


Fig. 171 Differential Retainer Bolts

1 - DIFFERENTIAL RETAINER BOLTS

(8) Install extension housing/adapter plate with a bead of Mopar® ATF RTV (MS-GF41) and torque bolts to 28 N·m (250 in. lbs.).

FINAL DRIVE (Continued)

(9) Install differential cover with a bead of Mopar® ATF RTV (MS-GF41) (Fig. 172) and torque bolts (Fig. 173) to 28 N·m (250 in. lbs.).

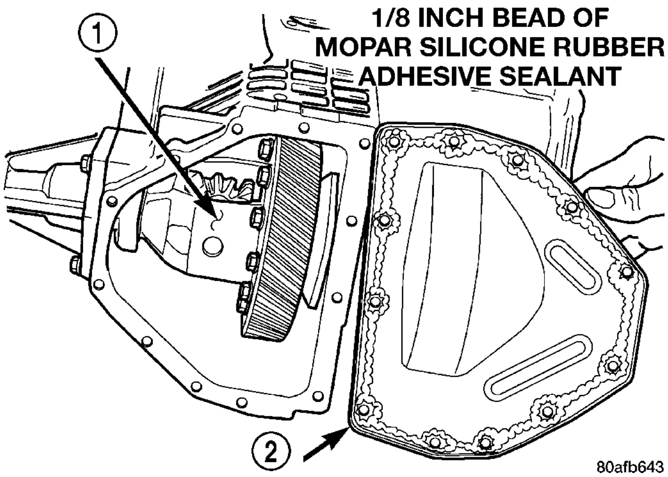


Fig. 172 Install Differential Cover

1 - DIFFERENTIAL ASSEMBLY
2 - DIFFERENTIAL COVER

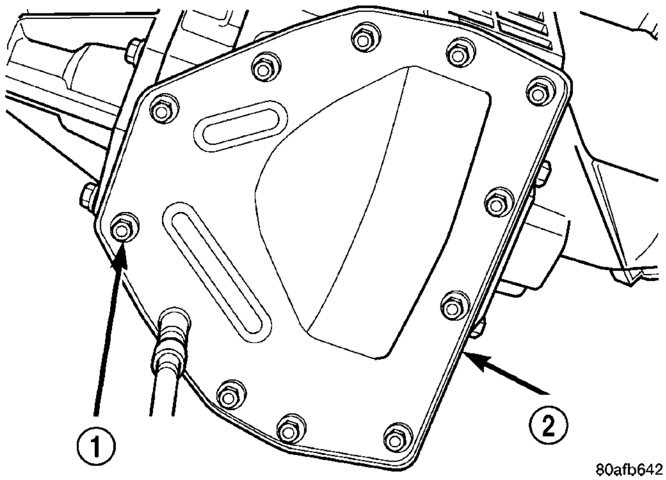


Fig. 173 Differential Cover Bolts

1 - DIFFERENTIAL COVER BOLTS
2 - DIFFERENTIAL COVER

ADJUSTMENTS

DIFFERENTIAL BEARING PRELOAD MEASUREMENT AND ADJUSTMENT

NOTE: Perform all differential bearing preload measurements with the transfer shaft and gear removed.

DIFFERENTIAL BEARING PRELOAD ADJUSTMENT USING EXISTING SHIM

(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. 174).

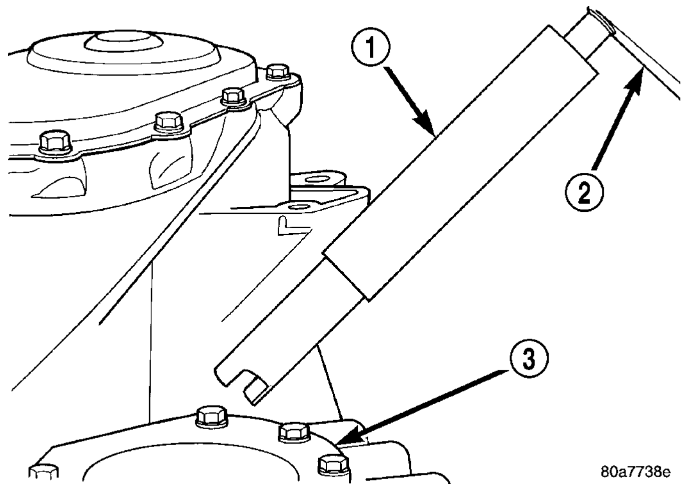


Fig. 174 Tool L-4436 and Torque Wrench

1 - SPECIAL TOOL L-4436–A
2 - TORQUE WRENCH
3 - DIFFERENTIAL BEARING RETAINER

(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 (Fig. 175). **The turning torque should be between 5 and 18 inch-pounds.**

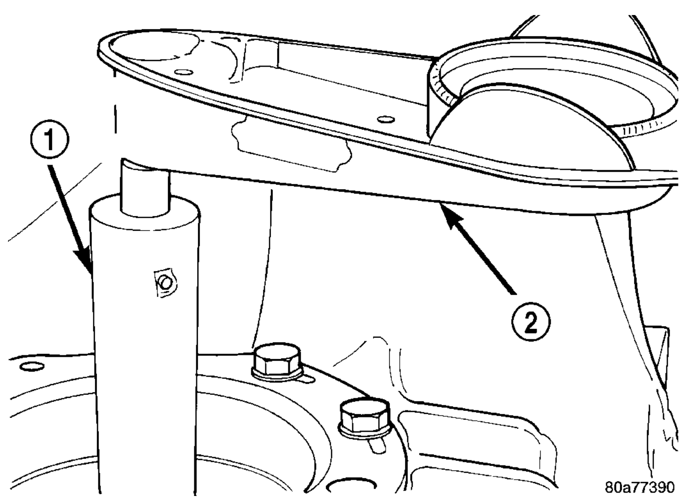


Fig. 175 Checking Differential Bearings Turning Torque

1 - SPECIAL TOOL L-4436–A
2 - TORQUE WRENCH

FINAL DRIVE (Continued)

(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.

(c) Remove the existing shim from under the cup.

(d) Measure the existing shim.

(e) If the turning torque was too high when measured, install a 0.05 mm (0.002 inch) thinner shim. If the turning torque is was too low, install a 0.05 mm (0.002 inch) thicker shim. Repeat until 5 to 18 inch-pounds turning torque is obtained. Oil Baffle is not required to be installed when making shim selection.

(f) 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.

(g) 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 (Fig. 175). **The turning torque should be between 5 and 18 inch-pounds.**

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

DIFFERENTIAL BEARING SHIM CHART

PART NUMBER	SHIM THICKNESS	
	MM	INCH
4659257	.980	0.0386
4659258	1.02	0.0402
4659259	1.06	0.0418
4659260	1.10	0.0434
4659261	1.14	0.0449
4659262	1.18	0.0465
4659263	1.22	0.0481
4659264	1.26	0.0497
4659265	1.30	0.0512
4659266	1.34	0.0528
4659267	1.38	0.0544
4659268	1.42	0.0560
4659269	1.46	0.0575
4659270	1.50	0.0591
4659271	1.54	0.0607
4659272	1.58	0.0623
4659273	1.62	0.0638
4659274	1.66	0.0654
4659275	1.70	0.0670
4659283	2.02	0.0796
4659284	2.06	0.0812

FINAL DRIVE (Continued)

PRELOAD ADJUSTMENT W/O SHIM

(1) Remove the bearing cup from the differential bearing retainer using Miller special Tool 6062A.

(2) Remove existing shim from under bearing cup.

(3) Reinstall the bearing cup into the retainer using Miller Special Tool 6061, and C-4171.

NOTE: Oil baffle is not required when making the shim calculation.

(4) Install the bearing retainer into the case. Torque bolts to 28 N•m (250 in. lbs.).

(5) Position the transaxle assembly vertically on the support stand and install Miller Special Tool L-4436-A into the bearing retainer.

(6) Rotate the differential at least one full revolution to ensure the tapered roller bearings are fully seated.

(7) Attach a dial indicator to the case and zero the dial. Place the tip on the end of Special Tool L-4436-A.

(8) Place a large screwdriver to each side of the ring gear and lift. Check the dial indicator for the amount of end play.

CAUTION: Do not damage the transaxle case and/or differential retainer sealing surface.

(9) Using the end play measurement that was determined, add 0.18mm (0.007 inch). This should give you between 5 and 18 inch pounds of bearing preload. Refer to the Differential Bearing Shim Chart to determine which shim to use.

(10) Remove the differential bearing retainer. Remove the bearing cup.

(11) Install the oil baffle. Install the proper shim combination under the bearing cup.

(12) Install the differential bearing retainer. Seal the retainer to the housing with Mopar® Silicone Rubber Adhesive Sealant. Torque bolts to 28 N•m (250 in. lbs.).

(13) Using Miller Special Tool L-4436-A and an inch-pound torque wrench, check the turning torque of the differential (Fig. 175). The turning torque should be between 5-18 inch-pounds.

NOTE: If turning torque is too high install a 0.05mm (0.002 inch) thicker shim. If the turning torque is too low, install a 0.05mm (0.002 inch) thinner shim. Repeat until 5-18 inch-pounds of turning torque is obtained.

FLUID

STANDARD PROCEDURE

FLUID LEVEL AND CONDITION CHECK

NOTE: Only transmission fluid of the type labeled Mopar ATF+4 (Automatic Transmission Fluid) should be used in this transaxle.

FLUID LEVEL CHECK

The transmission sump has a fluid level indicator (dipstick) to check oil similar to most automatic transmissions. It is located on the left side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P Park and N Neutral positions. Place the selector lever in P Park to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature 82° C (180° F), the fluid level is correct if it is in the HOT region on the oil level indicator (Fig. 176). The fluid level should be within the COLD region of the dipstick at 27° C (80° F) fluid temperature.

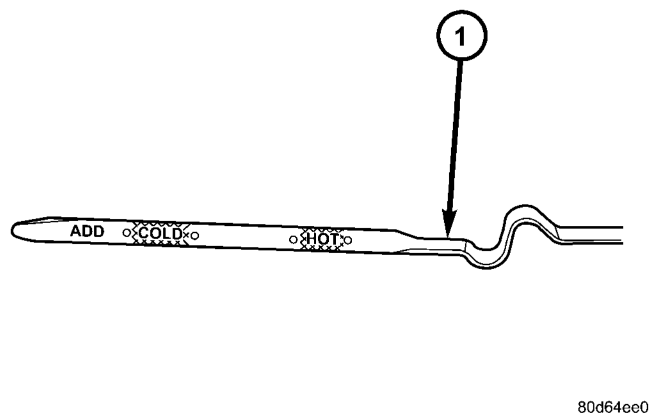


Fig. 176 Fluid Level Indicator

1 - FLUID LEVEL INDICATOR

FLUID LEVEL CHECK USING DRB

NOTE: Engine and Transaxle should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.

(2) Hook up DRB scan tool and select transmission.

FLUID (Continued)

(3) Select sensors.

(4) Read the transmission temperature value.

(5) Compare the fluid temperature value with the fluid temperature chart (Fig. 177).

(6) Adjust transmission fluid level shown on the indicator according to the chart.

(7) Check transmission for leaks.

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, air bubbles can cause overheating and/or 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.

FLUID CONDITION

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 recondition is probably required. 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.

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

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

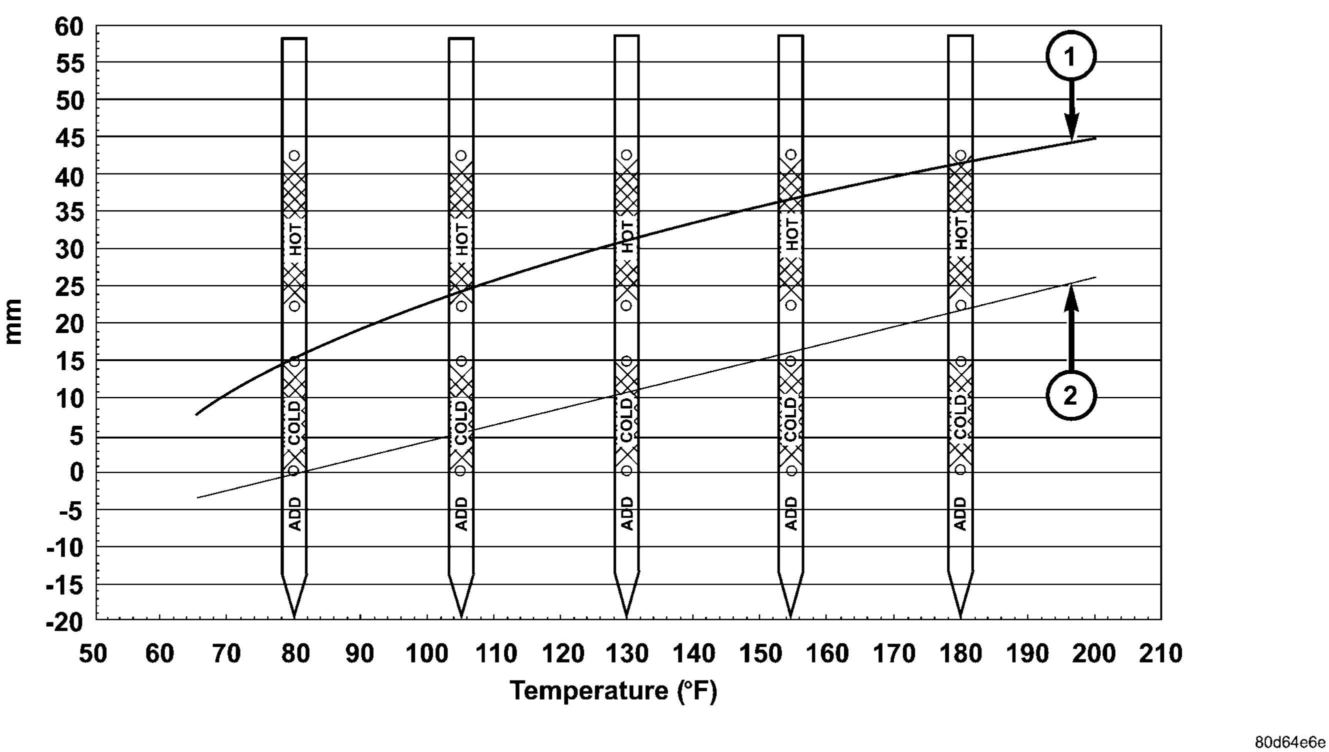


Fig. 177 Transmission Fluid Temperature Chart

1 - MAX. LEVEL

2 - MIN. LEVEL

FLUID (Continued)

STANDARD PROCEDURE - FLUID AND FILTER SERVICE

NOTE: Refer to the maintenance schedules in LUBRICATION and MAINTENANCE, or the vehicle owner's manual, for the recommended maintenance (fluid/filter change) intervals for this transaxle.

NOTE: Only fluids of the type labeled Mopar® ATF+4 (Automatic Transmission Fluid) should be used. A filter change should be made at the time of the transmission oil change. The magnet (on the inside of the oil pan) should also be cleaned with a clean, dry cloth.

NOTE: If the transaxle is disassembled for any reason, the fluid and filter should be changed.

FLUID/FILTER SERVICE (RECOMMENDED)

(1) Raise vehicle on a hoist. Refer to LUBRICATION and MAINTENANCE for proper procedures. 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 (Fig. 178).

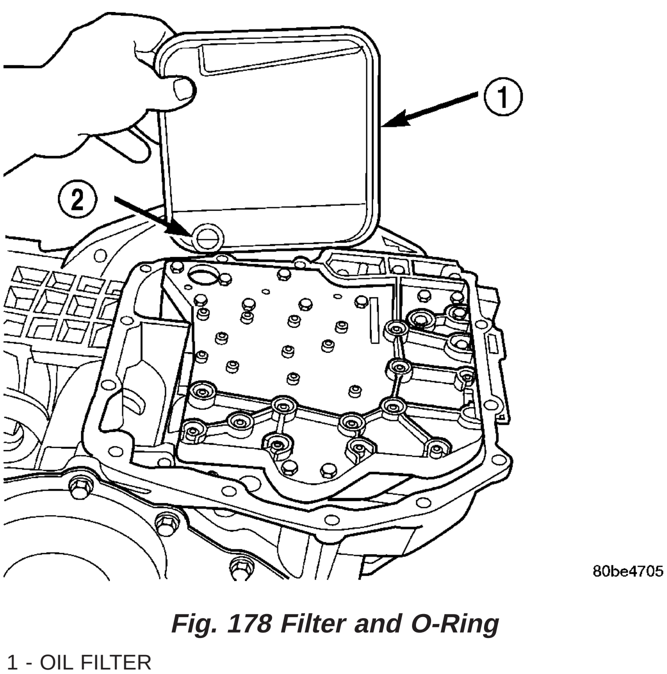


Fig. 178 Filter and O-Ring

1 - OIL FILTER
2 - O-RING

(4) Clean the oil pan and magnet. Reinstall pan using new Mopar Silicone Adhesive sealant. Tighten oil pan bolts to 19 N·m (165 in. lbs.).

(5) Pour four quarts of Mopar® ATF+4 (Automatic Transmission Fluid) through the dipstick opening.

(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.

(7) Check the transaxle fluid level and add an appropriate amount to bring the transaxle fluid level to 3mm (1/8 in.) below the lowest mark on the dipstick (Fig. 179).

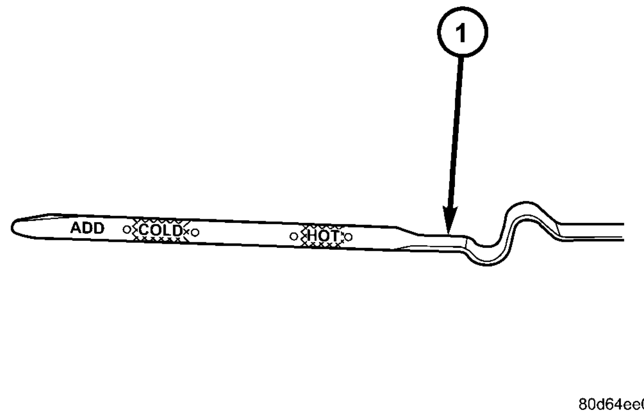


Fig. 179 Fluid Level Indicator

1 - FLUID LEVEL INDICATOR

(8) Recheck the fluid level after the transaxle has reached normal operating temperature (180°F.). Refer to Fluid Level and Condition Check for the proper fluid fill procedure.

(9) To prevent dirt from entering transaxle, make certain that dipstick is fully seated into the dipstick opening.

DIPSTICK TUBE FLUID SUCTION METHOD (ALTERNATIVE)

(1) When performing the fluid suction method, make sure the transaxle is at full operating temperature.

(2) To perform the dipstick tube fluid suction method, use a suitable fluid suction device (Vacula™ or equivalent).

(3) Insert the fluid suction line into the dipstick tube.

NOTE: Verify that the suction line is inserted to the lowest point of the transaxle oil pan. This will ensure complete evacuation of the fluid in the pan.

(4) Follow the manufacturers recommended procedure and evacuate the fluid from the transaxle.

(5) Remove the suction line from the dipstick tube.

FLUID (Continued)

(6) Pour four quarts of Mopar® ATF+4 (Automatic Transmission Fluid) through the dipstick opening.

(7) 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.

(8) Check the transaxle fluid level and add an appropriate amount to bring the transaxle fluid level to 3mm (1/8 in.) below the lowest mark on the dipstick (Fig. 179).

(9) Recheck the fluid level after the transaxle has reached normal operating temperature (180°F.). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/FLUID - STANDARD PROCEDURE)

(10) To prevent dirt from entering transaxle, make certain that dipstick is fully seated into the dipstick opening.

GEARSHIFT CABLE

REMOVAL

(1) Loosen set screw and remove knob from shifter handle (Fig. 180).

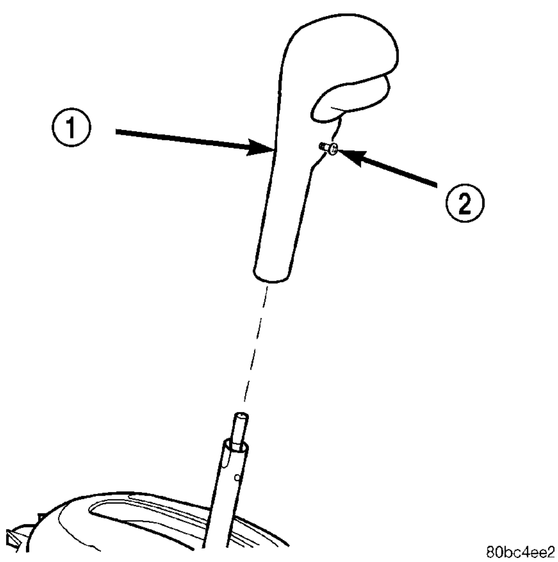


Fig. 180 Gearshift Knob Removal/Installation

1 - SHIFTER KNOB
2 - SET SCREW

(2) Remove the center console assembly as shown in (Fig. 181).

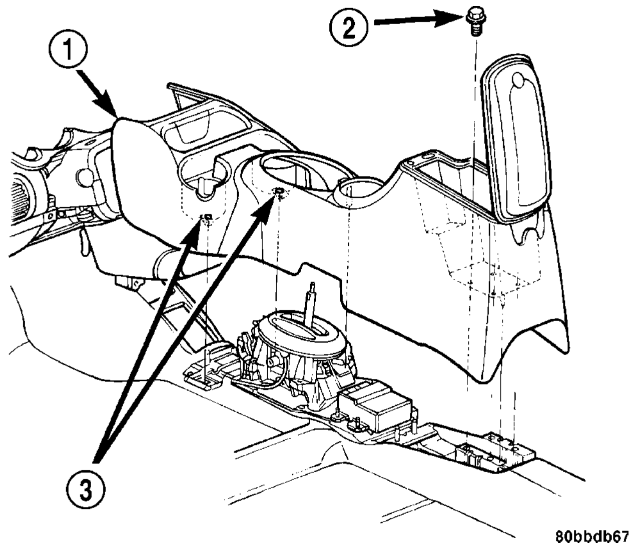


Fig. 181 Center Console Removal/Installation

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

(3) Remove shifter bezel (Fig. 182).

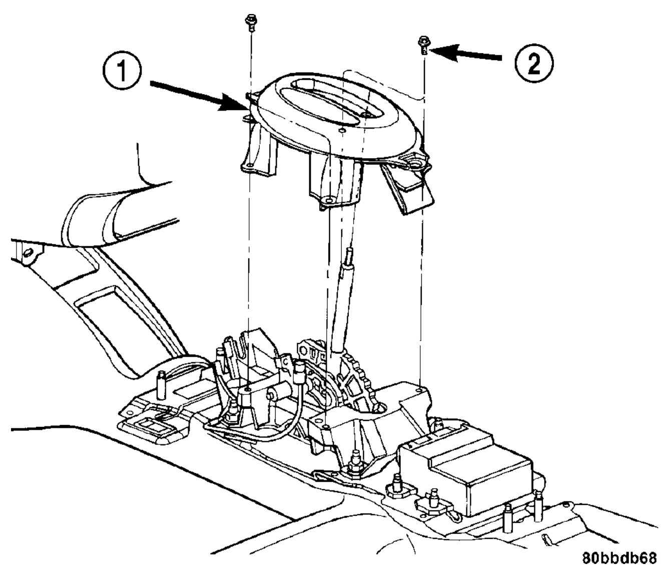


Fig. 182 Shifter Bezel Removal/Installation

1 - BEZEL
2 - SCREW (4)

GEARSHIFT CABLE (Continued)

(4) Disconnect shift cable from shifter assembly as shown in (Fig. 183).

(5) Remove three grommet plate to floor pan nuts as shown in (Fig. 183).

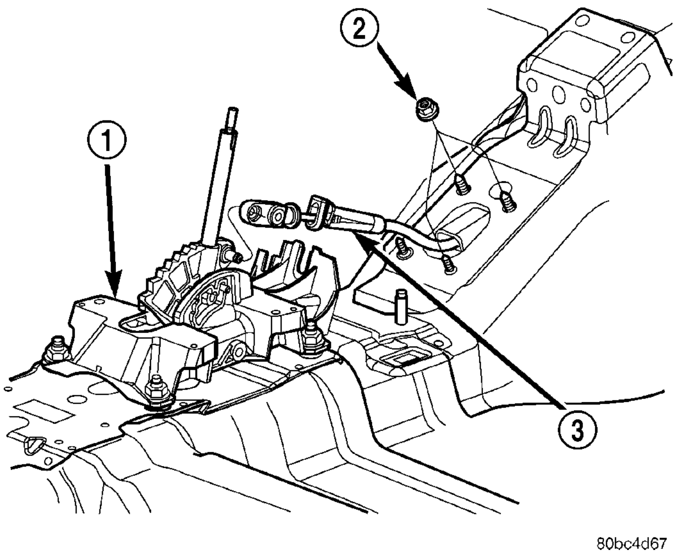


Fig. 183 Gearshift Cable at Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GROMMET PLATE NUT
3 - SHIFT CABLE

(6) Disconnect both battery cables, remove battery hold down clamp and bolt, and remove battery.

(7) Remove air cleaner/throttle body assy. (Fig. 184) as follows:

(a) Disconnect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(b) Disconnect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(c) Remove mounting bolt and nut (Fig. 184) and partially remove air cleaner assembly.

(d) Disconnect accelerator and speed control (if equipped) cables after the assy. is removed from position. Remove air cleaner assembly from vehicle.

(8) Remove battery tray from bracket.

(9) Disconnect shifter cable from shift lever and remove from bracket (Fig. 185).

(10) Raise vehicle on hoist.

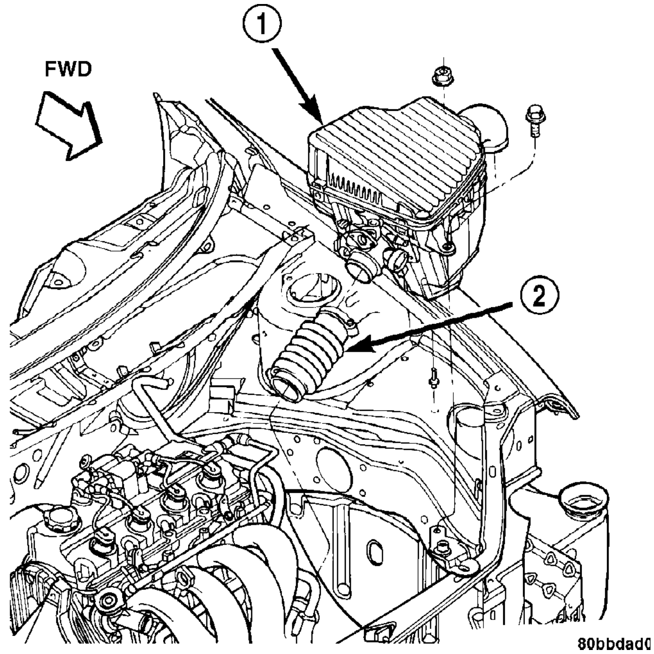


Fig. 184 Air Cleaner Assembly Removal/Installation

1 - AIR CLEANER ASSY.
2 - THROTTLE BODY DUCT

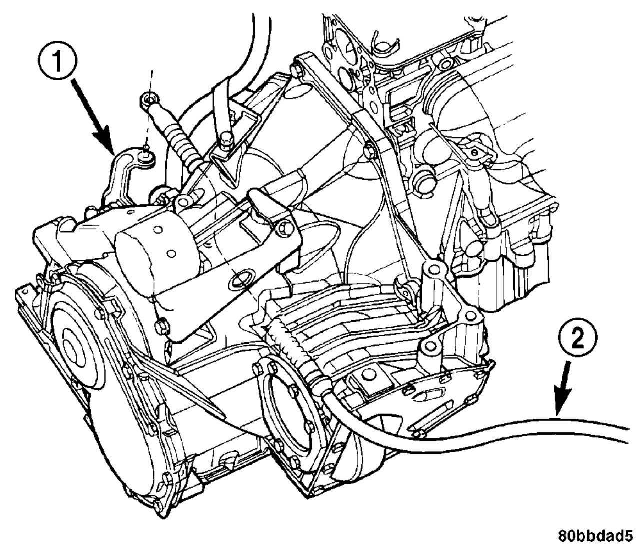


Fig. 185 Gear Shift Cable at Transaxle

1 - SHIFT LEVER
2 - SHIFT CABLE

GEARSHIFT CABLE (Continued)

(11) Remove catalytic converter heat shield (Fig. 186).

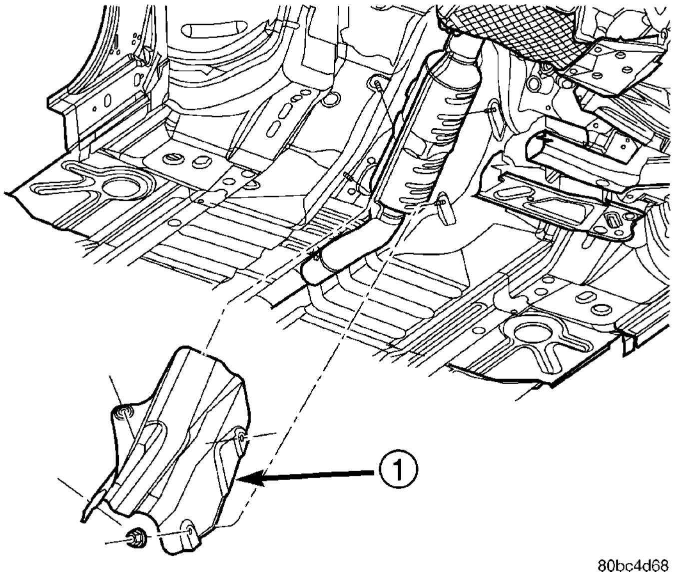


Fig. 186 Catalytic Converter Heat Shield

1 - CONVERTER HEAT SHIELD

(12) Remove intermediate pipe heat shield front bolts.

(13) Remove remaining grommet plate screw and remove cable assembly from vehicle (Fig. 187).

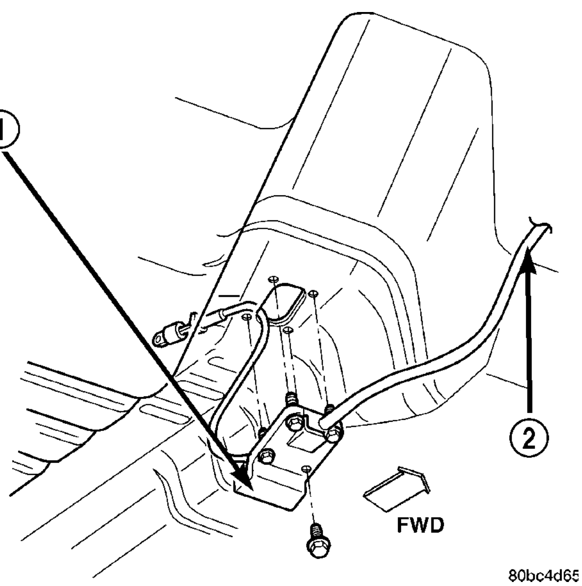


Fig. 187 Grommet Plate/Shift Cable at Floor Pan

1 - GROMMET PLATE
2 - SHIFT CABLE

INSTALLATION

(1) Install cable assembly through floor pan opening and secure to floor pan with grommet plate and one screw (Fig. 187). Make sure the three grommet plate studs protrude through cable assembly and floor pan and tighten screw to 7 N·m (60 in. lbs.).

(2) Route transaxle end of cable assembly into engine compartment and over transaxle assembly.

(3) Install and tighten intermediate pipe heat shield front screws.

(4) Install catalytic converter heat shield (Fig. 186).

(5) Install gear shift cable to bracket and connect to shift lever (Fig. 185).

(6) Install and tighten the three grommet plate-to-floor pan nuts. Tighten to 6 N·m (50 in. lbs.) torque.

(7) Connect gearshift cable to shifter assembly as shown in (Fig. 183).

(8) Install shifter bezel (Fig. 182).

(9) **Adjust gearshift cable as follows:**

(a) Place gearshift lever in the PARK (P) position.

(b) Loosen shift cable adjustment screw (Fig. 188).

(c) Verify transaxle is in the PARK (P) position and the shifter lever is in gated PARK..

(d) Tighten shift cable adjustment screw to 8 N·m (70 in. lbs.) torque.

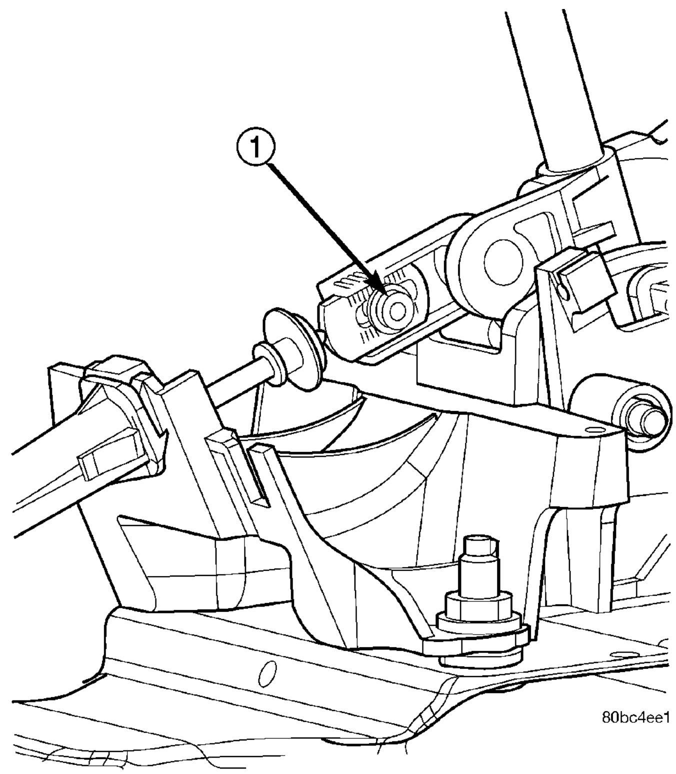


Fig. 188 Gearshift Cable Adjustment Screw

1 - GEARSHIFT CABLE ADJUSTMENT SCREW

(10) Install battery tray.

(11) Install battery and hold down clamp.

(12) Install the air cleaner/throttle body assy. (Fig. 184) as follows:

GEARSHIFT CABLE (Continued)

(a) Connect the accelerator and speed control (if equipped) cables to the air cleaner/throttle body assy.

(b) Install assy into position, making sure the air cleaner locating slot is engaged to the battery bracket tab, and tighten fasteners to 14 N·m (120 in. lbs.) torque.

(c) Verify throttle body duct is fully seated to intake manifold and tighten clamp to 5 N·m (40 in. lbs.) torque.

(d) Connect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) connectors.

(e) Connect proportional purge solenoid (PPS) and crankcase vent hose from throttle body.

(13) Install center console assembly (Fig. 181).

(14) Install gearshift knob and tighten set screw to 2 N·m (15 in. lbs.) torque (Fig. 180).

(15) Connect battery cables.

(16) Verify that engine starter operates in both PARK (P) and NEUTRAL (N). Starter should not operate in any other gear position.

ADJUSTMENTS

GEARSHIFT CABLE

Normal operation of the Park/Neutral Position Switch provides a quick check to confirm proper linkage adjustment. The engine starter should only operate when the transaxle shift lever is in the PARK (P) or NEUTRAL (N) positions.

If the engine starts in any other gear position, or the vehicle rolls when the shifter is in gated PARK (P), a gearshift cable adjustment is necessary.

ADJUSTMENT

(1) Loosen set screw and remove knob from shifter handle (Fig. 189).

(2) Remove the center console assembly as shown in (Fig. 190).

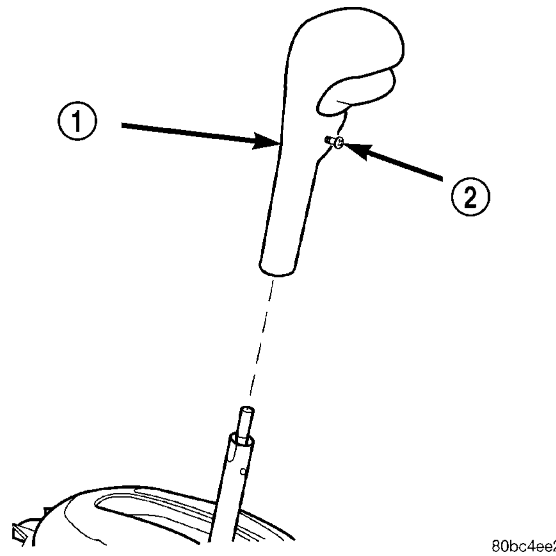


Fig. 189 Gearshift Knob Removal/Installation

1 - SHIFTER KNOB
2 - SET SCREW

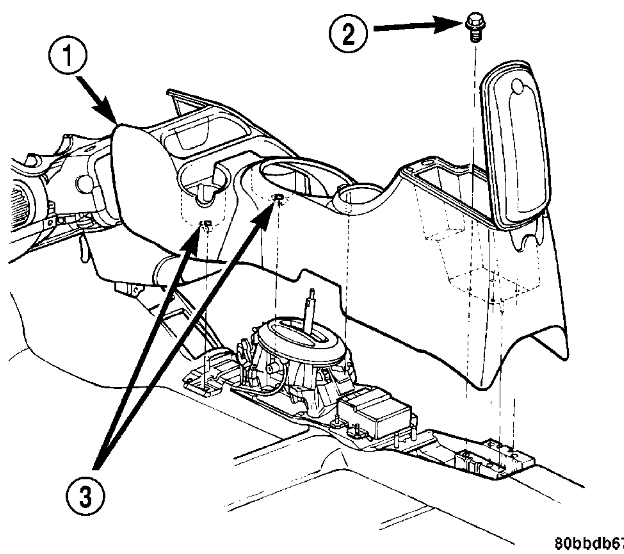


Fig. 190 Center Console Removal/Installation

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

GEARSHIFT CABLE (Continued)

(3) **Adjust gearshift cable as follows:**

(a) Place gearshift lever in the PARK (P) position.

(b) Loosen shift cable adjustment screw (Fig. 191).

(c) Move transaxle manual lever to the PARK. Verify transaxle is in PARK by attempting to roll vehicle in either direction.

(d) Tighten shift cable adjustment screw to 8 N·m (70 in. lbs.) torque.

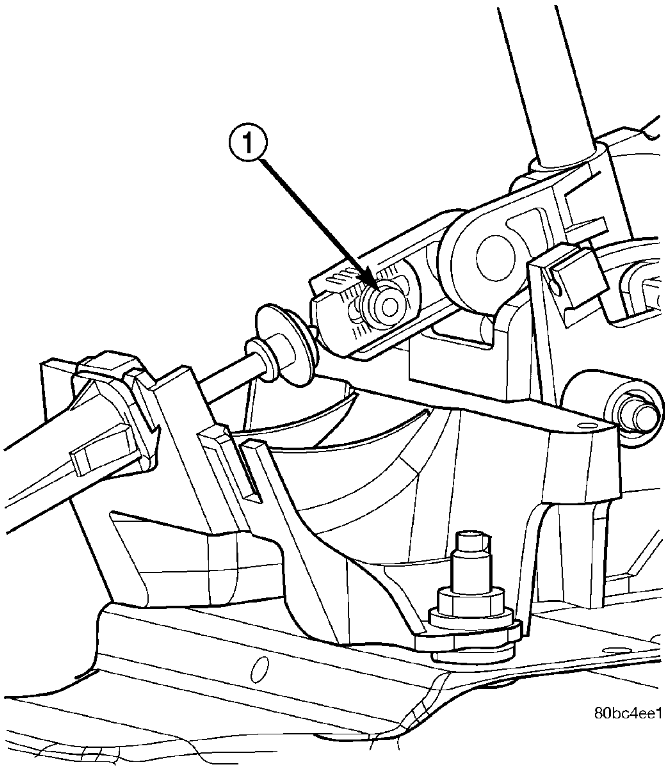


Fig. 191 Gearshift Cable Adjustment Screw

1 - GEARSHIFT CABLE ADJUSTMENT SCREW

(4) Verify proper cable adjustment. Engine should start with the shifter lever in PARK (P) and NEUTRAL (N) positions ONLY.

(5) Install center console assembly (Fig. 190).

(6) Install gearshift knob and tighten set screw to 2 N·m (15 in. lbs.) torque (Fig. 189).

HOLDING CLUTCHES

DESCRIPTION

Two hydraulically applied multi-disc clutches are used to hold planetary geartrain components stationary while the input clutches drive others. The 2/4 and Low/Reverse clutches are considered holding clutches and are contained at the rear of the transaxle case. (Fig. 192).

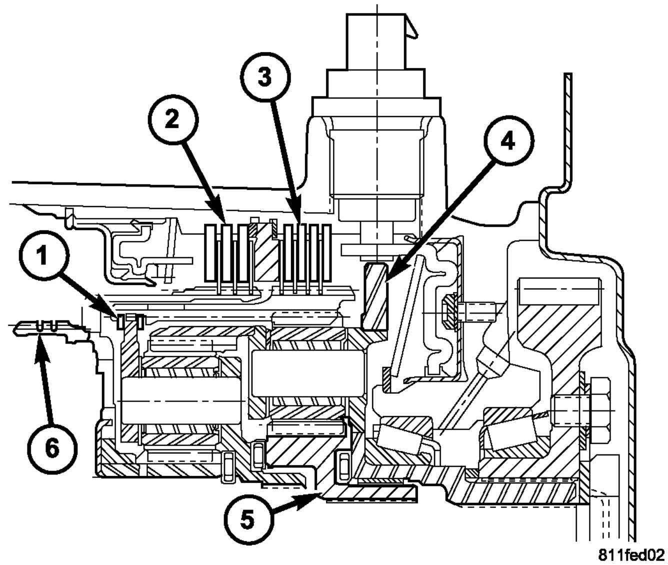


Fig. 192 2/4 and Low/Reverse Clutches

1 - FRONT PLANET CARRIER/REAR ANNULUS
2 - 2/4 CLUTCH
3 - LOW/REVERSE CLUTCH
4 - REAR PLANET CARRIER/FRONT ANNULUS
5 - REAR SUN GEAR
6 - FRONT SUN GEAR ASSEMBLY

OPERATION

NOTE: Refer to the "Elements In Use" chart in Diagnosis and Testing for a collective view of which clutch elements are applied at each position of the selector lever.

2/4 CLUTCH

The 2/4 clutch is hydraulically applied in second and fourth gears by pressurized fluid against the 2/4 clutch piston. When the 2/4 clutch is applied, the front sun gear assembly is held or grounded to the transaxle case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gears by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the front planet carrier/rear annulus assembly is held or grounded to the transaxle case.

INPUT CLUTCH ASSEMBLY

DISASSEMBLY

(1) Mount input clutch assembly to Input Clutch Pressure Fixture (Tool 8391).

(2) Tap down reverse clutch reaction plate to release pressure from snap ring (Fig. 193).

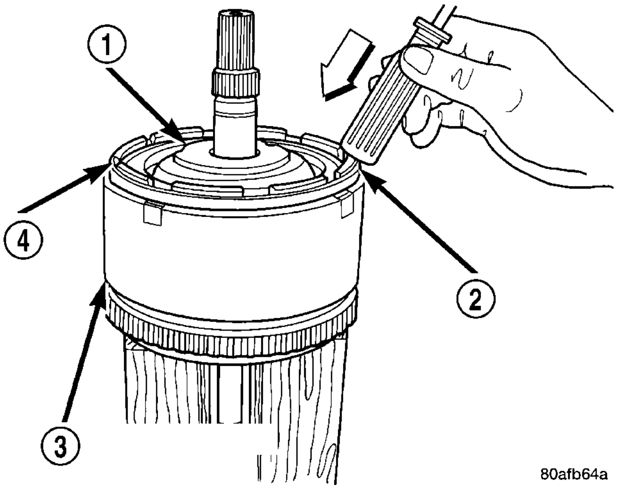


Fig. 193 Tapping Reaction Plate

1 - #4 THRUST PLATE (SELECT)
2 - TAP DOWN REVERSE CLUTCH REACTION PLATE TO REMOVE OR INSTALL SNAP RING
3 - INPUT SHAFT CLUTCHES RETAINER ASSEMBLY
4 - REVERSE CLUTCH REACTION PLATE

(3) Remove reverse clutch snap ring (Fig. 194).

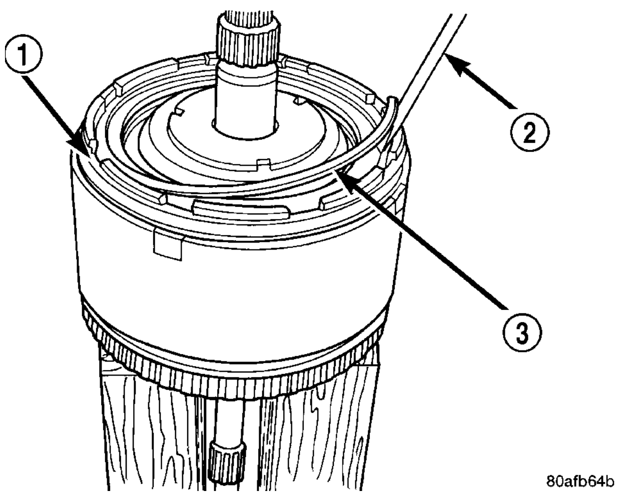


Fig. 194 Reverse Clutch Snap Ring

1 - REACTION PLATE
2 - SCREWDRIVER
3 - REVERSE CLUTCH SNAP RING (SELECT)

(4) Pry up and remove reverse clutch reaction plate (Fig. 195).

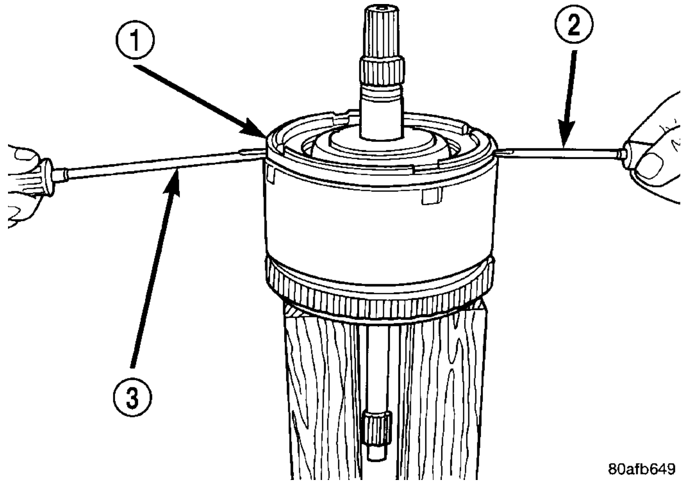


Fig. 195 Pry Reverse Clutch Reaction Plate

1 - REVERSE CLUTCH REACTION PLATE
2 - SCREWDRIVER
3 - SCREWDRIVER

INPUT CLUTCH ASSEMBLY (Continued)

(5) Remove reverse clutch pack (Fig. 196). **Tag components for assembly identification.**

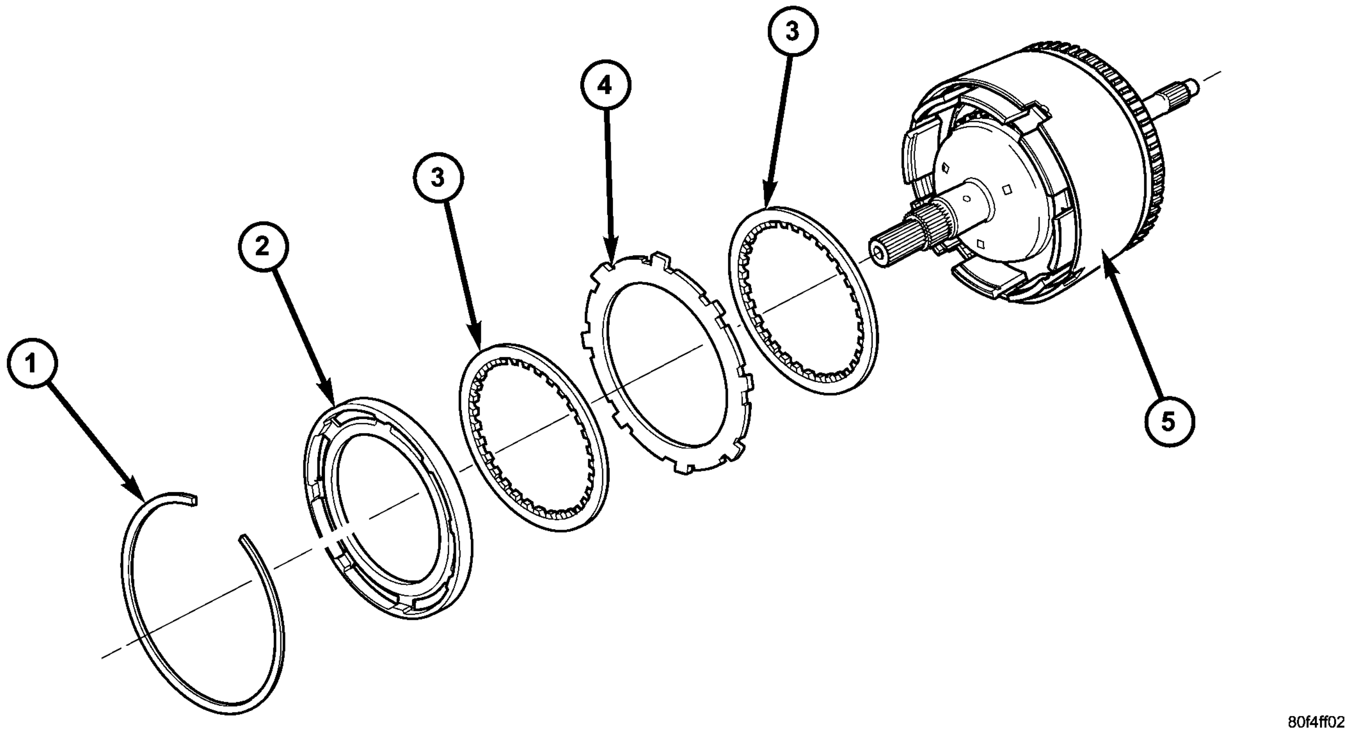


Fig. 196 Reverse Clutch Assembly

1 - SNAP RING
2 - REACTION PLATE
3 - CLUTCH DISC (2)
4 - CLUTCH PLATE (1)
5 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(6) Remove the OD/Reverse pressure plate snap ring (Fig. 197).

(7) Remove OD/Reverse pressure plate (Fig. 197).

(8) Remove OD/Reverse pressure plate wave snap ring (Fig. 197).

(9) Remove OD clutch pack (Fig. 197). **Tag components for assembly identification.**

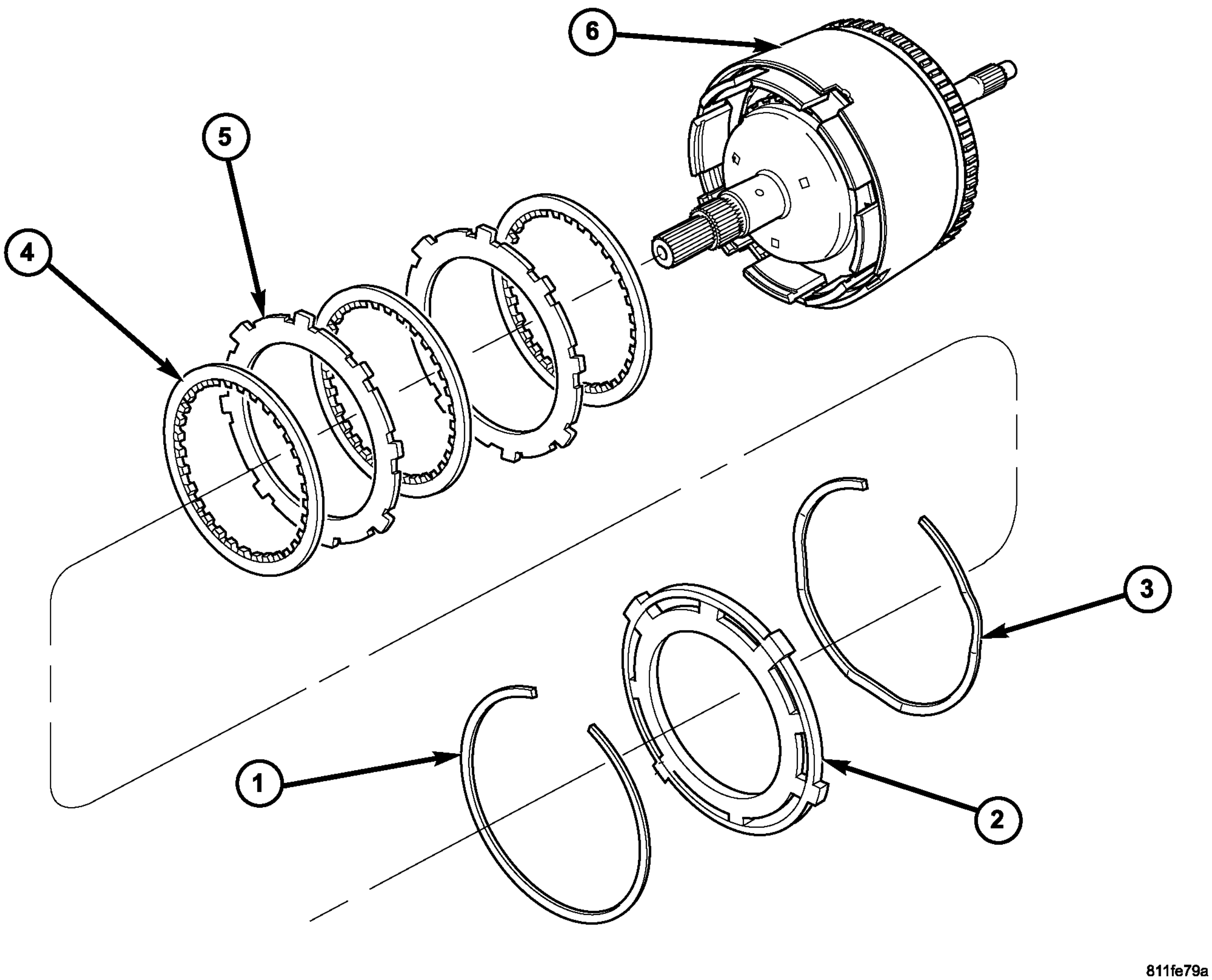


Fig. 197 Overdrive Clutch Assembly

1 - SNAP RING
2 - OD/REVERSE PRESSURE PLATE
3 - SNAP RING (WAVE)
4 - CLUTCH DISC (3)
5 - CLUTCH STEEL (2)
6 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(10) Remove and inspect OD and UD Shafts, as well as #3 thrust washer and plate, and #2 needle bearing (Fig. 198).

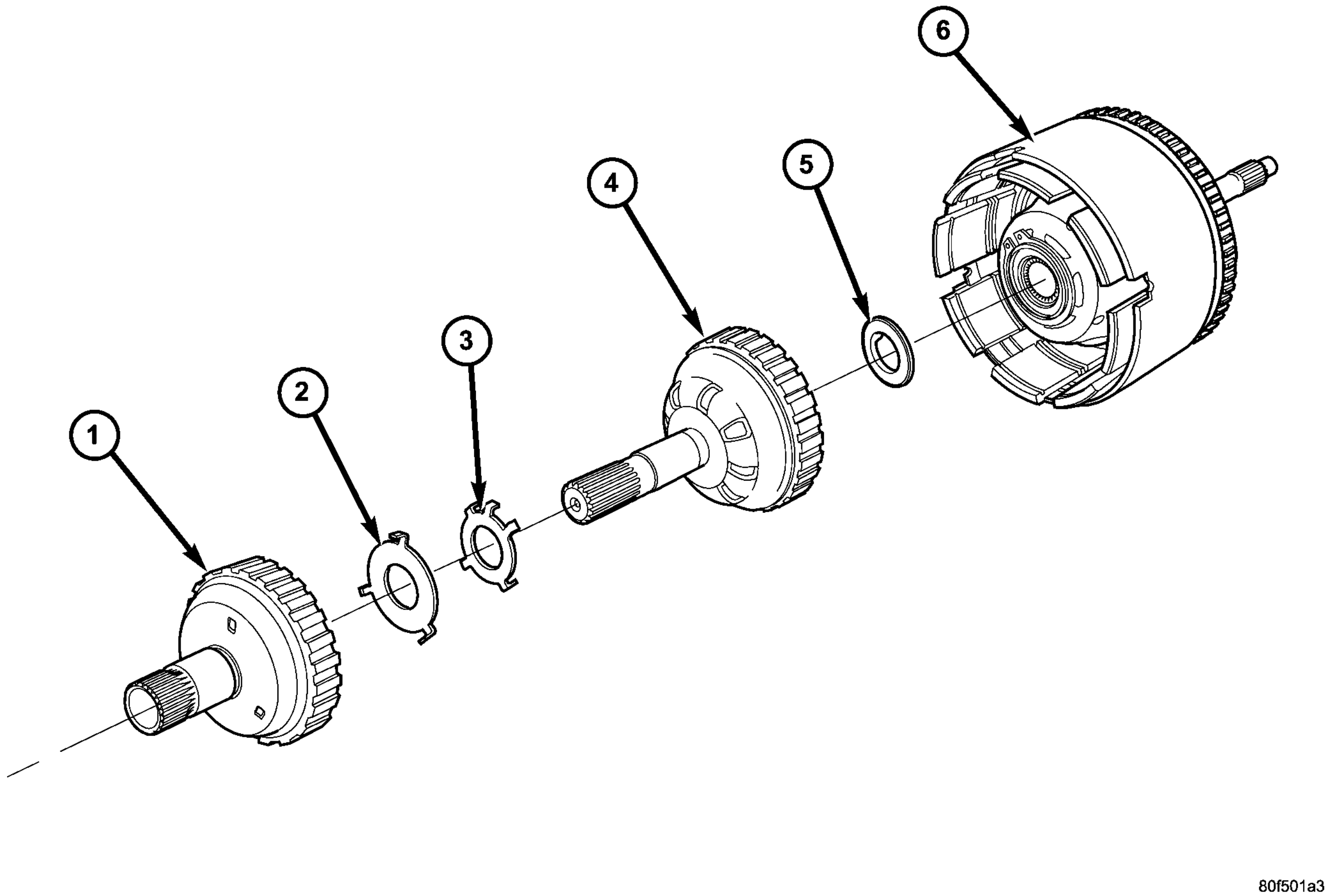


Fig. 198 Overdrive/Underdrive Shafts

1 - OVERDRIVE SHAFT
2 - #3 THRUST PLATE (3 TABS)
3 - #3 THRUST WASHER (5 TABS)
4 - UNDERDRIVE SHAFT
5 - #2 NEEDLE BEARING (3 TABS)
6 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(11) Remove the OD/UD reaction plate tapered snap ring, reaction plate, and first friction disc (Fig. 199).

(12) Remove the UD clutch flat snap ring and rest of UD clutch pack (Fig. 199). **Tag clutch pack for assembly identification.**

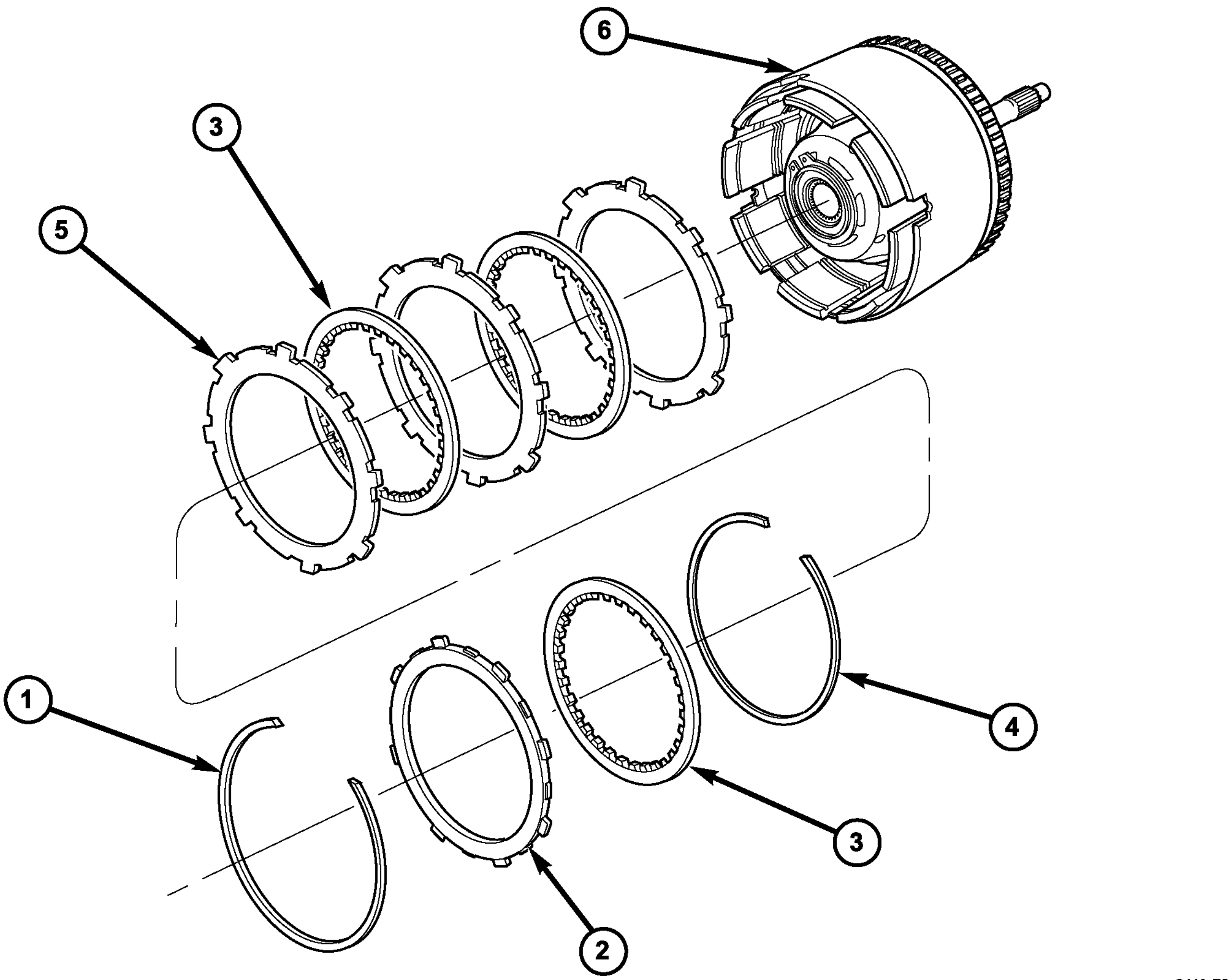


Fig. 199 Underdrive Clutch Assembly

1 - SNAP RING (TAPERED)
2 - OD/UD REACTION PLATE
3 - CLUTCH DISC (3)
4 - SNAP RING (FLAT)
5 - CLUTCH PLATE (3)
6 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

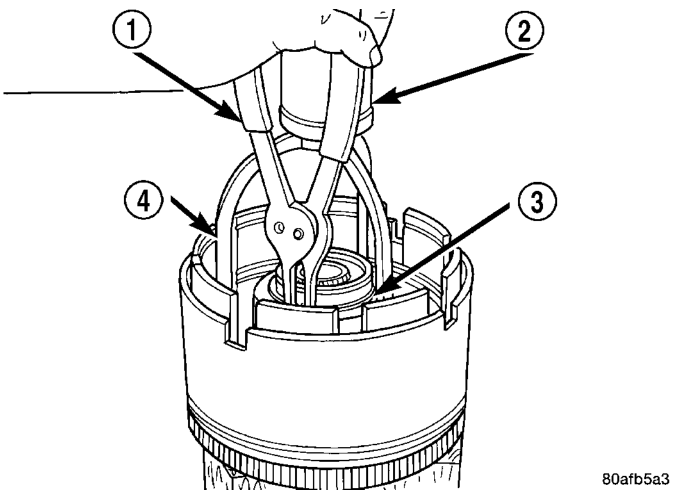


Fig. 200 UD Spring Retainer Snap Ring

1 - SNAP RING PLIERS
2 - ARBOR PRESS RAM
3 - SNAP RING
4 - SPECIAL TOOL 5059A

CAUTION: Compress return spring just enough to remove or install snap ring.

(13) Using Tool 5059A and an arbor press, compress UD clutch piston/spring enough to remove snap ring (Fig. 200) (Fig. 201).

(14) Remove spring retainer, spring, and piston (Fig. 201).

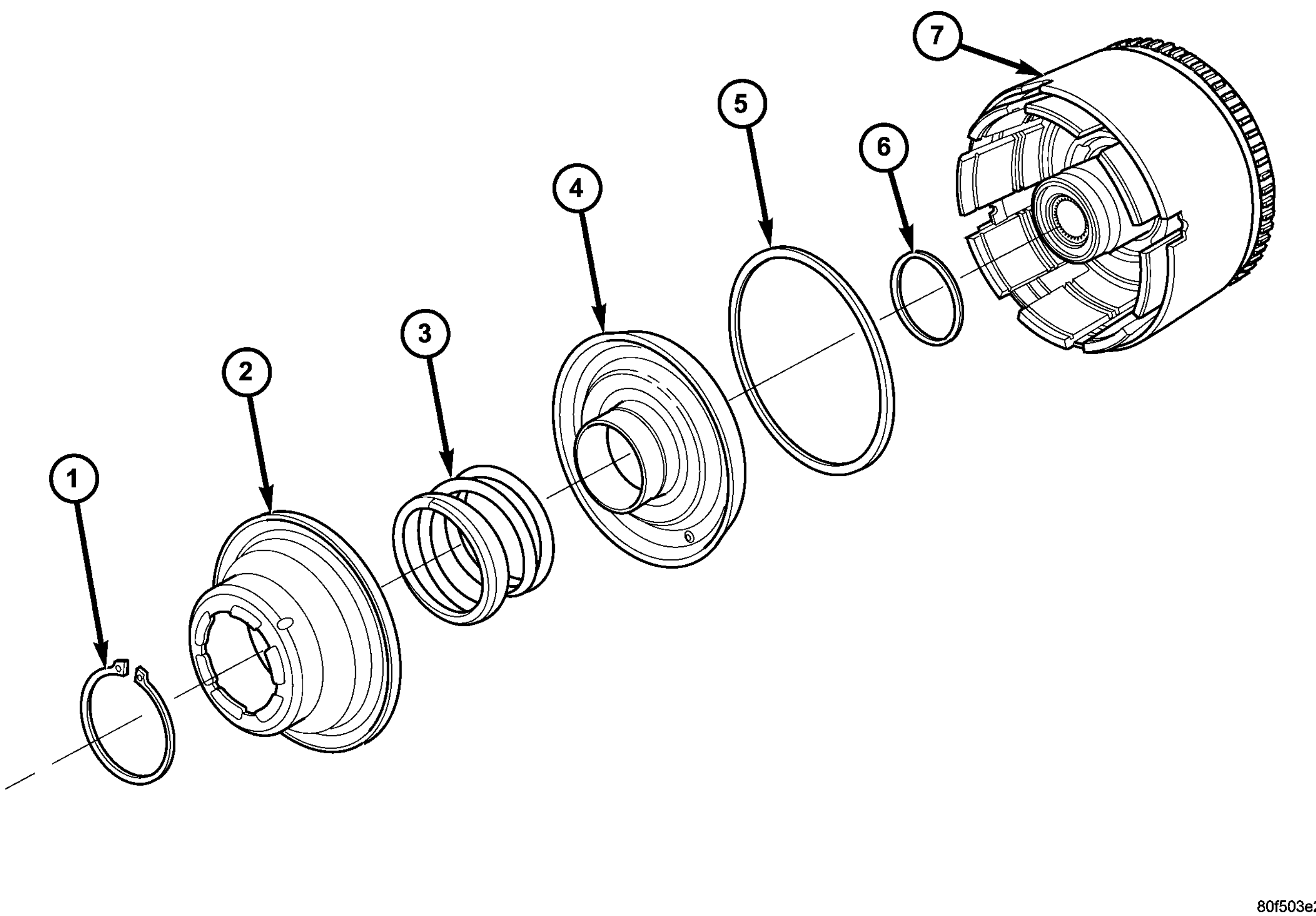


Fig. 201 Underdrive Clutch Piston, Spring and Retainer

1 - SNAP RING
2 - SPRING RETAINER
3 - SPRING
4 - UD CLUTCH PISTON
5 - SEAL, OUTER
6 - SEAL, INNER
7 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(15) Remove input hub tapered snap ring (Fig. 202) (Fig. 208).

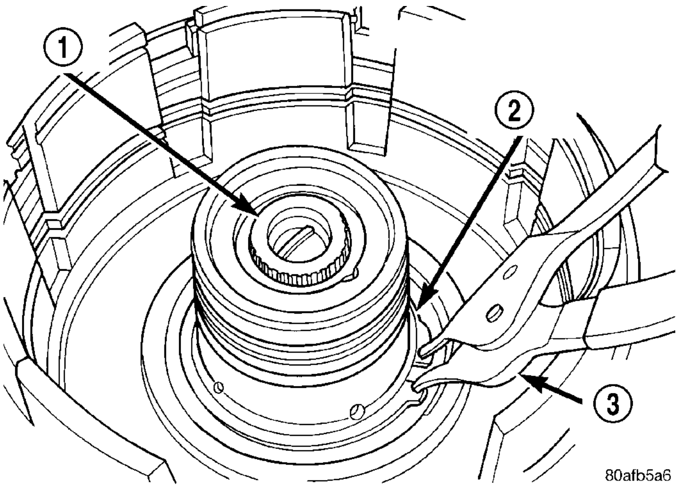


Fig. 202 Input Hub Tapered Snap Ring

1 - INPUT SHAFT
2 - INPUT HUB SNAP RING (TAPERED SIDE UP WITH TABS IN CAVITY)
3 - SNAP RING PLIERS

(16) Tap on input hub with soft faced hammer and separate input hub from OD/Reverse piston and clutch retainer (Fig. 203).

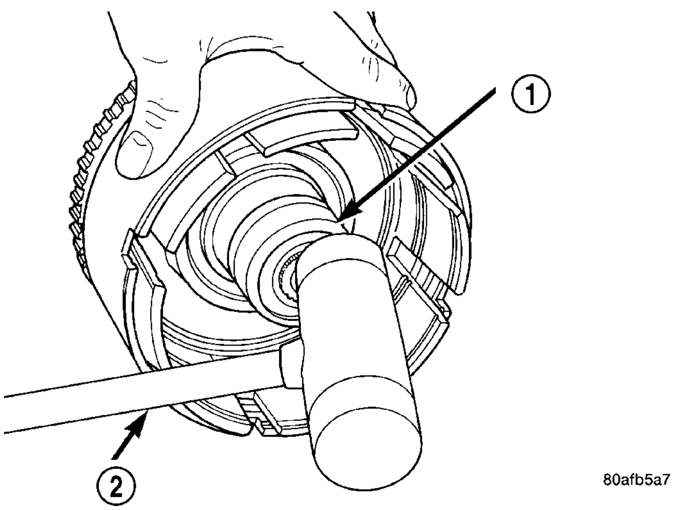


Fig. 203 Tap on Input Hub

1 - INPUT SHAFT AND HUB ASSEMBLY
2 - PLASTIC HAMMER

(17) Separate clutch retainer from OD/Reverse piston (Fig. 204).

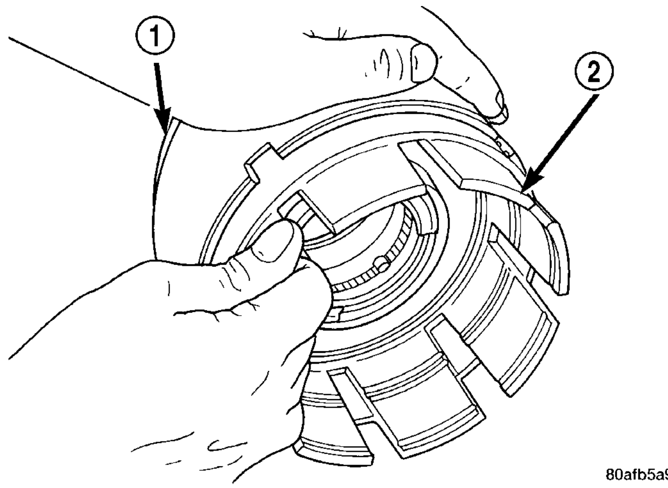


Fig. 204 Pull Retainer from Piston

1 - OVERDRIVE/REVERSE PISTON
2 - INPUT CLUTCHES RETAINER

INPUT CLUTCH ASSEMBLY (Continued)

(18) Using Tool 6057 and an arbor press, compress return OD/Reverse piston return spring just enough to remove snap ring (Fig. 205).

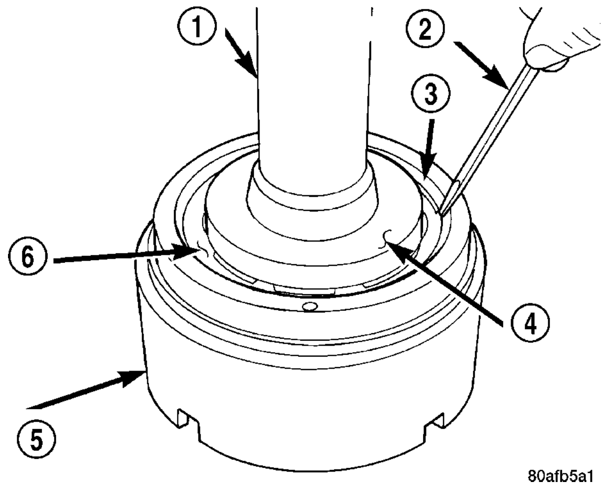


Fig. 205 Install Snap Ring

1 - ARBOR PRESS RAM (COMPRESS RETURN SPRING JUST ENOUGH TO REMOVE OR INSTALL SNAP RING)
2 - SCREWDRIVER
3 - SNAP RING
4 - SPECIAL TOOL 6057
5 - OD/REVERSE PISTON
6 - RETURN SPRING

(19) Remove input shaft to input clutch hub snap ring (Fig. 206) (Fig. 208).

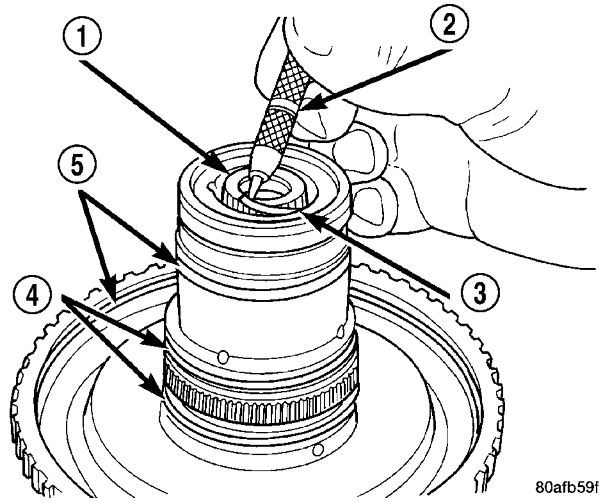


Fig. 206 Remove Input Shaft Snap Ring

1 - INPUT SHAFT
2 - SHARP-POINTED TOOL
3 - SNAP RING
4 - O-RINGS
5 - SEALS

(20) Using a suitably sized socket and an arbor press, remove input shaft from input shaft hub (Fig. 207).

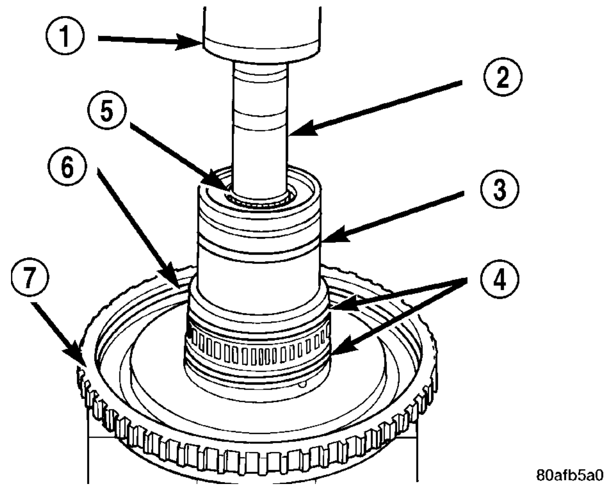


Fig. 207 Remove Input Shaft

1 - ARBOR PRESS RAM
2 - SOCKET
3 - SEAL
4 - O-RINGS
5 - INPUT SHAFT
6 - SEAL
7 - INPUT SHAFT HUB ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

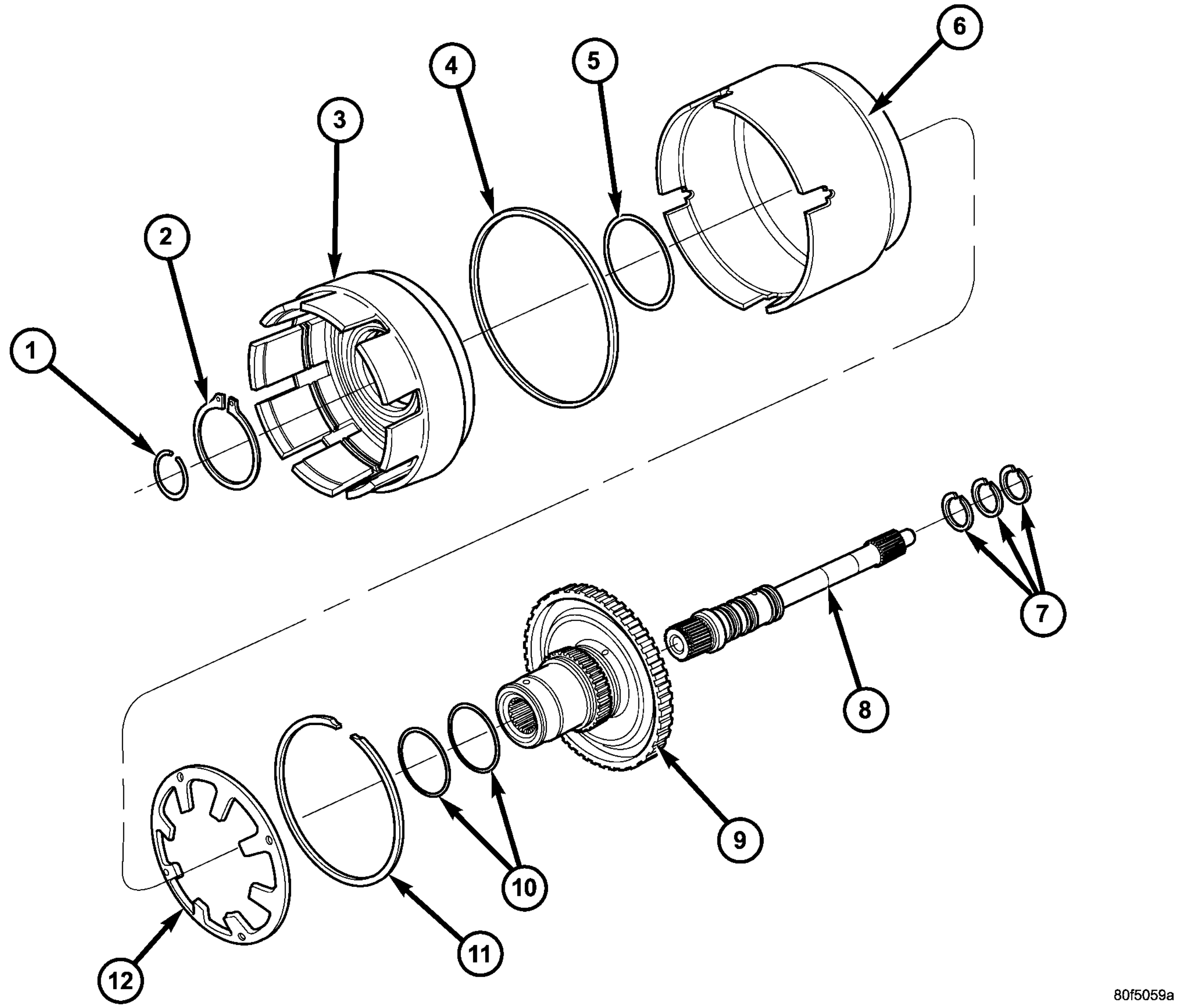


Fig. 208 Input Clutch Hub, Retainer, and OD/Reverse Piston

1 - SNAP RING (INPUT SHAFT)
2 - SNAP RING
3 - CLUTCH RETAINER
4 - SEAL, OUTER
5 - SEAL, INNER
6 - OD/REVERSE PISTON
7 - SEAL, INPUT SHAFT
8 - SHAFT, INPUT
9 - HUB
10 - SEAL
11 - SNAP RING
12 - BELLEVILLE SPRING

ASSEMBLY

Use petrolatum on all seals to ease assembly of components.

(1) Using an arbor press, install input shaft to input shaft hub (Fig. 209).

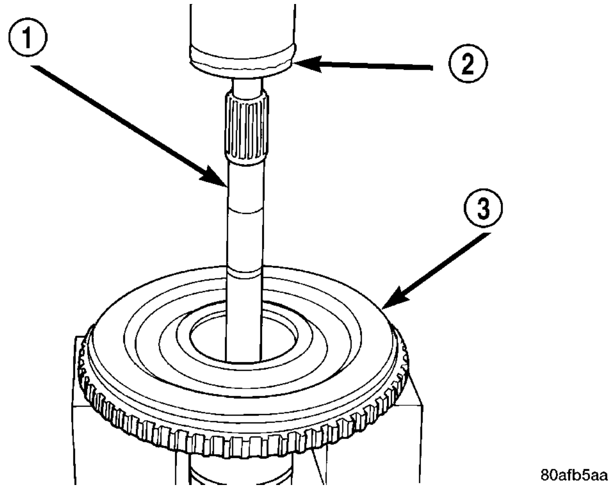


Fig. 209 Install Input Shaft

1 - INPUT SHAFT
2 - ARBOR PRESS RAM
3 - INPUT SHAFT HUB ASSEMBLY

(2) Install input shaft snap ring (Fig. 210).

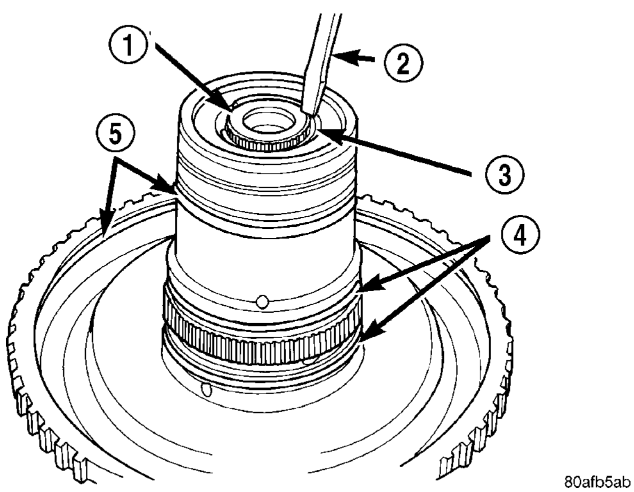


Fig. 210 Install Input Shaft Snap Ring

1 - INPUT SHAFT
2 - SCREWDRIVER (DO NOT SCRATCH BEARING SURFACE)
3 - SNAP RING
4 - O-RINGS
5 - SEALS

(3) Using an arbor press and Tool 6057, Install OD/Reverse piston return spring and snap ring (Fig. 211) (Fig. 212).

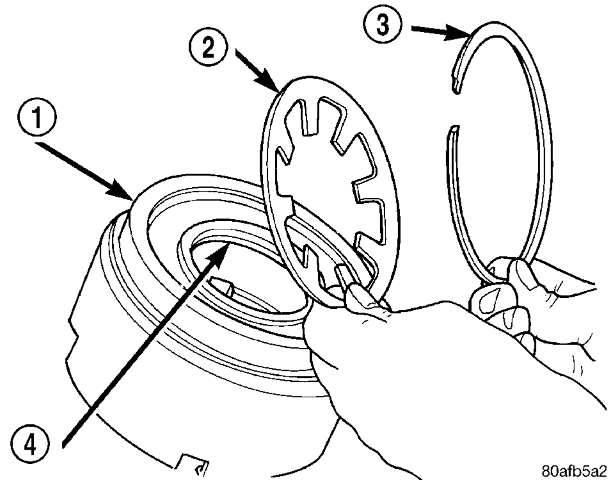


Fig. 211 Return Spring and Snap Ring

1 - OD/REVERSE PISTON
2 - RETURN SPRING
3 - SNAP RING
4 - O-RING

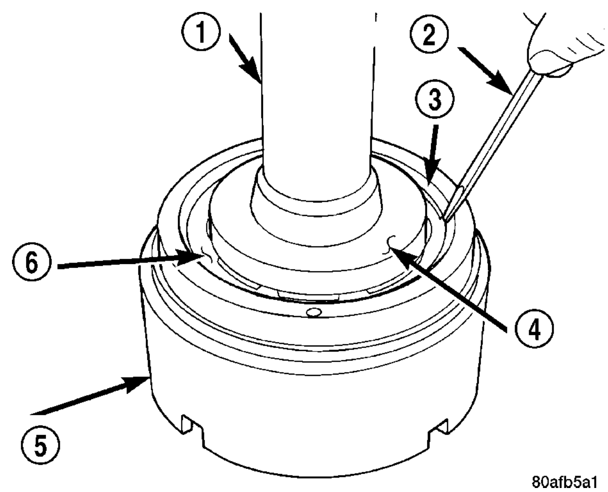


Fig. 212 Install Snap Ring

1 - ARBOR PRESS RAM (COMPRESS RETURN SPRING JUST ENOUGH TO REMOVE OR INSTALL SNAP RING)
2 - SCREWDRIVER
3 - SNAP RING
4 - SPECIAL TOOL 6057
5 - OD/REVERSE PISTON
6 - RETURN SPRING

INPUT CLUTCH ASSEMBLY (Continued)

(4) Install the OD/Reverse piston assembly to the input clutch retainer as shown in (Fig. 213).

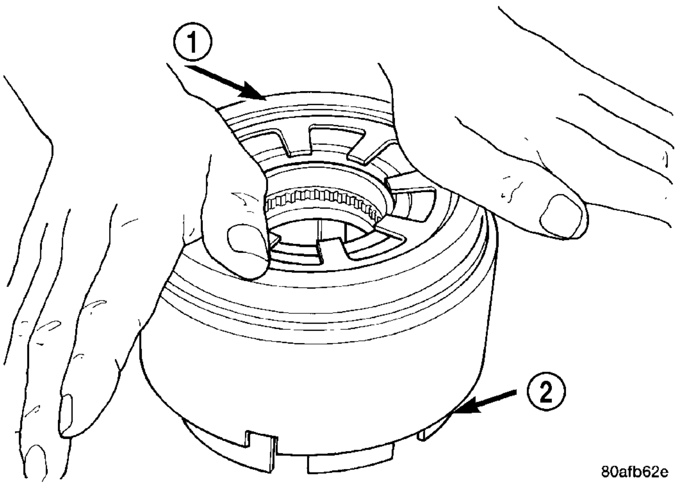


Fig. 213 Install OD/Reverse Piston

1 - PUSH DOWN TO INSTALL OVERDRIVE/REVERSE PISTON
2 - INPUT CLUTCHES RETAINER

(5) Install the input hub/shaft assy. to the OD/Reverse piston/clutch retainer assy. (Fig. 214).

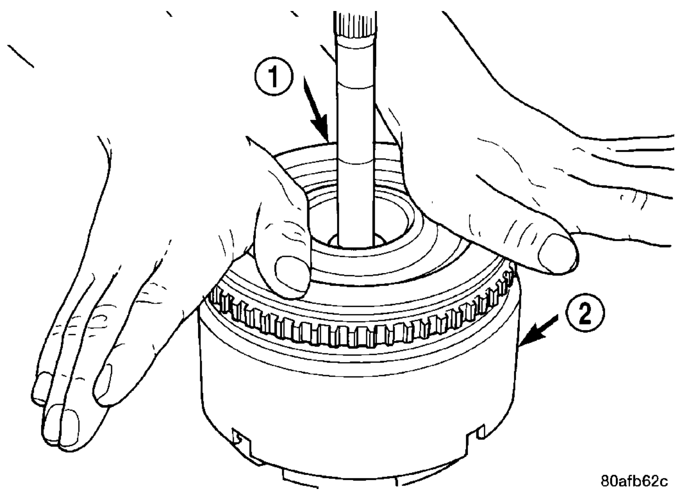


Fig. 214 Install Input Shaft Hub Assembly

1 - PUSH DOWN TO INSTALL INPUT SHAFT HUB ASSEMBLY (ROTATE TO ALIGN SPLINES)
2 - OD/REV. PISTON

(6) Install input hub tapered snap ring (Fig. 215) (Fig. 216).

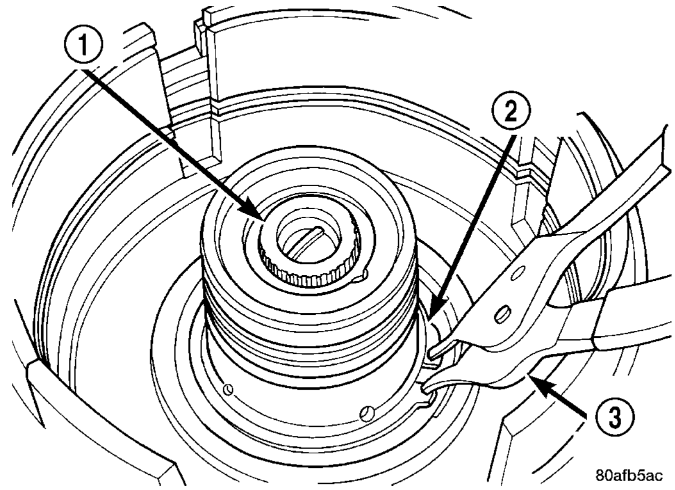


Fig. 215 Install Input Hub Tapered Snap Ring

1 - INPUT SHAFT
2 - INPUT HUB SNAP RING (TAPERED SIDE UP WITH TABS IN CAVITY)
3 - SNAP RING PLIERS

INPUT CLUTCH ASSEMBLY (Continued)

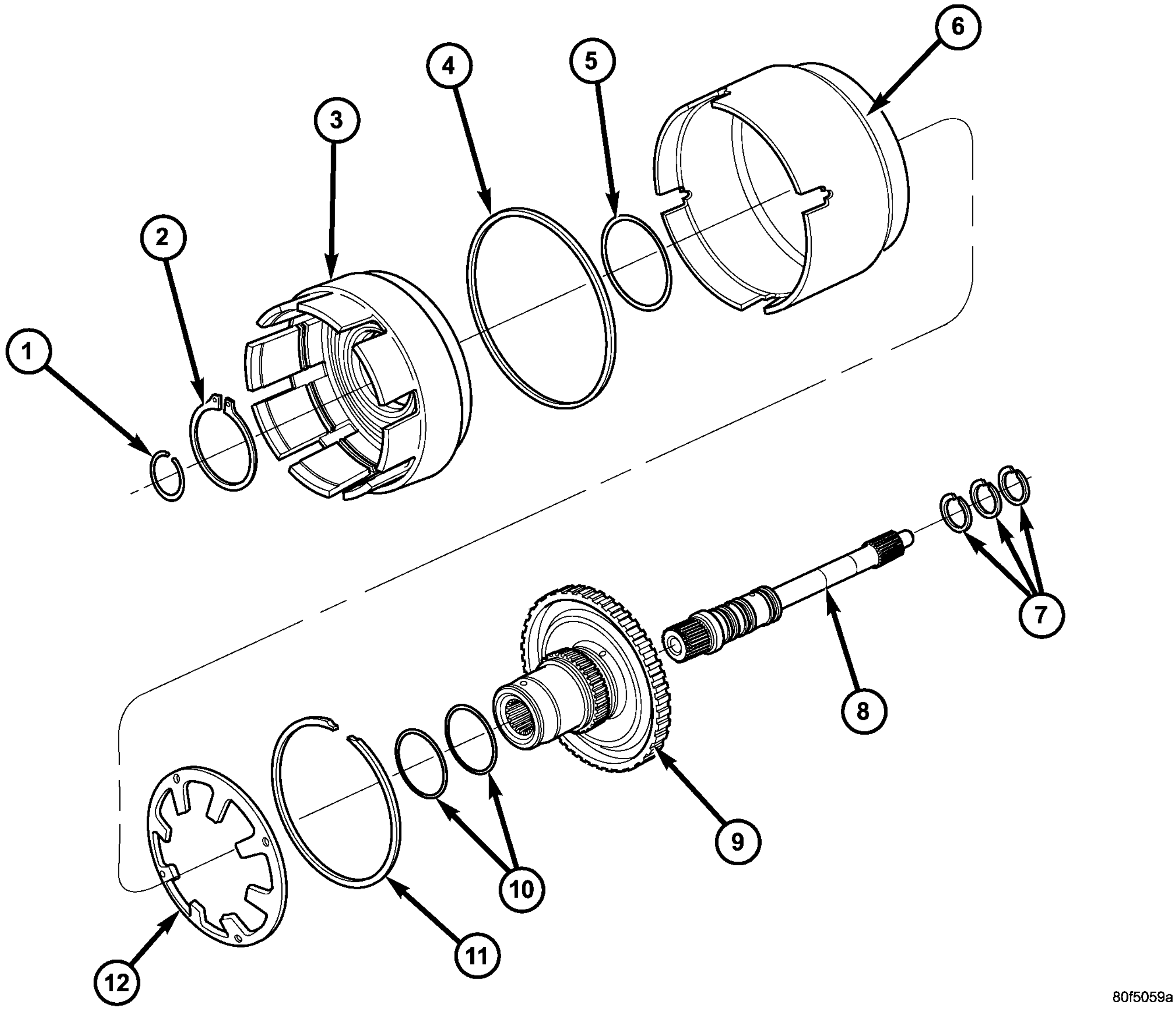


Fig. 216 Input Clutch Hub, Retainer, and OD/Reverse Piston

1 - SNAP RING (INPUT SHAFT)	7 - SEAL, INPUT SHAFT
2 - SNAP RING	8 - SHAFT, INPUT
3 - CLUTCH RETAINER	9 - HUB
4 - SEAL, OUTER	10 - SEAL
5 - SEAL, INNER	11 - SNAP RING
6 - OD/REVERSE PISTON	12 - BELLEVILLE SPRING

INPUT CLUTCH ASSEMBLY (Continued)

(7) Install UD clutch piston (Fig. 217).

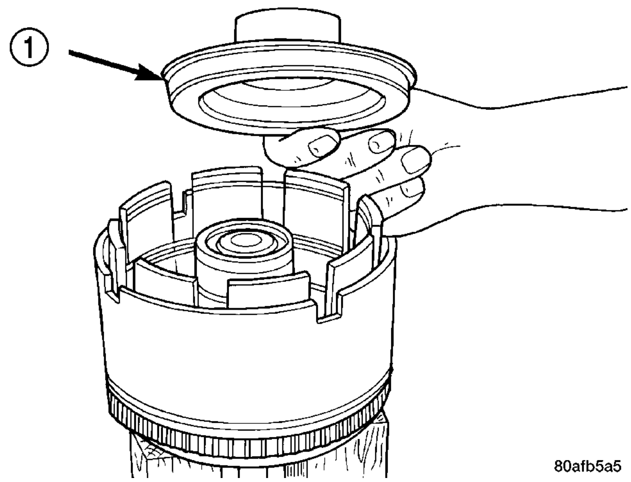


Fig. 217 Underdrive Clutch Piston

1 - PISTON

(8) Install UD piston return spring and Tool 5067 as shown in (Fig. 218).

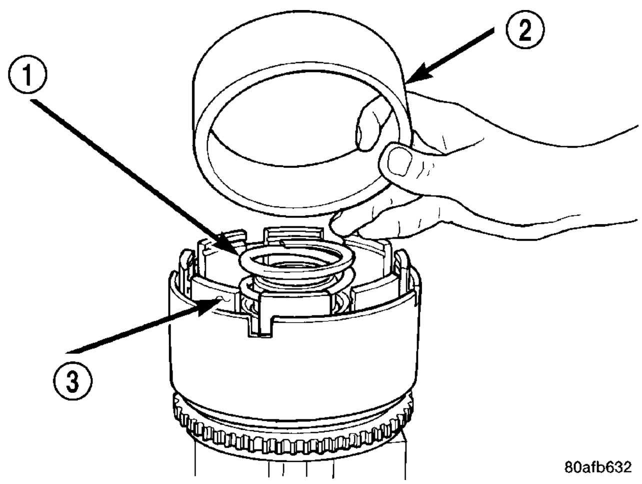


Fig. 218 Seal Compressor Special Tool 5067

1 - PISTON RETURN SPRING
2 - SPECIAL TOOL 5067
3 - INPUT SHAFT CLUTCHES RETAINER ASSEMBLY

(9) Using Tool 5059A and an arbor press, Install the UD spring retainer and snap ring (Fig. 219) (Fig. 220) (Fig. 221) Compress just enough to install snap ring.

CAUTION: Compress return spring just enough to install snap ring.

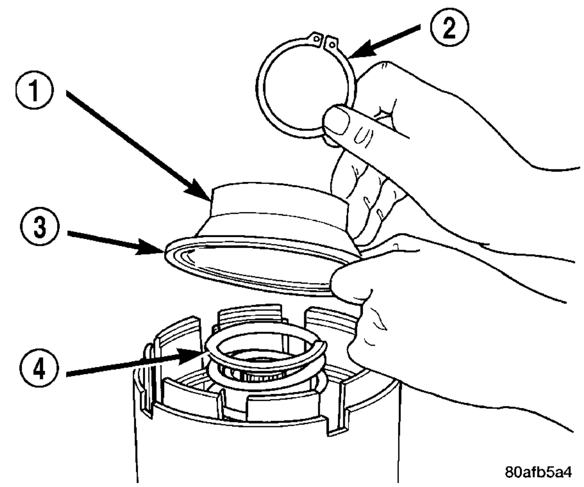


Fig. 219 UD Return Spring and Retainer

1 - UNDERDRIVE SPRING RETAINER
2 - SNAP RING
3 - SEAL
4 - PISTON RETURN SPRING

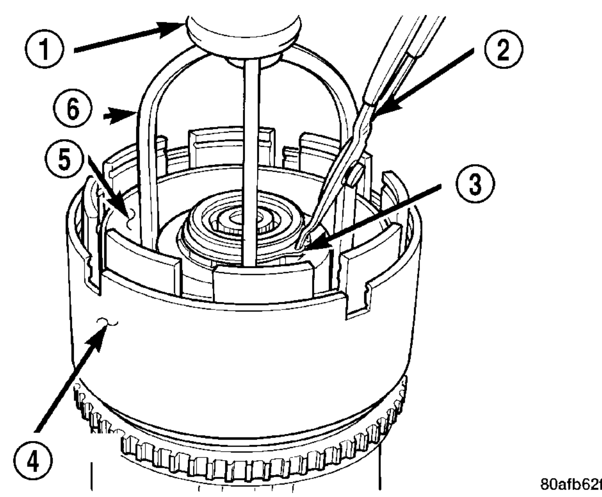


Fig. 220 Install UD Spring Retainer and Snap Ring

1 - ARBOR PRESS RAM
2 - SNAP RING PLIERS
3 - SNAP RING
4 - OD/REVERSE PISTON
5 - TOOL 5067
6 - TOOL 5059A

INPUT CLUTCH ASSEMBLY (Continued)

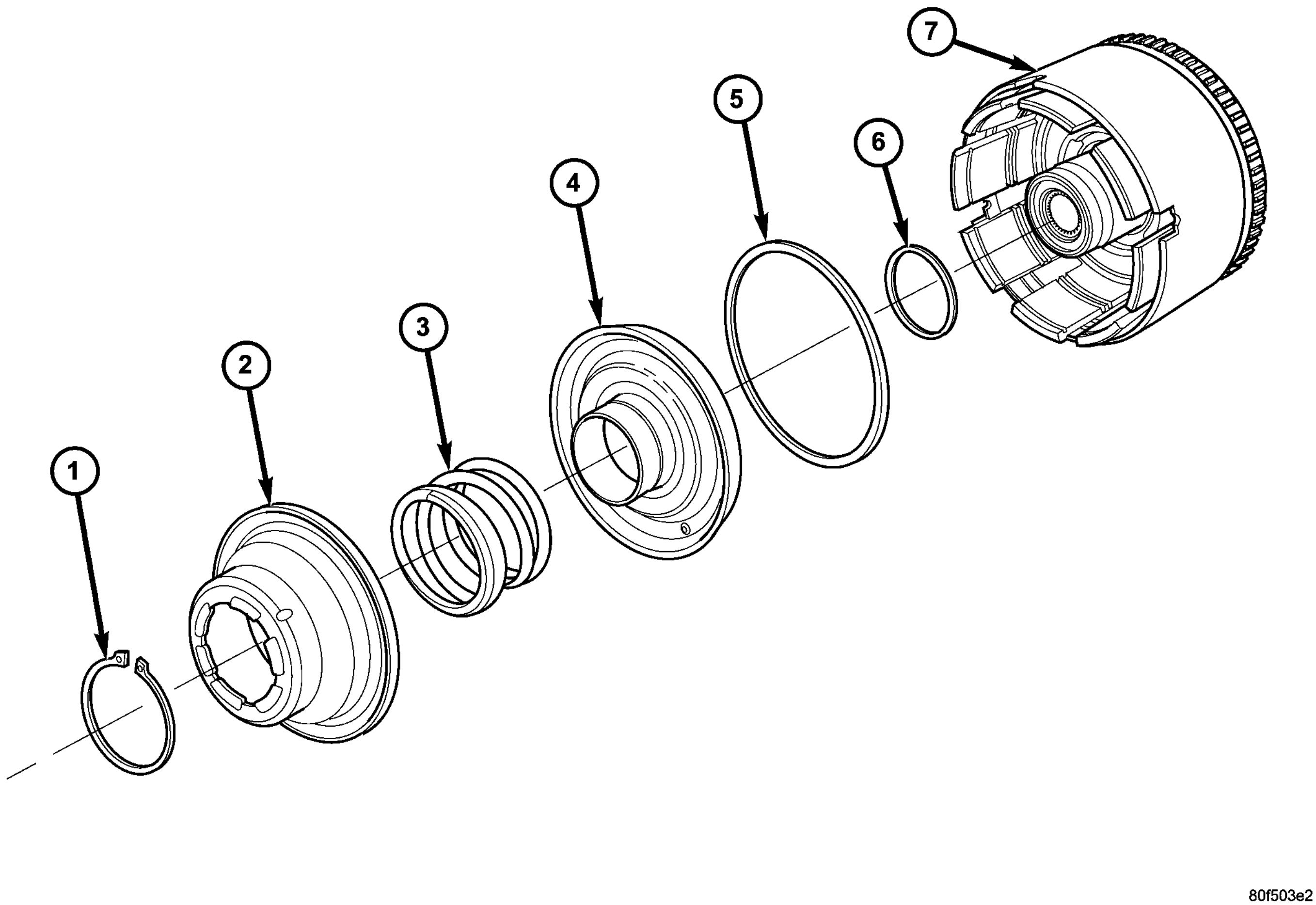


Fig. 221 Underdrive Clutch Piston, Spring and Retainer

1 - SNAP RING
2 - SPRING RETAINER
3 - SPRING
4 - UD CLUTCH PISTON
5 - SEAL, OUTER
6 - SEAL, INNER
7 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(10) Install the UD clutch pack. Leave out upper disc, until snap ring is installed (Fig. 222).

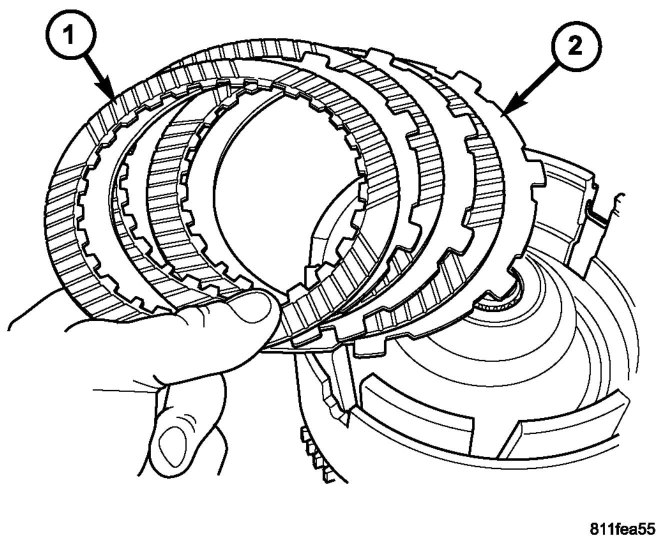


Fig. 222 Install Underdrive Clutch Pack

1 - CLUTCH DISC
2 - CLUTCH PLATE

(11) Install the UD clutch flat snap ring (Fig. 223).

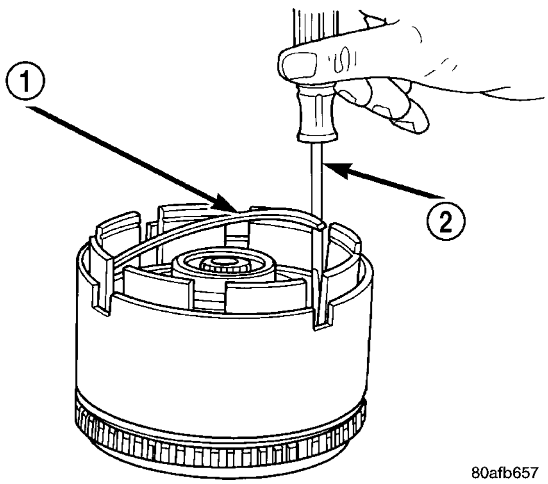


Fig. 223 UD Clutch Flat Snap Ring

1 - UNDERDRIVE CLUTCH REACTION PLATE FLAT SNAP RING
2 - SCREWDRIVER

(12) Install the last UD clutch disc (Fig. 224).

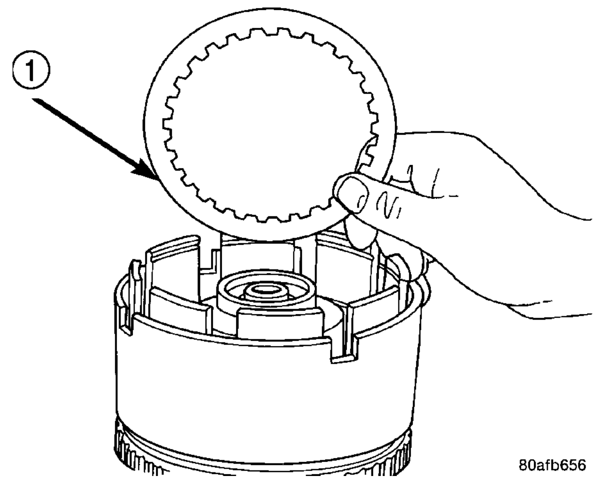


Fig. 224 Install Last UD Clutch Disc

1 - ONE UNDERDRIVE CLUTCH DISC

INPUT CLUTCH ASSEMBLY (Continued)

(13) Install the OD/UD clutch reaction plate and snap ring (Fig. 225) (Fig. 226). The OD/UD clutches reaction plate has a step on both sides. Install the OD/UD clutches reaction plate tapered step side up.

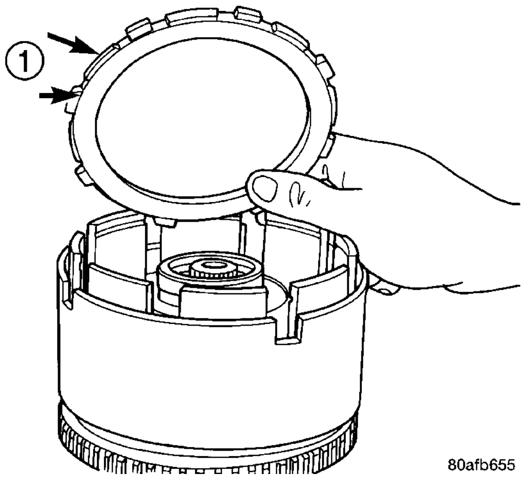


Fig. 225 OD/UD Reaction Plate

1 - OD/UD CLUTCH REACTION PLATE (TAPERED STEP SIDE UP)

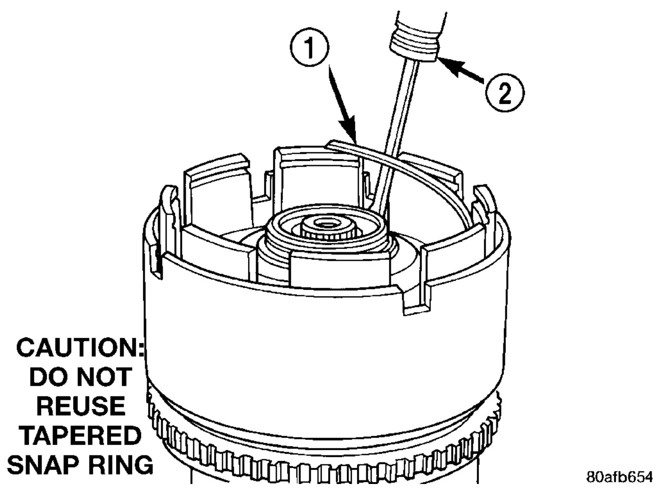


Fig. 226 Tapered Snap Ring

1 - OVERDRIVE/UNDERDRIVE CLUTCHES REACTION PLATE TAPERED SNAP RING
2 - SCREWDRIVER (DO NOT SCRATCH REACTION PLATE)

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.

(14) Seat tapered snap ring to ensure proper installation (Fig. 227) (Fig. 228).

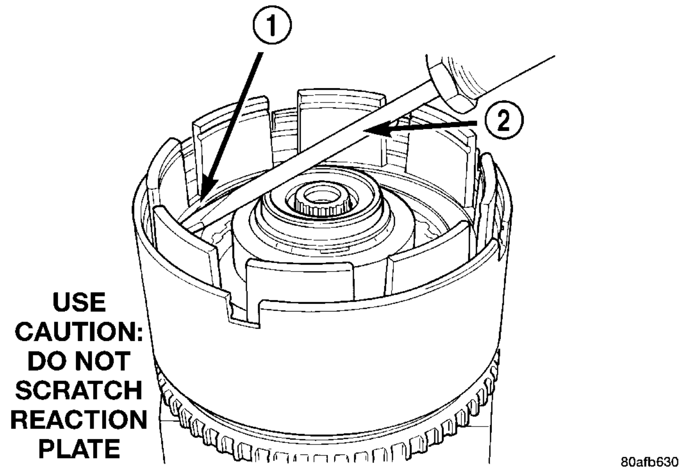


Fig. 227 Seating Tapered Snap Ring

1 - OVERDRIVE/UNDERDRIVE CLUTCHES REACTION PLATE TAPERED SNAP RING
2 - SCREWDRIVER

INPUT CLUTCH ASSEMBLY (Continued)

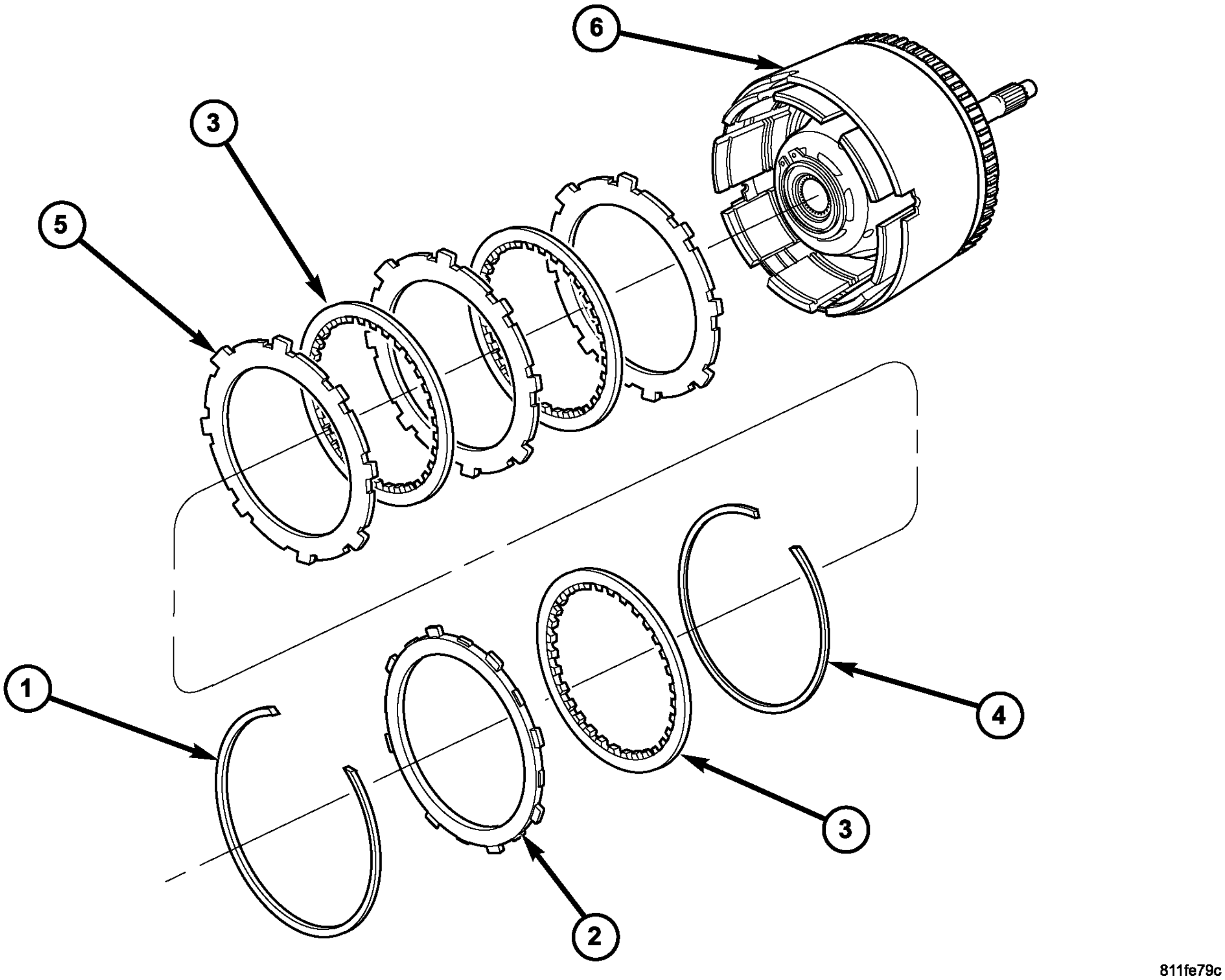


Fig. 228 Underdrive Clutch Assembly

1 - SNAP RING (TAPERED)
2 - OD/UD REACTION PLATE
3 - CLUTCH DISC (3)
4 - SNAP RING (FLAT)
5 - CLUTCH PLATE (3)
6 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(15) Install input clutch assembly to the Input Clutch Pressure Fixture–Tool 8391 (Fig. 229).

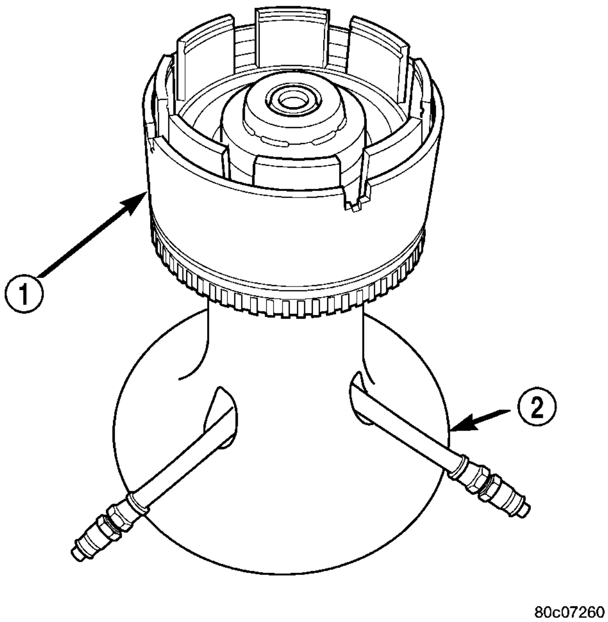


Fig. 229 Input Clutch Assembly on Pressure Fixture Tool 8391

1 - INPUT CLUTCH ASSEMBLY
2 - INPUT CLUTCH PRESSURE FIXTURE 8391

(16) Set up dial indicator on the UD clutch pack as shown in (Fig. 230).

(17) Using moderate pressure, press down and hold (near indicator) the UD clutch pack with screwdriver or suitable tool and zero dial indicator (Fig. 231). When releasing pressure on clutch pack, indicator reading should advance 0.005–0.010.

CAUTION: Do not apply more than 30 psi (206 kPa) to the underdrive clutch pack.

(18) Apply 30 psi (206 kPa) to the underdrive hose on Tool 8391 and measure UD clutch clearance. Measure and record UD clutch pack measurement in four (4) places, 90° apart.

(19) Take average of four measurements and compare with UD clutch pack clearance specification. **Underdrive clutch pack clearance must be 0.94-1.50 mm (0.037-0.059 in.).**

(20) If necessary, select the proper reaction plate to achieve specifications:

UNDERDRIVE REACTION PLATE THICKNESS	
4659939AB	5.837-5.937 mm (0.230-0.234 in.)
4659940AB	6.147-6.248 mm (0.242-0.246 in.)
4659941AB	6.457-6.557 mm (0.254-0.258 in.)

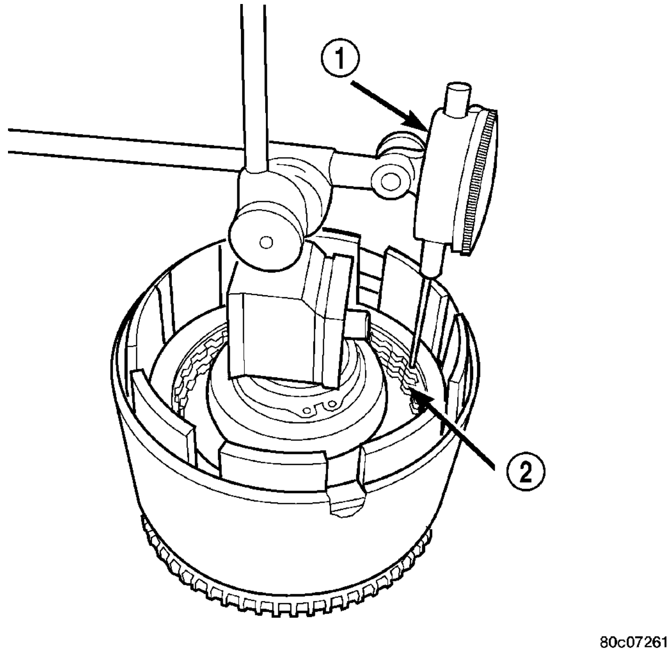


Fig. 230 Set Up Dial Indicator to Measure UD Clutch Clearance

1 - DIAL INDICATOR
2 - UNDERDRIVE CLUTCH

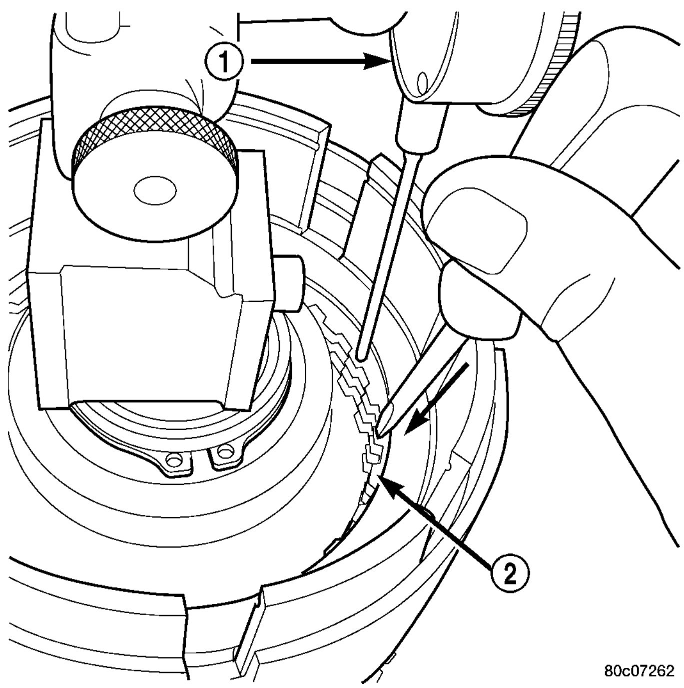


Fig. 231 Press Down on UD Clutch Pack and Zero Dial Indicator

1 - DIAL INDICATOR
2 - UNDERDRIVE CLUTCH

INPUT CLUTCH ASSEMBLY (Continued)

(21) Install the OD clutch pack (Fig. 232).

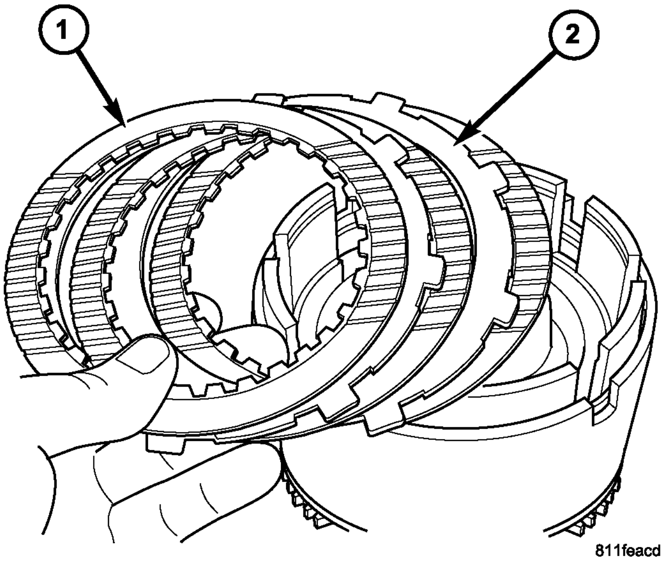


Fig. 232 Install Overdrive Clutch Pack

1 - CLUTCH DISC
2 - CLUTCH PLATE

(22) Install OD pressure plate waved snap ring (Fig. 233).

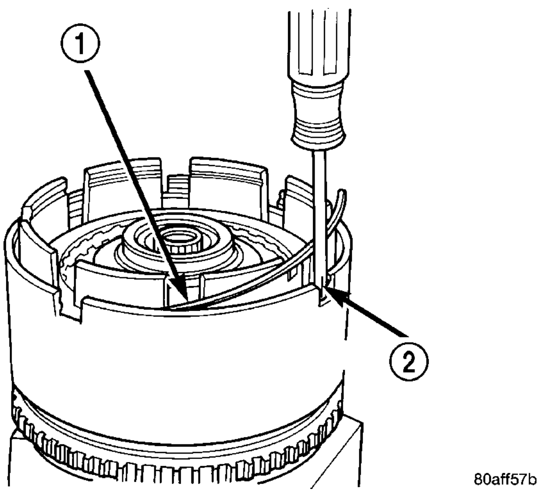


Fig. 233 Install Waved Snap Ring

1 - OVERDRIVE PRESSURE PLATE WAVED SNAP RING
2 - SCREWDRIVER

(23) Install the OD/Reverse pressure plate with large step down (towards OD clutch pack) (Fig. 234).

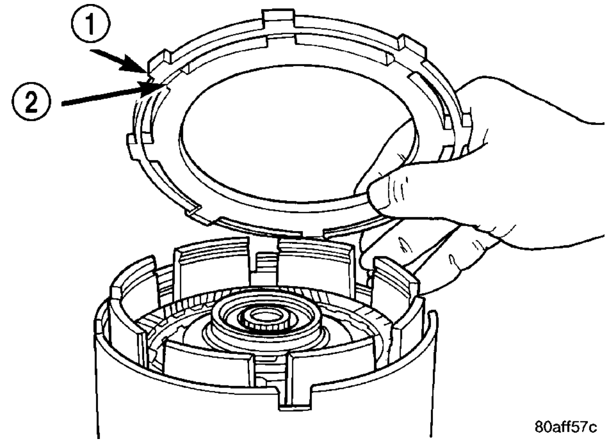


Fig. 234 OD/Reverse Reaction Plate

1 - OVERDRIVE/REVERSE PRESSURE PLATE
2 - (STEP SIDE DOWN)

(24) Install OD pressure plate flat snap ring (Fig. 235) (Fig. 236).

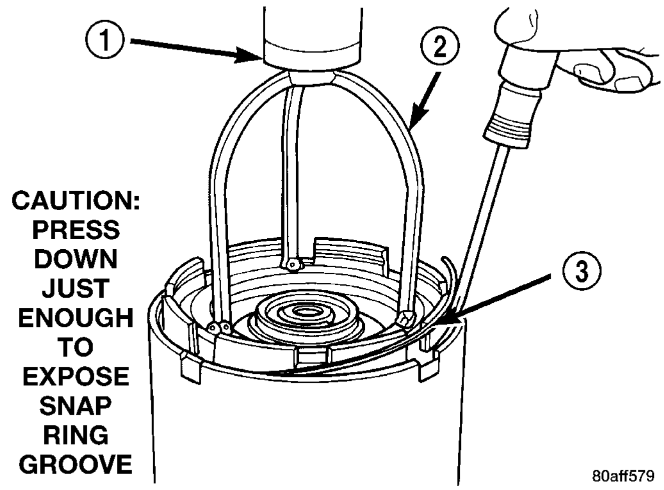


Fig. 235 Install Flat Snap Ring

1 - ARBOR PRESS RAM
2 - TOOL 5059A
3 - FLAT SNAP RING

INPUT CLUTCH ASSEMBLY (Continued)

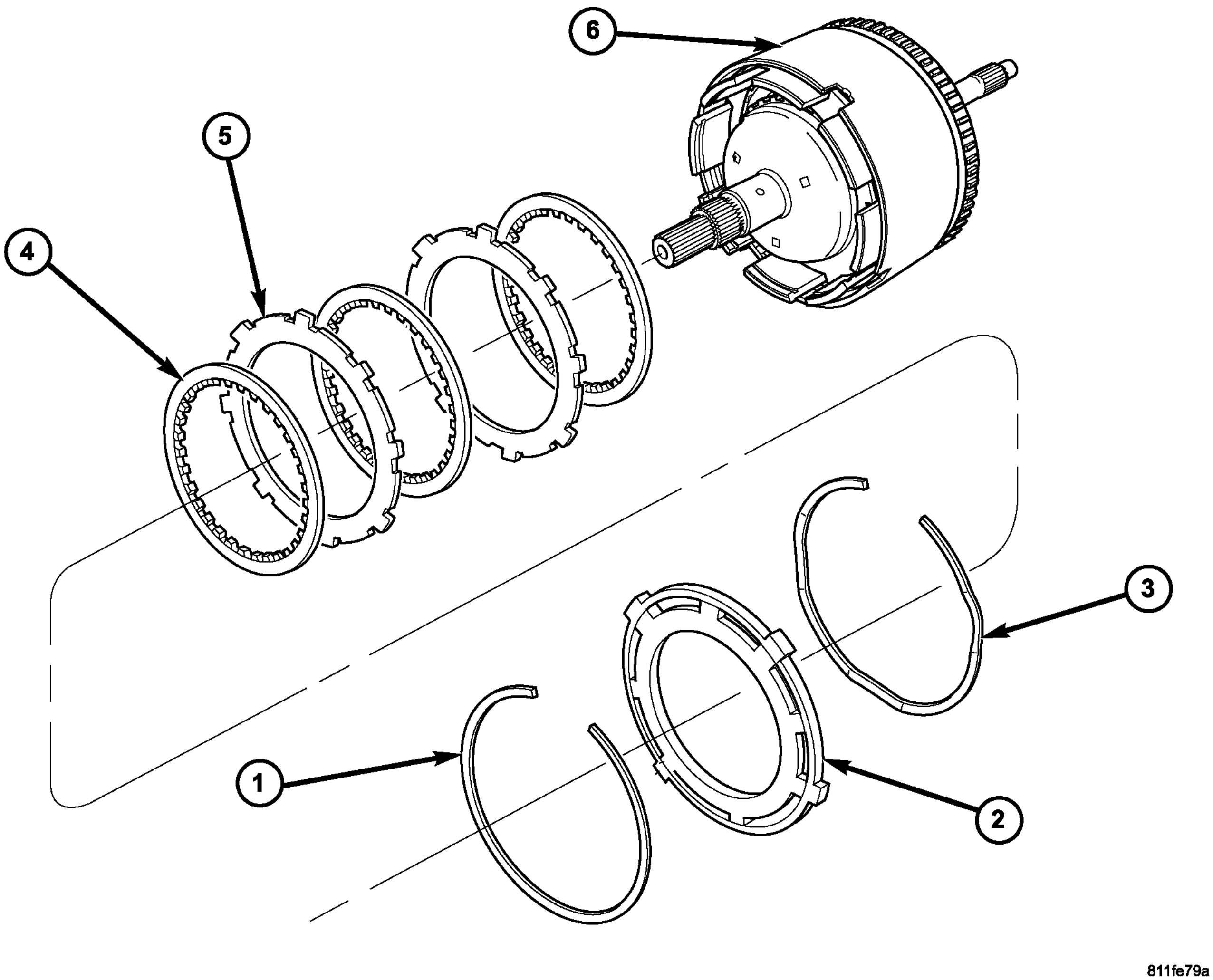


Fig. 236 Overdrive Clutch Assembly

1 - SNAP RING
2 - OD/REVERSE PRESSURE PLATE
3 - SNAP RING (WAVE)
4 - CLUTCH DISC (3)
5 - CLUTCH STEEL (2)
6 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(25) Measure OD clutch pack clearance. Set up dial indicator on top of the OD/Reverse pressure plate as shown in (Fig. 237).

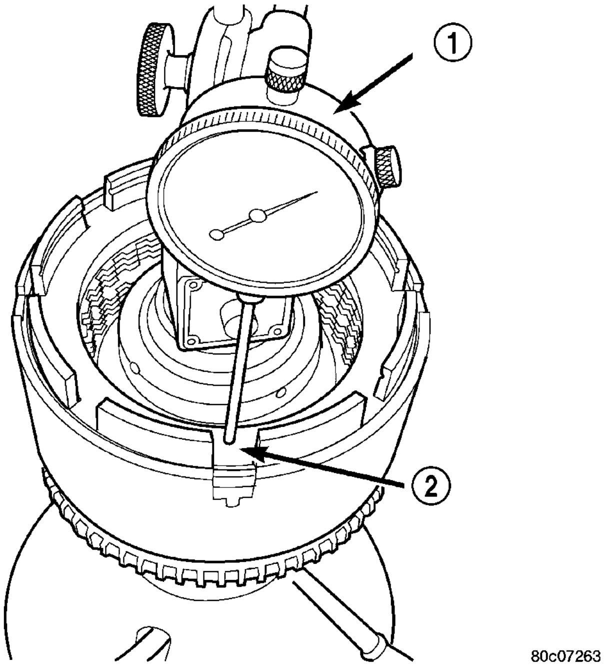


Fig. 237 Measure OD Clutch Pack Clearance

1 - DIAL INDICATOR
2 - OD/REVERSE REACTION PLATE

(26) Zero dial indicator and apply 30 psi (206 kPa) air pressure to the overdrive clutch hose on Tool 8391. Measure and record OD clutch pack measurement in four (4) places, 90° apart.

(27) Take average of four measurements and compare with OD clutch pack clearance specification. **The overdrive (OD) clutch pack clearance is 1.07-3.25 mm (0.042-0.128 in.).**

If not within specifications, the clutch is not assembled properly. There is no adjustment for the OD clutch clearance.

(28) Install reverse clutch pack (two frictions/one steel) (Fig. 238).

(29) Install reverse clutch reaction plate with the flat side down towards reverse clutch (Fig. 239).

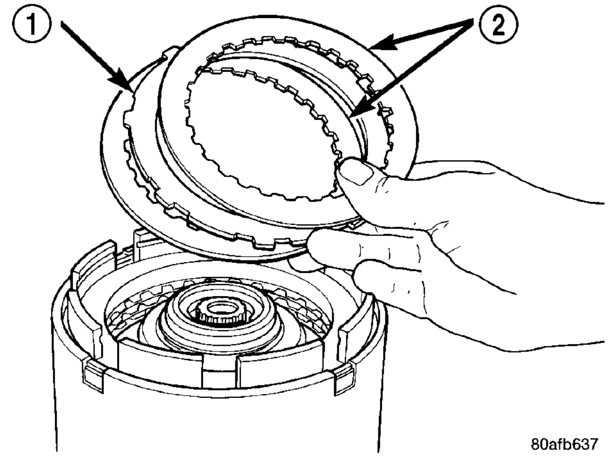


Fig. 238 Install Reverse Clutch Pack

1 - REVERSE CLUTCH PLATE
2 - REVERSE CLUTCH DISCS

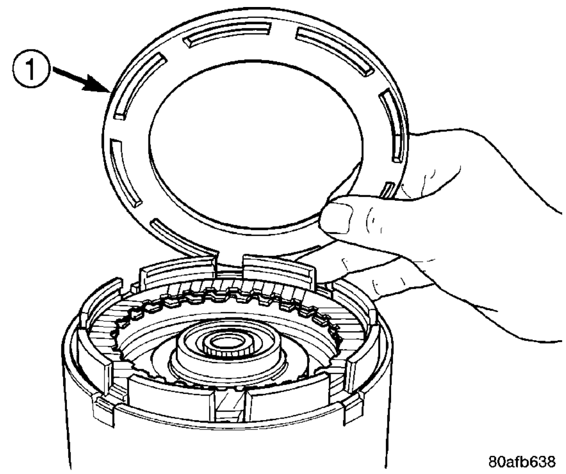


Fig. 239 Install Reaction Plate

1 - REVERSE CLUTCH REACTION PLATE (FLAT SIDE DOWN)

INPUT CLUTCH ASSEMBLY (Continued)

(30) Tap reaction plate down to allow installation of the reverse clutch snap ring. Install reverse clutch snap ring (Fig. 240) (Fig. 241).

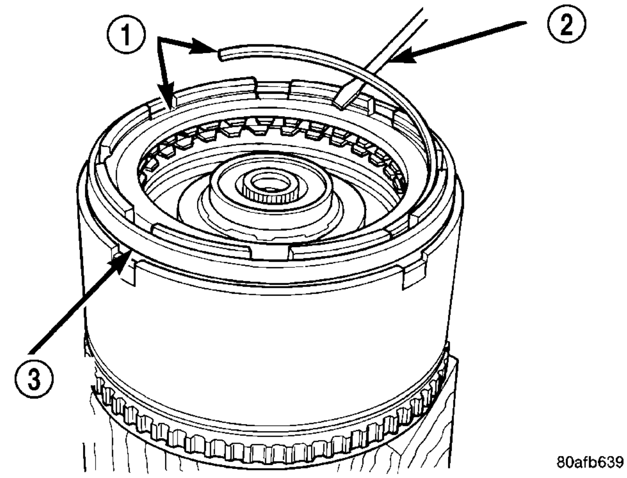


Fig. 240 Install Reverse Clutch Snap Ring

1 - REVERSE CLUTCH SNAP RING (SELECT)
2 - SCREWDRIVER
3 - REVERSE CLUTCH REACTION PLATE

(31) Pry up reverse reaction plate to seat against snap ring (Fig. 242).

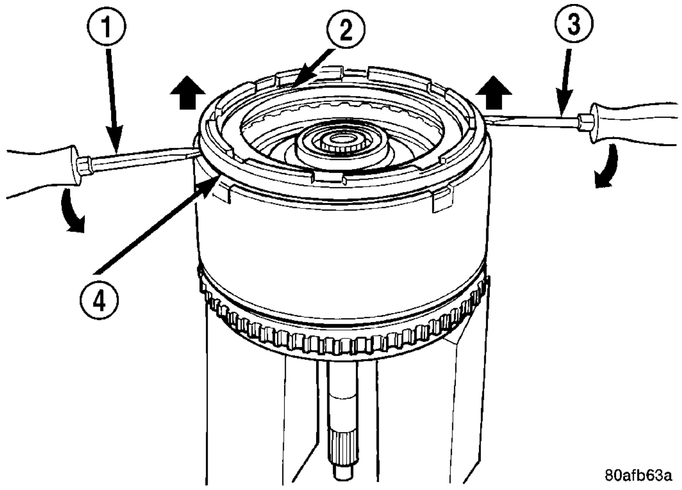


Fig. 242 Pry Up Reaction Plate

1 - SCREWDRIVER
2 - SNAP RING
3 - SCREWDRIVER
4 - MUST RAISE REVERSE REACTION PLATE TO RAISE SNAP RING

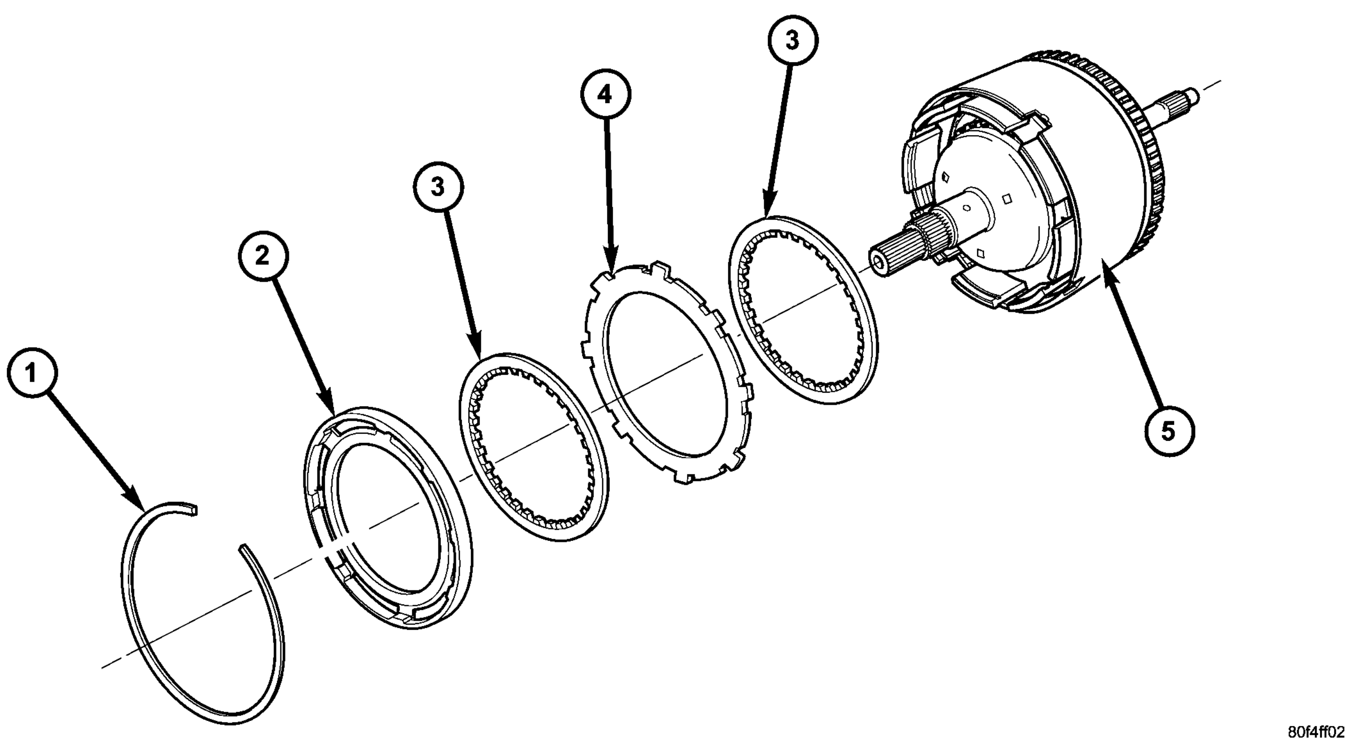


Fig. 241 Reverse Clutch Assembly

1 - SNAP RING
2 - REACTION PLATE
3 - CLUTCH DISC (2)
4 - CLUTCH PLATE (1)
5 - INPUT CLUTCH ASSEMBLY

INPUT CLUTCH ASSEMBLY (Continued)

(32) Set up a dial indicator on the reverse clutch pack as shown in (Fig. 243).

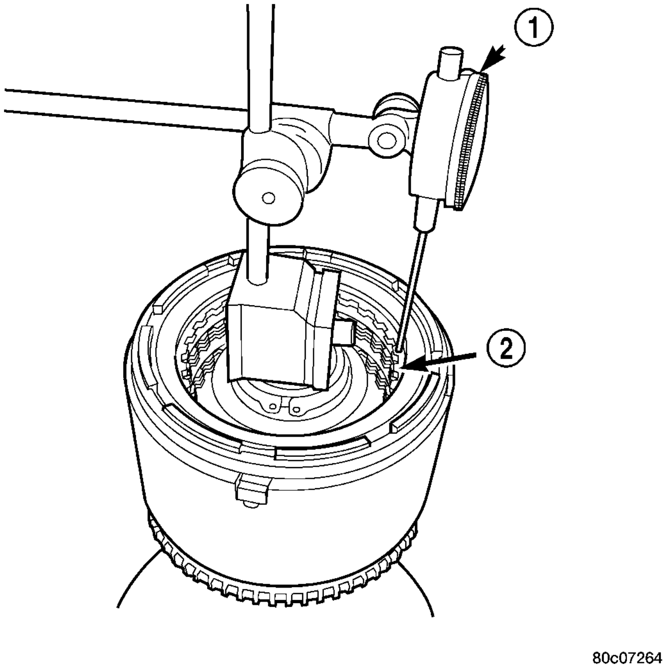


Fig. 243 Measure Reverse Clutch Pack Clearance

1 - DIAL INDICATOR
2 - REVERSE CLUTCH

(33) Using moderate pressure, press down and hold (near indicator) reverse clutch disc with screwdriver or suitable tool and zero dial indicator (Fig. 244). When releasing pressure, indicator should advance 0.005-0.010. as clutch pack relaxes.

(34) Apply 30 psi (206 kPa) air pressure to the reverse clutch hose on Tool 8391. Measure and record reverse clutch pack measurement in four (4) places, 90° apart.

(35) Take average of four measurements and compare with reverse clutch pack clearance specification. **The reverse clutch pack clearance is 0.89-1.37 mm (0.035-0.054 in.).** Select the proper reverse clutch snap ring to achieve specifications:

REVERSE CLUTCH SNAP RING THICKNESS	
4377195	1.53-1.58 mm (0.060-0.062 in.)
4412871	1.77-1.83 mm (0.070-0.072 in.)
4412872	2.02-2.07 mm (0.080-0.082 in.)
4412873	2.27-2.32 mm (0.090-0.091 in.)

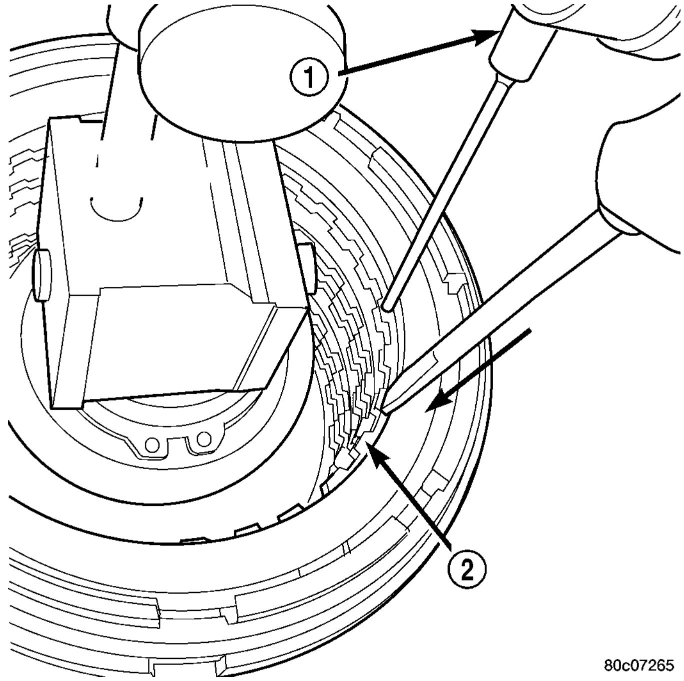


Fig. 244 Press Down on Reverse Clutch and Zero Indicator

1 - DIAL INDICATOR
2 - REVERSE CLUTCH

(36) To complete the assembly, reverse clutch and overdrive clutch must be removed.

(37) Install the #2 needle bearing (Fig. 245).

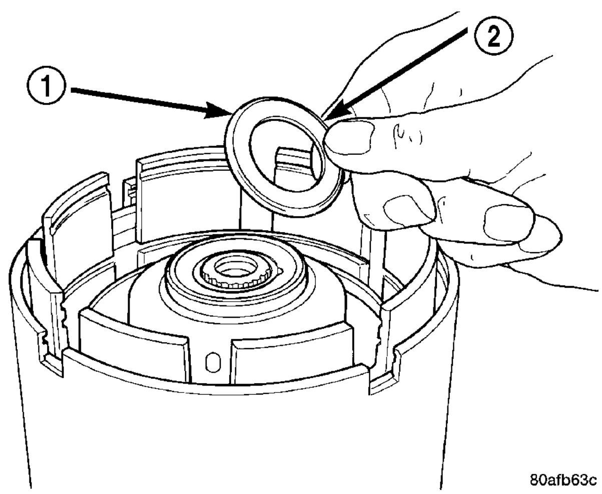


Fig. 245 Install No. 2 Needle Bearing

1 - #2 NEEDLE BEARING (NOTE 3 SMALL TABS)
2 - TABS UP

INPUT CLUTCH ASSEMBLY (Continued)

(38) Install the underdrive shaft assembly (Fig. 246).

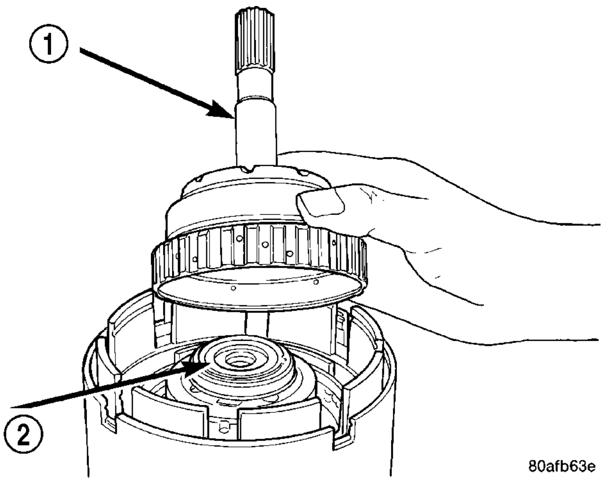


Fig. 246 Install Underdrive Shaft Assembly

1 - UNDERDRIVE SHAFT ASSEMBLY
2 - #2 NEEDLE BEARING

(39) Install the #3 thrust washer to the underdrive shaft assembly. Be sure five tabs are seated properly (Fig. 247).

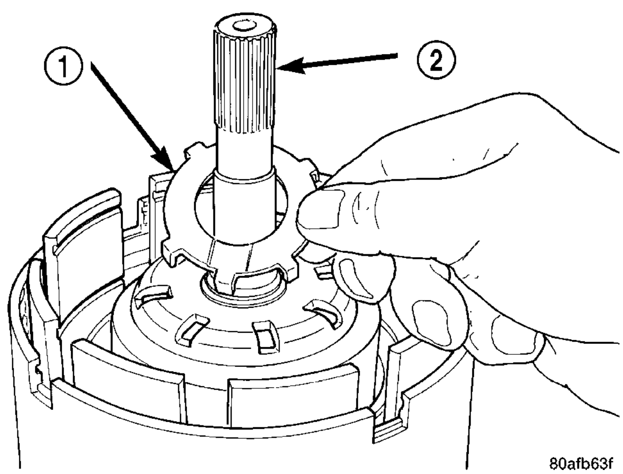


Fig. 247 Install No. 3 Thrust Washer

1 - #3 THRUST WASHER (NOTE 5 TABS)
2 - UNDERDRIVE SHAFT ASSEMBLY

(40) Install the #3 thrust plate to the bottom of the overdrive shaft assembly. Retain with petrolatum or transmission assembly gel (Fig. 248).

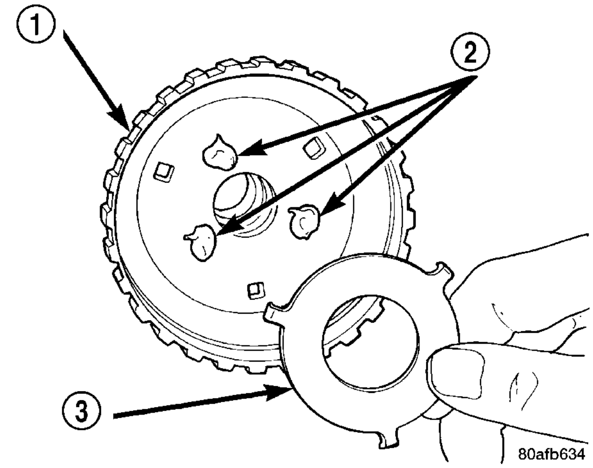


Fig. 248 Install No. 3 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - DABS OF PETROLATUM (FOR RETENTION)
3 - #3 THRUST PLATE (NOTE 3 TABS)

(41) Install the overdrive shaft assembly (Fig. 249) (Fig. 250).

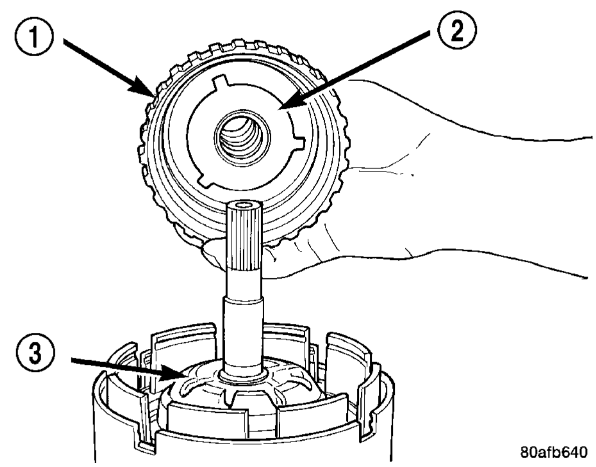


Fig. 249 Install Overdrive Shaft Assembly

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #3 THRUST PLATE
3 - #3 THRUST WASHER

INPUT CLUTCH ASSEMBLY (Continued)

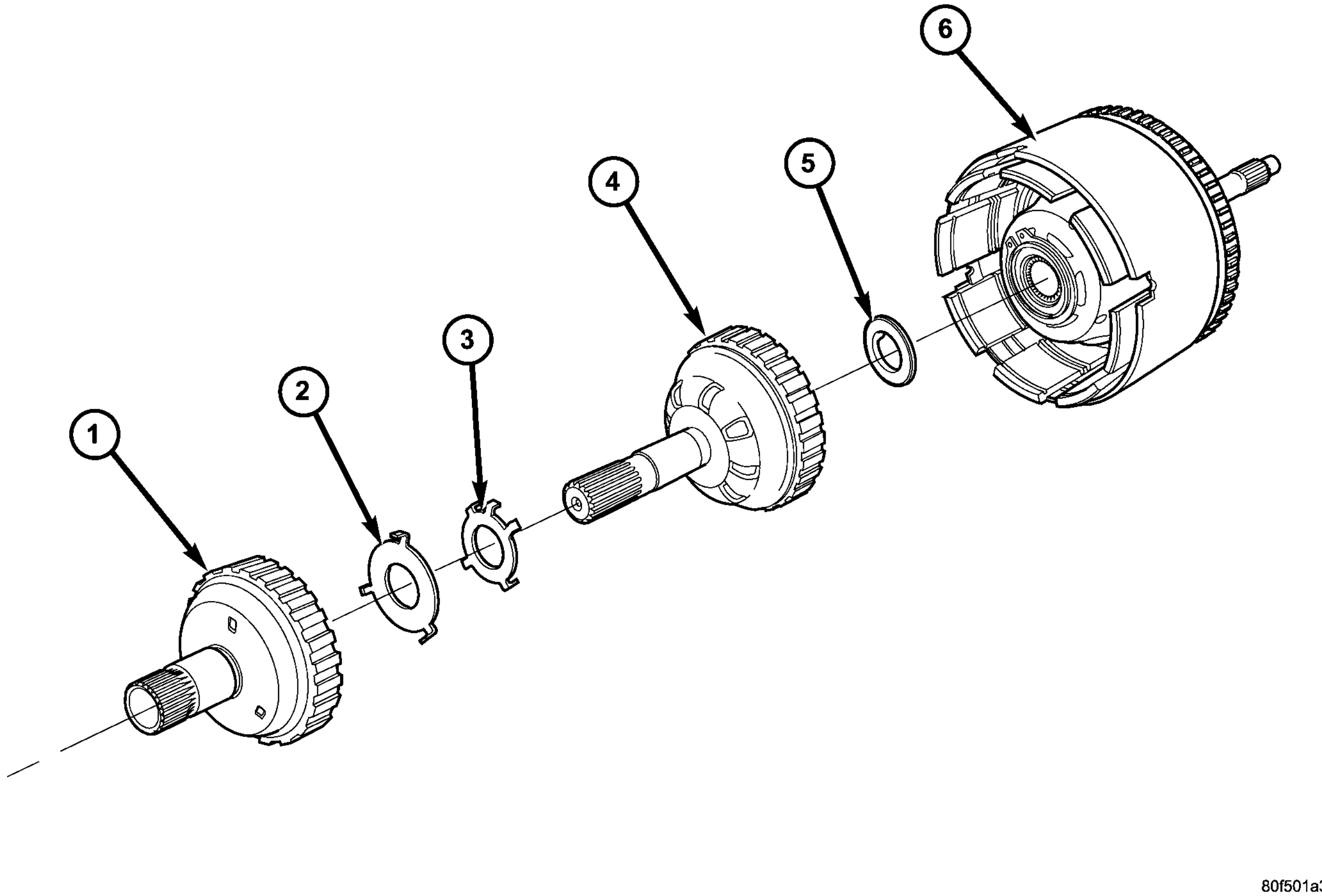


Fig. 250 Overdrive/Underdrive Shafts

1 - OVERDRIVE SHAFT
2 - #3 THRUST PLATE (3 TABS)
3 - #3 THRUST WASHER (5 TABS)
4 - UNDERDRIVE SHAFT
5 - #2 NEEDLE BEARING (3 TABS)
6 - INPUT CLUTCH ASSEMBLY

(42) Reinstall overdrive and reverse clutch as shown. **Rechecking these clutch clearances is not necessary.**

OIL PUMP

DESCRIPTION

The oil pump is located in the pump housing inside the bell housing of the transaxle case (Fig. 251). The oil pump consists of an inner and outer gear, a housing, and a cover that also serves as the reaction shaft support.

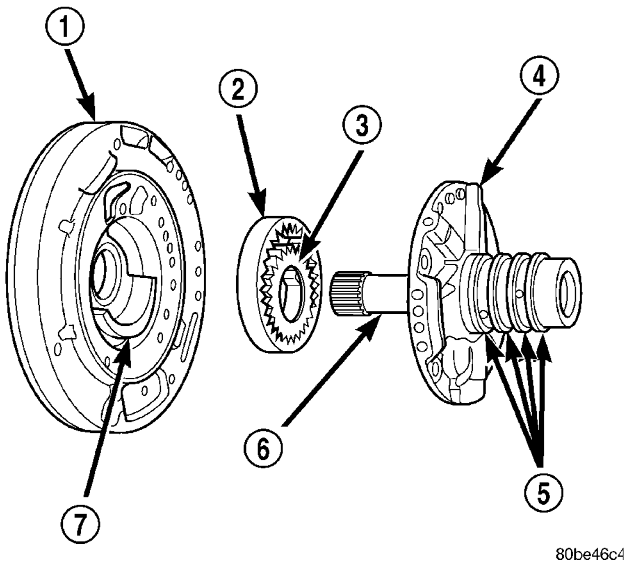


Fig. 251 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

OPERATION

As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

DISASSEMBLY

When disassembling the transaxle it is necessary to inspect the oil pump for wear and damage.

(1) Remove the reaction shaft support bolts.

(2) Remove reaction shaft support from pump housing (Fig. 252).

(3) Remove the pump gears (Fig. 253) and check for wear and damage on pump housing and gears.

(4) Re-install the gears and check clearances.

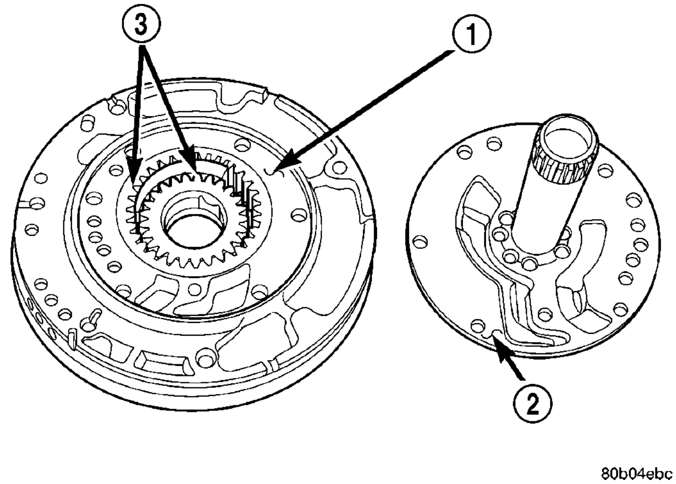


Fig. 252 Reaction Shaft Support

1 - PUMP HOUSING
2 - REACTION SHAFT SUPPORT
3 - PUMP GEARS

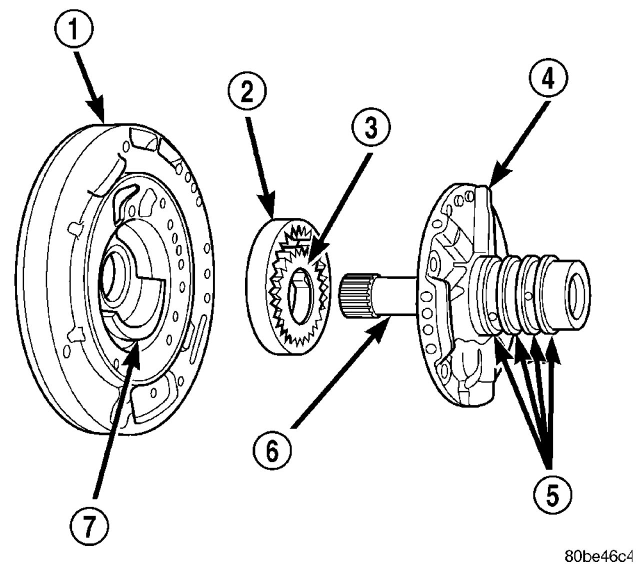


Fig. 253 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

OIL PUMP (Continued)

(5) Measure the clearance between the outer gear and the pump pocket (Fig. 254). Clearance should be 0.089–0.202 mm (0.0035-0.0079 in.).

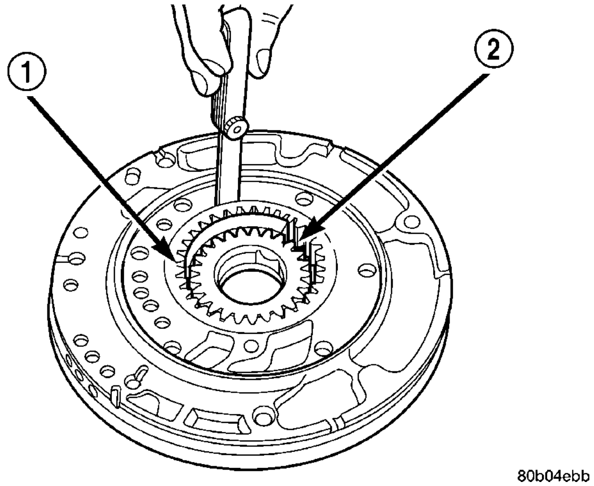


Fig. 254 Measure Outer Gear to Pocket

1 - OUTER GEAR
2 - POCKET

(6) Measure clearance between outer gear and crescent. Clearance should be 0.060-0.298 mm (0.0023-0.0117 in.).

(7) Measure clearance between inner gear and crescent. Clearance should be 0.093-0.385 mm (0.0036-0.0151 in.).

(8) Position an appropriate piece of Plastigage across both pump gears.

(9) Align the Plastigage to a flat area on the reaction shaft support housing.

(10) Install the reaction shaft to the pump housing. Tighten the bolts to 27 N·m (20 ft. lbs.).

(11) Remove bolts and carefully separate the housings. Measure the Plastigage following the instructions supplied.

(12) Clearance between outer gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.). Clearance between inner gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.).

ASSEMBLY

(1) Assemble oil pump as shown in (Fig. 255)

(2) Install and torque reaction shaft support-to-oil pump housing bolts to 28 N·m (20 ft. lbs.) torque.

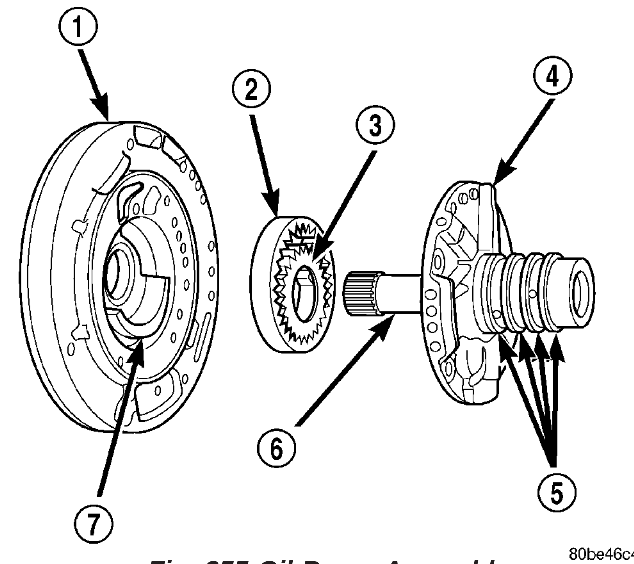


Fig. 255 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

PLANETARY GEARTRAIN

DESCRIPTION

The planetary geartrain is located between the input clutch assembly and the rear of the transaxle case. The planetary geartrain consists of two sun gears, two planetary carriers, two annulus (ring) gears, and one output shaft (Fig. 256).

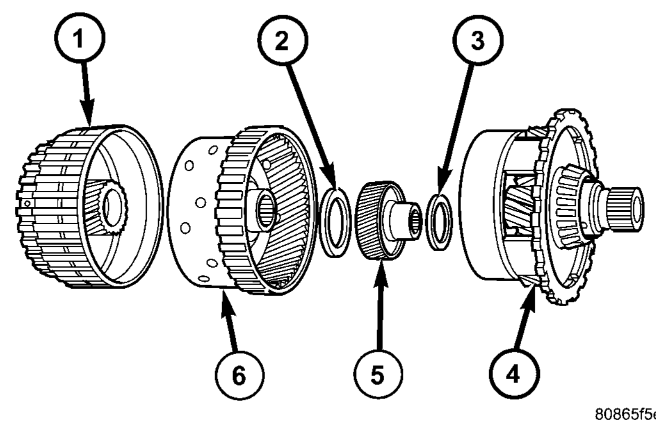


Fig. 256 Planetary Geartrain

1 - FRONT SUN GEAR ASSEMBLY
2 - #6 THRUST BEARING
3 - #7 THRUST BEARING
4 - REAR CARRIER/FRONT ANNULUS ASSEMBLY
5 - REAR SUN GEAR
6 - FRONT CARRIER/REAR ANNULUS ASSEMBLY

OPERATION

The planetary geartrain utilizes two planetary gear sets that connect the transmission input shaft to the output shaft. Input and holding clutches drive or lock different planetary members to change output ratio or direction.

SEAL - OIL PUMP

REMOVAL

(1) Remove transaxle from vehicle (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE - REMOVAL).

(2) Using Tool C-3981-B, remove oil pump seal (Fig. 257).

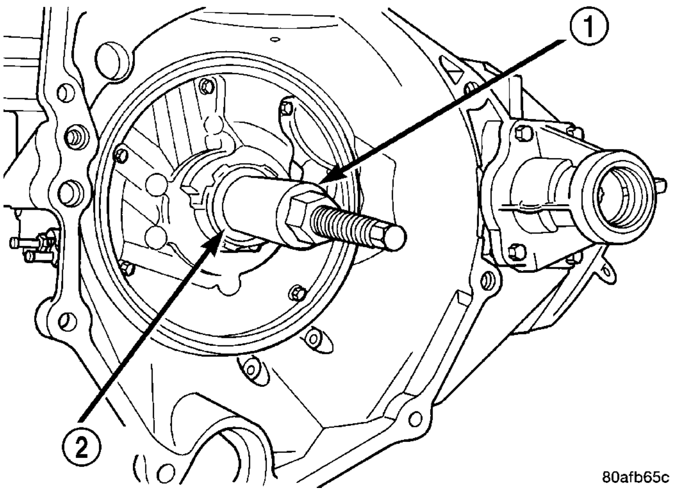


Fig. 257 Remove Oil Pump Seal

1 - TOOL C-3981–B
2 - OIL PUMP SEAL

INSTALLATION

(1) Using Tool C-4193, install oil pump seal (Fig. 258).

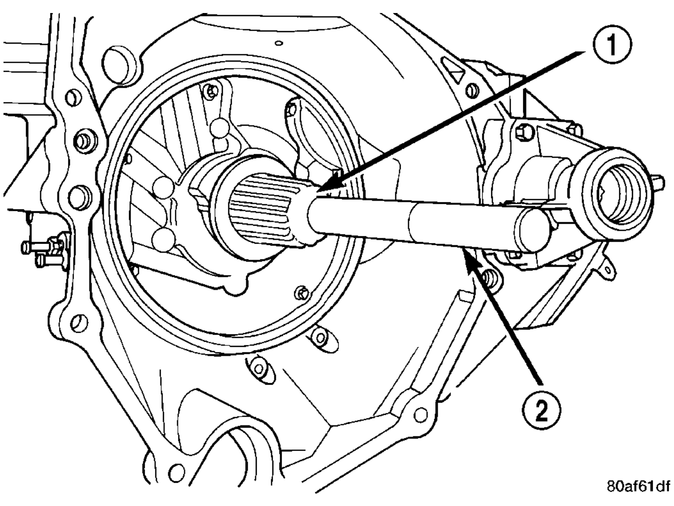


Fig. 258 Install Oil Pump Seal

1 - TOOL C-4193
2 - HANDLE TOOL C-4171

(2) Install transaxle to vehicle (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE - INSTALLATION).

SHIFT INTERLOCK CABLE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Loosen set screw and remove knob from shifter handle (Fig. 259).

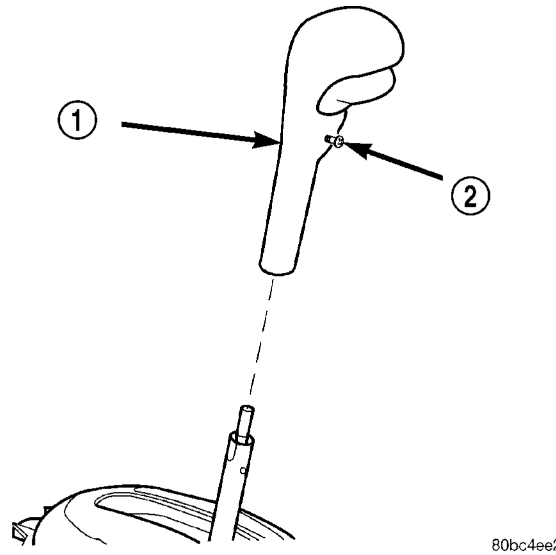


Fig. 259 Gearshift Knob Removal/Installation

1 - SHIFTER KNOB
2 - SET SCREW

(3) Remove the center console assembly as shown in (Fig. 260).

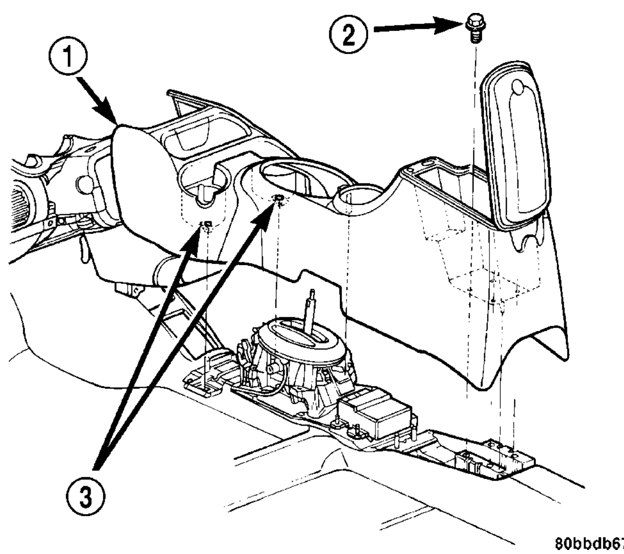


Fig. 260 Center Console Removal/Installation

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

SHIFT INTERLOCK CABLE (Continued)

(4) Remove shifter bezel (Fig. 261).

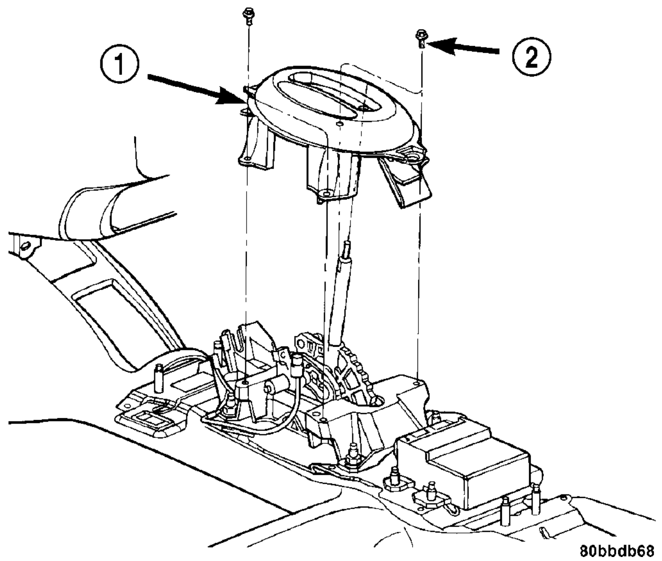


Fig. 261 Shifter Bezel Removal/Installation

1 - BEZEL
2 - SCREW (4)

(5) Disconnect the shifter/ignition interlock cable from the shifter lever and bracket as shown in (Fig. 262). Remove the cable core end from the plastic cam of the shifter mechanism and release cable from shifter bracket

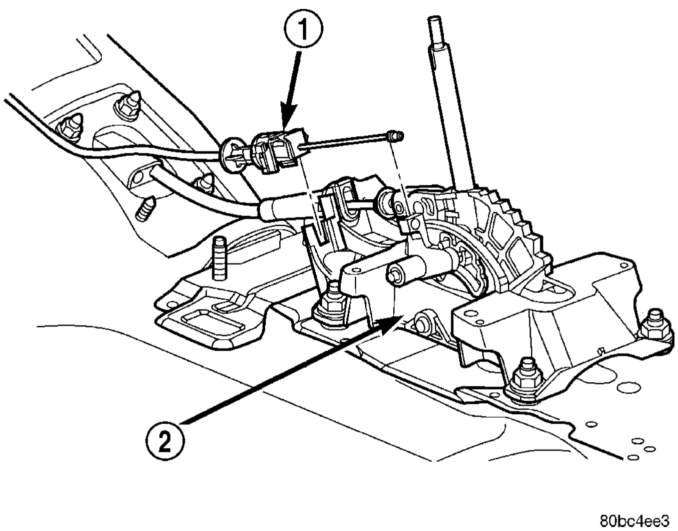


Fig. 262 Interlock Cable at Shifter Assembly

1 - INTERLOCK CABLE
2 - SHIFTER ASSEMBLY

(6) Remove the steering column lower cover (Fig. 263).

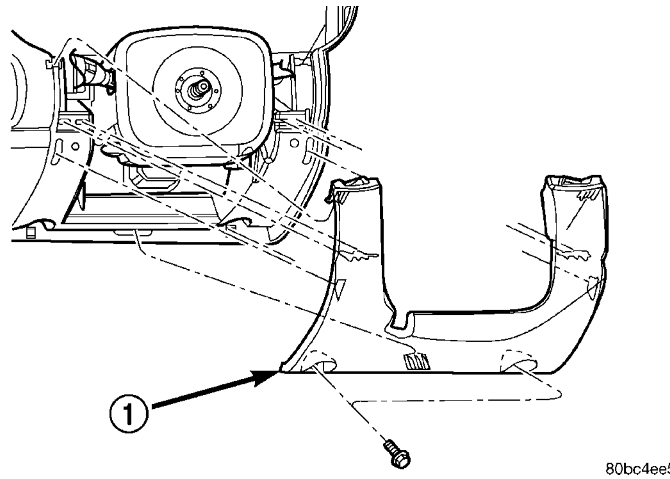


Fig. 263 Steering Column Lower Cover

1 - LOWER COVER

(7) Remove the steering column upper and lower shrouds (Fig. 264).

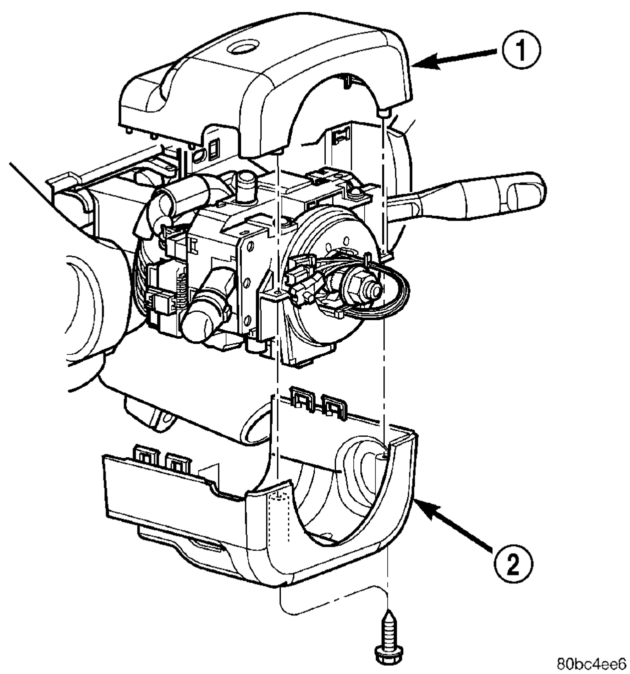


Fig. 264 Steering Column Shrouds

1 - UPPER SHROUD
2 - LOWER SHROUD

SHIFT INTERLOCK CABLE (Continued)

(8) Disconnect the Brake Transmission Shift Interlock (BTSI) solenoid connector from the interlock cable (Fig. 265).

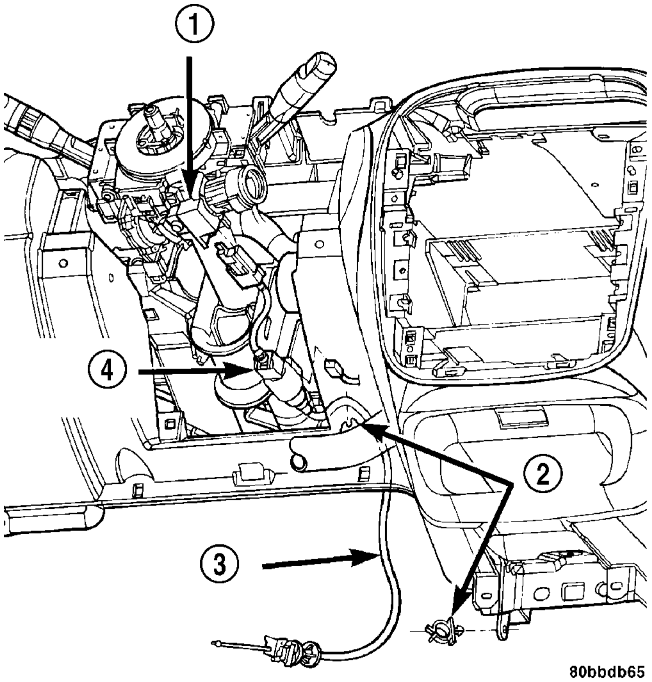


Fig. 265 Interlock Cable at Steering Column

1 - IGNITION SWITCH
2 - CLIP
3 - INTERLOCK CABLE
4 - BTSI SOLENOID

(9) Rotate the ignition key to the "OFF" or "ON/RUN" position (Fig. 266).

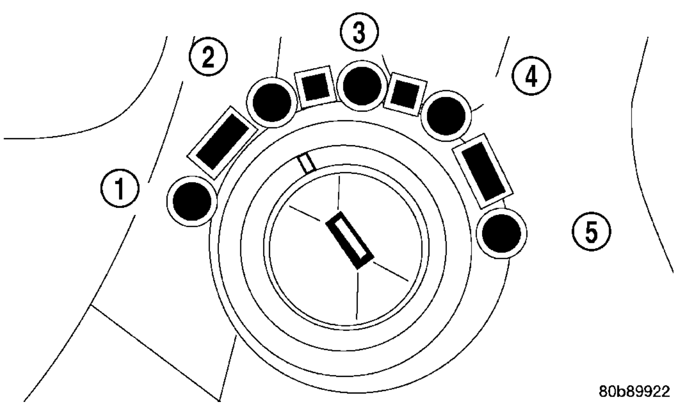


Fig. 266 Ignition Key/Switch Positions

1 - ACC
2 - LOCK
3 - OFF
4 - ON/RUN
5 - START

(10) Squeeze the interlock cable locking tab. Remove the cable from the interlock housing (Fig. 267).

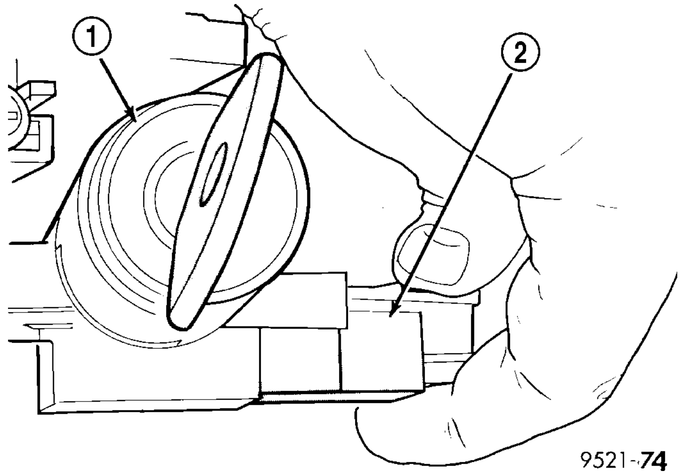


Fig. 267 Interlock

1 - IGNITION LOCK CYLINDER
2 - INTERLOCK CABLE

(11) Release cable from retaining clips and remove through opening under steering column.

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 through hole in instrument panel below steering column and around to gear shifter assembly.

(2) Turn the ignition key to the "OFF" or "ON/RUN" position (Fig. 266).

(3) Install the interlock cable into the interlock housing at the steering column (Fig. 268). Verify the cable snaps into the housing and is fully seated.

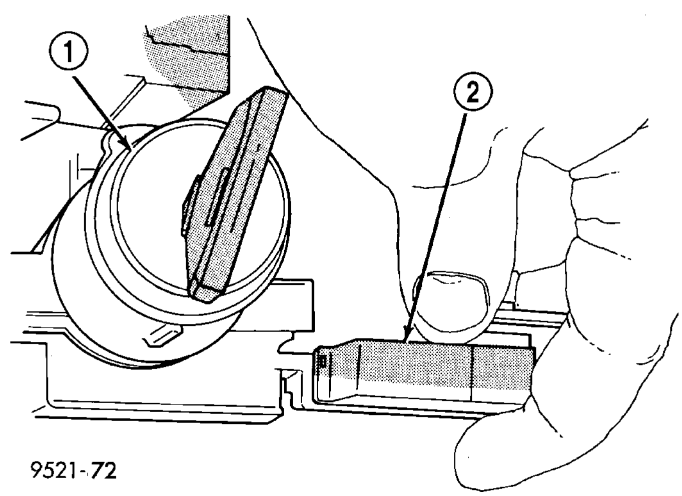


Fig. 268 Interlock Cable at Interlock Housing

1 - IGNITION SWITCH
2 - INTERLOCK CABLE

SHIFT INTERLOCK CABLE (Continued)

(4) Return the ignition key to the "LOCK" position (Fig. 266).

(5) Connect the BTSI solenoid connector (Fig. 265).

(6) Install cable into retaining clips as shown in (Fig. 265).

(7) Install steering column upper and lower shrouds (Fig. 264).

(8) Install steering column lower cover (Fig. 263).

(9) Verify that shifter is in gated "PARK".

(10) 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 gear-shift mechanism as shown in (Fig. 262).

(11) **Adjust interlock cable/system as follows:** If interlock cable is being replaced, it will come with an adjustment pin. Remove the pin from the cable and allow the cable to "self-adjust". Lock cable adjustment by pressing down on the adjuster lock until bottomed at the cable housing. If interlock cable is being re-used, no pin will be provided. Pry up on cable adjuster lock to release and allow cable to "self-adjust". Lock cable adjustment by pressing down on the adjuster lock until bottomed at the cable housing.

(12) **Connect battery negative cable and verify interlock system operation as follows:**

ACTION	EXPECTED RESPONSE
1. Turn key to the ″OFF″ position.	1. Shifter CAN be shifted out of park.
2. Turn key to the ″ON/RUN″ position.	2. Shifter CANNOT be shifted out of park.
3. Turn key to the ″ON/RUN″ position and depress the brake pedal.	3. Shifter CAN be shifted out of park.
4. Leave shifter in any gear and try to return key to the ″LOCK″ or ″ACC″ position.	4. Key cannot be returned to the ″LOCK″ or ″ACC″ position.
5. Return shifter to ″PARK″ and try to remove the key.	5. Key can be removed (after returning to ″LOCK″ position).
6. With the key removed, try to shift out of ″PARK″.	6. Shifter cannot be shifted out of ″PARK″.
NOTE: Any failure to meet these expected responses requires system adjustment or repair.	

(13) Install shifter bezel (Fig. 261).

(14) Install center console assembly (Fig. 260).

(15) Install gearshift knob and tighten set screw to 2 N·m (15 in. lbs.) torque (Fig. 259).

SHIFT INTERLOCK MECHANISM

REMOVAL

(1) Remove the steering column lower cover (Fig. 269).

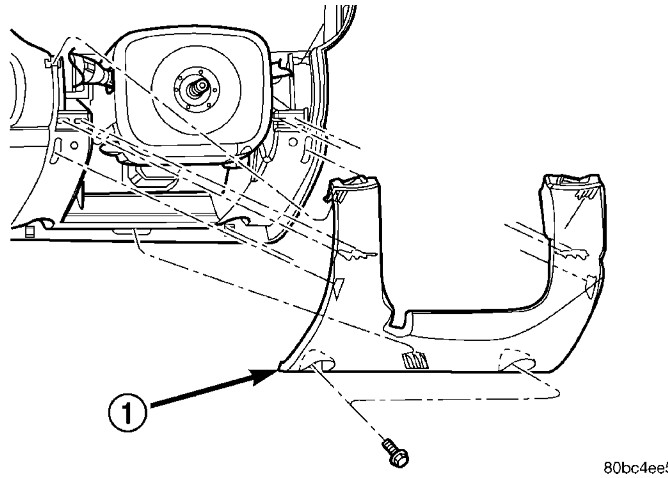


Fig. 269 Steering Column Lower Cover

1 - LOWER COVER

(2) Remove the steering column upper and lower shrouds (Fig. 270).

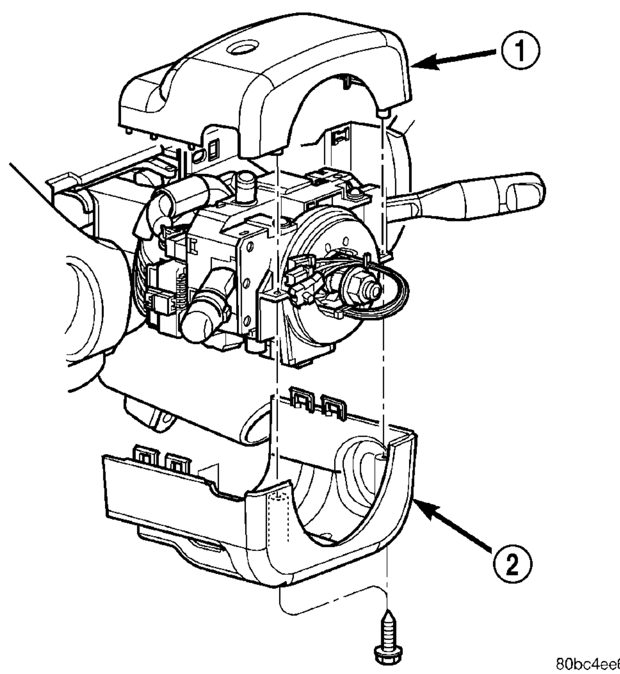


Fig. 270 Steering Column Shrouds

1 - UPPER SHROUD
2 - LOWER SHROUD

SHIFT INTERLOCK MECHANISM (Continued)

(3) Turn the ignition key to the “OFF” or “ON/RUN” position (Fig. 271).

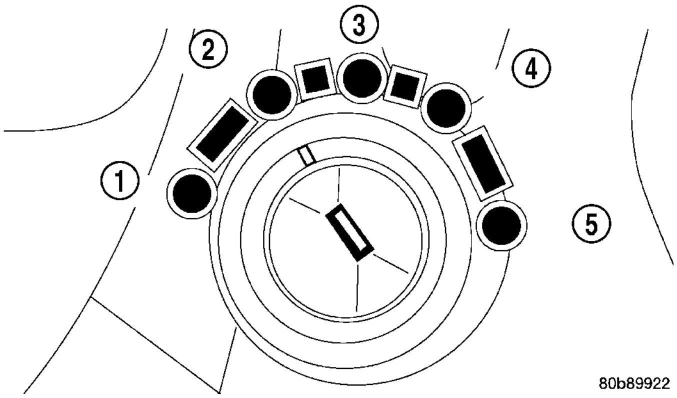


Fig. 271 Ignition Key/Switch Positions

1 - ACC
2 - LOCK
3 - OFF
4 - ON/RUN
5 - START

(4) Grasp the interlock cable and connector firmly. Remove the interlock cable (Fig. 272).

(5) Remove the two interlock mechanism-to-steering column attaching screws (Fig. 273). Remove the interlock housing.

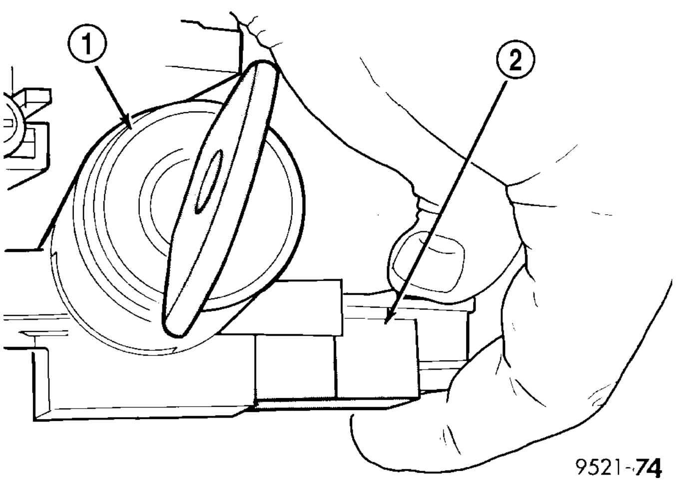


Fig. 272 Interlock Cable

1 - IGNITION LOCK CYLINDER
2 - INTERLOCK CABLE

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 steering column upper and lower shrouds (Fig. 270).

(4) Install steering column lower cover (Fig. 269).

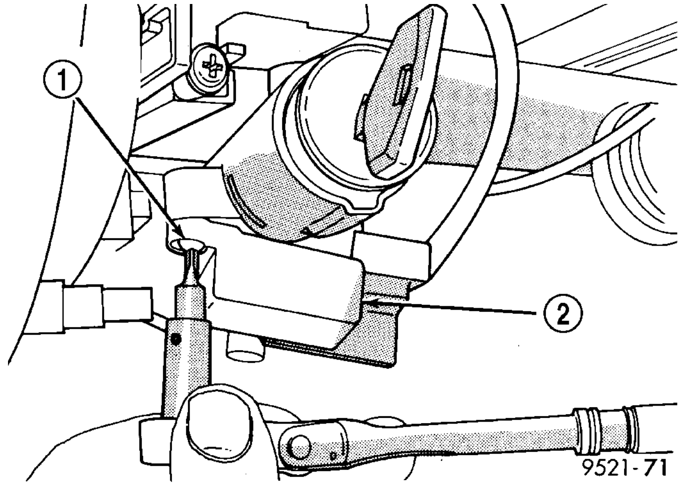


Fig. 273 Interlock Mechanism

1 - MOUNTING SCREW
2 - INTERLOCK MECHANISM

SHIFT INTERLOCK SYSTEM

DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

The following chart describes the normal operation of the Brake Transmission Shift Interlock (BTSI) system. If the “expected response” differs from the vehicle’s response, then system repair and/or adjustment is necessary. Refer to Brake Transmission Interlock Removal and Installation or Adjustment in this Group.

ACTION	EXPECTED RESPONSE
1. Turn key to the ″OFF″ position.	1. Shifter CAN be shifted out of park.
2. Turn key to the ″ON/RUN″ position.	2. Shifter CANNOT be shifted out of park.
3. Turn key to the ″ON/RUN″ position and depress the brake pedal.	3. Shifter CAN be shifted out of park.
4. Leave shifter in any gear and try to return key to the ″LOCK″ or ″ACC″ position.	4. Key cannot be returned to the ″LOCK″ or ″ACC″ position.
5. Return shifter to ″PARK″ and try to remove the key.	5. Key can be removed (after returning to ″LOCK″ position).
6. With the key removed, try to shift out of ″PARK″.	6. Shifter cannot be shifted out of ″PARK″.
NOTE: Any failure to meet these expected responses requires system adjustment or repair.	

SHIFT INTERLOCK SYSTEM (Continued)

ADJUSTMENTS

BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM

VERIFICATION

The following chart describes the normal operation of the Brake Transmission Shift Interlock (BTSI) system. If the “expected response” differs from the vehicle’s response, then system repair and/or adjustment is necessary.

ACTION	EXPECTED RESPONSE
1. Turn key to the ″OFF″ position.	1. Shifter CAN be shifted out of park.
2. Turn key to the ″ON/RUN″ position.	2. Shifter CANNOT be shifted out of park.
3. Turn key to the ″ON/RUN″ position and depress the brake pedal.	3. Shifter CAN be shifted out of park.
4. Leave shifter in any gear and try to return key to the ″LOCK″ or ″ACC″ position.	4. Key cannot be returned to the ″LOCK″ or ″ACC″ position.
5. Return shifter to ″PARK″ and try to remove the key.	5. Key can be removed (after returning to ″LOCK″ position).
6. With the key removed, try to shift out of ″PARK″.	6. Shifter cannot be shifted out of ″PARK″.
NOTE: Any failure to meet these expected responses requires system adjustment or repair.	

ADJUSTMENT

(1) Loosen set screw and remove knob from shifter handle (Fig. 274).

(2) Remove the center console assembly as shown in (Fig. 275).

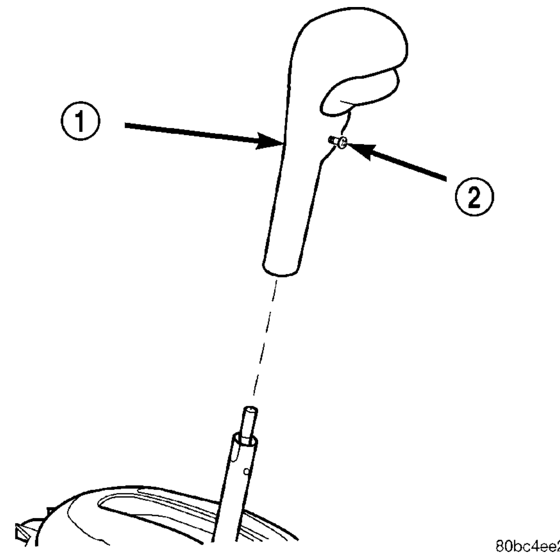


Fig. 274 Gearshift Knob Removal/Installation

1 - SHIFTER KNOB
2 - SET SCREW

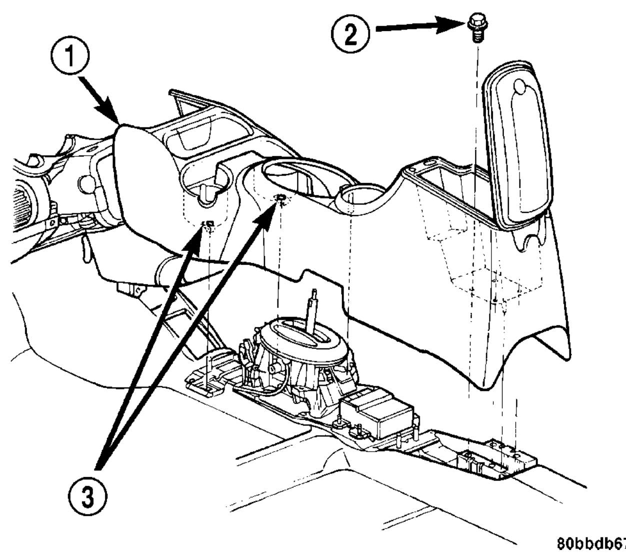


Fig. 275 Center Console Assembly

1 - CONSOLE
2 - SCREW (4)
3 - SCREW (2)

SHIFT INTERLOCK SYSTEM (Continued)

(3) Remove shifter bezel (Fig. 276).

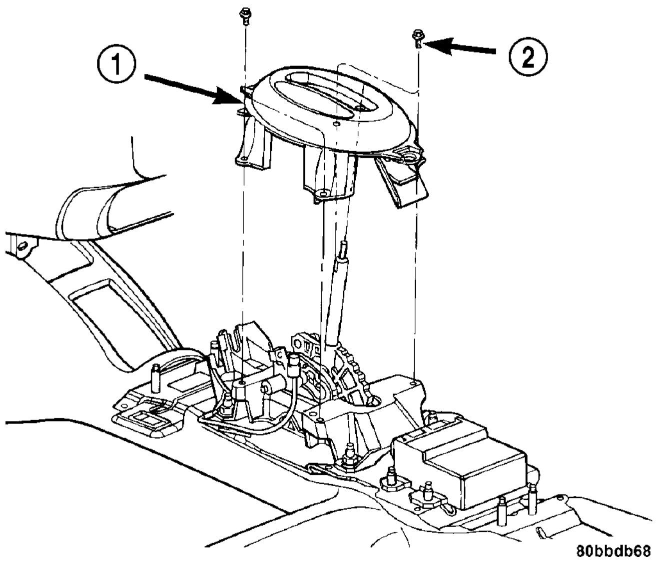


Fig. 276 Shifter Bezel Removal/Installation

1 - BEZEL
2 - SCREW (4)

(4) **Adjust interlock cable/system as follows:**Pry up on cable adjuster lock to release and allow cable to "self-adjust". Lock cable adjustment by pressing down on the adjuster lock until bottomed at the cable housing.

(5) Verify correct system operation. Refer to verification procedure.

(6) Install shifter bezel (Fig. 276).

(7) Install center console assembly (Fig. 275).

(8) Install gearshift knob and tighten set screw to 2 N·m (15 in. lbs.) torque (Fig. 274).

SOLENOID/PRESSURE SWITCH ASSY

DESCRIPTION

The Solenoid/Pressure Switch Assembly (Fig. 277) is external to the transaxle and mounted to the transaxle case. The assembly consists of four solenoids that control hydraulic pressure to the LR/CC, 2/4, OD, and UD friction elements. The reverse clutch is controlled by line pressure from the manual valve in the valve body. The solenoids are contained within the Solenoid/Pressure Switch Assembly, and can only be serviced by replacing the assembly.

The solenoid assembly also contains pressure switches that monitor and send hydraulic circuit information to the PCM/TCM. Likewise, the pressure switches can only be service by replacing the assembly.

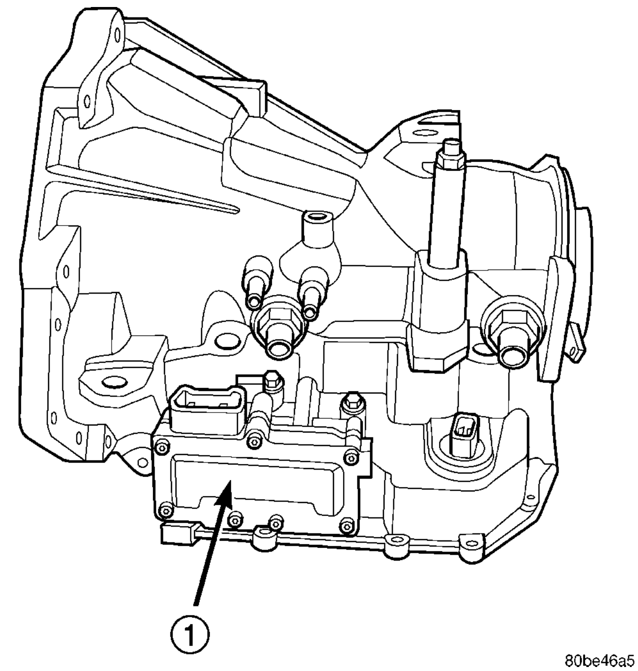


Fig. 277 Solenoid/Pressure Switch Assembly

1 - SOLENOID AND PRESSURE SWITCH ASSEMBLY

OPERATION

SOLENOIDS

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The PCM/TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid needed. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The 2/4 and UD solenoids are normally applied, which by design allow fluid to pass through in their relaxed or "off" state. This allows transaxle limp-in (P,R,N,2) in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM/TCM during this test. It no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The PCM/TCM relies on three pressure switches to monitor fluid pressure in the L/R, 2/4, and OD hydraulic circuits. The primary purpose of these switches is to help the PCM/TCM detect when clutch circuit hydraulic failures occur. The range for the

SOLENOID/PRESSURE SWITCH ASSY (Continued)

pressure switch closing and opening points is 11-23 psi. Typically the switch opening point will be approximately one psi lower than the closing point. For example, a switch may close at 18 psi and open at 17 psi. The switches are continuously monitored by the PCM/TCM for the correct states (open or closed) in each gear as shown in the following chart:

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

A Diagnostic Trouble Code (DTC) will set if the PCM/TCM senses any switch open or closed at the wrong time in a given gear.

The PCM/TCM also tests the 2/4 and OD pressure switches when they are normally off (OD and 2/4 are tested in 1st gear, OD in 2nd gear, and 2/4 in 3rd gear). The test simply verifies that they are operational, by looking for a closed state when the corresponding element is applied. Immediately after a shift into 1st, 2nd, or 3rd gear with the engine speed above 1000 rpm, the PCM/TCM momentarily turns on element pressure to the 2/4 and/or OD clutch circuits to identify that the appropriate switch has closed. If it doesn't close, it is tested again. If the switch fails to close the second time, the appropriate Diagnostic Trouble Code (DTC) will set.

REMOVAL

NOTE: If solenoid/pressure switch assembly is being replaced, it is necessary to perform the TCM Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Disconnect battery negative cable.

(2) Remove air cleaner/throttle body assembly.

(3) Disconnect solenoid/pressure switch assembly connector.

(4) Disconnect input speed sensor connector.

(5) Remove input speed sensor (Fig. 278).

(6) Remove three (3) solenoid/pressure switch assembly-to-transaxle case bolts (Fig. 279).

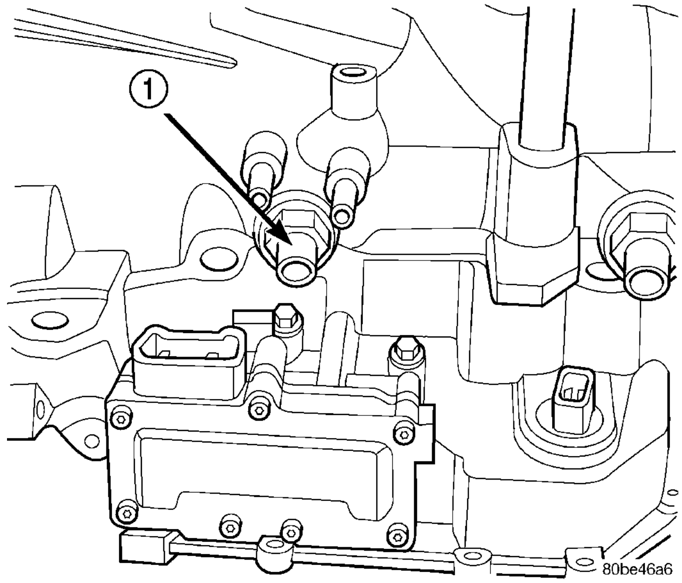


Fig. 278 Input Speed Sensor

1 - INPUT SPEED SENSOR

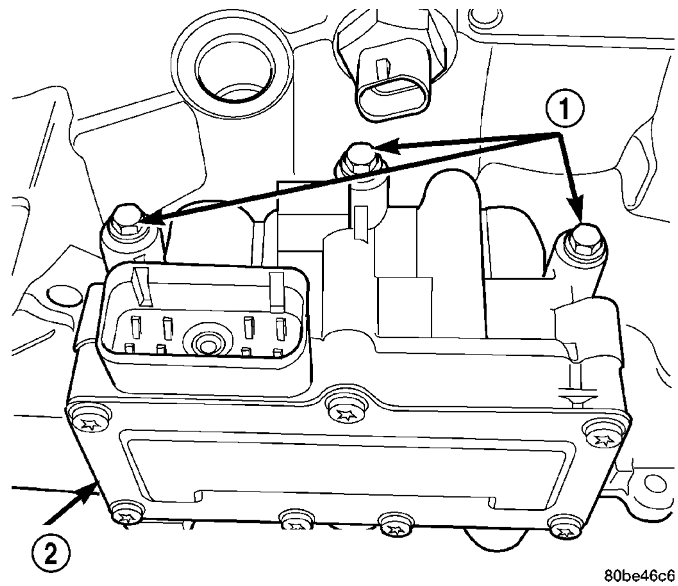


Fig. 279 Solenoid/Pressure Switch Assembly-to-Case Bolts

1 - BOLTS
2 - SOLENOID AND PRESSURE SWITCH ASSEMBLY

SOLENOID/PRESSURE SWITCH ASSY (Continued)

(7) Remove solenoid/pressure switch assembly and gasket (Fig. 280). Use care to prevent gasket material and foreign objects from become lodged in the transaxle case ports.

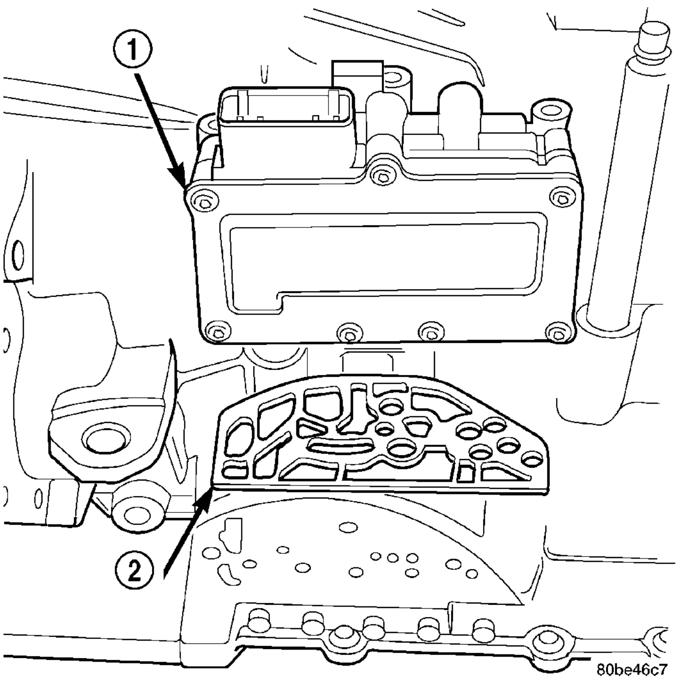


Fig. 280 Solenoid/Pressure Switch Assembly and Gasket

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - GASKET

INSTALLATION

NOTE: If solenoid/pressure switch assembly is being replaced, it is necessary to perform the TCM Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install solenoid/pressure switch assembly and new gasket to transaxle (Fig. 280).
(2) Install and torque three (3) bolts (Fig. 279) to 13 N·m (110 in. lbs.).
(3) Install input speed sensor (Fig. 278) and torque to 27 N·m (20 ft. lbs.).
(4) Connect input speed sensor connector.
(5) Install solenoid/pressure switch 8-way connector and torque to 4 N·m (35 in. lbs.).
(6) Install air cleaner/throttle body assembly.
(7) Connect battery negative cable.
(8) If solenoid/pressure switch assembly was replaced, perform TCM Quick Learn procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

SPEED SENSOR - INPUT

DESCRIPTION

The Input Speed Sensor is a two-wire magnetic pickup device that generates AC signals as rotation occurs. It is threaded into the transaxle case (Fig. 281), sealed with an o-ring (Fig. 282), and is considered a primary input to the Powertrain/Transmission Control Module.

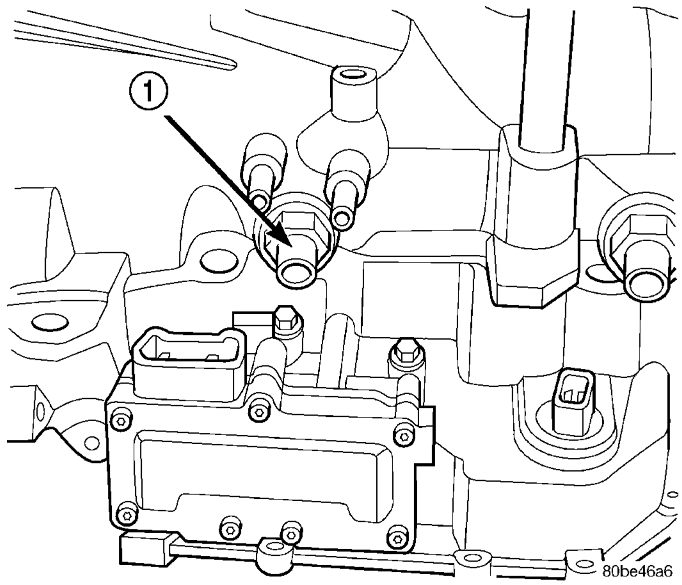


Fig. 281 Input Speed Sensor Location

1 - INPUT SPEED SENSOR

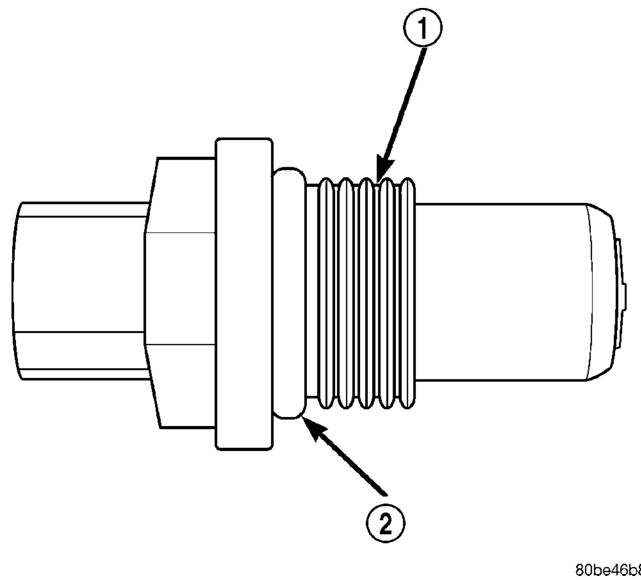


Fig. 282 O-Ring Location

1 - INPUT SPEED SENSOR
2 - O-RING

SPEED SENSOR - INPUT (Continued)

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil (Fig. 283), an AC voltage is generated and sent to the PCM/TCM. The PCM/TCM interprets this information as input shaft rpm.

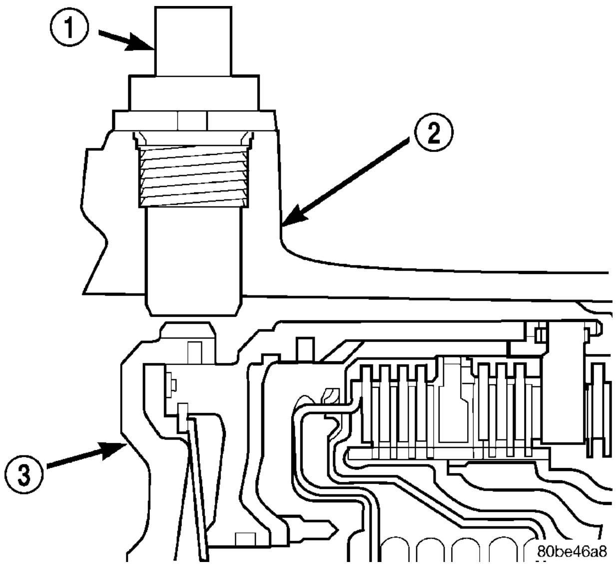


Fig. 283 Sensor Relation to Input Clutch Hub

1 - INPUT SPEED SENSOR
2 - TRANSAXLE CASE
3 - INPUT CLUTCH HUB

The PCM/TCM compares the input speed signal with output speed signal to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The PCM/TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Disconnect battery negative cable.

(2) Remove air cleaner/throttle body assembly.

(3) Disconnect input speed sensor connector.

(4) Unscrew and remove input speed sensor (Fig. 284).

(5) Inspect speed sensor o-ring (Fig. 285) and replace if necessary.

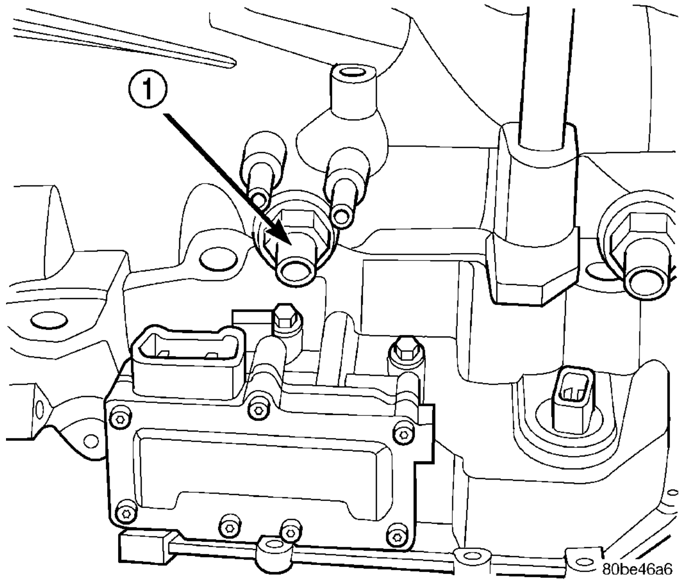


Fig. 284 Input (Turbine) Speed Sensor

1 - INPUT SPEED SENSOR

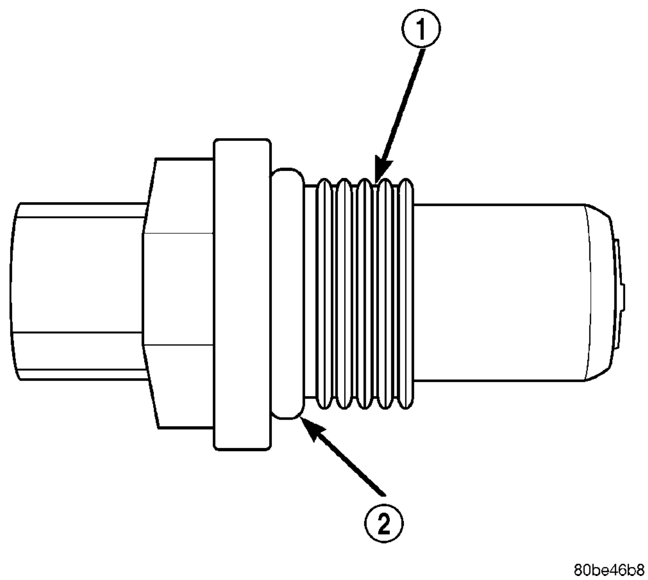


Fig. 285 O-ring Location

1 - INPUT SPEED SENSOR
2 - O-RING

INSTALLATION

(1) Verify o-ring is installed into position.

(2) Install and tighten input speed sensor to 27 N·m (20 ft. lbs.).

(3) Connect speed sensor connector.

(4) Install air cleaner/throttle body assembly.

(5) Connect battery negative cable.

SPEED SENSOR - OUTPUT

DESCRIPTION

The Output Speed Sensor is a two-wire magnetic pickup device that generates an AC signal as rotation occurs. It is threaded into the transaxle case (Fig. 286), sealed with an o-ring (Fig. 287), and is considered a primary input to the Powetrain/Transmission Control Module.

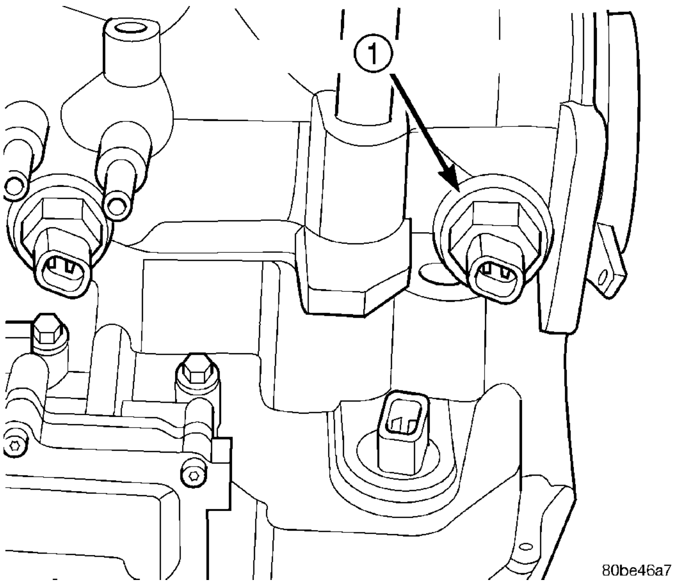


Fig. 286 Output Speed Sensor

1 - OUTPUT SPEED SENSOR

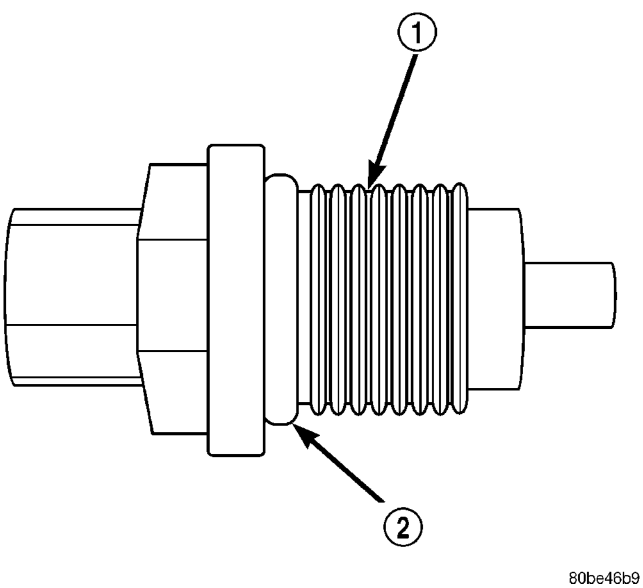


Fig. 287 O-Ring Location

1 - OUTPUT SPEED SENSOR
2 - O-RING

OPERATION

The Output Speed Sensor provides information on how fast the output shaft is rotating. As the rear planetary carrier park pawl lugs pass by the sensor coil (Fig. 288), an AC voltage is generated and sent to the PCM/TCM. The PCM/TCM interprets this information as output shaft rpm.

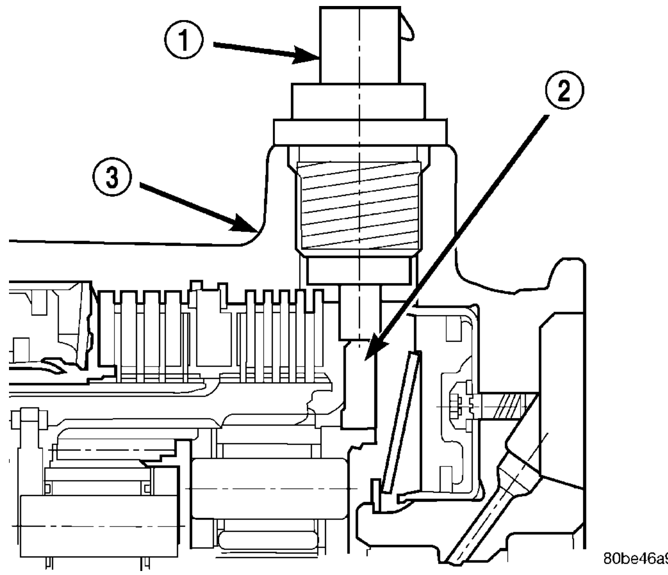


Fig. 288 Sensor Relation to Planet Carrier Park Pawl

1 - OUTPUT SPEED SENSOR
2 - REAR PLANET CARRIER/OUTPUT SHAFT ASSEMBLY
3 - TRANSAXLE CASE

The PCM/TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

VEHICLE SPEED SIGNAL

The vehicle speed signal is taken from the Output Speed Sensor. The PCM converts this signal into a pulse per mile signal and sends the vehicle speed message across the communication bus to the BCM. The BCM sends this signal to the Instrument Cluster to display vehicle speed to the driver. The vehicle speed signal pulse is roughly 8000 pulses per mile.

SPEED SENSOR - OUTPUT (Continued)

REMOVAL

(1) Disconnect battery negative cable.

(2) Raise vehicle on hoist.

(3) Disconnect output speed sensor connector (Fig. 289).

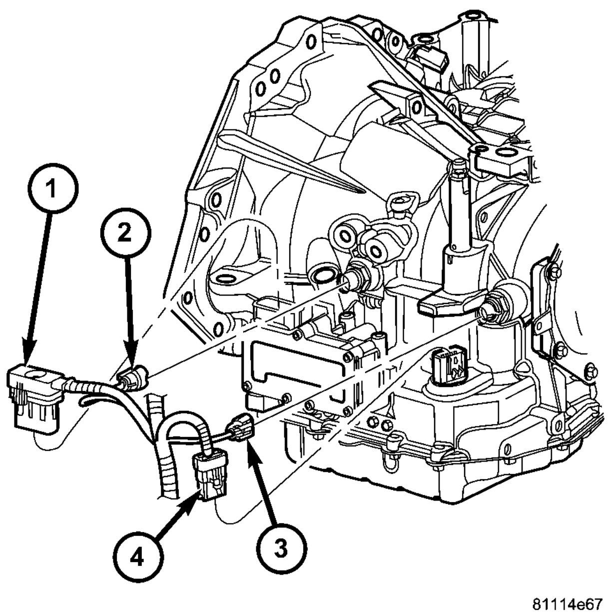


Fig. 289 Transmission Connectors

1 - SOLENOID PACK CONNECTOR
2 - INPUT SPEED SENSOR CONNECTOR
3 - OUTPUT SPEED SENSOR CONNECTOR
4 - TRANSMISSION RANGE SENSOR CONNECTOR

(4) Unscrew and remove output speed sensor (Fig. 290).

(5) Inspect speed sensor o-ring (Fig. 291) and replace if necessary.

INSTALLATION

(1) Verify o-ring is installed into position (Fig. 291).

(2) Install and tighten input speed sensor to 27 N·m (20 ft. lbs.).

(3) Connect speed sensor connector (Fig. 289).

(4) Connect battery negative cable.

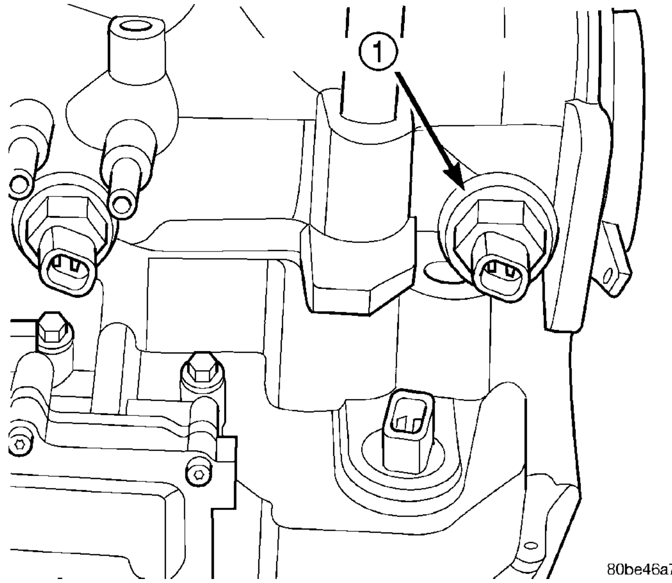


Fig. 290 Output Speed Sensor

1 - OUTPUT SPEED SENSOR

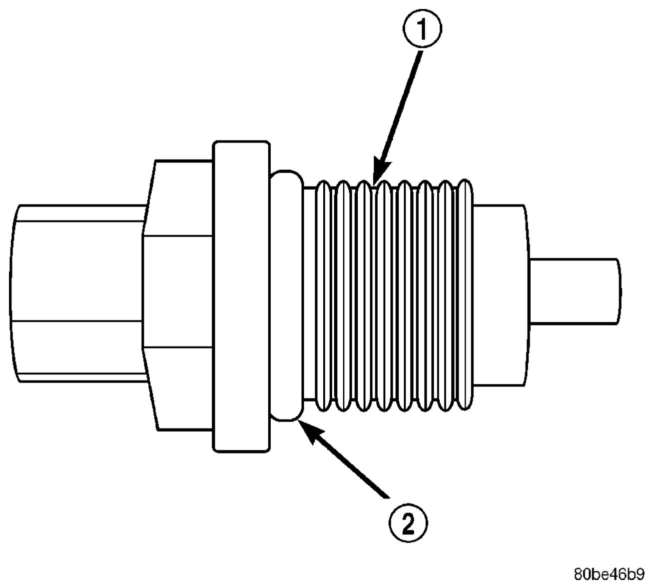


Fig. 291 O-ring Location

1 - OUTPUT SPEED SENSOR
2 - O-RING

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 292) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The converter clutch engages in third gear. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

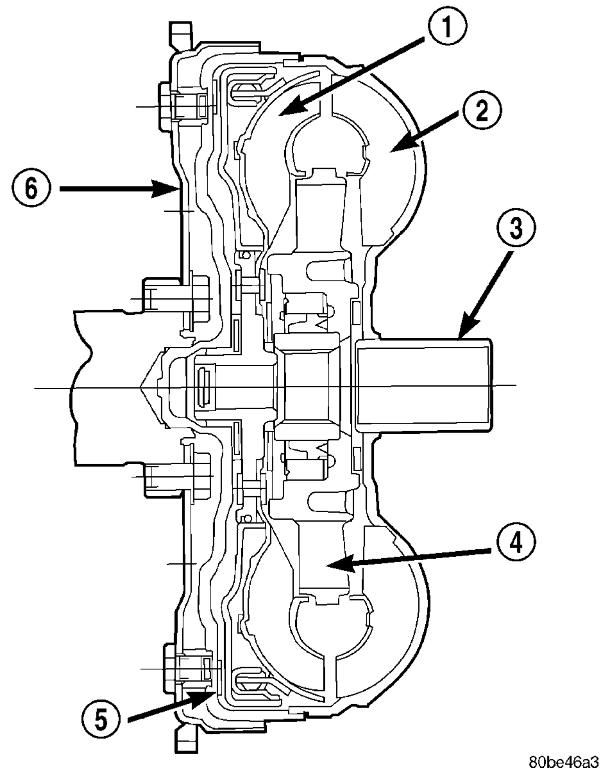


Fig. 292 Torque Converter Assembly

1 - TURBINE
2 - IMPELLER
3 - HUB
4 - STATOR
5 - CONVERTER CLUTCH DISC
6 - DRIVE PLATE

TORQUE CONVERTER (Continued)

IMPELLER

The impeller (Fig. 293) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving member of the system.

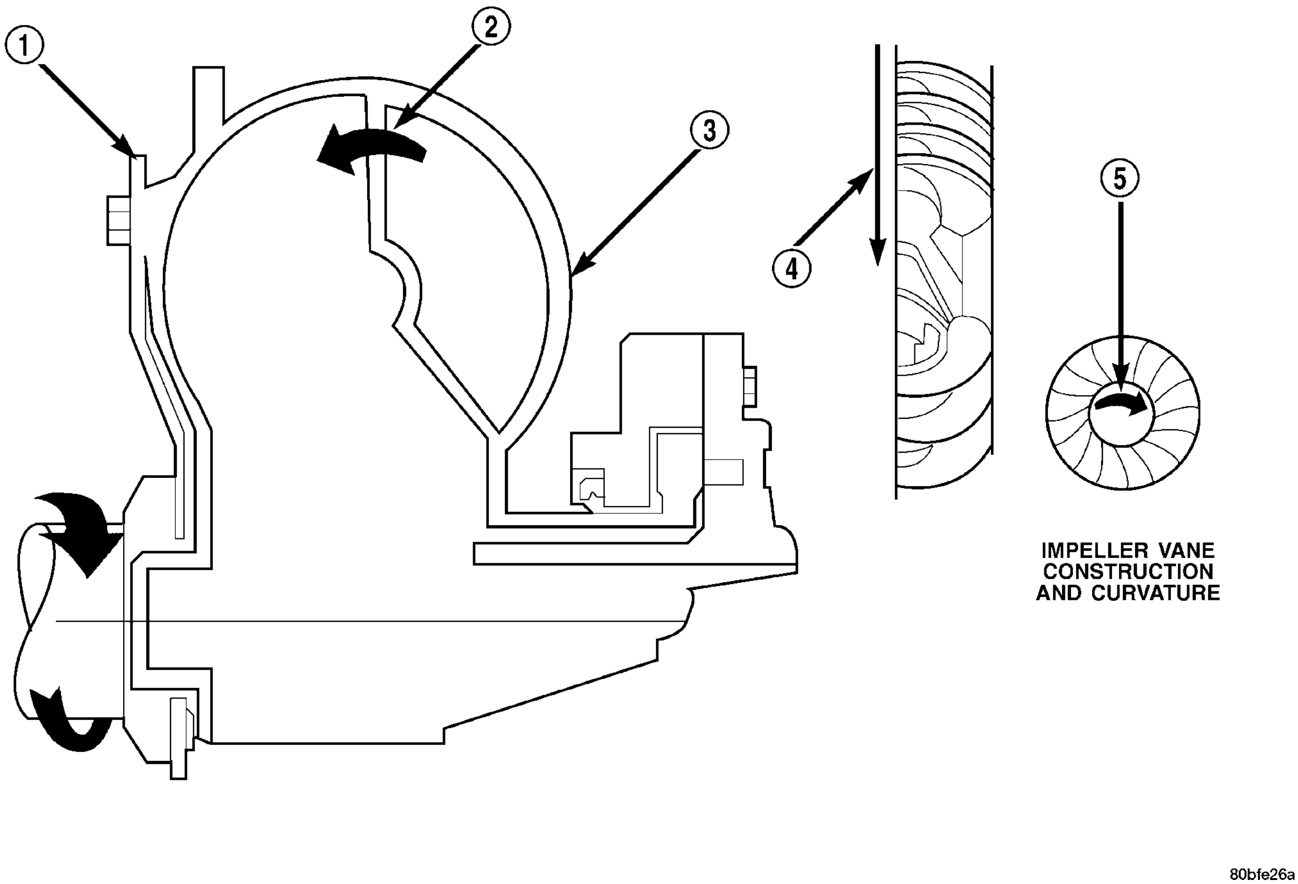


Fig. 293 Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

TORQUE CONVERTER (Continued)

TURBINE

The turbine (Fig. 294) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

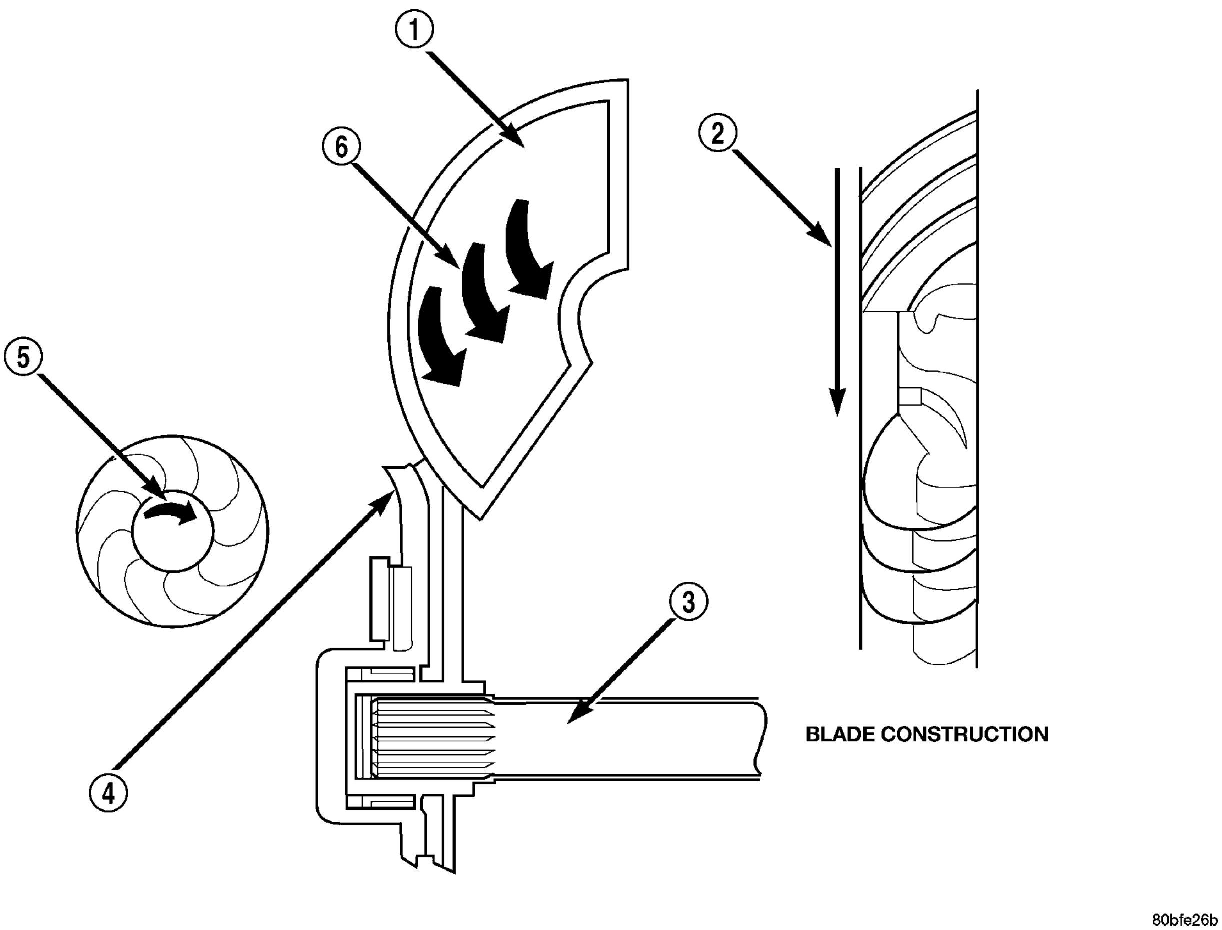


Fig. 294 Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

TORQUE CONVERTER (Continued)

STATOR

The stator assembly (Fig. 295) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 296). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

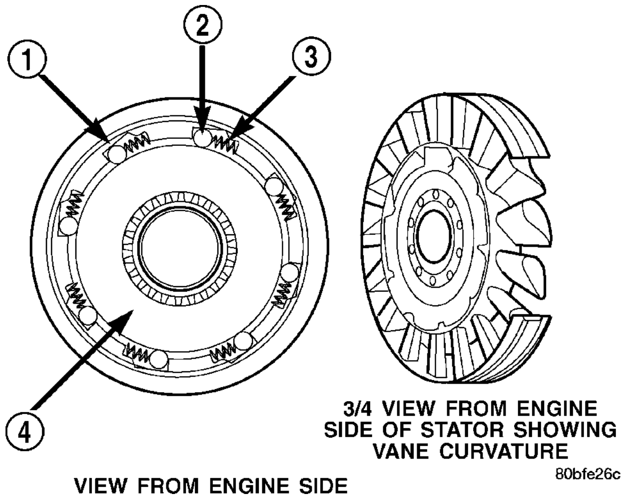


Fig. 295 Stator Components

1 - CAM (OUTER RACE)
2 - ROLLER
3 - SPRING
4 - INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 297) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock–free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston was added to the turbine, and a friction material was added to the inside of the front cover to provide this mechanical lock-up.

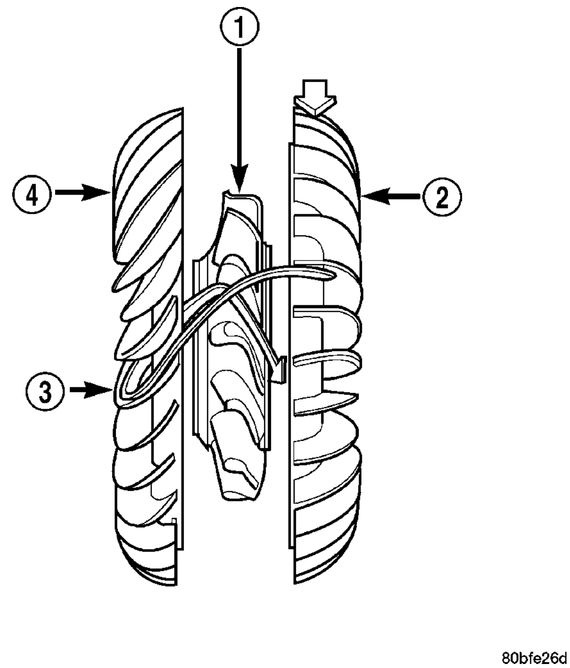


Fig. 296 Stator Location

1 - STATOR
2 - IMPELLER
3 - FLUID FLOW
4 - TURBINE

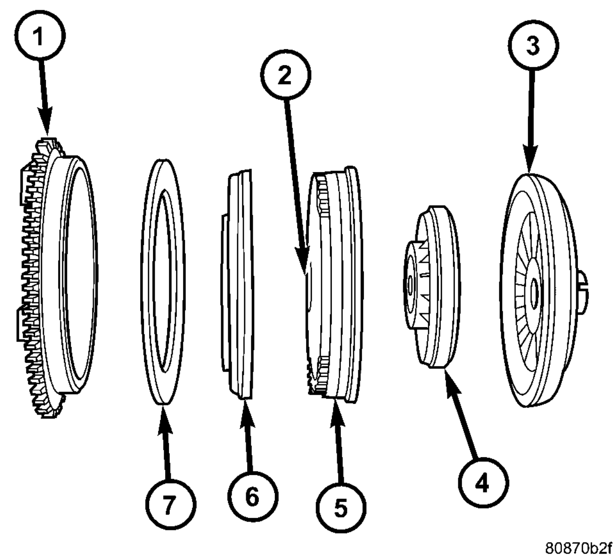


Fig. 297 Torque Converter Clutch (TCC)

1 - IMPELLER FRONT COVER
2 - THRUST WASHER ASSEMBLY
3 - IMPELLER
4 - STATOR
5 - TURBINE
6 - PISTON
7 - FRICTION DISC

TORQUE CONVERTER (Continued)

OPERATION

The converter impeller (Fig. 298) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 299). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over–running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock–up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston to the front cover's friction material, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The engagement and disengagement of the TCC are automatic and controlled by the Powertrain Control Module (PCM). The engagement cannot be activated in the lower gears because it eliminates the torque multiplication effect of the torque converter necessary for acceleration. Inputs that determine

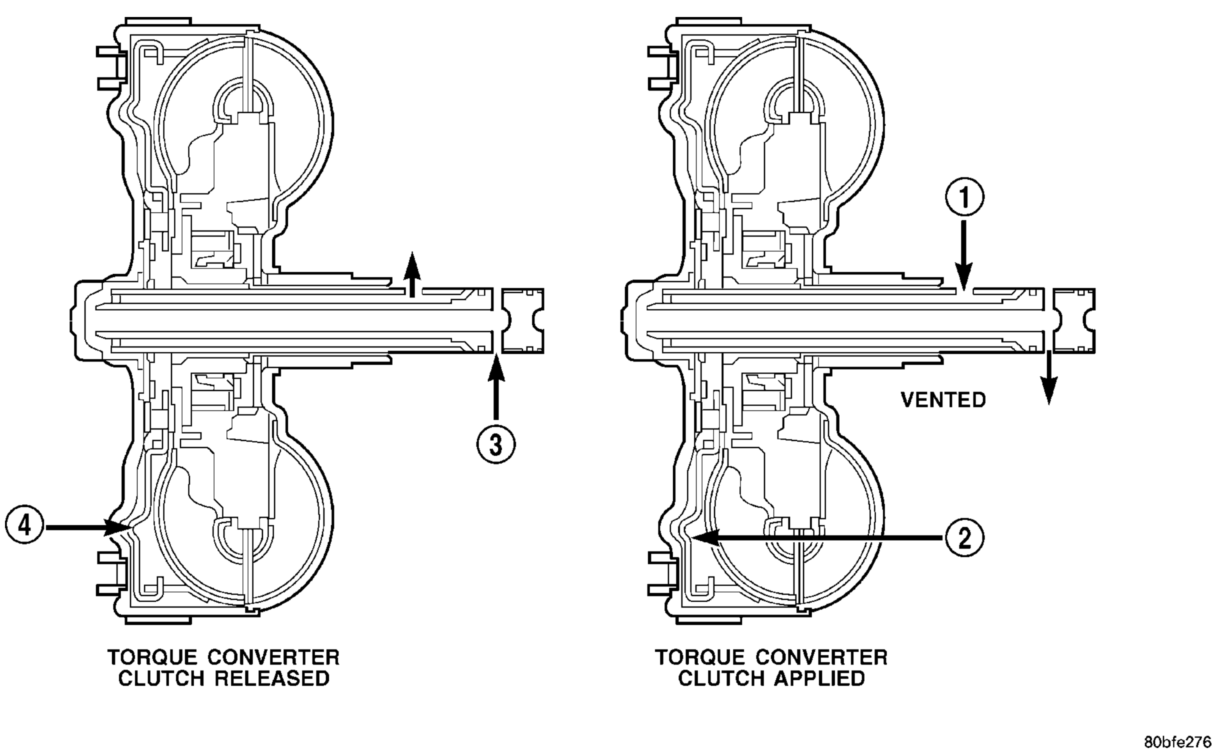


Fig. 298 Torque Converter Fluid Operation

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TORQUE CONVERTER (Continued)

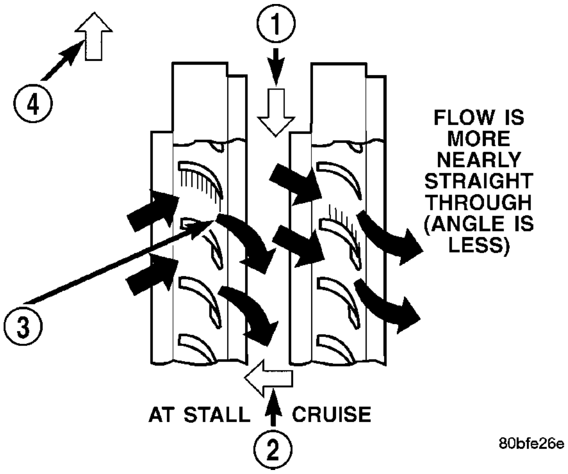


Fig. 299 Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

clutch engagement are: coolant temperature, vehicle speed and throttle position. The torque converter clutch is engaged by the clutch solenoid on the valve body. The clutch will engage at approximately 56 km/h (35 mph) with light throttle, after the shift to third gear.

REMOVAL

(1) Remove transmission and torque converter from vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE - REMOVAL)

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate converter hub and oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 300). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE - INSTALLATION)

(9) Fill the transmission with the recommended fluid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/FLUID - STANDARD PROCEDURE)

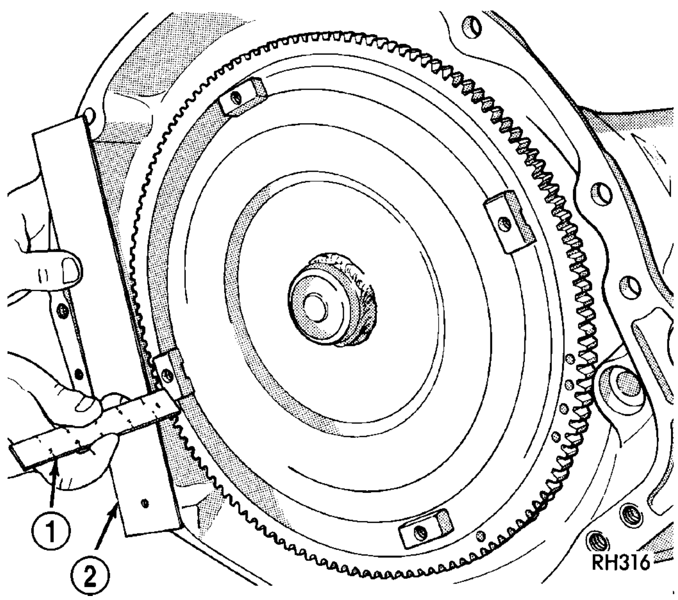


Fig. 300 Checking Torque Converter Seating

1 - SCALE
2 - STRAIGHTEDGE

TRANSMISSION CONTROL RELAY

DESCRIPTION

The transmission control relay (Fig. 301) is located in the Power Distribution Center (PDC), which is located on the left side of the engine compartment.

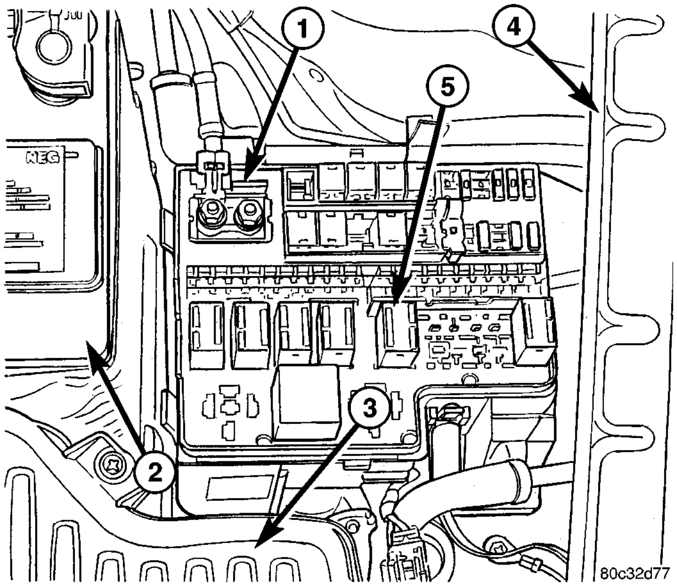


Fig. 301 Transmission Control Relay Location

1 - POWER DISTRIBUTION CENTER (PDC)
2 - BATTERY
3 - AIR CLEANER/THROTTLE BODY ASSY.
4 - LEFT FENDER
5 - TRANSMISSION CONTROL RELAY

OPERATION

The relay is supplied fused B+ voltage, energized by the PCM/TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode. When the relay is "off", no power is supplied to the solenoid pack and the transmission is in "limp-in" mode. After a controller reset (ignition key turned to the "run" position or after cranking engine), the PCM/TCM energizes the relay. Prior to this, the PCM/TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the PCM/TCM monitors the terminals to verify that the voltage is greater than 3 volts.

TRANSMISSION RANGE SENSOR

DESCRIPTION

The Transmission Range Sensor (TRS) is mounted to the top of the valve body inside the transaxle and can only be serviced by removing the valve body. The electrical connector extends through the transaxle case (Fig. 302).

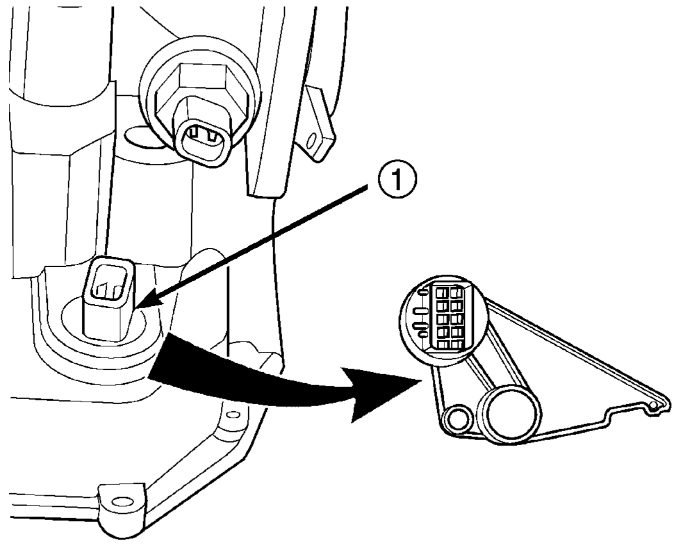


Fig. 302 Transmission Range Sensor (TRS) Location

1 - TRANSMISSION RANGE SENSOR

The Transmission Range Sensor (TRS) has four switch contacts that monitor shift lever position and send the information to the PCM/TCM.

The TRS also has an integrated temperature sensor (thermistor) that communicates transaxle temperature to the TCM and PCM (Fig. 303).

OPERATION

The Transmission Range Sensor (TRS) (Fig. 302) communicates shift lever position (SLP) to the PCM/TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the PCM/TCM receives from four sense circuits. The PCM/TCM interprets this information and determines the appropriate transaxle gear position and shift schedule.

Since there are four switches, there are 16 possible combinations of open and closed switches (codes). Seven of these codes are related to gear position and three are recognized as "between gear" codes. This results in six codes which should never occur. These are called "invalid" codes. An invalid code will result

TRANSMISSION RANGE SENSOR (Continued)

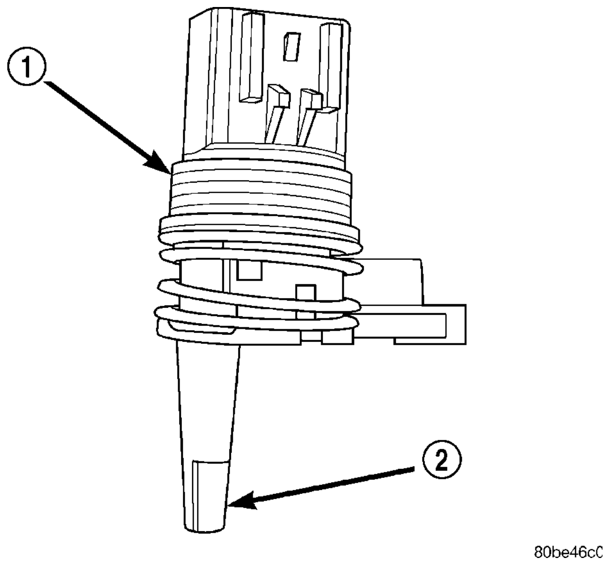


Fig. 303 Transmission Temperature Sensor

1 - TRANSMISSION RANGE SENSOR
2 - TEMPERATURE SENSOR

in a DTC, and the PCM/TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

TRS SWITCH STATES

SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
OD	OP	OP	OP	CL
3	OP	OP	CL	OP
L	CL	OP	CL	CL

TRANSMISSION TEMPERATURE SENSOR

The TRS has an integrated thermistor (Fig. 303) that the PCM/TCM uses to monitor the transmission's sump temperature. Since fluid temperature can affect transmission shift quality and convertor lock up, the PCM/TCM requires this information to determine which shift schedule to operate in. The PCM also monitors this temperature data so it can energize the vehicle cooling fan(s) when a transmission "overheat" condition exists. If the thermistor circuit fails, the PCM/TCM will revert to calculated oil temperature usage.

CALCULATED TEMPERATURE

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

REMOVAL

(1) Remove valve body assembly from transaxle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/VALVE BODY - REMOVAL)

(2) Remove transmission range sensor retaining screw and remove sensor from valve body (Fig. 304).

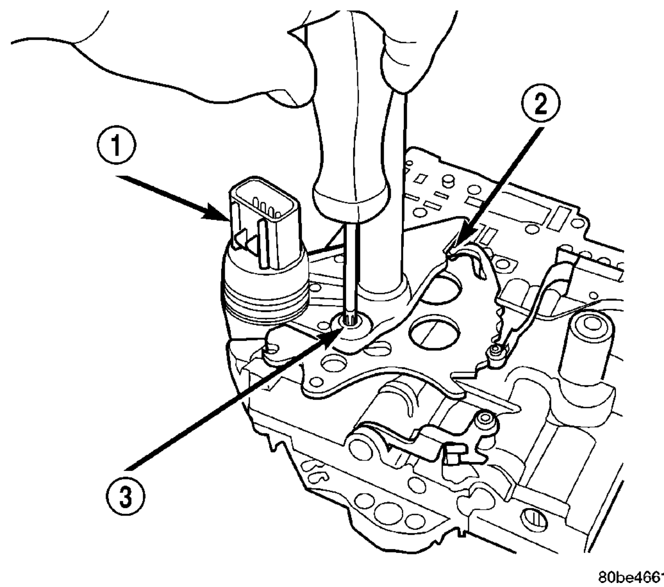


Fig. 304 Remove Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL VALVE CONTROL PIN
3 - RETAINING SCREW

(3) Remove TRS from manual shaft.

INSTALLATION

(1) Install transmission range sensor (TRS) to the valve body and torque retaining screw (Fig. 304) to 5 N·m (45 in. lbs.).

(2) Install valve body to transaxle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/VALVE BODY - INSTALLATION)

VALVE BODY

DESCRIPTION

The valve body assembly consists of a cast aluminum valve body, a separator plate, and transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, solenoid/pressure switch assembly, and frictional clutches. The valve body contains the following components (Fig. 305):

- Regulator valve
- Solenoid switch valve
- Manual valve
- Converter clutch switch valve
- Converter clutch control valve
- Torque converter regulator valve
- Low/Reverse switch valve

In addition, the valve body also contains the thermal valve, #2,3&4 check balls, the #5 (overdrive) check valve and the 2/4 accumulator assembly. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/VALVE BODY - DISASSEMBLY)

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

REGULATOR VALVE

The regulator valve controls hydraulic pressure in the transaxle. It receives unregulated pressure from the pump, which works against spring tension to maintain oil at specific pressures. A system of sleeves and ports allows the regulator valve to work at one of three predetermined pressure levels. Regulated oil pressure is also referred to as "line pressure."

SOLENOID SWITCH VALVE

The solenoid switch valve controls line pressure from the LR/CC solenoid. In one position, it allows the low/reverse clutch to be pressurized. In the other, it directs line pressure to the converter control and converter clutch valves.

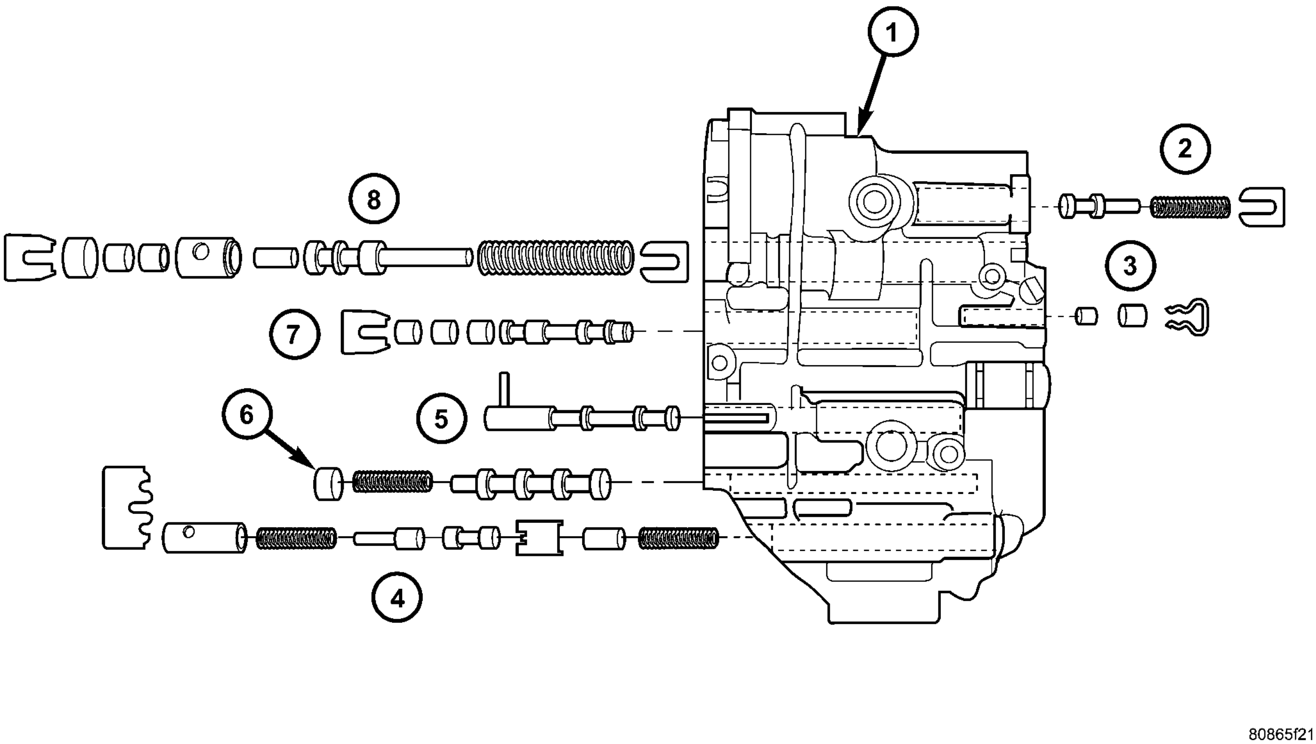


Fig. 305 Valve Body Assembly

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

VALVE BODY (Continued)

MANUAL VALVE

The manual valve is operated by the mechanical shift linkage. Its primary responsibility is to send line pressure to the appropriate hydraulic circuits and solenoids. The valve has three operating ranges or positions.

CONVERTER CLUTCH SWITCH VALVE

The main responsibility of the converter clutch switch valve is to control hydraulic pressure applied to the front (off) side of the converter clutch piston. Line pressure from the regulator valve is fed to the torque converter regulator valve, where it passes through the valve, and is slightly regulated. The pressure is then directed to the converter clutch switch valve and to the front side of the converter clutch piston. This pressure pushes the piston back and disengages the converter clutch.

CONVERTER CLUTCH CONTROL VALVE

The converter clutch control valve controls the back (on) side of the torque converter clutch. When the PCM/TCM energizes or modulates the LR/CC solenoid to apply the converter clutch piston, both the converter clutch control valve and the converter control valve move, allowing pressure to be applied to the back side of the clutch.

T/C REGULATOR VALVE

The torque converter regulator valve slightly regulates the flow of fluid to the torque converter.

LOW/REVERSE SWITCH VALVE

The low/reverse clutch is applied from different sources, depending on whether low (1st) gear or reverse is selected. The low/reverse switch valve alternates positions depending on from which direction fluid pressure is applied. By design, when the valve is shifted by fluid pressure from one channel, the opposing channel is blocked. The switch valve alienates the possibility of a sticking ball check, thus providing consistent application of the low/reverse clutch under all operating conditions.

REMOVAL

NOTE: If valve body is replaced or reconditioned, the TCM Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Disconnect battery negative cable.
(2) Remove air cleaner/throttle body assembly.
(3) Disconnect gearshift cable from manual valve lever.
(4) Remove manual valve lever from manual shaft.
(5) Disconnect transmission range sensor (TRS).
(6) Raise vehicle on hoist.
(7) Remove oil pan bolts (Fig. 306).

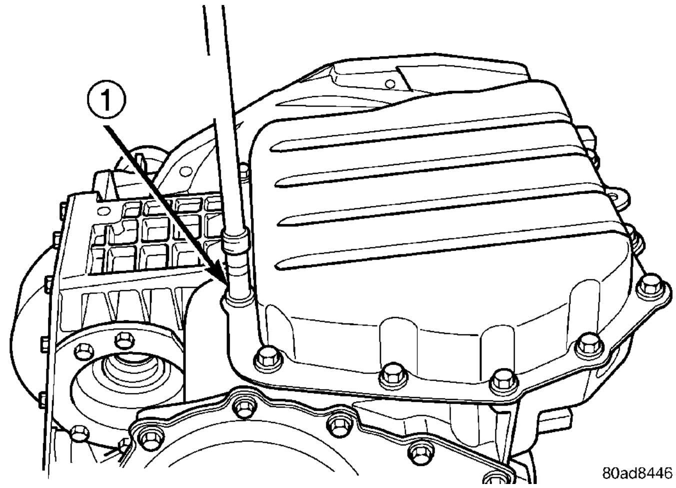


Fig. 306 Oil Pan Bolts

1 - OIL PAN BOLTS (USE RTV UNDER BOLT HEADS)

(8) Remove oil pan (Fig. 307).

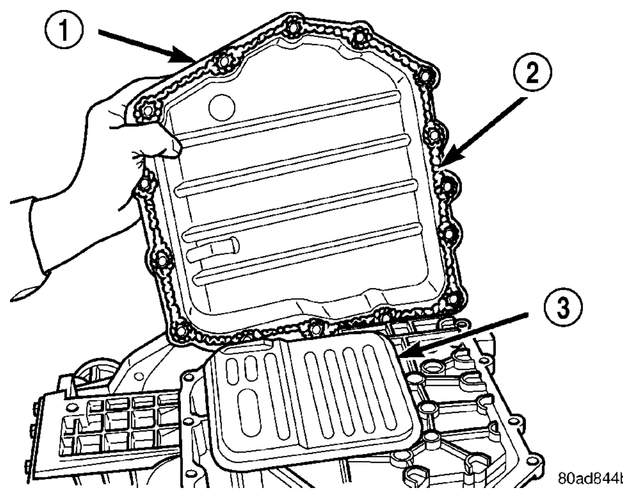


Fig. 307 Oil Pan

1 - OIL PAN
2 - 1/8 INCH BEAD OF RTV SEALANT
3 - OIL FILTER

VALVE BODY (Continued)

(9) Remove oil filter (Fig. 308).

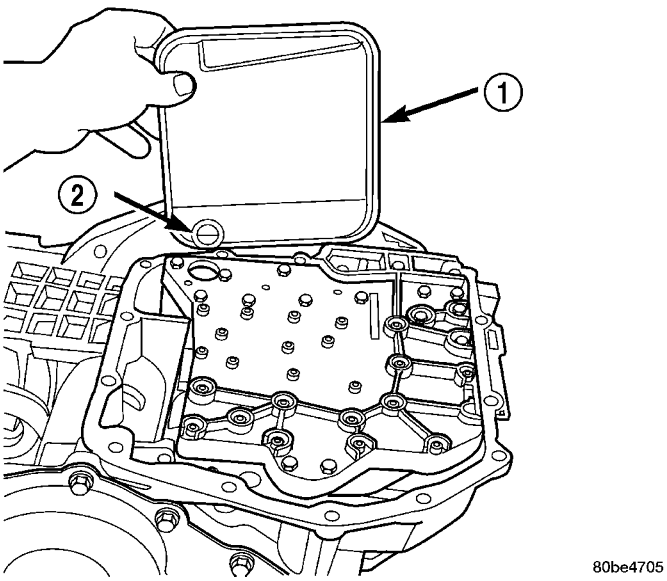


Fig. 308 Oil Filter

1 - OIL FILTER
2 - O-RING

(10) Remove the valve body-to-transaxle case bolts (Fig. 309).

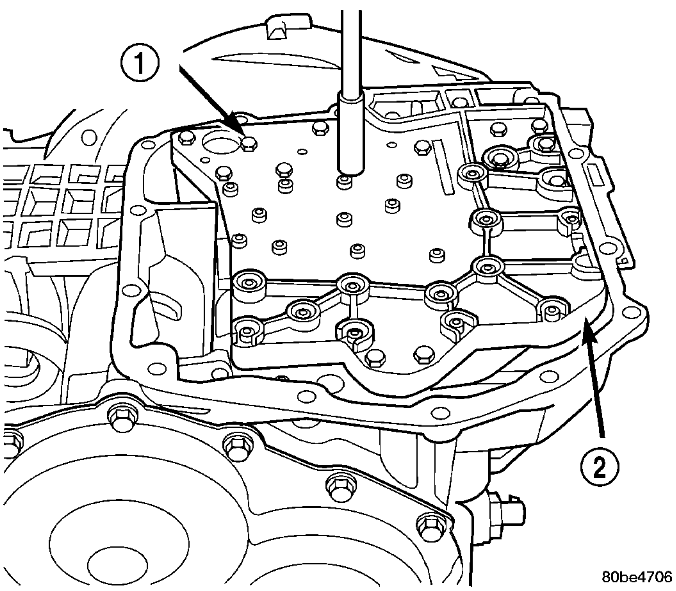


Fig. 309 Valve Body-to-Case Bolts

1 - VALVE BODY ATTACHING BOLTS (18)
2 - VALVE BODY

NOTE: To ease removal of the valve body, turn the manual valve lever fully clockwise to low or first gear.

(11) Remove park rod rollers from guide bracket and remove valve body from transaxle (Fig. 310) (Fig. 311).

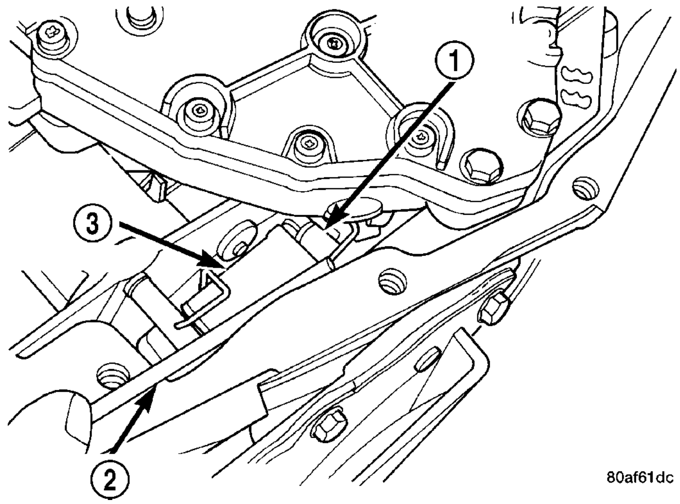


Fig. 310 Push Park Rod Rollers from Guide Bracket

1 - PARK SPRAG ROLLERS
2 - SCREWDRIVER
3 - PARK SPRAG GUIDE BRACKET

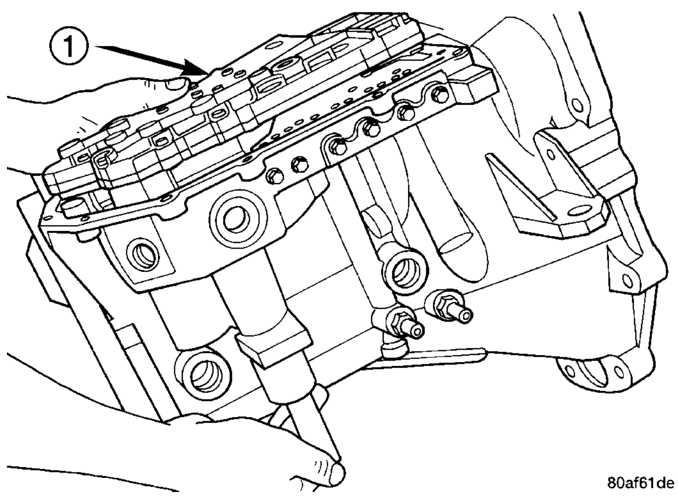


Fig. 311 Valve Body Removal/Installation

1 - VALVE BODY

CAUTION: The valve body manual shaft pilot may distort and bind the manual valve if the valve body is mishandled or dropped.

VALVE BODY (Continued)

DISASSEMBLY

NOTE: If valve body assembly is being reconditioned, the PCM/TCM Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Remove manual shaft seal (Fig. 312).

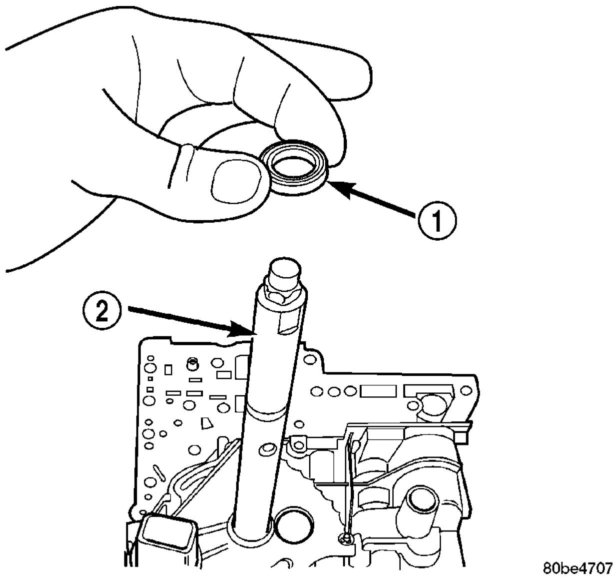


Fig. 312 Manual Shaft Seal

1 - SEAL
2 - MANUAL SHAFT

(2) Remove Transmission Range Sensor retaining screw (Fig. 313).

(3) Remove Manual Shaft/Rooster Comb and Transmission Range Sensor (Fig. 314).

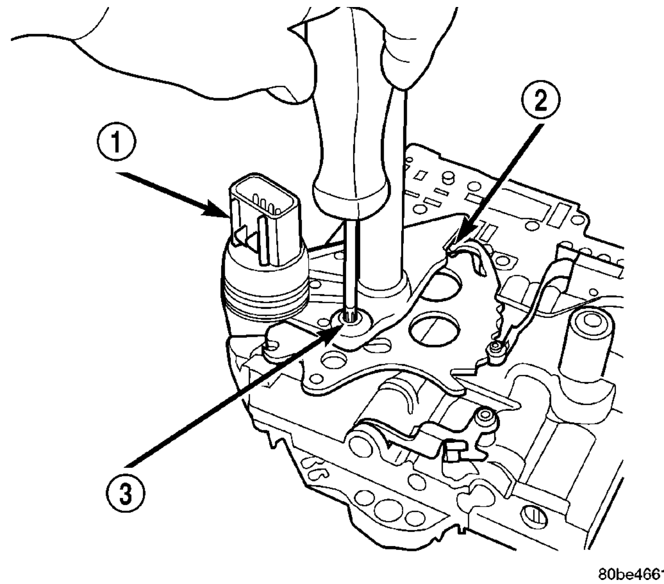


Fig. 313 Remove Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL VALVE CONTROL PIN
3 - RETAINING SCREW

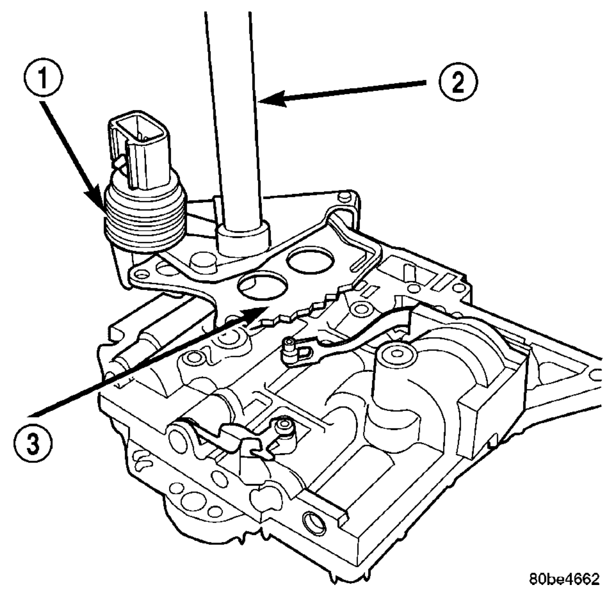


Fig. 314 Manual Shaft/Rooster Comb and Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL SHAFT
3 - ROOSTER COMB

VALVE BODY (Continued)

(4) Remove 2/4 Accumulator Retaining Plate (Fig. 315).

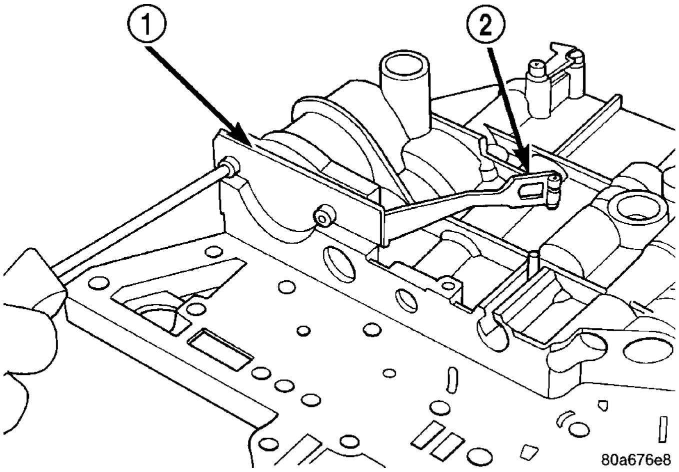


Fig. 315 2/4 Accumulator Retaining Plate

1 - 2–4 ACCUMULATOR RETAINING PLATE
2 - DETENT SPRING

(5) Remove 2/4 Accumulator components as shown in (Fig. 316).

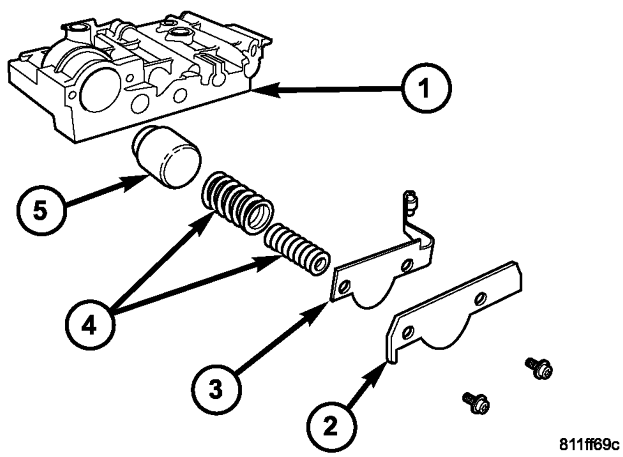


Fig. 316 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - RETURN SPRINGS
5 - PISTON

(6) Remove Valve Body to Transfer Plate screws (Fig. 317).

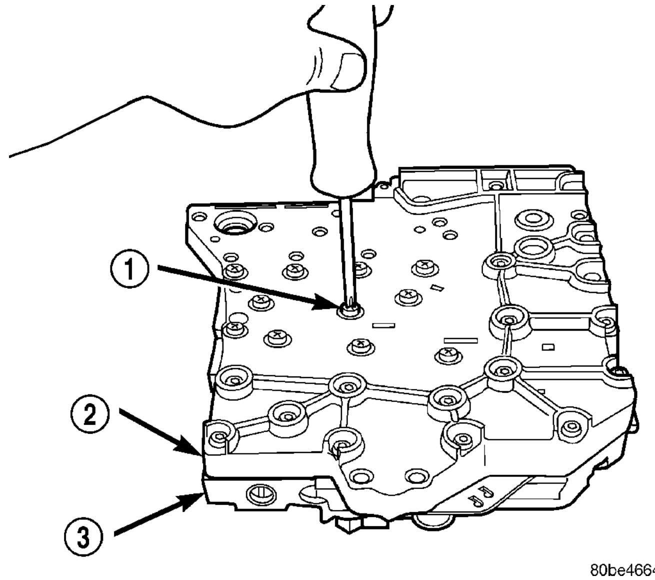


Fig. 317 Remove Valve Body to Transfer Plate Screws

1 - SCREW (24)
2 - TRANSFER PLATE
3 - VALVE BODY

(7) Invert assembly and remove Transfer Plate (Fig. 318). Beware of loose check balls.

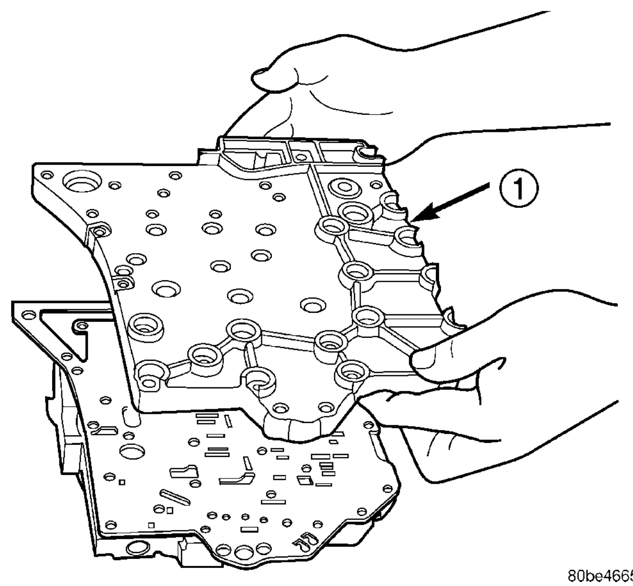


Fig. 318 Remove Transfer Plate

1 - TRANSFER PLATE

VALVE BODY (Continued)

(8) Remove oil screen (Fig. 319).

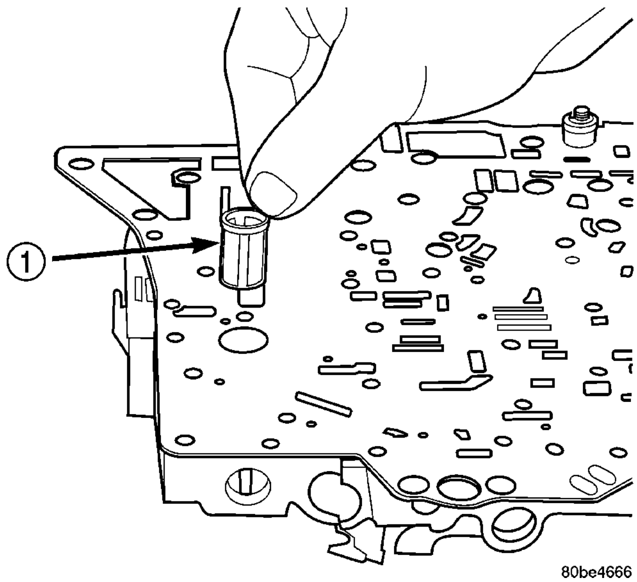


Fig. 319 Remove Oil Screen

1 - OIL SCREEN

(9) Remove the overdrive clutch (#5) check valve (Fig. 320)

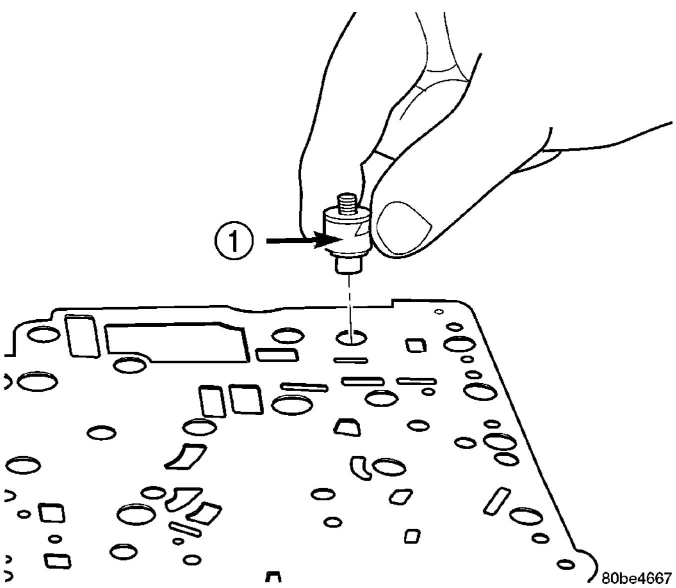


Fig. 320 Remove Overdrive Clutch (#5) Check Valve

1 - OVERDRIVE CLUTCH (#5) CHECK VALVE

(10) Remove separator plate (Fig. 321).

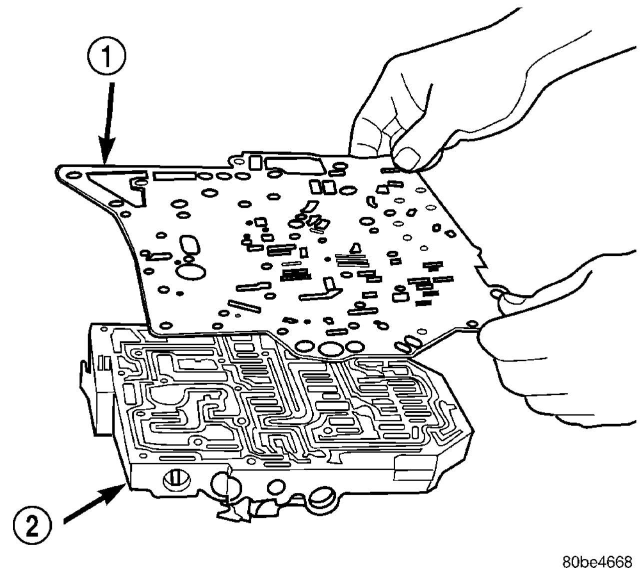


Fig. 321 Remove Separator Plate

1 - SEPARATOR PLATE
2 - VALVE BODY

(11) Remove thermal valve (Fig. 322).

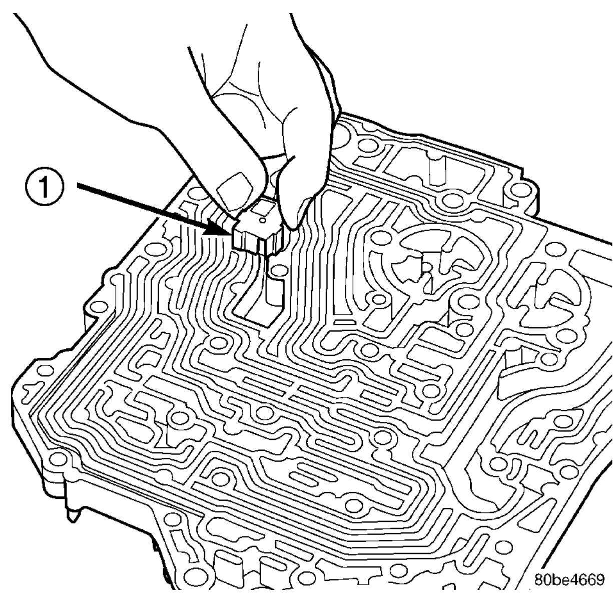


Fig. 322 Remove Thermal Valve

1 - THERMAL VALVE

VALVE BODY (Continued)

(12) Remove check balls (Fig. 323).

NOTE: Tag all valve/spring assemblies for reassembly identification.

(13) Remove dual retainer plate using Tool 6301 (Fig. 324).

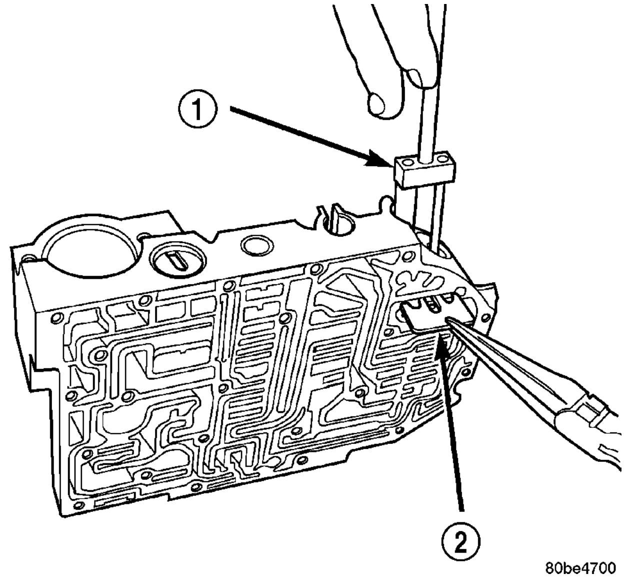


Fig. 324 Remove Dual Retainer Plate using Tool 6301

1 - TOOL 6301
2 - RETAINER

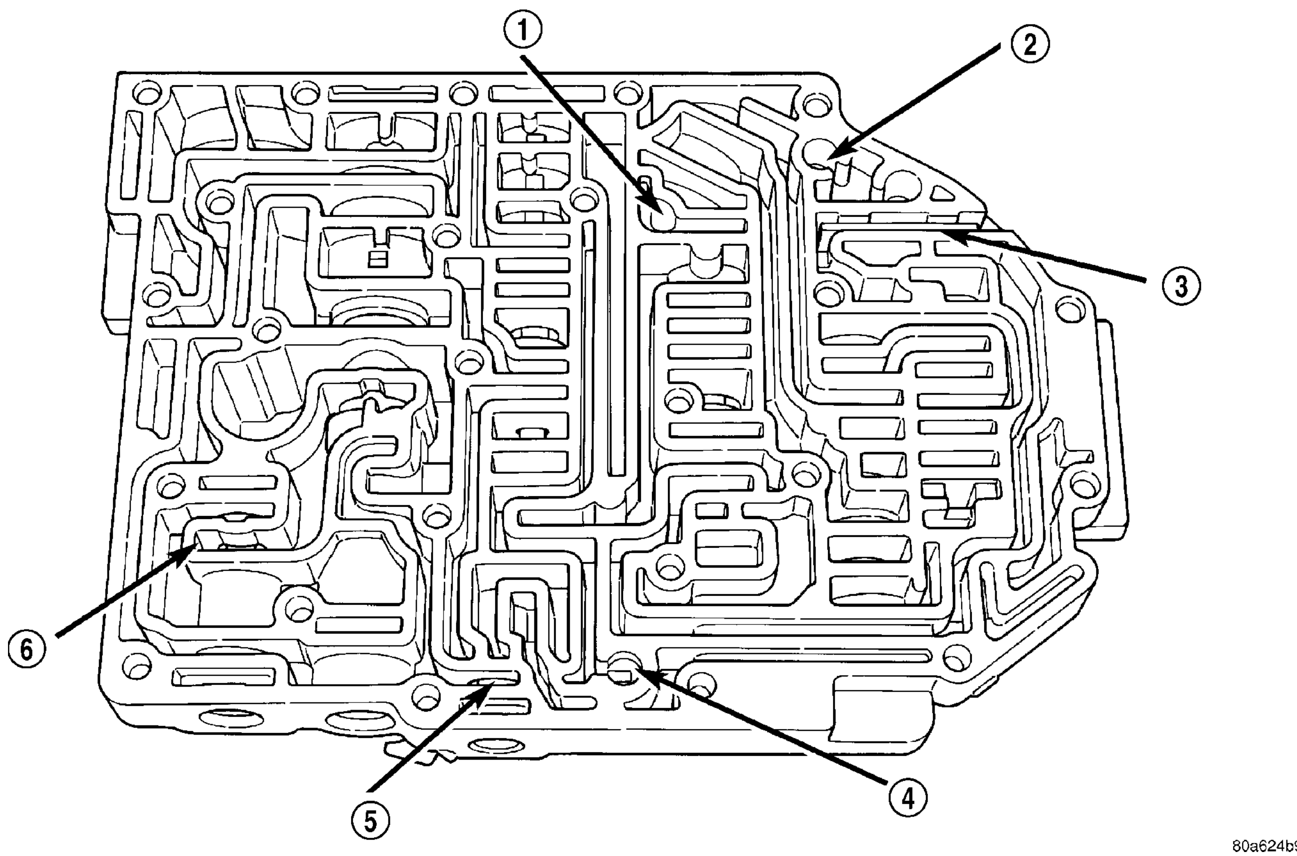


Fig. 323 Ball Check Location

1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - RETAINER
4 - (#3) BALL CHECK LOCATION
5 - LOW/REVERSE SWITCH VALVE
6 - T/C LIMIT VALVE

VALVE BODY (Continued)

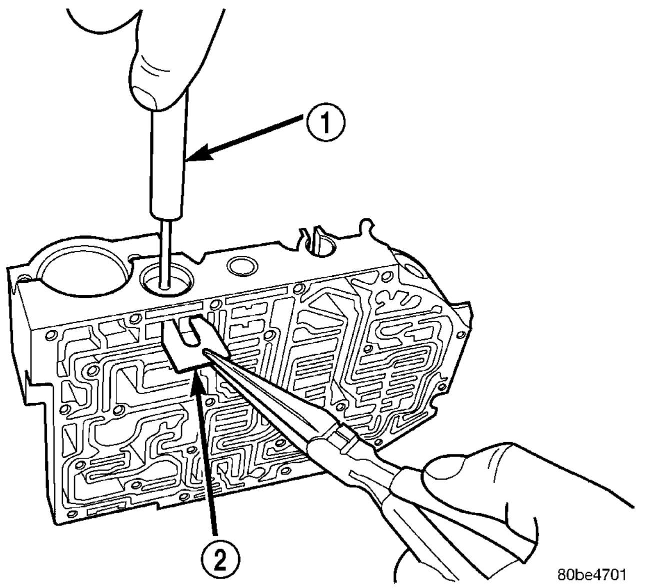


Fig. 325 Remove Regulator Valve Spring Retainer using Tool 6302

1 - TOOL 6302
2 - RETAINER

(14) Remove regulator valve spring retainer (Fig. 325).

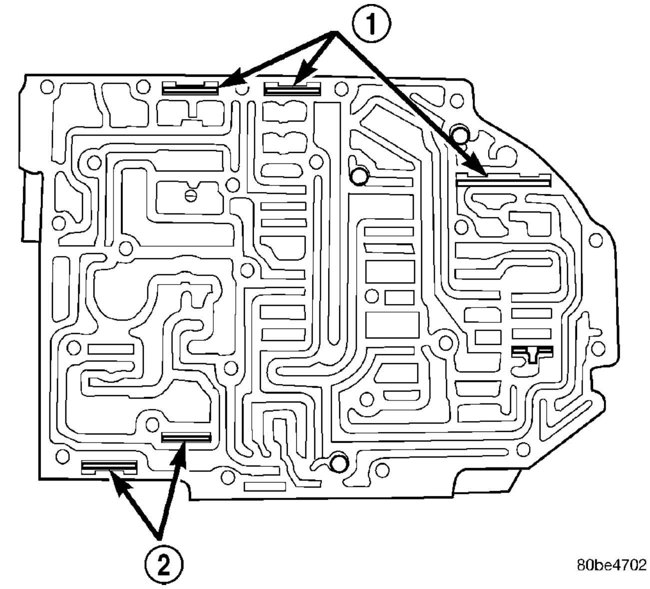


Fig. 326 Valve Retainer Location

1 - RETAINER
2 - RETAINER

(15) Remove remaining retainers as shown in (Fig. 326).

(16) Remove valves and springs as shown in (Fig. 327).

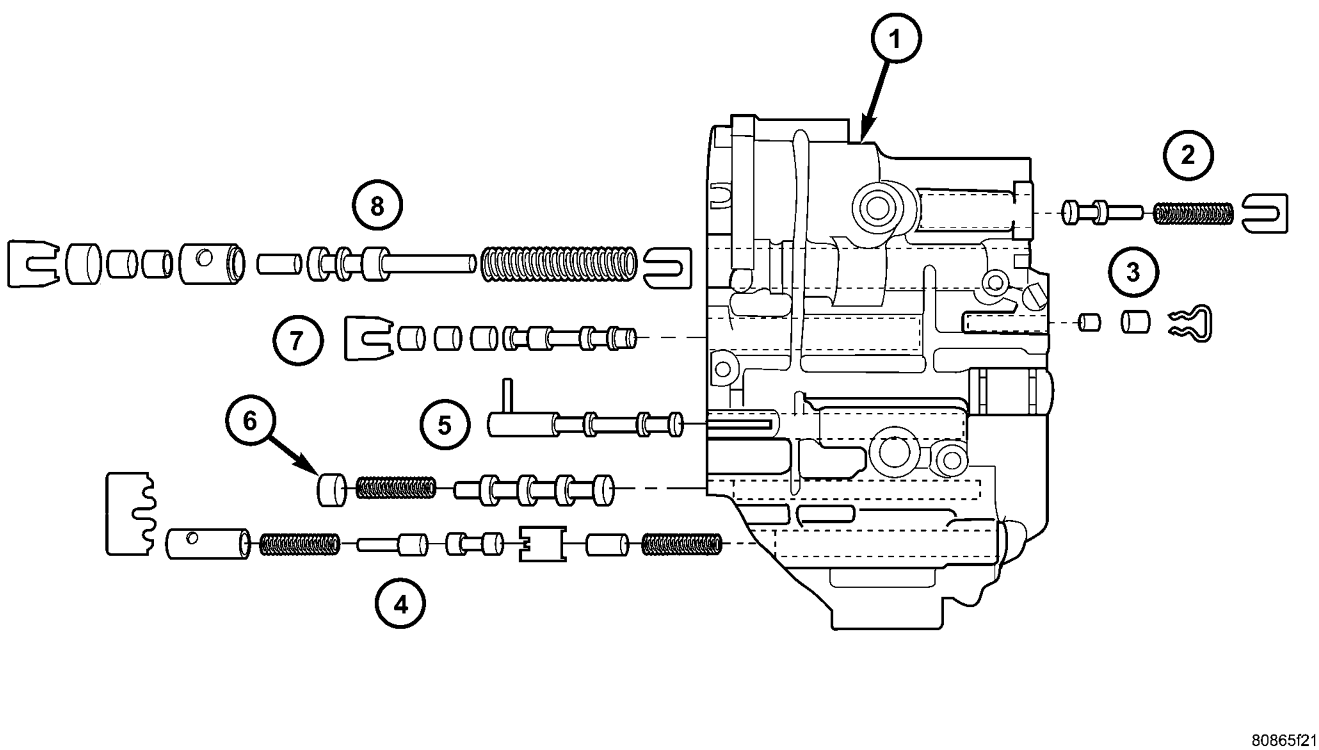


Fig. 327 Springs and Valves Location

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

VALVE BODY (Continued)

NOTE: Refer to Valve Body Cleaning and Inspection for cleaning procedures.

ASSEMBLY

NOTE: If valve body assembly is reconditioned, the PCM/TCM Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install valves and springs as shown in (Fig. 327).

(2) Install regulator valve spring retainer (Fig. 328).

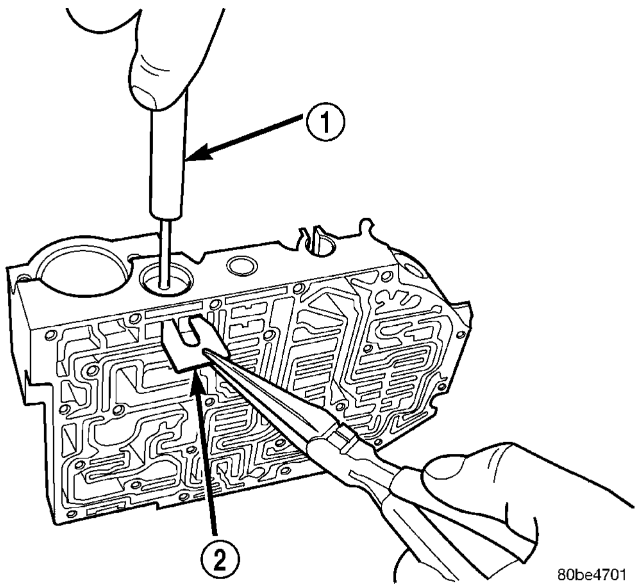


Fig. 328 Install Regulator Valve Spring Retainer using Tool 6302

1 - TOOL 6302
2 - RETAINER

(3) Install dual retainer plate using Tool 6301 (Fig. 329).

(4) Verify that all retainers are installed as shown in (Fig. 330). Retainers should be flush or below valve body surface.

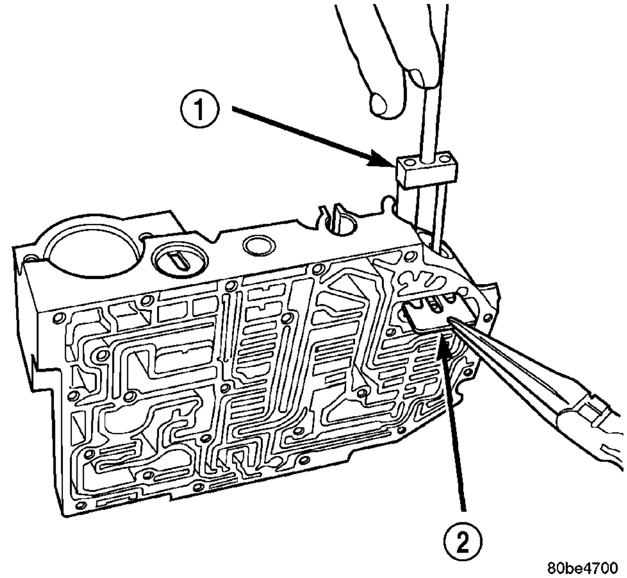


Fig. 329 Install Dual Retainer Plate using Tool 6301

1 - TOOL 6301
2 - RETAINER

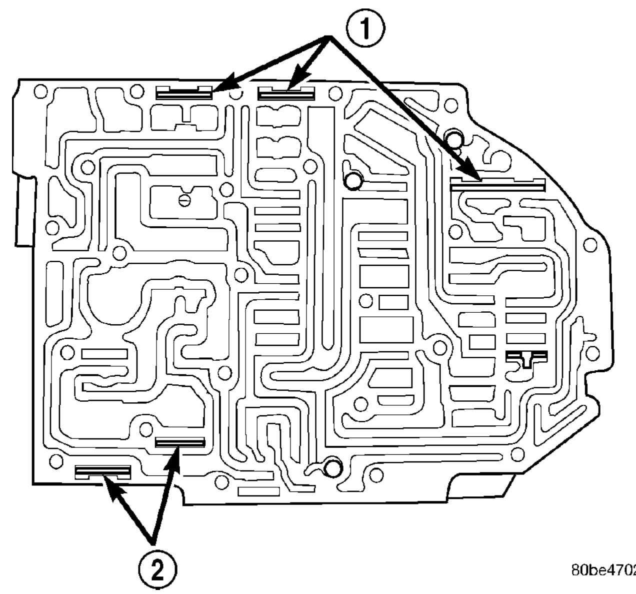


Fig. 330 Valve Retainer Location

1 - RETAINER
2 - RETAINER

VALVE BODY (Continued)

(5) Install check balls into position as shown in (Fig. 331). If necessary, secure them with petrolatum or transmission assembly gel for assembly ease.

(6) Install thermal valve into transfer plate (Fig. 332).

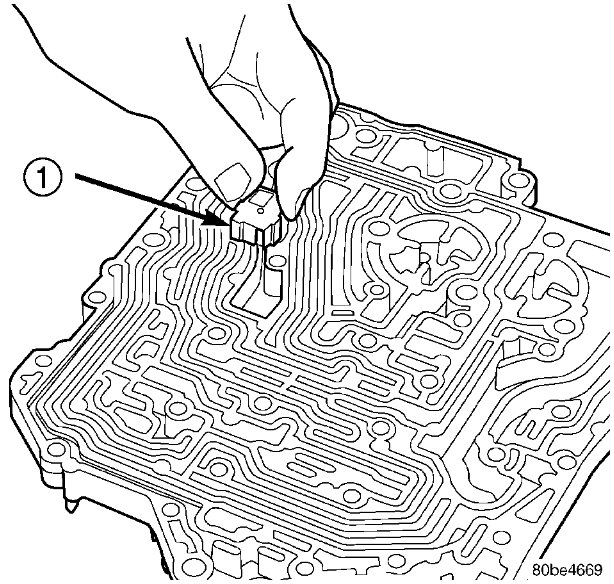


Fig. 332 Install Thermal Valve

1 - THERMAL VALVE

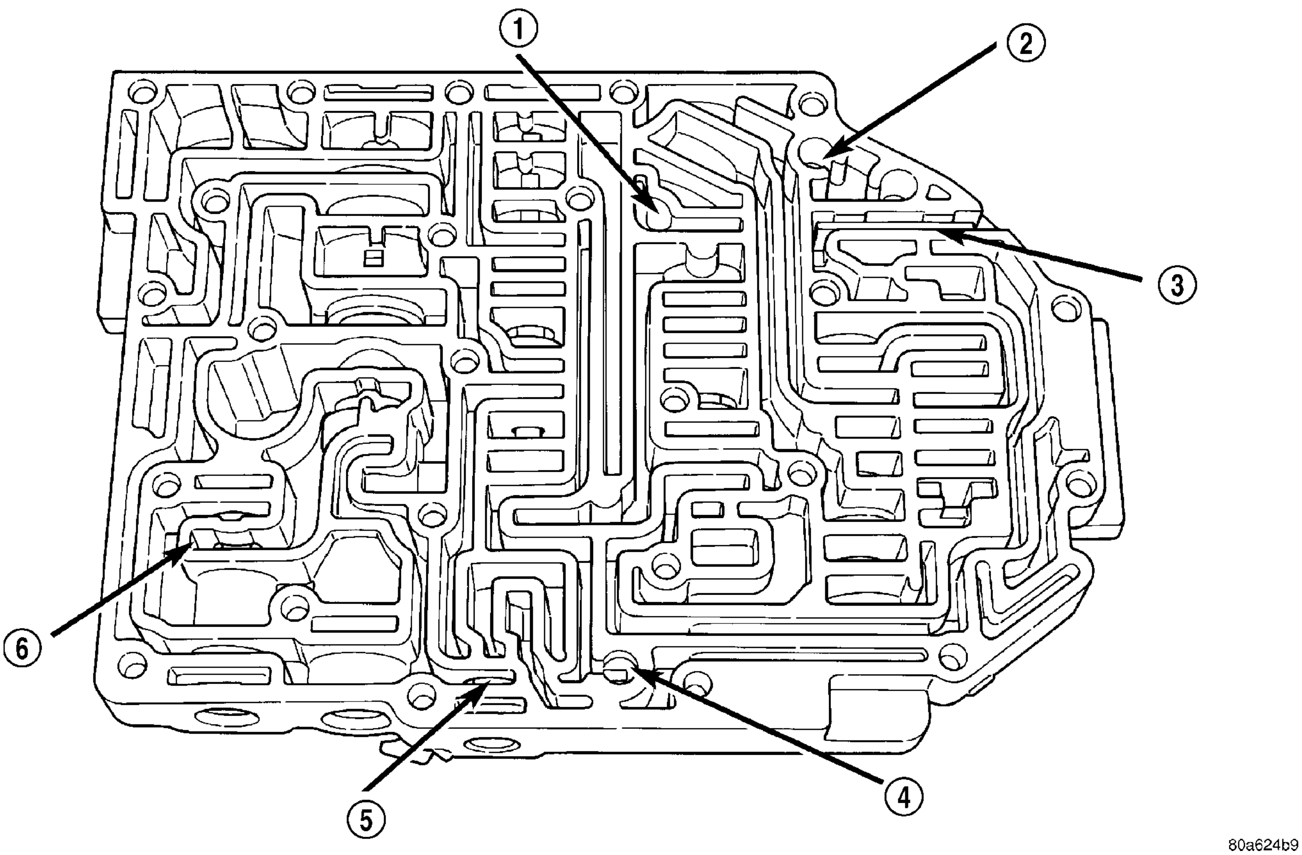


Fig. 331 Ball Check Location

1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - RETAINER
4 - (#3) BALL CHECK LOCATION
5 - LOW/REVERSE SWITCH VALVE
6 - T/C LIMIT VALVE

VALVE BODY (Continued)

(7) Install separator plate to valve body (Fig. 333).

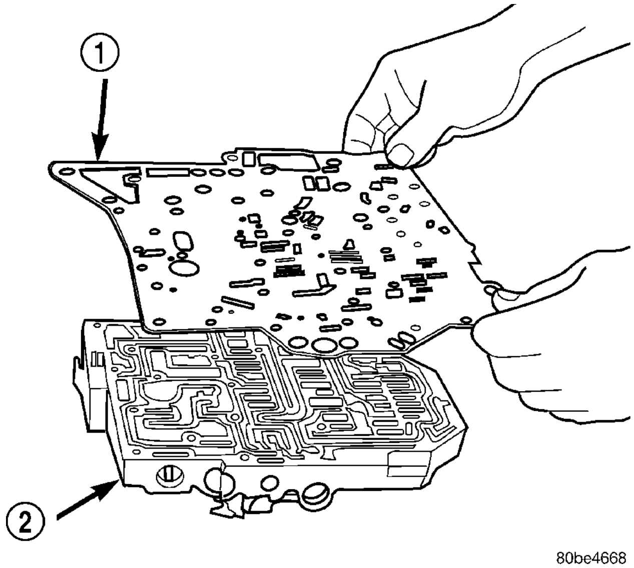


Fig. 333 Install Separator Plate

1 - SEPARATOR PLATE
2 - VALVE BODY

(8) Install the overdrive clutch (#5) check valve to separator plate (Fig. 334)

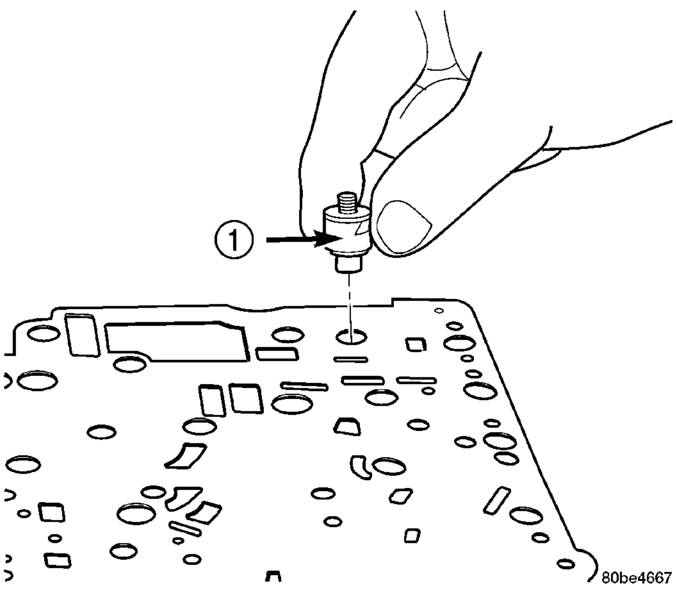


Fig. 334 Install Overdrive Clutch (#5) Check Valve

1 - OVERDRIVE CLUTCH (#5) CHECK VALVE

(9) Install oil screen to separator plate (Fig. 335).

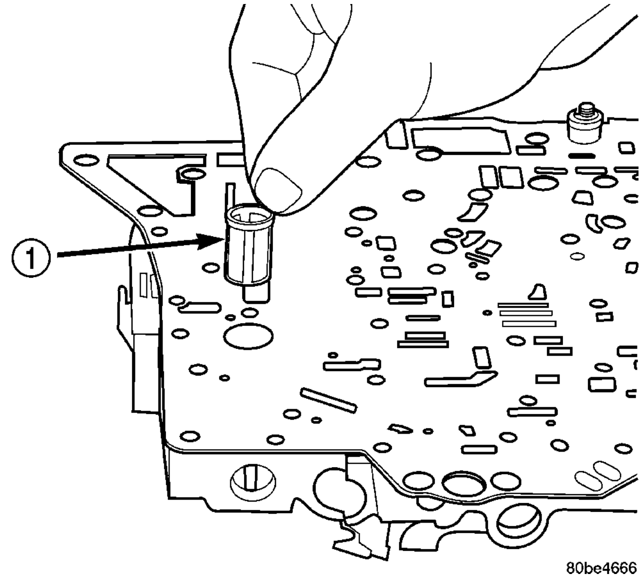


Fig. 335 Install Oil Screen

1 - OIL SCREEN

(10) Install transfer plate to valve body and separator plate. Make sure oil screen and #5 check valve do not bind (Fig. 336).

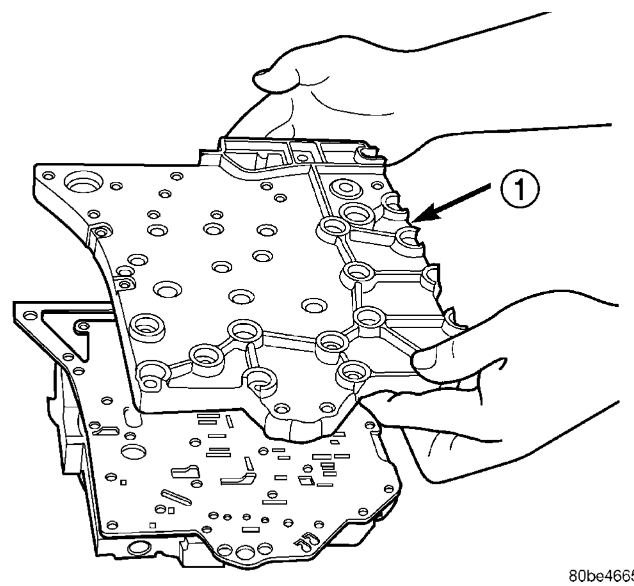


Fig. 336 Install Transfer Plate

1 - TRANSFER PLATE

VALVE BODY (Continued)

(11) Install twenty-four transfer plate to valve body screws (Fig. 337) and torque to 5 N·m (45 in. lbs.).

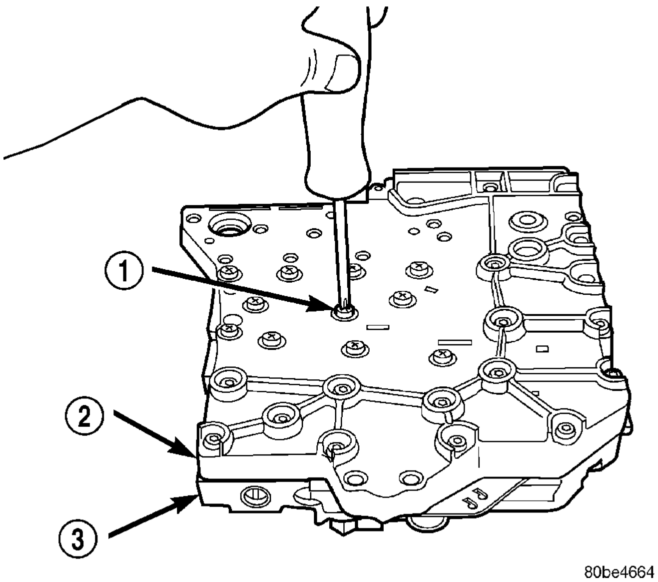


Fig. 337 Install Valve Body to Transfer Plate Screws

1 - SCREW (24)
2 - TRANSFER PLATE
3 - VALVE BODY

(12) Install 2/4 Accumulator components as shown in (Fig. 338).

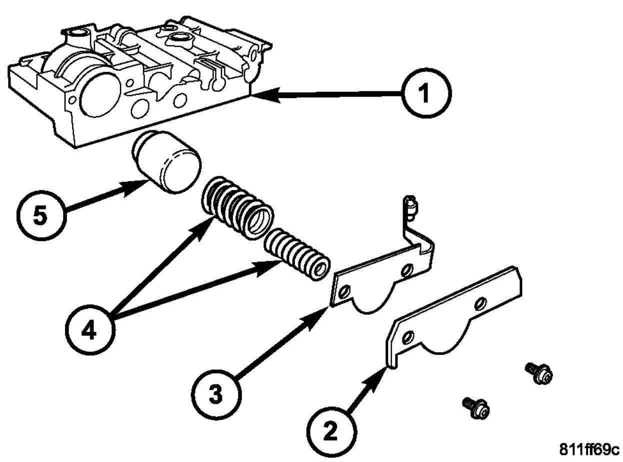


Fig. 338 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - RETURN SPRINGS
5 - PISTON

(13) Torque 2/4 Accumulator retainer to 5 N·m (45 in. lbs.) (Fig. 339).

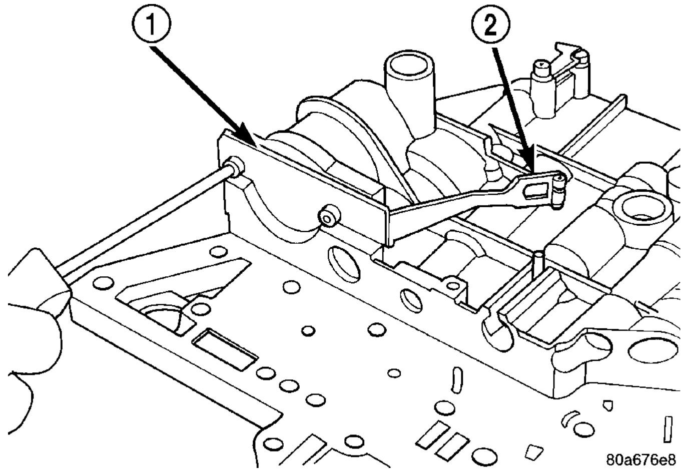


Fig. 339 2/4 Accumulator Retaining Plate

1 - 2–4 ACCUMULATOR RETAINING PLATE
2 - DETENT SPRING

(14) Install Manual Shaft/Rooster Comb and Transmission Range Sensor (Fig. 340).

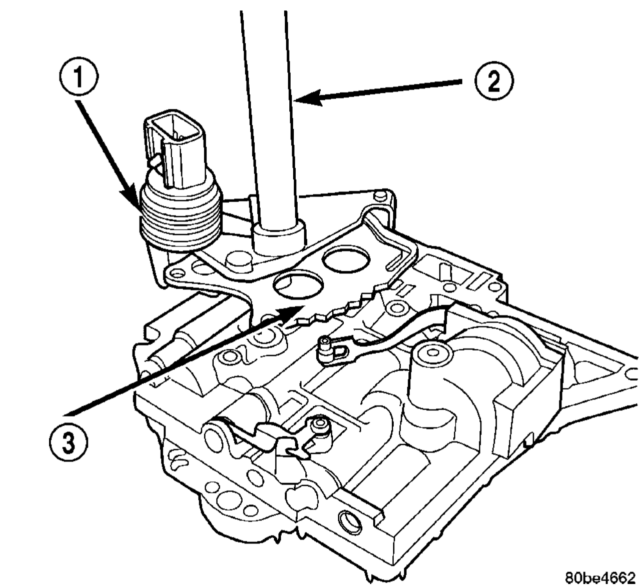


Fig. 340 Install Manual Shaft/Rooster Comb and Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL SHAFT
3 - ROOSTER COMB

VALVE BODY (Continued)

(15) Make sure Manual Valve control pin is contained within the rooster comb slot (Fig. 341). Install Transmission Range Sensor retaining screw (Fig. 341) and torque to 5 N·m (45 in. lbs.).

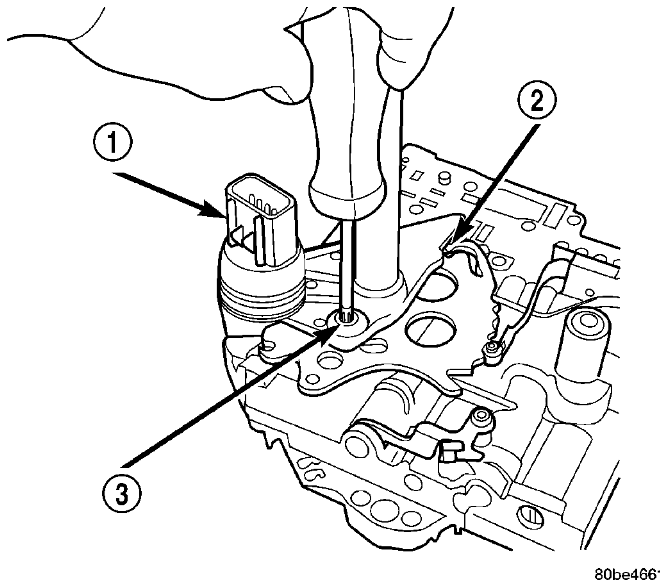


Fig. 341 Install Transmission Range Sensor Retaining Screw

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL VALVE CONTROL PIN
3 - RETAINING SCREW

(16) Install manual shaft seal (Fig. 342).

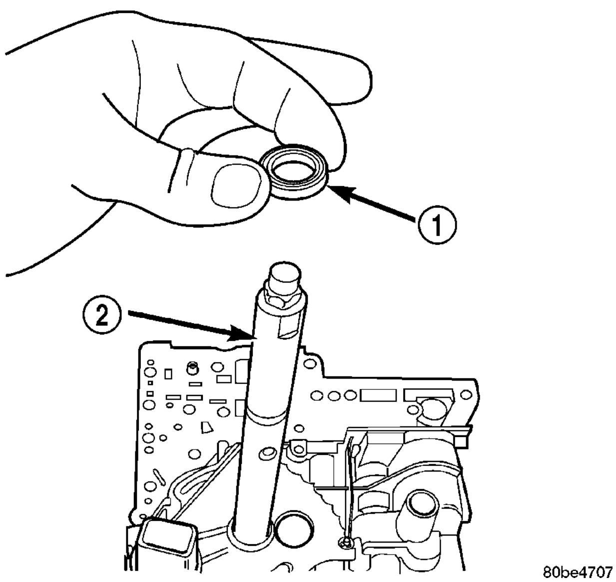


Fig. 342 Manual Shaft Seal

1 - SEAL
2 - MANUAL SHAFT

INSTALLATION

NOTE: If valve body assembly is being replaced or reconditioned, it is necessary to perform the TCM Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install valve body assembly to transaxle (Fig. 343). Install and torque valve body-to-transaxle case bolts (Fig. 344) to 12 N·m (105 in. lbs.).

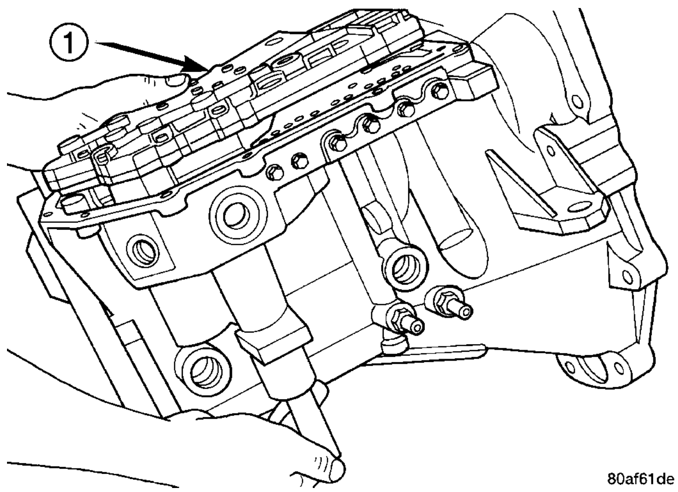


Fig. 343 Valve Body Removal/Installation

1 - VALVE BODY

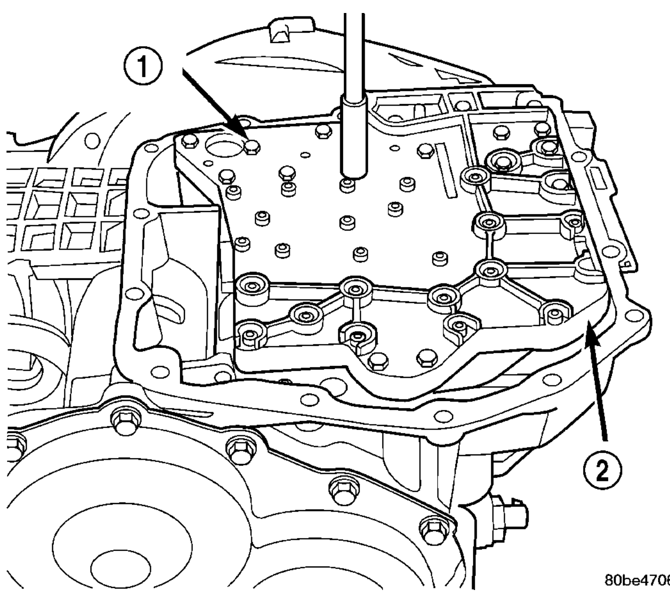


Fig. 344 Valve Body-to-Case Bolts

1 - VALVE BODY ATTACHING BOLTS (18)
2 - VALVE BODY

VALVE BODY (Continued)

(2) Install transaxle oil filter (Fig. 345). Inspect the o-ring and replace if necessary.

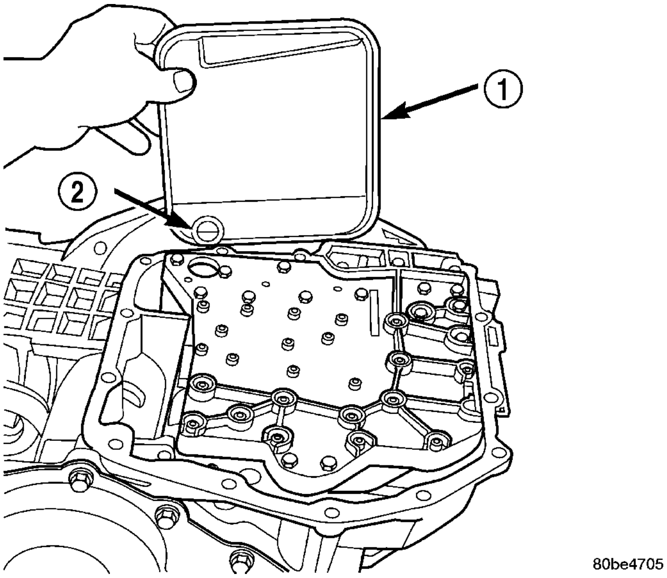


Fig. 345 Install Oil Filter and O-Ring

1 - OIL FILTER
2 - O-RING

(3) Ensure the transaxle oil pan and transaxle case sealing surfaces are clean and dry. Install an 1/8" bead of Mopar® ATF RTV (MS-GF41) to the oil pan and install (Fig. 346). Torque oil pan-to-transaxle case bolts (Fig. 347) to 19 N·m (165 in. lbs.).

(4) Lower vehicle.

(5) Connect transmission range sensor connector.

(6) Install manual valve lever to manual shaft.

(7) Install gearshift cable to manual valve lever.

(8) Install air cleaner/throttle body assembly.

(9) Connect battery negative cable.

(10) Fill transaxle with Mopar® ATF +4 Transmission fluid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 41TE/FLUID - STANDARD PROCEDURE)

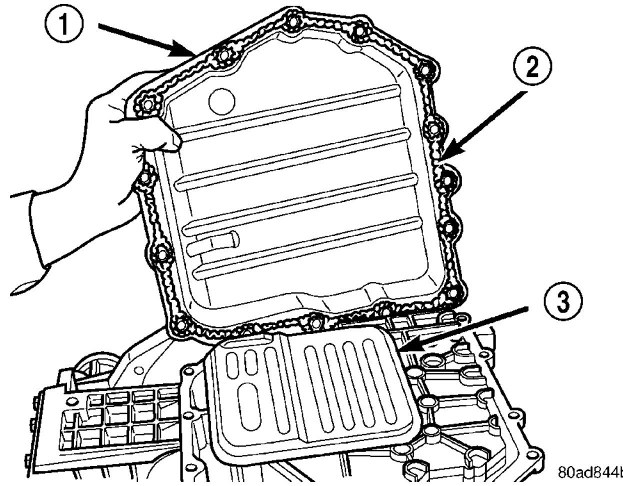


Fig. 346 Oil Pan

1 - OIL PAN
2 - 1/8 INCH BEAD OF Mopar® ATF RTV (MS-GF41)
3 - OIL FILTER

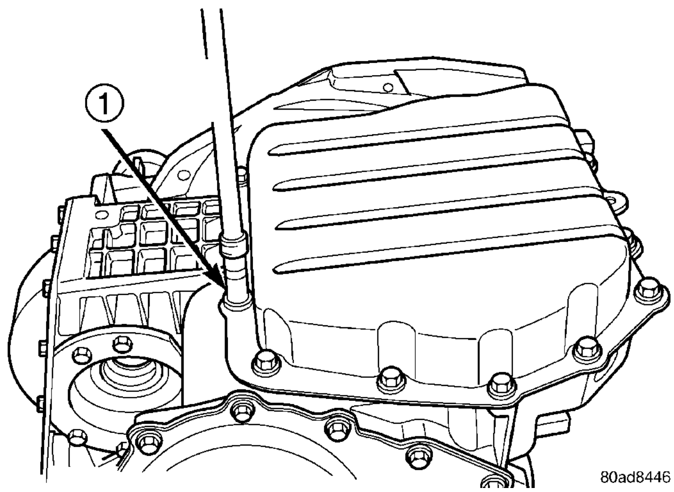


Fig. 347 Oil Pan Bolts

1 - OIL PAN BOLTS (USE RTV UNDER BOLT HEADS)

TIRES/WHEELS

TABLE OF CONTENTS

TIRES/WHEELS

DIAGNOSIS AND TESTING - TIRE AND WHEEL RUNOUT

NOTE: Runout should always be measured off the vehicle and on a suitable balance machine.

Radial runout is the difference between the high and low points on the outer edge of the tire or wheel.

Lateral runout is the total side-to-side wobble of the tire or wheel.

Radial runout of more than 1.5 mm (0.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (0.080 inch) measured at the side of the tire as close to the tread as possible may cause the vehicle to shake.

Sometimes radial runout can be reduced by relocating the wheel and tire on the wheel studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

TIRES/WHEELS (Continued)

METHOD 1 (RELOCATE WHEEL ON HUB)

Check accuracy of the wheel mounting surface; adjust wheel bearings (if applicable).

Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

Verify all wheel nuts are tightened and torqued in the correct sequence (Fig. 1).

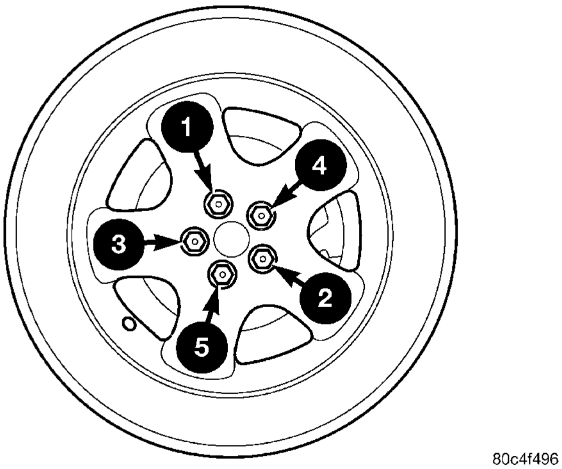


Fig. 1 Wheel Tightening Sequence

Use runout gauge D-128-TR to determine runout (Fig. 2).

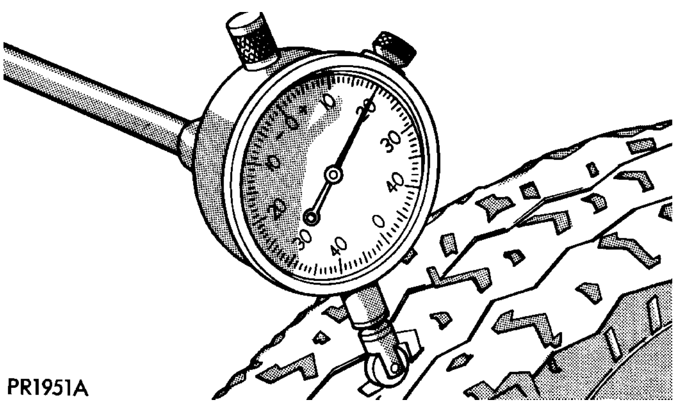


Fig. 2 Runout Gauge

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 runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout (Fig. 3) and proceed to Method 2.

METHOD 2 (RELOCATE TIRE ON WHEEL)

Rotating tire on wheel is particularly effective when there is runout in both tire and wheel.

Remove tire from wheel and remount wheel on hub in former position.

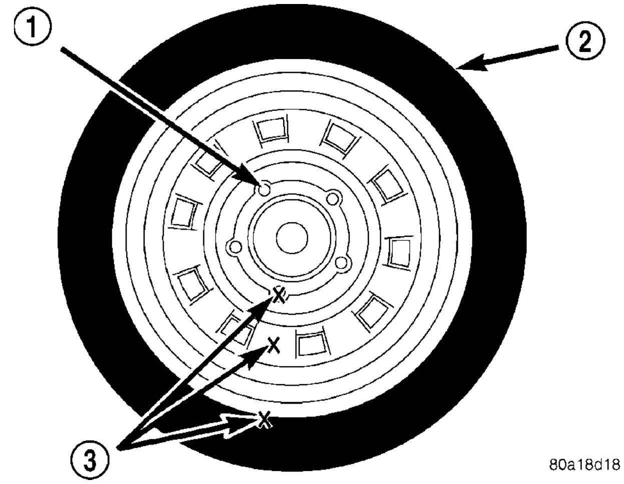


Fig. 3 Chalk Marking On Wheel, Tire And Stud

1 - STUD
2 - TIRE
3 - CHALK MARK LOCATIONS

Check the radial runout of the wheel (Fig. 4). The radial runout should be no more than 0.762 mm (0.030 inch).

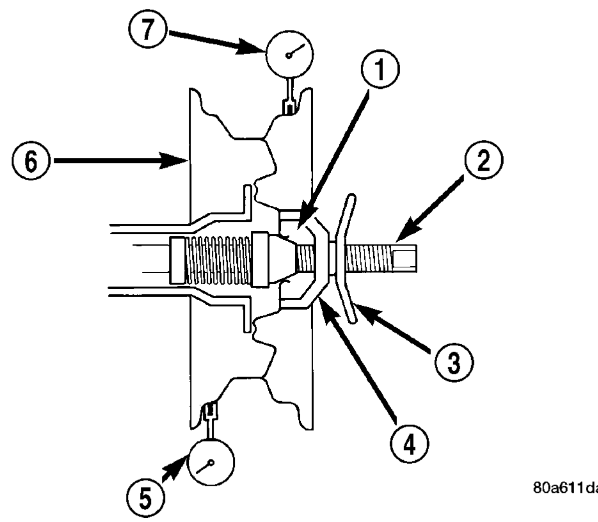


Fig. 4 Checking Wheel Radial Runout

1 - MOUNTING CONE
2 - SPINDLE SHAFT
3 - WING NUT
4 - PLASTIC CUP
5 - DIAL INDICATOR
6 - WHEEL
7 - DIAL INDICATOR

Check the lateral runout of the wheel (Fig. 5). The lateral runout should be no more than 0.762 mm (0.030 inch).

If the point of greatest wheel radial runout is near the original chalk mark, remount the tire on the rim 180 degrees from its original position. Recheck the runout. If this does not reduce the runout to an acceptable level, replace the wheel or the tire.

TIRES/WHEELS (Continued)

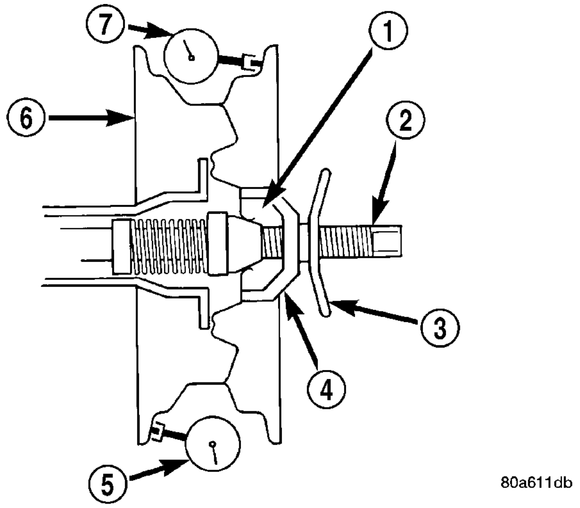


Fig. 5 Checking Wheel Lateral Runout

1 - MOUNTING CONE
2 - SPINDLE SHAFT
3 - WING NUT
4 - PLASTIC CUP
5 - DIAL INDICATOR
6 - WHEEL
7 - DIAL INDICATOR

STANDARD PROCEDURE

STANDARD PROCEDURE - TIRE AND WHEEL BALANCE

NOTE: Balance equipment must be calibrated and maintained per equipment manufacturer's specifications.

Wheel balancing can be accomplished with either on-vehicle or off-vehicle equipment.

NOTE: If using on-vehicle balancing equipment, on the driving axle, remove the opposite wheel and tire assembly.

It is recommended that a two-plane dynamic balancer be used when a wheel and tire assembly requires balancing. A static balancer should only be used when a two-plane balancer is not available.

Balance wheel and tire assemblies dynamically and statically to less than 0.25 (¼) ounce.

For static balancing, find location of heavy spot causing 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. 6).

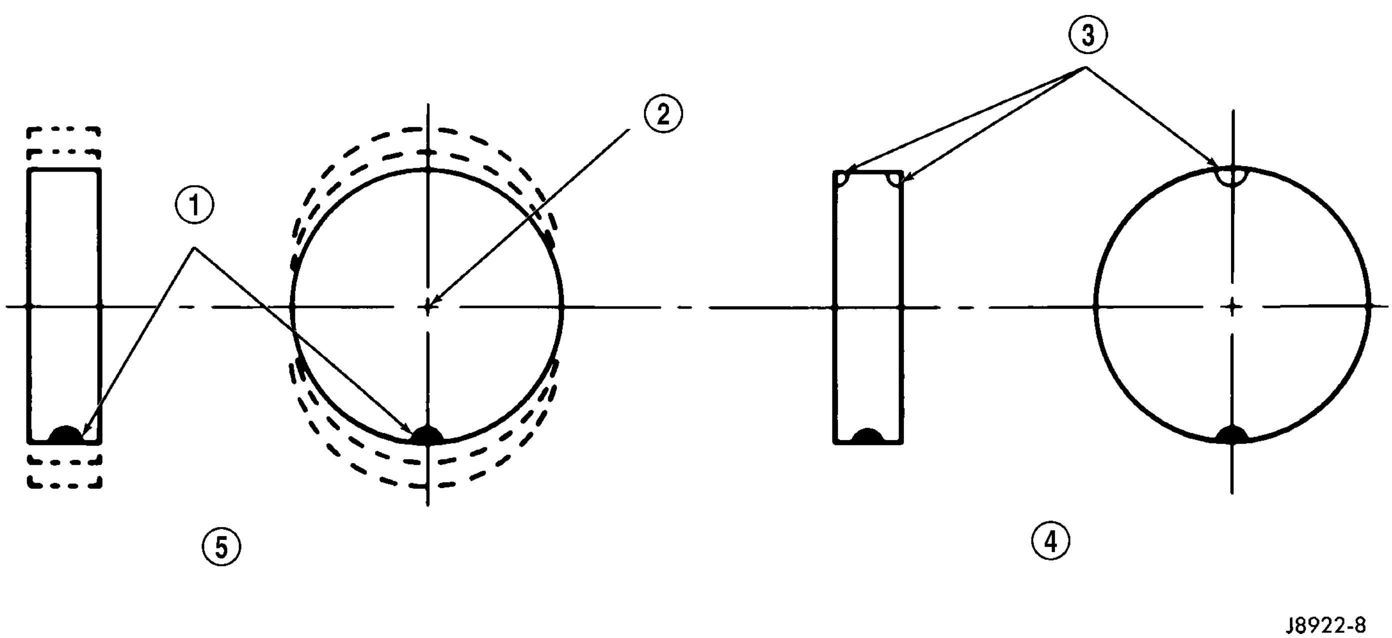


Fig. 6 Static Unbalance & Balance

1 - HEAVY SPOT
2 - CENTER LINE OF SPINDLE
3 - ADD BALANCE WEIGHTS HERE
4 - CORRECTIVE WEIGHT LOCATION
5 - TIRE OR WHEEL TRAMP, OR WHEEL HOP

TIRES/WHEELS (Continued)

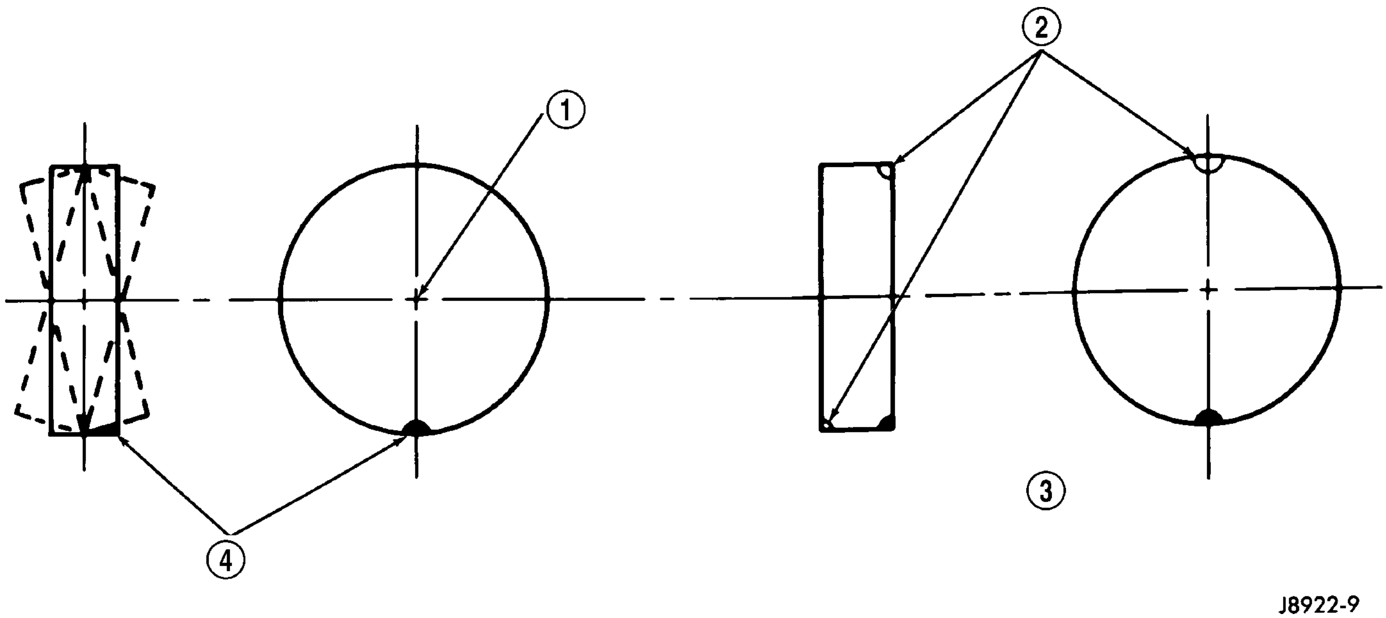


Fig. 7 Dynamic Unbalance & Balance

1 - CENTER LINE OF SPINDLE
2 - ADD BALANCE WEIGHTS HERE
3 - CORRECTIVE WEIGHT LOCATION
4 - HEAVY SPOT WHEEL SHIMMY AND VIBRATION

For dynamic balancing, the balance equipment is designed to indicate the location and amount of weight to be applied to both the inner and outer rim flanges (Fig. 7).

Aluminum wheels use unique wheel weights (Fig. 8). Each wheel weight is designed to fit the contoured surface of the wheel (Fig. 8). When balancing an aluminum wheel, the correct wheel weight must be used. Do not use any other type of wheel weight. It will not properly fit the contour of the wheel.

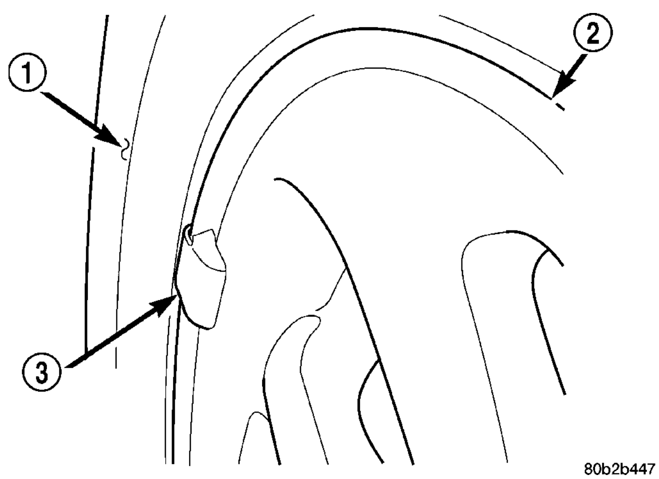


Fig. 8 Aluminum Wheel Weight

1 - TIRE
2 - WHEEL
3 - WHEEL WEIGHT

Always verify the Balance. When using off-vehicle equipment, rotate assembly 180 degrees on balance equipment to verify balance. Variation should not be more than 0.125 (⅛) ounce. If variation is more than 0.125 ounce, balancing equipment could be malfunctioning.

If difficult to balance, break down the wheel and tire assembly and check for loose debris inside tire. Prior to disassembly, mark (index) the tire at the valve stem. Use this mark in order to remount the tire in its original orientation with respect to the wheel.

STANDARD PROCEDURE - TIRE AND WHEEL BALANCE - SRT-4

NOTE: Balance equipment must be calibrated and maintained per equipment manufacturer's specifications to achieve preferred results.

It is recommended that a two-plane dynamic balancer designed to balance using stick-on type wheel weights be used when a wheel and tire assembly requires balancing. Static balancing equipment should only be used when a two-plane balancer is not available. Balance tire and wheel assemblies to less than 0.25 (¼) ounce (7.0 grams) imbalance.

This vehicle is equipped with wheels that do not have a flange on the outer face. For that reason, clip-on wheel weights cannot be used on the outer face of any wheel and must not be used on the inner face due to clearance issues. In their place, stick-on

TIRES/WHEELS (Continued)

type weights must be used. Wheel weights may be placed in locations indicated in figure (Fig. 9).

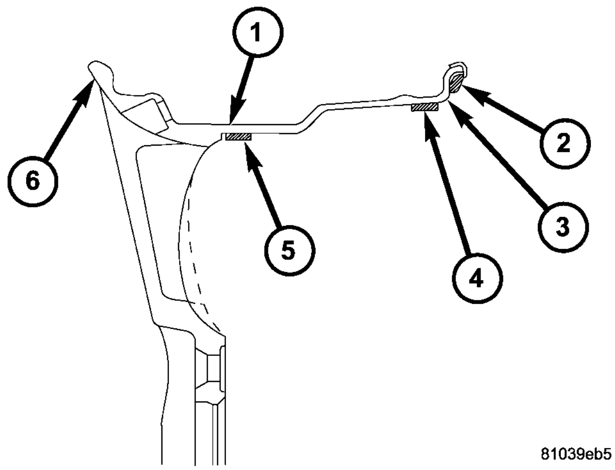


Fig. 9 Wheel Weight Locations

1 - WHEEL
2 - CLIP-ON WHEEL WEIGHT (DO NOT USE)
3 - INNER FACE OF WHEEL
4 - STICK-ON WHEEL WEIGHT (INNER LOCATION)
5 - STICK-ON WHEEL WEIGHT (OUTER LOCATION)
6 - OUTER FACE OF WHEEL

STANDARD PROCEDURE - TIRE AND WHEEL MATCH MOUNTING

Steel 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 runout 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 in the drop well on the tire side 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 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. 10).

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 11).

(3) Measure the total indicator runout again. Mark the tire to indicate the high spot.

(4) If runout is still excessive (in excess of 1.524 mm or 0.060 in.), the following procedures must be done.

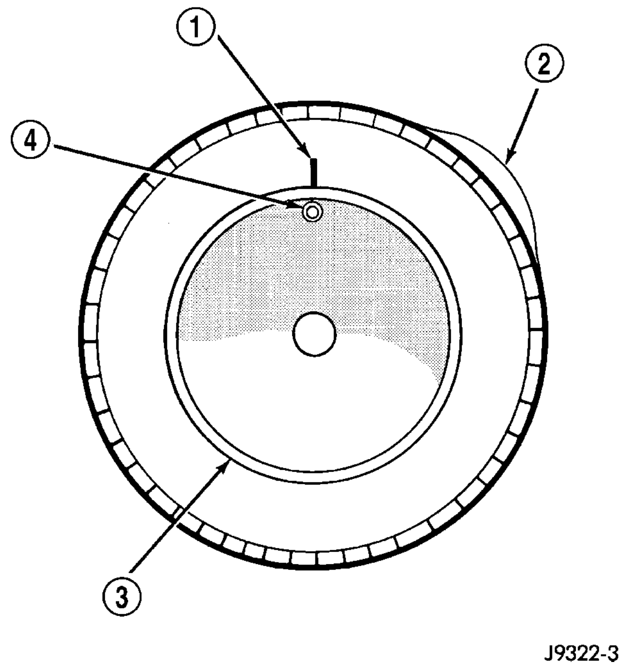


Fig. 10 First Measurement On Tire

1 - REFERENCE MARK
2 - 1ST MEASUREMENT HIGH SPOT MARK TIRE AND RIM
3 - WHEEL
4 - VALVE STEM

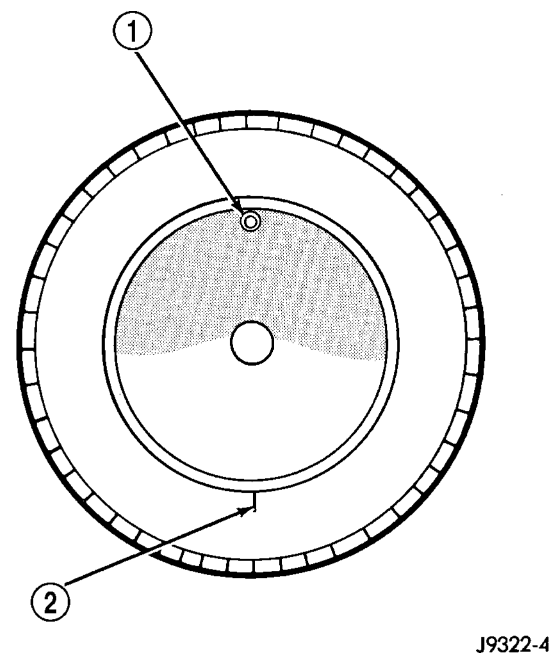


Fig. 11 Remount Tire 180 Degrees

1 - VALVE STEM
2 - REFERENCE MARK

- If the new high spot is within 102 mm (4.0 in.) of the first spot on the tire and is still excessive, replace the tire.

TIRES/WHEELS (Continued)

• If the new 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 Tire and Wheel Runout.

• If the new high spot is NOT within 102 mm (4.0 in.) of either high spot, draw an arrow on the tread from new high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 12), then remeasure runout. This procedure will normally reduce the runout to an acceptable amount.

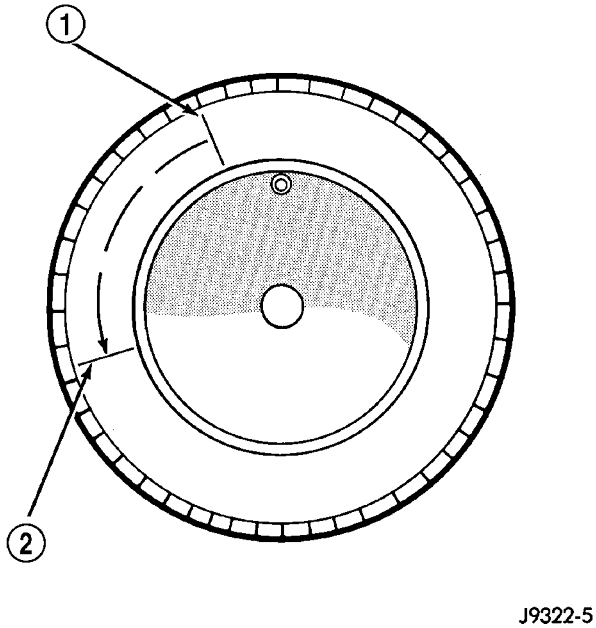


Fig. 12 Remount Tire 90 Degrees In Direction of Arrow

1 - 2ND HIGH SPOT ON TIRE
2 - 1ST HIGH SPOT ON TIRE

STANDARD PROCEDURE - 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. 13). 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.

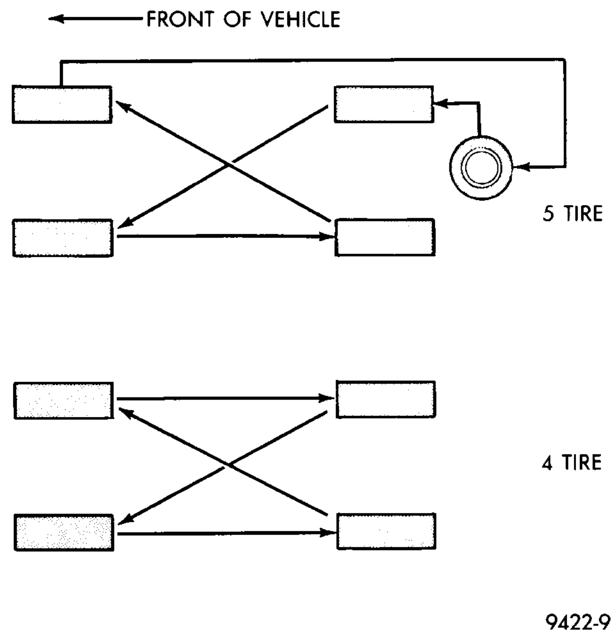


Fig. 13 Forward-Cross Tire Rotation Method

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.

REMOVAL

REMOVAL - TIRE AND WHEEL ASSEMBLY (ALUMINUM WHEEL)

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) If the wheel has a large center cap that covers the wheel mounting nuts, remove the cap by prying it off.

(3) Remove the wheel mounting nuts from the studs.

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

TIRES/WHEELS (Continued)

REMOVAL - TIRE AND WHEEL ASSEMBLY (STEEL WHEEL)

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

CAUTION: When removing the bolt-on wheel cover, do not attempt to pry the wheel cover off the wheel.

(2) Unthread and remove the 5 nuts attaching the wheel and wheel cover to the vehicle (Fig. 14).

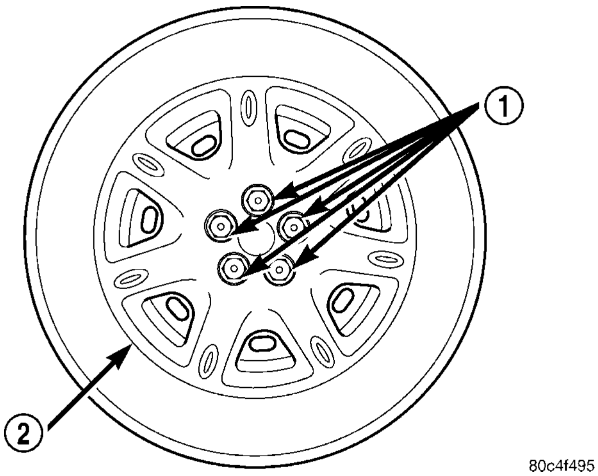


Fig. 14 Wheel And Cover Mounting

1 - WHEEL MOUNTING NUTS
2 - BOLT-ON WHEEL COVER

(3) Remove the wheel cover using care not to let the tire and wheel assembly fall off the vehicle.

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

INSTALLATION

INSTALLATION - TIRE AND WHEEL ASSEMBLY (ALUMINUM WHEEL)

CAUTION: Installing the wheel mounting nuts without having good metal-to-metal contact between the back of the wheel and the hub mounted brake disc or drum could cause the wheel to bind and eventually cause loosening of the wheel mounting nuts.

(1) Install the tire and wheel assembly on the hub studs against the hub mounted brake disc or drum using the hub pilot as a guide.

CAUTION: When installing the tire and wheel assembly, never use oil or grease on studs or nuts.

(2) Install and lightly tighten the wheel mounting nuts in the proper sequence (Fig. 15).

(3) Lower the vehicle.

(4) Progressively tighten the 5 wheel mounting nuts in the proper sequence until tightened to half of the specified torque (Fig. 15). Finally, tighten the wheel nuts in the proper sequence to a torque of 135 N·m (100 ft. lbs.).

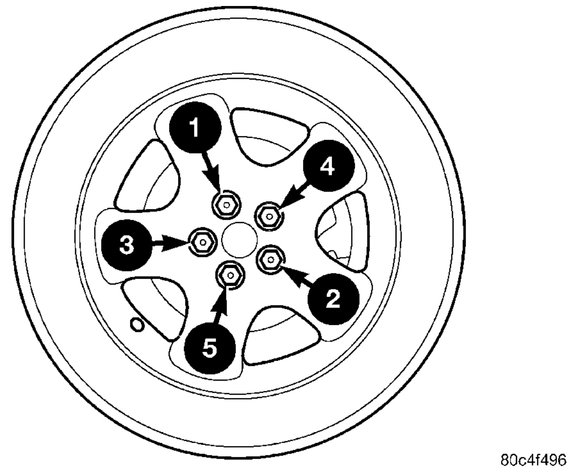


Fig. 15 Wheel Tightening Sequence

(5) If the wheel has a large center cap to cover the wheel mounting nuts, install the cap.

INSTALLATION - TIRE AND WHEEL ASSEMBLY (STEEL WHEEL)

CAUTION: Installing the wheel mounting nuts without having good metal-to-mental contact between the back of the wheel and the hub mounted brake disc or drum could cause the wheel to bind and eventually cause loosening of the wheel mounting nuts.

CAUTION: When installing the tire and wheel assembly, never use oil or grease on studs or nuts.

(1) Install the tire and wheel assembly on the wheel studs, up against the hub mounted brake disc or drum, using the hub pilot as a guide.

(2) Align the valve notch in the wheel cover with the valve stem on the wheel and install the wheel cover on the hub mounted studs.

(3) Install and lightly tighten the wheel mounting nuts in the proper sequence (Fig. 16).

(4) Lower the vehicle.

(5) Progressively tighten the 5 wheel mounting nuts in the proper sequence until tightened to half of the specified torque (Fig. 16). Finally, tighten the wheel mounting nuts in the proper sequence to 135 N·m (100 ft. lbs.) torque.

TIRES/WHEELS (Continued)

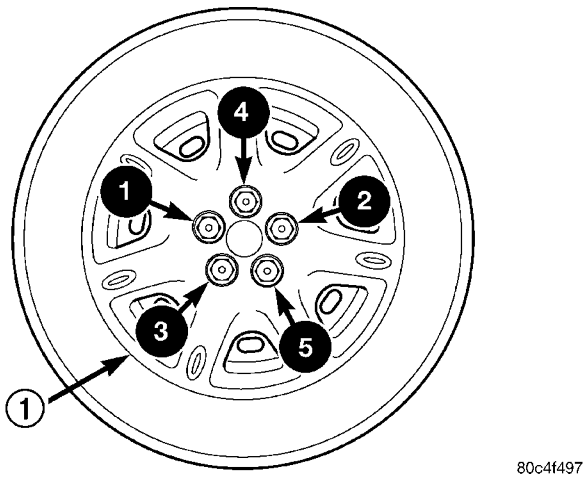


Fig. 16 Nut Tightening Sequence

1 - BOLT-ON WHEEL COVER

TIRES

DESCRIPTION

DESCRIPTION - TIRE

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
- Operating vehicle with over or under inflated tire pressures

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. 17).

Performance tires will have a speed rating letter after the aspect ratio number. For example, the letter "S" indicates that the tire is speed rated up to 112 mph (180 km/h). The speed rating is not always printed on the tire sidewall.

- Q -up to 100 mph (160 km/h)
- S -up to 112 mph (180 km/h)
- T -up to 118 mph (190 km/h)
- U -up to 124 mph (200 km/h)
- H -up to 130 mph (210 km/h)
- V -up to 149 mph (240 km/h)
- Z -more than 149 mph (240 km/h) (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 sidewall.

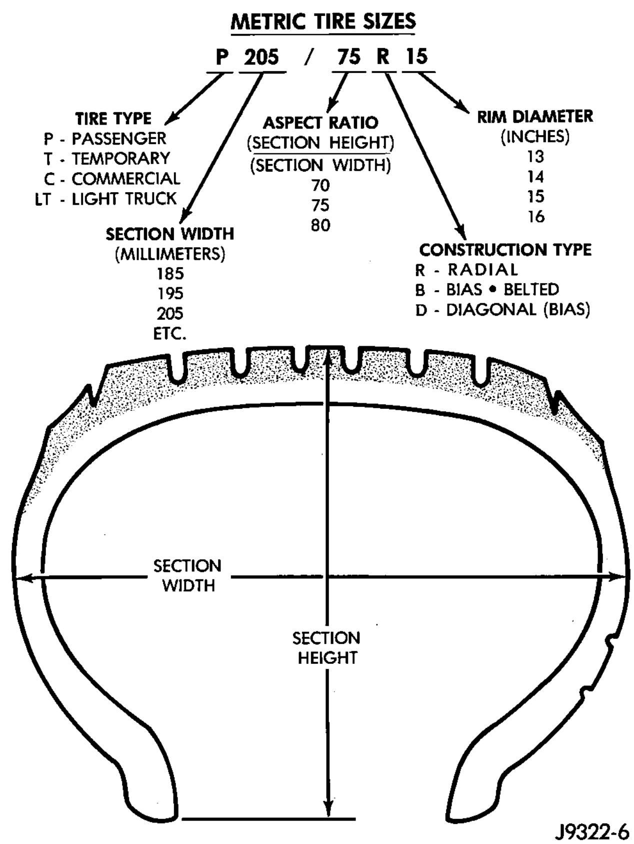


Fig. 17 Tire Identification (Typical)

TIRE CHAINS

Refer to the owners manual supplied with the vehicle to determine whether the use of tire chains is permitted on this vehicle.

DESCRIPTION - RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life and ride quality, and decrease rolling resistance.

Radial-ply tires must always be used in sets of four. 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 80 km/h (50 mph) is recommended while a temporary spare is in use.

TIRES (Continued)

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 Antilock Brakes.

The use of tires from different manufactures on the same vehicle is NOT recommended. The proper tire pressure should be maintained on all four tires.

DESCRIPTION - REPLACEMENT TIRES

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

WARNING:: IN ORDER TO MAINTAIN THE SPEED CAPABILITY OF THE VEHICLE, REPLACEMENT TIRES MUST HAVE SPEED RATINGS EQUAL TO OR HIGHER THAN THOSE FITTED TO THE VEHICLE AS ORIGINAL EQUIPMENT. IF TIRES WITH LOWER SPEED RATINGS ARE FITTED, THE VEHICLE'S HANDLING MAY BE AFFECTED AND THE SPEED CAPABILITY OF THE VEHICLE MAY BE LOWERED TO THE MAXIMUM SPEED CAPABILITY OF THE REPLACEMENT TIRES. TO AVOID AN ACCIDENT RESULTING IN SEVERE OR FATAL INJURY, CONSULT THE TIRE MANUFACTURER IN REGARDS TO MAXIMUM SPEED RATINGS.

It is recommended 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 original equipment tires provide a proper combination of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

DESCRIPTION - SPARE TIRE (TEMPORARY)

The compact temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 80 km/h (50 mph) when using the temporary spare tire. Refer to Owner's Manual for complete details.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - 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 noise level during acceleration and deceleration. The engine, differential and exhaust noises will change as speed varies, while the tire noise will usually remain constant.

DIAGNOSIS AND TESTING - TIRE WEAR PATTERNS

Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other (Fig. 18).

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread (Fig. 18).

DIAGNOSIS AND TESTING - 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 (Fig. 19).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.

TIRES (Continued)

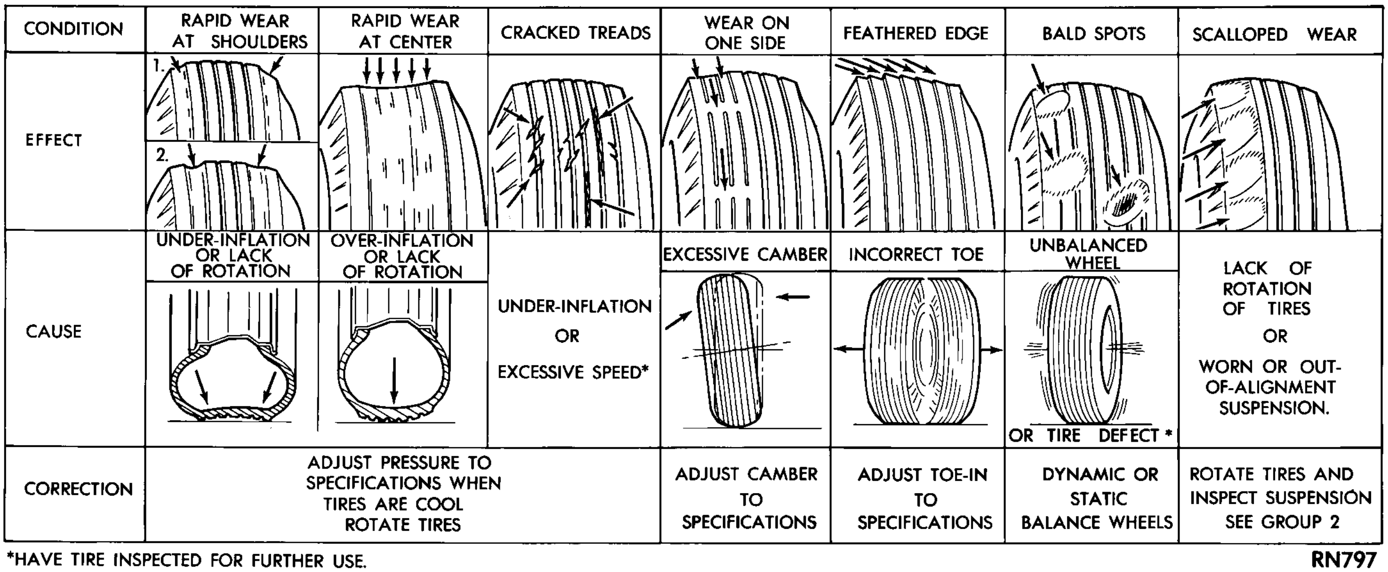


Fig. 18 Tire Wear Patterns

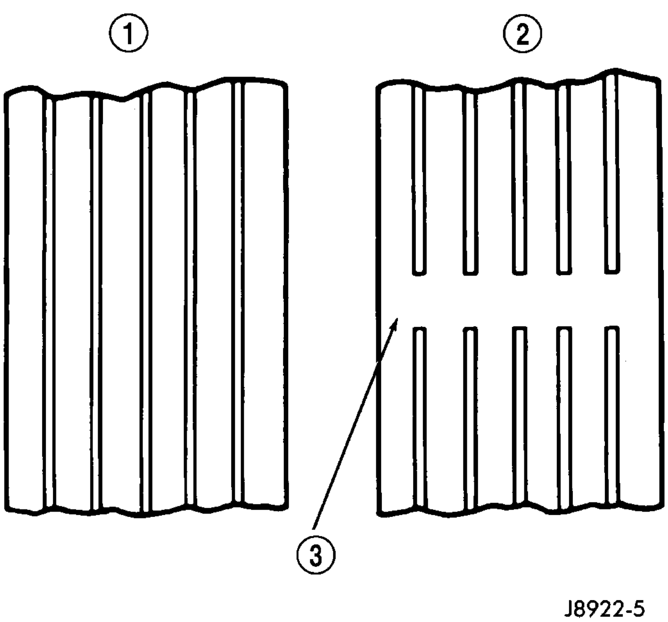


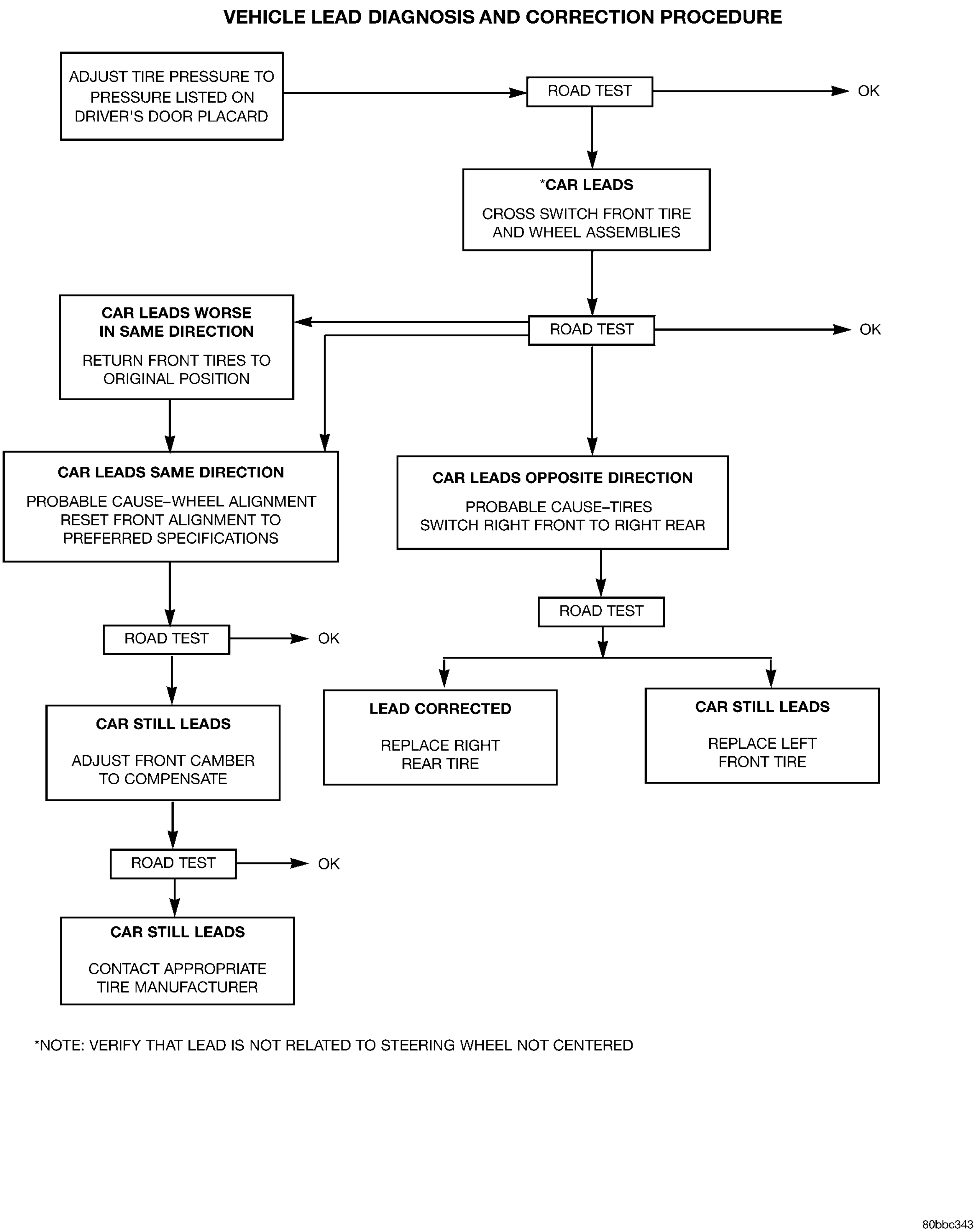
Fig. 19 Tread Wear Indicators

1 - TREAD ACCEPTABLE
2 - TREAD UNACCEPTABLE
3 - WEAR INDICATOR

DIAGNOSIS AND TESTING - VEHICLE LEAD DIAGNOSIS AND CORRECTION

Use the following chart to diagnose a vehicle that has a complaint of a drift or lead condition. The use of this chart will help to determine if the lead condition is the result of a bad tire or is caused by the wheel alignment.

TIRES (Continued)



TIRES (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - TIRE INFLATION PRESSURES

The specified tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. The proper tire pressure specification can be found on the Tire Inflation Pressure Label provided with the vehicle (usually on the driver's side B-pillar).

A quality air pressure gauge is recommended to check tire air pressure. 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. After checking the air pressure, replace valve cap finger tight.

Inflation pressures specified on the Tire Inflation Pressure Label are always the cold inflation pressure of the tire. 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 buildup.

Improper inflation can cause:
- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift.

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, tire flexing, and can result in tire failure (Fig. 20).

Over inflation causes rapid center wear and loss of the tire's ability to cushion shocks (Fig. 21).

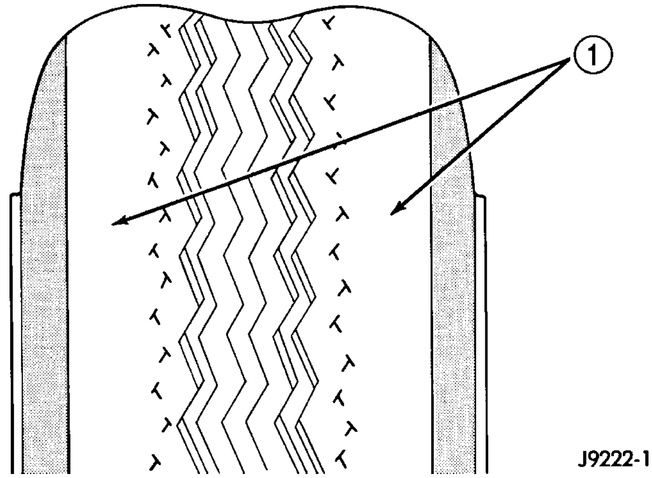


Fig. 20 Under Inflation Wear

1 - THIN TIRE TREAD AREAS

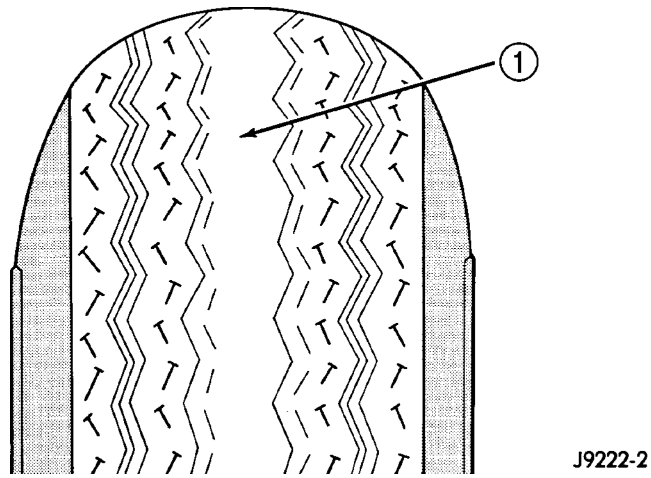


Fig. 21 Over Inflation Wear

1 - THIN TIRE TREAD AREA

STANDARD PROCEDURE - TIRE PRESSURE FOR HIGH SPEED OPERATION

DaimlerChrysler Corporation advocates driving at safe speeds within posted speed limits. Speed capacity of a tire is a function of the tire speed rating, inflation pressure and vehicle axle weight. Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. Vehicles loaded to maximum capacity should not be driven at continuous speeds over 120 km/h (75 mph). Never exceed the maximum speed capacity of the tire. For information on tire identification and speed ratings, (Refer to 22 - TIRES/WHEELS/TIRES - DESCRIPTION).

STANDARD PROCEDURE - TIRE LEAK REPAIRING

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. 22). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before attempting to dismount the tire from the wheel. **Use a lubricant 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.

TIRES (Continued)

Install wheel on vehicle, and progressively tighten the 5 wheel nuts to a torque of 135 N·m (100 ft. lbs.).

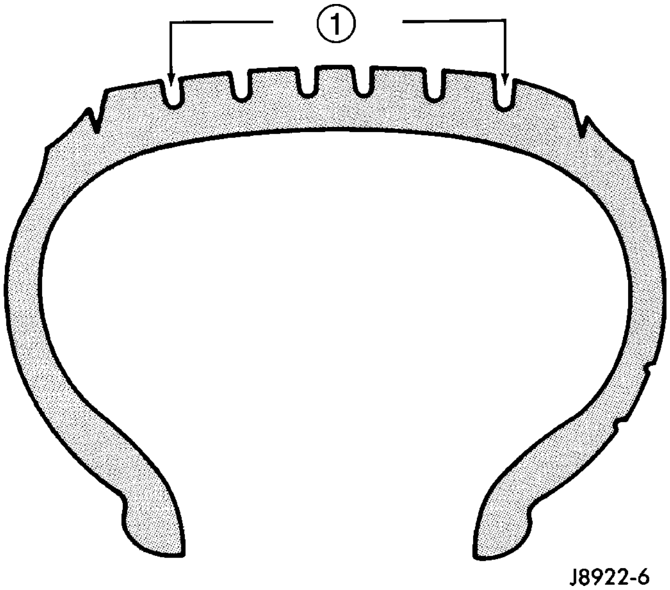


Fig. 22 Tire Repair Area

1 - REPAIRABLE AREA

CLEANING - TIRES

Before delivery of a vehicle, remove the protective coating on the tires with white sidewalls or raised white letters. To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

CAUTION: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

SPECIFICATIONS

TIRES - SRT-4

DESCRIPTION	SPECIFICATION
MANUFACTURER	BF GOODRICH
MODEL	KDWII
TIRE SIZE	205/50 ZR17
TREAD PATTERN	DIRECTIONAL

WHEELS

DESCRIPTION

Original equipment wheels are designed for proper operation at all loads up to the specified maximum vehicle capacity.

All models use steel or cast aluminum drop center wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 23).

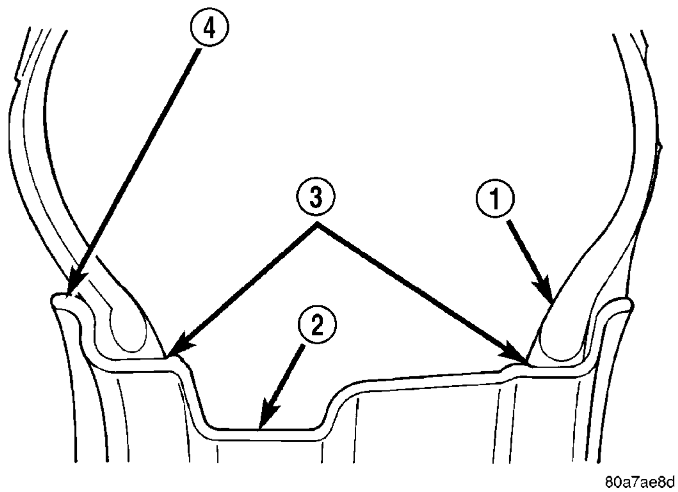


Fig. 23 Safety Rim

1 - TIRE
2 - WELL
3 - SAFETY HUMPS
4 - FLANGE

Initial inflation of the tires forces the bead over these raised sections. In case of air loss the raised sections help 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 specific wheel applications and must be replaced with equivalent parts. Do not use replacement parts of lesser quality or of a substitute design. All aluminum wheels use wheel nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels.

Vehicles that are equipped with lock-on wheel covers use large nose wheel nuts. The wheel nuts are externally threaded so that the wheel covers can be attached to the wheel nuts.

WHEELS (Continued)

DIAGNOSIS AND TESTING - WHEEL INSPECTION

Inspect wheels for:

- Excessive runout
- Dents, cracks or irregular bends
- Damaged wheel stud (lug) holes
- Air Leaks

NOTE: Do not attempt to repair a wheel by hammering, heating or welding.

If a wheel is damaged, an original equipment replacement wheel should be used. When obtaining replacement wheels, they must be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE.

WARNING: REPLACEMENT WITH USED WHEELS IS NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

CLEANING

WHEEL AND WHEEL TRIM CARE

All wheels and wheel trim, especially aluminum and chrome plated, should be cleaned regularly using mild soap and water to maintain their luster and to prevent corrosion. Wash them with the same soap solution recommended for the body of the vehicle.

When cleaning extremely dirty wheels, care must be taken in the selection of tire and wheel cleaning chemicals and equipment to prevent damage to the wheels. Mopar® Wheel Treatment or Mopar® Chrome Cleaner is recommended. Any of the “DO NOT USE” items listed below can damage wheels and wheel trim.

DO NOT USE:

- Any abrasive cleaner
- Any abrasive cleaning pad (such as steel wool) or abrasive brush
- Any cleaner that contains an acid which can react with and discolor the chrome surface. **Many wheel cleaners contain acids that can harm the wheel surface.**
- Oven cleaner
- A car wash that uses carbide-tipped wheel cleaning brushes or acidic solutions.

SPECIFICATIONS

WHEEL

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Wheel Mounting (Lug) Nut Hex Size	19 mm
Wheel Mounting Stud Size	M12 x 1.5 mm

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Wheel Mounting (Lug) Nut	135	100	—

WHEEL - SRT-4

DESCRIPTION	SPECIFICATION
WHEEL SIZE	17 in. x 6 in.
WHEEL MOUNTING NUT HEX SIZE	19 mm
WHEEL MOUNTING STUD SIZE	M12 x 1.5 mm
WHEEL MOUNTING NUT TORQUE	135 N·m (100 ft. lbs.)

WHEEL COVER

REMOVAL

(1) Raise the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

CAUTION: When removing the bolt-on wheel cover, do not attempt to pry the wheel cover off the wheel.

(2) Unthread and remove the 5 nuts attaching the wheel and wheel cover to the vehicle (Fig. 24).

(3) Remove the wheel cover using care not to let the tire and wheel assembly fall off the vehicle.

WHEEL COVER (Continued)

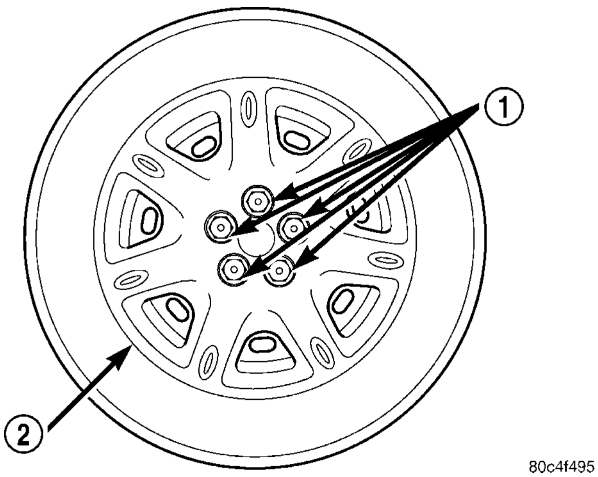


Fig. 24 Wheel And Cover Mounting

1 - WHEEL MOUNTING NUTS
2 - BOLT-ON WHEEL COVER

INSTALLATION

CAUTION: Installing the wheel mounting nuts without having good metal-to-mental contact between the back of the wheel and the hub mounted brake disc or drum could cause the wheel to bind and eventually cause loosening of the wheel mounting nuts.

CAUTION: Never use oil or grease on wheel studs or wheel mounting nuts.

(1) With the tire and wheel assembly positioned on the wheel studs without the wheel mounting nuts installed, align the valve notch in the wheel cover with the valve stem on the wheel and install the wheel cover on the hub mounted studs.

(2) Install and lightly tighten the wheel mounting nuts in the proper sequence (Fig. 25).

(3) Lower the vehicle.

(4) Progressively tighten the 5 wheel mounting nuts in the proper sequence until tightened to half of the specified torque (Fig. 25). Finally, tighten the wheel mounting nuts in the proper sequence to 135 N·m (100 ft. lbs.) torque.

WHEEL MOUNTING STUDS - FRONT

REMOVAL

Use the following procedure to remove and install one of five studs on one wheel hub.

(1) Raise the vehicle. Refer to Hoisting in Lubrication And Maintenance.

(2) Remove the front tire and wheel assembly.

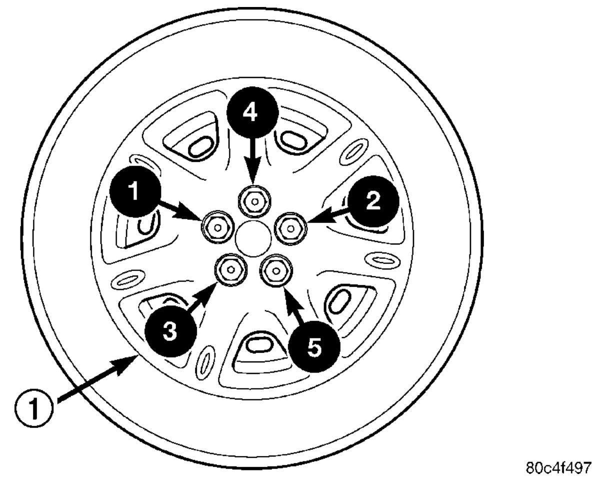


Fig. 25 Nut Tightening Sequence

1 - BOLT-ON WHEEL COVER

(3) Remove the two guide pin bolts securing the front disc brake caliper to the steering knuckle (Fig. 26).

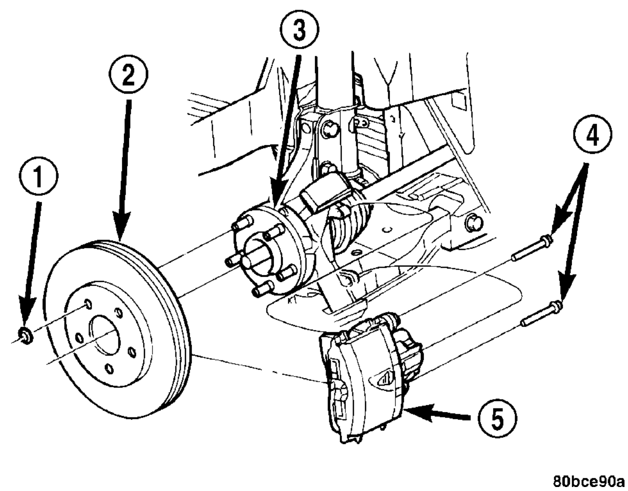


Fig. 26 Brake Caliper And Rotor

1 - RETAINER CLIP
2 - BRAKE ROTOR
3 - HUB
4 - GUIDE PIN BOLTS
5 - DISC BRAKE CALIPER

(4) Remove the disc brake caliper from the steering knuckle. The caliper is removed by first tipping either the top (right side) or bottom (left side) of the caliper away from the brake rotor, then pulling the caliper off the opposite end's caliper slide abutment (on the knuckle) and rotor.

(5) Hang the caliper out of the way using a wire hanger or cord. Do not support the caliper by letting it hang by the hydraulic hose.

(6) Remove any retainer clips from the wheel mounting studs. Remove the brake rotor from the front hub (Fig. 26).

WHEEL MOUNTING STUDS - FRONT (Continued)

CAUTION: Do not hammer wheel mounting studs out of the hub. Damage to the wheel bearing will occur, leading to premature bearing failure.

(7) Install a wheel mounting nut on the wheel mounting stud being removed from the hub far enough so the threads on the stud are even with end of lug nut. Rotate the hub so the stud requiring removal is aligned with notch cast into front of the steering knuckle. Install Remover, Special Tool C-4150A, on hub flange and wheel stud (Fig. 27).

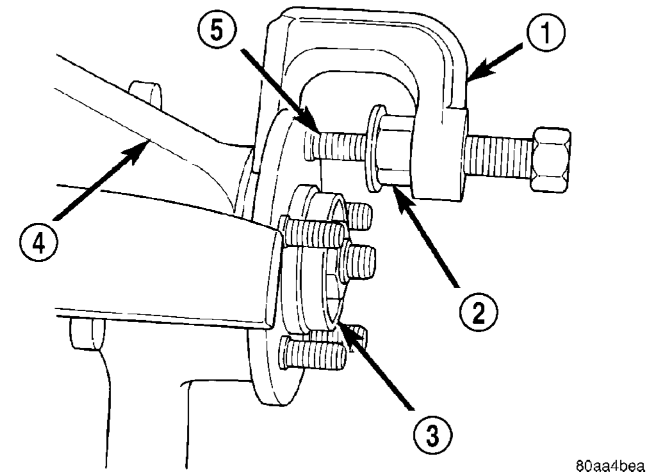


Fig. 27 Wheel Stud Removal

1 - SPECIAL TOOL C-4150A
2 - LUG NUT
3 - HUB/BEARING
4 - STEERING KNUCKLE
5 - WHEEL STUD

(8) Tighten the remover, pushing the wheel mounting stud out the rear of the hub flange. When the shoulder of the stud is past the flange, remove the remover from the hub. Remove the nut from the stud, then remove the stud from the flange.

INSTALLATION

Use the following procedure to remove and install one of five studs on one wheel hub.

(1) Install the wheel mounting stud in the flange of hub from the rear side. Install several washers and a wheel mounting nut on the stud (Fig. 28). The wheel mounting nut must be installed with the flat side of the wheel mounting nut against the washers to eliminate binding.

(2) Tighten the wheel mounting nut. This will pull the wheel mounting stud into the flange of the hub. When the head of the stud is fully seated against the rear of the hub flange, remove the wheel mounting nut and washers from the stud.

(3) Install the brake rotor on the hub (Fig. 26).

(4) Install the disc brake caliper (with pads) on the brake rotor and steering knuckle. The left side caliper is installed by first sliding the top of the caliper past the top abutment on the steering knuckle to hook the top edge of the caliper, then pushing the lower end of the caliper into place against the knuckle (Fig. 29). The right side caliper is installed by first sliding the bottom edge of the caliper past the lower abutment on the steering knuckle to hook the lower edge of the caliper, then pushing the top of the caliper into place against the steering knuckle.

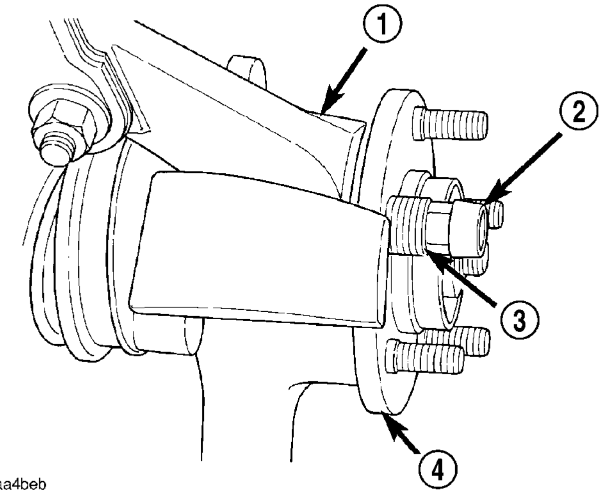


Fig. 28 Installing Wheel Stud

1 - STEERING KNUCKLE
2 - WHEEL LUG NUT
3 - WASHERS
4 - HUB/BEARING

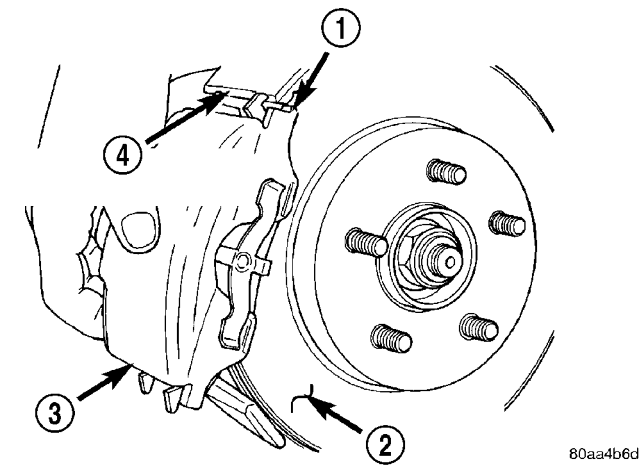


Fig. 29 Brake Caliper Installation

1 - SLIDE TOP OF BRAKE CALIPER UNDER TOP ABUTMENT OF STEERING KNUCKLE AS SHOWN
2 - BRAKING DISC
3 - DISC BRAKE CALIPER
4 - STEERING KNUCKLE BRAKE ABUTMENT

(5) Install the two guide pin bolts securing the front disc brake caliper to the steering knuckle (Fig. 26). Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

WHEEL MOUNTING STUDS - FRONT (Continued)

(6) Install the tire and wheel assembly. Install the wheel mounting nuts and tighten them to a torque of 135 N·m (100 ft. lbs.).

(7) Lower the vehicle.

WHEEL MOUNTING STUDS - REAR

REMOVAL

CAUTION: DO NOT hammer studs 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.

(1) Remove the hub and bearing from the vehicle. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)

CAUTION: Take care to keep hub and bearing assembly from falling during stud removal. Damage to the hub and bearing could result.

(2) Position the hub and bearing assembly under a hydraulic press ram, supported by a 21 mm deep-well impact socket under the stud to be replaced (Fig. 30).

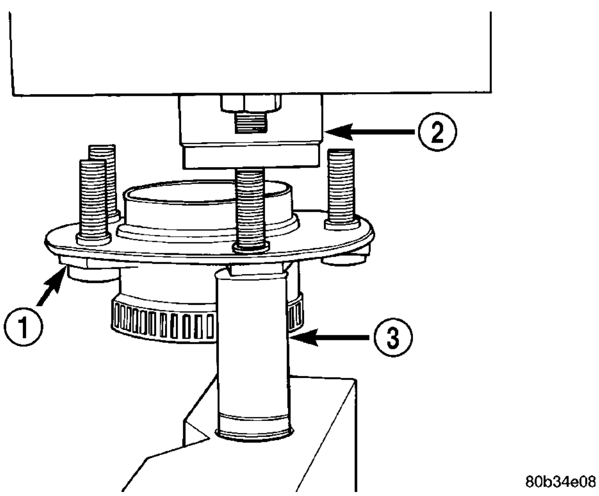


Fig. 30 Wheel Stud Removal

1 - HUB AND BEARING ASSEMBLY
2 - PRESS RAM
3 - 21mm IMPACT SOCKET

(3) Press the stud out of the hub flange and into the socket well.

(4) Remove the hub and bearing assembly from the press.

(5) Remove the stud from the socket.

INSTALLATION

CAUTION: DO NOT hammer studs into the hub flange. If a stud is installed in such a manner, damage to the hub and bearing assembly may occur leading to premature bearing failure.

(1) Install wheel stud into stud hole in hub and bearing assembly.

(2) Position the hub and bearing assembly face down with stud pointing down into the well of the 21 mm socket. The hydraulic press ram must line up with the stud (Fig. 31).

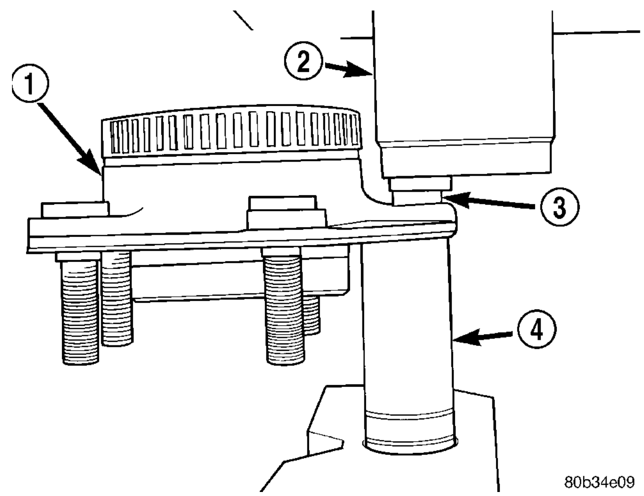


Fig. 31 Wheel Stud Installation

1 - HUB AND BEARING ASSEMBLY
2 - PRESS RAM
3 - WHEEL STUD
4 - 21mm IMPACT SOCKET

(3) Press the stud into the hub flange until it bottoms.

(4) Remove the hub and bearing assembly from the press.

(5) Install the hub and bearing on the vehicle. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)

BODY

TABLE OF CONTENTS

BODY

DESCRIPTION - VEHICLE IDENTIFICATION

Throughout this group, references to the DaimlerChrysler 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.

WARNING

SAFETY PRECAUTIONS AND WARNINGS

WARNING: 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.

BODY (Continued)

DIAGNOSIS AND TESTING

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 LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

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.

BODY (Continued)

DIAGNOSIS AND TESTING - 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 cross winds. 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.

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.

STANDARD PROCEDURE

STANDARD PROCEDURE - HEAT STAKING

(1) Remove trim panel.

(2) Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and/or component seams for looseness.

(3) Heat stake the components.

(a) If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

(b) If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

(4) Allow the repaired area to cool and verify the repair.

(5) Install trim panel.

STANDARD PROCEDURE - PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively on DaimlerChrysler Motors vehicles. Always follow repair material manufacturer's plastic identification and repair procedures.

Rigid Plastics:

Examples of rigid plastic use: Fascias, Hoods, Doors, and other Body Panels, which include SMC, ABS, and Polycarbonates.

Semi-Rigid Plastics:

Examples of semi-rigid plastic use: Interior Panels, Under Hood Panels, and other Body Trim Panels.

Flexible Plastics:

Examples of flexible plastic use: Fascias, Body Moldings, and upper and lower Fascia Covers.

Repair Procedure:

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

Adhesion Promoter/Surface Modifier:

Adhesion Promoters/Surface Modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

BODY (Continued)

SAFETY PRECAUTION AND WARNINGS

WARNING:

- **EYE PROTECTION SHOULD BE USED WHEN SERVICING COMPONENTS. PERSONAL INJURY CAN RESULT.**
- **USE AN OSHA APPROVED BREATHING MASK WHEN MIXING EPOXY, GRINDING, AND SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.**
- **AVOID PROLONGED SKIN CONTACT WITH RESIN, PETROLEUM, OR ALCOHOL BASED SOLVENTS. PERSONAL INJURY CAN RESULT.**
- **DO NOT VENTURE UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.**

NOTE:

- **When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.**
- **Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.**

RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	ACRYLONITRILE STYRENE ACRYLITE	LURAN S	CONSOLES, GRILLES
ABS	ACRYLONITRILE BUTADIENE STYRENE	TERLURAN	″A″ PILLARS, CONSOLES, GRILLES
ABS/PC	ABS/PC ALLOY	PULSE, PROLOY, BAYBLEND	DOORS, INSTRUMENT PANELS
ABS/PVC	ABS/PV ALLOY	PROLOY, PULSE, LUSTRAN, CYCLOVIN	DOOR PANELS, GRILLES, TRIM
BMC	BULK MOLDING COMPOUND	BMC	FENDER EXTENSIONS
EMA	EHTYLENE METHYL ACRYLATE/IONOMER	SURLYN, EMA, IONOMER	BUMPER GUARDS, PADS
METTON	METTON	METTON	GRILLES, KICK PANELS, RUNNING BOARDS
MPPO	MODIFIED POLYPHENYLENE OXIDE	MPPO	SPOILER ASSEMBLY
PA	POLYAMID	ZYTEL, VYDYNE, PA, MINLON	FENDERS, QUARTER PANELS
PET	THERMOPLASTIC POLYESTER	RYNITE	TRIM
PBT/PPO	PBT/PPO ALLOY	GERMAX	CLADDINGS
PBTP	POLYBUTYLENE THEREPTHALATE	PBT, PBTP, POCAN, VALOX	WHEEL COVERS, FENDERS, GRILLES
PBTP/EEBC	POLYBUTYLENE THEREPTHALATE/EEBC ALLOY	BEXLOY, ″M″, PBTP/EEBC	FASCIAS, ROCKER PANEL, MOLDINGS
PC	POLYCARBONATE	LEXAN, MERLON, CALIBRE, MAKROLON PC	TAIL LIGHT LENSES, IP TRIM, VALANCE PANELS
PC/ABS	PC/ABS ALLOY	GERMAX, BAY BLENDS, PULSE	DOORS, INSTRUMENT PANELS
PPO	POLYPHENYLENE OXIDE	AZDEL, HOSTALEN, MARLEX, PRFAX, NORYL, GTX, PPO	INTERIOR TRIM, DOOR PANELS, SPLASH SHIELDS, STEERING COLUMN SHROUD
PPO/PA	POLYPHENYLENE/POLYAMID	PPO/PA, GTX 910	FENDERS, QUARTER PANELS

BODY (Continued)

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
PR/FV	FIBERGLASS REINFORCED PLASTIC	FIBERGLASS, FV, PR/FV	BODY PANELS
PS	POLYSTYRENE	LUSTREX, STYRON, PS	DOOR PANELS, DASH PANELS
RTM	RESIN TRANSFER MOLDING COMPOUND	RTM	BODY PANELS
SMC	SHEET MOLDED COMPOUND	SMC	BODY PANELS
TMC	TRANSFER MOLDING COMPOUND	TMC	GRILLES
UP	UNSATURATED POLYESTER (THERMOSETTING)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	GRILLE OPENING PANEL, LIFTGATES, FLARESIDE FENDERS, FENDER EXTENSIONS
EEBC	ETHER/ESTER BLOCKED CO-POLYMER	EEBC	BUMPERS
EEBC/PBTP	EEBC/POLYBUTYLENE TEREPTHALATE	EEBC, PBTP, BEXLOY	BUMPER, ROCKER PANELS
EMPP	ETHYLENE MODIFIED POLYPROPYLENE	EMPP	BUMPER COVERS
EPDM	ETHYLENE/PROPROPYLENE DIENE MONOMER	EPDM, NORDEL, VISTALON	BUMPERS
EPM	ETHYLENE/PROPROPYLENE CO-POLYMER	EPM	FENDERS
MPU	FOAM POLYURETHANE	MPU	SPOILERS
PE	POLYETHYLENE	ALATHON, DYLAN, LUPOLEN, MARLEX	-
PP	POLYPROPYLENE (BLENDS)	NORYL, AZDEL, MARLOX, DYLON, PRAVEX	INNER FENDER, SPOILERS, KICK PANELS
PP/EPDM	PP/EPDM ALLOY	PP/EPDM	SPOILERS, GRILLES
PUR	POLYURETHANE	COLONELS, PUR, PU	FASCIAS, BUMPERS
PUR/PC	PUR/PC ALLOY	TEXIN	BUMPERS
PVC	POLYVINYL CHLORIDE	APEX, GEON, VINYLITE	BODY MOLDINGS, WIRE INSULATION, STEERING WHEELS
RIM	REACTION INJECTED MOLDED POLYURETHANE	RIM, BAYFLEX	FRONT FASCIAS, MODULAR WINDOWS
RRIM	REINFORCED REACTION INJECTED MOLDED	PUR, RRIM	FASCIAS, BODY PANELS, BODY TRIMS
TPE	THERMO POLYETHYLENE	TPE, HYTREL, BEXLOY-V	FASCIAS, BUMPERS, CLADDINGS
TPO	THERMOPOLYOLEFIN	POLYTROPE, RENFLEX, SANTOPRENE, VISAFLEX, ETA, APEX, TPO, SHIELDS, CLADDINGS	BUMPERS, END CAPS, TELCAR, RUBBER, STRIPS, SIGHT, INTERIOR B POST
TPP	THERMO-POLYPROPYLENE	TPP	BUMPERS
TPU	THERMOPOLYURETHANE, POLYESTER	TPU, HYTREL, TEXIN, ESTANE	BUMPERS, BODY SIDE, MOLDINGS, FENDERS, FASCIAS

BODY (Continued)

PANEL SECTIONING

If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel (Fig. 1). To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be "V'd" at a 20 degree angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

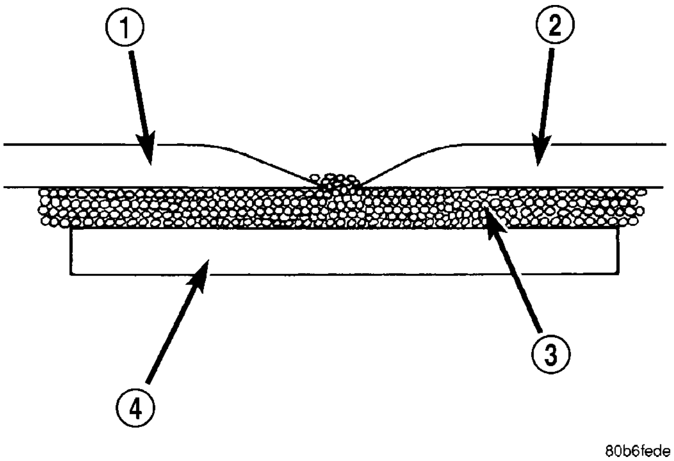


Fig. 1 PANEL SECTIONING

1 - EXISTING PANEL
2 - NEW PANEL
3 - PANEL ADHESIVE
4 - BONDING STRIP

When bonding plastic panels, Follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

PANEL REINFORCEMENT

Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement (Fig. 2) and (Fig. 3). Open meshed fiberglass dry wall tape can be used to form a reinforcement. The dry wall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more dry wall tape used, the stronger the repair.

Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first "V'd" out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 degree angle will increase the bonding surface for a repair (Fig. 4). It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.

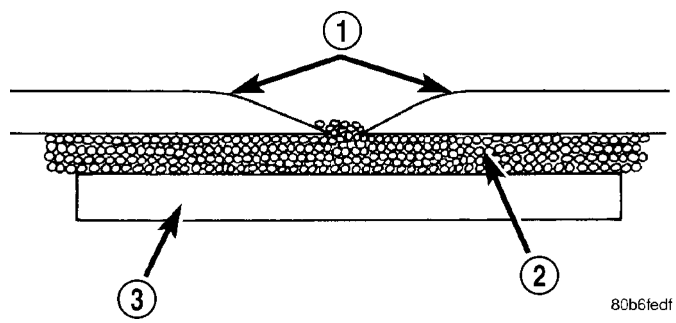


Fig. 2 SOFTENED EDGES

1 - SOFTENED EDGES
2 - PANEL ADHESIVE
3 - BONDING STRIP

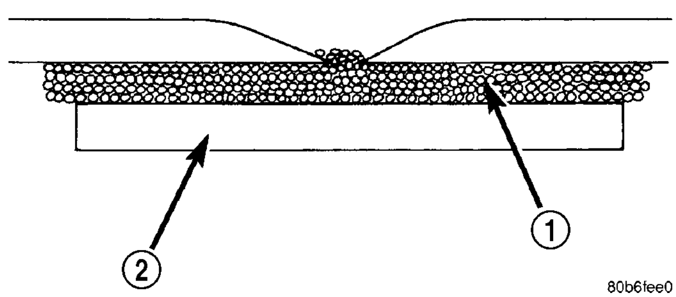


Fig. 3 PANEL REINFORCEMENT

1 - PANEL ADHESIVE
2 - REINFORCEMENT

BODY (Continued)

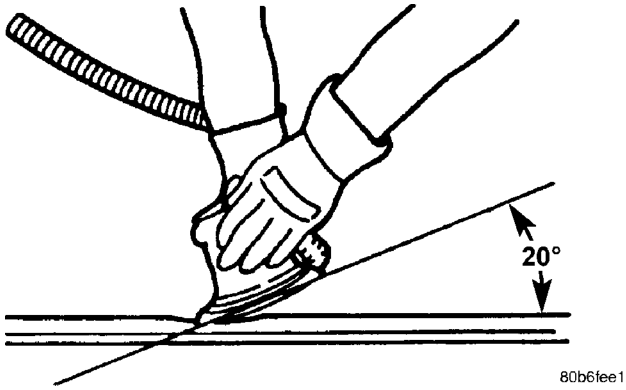


Fig. 4 BEVELING ANGLE - 20 DEGREE

• Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used (Fig. 5).

• The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damage part to its original strength and appearance without exceeding the value of the replacement part.

• When plastic repairs are required, it is recommended that the part be left on the vehicle when every possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.

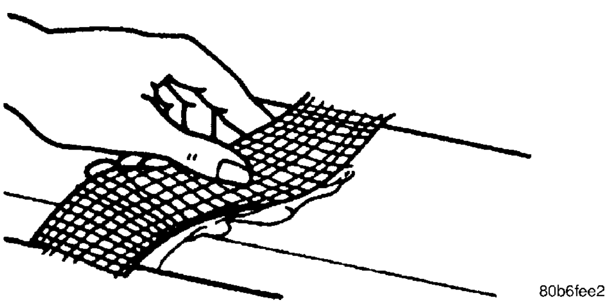


Fig. 5 FIBERGLASS TAPE

VISUAL INSPECTION

Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind (Fig. 7) (Fig. 6).

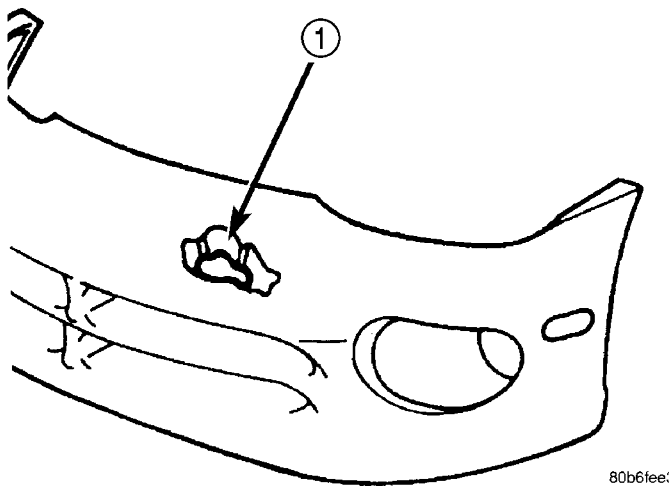


Fig. 6 DAMAGE COMPONENT

1 - PUNCTURE

PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel would require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to assure adhesion of repair materials.

BODY (Continued)

PATCHING PANELS

An panel that has extensive puncture type damage can be repaired by cutting out the damaged material (Fig. 7). Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20 degrees to expose a larger bonding area on the outer side. This will allow for an increased reinforcement areas.

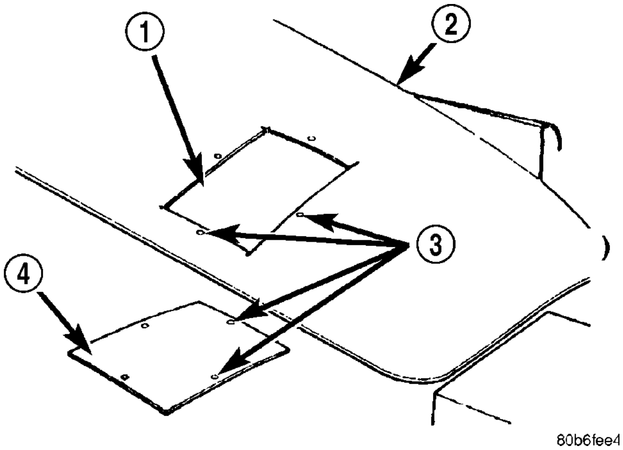


Fig. 7 DAMAGED PANEL CUTOUT AND PATCH

1 - CUTOUT
2 - DAMAGED BODY PANEL
3 - 4 MM (0.160 IN.) HOLES
4 - PATCH CUT TO SIZE

PANEL PATCH FABRICATIONS

A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. Lift gates and fenders can be used to supply patch material. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (dry wall tape). Perform the following operation if required:

(1) Cover waxed paper or plastic with adhesive backed nylon mesh (dry wall tape) larger than the patch required (Fig. 8).

(2) Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.

(3) Apply a liberal coat of adhesive over the reinforcement mesh (Fig. 8). If necessary apply a second or third coat of adhesive and mesh after first coat has cured. The thickness of the patch should be the same as the repair area.

(4) After patch has cured, peel waxed paper or plastic from the back of the patch.

(5) If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.

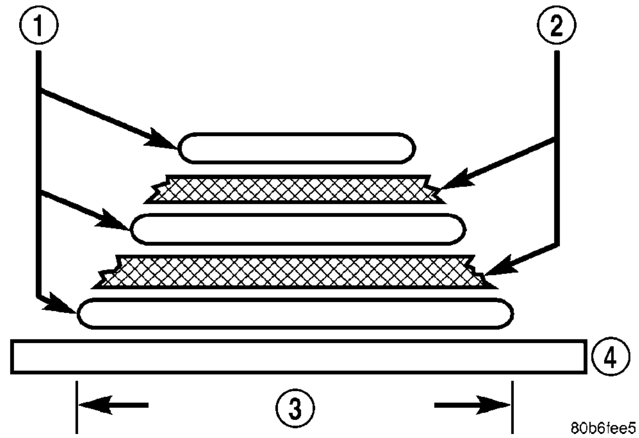


Fig. 8 FABRICATED PANEL

1 - STRUCTURAL ADHESIVE
2 - FIBERGLASS CLOTH OR FIBERGLASS MESH TAPE
3 - WIDTH OF V-GROOVE
4 - WAXED PAPER

PANEL PATCH INSTALLATION

(1) Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.

(2) Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.

(3) Using the pattern as a guide, cut the patch to size.

(4) Cut scrap pieces of patch material into 50 mm (2 in.) squares to use as patch supports to sustain the patch in the cutout.

(5) Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole (Fig. 7).

(6) Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.

(7) Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.

(8) Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.

(9) Mix enough adhesive to cover one side of all support squares.

(10) Apply adhesive to cover one side of all support squares.

BODY (Continued)

(11) Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares (Fig. 9).

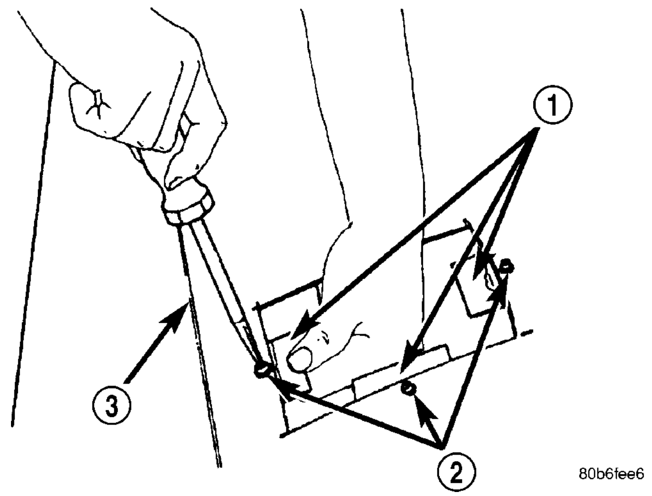


Fig. 9 SECURE SUPPORT SQUARES TO BODY PANEL

1 - SUPPORT SQUARES
2 - SCREWS
3 - DAMAGED BODY PANEL

(12) Position patch in cutout against support squares and adjust patch until the gap is equal along all sides (Fig. 10).

(13) Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.

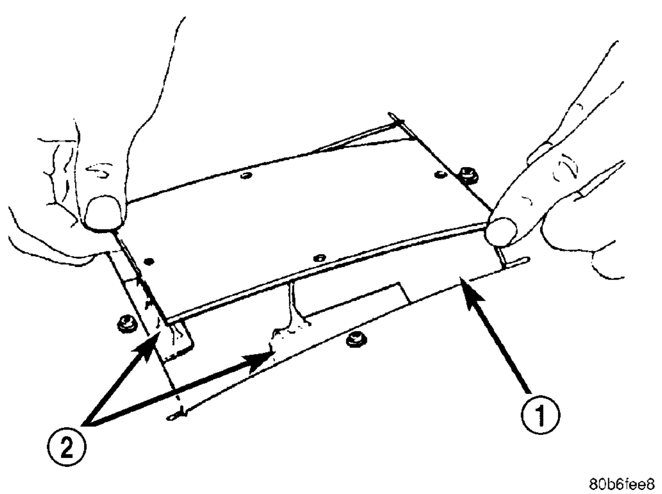


Fig. 10 POSITION PATCH IN CUTOUT AND ALIGN

1 - CUTOUT
2 - SUPPORT SQUARES

(14) Apply a coat of adhesive to the exposed ends of the support squares (Fig. 11).

(15) Install screws to hold the patch to support squares (Fig. 12). Tighten screws until patch surface is flush with panel surface.

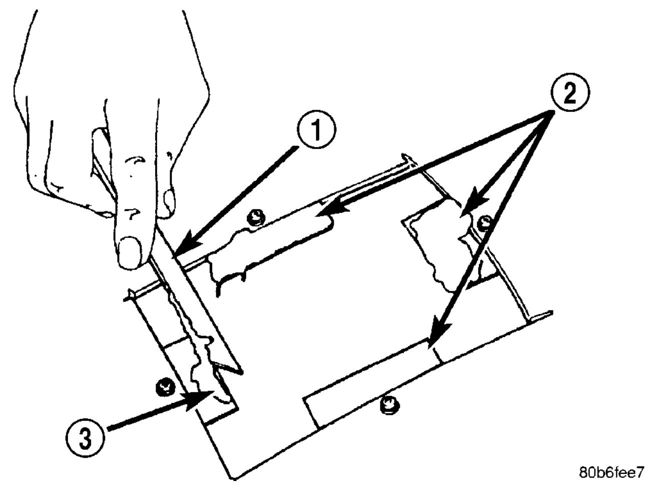


Fig. 11 APPLY ADHESIVE TO SUPPORT SQUARES

1 - APPLICATOR
2 - SUPPORT SQUARES
3 - ADHESIVE

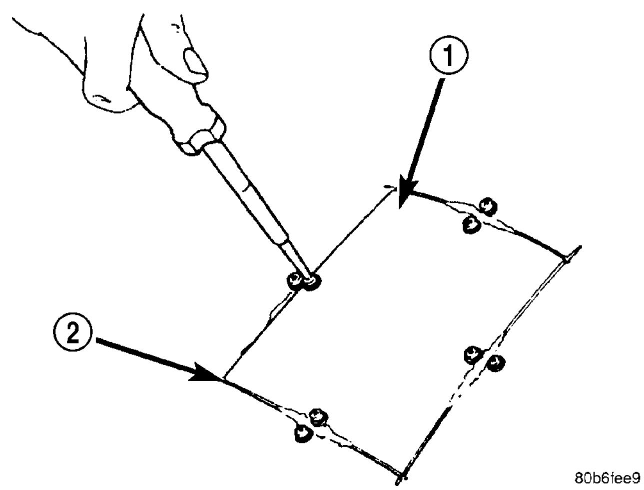


Fig. 12 INSTALL SCREWS

1 - PATCH
2 - GAP

BODY (Continued)

(16) Allow adhesive to cure, and remove all screws.

(17) Using a 125 mm (5 in.) 24 grit disc grinder, grind a 50 mm (2 in.) to 75 mm (3 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch (Fig. 13). With compressed air, blow dust from around patch.

(18) Apply adhesive backed nylon mesh (dry wall tape) over gaps around patch (Fig. 14).

(19) Mix enough adhesive to cover the entire patch area.

(20) Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair (Fig. 15).

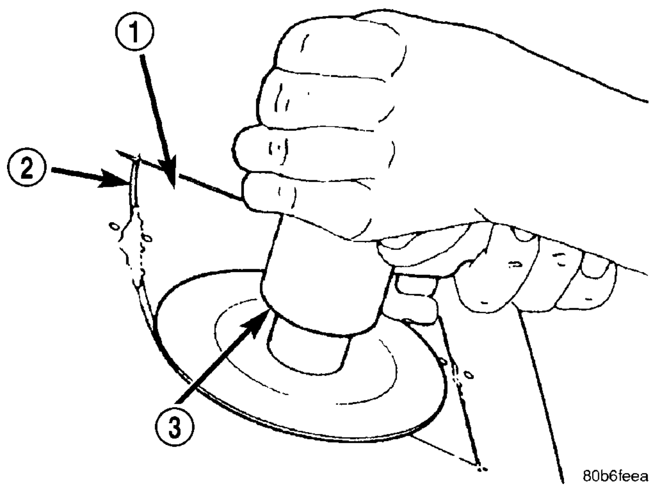


Fig. 13 GRIND SURFACE

1 - PATCH
2 - GAP
3 - DISC GRINDER

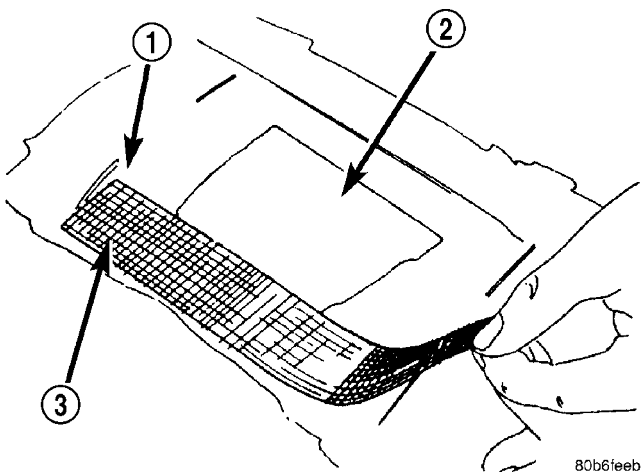


Fig. 14 COVER GAPS WITH MESH

1 - GROUND DOWN AREA
2 - PATCH
3 - MESH

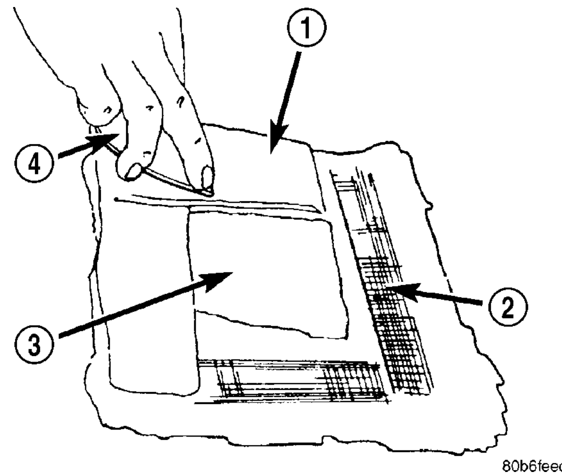


Fig. 15 COVER MESH WITH ADHESIVE

1 - ADHESIVE
2 - MESH
3 - PATCH
4 - SPREADER

PATCHED PANEL SURFACING

After patch panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

BODY (Continued)

SPECIFICATIONS

SPECIFICATIONS - TORQUE

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
All seat belt anchor bolts	40	30	—
All seat belt anchor nuts	40	30	—
All seat belt retractor bolts	40	30	—
Decklid latch striker	22	16	—
Front seat track to floor pan bolts	55	40	—
Front seat inboard pivot bolt	40	30	—
Front seat recliner to seat cushion frame	12	9	—
Front seat track to cushion frame bolt	12	9	—
Front seat back	40	30	—
Front seat back recliner to seat back	12	9	—
Front door hinge to hinge pillar bolt	28	21	—
Front door hinge to door nuts and bolt	28	21	—
Front door latch striker	28	20	—
Hood latch striker	13.5	10	—
Rear door glass to regulator bolt	11	—	105
Rear door hinge to B-pillar bolt	28	20	—
Rear door hinge to door bolt	28	20	—
Rear door latch striker	28	20	—
Rear seat back and seat belt buckle anchor nut	57	42	—
Sunroof module	5	—	44

BODY LUBRICATION

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 under hood 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.

BODY (Continued)

LUBRICANT USAGE

ENGINE OIL

- Door Hinges – Hinge Pin and Pivot Contact Areas
- Hood Hinges – Pivot Points
- Liftgate Hinges

MOPAR® SPRAY WHITE LUBE OR EQUIVALENT

- Door Check Straps
- Liftgate Latches
- Liftgate Prop Pivots
- Ash Receiver
- Fuel Filler Door Remote Control Latch Mechanism
- Parking Brake Mechanism
- Sliding Seat Tracks
- Liftgate Latch

MOPAR® Multipurpose GREASE OR EQUIVALENT

- All Other Hood Mechanisms

MOPAR® LOCK CYLINDER LUBRICANT OR EQUIVALENT

- Door Lock Cylinders
- Liftgate Lock Cylinder

SPECIAL TOOLS

BODY

INDEX

DESCRIPTION	FIGURE
STICK, TRIM C 4755	16
REMOVER, MOLDINGS C-4829	17
PLIERS, HEADLINER CLIP 6967	18

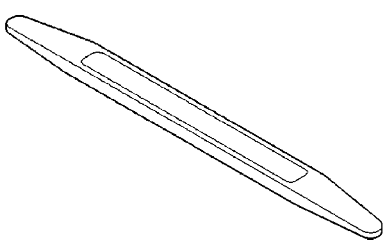


Fig. 16 STICK, TRIM C 4755

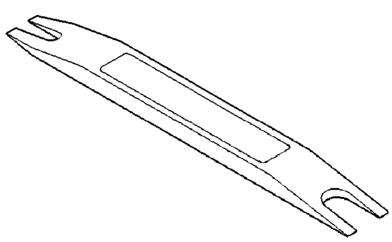


Fig. 17 REMOVER, MOLDINGS C-4829

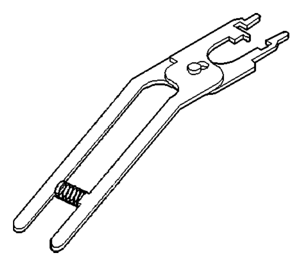


Fig. 18 PLIERS, HEADLINER CLIP 6967

DECKLID/HATCH/LIFTGATE/TAILGATE

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COVER

REMOVAL

(1) Remove fasteners attaching decklid cover to vehicle (Fig. 1).

(2) Remove decklid cover from vehicle.

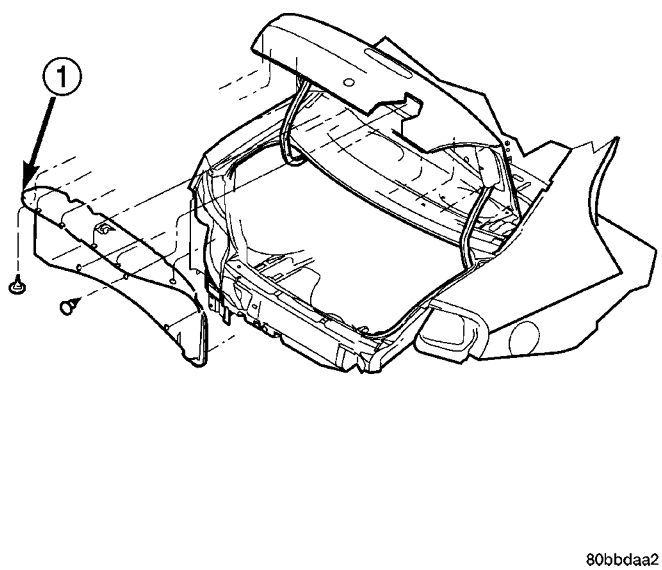

Fig. 1 Decklid Trim Panel

1 - DECKLID COVER

INSTALLATION

(1) Position cover on decklid over the striker.

(2) Install push in fasteners.

(3) Seat the lower edges of the carpet and smooth out.

(4) Close decklid.

DECKLID

REMOVAL

(1) Open decklid.

(2) Mark bolt locations on inside of decklid to aid installation.

(3) Disengage clips attaching wire harness and decklid release cable to decklid.

(4) Disconnect wire connector and release cable from decklid latch.

(5) Remove bolts attaching top of hinge to decklid (Fig. 2).

(6) With aid from a helper, remove bolts holding bottom of hinge to decklid.

(7) Remove decklid from vehicle.

INSTALLATION

(1) Place decklid in position on vehicle.

(2) With aid from a helper, install bolts attaching bottom of hinge to decklid.

(3) Install bolts attaching top of hinge to decklid.

(4) Align decklid to achieve equal spacing on all sides and flush across gaps.

(5) Verify decklid operation and sealing.

(6) Connect wire connector and release cable on latch.

(7) Install clips attaching wire harness and cable to decklid.

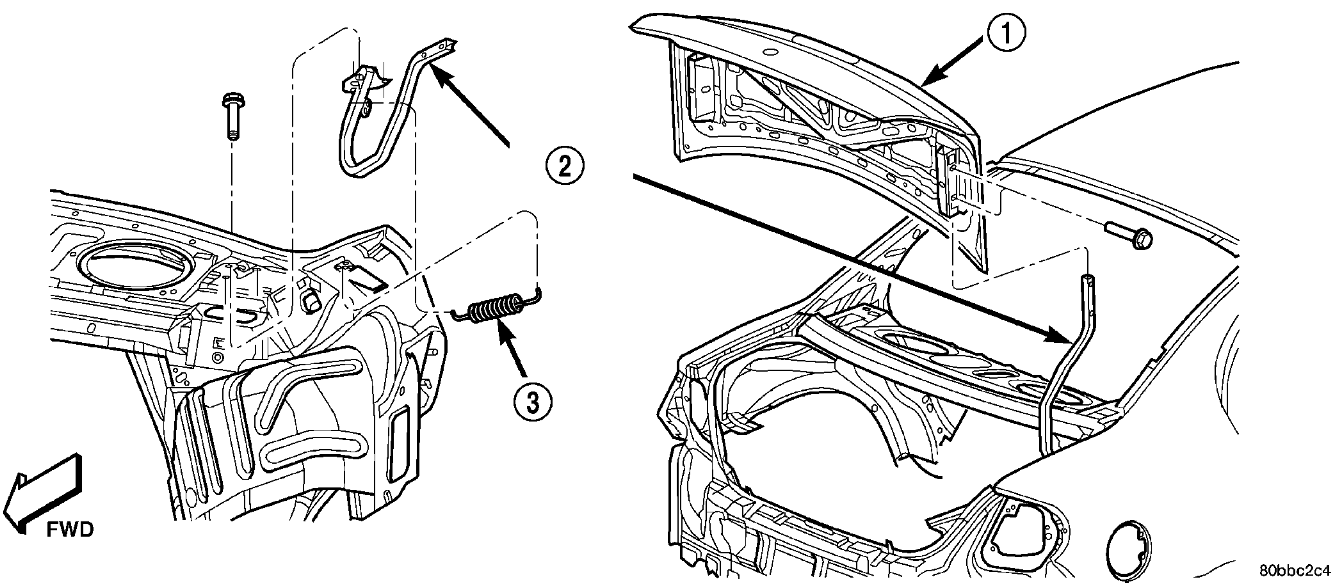

Fig. 2 Decklid

1 - DECKLID
2 - DECKLID HINGE
3 - DECKLID SPRING

LATCH

REMOVAL

(1) Open decklid.

(2) Remove bolts attaching decklid latch to decklid (Fig. 3).

(3) Remove attaching latch from decklid.

(4) Disconnect remote decklid latch release cable form decklid latch.

(5) Disconnect decklid ajar switch connector from latch.

(6) Remove latch from vehicle.

INSTALLATION

(1) Place decklid latch into position (Fig. 3).

(2) Connect remote decklid latch wire connector to decklid latch.

(3) Connect decklid ajar and lamp switch connector to latch.

(4) Install bolts attaching decklid latch to decklid lid.

(5) Check decklid latch for proper alignment.

(6) Close decklid.

LATCH STRIKER

REMOVAL

(1) Release decklid latch and open decklid.

(2) Remove push in fasteners attaching decklid lining to tail panel.

(3) Remove trunk lining from tail panel.

(4) Remove bolts attaching decklid latch striker to tail panel (Fig. 4).

(5) Remove striker from vehicle.

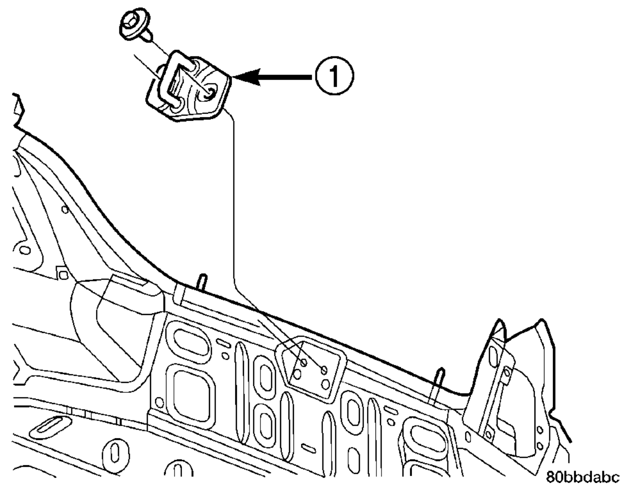

Fig. 4 Decklid Latch Striker

1 - DECKLID LATCH STRIKER

INSTALLATION

(1) Install striker in vehicle.

(2) Install trunk lining from tail panel.

(3) Install push in fasteners attaching decklid lining to tail panel.

(4) Close decklid.

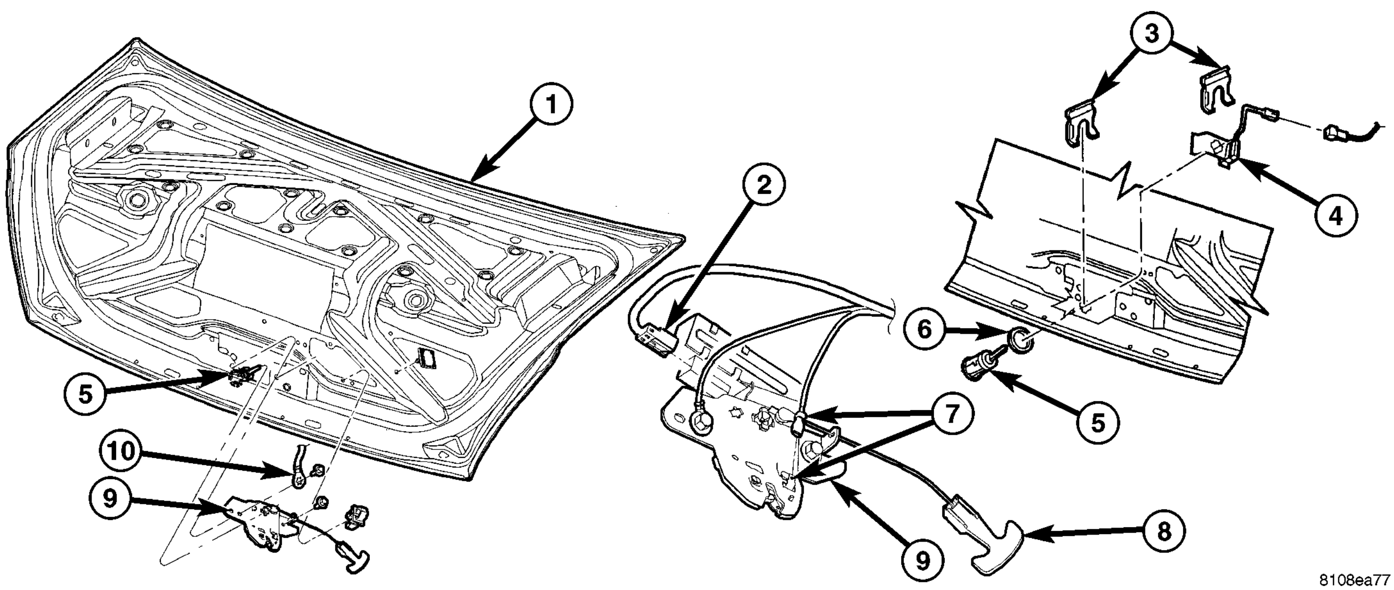

Fig. 3 DECKLID LATCH ASSEMBLY

1 - DECKLID
2 - POWER DECKLID
3 - RETAINER CLIP(S)
4 - DECKLID SECURITY ALARM SWITCH
5 - LOCK CYLINDER
6 - GASKET
7 - DECKLID LAMP SWITCH CONNECTOR
8 - EMERGENCY DECKLID RELEASE HANDLE
9 - POWER DECKLID LATCH
10 - GROUND WIRE AND ATTACHING SCREW

LIFT SPRING

REMOVAL

WARNING: USE EYE AND HAND PROTECTION WHEN REMOVING SPRINGS, PERSONAL INJURY MAY RESULT.

(1) Release and open decklid.
(2) Support decklid on a suitable prop device.
(3) Using a common pliers, disengage spring from rearward notch or hole under decklid opening side trough (Fig. 5).
(4) Disengage spring from decklid hinge.

INSTALLATION

(1) Engage spring to decklid hinge.
(2) Using a common pliers, connect spring to the rearward notch or hole under decklid opening side trough (Fig. 5). Without spoiler connect the spring into the hole. With spoiler connect spring to the notch.
(3) Position spring with the damper at the of the spring with only 3 coils showing.
(4) Remove decklid support device.
(5) Close decklid.

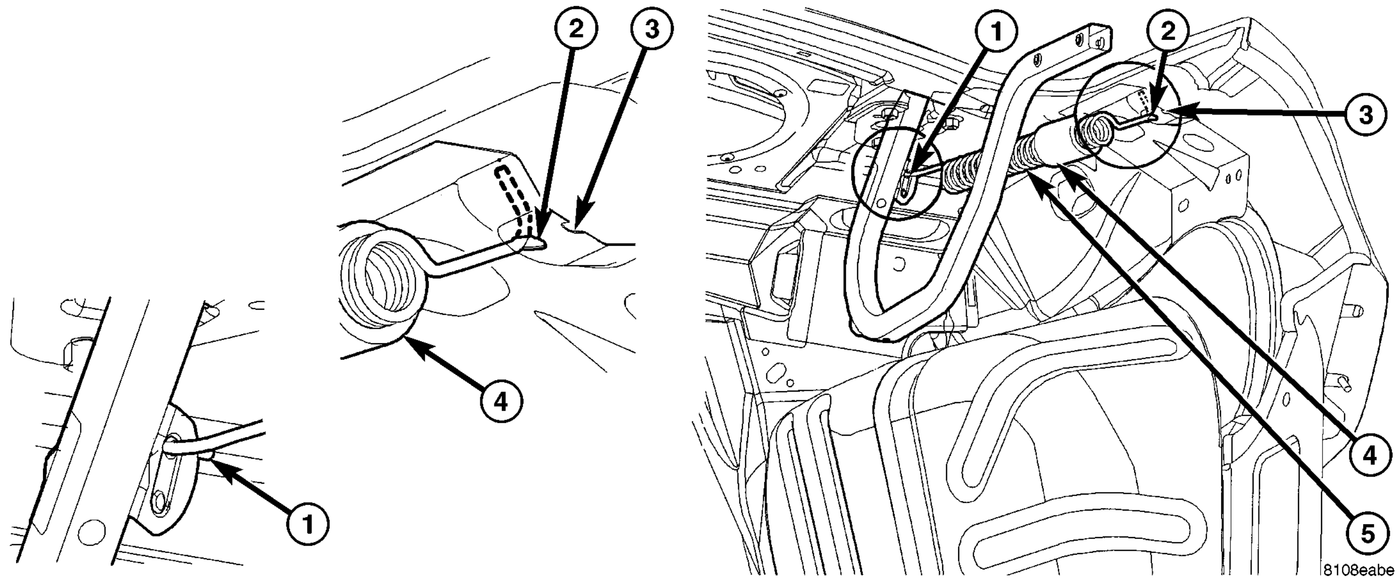

Fig. 5 DECKLID HINGE LIFT SPRING

1 - UPPER HOLE WITH AND WITHOUT SPOILER
2 - FORWARD HOLE WITHOUT SPOILER
3 - REARWARD NOTCH WITH SPOILER
4 - SPRING DAMPER
5 - DECKLID HINGE SPRING

LOCK CYLINDER

REMOVAL

(1) Remove decklid latch.
(2) Remove clip attaching decklid lock cylinder to decklid.
(3) Pull lock cylinder from decklid (Fig. 2).

INSTALLATION

(1) Place lock cylinder into position.
(2) Install clip attaching decklid lock cylinder to decklid.
(3) Install decklid latch.

EMERGENCY RELEASE CABLE

REMOVAL

(1) Remove the decklid cover. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/COVER - REMOVAL)
(2) Unclip cable and handle assembly (Fig. 6).

INSTALLATION

(1) Attach emergency release cable clip to the latch stud.
(2) Install the decklid cover. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/COVER - INSTALLATION)

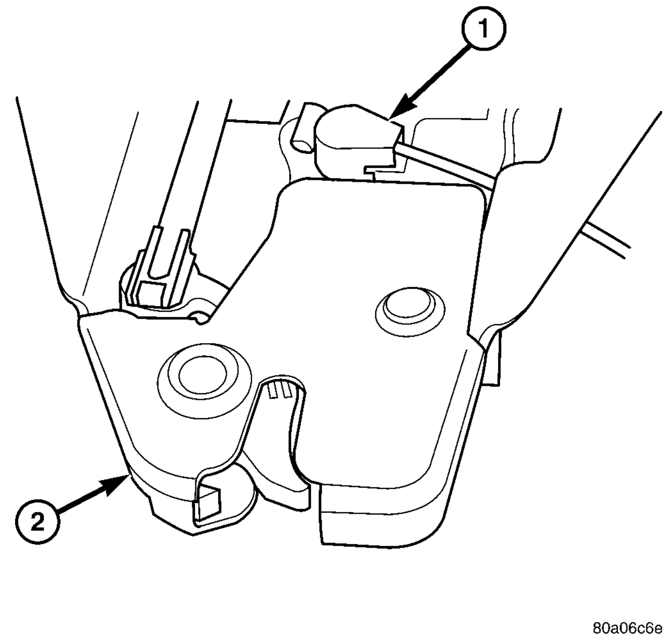

Fig. 6 EMERGENCY RELEASE CABLE - TYPICAL

1 - Release Cable Clip
2 - Decklid Latch

DOOR - FRONT

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APPLIQUE

REMOVAL

REMOVAL - FRONT AND REAR DOORS

(1) Remove the screws.
(2) Remove screws attaching applique to door (Fig. 1).

REMOVAL - LOWER FRONT DOOR

(1) Mark reference points before removing lower front door applique (Fig. 2).
(2) If necessary, use a heat gun gently apply heat in a circular motion to loosen the adhesive bond.
(3) Using a nonmetallic prying device, such as a plastic or wood trim stick gently pry up at corner of the applique. Pull applique from front door painted surface.
(4) Remove adhesive tape residue from painted surface of vehicle. Use a 3M Scotch-Brite™ Molding Adhesive and Stripe Removal Disc, or equivalent, to clean adhesive residue from painted surfaces. These products are available from automotive paint suppliers. Refer to instructions supplied with the specific product for proper usage.

APPLIQUE (Continued)

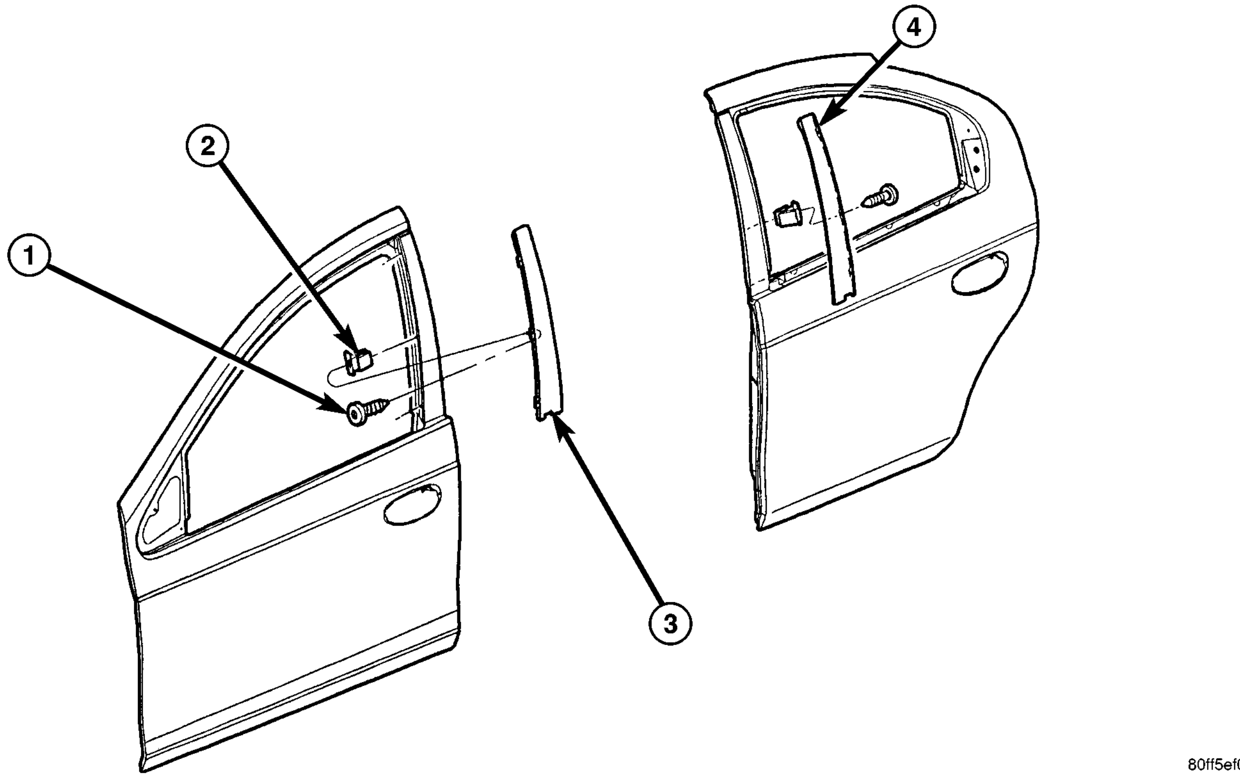

Fig. 1 FRONT AND REAR DOOR APPLIQUE

1 - SCREWS (3 PER APPLIQUE)
2 - SNAP IN SPRING NUTS (3 PER APPLIQUE)
3 - FRONT DOOR APPLIQUE
4 - REAR ROOD APPLIQUE

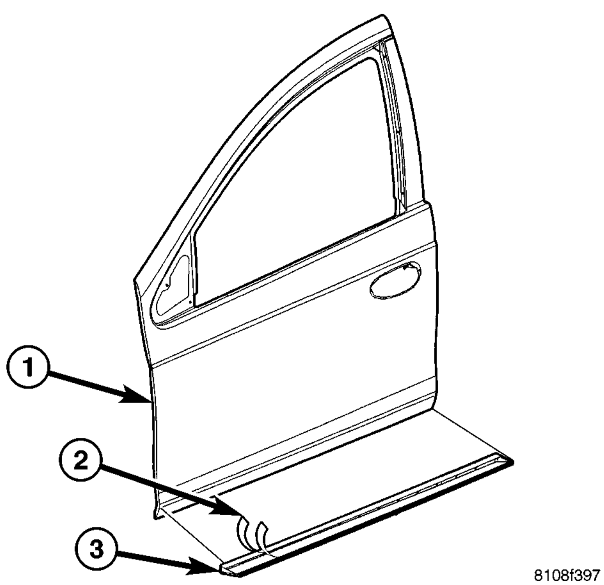

Fig. 2 LOWER FRONT DOOR APPLIQUE

1 - FRONT DOOR
2 - REMOVING ADHESIVE COVER FROM DOUBLE SIDED TAPE
3 - FRONT DOOR APPLIQUE

INSTALLATION

INSTALLATION - FRONT AND REAR DOORS

(1) Place applique into position on door (Fig. 1).
(2) Install the scews attaching door applique.

INSTALLATION - LOWER FRONT DOOR

(1) If applique is to be reused (Fig. 2);
(a) Remove tape residue from applique.
(b) Clean back of applique with Mopar® Super Kleen, or equivalent.
(c) Wipe applique dry with lint free cloth.
(d) Apply a single coat of Mopar® TPO Molding Prep to tape side of molding and allow to dry thoroughly.
(e) Apply new body side molding (double sided) tape to back of applique.
(2) Clean front door surface with Mopar® Super Kleen, or equivalent. Wipe surface dry with lint free cloth.
(3) Remove protective cover from tape on back of applique.
(4) Apply molding to front door from front to rear.
(5) Using a roller tool, roll applique onto front door panel with enough force to assure adhesion. Do not apply excessive force, or damage to body panels may result.

CHECK STRAP

REMOVAL

(1) Remove door trim panel and water dam.

(2) Remove bolt attaching check strap to hinge pillar.

(3) Remove door speaker.

(4) Remove glass run.

(5) Remove bolts attaching check strap to door end frame (Fig. 3).

(6) Remove check strap from vehicle.

INSTALLATION

NOTE: Do not grease check strap.

(1) Position door check on vehicle and install bolts attaching strap to door end frame.

(2) Install glass run.

(3) Install door speaker, if so equipped.

(4) Install bolt attaching door check strap to hinge pillar.

(5) Install door trim panel and water dam.

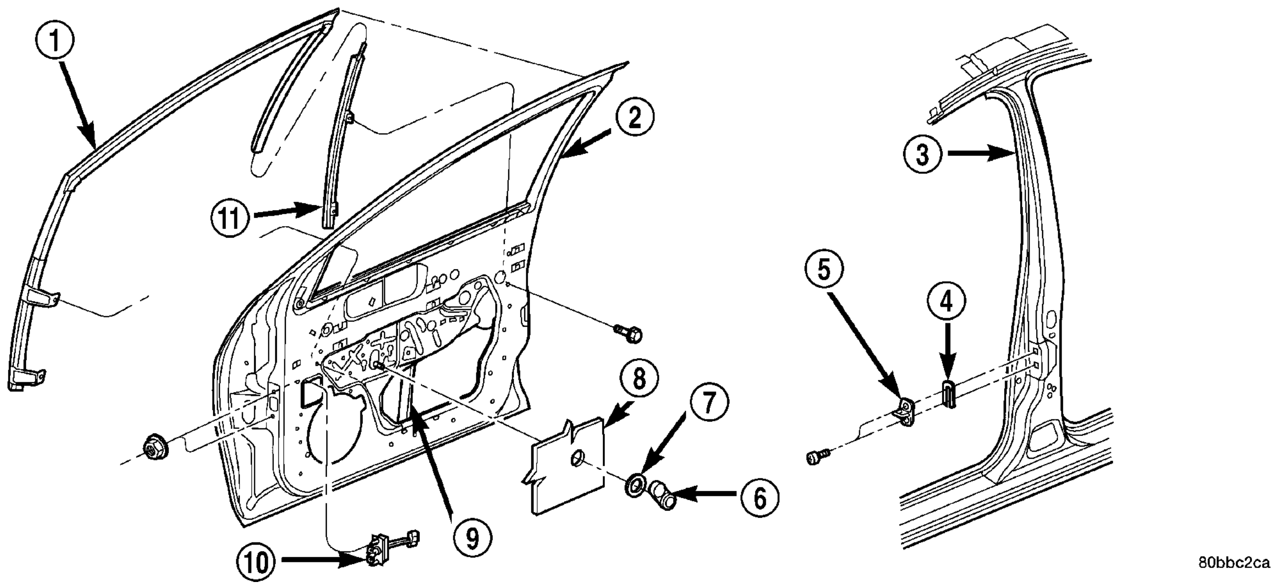

Fig. 3 Front Door Check Strap

1 - FRONT DOOR GLASS RUN WEATHERSTRIP
2 - FRONT DOOR
3 - B-PILLAR
4 - SPACER
5 - DOOR LATCH STRIKER
6 - WINDOW REGULATOR HANDLE
7 - SPACER
8 - DOOR TRIM PANEL
9 - WINDOW REGULATOR
10 - DOOR CHECK STRAP
11 - FRONT DOOR GLASS RUN BRACKET WEATHER

DOOR

REMOVAL

NOTE: The retaining clips used on the door hinge pins are not to be reused. Verify availability prior to proceeding.

(1) Open and support door on a suitable lifting device.

(2) Disconnect wire connector at hinge pillar, if necessary.

(3) Remove bolts attaching door check strap to hinge pillar.

(4) Remove bolts attaching lower hinge to door.

(5) Remove bolts attaching upper hinge to door. (Fig. 4).

(6) Remove door from vehicle.

INSTALLATION

(1) Apply Mopar® Multi-purpose Grease to inside of door hinge bushings.

(2) Position door to the hinges on vehicle.

(3) Install bolt into hinge top hole on the right side or bottom hole left side (smallest hole).

(4) Install bolt into hinge bottom hole on the right side or top hole left side (slotted hole).

(5) Install bolts attaching door check strap to hinge pillar.

(6) Connect wire connector at hinge pillar, if necessary.

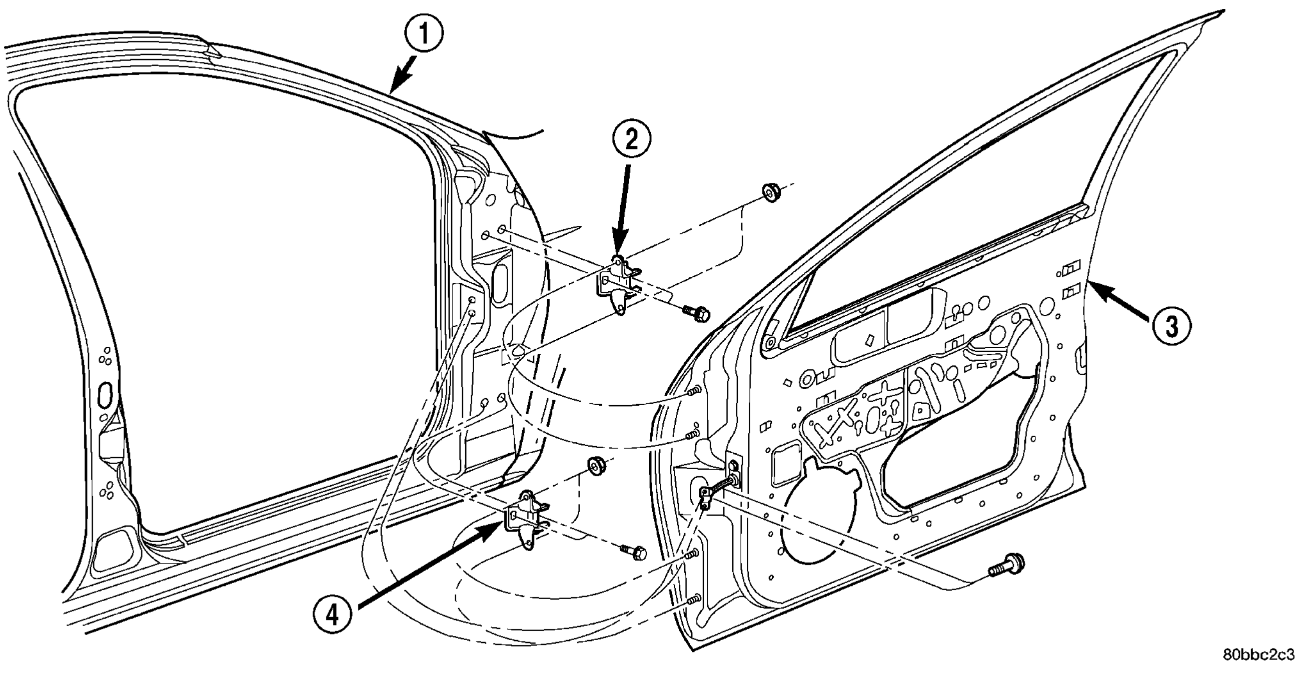

Fig. 4 Front Door

1 - BODY ASSEMBLY
2 - UPPER HINGE
3 - FRONT DOOR
4 - LOWER HINGE

DOOR GLASS

REMOVAL

(1) Remove door trim panel and water dam.

(2) Remove inner door belt weatherstrip.

(3) Loosen window inner belt stabilizer.

(4) Lower door glass to bottom of door to gain access to attaching bolts.

(5) Remove bolts attaching door glass to window regulator lift plates (Fig. 5) and (Fig. 6).

(6) Disengage door glass from regulator.

(7) Lift door glass upward out of the opening at the top of door.

INSTALLATION

(1) Carefully lower door glass through opening in top of door.

(2) Position door glass into window regulator lift plates.

(3) Install bolts door glass to lift plates and do not tighten.

(4) Tighten window inner belt stabilizer.

(5) Raise glass to the full up position and then tighten the lift plate bolts.

(6) Install inner door belt weatherstrip.

(7) Install door trim panel and water dam.

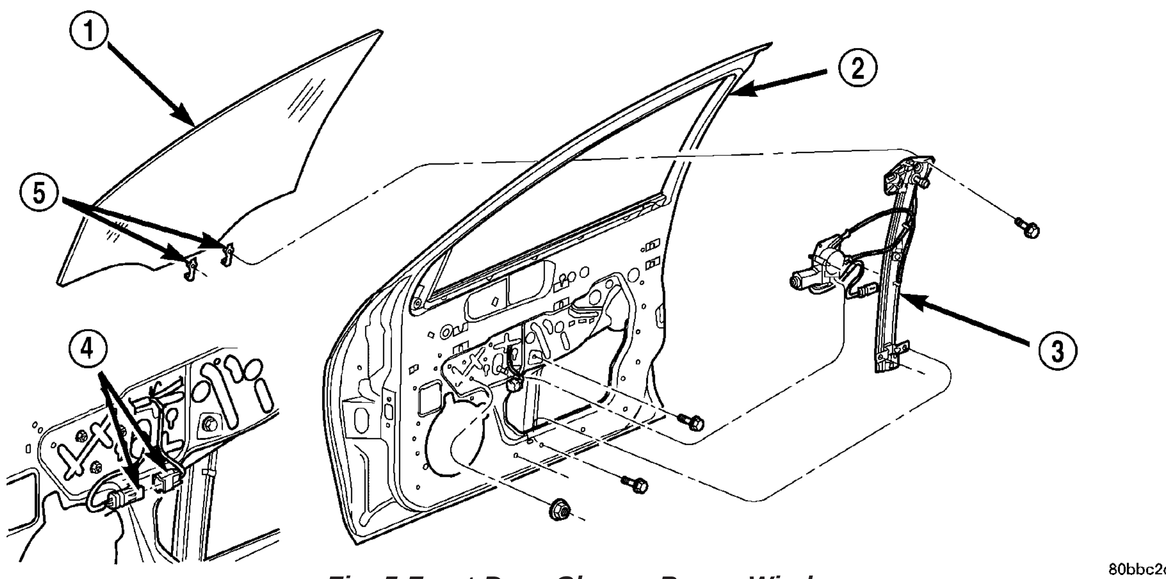

Fig. 5 Front Door Glass – Power Window

1 - FRONT DOOR GLASS
2 - FRONT DOOR
3 - POWER WINDOW REGULATOR
4 - POWER WINDOW CONNECTORS
5 - WINDOW TO REGULATOR FASTENER

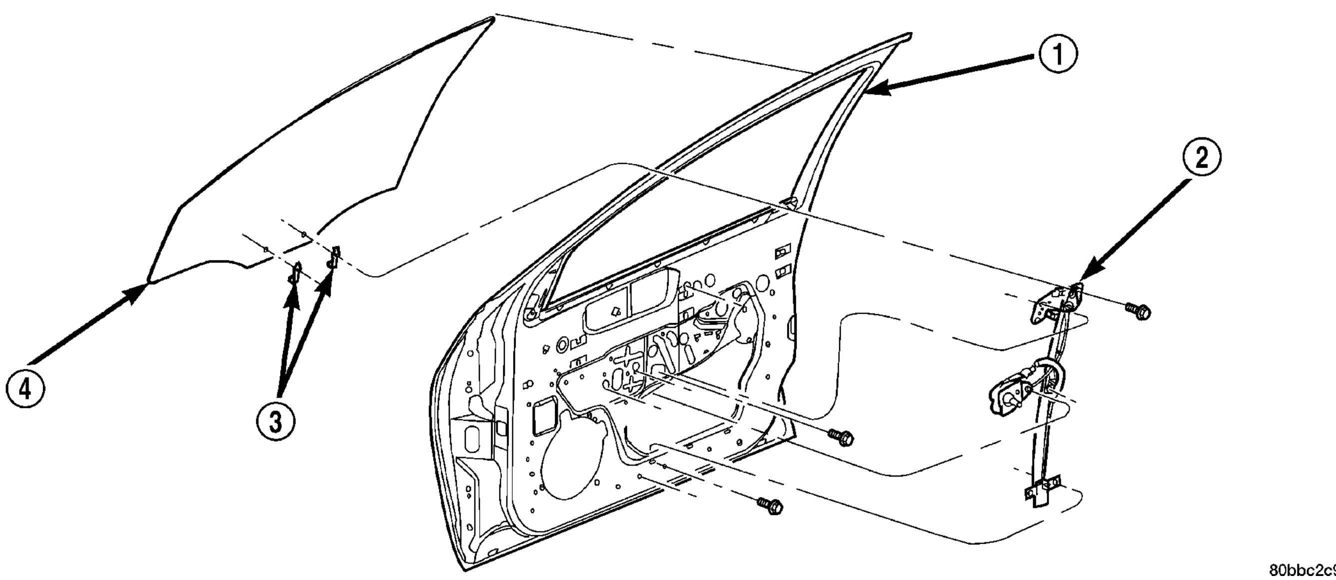

Fig. 6 Front Door Glass – Manual Window

1 - FRONT DOOR
2 - FRONT WINDOW MANUAL REGULATOR
3 - WINDOW TO REGULATOR FASTENERS
4 - FRONT DOOR GLASS

EXTERIOR HANDLE

REMOVAL

(1) Remove door trim panel. (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - REMOVAL)

(2) Remove the waterdam as necessary to gain access to the exterior handle and door latch mechanisms.

(3) Close door glass.

(4) Disconnect lock and latch rods from door latch.

(5) Remove screws attaching door handle retainer to outer door panel (Fig. 7).

(6) Remove door handle from vehicle.

INSTALLATION

(1) Position door handle into door and install retainer at back of handle.

(2) Install the screws attaching door handle retainer to outer door panel.

(3) Connect lock and latch rods to door latch.

(4) Place waterdam onto the door and pressurize at the butyl bead to seal completely.

(5) Install door trim panel. (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - INSTALLATION)

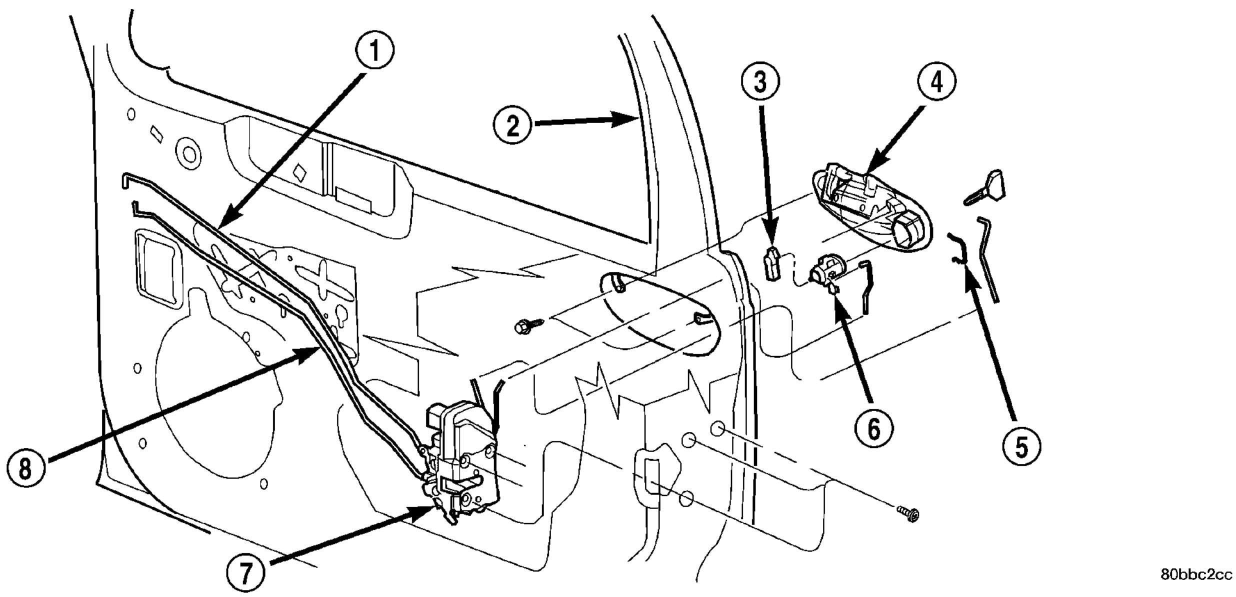

Fig. 7 Front Door Outside Handle

1 - LOCK TO LATCH LINK & SLEEVE
2 - FRONT DOOR
3 - CENTRAL LOCKING SWITCH
4 - OUTSIDE DOOR HANDLE
5 - LOCK CYLINDER RETAINING CLIP
6 - LOCK CYLINDER
7 - FRONT DOOR LATCH
8 - INSIDE DOOR HANDLE LINK & SLEEVE

FRONT DOOR HINGE

REMOVAL

(1) Open and support door on a suitable lifting device.
(2) Remove bolts attaching 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 attaching hinge to door end frame (Fig. 4).
(5) Remove bolts attaching hinge to lower A-pillar.
(6) Remove 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 attaching hinge to lower A-pillar.
(4) Loosely install bolts attaching hinge to door end frame.
(5) Align hinge to marks made previously and tighten all bolts.
(6) Install bolts attaching 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.

LATCH

REMOVAL

(1) Remove door trim panel and water shield.
(2) Close door glass.
(3) Disconnect lock and latch rods from door latch (Fig. 8).
(4) Disengage wire connector from power door lock motor, if equipped.
(5) Remove screws holding latch to door end frame.
(6) Remove door latch from vehicle.

INSTALLATION

CAUTION: Do not close door before adjusting the door latch. Door may fail to open.

(1) Position door latch inside door and install screws holding latch to door end frame.
(2) Engage wire connector into power door lock motor, if so equipped.
(3) Connect latch and lock rods to door latch.
(4) Install door trim panel and water shield.
(5) Adjust door latch using procedure in this section.

ADJUSTMENTS

ADJUSTMENT

(1) Insert a hex-wrench through the elongated hole in the door end frame near the latch striker opening.
(2) Loosen socket head screw on the side of the latch linkage.

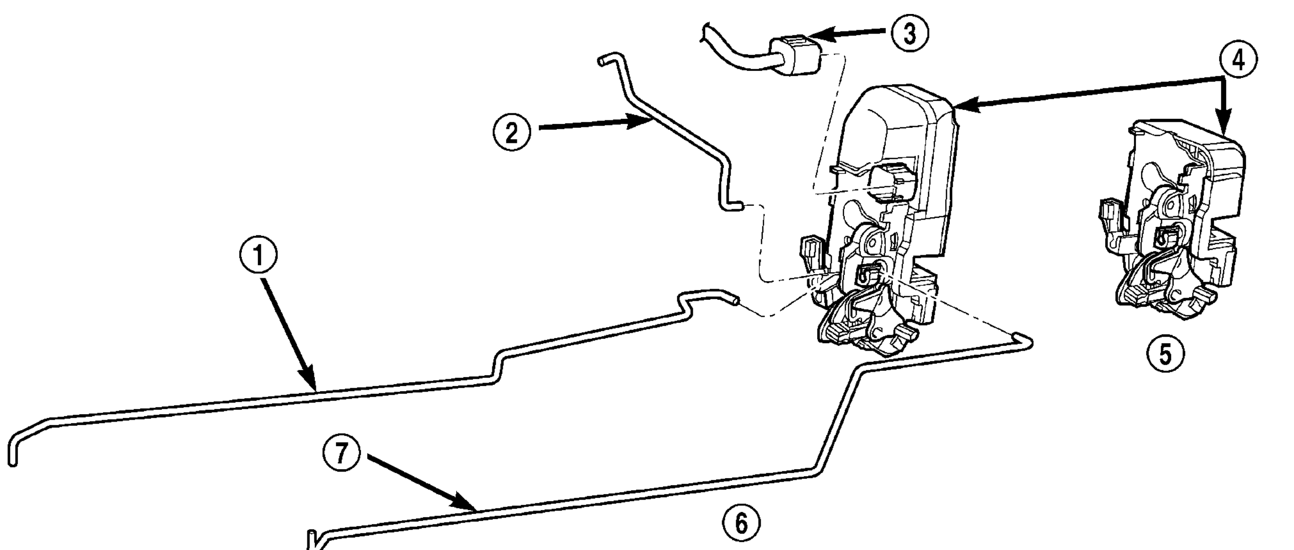

Fig. 8 Front Door Latch

1 - INSIDE LOCK TO LATCH
2 - OUTSIDE HANDLE TO LATCH
3 - POWER DOOR LOCK CONNECTOR
4 - REAR DOOR LATCH
5 - MANUAL
6 - POWER
7 - INSIDE DOOR HANDLE TO LATCH

LATCH (Continued)

(3) Lift upward on outside door handle and release it.
(4) Tighten socket head screw on latch.
(5) Verify latch operation.

LATCH STRIKER

REMOVAL

(1) Mark outline of door latch striker on B-pillar to aid installation.
(2) Remove screws attaching door latch striker to B-pillar (Fig. 9).
(3) Remove door latch striker from vehicle.

INSTALLATION

(1) Install door latch striker into the door.
(2) Install screws attaching door latch striker to B-pillar loosely.
(3) Align door latch striker to outline marks on the B-pillar
(4) Tighten screws attaching door latch striker to B-pillar.
(5) Check door alignment and adjust as necessary.

LOCK CYLINDER

REMOVAL

(1) Remove door trim panel and water dam.
(2) Close door glass.
(3) Disconnect door lock rod from latch.
(4) Remove clip attaching lock cylinder to door handle.
(5) Pull lock cylinder from door handle (Fig. 10).

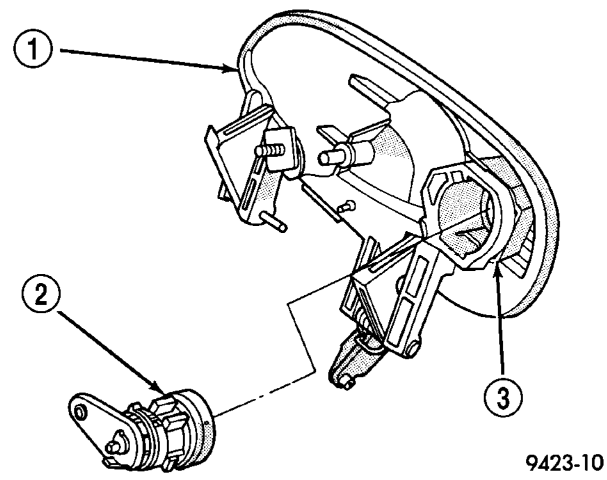

Fig. 10 Door Lock Cylinder

1 - OUTSIDE DOOR HANDLE
2 - LOCK CYLINDER
3 - RETAINER

INSTALLATION

(1) Push lock cylinder into door handle.
(2) Install clip attaching lock cylinder to door handle.
(3) Connect door lock rod from latch.
(4) Install door trim panel and water dam.

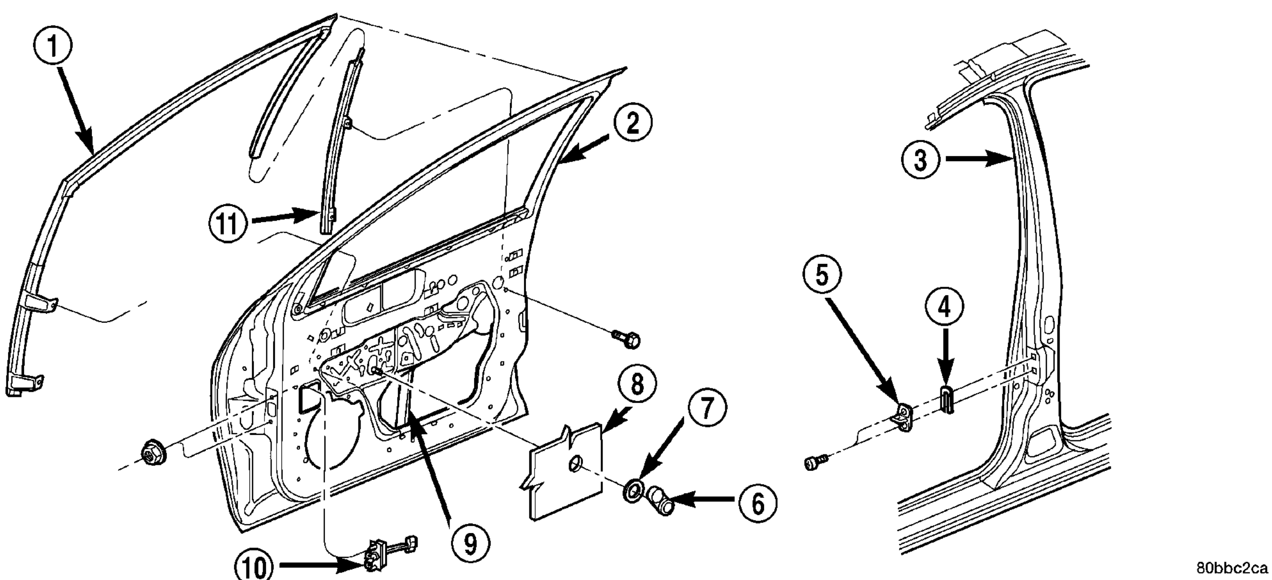

Fig. 9 Front Door Latch Striker

1 - FRONT DOOR GLASS RUN WEATHERSTRIP
2 - FRONT DOOR
3 - B-PILLAR
4 - SPACER
5 - DOOR LATCH STRIKER
6 - WINDOW REGULATOR HANDLE
7 - SPACER
8 - DOOR TRIM PANEL
9 - WINDOW REGULATOR
10 - DOOR CHECK STRAP
11 - FRONT DOOR GLASS RUN BRACKET WEATHER

FRONT VERTICAL GUIDE BAR

REMOVAL

(1) Remove door trim panel and water dam.
(2) Remove door speaker, if equipped.
(3) Remove front lift guide.
(4) Remove bolt attaching top of front guide bar to inner door panel.
(5) Using a Snap-on® flare-nut socket (FRXM10) and a hex wrench, remove nut attaching bottom of guide bar to door panel while holding jack screws.

INSTALLATION

(1) Install nut attaching bottom of guide bar to door panel.
(2) Install bolt attaching top of front guide bar to inner door panel.
(3) Install front lift guide.
(4) Install door speaker, if equipped.
(5) Verify door glass alignment, adjust if necessary.
(6) Install door trim panel and water dam.

TRIM PANEL

REMOVAL

(1) Release door latch and open door.
(2) Lower door glass.
(3) Remove window regulator crank, if so equipped (Fig. 13).
(4) Remove screw from inside arm rest pull cup (Fig. 11).
(5) Remove screw from behind inside latch release handle.
(6) Disengage push-in fasteners attaching trim to door panel around perimeter of trim panel.
(7) Tilt trim panel outward to clear locator pins on backside of trim panel.
(8) Disconnect trim panel from retainer channel in inner belt weatherstrip at top of door by lifting while gently jiggling.
(9) Move trim panel away from door and disengage clip attaching latch rod to handle.
(10) Remove latch rod from handle.

CAUTION: Do not allow door trim panel to hang by the wire connector or wiring.

(11) Disconnect wire connector from power door lock switch, mirror switch, and power window switch if so equipped.
(12) Remove trim panel from door.

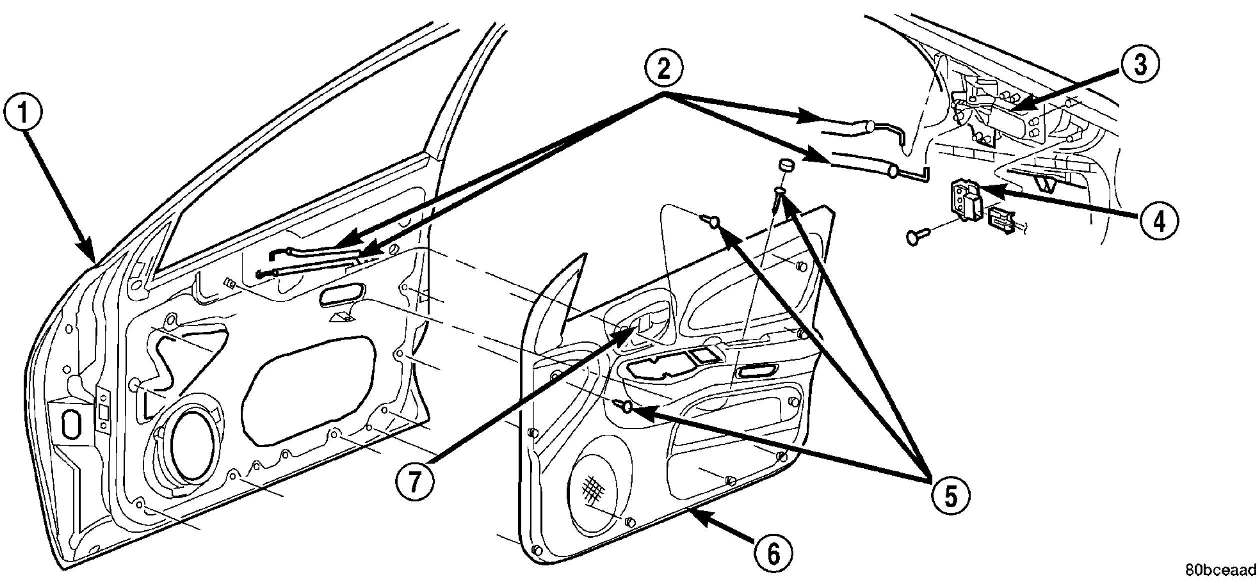

Fig. 11 Front Door Trim

1 - FRONT DOOR
2 - LINK AND SLEEVES
3 - INNER REMOTE HANDLE
4 - POWER DOOR LOCK SWITCH
5 - DOOR TRIM SCREWS
6 - FRONT DOOR TRIM PANEL
7 - INSIDE DOOR HANDLE

TRIM PANEL (Continued)

INSTALLATION

(1) Replace any damaged or missing push in fasteners from around perimeter of door trim panel.

(2) Place trim panel near door.

(3) Connect wire connector into power door lock switch, mirror switch, and power window switch, if so equipped.

(4) Insert latch rod into handle and engage clip.

(5) Install trim panel into retainer channel at top of door and push down to seat.

(6) Locate door trim panel to inner door panel by aligning locating pins on backside of trim panel to mating holes in inner door panel.

(7) Install push in fasteners to hold trim to door panel around perimeter of trim panel.

(8) Install screw inside latch release handle.

(9) Install screw inside arm rest pull cup.

(10) With the window in the down position, orientate the window regulator crank handle appropriately. Install the right handle at the 10 o'clock position and the left handle at the 2 O'clock position, if so equipped.

WATERDAM

REMOVAL

(1) Remove door trim panel.

(2) Remove door speaker, if equipped.

(3) Remove door trim pull cup mount bracket.

(4) Disconnect clip attaching lock linkage to lock button bell-crank.

(5) Peel water dam away from adhesive around perimeter of inner door panel (Fig. 12).

INSTALLATION

(1) Insure that enough adhesive remains to securely retain the water dam. Replace as necessary.

(2) Place the water dam into position and press securely to adhesive making sure to properly route wiring and linkages.

(3) Engage clip attaching 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.

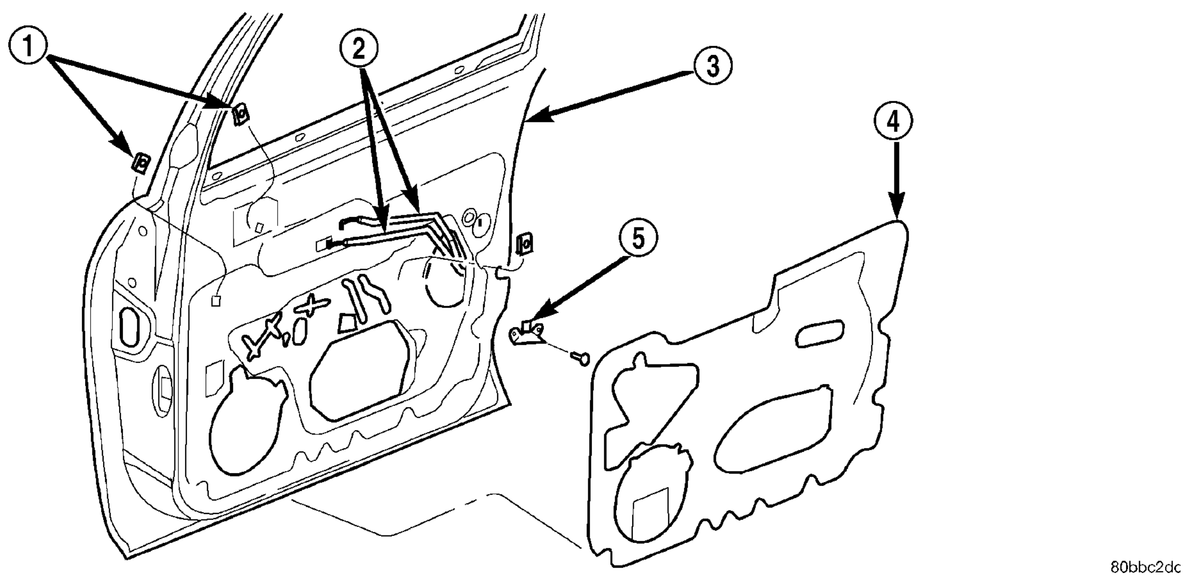

Fig. 12 Water Dam

1 - U NUTS
2 - LINK AND SLEEVES
3 - FRONT DOOR
4 - WATER DAM
5 - TRIM ATTACHING BRACKET

WINDOW CRANK

REMOVAL

(1) Open door.

(2) Slide a window crank removal tool behind the window crank to release crank handle lock clip (Fig. 13).

(3) Remove handle from regulator shaft.

INSTALLATION

(1) Place the lock clip on the window crank.

(2) Place window crank on regulator shaft with the window in the down position.

(3) Orientate the window regulator crank handle appropriately at the 10 o'clock position and the left handle at the 2 o'clock position.

(4) Push the handle in to the lock position on the regulator shaft.

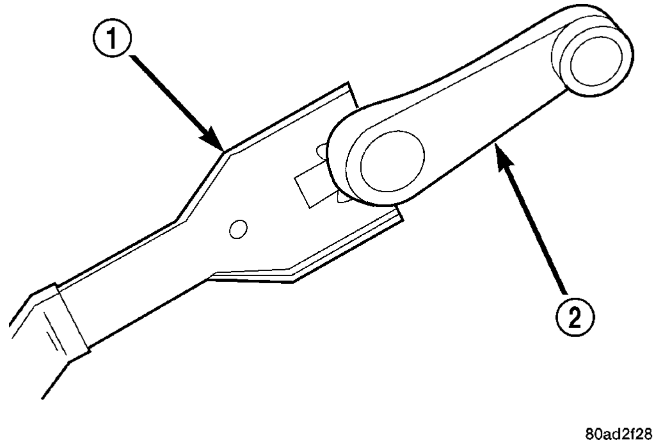

Fig. 13 Window Crank

1 - WINDOW CRANK REMOVAL TOOL
2 - WINDOW CRANK

DOORS - REAR

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APPLIQUE

REMOVAL - LOWER REAR DOOR

(1) Mark reference points before removing lower rear door applique (Fig. 1).

(2) If necessary, use a heat gun gently apply heat in a circular motion to loosen the adhesive bond.

(3) Using a nonmetallic prying device, such as a plastic or wood trim stick gently pry up at corner of the applique. Pull applique from lower rear door painted surface.

(4) Remove adhesive tape residue from painted surface of vehicle. Use a 3M Scotch-Brite™ Molding Adhesive and Stripe Removal Disc, or equivalent, to clean adhesive residue from painted surfaces. These products are available from automotive paint suppliers. Refer to instructions supplied with the specific product for proper usage.

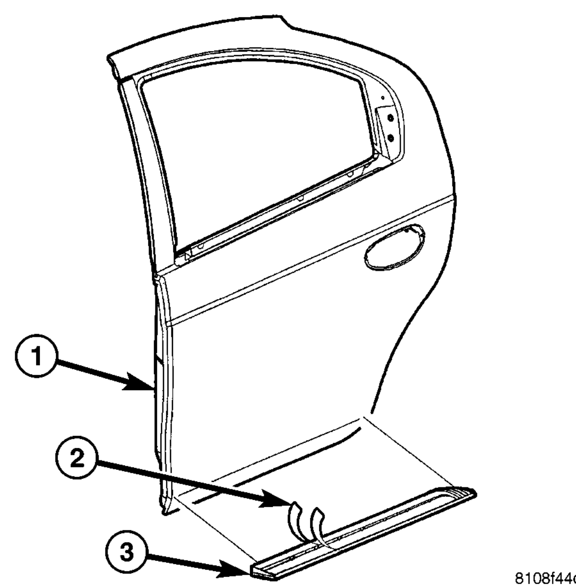

Fig. 1 REAR DOOR APPLIQUE

1 - REAR DOOR
2 - REMOVING ADHESIVE COVER FROM DOUBLE SIDED TAPE
3 - REAR DOOR APPLIQUE

INSTALLATION - LOWER REAR DOOR

(1) If applique is to be reused (Fig. 1);

(a) Remove tape residue from applique.

(b) Clean back of applique with Mopar® Super Kleen, or equivalent.

(c) Wipe applique dry with lint free cloth.

(d) Apply a single coat of Mopar® TPO Molding Prep to tape side of molding and allow to dry thoroughly.

(e) Apply new body side molding (double sided) tape to back of applique.

(2) Clean rear door surface with Mopar® Super Kleen, or equivalent. Wipe surface dry with lint free cloth.

APPLIQUE (Continued)

(3) Remove protective cover from tape on back of applique.

(4) Apply applique to rear door from front to rear.

(5) Using a roller tool, roll applique onto rear door panel with enough force to assure adhesion. Do not apply excessive force, or damage to body panels may result.

CHECK STRAP

REMOVAL

(1) Remove door trim panel.

(2) Remove bolts attaching check strap to hinge pillar.

(3) Remove check strap seal from door end frame.

(4) Remove bolts attaching check strap to door end frame (Fig. 2).

(5) Remove check strap from vehicle.

INSTALLATION

CAUTION: Do not close door before adjusting the door latch. Door may fail to open.

(1) Position door check strap on vehicle.

(2) Install check strap attaching bolts to the door end frame.

(3) Install check strap seal. If seal is damaged or worn replace seal.

(4) Install check strap attaching bolts to the hinge pillar.

(5) Install door trim panel.

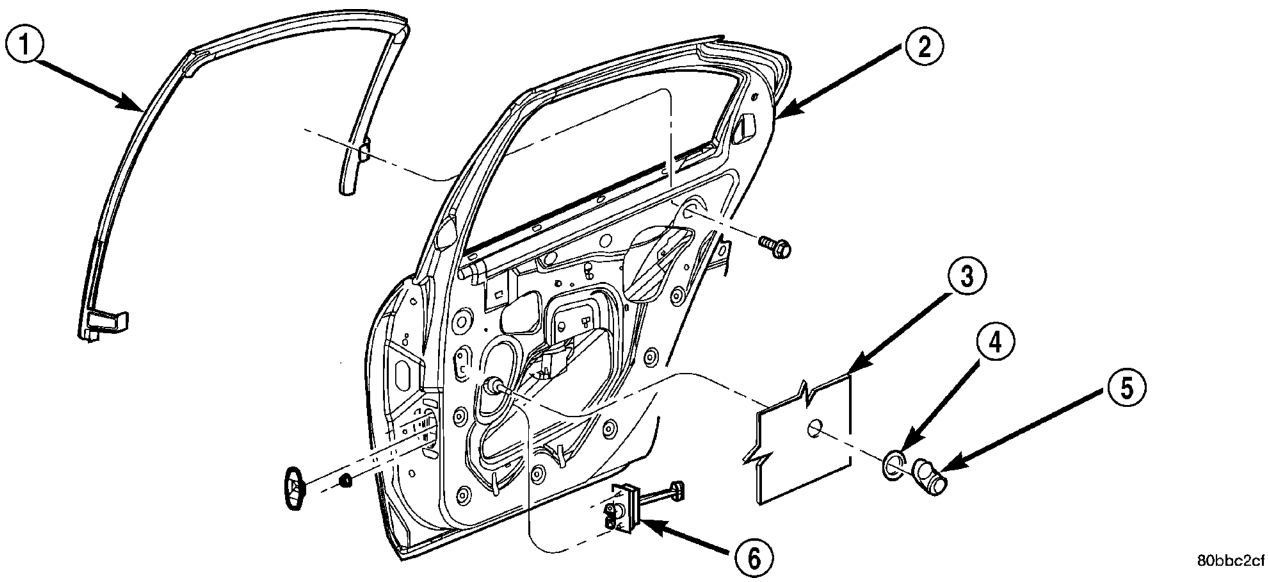

Fig. 2 Rear Door Check Strap

1 - REAR DOOR GLASS RUN WEATHERSTRIP
2 - REAR DOOR
3 - DOOR TRIM PANEL
4 - SPACER
5 - WINDOW REGULATOR HANDLE
6 - DOOR CHECK STRAP

DOOR

REMOVAL

(1) Open door and support on a suitable lifting device.

(2) Disconnect the wire connector at the hinge pillar.

(3) Remove bolts attaching door check strap to B-pillar.

(4) Remove bolts attaching lower hinge to door (Fig. 3).

(5) Remove bolts attaching upper hinge to door.

INSTALLATION

(1) Apply Mopar® Multimileage Grease to the inside of the door hinge bushings.

(2) Install bolts to the upper hinge to door.

(3) Install bolts to the lower hinge to door.

(4) Connect the wire connector at the B-pillar.

(5) Remove lifting device.

(6) Adjust door as necessary.

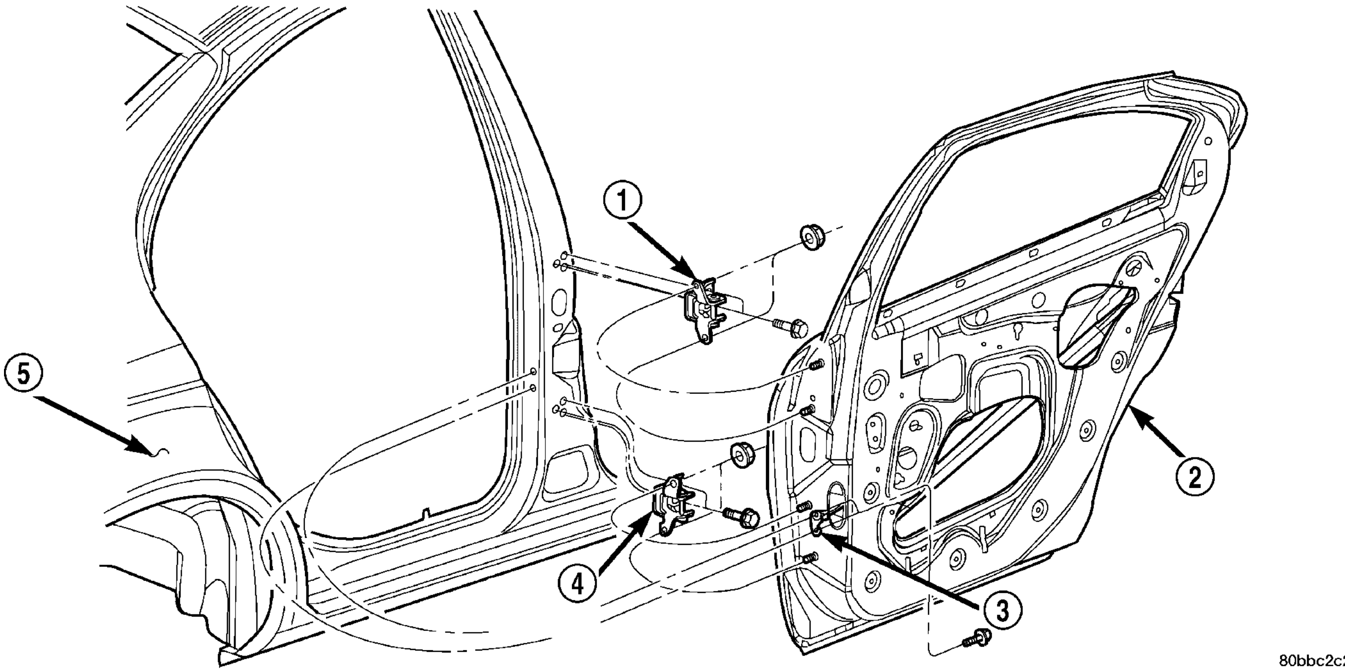

Fig. 3 Rear Door

1 - UPPER HINGE
2 - REAR DOOR
3 - CHECK STRAP
4 - LOWER HINGE
5 - BODY ASSEMBLY

DOOR GLASS

REMOVAL

(1) Remove door trim panel and inner belt weatherstrip.

(2) Lower the window to 50 mm (2 ins.) from bottom of travel.

(3) Loosen bolts attaching rear lower run channel to inner door panel (Fig. 4).

(4) Remove rear run channel from door.

(5) Loosen screws attaching window regulator channel to glass.

(6) Slide channel rearward to allow screw heads to pass through key hole slots in channel.

(7) Remove glass from roller channel.

(8) Lift door glass upward out of the opening at the top of door.

INSTALLATION

(1) Lower door glass through opening in top of door and into position in the window regulator.

(2) Position door glass onto roller channel.

(3) Slide roller channel forward to allow screw heads to engage key hole slots in channel.

(4) Tighten screws attaching window regulator roller channel to glass.

(5) Install inner door belt door trim panel inner belt weatherstrip.

(6) Operate window and check for interference. Adjust glass as necessary.

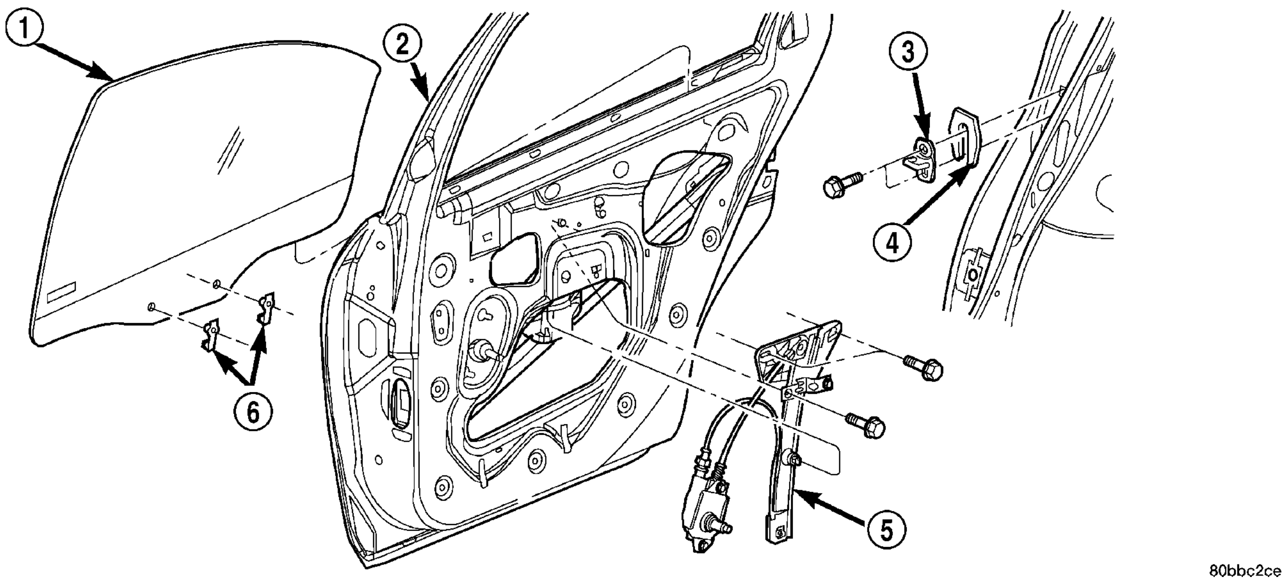

Fig. 4 Rear Door Glass

1 - REAR DOOR GLASS
2 - REAR DOOR
3 - LATCH STRIKER
4 - SPACER
5 - REAR WINDOW MANUAL REGULATOR
6 - WINDOW TO REGULATOR FASTENERS

EXTERIOR HANDLE

REMOVAL

(1) Remove door trim panel.
(2) Close door glass.
(3) Disengage clips attaching linkage rods to door handle.
(4) Remove nuts attaching outside handle to door (Fig. 5).
(5) Remove outside handle.

INSTALLATION

(1) Position door outside handle in opening.
(2) Tighten attaching nuts.
(3) Connect linkage rods to latch.
(4) Connect lock and latch rods to door handle.
(5) Install door trim panel.

HINGE

REMOVAL

NOTE: If both hinges on one door are to be replaced, remove and install one hinge completely prior to beginning the second hinge.

(1) Open and support door on a suitable lifting device.
(2) Remove bolts attaching door check strap to lower B-pillar for greater access, if necessary.
(3) Mark position of hinge on both the door end frame and lower B-pillar to ease installation.
(4) Remove bolts attaching hinge to door end frame (Fig. 3).
(5) Remove bolts attaching hinge to lower B-pillar.
(6) Remove door hinge from vehicle.

INSTALLATION

NOTE: If both hinges on one door are to be replaced, remove and install one hinge completely prior to beginning the second hinge.

NOTE: Do not grease door hinges.

(1) If necessary, paint new door hinge prior to installation.
(2) Position door hinge on vehicle.
(3) Loosely install bolts attaching hinge to lower B-pillar.
(4) Loosely install bolts attaching hinge to door end frame.
(5) Align hinge to marks made previously and tighten all bolts.
(6) Install bolts attaching door check strap to lower B-pillar, if removed previously.
(7) Verify door fit and operation. Adjust door hinge for proper door alignment, if necessary.

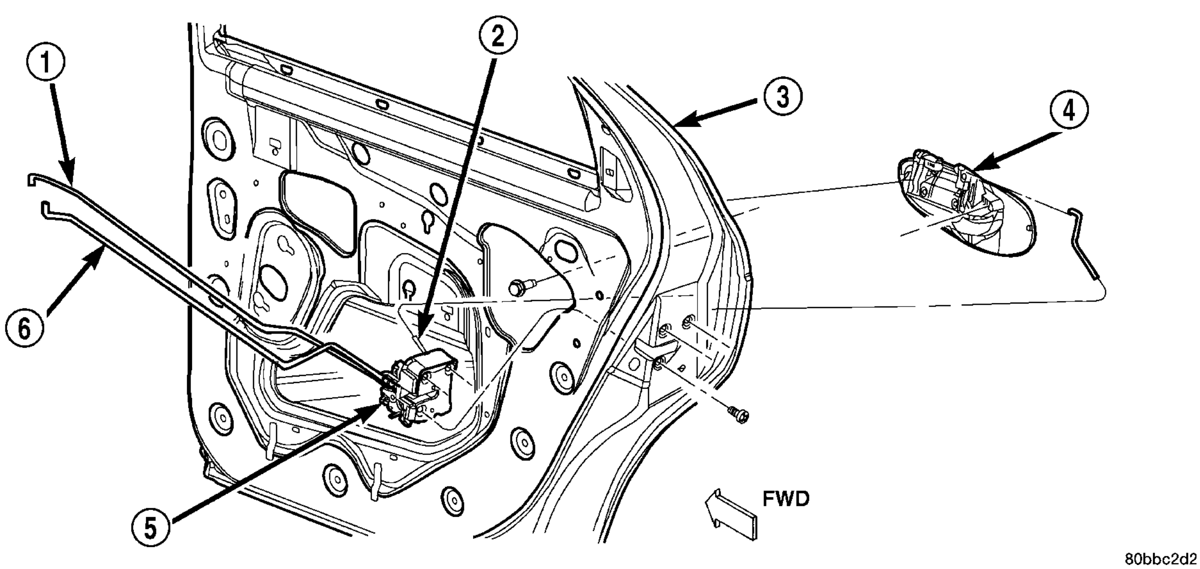

Fig. 5 Rear Door Outside Handle

1 - LOCK TO LATCH LINK & SLEEVE
2 - OUTSIDE HANDLE TO LATCH
3 - REAR DOOR
4 - OUTSIDE DOOR HANDLE
5 - CHILD SAFETY LATCH
6 - INSIDE DOOR HANDLE LINK & SLEEVE

LATCH

REMOVAL

(1) Remove door trim panel.
(2) Close door glass.
(3) Loosen lower rear run channel.
(4) Disconnect clips attaching linkage rods to door latch.
(5) Remove linkage rods from latch (Fig. 6).
(6) Remove screws attaching latch to door end frame
(7) Remove door latch from vehicle.

INSTALLATION

CAUTION: Do not close door before adjusting the door latch. Door may fail to open.

(1) Position door latch on vehicle and install screws attaching latch to door end frame.
(2) Connect linkage rods to latch.
(3) Connect lock and latch rods to door latch.
(4) Tighten lower rear run channel.
(5) Install door trim panel.

ADJUSTMENTS

ADJUSTMENT

(1) Insert a hex-wrench through the elongated hole in the door end frame near the latch striker opening.
(2) Loosen socket head screw on the side of the latch linkage.
(3) Lift upward on outside door handle and release it.
(4) Tighten socket head screw on latch.
(5) Verify latch operation.

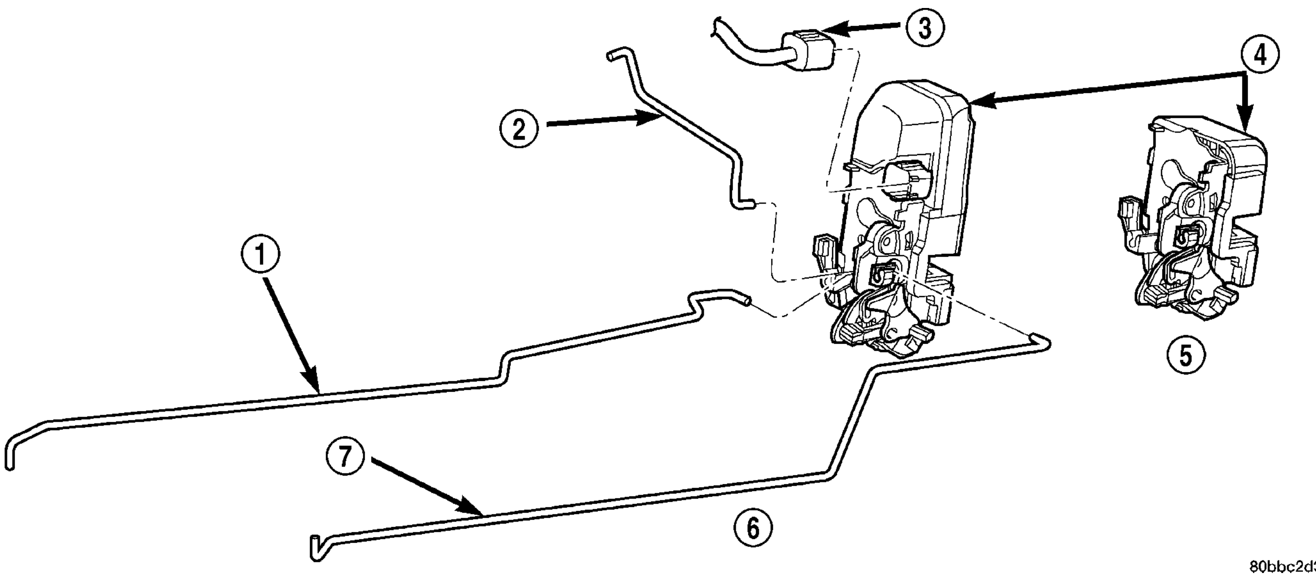

Fig. 6 Rear Door Latch

1 - INSIDE LOCK TO LATCH
2 - OUTSIDE HANDLE TO LATCH
3 - POWER DOOR LOCK CONNECTOR
4 - REAR DOOR LATCH
5 - MANUAL
6 - POWER
7 - INSIDE DOOR HANDLE TO LATCH

LATCH STRIKER

REMOVAL

(1) Mark outline of door latch striker on B-pillar to aid installation.

(2) Remove screws attaching door latch striker to B-pillar (Fig. 4).

(3) Remove door latch striker from vehicle.

INSTALLATION

(1) Install door latch striker from vehicle.

(2) Install screws attaching door latch striker to B-pillar.

(3) Align marked outline of door latch striker on B-pillar to aid installation.

TRIM PANEL

REMOVAL

(1) Release door latch and open door.

(2) Lower window glass.

(3) Remove window regulator crank.

(4) Remove screw from inside arm rest pull cup.

(5) Remove screw from behind inside latch release handle (Fig. 7).

(6) Disengage push in fasteners attaching trim to door panel around perimeter of trim panel.

(7) Disengage push-in metal spring clip holding trim in sail flag area.

(8) Lift trim panel up off belt weatherstrip.

(9) Tilt top of trim panel away from door and disengage clip attaching latch rod to handle.

(10) Remove latch rod from handle.

(11) Remove trim panel from door.

INSTALLATION

(1) Replace any damaged or missing push in fasteners from around perimeter of door trim panel.

(2) Place trim panel in position on door.

(3) Insert latch rod into handle and engage clip.

(4) Engage trim panel into retainer channel at top of door.

(5) Locate door trim panel to inner door panel by aligning locating pins on backside of trim panel to mating holes in inner door panel.

(6) Engage push in fasteners attaching trim to door panel around perimeter of trim panel.

(7) Install screw behind inside latch release handle.

(8) Install screw inside arm rest pull cup.

(9) Install window regulator crank.

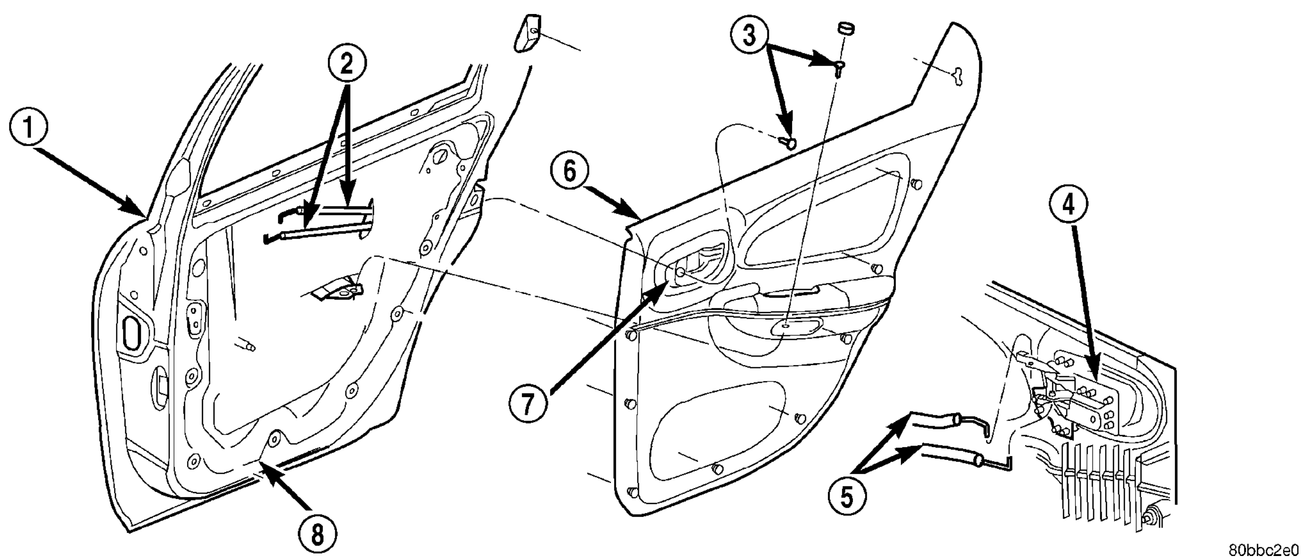

Fig. 7 Rear Door Trim

1 - REAR DOOR
2 - LINK AND SLEEVES
3 - DOOR TRIM SCREWS
4 - POWER DOOR LOCK SWITCH
5 - LINK AND SLEEVES
6 - REAR DOOR TRIM PANEL
7 - INSIDE DOOR HANDLE
8 - WATER DAM

WATERDAM

REMOVAL

(1) Remove door trim panel.
(2) Remove door speaker, if equipped.
(3) Remove door trim pull cup mount bracket.
(4) Disconnect clip attaching lock linkage to lock button bell-crank.
(5) Peel water dam away from adhesive around perimeter of inner door panel (Fig. 8).

INSTALLATION

(1) Insure that enough adhesive remains to securely retain the water dam. Replace as necessary.
(2) Place the water dam into position and press securely to adhesive making sure to properly route wiring and linkages.
(3) Engage clip attaching 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.

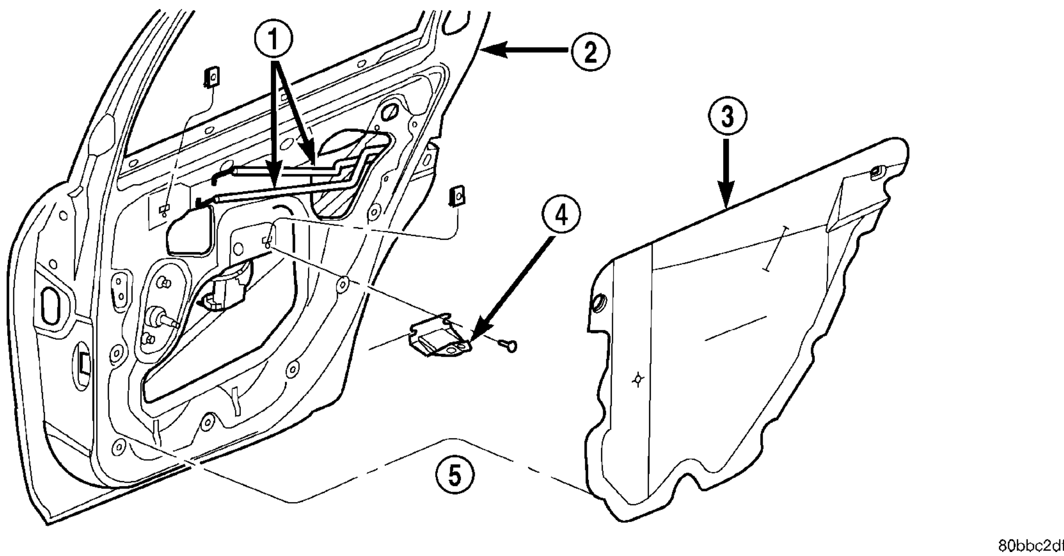

Fig. 8 Water Dam

1 - LINK AND SLEEVES
2 - REAR DOOR
3 - WATER DAM
4 - TRIM ATTACHING BRACKET
5 - REAR DOOR TYPICAL

WINDOW REGULATOR

REMOVAL

(1) Remove door trim panel.

(2) Remove door glass from regulator channel.

(3) Cut away the tie strap from the outboard regulator cable. (Fig. 9)

(4) Loosen screws attaching window regulator channel and crank housing to door panel (Fig. 4).

(5) Disengage screw and bolt heads from keyhole slots in door panel.

(6) Loosen bolts attaching window regulator to door panel.

(7) Disengage regulator from door panel, and crank housing.

(8) Slide regulator rearward and rotate forward end of roller channel through access hole in door panel,

(9) Remove window regulator from door through access hole in inner panel.

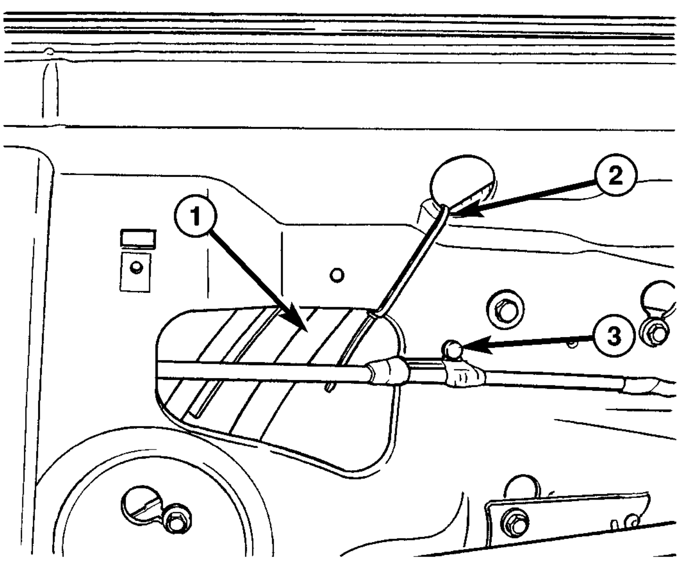

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Fig. 9 TIE STRAP DOOR REGULATOR CABLE

1 - DOOR REGULATOR CABLE
2 - TIE STRAP
3 - WHITE RETAINING CLIP

INSTALLATION

(1) Position window regulator and crank housing on door panel through access hole in door panel.

(2) Tighten bolts attaching window regulator to door panel.

(3) Engage window regulator bolt heads on channel to key hole slots in door panel.

(4) Tighten screw attaching window regulator channel and crank housing.

(5) Install a new tie strap around the outboard regulator cable and door inner sheet metal. (Fig. 9)

(6) Position glass to regulator roller channel.

(7) Tighten fasteners attaching door glass to roller channel.

(8) Install door trim panel.

EXTERIOR

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BODY STRIPES AND DECALS

REMOVAL

(1) Mark reference points before removing.

(2) Using a heat gun gently apply heat in a circular motion to loosen the adhesive bond.

(3) With your fingernail lift up and peel away badgeing /tape from panel, using a heat gun as you go.

(4) Clean off all traces of adhesive from the panel(s) with a general purpose adhesive remover.

INSTALLATION

(1) Clean panel surface with isopropy alcohol.

(2) Remove paper carrier and align badgeing/tape to reference points or adjacent panel.

(3) Install and press securely, using a plastic spreader to eliminate all air bubbles.

(4) Remove top protective carrier.

(5) Clean away any reference points.

COWL GRILLE SCREEN

REMOVAL

(1) Release hood latch and open hood.

(2) Remove windshield wiper arms. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).

(3) Remove the five screws attaching cowl screen cover to just below windshield flange. (Fig. 1).

(4) Remove cowl plenum to hood weatherstrip, at the leading edge of cowl cover. Pull weatherstrip towards the front of the vehicle to remove.

(5) Remove cowl screen windshield seal from upper edge of the cowl screen cover.

(6) Remove cowl screen cover from the vehicle.

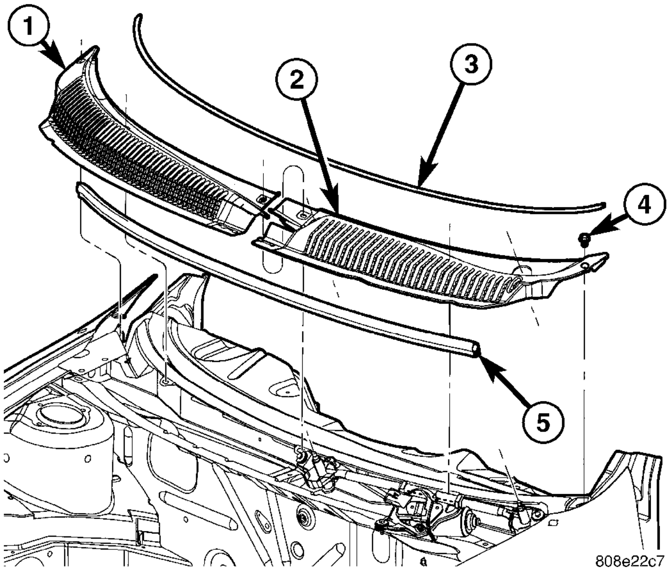

Fig. 1 COWL SCREEN COVER

1 - RIGHT COWL TOP SCREEN COVER
2 - LEFT COWL TOP SCREEN COVER
3 - COWL SCREEN WINDSHIELD SEAL
4 - SCREWS (5)
5 - COWL PLENUM TO HOOD WEATHERSTRIP

INSTALLATION

(1) Place cowl screen cover into position on vehicle (Fig. 2).

(2) Start five screws attaching cowl screen cover to cowl at base of windshield opening.

(3) Install cowl screen windshield seal to upper edge of the cowl screen.

(4) Push cowl plenum to hood weatherstrip, into position on the leading edge of cowl screen cover.

(5) Install windshield wiper arms, refer to Group 8K, Windshield Wiper and Washer Systems, for proper procedures.

(6) Tighten screws attaching cowl screen cover to cowl at base of windshield opening.

(7) Install windshield wiper arms. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).

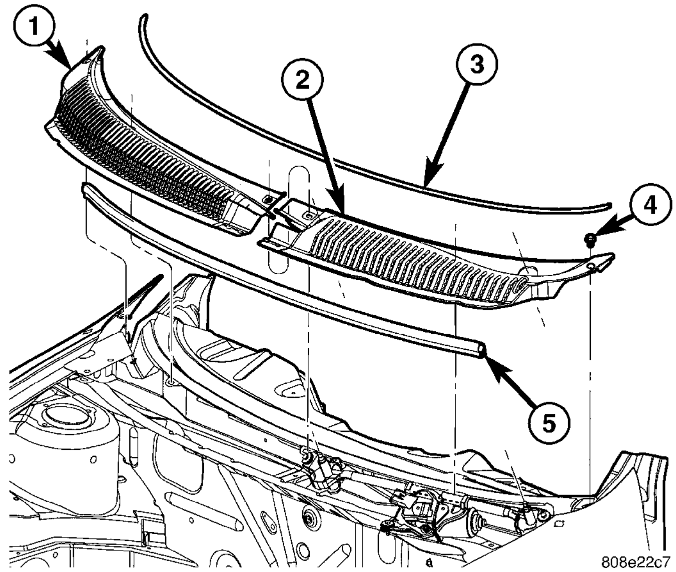

Fig. 2 COWL SCREEN COVER

1 - RIGHT COWL TOP SCREEN COVER
2 - LEFT COWL TOP SCREEN COVER
3 - COWL SCREEN WINDSHIELD SEAL
4 - SCREWS (5)
5 - COWL PLENUM TO HOOD WEATHERSTRIP

EXTERIOR NAME PLATES

REMOVAL

(1) Mark reference points before removing.

(2) Using a heat gun gently apply heat in a circular motion to loosen the adhesive bond.

(3) Using a nonmetallic prying device, such as a plastic or wood trim stick gently pry up at corners and remove.

(4) Clean off all traces of adhesive or double sided tape from the panel with a general purpose adhesive remover.

INSTALLATION

(1) Clean panel surface with isopropy alcohol.

(2) Align badgeing to reference points.

(3) Install and press securely to full adhesive contact

(4) Clean away any reference points.

FRONT END SPLASH SHIELDS

REMOVAL

(1) Hoist and support vehicle on safety stands. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove front wheel. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(3) Remove push-in fasteners attaching splash shield to frame rail forward of suspension (Fig. 3).

(4) Remove push in fasteners attaching splash shield to frame rail rearward of suspension.

(5) Remove screws attaching wheelhouse splash shield to front fender.

(6) Remove splash shield from vehicle.

INSTALLATION

(1) Place splash shield in position on vehicle.

(2) Install screws attaching wheelhouse splash shield to front fender.

(3) Install push in fasteners attaching splash shield to frame rail rearward of suspension.

(4) Install push in fasteners attaching splash shield to frame rail forward of suspension.

(5) Install front wheel.

(6) Lower vehicle.

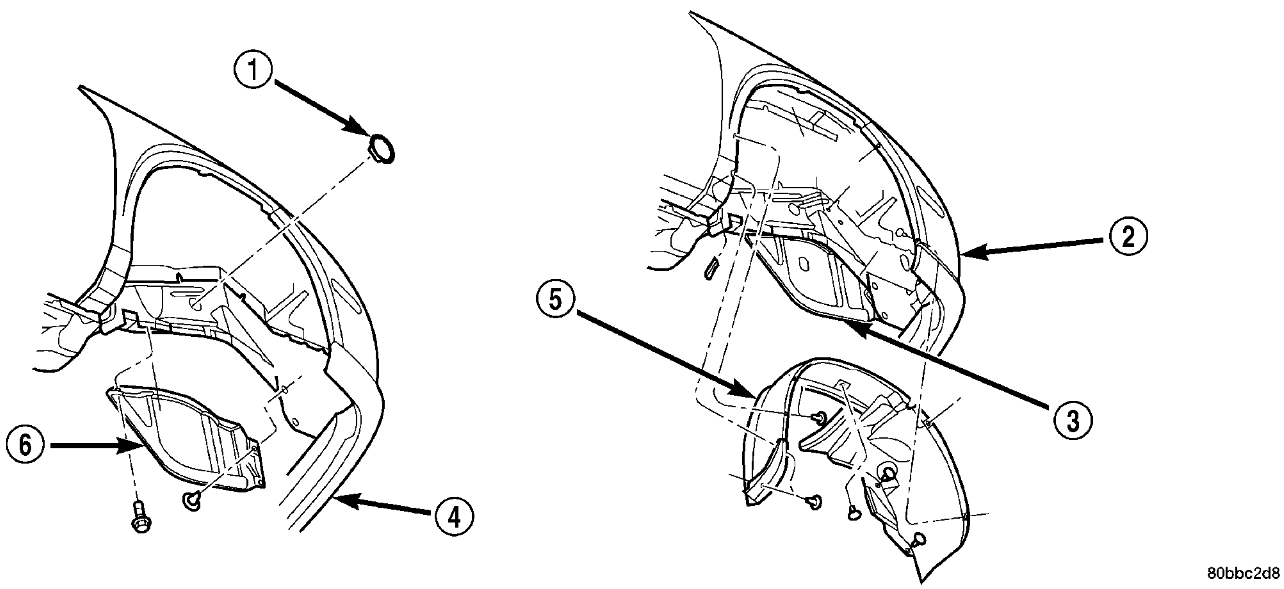

Fig. 3 Front Wheelhouse Splash Shield

1 - PUSH IN PLUG
2 - FRONT FASCIA
3 - PULLEY SPLASH SHIELD
4 - FRONT FASCIA
5 - FRONT FENDER SPLASH SHIELD
6 - PULLEY SPLASH SHIELD

FRONT FENDER

REMOVAL

(1) Remove headlamp housing.
(2) Right side of vehicle remove pulley splash shield.
(3) Remove inner splash shield.
(4) Remove fender to fascia nuts.
(5) Remove fender bolt to lower rocker panel.
(6) Remove fender bolt to lower cowl.
(7) Pull fascia away from fender.
(8) Remove bolts attaching fender to upper rail.
(9) Remove fender from vehicle (Fig. 4).

INSTALLATION

(1) Place fender in position on vehicle.
(2) Start the center upper rail bolt.
(3) From inside engine compartment, install all the bolts attaching fender to upper rail and tighten.
(4) Install lower cowl panel bolt to fender.
(5) Install rocker panel bolt to fender.
(6) Place fascia into position.
(7) Install fender to fascia nuts.
(8) Install inner splash shield.
(9) Install right side pulley splash shield.
(10) Install headlamp assembly.
(11) Check fender for flush and gap.

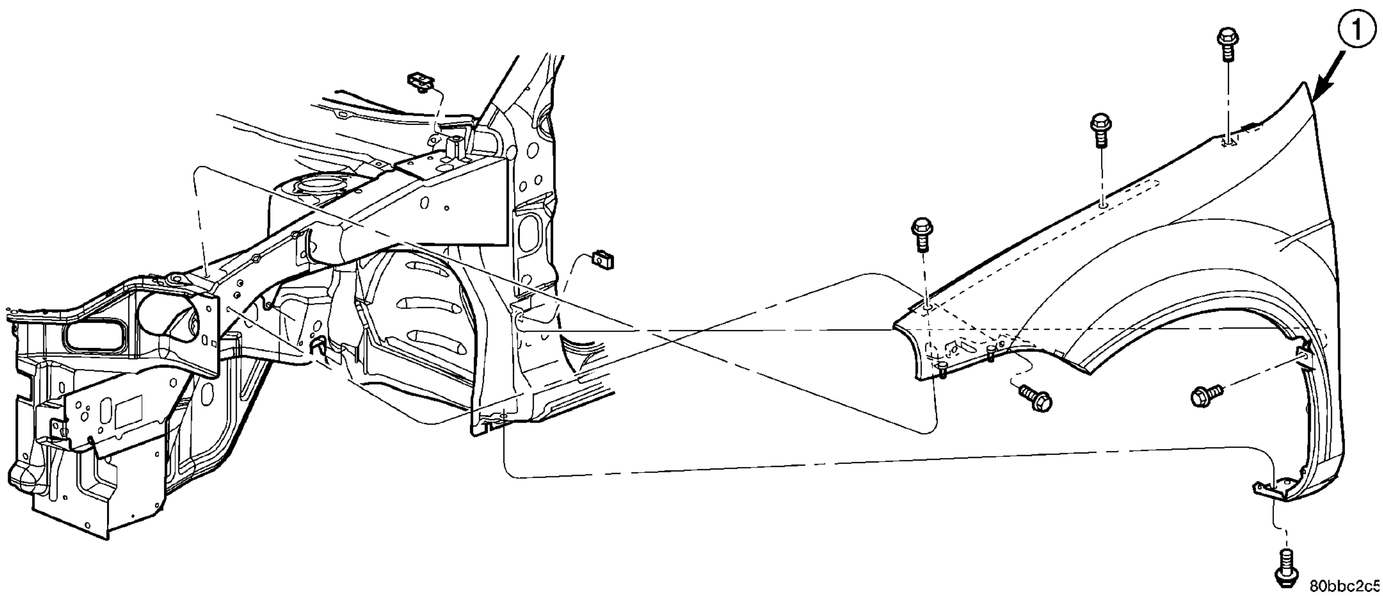

Fig. 4 Fender

1 - FENDER

FUEL FILL DOOR

REMOVAL

(1) Open the fuel filler door.

(2) Remove the screws attaching the door to the quarter panel (Fig. 5).

(3) Remove the door from the panel.

INSTALLATION

(1) Position the fuel filler door on the quarter panel with the screw holes aligned.

(2) Install the screws attaching the fuel filler door to the quarter panel.

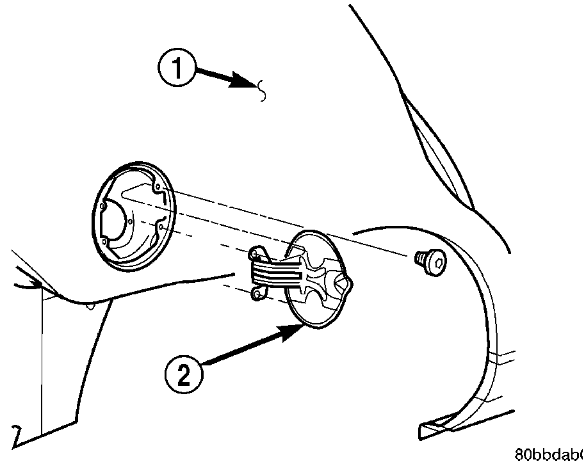

Fig. 5 Fuel Filler Door

1 - BODY ASSEMBLY
2 - FUEL FILLER DOOR

GRILLE

REMOVAL

(1) Release hood latch, open and support hood on prop rod.

(2) Remove the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).

(3) Remove the nut and remove the emblem. (Fig. 6)

(4) Using a trim stick C-4755 or equivalent, release the grille clips and remove the grille.

(5) Using a trim stick C-4755 or equivalent, release the grille surround clips and remove the grille surrounds.

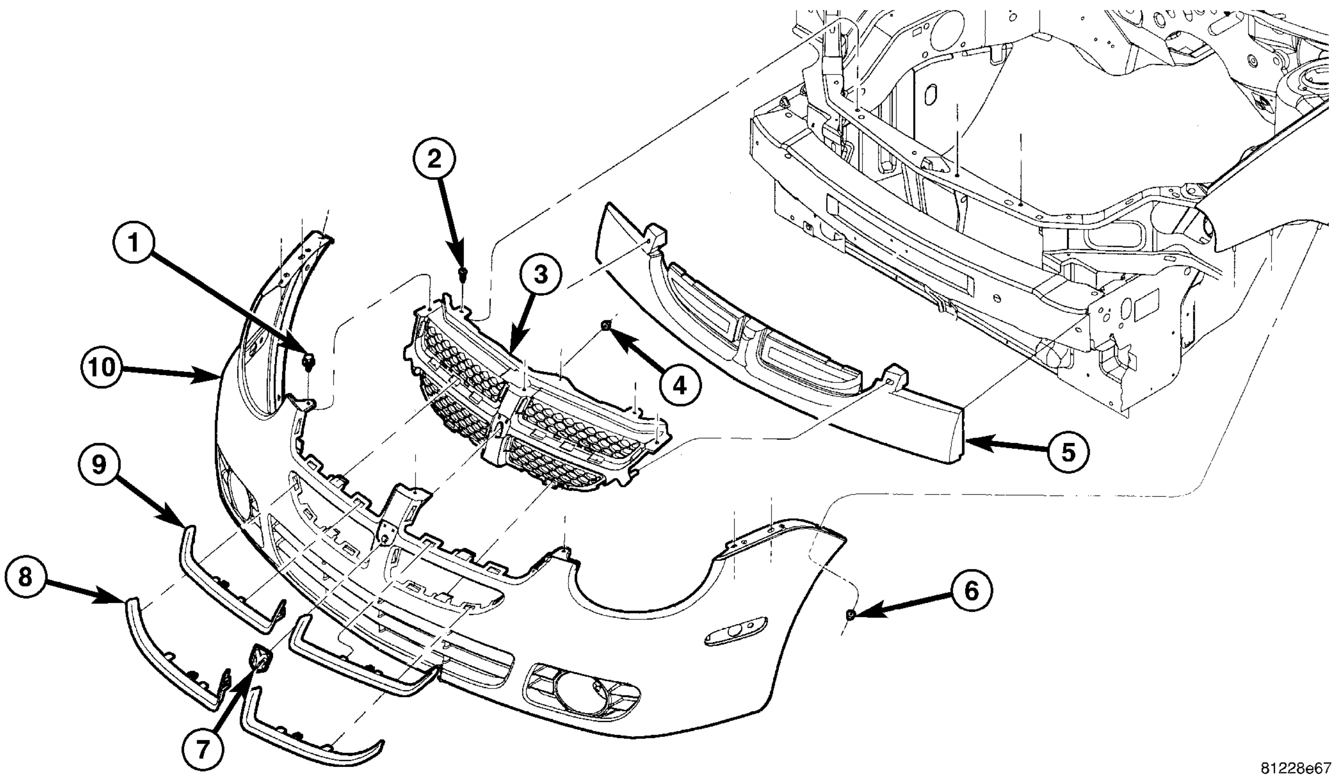

Fig. 6 FRONT FASCIA - DOMESTIC

1 - PUSH PIN FASTENER(S)
2 - ATTACHING SCREW(S)
3 - GRILLE
4 - EMBLEM NUT
5 - FRONT BUMPER FOAM
6 - FASCIA TO FENDER NUT
7 - EMBLEM
8 - SURROUND LOWER GRILLE
9 - SURROUND UPPER GRILLE
10 - FRONT FASCIA

GRILLE (Continued)

IMPORT

(1) Release hood latch, open and support hood on prop rod.

(2) Remove screws attaching grille to fascia (Fig. 7).

(3) Pull grille away from fascia, reach between grille and fascia with pliers and compress lower grille clips.

(4) Pull grille away from fascia and remove grille from vehicle.

INSTALLATION

(1) Install the grille and install the grille surrounds (Fig. 6).

(2) Seat the all the retaining clips fully.

(3) Install the emblem and install the nut.

(4) Install the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)

IMPORT

(1) Align lower grille clips and center grille tab into fascia slots (Fig. 7).

(2) Push lower grille forward until lower clips are seated into fascia slots. A click should be heard when clips are totally engaged into fascia slots.

(3) Seat top of grille to fascia and install screws attaching grille to fascia.

SIDE VIEW MIRROR

REMOVAL

(1) Remove side view mirror bezel or door trim panel as necessary.

(2) Remove nuts attaching mirror to door inner panel (Fig. 8).

(3) Manual mirrors snap left side manual remote from bezel.

(4) Electrical mirrors disconnect.

(5) Remove mirror from vehicle.

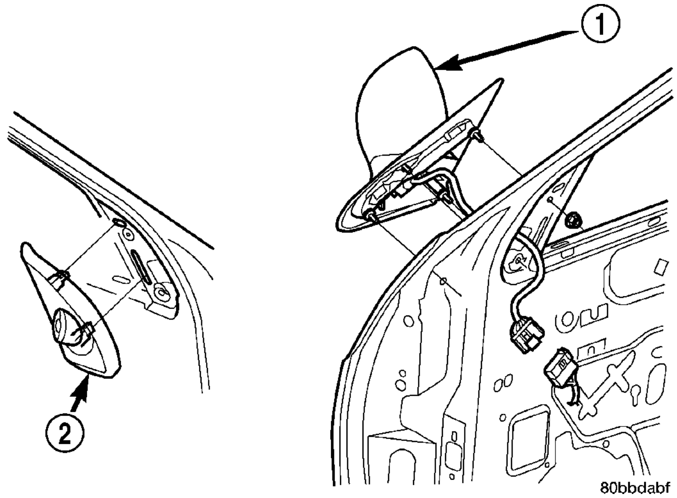

Fig. 8 Side View Mirror

1 - MIRROR ASSEMBLY
2 - MIRROR BEZEL

INSTALLATION

(1) Position side view mirror on vehicle and install nuts attaching mirror to door inner panel.

(2) Connect electrical mirror connector.

(3) Install nuts attaching mirror.

(4) Install mirror bezel or door trim panel as necessary.

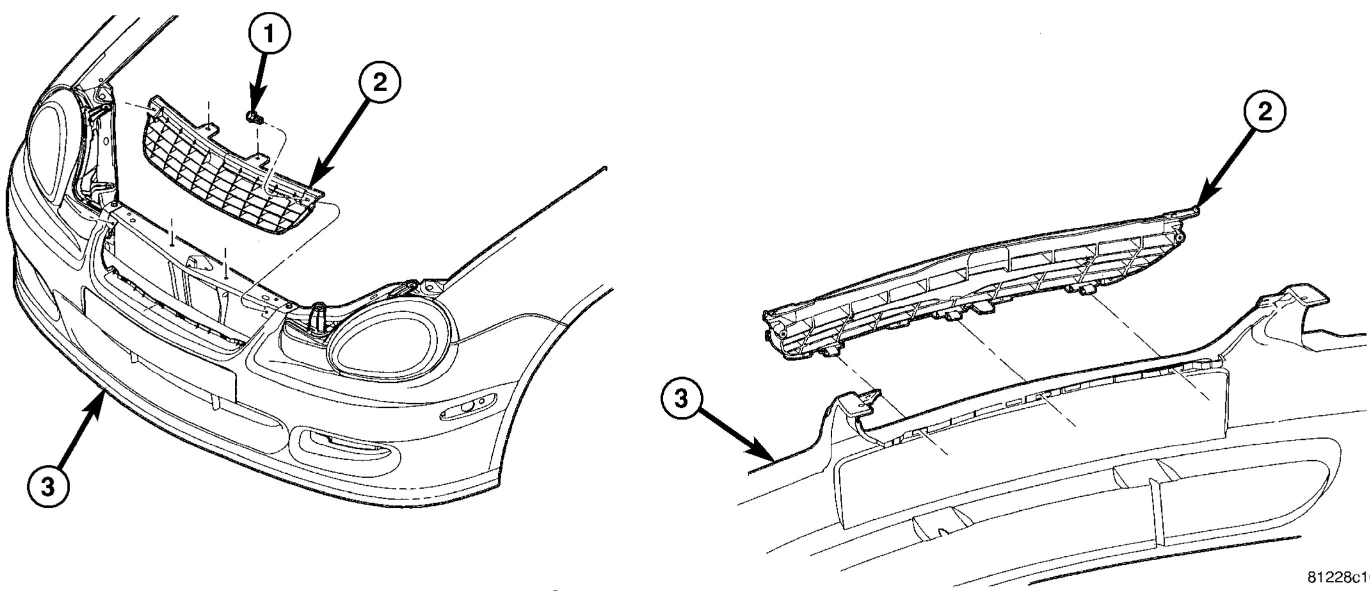

Fig. 7 GRILLE - IMPORT

1 - ATTACHING SCREW(S)
2 - GRILLE
3 - FASCIA

SIDE VIEW MIRROR TRIM BEZEL

REMOVAL

(1) Disengage clips attaching side view mirror bezel to stanchion. Left side only with manual mirrors (Fig. 8).

(2) Remove mirror bezel from vehicle.

INSTALLATION

(1) Place mirror bezel in position.

(2) Engage clips attaching side view mirror bezel to stanchion.

AIR EXHAUSTER

REMOVAL

(1) Hoist rear end of vehicle and support on safety stands.

(2) From behind rear bumper fascia below quarter panel, disengage clips attaching body vent to trunk well.

(3) Remove body vent from vehicle (Fig. 9).

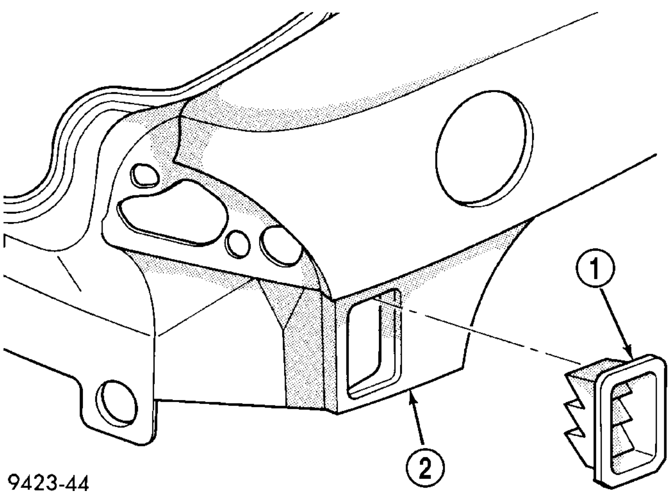

Fig. 9 Body Vent

1 - BODY VENT
2 - TRUNK WELL SIDE PANEL

INSTALLATION

(1) Place body vent in vehicle.

(2) From behind rear bumper fascia below quarter panel, engage clips attaching body vent to trunk well.

(3) Lower vehicle.

REAR WHEELHOUSE SPLASH SHIELD

REMOVAL

(1) Remove the wheel. (Refer to 22 - TIRES/WHEELS - REMOVAL)

(2) Remove the two screws and the three push-pin fasteners (Fig. 10).

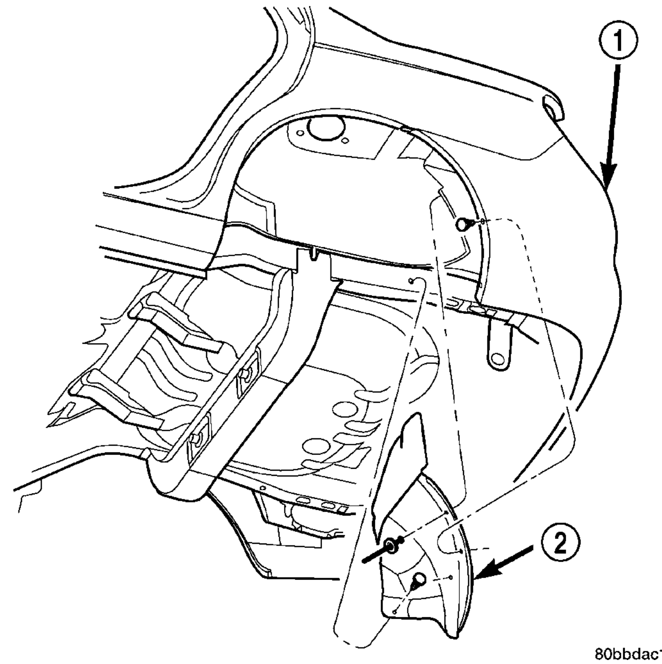

Fig. 10 Rear Wheel Housing Splash Shield

1 - REAR FASCIA
2 - REAR WHEEL HOUSING SPLASH SHIELD

INSTALLATION

(1) Install the shield.

(2) Install the three push-pin fasteners and two screws.

(3) Install the wheel. (Refer to 22 - TIRES/WHEELS - INSTALLATION)

SPOILER

REMOVAL

(1) Remove the decklid cover. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/COVER - REMOVAL)

(2) Remove the four nuts and remove the spoiler. (Fig. 11)

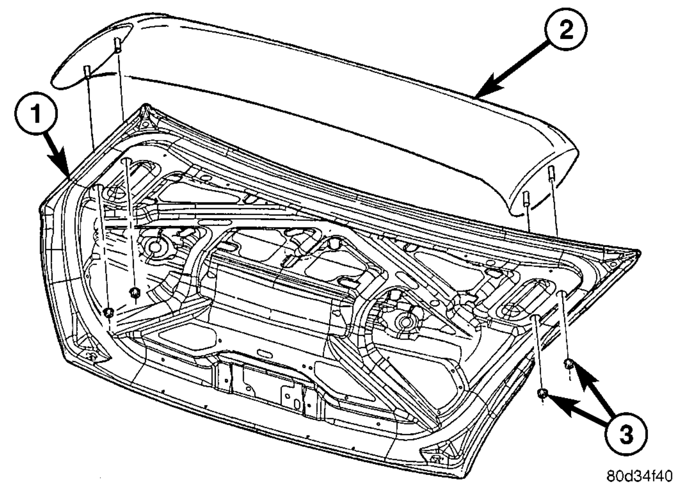

Fig. 11 SPOILER

1 - DECKLID
2 - SPOILER
3 - NUTS

INSTALLATION

(1) Install the spoiler and nuts (Fig. 11).

(2) Tighten nuts to 3 N·m (30 in. lbs.) torque.

(3) Install the decklid cover. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/COVER - INSTALLATION)

SIDE VIEW MIRROR GLASS

REMOVAL

WARNING: ALWAYS WEAR EYE AND HAND PROTECTION WHEN SERVICING THE MIRROR ASSEMBLY. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY FROM BROKEN GLASS.

(1) Carefully pull/pry the broken glass holder from the mirror assembly.

(2) Disconnect the heated mirror electrical connectors from the terminals on the mirror glass holder, if equipped.

INSTALLATION

CAUTION: It is important to make sure the motor is square to the glass holder (attaching fingers) prior to glass holder attachment, otherwise the glass holder could be installed incorrectly causing poor retention and possible repeat failure.

(1) Position the new mirror glass holder to the mirror assembly.

NOTE: Position the mirror glass holder so that the moisture drain hole on the mirror glass holder assembly is facing downward.

(2) Align the mirror glass holder's attaching fingers to the mirror motor housing.

NOTE: Ensure that the protective rubber cover of the mirror motor housing is positioned correctly around the bottom of the fingers area.

(3) Using one hand, firmly press the mirror glass holder assembly into place while at the same time supporting the housing assembly from the backside with the other hand.

NOTE: Pressure must be applied equally over the center portion of the mirror to engage the mirror glass holder's attaching fingers to the corresponding fingers on the housing assembly. One or more clicks may be heard when finger engagement takes place.

(4) Verify retention of the mirror glass holder assembly by gently pulling outward on the mirror glass holder.

SILL EXTENSION

REMOVAL

(1) Raise and support vehicle (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

(2) Remove screws attaching the forward end of the front sill extension (Fig. 12) or (Fig. 13).

(3) Using proper tool, remove lower push pin fasteners attaching sill extension molding to sill.

(4) Using a trim stick, remove front sill molding from vehicle.

(5) Remove lower push pin fasteners attaching rear sill molding to sill.

(6) Using trim stick, remove rear sill molding from vehicle.

INSTALLATION

(1) Place rear sill molding into position and seat pins fully (Fig. 12) or (Fig. 13).

(2) Install screws attaching the forward end of the front sill extension.

(3) Install lower push pin fasteners attaching rear sill molding to sill.

SILL EXTENSION (Continued)

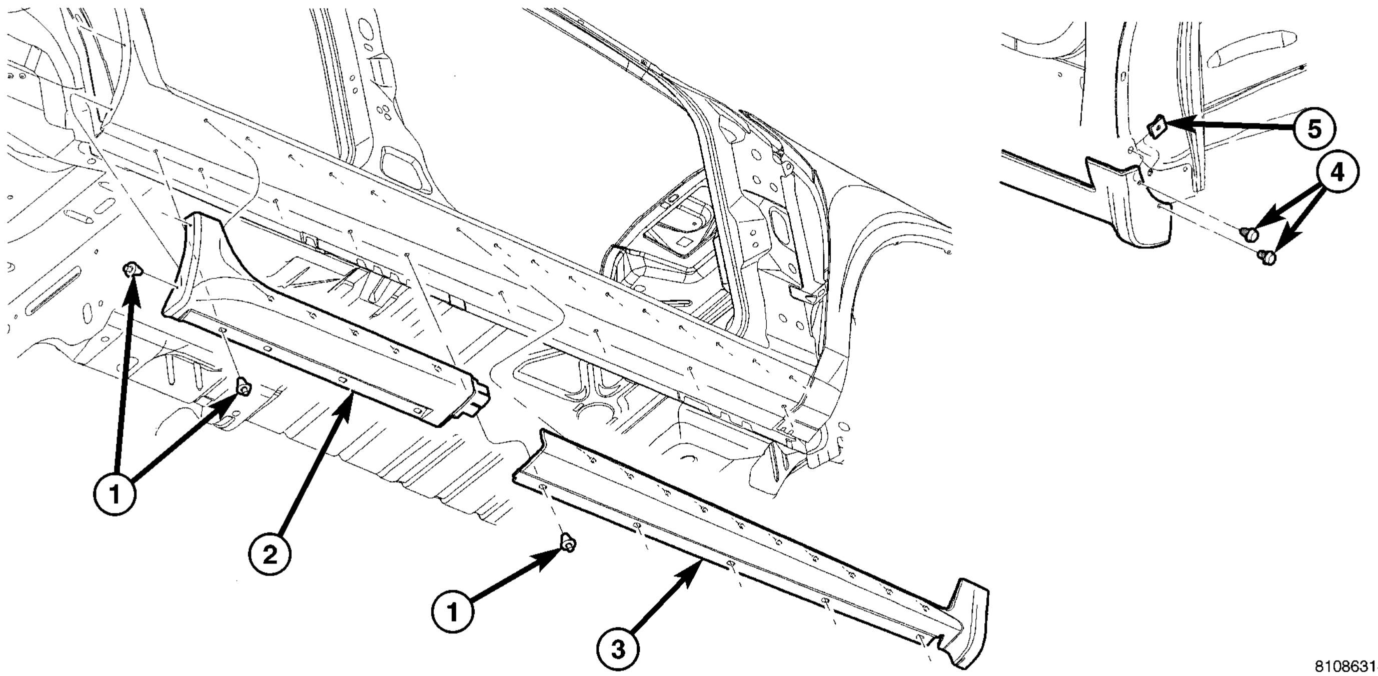

Fig. 12 SILL EXTENSION MOLDING

1 - PUSH PIN(S)
2 - REAR SILL EXTENSION MOLDING
3 - FRONT SILL EXTENSION
4 - SCREWS
5 - SPRING U-NUT(S)

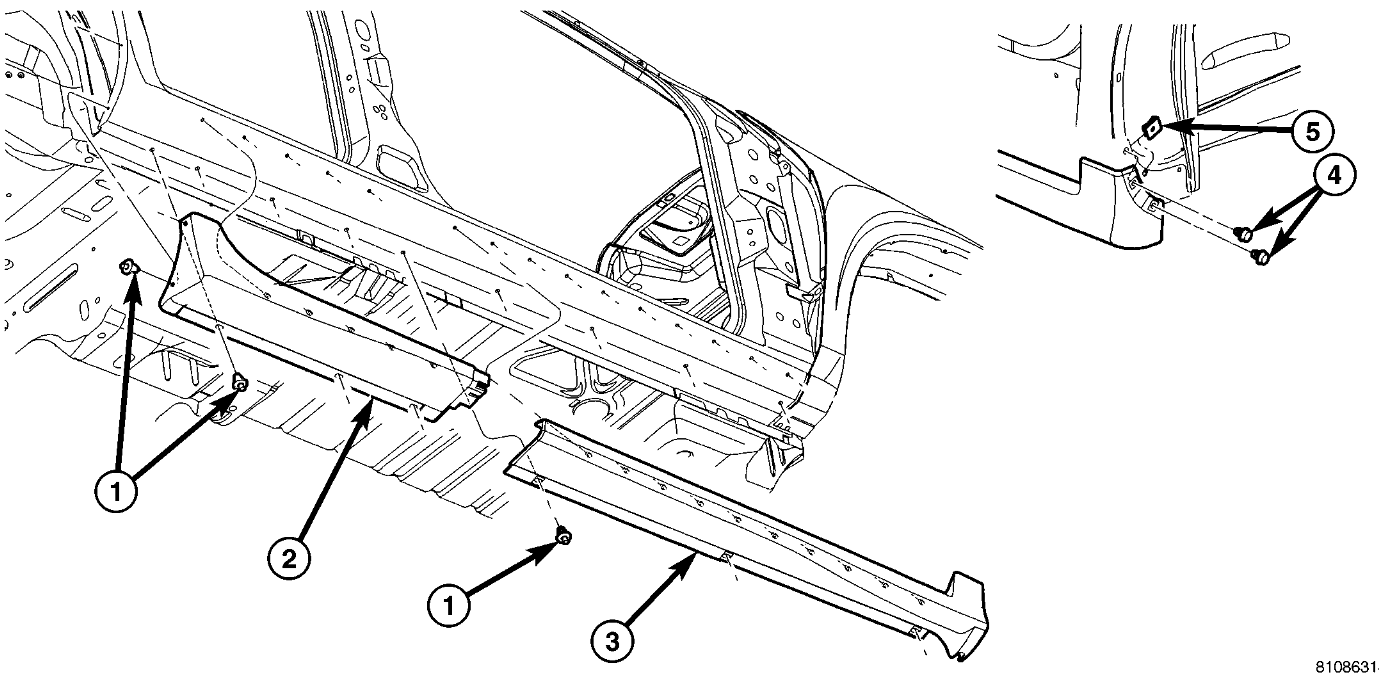

Fig. 13 SILL EXTENSION MOLDING - SRT-4

1 - PUSH PIN(S)
2 - REAR SILL EXTENSION MOLDING
3 - FRONT SILL EXTENSION
4 - SCREWS
5 - SPRING U-NUT(S)

(4) Place front sill molding into position and seat pins fully.

(5) Install lower push pin fasteners attaching sill extension molding to sill.

HOOD

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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 provide reference marks for installation. When installing hood hinge, 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.

(3) Remove bolts holding hood to hinge (Fig. 1).

(4) Remove bolts holding hood hinge to load beam flange and separate hinge from vehicle. If necessary, paint new hinge before installation.

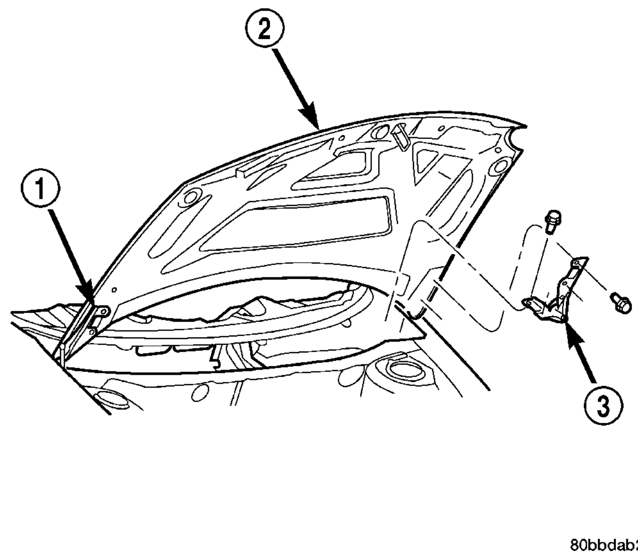

Fig. 1 Hood Hinge

1 - HOOD HINGE
2 - HOOD
3 - HOOD HINGE

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) Remove support from under hood and verify hood operation.

HOOD

REMOVAL

(1) Raise hood to full up position.

(2) Disengage under hood lamp wire connector from engine compartment wire harness.

(3) Remove hood cover (Fig. 2).

(4) Mark all bolt and hinge attachment locations with a grease pencil or other suitable device to provide reference marks for installation. When installing hood, 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.

(5) Remove the top bolts attaching hood to hinge and loosen the bottom bolts until they can be removed by hand.

(6) With assistance from a helper at the opposite side of the vehicle to support the hood, remove bottom bolts attaching hood to hinge.

(7) Remove the hood from the vehicle.

INSTALLATION

(1) Place hood in position on vehicle. With assistance from a helper at the opposite side of the vehicle to support the hood, install bottom bolts to hold hood to hinge finger tight.

(2) Install top bolts attaching hood to hinge finger tight.

(3) Position bolts at 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. (Fig. 3)

(4) Install hood cover.

(5) Engage under hood lamp wire connector to engine compartment wire harness.

(6) Verify hood operation and alignment.

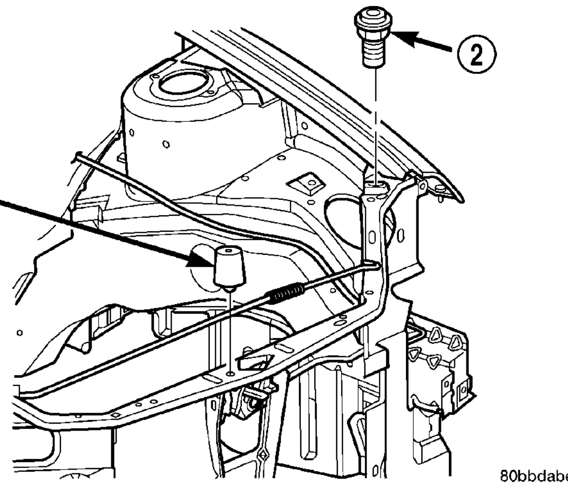

Fig. 3 Hood Adjust Bumper

1 - HOOD STATIONARY BUMPER
2 - HOOD ADJUST BUMPER

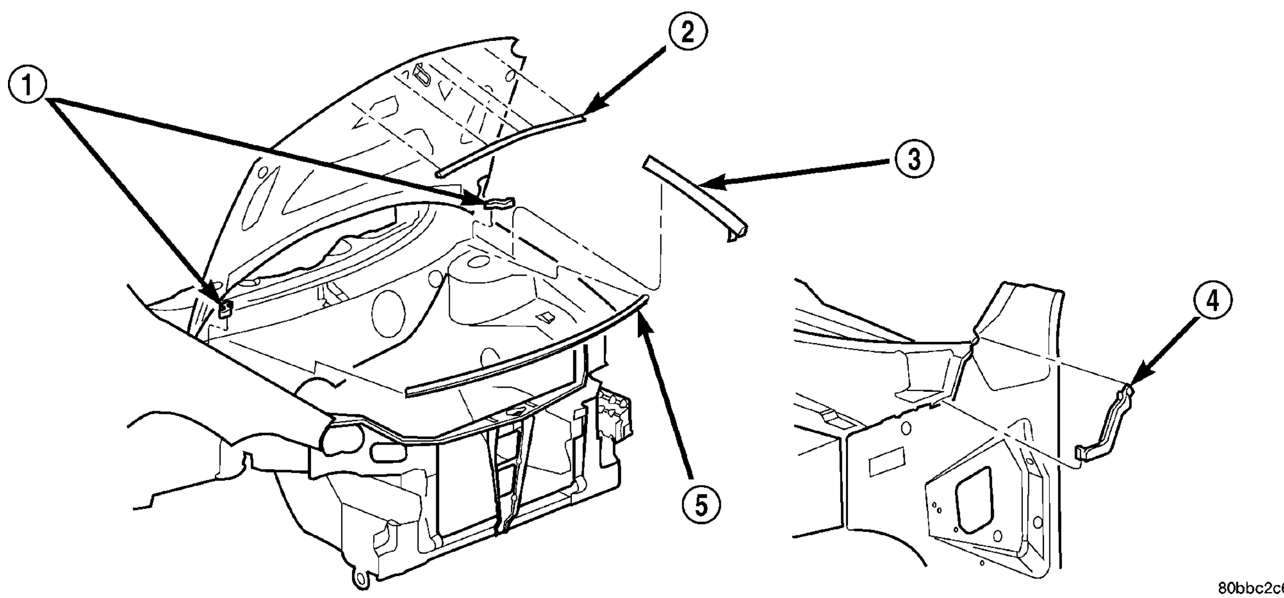

Fig. 2 Hood

1 - FENDER TO HOOD HINGE SEAL
2 - HOOD TO RADIATOR WEATHERSTRIP
3 - FENDER TO HOOD SEAL
4 - COWL SIDE TO COWL TOP
5 - COWL PLENUM TO HOOD WEATHERSTRIP

LATCH

REMOVAL

Domestic

(1) Remove the upper fasteners securing the grille to the upper radiator closure panel. (Fig. 4)

(2) Using a socket and extension, remove the nuts attaching hood latch to radiator closure panel. (Fig. 5)

(3) Carefully pull the grille out from the radiator closure and remove the hood latch assembly.

(4) Disengage remote release cable from latch.

International

(1) Release hood latch and open hood.

(2) Support hood on prop rod.

(3) Remove grille.

(4) Remove nuts attaching hood latch to radiator closure panel (Fig. 5).

(5) Remove hood latch from closure panel.

(6) Disengage remote release cable from latch.

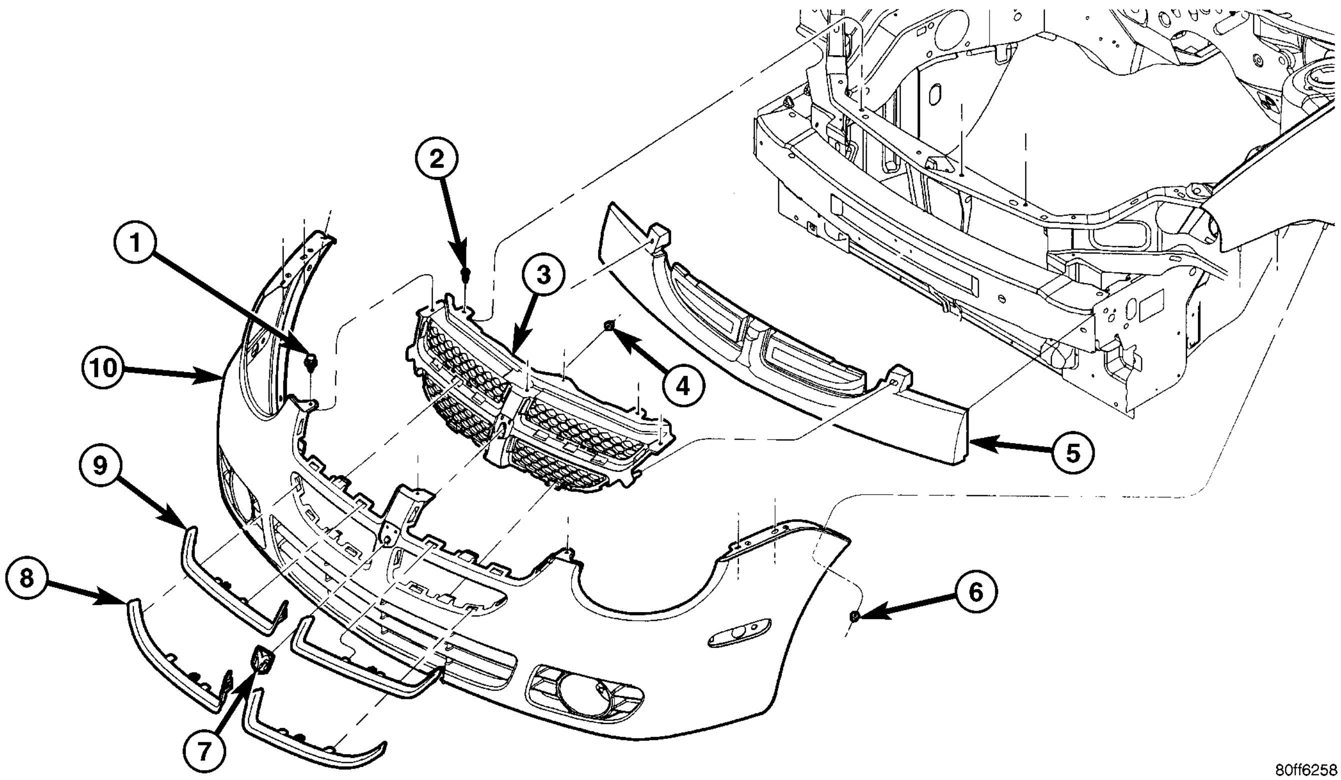

Fig. 4 FRONT FASCIA - DOMESTIC

1 - PUSH PIN FASTENER(S)
2 - ATTACHING SCREW(S)
3 - GRILLE
4 - EMBLEM NUT
5 - FRONT BUMPER FOAM
6 - FASCIA TO FENDER NUT
7 - EMBLEM
8 - SURROUND LOWER GRILLE
9 - SURROUND UPPER GRILLE
10 - FRONT FASCIA

LATCH (Continued)

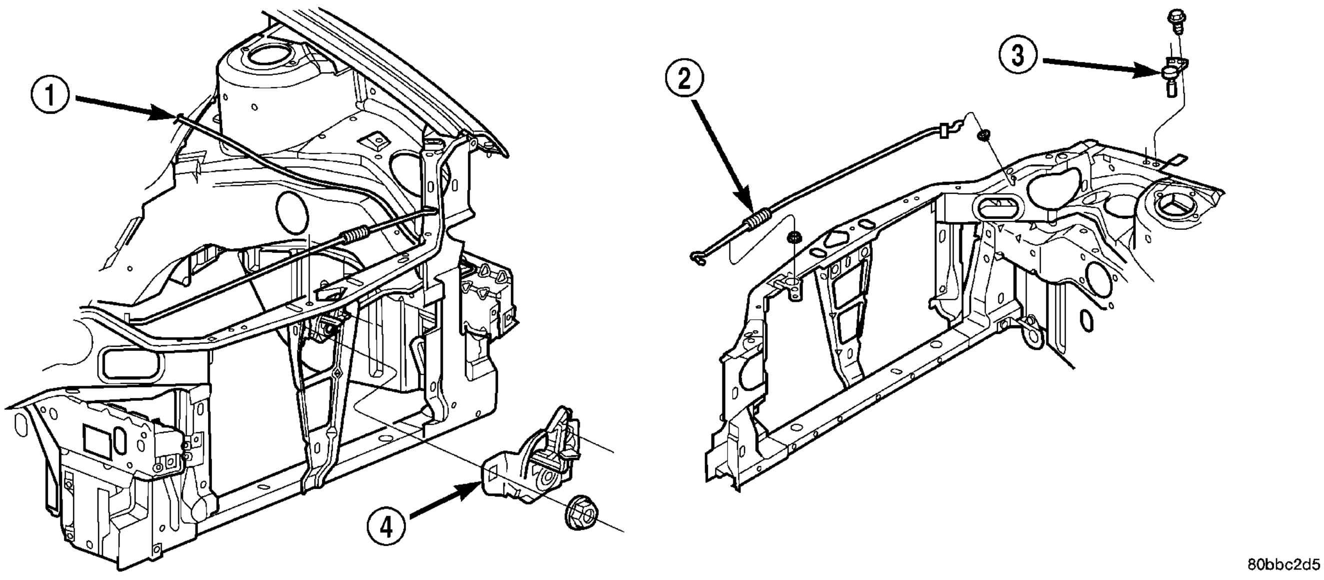

Fig. 5 HOOD LATCH

1 - HOOD LATCH RELEASE CABLE
2 - HOOD PROP ROD
3 - HOOD SECURITY ALARM
4 - HOOD LATCH

INSTALLATION

Domestic

(1) Engage remote release cable into latch.

(2) Carefully pull back the grille and place hood latch onto radiator closure panel.

(3) Install the nuts and tighten to 15 N·m (11 ft. lbs.).

(4) Install the upper fasteners securing the grille to the upper radiator closure panel.

International

(1) Engage remote release cable into latch.

(2) Place hood latch onto radiator closure panel.

(3) Install nuts attaching latch to closure panel and tighten to 15 N·m (11 ft. lbs.).

(4) Install grille.

(5) Close hood and verify alignment of hood and that latch is securely engaged.

LATCH RELEASE CABLE

REMOVAL

(1) Unlatch hood and open

(2) Disconnect remote hood release cable from hood latch (Refer to 23 - BODY/HOOD/LATCH - REMOVAL).

(3) Release any remote hood cable attachments and free cable (Fig. 6).

(4) Remove left front cowl trim panel (Refer to 23 - BODY/INTERIOR/SIDE COWL TRIM - REMOVAL).

(5) Remove screws attaching hood release handle to cowl panel and release cable from clip (Fig. 7).

(6) Disconnect rubber grommet from dash panel behind instrument panel.

(7) Pull release cable through hole in dash panel.

(8) Remove cable and handle from vehicle.

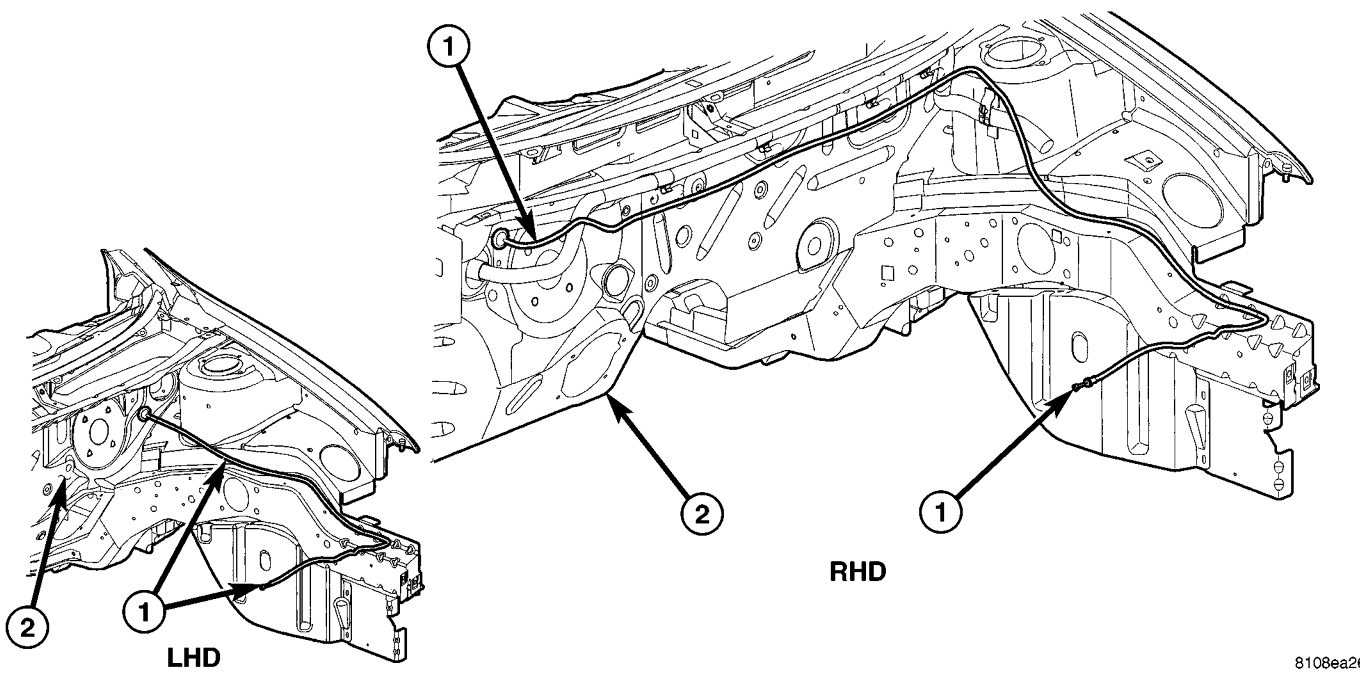

Fig. 6 HOOD REMOTE RELEASE CABLE

1 - HOOD LATCH RELEASE CABLE ASSEMBLY
2 - DASH PANEL

LATCH RELEASE CABLE (Continued)

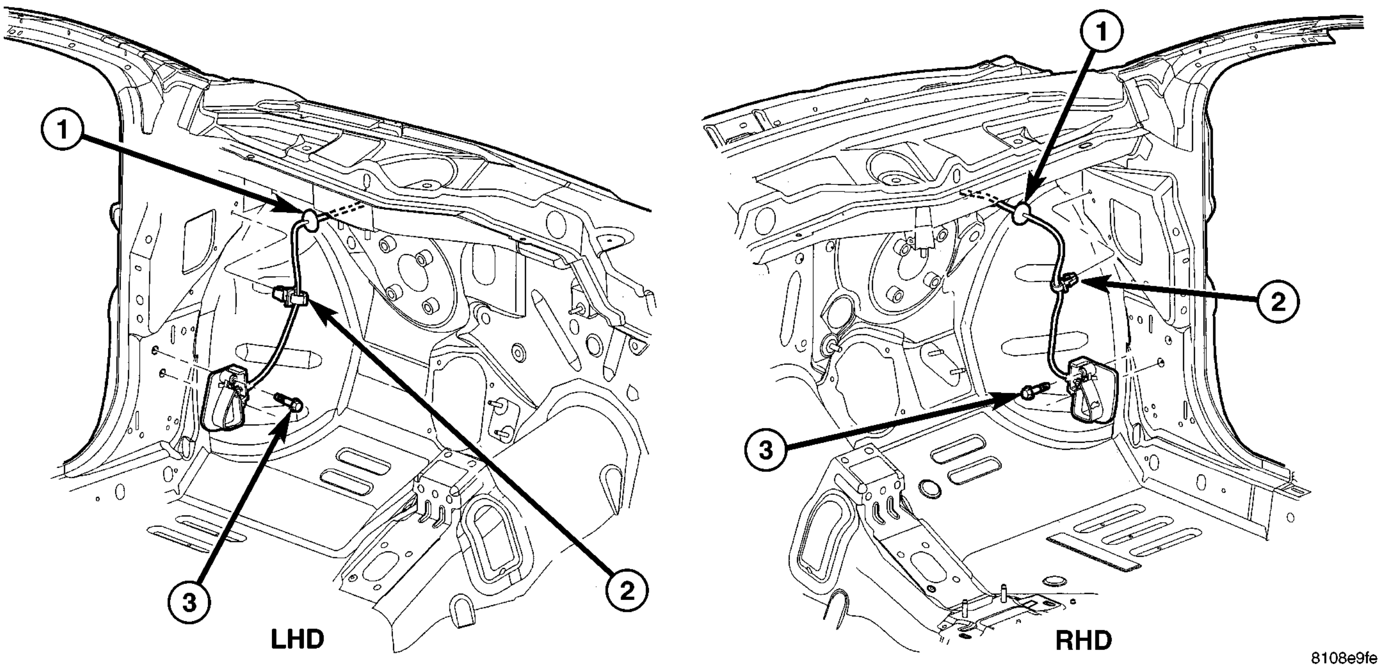

Fig. 7 HOOD RELEASE CABLE - INSIDE

1 - HOOD LATCH RELEASE ASSEMBLY
2 - CLIP
3 - HOOD LATCH RELEASE HANDLE - ATTACHING BOLT(S)

INSTALLATION

(1) From inside of vehicle feed remote release cable through hole in dash panel (Fig. 7)

(2) Connect rubber grommet into dash panel.

(3) Install screws attaching hood release handle to cowl panel.

(4) Install left front cowl trim panel (Refer to 23 - BODY/INTERIOR/SIDE COWL TRIM - INSTALLATION).

(5) Connect any remote cable attachments (Fig. 6).

(6) Connect remote hood release cable to hood latch (Refer to 23 - BODY/HOOD/LATCH - INSTALLATION).

(7) Close hood and verify operation.

(8) Check remote hood release cable for proper operation.

LATCH STRIKER

REMOVAL

(1) Release hood latch and open hood.

(2) Remove bolts attaching striker to inside of hood.

(3) Remove hood latch striker from vehicle.

INSTALLATION

(1) Position hood latch striker on vehicle.

(2) Install bolts attaching hood latch striker to hood. Tighten bolts to 13.5 N·m (10 ft. lbs.) torque.

(3) Align hood latch striker to engage smoothly into hood latch.

(4) Verify hood operation and alignment. Adjust as necessary.

(5) Tighten attaching bolts to 13.5 N·m (10 ft. lbs.) torque.

SILENCER PAD

REMOVAL

(1) Release hood latch and open hood.
(2) Disconnect hood lamp wire connector and remove hood lamp (Fig. 8).
(3) Remove fasteners attaching hood silencer to hood.
(4) Remove hood silencer from vehicle.

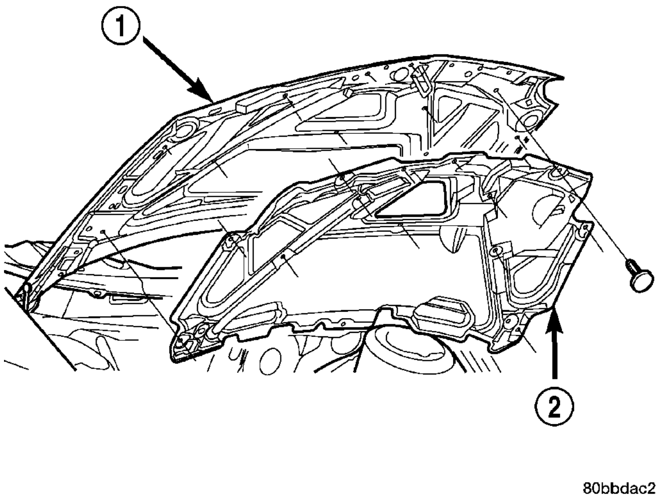

Fig. 8 SILENCER PAD

1 - HOOD
2 - HOOD SILENCER

INSTALLATION

(1) Place hood silencer in position on vehicle.
(2) Install fastener attaching hood silencer to hood.
(3) Install hood lamp and connect wire connector.
(4) Close hood.

ADJUSTMENT BUMPER

REMOVAL

(1) Release hood latch and open hood.
(2) Rotate hood adjuster bumper counterclockwise.
(3) Remove hood adjuster bumper from headlamp reinforcement.

HOOD AIR SCOOP BEZEL

REMOVAL

(1) Release hood latch and open hood.
(2) Remove nuts attaching hood air scoop bezel to hood (Fig. 9).
(3) Remove hood air scoop bezel from vehicle.

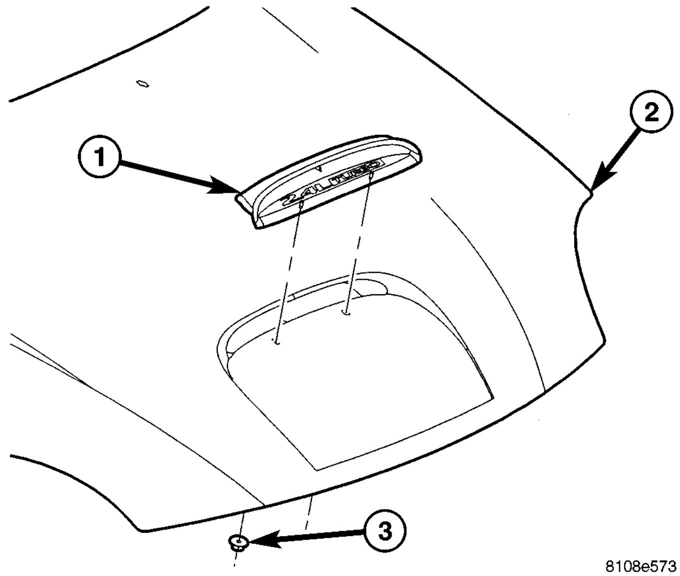

Fig. 9 HOOD AIR SCOOP BEZEL

1 - HOOD AIR SCOOP BEEZEL
2 - HOOD ASSEMBLY
3 - ATTACHING NUT(S)

INSTALLATION

(1) Place into position hood air scoop bezel.
(2) Install nuts attaching hood air scoop bezel to hood (Fig. 9).
(3) Close hood.

INSTRUMENT PANEL

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CLUSTER BEZEL

REMOVAL

(1) Remove instrument panel top cover. Refer to Body, Instrument Panel, Instrument Panel Top Cover, Removal.

(2) Using a trim stick (special tool #C-4755) or equivelent, gently pry up on the cluster bezel and remove from vehicle.

INSTALLATION

(1) Place the cluster bezel into position and firmly snap into place.

(2) Install the instrument panel top cover. Refer to Body, Instrument Panel, Instrument Panel Top Cover, Installation.

ACCESSORY SWITCH BEZEL

REMOVAL

(1) Disconnect and isolate the battery negative cable (Fig. 1).

(2) Remove the instrument panel center bezel. Refer to Body, Instrument Panel, Instrument Panel Center Bezel Removal.

(3) Remove four screws retaining accessory switch bezel.

(4) Disconnect the harness connectors to the following:

- Rear Window Defogger Switch (if equipped)

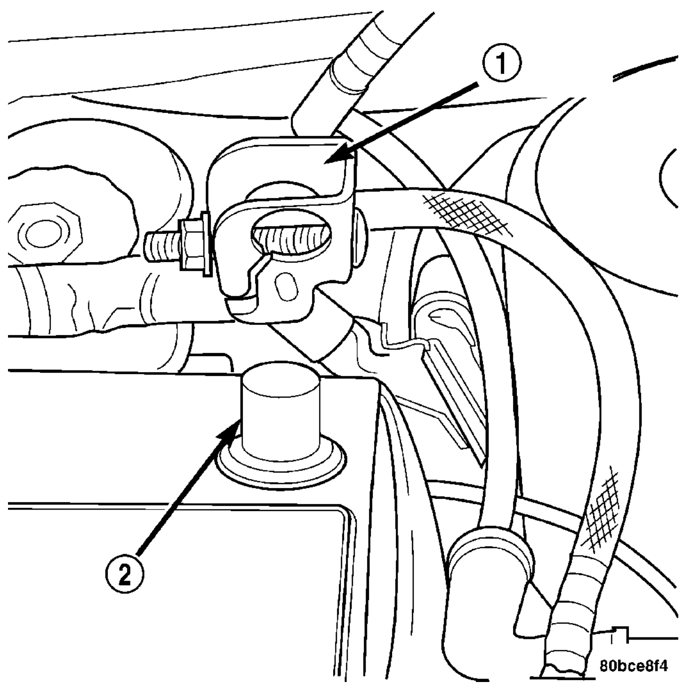

Fig. 1 BATTERY NEGATIVE CABLE REMOVE/INSTALL

1 - NEGATIVE CABLE
2 - NEGATIVE BATTERY POST

- Cigar Lighter/Power Outlet

The accessory switches are not serviced separately, but the cigar lighter/power outlet is and must be transferred to the new bezel. Refer to Electrical, Power Distribution, Cigar Lighter/Power Outlet Removal and Installation.

ACCESSORY SWITCH BEZEL (Continued)

INSTALLATION

The accessory switches are not serviced separately, but the cigar lighter/power outlet is and must be transferred to the new bezel. Refer to Electrical, Power Distribution, Cigar Lighter/Power Outlet Removal and Installation.

(1) Connect the harness connectors to the following:

- Cigar Lighter/Power Outlet
- Rear Window Defogger Switch (if equipped)

(2) Install the four screws retaining the accessory switch bezel.

(3) Install the instrument panel center bezel. Refer to Body, Instrument Panel, Instrument Panel Center Bezel, Installation.

(4) Connect the battery negative cable (Fig. 1).

GLOVE BOX

REMOVAL

(1) Remove three glove box door hinge screws.

(2) Open glove box and remove assembly from vehicle.

(3) Remove the latch by gently prying the retainer clip out of its slot.

(4) Remove nine screws retaining glove box door to bin assembly.

(5) Remove glove box door from bin and remove.

(6) Remove dampers by gently stretching them over the end of their pins.

INSTALLATION

(1) Assemble glove box door and bin.

(2) Install the nine screws retaining glove box door to bin assembly.

(3) Install the latch using retainer clip.

(4) Install glove box dampers over end of pins.

(5) Place glove box into instrument panel opening.

(6) Close glove box door and install the three glove box door hinge screws.

INSTRUMENT PANEL ASSEMBLY

REMOVAL

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Push seats back to their full back position.

(3) Using a trim stick (special tool #C-4755) or equivalent, gently pry out on left and right A-pillar trim moldings and remove.

(4) Remove the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)

(5) Gently pull up on cluster bezel and remove from vehicle.

(6) Remove two screws. Then gently pull rearward on left lower instrument panel cover and remove from vehicle.

CAUTION: Lock the steering wheel in the straight ahead position. This will prevent clock spring damage when the steering wheel rotates freely.

(7) Remove steering column. (Refer to 19 - STEERING/COLUMN - REMOVAL)

(8) Remove left and right instrument panel end covers.

(9) Remove left and right cowl side panels.

(10) Remove floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(11) Depress the sides of the Data Link Connector (DLC) and remove from instrument panel reinforcement.

(12) Remove two center support mounting bolts.

(13) Remove left and right A-pillar mounting bolts, two on each side.

(14) Disconnect right side antenna connector.

(15) Remove left and right A-pillar door harness connectors (Fig. 2).

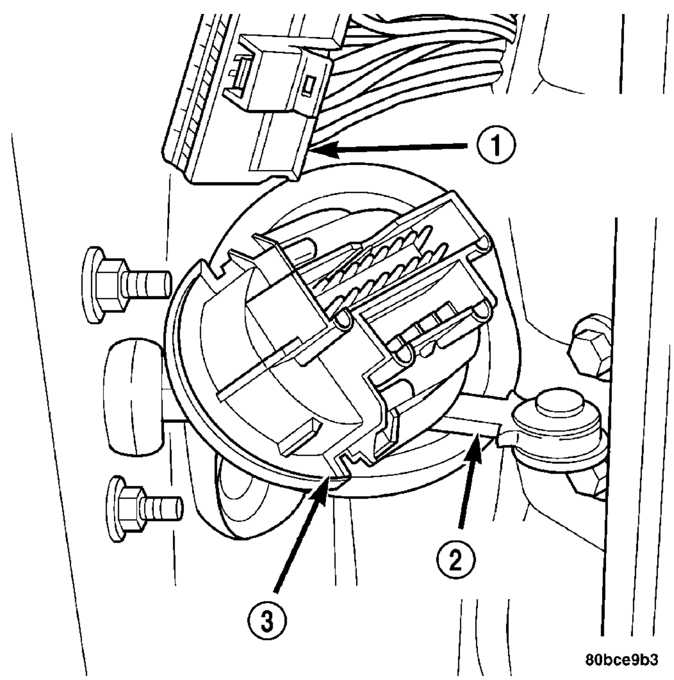

Fig. 2 A-PILLAR DOOR HARNESS CONNECTOR

1 - INSTRUMENT PANEL HARNESS CONNECTOR
2 - DOOR CHECK STRAP
3 - DOOR HARNESS CONNECTOR

INSTRUMENT PANEL ASSEMBLY (Continued)

(16) Disconnect two harness connectors to HVAC at right top instrument panel (Fig. 3).

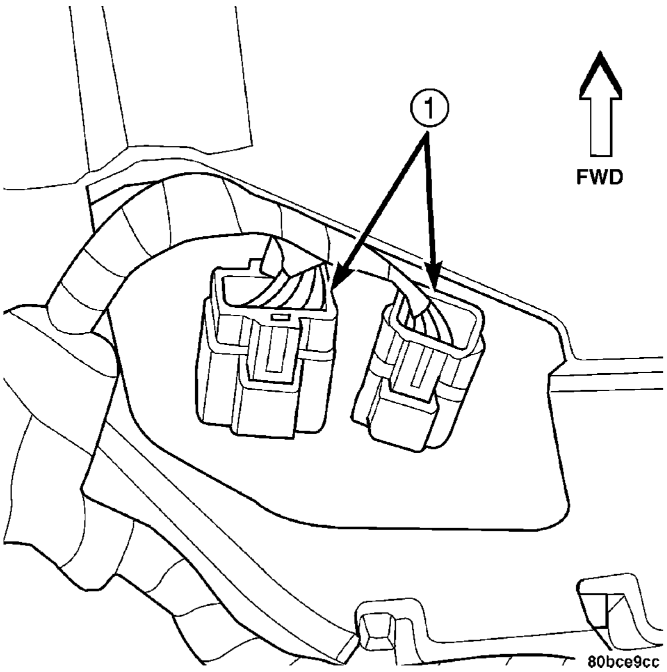

Fig. 3 INSTRUMENT PANEL TO HVAC HARNESS CONNECTORS

1 - HVAC HARNESS CONNECTORS

(17) Disconnect one left side harness connector at top left of instrument panel for vanity and rear view mirrors.

(18) Pull off the HVAC control head knobs.

(19) Remove both A/C outlet barrels.

(20) Remove two screws retaining the top front of the center bezel.

(21) Using a trim stick or equivalent, gently pry out on the instrument panel center bezel and remove.

(22) Remove the two retaining screws to the HVAC control head.

(23) Disconnect the one instrument panel wire harness connector.

(24) Disconnect the one vacuum harness connector.

(25) Pull HVAC control head out of instrument panel, twist 90° and push back through the opening (Fig. 4). Do not disconnect the control cables.

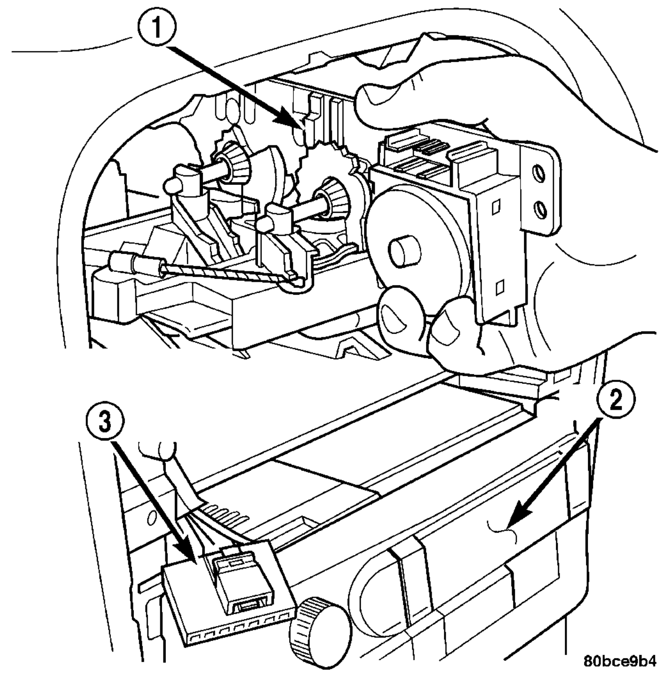

Fig. 4 HVAC CONTROL HEAD

1 - HVAC CONTROL HEAD
2 - RADIO
3 - HVAC CONTROL HEAD HARNESS CONNECTOR

(26) Disconnect the center console wiring:

- Airbag Control Module (ACM)
- Parking Brake Warning Lamp Switch
- Transmission Range Indicator Lamp
- Shift Interlock Cable (ATX)

(27) With help from an assistant, remove two bolts on top of the brake pedal support bracket. Pull rearward on instrument panel assembly and remove from vehicle.

(28) Remove center A/C duct from the instrument panel (Fig. 15).

If replacing instrument panel, transfer parts (Fig. 5) as necessary.

INSTRUMENT PANEL ASSEMBLY (Continued)

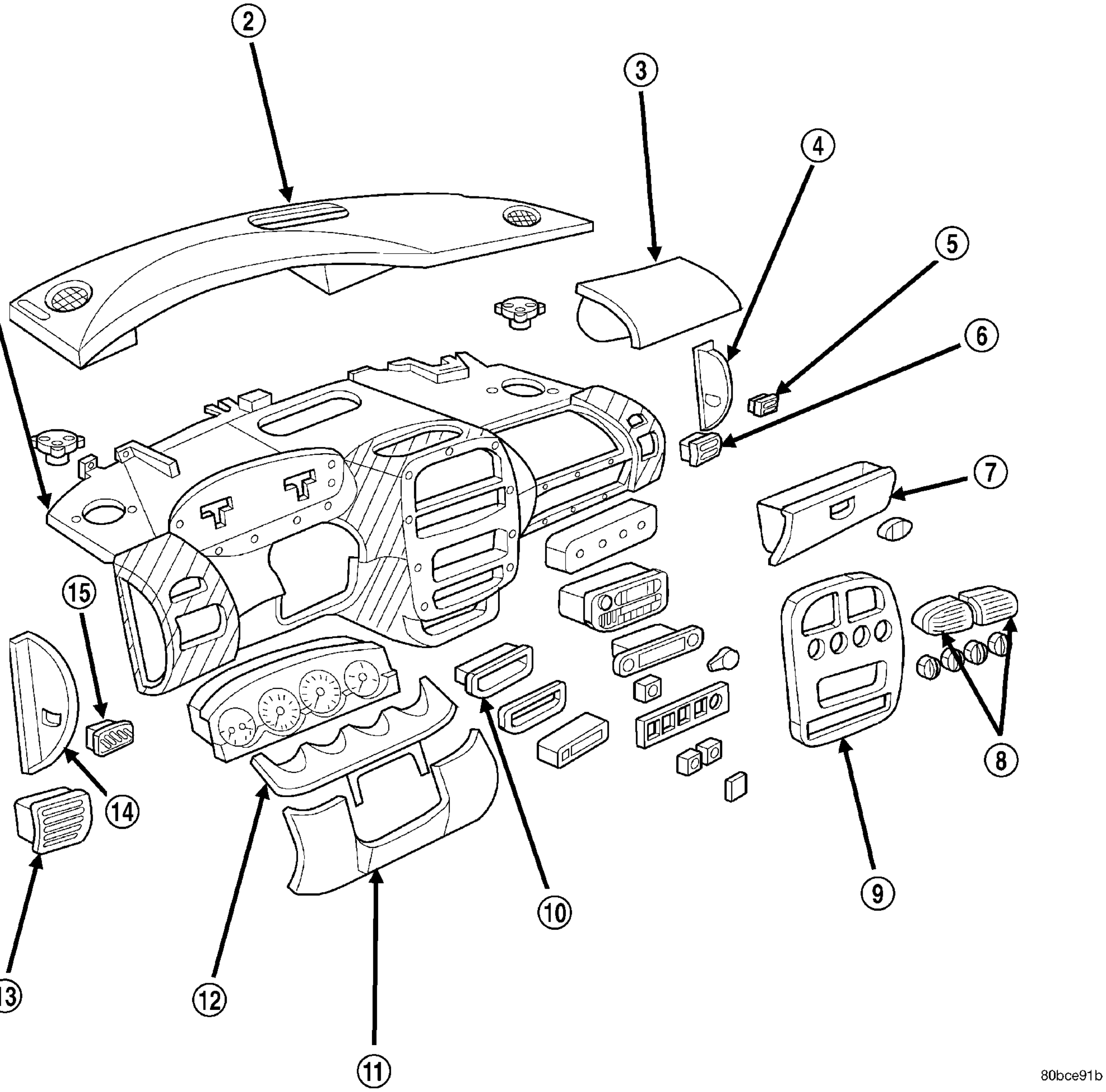

Fig. 5 INSTRUMENT PANEL ASSEMBLY

1 - INSTRUMENT PANEL ASSEMBLY
2 - TOP COVER ASSEMBLY
3 - MODULE, PASSENGER SIDE AIRBAG
4 - END CAP, RIGHT
5 - DEMISTER GRILLE, RIGHT
6 - LOUVER, AIR OUTLET, RIGHT
7 - DOOR, GLOVE BOX
8 - LOUVER, AIR OUTLET, CENTER
9 - BEZEL INSTRUMENT PANEL, CENTER
10 - BIN, LOWER STORAGE
11 - STEERING COLUMN COVER ASSEMBLY
12 - CLUSTER BEZEL
13 - LOUVER, AIR OUTLET, LEFT
14 - END CAP, LEFT
15 - DEMISTER GRILLE, LEFT

INSTRUMENT PANEL ASSEMBLY (Continued)

REMOVAL - RHD

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS, WARNINGS BEFORE ATTEMPTING ANY 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.

CAUTION: LOCK THE STEERING WHEEL IN THE STRAIGHT AHEAD POSITION. THIS WILL PREVENT CLOCKSPRING DAMAGE WHEN THE STEERING COLUMN IS REMOVED FROM THE VEHICLE. (Fig. 6)

(1) Disconnect and isolate the negative battery cable.

(2) Remove the floor console. Refer to Body, Interior, Center Console, Removal.

(3) Remove the right and left side instrument panel end covers (Fig. 7). Using the finger grip feature, pull straight away from the instrument panel to disengage the (3) retaining clips.

(4) Remove the right and left side A-pillar trims. Refer to Body, Interior.

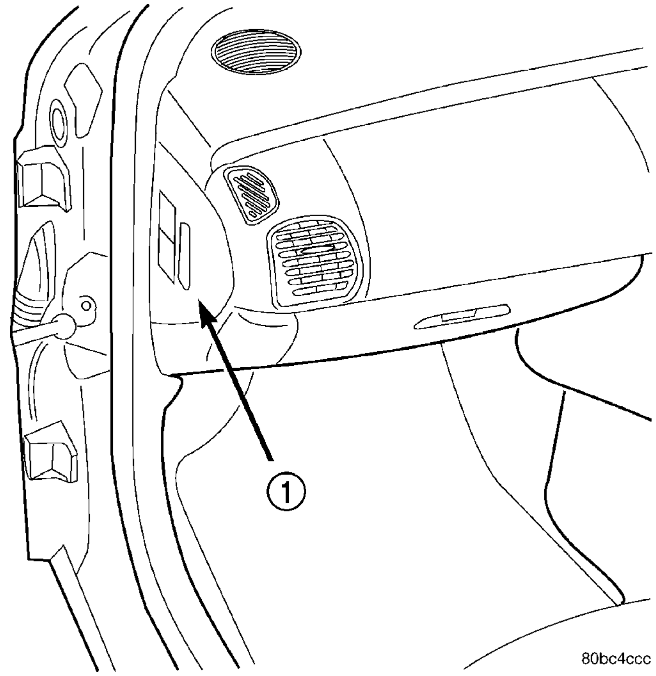

Fig. 7 RHD INSTRUMENT PANEL END COVER

1 - INSTRUMENT PANEL END COVER

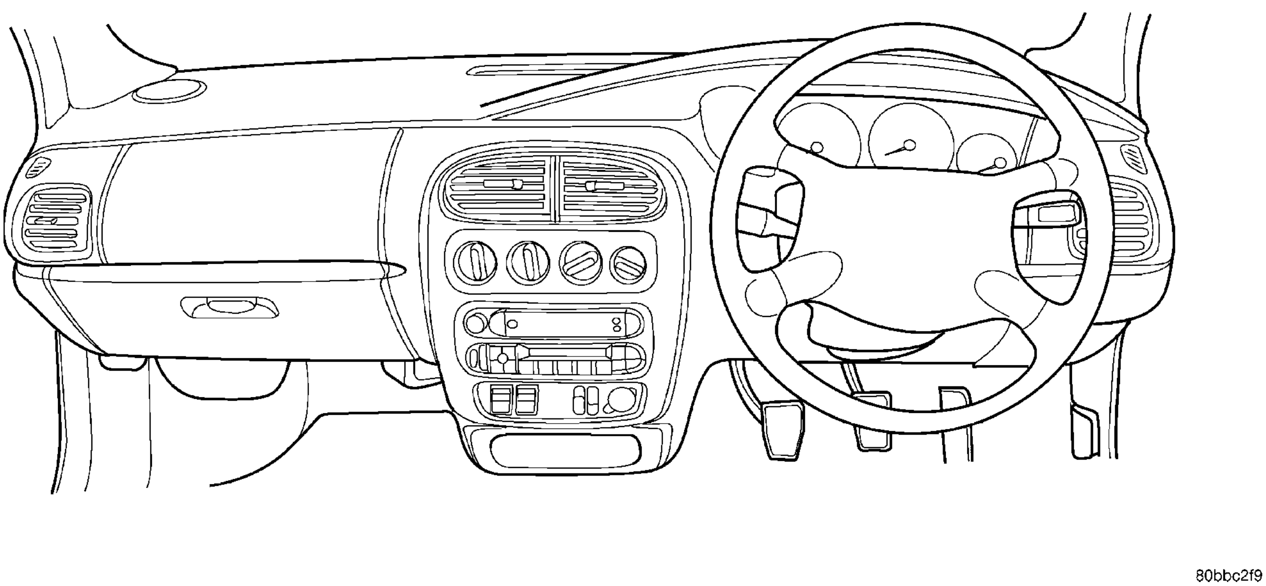

Fig. 6 RHD INSTRUMENT PANEL

INSTRUMENT PANEL ASSEMBLY (Continued)

(5) Loosen the (2) screws retaining the instrument panel top cover. Located in the defroster grille (Fig. 8).

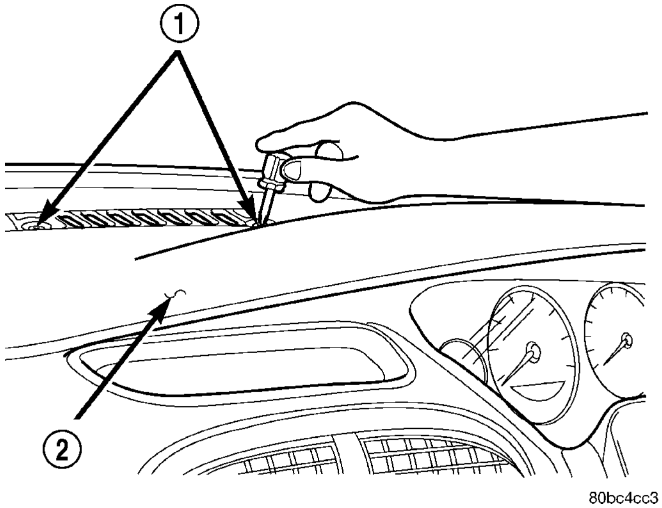

Fig. 8 INSTRUMENT PANEL TOP COVER CENTER RETAINING SCREWS

1 - TOP COVER RETAINING SCREWS
2 - INSTRUMENT PANEL TOP COVER

(6) Using the heel of both hands, lift up to unclip and remove the instrument panel top cover.

(7) Unclip and remove the instrument cluster bezel. Refer to Body, Instrument Panel, Instrument Panel Top Cover, Removal.

(8) Remove the (2) screws retaining the lower steering column cover and remove the cover from the vehicle.

(9) Remove the (2) screws retaining the steering column shroud and remove the shroud from the vehicle.

(10) Disconnect the clockspring, wiper/washer, multi-function, ignition and if equipped, the two SKIM module connections and the shift interlock cable on automatic transaxle equipped vehicles.

(11) Remove the steering shaft coupler pinch bolt retaining pin.

CAUTION: The steering wheel must be in the locked position before removing the coupler pinch bolt or clockspring damage can occur.

(12) Remove the steering shaft coupler pinch bolt and separate the shafts by pulling them straight apart (Fig. 9).

(13) Remove the (4) steering column retaining nuts and remove the column from the vehicle.

(14) Pull back the weather-stripping and remove the right and left side lower kick panels.

(15) Rotate the A/C outlet registers to the full down position. Grip each outlet at its outboard end and gently over rotate to release from its pivot point. Swing outlet straight out and remove by hand

(16) Remove the (4) HVAC control knobs by pulling them straight off the switch shaft by hand.

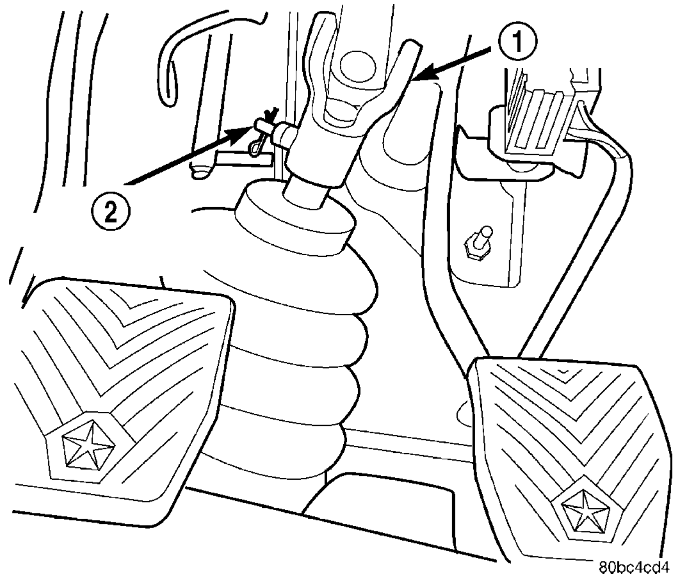

Fig. 9 STEERING SHAFT COUPLER PINCH BOLT LOCATION

1 - STEERING SHAFT COUPLER
2 - STEERIING SHAFT COUPLER PINCH BOLT

(17) Remove the (2) screws from the center instrument bezel (Fig. 10).

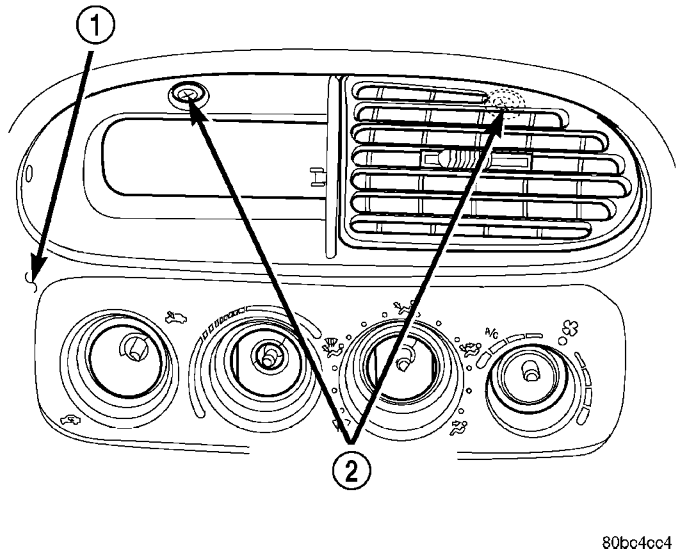

Fig. 10 CENTER BEZEL RETAINING SCREWS

1 - CENTER BEZEL
2 - CENTER BEZEL RETAINING SCREWS (BEHIND A/C OUTLET LOUVERS)

(18) Remove the center instrument panel bezel. Gently pull it straight out to unsnap the (4) retaining clips.

(19) Remove the (2) HVAC control head retaining screws. Pull the control away from the instrument panel and rotate the control horizontally to position the assembly through the hole in the instrument panel. This will eliminate the need to disconnect the control cables.

INSTRUMENT PANEL ASSEMBLY (Continued)

(20) Unclip the Data Link Connector (DLC) from the right side of the instrument panel reinforcement.

(21) Disconnect the instrument panel wire harness from behind the right kick panel. To disconnect the harness remove the (2) screws retaining the instrument panel connector to the steering column casting. Remove the plastic clips from the connector retainer. Unclip the bottom retainer and slide the mated instrument panel and headlamp connectors out of the holder. Disconnect the instrument panel wire harness connector.

(22) Disconnect the (3) wire harnesses from the top of the instrument panel.

(23) Unclip the wire harness along the center console and disconnect the airbag control module, parking brake and transmission range indicator lamp if equipped.

(24) Gently pry the right front door wire harness boot away from the A-pillar to access and disconnect the right door wire harness connector.

(25) Gently pry the left front door wire harness boot away from the A-pillar to access and disconnect the left door wire harness connector.

(26) Disconnect the radio antenna located below the glove compartment.

(27) Remove the (4) instrument panel retaining fasteners from the top of the instrument panel.

(28) Remove the (2) instrument panel retaining bolts which attach the instrument panel to the body at the tunnel bracket (Fig. 11).

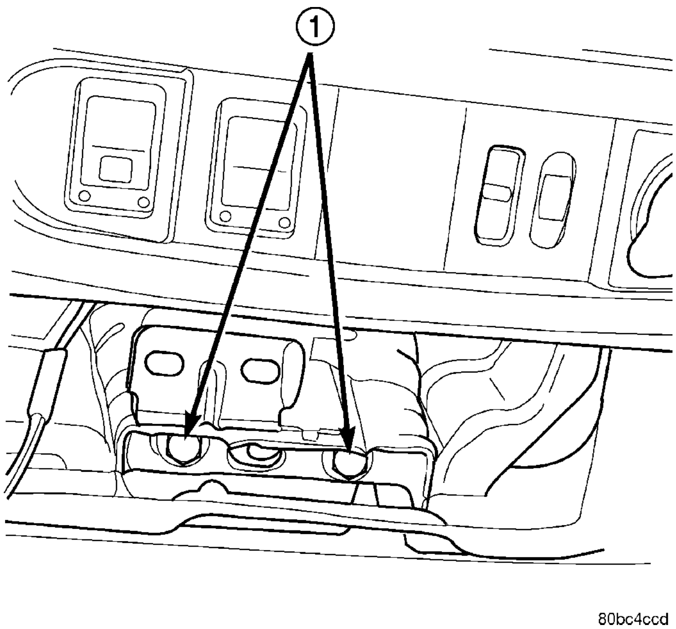

Fig. 11 CENTER INSTRUMENT PANEL RETAINING BOLTS

1 - CENTER INSTRUMENT PANEL RETAINING BOLTS

(29) Remove the (4) instrument panel retaining bolts from the right and left side body side cowls (Fig. 12) and (Fig. 13).

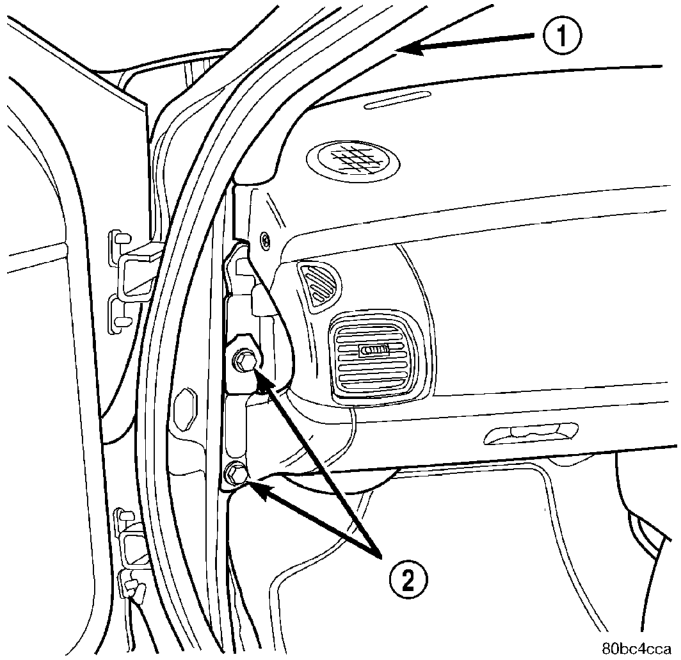

Fig. 12 RHD INSTRUMENT PANEL RETAINING LEFT SIDE BOLTS

1 - A-PILLAR TRIM
2 - INSTRUMENT PANEL TOP COVER LEFT SIDE RETAINING SCREWS

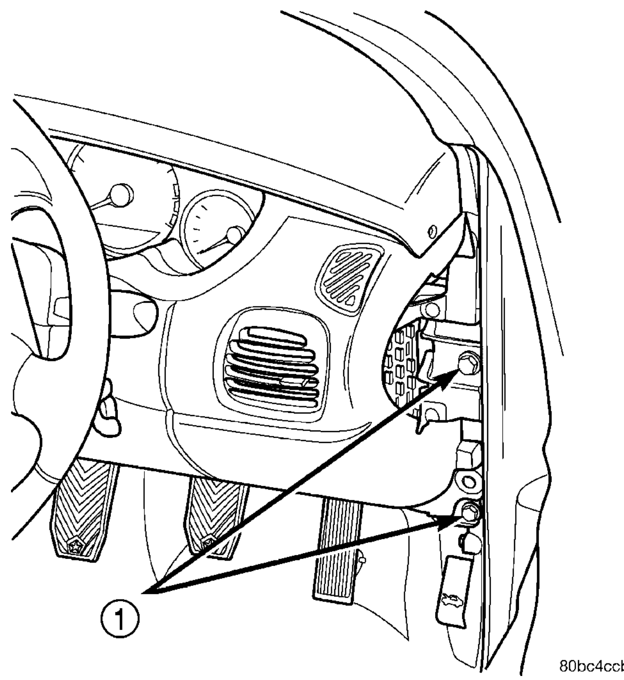

Fig. 13 RHD INSTRUMENT PANEL RIGHT SIDE RETAINING BOLTS

1 - RIGHT SIDE INSTRUMENT PANEL RETAINING BOLTS

(30) With the assistance from another person, guide the HVAC control head through the instrument panel opening while removing the instrument panel.

(31) If replacing the instrument panel, transfer all parts to new instrument panel.

INSTRUMENT PANEL ASSEMBLY (Continued)

INSTALLATION

INSTALLATION

If replacing instrument panel, transfer parts from old instrument panel as necessary.

(1) With help on an assistant, place instrument panel assembly into vehicle and onto the roll down bolts.

(2) Feed the HVAC control into its opening in the back of the panel. Align the 75-way electrical connector and carefully guide the panel into position on the dash.

NOTE: The use of two drift pins or 1/2 inch diameter bolts through the B-pillar pilot holes will assure proper vertical position of the panel. Otherwise, visual align these holes before tightening the first bolt on each side.

(3) Connect the center console wiring:
- Airbag Control Module (ACM)
- Parking Brake Warning Lamp Switch
- Transmission Range Indicator Lamp
- Brake Interlock Cable (ATX)

(4) Pull HVAC control head out of instrument panel, twist 90° and position in place (Fig. 4).

(5) Connect the one vacuum harness connector.

(6) Connect the one instrument panel wire harness connector.

(7) Install the two retaining screws to the HVAC control head.

(8) Install the center A/C duct through the opening in the instrument panel, making sure it snaps down over the mating duct on the A/C unit. Tabs on each side will guide into slots in instrument panel.

(9) Position the center bezel and firmly snap into place.

(10) Install the two screws retaining the top front of the center bezel.

(11) Snap in the A/C outlet barrels.

(12) Firmly push on the HVAC control head knobs.

(13) Connect one left side harness connector at top left of instrument panel for vanity and rear view mirrors.

(14) Connect two harness connectors to HVAC at right top instrument panel (Fig. 3).

(15) Install the left and right A-pillar door harness connectors (Fig. 2).

(16) Connect the right side antenna connector.

(17) Install the left and right A-pillar mounting bolts. First the lower bolt, then the upper bolt on each side.

(18) Install the two center support mounting bolts.

(19) Install two bolts on top of the brake pedal support bracket.

(20) Install the two cowl top instrument panel retaining nuts (right side).

(21) Position the Data Link Connector (DLC) into mounting slot and firmly snap into place in instrument panel reinforcement.

(22) Install the center console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

(23) Install the left and right cowl side panels.

(24) Install the left and right instrument panel end covers.

(25) Install the steering column. (Refer to 19 - STEERING/COLUMN - INSTALLATION)

(26) Position the steering column cover over mounting slots and firmly snap into place. Install the two screws on lower edge.

(27) Position the cluster bezel over mounting slots and firmly snap into place.

(28) Install the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION)

(29) Position the left and right A-pillar trim moldings over mounting slots and firmly snap into place.

(30) Install the door seal.

(31) Connect the battery negative cable.

INSTALLATION - RHD

(1) Before installing the instrument panel, be certain the (2) instrument panel wire harness connector retaining screws have been removed. The wire bundle should hang between the two connector mounting tabs on the instrument panel (Fig. 14).

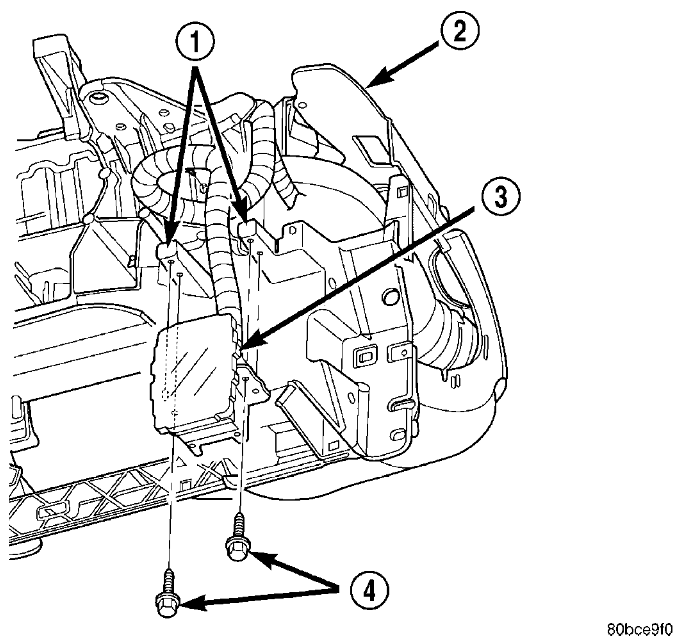

Fig. 14 INSTRUMENT PANEL WIRE HARNESS CONNECTOR

1 - INSTRUMENT PANEL CONNECTOR MOUNTS
2 - TOP OF INSTRUMENT PANEL
3 - INSTRUMENT PANEL CONNECTORS
4 - RETAINING SCREWS

INSTRUMENT PANEL ASSEMBLY (Continued)

(2) If replacing the instrument panel, transfer all parts to new instrument panel.

(3) With the assistance from another person, install the instrument panel into the vehicle. Guide the HVAC control head through the instrument panel opening while installing the assembly.

(4) Install the (4) instrument panel retaining bolts to the right and left side body side cowls.

(5) Install the (2) instrument panel retaining bolts which attach the instrument panel to the body at the tunnel bracket.

(6) Install the (4) instrument panel retaining fasteners to the top of the instrument panel.

(7) Connect the radio antenna located below the glove compartment.

(8) Connect the left door wire harness connector.

(9) Connect the right door wire harness connector.

(10) Connect the ACM, parking brake, and transmission range indicator lamp wiring connectors if equipped.

(11) Connect the (3) wire harnesses to the top of the instrument panel.

(12) Connect the instrument panel wire harness connector. Install the plastic clips to the connector retainer. To connect the harness install the (2) screws retaining the instrument panel connector to the steering column casting. Connect the instrument panel wire harness to the right kick panel.

(13) Clip the Data Link Connector (DLC) to the right side of the instrument panel reinforcement.

(14) Pull the control through the instrument panel and rotate the control horizontally to position the assembly through the hole in the instrument panel. Install the (2) HVAC control head retaining screws.

(15) Install the center bezel. Gently push it to snap the (4) retaining clips.

(16) Install the (2) screws to the center instrument bezel.

(17) Install the (4) HVAC control knobs by pushing them straight on the switch shaft by hand.

(18) Position the A/C outlets over the outlet housing and firmly snap into place. Verify that they pivot properly.

(19) Install the right and left side lower kick panels and replace the weather-stripping if removed.

(20) Install the steering column into the vehicle. Install the (4) steering column retaining nuts.

(21) Connect the upper and lower steering column shafts. Install the steering shaft coupler pinch bolt.

(22) Install the steering shaft coupler pinch bolt retaining pin.

(23) Connect the clockspring, wiper/washer, multifunction, ignition and if equipped, the two SKIM module connections and the shift interlock cable on automatic transaxle equipped vehicles.

(24) Install the (2) screws retaining the steering column shroud and install the shroud on the steering column.

(25) Install the (2) screws retaining the lower steering column cover.

(26) Install the instrument cluster bezel. Refer to Body, Instrument Panel, Instrument Panel Top Cover, Installation.

(27) Install the instrument panel top cover.

(28) Install the (2) screws retaining the instrument panel top cover. Located in the defroster grille.

(29) Install the right and left side A-pillar trims. Refer to Body, Interior.

(30) Install the right and left side instrument panel end cover.

(31) Install the floor console. Refer to Body, Interior, Center Console, Installation.

(32) Disconnect the battery negative cable.

INSTRUMENT PANEL CENTER BEZEL

REMOVAL

(1) Remove HVAC control knobs from control head.

(2) Remove both center A/C outlet louvers (Fig. 15) by rolling downward and pulling out.

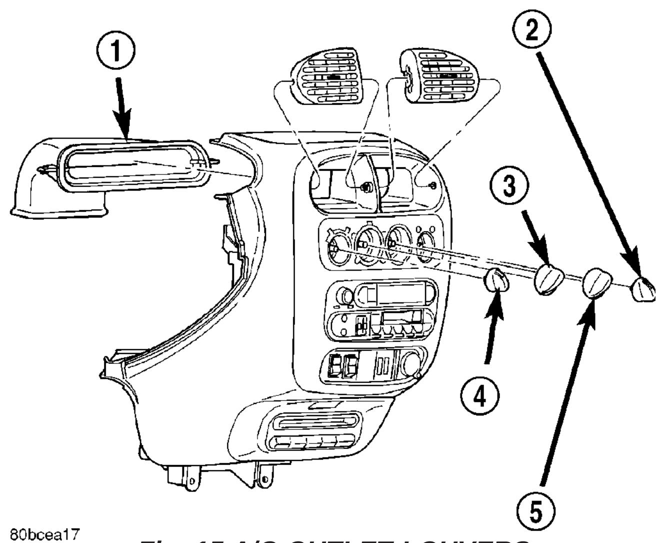

Fig. 15 A/C OUTLET LOUVERS

1 - INSTRUMENT PANEL CENTER AIR DUCT
2 - OUTSIDE AIR/RECIRC CONTROL KNOB
3 - MODE CONTROL KNOB
4 - BLOWER SPEED KNOB
5 - TEMPERATURE CONTROL KNOB

(3) Remove two screws retaining the top front of the center bezel up inside the center A/C outlet duct.

(4) Using a trim stick (special tool #C-4755) or equivalent, gently pry out on instrument panel center bezel.

(5) Remove bezel from vehicle.

INSTRUMENT PANEL CENTER BEZEL (Continued)

INSTALLATION

(1) Position the instrument panel center bezel over mounting slots and firmly snap into place.

(2) Install the two screws retaining the top front of the center bezel up inside the center A/C outlet duct.

(3) Install both center A/C outlet louvers (Fig. 15) by snapping into place.

(4) Install the HVAC control knobs onto the control head.

INSTRUMENT PANEL END COVER

REMOVAL

(1) The driver's end cover can be removed using the handle. Using a trim stick (special tool #C-4755) or equivalent, gently pry out on the right end cover and remove. The fuse diagram is located inside the left end cover. Fuse Access is under the left end cover.

INSTALLATION

(1) Guide the end cover under the forward lip of the door seal and position the end cover over the mounting slots and firmly snap into place.

(2) Close door.

STORAGE BIN

REMOVAL

(1) Using a trim stick (special tool #C-4755) or equivalent, gently pry out on the side of the lower storage bin.

(2) Disconnect the center console flood lamp.

(3) Transfer the center console flood lamp housing to new bin (if replacing).

INSTALLATION

(1) Transfer the center console flood lamp housing to new bin (if replacing).

(2) Connect the center console flood lamp.

(3) Position the storage bin over mounting slots and firmly snap into place.

INSTRUMENT PANEL TOP COVER

REMOVAL

(1) Loosen the two screws at each end off the defroster slot until they are flush with top cover surface (DO NOT REMOVE).

(2) Remove the screw at each end of the top cover.

(3) Using a trim stick (special tool #C-4755) or equivalent, gently pry out on both the left and right A-pillar trim panels and remove.

(4) Use care not to scratch the panel. Lift up at each end of the cluster bezel and along the rearward edge of the top cover to disengage the clips.

(5) Pull the top cover rearward until the forward pins disengage from the instrument panel.

INSTALLATION

(1) Push the top cover forward assuring that the pins on the top cover engage the slots in the in the instrument panel.

(2) Use care not to scratch the panel. Position the top cover clips over their mounting slots and start the retaining clips into each slot. Starting in the middle, firmly snap the top cover into place using a firm blow with the hand at each clip position.

(3) Align the left and right A-pillar trim panels over the mounting slots and firmly snap into place.

STEERING COLUMN OPENING COVER

REMOVAL

(1) Remove instrument cluster bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL)

(2) Remove the two screws along the lower edge of the cover.

(3) Grasp left lower steering column cover from the bottom and pull rearward to disengage clips.

(4) Remove steering column cover from vehicle.

INSTALLATION

(1) Position the left lower steering column cover over mounting slots and firmly snap into place.

(2) Install the two lower cover retaining screws.

(3) Install the instrument cluster bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION)

INTERIOR

TABLE OF CONTENTS

A-PILLAR TRIM

REMOVAL

(1) Disengage clips holding trim to A-pillar.
(2) Separate A-pillar trim from vehicle (Fig. 1).

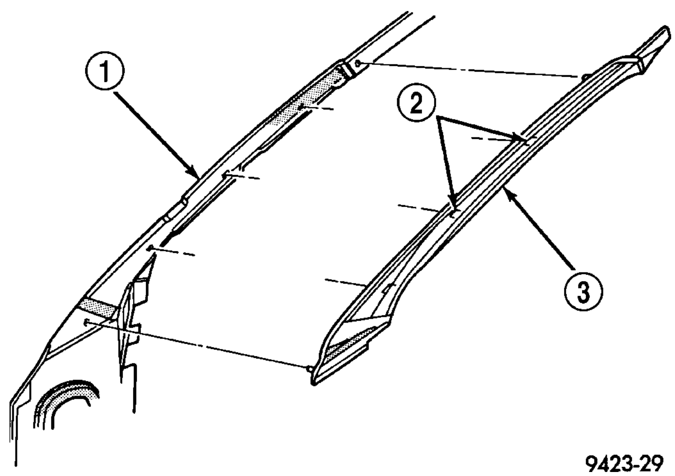

Fig. 1 A-pillar Trim

1 - WINDSHIELD A-PILLAR
2 - CLIPS
3 - A-PILLAR TRIM

INSTALLATION

(1) Position A–pillar trim panel to A–pillar.
(2) Align locating pins on backside of trim panel to mating holes in A–pillar.
(3) Push clips on trim panel into slots in A–pillar.

B-PILLAR TRIM

REMOVAL

(1) Remove bolt attaching lower seat belt anchor to floor pan kick-up (Fig. 2).

(2) Remove shoulder belt height control knob.

(3) Remove turning loop cover.

(4) Remove bolt and remove the turning loop.

(5) Remove bolt attaching turning loop to belt adjuster (Fig. 3).

(6) Remove access cover from B-pillar trim.

(7) Disengage clips attaching trim to B-pillar.

(8) Feed seat belt turning loop and seat belt through trim panel.

(9) Remove B-pillar trim from vehicle.

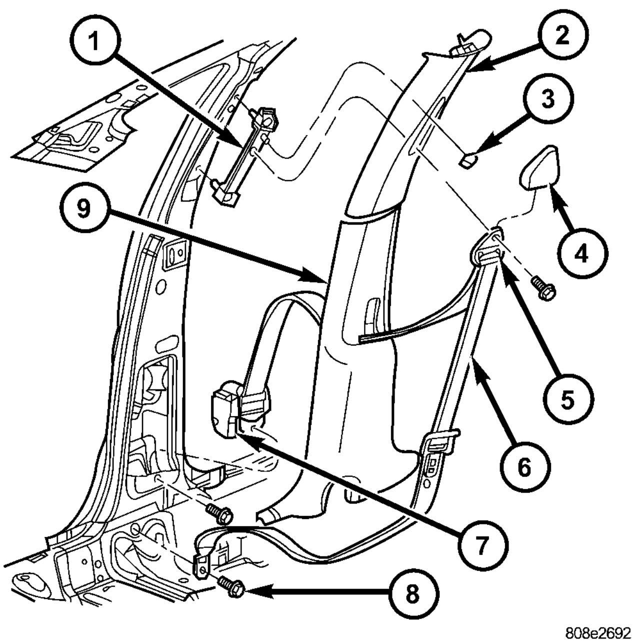

Fig. 2 B-pillar Trim

1 - FRONT SEAT BELT ADJUSTER
2 - UPPER B-PILLAR TRIM PANEL
3 - ADJUSTER BUTTON
4 - TURNING LOOP COVER
5 - TURNING LOOP
6 - SEAT BELT
7 - SEAT BELT RETRACTOR
8 - ANCHOR BOLT
9 - LOWER B-PILLAR TRIM PANEL

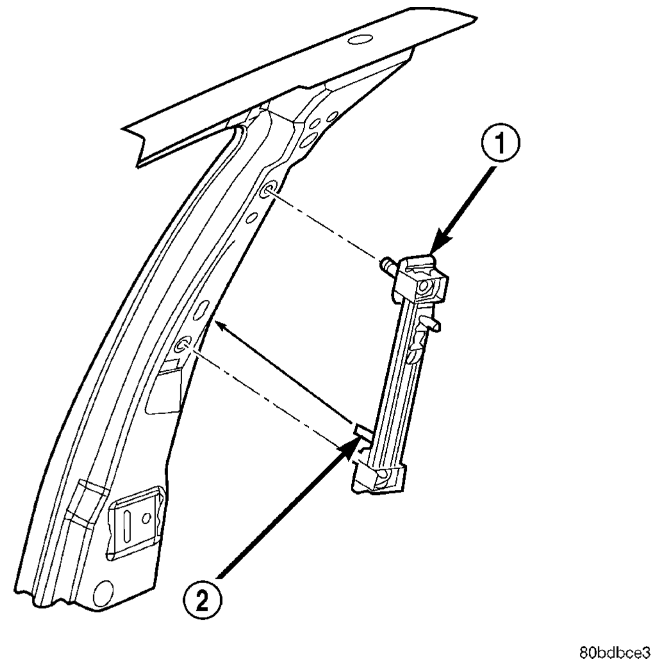

Fig. 3 Turning Loop to Belt Adjuster

1 - FRONT SHOULDER BELT ADJUSTER
2 - TAB IS ON BOTTOM

INSTALLATION

NOTE: Tighten all seat belt bolts to 40 N·m (30 ft. lbs.) torque.

(1) Position B-pillar trim panel near B-pillar.

(2) Feed seat belt turning loop and seat belt through trim panel.

(3) Align locating pins on backside of trim panel to mating holes in B-pillar.

(4) Push clips on trim panel into slots in B-pillar.

(5) Install access cover to B-pillar trim.

(6) Install bolt attaching turning loop to belt adjuster.

(7) Install the turning loop cover.

(8) Move adjuster in to the lowest position.

(9) Install shoulder belt height control knob.

(10) Install bolt attaching lower seat belt anchor to floor pan kick-up.

CARPETS AND FLOOR MATS

REMOVAL

For removal of the carpet, the carpet will need to be cut under the instrument panel.

(1) Remove front seats.

(2) Remove rear seat cushion.

(3) Remove bolts attaching front seat belt lower anchors to floor (Fig. 4).

(4) Remove door sill trim covers.

(5) Remove cowl trim covers.

(6) Remove center floor console.

(7) Remove decklid release assist handle.

(8) Remove lower fasteners from B-pillar trim panel.

(9) Pull carpet from behind trim panel.

(10) Fold carpet in half toward rear seat.

(11) Remove carpet through rear door opening.

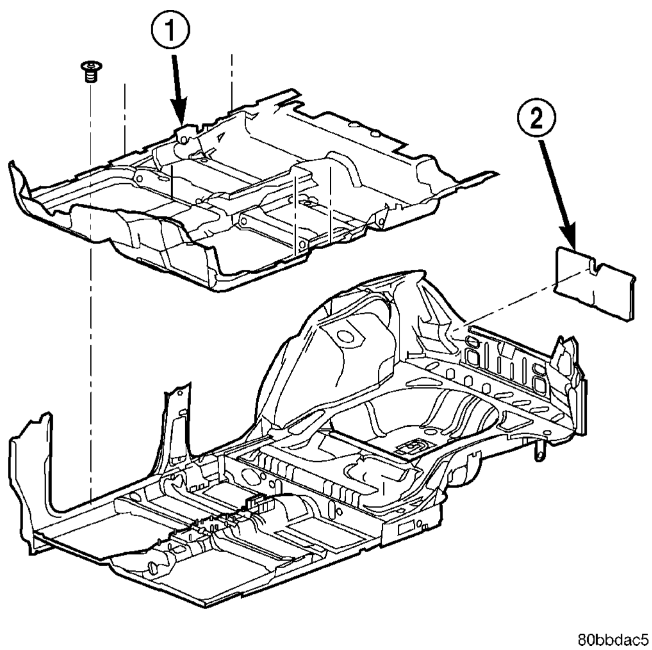

Fig. 4 Carpet

1 - FLOOR CARPET
2 - TRUCK REAR END PANEL

INSTALLATION

The new carpet must be cut for installation. The area is mark on the reverse side of the carpet. The location is in front of the tunnel area.

(1) Install carpet through rear door opening.

(2) Unfold carpet.

(3) Tuck carpet behind trim panel.

(4) Install lower fasteners holding B-pillar trim panel.

(5) Install decklid release assist handle.

(6) Install center floor console.

(7) Install cowl trim covers.

(8) Install door sill trim covers.

(9) Install bolts attaching front seat belt lower anchors to floor. Tighten all seat belts to 40 N·m (30 ft. lbs.) torque.

(10) Install rear seat cushion.

(11) Install front seats.

DOOR SILL TRIM

REMOVAL

(1) Open door to gain access to sill trim.

(2) Disengage clips attaching sill trim to door sill and door opening flange.

(3) Remove door sill trim from vehicle (Fig. 5) and (Fig. 6).

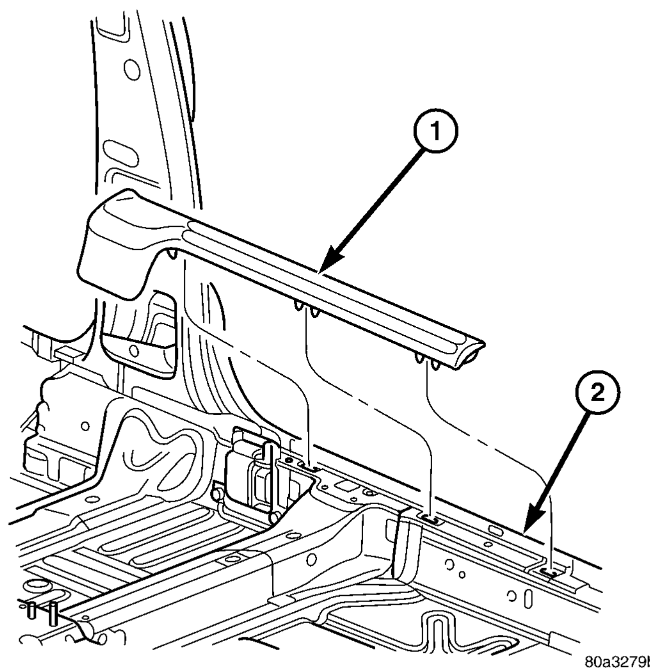

Fig. 5 FRONT DOOR SILL TRIM

1 - FRONT DOOR SILL TRIM
2 - FRONT DOOR SILL

DOOR SILL TRIM (Continued)

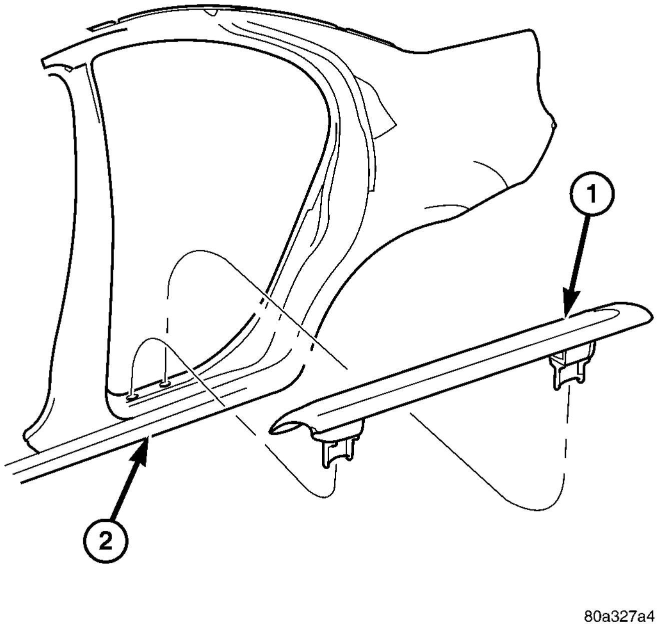

Fig. 6 REAR DOOR SILL TRIM

1 - REAR DOOR SILL TRIM
2 - REAR DOOR SILL

INSTALLATION

(1) Position door sill trim on door sill.

(2) Align locating pins on backside of trim panel to holes in door sill.

(3) Engage clips on trim panel into slots in door sill.

(4) Engage clips on trim panel onto door opening flange.

(5) Press downward on trim panel to fully engage all clips.

FLOOR CONSOLE

REMOVAL

(1) Fully apply parking brake.

(2) Remove screw cover plugs over screws just rearward of cup holders.

(3) Remove screws in cup holders attaching console to floor bracket (Fig. 7).

(4) Open console storage compartment lid, if so equipped.

(5) Remove screws attaching console to floor bracket.

(6) Remove shift lever knob, if vehicle is equipped with a manual transmission.

(7) Lift console upward over gear selector and park brake handle.

(8) Remove console from vehicle.

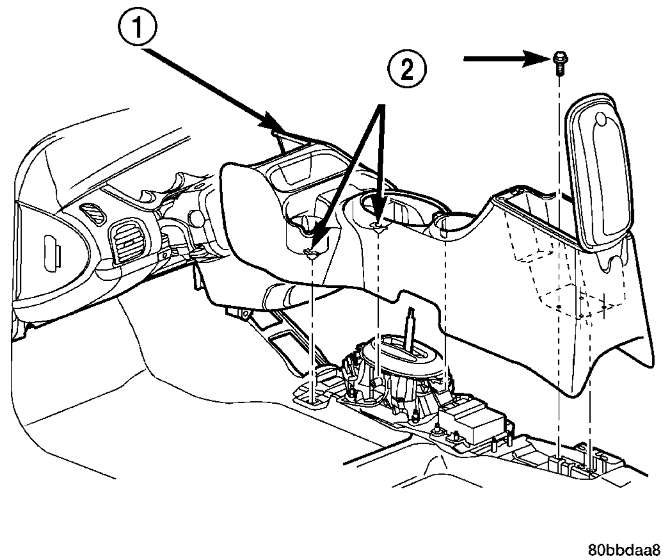

Fig. 7 Floor Console

1 - FLOOR CONSOLE WITH ARMREST
2 - ATTACHING SCREWS

INSTALLATION

(1) Place floor console into position in vehicle.

(2) Install screws attaching console to floor brackets.

(3) Install shift lever knob, if vehicle is equipped with a manual transmission.

(4) Release parking brake.

HEADLINER

REMOVAL

(1) Remove screws attaching sun visors to roof header panel.

(2) Disconnect wire connector from lighted vanity mirror, if so equipped.

(3) Remove sun visors from vehicle.

(4) Remove A-pillar trim covers.

(5) Remove B-pillar trim panels.

(6) Remove (upper) quarter panel trim panels.

(7) Remove assist handle, if so equipped.

(8) Remove sun visor hooks.

(9) Remove coat hooks, if so equipped.

(10) Remove three push in fasteners at rear of headliner.

(11) Disengage dome lamp wire connector, at rear of headliner.

(12) Remove push in fastener attaching wiring to C-pillar.

(13) Remove headliner through door opening (Fig. 8).

HEADLINER (Continued)

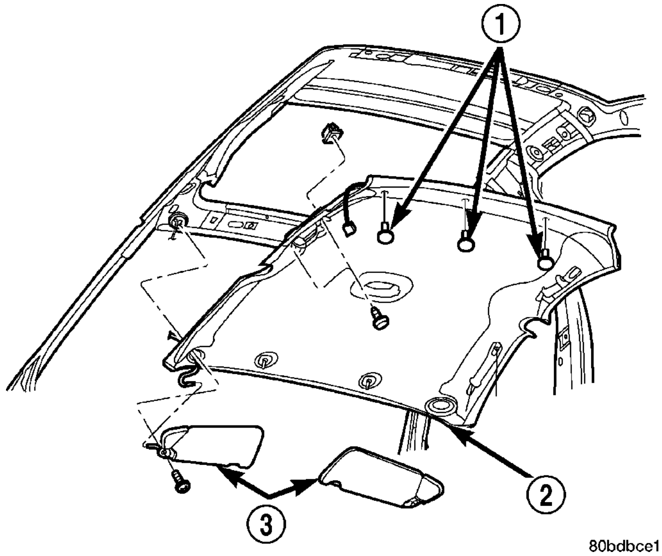

Fig. 8 Headliner

1 - HEADLINER TO REAR HEADER FASTENERS
2 - HEADLINER
3 - VISORS

INSTALLATION

(1) Position headliner in vehicle.
(2) Install sun visor hooks, if so equipped.
(3) Install coat hooks, if so equipped.
(4) Install three push in fastener at rear of headliner.
(5) Install assist handles, if so equipped.
(6) Install push in fastener attaching headliner wiring to C-pillar.
(7) Connect dome lamp wire connector, at rear of headliner.
(8) Install (upper) quarter panel trim panel.
(9) Install B-pillar trim panels.
(10) Install A-pillar trim covers.
(11) Install sun visors, lighted vanity mirror wire connector, if so equipped, and screws attaching sun visors to roof header panel.

LOWER QUARTER TRIM

REMOVAL

(1) Remove upper quarter trim panel.
(2) Remove rear seat cushion and back.
(3) Disengage clips attaching trim to lower quarter panel.
(4) Remove seat belt from slot in trim panel.
(5) Remove lower quarter trim from vehicle (Fig. 13).

INSTALLATION

(1) Position lower quarter trim panel to vehicle.
(2) Install seat belt to slot in trim panel.
(3) Align locating pins on backside of trim panel to mating holes in inner quarter panel.
(4) Press clips on trim panel into slots in inner quarter panel.
(5) Install rear seat back and cushion.
(6) Install upper quarter trim panel.

REAR SHELF TRIM PANEL

REMOVAL

(1) Remove quarter trim panels as necessary.(Refer to 23 - BODY/INTERIOR/UPPER QUARTER TRIM - REMOVAL)
(2) Remove rear seat cushion and back.(Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL)
(3) Disengage seat belt bezels from rear shelf trim panel.
(4) Remove rear seat shoulder belt from the shelf by sliding belt through the slot.
(5) Remove rear shelf trim panel from vehicle (Fig. 9).

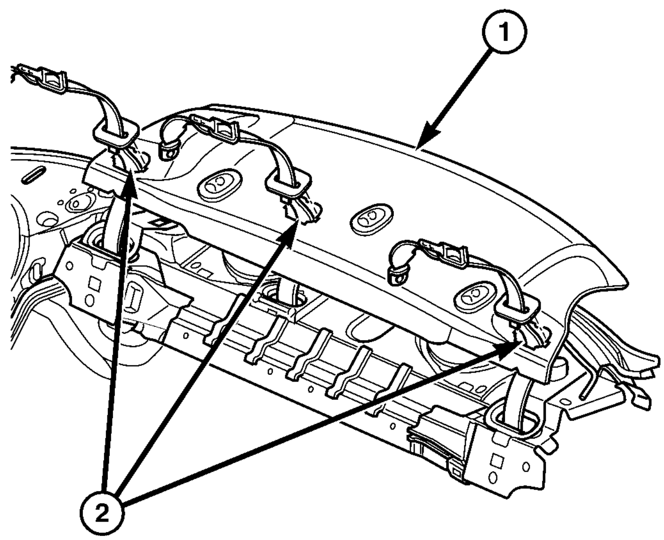

Fig. 9 REAR SHELF PANEL

1 - REAR SELF PANEL
2 - SEAT BELT SLOTS

INSTALLATION

(1) Place into position rear shelf trim panel.
(2) Slide the rear seat shoulder belt through the slot in the rear shelf trim panel.
(3) Engage seat belt bezels to rear shelf trim panel.

REAR SHELF TRIM PANEL (Continued)

(4) Install rear seat cushion and back.(Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION)

(5) Install quarter trim.(Refer to 23 - BODY/INTERIOR/UPPER QUARTER TRIM - INSTALLATION)

REAR VIEW MIRROR

REMOVAL

(1) Loosen the mirror base set screw (Fig. 10).

(2) Slide the mirror base upward and off the bracket.

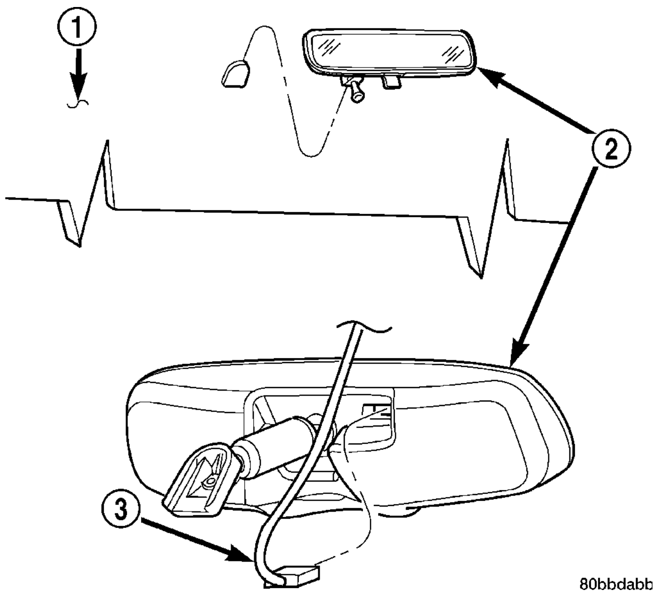

Fig. 10 Rear View Mirror

1 - WINDSHIELD
2 - MIRROR
3 - LIGHTED MIRROR CONNECTOR

INSTALLATION

(1) Position the mirror base at the bracket and slide it downward onto the support bracket.

(2) Tighten the setscrew 1 N·m (15 in. lbs.) torque.

SIDE COWL TRIM

REMOVAL

(1) Disengage clips attaching cowl trim to cowl side panel.

(2) Remove cowl trim from vehicle (Fig. 11).

INSTALLATION

(1) Position cowl trim panel to inner cowl panel.

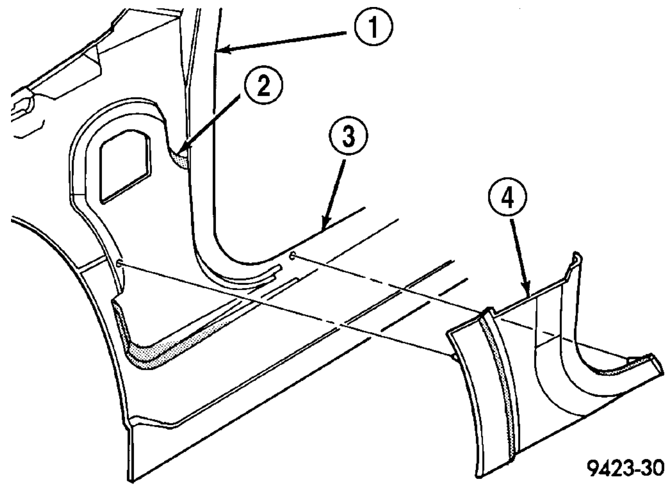

Fig. 11 Side Cowl Trim

1 - DOOR OPENING
2 - COWL
3 - SILL
4 - COWL TRIM

(2) Align locating pins on backside of cowl trim panel to mating holes in inner cowl panel.

(3) Push clips on trim panel into slots in inner cowl panel.

SUN VISOR

REMOVAL

All vehicles with driver and passenger side airbags must have a colored coded five Bullet point airbag warning label applied to the sun visor, verify label availability and ensure the label is installed.

(1) Remove sun visor from center support.

(2) Remove screws attaching sun visor to roof header.

(3) Remove sun visor from header.

(4) If equipped, disconnect wire connector from body harness.

(5) Remove sun visor from vehicle.

INSTALLATION

All vehicles with driver and passenger side airbags must have a colored coded five Bullet point airbag warning label applied to the sun visor, verify label availability and ensure the label is installed.

(1) Place sun visor in position.

(2) If equipped, connect wire connector from body harness.

(3) Install screws attaching sun visor to header.

(4) Install sun visor into center support.

TRUNK LINING

REMOVAL

(1) Remove fasteners (three per side) attaching carpet to shelf panel. Fasteners are accessed from inside the vehicle (Fig. 12).

(2) Pull out leading flaps of the carpet through the opening from the shelf panel.

(3) Pull carpet from under the springs.

(4) Remove trunk carpet from vehicle.

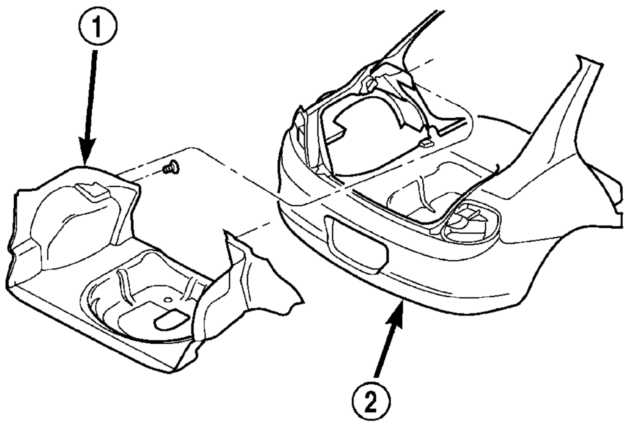

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Fig. 12 Trunk Carpet

1 - REAR FASCIA
2 - TRUNK CARPET

INSTALLATION

(1) Place carpet in truck and smooth out.

(2) Tuck both sides of the carpet ends under springs.

(3) Position the leading flaps of the carpet through the opening onto the shelf panel.

(4) Install fasteners (three per side) to secure the carpet to shelf panel (install fasteners from inside the vehicle).

(5) Overlap the slits in the back of the carpet so the center section lays over the outer sections.

UPPER QUARTER TRIM

REMOVAL

(1) Disengage clips attaching trim to upper quarter panel (Fig. 13).

(2) Remove upper trim panel from vehicle.

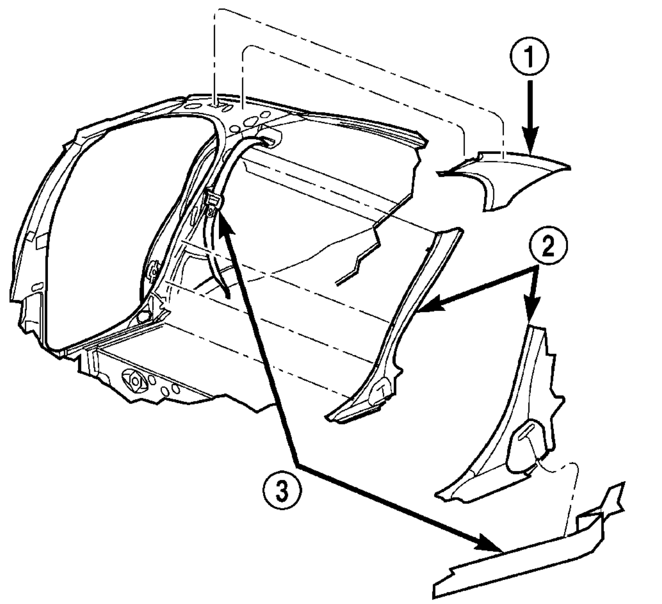

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Fig. 13 Upper Quarter Trim

1 - UPPER QUARTER TRIM PANEL
2 - LOWER QUARTER TRIM PANEL
3 - SEAT BELT

INSTALLATION

(1) Check to ensure that electric rear window wiring is positioned correctly in the roof channel provided.

(2) Position trim panel in vehicle.

(3) Align locating pins on backside of trim panel to mating holes in upper quarter panel.

(4) Push clips on trim panel into slots in upper quarter panel.

PAINT

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PAINT

SPECIFICATIONS - COLOR CODES

EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE	EXTERIOR COLOR	DAIMLERCHRYSLER CODE
ATLANTIC BLUE PEARL COAT	ZBJ	FLAME RED CLEAR COAT	PR4
BLACK CLEAR COAT	DX8	GRAPHITE METALLIC CLEAR COAT	ZDR
BLAZE RED CRYSTAL PEARL COAT	ARH	MIDNIGHT BLUE PEARL COAT	ZKJ
BRIGHT SILVER METALLIC CLEAR COAT	WS2	SOLAR YELLOW	VYH
ELECTRIC BLUE PEARL COAT	AB5	STONE WHITE CLEAR COAT	SW1

INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER COLOR CODE
DARK SLATE GRAY	DV
TAUPE	L5

BASE COAT/CLEAR COAT FINISH

DESCRIPTION

On most vehicles a two-part paint application (basecoat/clearcoat) is used. Color paint that is applied to primer is called basecoat. The clearcoat protects the basecoat from ultraviolet light and provides a durable high-gloss finish.

CAUTION: 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 surfaces. Damage to finish or color can result.

PAINT CODE

DESCRIPTION

The paint code is identified on the Vehicle Safety Certification Label which is located on the drivers door shut face. The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat. The codes listed in the Color Code Chart are used for manufacturing purposes.

PAINT SURFACE TOUCH-UP

DESCRIPTION

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 VEHICLE DATA/VEHICLE INFORMATION/BODY CODE PLATE - DESCRIPTION).

WARNING: USE AN OSHA APPROVED RESPIRATOR AND SAFETY GLASSES WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

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 scratch or chip 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 clearcoat, the touch up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.

(6) On vehicles with clearcoat, 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.

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

FINESSE SANDING/BUFFING & POLISHING

DESCRIPTION

Minor acid etching, orange peel, or smudging in clearcoat or single-stage finishes can be reduced with light finesse sanding, hand buffing, and polishing. **If the finish has been finesse sanded in the past, it cannot be repeated. Finesse sanding operation should be performed by a trained automotive paint technician.**

CAUTION: Do not remove clearcoat finish, if equipped. Basecoat paint must retain clearcoat for durability.

SEATS

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FRONT SEAT

REMOVAL

(1) Move seat to forward position.
(2) Remove bolts attaching rear of seat track to floor.
(3) Move seat to rearward position.
(4) Remove bolts attaching front of seat track to floor crossmember (Fig. 1).
(5) Remove seat from vehicle.

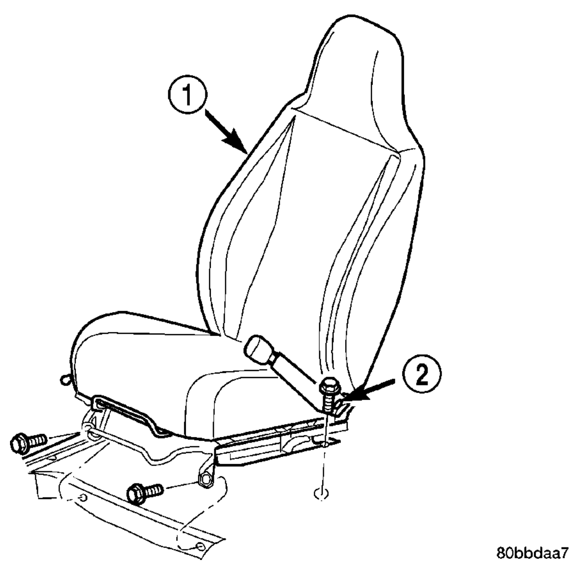

Fig. 1 Front Seat

1 - SEAT
2 - SEAT BELT BOLT

INSTALLATION

(1) Move seat to mid-position and **verify** that both seat tracks are locked into same position with eight teeth behind the latch mechanism.
(2) Move seat into position in vehicle. Do not use the head restraint, side shield, recliner handle, or the adjuster lift bar to move the seat.
(3) Ensure that the locating tabs on the front mounting feet are installed through the slits in the carpet and into the openings in the floor pan crossmember.
(4) Install and tighten front inboard bolt attaching seat track to floor crossmember.
(5) Install front outboard bolt attaching seat track to floor crossmember. Tighten front seat bolt to 55 N·m (40 ft. lbs.) torque.
(6) Install rear seat track attaching bolts to floor. Tighten rear seat bolts outboard first then inboard to 55 N·m (40 ft. lbs.) torque.

FRONT SEAT BACK

REMOVAL

(1) Remove seat from vehicle.
(2) Remove seat cushion side shields.
(3) Remove bolts attaching recliner to seat back cushion frame.
(4) Remove inboard pivot bolt.
(5) Disconnect any electrical connectors to the seat back, if equipped.
(6) Remove seat back from seat cushion.

INSTALLATION

(1) Position seat back on cushion.
(2) Connect electrical connectors to the seat back, if equipped.
(3) Install inboard pivot bolt. Tighten bolt to 40 N·m (30 ft. lbs.) torque.
(4) Install bolts attaching recliner to seat cushion frame. Tighten bolts to 12 N·m (9 ft. lbs.) torque.
(5) Install seat cushion side shields.
(6) Install seat in vehicle.

FRONT SEAT BACK COVER

REMOVAL

(1) Remove seat from vehicle.
(2) Remove head restraint.
(3) Remove front seat back.
(4) Disengage the J-strap retainer or zipper if equipped.
(5) Roll cover upward to hog rings. Cut hog rings to free cover (Fig. 2).
(6) Roll cover to top of seat back and remove head restraint sleeve guides.
(7) Remove cover from seat back.

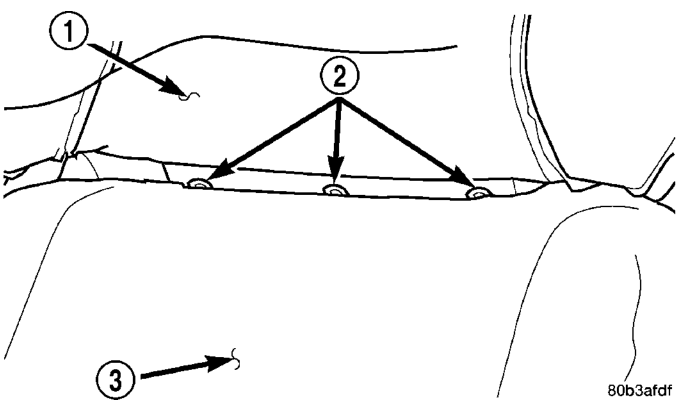

Fig. 2 Front Seat Back Hog Rings

1 - SEAT COVER
2 - HOG RINGS
3 - CUSHION

INSTALLATION

NOTE: Do not reuse the recliner assembly attaching bolts.

(1) Position cover at the top of seat back.
(2) Carefully roll cover down to the area that hog rings are to be installed.
(3) Install hog rings.
(4) Roll cover downward.
(5) Engage the J-strap retainer or zipper, if equipped.
(6) Install new head restraint sleeve guides.
(7) Install seat back to seat cushion. Tighten bolts to 40 N·m (30 ft. lbs.) torque.
(8) Install seat in vehicle.
(9) Install head restraint.
(10) Check seat back and headrest operation.

FRONT SEAT CUSHION

REMOVAL

(1) Remove seat from vehicle.
(2) Remove front seat cushion side shield.
(3) Remove seat back.
(4) Remove track and recliner assembly.
(5) Remove seat cushion (Fig. 3).

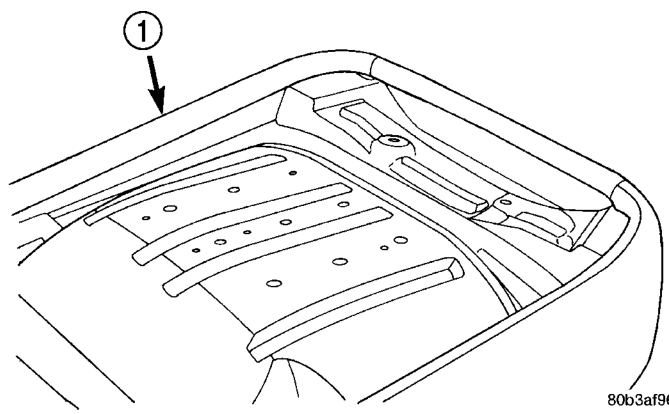

Fig. 3 Front Seat Cushion

1 - FRONT SEAT CUSHION

INSTALLATION - FRONT SEAT CUSHION

(1) Connect seat cushion heater element connector, if equipped.
(2) Install track and recliner assembly. Tighten bolts to 12 N·m (9 ft. lbs.) torque.
(3) Install seat back. Tighten bolts to 40 N·m (30 ft. lbs.) torque. (Fig. 3)
(4) Install cushion side shields.
(5) Install seat in vehicle.

FRONT SEAT CUSHION COVER

REMOVAL

(1) Remove seat from vehicle.
(2) Remove front seat cushion side shields.
(3) Remove seat back.
(4) Remove track and recliner assembly.
(5) Disengage J-strap attaching seat cover from the seat cushion frame.
(6) Pull cover off to the hog rings.
(7) Cut hog rings attaching seat cover to seat cushion pad.
(8) Remove seat cushion cover from seat cushion.

INSTALLATION

(1) Position seat cover on cushion.
(2) Align seat cover with cushion alignment indentations.
(3) Install hog rings.
(4) Engage J-strap attaching seat cover to front of seat cushion frame.
(5) Install track and recliner assembly. Tighten front track to pan bolts to 12 N·m (9 ft. lbs.) torque.
(6) Install seat back.
(7) Install front seat cushion side shields.
(8) Install seat in vehicle.

REAR SEAT CUSHION

REMOVAL

(1) Pull upward at each end of the rear seat cushion to disengage retainer loops from cups in floor.
(2) Remove rear seat cushion from vehicle (Fig. 4).

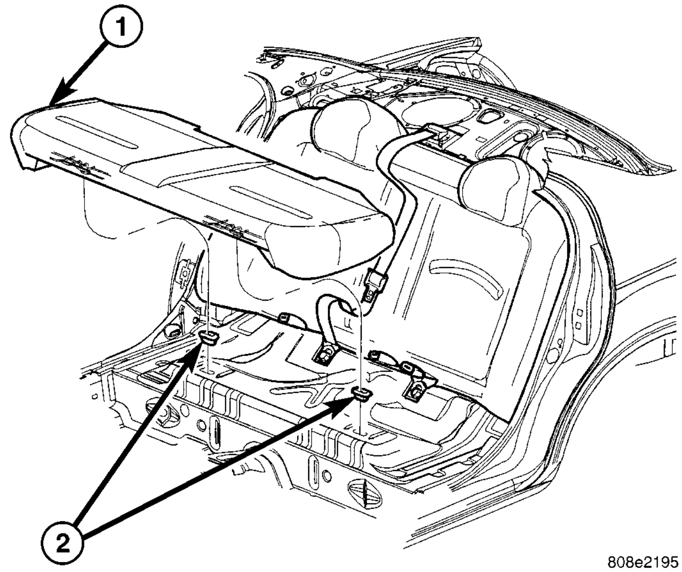

Fig. 4 Rear Seat Cushion

1 - REAR SEAT CUSHION
2 - CUSHION ATTACHING RETAINER

INSTALLATION

(1) Place rear seat cushion in position under bottom of seat back.
(2) Position inboard seat belts on top of seat cushion.
(3) Guide seat cushion loops into retainer cups in floor pan.
(4) Push downward on the front corners of the seat cushion to engage retainers.

REAR SEAT BACK

REMOVAL

(1) Remove rear seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - REMOVAL)

(2) Remove bolts attaching rear seat back and seat belts to floor (Fig. 5).

(3) Push rear seat back upward to disengage hooks at top of seat back (Fig. 6).

(4) Remove rear seat from vehicle.

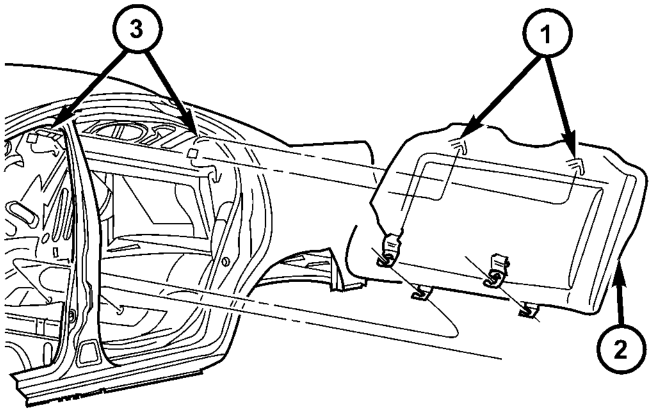

Fig. 6 SEAT BACK 80b3075c

1 - SEAT BACK HOOKS
2 - REAR SEAT BACK
3 - SEAT BACK ATTACHMENT CLIPS

INSTALLATION

(1) Move rear seat back into position in vehicle.

(2) Push seat back downward to engage hooks at top of seat back.

(3) Install bolts attaching rear seat back and seat belts to floor.

NOTE: The torque specification for the inner seat belt/rear seat back retaining bolts is 57 N·m (42 ft. lbs.).

(4) Install rear seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - INSTALLATION)

STRIKER - REAR SEAT BACK

REMOVAL

(1) Remove the seat back assembly. (Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL)

(2) Remove the three bolts attaching the left side striker to the seat back assembly collar, that latches to the 60 section left side seat back and discard the striker.

INSTALLATION

(1) Install the new striker and install the three bolts.

(2) Install the seat back assembly. (Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION)

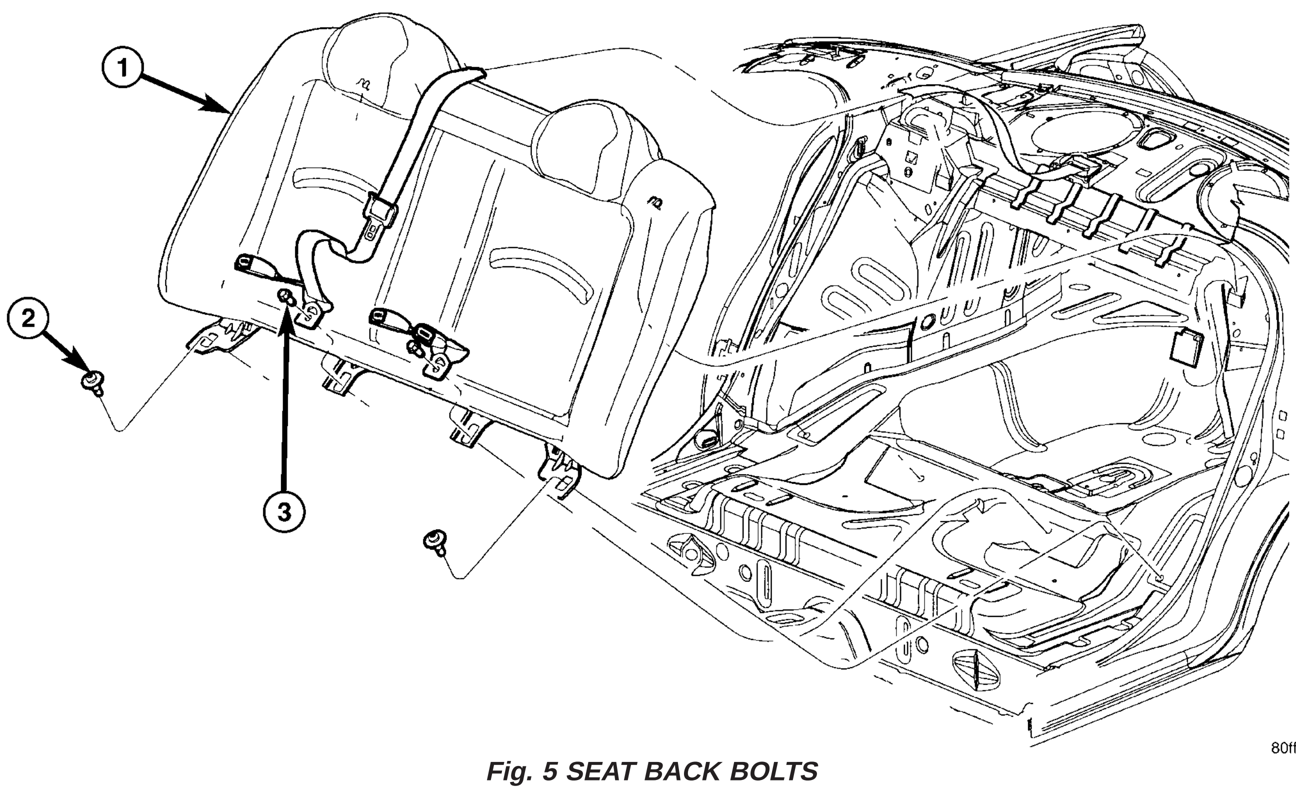

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Fig. 5 SEAT BACK BOLTS

1 - SEAT BACK ASSEMBLY
2 - OUTER BOLTS (2)
3 - INNER BOLTS (2)

SUNROOF

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SUNROOF

DESCRIPTION - SUNROOF COMPONENT LOCATIONS

Refer to (Fig. 1)for sunroof component locations.

DIAGNOSIS AND TESTING - SUNROOF

Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. If not, a common electrical problem may exist. For circuit, splice and component descriptions (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION - DESCRIPTION). Check the condition of the circuit protection (fuses, circuit breakers or fuse links) Inspect all wiring connector pins for proper engagement and continuity (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION - DIAGNOSIS AND TESTING). Check for battery voltage at the power sunroof control switches. If battery voltage is detected at the control switches, proceed with the following tests.

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. If however, the sunroof glass is in a partial closed position, high pressure water may be forced beyond the water management system boundaries and onto the headlining.

SUNROOF (Continued)

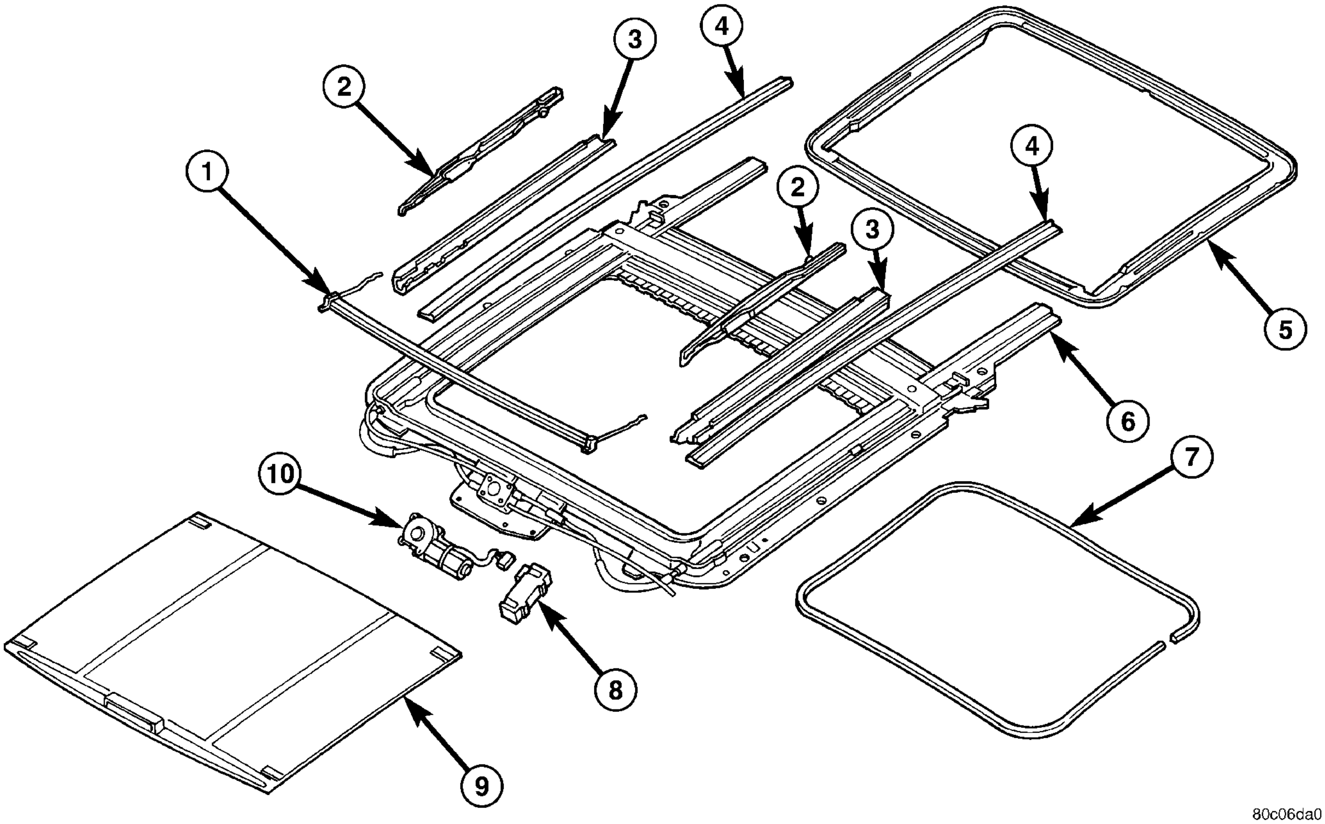

Fig. 1 SUNROOF COMPONENTS

Item Number	Component Name	Item Number	Component Name
1	Wind Deflector Motor Bracket	6	Frame Assembly
2	Mechanism Bracket	7	Sunroof Headliner Trim Welt
3	Guide	8	Single Control Unit (SCU)
4	Sunshade Guide	9	Sunshade
5	Glass Panel	10	Drive Motor Assembly

SYMPTOM	STEP	POSSIBLE CAUSE
Sunroof squeaks when opening/ closing.	1	Identify if cause is seal squeak. If seal is worn, replace seal.
	2	Check seal compression for uniformity in opening. If not uniform, glass is not centered in opening.
	3	Re-center glass by repositioning module in opening.
	4	Identify if mechanism squeaks.
	5	Check for lubrication, re-lube if necessary.
	6	Check for dirt/debris in tracks, clean and re-lube.
	7	Identify if motor squeaks, replace motor.
Water leaks into the vehicle.	1	Check for good connection at drain tubes, re-connect where needed.
	2	Check for plugged/pinched hoses throughout.
	3	Adjust glass panel per Service Manual.
	4	Check seal for wear/damage, replace glass if necessary.

SUNROOF (Continued)

SYMPTOM	STEP	POSSIBLE CAUSE
Motor inoperative.	1	Check connectors at motor, switch, control module, and power source.
	2	Check for effective control module, replace if necessary.
	3	Replace motor.
Motor noise when opening/ closing.	1	Identify if motor noise, replace motor.
	2	Insure noise is from motor and not cables, (cable ratcheting).
Grinding noise when opening/ closing.	1	Identify if motor is grinding, replace motor.
	2	Check for lubrication in tracks and mechanism, re-lube if necessary.
	3	Check for dirt/debris in tracks, clean and re-lube.
	4	Cables ratchet at motor pinion: Mechanism jammed, fix mechanism and replace cables & motor bracket.
Wind noise when sunroof is fully closed.	1	Check seal compression for uniformity in opening. If not uniform, glass is not centered in opening.
	2	Glass not adjusted flush to roof, re-adjust glass.
	3	Mechanism not fully closed. A) Motor out of time, re-time motor/mechanism. B) Cable ratcheting, replace cables and motor bracket.
	4	Seal worn, Replace glass.
Sunroof will not open/close.	1	Check switch and switch connection per Service Manual
	2	Check mechanism for binding (result of forcing glass closed or broken components).
	3	See Motor Inoperative.
Sunroof rattles, anytime, open or closed.	1	Loose attachment screws (module), re-fasten and adjust module.
	2	Loose glass panel, re-fasten and adjust glass panel.
	3	Loose drain channel, re-fasten or secure to repair.
	4	Broken mechanism, replace sunroof assembly module.
	5	Mechanism not fully closed. A) Motor out of time, re-time motor/mechanism. B) Cable ratcheting, replace cables and motor bracket.
	6	Check for sunshade out of track or for sunshade broken slide block.
	7	Loose wind deflector. Replace if necessary.
Sunshade squeaks/rattles, anytime. -OR- Sunshade force high./low or binding during operation.	1	Sunshade slide blocks out of track(s), put back in tracks.
	2	Missing felt pads on drain channel, add felt pads.
	3	Felt on drain channel rolling off, (sunshade rubs on adhesive), replace felt pads.
	4	Slide block binding in sunshade, free-up slide block by actuating a couple times, grease slide block(s) and spring(s).
	5	Broken slide block in sunshade, replace slide block.
	6	Slide block spring missing, replace spring & slide block.
	7	Sunshade interference with drain channel or trim welt, replace trim welt and/or sunshade.

LIMIT SWITCH

DESCRIPTION

The Sunroof Limit Switch is located in the drive motor assembly housing and is not serviceable.

MODULE ASSEMBLY

REMOVAL

(1) Close glass panel, if possible.
(2) Remove A-pillar trim.
(3) Remove upper B-pillar and C-pillar trim.
(4) Remove sunroof welt (Fig. 1).
(5) Remove the switch.
(6) Detach fastener from headlinder bracket to the front beam.
(7) Remove all assist handles.
(8) Remove sun visors.
(9) Remove headlining and disconnect the dome lamp connector.
(10) Disconnect sunroof motor wiring connector.
(11) Disconnect drain tubes.
(12) Remove fasteners attaching sunroof module to vehicle roof.
(13) With the aid of a helper, remove sunroof module from roof.
(14) Remove sunroof module from vehicle.

INSTALLATION

(1) With the aid of a helper, position sunroof module in vehicle.
(2) Install fasteners attaching sunroof module to vehicle roof and support braces. Tighten all fasteners to 5 Nm (44 in. lbs.), starting from the front and working rearward and then the motor bracket.
(3) Connect drain tubes.
(4) Connect sunroof motor wiring connector.
(5) Headliner in position connect dome lamp wire connector. Install headlining.
(6) Install the fastener from the headliner bracket to front beam.
(7) Install switch.
(8) Install sunroof welt.
(9) Install B-pillar and C-pillar trim.
(10) Install A-pillar trim.
(11) Install sun visors.
(12) Install all assist handles.
(13) Install sunroof sunshade.
(14) Install sunroof glass panel.
(15) Cycle glass panel open and close.
(16) Ensure glass adjustment, refer to Glass Adjustment procedure.
(17) Verify correct operation.

CONTROL UNIT

REMOVAL

(1) Remove sun visors, front grab handles, A-pillar screw, Right upper B-pillar trim. Disengage front door weatherstrip from headliner, pull headliner down to access control unit (Fig. 1).
(2) Disconnect wire connector from control unit.
(3) Slide control unit up and forward and remove.

INSTALLATION

(1) Place sunroof control unit into position.
(2) Lock control unit into position.
(3) Connect wire connector to control unit.
(4) Install sun visors, front grab handles, A-pillar screw, Right upper B-pillar trim. Engage front door weatherstrip to headliner.
(5) Cycle sunroof to the full open position.
(6) Ensure sunroof adjustment. Refer to Sunroof Glass Adjustment.

SUNROOF DRIVE MOTOR

REMOVAL

NOTE: The Drive Motor is shipped in the VENT position. If the sunroof glass is not in the VENT position, it must be moved to the VENT position. Refer to Placing The Sunroof Glass Into The VENT Position. If the drive motor and/or the sunroof mechanism is not in the VENT positions, the sunroof vent height will not be correct. Refer to Placing The Sunroof Glass Into The VENT Position and/or Placing Drive Motor Into The VENT Position.

(1) If the drive motor is to be reused, cycle the sunroof glass to the VENT position, if possible.
(2) Remove sun visors, front grab handles, A-pillar screw, Right upper B-pillar trim. Disengage front door weatherstrip from headliner, pull headliner down to access sunroof drive motor (Fig. 1).
(3) Disconnect wire harness connector from motor.
(4) Remove the three screws attaching drive motor to sunroof module bracket.
(5) Remove drive motor from bracket from the front beam.

INSTALLATION

(1) If the drive motor and/or sunroof glass is not in the VENT position, refer to Placing The Sunroof Glass Into The VENT Position and/or Placing Drive Motor Into The VENT Position.
(2) Place drive motor into position on the front beam.

SUNROOF DRIVE MOTOR (Continued)

(3) If glass panel is mounted, with the aid of a helper, hold the sunroof glass panel in the VENT position while installing the motor.

(4) Install screws attaching drive motor to motor bracket.

(5) Connect wire harness to drive motor.

(6) Install sun visors, front grab handles, A-pillar screw, Right upper B-pillar trim. Engage front door weatherstrip to headliner.

(7) Ensure sunroof adjustment. Refer to Sunroof Glass Adjustment.

GLASS PANEL

REMOVAL

(1) Position sunroof sunshade in full rearward position (Fig. 1).

(2) Position the glass reinforcement panel in the CLOSED position before removing the six mounting screws.

(3) Remove sunroof glass panel six screws.

(4) Push glass panel upward from underside until glass panel clears the roof panel.

(5) Lift glass panel from vehicle.

INSTALLATION

(1) Position glass reinforcement panel in roof opening.

(2) Start, but do not tighten, glass attachment screws. Ensure glass is in the CLOSED position.

(3) Cycle sunroof glass panel to the close position. Using a business card as a guide, slide card around the edge of glass panel to ensure panel is centered in opening.

(4) With the aid of a helper, hold the glass panel in position and tighten glass attaching screws.

(5) Ensure glass adjustment, refer to Glass Adjustment procedure.

ADJUSTMENTS

ADJUSTMENTS – SUNROOF VENT POSITION

PLACING SUNROOF GLASS IN VENT POSITION

(1) Remove the drive motor.

(2) Remove sunroof glass panel.

(3) Slide the mechanism forward till the mechanism slide is parallel with the front edge of the guide (Fig. 2).

(4) Using a rule, measure the rear end of the mechanism to the guide on each side of sun roof (Fig. 3) or (Fig. 4).

(5) Initial height should be 44 to 48 mm. Adjust mechanism so that both sides are ± 1.0 mm of each other.

(6) Install drive motor.

(7) Install sunroof panel.

(8) Ensure glass adjustment, refer to Glass Adjustment procedure.

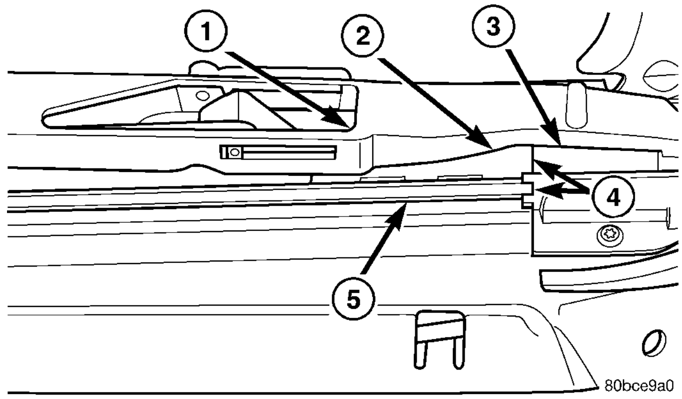

Fig. 2 POSITION MECHANISM SLIDE

1 - MECHANISM
2 - DRIVING SLIDE
3 - LOCATOR
4 - ALIGN
5 - GUIDE

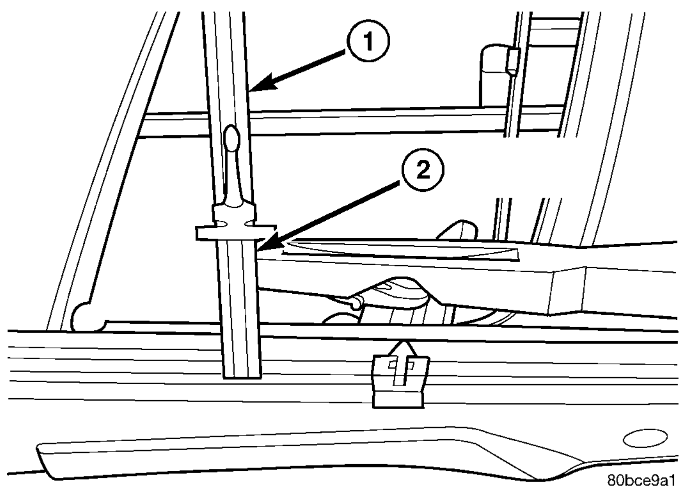

Fig. 3 MEASURING HEIGHT - OUT OF VEHICLE

1 - RULE
2 - REAR END OF MECHANISM

RE–POSITIONING DRIVE MOTOR

If the drive motor is not in the correct position it can be adjusted to the correct position when the sunroof glass is in the vent position. Remove the drive motor from the sunroof module, reconnect the wires to the motor and press the motor switch to the vent position. This should place the drive motor into the vent position. The motor may now be installed if the sunroof glass panel is in the vent position.

GLASS PANEL (Continued)

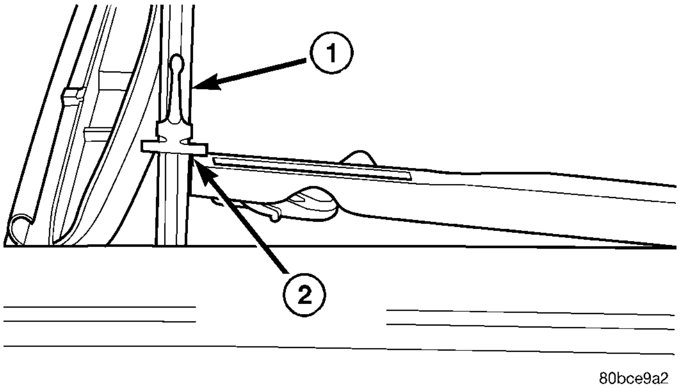

Fig. 4 MEASURING HEIGHT - IN VEHICLE

1 - RULE
2 - REAR END OF MECHANISM

ADJUSTMENTS – SUNROOF GLASS

FLUSHNESS

(1) Position sunshade in full rearward position. Place the glass panel in the full closed position.

(2) To adjust front of glass;

(a) Loosen front and middle glass attachment screws.

(b) Adjust front of sunroof glass panel so that the corners are flush to 1.0 mm below the top surface of the roof panel.

(c) Tighten all glass attachment screws.

(3) To adjust rear of glass;

(a) Loosen rear and middle glass attachment screws.

(b) Adjust rear of sunroof glass panel so that the corners are flush to plus 1.0 mm off the top surface of the roof panel.

(c) Tighten all glass attachment screws.

CENTERING SUNROOF GLASS ADJUSTMENT

Using a business card, check sunroof glass for center in opening (Fig. 5). Move business card around the glass seal, noting area where there is less pressure on the card. Loosen glass attaching screws adjust as necessary.

SUNSHADE

REMOVAL

(1) Open sunroof glass panel to the vent position.

(2) Through the glass panel opening, disengage the two rear slide blocks of sunshade from sunshade guide (Fig. 1).

(3) Slide the sunshade rearward to have access to the two front slide blocks of sunshade and disengage sunshade from sunshade guide.

(4) Lift sunshade out of sunshade guide.

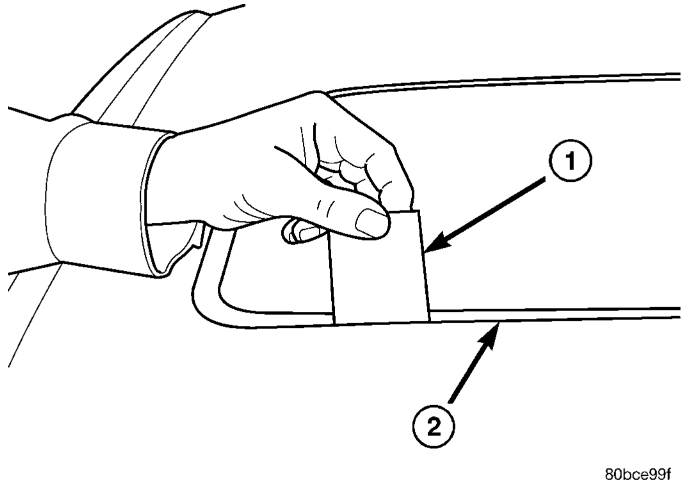

Fig. 5 INSERT BUSINESS CARD

1 - BUSINESS CARD
2 - SEALING SURFACE

INSTALLATION

(1) Place sunshade with cloth side down and install one side's slide blocks into the track on the sunshade guide.

(2) Slide the other side's slide blocks to fully inward position and insert them into the sunshade guide.

(3) Verify that all four slide blocks are fully engaged in the sunshade guide.

(4) Slide sunshade fully rearward and forward to verify operation..

WIND DEFLECTOR

REMOVAL

(1) Open sunroof to full open position.

(2) Pull one end of wind deflector flap out of the wind deflector (Fig. 1).

(3) Release corner piece locking tab and separate corner piece from wind deflector beam.

(4) Rotate corner piece outboard to release tab from roof flange.

(5) Rotate corner piece to a vertical position and pull it up through hole in the sunshade guide.

(6) Repeat for other corner piece.

INSTALLATION

(1) Hold corner piece vertically and push tab down through hole in the sunshade guide.

(2) Rotate corner piece inward and place tab under roof flange.

(3) Connect corner piece to wind deflector.

(4) Install wind deflector flap into wind deflector.

(5) Repeat for other corner piece.

STATIONARY GLASS

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STATIONARY GLASS

DESCRIPTION

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, AND PINCH WELD (FENCE) PRIMER PROVIDED BY THE ADHESIVE MANUFACTURER. IF NOT, STRUCTURAL INTEGRITY COULD BE COMPROMISED.
CHRYSLER DOES NOT RECOMMEND GLASS ADHESIVE BY BRAND. TECHNICIANS SHOULD REVIEW PRODUCT LABELS AND TECHNICAL DATA SHEETS, AND USE ONLY ADHESIVES THAT THEIR MANUFACTURES WARRANT WILL RESTORE A VEHICLE TO THE REQUIREMENTS OF FMVSS 212. TECHNICIANS SHOULD ALSO INSURE THAT PRIMERS AND CLEANERS ARE COMPATIBLE WITH THE PARTICULAR ADHESIVE USED.
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.

BACKLITE

REMOVAL

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. BE SURE TO REFER TO THE URETHANE MANUFACTURER'S DIRECTIONS FOR CURING TIME SPECIFICATIONS, AND DO NOT USE ADHESIVE AFTER ITS EXPIRATION DATE.

CAUTION: Open the left front door glass before installing the rear window to avoid pressurizing the passenger compartment if a door is slammed before the urethane bonding is fully cured. Water leaks can result

Refer to the windshield paragraph of this section for a description of tools and adhesive systems that are recommended for use in this procedure.

(1) Remove rear window moldings.
(2) Remove upper quarter trim panel.

BACKLITE (Continued)

(3) Disconnect wire connectors from rear window defogger.

WARNING: WEAR EYE AND HAND PROTECTION WHEN HANDLING SAFETY GLASS. PERSONAL INJURY CAN RESULT.

CAUTION: Do not damage body or trim finish when cutting out glass or applying fence primer.

(4) Cut the urethane around the perimeter of the rear window glass. Refer to Windshield section of this group for proper procedures.
(5) Remove the rear window from the vehicle.

INSTALLATION

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. BE SURE TO REFER TO THE URETHANE MANUFACTURER'S DIRECTIONS FOR CURING TIME SPECIFICATIONS, AND DO NOT USE ADHESIVE AFTER ITS EXPIRATION DATE.

CAUTION: Open the left front door glass before installing the rear window to avoid pressurizing the passenger compartment if a door is slammed before the urethane bonding is fully cured. Water leaks can result

Refer to the windshield paragraph of this section for a description of tools and adhesive systems that are recommended for use in this procedure.
(1) Prepare the work area, window fence, and glass the same way as described in the Windshield section of this group.
(2) Place fence spacers at the locations shown (Fig. 1).
(3) Install the rear window molding on glass.
(4) Apply a 10 mm (0.4 in.) bead of urethane around the perimeter of the glass.
(5) Install the glass in the same manner described in the Windshield section of this group (Fig. 1).
(6) Connect rear window defogger wiring and interior trim.
(7) After urethane has cured, water test rear window to verify repair. Verify rear window defogger operation.

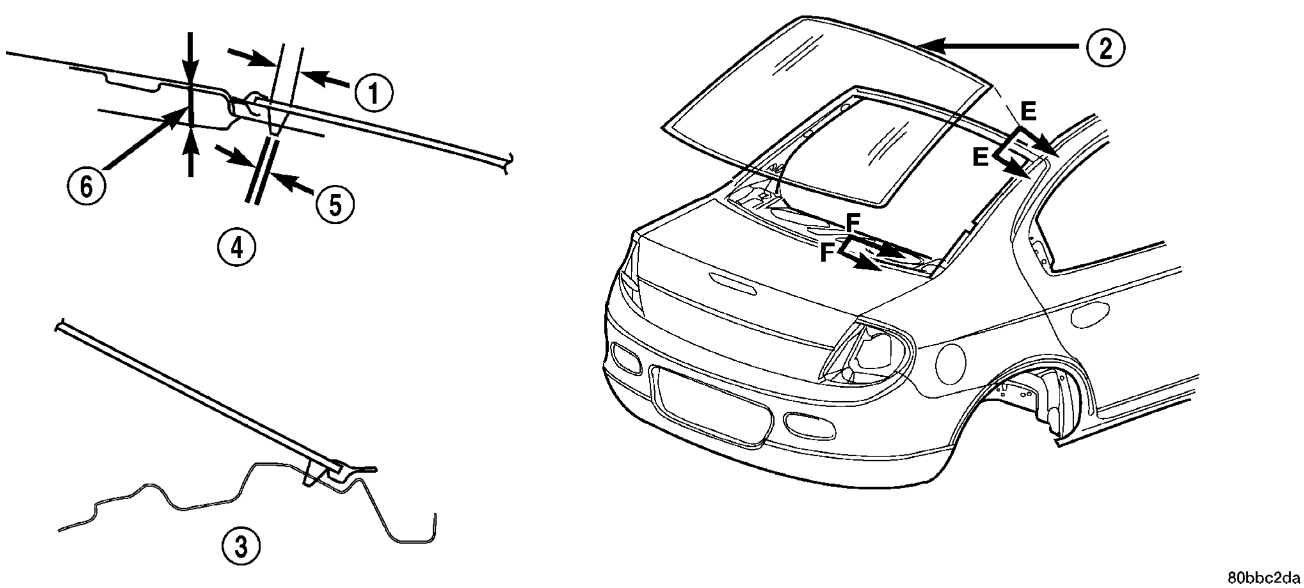

Fig. 1 Rear Window Glass

1 - 9.5 MM
2 - REAR WINDOW
3 - SECTION F-F
4 - SECTION E-E
5 - 3 MM
6 - 12.7 MM

WINDSHIELD

DESCRIPTION

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.

POWER KNIFE

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

- Fein® Power Cutout Knife
- Equalizer® Magnum, Interior Auto Glass Cut Out Knife

ADHESIVE, PRIMER AND CLEANER

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

The following urethane adhesive systems are OEM certified and conform to the FMVSS 212 windshield retention standard and the FMVSS 216 roof crush standard.

REMOVAL

EXTERIOR METHOD

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.

(1) Remove inside rear view mirror.

(2) Remove windshield wiper arms.

(3) Remove cowl cover.

(4) Place protective covers over instrument panel and hood.

(5) Remove the screws and remove the windshield A-pillar moldings. (Fig. 2)

(6) Using a sharp cold knife, cut urethane adhesive holding the windshield to the A-pillars, roof header and cowl pinch weld fences (Fig. 3). A power cutting device can be used if available.

(7) Separate windshield from vehicle.

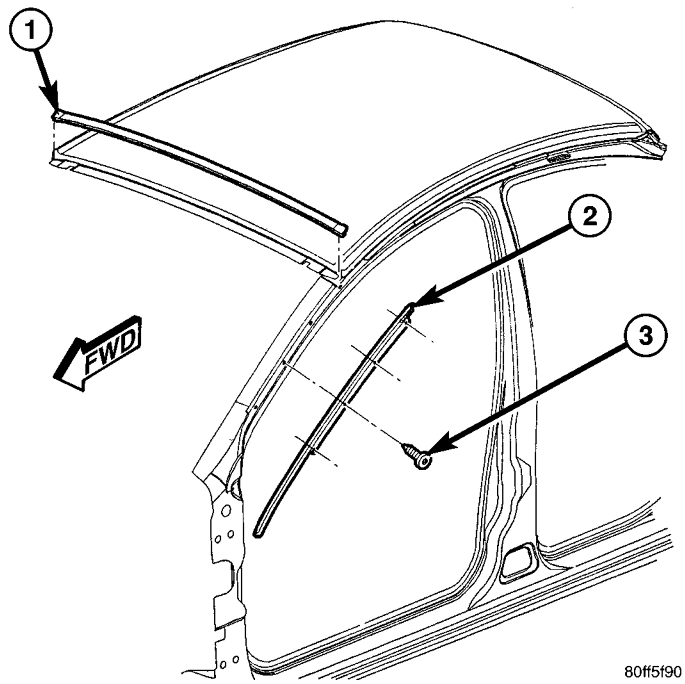

Fig. 2 WINDSHIELD HEADER OUTSIDE MOLDING

1 - WINDSHIELD HEADER MOLDING
2 - A-PILLAR OUTSIDE MOLDING
3 - A-PILLAR

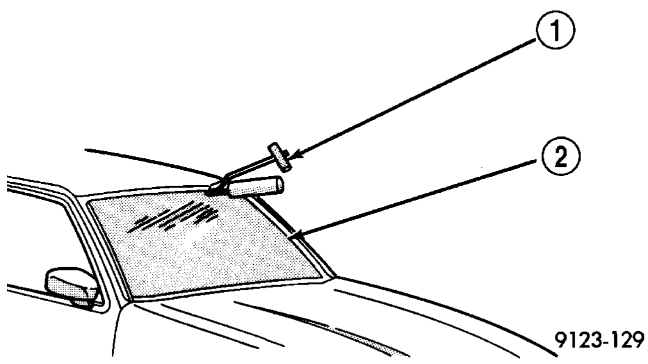

Fig. 3 Cut Urethane Around Windshield

1 - COLD KNIFE
2 - WINDSHIELD

INTERIOR METHOD

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.

WINDSHIELD (Continued)

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.

(1) Remove inside rear view mirror.

(2) Remove instrument panel top cover, refer to Group 8E, Instrument Panel.

(3) Remove A-pillar trim covers.

(4) Place protective covers over instrument panel and hood.

(5) 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.

(6) Remove windshield from vehicle.

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.

(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) Remove replacement windshield from windshield opening.

(4) 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. 4).

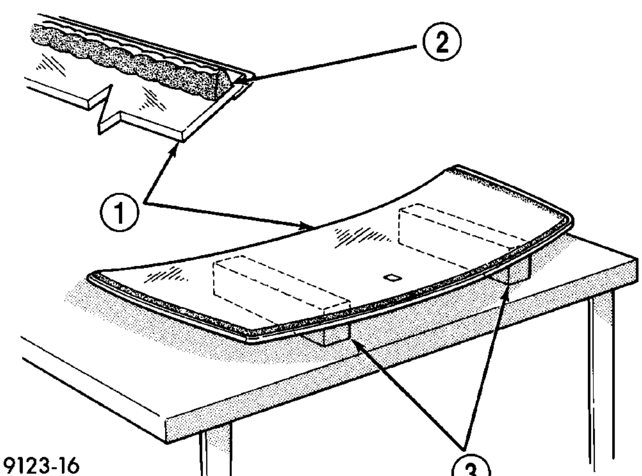

Fig. 4 Work Surface Set up and Molding Installation

1 - WINDSHIELD AND MOULDINGS
2 - URETHANE BEAD AROUND GLASS 7mm (.3 in.) FROM EDGE
3 - BLOCKS

WINDSHIELD (Continued)

WARNING: DO NOT USE SOLVENT BASED GLASS CLEANER TO CLEAN WINDSHIELD BEFORE APPLYING GLASS PREP AND PRIMER. POOR ADHESION CAN RESULT.

(5) Clean inside of windshield with ammonia based glass cleaner and lint-free cloth.

(6) Apply molding to Top of windshield.

(7) 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.

(8) Apply Glass Primer 25 mm (1 in.) wide around perimeter of windshield. Allow at least three minutes drying time.

(9) Using a razor knife, remove as much original urethane as possible. Do not damage paint on windshield fence.

(10) Apply pinch weld primer 15 mm (.75 in.) wide around the windshield fence. Allow at least three minutes drying time.

(11) Apply a 10 mm (0.4 in.) bead of urethane on center line of windshield fence.

(12) 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.

(13) Slowly lower windshield glass to windshield opening fence. Guide the molding into proper position as necessary. Push windshield inward molding is flush to roof line and A-pillars (Fig. 5).

(14) Clean access urethane from exterior with Mopar®, Super Clean or equivalent.

(15) 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.

(16) Install A-pillar moldings.

(17) Install cowl cover and wipers.

(18) Install inside rear view mirror.

(19) After urethane has cured, remove tape strips and water test windshield to verify repair.

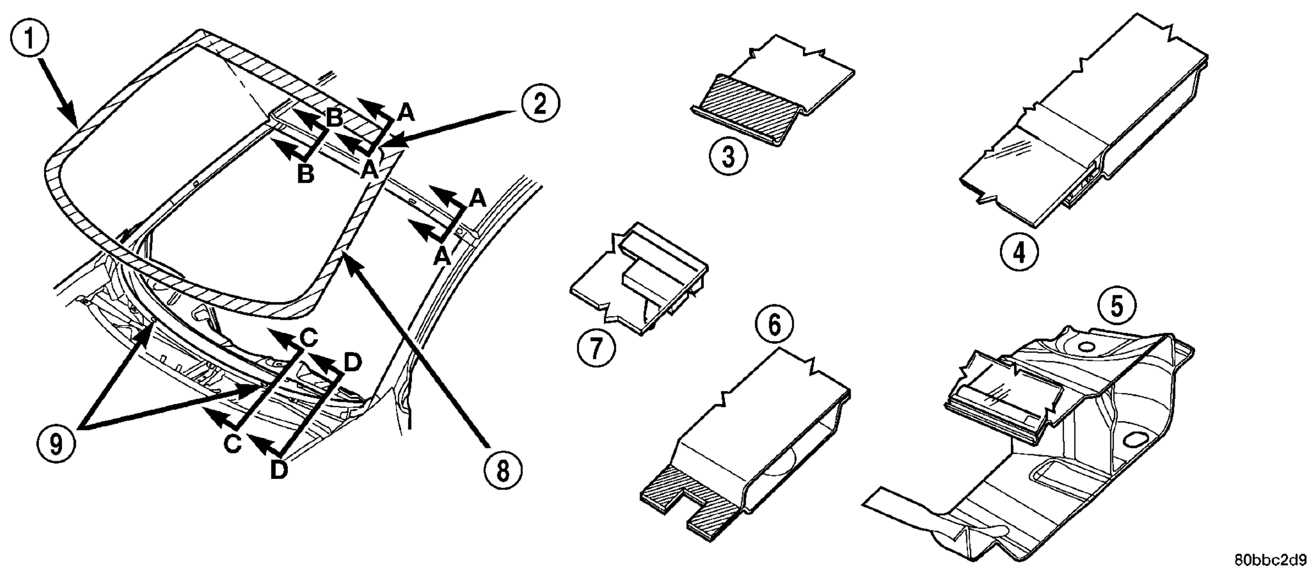

Fig. 5 Lower Windshield Into Position

1 - WINDSHIELD
2 - WINDSHIELD TO FENCE RETAINER
3 - SECTION D-D
4 - SECTION B-B
5 - SECTION C-C
6 - SECTION A-A (FENCE)
7 - SECTION A-A (GLASS)
8 - HIGH VISCOSITY ADHESIVE
9 - WINDSHIELD FENCE SUPPORT SPACERS

WEATHERSTRIP/SEALS

TABLE OF CONTENTS

B-PILLAR WEATHERSTRIP CHANNEL

REMOVAL

(1) Remove b-pillar applique. (Refer to 23 - BODY/DOOR - FRONT/APPLIQUE - REMOVAL)
(2) Remove push in fasteners attaching weatherstrip to b-pillar.
(3) Pull weatherstrip from b-pillar channels.
(4) Remove screws attaching channels to b-pillar.
(5) Remove channels from b-pillar.

INSTALLATION

(1) Install channels from b-pillar.
(2) Install screws attaching channels to b-pillar.
(3) Install weatherstrip to b-pillar channels.
(4) Install push in fasteners attaching weatherstrip to b-pillar.
(5) Install b-pillar applique. (Refer to 23 - BODY/DOOR - FRONT/APPLIQUE - INSTALLATION)

FDR GLASS RUN WEATHERSTRIP

REMOVAL

(1) Remove flag cover, door trim panel, water dam as necessary.

(2) Remove door glass.

(3) Loosen side view mirror, as necessary.

(4) Remove weatherstrip fasteners.

(5) Pull weatherstrip from lower front channel above door latch.

(6) Pull run weatherstrip from window frame channel (Fig. 1).

INSTALLATION

(1) Clean butyl material from door flange area.

(2) Place door run weatherstrip in position on window frame channel.

(3) Push door run weatherstrip into window frame channel.

(4) Push weatherstrip into lower front channel above door latch.

(5) Install weatherstrip fasteners.

(6) Install door glass.

(7) Tighten side view mirror.

(8) Install pull cup support bracket, water shield, door trim panel and flag trim.

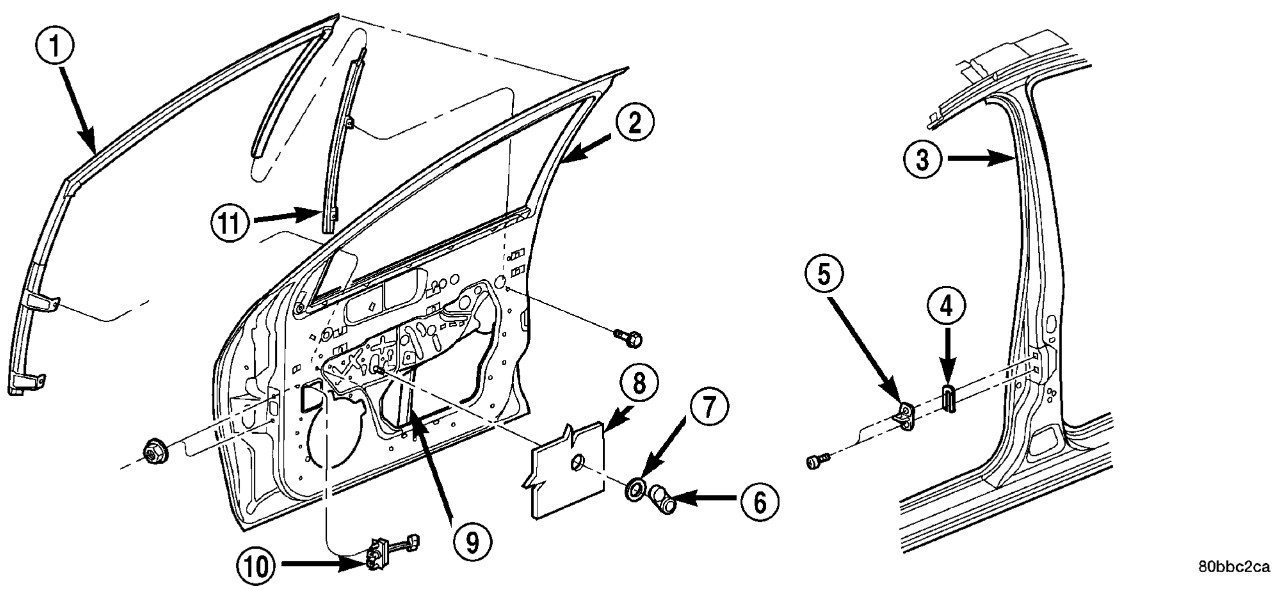

Fig. 1 Door Glass Run Weatherstrip

1 - FRONT DOOR GLASS RUN WEATHERSTRIP
2 - FRONT DOOR
3 - B-PILLAR
4 - SPACER
5 - DOOR LATCH STRIKER
6 - WINDOW REGULATOR HANDLE
7 - SPACER
8 - DOOR TRIM PANEL
9 - WINDOW REGULATOR
10 - DOOR CHECK STRAP
11 - FRONT DOOR GLASS RUN BRACKET WEATHER

OUTER BELT WEATHERSTRIP

REMOVAL

(1) Open door glass.

(2) Pull upward at rear end of outer belt weatherstrip.

(3) Remove outer belt weatherstrip from vehicle (Fig. 2).

INSTALLATION

(1) Starting at leading edge of door, press weatherstrip onto door.

(2) Operate window and check for interference

DOOR UPPER SECONDARY WEATHERSTRIP

REMOVAL

(1) Using a fork-type prying tool, disengage push in fasteners attaching door upper secondary weatherstrip to door opening.

(2) Remove weatherstrip from door.

INSTALLATION

(1) Position weatherstrip to opening door.

(2) Press door upper secondary weatherstrip fasteners into position.

FRONT/REAR DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove door trim panel.

(2) Remove weatherstrip from door. Use a rubber mallet and a block of wood, tap upward at each clip holding the molding to the door (Fig. 3).

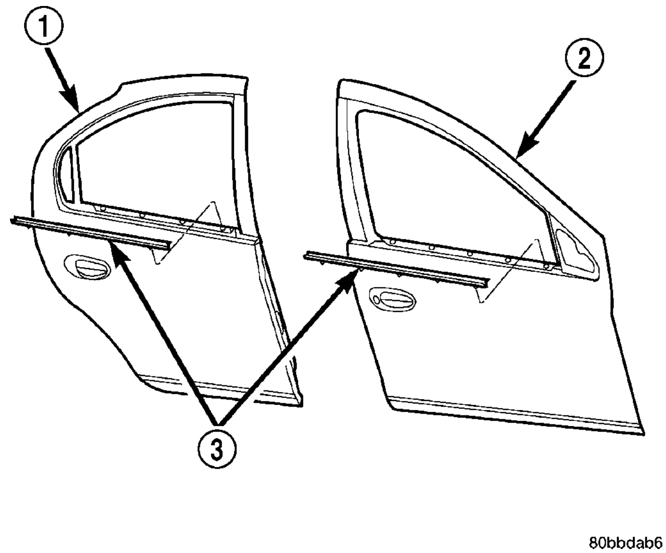

Fig. 3 Front/Rear Door Inner Belt Weatherstrip

1 - REAR DOOR
2 - FRONT DOOR
3 - INNER BELT WEATHERSTRIP

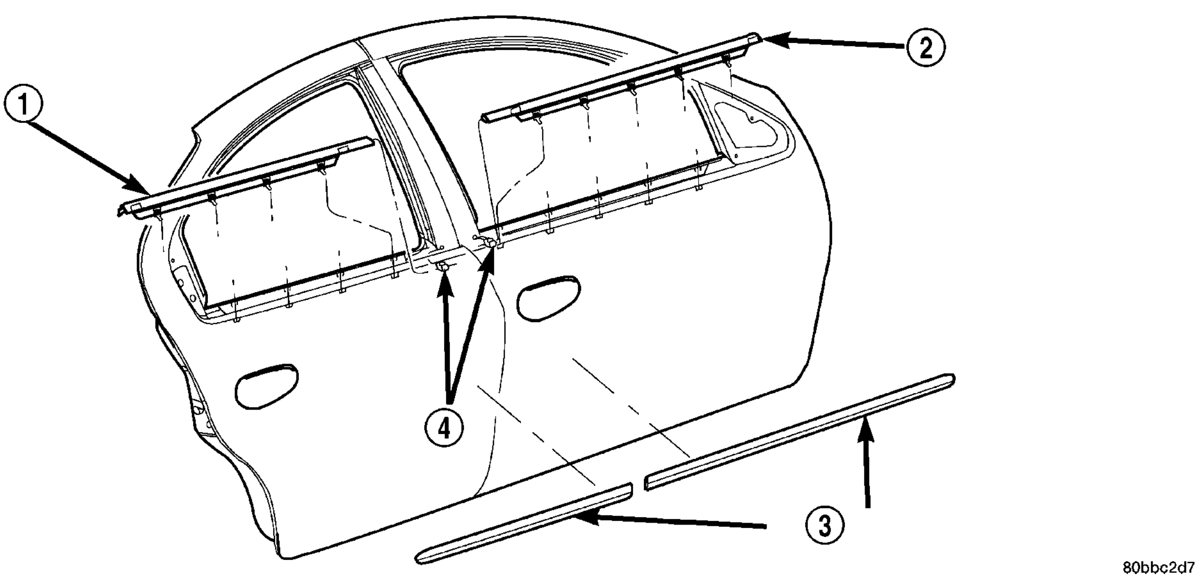

Fig. 2 Door Outer Belt Weatherstrip

1 - REAR DOOR OUTER BELT WEATHERSTRIP
2 - FRONT DOOR OUTER BELT WEATHERSTRIP
3 - DOOR MOLDING
4 - OUTER BELT WEATHERSTRIP

FRONT/REAR DOOR INNER BELT WEATHERSTRIP (Continued)

INSTALLATION

(1) Push down on weatherstrip to engage channel to door panel.

(2) Install door trim panel.

REAR DOOR GLASS RUN WEATHERSTRIP

REMOVAL

(1) Remove door trim panel, water dam as necessary.

(2) Remove door glass.

(3) Remove weatherstrip fasteners.

(4) Pull weatherstrip from lower front channel above door latch.

(5) Pull run weatherstrip from window frame channel (Fig. 4).

INSTALLATION

(1) Clean butyl material from door flange area.

(2) Place door run weatherstrip in position on window frame channel.

(3) Push door run weatherstrip into window frame channel.

(4) Push weatherstrip into lower front channel above door latch.

(5) Install weatherstrip fasteners.

(6) Install door glass.

(7) Install pull cup support bracket, water shield, and door trim panel.

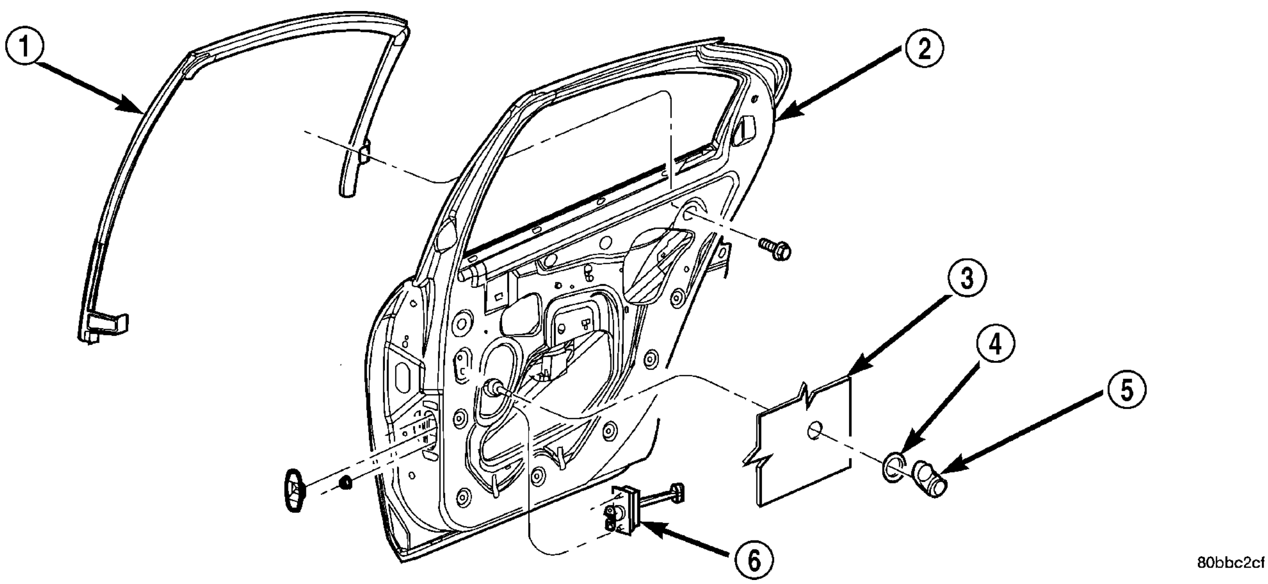

Fig. 4 Door Glass Run Weatherstrip

1 - REAR DOOR GLASS RUN WEATHERSTRIP
2 - REAR DOOR
3 - DOOR TRIM PANEL
4 - SPACER
5 - WINDOW REGULATOR HANDLE
6 - DOOR CHECK STRAP

RDR SECONDARY WEATHERSTRIP

REMOVAL

(1) Using a fork-type prying tool C-4829 or equivalent, disengage push in fasteners attaching door upper secondary weatherstrip to door opening.

(2) Remove weatherstrip from door.

INSTALLATION

(1) Position weatherstrip to opening door.

(2) Press door upper secondary weatherstrip fasteners into position.

ROOF RAIL WEATHERSTRIP

REMOVAL

(1) Open front and rear doors.

(2) Using a door trim removing tool, disengage the push-in fasteners holding A-pillar and C-pillar weatherstrip molding.

(3) Starting at the bottom of the A-pillar, pull the roof rail weatherstrip from the windshield side molding.

(4) Pull roof rail weatherstrip from the roof rail pinch flange above the door opening (Fig. 5).

(5) Separate roof rail weatherstrip from vehicle.

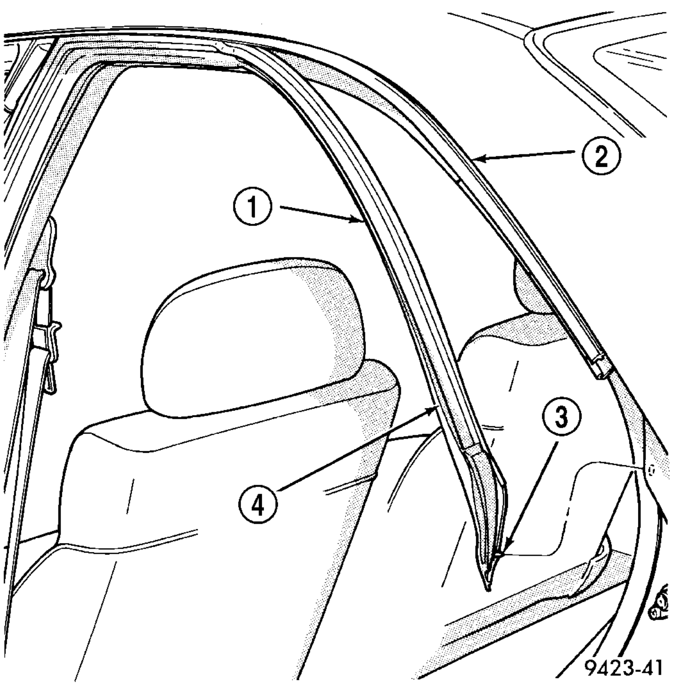

Fig. 5 Roof Rail Weatherstrip

1 - ROOF RAIL WEATHER STRIP
2 - ROOF RAIL CHANNEL
3 - PUSH-IN FASTENER
4 - RETAINING LIP

INSTALLATION

(1) Place weatherstrip in position on pinch flange.

(2) Starting at the bottom of the C-pillar, install the roof rail weatherstrip molding to the pinch rail.

(3) Install push-in fasteners to hold weatherstrip to A-pillar and C-pillar.

ROOF RAIL WEATHERSTRIP RETAINR CHANNEL

REMOVAL

(1) Open door(s).

(2) Using trim stick disconnect the top and bottom push in fasteners from B-pillar applique. Gently pull outward on the applique to remove from the vehicle.

NOTE: The applique is attached to the vehicle with two sided tape between the push in fasteners, ensure all of the old two sided tape is removed from the vehicle surface before installation of new part.

(3) Remove weatherstrip from the retainer channel (Fig. 6).

(4) Remove retainer channel from the body side aperture.

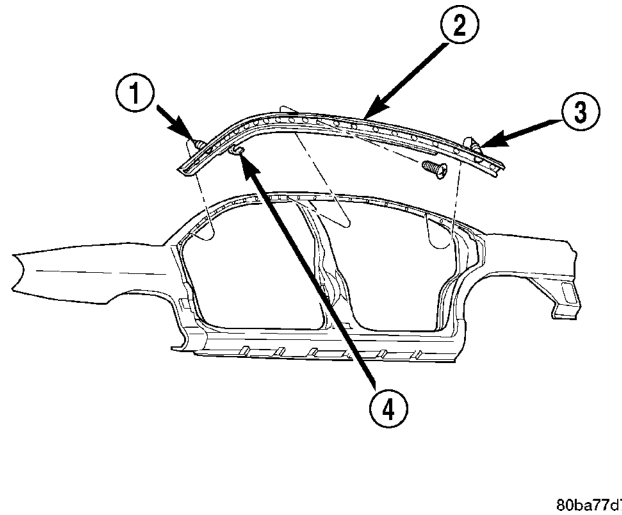

Fig. 6 Roof Rail Weatherstrip Retainer Channel

1 - PUSH PIN
2 - ROOF RAIL WEATHERSTRIP RETAINER CHANNEL
3 - PUSH PIN
4 - REMOVE BACKING STRIP FROM FOAM TAPE

ROOF RAIL WEATHERSTRIP RETAINR CHANNEL (Continued)

INSTALLATION

(1) Install retainer channel to the body side aperture.

(2) Remove weatherstrip from the retainer channel.

(3) Connect the top and bottom push in fasteners to B-pillar applique. Gently push on the applique to install from the vehicle.

SECONDARY SILL WEATHERSTRIP

REMOVAL

(1) Using a fork-type prying tool, disengage push in fasteners attaching sill secondary weatherstrip to door (Fig. 7).

(2) Remove weatherstrip from door.

INSTALLATION

(1) Position weatherstrip to door.

(2) Press sill secondary weatherstrip fasteners into position.

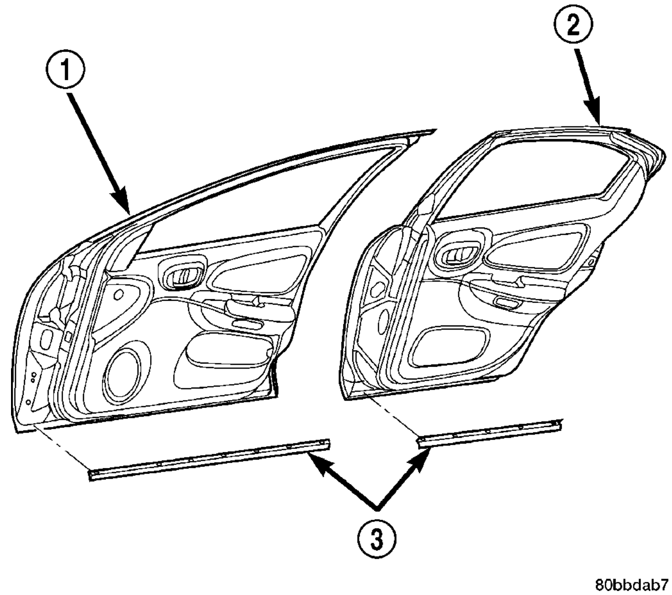

Fig. 7 Front/Rear Sill Secondary Weatherstrip

1 - FRONT DOOR
2 - REAR DOOR
3 - SILL SECONDARY WEATHERSTRIP

TRUNK OPENING WEATHERSTRIP

REMOVAL

(1) Open decklid.

(2) Pull decklid weatherstrip form decklid opening fence (Fig. 8).

(3) Remove weatherstrip from vehicle.

INSTALLATION

(1) Place decklid opening weatherstrip into position.

(2) Press the weatherstrip onto the decklid opening fence.

(3) Close decklid.

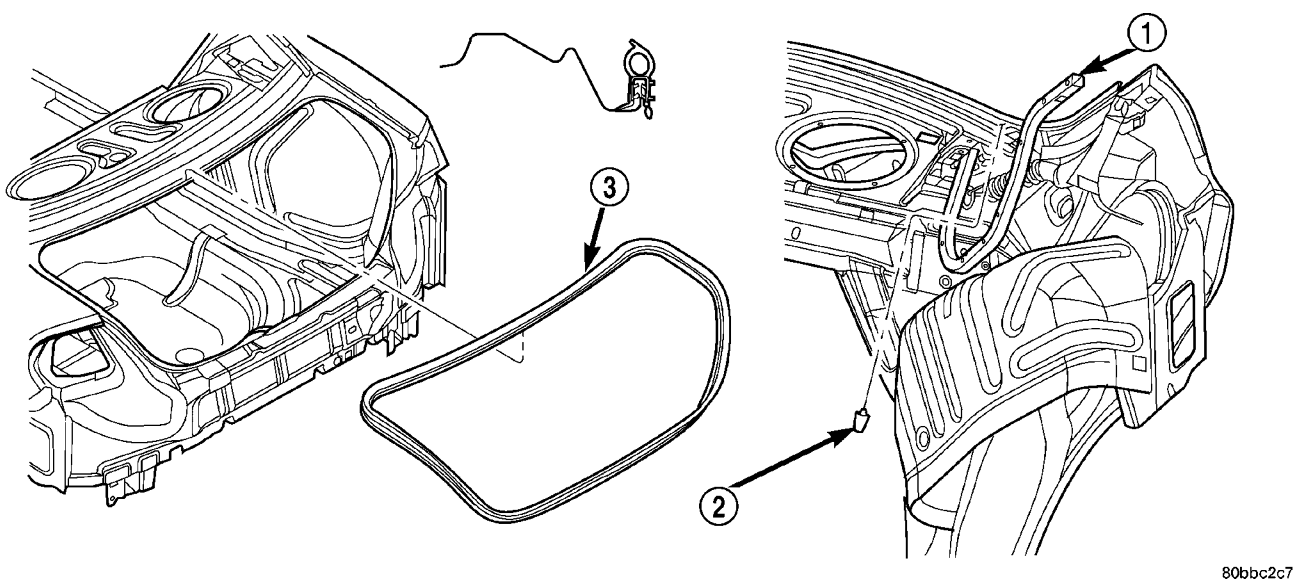

Fig. 8 Decklid Opening Weatherstrip

1 - DECKLID HINGE
2 - DECKLID UP STOP BUMPER
3 - DECKLID OPENING WEATHERSTRIP

BODY STRUCTURE

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GAP AND FLUSH

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GAP AND FLUSH (Continued)

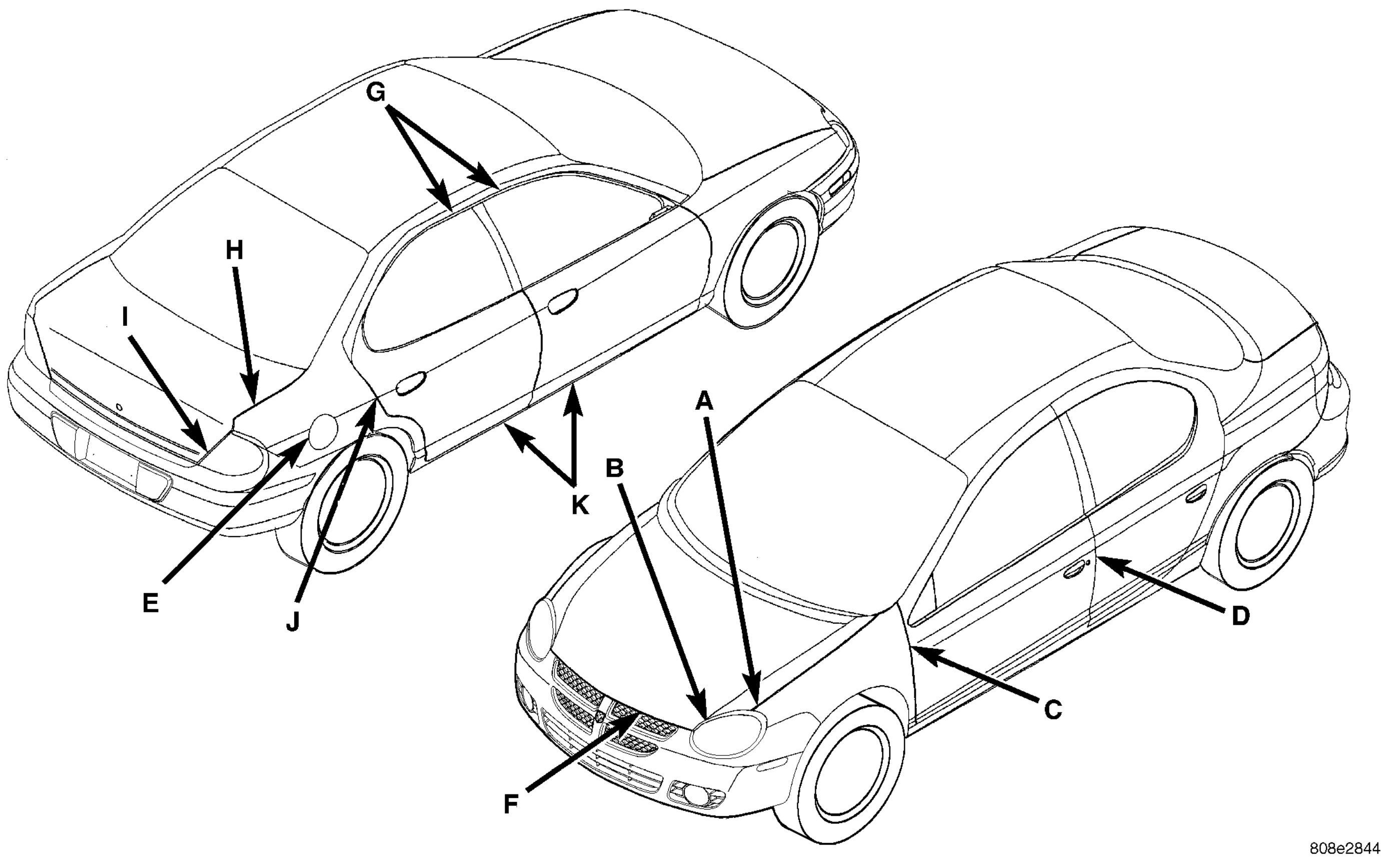

Fig. 1 BODY GAP AND FLUSH

	LOCATION	GAP	FLUSH
A	Hood to Fender	4.0 ± 1.0 // 1.0	± 1.0
B	Hood to Fender (Fore & Aft)	Flush w/in ± 1.5	N/A
C	Front Door to Fender	5.0 ± 1.0 // 1.0	± 1.0
D	Rear Door to Front Door	5.0 ± 1.0 // 1.0	± 1.0
E	Fuel Filler Door to Quarter Panel	3.0 ± 0.75 conc. ± 0.5	0.5 ± 0.5
F	Fascia to Hood	Parallel // w/in 2.0	N/A
G	Front & Rear Door to Roof	5.0 ± 1.5 // 1.0	0.0 ± 1.5 // 1.0
H	Deck Lid to Quarter Panel	4.0 1.5 // 1.0	1.0 ± 1.0 // 1.0
I	Tail Lamp to Applique & Deck Lid	4.0 ± 1.5 // 1.0	1.0 ± 1.0 // 1.0
J	Rear Door to Quarter Panel	4.0 ± 1.0 // 1.0	0.0 ± 1.0 // 1.0
K	Front & Rear Door to Sill	5.0 ± 1.5 // 1.5	6.4 ± 1.5 / 1.5

NOTE:
ALL MEASUREMENTS ARE IN mm

OPENING DIMENSIONS

SPECIFICATIONS - BODY OPENING DIMENSION

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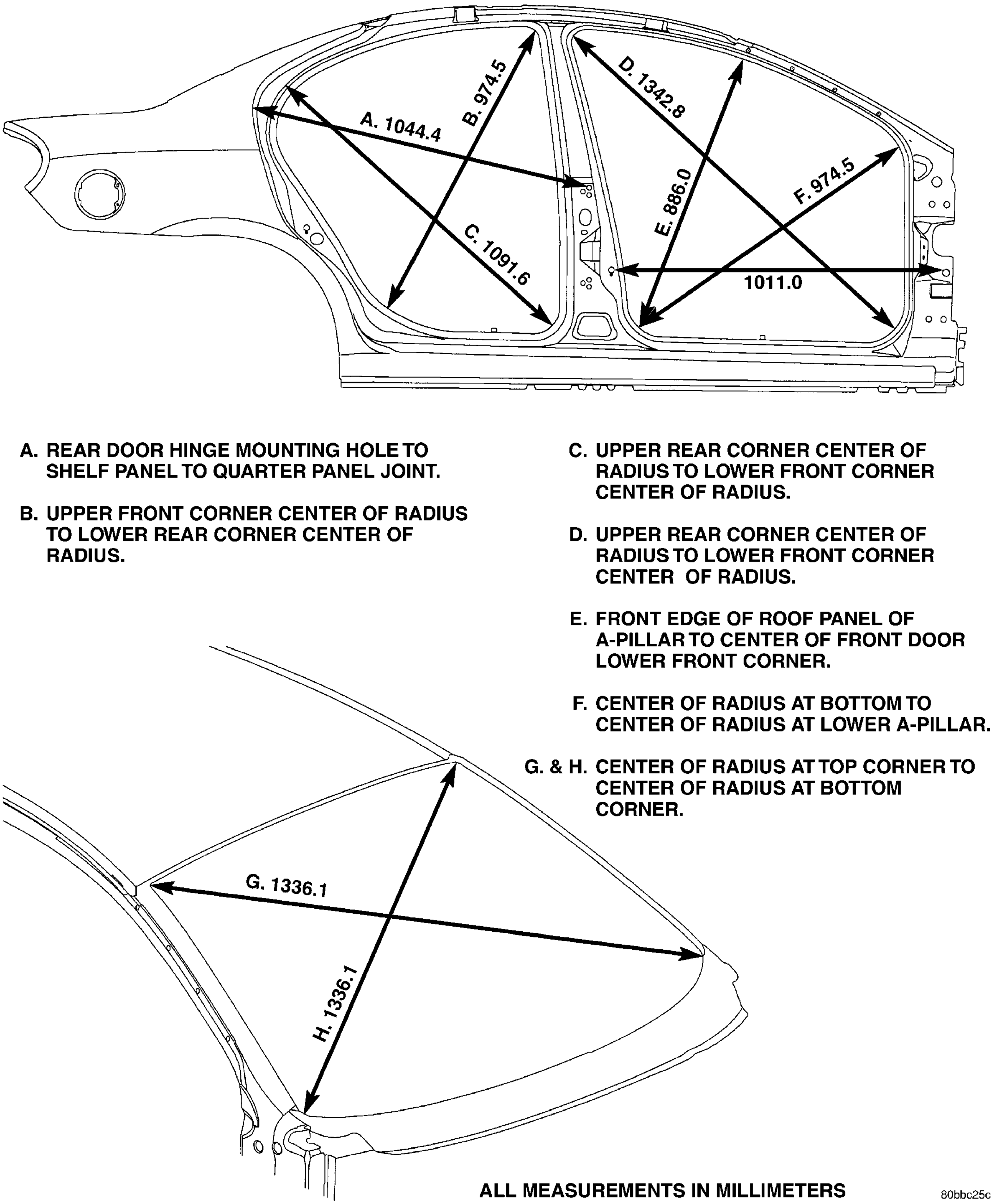

Fig. 2 DOOR AND WINDSHIELD OPENINGS

OPENING DIMENSIONS (Continued)

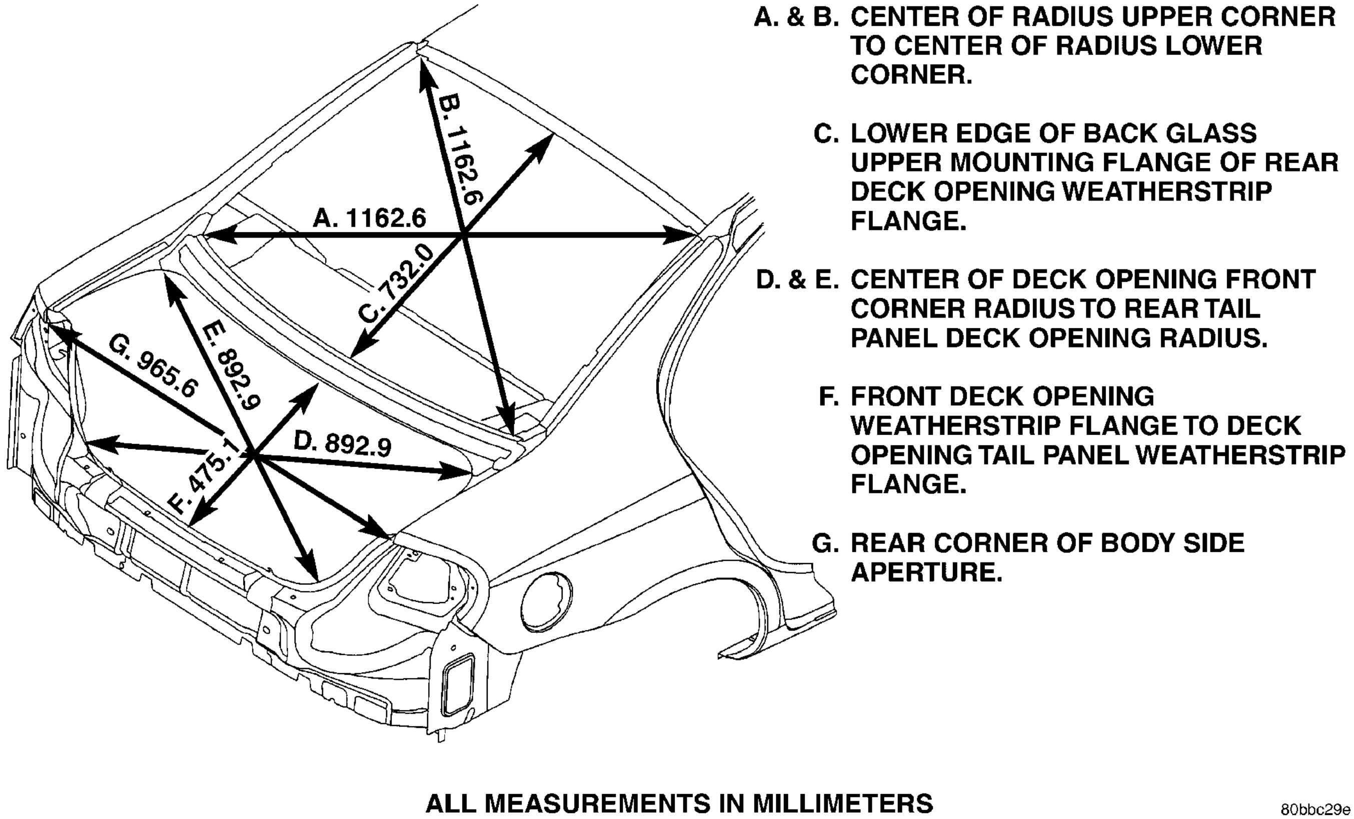

Fig. 3 REAR WINDOW AND TRUNK OPENINGS

SEALER LOCATIONS

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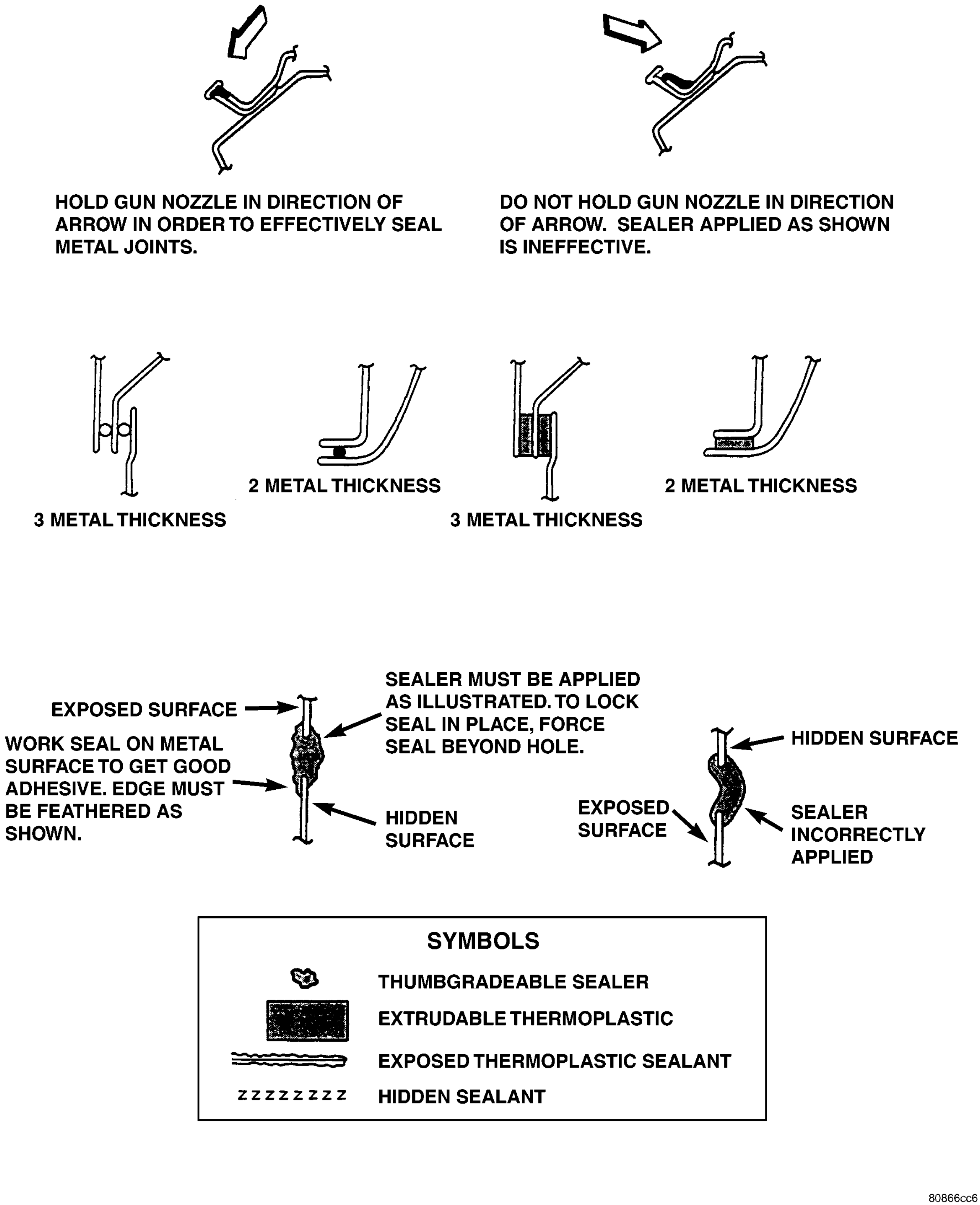

Fig. 4 METHODS OF APPLYING AUTO BODY SEALANT

SEALER LOCATIONS (Continued)

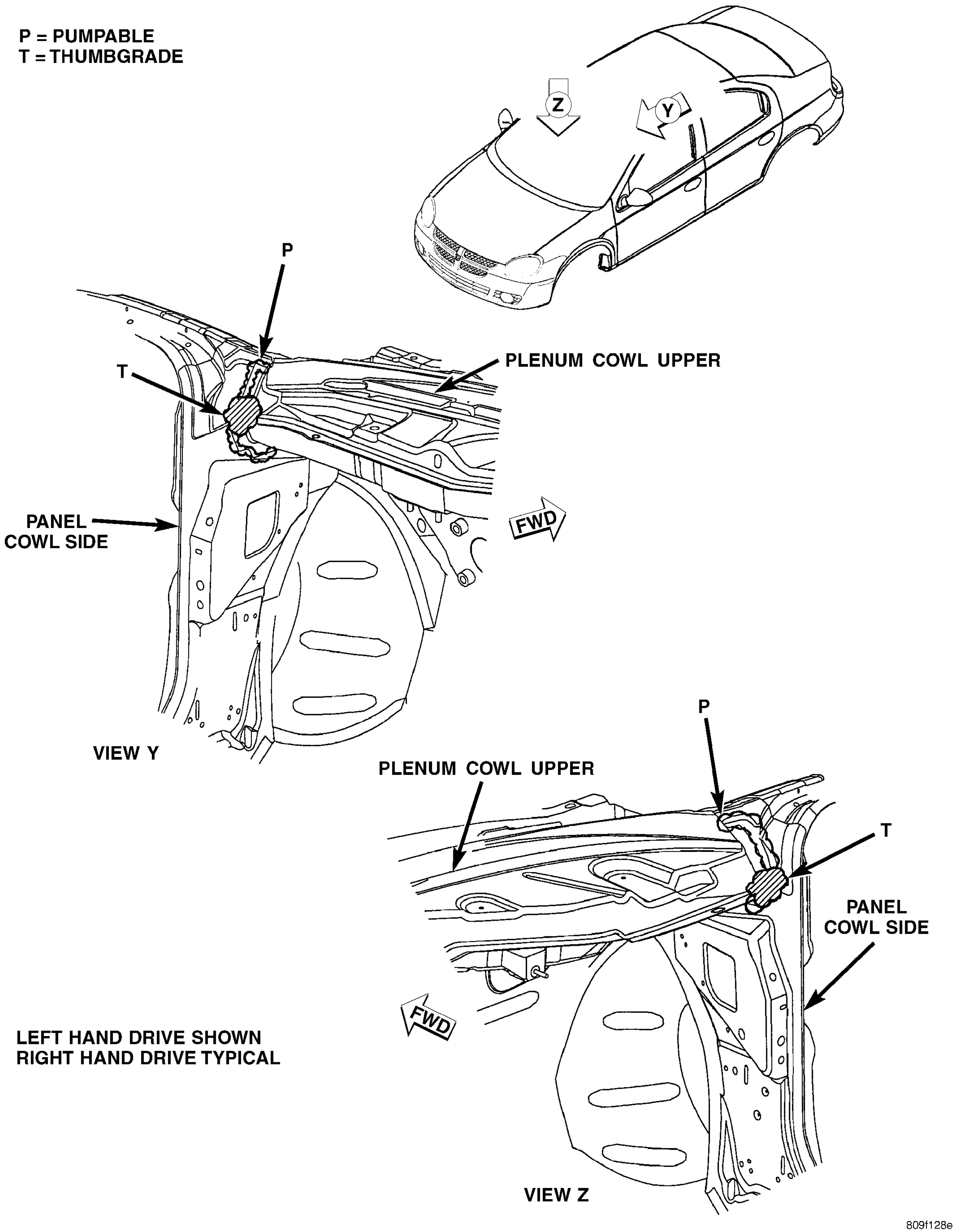

Fig. 5 COWL SIDE AND PLENUM

SEALER LOCATIONS (Continued)

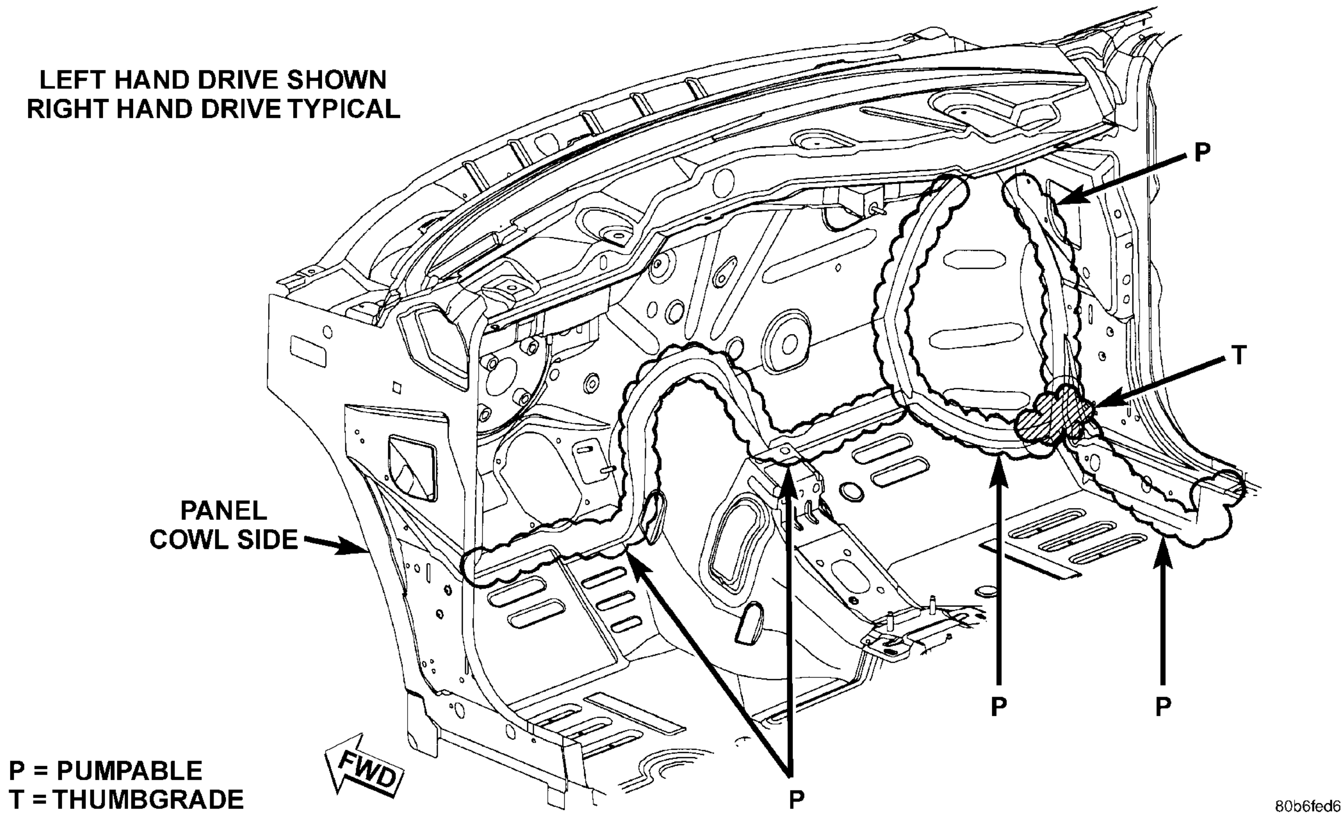

Fig. 6 COWL, PLENUM AND FLOOR PAN

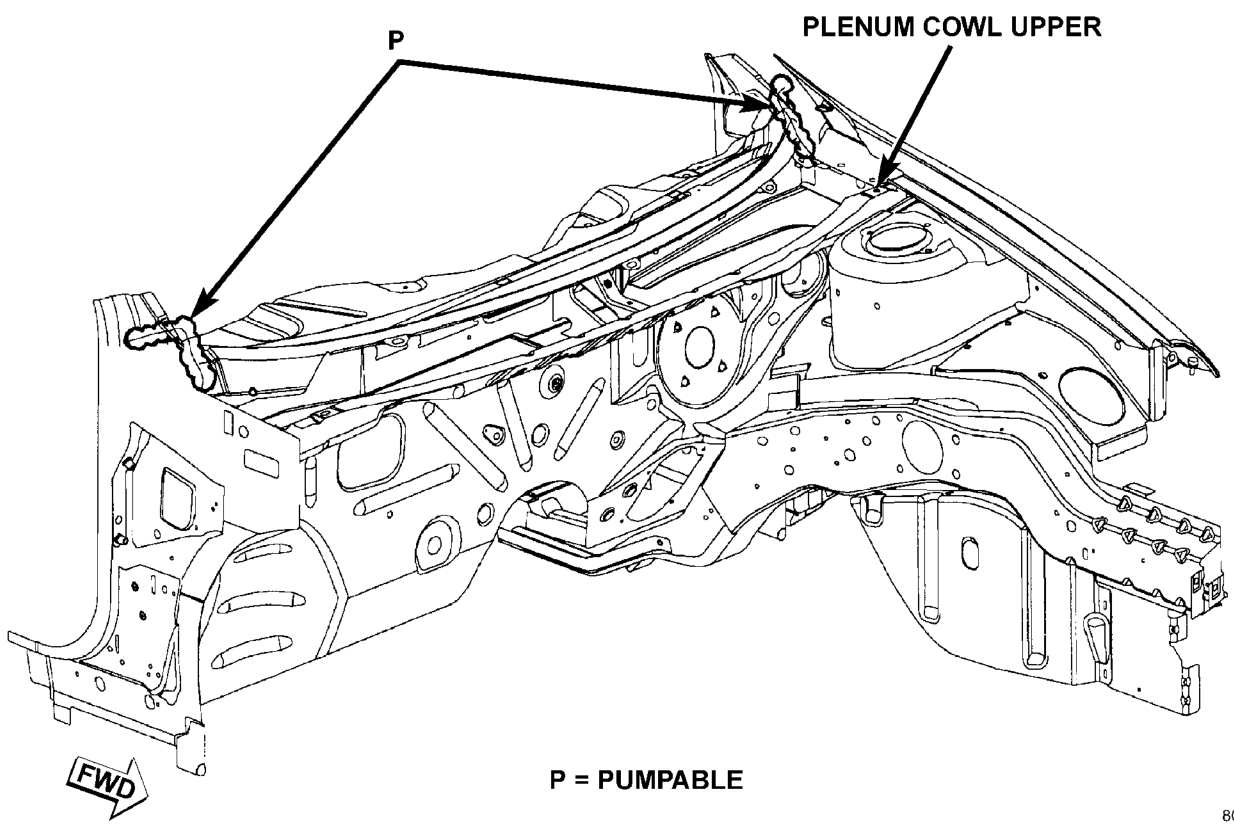

Fig. 7 UPPER COWL AND PLENUM

SEALER LOCATIONS (Continued)

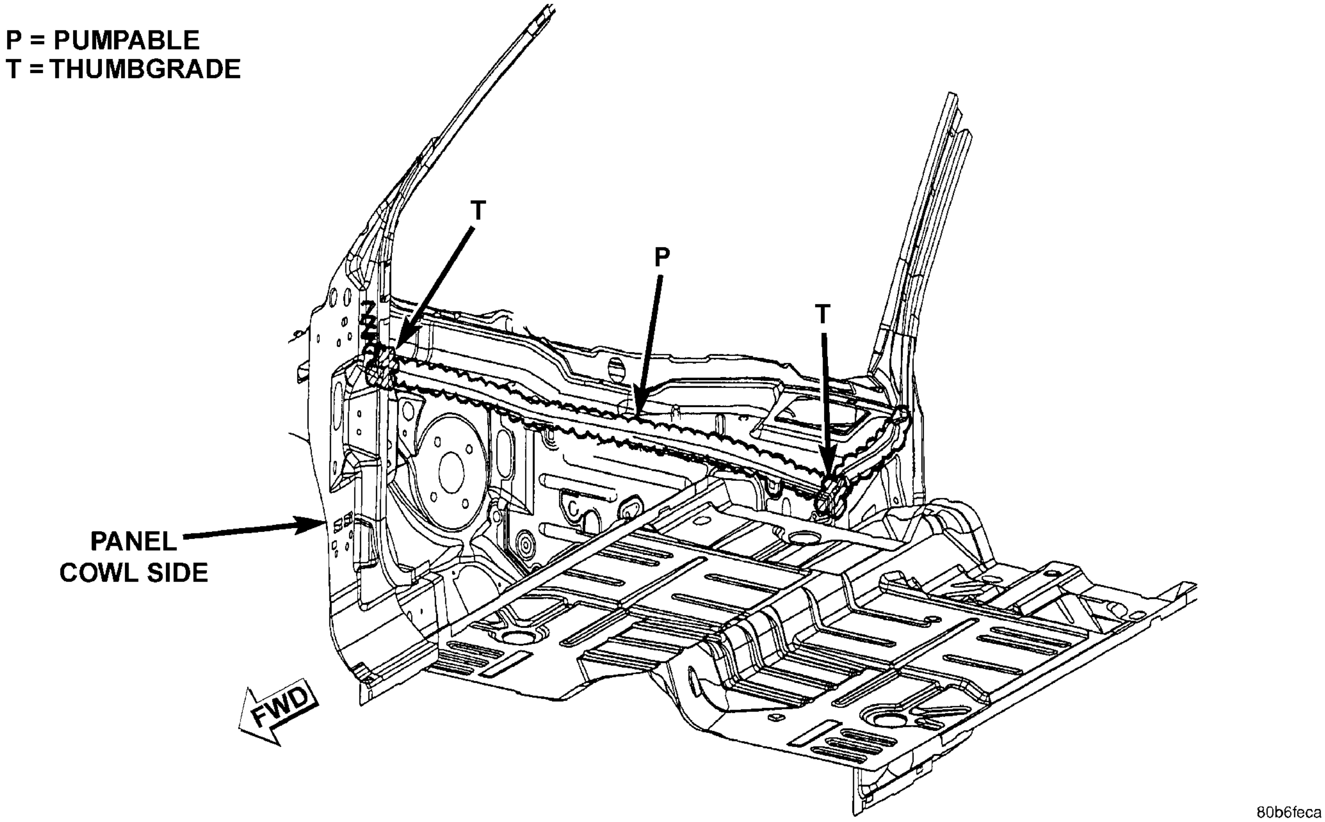

Fig. 8 COWL SIDE, PLENUM AND FLOOR PAM

SEALER LOCATIONS (Continued)

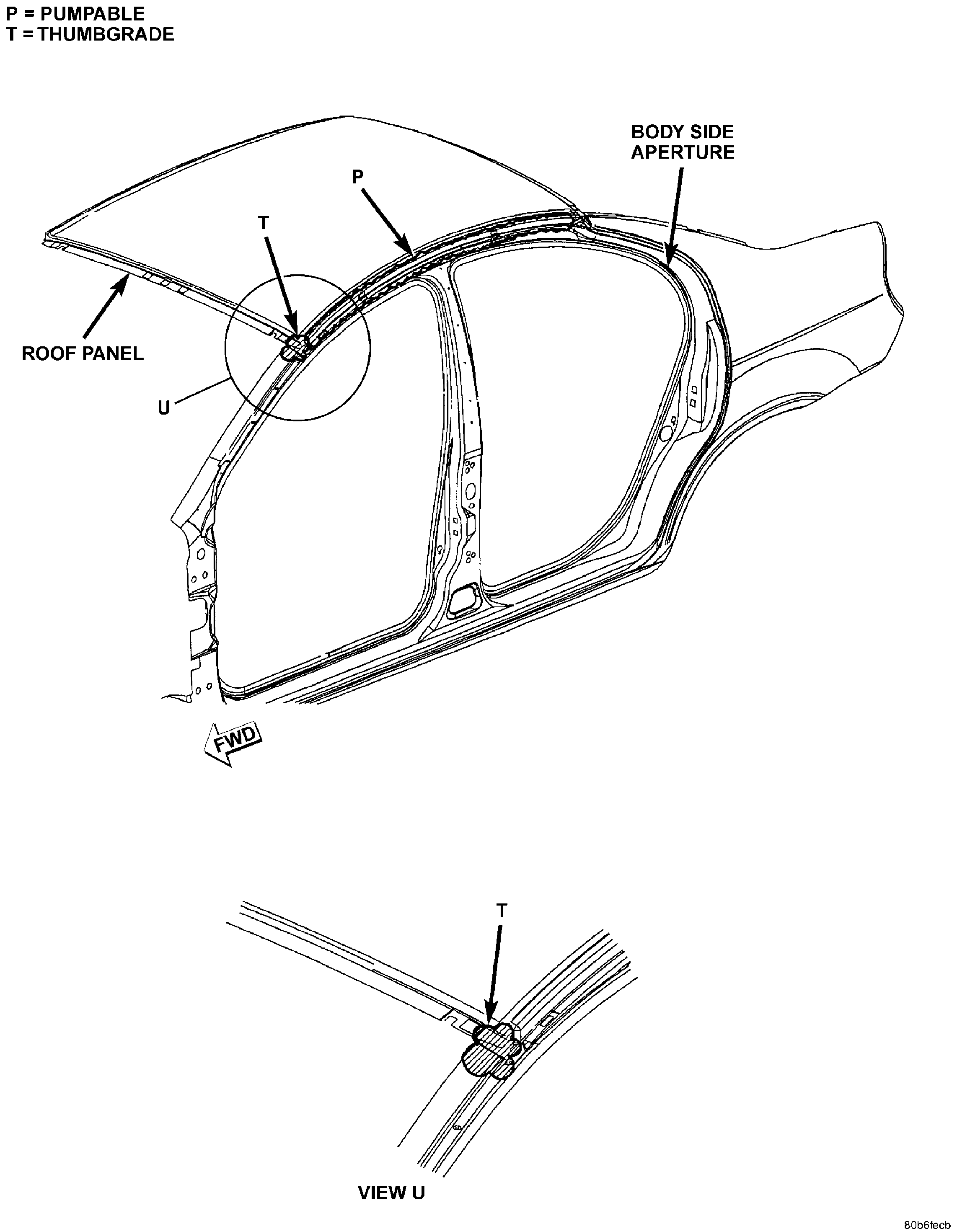

Fig. 9 ROOF PANEL

SEALER LOCATIONS (Continued)

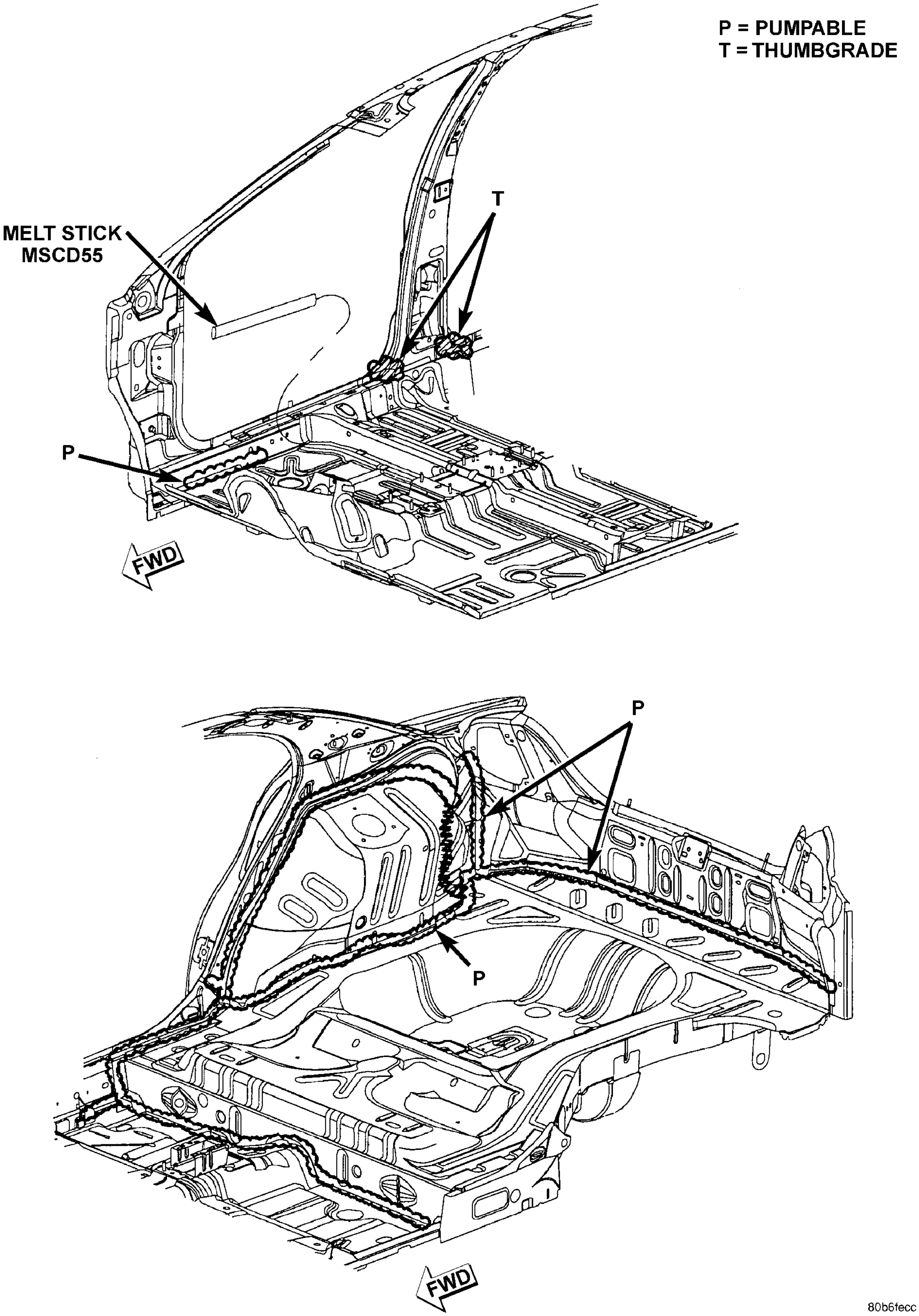

Fig. 10 FLOOR PAN, REAR INNER (RIGHT) WHEELHOUSE, AND REAR END PANEL

SEALER LOCATIONS (Continued)

P = PUMPABLE
T = THUMBGRADE

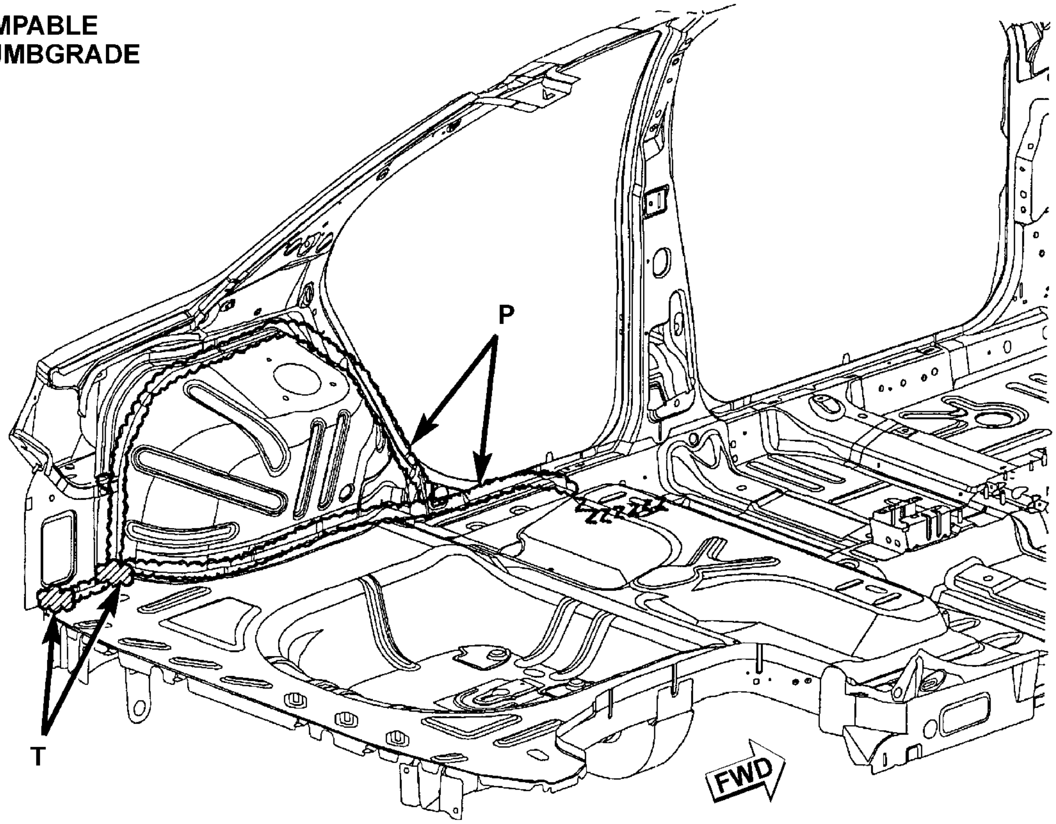

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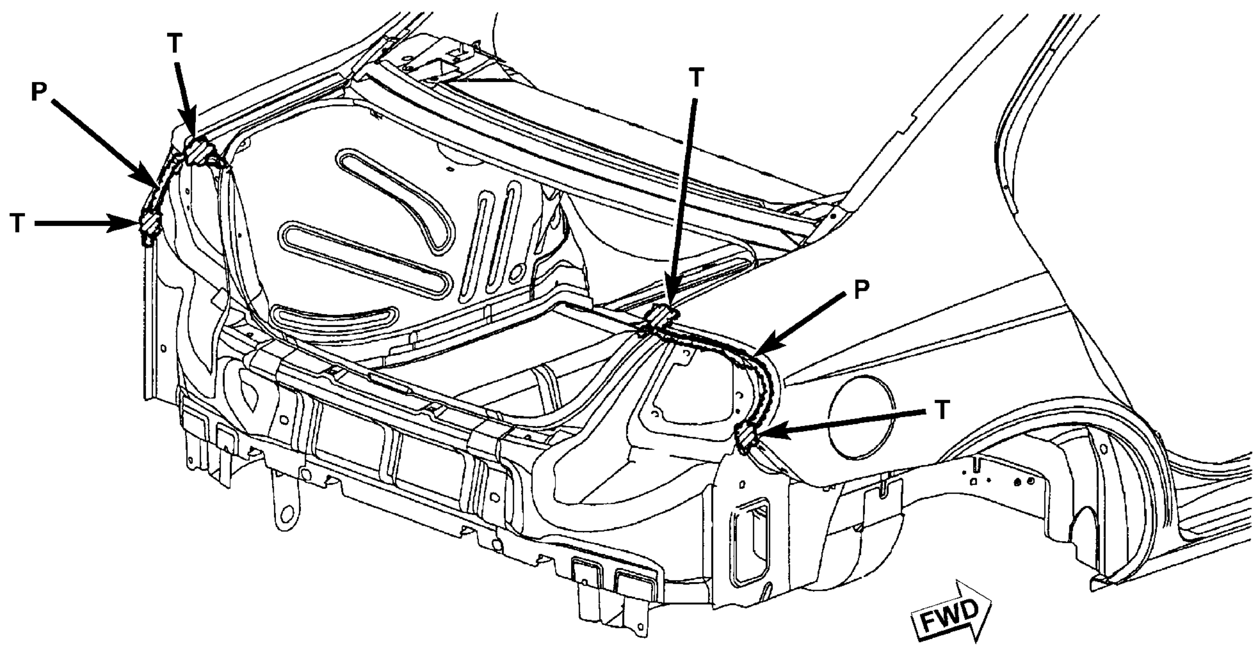
Fig. 11 FLOOR PAN AND REAR INNER (LEFT) WHEELHOUSE

P = PUMPABLE
T = THUMBGRADE



NOTE: BRUSHED SEAL THICKNESS MINIMIZED & KEPT 10MM AWAY FROM TANGENT OF THE BODYSIDE APERTURE.

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Fig. 12 TAIL LAMP AREA

SEALER LOCATIONS (Continued)

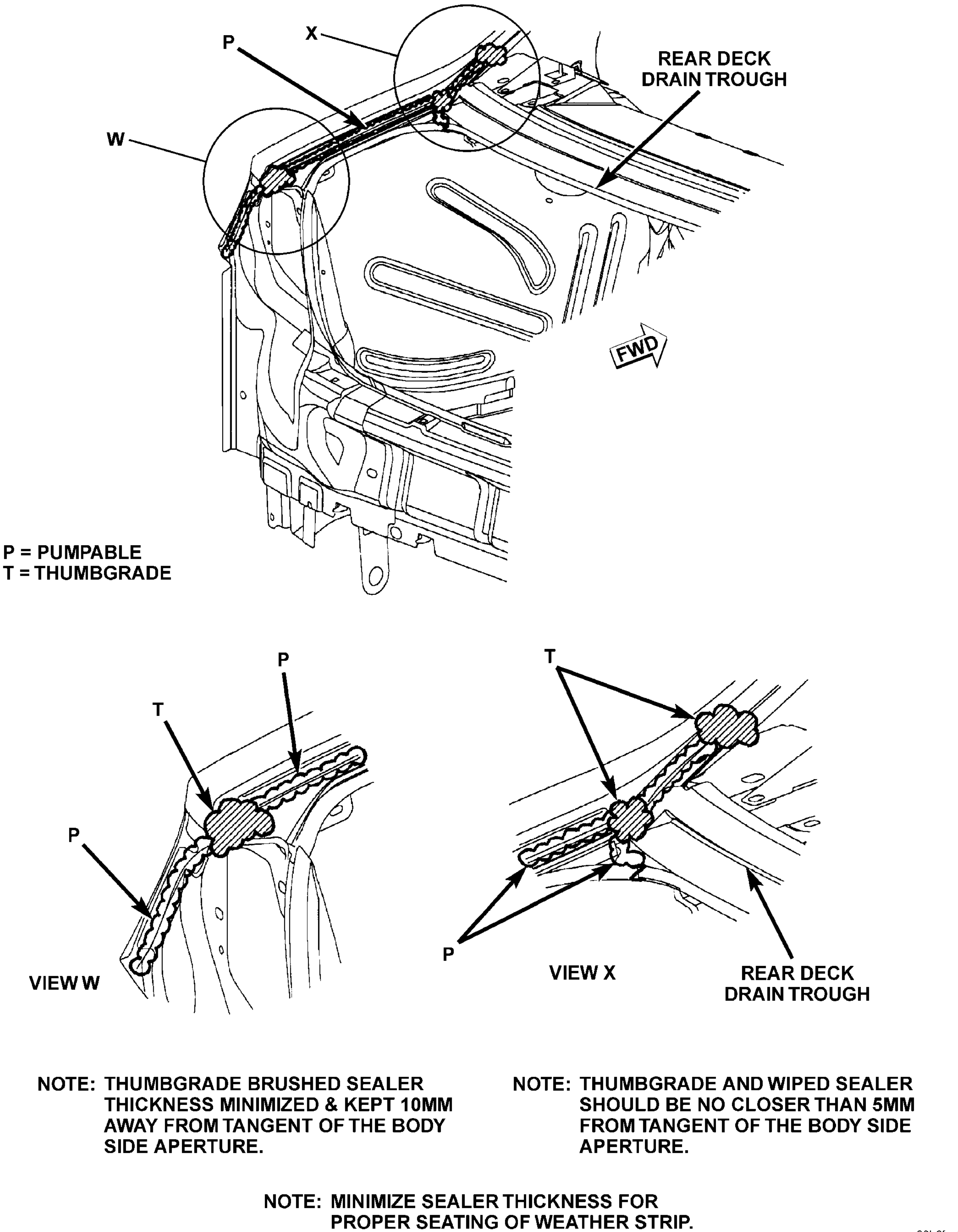

Fig. 13 TRUNK OPENING AREA

SEALER LOCATIONS (Continued)

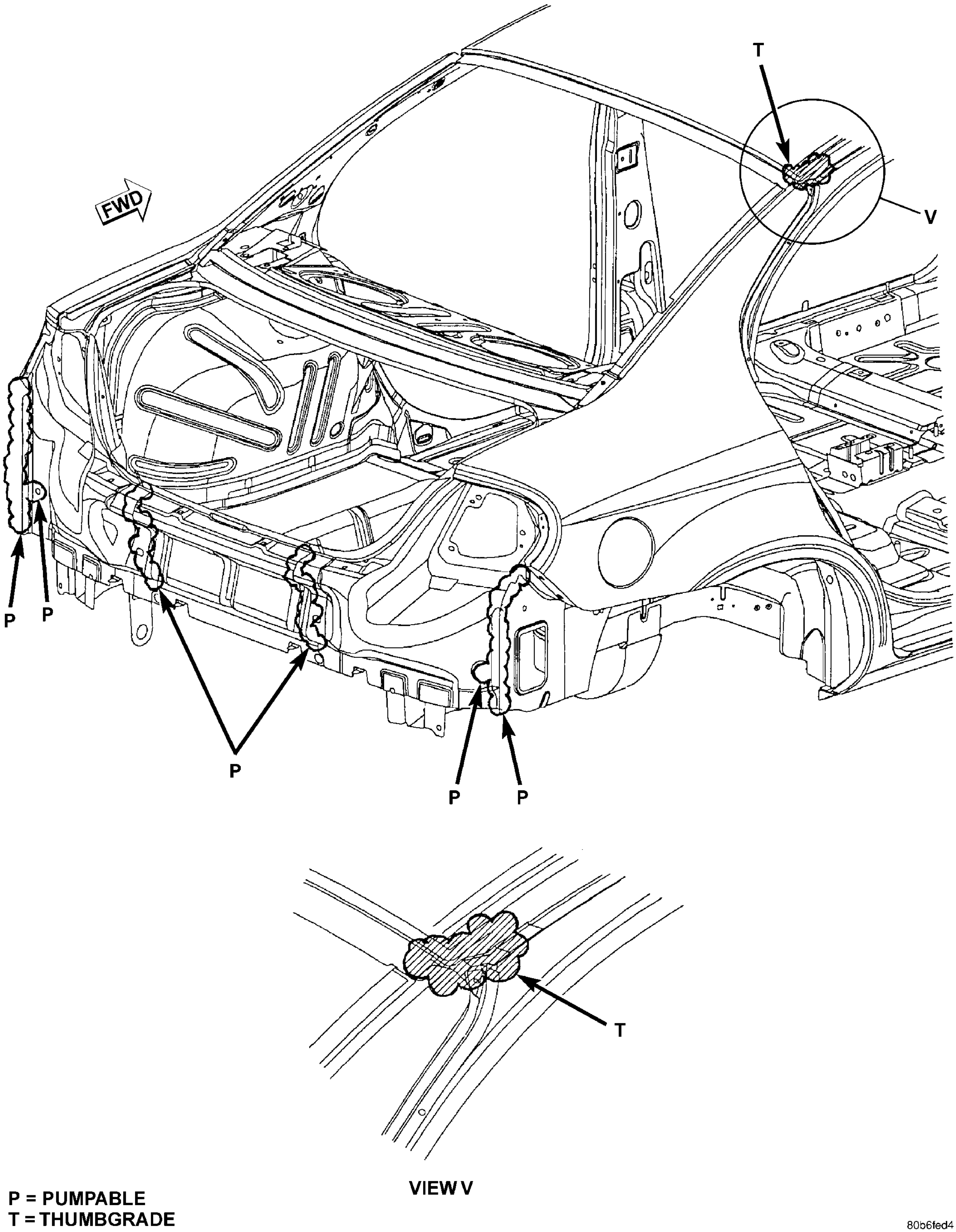

Fig. 14 TRUNK AREA

SEALER LOCATIONS (Continued)

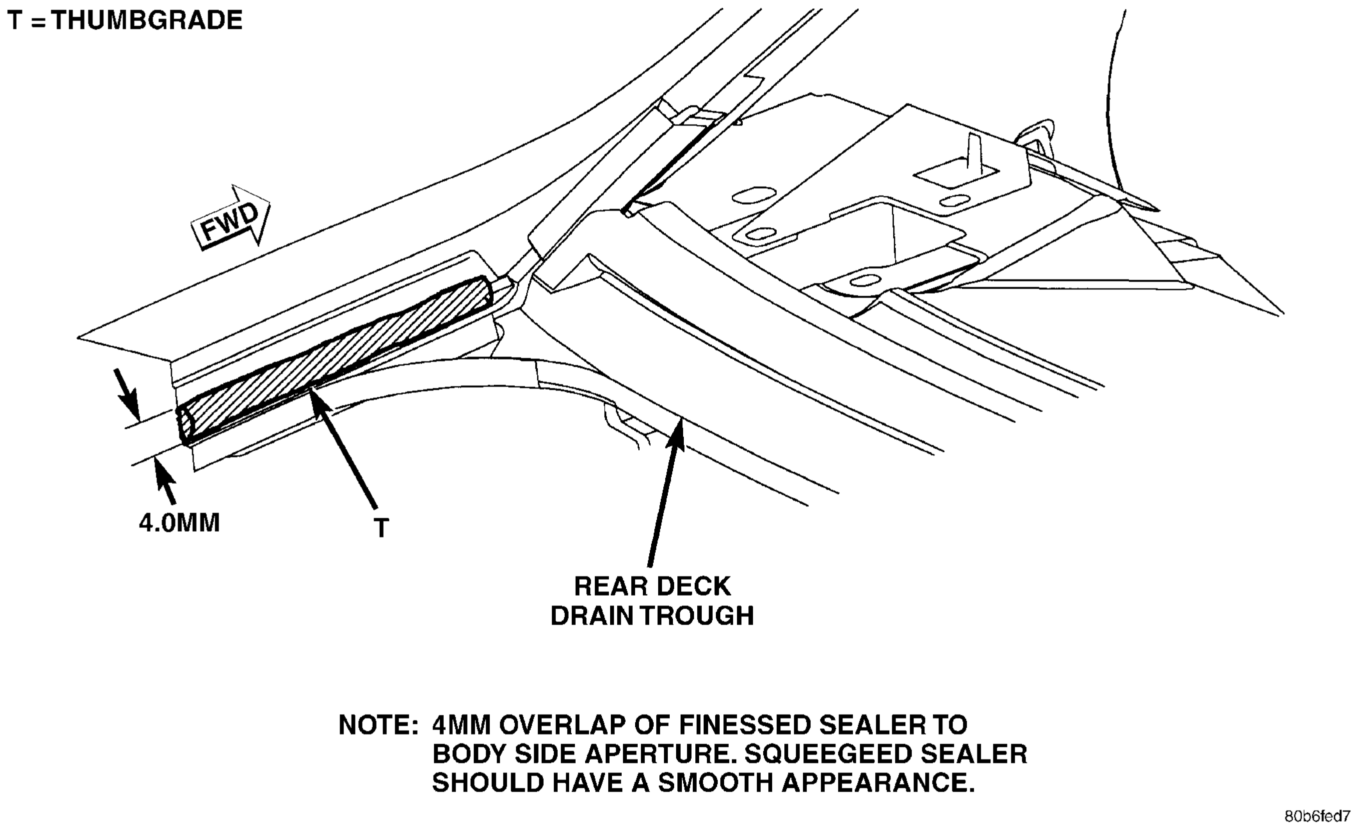

Fig. 15 TRUNK TROUGH AREA

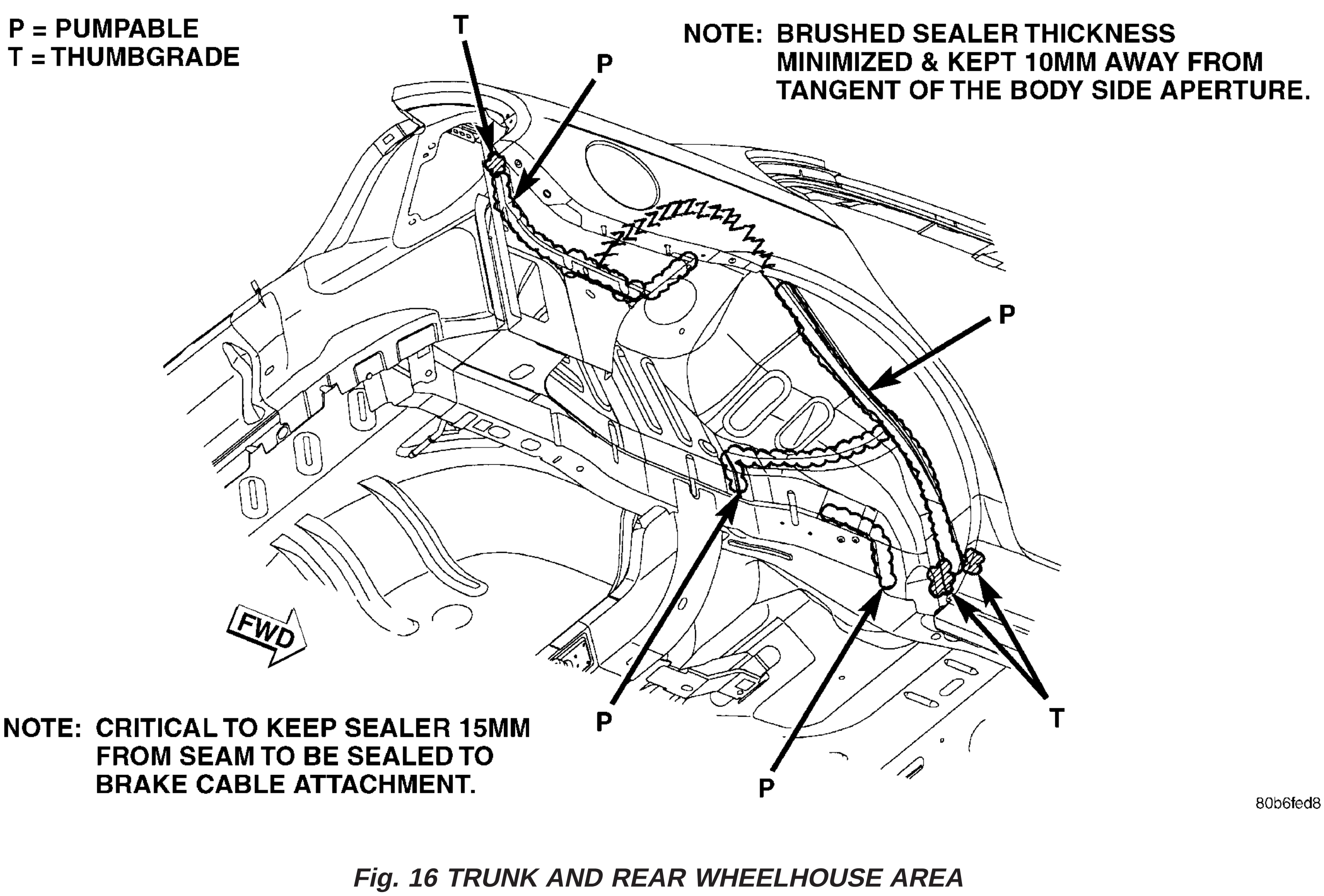

Fig. 16 TRUNK AND REAR WHEELHOUSE AREA

STRUCTURAL ADHESIVE LOCATIONS

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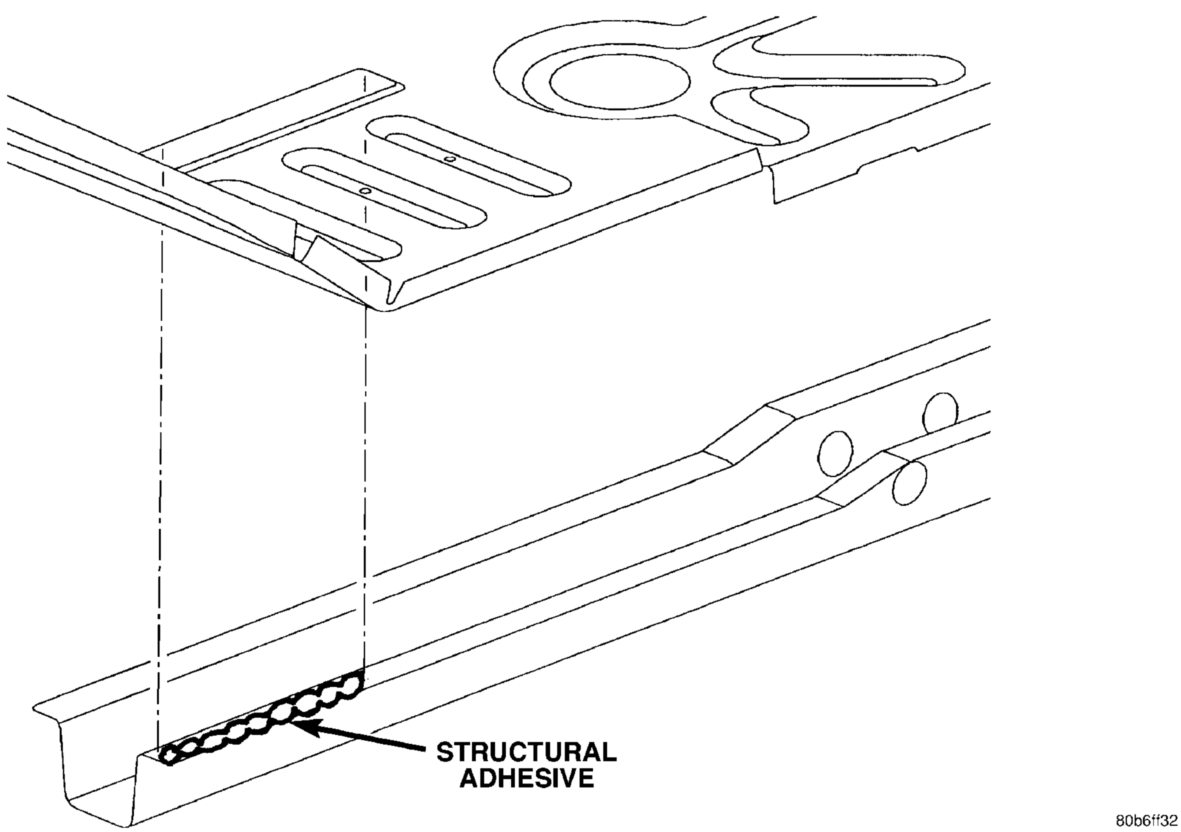

Fig. 17 RAIL TO FRONT FLOOR PAN

STRUCTURAL ADHESIVE LOCATIONS (Continued)

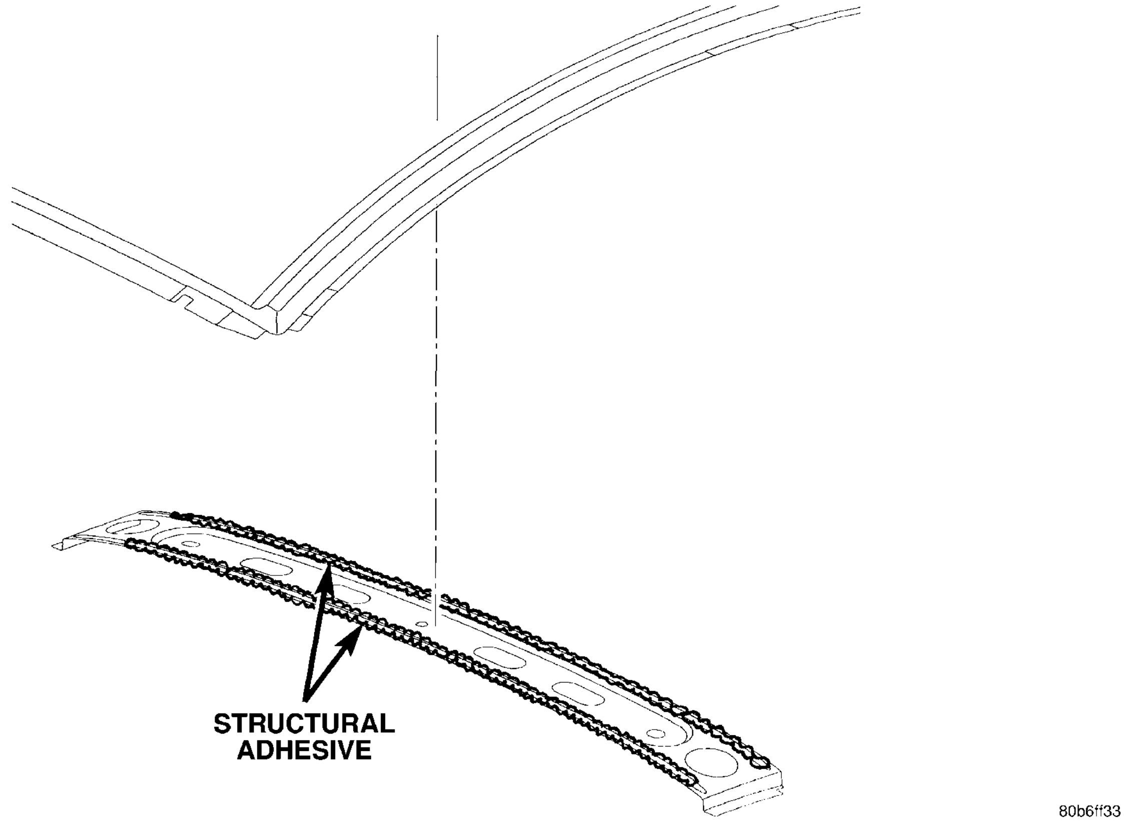

Fig. 18 ROOF BOW TO ROOF PANEL

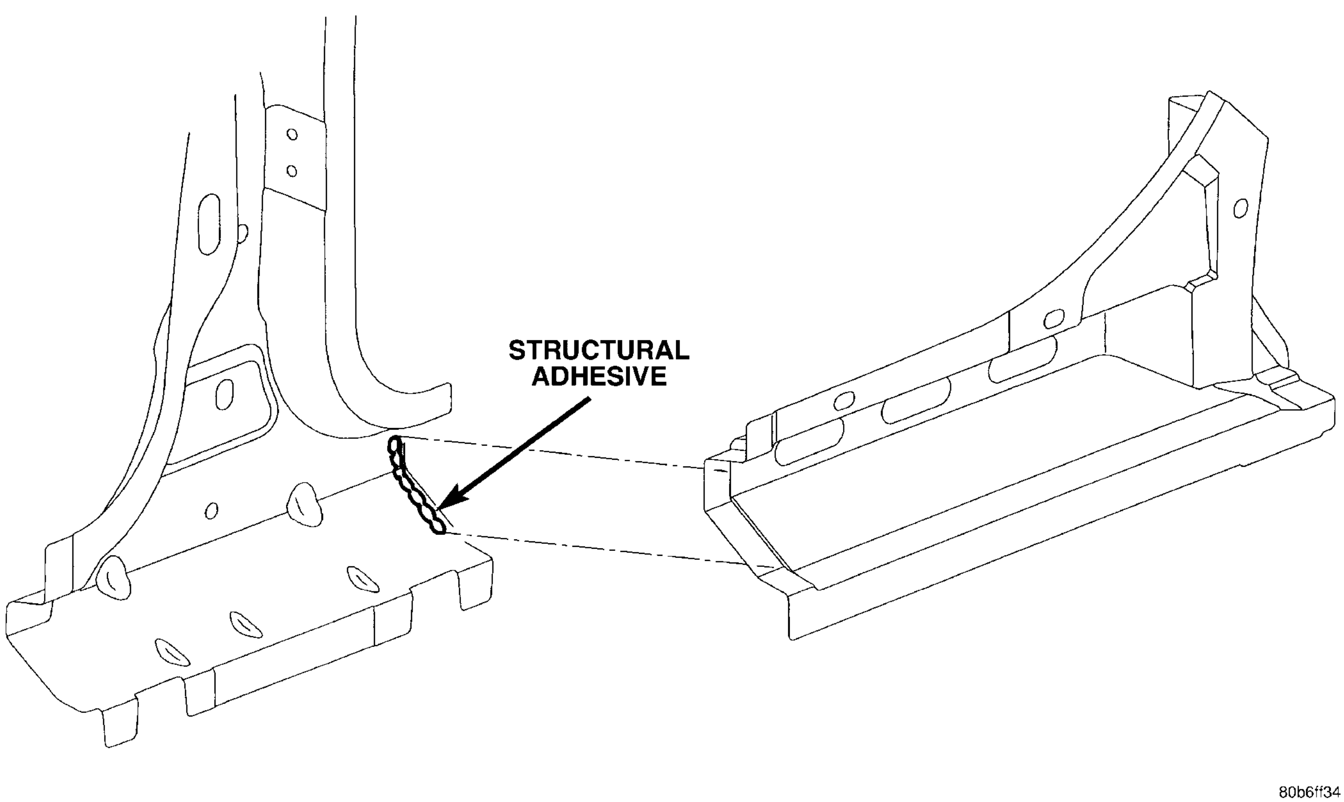

Fig. 19 CENTER PILLAR TO EXTENSION

STRUCTURAL ADHESIVE LOCATIONS (Continued)

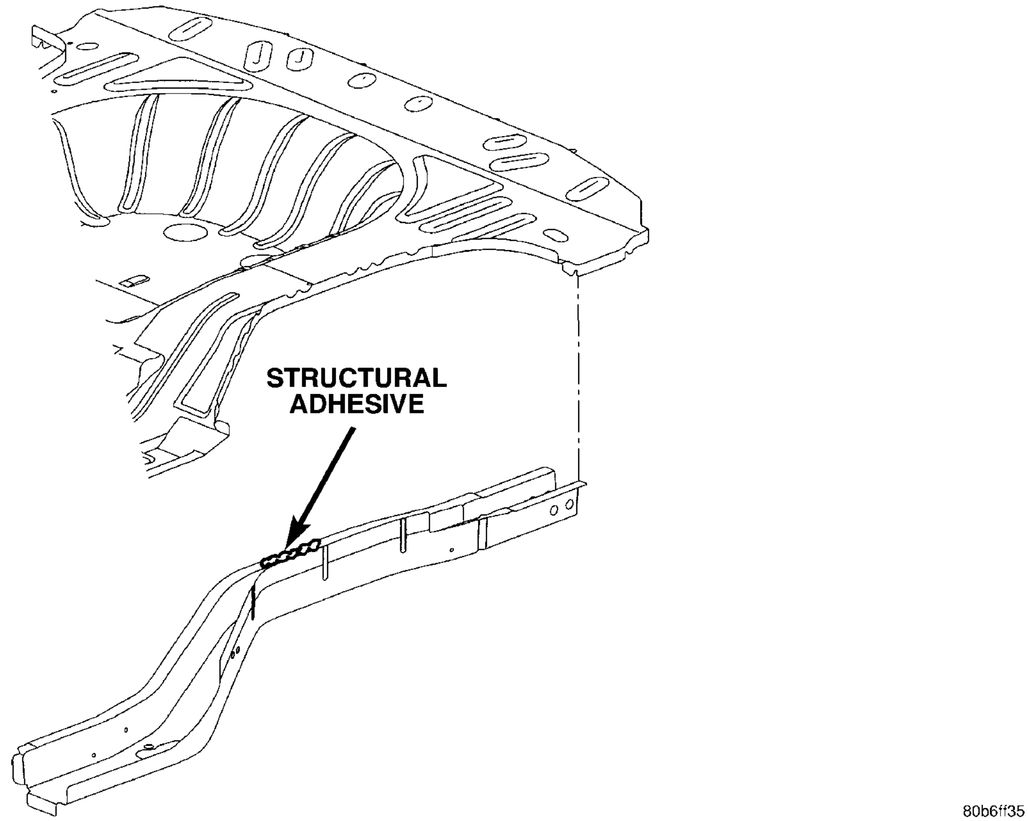

Fig. 20 RAIL TO REAR FLOOR PAN

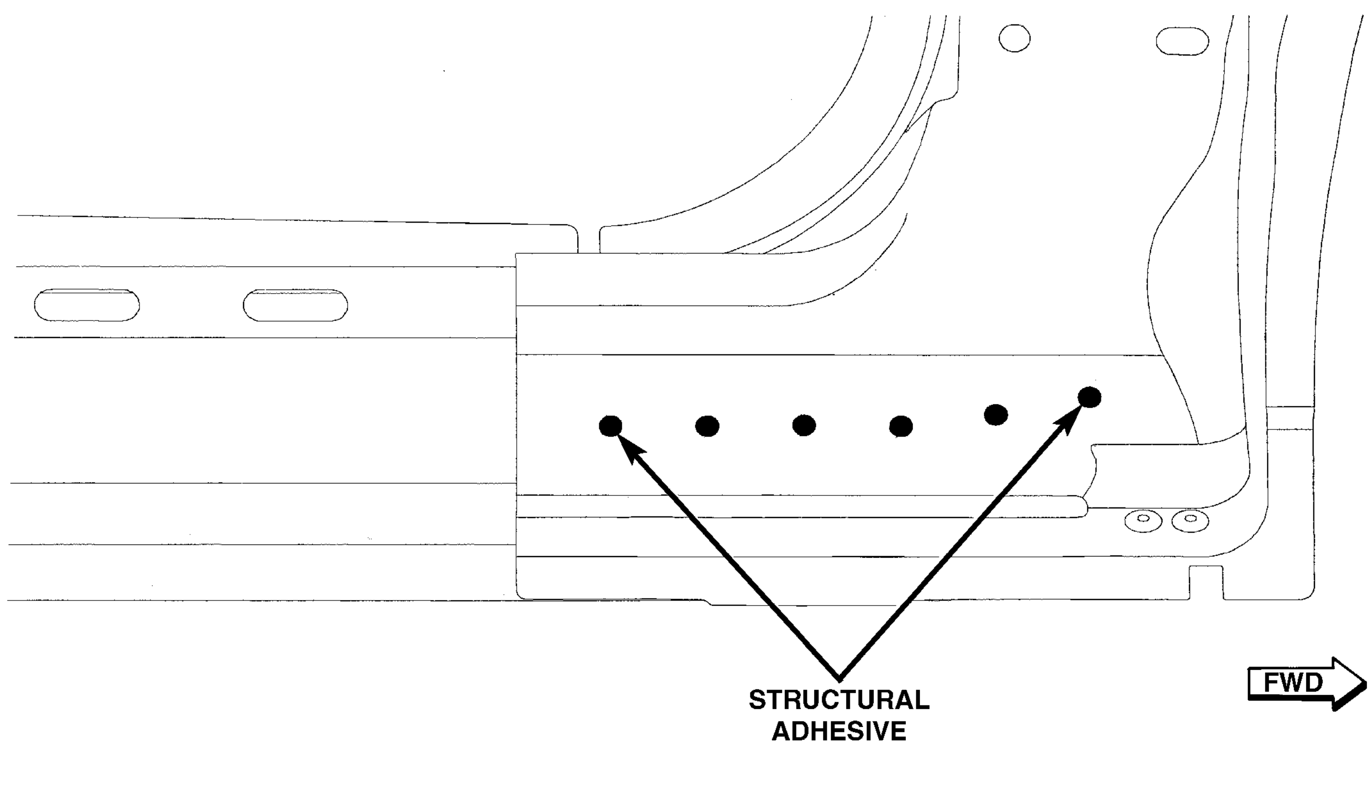

Fig. 21 DYNAMIC SIDE IMPACT REINFORCEMENT TO FRONT HINGE PILLAR

WELD LOCATIONS

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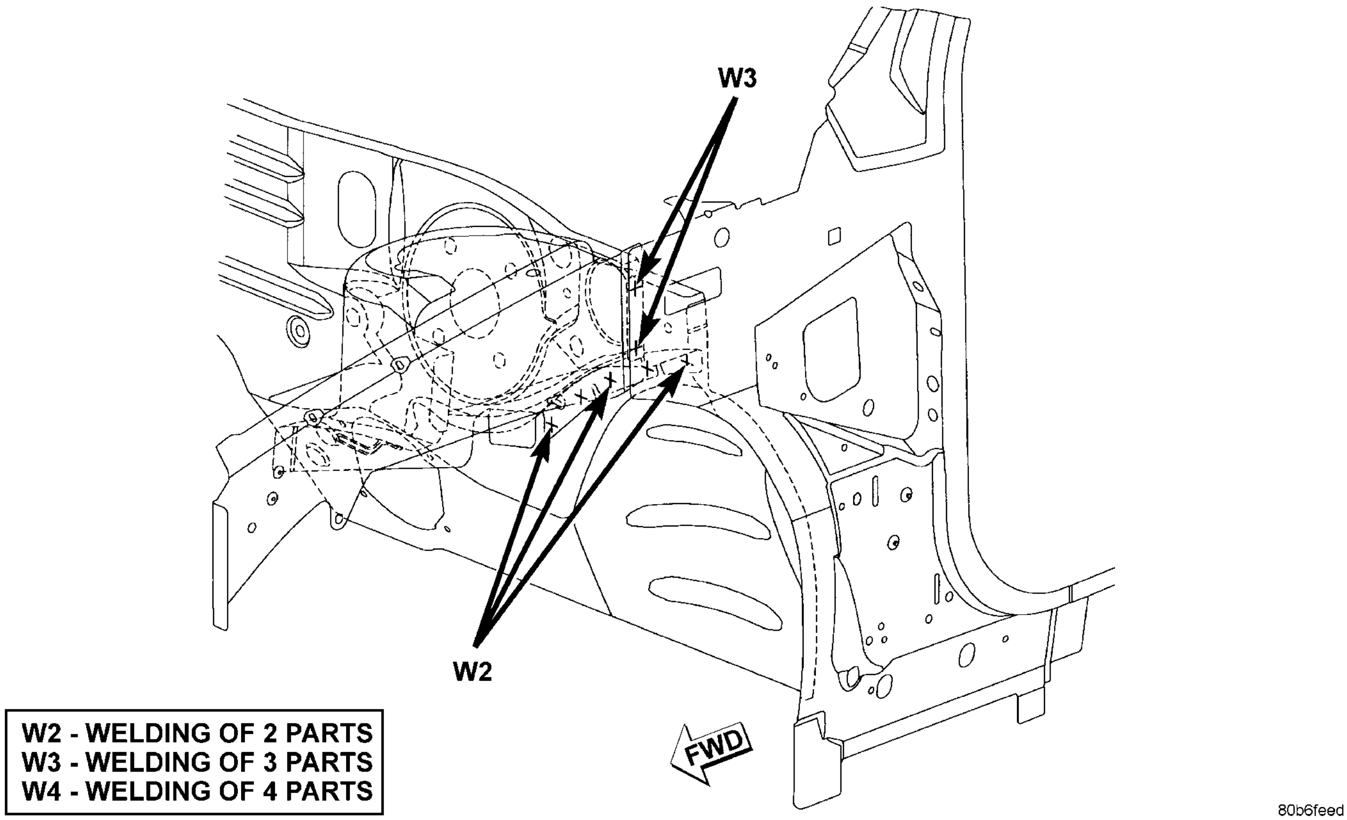


Fig. 22 FRONT SUSPENSION STRUT TOWER TO SIDE COWL AND DASH PANEL

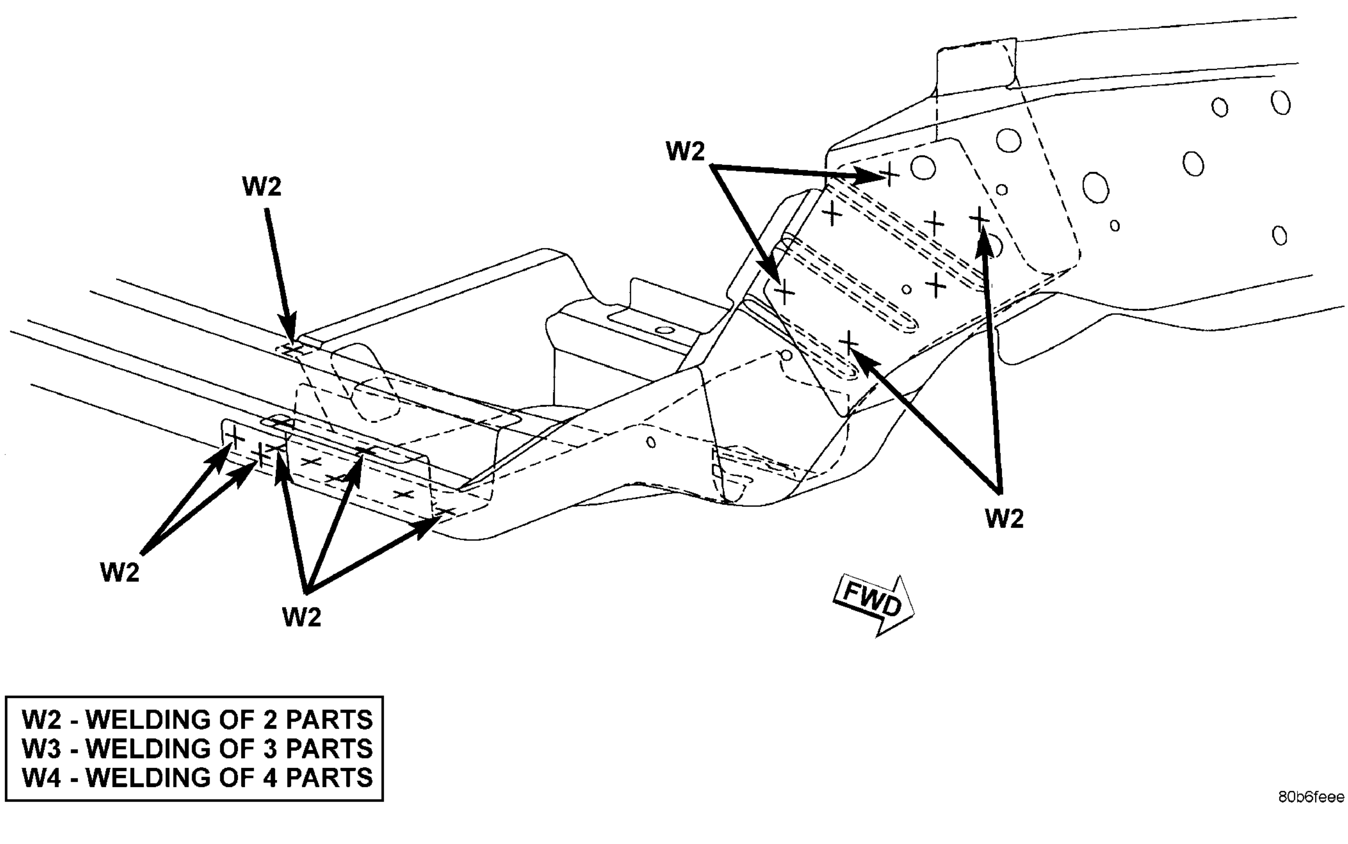


Fig. 23 FRONT SIDE COWL AND FRONT RAIL ASSEMBLY TO RAIL EXTENSION

WELD LOCATIONS (Continued)

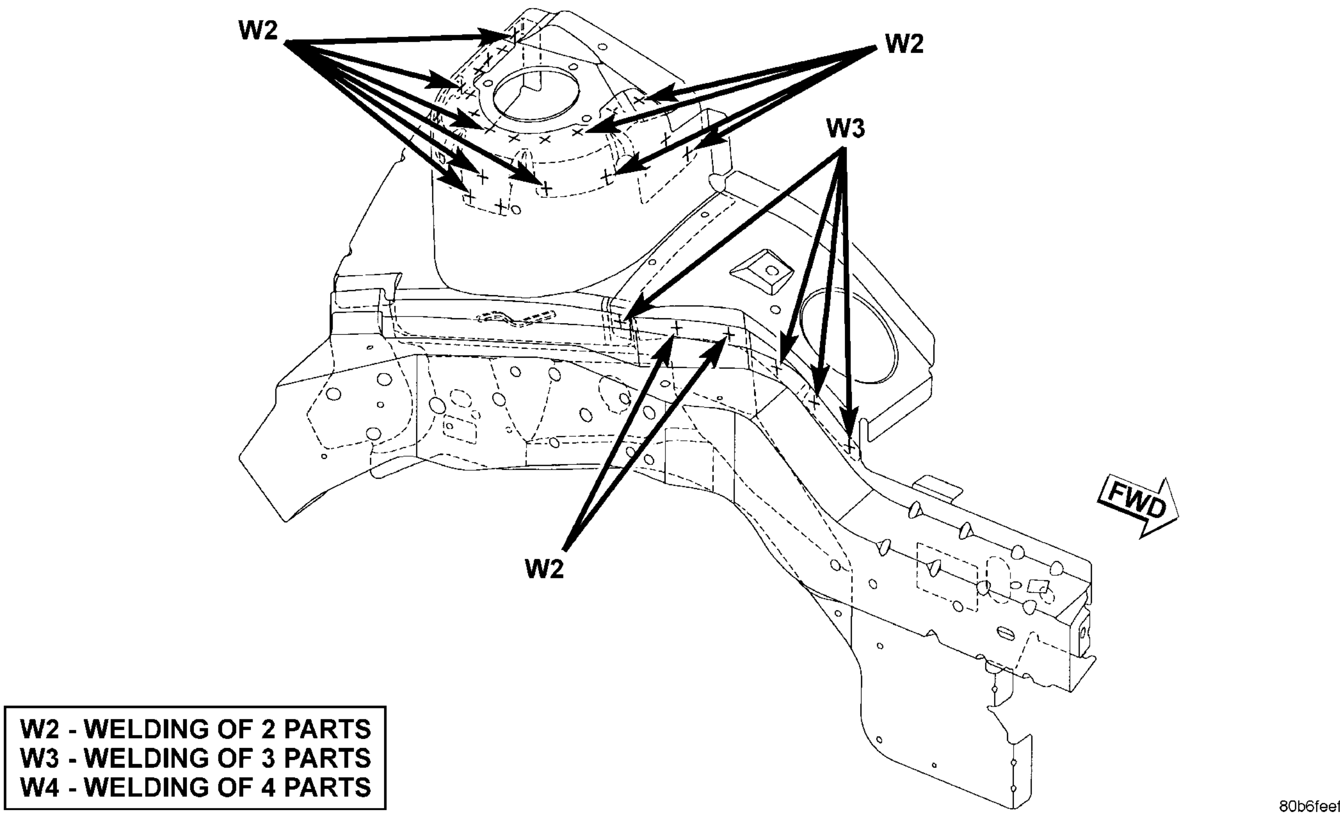


Fig. 24 FRONT SUSPENSION STRUT TOWER, FENDER SIDE SHIELD, SIDE RAIL AND REINFORCEMENTS

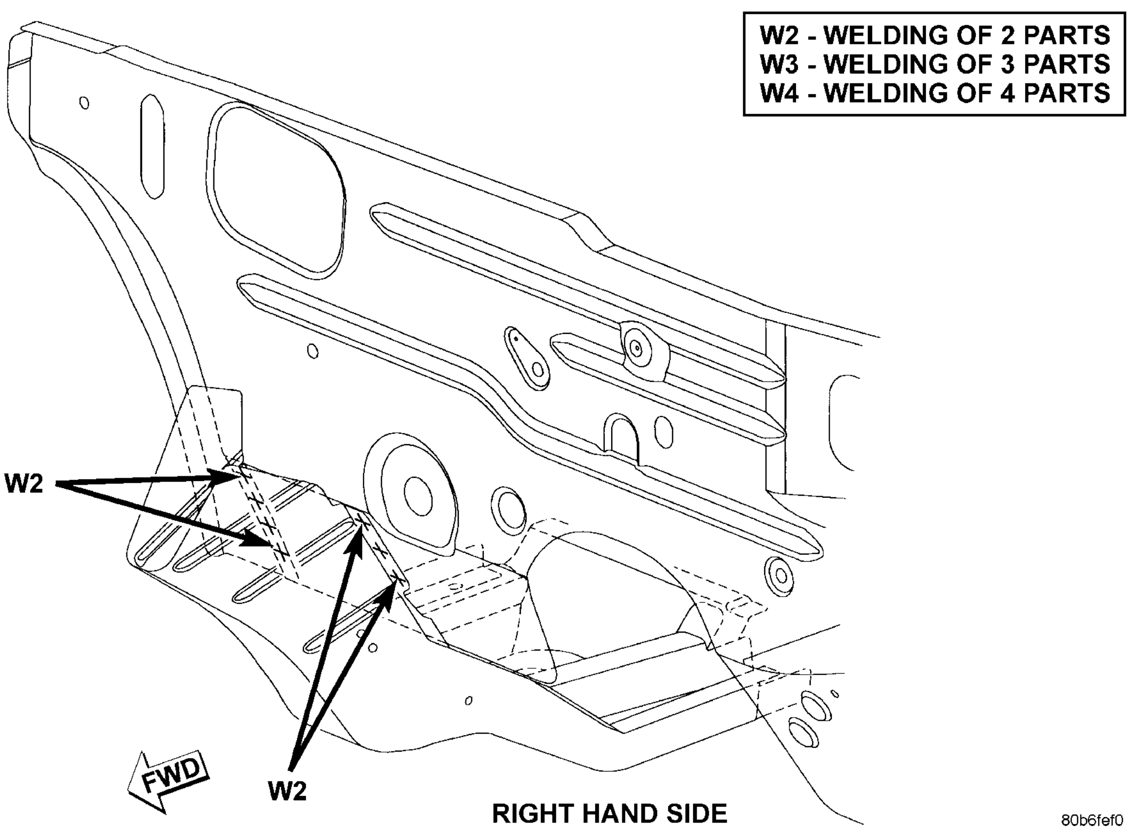


Fig. 25 FRONT SIDE RAIL ASSEMBLY, COWL SIDE TO DASH PANEL

WELD LOCATIONS (Continued)

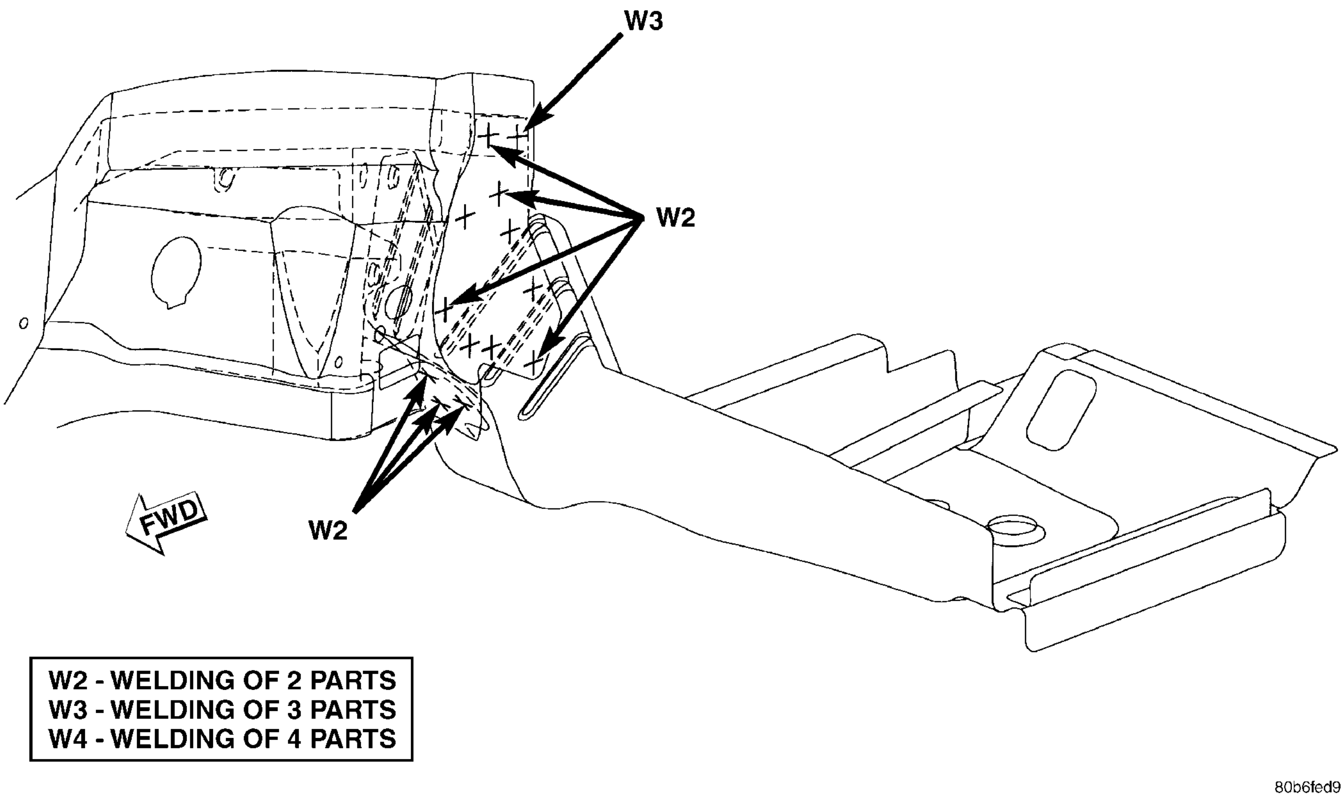


Fig. 26 FRONT SIDE RAIL TO REAR COWL SIDE

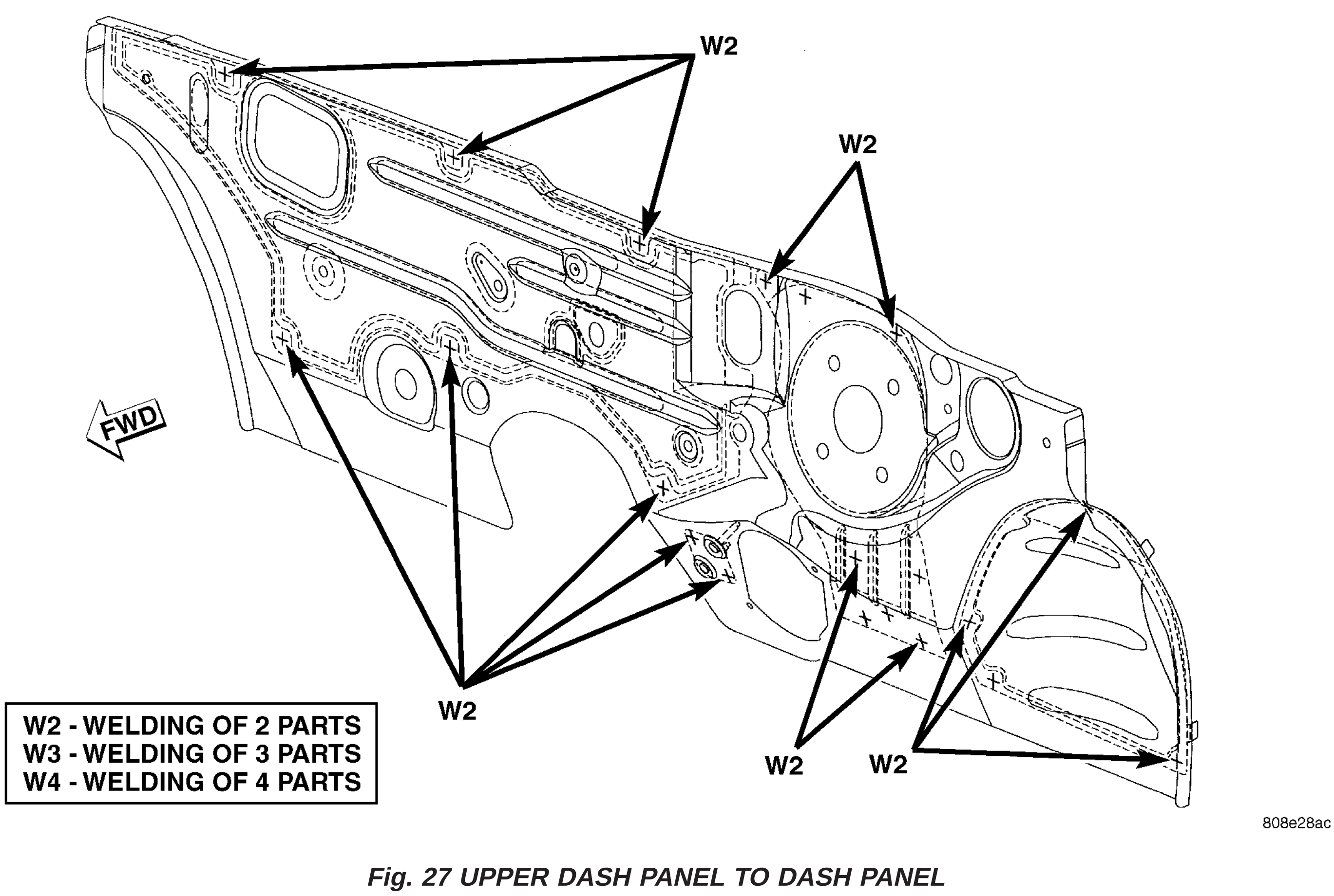


Fig. 27 UPPER DASH PANEL TO DASH PANEL

WELD LOCATIONS (Continued)

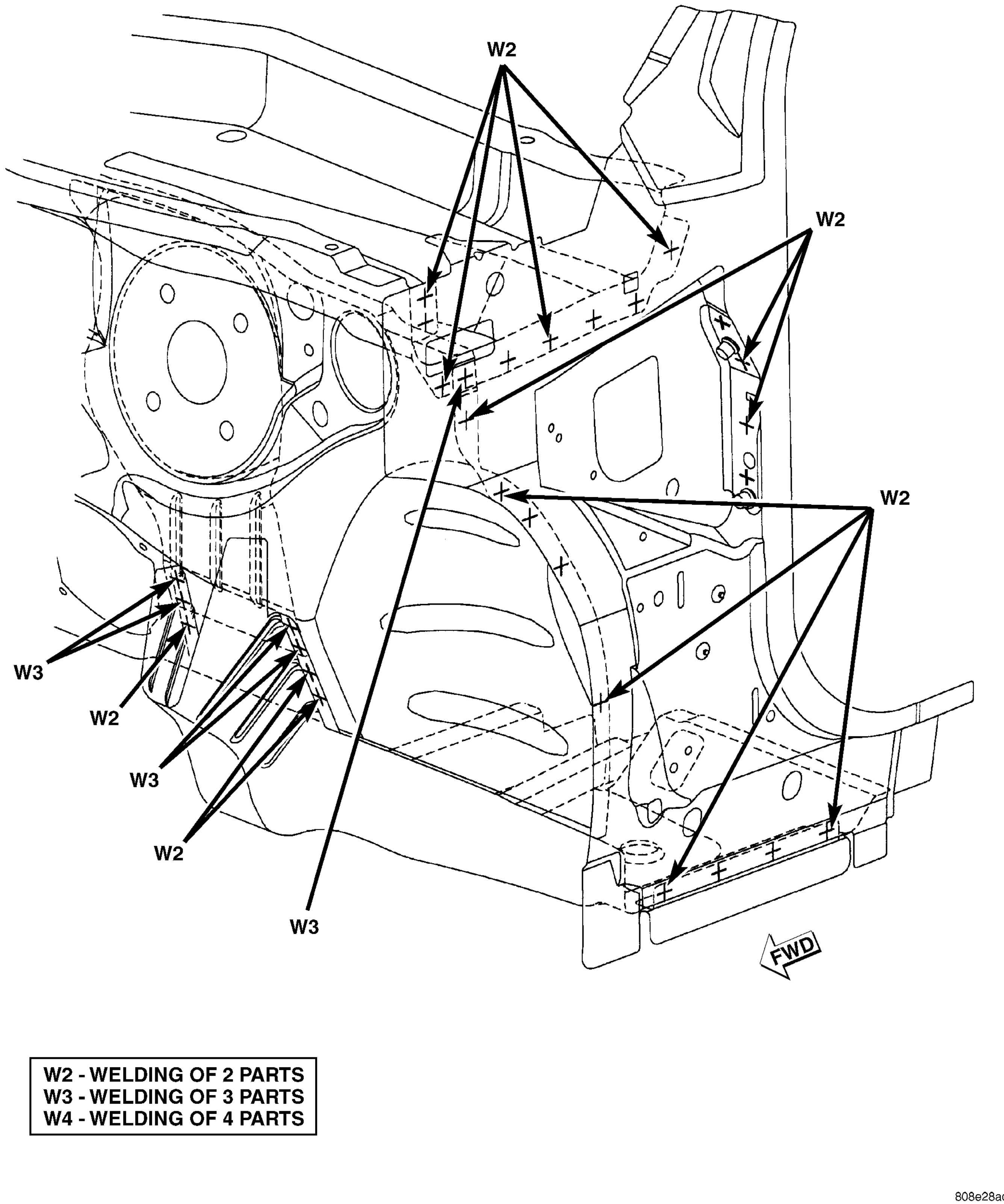


Fig. 28 COWL SIDE PANEL, PLENUM TO FRONT SIDE RAIL

WELD LOCATIONS (Continued)

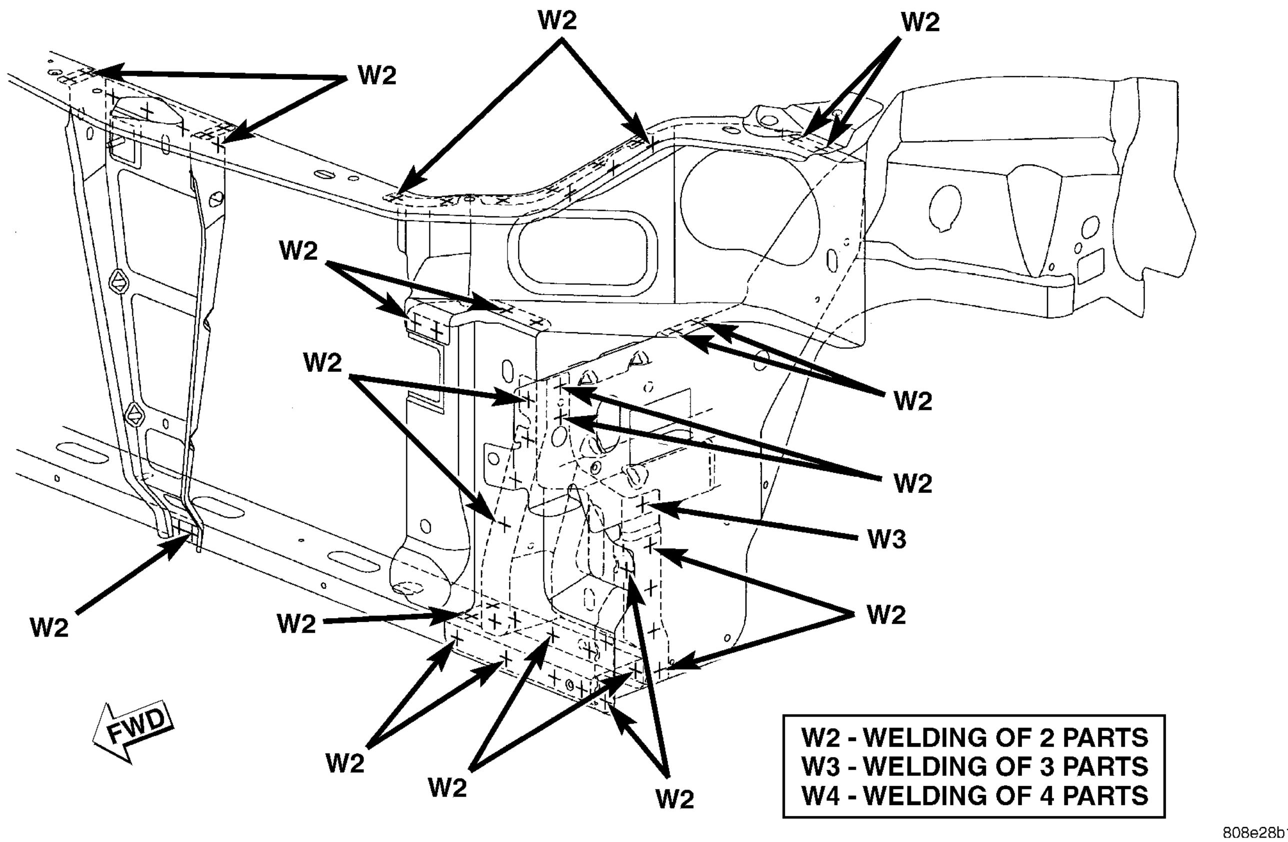


Fig. 29 RADIATOR CLOSURE ASSEMBLY TO FRONT SIDE RAIL

WELD LOCATIONS (Continued)

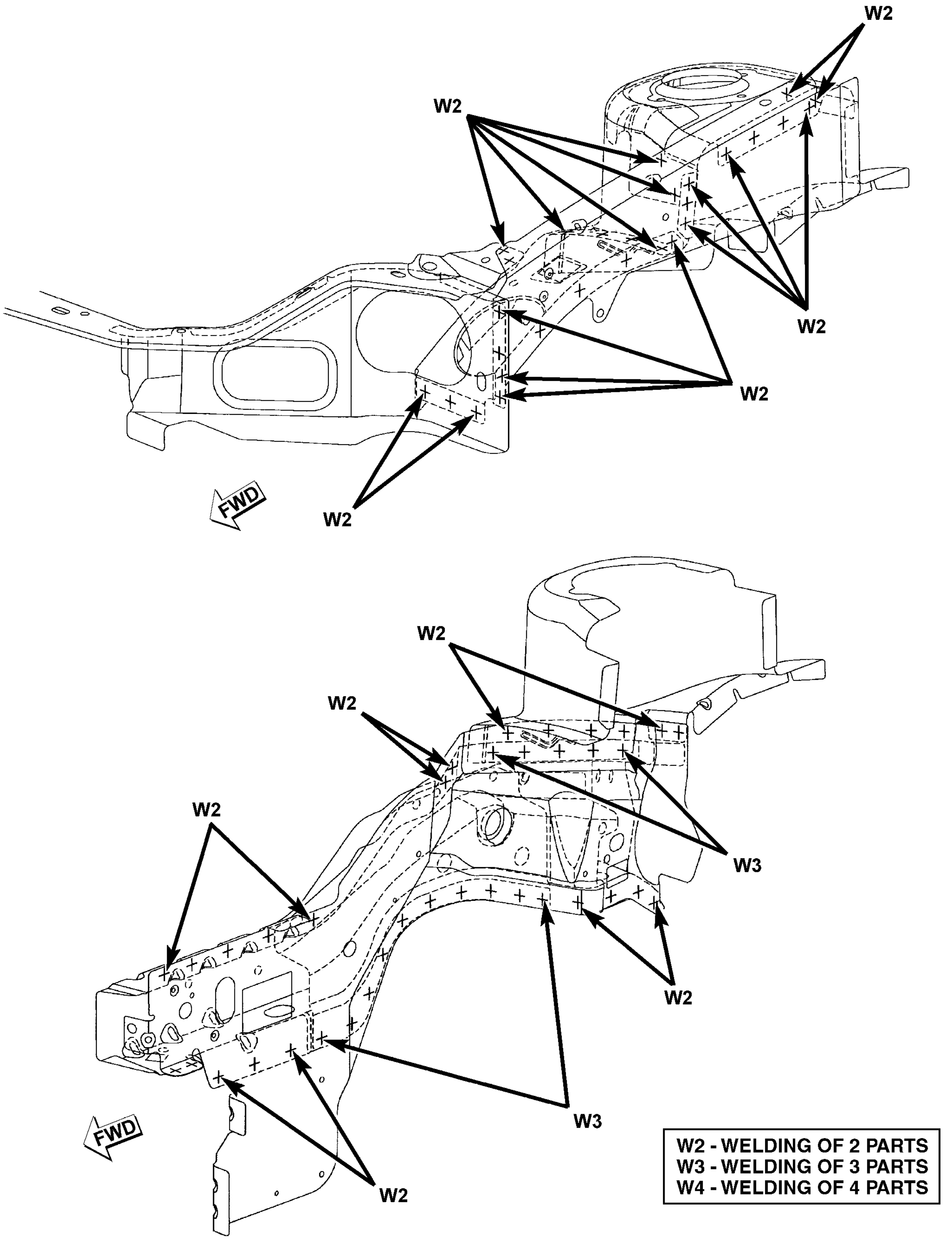


Fig. 30 FRONT FENDER SIDE SHIELD, SIDE RAIL AND FRONT SUSPENSION STRUT TOWER

WELD LOCATIONS (Continued)

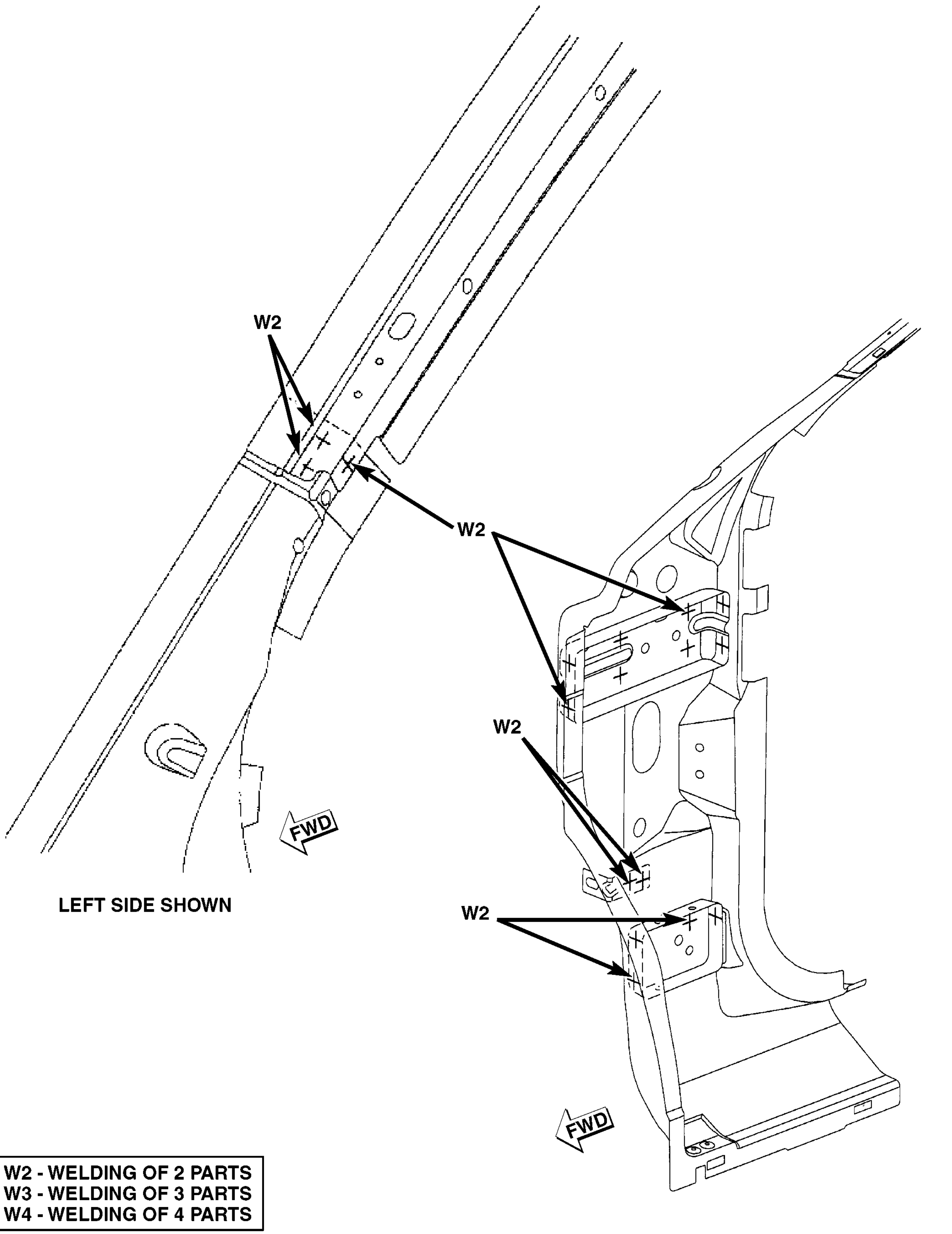


Fig. 31 FRONT HINGE PILLAR ASSEMBLY

WELD LOCATIONS (Continued)

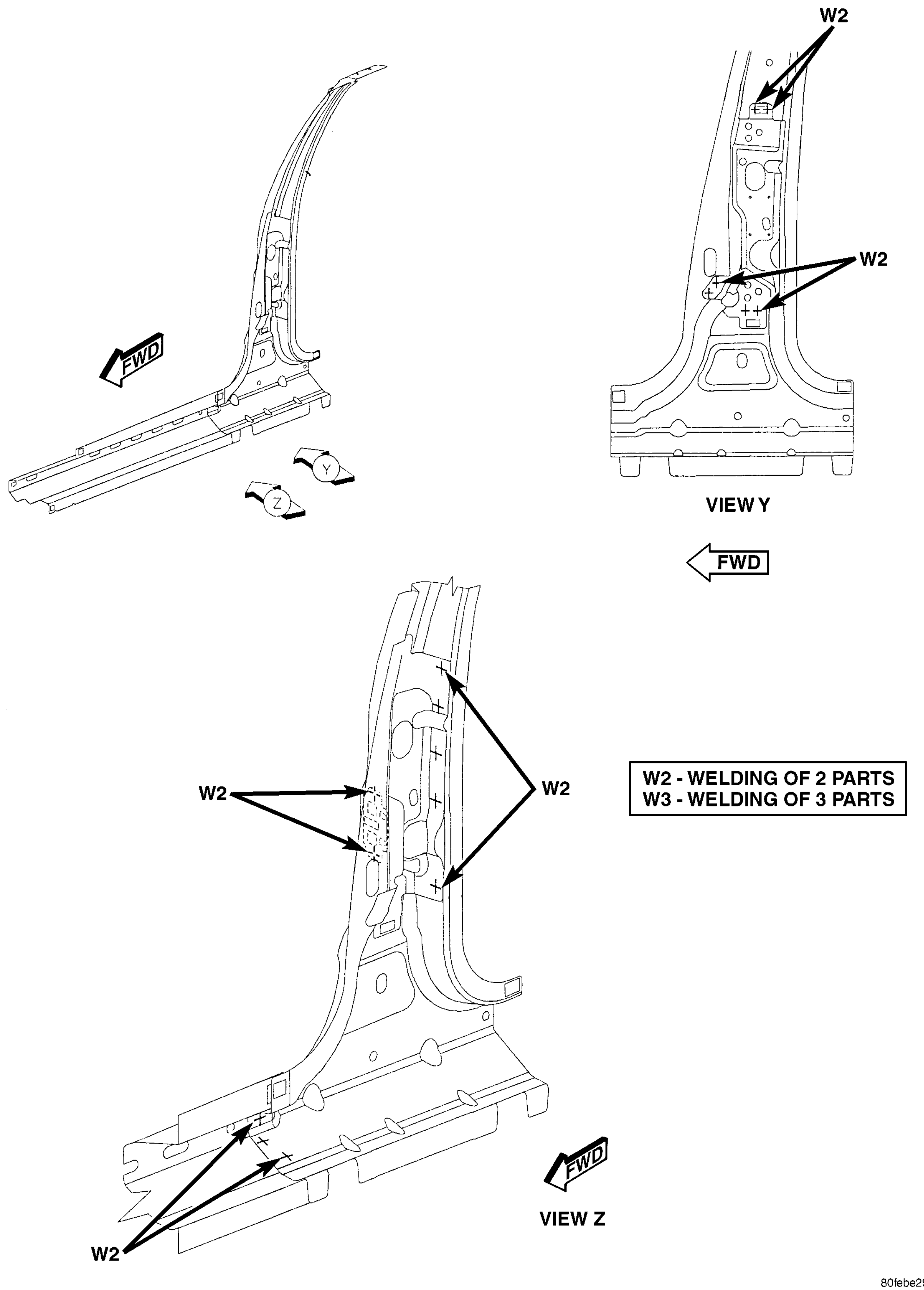


Fig. 32 CENTER PILLAR ASSEMBLY

WELD LOCATIONS (Continued)

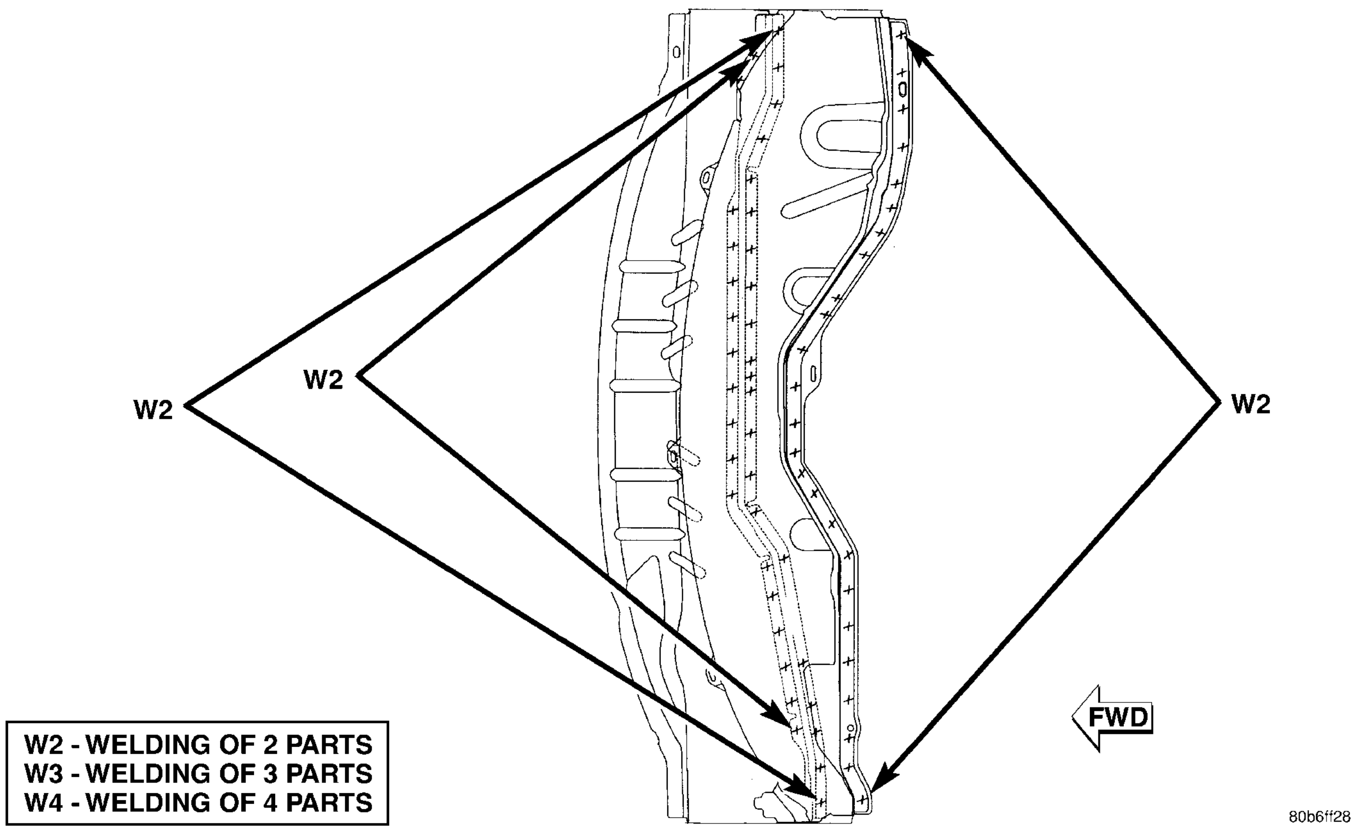


Fig. 33 COWL PLENUM AND REINFORCEMENT TO COWL TOP PANEL

WELD LOCATIONS (Continued)

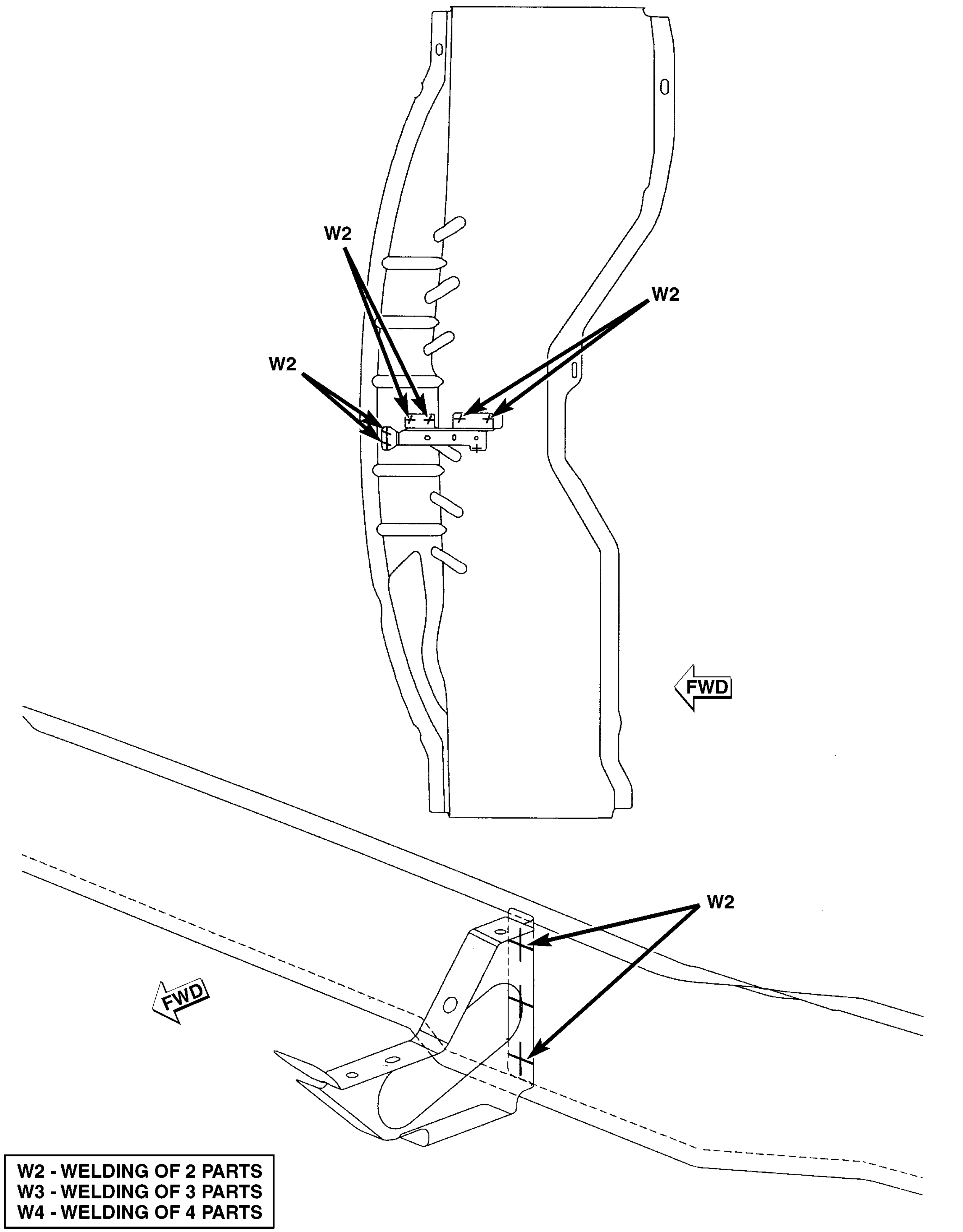


Fig. 34 COWL PLENUM REINFORCEMENT GUSSET TO COWL PLENUM PANEL

WELD LOCATIONS (Continued)

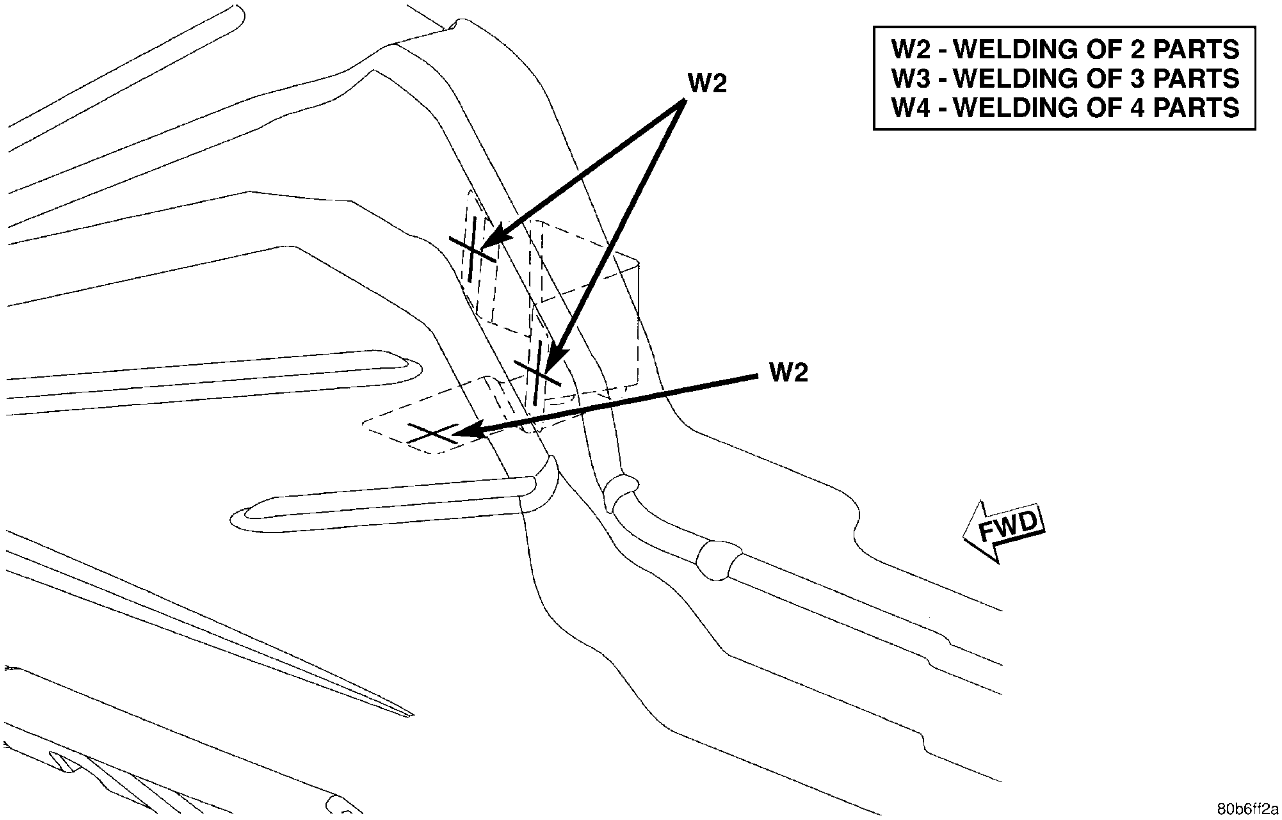


Fig. 35 COWL PLENUM A/C BRACKET TO COWL PLENUM PANEL

WELD LOCATIONS (Continued)

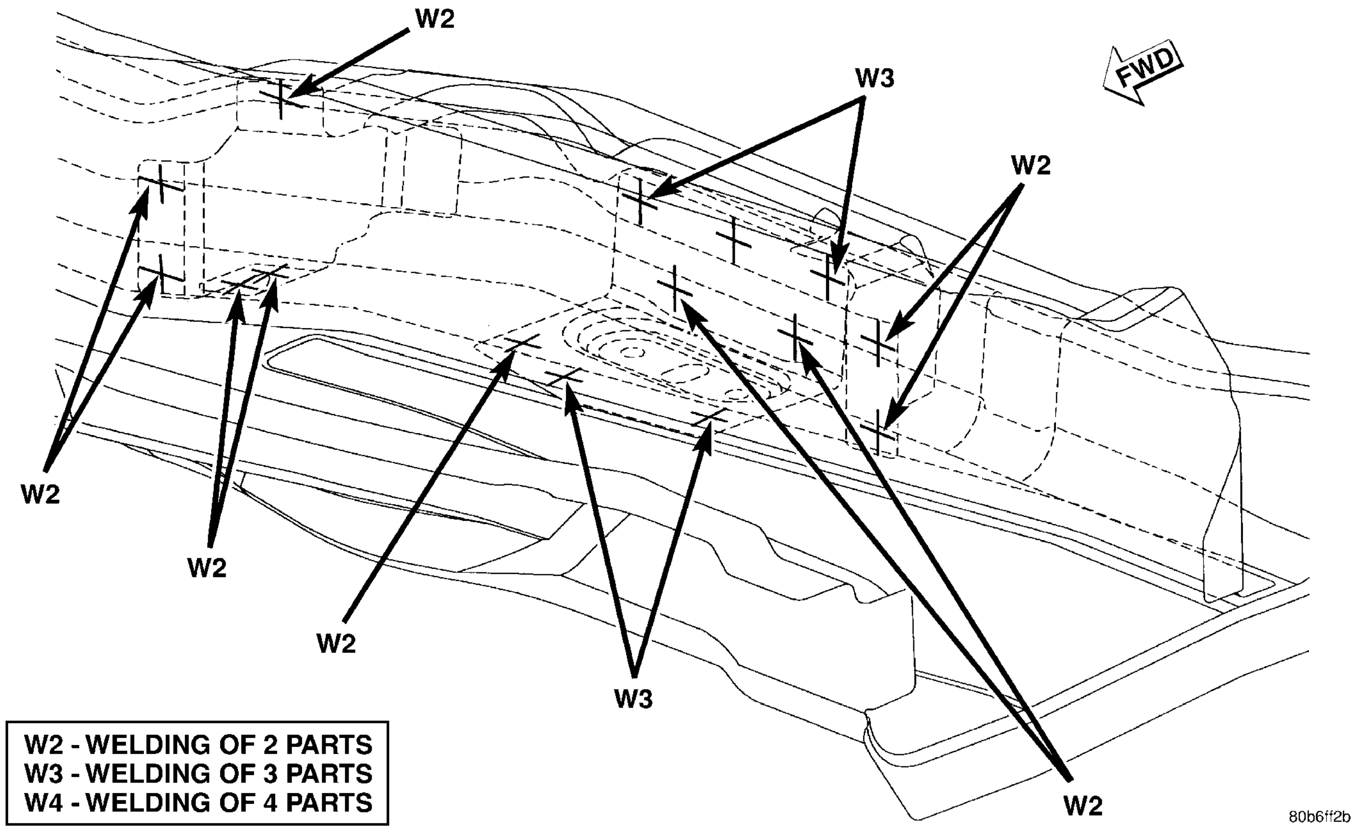


Fig. 36 COWL PLENUM BRAKE PEDAL SUPPORT BRACKET AND REINFORCEMENT, TO COWL PLENUM PANEL AND REINFORCEMENT

WELD LOCATIONS (Continued)

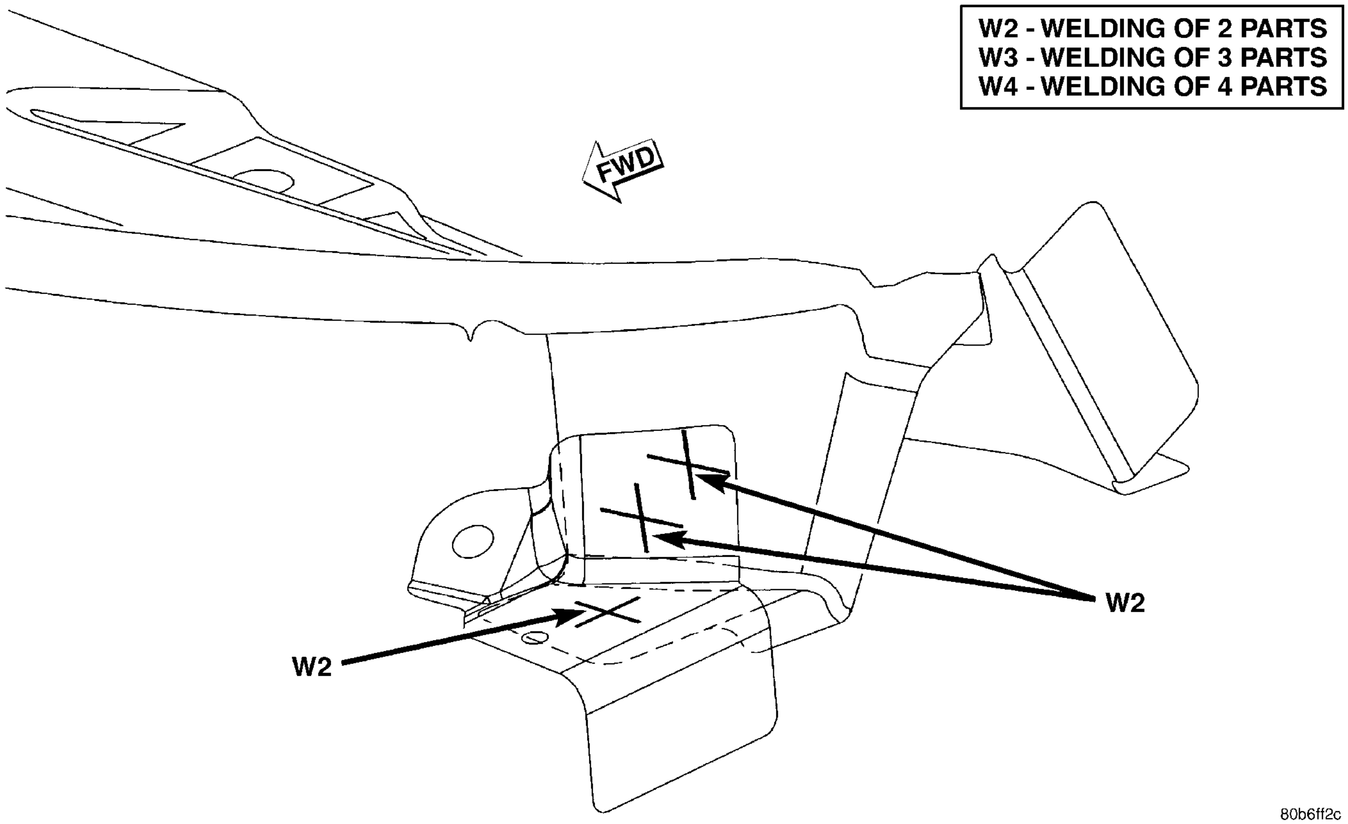


Fig. 37 WIPER MOTOR BRACKET TO COWL TOP PANEL

WELD LOCATIONS (Continued)

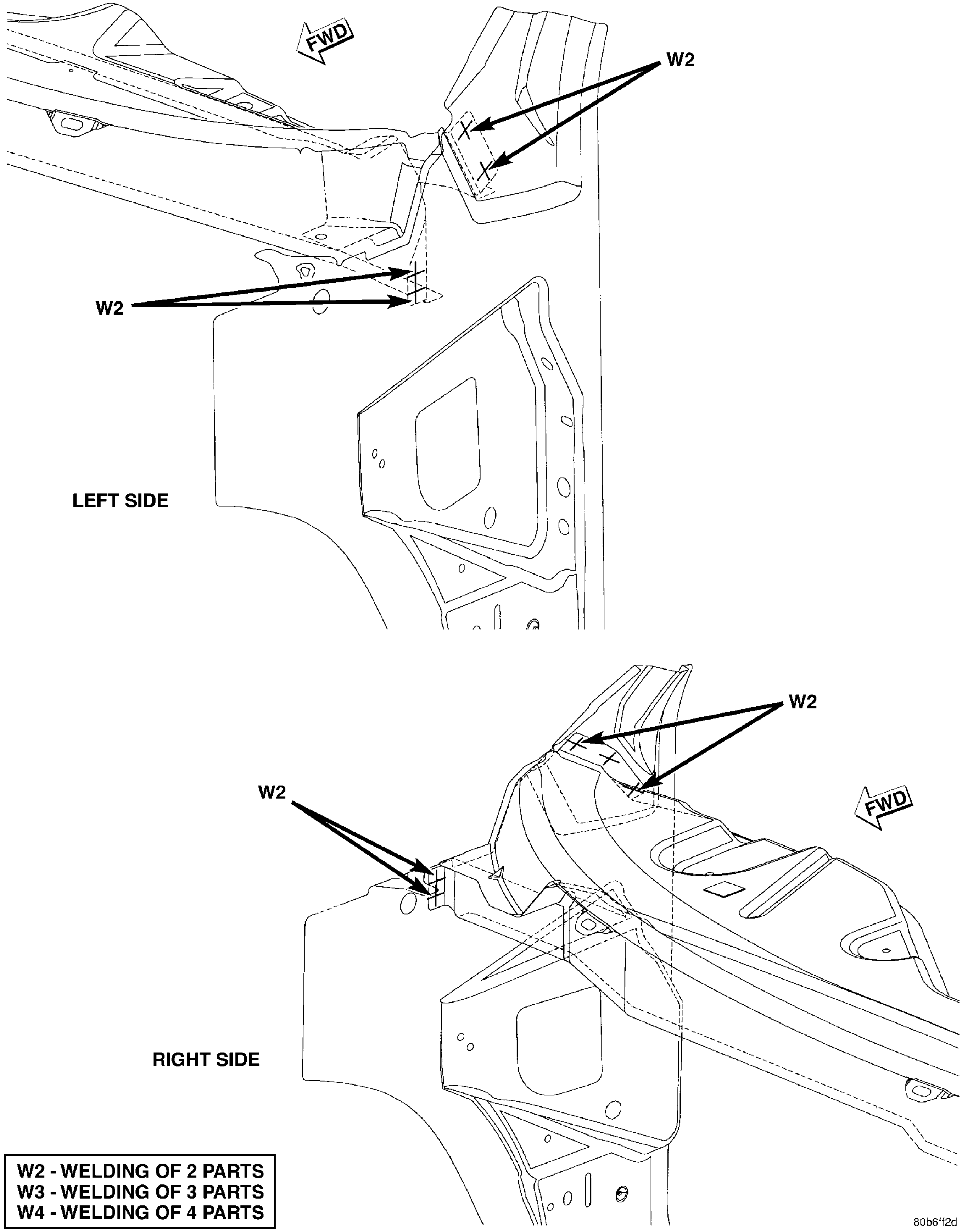


Fig. 38 COWL TOP PANEL AND REINFORCEMENT TO COWL SIDE PANELS

WELD LOCATIONS (Continued)

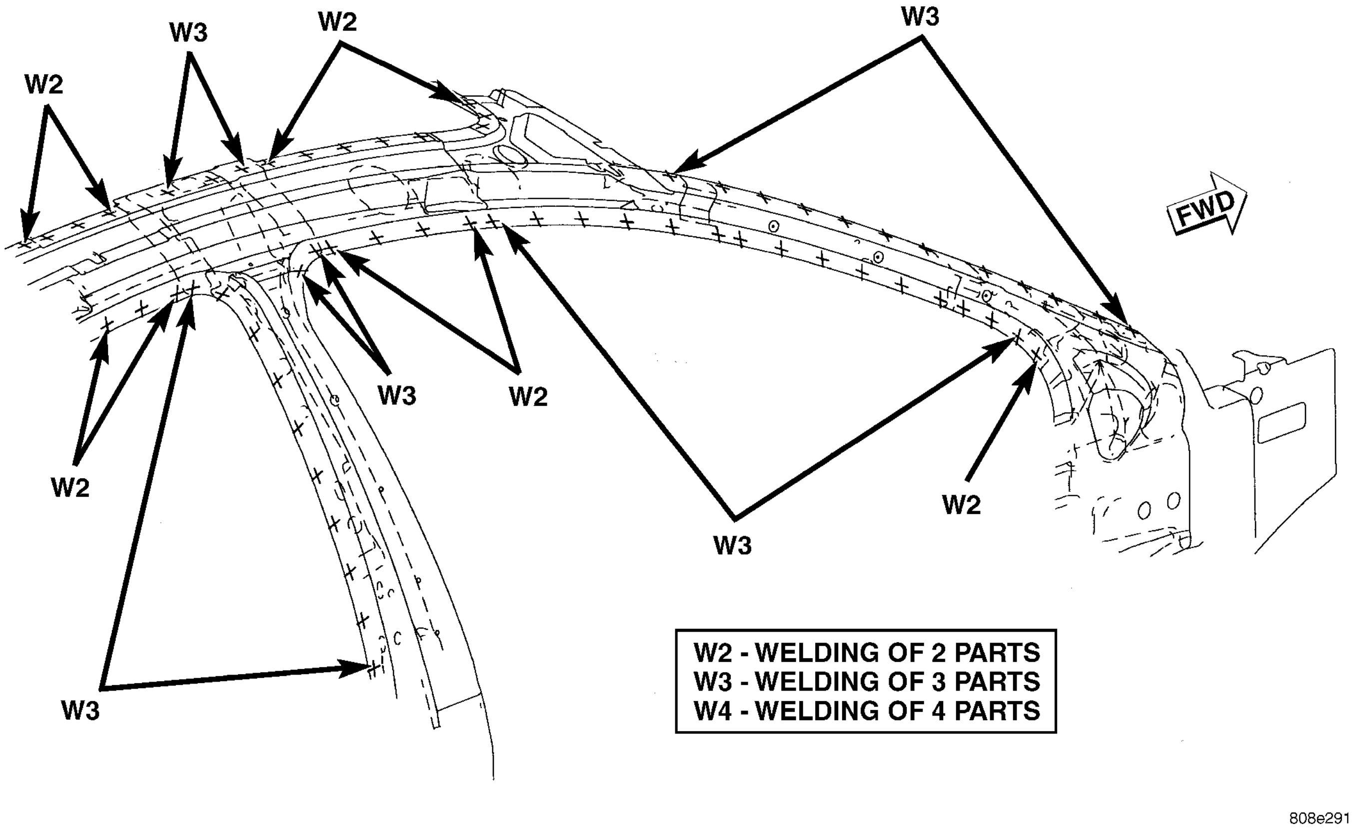


Fig. 39 INNER BODY SIDE TO OUTER BODY SIDE

WELD LOCATIONS (Continued)

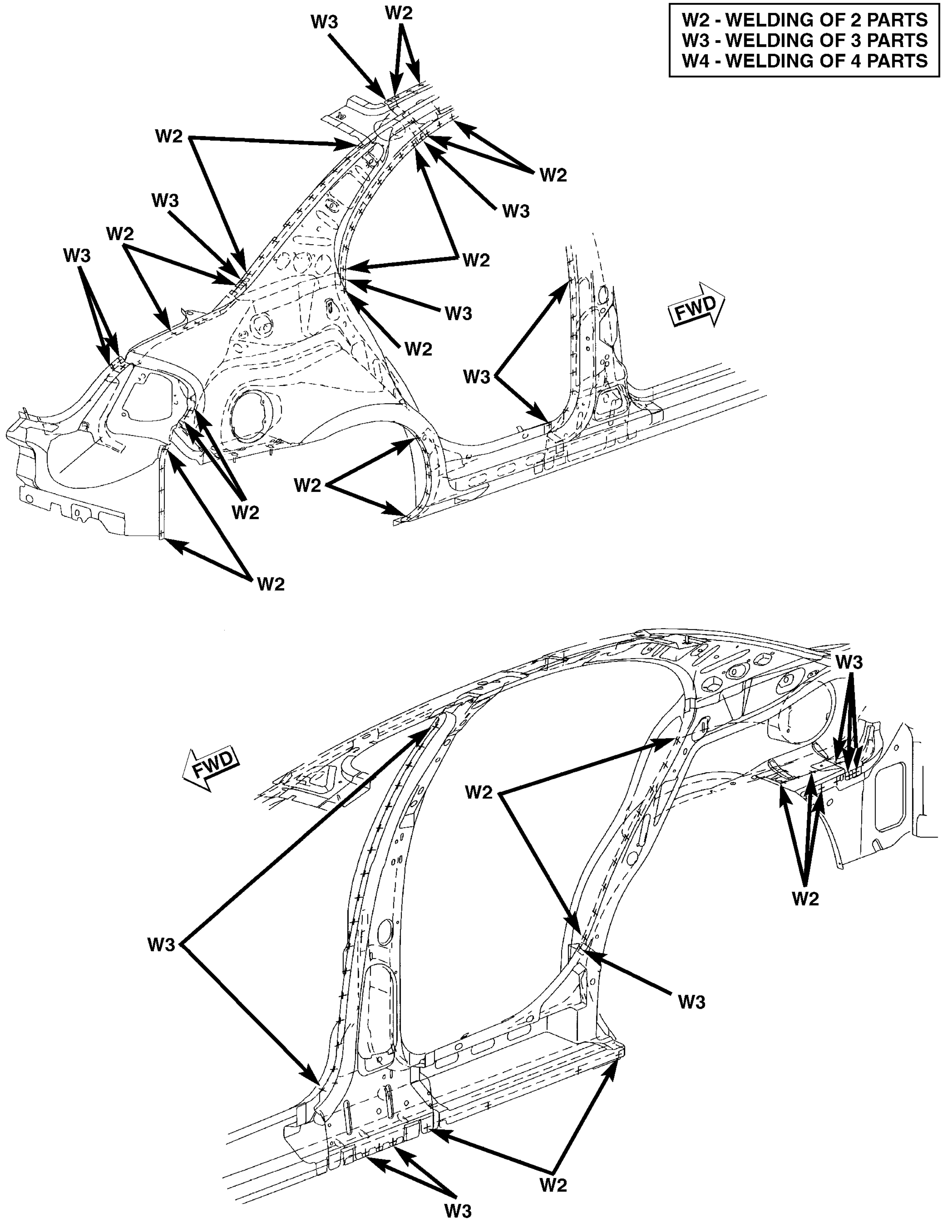


Fig. 40 INNER BODY SIDE TO OUTER BODY SIDE AND WHEELHOUSE

WELD LOCATIONS (Continued)

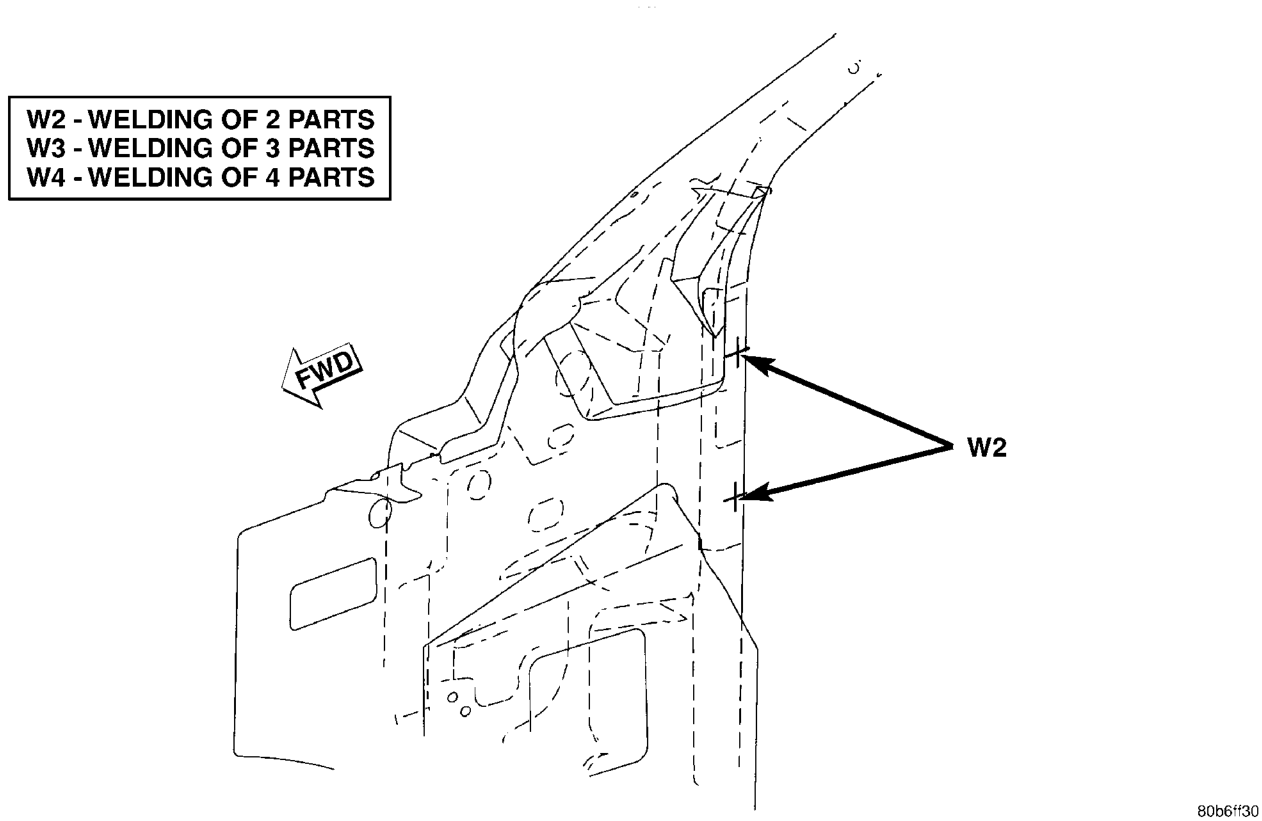


Fig. 41 OUTER BODY SIDE TO INNER WINDSHIELD OPENING

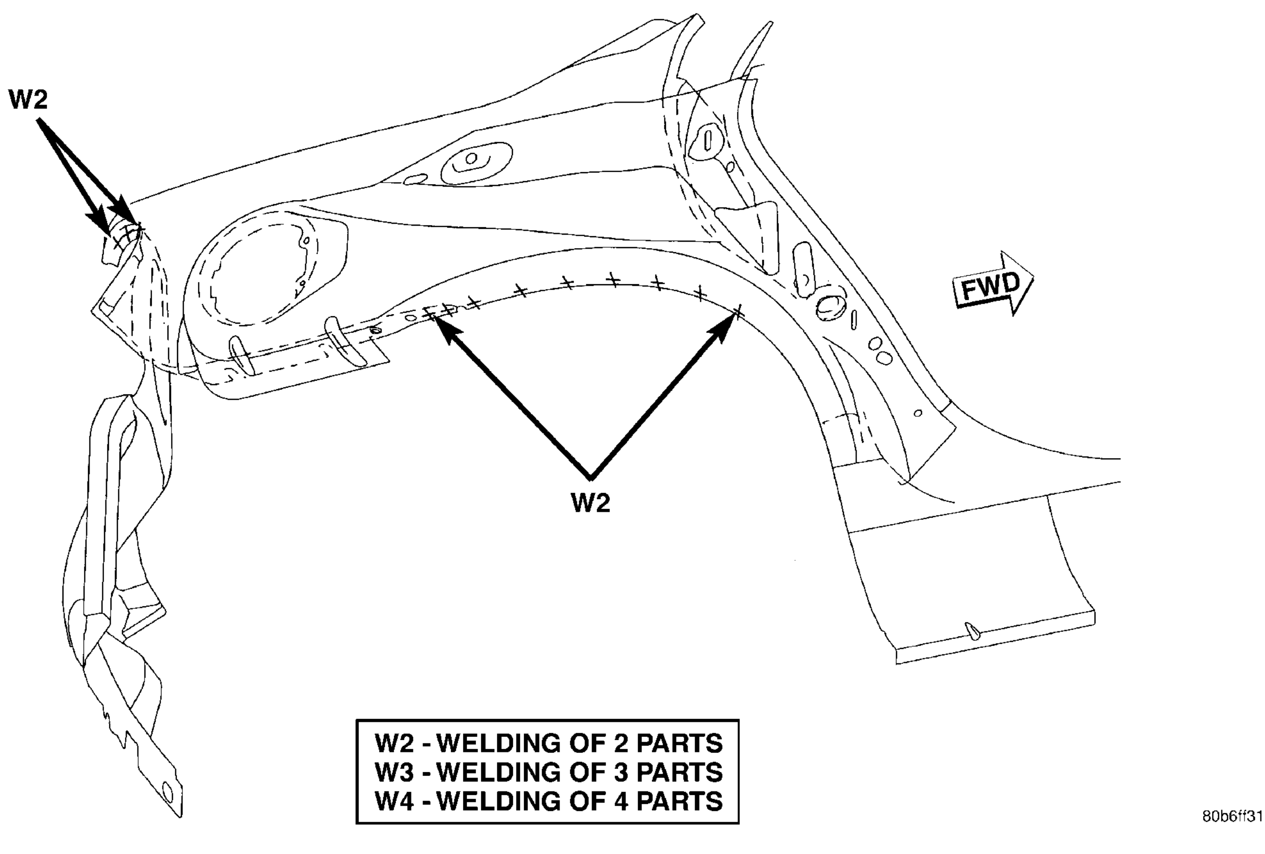


Fig. 42 OUTER BODY SIDE PANEL TO INNER WHEELHOUSE AND LOWER DECK REAR CLOSURE

WELD LOCATIONS (Continued)

W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

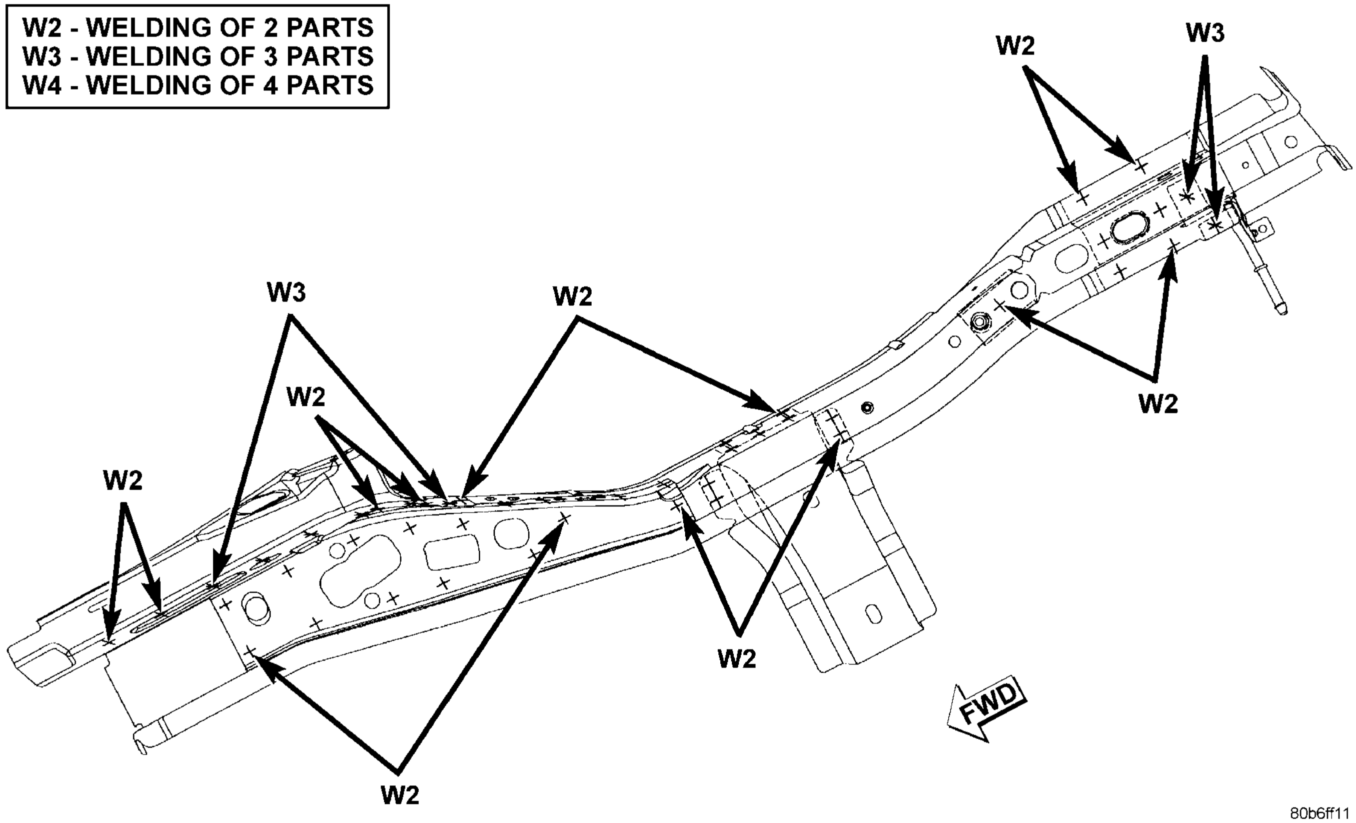
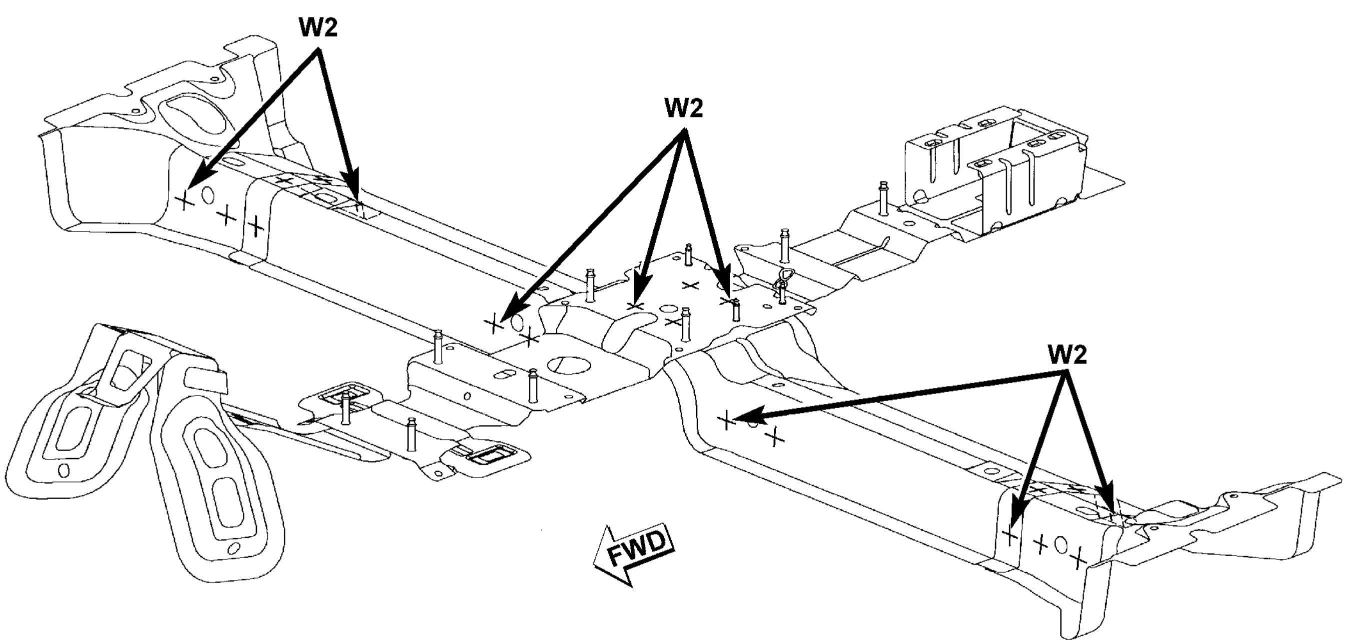


Fig. 43 REAR RAIL ASSEMBLY



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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Fig. 44 FRONT CROSSMEMBER AND CONSOLE BRACKET

WELD LOCATIONS (Continued)

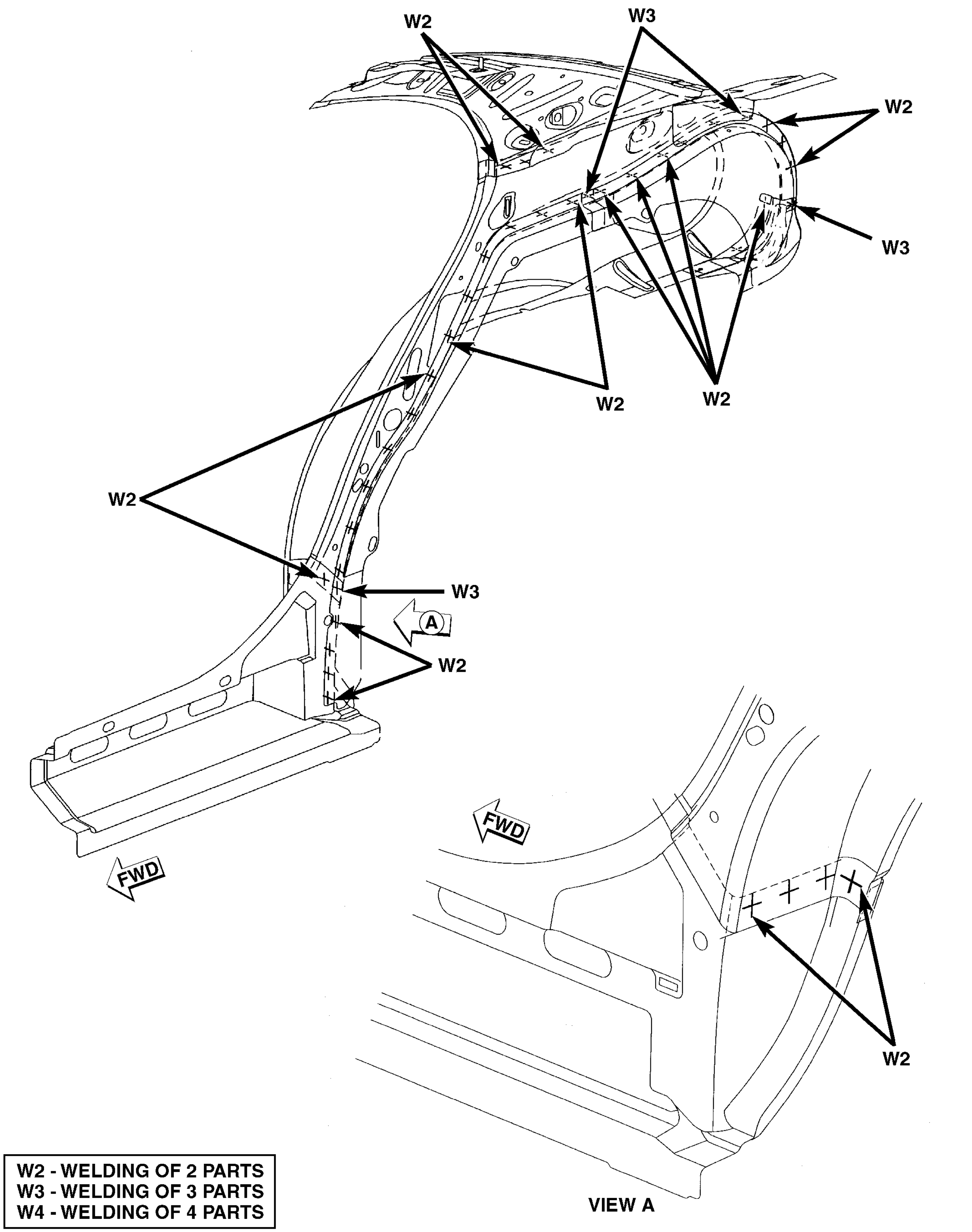

Fig. 45 INNER QUARTER PANEL TO OUTER WHEELHOUSE AND REINFORCEMENT

WELD LOCATIONS (Continued)

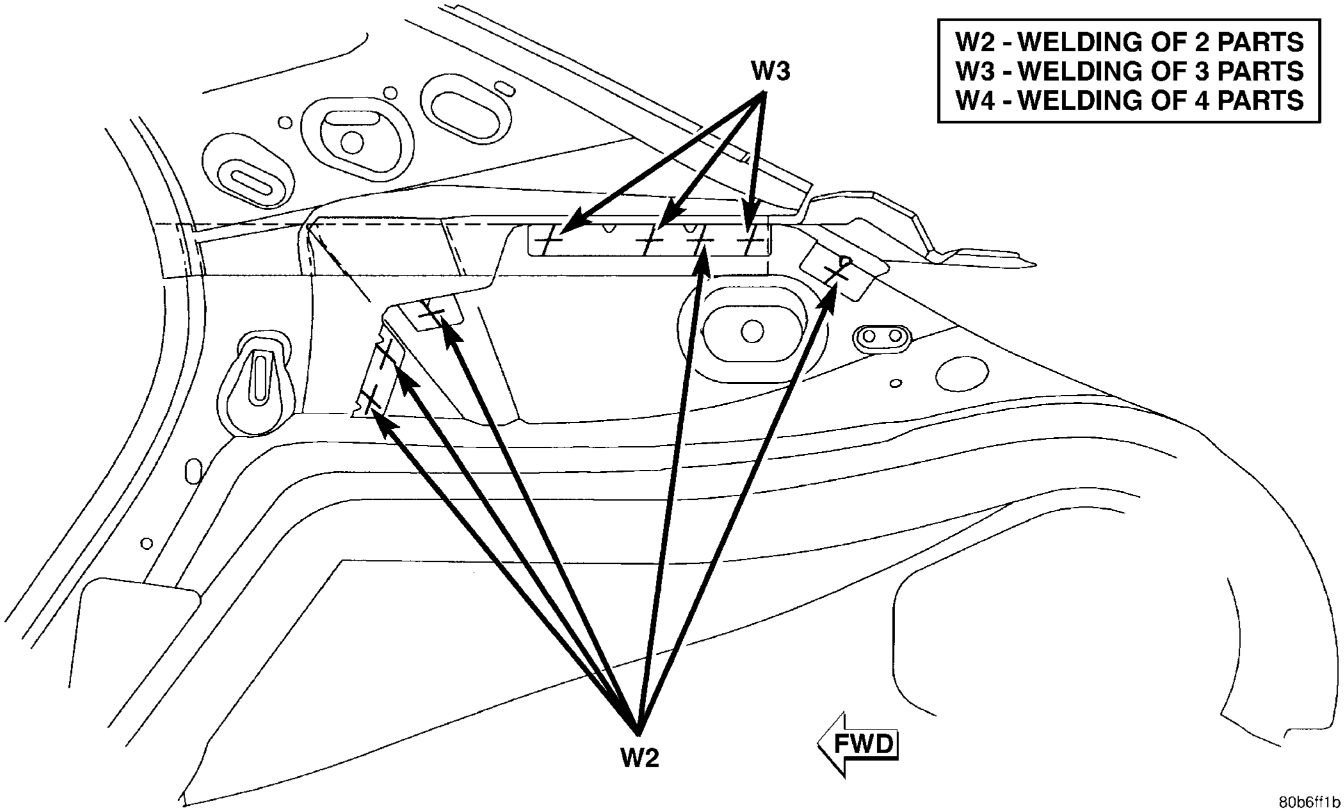

Fig. 46 QUARTER PANEL WHEELHOUSE TO UPPER QUARTER PANEL AND EXTENSION

WELD LOCATIONS (Continued)

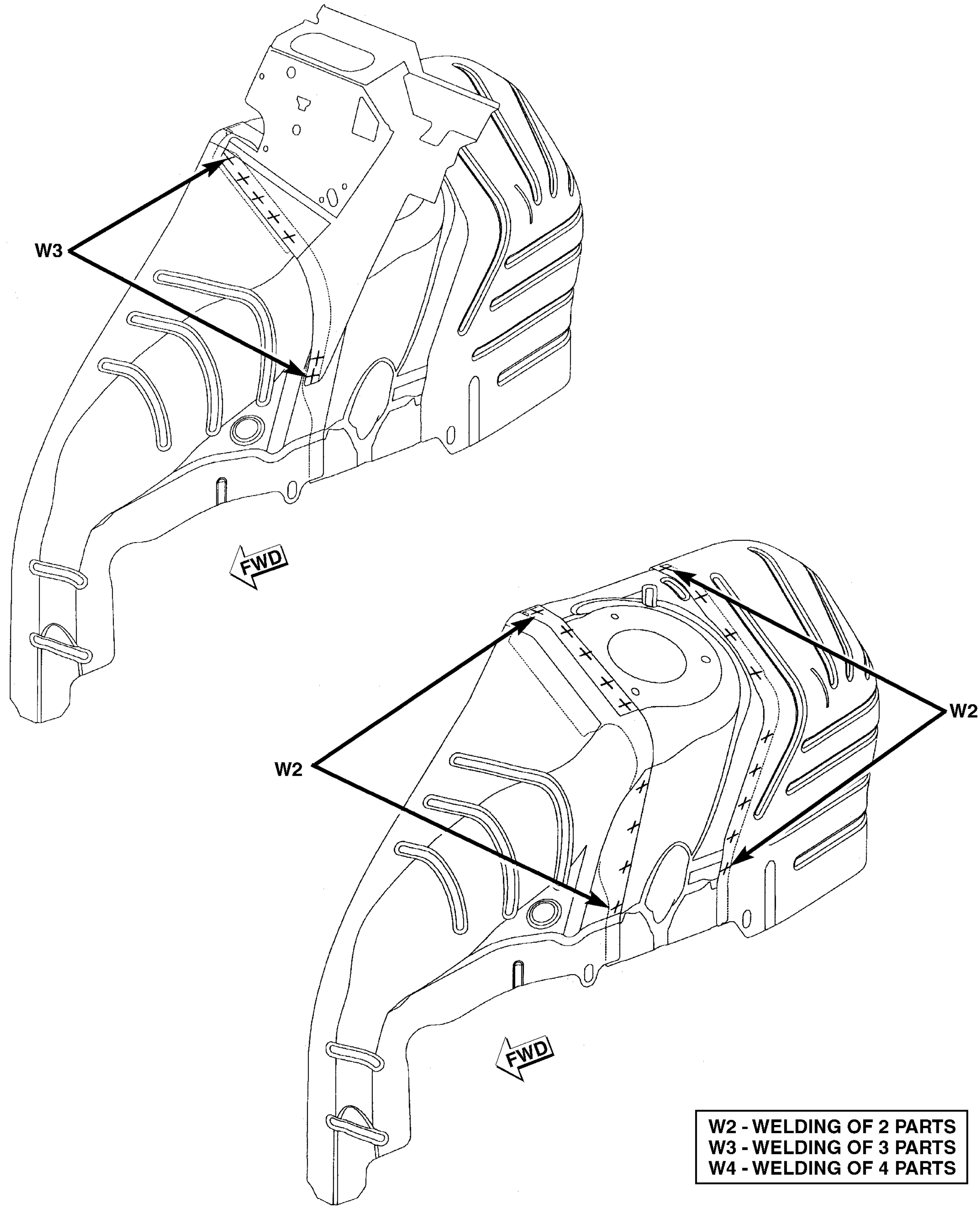

Fig. 47 REAR INNER WHEELHOUSE ASSEMBLY

WELD LOCATIONS (Continued)

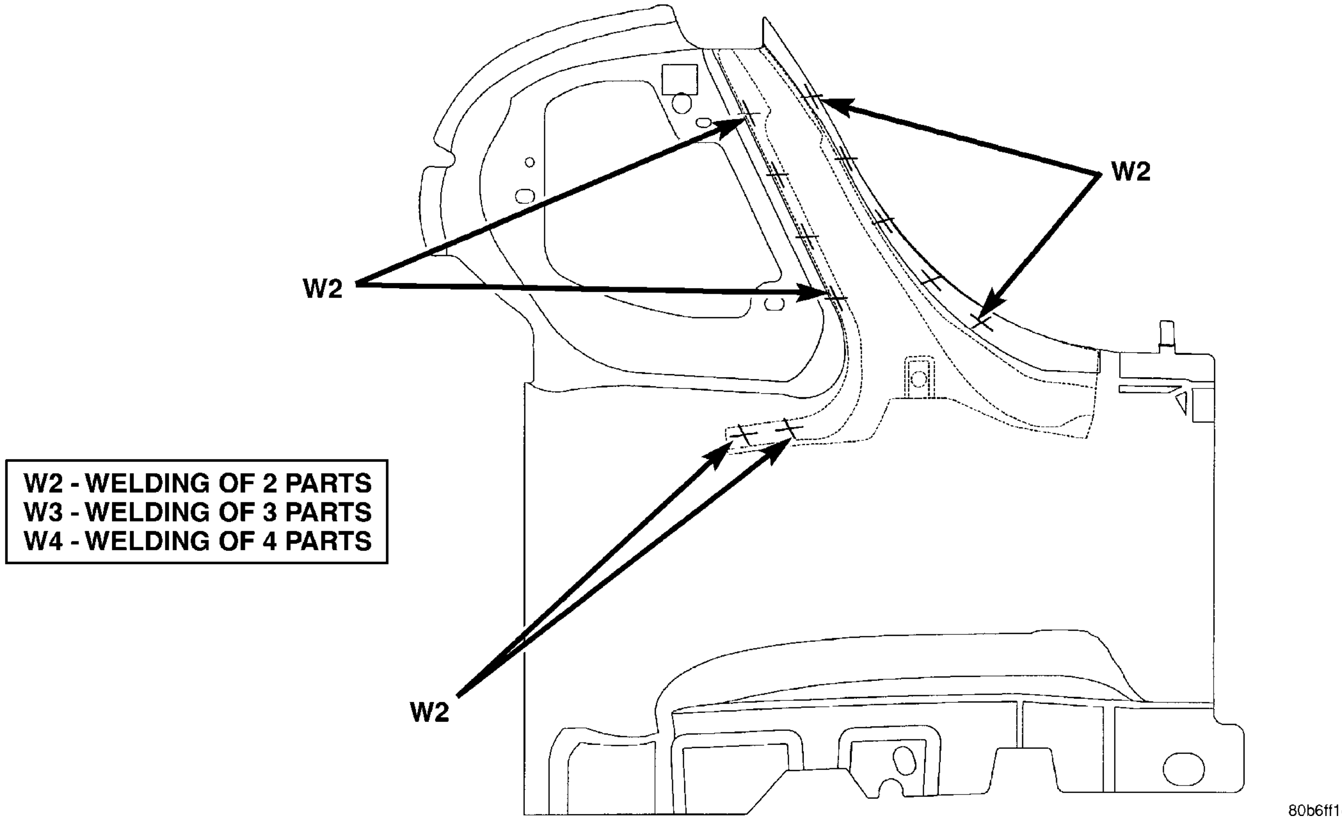

Fig. 48 TAIL LAMP PANEL LOWER DECK CLOSURE ASSEMBLY

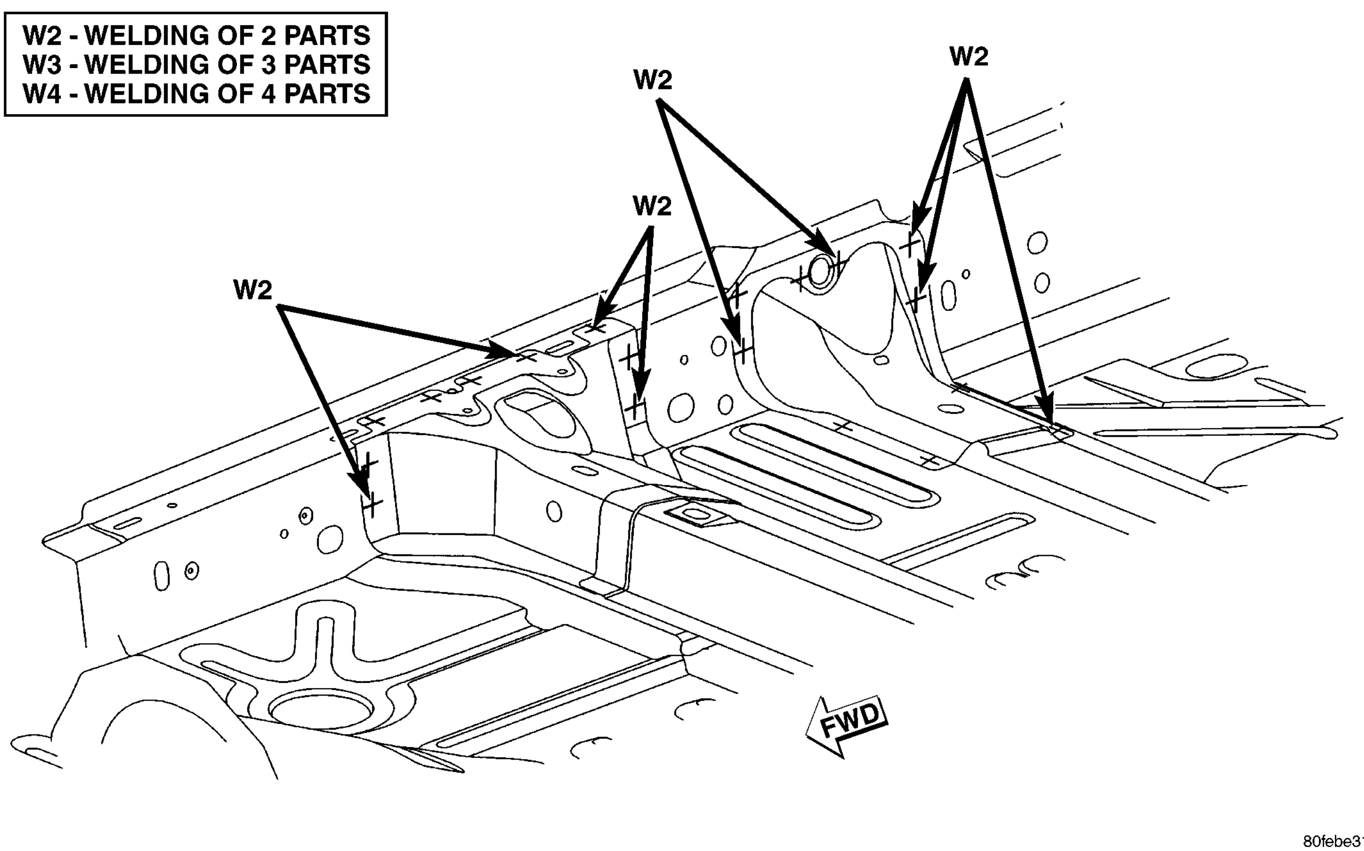

Fig. 49 BODY SILL INNER PANEL TO FRONT FLOOR REINFORCEMENT AND GUSSET

WELD LOCATIONS (Continued)

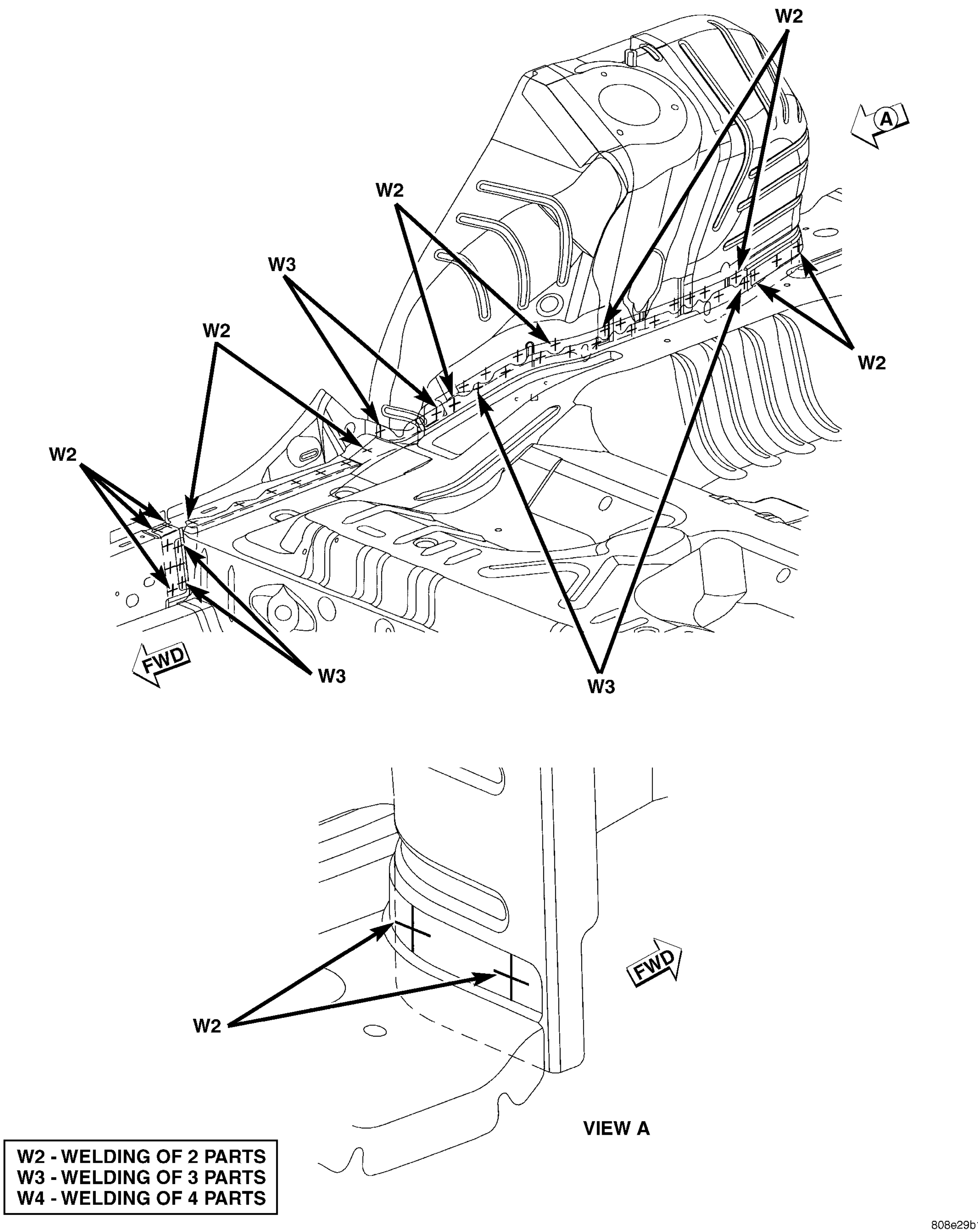

Fig. 50 REAR FLOOR PAN TO BODY SIDE SILL EXTENSION AND REAR WHEELHOUSE

WELD LOCATIONS (Continued)

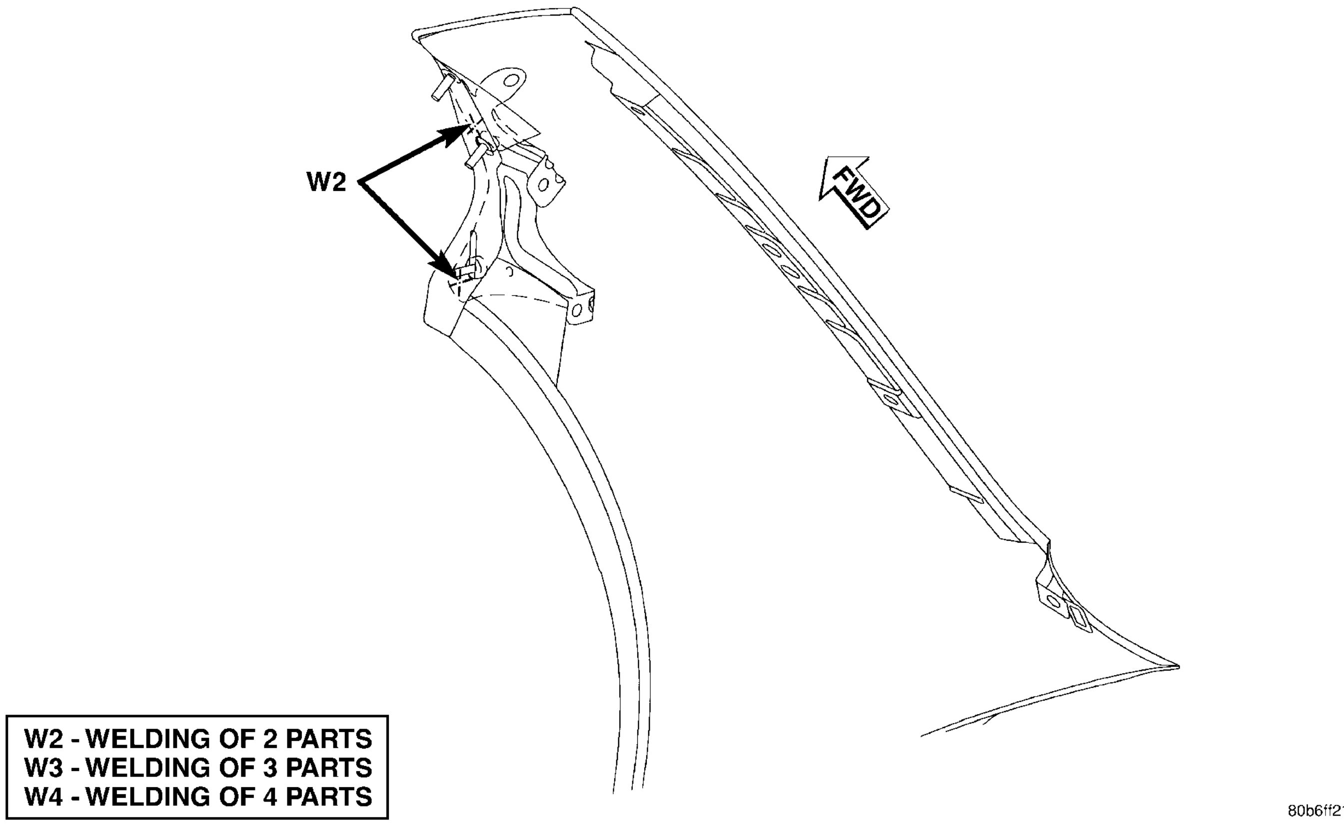

Fig. 51 FENDER TO WELD BRACKET

WELD LOCATIONS (Continued)

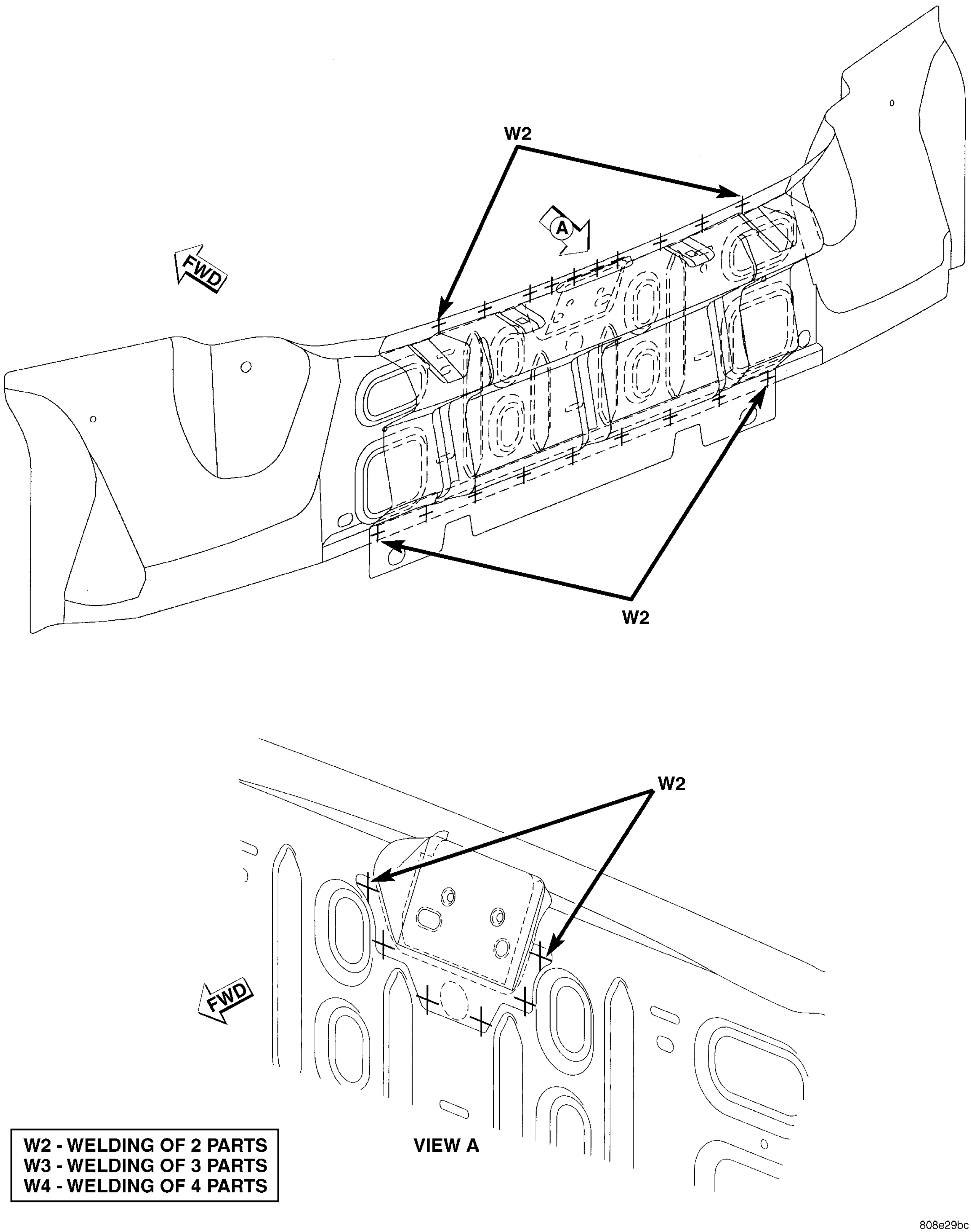

Fig. 52 DECK OPENING LOWER REINFORCEMENT TO REAR LOWER DECK CLOSURE PANEL

WELD LOCATIONS (Continued)

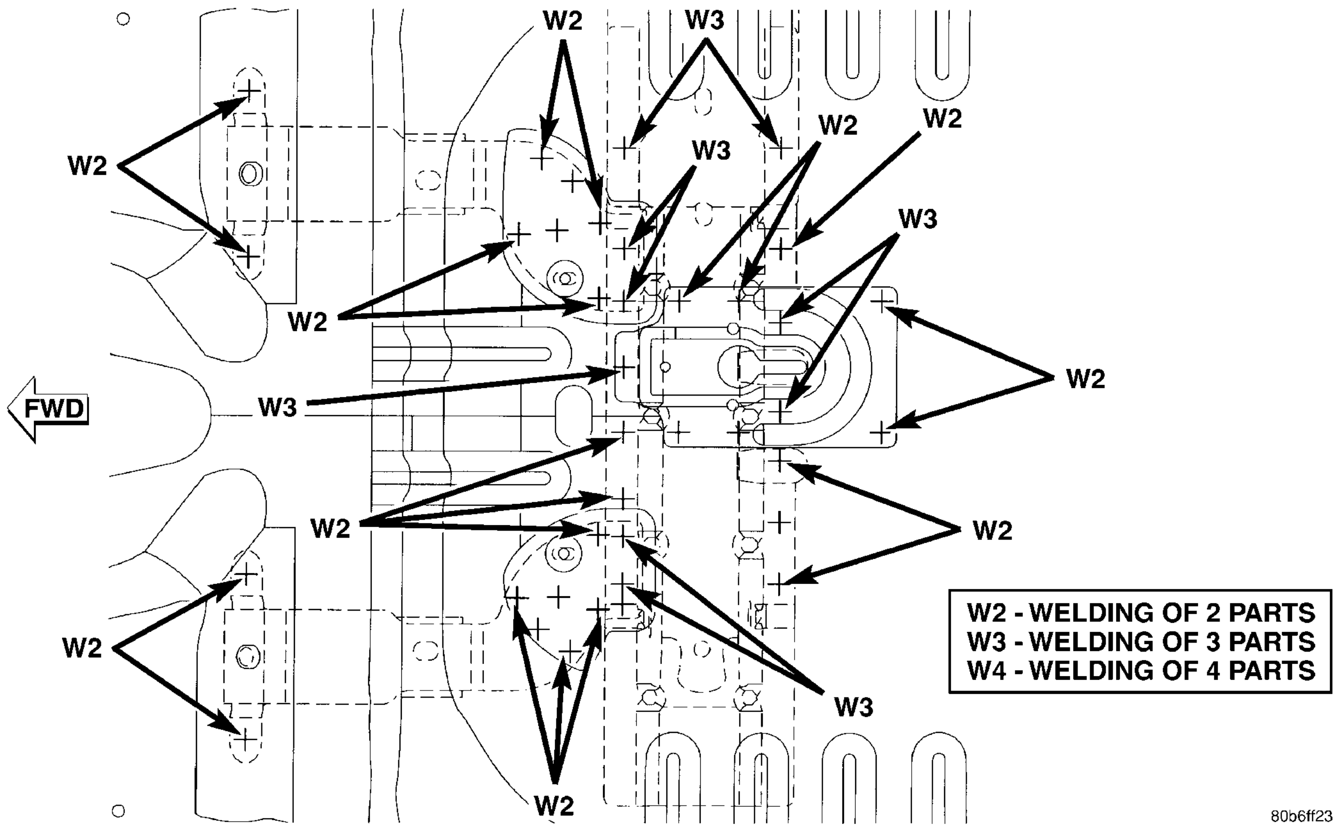

Fig. 53 REAR FLOOR PAN TO REAR SUSPENSION CROSSMEMBER, SEAT AND SPARE TIRE ANCHOR

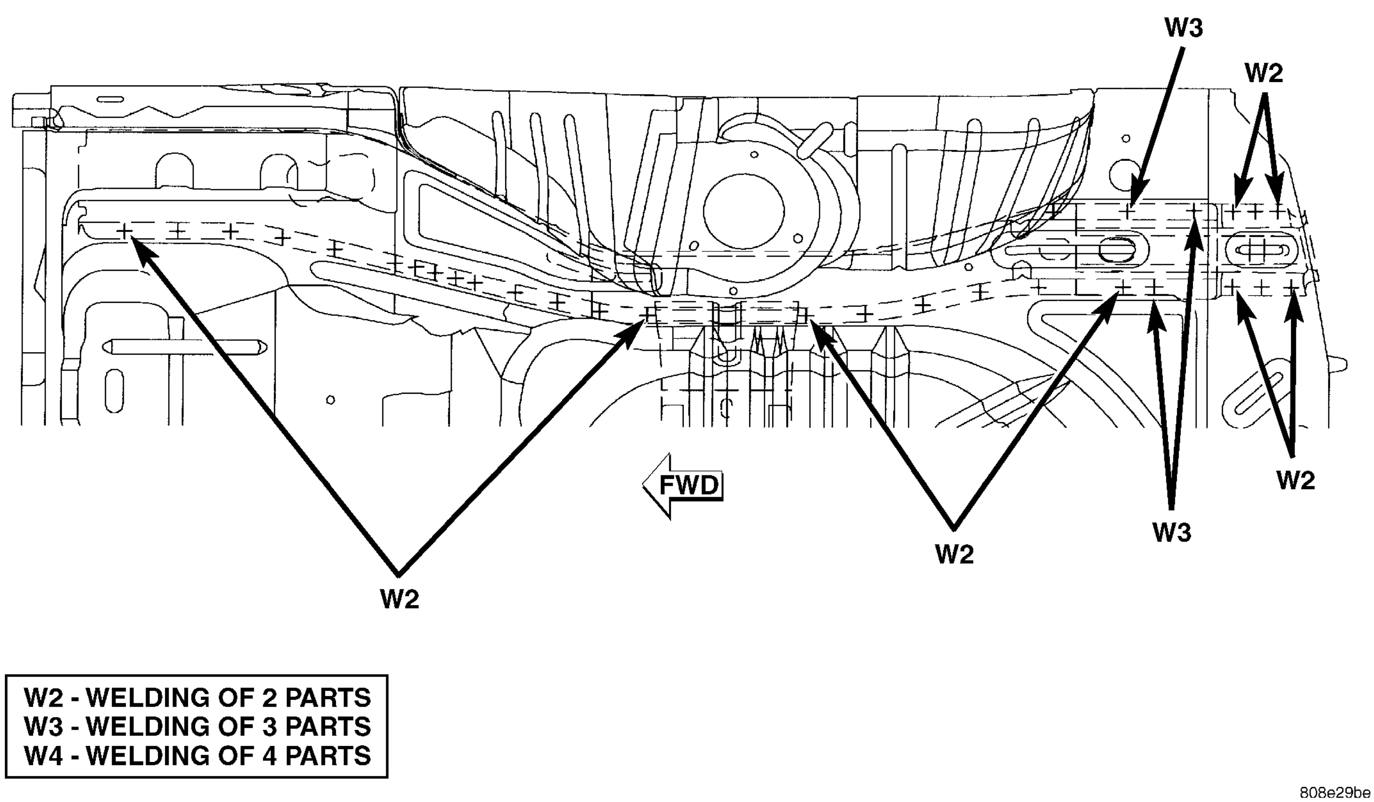

Fig. 54 REAR FLOOR PAN TO REAR RAIL

WELD LOCATIONS (Continued)

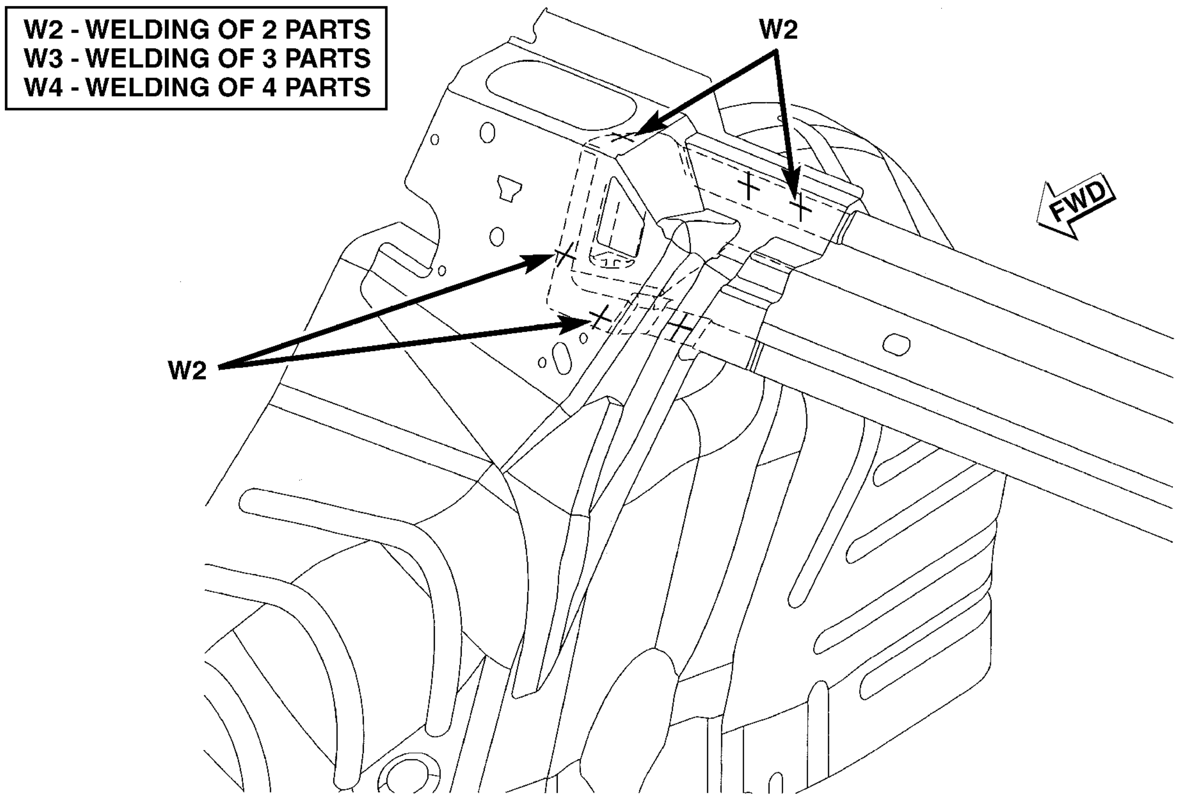

Fig. 55 SHELF PANEL SUPPORT TO SHELF REINFORCEMENT

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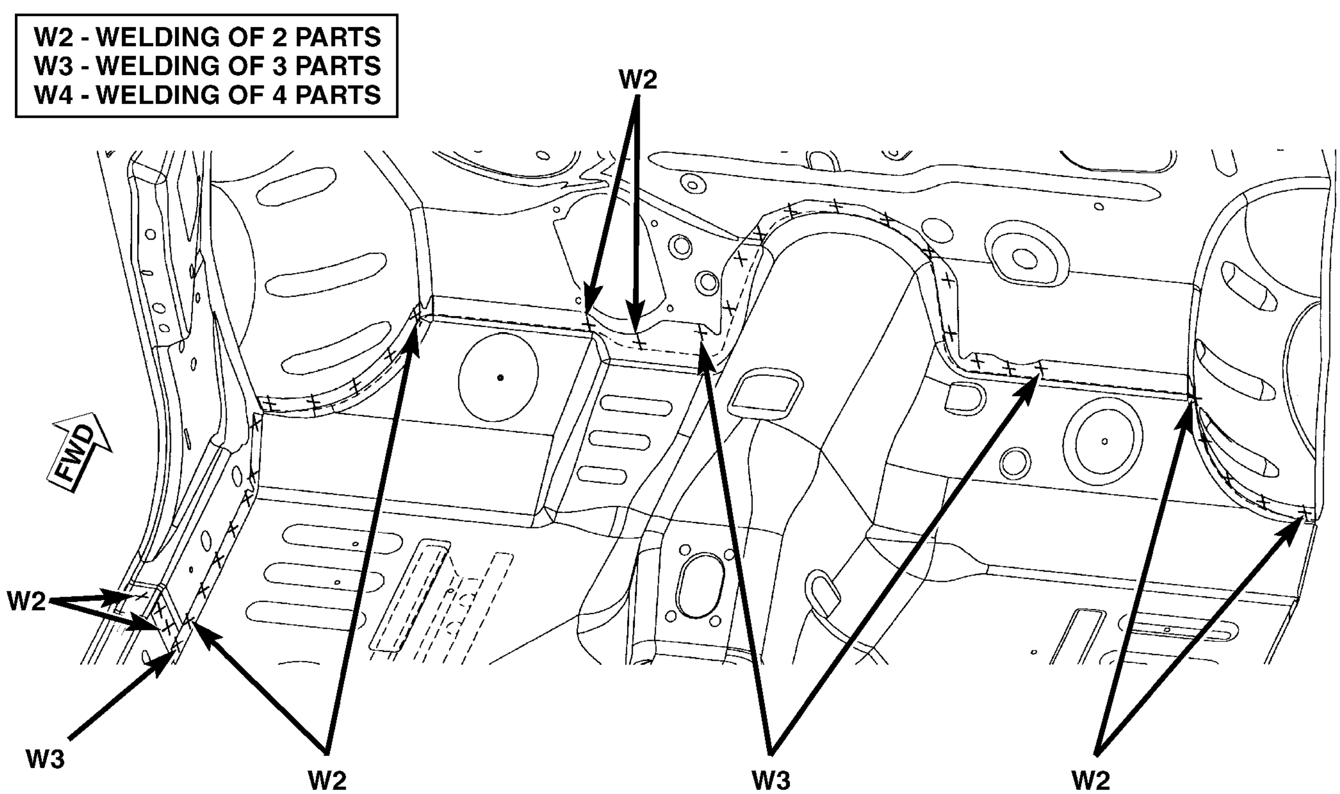

808e29cb

Fig. 56 DASH PANEL TO FRONT FLOOR PAN

WELD LOCATIONS (Continued)

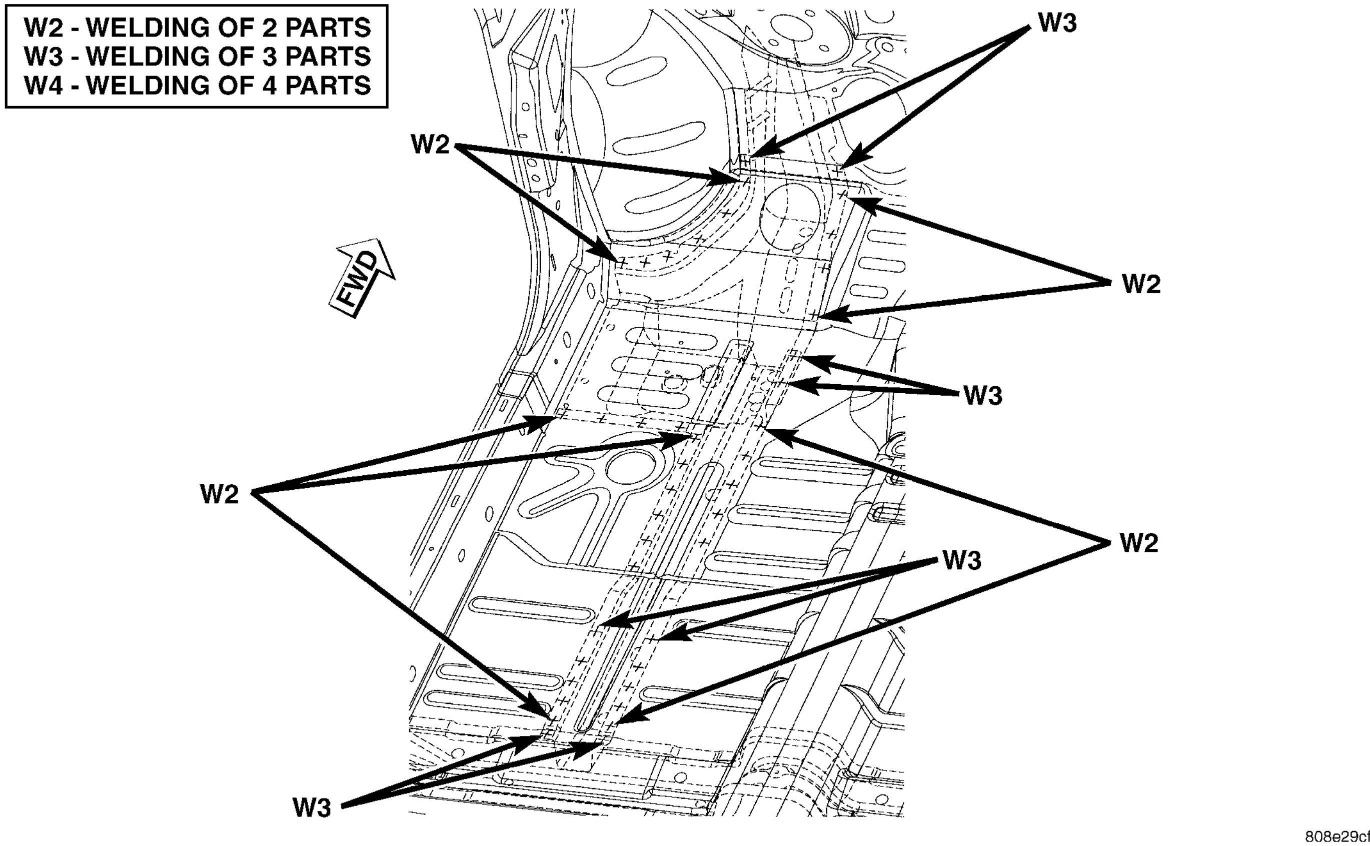

Fig. 57 FLOOR PAN TO RAIL - FRONT SIDE REAR TO COWL SIDE

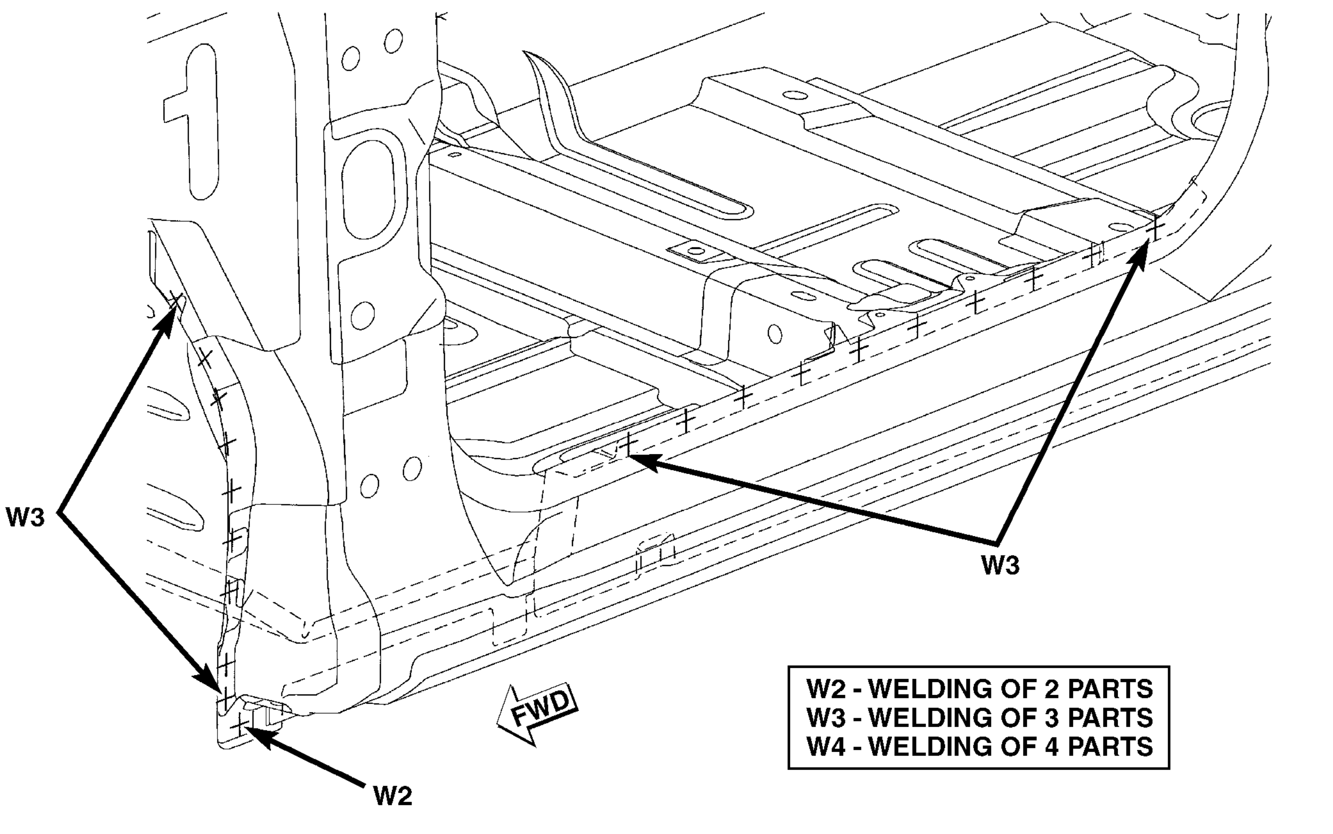

Fig. 58 INNER AND OUTER BODY SIDE APERTURE TO COWL AND FRONT FLOOR PAN

WELD LOCATIONS (Continued)

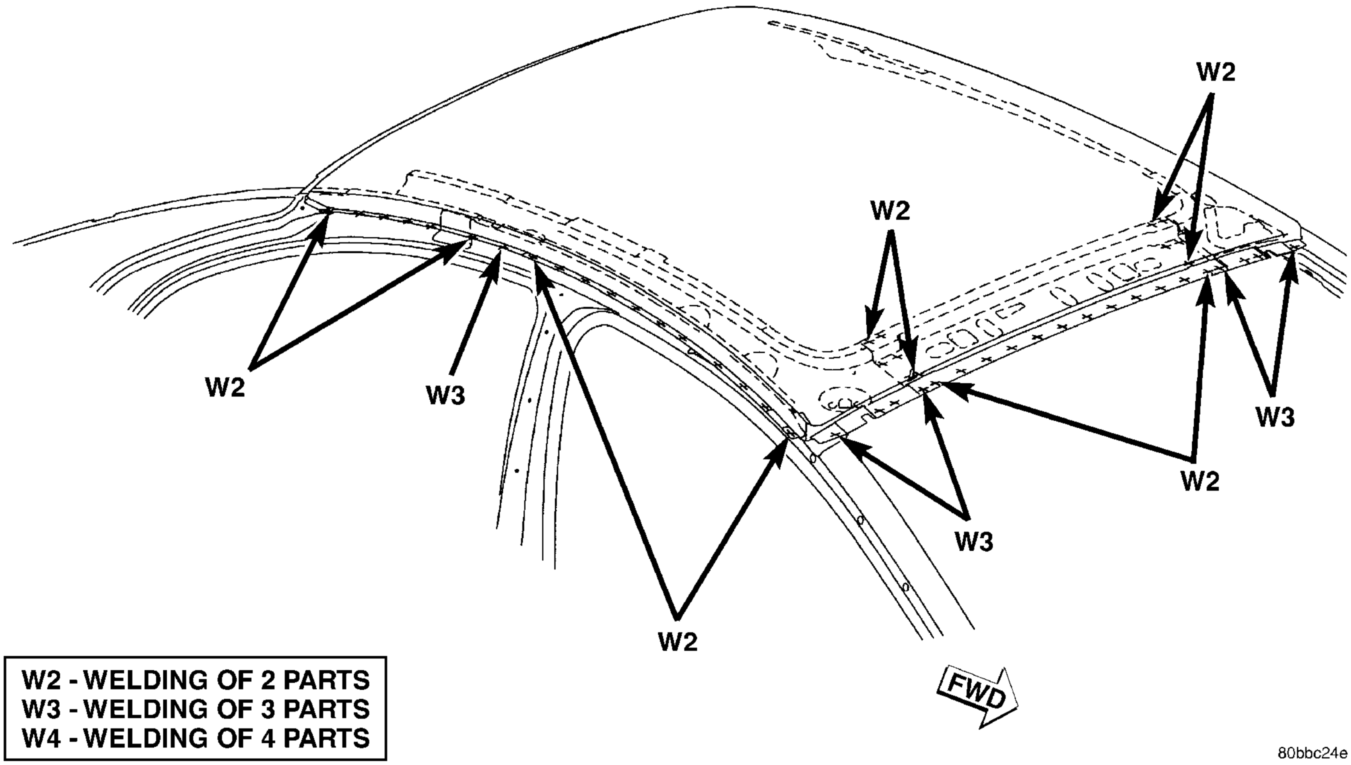

Fig. 59 OUTER BODY SIDE APERTURE TO ROOF PANEL AND ROOF RAILS

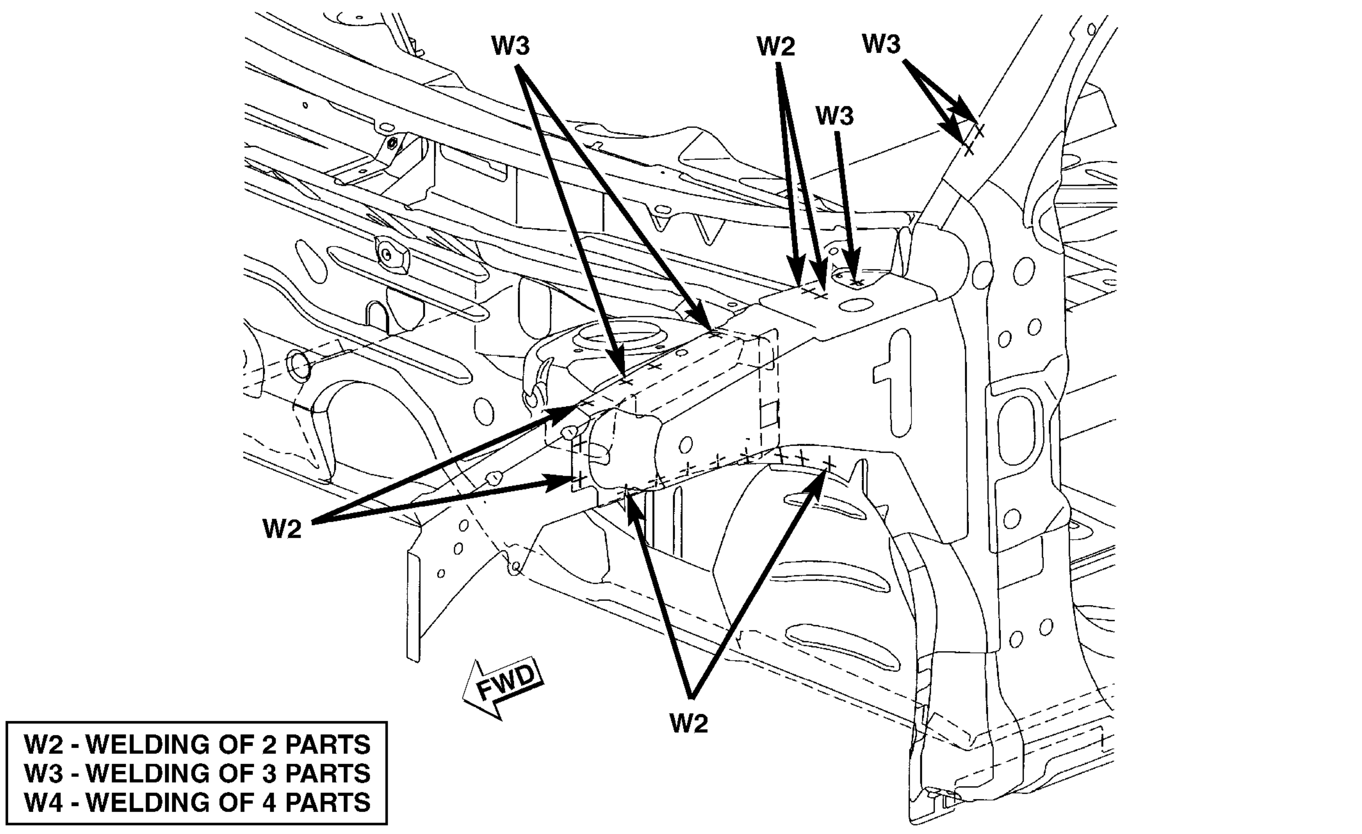

Fig. 60 FRONT FENDER SUPPORT TO COWL AND OUTER BODY SIDE APERTURE

WELD LOCATIONS (Continued)

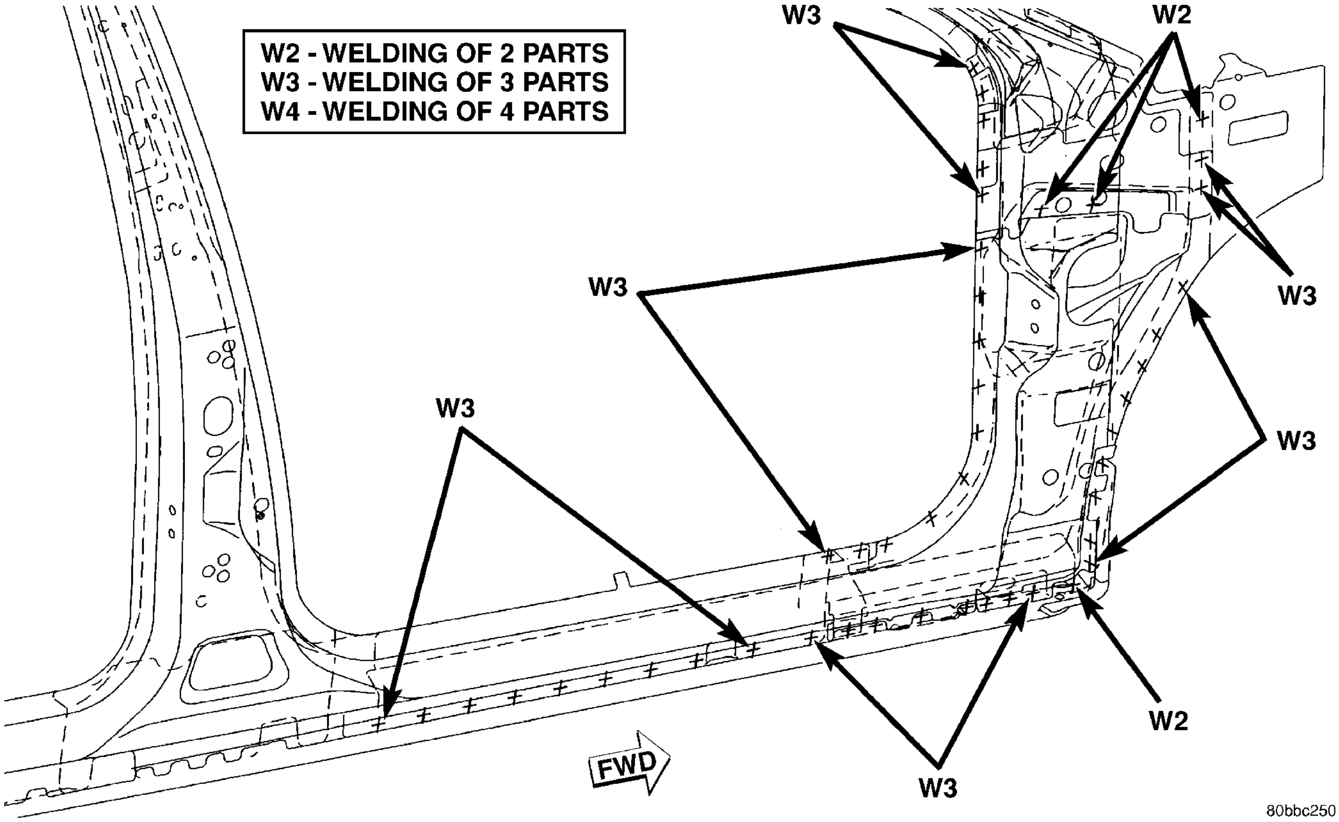

Fig. 61 OUTER BODY SIDE APERTURE TO SILL AND COWL SIDE PANEL

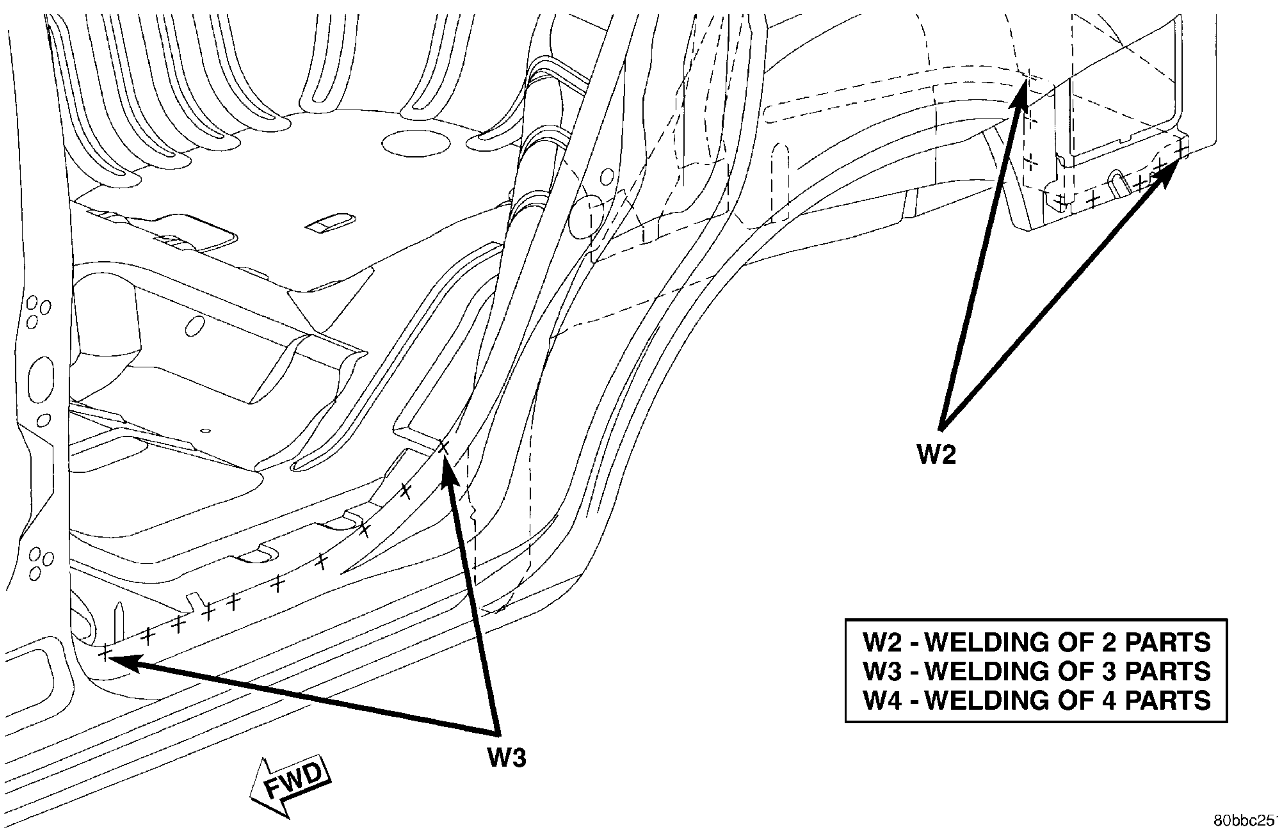

Fig. 62 INNER AND OUTER BODY SIDE APERTURE TO SILL AND FLOOR PAN

WELD LOCATIONS (Continued)

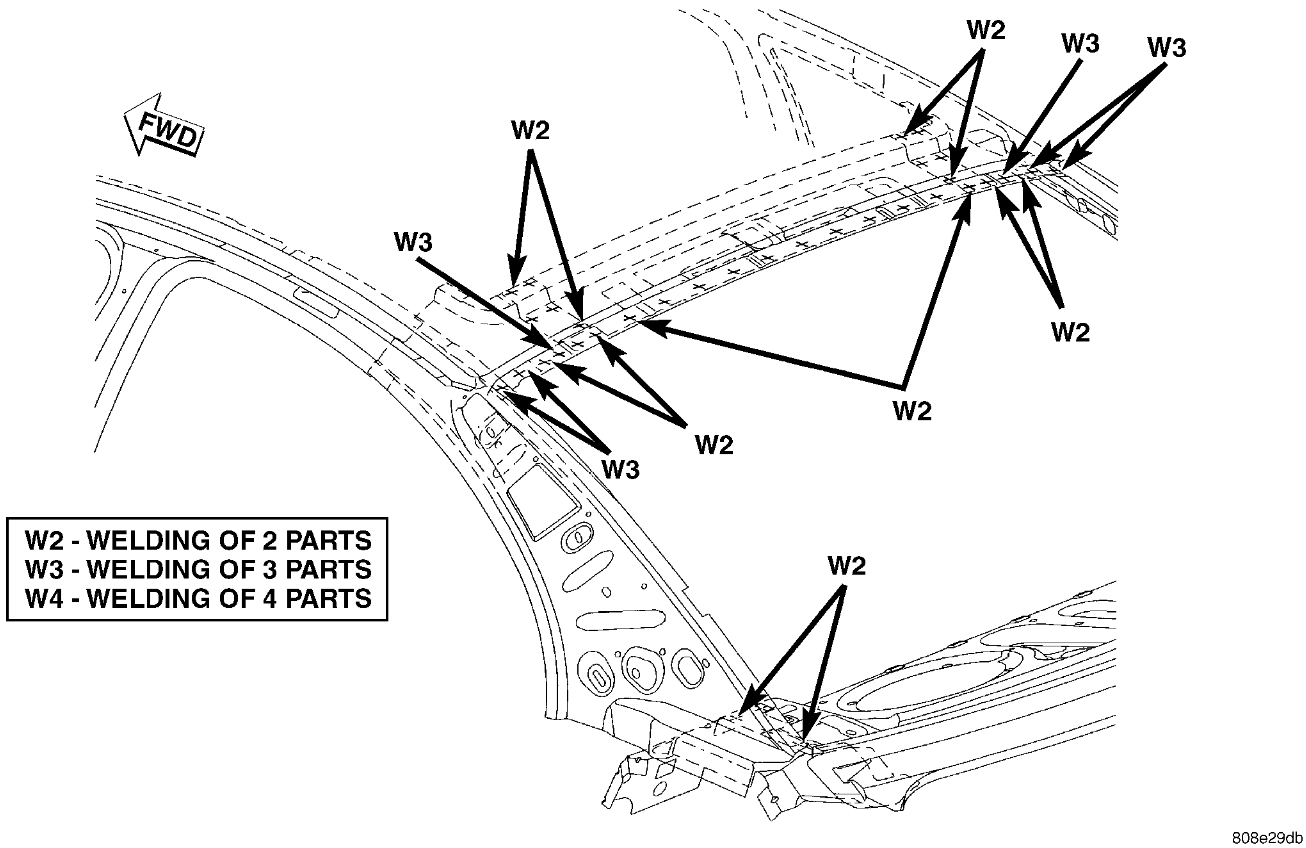

Fig. 63 OUTER BODY SIDE APERTURE TO ROOF PANEL AND REAR SHELF TO EXTENSION

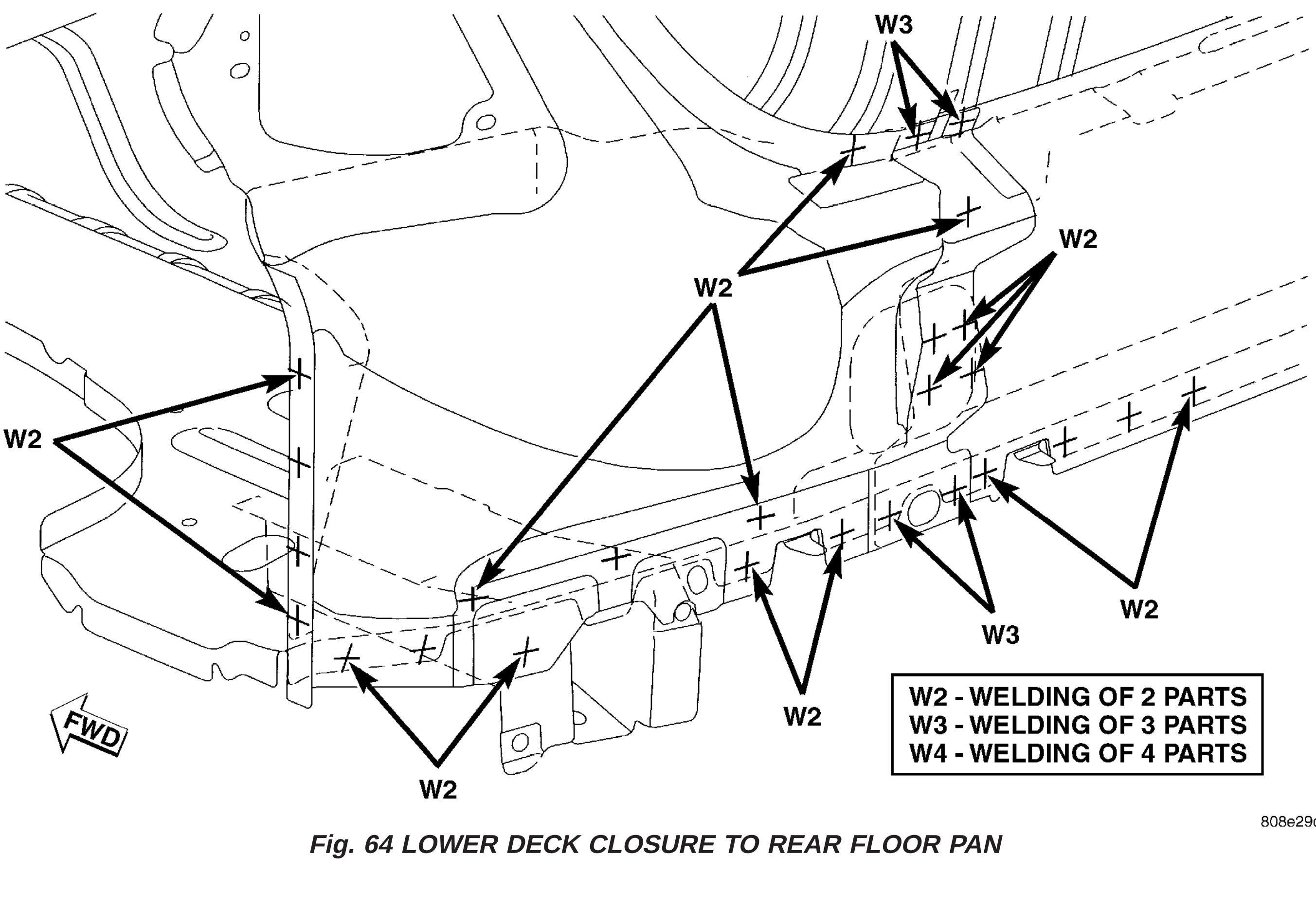

Fig. 64 LOWER DECK CLOSURE TO REAR FLOOR PAN

WELD LOCATIONS (Continued)

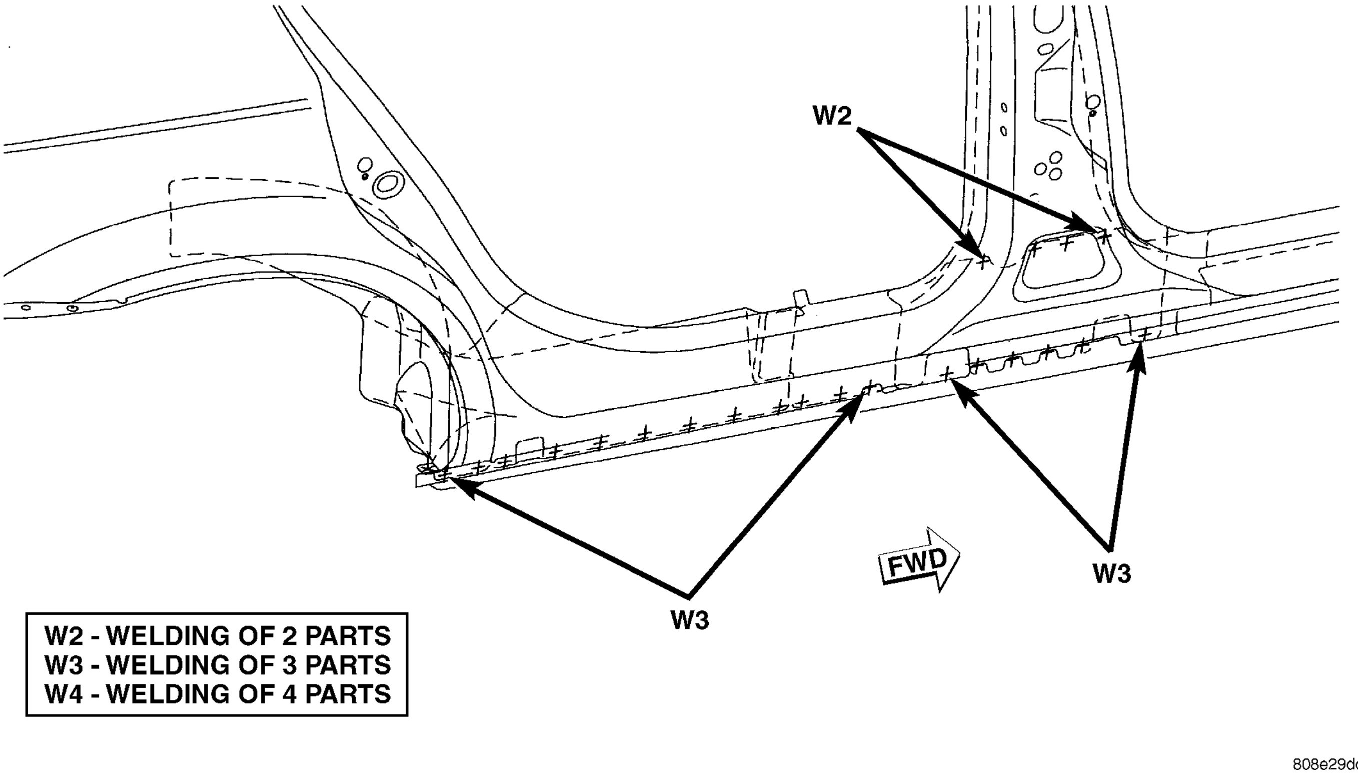

Fig. 65 OUTER BODY SIDE APERTURE TO CENTER PILLAR

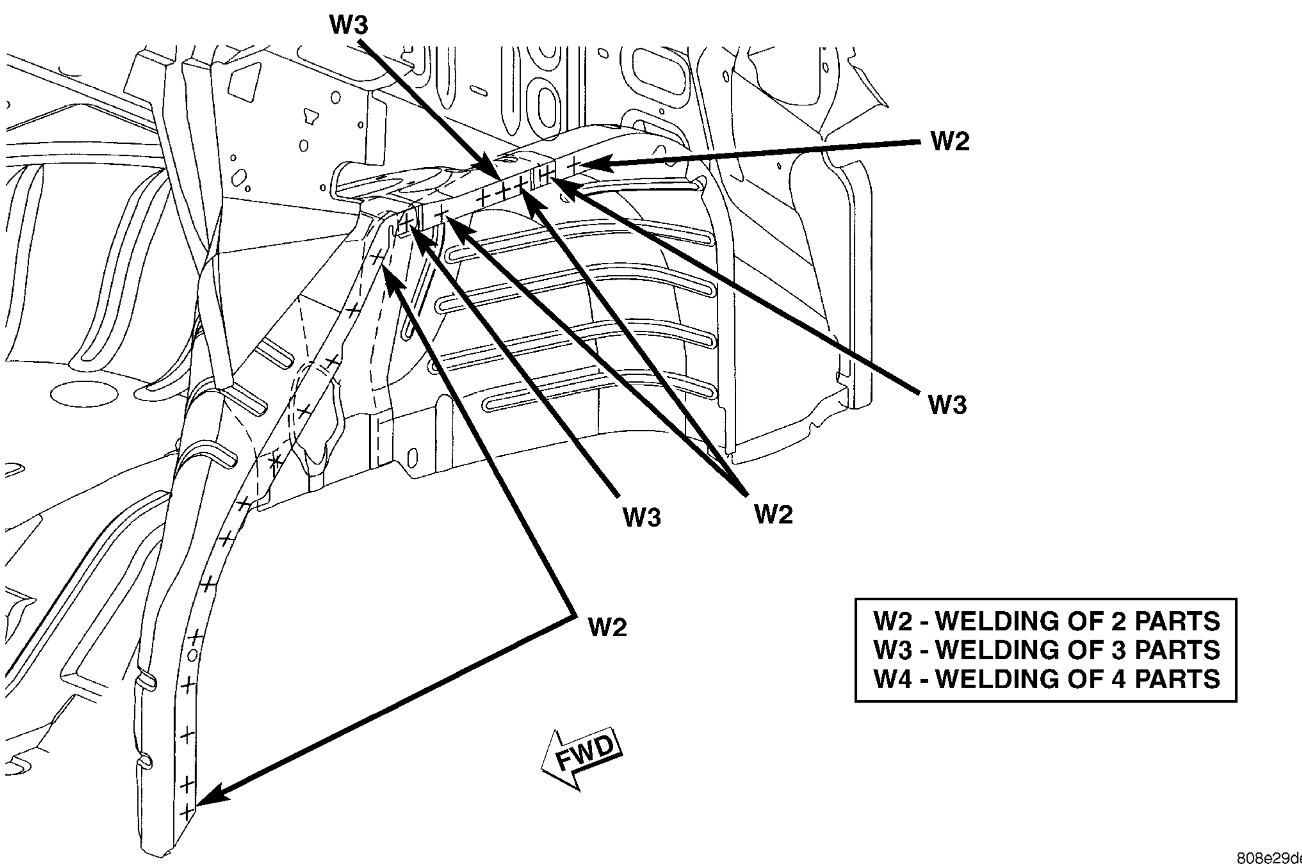

Fig. 66 INNER WHEELHOUSE TO OUTER WHEELHOUSE

WELD LOCATIONS (Continued)

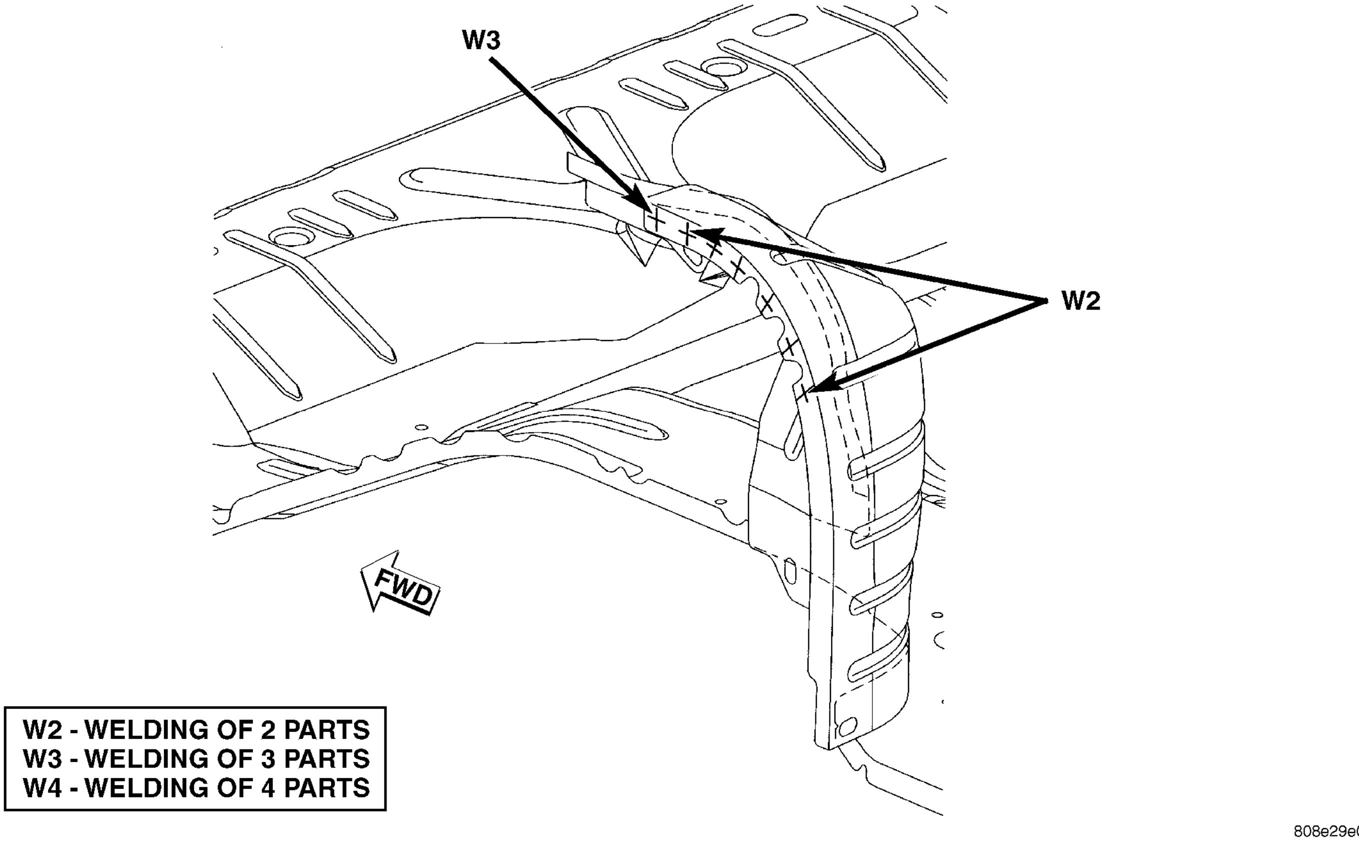

Fig. 67 INNER WHEELHOUSE TO WHEELHOUSE EXTENSION

WELD LOCATIONS (Continued)

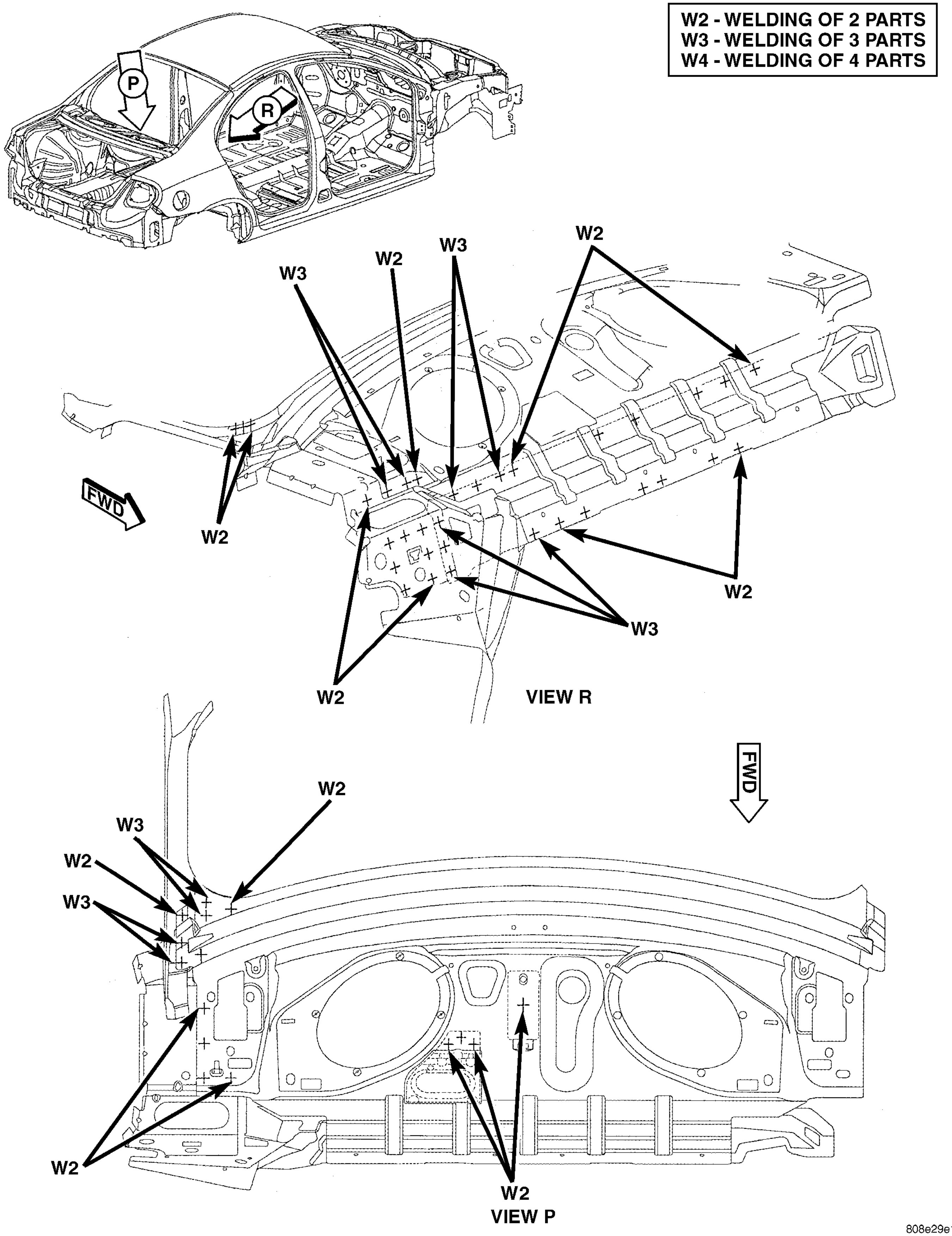

Fig. 68 PANEL SHELF TO TROUGH AND WHEELHOUSE

WELD LOCATIONS (Continued)

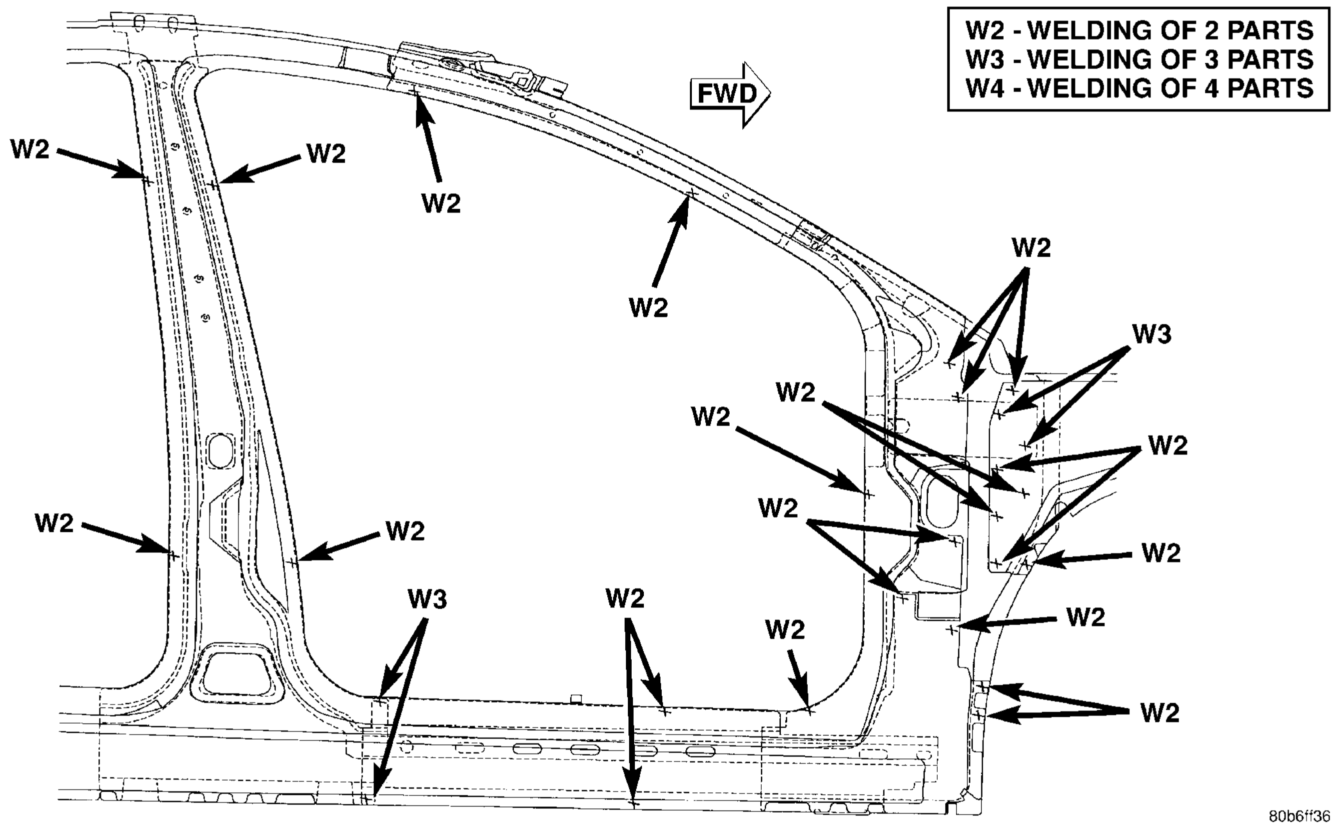

Fig. 69 RIGHT BODY SIDE APERTURE – FRONT

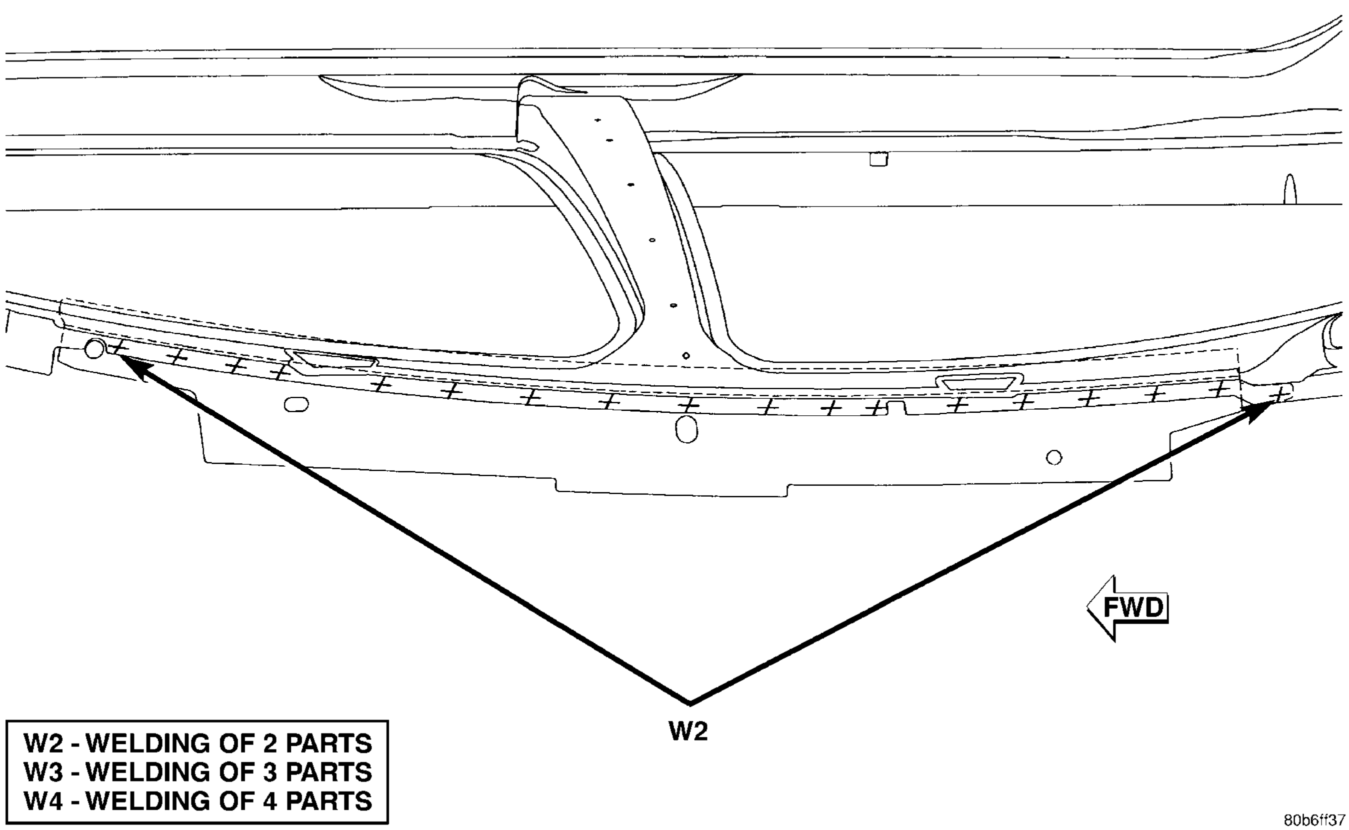

Fig. 70 BODY SIDE APERTURE TO ROOF RAIL INNER AND REINFORCEMENT

WELD LOCATIONS (Continued)

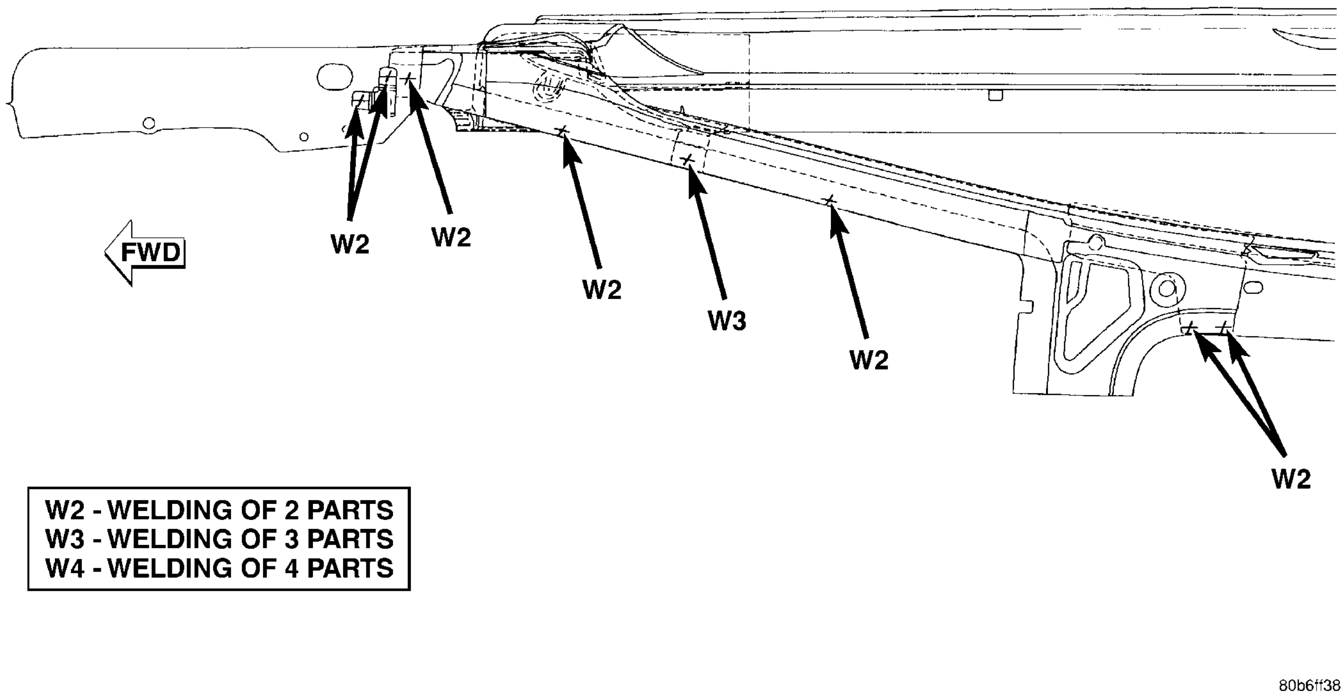

Fig. 71 FRONT UPPER LOAD BEAM BRACKET, WINDSHIELD FRAME AND PILLAR TO BODY SIDE APERTURE

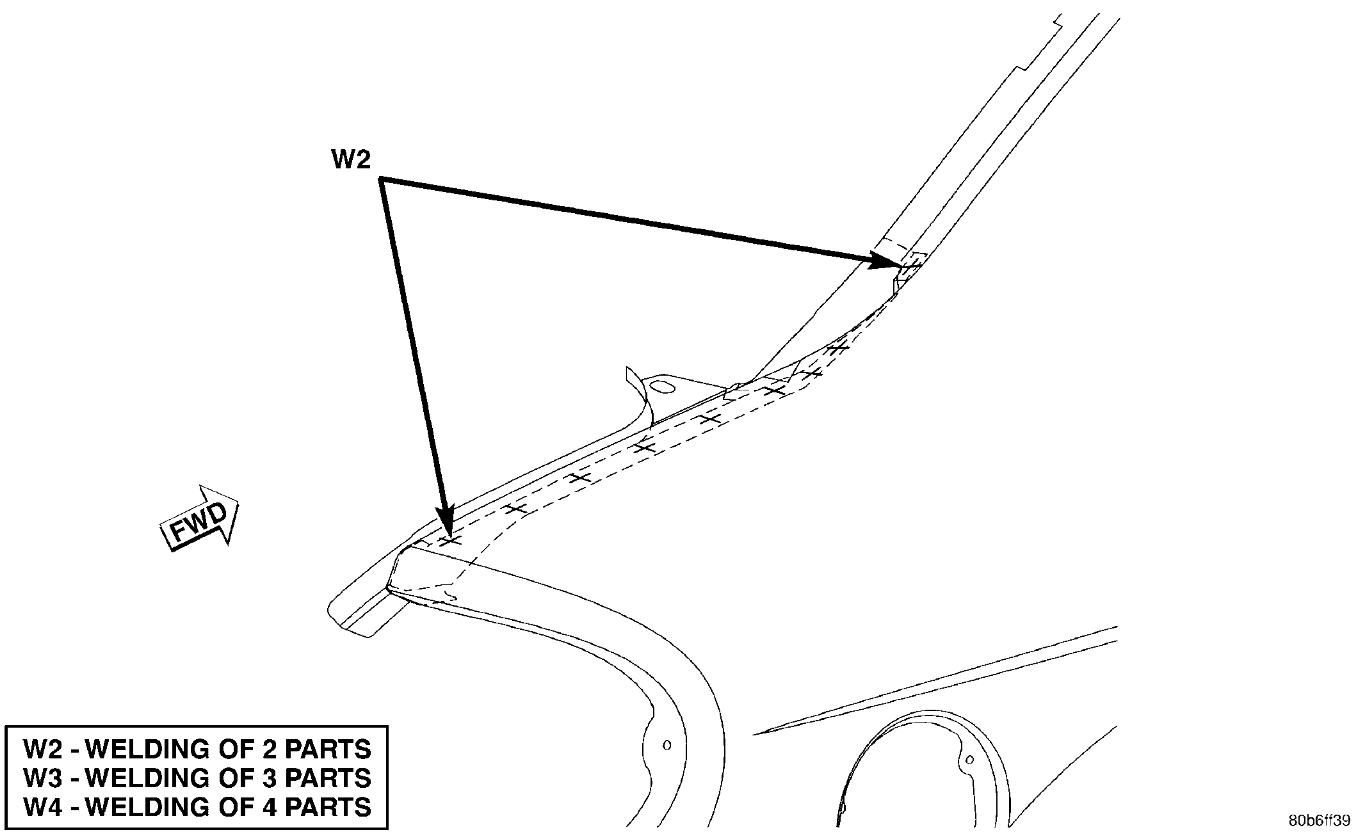

Fig. 72 DRAIN TROUGH TO BODY SIDE APERTURE

WELD LOCATIONS (Continued)

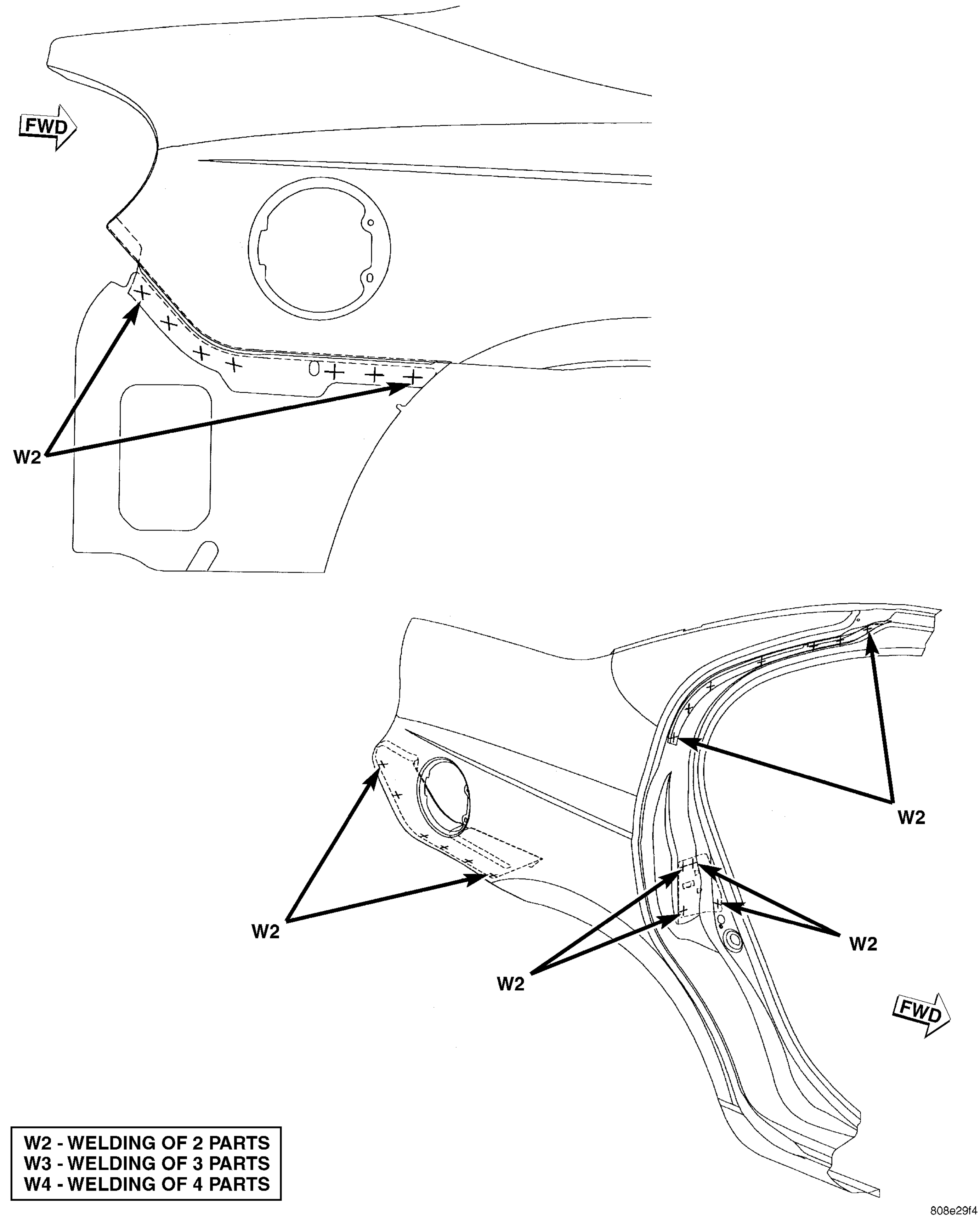

Fig. 73 FLOOR PAN EXTENSION, STRAP ASSEMBLY, REAR DOOR STRIKER RETAINER TO BODY SIDE APE

WELD LOCATIONS (Continued)

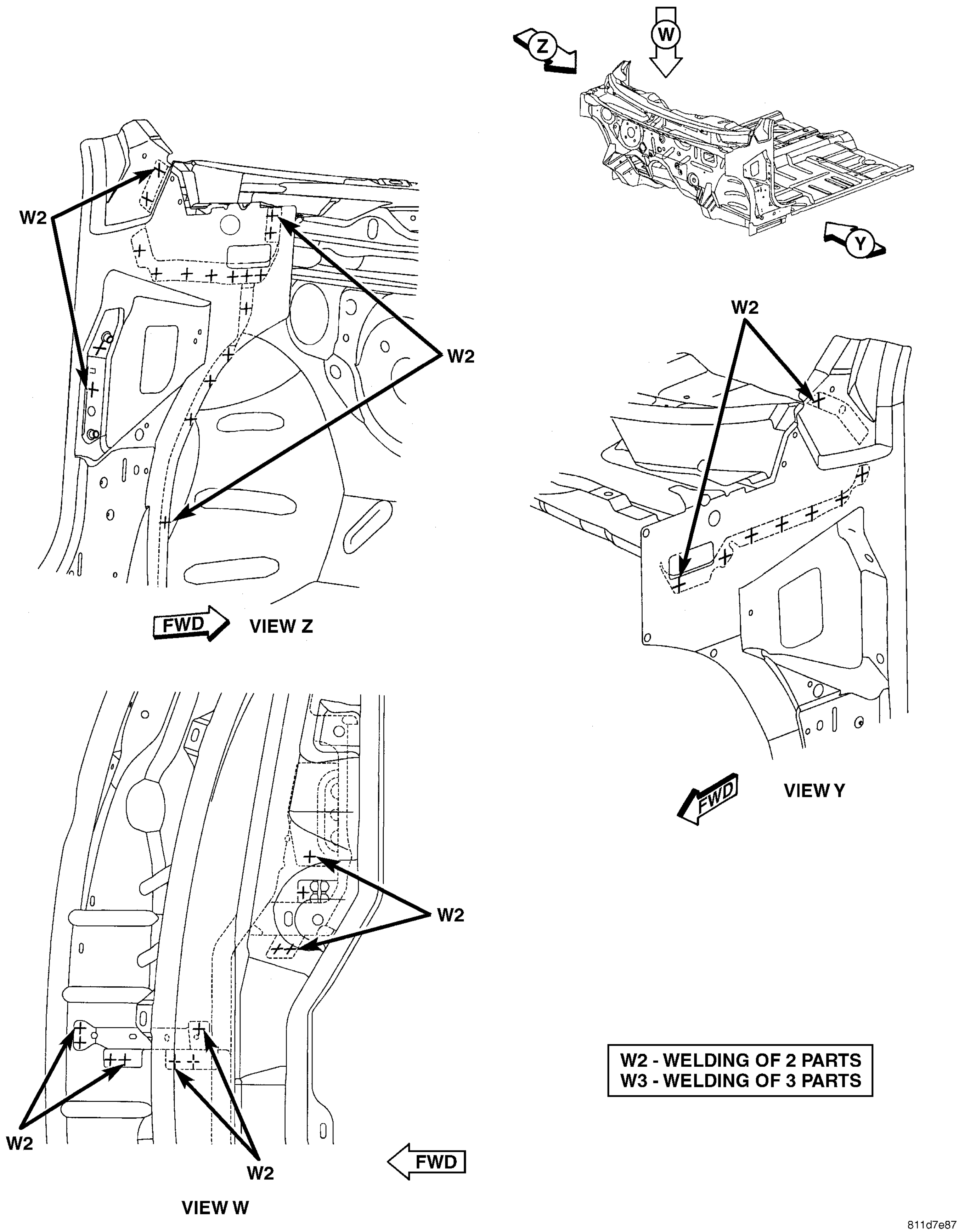

Fig. 74 COWL TOP PANEL, COWL PLENUM AND COWL SIDE PANEL - RIGHT HAND DRIVE ONLY

WELD LOCATIONS (Continued)

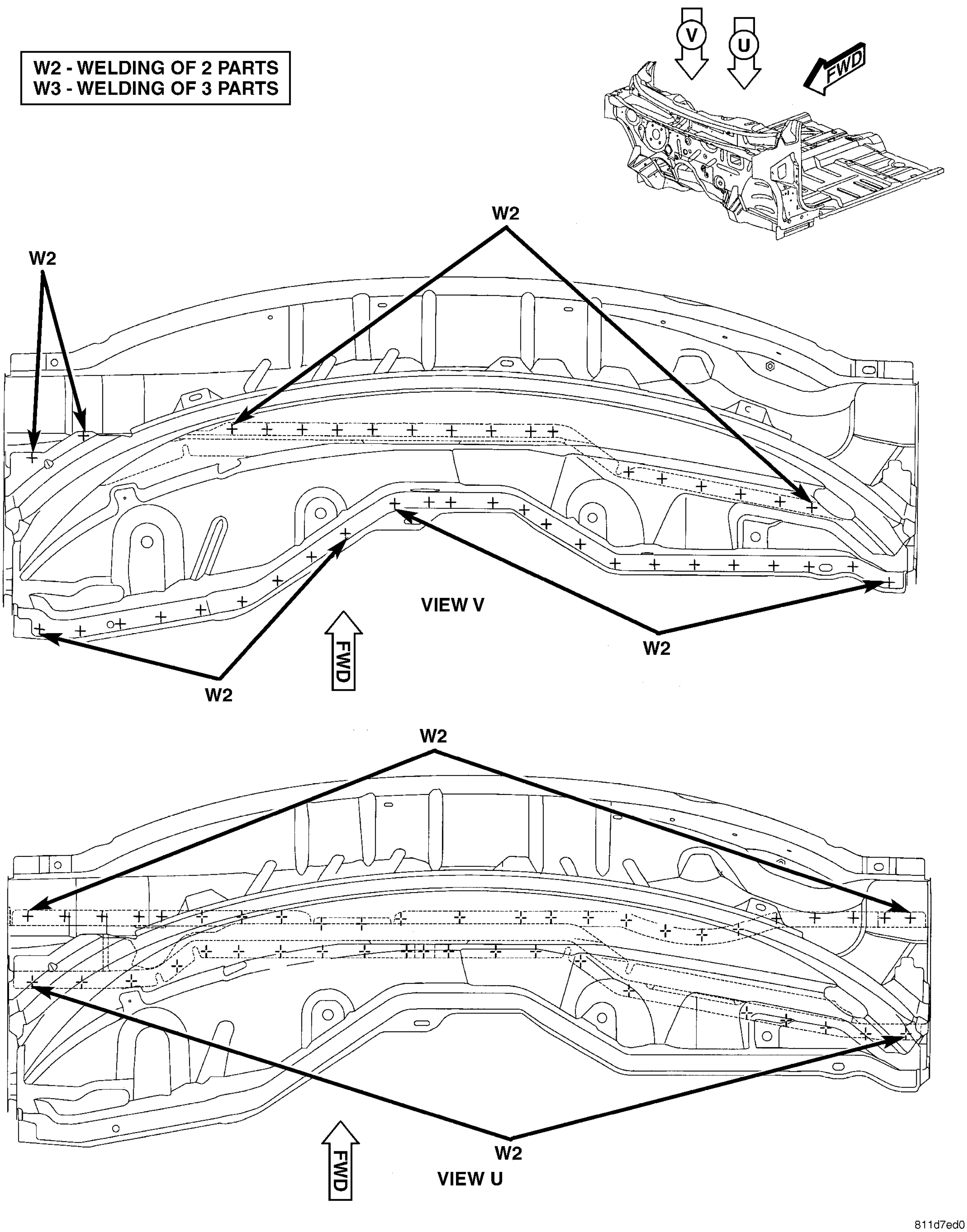

Fig. 75 COWL TOP PANEL, DASH PANEL COWL PLENUM AND REINFORCEMENT - RIGHT HAND DRIVE ONLY

WELD LOCATIONS (Continued)

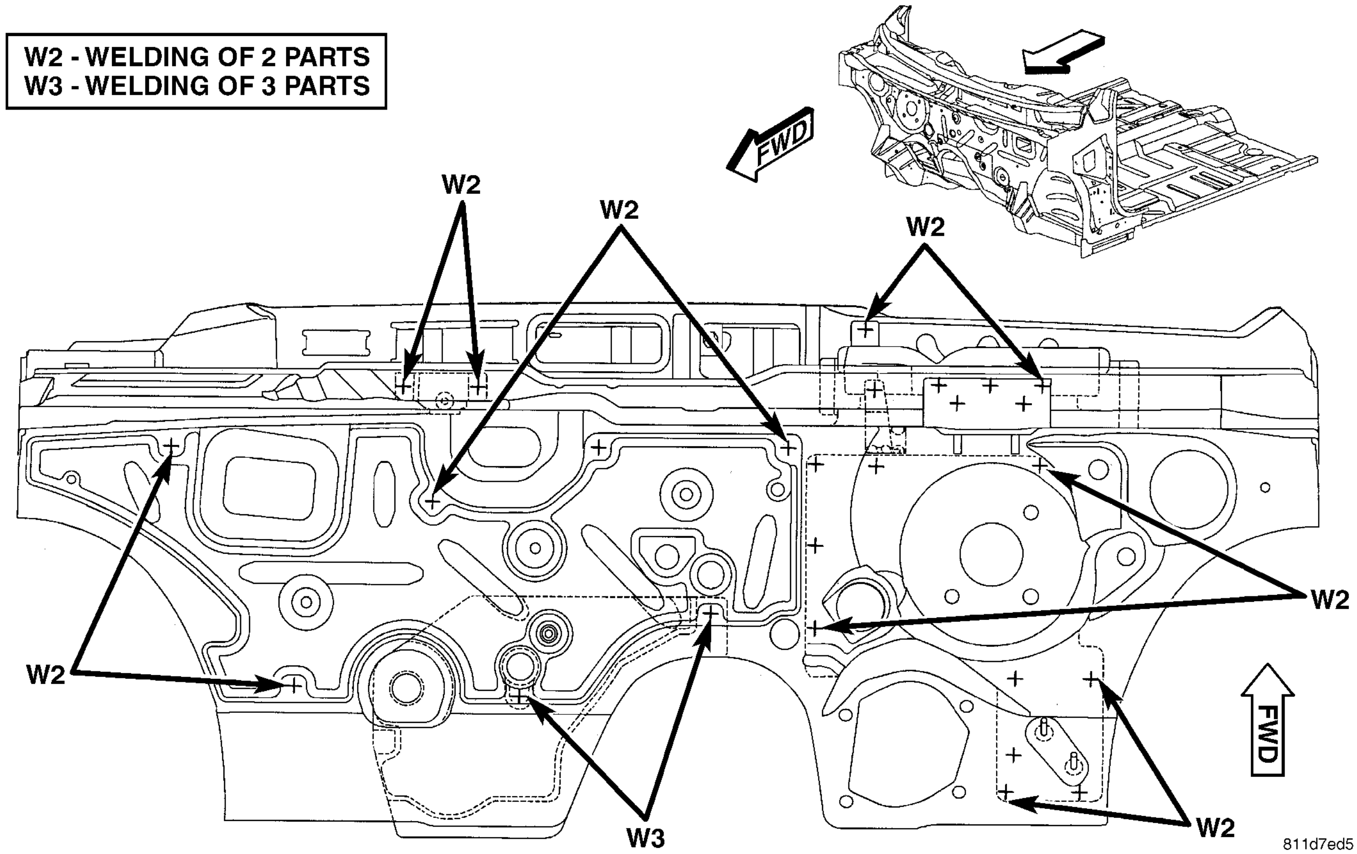

Fig. 76 BRACKETS, CLUTCH PEDAL, BRAKE PEDAL AND A/C SUPPORT TO DASH PANEL - RIGHT HAND ONLY

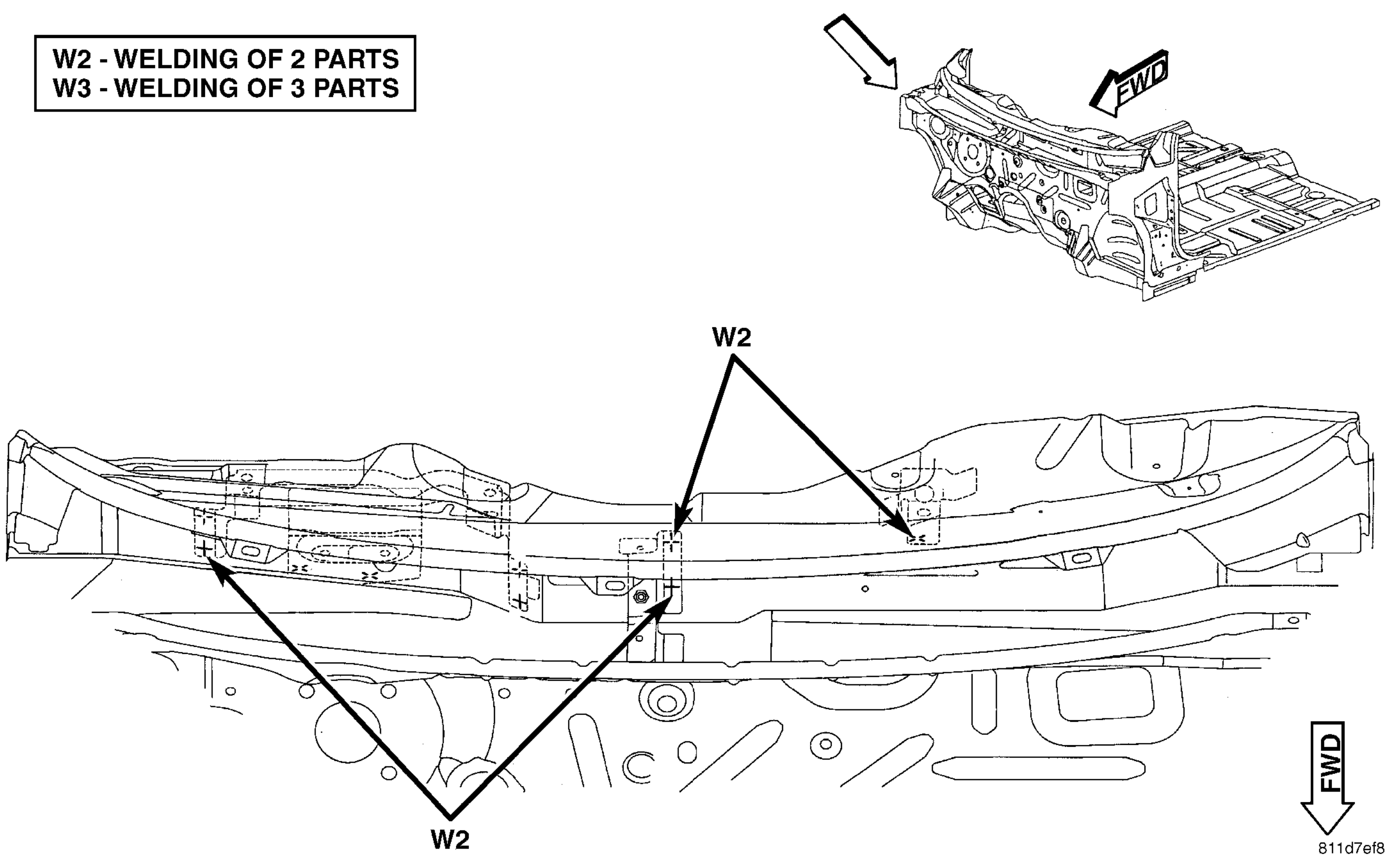

Fig. 77 BRACKETS, COWL PLENUM REINFORCEMENT AND EXTENSION AND COWL PLENUM - RIGHT HAND ONLY

WELD LOCATIONS (Continued)

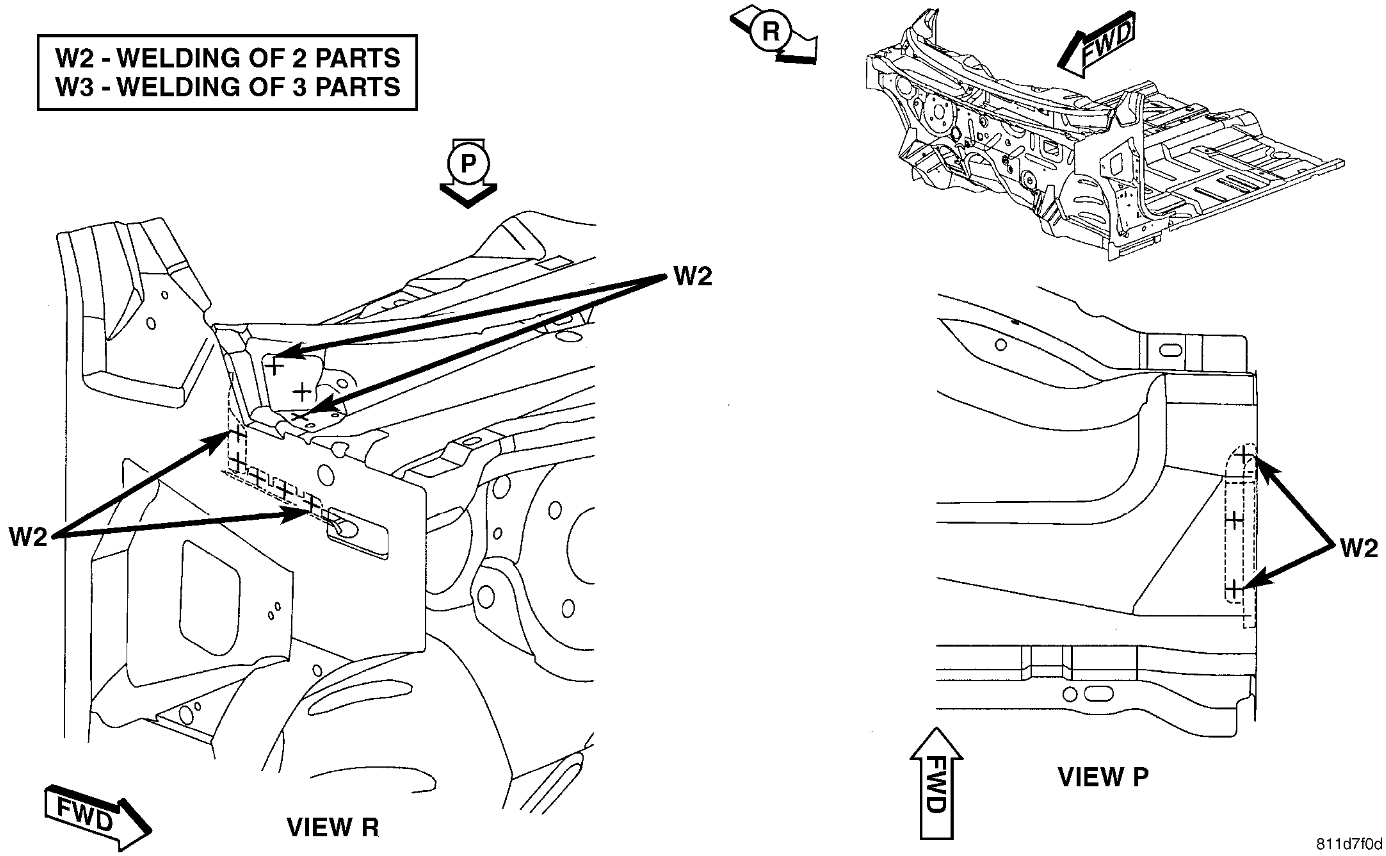

Fig. 78 WIPER SYSTEM MOUNTING BRACKET, COWL PLENUM REINFORCEMENT AND COWL TOP PANEL - RIGHT HAND DRIVE ONLY

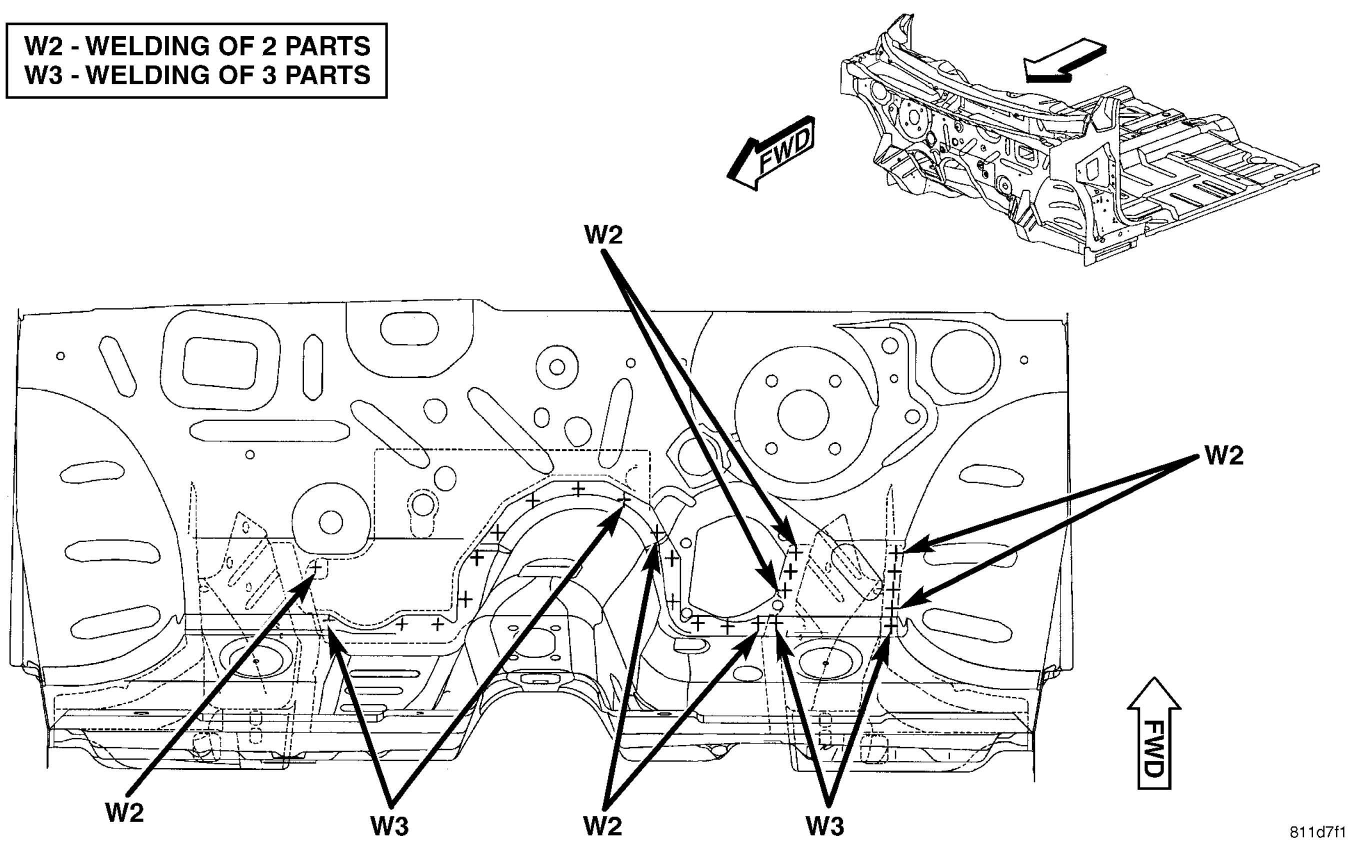

Fig. 79 DASH PANEL AND FLOOR PAN - RIGHT HAND DRIVE ONLY

HEATING & AIR CONDITIONING

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HEATING & AIR CONDITIONING

DESCRIPTION

DESCRIPTION - ENGINE COOLING SYSTEM REQUIREMENTS

To maintain the performance level of the heating-air conditioning system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or condenser will reduce the performance of the air conditioning and engine cooling systems.

The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. Refer to Cooling for more information before opening or attempting any service to the engine cooling system.

DESCRIPTION - HEATER AND AIR CONDITIONER

A manually controlled single zone type heating-air conditioning system or a manually controlled heater-only system is available as standard equipment on this model (depending on market).

All vehicles are equipped with a common heater, ventilation and air conditioning (HVAC) housing (Fig. 1). The system combines air conditioning, heating and ventilation capabilities in a single unit mounted within the passenger compartment under the instrument panel. The HVAC housing includes:

- Blower motor
- Blower motor resistor block
- Recirculation door and actuator (A/C system only)
- Heater core
- Evaporator core (A/C system only)
- Mode door

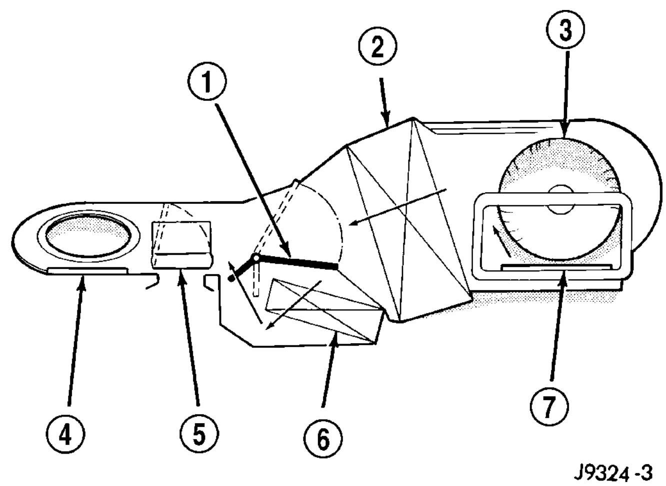

Fig. 1 Common Blend-Air HVAC System-Typical

1 - TEMPERATURE BLEND/AIR DOOR
2 - EVAPORATOR CORE
3 - BLOWER
4 - PANEL DEFROST DOOR
5 - HEAT DEFROST DOOR
6 - HEATER CORE
7 - RECIRCULATING AIR DOOR

Based upon the system mode selected, conditioned air can exit the standard heater-only or optional heater-A/C unit housing through one or a combination of the three main housing outlets: defrost, panel or floor. The defrost and panel outlets are located on the face of the housing and the floor outlet is located on the bottom of the housing. Once the conditioned air exits the HVAC housing, it is further directed through molded plastic ducts to the various outlets in

HEATING & AIR CONDITIONING (Continued)

the vehicle interior. These outlets and their locations are as follows:

- **Defroster Outlet** - A single large defroster outlet is located in the center of the instrument panel top cover, near the base of the windshield.
- **Side Window Demister Outlets** - There are two side window demister outlets, one is located at each outboard end of the instrument panel top cover, near the belt line at the A-pillars.
- **Panel Outlets** - There are four panel outlets in the instrument panel, one located near each outboard end of the instrument panel facing the rear of the vehicle and two located near the top of the instrument panel center bezel.
- **Front Floor Outlets** - There are two front floor outlets. One located above each side of the floor panel center tunnel near the dash panel.

OPERATION

The heating and air conditioning system pulls outside (ambient) air through the cowl opening at the base of the windshield, then into the plenum chamber above the heating, ventilation and air conditioning (HVAC) housing. On models equipped with air conditioning, the air passes through the evaporator. Air flow 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 instrument panel. The air flow can then be directed from the panel, floor and defrost outlets in various combinations using the mode selector. Air flow velocity can be adjusted with the blower speed selector switch on the instrument panel.

On models equipped with air conditioning, the ambient air intake can be controlled by opening and closing the recirculating air door. When placed in RECIRC, air that is inside the vehicle is continuously recirculated through the HVAC housing. Ambient air cannot be controlled on vehicles without A/C. The system uses outside air at all times.

The air conditioning compressor can be engaged by turning the fan switch counterclockwise from the Off position. It can also be engaged by placing the mode control in the mix to defrost positions. This will remove heat and humidity from the air before it is directed through or around the heater core.

The defroster outlet receives airflow from the HVAC housing through the molded plastic defroster duct, which is snapped onto the HVAC housing defroster outlet and secured by a tab to a mounting slot in the dash panel. The airflow from the defroster outlet is directed by fixed vanes in the defroster outlet grille and cannot be adjusted. The defroster outlet grille is integral to the instrument panel top cover.

The side window demister outlets receive airflow from the HVAC housing through the air outlet distribution duct, two molded plastic demister hoses and two intermediate ducts. The air outlet distribution duct is secured to the instrument panel with screws and receives airflow through the panel outlet of the HVAC housing. The airflow from the side window demister outlets is directed by fixed vanes in the demister outlet grilles and cannot be adjusted. The side window demister outlet grilles are integral to the instrument panel top cover. The demisters direct air from the HVAC housing through the outlets located on the top corners of the instrument panel. The demisters operate when the mode selector is anywhere between floor and defrost settings. Some air may be noticeable from the demister outlets when the mode selector is in the bi-level to floor positions.

The panel outlets also receive airflow from the HVAC housing through the air outlet distribution duct. Molded plastic panel outlet ducts direct airflow from the distribution duct to the outboard panel outlets, while a center air outlet duct directs airflow from the distribution duct to the two center panel outlets. The airflow from each of the panel outlets is adjustable. A knob in the center of each panel outlet grille is used in a joystick fashion to adjust a center diffuser that changes the airflow direction, and a knob on the outer edge of each panel outlet grille opens or closes a shutter to turn airflow on or off through that outlet.

The front floor outlets receive airflow from the HVAC housing through the floor distribution duct. The front floor outlets are integral to the molded plastic floor distribution duct, which is secured to the bottom of the HVAC housing. The floor outlets cannot be adjusted.

DIAGNOSIS AND TESTING

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 HVAC housing, 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 instrument control set to RECIRC, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, A/C performance levels rise.

HEATING & AIR CONDITIONING (Continued)

PERFORMANCE TEST PROCEDURE

Review Safety Precautions and Warnings in this group before performing (Refer to 24 - HEATING & AIR CONDITIONING - DESCRIPTION) 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.

(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 closed and windows open.

(5) Insert a thermometer in the left center A/C panel outlet and operate the engine for five minutes. The A/C clutch may cycle depending on ambient conditions. If the clutch cycles, unplug the low pressure cycling clutch switch wire harness connector from the switch located on the accumulator. Place a jumper wire across the terminals of the low pressure cycling clutch switch wire harness connector.

(6) With the A/C clutch engaged, compare the discharge air temperature to the A/C Performance Temperatures charts.

(7) If the discharge air temperature fails to meet the specifications in the performance temperature charts.(Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE) for further diagnosis.

A/C PERFORMANCE TEMPERATURES- (NON-TURBO ENGINES ONLY)

Ambient Temperature	21°C (70°F)	26.5°C (80°F)	32°C (90°F)	37°C (100°F)	43°C (110°F)
Air Temperature at Left Center Panel Outlet	6°C (42°F)	9°C (48°F)	12°C (53°F)	14°C (57°F)	21°C (69°F)
Compressor Discharge Pressure After the Condenser	850 kPa (125 PSI)	1000 kPa (150 PSI	1500 kPa (215 PSI)	2000 kPa (275 PSI)	2400 kPa (350 PSI)
Evaporator Suction Pressure	180 kPa (26 PSI)	250 kPa (35PSI)	260 kpa (38 PSI)	310 kpa (45 PSI)	400 kPa (57 PSI)

A/C PERFORMANCE TEMPERATURES- (2.4L TURBO ENGINE ONLY)

Ambient Temperature	21°C (70°F)	26.5°C (80°F)	32°C (90°F)	37°C (100°F)	43°C (110°F)
Air Temperature at Left Center Panel Outlet	1-8°C (34-46°F)	3-9°C (37-49°F)	4-10°C (39-50°F)	6-11°C (43-52°F)	7-18°C (45-65°F)
Compressor Discharge Pressure After the Filter Drier	1034-1724 kPa (150-250 PSI)	1517-2275 kPa (220-330 PSI	1999-2620 kPa (290-380 PSI)	2068-2965 kPa (300-430 PSI)	2275-3421 kPa (330-496 PSI)
Evaporator Suction Pressure	103-207 kPa (15-30 PSI)	117-221 kPa (17-32 PSI)	138-241 kpa (20-35 PSI)	172-269 kpa (25-39 PSI)	207-345 kPa (30-50 PSI)

DIAGNOSIS AND TESTING - HEATER PERFORMANCE TEST

PRE-DIAGNOSTIC PREPARATIONS

Review Safety Precautions and Warnings(Refer to 24 - HEATING & AIR CONDITIONING - DESCRIPTION) 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.

TEMPERATURE REFERENCE CHART

Ambient Temperature		Minimum Floor Outlet Temperature	
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°

If the floor outlet air temperature is insufficient (Refer to 7 - COOLING - DIAGNOSIS AND TESTING. Both heater hoses should be HOT to the touch (coolant return hose should be slightly cooler than the 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.
(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 door not functioning properly.

TEMPERATURE CONTROL

If temperature cannot be adjusted with the Temperature knob one of the following could require service:

(1) Blend door binding.
(2) Faulty temperature control cable.
(3) Improper engine coolant temperature.
(4) Faulty A/C-heater Control.

SPECIFICATIONS - A/C SYSTEM

The R-134a refrigerant system charge capacity for this vehicle can be found on the underhood specification label for the A/C unit.

HEATING & AIR CONDITIONING (Continued)

A/C SYSTEM SPECIFICATION CHART

Item	Description	Notes
Compressor	Nippondenso 10S15 - 2.0L LHD models Nippondenso 10S17 - 2.4L and RHD models	ND-8 PAG oil
Freeze-up Control - 2.0L LHD models	A/C low pressure switch	Input to PCM, accumulator mounted, cycles clutch off below -1° C (30° F), cycles back on above 7.2° C (45° F)
Freeze-up Control - 2.4L and RHD models	Evaporator temperature sensor	Input to PCM, evaporator mounted, cycles clutch off below 1° C (34° F), cycles back on above 7.2° C (45° F)
Low psi Control - 2.0L LHD models	A/C low pressure switch	Accumulator mounted - opens below 152 kPa (22 psi) - resets above 234 - 262 kPa (34 - 38 psi)
Low psi Control - 2.4L and RHD models	A/C low pressure switch	Expansion valve mounted - opens below 96 kPa (14 psi) - resets above 234 - 262 kPa (34 - 38 psi)
High psi Control	A/C high pressure switch	Compressor mounted - opens at discharge pressure above 3240 kPa (470 psi) - resets at 2275 - 2551 kPa (330 - 370 psi)
Compressor Clutch Coil Draw	2.5 amps @ 12V± 0.5V @ 21° C (70° F)	
Compressor Clutch Air Gap	0.35 - 0.65 mm (0.014 - 0.026 in.)	

TORQUE SPECIFICATIONS

Description	N·m	Ft. Lbs.	In. Lbs.
A/C Compressor Shaft Bolt	17.5	–	155
A/C Compressor Mounting Bolts	28	21	–
A/C Expansion Valve Bolts - 2.4L/RHD models	10	–	88
A/C-heater Control Screws	2.3	–	20
Air Outlet Distribution Duct Screws	2.3	–	20
Air Outlet Center Duct Screws	2.3	–	20
Accumulator Mounting Bracket Bolt	11	–	97
Refrigerant Lines/ Expansion Valve to Evaporator Tapping Plate Bolts	10	–	88
Blower Motor Screws (A/C equipped)	2.3	–	20

HEATING & AIR CONDITIONING (Continued)

Description	N·m	Ft. Lbs.	In. Lbs.
Condenser Retaining Screws	2	–	17
Discharge Line to Compressor Bolt	12	–	108
Discharge Line to Condenser Bolt	12	–	108
Floor Distribution Duct Screws	2.3	–	20
HVAC Housing Screws	2.3	–	20
HVAC Housing Outboard Bolt	4.5	–	40
HVAC Housing Stud Nuts	4.5	–	40
Left Demister Adapter Duct Screws	2.3	–	20
Liquid Lines to Receiver/ Drier Bolts - 2.4L/RHD models	2.3	–	20
Liquid Line to Condenser Bolt	12	–	108
Mode Control Cable Housing Screw	2.3	–	20
Refrigerant Lines to Expansion Valve Bolt - 2.4L/RHD models	20	15	–
Suction Lines to Accumulator Nuts - 2.0L LHD models	2.3	–	20
Suction Line Mid-Line Connector Block Nut	4.5	–	40
Suction Line to Compressor Bolt	12	–	108
Temperature Control Cable Housing Screw	2.3	–	20

CONTROLS

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A/C COMPRESSOR CLUTCH COIL

DESCRIPTION

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 1). The electromagnetic coil unit and the hub bearing and pulley assembly are each retained on the nose of the compressor front housing with snap rings. The clutch plate is keyed to the compressor shaft and secured with a retainer. These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt.

OPERATION

When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the compressor shaft. When the coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

A/C compressor clutch engagement is controlled by the following components:

- A/C-heater mode control switch
- A/C low pressure switch
- A/C high pressure switch
- A/C compressor clutch relay
- Powertrain Control Module (PCM)

A/C COMPRESSOR CLUTCH COIL (Continued)

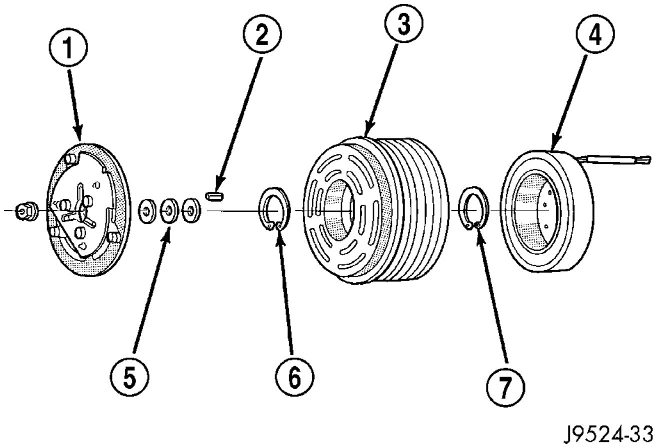

Fig. 1 A/C Compressor Clutch - Typical

1 - CLUTCH PLATE
2 - SHAFT KEY
3 - PULLEY
4 - COIL
5 - CLUTCH SHIMS
6 - SNAP RING
7 - SNAP RING

The PCM may delay compressor clutch engagement for up to thirty seconds.

REMOVAL

Compressor assembly must be removed from the mounting bracket (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL). Although, refrigerant discharge is not necessary.

(1) Remove the compressor shaft bolt (Fig. 2). A band type oil filter removal tool can be placed around the clutch plate to aid in bolt removal.

(2) Tap the clutch plate with a plastic hammer and remove clutch plate and shim(s) (Fig. 3).

NOTE: Use care not to lose any of the shim(s).

CAUTION: Do not use screwdrivers between the clutch plate assembly and pulley to remove front plate as this may damage the front plate assembly.

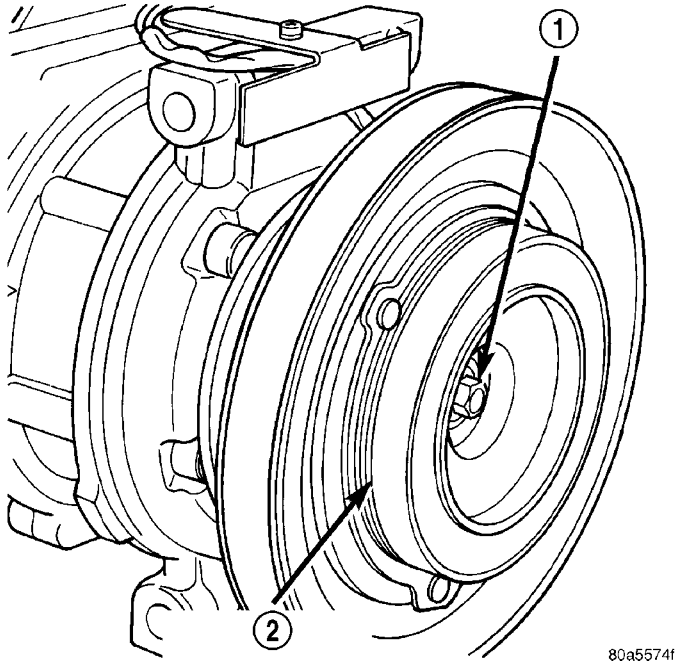

Fig. 2 Compressor Shaft Bolt and Clutch Plate

1 - COMPRESSOR SHAFT BOLT
2 - COMPRESSOR CLUTCH PLATE

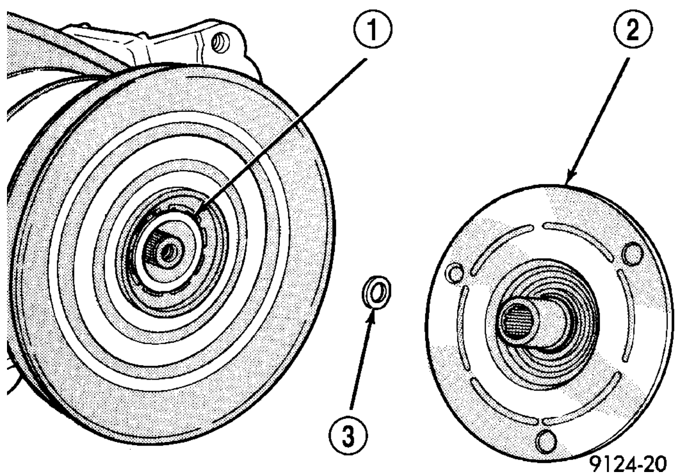

Fig. 3 Clutch Plate and Shim(s)

1 - COMPRESSOR SHAFT
2 - CLUTCH PLATE
3 - CLUTCH PLATE SHIM

A/C COMPRESSOR CLUTCH COIL (Continued)

(3) Remove pulley retaining snap ring with Snap Ring Pliers, and slide pulley assembly off of compressor (Fig. 4).

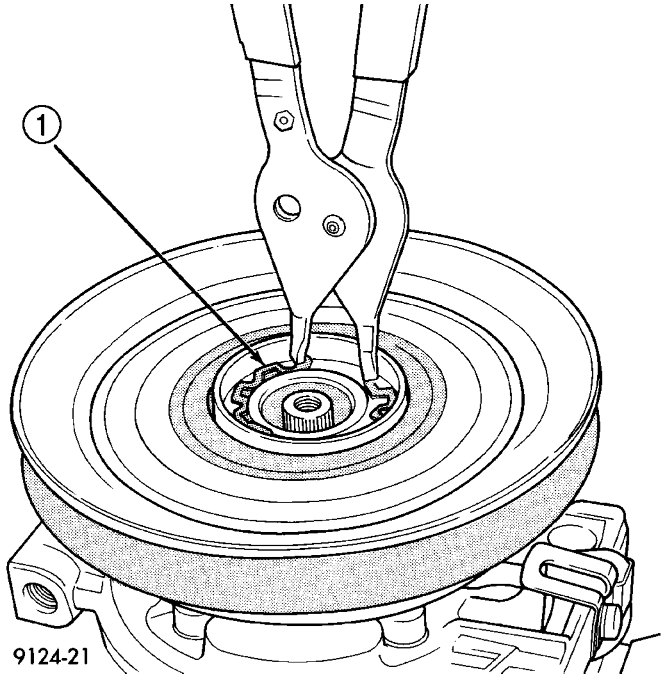

Fig. 4 Removing Pulley Snap Ring

1 - SNAP RING

(4) Remove coil wire bracket/ground clip screw and wire harness.

(5) Remove snap ring retaining field coil onto compressor housing (Fig. 5). Slide field coil off of compressor housing.

(6) Examine frictional faces of the clutch pulley and front plate for wear. The pulley and front 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 oil and remove the felt from the front cover. If the compressor felt is saturated with oil, the shaft seal is leaking and will have to be replaced.

(7) Check bearing for roughness or excessive leakage of grease. Replace bearing as required.

INSTALLATION

(1) Align pin in the back of the field coil with hole in compressor end housing, position the field coil into place. Make sure that lead wires are properly routed, and fasten the coil wire bracket/ground retaining screw.

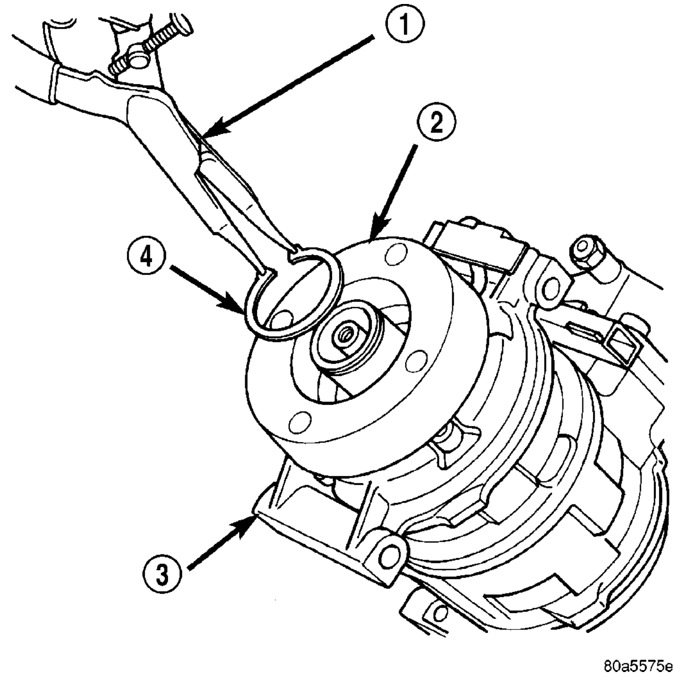

Fig. 5 Clutch Coil Snap Ring

1 - SNAP RING PLIERS
2 - CLUTCH COIL
3 - COMPRESSOR
4 - SNAP RING

NOTE: A new snap ring must be used. The bevel side of the snap ring must be outward.

(2) Install field coil retaining snap ring with Snap Ring Pliers. Press snap ring to make sure it is properly seated in the groove.

CAUTION: If snap ring is not fully seated it will vibrate out, resulting in a clutch failure and severe damage to the front face of the compressor.
Do not mar the pulley frictional surface.

(3) Install pulley assembly to compressor. If necessary, tap gently with a block of wood on the friction surface (Fig. 6).

(4) Install pulley assembly retaining snap ring (bevel side outward) with Snap Ring Pliers. Press the snap ring to make sure it is properly seated in the groove.

(5) If the original front plate assembly and pulley assembly are to be reused, the old shim(s) can be used. If not, place a trial stack of shims, 2.54 mm (0.10 in.) thick, on the shaft against the shoulder.

(6) Install front plate assembly onto shaft.

A/C COMPRESSOR CLUTCH COIL (Continued)

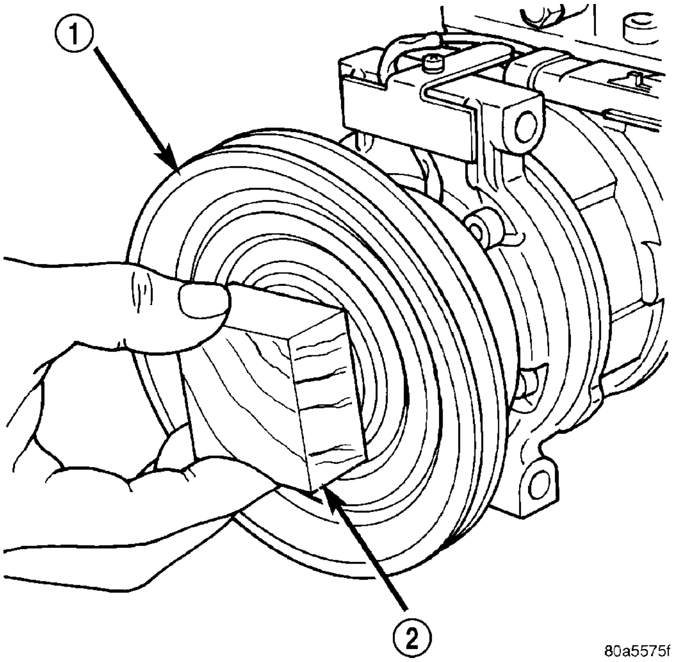

Fig. 6 Installing Pulley Assembly

1 - PULLEY ASSEMBLY
2 - WOOD BLOCK

(7) If installing a new front plate and/or pulley assembly, the gap between front plate and pulley face must be checked. Use the following procedure:

(a) Attach a dial indicator to front plate so that movement of the plate can be measured.

(b) With the dial indicator zeroed on the front plate, energize the clutch and record the amount of movement.

(c) The readings should be 0.35 to 0.65 mm (0.014 to 0.026 in.). If proper reading is not obtained, add or subtract shims until desired reading is obtained.

(8) Install compressor shaft bolt. Tighten the bolt to 17.5 N·m (155 in. lbs.).

NOTE: Shims may compress after tightening shaft nut. Check air gap in four or more places to verify if air gap is still correct. Spin pulley for final check.

(9) Install the compressor onto the compressor mount (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

CLUTCH BREAK-IN

After new clutch installation, cycle the A/C clutch 20 times (5 seconds on and 5 seconds off). During this procedure, set the system to the A/C mode, engine rpm at 1500 - 2000, and high blower speed. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher clutch torque capability.

A/C COMPRESSOR CLUTCH RELAY

DESCRIPTION

The A/C compressor clutch relay (Fig. 7) is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay. The A/C compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for A/C compressor clutch relay identification and location.

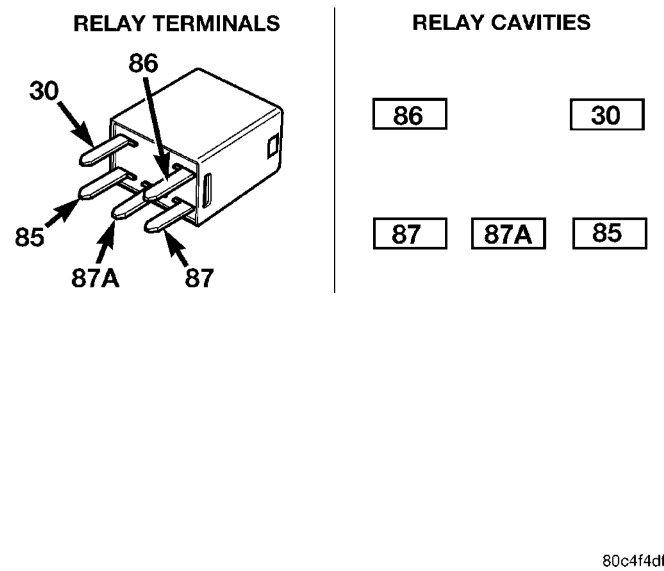

Fig. 7 A/C Compressor Clutch Relay

TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

A/C COMPRESSOR CLUTCH RELAY (Continued)

The black, molded plastic case is the most visible component of the A/C compressor clutch relay. Five male spade-type terminals extend from the bottom of the base to connect the relay to the vehicle electrical system, and the ISO designation for each terminal is molded into the base adjacent to each terminal. The ISO terminal designations are as follows:

- **30 (Common Feed)** - This terminal is connected to the movable contact point of the relay.
- **85 (Coil Ground)** - This terminal is connected to the ground feed side of the relay control coil.
- **86 (Coil Battery)** - This terminal is connected to the battery feed side of the relay control coil.
- **87 (Normally Open)** - This terminal is connected to the normally open fixed contact point of the relay.
- **87A (Normally Closed)** - This terminal is connected to the normally closed fixed contact point of the relay.

The factory-installed A/C compressor clutch relay cannot be adjusted or repaired. If the relay is damaged or faulty, it must be replaced.

OPERATION

The A/C compressor clutch relay is an electromechanical switch that uses a low current input from the Powertrain Control Module (PCM) to control the high current output to the Compressor clutch electromagnetic coil. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. The resistor or diode is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The A/C compressor clutch relay terminals are connected to the vehicle electrical system through a receptacle in the PDC. The inputs and outputs of the A/C compressor clutch relay include:

- The common feed terminal (30) receives a battery current input from a fuse in the PDC through a fused B(+) circuit at all times.
- The coil ground terminal (85) receives a ground input from the PCM through the A/C compressor clutch relay control circuit only when the PCM electronically pulls the control circuit to ground.
- The coil battery terminal (86) receives a battery current input from a fuse in the fuse block module through a fused ignition switch output (run-start) circuit only when the ignition switch is in the On or Start positions.
- The normally open terminal (87) provides a battery current output to the compressor clutch coil through the A/C compressor clutch relay output circuit only when the A/C compressor clutch relay coil is energized.
- The normally closed terminal (87A) is not connected to any circuit in this application, but provides a battery current output only when the A/C compressor clutch relay coil is de-energized.

Refer to the appropriate wiring information for complete air conditioning-heater wiring diagrams.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 8).

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for A/C compressor clutch relay identification and location.

(4) Remove the A/C compressor clutch relay from the PDC.

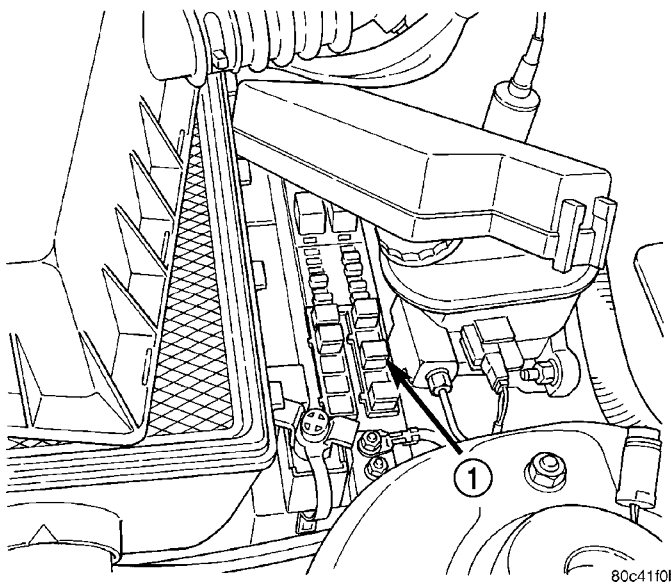

Fig. 8 Power Distribution Center - LHD Shown, RHD Typical

1 - PDC

INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper A/C compressor clutch relay location.

(2) Position the A/C compressor clutch relay in the proper receptacle in the PDC.

A/C COMPRESSOR CLUTCH RELAY (Continued)

(3) Align the A/C compressor clutch relay terminals with the terminal cavities in the PDC receptacle.

(4) Push down firmly on the A/C compressor clutch relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Install the cover onto the PDC.

(6) Reconnect the battery negative cable.

A/C HEATER CONTROL

DESCRIPTION

Both the heater-only and heater-A/C systems use a combination of, electrical, cable, and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the features, use, and suggested operation of these controls.

The heater-only or heater-A/C control panel is located to the right of the instrument cluster on the instrument panel. The control panel contains rotary-type knobs. There is a blower motor speed switch, mode control switch, temperature control, and airflow control.

The heater-only or heater-A/C control panel cannot be repaired. If faulty or damaged, the entire unit must be replaced. The control knobs and the illumination lamps are available for service replacement.

DIAGNOSIS AND TESTING - VACUUM CONTROL SYSTEM

Use an adjustable vacuum test set (Special Tool C-3707-B) and a suitable vacuum pump to test the heater-A/C vacuum control system. With a finger placed over the end of the vacuum test hose probe (Fig. 9), adjust the bleed valve on the test set gauge to obtain a vacuum of exactly 27 kPa (8 in. Hg.). Release and block the end of the probe several times to verify that the vacuum reading returns to the exact 27 kPa (8 in. Hg.) setting. Otherwise, a false reading will be obtained during testing.

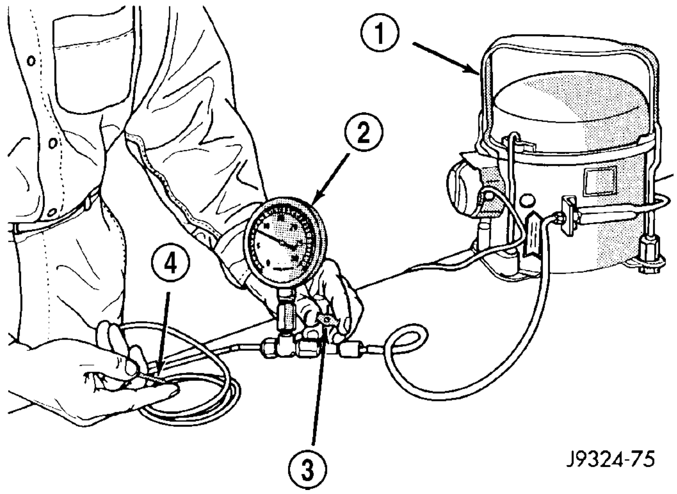

Fig. 9 Adjust Vacuum Test Bleed Valve

1 - VACUUM PUMP TOOL C-4289
2 - VACUUM TEST SET C-3707
3 - BLEED VALVE
4 - PROBE

HEATER-A/C VACUUM SYSTEM DIAGNOSIS

Condition	Possible Causes	Correction
No Forced Air in Heat Position	1. Vacuum line pinched or leaking. 2. Faulty heat defroster or mode door. 3. Faulty selector switch. 4. Vacuum check valve.	1. Locate and repair vacuum leak or pinched line. 2. Test actuators and door operation. Repair as necessary. 3. Test selector switch and replace if necessary. 4. Test check valve and replace if necessary.
No Forced Air in Panel Position	1. Vacuum line pinched or leaking. 2. Faulty mode door. 3. Faulty selector switch. 4. Vacuum check valve.	1. Locate and repair vacuum leak or pinched line. 2. Test actuator and door operation. Repair as necessary. 3. Test selector switch and replace if necessary. 4. Test check valve and replace if necessary.

A/C HEATER CONTROL (Continued)

Condition	Possible Causes	Correction
No Forced Air in Defrost Position	1. Vacuum line pinched or leaking. 2. Faulty heat , defroster, or mode door. 3. Faulty selector switch. 4. Vacuum check valve.	1. Locate and repair vacuum leak or pinched line. 2. Test actuators and door operation. Repair as necessary. 3. Test selector switch and replace if necessary. 4. Test check valve and replace if necessary.

ONE-WAY CHECK VALVE

(1) Disconnect the heater-A/C vacuum supply (Black) tube in the engine compartment. This tube passes through an opening in the dash panel.

(2) Remove the one-way vacuum check valve. The valve is located on the (Black) vacuum supply hose at the brake power booster.

(3) Connect the test set vacuum supply hose to the heater side of the valve. When connected to this side of the check valve, no vacuum should pass and the test set gauge should return to the 27 kPa (8 in. Hg.) setting. If OK, go to step Step 4. If not OK, replace the faulty valve.

(4) Connect the test set vacuum supply hose to the engine vacuum side of the valve. When connected to this side of the check valve, vacuum should flow through the valve without restriction. If not OK, replace the faulty valve.

A/C-HEATER CONTROLS

The operation of the recirculation door can be viewed by removing the blower motor and looking up into the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/BLOWER MOTOR - REMOVAL).

(1) Connect the test set vacuum probe to the heater-A/C vacuum supply (Black) hose in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

(2) Start with the mode control in the Panel position and the recirculation control in the Outside-air position.

(3) Move the recirculation control to the Recirculation position (the recirculation door should move into the Recirculation position). After a short pause move the mode control to the Defrost position (the recirculation door should move to the Outside-air position). The test gauge should return to the calibrated setting of 27 kPa (8 in. Hg.) after each selection is made. If the gauge cannot achieve the calibrated setting, the vacuum circuit or a component has a leak.

(4) If the gauge achieves the calibrated setting but the door does not move, there is either a pinched vacuum line or a failed actuator.

LOCATING VACUUM LEAKS

(1) Connect the test vacuum probe to the vehicles (Black) supply hose. Position the vacuum test gauge so it can be viewed from the passenger compartment.

(2) Place the mode control in the Panel position and the recirculation control in the Recirculation position.

(3) Remove the center instrument panel bezel.

(4) Remove the center vent duct.

(5) Remove and block the supply (Black) vacuum line at the A/C-heater control. The test gauge should return to the calibrated setting of 27 kPa (8 in. Hg). If not, there is a leak in the supply line.

(6) If there is no leak in the supply line, reconnect it to the A/C-heater control and remove the actuator feed (Red) line from the control. Block the vacuum connection on the control from where the line was removed. The test gauge should return to the calibrated setting of 27 kPa (8 in. Hg.). If not, there is a leak in the control.

(7) If there is no leak in the supply line or the A/C-heater control, reconnect the actuator feed (Red) line to the control. Remove and block the actuator feed (Red) line at the actuator. The actuator vacuum port is accessible behind and above the glove box. The test gauge should return to the calibrated setting of 27 kPa (8 in. Hg.). If not there is a leak in the actuator feed line.

(8) If there is no leak in the supply line, A/C-heater control, or the actuator feed line, the leak must be in the actuator itself. Connect the vacuum hose from the Vacuum Test Gauge directly to the actuator to verify the leak.

LOCATING PINCHED VACUUM LINES

The operation of the recirculation door can be viewed by removing the blower motor and looking up into the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/BLOWER MOTOR - REMOVAL).

(1) Connect the test vacuum probe to the vehicles (Black) supply hose. Position the vacuum test gauge so it can be viewed from the passenger compartment.

(2) Place the mode control in the Panel position and the recirculation control in the Recirculation position.

(3) Remove the center instrument panel bezel.

A/C HEATER CONTROL (Continued)

(4) Remove the center vent duct.

(5) Remove the supply (Black) vacuum line at the A/C-heater control. The test gauge should drop indicating free flow through the supply line. If not, there is a blockage in the supply line.

(6) If there is no blockage in the supply line, reconnect it to the A/C-heater control. Remove the actuator feed (Red) line from the control. The test gauge should drop indicating free flow through the supply line and control. If not the vacuum switches on the control are not functioning.

(7) If there is no blockage in the supply line or the A/C-heater control, reconnect the actuator feed (Red) line to the control. Remove the actuator feed (Red) line at the actuator. The actuator vacuum port is accessible behind and above the glove box. The test gauge should drop indicating free flow through the supply line, control, and the actuator feed line. If not, there is a blockage in the actuator feed line.

(8) If there is no blockage in the supply line, A/C-heater control, or the actuator feed line, the actuator must have failed. Connect the vacuum hose from the Vacuum Test Gauge directly to the actuator to verify the actuator has failed.

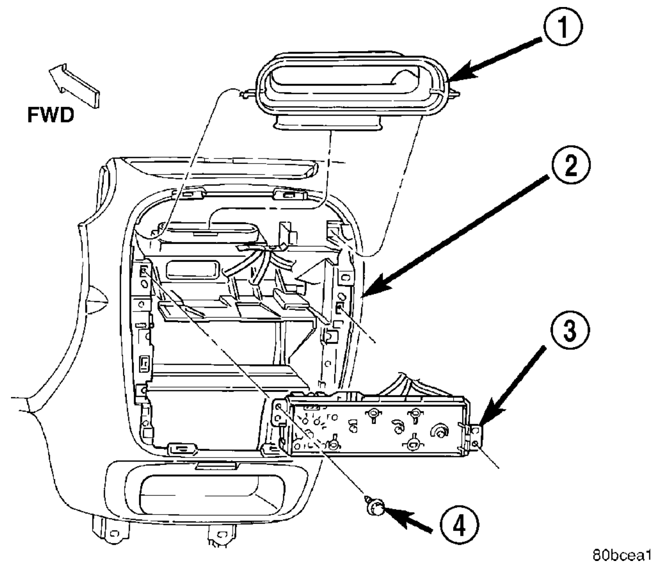

Fig. 10 HVAC Center Air Duct & A/C-Heater Control

1 - CENTER AIR DUCT
2 - INSTRUMENT PANEL
3 - A/C-HEATER CONTROL
4 - SCREW (2)

REMOVAL

(1) Remove the instrument panel center stack bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(2) Remove the center air duct (Fig. 10).

(3) Remove the screws that secure the A/C-heater control to the instrument panel.

(4) Remove the A/C-heater control from the instrument panel.

(5) Disconnect the vacuum harness, control cables and wire harness from the A/C-heater control (Fig. 11).

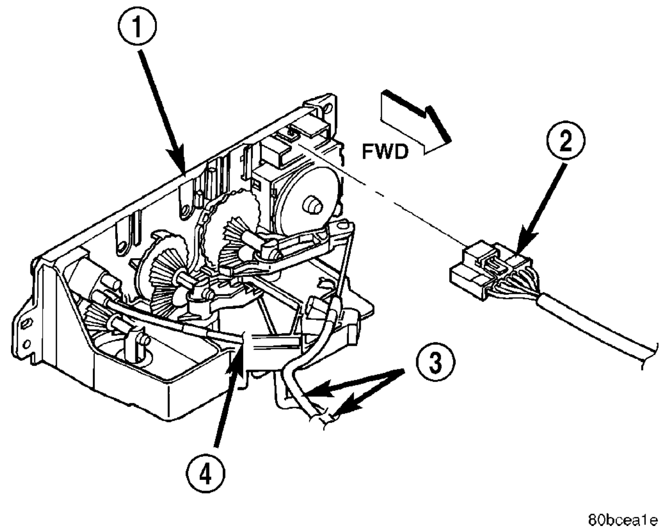

Fig. 11 A/C-Heater Control

1 - A/C-HEATER CONTROL
2 - ELECTRICAL CONNECTOR
3 - CONTROL CABLES
4 - VACUUM HARNESS

INSTALLATION

(1) Connect the vacuum harness, control cables and wire harness to the back of the A/C-heater control and adjust the mode and temperature control cables.

(2) Install the A/C-heater control to the instrument panel. Tighten the screws to 2.3 N·m (20 in. lbs.).

(3) Install the center air duct.

(4) Install the instrument panel center stack bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

A/C HIGH PRESSURE SWITCH

DESCRIPTION

The A/C high pressure switch is located on the rear of the A/C compressor. The A/C high pressure switch turns off the compressor if the refrigerant system pressure exceeds 3240 kPa (470 psi). The A/C high pressure switch is factory calibrated and cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

REMOVAL

WARNING: THE REFRIGERANT MUST BE REMOVED FROM THE SYSTEM BEFORE REMOVING THE A/C HIGH PRESSURE SWITCH.

(1) Recover refrigerant from A/C system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(2) Disconnect and isolate the battery negative cable.

(3) Raise and support the vehicle.

(4) Disconnect the engine wire harness connector from the A/C high pressure switch on the A/C compressor back cover (Fig. 12).

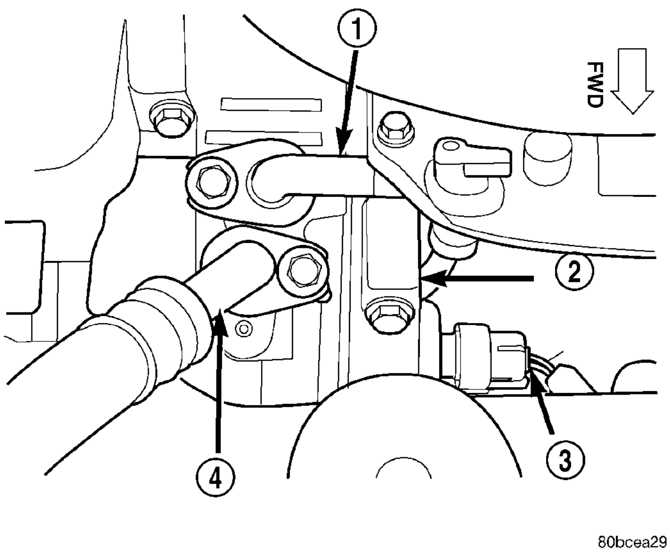

Fig. 12 A/C High Pressure Switch - Typical

1 - DISCHARGE LINE
2 - A/C COMPRESSOR
3 - A/C HIGH PRESSURE SWITCH
4 - SUCTION LINE

(5) Using snap ring pliers, remove the internal snap ring that secures the A/C high pressure switch to the port in the compressor back cover.

(6) Pull the A/C high pressure switch out of the compressor back cover.

(7) Install a plug in or tape over the opened switch port on the compressor back cover.

(8) Remove the rubber O-ring seal from the A/C high pressure switch and discard.

INSTALLATION

WARNING: THE REFRIGERANT MUST BE REMOVED FROM THE SYSTEM BEFORE REMOVING THE A/C HIGH PRESSURE SWITCH.

(1) Clean any foreign matter from the switch mounting bore.

(2) Install the A/C high pressure switch with a new O-ring. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(3) Remove the tape or plug from the switch port on the compressor back cover.

(4) Insert the A/C high pressure switch into the port on the compressor back cover.

(5) Using snap ring pliers, install the internal snap ring that secures the A/C high pressure switch to the port in the compressor back cover.

(6) Connect the wire harness connector to the A/C high pressure switch.

(7) Lower the vehicle.

(8) Reconnect the battery negative cable.

(9) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(10) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

A/C LOW PRESSURE SWITCH

DESCRIPTION

The A/C low pressure switch is a single pole, single throw, pressure actuated switch that is installed in a threaded port into the suction passage of the accumulator on 2.0L LHD models or in a threaded port into the suction passage of the expansion valve on 2.4L and RHD models. The accumulator fitting on 2.0L LHD models contain a Schrader type valve, which allows the switch to be serviced without discharging the refrigerant system and is equipped with a O-ring to seal the switch plumbing connection. The A/C low pressure switch on 2.4l and RHD models can only be serviced with the refrigerant system discharged.

The A/C low pressure switch is factory calibrated and cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

A/C LOW PRESSURE SWITCH (Continued)

OPERATION

The A/C low pressure switch is electrically connected in series with the A/C-heater control mode switch and the A/C high pressure switch, between ground and the powertrain control module (PCM). The A/C low pressure switch contact opens or closes the path the ground, signaling the PCM to turn the A/C compressor clutch on and off. This regulates the refrigerant system pressure and controls evaporator coil temperature. Controlling the evaporator temperature prevents condensate water on the evaporator fins from freezing and obstructing air conditioning system air flow.

On 2.0L LHD models, the A/C low pressure switch contacts are open when the suction pressure is approximately 152 kPa (22 psi) or lower. The switch contacts will close when the suction pressure rises to approximately 234 to 262 kPa (34 to 38 psi) or above. Lower ambient temperatures, below approximately -1° C (30° F), will also cause the A/C low pressure switch contacts to open. This is due to the pressure/temperature relationship of the refrigerant in the system.

On 2.4L and RHD models, the A/C low pressure switch contacts are open when the suction pressure is approximately 96 kPa (14 psi) or lower. The switch contacts will close when the suction pressure rises to approximately 234 to 262 kPa (34 to 38 psi) or above.

DIAGNOSIS AND TESTING - A/C LOW PRESSURE SWITCH

Before performing diagnosis of the A/C low pressure switch, be certain that the switch is properly installed. If the switch is not properly installed, it may not open the Schrader-type valve in the accumulator fitting on LHD models, which will prevent the switch from correctly monitoring the refrigerant system pressure.

(1) Verify that the refrigerant system has the correct refrigerant charge (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) With gear selector in park or neutral and park brake set, start engine and allow to idle.

(3) Place the A/C-heater mode control switch in any A/C position.

(4) Raise hood and disconnect the wire harness connector from the A/C low pressure switch.

(5) Using a suitable jumper wire, install the wire between the two terminal cavities of the A/C low pressure switch wire harness connector. The A/C compressor clutch should engage.

(6) If the A/C compressor clutch does not engage, the A/C compressor clutch, A/C compressor clutch relay, A/C-heater mode control switch, A/C high pressure switch, PCM, fuses or related wiring circuits may be defective (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION - DIAGNOSIS AND TESTING).

(7) If the A/C compressor clutch does engage, connect a manifold gauge set to the low side refrigerant system service port (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(8) Check for continuity between the two terminals of the A/C low pressure switch. There should be continuity with a suction pressure reading of 276 kPa (40 psi) or above, and no continuity with a suction pressure reading of 172 kPa (25 psi) or below. If OK, test and repair the A/C compressor clutch, A/C compressor clutch relay, A/C-heater mode control switch, A/C high pressure switch, PCM, fuses or related wiring circuits as required. If not OK, replace the faulty A/C low pressure switch.

REMOVAL

REMOVAL - 2.0L LHD MODELS

NOTE: Note: It is not necessary to discharge the refrigerant system to replace the A/C low pressure switch.

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the wire harness connector from the A/C low pressure switch (Fig. 13).

(3) Remove the A/C low pressure switch from the fitting on the top of the accumulator.

(4) Remove the O-ring seal from the accumulator and discard.

REMOVAL - 2.4L AND RHD MODELS

WARNING: THE REFRIGERATION SYSTEM MUST BE COMPLETELY RECOVERED BEFORE PROCEEDING WITH THIS OPERATION.

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Disconnect and isolate the battery negative cable.

A/C LOW PRESSURE SWITCH (Continued)

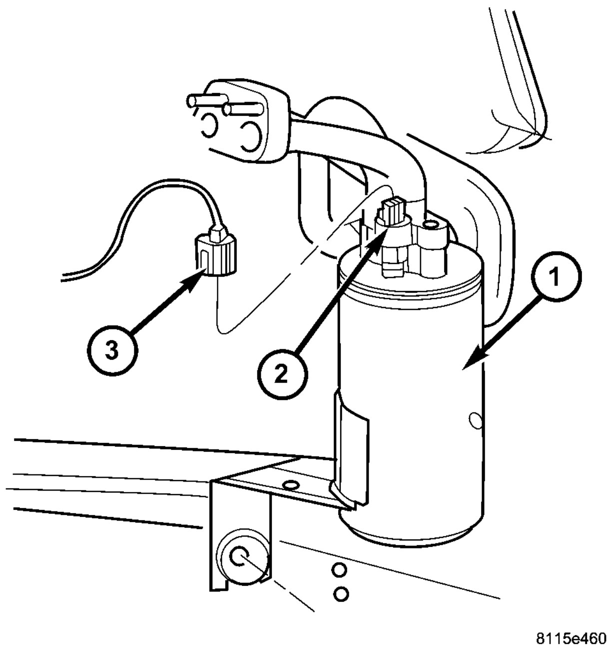

Fig. 13 A/C Low Pressure Switch - Typical

1 - ACCUMULATOR
2 - A/C LOW PRESSURE SWITCH
3 - WIRE HARNESS CONNECTOR

(3) Disconnect the wire harness connector from the A/C low pressure switch (Fig. 14).

(4) Using a sender unit removal socket or equivalent, remove the A/C low pressure switch from the expansion valve.

(5) Remove the O-ring seal from the pressure switch fitting and discard.

(6) Install plug in, or tape over the opened expansion valve port.

INSTALLATION

INSTALLATION - 2.0L LHD MODELS

NOTE: Replace the O-ring seal before installing the A/C low pressure switch.

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the accumulator fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(2) Install and tighten the A/C low pressure switch onto the accumulator fitting. The switch should be hand-tightened securely onto the accumulator fitting.

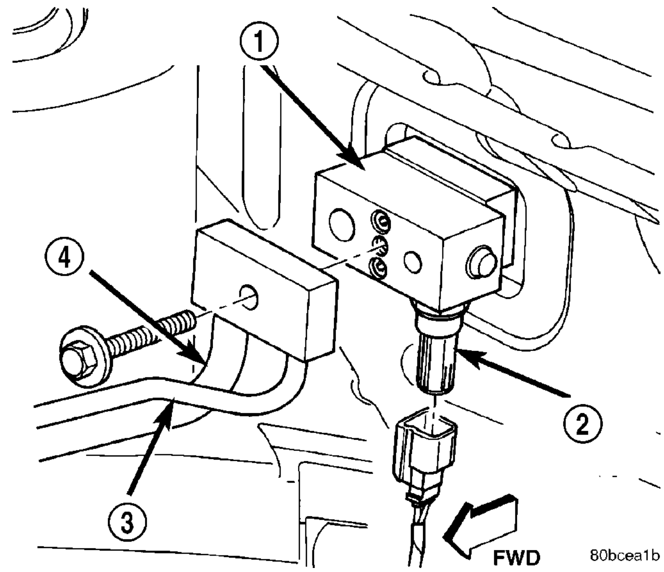

Fig. 14 A/C Low Pressure Switch

1 - A/C EXPANSION VALVE
2 - A/C LOW PRESSURE SWITCH
3 - LIQUID LINE
4 - SUCTION LINE

(3) Connect the wiring harness connector to the A/C low pressure switch.

(4) Reconnect the battery negative cable.

INSTALLATION - 2.4L AND RHD MODELS

(1) Remove the tape or plug from the opened expansion valve port.

(2) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the A/C low pressure switch fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(3) Using a sender unit socket or equivalent, install the A/C low pressure switch onto the expansion valve. Tighten the switch securely.

(4) Connect the wire harness connector to the A/C low pressure switch.

(5) Reconnect the negative battery cable.

(6) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(7) Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

BLOWER MOTOR RESISTOR BLOCK

DESCRIPTION

The blower motor resistor block (Fig. 15) is located in the cowl, at the base of the windshield. There are two different blow motor resistor blocks depending on whether the vehicle is equipped with A/C or not.

The blower motor resistor block is mounted to the dash panel within the engine compartment. The resistor block consists of a molded plastic mounting plate with an integral wire connector receptacle. Concealed behind the mounting plate are coiled resistor wires contained within a protective stamped steel cage. The blower motor resistor block is accessed for service by removing the cowl top screen.

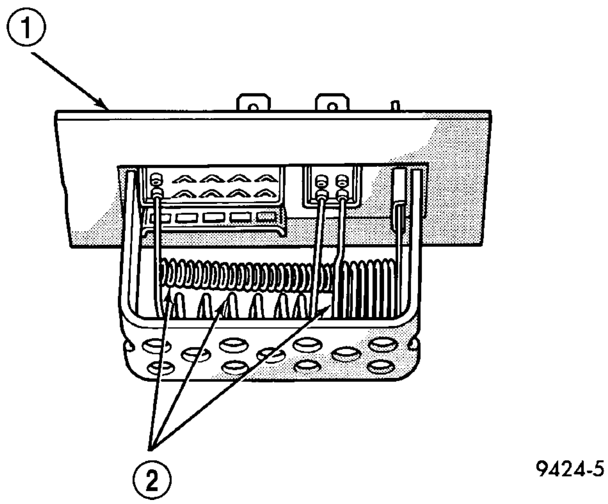

Fig. 15 Blower Motor Resistor Block

1 - BLOWER MOTOR RESISTOR BLOCK
2 - RESISTORS

REMOVAL

CAUTION: Stay clear of the blower motor and resistor block (Hot). Do not operate the blower motor with the resistor block removed.

(1) Remove windshield wipers (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).

(2) Remove cowl top screen (Refer to 23 - BODY/EXTERIOR/COWL GRILLE SCREEN - REMOVAL).

(3) Disconnect the resistor block wire harness connector (Fig. 16).

(4) Remove/unsnap resistor block from vehicle.

(5) Remove the resistor block from the vehicle.

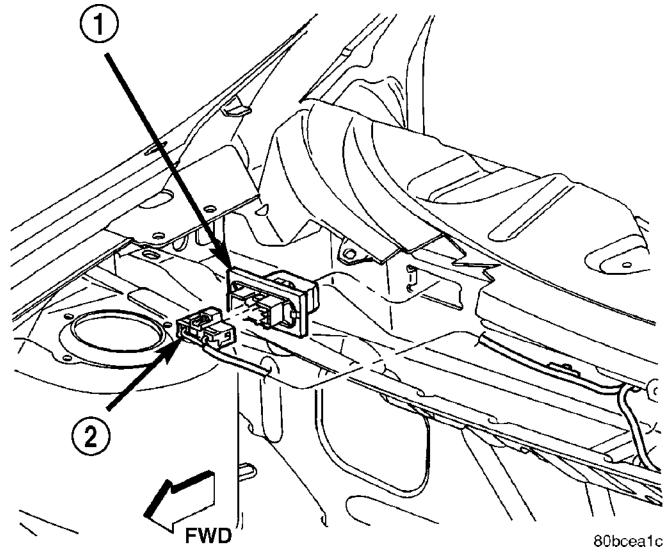

Fig. 16 Blower Motor Resistor Block - Typical

1 - RESISTOR BLOCK
2 - ELECTRICAL CONNECTOR

INSTALLATION

CAUTION: Stay clear of the blower motor and resistor block (Hot). Do not operate the blower motor with the resistor block removed.

(1) Install the blower motor resistor block into the cowl.

(2) Connect the resistor block wire harness connector.

(3) Install the cowl top screen (Refer to 23 - BODY/EXTERIOR/COWL GRILLE SCREEN - INSTALLATION).

(4) Install the windshield wipers (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).

(5) Reconnect the battery negative cable.

EVAPORATOR TEMPERATURE SENSOR

DESCRIPTION

2.4L and RHD models equipped with A/C use an evaporator temperature sensor. The evaporator temperature sensor is a switch with a sensing probe that is inserted between the evaporator coil fins at the coldest point on the face of the A/C evaporator. The evaporator temperature sensor prevents condensate water on the evaporator coil from freezing and obstructing A/C system air flow by cycling the compressor clutch OFF when evaporator temperature drops below the freeze point. It cycles the compressor back ON when the evaporator temperature rises

EVAPORATOR TEMPERATURE SENSOR (Continued)

above the freeze point. The sensor probe is filled with a special silicone-based thermal grease. Three terminals within a molded plastic connector receptacle on the sensor connect it to the vehicle electrical system through a take out and connector of the HVAC wire harness. The evaporator temperature sensor can be replaced without having to remove the HVAC housing from the vehicle.

The evaporator temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - EVAPORATOR TEMPERATURE SENSOR

The work area and vehicle must be between 16° C (60° F) and 32° C (90° F) when testing the evaporator temperature sensor.

(1) Disconnect the wire harness connector from the evaporator temperature sensor located behind the glove box (Fig. 17).

(2) Start engine and set A/C to low blower motor speed, panel, full cool, and RECIRC.

(3) Using a voltmeter, check for battery voltage between Pin 1 and 2. If no voltage is detected, there is no power to the evaporator temperature sensor. Check wiring and fuses (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION - DIAGNOSIS AND TESTING).

(4) Using a voltmeter, check for battery voltage between Pin 1 and Pin 3. If no voltage is detected, there is no voltage from the powertrain control module (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION - DIAGNOSIS AND TESTING). If voltage is OK, connect a jumper wire between Pin 1 and Pin 3. The A/C compressor clutch should engage. If the clutch engages, remove the jumper wire immediately and go to Step 5. If the compressor clutch does not engage, check the operation of the clutch and repair as necessary (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING).

(5) If the A/C compressor clutch engages, connect the evaporator temperature sensor 3-way connector. The compressor clutch should engage or cycle depending on evaporator temperature. If OK, go to Step 6. If not OK, replace the evaporator temperature sensor.

(6) The engine running and the A/C set to:

- Blower motor on low speed
- Panel position
- Full cool
- RECIRC.

Close all doors and windows. Place a thermometer in the center discharge vent.

(7) If the clutch does not begin to cycle off between 2° C to 7° C (35° F to 45° F), verify that the evaporator temperature sensor probe is fully installed and not loose in evaporator. If it is not properly installed, install probe and retest outlet temperature. If the evaporator probe is properly installed, replace the evaporator temperature sensor.

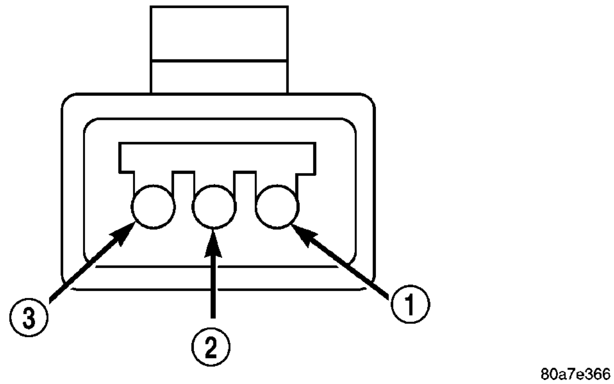

Fig. 17 Evaporator Temperature Sensor Connector

1 - PIN #3
2 - PIN #2
3 - PIN #1

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Disconnect the wire harness connector from the evaporator temperature sensor by reaching behind the glove box.

(3) Remove the rubber temperature probe grommet from the HVAC housing (Fig. 18).

(4) Remove the evaporator temperature sensor probe from the A/C evaporator.

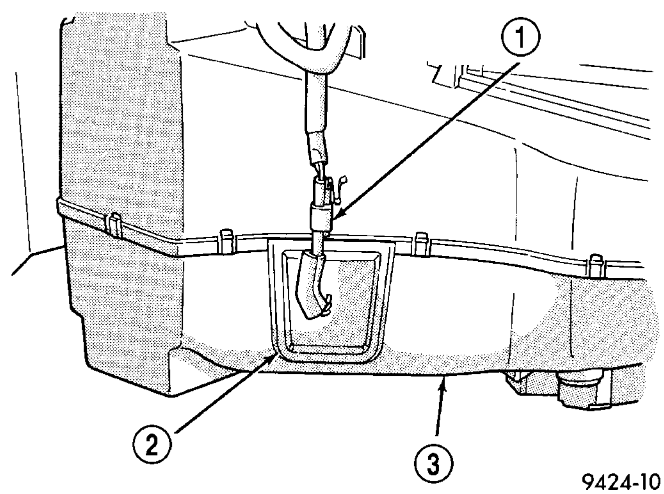

Fig. 18 Evaporator Temperature Sensor - Typical RHD

1 - WIRE HARNESS CONNECTOR
2 - EVAPORATOR PROBE RUBBER GROMMET
3 - HVAC HOUSING

EVAPORATOR TEMPERATURE SENSOR (Continued)

INSTALLATION

(1) Install the evaporator temperature sensor probe into the A/C evaporator.

(2) Install the rubber grommet into the HVAC housing.

(3) Reconnect the negative battery cable.

MODE DOOR CABLE

REMOVAL

NOTE: The mode control cable can be removed and installed without having to remove the instrument panel from the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Remove instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(3) Remove center air duct (Fig. 19).

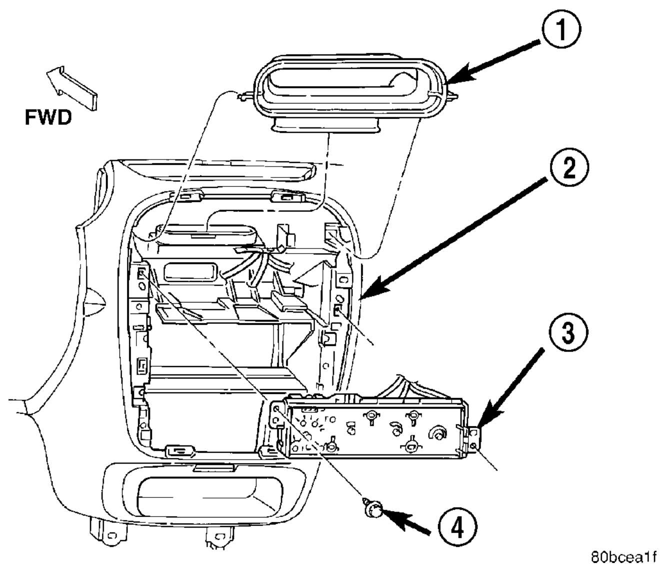

Fig. 19 HVAC Center Air Duct & Control Head

1 - CENTER AIR DUCT
2 - INSTRUMENT PANEL
3 - A/C-HEATER CONTROL
4 - SCREW (2)

(4) Remove the A/C-heater control and disconnect the mode control cable (Fig. 20).

(5) Disconnect the mode control cable end from the mode door lever.

(6) Remove the mode control cable through the instrument panel A/C-heater control opening.

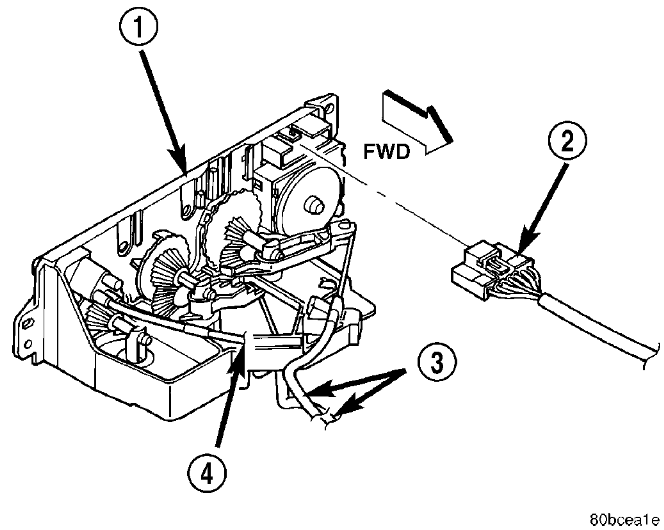

Fig. 20 HVAC Control Head Cable

1 - A/C-HEATER CONTROL
2 - ELECTRICAL CONNECTOR
3 - CONTROL CABLES
4 - VACUUM HARNESS

INSTALLATION

(1) Position the mode control cable through the instrument panel A/C-heater control opening.

(2) Reach through the instrument panel center air duct opening to access and reconnect the mode control cable end to the mode door lever.

(3) Install and tighten the screw that secures the mode control cable housing. Tighten the screw to 2.3 N·m (20 in. lbs.).

(4) Install the instrument panel center stack bezel.

(5) Reconnect the battery negative cable.

ADJUSTMENT

(1) Engage the mode control cable to the actuator arm lever on the mode door and attach it to the housing.

(2) Attach the other end of the cable to the A/C-heater control.

(3) Turn the mode knob completely counterclockwise.

(4) While holding the knob in the counterclockwise position, pull on the gray casing of the mode cable. This will take up any free play in the cable and index the mode door to the mode knob.

(5) Snap the cable hold down clip into position.

RECIRCULATION DOOR ACTUATOR

DESCRIPTION

NOTE: This vehicle uses vacuum to operate only the recirculation door. All other controls are cable operated.

Vehicles equipped with A/C have a vaccum operated recirculation door actuator. When vacuum is supplied by the A/C-heater control to the recirculation door actuator, the recirculation door moves to the RECIRC position. The actuator is spring loaded so the door moves to the Outside-air position when there is no vacuum supplied. The operation of the door can be viewed by removing the blower motor and looking up into the HVAC housing.

Normally, vacuum is supplied to the actuator by placing the recirculation control knob in the RECIRC position. The mode and the recirculation controls are mechanically interlocked so the recirculation control cannot be placed in the RECIRC position if the mode control is at/or between the mix and defrost positions. Vacuum is supplied to the actuator only when recirculation control is at the RECIRC position. If the recirculation control is between the Outside-air position and RECIRC position the system will still be in the Outside-air position. If the recirculation control is in the RECIRC position and the mode control is moved from the Floor to the Defrost positions, the recirculation control will move from the RECIRC position, to the Outside-air position beginning at the Mix position. This is to help prevent window fogging.

OPERATION

Normally, vacuum is supplied to the actuator by placing the recirculation control knob in the RECIRC position. The mode and the recirculation controls are mechanically interlocked so the recirculation control cannot be placed in the RECIRC position if the mode control is at/or between the mix and defrost positions. Vacuum is supplied to the actuator only when recirculation control is at the RECIRC position. If the recirculation control is between the Outside-air position and RECIRC position the system will still be in the Outside-air position. If the recirculation control is in the RECIRC position and the mode control is moved from the Floor to the Defrost positions, the recirculation control will move from the RECIRC position, to the Outside-air position beginning at the Mix position. This is to help prevent window fogging.

The recirculation door actuator cannot be adjusted or repaired and, if damaged or faulty, it must be replaced.

REMOVAL

NOTE: The instrument panel must be removed from the vehicle to gain access to the recirculation door actuator.

(1) Disconnect and isolate the battery negative cable.

(2) Remove instrument panel from vehicle (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(3) Disconnect the vacuum line harness connector from the recirculation door actuator.

(4) Release the latch that secures the recirculation door actuator mount to the stanchion on the HVAC housing, and disengage the recirculation door actuator from the housing.

(5) Disconnect the recirculation door actuator linkage from the recirculation door lever (Fig. 21).

(6) Remove the recirculation door actuator from the HVAC housing.

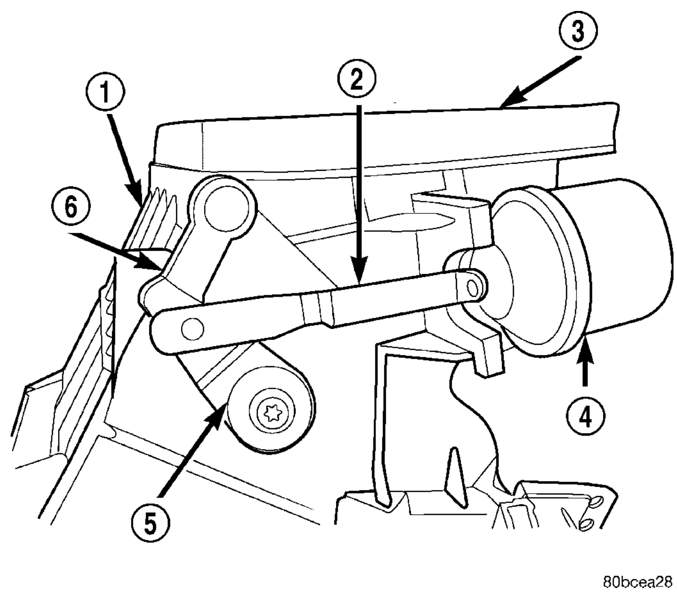

Fig. 21 Recirculation Door Actuator and Linkage - Typical

1 - OUTSIDE AIR/RECIRC DOOR HOUSING
2 - VACUUM ACTUATOR LINKAGE
3 - FOAM SEAL
4 - RECIRC DOOR VACUUM ACTUATOR
5 - DOOR LEVER
6 - DOOR LEVER

INSTALLATION

(1) Position the recirculation door actuator to the HVAC housing.

(2) Connect the recirculation door actuator linkage to the recirculation door lever.

(3) Align the recirculation door actuator mount to the stanchion on the HVAC housing, and press it onto the stanchion firmly to engage the latch.

RECIRCULATION DOOR ACTUATOR (Continued)

(4) Connect the vacuum harness connector to the recirculation door actuator.

(5) Reinstall the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(6) Reconnect the battery negative cable.

TEMPERATURE CONTROL CABLE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove instrument panel center stack bezel- (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(3) Remove the center air duct from the instrument panel.

(4) Remove A/C-heater control (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL).

(5) Reach through the instrument panel center air duct opening to access and remove the screw that secures the temperature control cable housing retainer to the top of the HVAC housing.

(6) Disconnect the cable at the A/C-heater control and remove the control from instrument panel.

(7) Disconnect the temperature control cable end from the blend door lever (Fig. 22).

(8) Remove the temperature control cable through the instrument panel A/C-heater control opening.

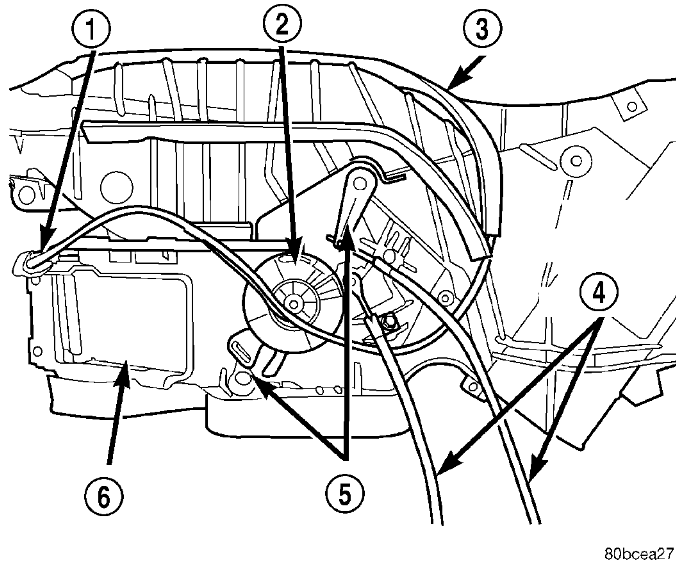

Fig. 22 HVAC Housing Cables - Typical

1 - VACUUM HARNESS
2 - DOOR CAM
3 - HVAC UPPER HOUSING
4 - HVAC CONTROL CABLES
5 - MODE DOOR LEVERS
6 - DEFROSTER DUCT OUTLET

INSTALLATION

(1) Position the temperature control cable through the instrument panel A/C-heater control opening.

(2) Reach through the instrument panel center air duct opening to access and reconnect the temperature control cable end to the blend-air door lever.

(3) Install and tighten the screw that secures the temperature control cable housing retainer to the top of the HVAC housing. Tighten the screw to 2.3 N·m (20 in. lbs.).

(4) Install the A/C-heater control (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - INSTALLATION).

(5) Install the instrument panel center stack bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

(6) Reconnect the battery negative cable.

ADJUSTMENT

(1) Engage the temperature control cable to actuator arm lever on temperature door and attach to the housing.

(2) Attach other end of cable to A/C-heater control.

(3) Turn the temperature knob completely counterclockwise.

(4) While holding the knob in the counterclockwise position, pull on the gray casing of the temperature cable. This will take up any free play in the cable and index the blend-air door to the temperature knob.

(5) Snap the cable hold down clip into position.

VACUUM CHECK VALVE

DESCRIPTION

Vehicles equipped with A/C use vacuum to operate the recirculation door. A vacuum check valve is connected to the brake booster vacuum supply. The vacuum check valve is designed to allow vacuum to flow in only one direction through the accessory vacuum supply circuits and to stabilize the vacuum within the HVAC recirculation circuit whenever the vehicle is accelerating or engine vacuum varies due to operating conditions.

OPERATION

The use of a vacuum check valve helps to maintain the system vacuum needed to retain the selected heater-A/C mode settings. The check valve will prevent the engine from bleeding down system vacuum through the intake manifold during extended heavy engine load (low engine vacuum) operation.

The vacuum check valve cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

The vehicle uses vacuum to operate the recirculation door. A vacuum check valve is connected to the brake booster vacuum supply. The check valve is used to stabilize the vacuum within the HVAC recirculation circuit whenever the vehicle is accelerating or engine vacuum varies due to operating conditions.

(1) Disconnect the vacuum harness from the vacuum check valve (Fig. 23).

(2) Remove the vacuum check valve from the brake booster vacuum check valve.

(3) Remove the vacuum check valve from the engine compartment.

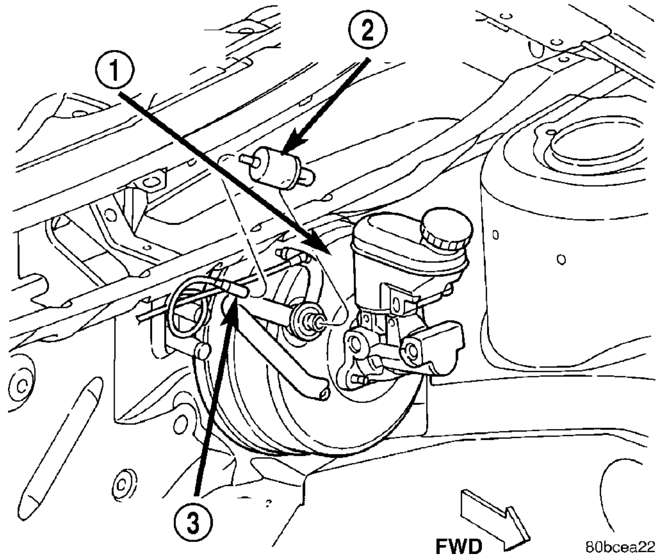

Fig. 23 Vacuum Check Valve

1 - BRAKE POWER BOOSTER
2 - VACUUM CHECK VALVE
3 - VACUUM HARNESS

INSTALLATION

(1) Install the vacuum check valve onto the brake booster vacuum check valve. Ensure correct vacuum flow.

(2) Connect the vacuum harness to the vacuum check valve.

DISTRIBUTION

TABLE OF CONTENTS

AIR OUTLETS

REMOVAL

AIR OUTLET DISTRIBUTION DUCT

(1) Remove the instrument panel assembly from the vehicle and place it on a bench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(2) Remove the screws that secure the air outlet distribution duct to the instrument panel (Fig. 1).

(3) Disengage the right demister hose from the integral retainer on the right side of the air outlet distribution duct.

(4) Disconnect the right demister hose from the integral right intermediate demister duct.

(5) Disconnect the right demister hose from the air outlet distribution duct and remove the demister hose from the instrument panel.

(6) Disengage the air outlet distribution duct from the defroster duct

(7) Disengage the left air outlet duct from the instrument panel.

(8) Remove the air outlet distribution duct, left intermediate duct and the air outlet ducts from the instrument panel as an assembly.

(9) If required, remove the right air outlet duct from the air outlet distribution duct.

(10) If required, remove the left intermediate duct from the air outlet distribution duct.

(11) If required, remove the left air outlet duct from the left intermediate duct.

LEFT DEMISTER ADAPTER DUCT

(1) Remove the instrument panel assembly from the vehicle and place it on a bench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(2) Remove the air outlet distribution duct from the instrument panel (Refer to AIR OUTLET DISTRIBUTION DUCT).

(3) Remove the screws that secure the left demister adapter duct to the instrument panel (Fig. 1).

(4) Remove the left demister adapter duct from the instrument panel.

AIR OUTLET CENTER DUCT

(1) Remove the center bezel from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(2) Remove the screws that secure the air outlet center duct to the center instrument panel (Fig. 2).

(3) Disengage the air outlet center duct from the air outlet distribution duct.

(4) Remove the air outlet center duct from the center instrument panel.

AIR OUTLETS (Continued)

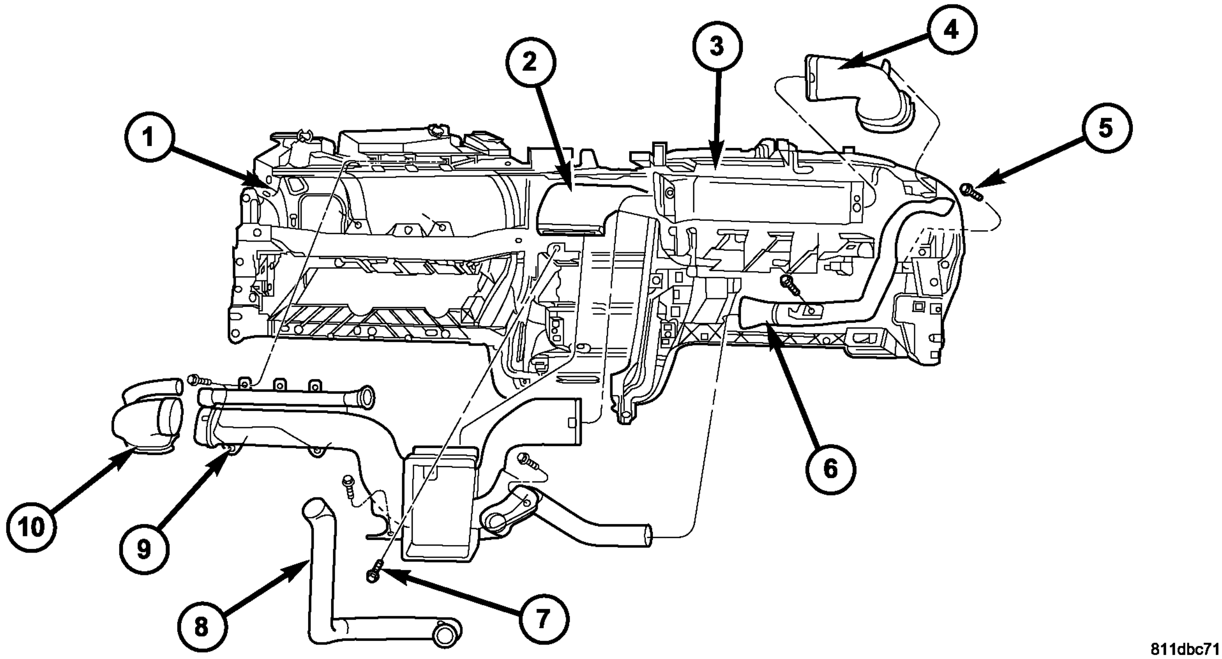

Fig. 1 Air Outlet Distribution Duct - LHD Shown, RHD Typical

1 - INSTRUMENT PANEL
2 - DEFROSTER DUCT
3 - LEFT INTERMEDIATE DUCT
4 - LEFT AIR OUTLET DUCT
5 - SCREW (2)
6 - LEFT DEMISTER ADAPTER DUCT
7 - SCREW (8)
8 - RIGHT DEMISTER HOSE
9 - AIR OUTLET DISTRIBUTION DUCT
10 - RIGHT AIR OUTLET DUCT

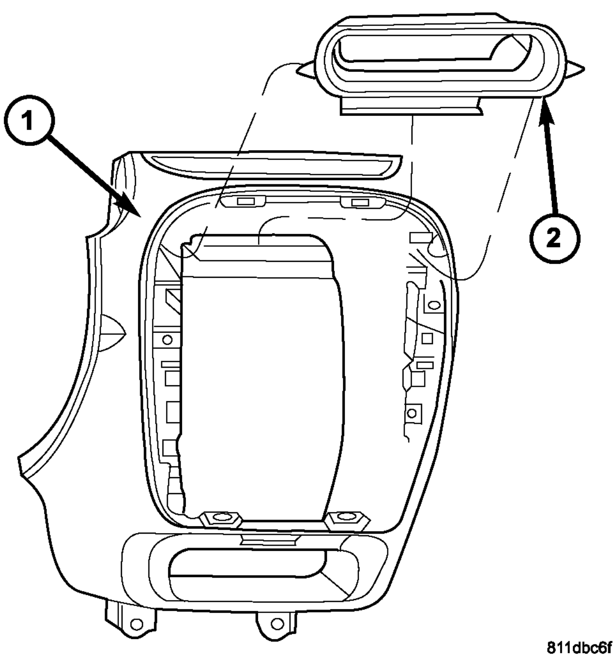

Fig. 2 Air Outlet Center Duct

1 - CENTER INSTRUMENT PANEL
2 - AIR OUTLET CENTER DUCT

INSTALLATION

AIR OUTLET DISTRIBUTION DUCT

(1) If removed, install the left air outlet to the left intermediate duct.

(2) If removed, install the left intermediate duct to the air outlet distribution duct.

(3) If removed, install the right air outlet duct to the air outlet distribution duct.

(4) Position the air outlet distribution duct, left intermediate duct and the air outlet ducts into the instrument panel as an assembly.

(5) Engage the left air outlet duct to the instrument panel.

(6) Engage the air outlet distribution duct to the defroster duct.

(7) Connect the right demister hose to the air outlet distribution duct.

(8) Connect the right demister hose to the integral right intermediate demister duct.

(9) Engage the right demister hose to the integral retainer on the right side of the air outlet distribution duct.

(10) Install the screws that secure the air outlet distribution duct to the instrument panel. Tighten the screws to 2.3 N·m (20 in. lbs.).

AIR OUTLETS (Continued)

(11) Install the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

LEFT DEMISTER ADAPTER DUCT

(1) Position the left demister adapter duct to the instrument panel.

(2) Install the screws that secure the left demister adapter duct to the instrument panel. Tighten the screws to 2.3 N·m (20 in. lbs.).

(3) Install the air outlet distribution duct to the instrument panel (Refer to AIR OUTLET DISTRIBUTION DUCT).

(4) Install the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

AIR OUTLET CENTER DUCT

(1) Position the air outlet center duct to the center instrument panel.

(2) Engage the air outlet center duct to the air outlet distribution duct.

(3) Install the screws that secure the air outlet center duct to the center instrument panel. Tighten the screws to 2.3 N·m (20 in. lbs.).

(4) Install the center bezel onto the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

BLOWER MOTOR

DESCRIPTION

The blower motor is a 12-volt, Direct Current (DC) motor with a squirrel cage-type blower wheel that is secured to the blower motor shaft. The blower motor and wheel are located near the passenger side end of the HVAC housing in the passenger compartment below the instrument panel. The blower motor and blower motor wheel are a factory balanced unit and cannot be adjusted or repaired. If faulty or damaged, the blower motor and blower wheel must be replaced as an assembly

OPERATION

The blower motor will operate whenever the ignition switch is in the On position, and the blower control switch is in any position except Off. The blower motor circuit is protected by a fuse in the instrument panel fuse block. The blower motor speed is controlled by regulating the battery feed through the blower control switch and the blower motor resistor. The blower motor and wheel are used to control the velocity of air moving through the heater-only or A/C-heater systems. The blower motor controls the velocity of the air flowing through the HVAC housing by spinning the blower wheel within the housing at the selected speed.

DIAGNOSIS AND TESTING - BLOWER MOTOR

BLOWER MOTOR INOPERATIVE

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring, diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

BLOWER MOTOR ELECTRICAL DIAGNOSIS

Refer to the Blower Motor Electrical Diagnosis chart for basic checks of the blower motor circuit (Fig. 3).

BLOWER MOTOR NOISE OR VIBRATION

Refer to the Blower Motor Noise/Vibration Diagnosis chart for basic checks of the blower motor when a vibration or noise is present (Fig. 4).

REMOVAL

NOTE: The blower motor is located on the bottom right side of the HVAC housing. The blower motor can be removed from the vehicle without having to remove the HVAC housing.

WITH AIR CONDITIONING

(1) Disconnect and isolate the negative battery cable.

(2) Remove the passenger side door sill scuff plate.

(3) Pull back the carpet to access the blower motor.

(4) Disconnect the wire harness connector from the blower motor.

BLOWER MOTOR (Continued)

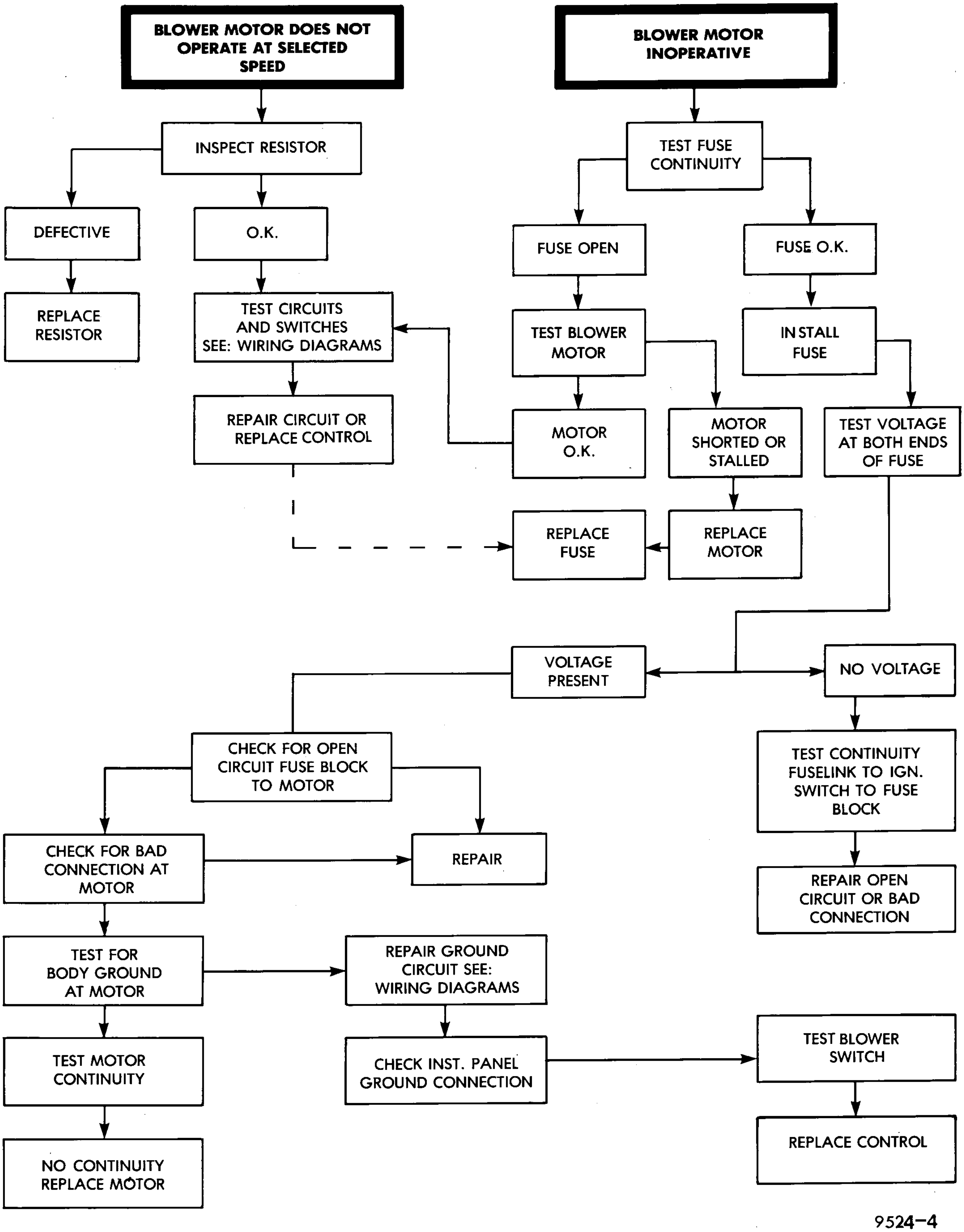

Fig. 3 Blower Motor Electrical Diagnosis

BLOWER MOTOR (Continued)

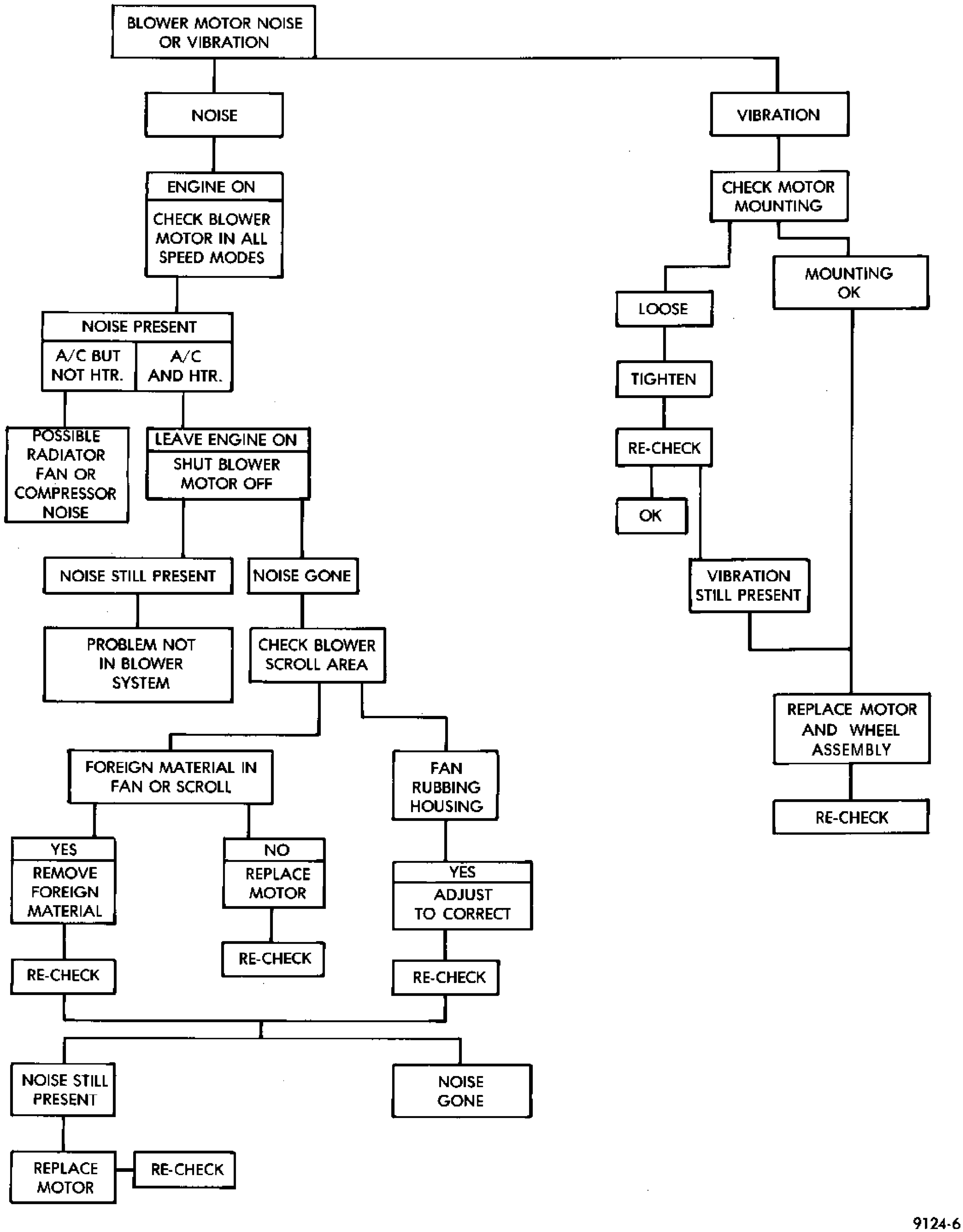

Fig. 4 Blower Motor Noise/Vibration Diagnosis

BLOWER MOTOR (Continued)

(5) Remove the screws that secure the blower motor to the HVAC housing (Fig. 5).

(6) Remove the blower motor from the HVAC housing.

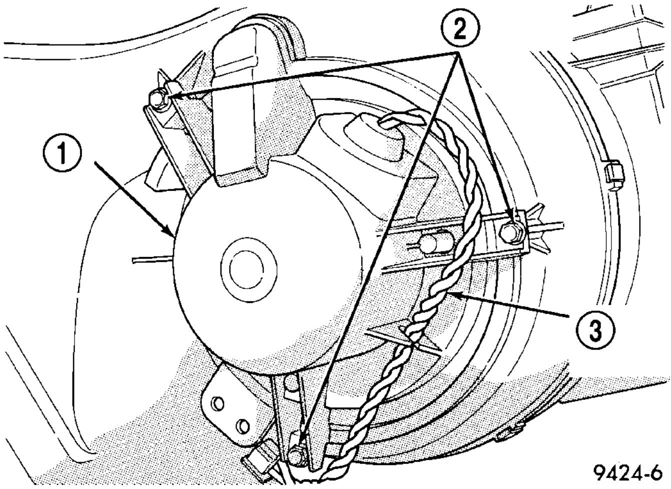

Fig. 5 Blower Motor - With A/C, Typical

1 - BLOWER MOTOR
2 - BLOWER MOTOR RETAINING SCREW (3)
3 - BLOWER MOTOR WIRING

WITHOUT AIR CONDITIONING

(1) Disconnect and isolate the negative battery cable.

(2) Disconnect the wire harness connector from the blower motor.

(3) Grasp the blower motor while pulling down on the locking tab. Turn the blower motor approximately 1/8 turn counterclockwise (Fig. 6).

(4) Remove the blower motor from the blower housing.

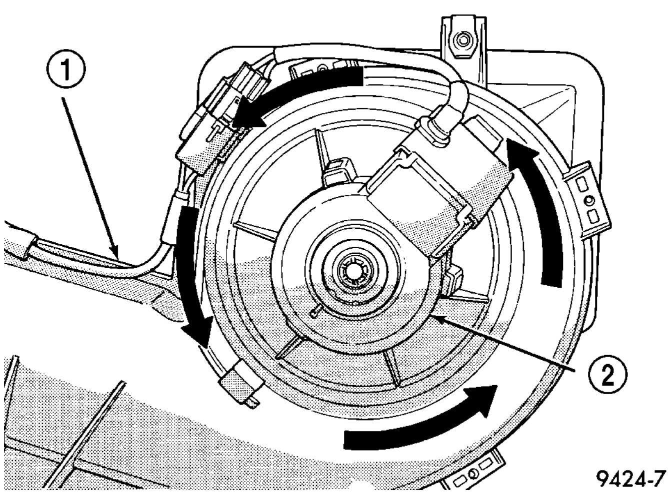

Fig. 6 Blower Motor - Without A/C, Typical

1 - BLOWER HOUSING
2 - BLOWER MOTOR

INSTALLATION

WITH AIR CONDITIONING

(1) Position the blower motor into the HVAC housing.

(2) Install the blower motor retaining screws. Tighten the screws to 2.3 N·m (20 in. lbs.).

(3) Connect the blower motor wire harness connector.

(4) Reposition the carpet.

(5) Install the door sill scuff plate.

(6) Reconnect the negative battery cable.

WITHOUT AIR CONDITIONING

(1) Position the blower motor into the housing.

(2) Rotate the blower motor clockwise until the tab snaps into the locked position, approximately 1/8 turn.

(3) Connect the blower motor wire harness connector.

(4) Reconnect the negative battery cable.

DEFROSTER DUCT

REMOVAL

(1) Remove the instrument panel from the vehicle (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(2) Remove the defroster duct from the top of the HVAC housing (Fig. 7).

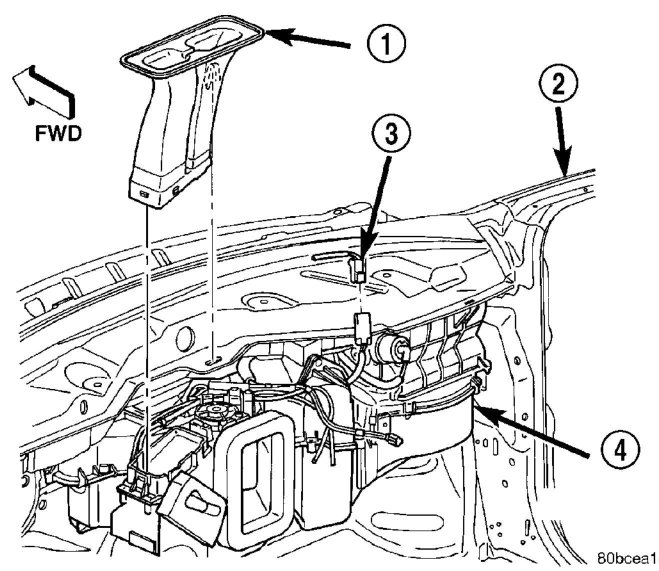

Fig. 7 Defroster Duct - Typical

1 - DEFROSTER DUCT
2 - BODY
3 - ELECTRICAL CONNECTOR
4 - HVAC HOUSING

DEFROSTER DUCT (Continued)

INSTALLATION

(1) Install the defroster duct onto the top of the HVAC housing. Snap the retainers into place.

(2) Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

HVAC HOUSING

REMOVAL

The HVAC housing must be removed from the vehicle and the two halves of the housing separated for service access of the heater core, evaporator and the mode, recirculation and blend doors.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN PLUMBING BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Partially drain the engine cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

(3) Disconnect and isolate the battery negative cable.

(4) Remove the coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY PRESS CONTAINER - REMOVAL).

(5) Remove the screw that secures the accumulator mounting bracket to the body.

(6) Remove the two bolts securing the accumulator tubes to the evaporator terminal block and disconnect the tubes from the terminal block.

(7) Remove the seals from the refrigerant lines fittings and discard.

(8) Install plugs in, or tape over all of the opened refrigerant line fittings and evaporator tubes.

(9) Disconnect the vacuum harness at the power brake booster (Fig. 8).

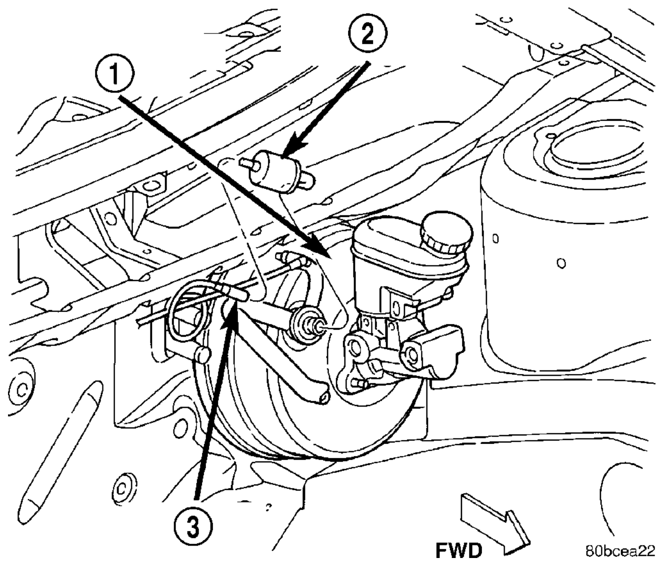

Fig. 8 A/C Vacuum Line - LHD Shown, RHD Typical

1 - BRAKE POWER BOOSTER
2 - A/C VACUUM CHECK VALVE
3 - VACUUM HARNESS

(10) Remove the rubber drain tube extension from the condensation drain tube (Fig. 9).

(11) Disconnect the heater hoses from the heater core tubes. Install plugs in, or tape over the opened heater core tubes to prevent coolant spillage during housing removal.

(12) Remove three HVAC housing retaining nuts located on the dash panel in the engine compartment.

(13) Remove the instrument panel from vehicle (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

(14) Remove the mode door and temperature control cables from the mode door and blend-air door levers and the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODE DOOR CABLE - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/TEMPERATURE CONTROL CABLES - REMOVAL).

(15) Remove the defroster and floor distribution ducts from the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DEFROSTER DUCTS - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FLOOR DISTRIBUTION DUCTS - REMOVAL).

(16) Disconnect the wire harness connectors.

(17) Remove the outboard HVAC housing retaining screw located in the passenger compartment (Fig. 10).

HVAC HOUSING (Continued)

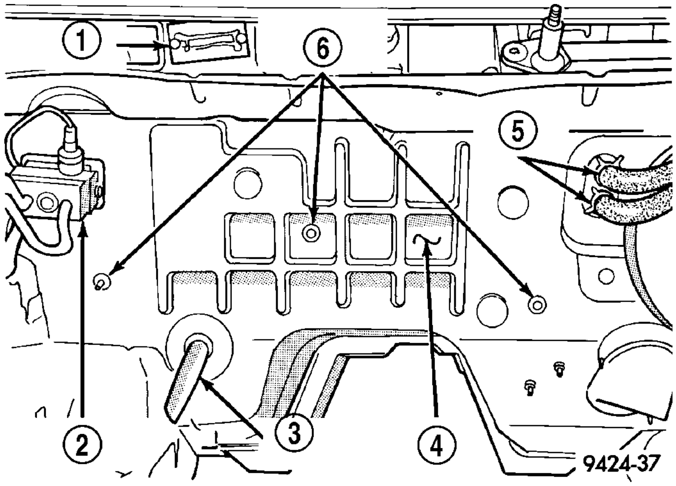

Fig. 9 Dash Panel - LHD Shown, RHD Typical

1 - BLOWER RESISTOR
2 - EVAPORATOR TAPPING PLATE
3 - DRAIN TUBE
4 - DASH PANEL
5 - HEATER HOSES
6 - RETAINING NUTS (3)

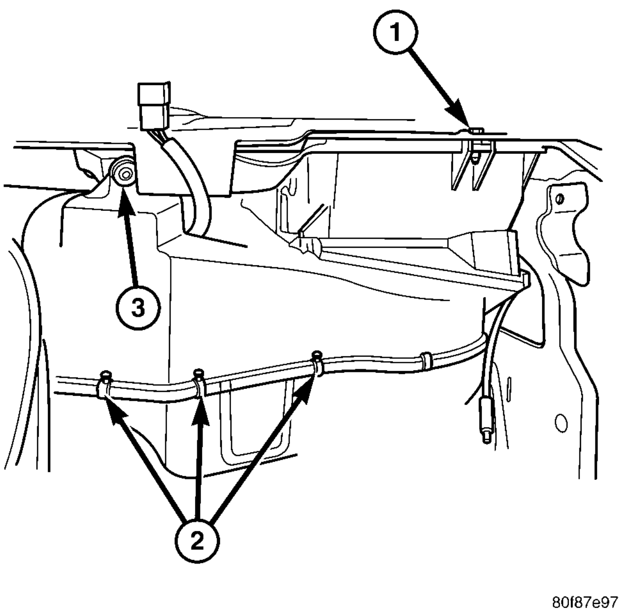

Fig. 10 Housing Screws-LHD Shown, RHD Typical

1 - OUTBOARD RETAINING SCREW
2 - HOUSING SCREW BOSSES
3 - DASH PANEL STUD AND NUT

(18) Remove the remaining nut located on the dash panel stud.

NOTE: Use care to ensure that the interior is covered in case of loss of residual fluids from the heater and evaporator cores.

(19) Remove the HVAC housing from the vehicle.

DISASSEMBLY

(1) Remove the HVAC housing from the vehicle (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).

(2) Place the HVAC housing in the upright position on a workbench, making allowance for leakage of fluids.

(3) Separate the air distribution foam seals at the case parting line (Fig. 11).

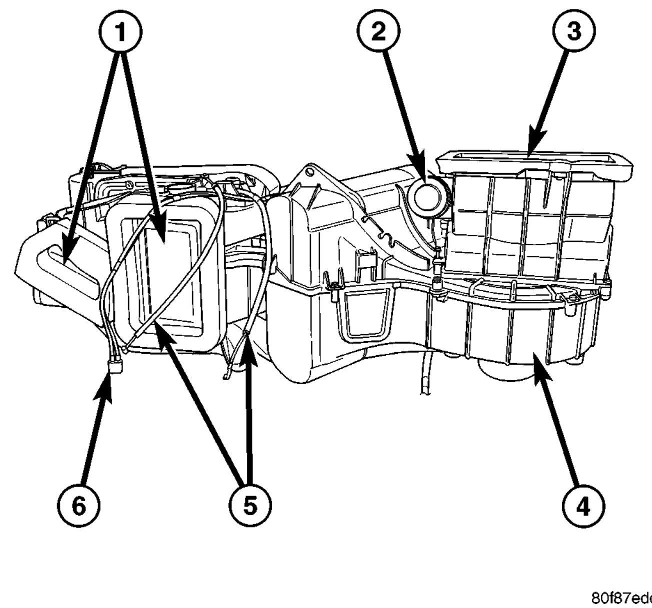

Fig. 11 HVAC Air Distribution Foam Seals - LHD Shown, RHD Typical

1 - AIR DISTRIBUTION
2 - RECIRCULATION DOOR VACUUM ACTUATOR
3 - AIR INLET
4 - BLOWER MOTOR
5 - CONTROL CABLES
6 - VACUUM HARNESS

(4) Remove the evaporator and heater core tube foam seals from the housing (Fig. 12).

(5) Remove the retaining clips and screws that hold the upper and lower housing together.

(6) Separate the two halves of the housing.

(7) Remove the heater core and evaporator from the lower housing as necessary.

ASSEMBLY

(1) Install the heater and evaporator cores into the case as necessary.

(2) Position the upper and lower HVAC housings together.

(3) Install the retaining clips and screws that secure the upper and lower case housings together. Tighten the screws to 2.3 N·m (20 in. lbs.).

HVAC HOUSING (Continued)

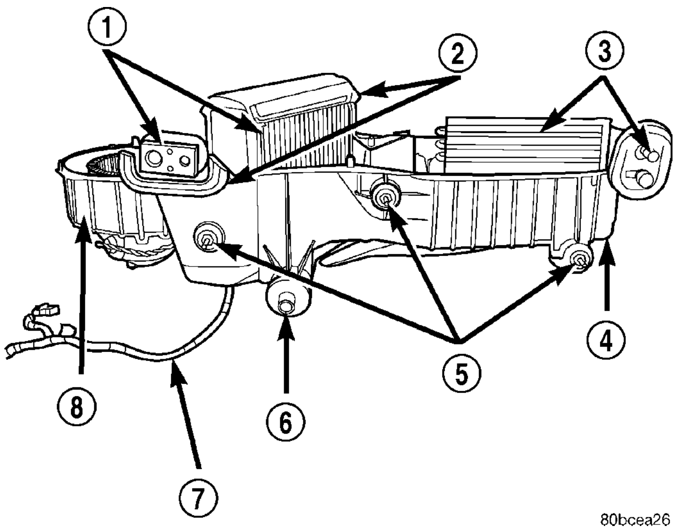

Fig. 12 Lower HVAC Housing - LHD Shown, RHD Typical

1 - EVAPORATOR AND CONNECTION
2 - FOAM SEALS
3 - HEATER CORE AND TUBES
4 - HVAC HOUSING LOWER CASE
5 - HOUSING MOUNTING STUDS
6 - HOUSING DRAIN
7 - WIRING
8 - BLOWER MOTOR AND WHEEL

(4) Install the evaporator and heater core tube foam seals onto the housing.

(5) Connect the air distribution outlet foam seals at the case parting line.

(6) Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

INSTALLATION

NOTE: High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free.

(1) Position the HVAC housing to the dash panel.

(2) Install the nut onto the dash panel stud. Tighten the nut to 4.5 N·m (40 in. lbs.).

(3) Install the outboard HVAC housing retaining bolt. Tighten the bolt to 4.5 N·m (40 in. lbs.).

(4) Connect the wire harness connectors.

(5) Install the defroster and floor distribution ducts onto the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DEFROSTER DUCTS - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FLOOR DISTRIBUTION DUCTS - INSTALLATION).

(6) Loosely install the mode door and temperature control cables to the mode door and blend-air door levers and to the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODE DOOR CABLE - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/TEMPERATURE CONTROL CABLES - INSTALLATION).

(7) Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION) and adjust the mode and temperature control cables.

(8) Install the three HVAC housing retaining nuts onto the housing studs in the engine compartment. Tighten the nuts to 4.5 N·m (40 in. lbs.).

(9) Unplug or remove the tape from the heater core hoses and tubes.

(10) Connect the heater hoses to the heater core tubes and install the heater hose clamps.

(11) Install the rubber drain tube extension onto the condensation drain tube.

(12) Connect the vacuum harness at the brake booster.

(13) Unplug or remove the tape from the opened refrigerant line fittings.

(14) Lubricate two new rubber O-ring seals with clean refrigerant oil and install them onto the accumulator tube fittings.

(15) Connect the accumulator tubes to the evaporator terminal block.

(16) Install the two bolts securing the refrigerant lines to the evaporator tube tapping plate. Tighten the bolts to 10 N·m (88 in. lbs.).

(17) Install the bolt securing the accumulator mounting bracket. Tighten the bolt to 11 N·m (97 in. lbs.).

(18) Position and install the coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION).

(19) Reconnect the negative battery cable.

(20) Refill the engine cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(21) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(22) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(23) Start the engine and check for proper operation of the heating and air conditioning systems as equipped.

PLUMBING

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PLUMBING

WARNING

ENGINE COOLING SYSTEM

WARNING: THE ENGINE COOLING SYSTEM IS DESIGNED TO DEVELOP INTERNAL PRESSURES OF 97 TO 123 KILOPASCALS (14 TO 18 POUNDS PER SQUARE INCH). DO NOT REMOVE OR LOOSEN THE COOLANT PRESSURE CAP, CYLINDER BLOCK DRAIN PLUGS, RADIATOR DRAIN, RADIATOR HOSES, HEATER HOSES, OR HOSE CLAMPS WHILE THE ENGINE COOLING SYSTEM IS HOT AND UNDER PRESSURE. FAILURE TO OBSERVE THIS WARNING CAN RESULT IN SERIOUS BURNS FROM THE HEATED ENGINE COOLANT. ALLOW THE VEHICLE TO COOL FOR A MINIMUM OF 15 MINUTES BEFORE OPENING THE COOLING SYSTEM FOR SERVICE.

A/C SYSTEM

WARNING: THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT UNDER HIGH PRESSURE. SEVERE PERSONAL INJURY MAY RESULT FROM IMPROPER SERVICE PROCEDURES. REPAIRS SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

AVOID BREATHING THE REFRIGERANT AND REFRIGERANT OIL VAPOR OR MIST. EXPOSURE MAY IRRITATE THE EYES, NOSE, AND/OR THROAT. WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM DIRECT CONTACT WITH THE REFRIGERANT. IF EYE CONTACT OCCURS, SEEK MEDICAL ATTENTION IMMEDIATELY.

DO NOT EXPOSE THE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC LEAK DETECTOR IS RECOMMENDED.

IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE THE WORK AREA BEFORE RESUMING SERVICE. LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.

THE EVAPORATION RATE OF R-134a REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT THE SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH THE REFRIGERANT.

THE R-134a SERVICE EQUIPMENT OR THE VEHICLE REFRIGERANT 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.

PLUMBING (Continued)

CAUTION

A/C SYSTEM

CAUTION: Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with the service equipment being used.

Never add R-12 to a refrigerant system designed to use R-134a and do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.

R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible and damage to the system will result.

Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause noise and system failure.

Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

If equipped, do not remove the secondary retention clip from any spring-lock coupler connection while the refrigerant system is under pressure. Recover the refrigerant before removing the secondary retention clip. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system. Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.

Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.

Keep service tools and the work area clean. Contamination of the refrigerant system must be avoided.

CAUTION: The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/recharging equipment and/or A/C systems.

Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. DaimlerChrysler recommends the detection of A/C system leaks through the use of approved leak detectors and fluorescent leak detection dyes. Vehicles found with A/C system sealers should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners voids the warranty for the A/C system.

DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS

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.

NOTE: The refrigerant system does come from the factory with a yellow tracer dye already installed to aid in detection of leaks.

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 System Empty procedure. If liquid line pressure is greater than 345 kPa (50 psi) proceed to System Low procedure. 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.

SYSTEM EMPTY

(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 0.284 Kg. (10 oz.) refrigerant charge to be injected into the system.

PLUMBING (Continued)

(3) Connect and dispense 0.284 Kg. (10 oz.) of refrigerant into the evacuated refrigerant system.

(4) Proceed to Step 2 of System Low procedure.

SYSTEM LOW

(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 or Neutral with parking brake set
- 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 DaimlerChrysler approved refrigerant dye.

STANDARD PROCEDURE

STANDARD PROCEDURE - HANDLING TUBING AND FITTINGS

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. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.

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. Before connecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.

All tools, including the refrigerant dispensing manifold, the manifold gauge set, and test hoses should be kept clean and dry.

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.

STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT

WARNING: EYE PROTECTION MUST BE WORN WHEN SERVICING AN AIR CONDITIONING REFRIGERANT SYSTEM. TURN OFF (ROTATE CLOCKWISE) ALL VALVES ON THE EQUIPMENT BEING USED, BEFORE CONNECTING TO OR DISCONNECTING FROM THE REFRIGERANT SYSTEM. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

PLUMBING (Continued)

When servicing the air conditioning system, a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used (Fig. 1). Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

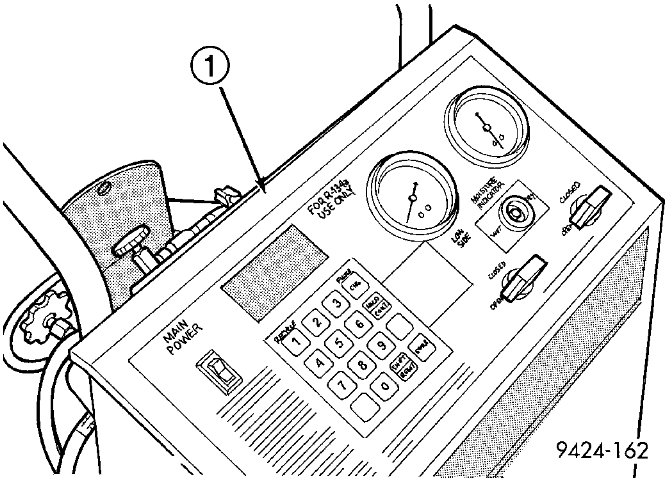

Fig. 1 Refrigerant Recovery/Recycling Station - Typical

1 - R-134 REFRIGERANT STATION

A manifold gauge set may be needed with some recovery/recycling/charging equipment (Fig. 2). The service hoses on the gauge set being used should have manual (turn wheel), or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

LOW PRESSURE GAUGE HOSE The low pressure hose (Blue with Black stripe) attaches to the low side service port. On 2.0L LHD models, this port is located on the liquid line near the accumulator. On 2.4L and RHD models, this port is located on the suction line.

HIGH PRESSURE GAUGE HOSE The high pressure hose (Red with Black stripe) attaches to the high side service port. On 2.0L LHD models, this port is located on the discharge line fitting at the condenser. On 2.4L and RHD models, this port is located on the liquid line fitting at the receiver/drier.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacu-

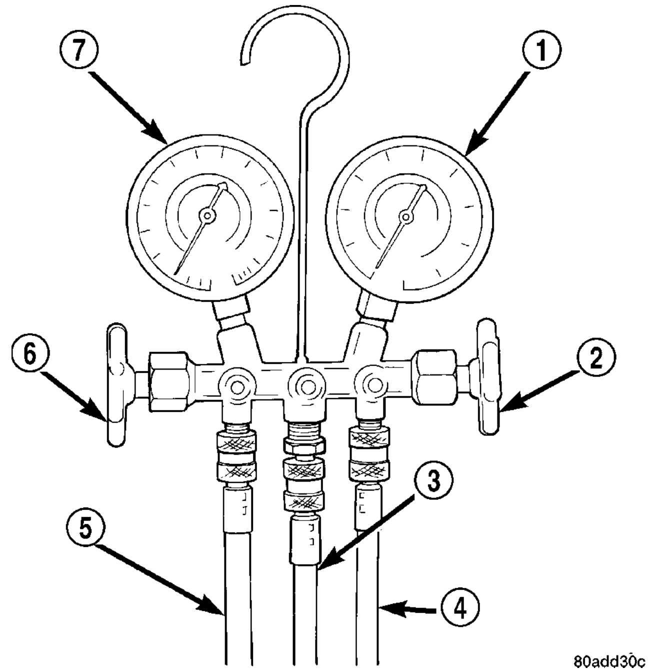

Fig. 2 Manifold Gauge Set - Typical

1 - HIGH PRESSURE GAUGE
2 - VALVE
3 - VACUUM/REFRIGERANT HOSE (YELLOW W/ BLACK STRIPE)
4 - HIGH PRESSURE HOSE (RED W/ BLACK STRIPE)
5 - LOW PRESSURE HOSE (BLUE W/ BLACK STRIPE)
6 - VALVE
7 - LOW PRESSURE GAUGE

ate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

STANDARD PROCEDURE - SYSTEM CHARGE LEVEL TEST

The procedure below should be used to check and/or fill the refrigerant charge in the air conditioning system.

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. 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.

PLUMBING (Continued)

NOTE: Refer to the underhood HVAC specification tag for the proper charge level.

It is recommended to use the gauges or reclaim/recycle equipment.

(1) Use a manifold gauge and check the liquid line pressure.

(2) Attach a clamp-on thermocouple to the liquid line near the condenser.

(3) The vehicle must be in the following modes:

- Automatic transaxle in park or manual transaxle in neutral.
- Engine at idle
- A/C controls set to outside air
- Panel mode
- A/C on full cool
- Blower motor on highest speed
- Vehicle windows closed

(4) Operate system for a couple of minutes to allow the system to stabilize.

(5) Observe liquid line pressure and temperature. Using the Charge Determination Chart (Fig. 3) determine where the system is currently operating. If the system is not in the proper range, reclaim all the refrigerant and recharge per A/C label.

STANDARD PROCEDURE - REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION.

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to recover the refrigerant from an R-134a refrigerant system. See the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.

STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE

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 compres-

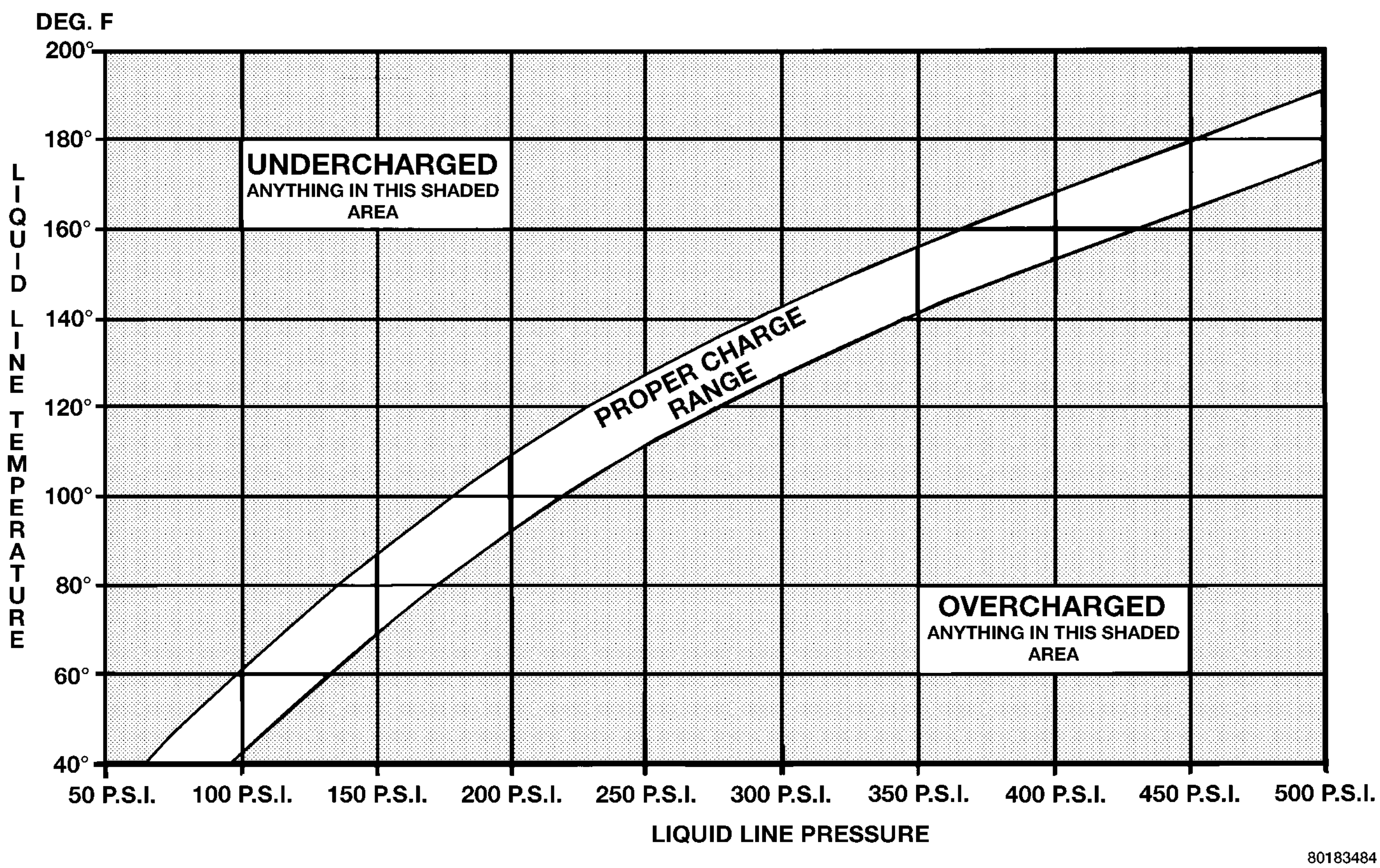

Fig. 3 Charge Determination Chart

PLUMBING (Continued)

sor 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.

(1) Connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment.

(2) Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads -88 kPa (- 26 in. Hg) vacuum or greater for 30 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.

STANDARD PROCEDURE - CHARGING A/C SYSTEM

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

CAUTION: A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. Refer the equipment manufacturer instructions for more information.

After the refrigerant system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system.

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

PARTIAL CHARGE

This vehicle does not have a sight glass. It is not possible to determine the amount of R-134a charge in the system. Therefore it is necessary to completely evacuate and recover the system, and then recharge the system fully.

CHARGING A/C SYSTEM

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. 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.

CAUTION: Do not overcharge refrigerant system, as excessive compressor head pressure can cause noise and system failure.

The procedure below should be used to fill the refrigerant charge in the air conditioning system. This A/C system does not have or use a sight glass to check or charge the system.

After system has been tested for leaks and evacuated, a refrigerant (R-134a) charge can be injected into the system.

NOTE: When connecting 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) If using a separate vacuum pump close all valves before disconnecting pump. Connect manifold gauge set to the A/C service ports.

PLUMBING (Continued)

(2) Measure refrigerant (refer to capacities). Refer to the instructions provided with the equipment being used.

(3) Verify engine is shut off. Open suction and discharge valves. Open the charge valve to allow the refrigerant to flow into the system. When transfer of refrigerant has stopped, close the suction and discharge valve.

(4) If all of the charge did not transfer from the dispensing device, put vehicle controls into the following mode:

- Automatic transaxle in park or manual transaxle in neutral
- Engine idling
- A/C control set in 100 percent outside air
- Panel mode
- Blower motor ON high speed
- Vehicle windows open

If A/C compressor does not engage, test compressor clutch control circuit and correct any failure. Refer to Electrical Wiring Diagrams.

(5) Open the suction valve to allow the remaining refrigerant to transfer to the system.

WARNING: DO NOT OPEN THE DISCHARGE (HIGH-PRESSURE) VALVE AT THIS TIME.

(6) Close all valves and test the A/C system performance.

(7) Disconnect the charging station or manifold gauge set. Install the service port caps.

A/C COMPRESSOR

DESCRIPTION

DESCRIPTION - A/C COMPRESSOR

The A/C compressor (Fig. 4) used on this vehicle has an aluminum swash plate, teflon coated pistons and aluminum sleeveless cylinder walls. A A/C high pressure switch is located on the back cover of the compressor.

The compressor is secured to the lower front strut-to-engine bracket with four bolts. The lower front strut-to-engine bracket is located on the lower, forward skirt of the engine block which is located in the right front corner of the engine compartment.

The compressor cannot be repaired. If faulty or damaged, the entire compressor unit must be replaced. The compressor clutch, pulley, clutch coil and the A/C high pressure switch are available for service replacement.

The compressor front shaft seal is not serviceable. If a leak is detected at the shaft seal, the compressor must be replaced as a unit.

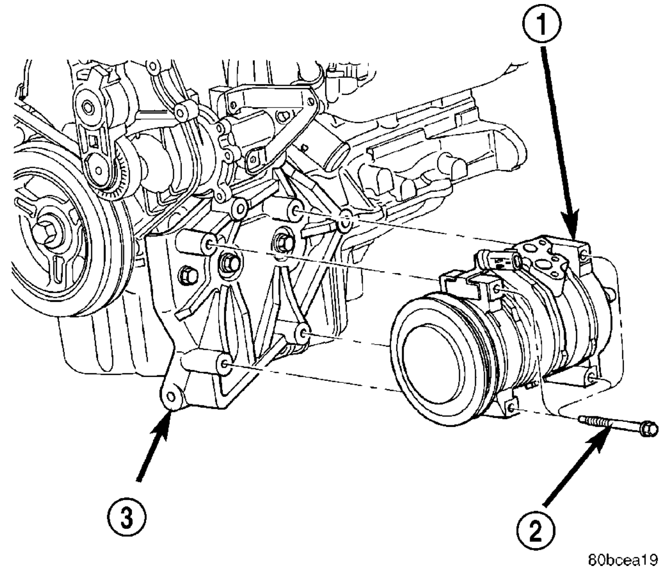

Fig. 4 A/C Compressor

1 - A/C COMPRESSOR
2 - MOUNTING BOLTS
3 - LOWER FRONT STRUT-TO-ENGINE BRACKET

DESCRIPTION - HIGH PRESSURE RELIEF VALVE

A high pressure relief valve is located on the rear of the A/C compressor. This mechanical valve is designed to vent refrigerant from the A/C system to protect against damage to the compressor and other system components, caused by condenser air flow restriction or an overcharge of refrigerant.

OPERATION

OPERATION - A/C COMPRESSOR

The A/C compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The A/C compressor draws in low-pressure refrigerant vapor from the evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor. The compressor pumps high-pressure refrigerant vapor to the condenser through the compressor discharge port.

OPERATION - HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents the system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The valve closes when a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the system pressure, and then

A/C COMPRESSOR (Continued)

re-seats itself. The majority of the refrigerant is conserved in the system. If the valve vents refrigerant, it does not mean that the valve is faulty.

The high pressure relief valve is a factory-calibrated unit. The valve cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the compressor assembly.

DIAGNOSIS AND TESTING - COMPRESSOR NOISE

When investigating an air conditioning related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. 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 brackets, or a loose compressor clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon belt tension, belts can develop noises that are mistaken for a compressor noise. Improper belt tension can cause a misleading noise when the compressor clutch is engaged, which may not occur when the compressor clutch is disengaged. Check the serpentine drive belt condition and tension as described in Cooling before beginning this procedure.

(1) Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise. Listen to the compressor while the clutch is engaged and disengaged. Probe the compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.

(2) Loosen all of the compressor mounting hardware and retighten. Tighten the compressor clutch mounting nut. Be certain that the clutch coil is mounted securely to the compressor, and that the clutch plate and pulley are properly aligned and have the correct air gap (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C COMPRESSOR CLUTCH - INSTALLATION).

(3) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).

(4) Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines for kinks or sharp bends that will restrict refrigerant flow, which can cause noises (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS).

(5) If the noise is from opening and closing of the high pressure relief valve, reclaim, evacuate, and recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE). If the high pressure relief valve still does not seat properly, replace the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).

(6) If the noise is from liquid slugging on the suction line, check the refrigerant oil level and the refrigerant system charge (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS - CHARGE CAPACITY).

(7) If the noise continues, replace the A/C compressor and repeat Step 1.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(3) Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(4) Raise and support the vehicle.

(5) Disconnect the engine wire harness connectors from the compressor clutch coil and the A/C high pressure switch.

(6) Remove the bolt that secures the suction line to the A/C compressor (Fig. 5).

(7) Disconnect the suction line from the A/C compressor suction port.

(8) Remove the rubber O-ring seal from the suction line fitting discard.

(9) Install plugs in, or tape over the opened A/C compressor suction port and the suction line fitting.

A/C COMPRESSOR (Continued)

(10) Remove the bolt that secures the discharge line to the A/C compressor.

(11) Disconnect the discharge line from the A/C compressor discharge port.

(12) Remove the rubber O-ring seal from the discharge line fitting and discard.

(13) Install plugs in, or tape over the opened A/C compressor discharge port and the discharge line fitting.

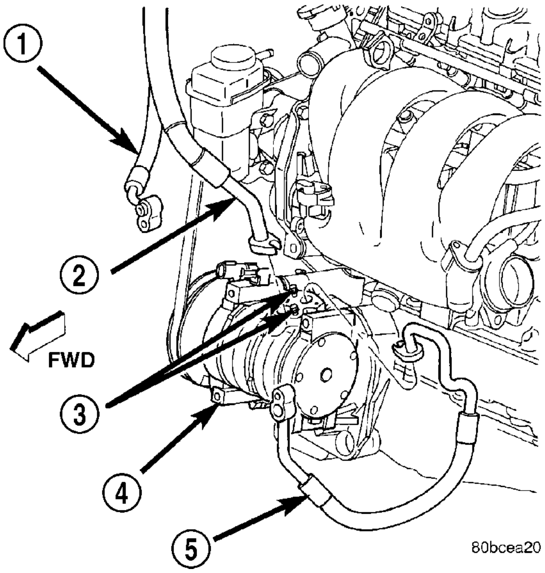

Fig. 5 A/C Compressor Lines

1 - LIQUID LINE
2 - SUCTION LINE
3 - COMPRESSOR MANIFOLD SCREWS
4 - A/C COMPRESSOR
5 - DISCHARGE LINE

(14) Support the A/C compressor and remove the A/C compressor mounting bolts (Fig. 6).

(15) Remove the A/C compressor from the engine compartment.

INSTALLATION

NOTE: If a replacement compressor is being installed, be certain to check the refrigerant oil level. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(1) Position the A/C compressor into the engine compartment.

(2) Install the four bolts that secure the A/C compressor to the mounting bracket. Tighten the bolts to 28 N·m (21 ft. lbs.).

(3) Remove the tape or plugs from the A/C compressor discharge port and the discharge line fitting.

(4) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the discharge line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

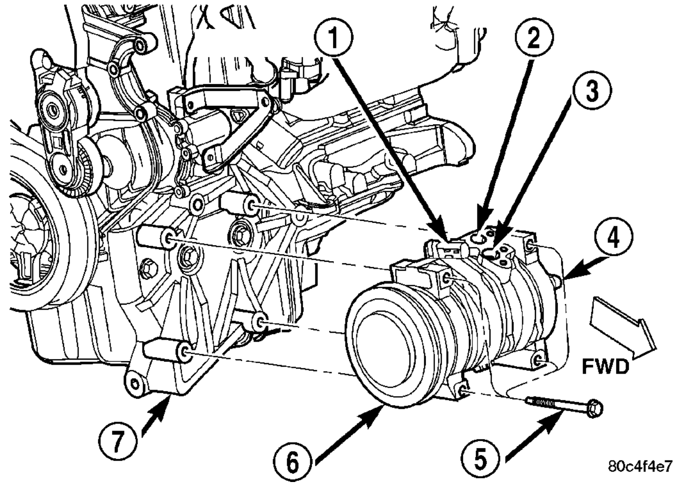

Fig. 6 A/C Compressor - Typical

1 - CLUTCH COIL WIRE CONNECTOR
2 - DISCHARGE PORT
3 - SUCTION PORT
4 - HIGH PRESSURE CUT-OUT SWITCH
5 - BOLT (4)
6 - A/C COMPRESSOR
7 - BRACKET

(5) Reconnect the discharge line fitting to the A/C compressor discharge port.

(6) Install the bolt that secures the discharge line fitting to the A/C compressor. Tighten the bolt to 12 N·m (108 in. lbs.).

(7) Remove the tape or plugs from the A/C compressor suction port and the suction line fitting.

(8) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(9) Reconnect the suction line fitting to the A/C compressor suction port.

(10) Install the bolt that secures the suction line fitting to the A/C compressor. Tighten the bolt to 12 N·m (108 in. lbs.).

(11) Reconnect the engine wire harness connectors to the compressor clutch coil connector and the high pressure cut out switch.

(12) Lower the vehicle.

(13) Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(14) Reconnect the battery negative cable.

(15) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

A/C COMPRESSOR (Continued)

(16) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

A/C CONDENSER

DESCRIPTION

The A/C condenser is located in the front of the engine cooling radiator. The A/C condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the A/C compressor to give up its heat to the air passing over the fins.

The A/C condenser is integral to the cooling module which includes the radiator, electric cooling fan, fan shroud, air seals and an automatic transmission oil cooler on models so equipped.

The condenser cannot be repaired and, if found to be leaking or damaged, it must be replaced.

OPERATION

When air passes through the condenser fins, the high-pressure refrigerant gas within the A/C condenser gives up its heat. The refrigerant then condenses as it leaves the A/C condenser and becomes a high-pressure liquid. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings at the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or A/C condenser service.

The A/C condenser cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(3) Remove battery support strut.

(4) Remove the bolt that secures the liquid line fitting to the condenser outlet port (Fig. 7).

(5) Disconnect the liquid line fitting from the condenser outlet port.

(6) Remove the seal from the liquid line fitting and discard.

(7) Install plug in, or tape over the opened liquid line fitting and the condenser outlet port.

(8) Remove the bolt that secures the discharge line fitting to the condenser inlet port.

(9) Disconnect the discharge line fitting from the condenser inlet port.

(10) Remove the seal from the discharge line fitting and discard.

(11) Install plug in, or tape over the opened discharge line fitting and the condenser inlet port.

(12) Remove upper radiator mounts.

(13) Remove the condenser retaining screws.

(14) Tilt radiator back and carefully remove the condenser from the vehicle.

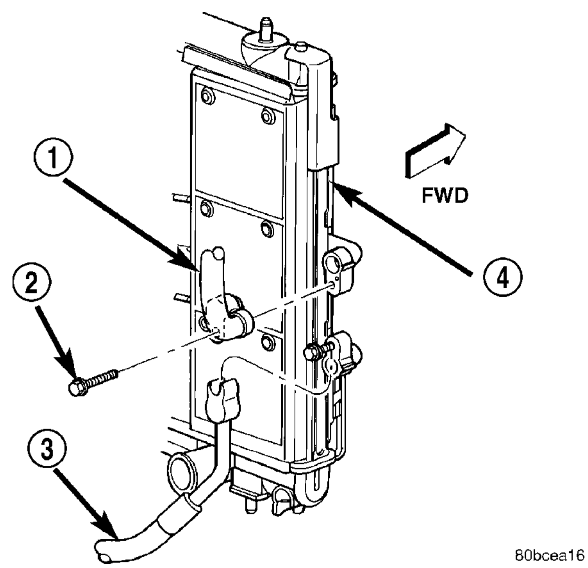

Fig. 7 A/C Condenser Refrigerant Lines

1 - LIQUID LINE
2 - BOLT (2)
3 - DISCHARGE LINE
4 - A/C CONDENSER

INSTALLATION

NOTE: If the condenser is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(1) Tilt the radiator back and position the condenser in the vehicle.

(2) Install the condenser retaining screws. Tighten the screws to 2 N·m (17 in. lbs.).

(3) Install the upper radiator mounts.

(4) Remove the tape or plug from the condenser inlet port and the discharge line fitting.

A/C CONDENSER (Continued)

(5) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the discharge line fitting.

(6) Reconnect the discharge line fitting to the condenser inlet port.

(7) Install and tighten the bolt that secures the discharge line fitting to the condenser inlet port. Tighten the bolt to 12 N·m (108 in. lbs.).

(8) Remove the tape or plug from the condenser outlet port and the liquid line fitting.

(9) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the liquid line fitting.

(10) Reconnect the liquid line fitting to the condenser outlet port.

(11) Install and tighten the bolt that secures the liquid line fitting to the condenser outlet port. Tighten the bolt to 12 N·m (108 in. lbs.).

(12) Install the battery support strut.

(13) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE)

(14) Recharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(15) Reconnect the battery negative cable.

A/C DISCHARGE LINE

DESCRIPTION

The A/C discharge line is the refrigerant line that goes from the A/C compressor to the A/C condenser. The discharge line has no serviceable parts except for the rubber O-rings. The discharge line cannot be repaired and, if found to be leaking or damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Disconnect and isolate the negative battery cable.

(2) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY).

(3) Remove the bolt that secures the discharge line fitting to the top of the compressor (Fig. 8).

(4) Disconnect the discharge line fitting from the compressor discharge port.

(5) Remove the seal from the discharge line fitting and discard.

(6) Install plug in, or tape over the opened discharge line fitting and the compressor discharge port.

(7) Raise the vehicle on a hoist.

(8) Remove the bolt that secures the discharge line fitting to the condenser.

(9) Disconnect the discharge line fitting from the condenser inlet port and remove the discharge line from the vehicle.

(10) Remove the seal from the discharge line fitting and discard.

(11) Install plug in, or tape over the opened discharge line fitting and the condenser inlet port.

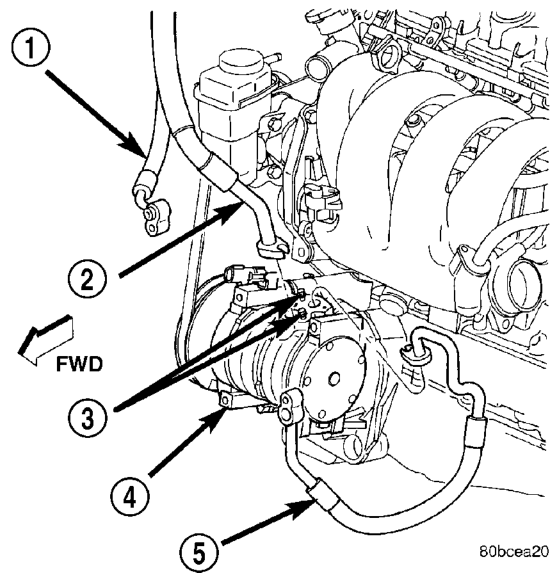

Fig. 8 A/C Compressor Lines

1 - LIQUID LINE
2 - SUCTION LINE
3 - COMPRESSOR MANIFOLD SCREWS
4 - A/C COMPRESSOR
5 - DISCHARGE LINE

INSTALLATION

NOTE: Replacement of the refrigerant line O-ring seals is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals could result in a refrigerant system leak.

(1) Position the discharge line into the engine compartment.

(2) Remove the tape or plugs from the condenser inlet port and the discharge line fitting.

(3) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the discharge line fitting.

(4) Connect the discharge line fitting to the condenser inlet port.

A/C DISCHARGE LINE (Continued)

(5) Install the bolt that secures the discharge line fitting to the condenser. Tighten the bolt to 12 N·m (108 in. lbs.).

(6) Lower the vehicle.

(7) Remove the tape or plugs from the compressor discharge port and the discharge line fitting.

(8) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the discharge line fitting.

(9) Connect the discharge line fitting to the compressor discharge port on the top of the compressor.

(10) Install the bolt that secures the discharge line fitting to the compressor. Tighten the bolt to 12 N·m (108 in. lbs.).

(11) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(12) Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(13) Reconnect the negative battery cable.

A/C EVAPORATOR

DESCRIPTION

The evaporator (Fig. 9) is located in the HVAC housing, behind the instrument panel. The evaporator is positioned in the housing so that all air that enters the housing must pass over the fins of the evaporator coils before it is distributed through the system ducts and outlets. However, air passing over the evaporator fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator tubes.

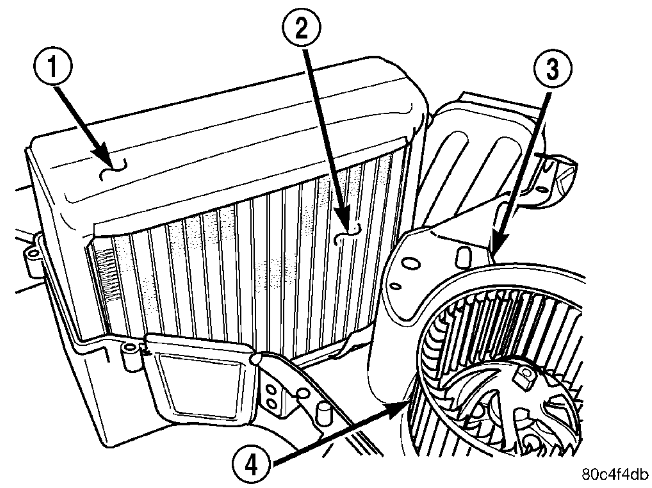

Fig. 9 Evaporator - LHD Shown, RHD Typical

1 - FOAM WRAP
2 - EVAPORATOR
3 - LOWER HVAC HOUSING
4 - BLOWER MOTOR AND WHEEL

OPERATION

Refrigerant enters the evaporator from the variable orifice valve as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the evaporator.

The evaporator cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Remove the heater housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).

(2) Disassemble the heater housing to access the evaporator (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - DISASSEMBLY).

(3) Lift the evaporator out of the lower half of the housing (Fig. 10).

A/C EVAPORATOR (Continued)

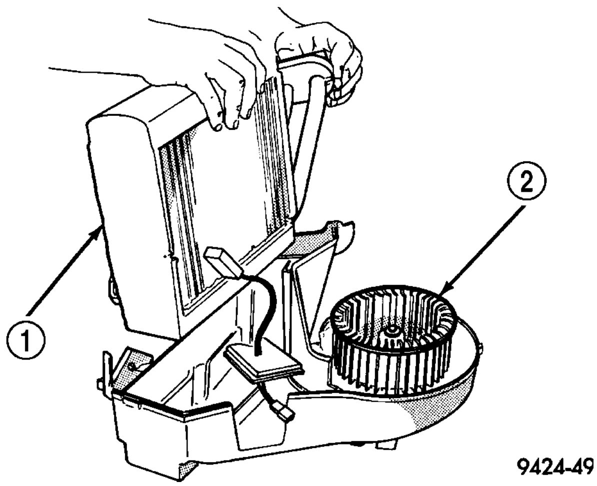

Fig. 10 A/C Evaporator - Typical

1 - A/C EVAPORATOR
2 - BLOWER MOTOR AND WHEEL

INSTALLATION

NOTE: If the evaporator is being replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system.

(1) Install the evaporator coil into the bottom half of the HVAC housing.

(2) Assemble the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HVAC HOUSING - ASSEMBLY).

(3) Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

A/C VARIABLE ORIFICE TUBE - 2.0L LHD MODELS

DESCRIPTION

On 2.0L LHD models, a variable orifice valve (VOV) is factory installed in the liquid line between the outlet of the condenser and the inlet of the evaporator (Fig. 11). The VOV is located in the end of the liquid line that is closest to the condenser. The inlet end of the VOV has a nylon mesh filter screen, which filters the refrigerant and helps to reduce the potential for blockage of the metering orifices by refrigerant system contaminants. The outlet end of the tube has a nylon mesh diffuser screen. The O-rings on the plastic body of the VOV seal the tube to the inside of the liquid line and prevent refrigerant from bypassing the metering orifices.

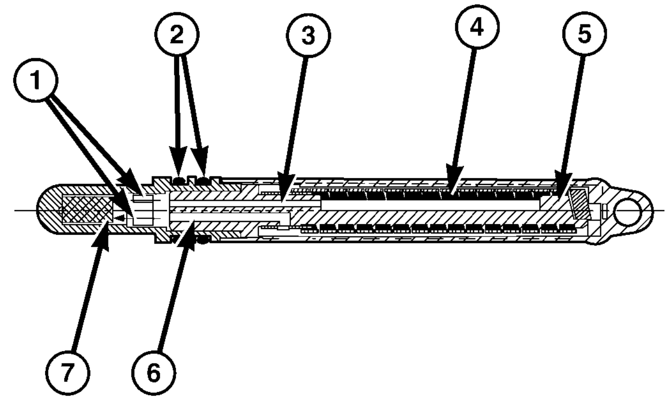

Fig. 11 Variable Orifice Valve - 2.0L LHD Models

1 - FIXED AND VARIABLE ORIFICES
2 - O-RINGS
3 - FIXED PORT
4 - BIMETAL COIL
5 - INLET FILTER SCREEN
6 - VARIABLE PORT
7 - DIFFUSER SCREEN

OPERATION

The variable orifice valve (VOV) is used to meter the flow of liquid refrigerant into the evaporator coil. The high-pressure liquid refrigerant from the condenser expands into a low-pressure liquid as it passes through the metering orifices and diffuser screen of the VOV. There are two parallel flow paths integral to the VOV, a fixed port and a variable port. As the temperature of the refrigerant increases, the bimetal coil moves the variable port to the closed position. High temperature results in more restriction, and lower temperature results in less restriction. This design improves A/C cooling at high loads and or city traffic.

The VOV is not serviceable. It cannot be repaired, and if faulty or plugged, it must be replaced as part of the liquid line.

A/C EXPANSION VALVE - 2.4L AND RHD MODELS

DESCRIPTION

An “H” valve-type thermal expansion valve (TXV) is used on 2.4L and RHD models. The A/C expansion valve is located at the dash panel between the liquid and suction lines and the A/C evaporator (Fig. 12). The A/C expansion valve consists of an aluminum H-valve body with a thermal sensor and a fitting for the A/C low pressure switch.

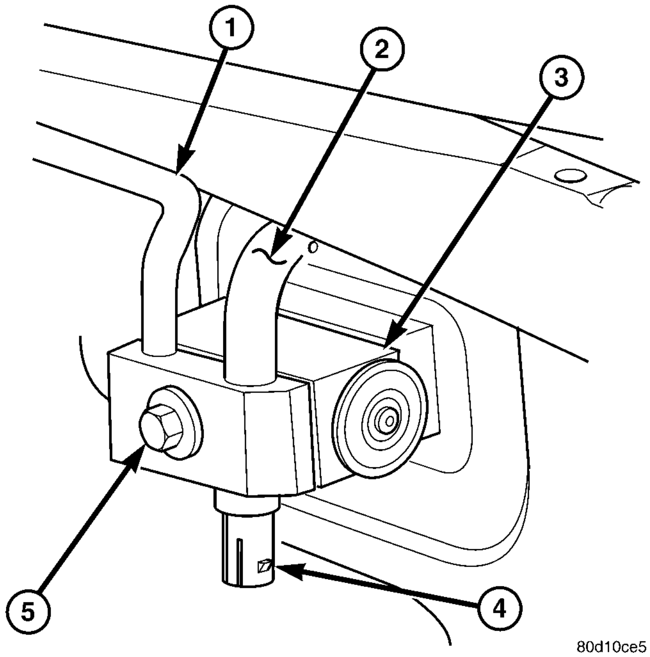

Fig. 12 Expansion Valve - 2.4L & RHD Models

1 - LIQUID LINE
2 - SUCTION LINE
3 - A/C EXPANSION VALVE
4 - A/C LOW PRESSURE SWITCH
5 - BOLT

OPERATION

High-pressure, low temperature liquid refrigerant from the liquid line passes through the expansion valve orifice, converting it into a low-pressure, low-temperature mixture of liquid and gas before it enters the A/C evaporator. A mechanical sensor in the expansion valve control head monitors the temperature and pressure of the refrigerant leaving the A/C evaporator through the suction line, and adjusts the orifice size at the liquid line port to let the proper amount of refrigerant into the A/C evaporator to meet the vehicle cooling requirements. Controlling the refrigerant flow through the A/C evaporator ensures that none of the refrigerant leaving the A/C evaporator is still in a liquid state, which could damage the A/C compressor.

The A/C expansion valve is a factory calibrated unit and cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - A/C EXPANSION VALVE

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

NOTE: The A/C expansion valve should only be tested following testing of the A/C compressor.

The A/C expansion valve can fail in three different positions (open, closed or restricted).

- **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 A/C expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant.
- **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 A/C expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant.
- **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 A/C expansion valve and receiver/drier.

REMOVAL

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Disconnect and isolate the negative battery cable.

(3) Disconnect the wire harness connector from the A/C low pressure switch (Fig. 13).

A/C EXPANSION VALVE - 2.4L AND RHD MODELS (Continued)

(4) Remove the bolt that secures the suction and liquid line fitting to the A/C expansion valve.

(5) Disconnect the suction line and liquid line fittings from the A/C expansion valve and position the refrigerant lines out of the way.

(6) Remove the gasket from the A/C expansion valve and discard.

(7) Install plugs in, or tape over the opened suction line and liquid line fittings and both expansion valve ports.

(8) Remove the two bolts that secure the A/C expansion valve to the evaporator tube tapping plate.

(9) Remove the A/C expansion valve from the evaporator tube tapping plate.

(10) Remove the gasket from the evaporator tube tapping plate and discard.

(11) Install plugs in, or tape over the opened evaporator inlet and outlet tube fittings and both expansion valve ports.

(12) If required, remove the A/C low pressure switch from the A/C expansion valve.

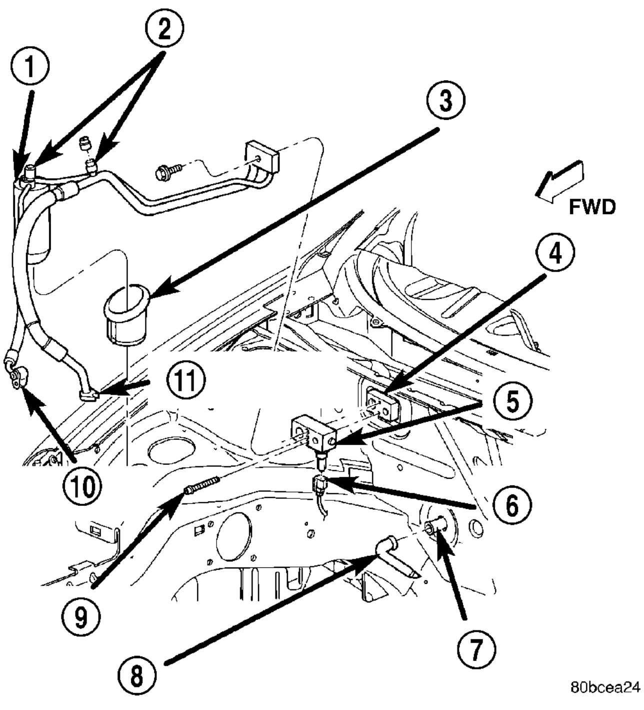

Fig. 13 A/C Expansion Valve - 2.4L Shown, RHD Typical

1 - FILTER/DRIER
2 - SERVICE PORTS
3 - FILTER DRIER MOUNTING GROMMET
4 - EVAPORATOR TAPPING BLOCK
5 - A/C EXPANSION VALVE
6 - A/C LOW PRESSURE SWITCH CONNECTOR
7 - HVAC HOUSING DRAIN OUTLET
8 - CONDENSATE DRAIN TUBE
9 - SCREW (2)
10 - LIQUID LINE
11 - SUCTION LINE

INSTALLATION

(1) If removed, install the A/C low pressure switch to the A/C expansion valve. Tighten the switch securely.

(2) Remove the tape or plugs from the evaporator inlet and outlet tube fittings and both ports on the back of the A/C expansion valve.

(3) Install a new gasket onto the evaporator tube tapping plate

(4) Position the A/C expansion valve onto the evaporator tube tapping plate.

(5) Install the two bolts that secure the A/C expansion valve to the evaporator tube tapping plate plate. Tighten the bolts to 10 N·m (88 in. lbs.).

(6) Remove the tape or plugs from the liquid and suction line fittings and both ports on the front of the A/C expansion valve.

(7) Install a new gasket onto the A/C expansion valve.

(8) Connect the liquid and suction line fitting to the A/C expansion valve.

(9) Install the bolt that secures the suction and liquid line fitting to the A/C expansion valve. Tighten the bolt to 20 N·m (15 ft. lbs.).

(10) Connect the wire harness connector to the A/C low pressure switch.

(11) Reconnect the negative battery cable.

(12) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(13) Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

ACCUMULATOR

DESCRIPTION

An accumulator (Fig. 14) is used on 2.0L LHD models. The accumulator is mounted in the engine compartment between the evaporator outlet and the compressor suction port. An integral mounting bracket is used to secure the accumulator to the right side rail with a bolt. A threaded fitting on the top of the accumulator canister provides the port through which the A/C low pressure switch monitors the refrigerant system pressures.

The accumulator cannot be repaired and, if faulty or damaged, it must be replaced. The suction and liquid lines, the rubber O-rings and the A/C low pressure switch are available for service replacement.

OPERATION

Refrigerant enters the accumulator canister as a low pressure vapor through the inlet tube. Any liquid, oil-laden refrigerant falls to the bottom of the

ACCUMULATOR (Continued)

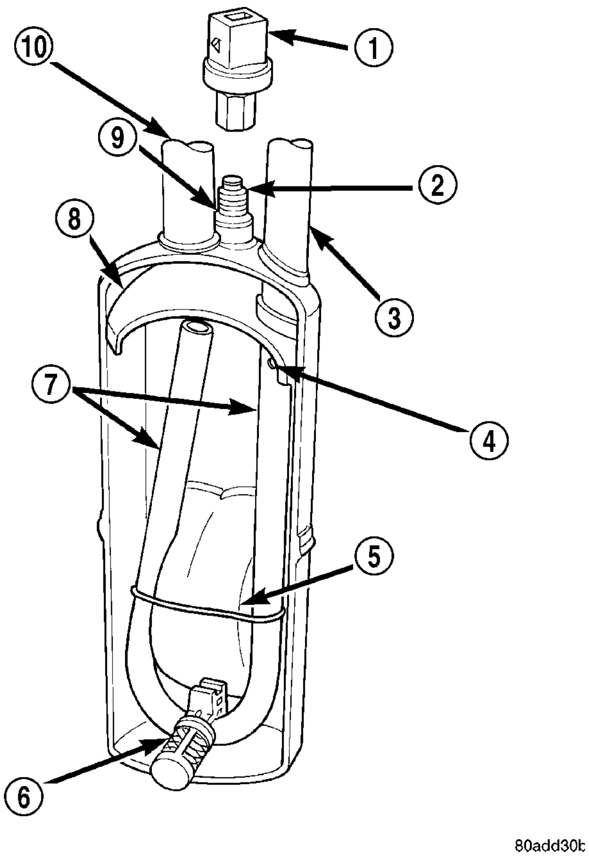

Fig. 14 Accumulator - Typical

1 - A/C LOW PRESSURE SWITCH
2 - PRESSURE SWITCH FITTING
3 - OUTLET TO COMPRESSOR
4 - ANTI-SIPHON HOLE
5 - DESICCANT BAG
6 - OIL RETURN ORIFICE FILTER
7 - VAPOR RETURN TUBE
8 - ACCUMULATOR DOME
9 - O-RING SEAL
10 - INLET FROM EVAPORATOR

canister, which acts as a separator. A desiccant bag located inside the accumulator canister absorbs any moisture which may have entered and become trapped within the refrigerant system.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Recover the refrigerant from the refrigerant system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Disconnect and isolate the battery negative cable.

(3) If equipped, relocate the vehicle speed control servo as necessary to access the accumulator(Refer to 8 - ELECTRICAL/SPEED CONTROL/SERVO - REMOVAL).

(4) Disconnect the wire harness connector from the A/C low pressure switch (Fig. 15).

(5) Remove the two nuts that secure the suction line fittings to the accumulator.

(6) Remove the O-ring seals from the opened suction line fittings and discard.

(7) Install plugs in, or tape over the opened suction line fittings and accumulator ports.

(8) Remove the bolt that secures the accumulator mounting bracket to the body.

(9) Remove the accumulator from the engine compartment.

(10) If necessary, remove the A/C low pressure switch from the accumulator (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C LOW PRESSURE SWITCH - REMOVAL).

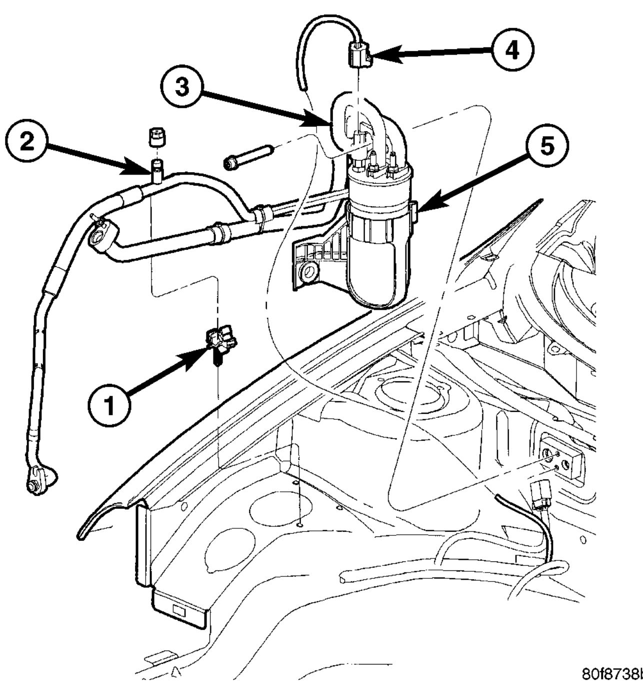

Fig. 15 Accumulator - LHD Models Only

1 - LIQUID LINE MOUNTING CLIP
2 - A/C CHARGE PORT
3 - A/C LOW PRESSURE SWITCH
4 - A/C LOW PRESSURE SWITCH CONNECTOR
5 - ACCUMULATOR

INSTALLATION

NOTE: If the accumulator is replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

ACCUMULATOR (Continued)

(1) If removed, install the A/C low pressure switch onto the accumulator using a new O-ring seal. Tighten the switch securely.

(2) Position the accumulator into the engine compartment.

(3) Install the bolt securing the accumulator mounting bracket. Tighten the bolt to 11 N·m (97 in. lbs.).

(4) Remove the tape or plugs from the opened suction and liquid line fittings and accumulator ports.

(5) Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the suction line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(6) Reconnect the suction line fittings to the accumulator.

(7) Install the nuts that secure the suction line fittings to the accumulator. Tighten the nuts to 2.3 N·m (20 in. lbs.).

(8) Connect the wire harness connector to the A/C low pressure switch.

(9) If equipped, reinstall the vehicle speed control servo (Refer to 8 - ELECTRICAL/SPEED CONTROL/SERVO - INSTALLATION).

(10) Reconnect the negative battery cable.

(11) Evacuate the refrigerant system(Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(12) Charge the refrigerant system(Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

CONDENSATION DRAIN TUBE

DESCRIPTION

Condensation that accumulates in the HVAC housing is drained out of the housing through a tube and on to the ground. The condensation drain tube must be kept open to prevent condensate water from collecting in the bottom of the HVAC housing.

The tapered end of the drain tube is designed to keep contaminants from entering the HVAC housing. If the tube is pinched or blocked, condensate cannot drain, causing water to back up and spill into the passenger compartment. It is normal to see condensate drainage below the vehicle in warm weather. If the tube is damaged, it should be replaced.

REMOVAL

(1) Raise vehicle on a hoist.

(2) Locate the condensate water drain tube on right side of dash panel under the hood (Fig. 16).

(3) Squeeze the retaining clamp and remove drain tube.

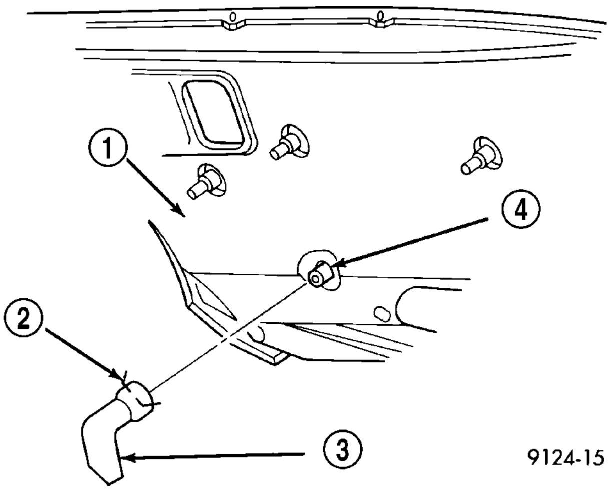

Fig. 16 Condensate Water Drain Tube – Typical

1 - DASH PANEL
2 - RETAINING CLAMP
3 - CONDENSATE WATER DRAIN TUBE
4 - HVAC HOUSING DRAIN

INSTALLATION

(1) Position the condensate water drain tube over the HVAC housing drain.

(2) Squeeze the retaining clamp and install the condensate water drain tube onto the HVAC housing drain.

(3) Lower the vehicle.

HEATER CORE

DESCRIPTION

The heater core (Fig. 17) is located in the HVAC housing, behind the instrument panel. It is a heat exchanger made of rows of tubes and fins. One end of the core is fitted with a molded plastic tank that includes the integral heater core tubes.

OPERATION

Engine coolant is circulated through the heater hoses and heater core at all times. As the coolant flows through the heater core, heat removed from the engine is transferred to the heater core fins and tubes. Air directed through the heater core picks up the heat from the heater core fins. The blend door allows control of the heater output air temperature by regulating the amount of air that is flowing through the heater core within the HVAC housing. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced.

HEATER CORE (Continued)

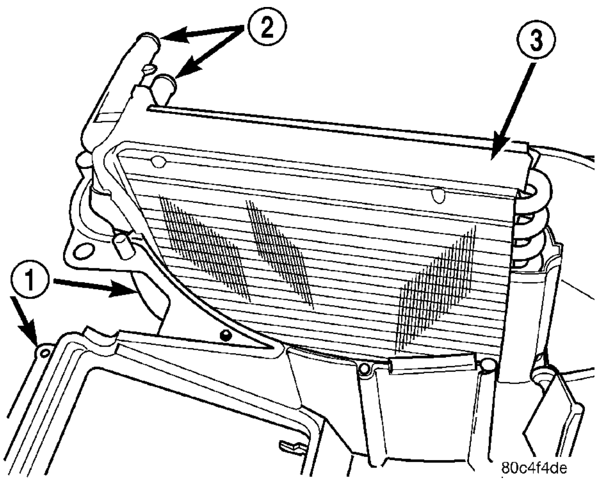

Fig. 17 Heater Core - LHD Shown, RHD Typical

1 - LOWER HVAC HOUSING
2 - HEATER CORE TUBES
3 - HEATER CORE

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Remove the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).

(2) Disassemble the HVAC housing to access the heater core(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - DISASSEMBLY).

(3) Lift the heater core out of the lower half of the housing (Fig. 18).

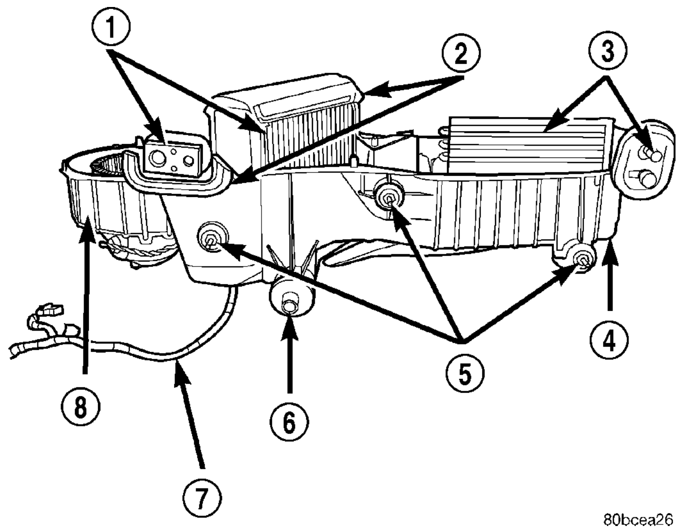

Fig. 18 Lower HVAC Housing - LHD Shown, RHD Typical

1 - EVAPORATOR AND TUBES
2 - FOAM SEALS
3 - HEATER CORE AND TUBES
4 - HVAC HOUSING LOWER CASE
5 - HOUSING MOUNTING STUDS
6 - HOUSING DRAIN
7 - WIRING
8 - BLOWER MOTOR AND WHEEL

INSTALLATION

(1) Install the heater core into the bottom half of the HVAC housing.

(2) Assemble the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY).

(3) Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

HEATER INLET HOSE

REMOVAL

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING).

(1) Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).

(2) Remove the heater hose retainer and separate the heater inlet and return hoses (Fig. 19).

(3) Using spring tension clamp pliers, compress and slide the clamps off of each end of the hose being removed.

HEATER INLET HOSE (Continued)

CAUTION:
DO NOT apply excessive pressure on heater tubes or connections when removing heater hoses. Excessive pressure may damage or deform the tubes/heater core, causing an engine coolant leak.

(4) Disconnect each hose end by carefully twisting the hose back and forth on the tube, while gently pulling it away from the end of the tube.

(5) If necessary, carefully cut the hose end and peel the hose off of the tube.

NOTE:
Replacement of the heater inlet hose will be required if the hose ends are cut for removal.

(6) Remove the heater inlet hose from the engine compartment.

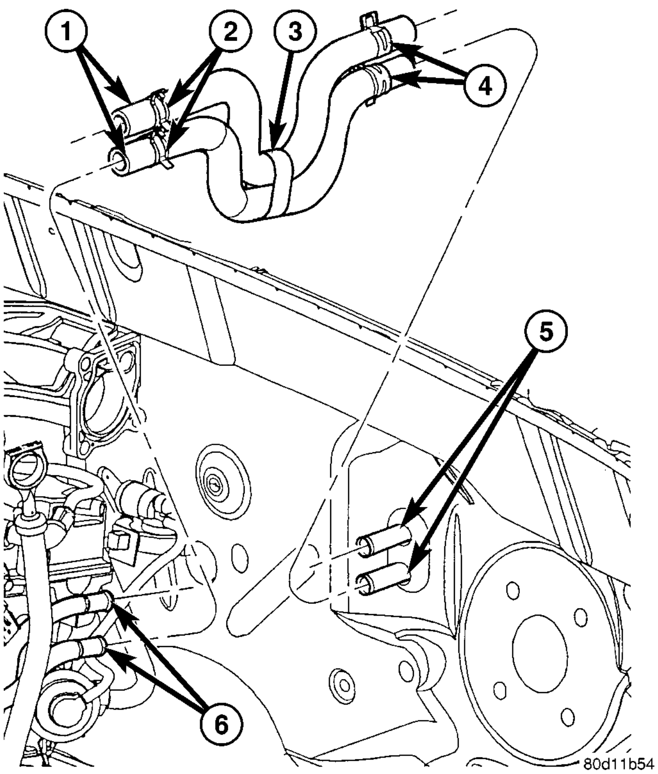

Fig. 19 Heater Hose Assembly- LHD 2.0L Shown, RHD Typical

1 - HEATER HOSES
2 - HEATER HOSE CLAMPS
3 - HEATER HOSE RETAINER
4 - HEATER HOSE CLAMPS
5 - HEATER CORE TUBES
6 - ENGINE HEATER PIPES

INSTALLATION

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING FRONT - WARNING - HEATER PLUMBING).

(1) Position the heater inlet hose into the engine compartment.

(2) Using spring tension clamp pliers, compress and slide each clamp away from the end of the hose being installed.

(3) Install each hose end by carefully twisting the hose back and forth while gently pushing it onto the tube.

(4) Using spring tension clamp pliers, compress and slide the clamps onto each end of the hose being installed.

(5) Install the heater hose retainer.

(6) Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).

HEATER RETURN HOSE

REMOVAL

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING).

(1) Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).

(2) Remove the heater hose retainer and separate the heater inlet and return hoses (Fig. 20).

(3) Using spring tension clamp pliers, compress and slide the clamps off of each end of the hose being removed.

CAUTION:
DO NOT apply excessive pressure on heater tubes or connections when removing heater hoses. Excessive pressure may damage or deform the tubes/heater core, causing an engine coolant leak.

(4) Disconnect each hose end by carefully twisting the hose back and forth on the tube, while gently pulling it away from the end of the tube.

(5) If necessary, carefully cut the hose end and peel the hose off of the tube.

NOTE:
Replacement of the heater return hose will be required if the hose ends are cut for removal.

(6) Remove the heater return hose from the engine compartment.

HEATER RETURN HOSE (Continued)

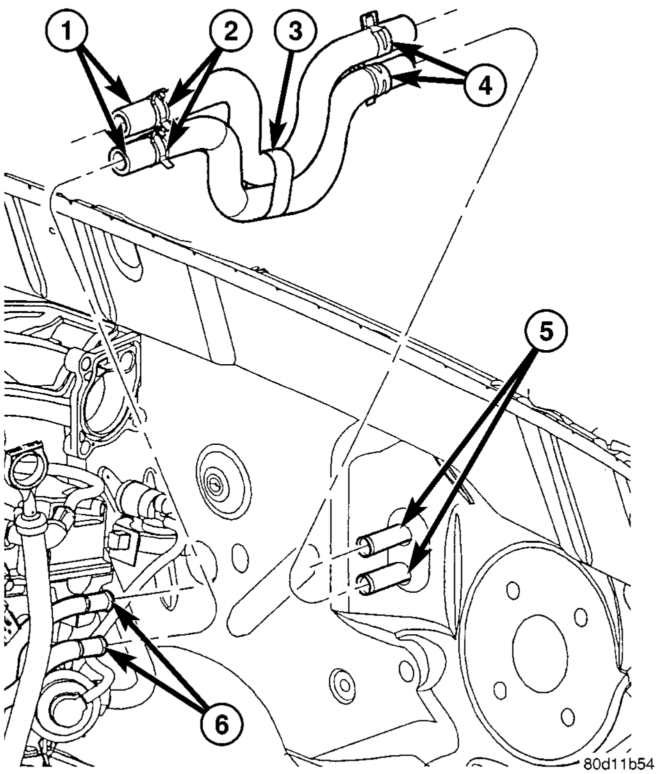

Fig. 20 Heater Hose Assembly- LHD 2.0L Shown, RHD Typical

1 - HEATER HOSES
2 - HEATER HOSE CLAMPS
3 - HEATER HOSE RETAINER
4 - HEATER HOSE CLAMPS
5 - HEATER CORE TUBES
6 - ENGINE HEATER PIPES

INSTALLATION

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING FRONT - WARNING - HEATER PLUMBING).

(1) Position the heater return hose into the engine compartment.

(2) Using spring tension clamp pliers, compress and slide each clamp away from the end of the hose being installed.

(3) Install each hose end by carefully twisting the hose back and forth while gently pushing it onto the tube.

(4) Using spring tension clamp pliers, compress and slide the clamps onto each end of the hose being installed.

(5) Install the heater hose retainer.

(6) Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).

LIQUID LINE

DESCRIPTION

The liquid line is the refrigerant line that goes from the A/C condenser to the accumulator tube tapping block. On 2.0L LHD models, the liquid line contains the variable orifice valve (VOV) and the low side service port and is only serviced as an assembly, except for the rubber O-ring seals and the service port valve core. On 2.4L and RHD models, the liquid line is serviced in two sections and contains the high side service port.

CAUTION: Use only O-ring seals specified for the vehicle. Failure to use correct O-ring seal will cause the refrigerant system connection to leak.

The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the liquid line is removed and installed.

If the liquid line is found to be leaking or is damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

2.0L LHD MODELS

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(2) Remove the bolt that secures the liquid line fitting to the condenser outlet port (upper fitting) (Fig. 21).

(3) Disconnect the liquid line fitting from the condenser outlet port.

(4) Remove the O-ring seal from the liquid line fitting and discard.

(5) Install plugs in, or tape over the opened liquid line fitting and the condenser outlet port.

(6) Remove the accumulator (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR - REMOVAL).

(7) Remove the two bolts that secure the suction and liquid line fittings to the evaporator tube tapping plate (Fig. 22).

(8) Disconnect the suction and liquid line fittings from the evaporator tube tapping plate.

(9) Remove the gasket from the evaporator tube tapping plate and discard.

LIQUID LINE (Continued)

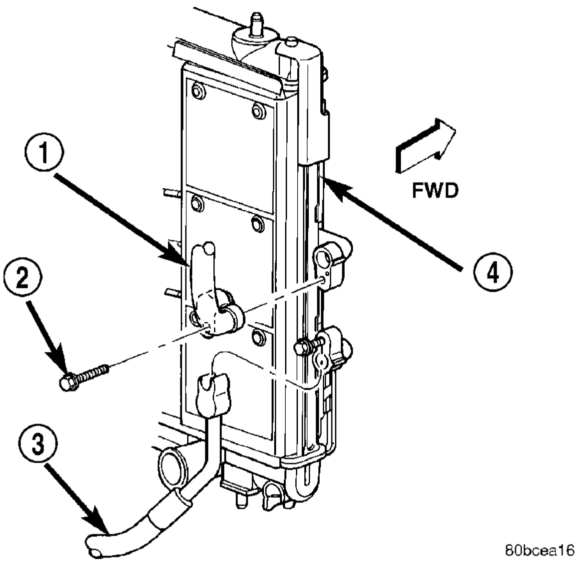

Fig. 21 Condenser Refrigerant Lines

1 - LIQUID LINE
2 - BOLT (2)
3 - DISCHARGE LINE
4 - A/C CONDENSER

(10) Install plugs in, or tape over the opened suction and liquid line fittings and the evaporator tube tapping plate ports.

(11) Remove the liquid line from the engine compartment.

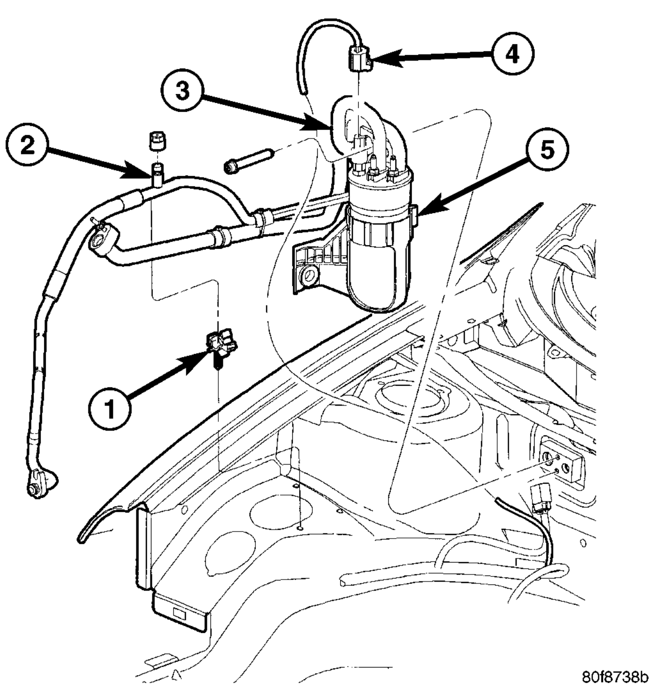

Fig. 22 Liquid Line - 2.0L LHD Models

1 - LIQUID LINE MOUNTING CLIP
2 - A/C CHARGE PORT
3 - A/C LOW PRESSURE SWITCH
4 - A/C LOW PRESSURE SWITCH CONNECTOR
5 - ACCUMULATOR

2.4L AND RHD MODELS

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(2) Disconnect and isolate the negative battery cable.

(3) Remove the bolt that secures the liquid line fitting to the condenser outlet port (upper fitting) (Fig. 21).

(4) Disconnect the liquid line fitting from the condenser outlet port.

(5) Remove the O-ring seal from the liquid line fitting and discard.

(6) Install plugs in, or tape over the opened liquid line fitting and the condenser outlet port.

(7) If equipped, relocate the vehicle speed control servo as necessary to access the receiver/drier.

(8) Remove the two bolts that secure the liquid lines to the receiver/drier (Fig. 23).

(9) Remove the O-ring seals from the opened liquid line fittings and discard.

(10) Install plugs in, or tape over the opened liquid line fittings and receiver/drier ports.

(11) Remove the front section of the liquid line from the engine compartment.

(12) Disconnect the front suction line fitting from the mid-line connector block of the rear suction and liquid line assembly.

(13) Remove the O-ring seal from the front suction line fitting and discard.

(14) Install plugs in, or tape over the opened front suction line fitting and the mid-line connector block of the suction and liquid line assembly.

(15) Remove the bolt that secures the rear suction and liquid line assembly to the A/C expansion valve.

(16) Disconnect the rear suction and liquid line assembly from the A/C expansion valve

(17) Remove the gasket from the A/C expansion valve and discard.

(18) Install plugs in, or tape over the opened rear suction and liquid line fittings and both expansion valve ports.

(19) Disengage the rear suction and liquid line assembly from the retaining clips as required and remove the rear suction and liquid line assembly from the engine compartment.

INSTALLATION

2.0L LHD MODELS

(1) Position the liquid line into the engine compartment.

(2) Remove the tape or plugs from the suction and liquid line fittings and the evaporator tube tapping plate port.

LIQUID LINE (Continued)

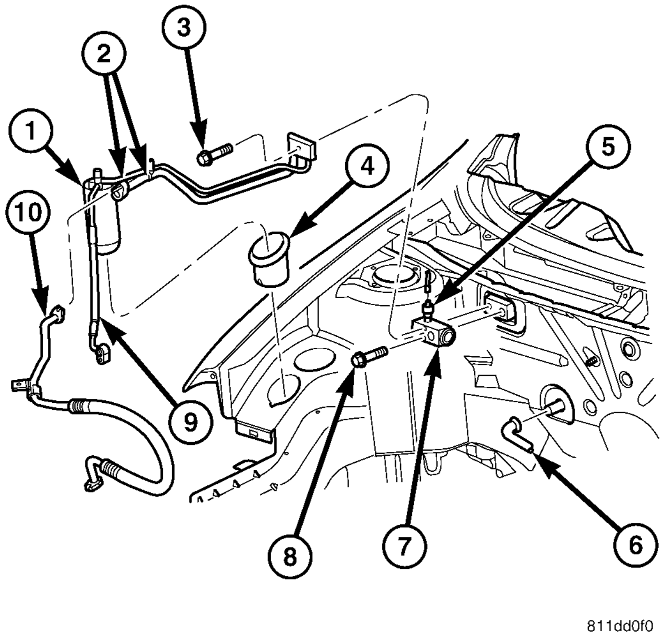

Fig. 23 Liquid Line - 2.4L LHD Shown, RHD Typical

1 - RECEIVER/DRIER
2 - SUCTION AND LIQUID LINE ASSEMBLY (REAR)
3 - BOLT
4 - RECEIVER/DRIER MOUNTING GROMMET
5 - A/C LOW PRESSURE SWITCH
6 - CONDENSATE DRAIN TUBE
7 - A/C EXPANSION VALVE
8 - BOLT
9 - LIQUID LINE (FRONT)
10 - SUCTION LINE (FRONT)

(3) Install a new gasket onto the evaporator tube tapping plate.

(4) Connect the liquid and suction line fittings to the evaporator tube tapping plate.

(5) Install the two bolts that secure the liquid and suction line fittings to the evaporator tube tapping plate plate. Tighten the bolts to 10 N·m (88 in. lbs.).

(6) Install the accumulator (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR - INSTALLATION).

(7) Remove the tape or plugs from the liquid line fitting and the condenser outlet port.

(8) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the liquid line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(9) Install the liquid line fitting to the condenser outlet port.

(10) Install the bolt that secures the liquid line fitting to the condenser outlet port. Tighten the bolt to 12 N·m (108 in. lbs.).

(11) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE)

(12) Recharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

2.4L AND RHD MODELS

(1) Position the rear suction and liquid line assembly into the engine compartment.

(2) Engage the rear suction and liquid line assembly to the retaining clips as required.

(3) Remove the tape or plugs from the liquid and suction line fittings and both ports on the front of the A/C expansion valve.

(4) Install a new gasket onto the A/C expansion valve.

(5) Connect the liquid and suction line fitting to the A/C expansion valve.

(6) Install the bolt that secures the suction and liquid line fitting to the A/C expansion valve. Tighten the bolt to 20 N·m (15 ft. lbs.).

(7) Remove the tape or plugs from the front suction line fitting and the mid-line connector block of the suction and liquid line assembly.

(8) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(9) Connect the front suction line fitting to the mid-line connector block.

(10) Install the nut that secures the front suction line fitting to the mid-line connector block. Tighten the nut to 4.5 N·m (40 in. lbs.).

(11) Position the front section of the liquid line into the engine compartment.

(12) Remove the tape or plugs from the opened liquid line fittings and receiver/drier ports.

(13) Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(14) Reconnect the liquid line fittings to the receiver/drier.

(15) Install the bolts that secure the liquid line fittings to the receiver/drier. Tighten the bolts to 2.3 N·m (20 in. lbs.).

(16) If equipped, reinstall the vehicle speed control servo.

(17) Remove the tape or plug from the condenser outlet port and the liquid line fitting.

LIQUID LINE (Continued)

(18) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the liquid line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(19) Reconnect the liquid line fitting to the condenser outlet port.

(20) Install and tighten the bolt that secures the liquid line fitting to the condenser outlet port. Tighten the bolt to 12 N·m (108 in. lbs.).

(21) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(22) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

RECEIVER / DRIER

DESCRIPTION

A receiver/drier (Fig. 24) is used on 2.4L and RHD models. The receiver/drier is mounted on the right side of the engine compartment and is located between the A/C condenser outlet and A/C evaporator inlet.

The receiver/drier cannot be repaired. If the receiver/drier is faulty or damaged, or if the refrigerant system has been contaminated or left open to the atmosphere for an indeterminable period of time, or if the A/C compressor has failed, the receiver/drier must be replaced.

OPERATION

The receiver/drier performs a filtering action to prevent foreign material in the refrigerant from contaminating the expansion valve. A desiccant bag is mounted inside the receiver/drier canister to absorb any moisture which may have entered and become trapped within the refrigerant system. In addition, during periods of high demand air conditioner operation, the receiver/drier acts as a reservoir to store surplus refrigerant. Refrigerant enters the receiver/drier as a high-pressure, low temperature liquid.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

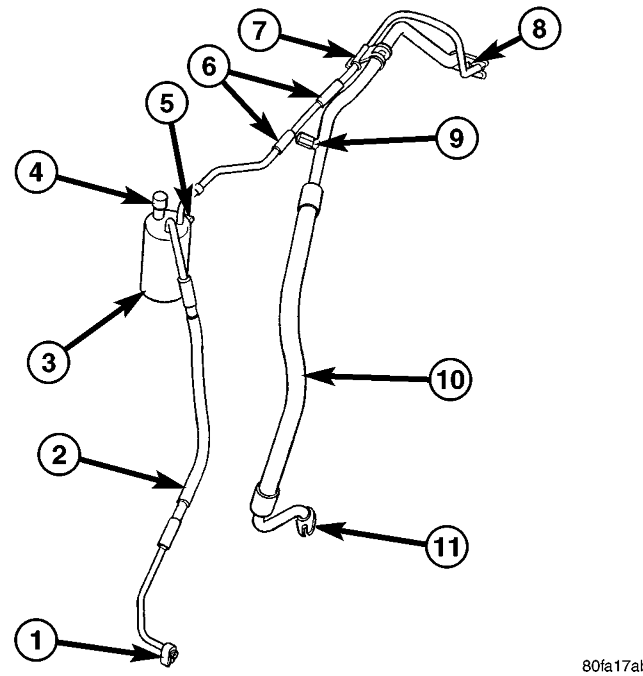

Fig. 24 Receiver/Drier with Refrigerant Lines - Typical

1 - CONDENSER FITTING
2 - LIQUID LINE
3 - RECEIVER/DRIER
4 - HIGH SIDE SERVICE PORT
5 - MOUNTING BRACKET
6 - INSULATOR (2)
7 - RETAINER BRACKET
8 - MOUNTING FLANGE
9 - LOW SIDE SERVICE PORT
10 - SUCTION LINE
11 - SUCTION LINE FITTING

(1) Recover the refrigerant from the refrigerant system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Remove the two bolts that secure the liquid lines to the receiver/drier (Fig. 25).

(3) Remove the O-ring seals from the opened liquid line fittings and discard.

(4) Install plugs in, or tape over the opened liquid line fittings and receiver/drier ports.

(5) Remove the receiver/drier from mounting grommet and the engine compartment.

INSTALLATION

NOTE: If the receiver/drier is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(1) Install the receiver/drier into the mounting grommet in the engine compartment.

RECEIVER / DRIER (Continued)

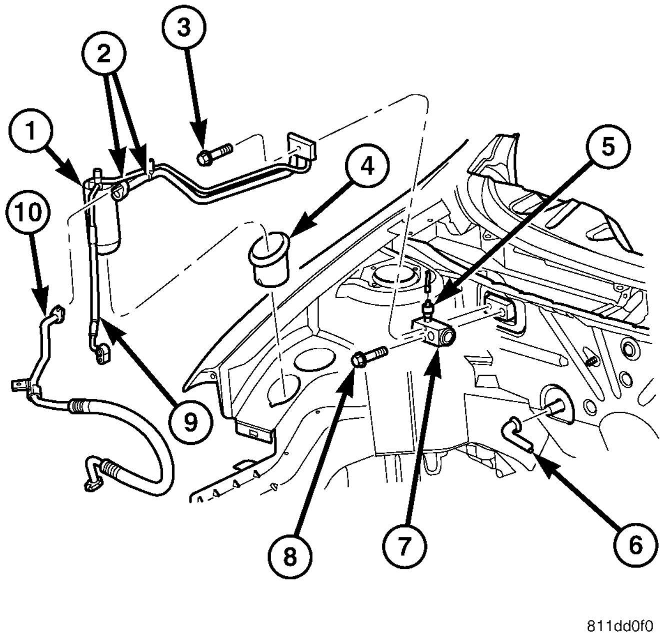

Fig. 25 Receiver/Drier - 2.4L LHD Shown, RHD Typical

1 - RECEIVER/DRIER
2 - SUCTION AND LIQUID LINE ASSEMBLY (REAR)
3 - BOLT
4 - RECEIVER/DRIER MOUNTING GROMMET
5 - A/C LOW PRESSURE SWITCH
6 - CONDENSATE DRAIN TUBE
7 - A/C EXPANSION VALVE
8 - BOLT
9 - LIQUID LINE (FRONT)
10 - SUCTION LINE (FRONT)

(2) Remove the tape or plugs from the opened liquid line fittings and receiver/drier ports.

(3) Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(4) Reconnect the liquid line fittings to the receiver/drier.

(5) Install the bolts that secure the liquid line fittings to the receiver/drier. Tighten the bolts to 2.3 N·m (20 in. lbs.).

(6) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(7) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

REFRIGERANT

DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas. Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

OPERATION

R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. Even a small amount of R-12 added to an R-134a refrigerant system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance. In addition, the PolyAlkylene Glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the compressor identifying to service technicians that the air conditioning system is equipped with R-134a.

REFRIGERANT OIL

DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, PolyAlkylene Glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The 10S15 A/C compressor used in this vehicle is designed to use an ND-8 PAG refrigerant oil. Use only refrigerant oil of this same type to service the refrigerant system.

OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause compressor damage, and too much can reduce air conditioning system performance.

REFRIGERANT OIL (Continued)

PAG refrigerant oil is much more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

STANDARD PROCEDURE - REFRIGERANT OIL LEVEL CHECK

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

CAUTION: The refrigerant oil used in this R-134a A/C system is ND-8 PAG R-134a refrigerant oil. Only refrigerant oil of the same type should be used to service the system. Do not use any other type of refrigerant oil. Always refer to the underhood A/C System Specification Label for the correct oil designation.

It is important to have the correct amount of lubricant in the A/C refrigerant system to ensure proper lubrication of the A/C compressor. Too little lubricant will result in damage to the compressor. Too much lubricant will reduce the cooling capacity of the A/C system and consequently result in higher discharge air temperatures.

The lubricant used in the compressor is polyalkalene glycol PAG lubricant. Only the refrigerant lubricant approved for use with this vehicle 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 will not be necessary to check the oil level in the A/C compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to component replacement, or a rupture or leak from a refrigerant line, connector fitting, component or component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of the recommended refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

When an air conditioning system is first assembled at the factory, all components (except the A/C compressor) are refrigerant oil free. After the refrigerant system has been charged with (R-134a) refrigerant and operated, the oil in the A/C compressor is dispersed through the lines and components. The A/C evaporator, A/C condenser and the accumulator or receiver/drier (depending on application) will retain a significant amount of oil. Refer to the A/C Component Refrigerant Oil Capacities table. When a component is replaced, the specified amount of refrigerant oil must be added. When a new A/C compressor is being installed, drain the lubricant from the used compressor, measure the amount drained and discard the used lubricant. Drain the lubricant from the new A/C compressor into a clean container. Return the amount of lubricant measured from the used compressor, plus the amount reclaimed from the system back into the new A/C compressor. When a line or component has ruptured and oil has escaped, the accumulator or receiver/drier (depending on application) must be replaced along with the ruptured component.

A/C COMPONENT REFRIGERANT OIL CAPACITIES

Component	ml	oz
Total System Fill	180	6.1
Accumulator, receiver/ drier	30	1.0
Condenser	30	1.0
Evaporator	60	2.0
Compressor	Drain and measure the oil from the old compressor - see text.	

COMPRESSOR REFRIGERANT OIL LEVEL CHECK

NOTE: Most reclaim/recycling equipment will measure the lubricant being removed during recovery. This amount of lubricant should be added back into the system. Refer to the reclaim/recycling equipment manufacturers instructions.

(1) Recover the refrigerant from the system.

(2) Disconnect the refrigerant lines from the A/C compressor. Cap open lines to prevent moisture from entering the system.

(3) Remove the A/C compressor from the vehicle.

(4) From the suction and discharge ports on the A/C compressor, drain the lubricant from the old A/C compressor into a clean container.

(5) From the suction and discharge ports on the A/C compressor, drain the lubricant from the new A/C compressor into a clean container.

(6) Install new lubricant back into the new A/C compressor in the amount measured from the used compressor, plus adding any amount of lubricant lost when the refrigerant system was reclaimed.

(7) Install the A/C compressor and connect the refrigerant lines. Then evacuate and charge refrigerant system.

SUCTION LINE

DESCRIPTION

The suction line is the refrigerant line that goes from the accumulator tube tapping plate to the A/C compressor. The suction line is serviced in two sections. On 2.4L and RHD models, the rear section of the suction line contains the low side service port is only serviced with the liquid line as an assembly, except for the rubber O-ring seals and the service port valve core.

CAUTION: Use only O-ring seals specified for the vehicle. Failure to use correct O-ring seal will cause the refrigerant system connection to leak.

The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the suction line is removed and installed.

If the suction line is found to be leaking or is damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

2.0L LHD MODELS

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Remove the bolt that secures the suction line fitting to the top of the compressor (Fig. 26).

(3) Disconnect the suction line fitting from the compressor inlet port.

(4) Remove the O-ring seal from the suction line fitting and discard.

(5) Install plugs in, or tape over the opened suction line fitting and the compressor inlet port.

(6) Disconnect the front suction line from the mid-line connector block (Fig. 27).

(7) Remove the O-ring seal from the suction line fitting and discard.

(8) Install plugs in, or tape over the opened suction line fitting and the mid-line connector block.

(9) Remove the suction line retaining brackets as required and remove the front suction line from the engine compartment.

(10) Remove the nut that secures the suction line fitting to the accumulator outlet port.

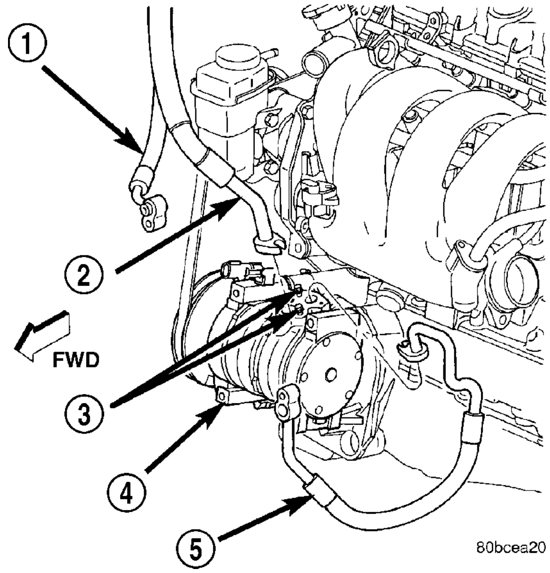

Fig. 26 A/C Compressor Lines

1 - LIQUID LINE
2 - SUCTION LINE
3 - COMPRESSOR MANIFOLD SCREWS
4 - A/C COMPRESSOR
5 - DISCHARGE LINE

(11) Remove the O-ring seals from the opened suction line fitting and discard.

(12) Install plugs in, or tape over the opened suction line fitting and accumulator outlet port.

(13) Remove the rear suction line from the engine compartment.

2.4L AND RHD MODELS

(1) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Remove the bolt that secures the suction line fitting to the top of the compressor (Fig. 26).

(3) Disconnect the suction line fitting from the compressor inlet port.

(4) Remove the O-ring seal from the suction line fitting and discard.

(5) Install plugs in, or tape over the opened suction line fitting and the compressor inlet port.

(6) Disconnect the front suction line from the mid-line connector block of the rear suction line assembly (Fig. 28).

(7) Remove the O-ring seal from the suction line fitting and discard.

(8) Install plugs in, or tape over the opened suction line fitting and the mid-line connector block.

(9) Remove the suction line from the retaining brackets as required and remove the front suction line from the engine compartment.

(10) If equipped, relocate the vehicle speed control servo as necessary to access the receiver/drier.

SUCTION LINE (Continued)

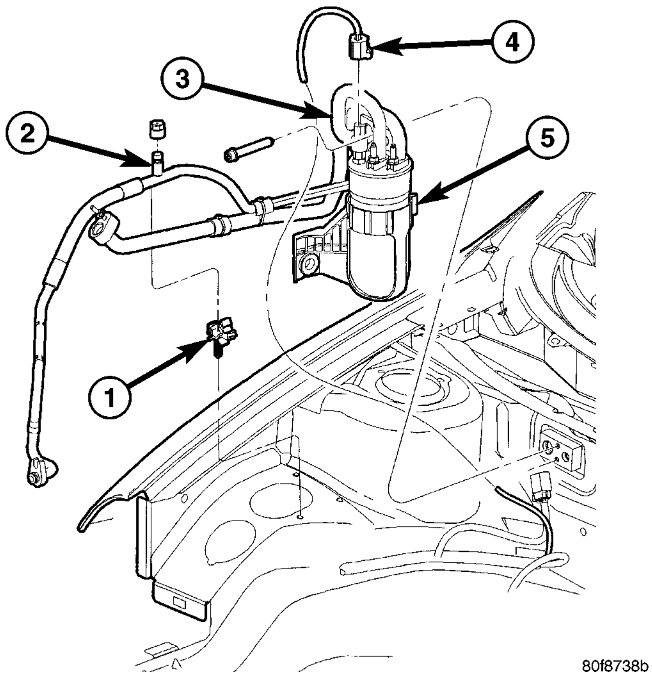

Fig. 27 Suction Line - 2.0L LHD Models

1 - LIQUID LINE MOUNTING CLIP
2 - A/C CHARGE PORT
3 - A/C LOW PRESSURE SWITCH
4 - A/C LOW PRESSURE SWITCH CONNECTOR
5 - ACCUMULATOR

(11) Remove the bolt that secures the rear section of the liquid line to the receiver/drier outlet port.

(12) Remove the O-ring seals from the opened liquid line fitting and discard.

(13) Install plugs in, or tape over the opened liquid line fitting and receiver/drier outlet port.

(14) Remove the bolt that secures the rear suction and liquid line assembly to the A/C expansion valve.

(15) Disconnect the rear suction and liquid line assembly from the A/C expansion valve

(16) Remove the gasket from the A/C expansion valve and discard.

(17) Install plugs in, or tape over the opened rear suction and liquid line fittings and both expansion valve ports.

(18) Disengage the rear suction and liquid line assembly from the retaining clips as required and remove the rear suction and liquid line assembly from the engine compartment.

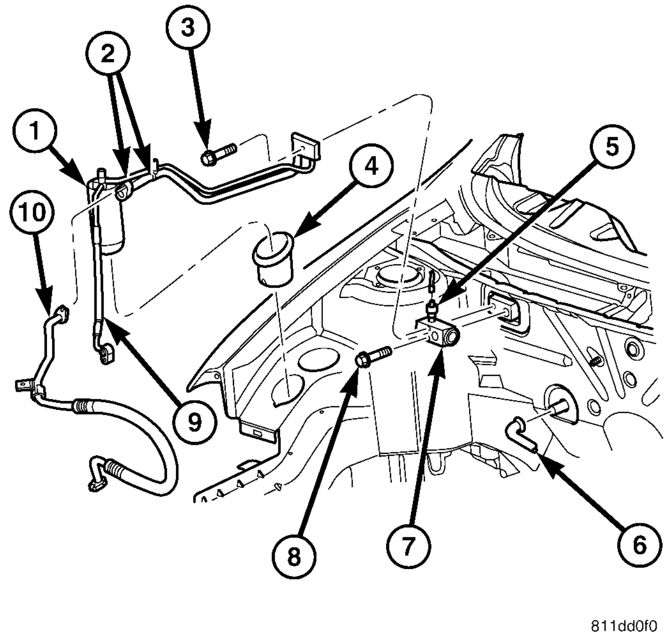

Fig. 28 Suction Line - 2.4L LHD Shown, RHD Typical

1 - RECEIVER/DRIER
2 - SUCTION AND LIQUID LINE ASSEMBLY (REAR)
3 - BOLT
4 - RECEIVER/DRIER MOUNTING GROMMET
5 - A/C LOW PRESSURE SWITCH
6 - CONDENSATE DRAIN TUBE
7 - A/C EXPANSION VALVE
8 - BOLT
9 - LIQUID LINE (FRONT)
10 - SUCTION LINE (FRONT)

INSTALLATION

2.0L LHD MODELS

(1) Position the rear suction line into the engine compartment.

(2) Remove the tape or plugs from the suction line fitting and accumulator outlet port.

(3) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(4) Connect the suction line fitting to the accumulator outlet port.

SUCTION LINE (Continued)

(5) Install the nut that secures the suction line fitting to the accumulator. Tighten the nut to 2.3 N·m (20 in. lbs.).

(6) Position the front suction line into the engine compartment.

(7) Remove the tape or plugs from the front suction line fitting and the mid-line connector block.

(8) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(9) Connect the front suction line fitting to the mid-line connector block.

(10) Install the nut that secures the front suction line fitting to the mid-line connector block. Tighten the nut to 4.5 N·m (40 in. lbs.).

(11) Remove the tape or plugs from the A/C compressor suction port and the suction line fitting.

(12) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(13) Connect the suction line fitting to the A/C compressor suction port.

(14) Install the bolt that secures the suction line fitting to the A/C compressor. Tighten the bolt to 12 N·m (108 in. lbs.).

(15) Install the suction line retaining brackets as required.

(16) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(17) Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

2.4L AND RHD MODELS

(1) Position the rear suction and liquid line assembly into the engine compartment.

(2) Engage the rear suction and liquid line assembly to the retaining clips as required.

(3) Remove the tape or plugs from the liquid and suction line fittings and both ports on the front of the A/C expansion valve.

(4) Install a new gasket onto the A/C expansion valve.

(5) Connect the liquid and suction line fitting to the A/C expansion valve.

(6) Install the bolt that secures the suction and liquid line fitting to the A/C expansion valve. Tighten the bolt to 20 N·m (15 ft. lbs.).

(7) Position the front suction line into the engine compartment.

(8) Remove the tape or plugs from the front suction line fitting and the mid-line connector block.

(9) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(10) Connect the front suction line fitting to the mid-line connector block.

(11) Install the nut that secures the front suction line fitting to the mid-line connector block. Tighten the nut to 4.5 N·m (40 in. lbs.).

(12) Remove the tape or plugs from the opened liquid line fitting and receiver/drier outlet port.

(13) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the liquid line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(14) Reconnect the liquid line fitting to the receiver/drier outlet port.

(15) Install the bolt that secures the liquid line fitting to the receiver/drier. Tighten the bolt to 2.3 N·m (20 in. lbs.).

(16) If equipped, reinstall the vehicle speed control servo.

(17) Remove the tape or plugs from the A/C compressor suction port and the suction line fitting.

(18) Lubricate a new rubber O-ring seal with clean refrigerant oil and install it on the suction line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(19) Connect the suction line fitting to the A/C compressor suction port.

(20) Install the bolt that secures the suction line fitting to the A/C compressor. Tighten the bolt to 12 N·m (108 in. lbs.).

(21) Install the suction line retaining brackets as required.

(22) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

(23) Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).

SERVICE PORT VALVE CORE

DESCRIPTION

The A/C service port valve cores are serviceable items. On 2.0L LHD models, the low side valve is located on the liquid line between the A/C condenser and the evaporator and, the high side valve is located on the discharge line fitting at the A/C condenser. On 2.4L and RHD models, the low side valve is located on the suction line near the receiver/drier and, the high side valve is located on the liquid line fitting at the receiver/drier outlet port (Fig. 29).

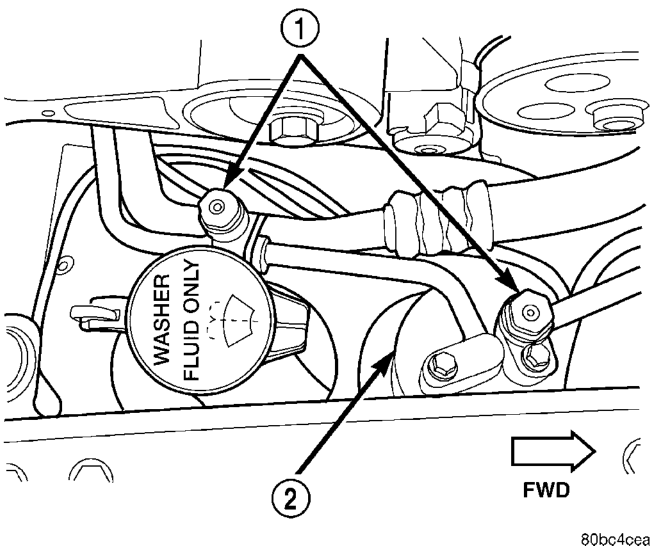

Fig. 29 A/C Service Ports - Typical

1 - A/C SERVICE PORTS
2 - RECEIVER/DRIER

REMOVAL - SERVICE PORT VALVE CORES

WARNING: REFER TO THE APPLICABLE WARNINGS AND CAUTIONS FOR THIS SYSTEM BEFORE PERFORMING THE FOLLOWING OPERATION (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Remove the protective cap from the low and/or high side service port as necessary.

(2) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT - STANDARD PROCEDURE).

(3) Using a standard Schrader-type valve core tool, remove the valve core from the service port as required.

(4) Install a plug in or tape over the opened service port.

INSTALLATION

(1) Lubricate the A/C service port valve core with clean refrigerant oil prior to installation. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(2) Remove the tape or plug from the A/C service port.

(3) Using a standard Schrader-type valve core tool, install and tighten the replacement valve core into the A/C service ports as required.

CAUTION: A valve core that is not fully seated in the A/C service port can result in damage to the valve during refrigerant system evacuation and charge. Such damage may result in a loss of system refrigerant while uncoupling the charge adapters.

(4) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/REFRIGERANT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).

(5) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/REFRIGERANT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

(6) Reinstall the protective cap onto the A/C service ports as required.

EMISSIONS CONTROL

TABLE OF CONTENTS

EMISSIONS CONTROL

DESCRIPTION

DESCRIPTION - MONITORED COMPONENT

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 as well as continuity tests (opens/shorts). 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.

The following is a list of the monitored components:

- Catalyst Monitor
- Comprehensive Components
- EGR (if equipped)
- Fuel Control (rich/lean)
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Purge
- Misfire
- Natural Vacuum Leak Detection (NVLD)

COMPREHENSIVE COMPONENTS

Along with the major monitors, OBD II requires that the diagnostic system monitor any component that could affect emissions levels. In many cases, these components were being tested under OBD I. The OBD I requirements focused mainly on testing emissions-related components for electrical opens and shorts.

However, OBD II also requires that inputs from powertrain components to the PCM be tested for **rationality**, and that outputs to powertrain components from the PCM be tested for **functionality**. Methods for monitoring the various Comprehensive Component monitoring include:

(1) Circuit Continuity
- Open
- Shorted high
- Shorted to ground

(2) Rationality or Proper Functioning
- Inputs tested for rationality
- Outputs tested for functionality

NOTE: Comprehensive component monitors are continuous. Therefore, enabling conditions do not apply. All will set a DTC and illuminate the MIL in 1-trip.

Input Rationality—While input signals to the PCM are constantly being monitored for electrical opens and shorts, they are also tested for rationality. This means that the input signal is compared against other inputs and information to see if it makes sense under the current conditions.

PCM sensor inputs that are checked for rationality include:

- Manifold Absolute Pressure (MAP) Sensor
- Oxygen Sensor (O2S) (slow response)
- Engine Coolant Temperature (ECT) Sensor

EMISSIONS CONTROL (Continued)

- Camshaft Position (CMP) Sensor
- Vehicle Speed Sensor
- Crankshaft Position (CKP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Ambient/Battery Temperature Sensors
- Power Steering Switch
- Oxygen Sensor Heater
- Engine Controller
- Brake Switch
- Natural Vacuum Leak Detection (NVLD)
- P/N Switch
- Trans Controls

Output Functionality—PCM outputs are tested for functionality in addition to testing for opens and shorts. When the PCM provides a voltage to an output component, it can verify that the command was carried out by monitoring specific input signals for expected changes. For example, when the PCM commands the Idle Air Control (IAC) Motor to a specific position under certain operating conditions, it expects to see a specific (target) idle speed (RPM). If it does not, it stores a DTC.

PCM outputs monitored for functionality include:

- Fuel Injectors
- Ignition Coils
- Torque Converter Clutch Solenoid
- Idle Air Control
- Purge Solenoid
- EGR Solenoid
- Radiator Fan Control
- Trans Controls

OXYGEN SENSOR (O2S) MONITOR

DESCRIPTION—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. When there is a large amount of oxygen in the exhaust caused by a lean condition, misfire or exhaust leak, the sensor produces a low voltage, below 450 mV. When the oxygen content is lower, caused by a rich condition, the sensor produces a higher voltage, above 450mV.

The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel 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, and purge.

The O2S may fail in any or all of the following manners:

- Slow response rate (Big Slope)
- Reduced output voltage (Half Cycle)
- Heater Performance

Slow Response Rate (Big Slope)—Response rate is the time required for the sensor to switch from lean to rich signal output once it is exposed to a richer than optimum A/F mixture or vice versa. As the PCM adjusts the air/fuel ratio, the sensor must be able to rapidly detect the change. As the sensor ages, it could take longer to detect the changes in the oxygen content of the exhaust gas. The rate of change that an oxygen sensor experiences is called 'Big Slope'. The PCM checks the oxygen sensor voltage in increments of a few milliseconds.

Reduced Output Voltage (Half Cycle)—The output voltage of the O2S ranges from 2.5 to 5 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. Many times the condition is only temporey and the sensor will recover. Under normal conditions the voltage signal surpasses the threshold, and a counter is incremented by one. This is called the Half Cycle Counter.

Heater Performance—The heater is tested by a separate monitor. Refer to the Oxygen Sensor Heater Monitor.

OPERATION—As the Oxygen Sensor signal switches, the PCM monitors the half cycle and big slope signals from the oxygen sensor. If during the test neither counter reaches a predetermined value, a malfunction is entered and a Freeze Frame is stored. Only one counter reaching its predetermined value is needed for the monitor to pass.

The Oxygen Sensor Signal Monitor is a two trip monitor that is tested only once per trip. When the Oxygen Sensor fails the test in two consecutive trips, the MIL is illuminated and a DTC is set. The MIL is extinguished when the Oxygen Sensor monitor passes in three consecutive trips. The DTC is erased from memory after 40 consecutive warm-up cycles without test failure.

Enabling Conditions—The following conditions must typically be met for the PCM to run the oxygen sensor monitor:

- Battery voltage
- Engine temperature
- Engine run time
- Engine run time at a predetermined speed
- Engine run time at a predetermined speed and throttle opening
- Transmission in gear (automatic only)

EMISSIONS CONTROL (Continued)

- Fuel system in Closed Loop
- Long Term Adaptive (within parameters)
- Power Steering Switch in low PSI (no load)
- Engine at idle
- Fuel level above 15%
- Ambient air temperature
- Barometric pressure
- Engine RPM within acceptable range of desired idle
- Closed throttle speed

Pending Conditions—The Task Manager typically does not run the Oxygen Sensor Signal Monitor if overlapping monitors are running or the MIL is illuminated for any of the following:

- Misfire Monitor
- Front Oxygen Sensor and Heater Monitor
- MAP Sensor
- Vehicle Speed Sensor
- Engine Coolant Temperature Sensor
- Throttle Position Sensor
- Engine Controller Self Test Faults
- Cam or Crank Sensor
- Injector and Coil
- Idle Air Control Motor
- EVAP Electrical
- EGR Solenoid Electrical
- Intake Air Temperature
- 5 Volt Feed

Conflict—The Task Manager does not run the Oxygen Sensor Monitor if any of the following conditions are present:

- A/C ON (A/C clutch cycling temporarily suspends monitor)
- Purge flow in progress
- Ethenal content learn is taking place and the ethenal used once flag is set

Suspend—The Task Manager suspends maturing a fault for the Oxygen Sensor Monitor if an of the following are present:

- Oxygen Sensor Heater Monitor, Priority 1
- Misfire Monitor, Priority 2

OXYGEN SENSOR HEATER MONITOR (NGC)

DESCRIPTION—If the Oxygen sensor (O2S) DTC as well as a O2S heater DTC is present, the O2S Heater DTC MUST be repaired first. After the O2S Heater is repaired, verify that the sensor circuit is operating correctly.

The voltage reading taken from the O2S are very temperature sensitive. The readings taken from the O2S are not accurate below 300 degrees C. Heating 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. Starting with the introduction on the NGC module the strategy for checking the heater circuit has changed. The heater resistance is checked by the NGC almost immediately after the engine is started. The same O2S heater return pin used to read the heater resistance is capable of detecting an open circuit, a shorted high or shorted low condition.

OXYGEN SENSOR HEATER MONITOR (SBEC)

DESCRIPTION—If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S heater fault MUST be repaired first. After the O2S fault is repaired, verify that the heater circuit is operating correctly.

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 heater element itself is not tested directly. 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. The resistance is normally between 100 ohms and 4.5 megaohms. When oxygen sensor temperature increases, the resistance in the internal circuit decreases. The PCM sends a 5 volts biased signal through the oxygen sensors to ground this monitoring circuit. As the temperature increases, resistance decreases and the PCM detects a lower voltage at the reference signal. Inversely, as the temperature decreases, the resistance increases and the PCM detects a higher voltage at the reference signal. The O2S circuit is monitored for a drop in voltage.

OPERATION—The Oxygen Sensor Heater Monitor begins after the ignition has been turned OFF and the O2 sensors have cooled. The PCM sends a 5 volt bias to the oxygen sensor every 1.6 seconds. The PCM keeps it biased for 35 ms each time. As the sensor cools down, the resistance increases and the PCM reads the increase in voltage. Once voltage has increased to a predetermined amount, higher than when the test started, the oxygen sensor is cool enough to test heater operation.

When the oxygen sensor is cool enough, the PCM energizes the ASD relay. Voltage to the O2 sensor begins to increase the temperature. As the sensor temperature increases, the internal resistance decreases. The PCM continues biasing the 5 volt signal to the sensor. Each time the signal is biased, the PCM reads a voltage decrease. When the PCM detects a voltage decrease of a predetermined value for several biased pulses, the test passes.

The heater elements are tested each time the engine is turned OFF if all the enabling conditions

EMISSIONS CONTROL (Continued)

are met. If the monitor fails, the PCM stores a maturing fault and a Freeze Frame is entered. If two consecutive tests fail, a DTC is stored. Because the ignition is OFF, the MIL is illuminated at the beginning of the next key cycle, after the 2nd failure.

Enabling Conditions—The following conditions must be met for the PCM to run the oxygen sensor heater test:

- Engine run time of at least 5.1 minutes
- Key OFF power down
- Battery voltage of at least 10 volts
- Sufficient Oxygen Sensor cool down

Pending Conditions—There are not conditions or situations that prompt conflict or suspension of testing. The oxygen sensor heater test is not run pending resolution of MIL illumination due to oxygen sensor failure.

Suspend—There are no conditions which exist for suspending the Heater Monitor.

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.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S 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 high oxygen 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 downstream 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.

Monitor Operation—To monitor catalyst efficiency, the PCM expands the rich and lean switch points of the heated oxygen sensor. With extended switch points, the air/fuel mixture runs richer and leaner to overburden the catalytic converter. Once the test is started, the air/fuel mixture runs rich and lean and the O2 switches are counted. A switch is counted when an oxygen sensor signal goes from below the lean threshold to above the rich threshold. The number of Rear O2 sensor switches is divided by the number of Front O2 sensor switches to determine the switching ratio.

The test runs for 20 seconds. As catalyst efficiency deteriorated over the life of the vehicle, the switch rate at the downstream sensor approaches that of the upstream sensor. If at any point during the test period the switch ratio reaches a predetermined value, a counter is incremented by one. The monitor is enabled to run another test during that trip. When the test fails three times, the counter increments to three, a malfunction is entered, and a Freeze Frame is stored. When the counter increments to three during the next trip, the code is matured and the MIL is illuminated. If the test passes the first, no further testing is conducted during that trip.

The MIL is extinguished after three consecutive good trips. The good trip criteria for the catalyst monitor is more stringent than the failure criteria. In order to pass the test and increment one good trip, the downstream sensor switch rate must be less than 80% of the upstream rate (60% for manual transmissions). The failure percentages are 90% and 70% respectively.

Enabling Conditions—The following conditions must typically be met before the PCM runs the catalyst monitor. Specific times for each parameter may be different from engine to engine.

- Accumulated drive time
- Enable time

EMISSIONS CONTROL (Continued)

- Ambient air temperature
- Barometric pressure
- Catalyst warm-up counter
- Engine coolant temperature
- Accumulated throttle position sensor
- Vehicle speed
- MAP
- RPM
- Engine in closed loop
- Fuel level

Pending Conditions—

- Misfire DTC
- Front Oxygen Sensor Response
- Front Oxygen Sensor Heater Monitor
- Front Oxygen Sensor Electrical
- Rear Oxygen Sensor Rationality (middle check)
- Rear Oxygen Sensor Heater Monitor
- Rear Oxygen Sensor Electrical
- Fuel System Monitor
- All TPS faults
- All MAP faults
- All ECT sensor faults
- Purge flow solenoid functionality
- Purge flow solenoid electrical
- All PCM self test faults
- All CMP and CKP sensor faults
- All injector and ignition electrical faults
- Idle Air Control (IAC) motor functionality
- Vehicle Speed Sensor
- Brake switch
- Intake air temperature

Conflict—The catalyst monitor does not run if any of the following are conditions are present:

- EGR Monitor in progress
- Fuel system rich intrusive test in progress
- EVAP Monitor in progress
- Time since start is less than 60 seconds
- Low fuel level
- Low ambient air temperature
- Ethanel content learn is taking place and the ethenal used once flag is set

Suspend—The Task Manager does not mature a catalyst fault if any of the following are present:

- Oxygen Sensor Monitor, Priority 1
- Upstream Oxygen Sensor Heater, Priority 1
- EGR Monitor, Priority 1
- EVAP Monitor, Priority 1
- Fuel System Monitor, Priority 2
- Misfire Monitor, Priority 2

DESCRIPTION - 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.

DESCRIPTION - 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 after 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 crossover 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 by running 1–good trip.

OPERATION - 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.

EMISSIONS CONTROL (Continued)

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, fuel system, or misfire 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. The misfire will however, increase the oxygen content in the exhaust, deceiving the PCM in to thinking the fuel system is too lean. Also see misfire detection. There are DTC's that can detect misfire and Ionization shorts in the secondary ignition circuit, refer to the Powertrain Diagnostic manual for more information

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression. Low compression lowers O2 content in the exhaust. Leading to fuel system, oxygen sensor, or misfire detection fault.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system. It may set a EGR (if equipped) or Fuel system or O2S fault.

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 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, including when diagnostics are performed.

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.

DESCRIPTION - 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 a DRBIII® scan tool.

The following is a list of the system monitors:

- EGR Monitor (if equipped)
- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Evaporative System Leak Detection Monitor (if equipped)

Following is a description of each system monitor, and its DTC.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

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 temperatures of 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. The PCM is programmed to maintain the optimum air/fuel ratio.

EMISSIONS CONTROL (Continued)

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 (if equipped), 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 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 (voltages are offset by 2.5 volts on NGC vehicles). 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.

OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S heater 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 temperatures of 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.

EGR MONITOR (if equipped)

The Powertrain Control Module (PCM) performs an on-board diagnostic check of the EGR system.

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. Also looks at EGR linear potentiometer for feedback.

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.

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. 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.

EMISSIONS CONTROL (Continued)

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.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's 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 downstream 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.

NATURAL VACUUM LEAK DETECTION (NVLD) (if equipped)

The Natural Vacuum Leak Detection (NVLD) system is the next generation evaporative leak detection system that will first be used on vehicles equipped with the Next Generation Controller (NGC). This new system replaces the leak detection pump as the method of evaporative system leak detection. This is to detect a leak equivalent to a 0.020″ (0.5 mm) hole. This system has the capability to detect holes of this size very dependably.

The basic leak detection theory employed with NVLD is the ″Gas Law″. This is to say that the pressure in a sealed vessel will change if the temperature of the gas in the vessel changes. The vessel will only see this effect if it is indeed sealed. Even small leaks will allow the pressure in the vessel to come to equilibrium with the ambient pressure. In addition to the detection of very small leaks, this system has the capability of detecting medium as well as large evaporative system leaks.

The NVLD seals the canister vent during engine off conditions. If the EVAP system has a leak of less than the failure threshold, the evaporative system will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. The diurnal effect is considered one of the primary contributors to the leak determination by this diagnostic. When the vacuum in the system exceeds about 1″ H2O (0.25 KPA), a vacuum switch closes. The switch closure sends a signal to the NGC. The NGC, via appropriate logic strategies (described below), utilizes the switch signal, or lack thereof, to make a determination of whether a leak is present.

The NVLD device is designed with a normally open vacuum switch, a normally closed solenoid, and a seal, which is actuated by both the solenoid and a diaphragm. The NVLD is located on the atmospheric vent side of the canister. The NVLD assembly may be mounted on top of the canister outlet, or in-line between the canister and atmospheric vent filter. The normally open vacuum switch will close with about 1″ H2O (0.25 KPA) vacuum in the evaporative system. The diaphragm actuates the switch. This is above the opening point of the fuel inlet check valve in the fill tube so cap off leaks can be detected. Submerged fill systems must have recirculation lines that do not have the in-line normally closed check valve that protects the system from failed nozzle liquid ingestion, in order to detect cap off conditions.

The normally closed valve in the NVLD is intended to maintain the seal on the evaporative system during the engine off condition. If vacuum in the evaporative system exceeds 3″ to 6″ H2O (0.75 to 1.5 KPA), the valve will be pulled off the seat, opening the seal. This will protect the system from excessive vacuum

EMISSIONS CONTROL (Continued)

as well as allowing sufficient purge flow in the event that the solenoid was to become inoperative.

The solenoid actuates the valve to unseal the canister vent while the engine is running. It also will be used to close the vent during the medium and large leak tests and during the purge flow check. This solenoid requires initial 1.5 amps of current to pull the valve open but after 100 ms. will be duty cycled down to an average of about 150 mA for the remainder of the drive cycle.

Another feature in the device is a diaphragm that will open the seal in the NVLD with pressure in the evaporative system. The device will ″blow off″ at about 0.5″ H2O (0.12 KPA) pressure to permit the venting of vapors during refueling. An added benefit to this is that it will also allow the tank to ″breathe″ during increasing temperatures, thus limiting the pressure in the tank to this low level. This is beneficial because the induced vacuum during a subsequent declining temperature will achieve the switch closed (pass threshold) sooner than if the tank had to decay from a built up pressure.

The device itself has 3 wires: Switch sense, solenoid driver and ground. It also includes a resistor to protect the switch from a short to battery or a short to ground. The NGC utilizes a high-side driver to energize and duty-cycle the solenoid.

DESCRIPTION - 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.

OPERATION

OPERATION - SYSTEM

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 DRBIII® scan tool to erase all DTC's and extinguish the MIL.

Technicians can display stored DTC's. For obtaining the DTC information, use the Data Link Connector with the DRBIII® scan tool (Fig. 1).

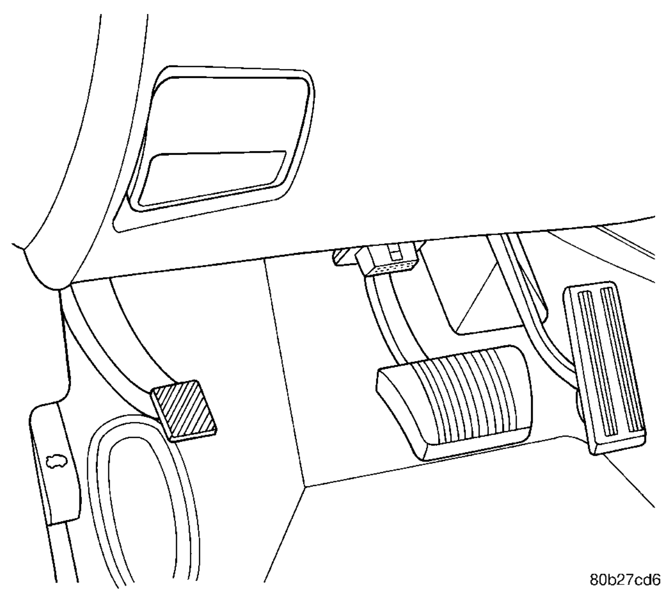

Fig. 1 Data Link Connector

EMISSIONS CONTROL (Continued)

DRB III® STATE DISPLAY TEST MODE

OPERATION

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.

EVAPORATIVE EMISSIONS

TABLE OF CONTENTS

EVAPORATIVE EMISSIONS

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 an activated carbon 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 (Fig. 1).

All engines use a proportional purge solenoid system. The PCM controls vapor flow by operating the purge solenoid. Refer to Proportional Purge Solenoid in this section.

NOTE: The evaporative system uses specially manufactured hoses. If they need replacement, only use fuel resistant hose. Also the hoses must be able to pass an Ozone compliance test.

NOTE: For more information on Onboard Refueling Vapor Recovery (ORVR), refer to the Fuel Delivery section.

EVAPORATIVE EMISSIONS (Continued)

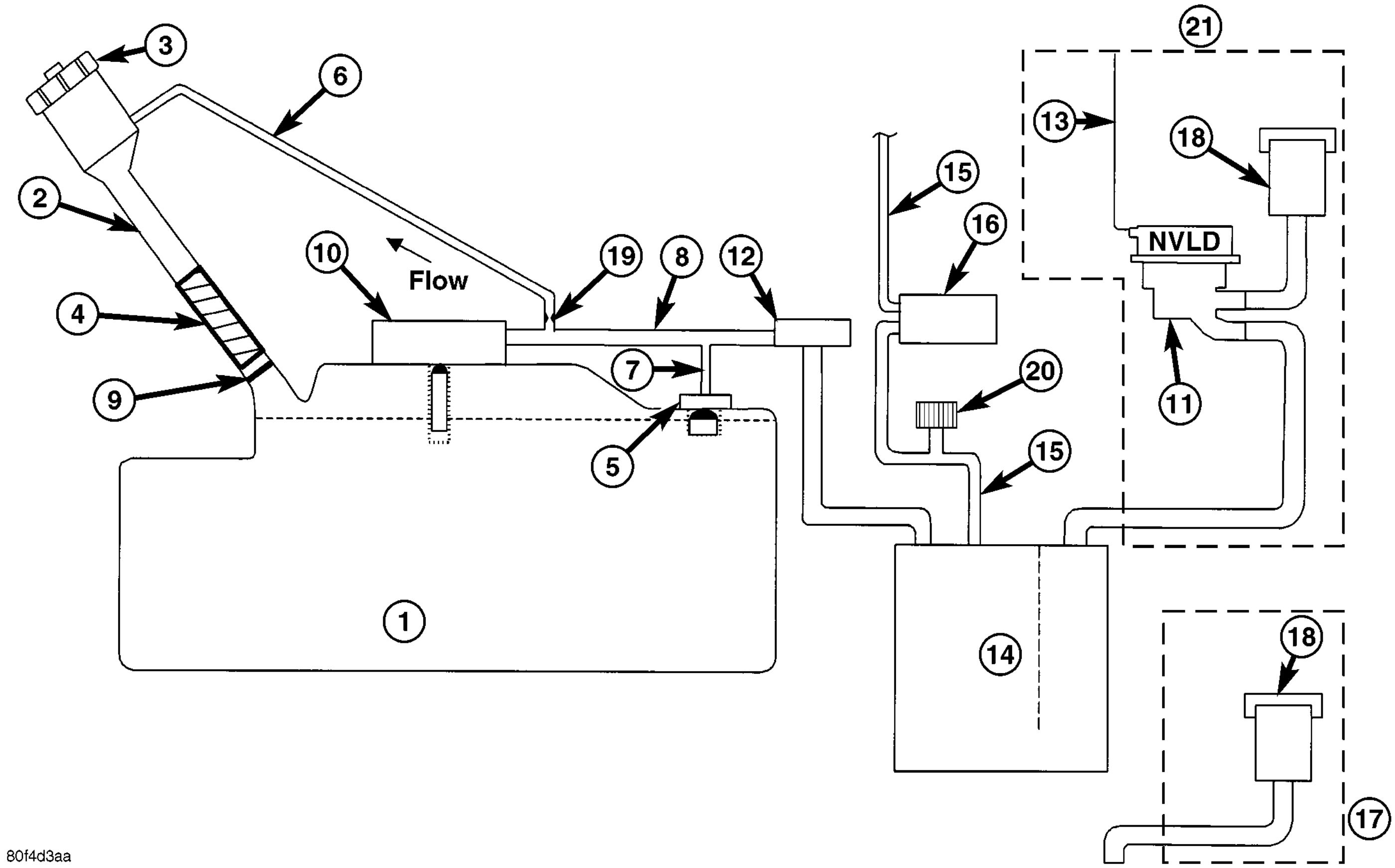

Fig. 1 ORVR System Schematic (PZEV)

1 - FUEL TANK (PLASTIC)
2 - FUEL FILLER TUBE
3 - FUEL CAP (PRESSURE/RELIEF)
4 - FILL TUBE TO FUEL TANK CONNECTOR (ELASTOMERIC)
5 - TANK VENT/ROLLOVER VALVE(S)
6 - VAPOR RECIRCULATION LINE
7 - TANK VAPOR LINE
8 - VAPOR LINE TO CANISTER
9 - CHECK VALVE (N/C)
10 - CONTROL VALVE
11 - NATURAL VACUUM LEAD DETECTION (NVLD)
12 - LIQUID SEPARATOR (IF EQUIPPED)
13 - ENGINE WIRING HARNESS TO NVLD
14 - VAPOR CANISTER
15 - PURGE LINE
16 - PURGE DEVICE
17 - WITHOUT NVLD
18 - BREATHER ELEMENT
19 - FLOW CONTROL ORIFICE
20 - SERVICE PORT
21 - WITH NVLD

EVAP/PURGE SOLENOID

DESCRIPTION (Fig. 2)

OPERATION

All vehicles use a proportional purge solenoid. The solenoid regulates the rate of vapor flow from the EVAP canister to the throttle body. The 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.

The proportional purge solenoid operates at a frequency of 200 hz and is controlled by an engine controller circuit that senses the current being applied to the proportional purge solenoid (Fig. 2) and then adjusts that current to achieve the desired purge flow. The proportional purge solenoid controls the

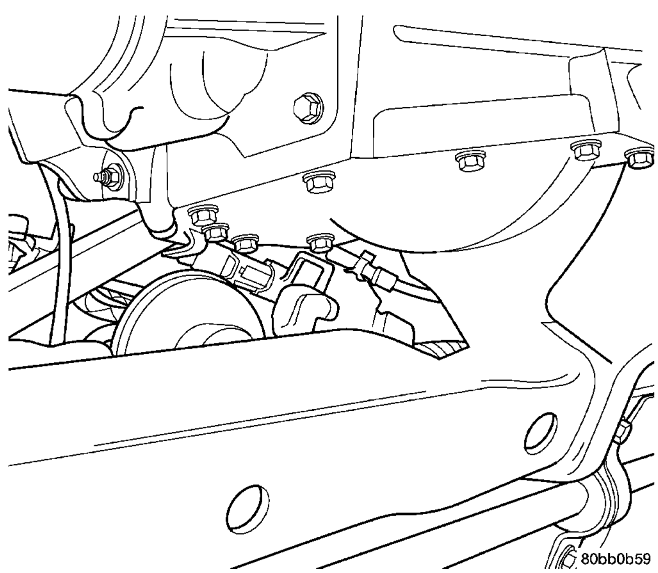

Fig. 2 Proportional Purge Solenoid

EVAP/PURGE SOLENOID (Continued)

purge rate of fuel vapors from the vapor canister and fuel tank to the engine intake manifold.

REMOVAL

The solenoid attaches to a bracket near the steering gear (Fig. 3). The solenoid will not operate unless it is installed correctly.

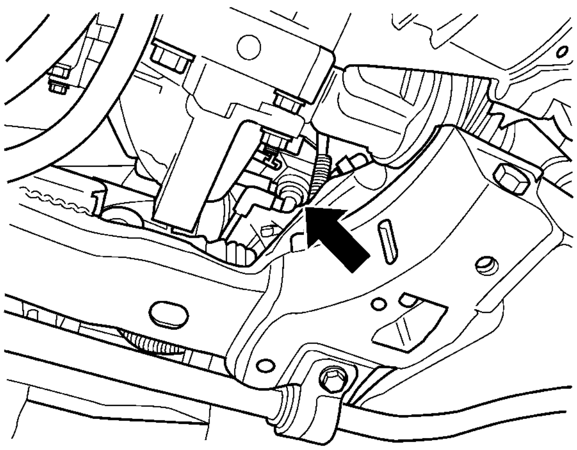

Fig. 3 Proportional Purge Solenoid Valve

(1) Raise vehicle and support.
(2) Disconnect electrical connector from solenoid.
(3) Disconnect vacuum tubes from solenoid.
(4) Remove solenoid from bracket.

INSTALLATION

The solenoid attaches to a bracket near the steering gear (Fig. 3). The solenoid will not operate unless it is installed correctly.

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) Lower vehicle.

FUEL FILLER CAP

DESCRIPTION

The plastic fuel fill cap is threaded/quarter turn onto the end of the fuel filler tube. It's purpose is to retain vapors and fuel in the fuel tank.

OPERATION

The fuel filler cap incorporates a two-way relief valve that is closed to atmosphere during normal operating conditions. The relief valve is calibrated to open when a pressure of 17 kPa (2.5 psi) or vacuum of 2 kPa (0.6 in. Hg) occurs in the fuel tank. When the pressure or vacuum is relieved, the valve returns to the normally closed position.

CAUTION: Remove the fuel filler cap to release fuel tank pressure before disconnecting any fuel system component.

LEAK DETECTION PUMP

REMOVAL

(1) Raise and support vehicle on a hoist.
(2) Push locking tab on electrical connector to unlock and remove connector.
(3) loosen the sway bar bracket to remove the pump bracket.
(4) Remove pump and bracket as an assembly.
(5) Disconnect lines from NVLD.
(6) Remove filter.
(7) Remove from bracket.

INSTALLATION

(1) Install pump to bracket and tighten bolts to 1.2 N·m (10.6 in. lbs.).
(2) Install filter and tighten to 2.8 N·m (25 in. lbs.).

NOTE: The LDP bracket must be between the rail and sway bar bracket.

(3) Install pump and bracket assembly to body and tighten front bolt to 11.7 N·m (105 in. lbs.).
(4) Install sway bar bracket bolt and tighten bolts to 33.8 N·m (25 ft. lbs.).
(5) **Before installing hoses to LDP, make sure they are not cracked or split. If a hose leaks, it will cause the Check Engine Lamp to illuminate.** Connect lines to the LDP.
(6) Install electrical connector to pump and push locking tab to lock.
(7) Lower vehicle
(8) Use the DRB III® scan tool, verify proper operation of LDP.

ON-BOARD REFUELING VAPOR RECOVERY

DESCRIPTION

Onboard Refueling Vapor Recovery (ORVR) System Schematic and components (Fig. 4).

OPERATION

The emission control principle used in the ORVR system is that the fuel flowing into the filler tube (appx. 1” I.D.) creates an aspiration effect which draws air into the fill tube (Fig. 5). During refueling, the fuel tank is vented to the vapor canister to capture escaping vapors. With air flowing into the filler tube, there are no fuel vapors escaping to the atmosphere. Once the refueling vapors are captured by the canister, the vehicle's computer controlled purge system draws vapor out of the canister for the engine to burn. The vapors flow is metered by the purge solenoid so that there is no or minimal impact on driveability or tailpipe emissions.

As fuel starts to flow through the fill tube, it opens the normally closed check valve and enters the fuel tank. Vapor or air is expelled from the tank through the control valve to the vapor canister. Vapor is absorbed in the canister until vapor flow in the lines stops, either following shut-off or by having the fuel level in the tank rise high enough to close the control valve. The control valve(Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK - OPERATION) contains a float that rises to seal the large diameter vent path to the canister. At this point in the fueling of the vehicle, the tank pressure increases, the check

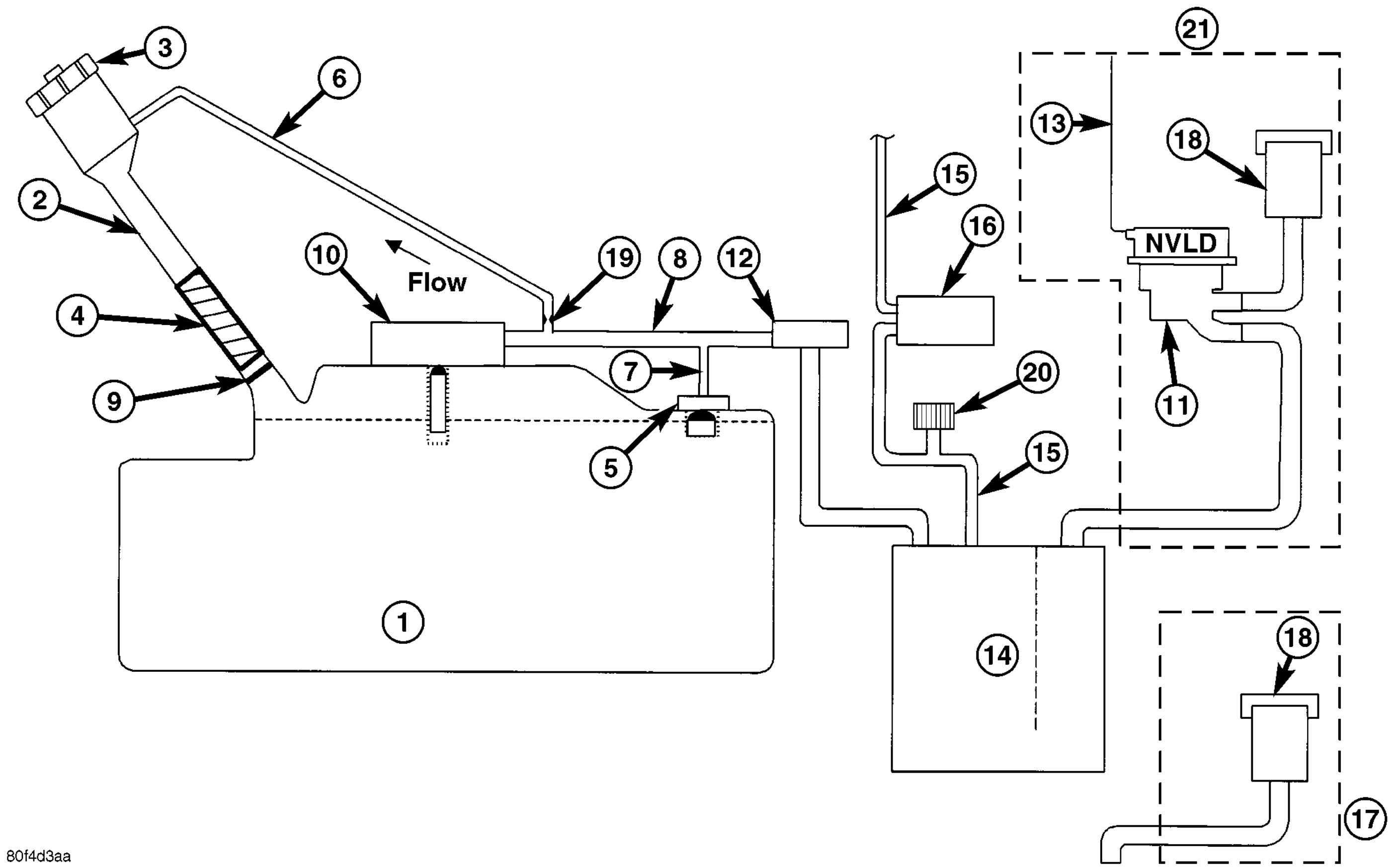

Fig. 4 ORVR System Schematic

1 - FUEL TANK (PLASTIC)
2 - FUEL FILLER TUBE
3 - FUEL CAP (PRESSURE/RELIEF)
4 - FILL TUBE TO FUEL TANK CONNECTOR (ELASTOMERIC)
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17 - WITHOUT NVLD
18 - BREATHER ELEMENT
19 - FLOW CONTROL ORIFICE
20 - SERVICE PORT
21 - WITH NVLD

ON-BOARD REFUELING VAPOR RECOVERY (Continued)

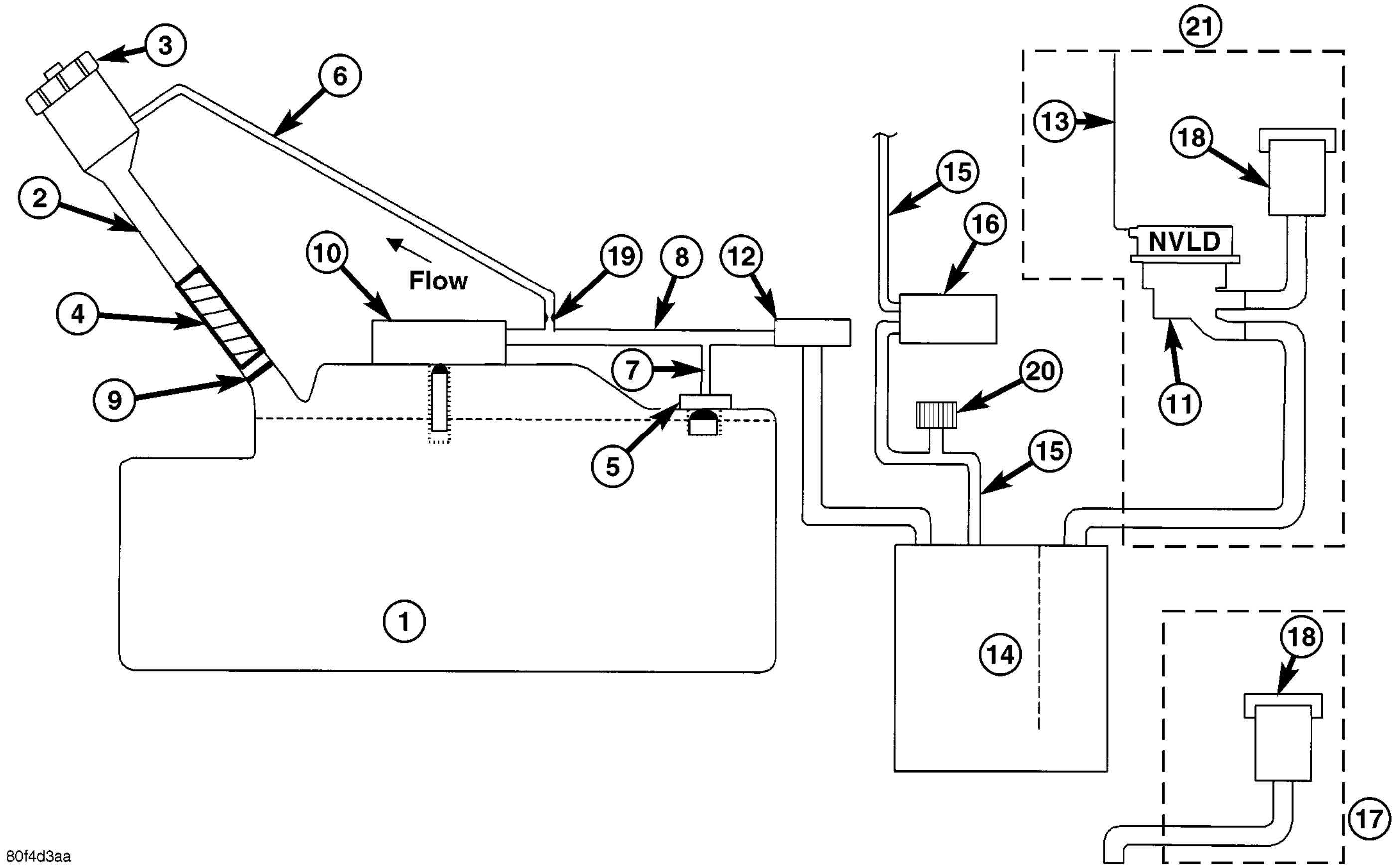

Fig. 5 ORVR System Schematic

1 - FUEL TANK (PLASTIC)
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20 - SERVICE PORT
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valve closes (preventing tank fuel from spitting back at the operator), and fuel then rises up the filler tube to shut-off the dispensing nozzle.

If the engine is shut-off while the On-Board diagnostics test is running, low level tank pressure can be trapped in the fuel tank and fuel can not be added to the tank until the pressure is relieved. This is due to the leak detection pump closing the vapor outlet from the top of the tank and the one-way check valve not allowing the tank to vent through the fill tube to atmosphere. Therefore, when fuel is added, it will back-up in the fill tube and shut off the dispensing nozzle. The pressure can be eliminated in two ways: 1. Vehicle purge must be activated and for a long enough period to eliminate the pressure. 2. Removing the fuel cap and allowing enough time for the system to vent thru the recirulation tube.

PCV VALVE

DESCRIPTION

Is a plastic valve in the engine valve cover (Fig. 6).

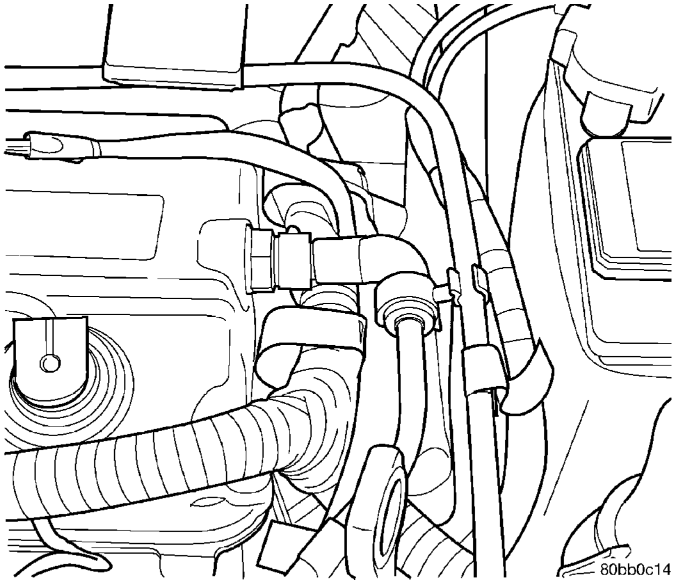

Fig. 6 PCV System - 2.0L

OPERATION

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).

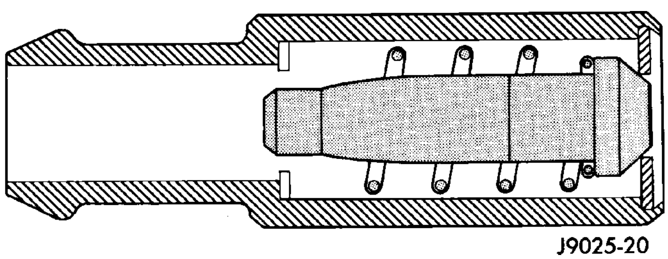

Fig. 7 Engine Off or Engine Backfire No Vapor Flow

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.

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).

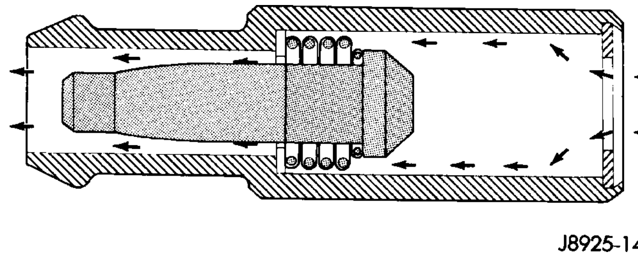

Fig. 8 High Intake Manifold Vacuum Minimal Vapor Flow

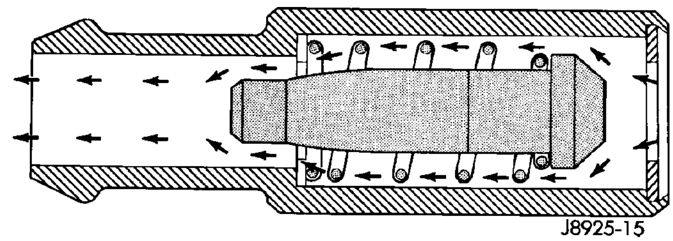

Fig. 9 Moderate Intake Manifold Vacuum Maximum Vapor Flow

DIAGNOSIS AND TESTING - PCV SYSTEM

WARNING: APPLY PARKING BRAKE AND/OR BLOCK WHEELS BEFORE PERFORMING ANY TEST OR ADJUSTMENT WITH THE ENGINE OPERATING.

(1) With engine idling, remove the hose from the PCV valve. If the valve is not plugged, a hissing noise will be heard as air passes through the valve. A strong vacuum should also be felt when a finger is placed over the valve inlet.

(2) Install hose on PCV valve. Remove the make-up air hose from the air plenum at the rear of the engine. Hold a piece of stiff paper (parts tag) loosely over the end of the make-up air hose.

(3) After allowing approximately one minute for crankcase pressure to reduce, the paper should draw up against the hose with noticeable force. If the engine does not draw the paper against the grommet after installing a new valve, replace the PCV valve hose.

(4) Turn the engine off. Remove the PCV valve from intake manifold. The valve should rattle when shaken.

(5) Replace the PCV valve and retest the system if it does not operate as described in the preceding tests. **Do not attempt to clean the old PCV valve.** If the valve rattles, apply a light coating of Loctite® Pipe Sealant With Teflon to the threads. Thread the PCV valve into the manifold plenum and tighten to 7 N·m (60 in. lbs.) torque.

PCV VALVE (Continued)

REMOVAL - 1.6L

(1) Remove the bolt for the PCV valve (Fig. 10).

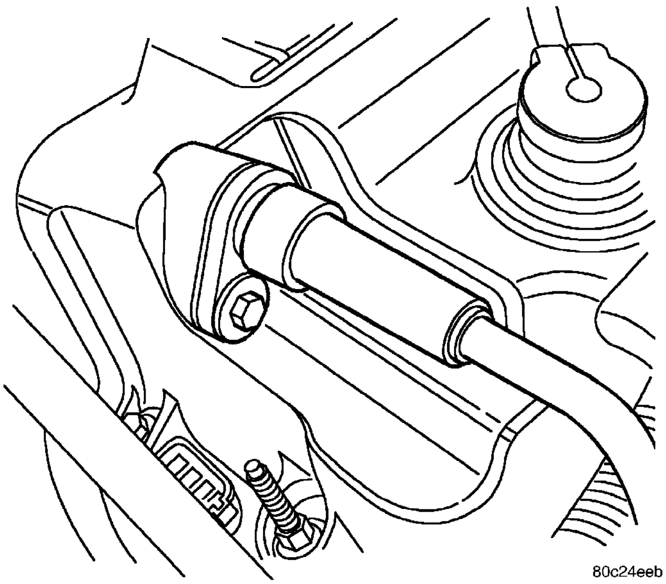

Fig. 10 PCV VALVE LOCATION - 1.6L

(2) Remove the hose.
(3) Remove the PCV (Fig. 11).

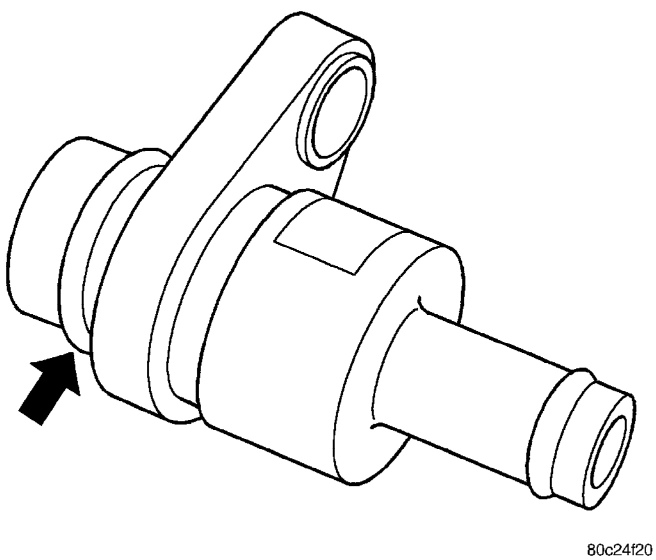

Fig. 11 PCV VALVE - 1.6L

INSTALLATION - 1.6L

(1) Lubericate the O-ring on the valve (Fig. 11).
(2) Install the PCV Valve (Fig. 10) and tighen the bolt to 8.1 N·m (72 in. lbs.).
(3) Install the hose.

VAPOR CANISTER

DESCRIPTION

The vacuum and vapor tubes connect to the top of the canister (Fig. 12).

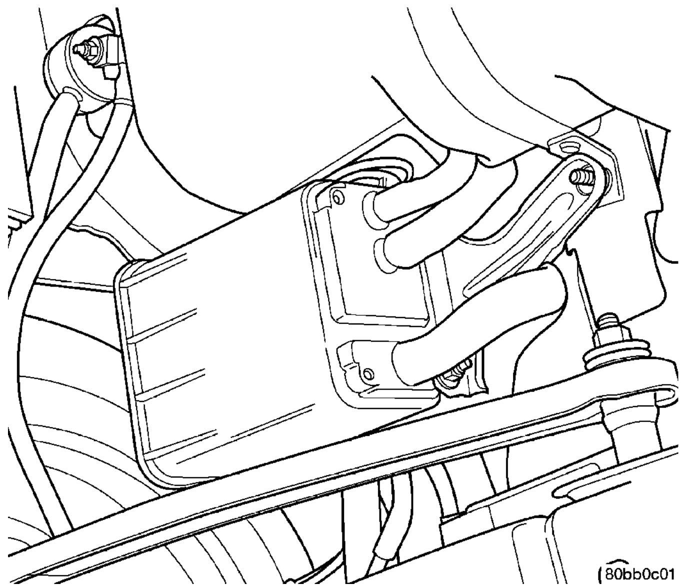

Fig. 12 EVAP Canister

OPERATION

All vehicles use a maintenance free, evaporative (EVAP) canister. Fuel tank vapors vent into the canister. The canister temporarily holds the fuel vapors until intake manifold vacuum draws them into the combustion chamber. The Powertrain Control Module (PCM) purges the canister through the proportional purge solenoid. The PCM purges the canister at predetermined intervals and engine conditions.

Purge Free Cells

Purge-free memory cells are used to identify the fuel vapor content of the evaporative canister. Since the evaporative canister is not purged 100% of the time, the PCM stores information about the evaporative canister's vapor content in a memory cell.

The purge-free cells are constructed similar to certain purge-normal cells. The purge-free cells can be monitored by the DRB III® Scan Tool. The only difference between the purge-free cells and normal adaptive cells is that in purge-free, the purge is completely turned off. This gives the PCM the ability to compare purge and purge-free operation.

VAPOR CANISTER (Continued)

REMOVAL

(1) Disconnect the negative battery cable.

(2) Raise vehicle and support.

(3) Disconnect the hoses from the EVAP canister (Fig. 13).

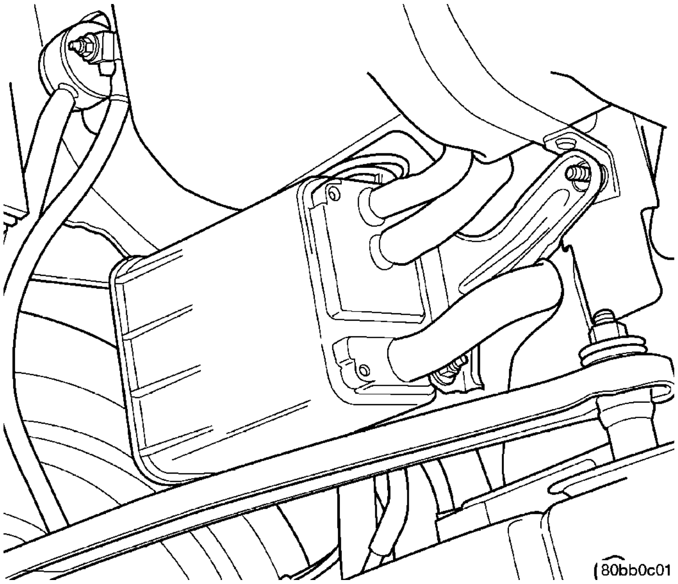

Fig. 13 EVAP Canister

(4) Remove 1 nut from the bracket of the EVAP canister (Fig. 14).

(5) Remove EVAP canister from bracket.

INSTALLATION

(1) Install EVAP canister to Bracket (Fig. 14).

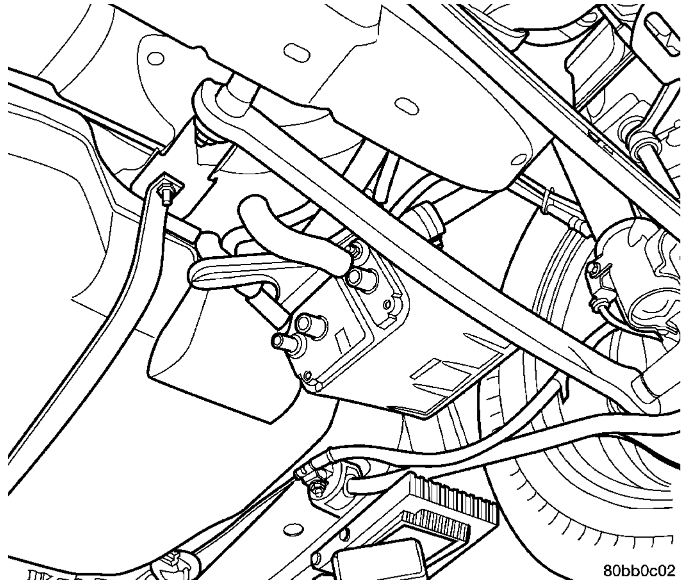

Fig. 14 EVAP

(2) Install 2 nuts to EVAP canister and bracket and tighten nuts to 6.7 N·m (60 in. lbs.).

(3) Connect hoses.

(4) Install EVAP canister and bracket to vehicle and tighten nut 22.4 N·m (250 in. lbs.).

(5) Lower vehicle.

(6) Connect negative battery cable.

ON-BOARD DIAGNOSTICS

TABLE OF CONTENTS

TASK MANAGER

DESCRIPTION

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is call the "Task Manager".

OPERATION

The Task Manager determines when tests happen and when functions occur. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are known as 'two trip monitors.' Other tests that turn the MIL lamp on after a single failure are known as 'one trip monitors.' A trip is defined as 'start the vehicle and operate it to meet the criteria necessary to run the given monitor.'

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- **Pending**

Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.

For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.

- **Conflict**

There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.

For example, if the Fuel System Monitor is in progress, the Task Manager does not run the catalyst Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.

- **Suspend**

Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **suspend** the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precise diagnosis.

For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the catalyst monitor, the Task Manager may still run the catalyst Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the catalyst system is actually failing or if an Oxygen Sensor is failing.

MIL Illumination

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

TASK MANAGER (Continued)

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a good trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the thirdgood trip) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MIL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

Diagnostic Trouble Codes (DTCs)

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

Priorities

- Priority 0 —Non-emissions related trouble codes.
- Priority 1 — One trip failure of a two trip fault for non-fuel system and non-misfire. (MIL Off)
- Priority 2 — One trip failure of a two trip fault for fuel system (rich/lean) or misfire. (MIL Off)
- Priority 3 — Two trip failure for a non-fuel system and non-misfire or matured one trip comprehensive component fault. (MIL On)
- Priority 4 — Two trip failure or matured fault for fuel system (rich/lean) and misfire or one trip catalyst damaging misfire. Catalyst damage misfire is a 2 trip MIL. The MIL flashes on the first trip when catalyst damage misfire levels are present. (MIL On)

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

DTC Self Erasure

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within ±375 RPM and load is within ±20% of when the fault occurred.

NOTE: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.

DTCs can be erased anytime with a DRBIII®. Erasing the DTC with the DRBIII® erases all OBD II information. The DRBIII® automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

Trip Indicator

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

Good Trip

The Good Trip counters are as follows:

- Global Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on DRBIII®)
  - Comprehensive Components
  - Major Monitor
- Warm-Up Cycles

Global Good Trip

To increment a Global Good Trip, the Oxygen sensor and Catalyst efficiency monitors must have run and passed, and 2 minutes of engine run time.

Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

Alternate Good Trip

TASK MANAGER (Continued)

Alternate Good Trips are used in place of Global Good Trips for Comprehensive Components and Major Monitors. If the Task Manager cannot run a Global Good Trip because a component fault is stopping the monitor from running, it will attempt to count an Alternate Good Trip.

The Task Manager counts an Alternate Good Trip for Comprehensive components when the following conditions are met:

- Two minutes of engine run time, idle or driving
- No other faults occur

The Task Manager counts an Alternate Good Trip for a Major Monitor when the monitor runs and passes. Only the Major Monitor that failed needs to pass to count an Alternate Good Trip.

Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the DRBIII®. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 160° F
- Engine coolant temperature must rise by 40° F
- No further faults occur

Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.

CAUTION: Erasing DTCs, either with the DRBIII®; or by disconnecting the battery, also clears all Freeze Frame data.

Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

FUEL SYSTEM

- **Fuel System Similar Conditions Window** — An indicator that 'Absolute MAP When Fuel Sys Fail' and 'RPM When Fuel Sys Failed' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.
- **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.
- **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor must stay below that threshold for a calibrated amount of time.

TASK MANAGER (Continued)

- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 160° F).
- **In Similar Misfire Window** — An indicator that 'Absolute MAP When Misfire Occurred' and 'RPM When Misfire Occurred' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.

Description	Group-Page

Description	Group-Page

Description	Group-Page

Description	Group-Page

Description	Group-Page

SERVICE MANUAL COMMENTS

What errors(s) have you found?

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In order for us to assist you, please include as much details as possible when reporting an error

Comments / Suggestions

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☐ **Dealership Technician**
Dealer Code: __________

Retail Customer ☐

Manual Title, Year, Number and Page: ____________________

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Your Name: ______________________________

Address: ______________________________

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